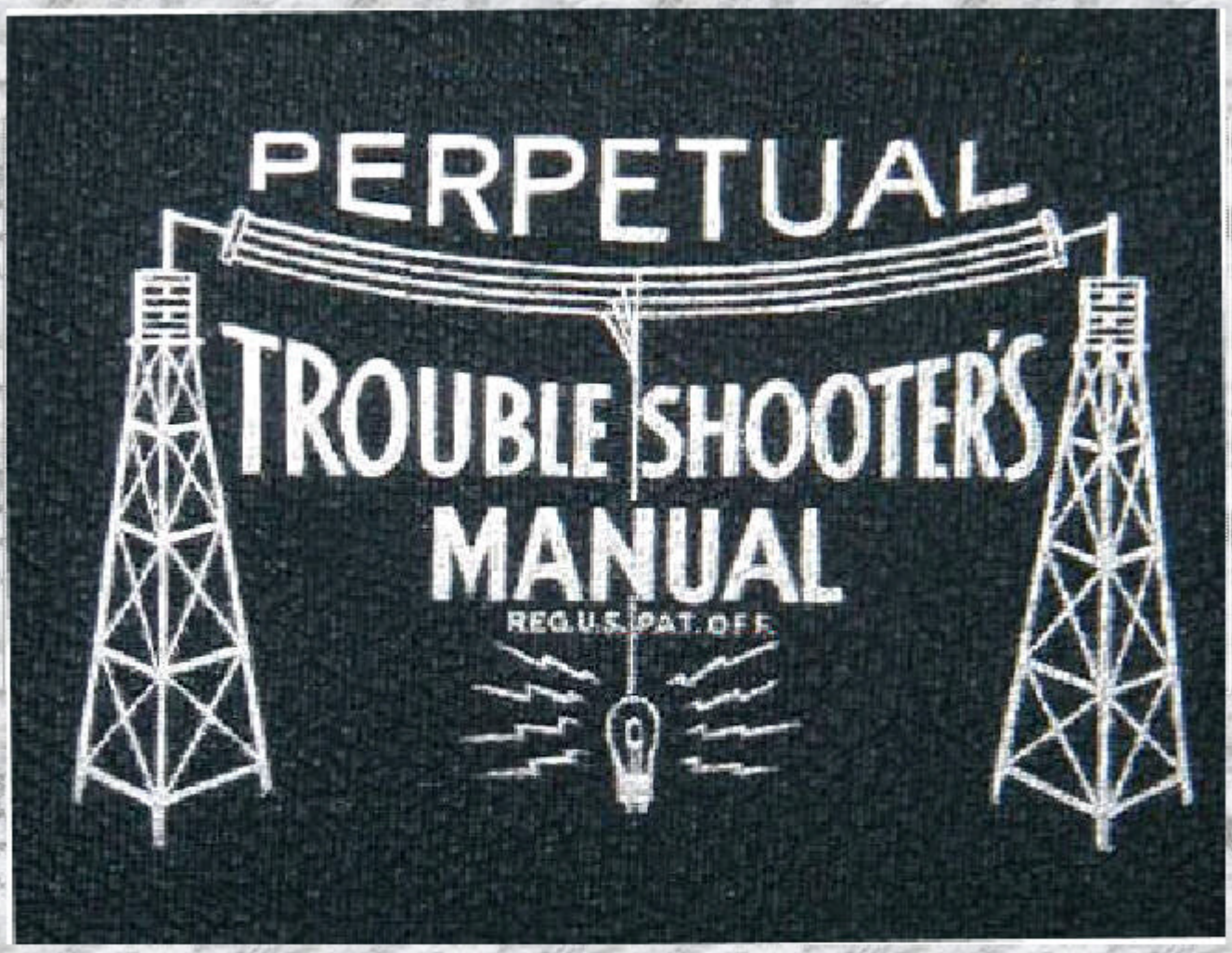
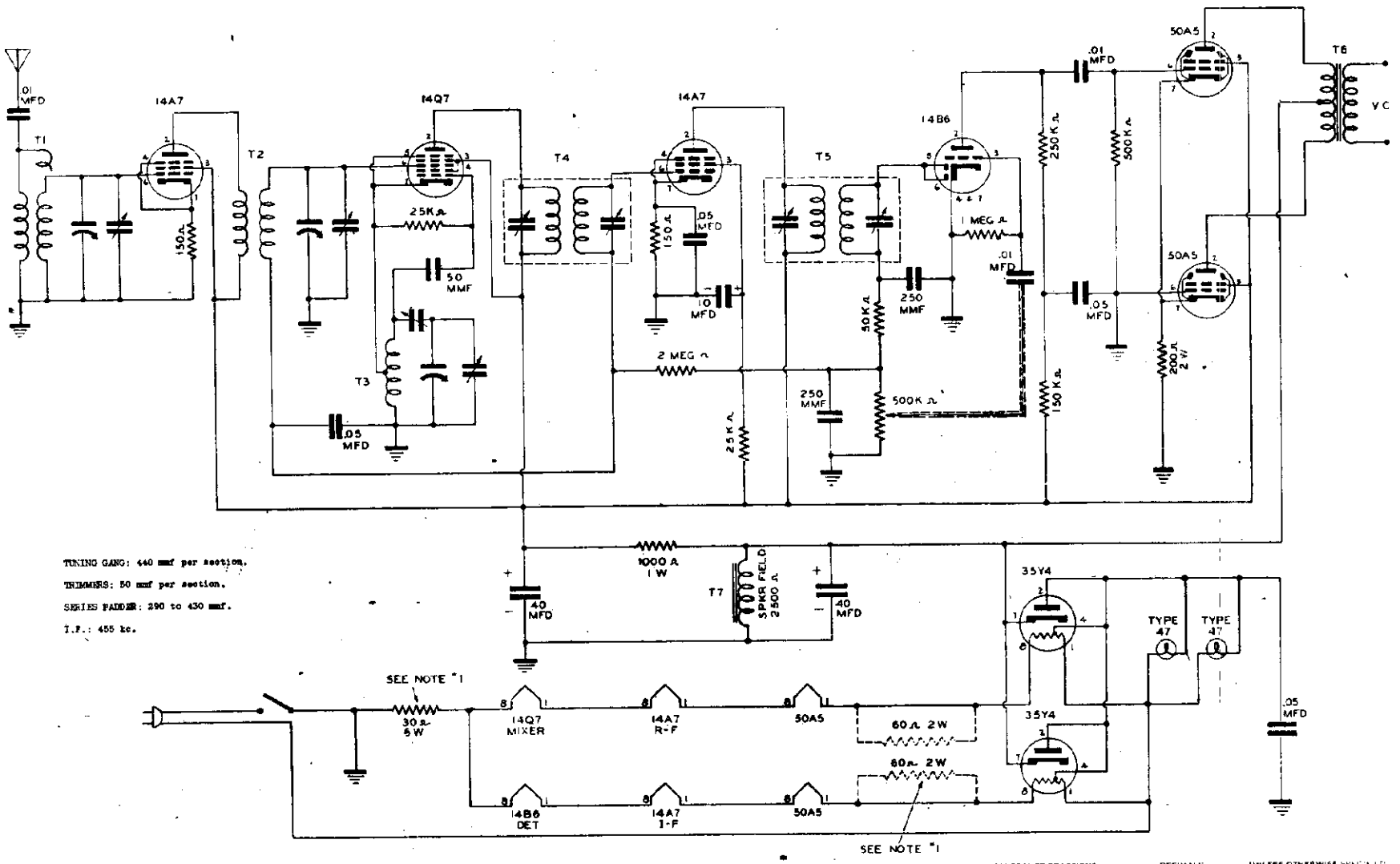
RIDER'S
VOLUME - XV
MISC-RCD



MISC AND RCD

AERMOTIVE EQUIPMENT CORP.



NOTE #1
WHEN 30Ω 5 WATT RESISTOR IS USED IN CIRCUIT FILAMENT, DO NOT USE THE TWO 60Ω 2 WATT RESISTORS.

DIMENSION TOLERANCE FRACTIONS | DECIMALS | UNLESS OTHERWISE SPECIFIED

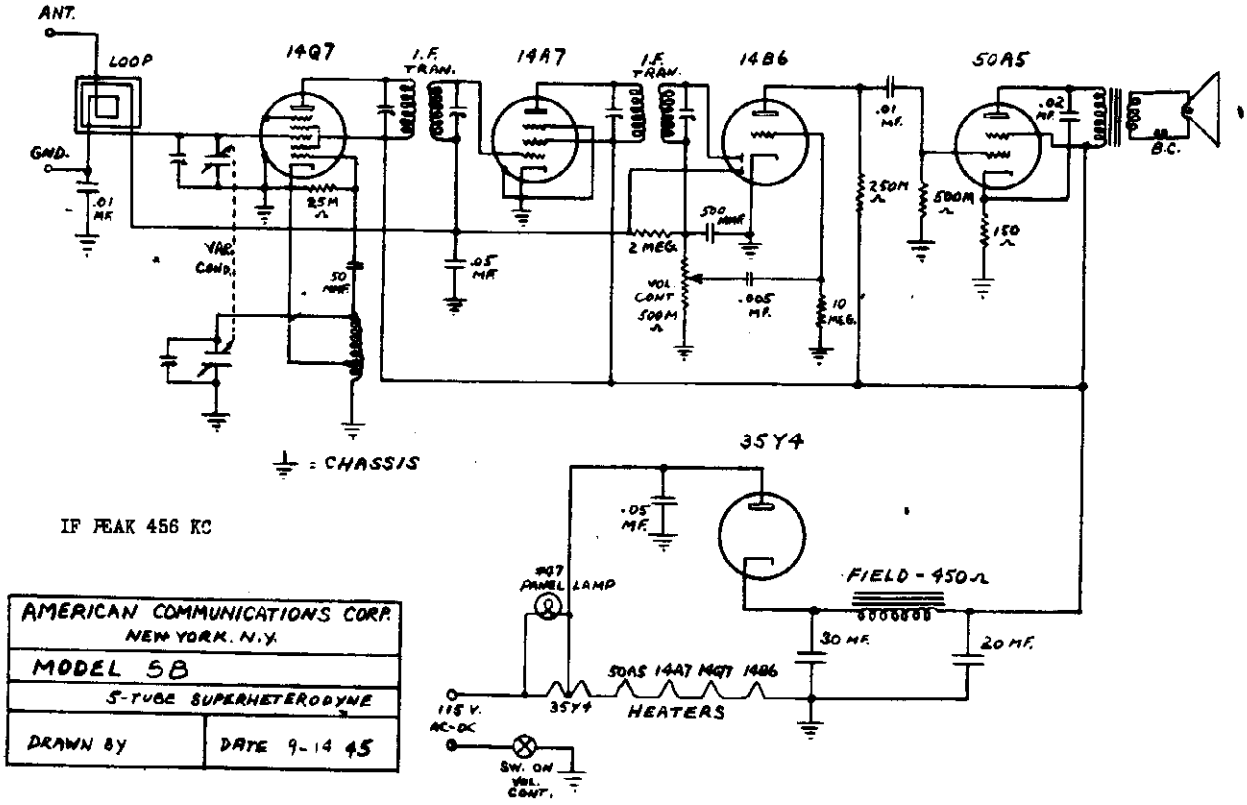
AIR COMMUNICATIONS, INC.
KANSAS CITY MISSOURI

SCHEMATIC DIAGRAM
181 AD RECEIVER

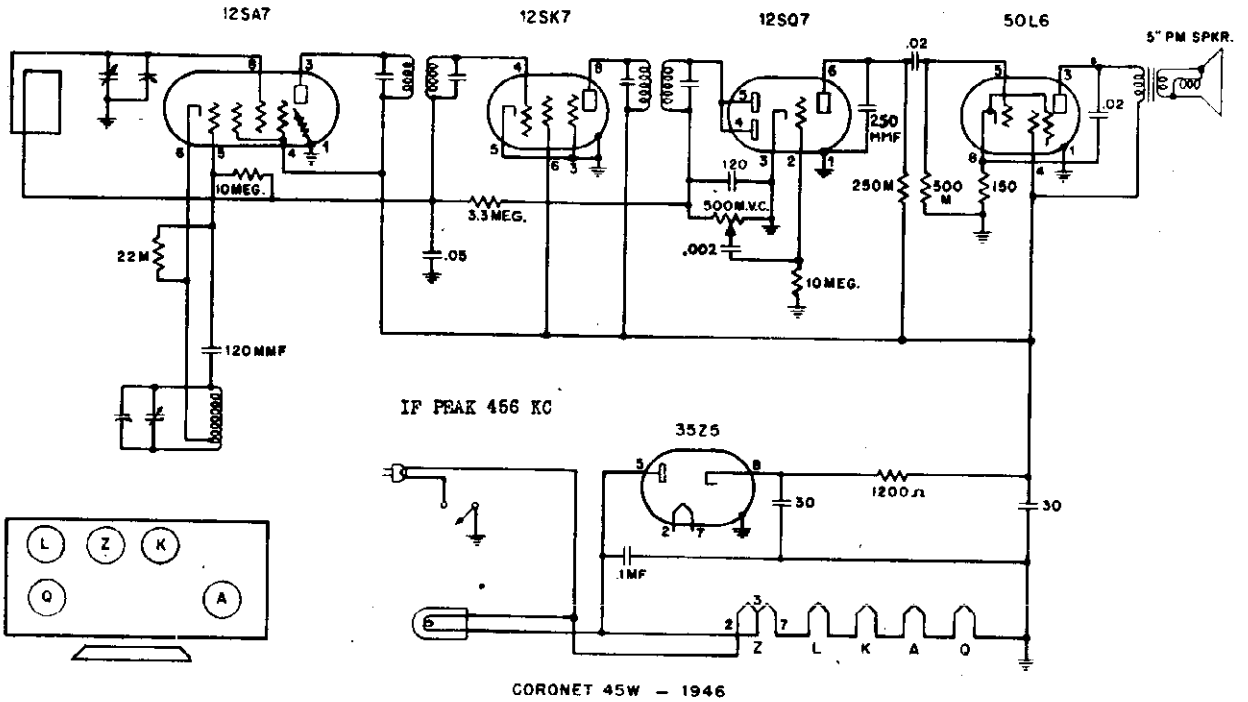
REVISIONS	DRAWN	CHECKED	APPROVED	
B REVISED PER PROD. 1-15-46 C.K.	E.N. 1-21-46			D101 B
A ORIGINAL ISSUE				

MODEL 5B
MODEL 45W

AMERICAN COMMUNICATIONS CORP.
CORONET RADIO & TELEV. CO.

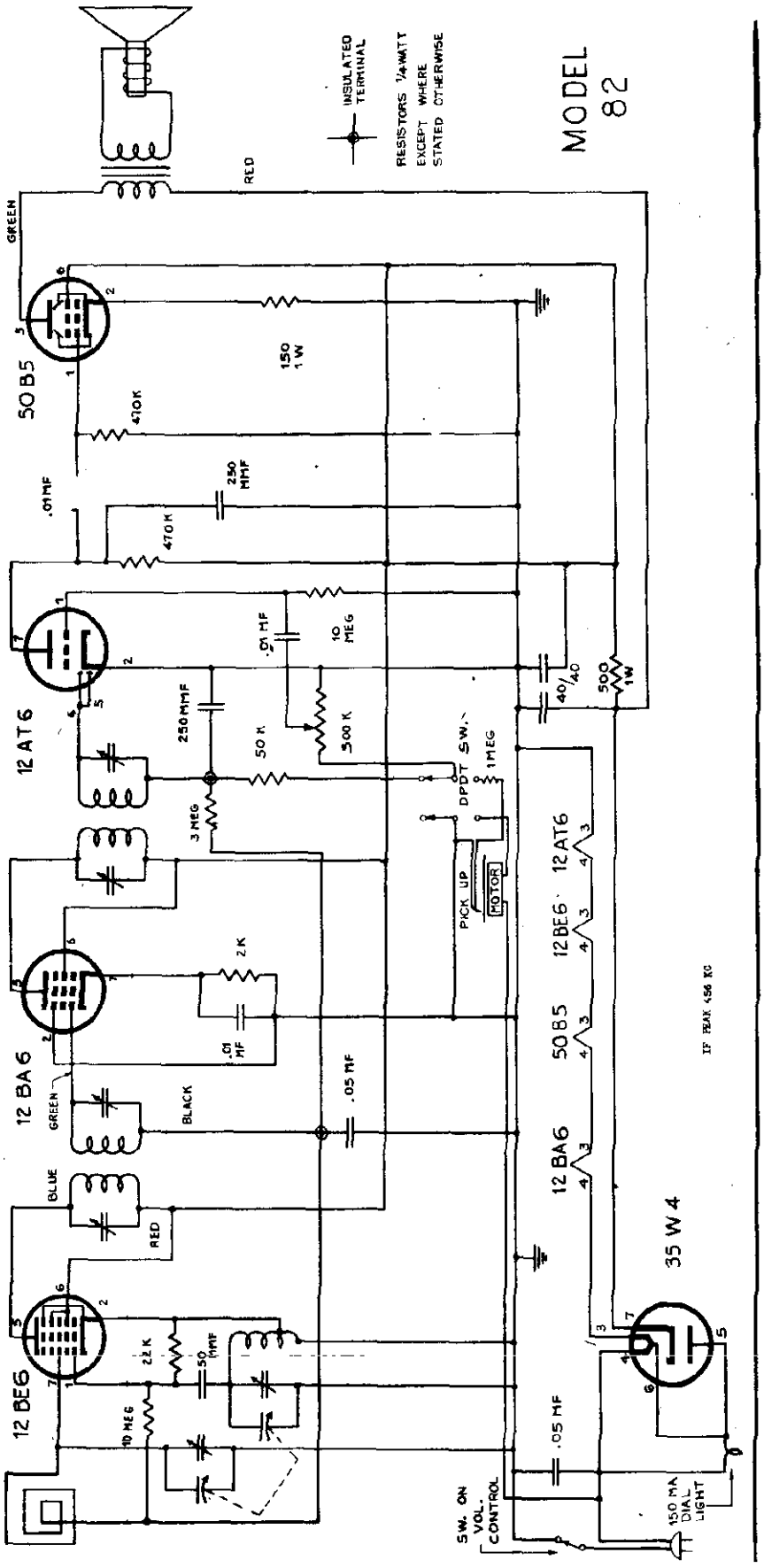


AMERICAN COMMUNICATIONS CORP. NEW YORK, N.Y.	
MODEL 5B	
5-TUBE SUPERHETERODYNE	
DRAWN BY	DATE 9-14 45



CORONET 45W – 1946

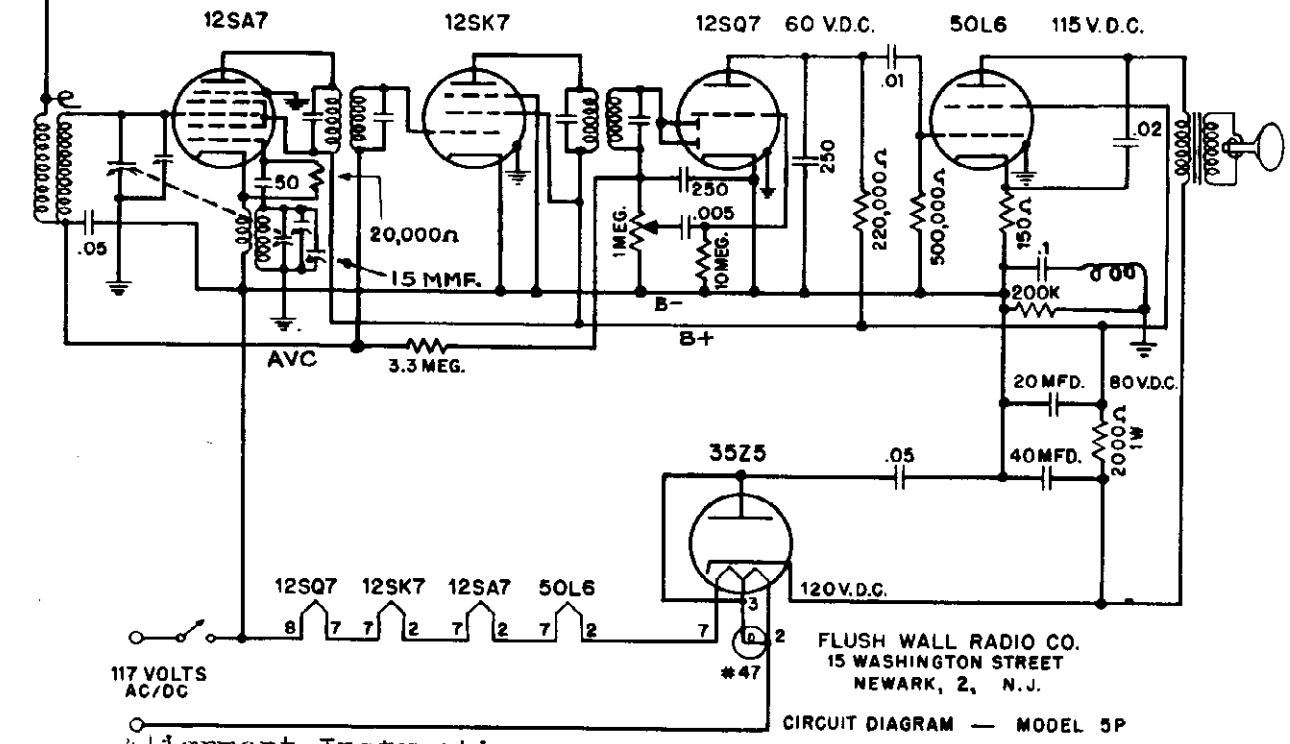
CONTINENTAL ELECTRONICS, LTD.



MODEL 5P

FLUSH WALL RADIO CO.
RENARD RADIO & TELEVISION CORP.

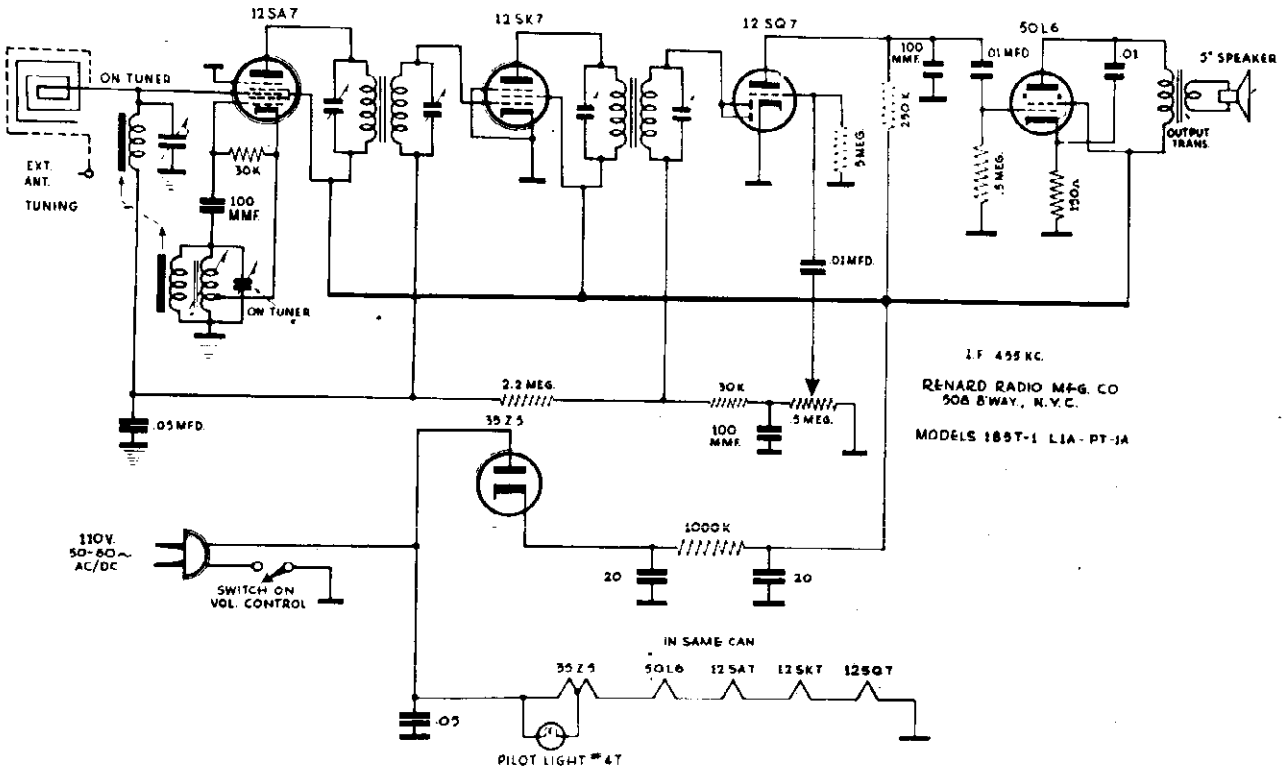
MODELS 1B5T-1, L1A-PT-1A



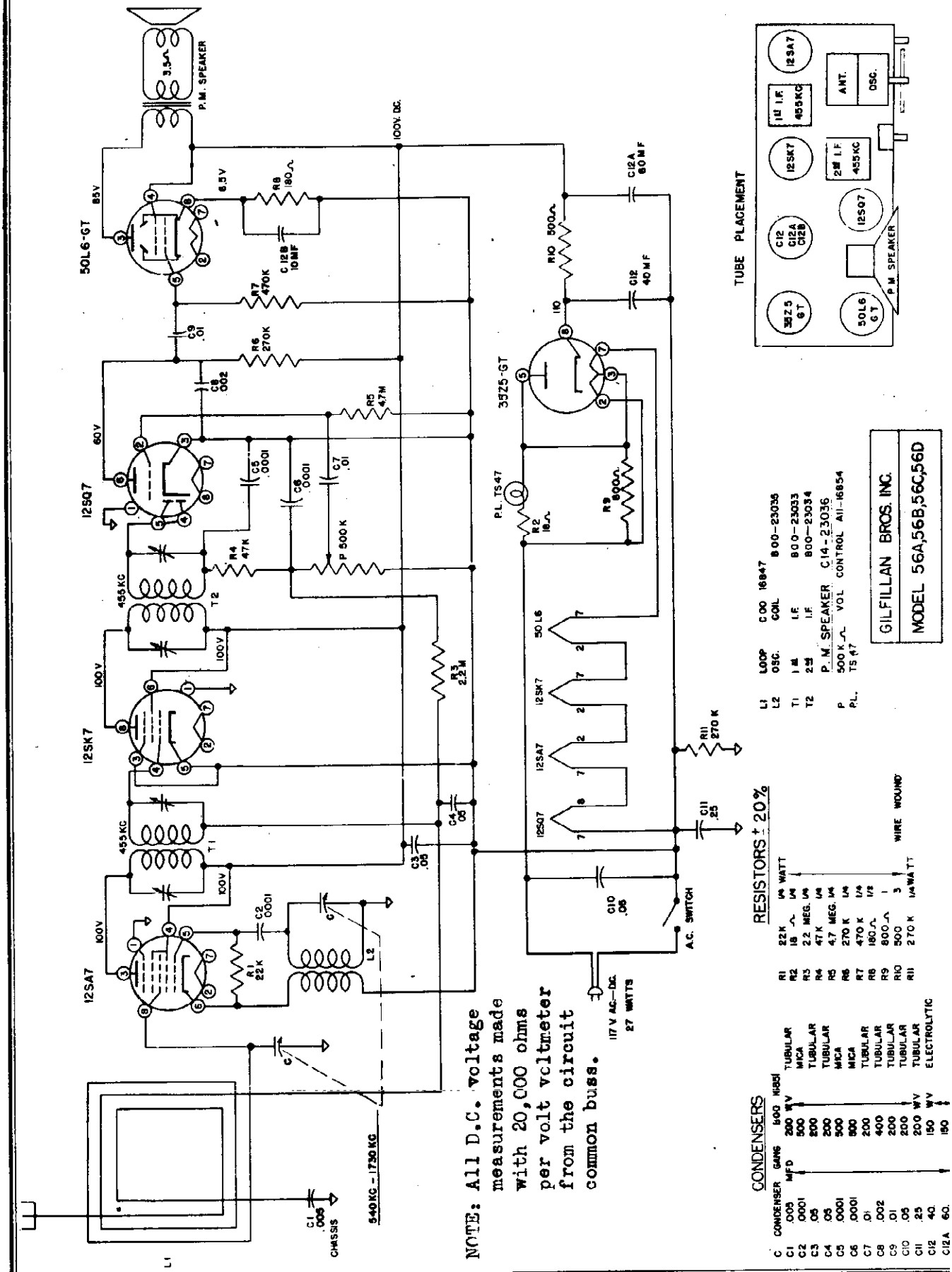
Alignment Instructions

Align I.F's. at 456 K.C., sig. gen. connected to antenna through 50 mmf cond.

Align osc. at 1620 K.C. Set signal generator at 1400 K.C., and align antenna timmer for max. output.



GILFILLAN BROS. INC.



L1 LOOP COIL 800-23035
L2 OSC. COIL 800-23033
T1 1st I.F. 800-23034
T2 2nd I.F.

P. P.M. SPEAKER C14-23036
P.L. T547 500 K VOL CONTROL A11-16854

GILFILLAN BROS. INC.
MODEL 56A,56B,56C,56D

RESISTORS ± 20%

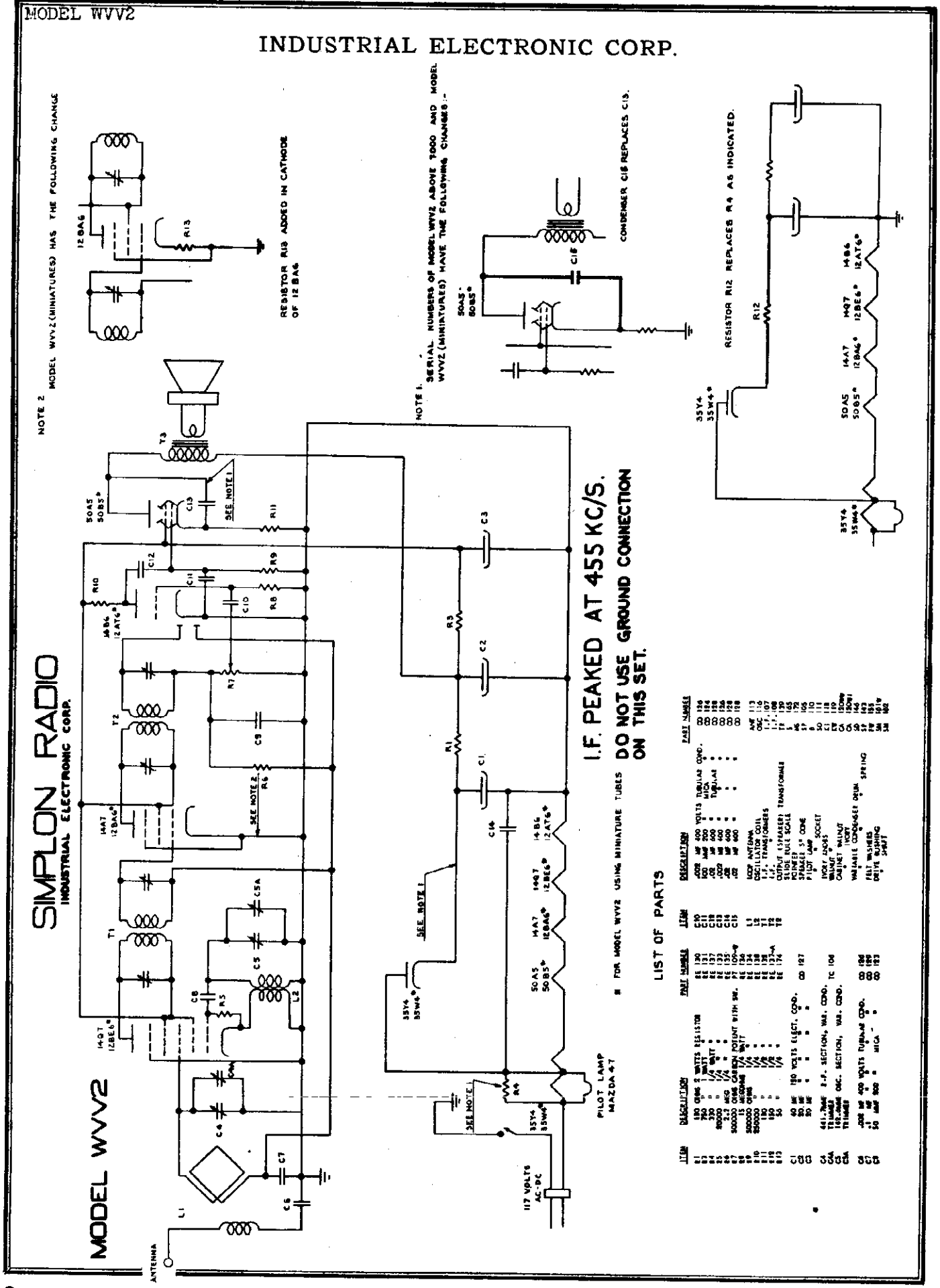
R1	22K	1/4 WATT
R2	18	1/4
R3	2.2 MEG.	1/4
R4	47 K	1/4
R5	4.7 MEG.	1/4
R6	270 K	1/4
R7	470 K	1/2
R8	180	1/2
R9	800	1
R10	500	3 WIRE WOUND
R11	270 K	1/4 WATT

CONDENSERS

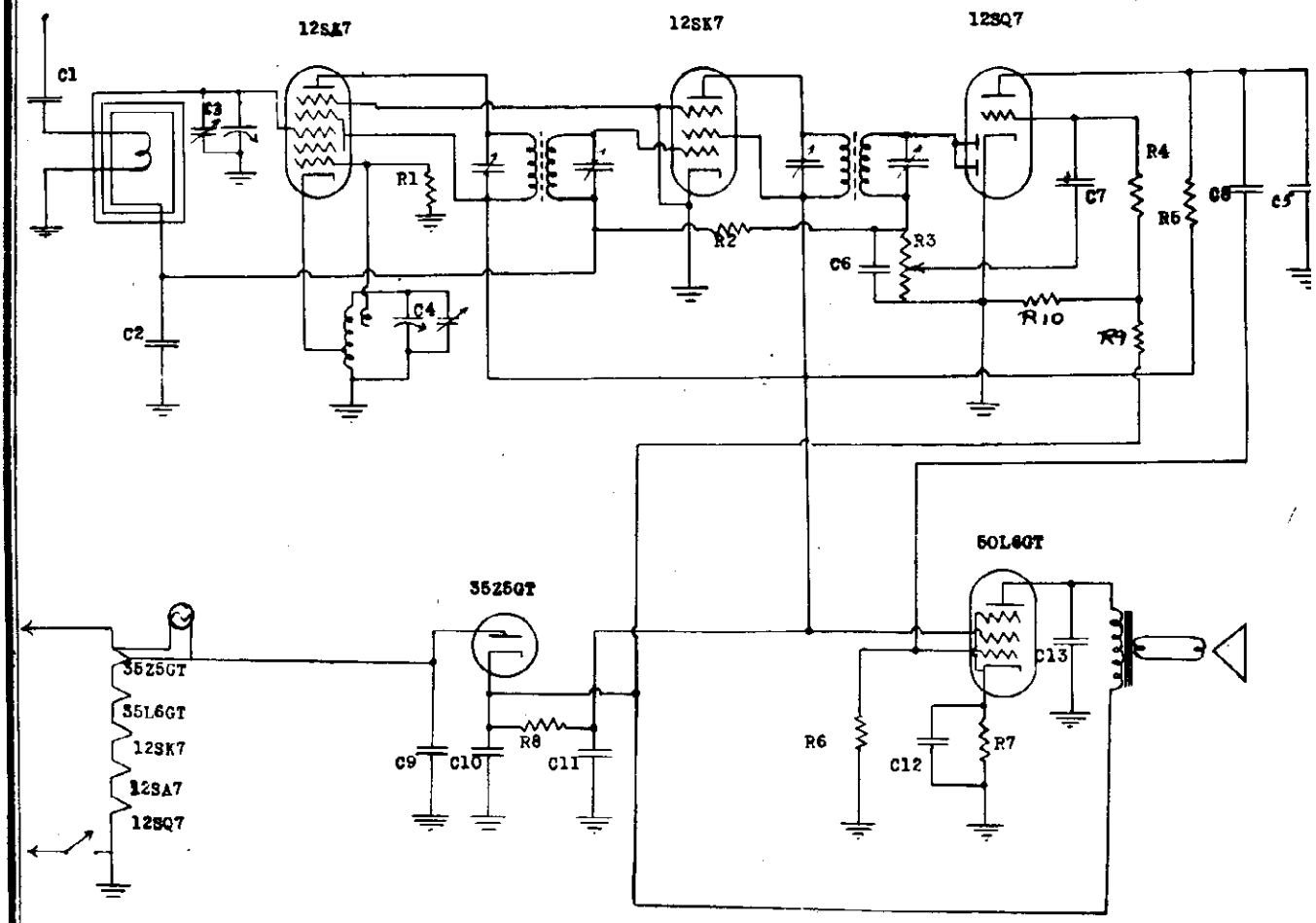
C	CONDENSER	GANG	500 VOLT	
C1	.005	MFD	200 WV	TUBULAR
C2	.0001		500	MICA
C3	.05		200	TUBULAR
C4	.05		200	TUBULAR
C5	.0001		500	MICA
C6	.0001		500	MICA
C7	.01		200	TUBULAR
C8	.002		400	TUBULAR
C9	.01		200	TUBULAR
C10	.05		200	TUBULAR
C11	.25		200 WV	TUBULAR
C12	40		150 WV	ELECTROLYTIC
C12A	60		150	

MODEL WVV2

INDUSTRIAL ELECTRONIC CORP.



KERNWOOD RADIO CORP.



*Voltage analysis

	Filament	Plate	Screen	Cathode
35Z5	35.0	117A.C.		122
50L6	50.0	117	90	7.5
12SQ7	12.6	55		0
12SK7	12.6	90	90	0
12SA7	12.6	90	90	0

Parts List

C1 --- .001 mfd 600 volt paper condenser
C2 --- .05 mfd 400 volt paper condenser
C3 --- Tuning condenser - antenna section
C4 --- " " - oscillator section
C5 --- 100 mmf Mica condenser
C6 --- " " " "
C7 --- .006 mfd 400 volt paper condenser
C8 --- .01 mfd 600 volt paper condenser
C9 .05 mfd 400 " " "
C10 -- 40 mfd 150 volt electrolytic condenser
C11 -- 20 mfd " " " "
C12 -- 10 mfd 35 " " "
C13 -- .02 mfd 400 " paper condenser
R1 --- 22M ohm 1/4 watt carbon resistor
R2 --- 2.2 megohm 1/4 watt carbon resistor
R3 --- .5 " volume control
R4 --- 10 megohm 1/4 watt carbon resistor
R5 --- 220M ohm 1/4 watt carbon resistor
R6 --- 470M " " " " "
R7 --- 150 " " " " "
R8 --- 2200 " " " " "
R9 --- 2.2 megohm 1/4 watt carbon resistor
R10 -- 68M ohm " " " "

Power Supply
110-125 volts A.C. or D.C.

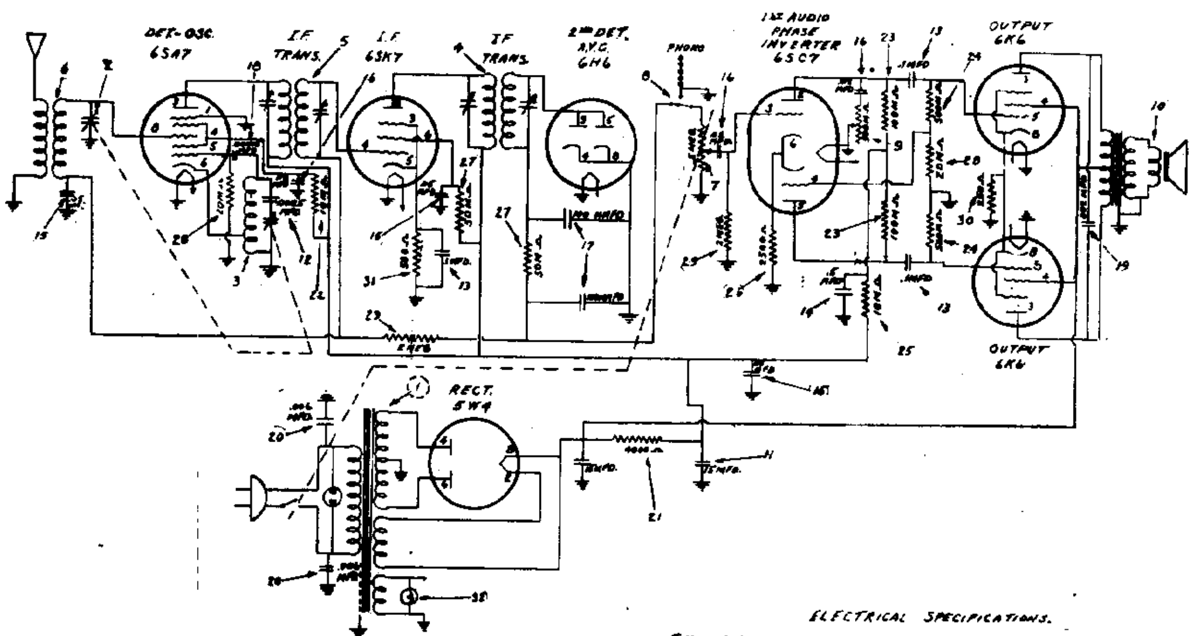
Power Consumption
30 watts

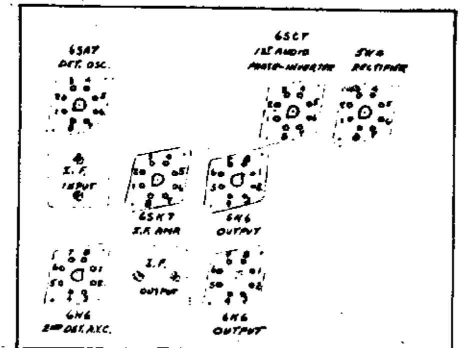
Frequency Range
540-1700 K.C.

*All measurements except A.C. voltages made with V.T.V.M.

IF PEAK 456 KC

KETAY MFG. CORP.





BOTTOM VIEW OF CHASSIS

NORMAL VOLTAGE READINGS

TUBE	CIRCUIT	1	2	3	4	5	6	7	8
		TERMINALS OF SOCKETS							
6K6	OUTPUT	—	0	280V. D.C.	280V. D.C.	0	—	6.3V AC	16 V. D.C.
6H6	2ND DET. AVC.	0	0	0	0	0	—	6.3V AC	0
6SA7	I.F. AMP.	0	0	3V A.C.	0	3V A.C.	100V. D.C.	6.3V AC	130V. D.C.
6SA7	DET. OSC.	0	0	130V. D.C.	85V. D.C.	0	0	6.3V AC	0
6SC7	1ST AUDIO PHASE INVERTER	0	135V A.C.	0	0	135V. D.C.	1.5V D.C.	0	6.3V A.C.
5W4	RECTIFIER	0	[illegible]	—	300V A.C.	—	300V. A.C.	275V D.C.	[illegible]

1- ALL READINGS TAKEN WITH RECEIVER O.N., ANTENNA GROUNDED TO CHASSIS (NO SIGNAL)
2- USE A LINE VOLTAGE OF 115 VOLTS OR MAKE ALLOWANCE FOR VARIATIONS.
3- USE A GOOD HIGH RESISTANCE VOLTMETER HAVING A RESISTANCE OF AT LEAST 1000 OHMS PER VOLT.
4- TAKE ALL D.C. READINGS ON THE 500 VOLT SCALE.
5- READ FROM INDICATED TERMINALS TO CHASSIS BASE.
6- SEE LOCATION CHART ABOVE FOR POSITION OF TERMINALS

ELECTRICAL SPECIFICATIONS.

TYPE OF CIRCUIT - SUPERHETERODYNE WITH A.V.C. AND PUSHPULL OUTPUT.
POWER SUPPLY - 115 VOLTS 50-60 CYCLES 60 WATTS
INTERMEDIATE FREQUENCY - 456 K.C.
TUNING RANGE - 535 K.C. TO 1700 K.C.
OUTPUT - 5 WATTS
TUBES USED - ONE 6SA7 DET. OSC., ONE 6SK7 I.F. AMP., ONE 6H6 2ND DET. AVC., ONE 6SC7 1ST AUDIO & PHASE INVERTER, TWO 6K6 PUSHPULL OUTPUT, ONE 5W4 RECTIFIER.

ALIGNMENT OF COMPENSATORS.

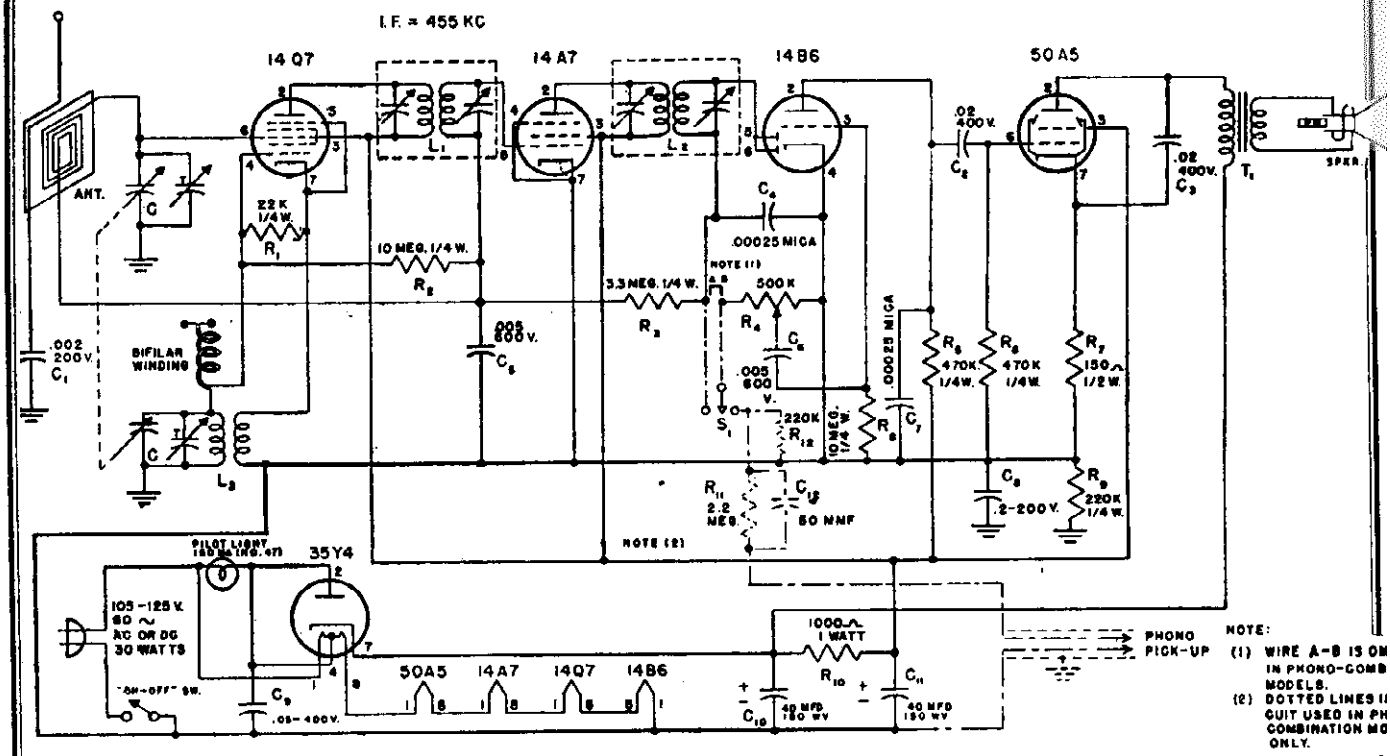
1- CONNECT SIGNAL GENERATOR TO ANTENNA LEAD THRU A .0001 MFD CONDENSER TURN VOLUME CONTROL TO FULL VOLUME POSITION. TURN TONE CONTROL TO TREBLE POSITION. CONNECT OUTPUT METER ACROSS VOICE COIL OF SPEAKER. THE OUTPUT METER SHOULD HAVE A 0-10 VOLT AC. RANGE.
2- SET SIGNAL GENERATOR TO 456 K.C. ADJUST I.F. TRIMMERS TO MAX. OUTPUT DURING THIS OPERATION READJUST OUTPUT OF SIGNAL GENERATOR TO MAINTAIN METER READING NEAR CENTER OF SCALE OR HIGHER, AS TOO LOW AN OUTPUT METER READING MAY NOT ALLOW ACCURATE MAX. TO BE OBTAINED.
3- SET SIGNAL GENERATOR TO 1700 K.C. TUNE SET TO HIGH FREQUENCY END THIS SHOULD LEAVE THE VARIABLE CONDENSER PLATES COMPLETELY UNMESHED. ADJUST OSCILLATOR TRIMMER TO THIS FREQUENCY. RESET SIGNAL GENERATOR TO 1200 K.C. ADJUST OSCILLATOR & R.F. TRIMMERS TO MAX. OUTPUT. THE SET SHOULD NOW TRACK PROPERLY.
4- THE OSCILLATOR CONDENSER END PLATES HAVE BEEN BENT AT THE FACTORY TO GIVE 1700 KC. COVERAGE AND TO INSURE CORRECT TRACKING. THESE PLATES NORMALLY WILL NOT REQUIRE ADJUSTMENT. HOWEVER IF THEY HAVE BEEN DISTURBED THROUGH HANDLING THEY WILL REQUIRE TOUCHING UP DURING ALIGNMENT.

PARTS LIST

No.	DESCRIPTION	PART No.
1	TRANSFORMER - POWER	A-10410
2	CONDENSER - VARIABLE	A-10411
3	OSCILLATOR COIL	A-10416
4	I.F. COIL - OUTPUT	A-10418
5	I.F. COIL - INPUT	A-10417
6	ANT. COIL	A-10419
7	POTENTIOMETER (VOLUME & A.C. SWITCH)	A-10420-1
8	ROTARY TOGGLE SWITCH (S.P.D.T.	A-10421
9	POTENTIOMETER (TONE)	A-10420-2
10	SPEAKER	A-10422
11	CONDENSER - DUAL 15 MFD ELECT.	A-10430
12	CONDENSER .0025 MFD. MICA	A-10445-9
13	CONDENSER .1 MFD 400V. - PAPER	A-10445-1
14	CONDENSER .5 MFD 400V. - PAPER	A-10445-2
15	CONDENSER .05 MFD 400V. - PAPER	A-10445-3
16	CONDENSER .02 MFD. 400V. - PAPER	A-10445-4
17	CONDENSER .0001 MFD. MICA-MOLDED	A-10445-5
18	CONDENSER .0006 MFD MICA-MOLDED	A-10445-6
19	CONDENSER .002 MFD. - 600V. PAPER	A-10445-7
20	CONDENSER .006 MFD. 400V. PAPER	A-10445-8
21	RESISTOR - 4000 OHM 2W	A-10446-1
22	RESISTOR - 10M OHM 1W	A-10446-12
23	RESISTOR - 100M OHM 1/2 W	A-10446-2
24	RESISTOR - 500M OHM 1/2 W	A-10446-9
25	RESISTOR - 10M OHM 1/2 W	A-10446-3
26	RESISTOR - 2500 OHM 1/2 W	A-10446-11
27	RESISTOR - 50M OHM 1/2 W	A-10446-4
28	RESISTOR - 20M OHM 1/2 W.	A-10446-10
29	RESISTOR - 2 MEG OHM 1/2 W	A-10446-7
30	RESISTOR - 250 OHM 1W.	A-10446-5
31	RESISTOR - 500 OHM 1/2 W.	A-10446-6
32	PILOT LIGHT #40	A-10436
	KNOB	A-10405
	KNOB	A-10406
	TUBE SOCKET	A-10415
	DIAL, ESCUTCHEON & LIGHT SOCKET	A-10403

MODELS 651,653,6541, 6547,6545,6560

W. T. KNOTT CO.



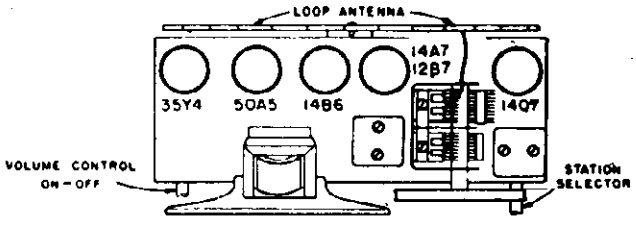
Alignment Procedure:

Steps	Connect output of oscillator to	Tune osc. to	Tune radio dial to	Adjust the following for max. peak output
1.	Tuning condenser stator (ant.) in series with .01 mfd.	455	Quiet point at high frequency end of dial.	1st and 2nd I. F. Transformers
2.	Antenna term. of Ant. loop in series with 100 mmf.	1720	Full clockwise (out of mesh)	Osc. trimmer
3.	Antenna term. of Ant. loop in series with 100 mmf.	1500	1500	Ant. trimmer

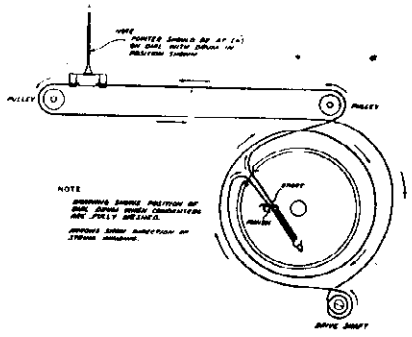
Output meter is connected across voice coil. Receiver volume is turned to maximum.

Tube Complement:

1 Type 14Q7—Oscillator—Converter.
1 Type 14A7—I. F. Amplifier.
1 Type 14B6—Det. A.V.C. and Amp.
1 Type 50A5—Power Amp.
1 Type 35Y4—Rectifier.



Nylon cord of the tuning and dial system may be replaced by following the diagram below.



Parts List:

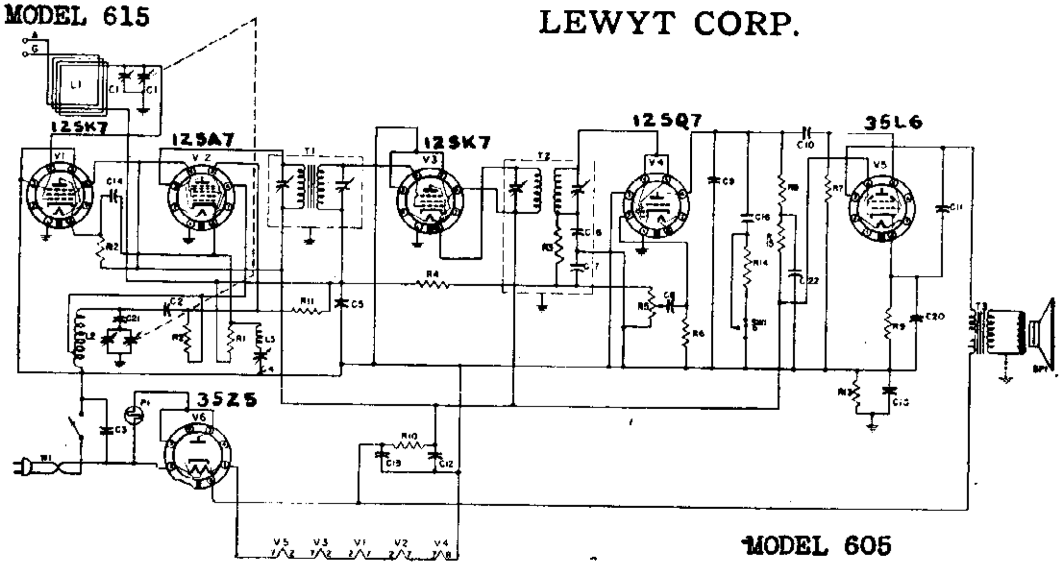
C —Two gang variable cond. with trimmers.	C-6.032	R 1—22K, ½W, 20%		
C 1—.002 Mfd., 200V paper		R 2—10 meg, ½W, 20%		
C 2—.02 Mfd., 400V paper		R 3—3.3 meg, ½W, 20%		
C 3—.02 Mfd., 400V paper		R 4—500K variable, audio taper, with SPST	A-9.066	
C 4—.00025 Mfd., mica		R 5—470K, ½W, 20%	L 1—Transformer, IF input, 455KC	C-2.191-1
C 5—.005 Mfd., 600V paper		R 6—470K, ½W, 20%	L 2—Transformer, IF output 455KC	C-2.191-2
C 6—.005 Mfd., 400V (or 600V) paper		R 7—150 ohms, ½W, 10%	L 3—Coil, oscillator	B-2.193
C 7—.00025 Mfd., mica		R 8—10 meg. ½W, 20%	Antenna, loop	B-5.006
C 8—.25 Mfd. (or .20 Mfd.), 200V paper		R 9—220K, ½W, 20%	Loudspeaker, PM, 5", Transformer to match 50A5	B-11.037
C 9—.05 Mfd., 400V, molded bakelite		R10—1000 ohms, 2W (or 1W), 20%		
C10, 11—Dual 40 Mfd., 150V	A-25.019	*R11—2.2 meg, ½W, 20%	Pilot light, Mazda No. 47, 150 Ma.	
*C12—50 Mmf., 20%		*R12—220K, ½W, 20%	* Used in phono combinations only.	

NOTE: TRIMMERS MAY BE LOCATED ON EITHER LONG OR SHORT SIDE OF VARIABLE CONDENSER.

Record Changer: Seeburg Model K

MODEL 605
MODEL 615

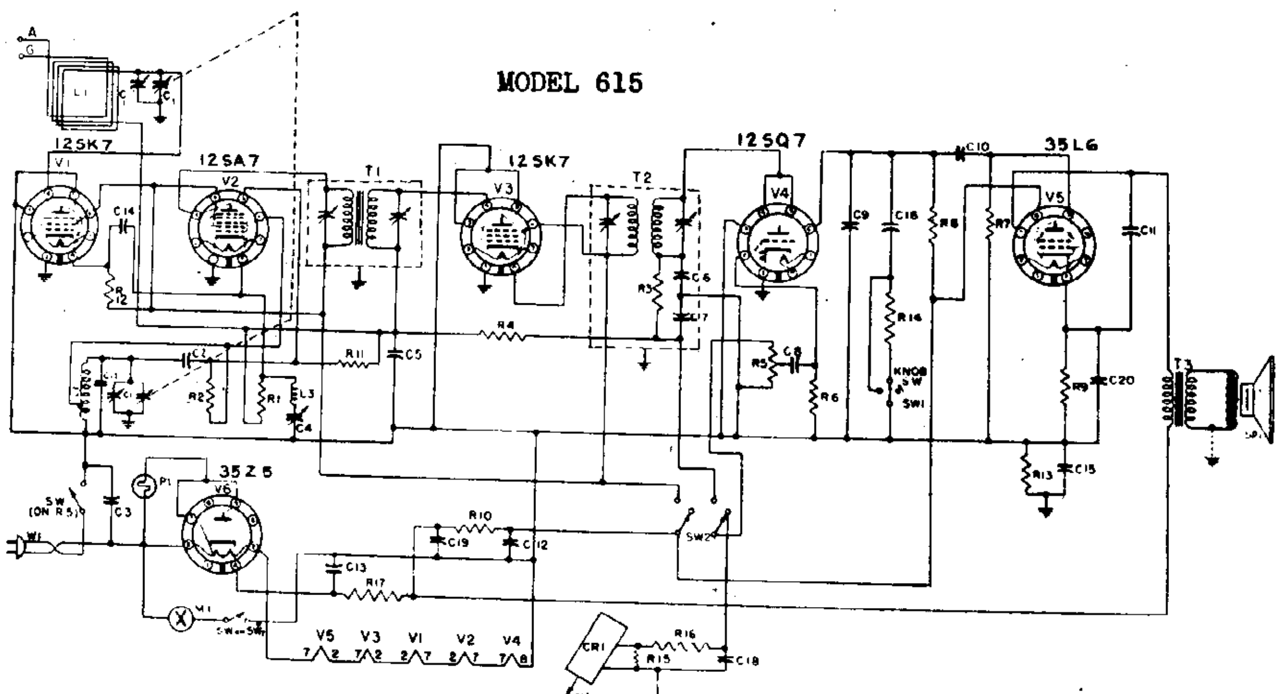
LEWYT CORP.



MODEL 605

	1	C22	5UF ±10 % 200V
	1	R15	47KΩ ±20% 1/4 W
W3L	1	SP1	4 1/2" PM SPEAKER
[illegible]	1	W1	LINE CORD
	1	T3	OUTPUT TRANS.
W19	1	T2	I. F. OUTPUT TRANS.
W21	1	T1	I. F. INPUT TRANS.
			[illegible]
			LIST OF MATERIALS

MODEL 615



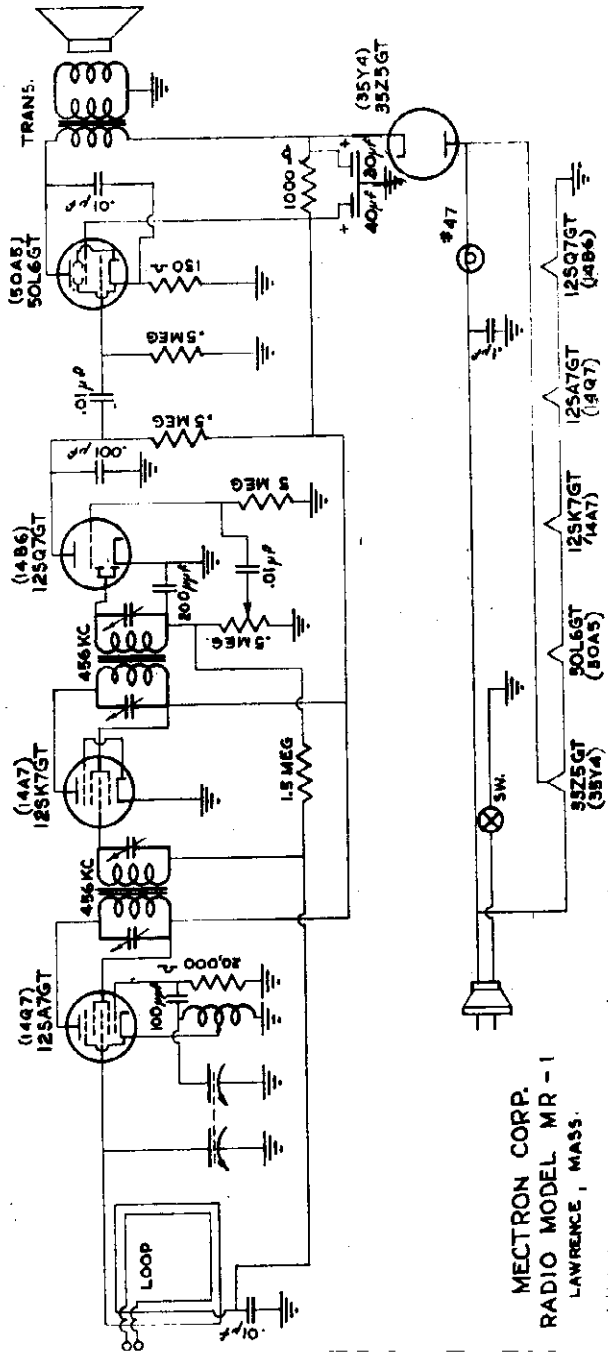
W19	1	T2	I.F. OUTPUT TRANS.
W21	1	T1	I.F. INPUT TRANS.
W70	1	SW1	1 POLE, 3 POSITION
X123	1	SP1	6" PM SPEAKER
	1	R17	330 Ω ±20% 2 W.
	1	R16	1 MEG. ±20% ½ W.
	1	R15	2.2 MEG. Ω ±20% ½ W.
	1	R14	47 K Ω ±20% ½ W.
	1	R13	470 K Ω ±20% ½ W.
	1	R12	.4700 Ω ±20% ½ W.
	1	R11	18 MEG. ±20% ½ W.
	1	R10	1500 Ω ±20% 1 W.
	1	R9	150 Ω ±20% ½ W.
	1	R8	0.22 MEG. ±20% ½ W.
	1	R7	0.47 MEG. ±20% ½ W.
	1	R6	4.7 MEG. ±20% ½ W.
W4 ITEM 5	1	R5	0.5 MEG. V.C. & SW.
	1	R4	22 MEG. ±20% ½ W.
	1	R3	(SEE T2 DWG. W19)
	1	R2	22 K ±20% ½ W.
	1	R1	100 K ±20% ½ W.

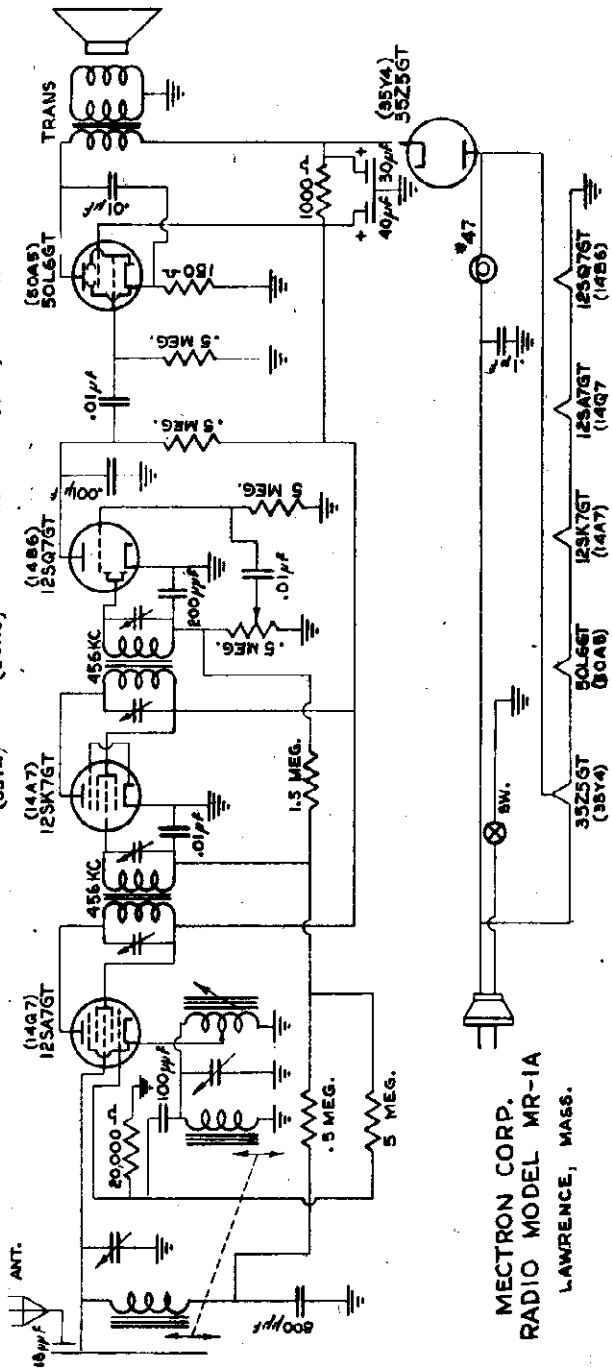
	1	P1	.15 A PILOT BULB #47
W80	1	M1	RECORD CHANGER
W20	1	L2	COIL, OSC
X75	1	L1	LOOP
W81	1	CR1	CRYSTAL PICKUP
	1	C20	20 µf +100% -20 [illegible] ELEC. FILTER
	1	C19	40 µf +100% -20 [illegible] ELEC. FILTER
	1	C18	50 µµf ±20, 200V. MICA
	1	C17	10 µµf ±20, 200V.
	1	C16	.005 µf +40 -20 600V.
	1	C15	0.1 µf +40 -20 200V.
	1	C14	100 µµf ±20 200V.
	1	C11	.005 µf +40 -20 600V.

	1	C10	.005 µf +40 -20 600V.
	1	C9	250 µµf +40 -20 200V. MICA
	1	C8	.005 µf +40 -20 600V.
	1	C7	(SEE T2 DWG. W19)
	1	C6	(SEE T2 DWG. W19)
	1	C5	.01 µf +40 -20 200V.
W72	1	C4 L3	I. F. TRAP.
	1	C3	.05 µf +40 -20 400V.
	1	C2	150 µµf ±20, 200V. MICA
W23	1	C1	TUNING CAPACITOR
W6	1	C13	50 µf ELEC. FILTER
ITEM 2	1	C12	30 µf ELEC. FILTER
DR. OR PART NO.	QTY.	REF. NO.	DESCRIPTION
LIST OF MATERIALS			

Record Changer: For Model 615, Webster 56

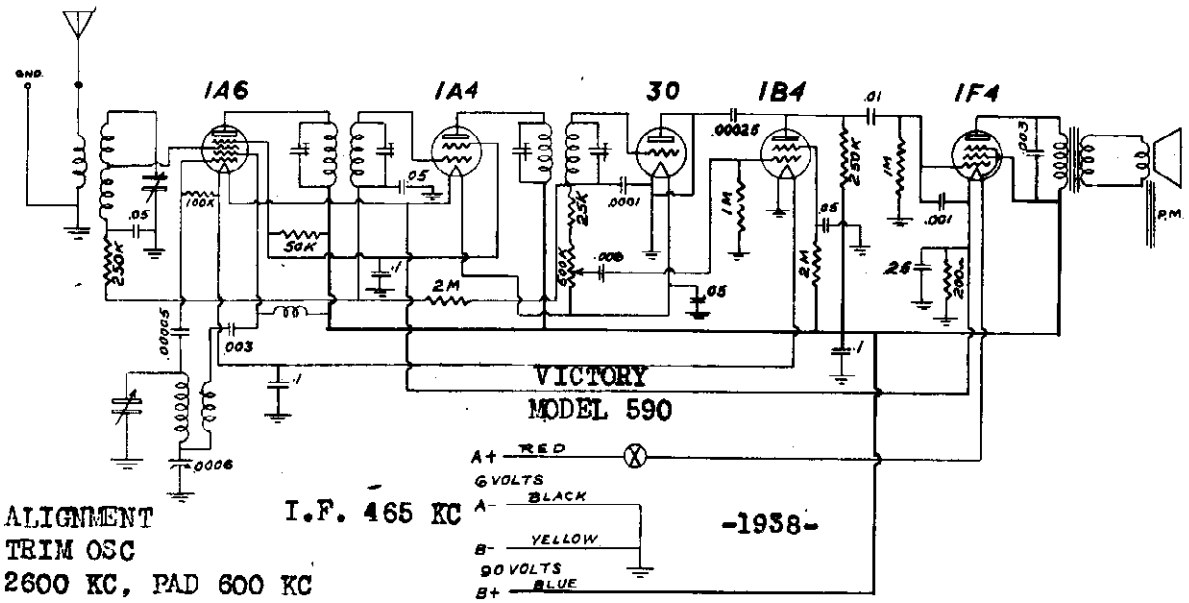
MECTRON CORP.





MODEL 590, Victory

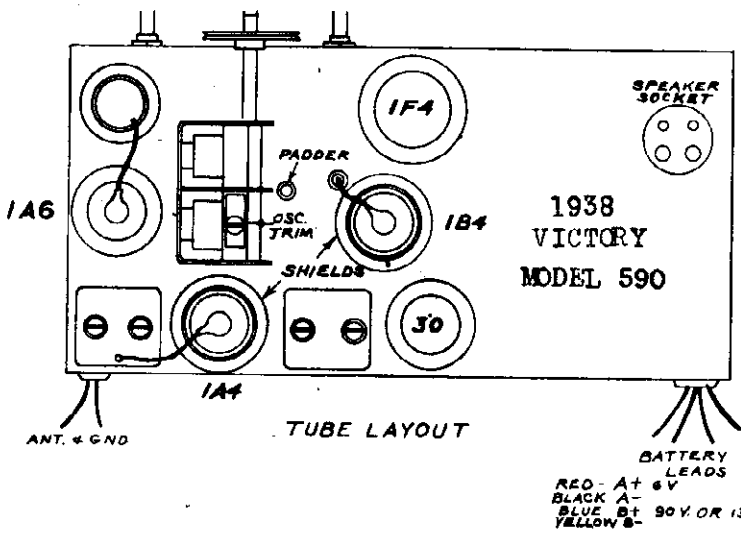
PARKER MCCRORY



ALIGNMENT
TRIM OSC
2600 KC, PAD 600 KC

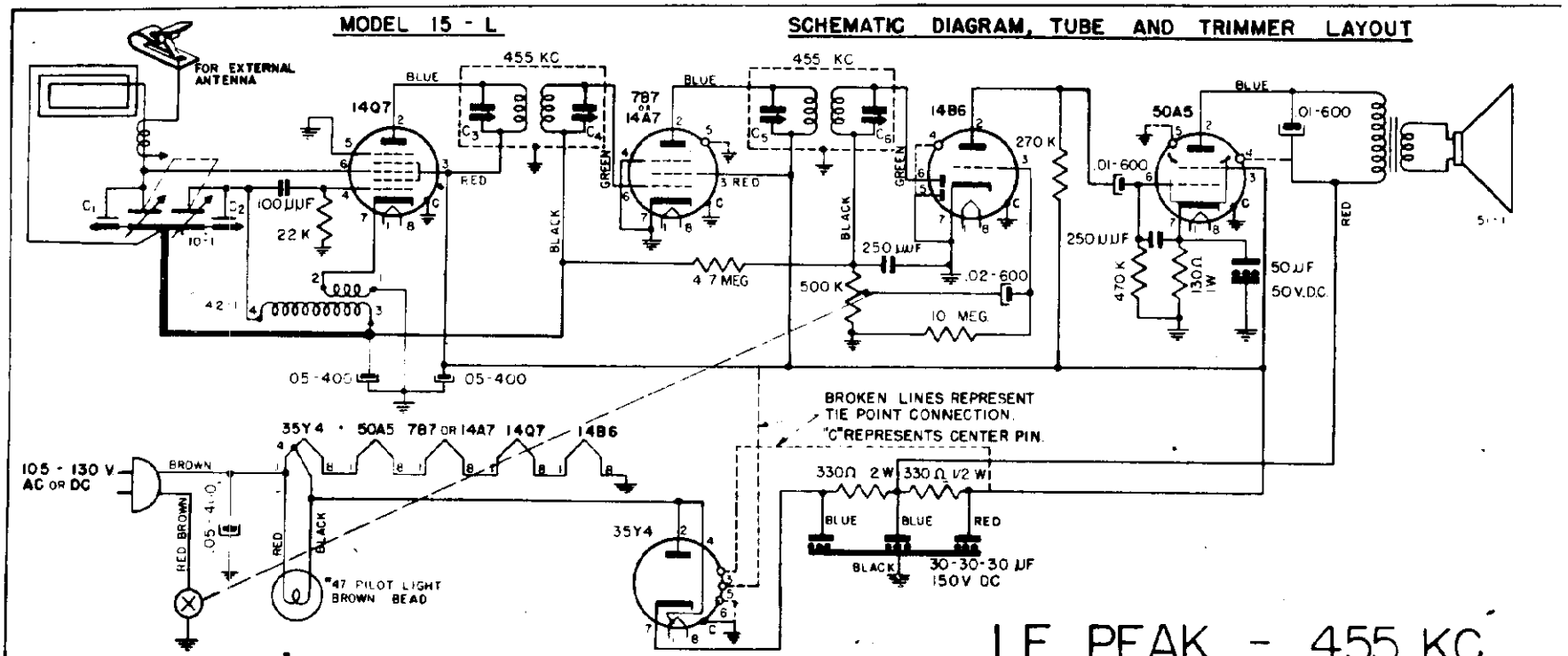
I.F. 465 KC

-1938-

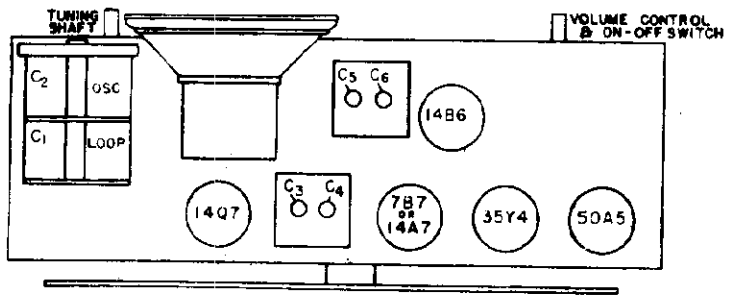


MODEL 15 - L

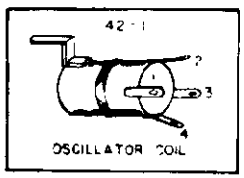
SCHEMATIC DIAGRAM, TUBE AND TRIMMER LAYOUT



IF PEAK - 455 KC



TOP VIEW OF CHASSIS
SHOWING POSITION OF TUBES AND TRIMMERS

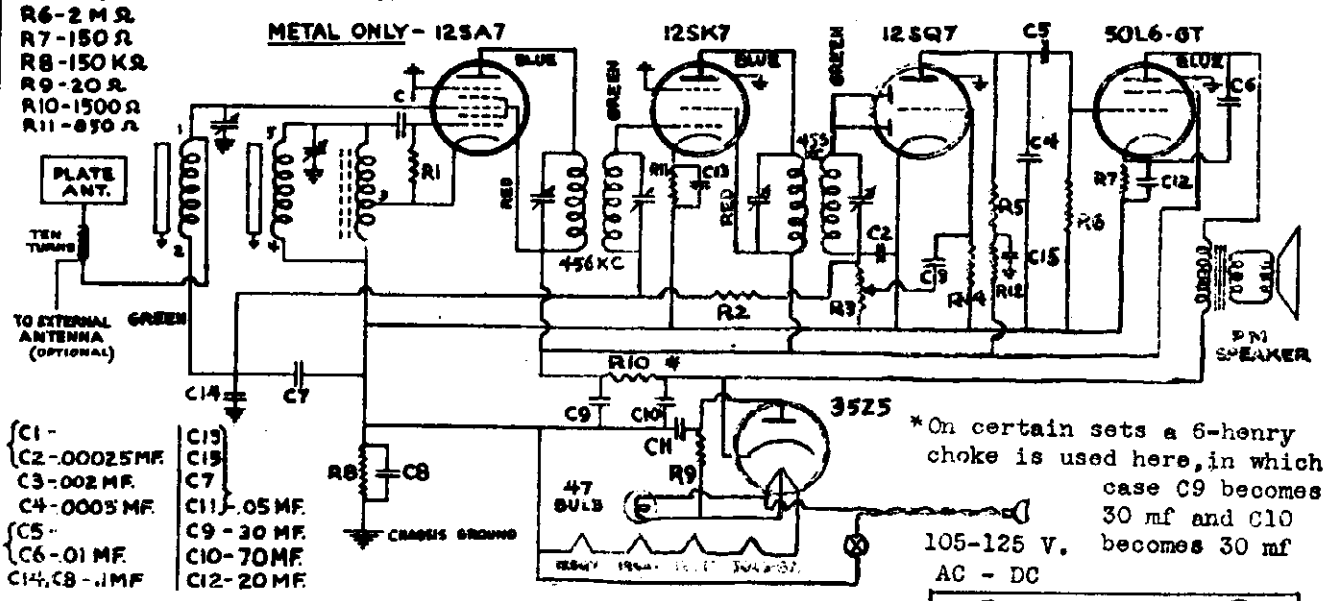


NOTE: ALL RESISTORS 1/4 WATT UNLESS OTHERWISE SPECIFIED

MODEL 501A

PROMENETTE RADIO & TELEV. CORP.

R1 - 20K Ω
R2 - 2M Ω
R3 - 500K Ω POT.
R4 - 470K Ω
R6 - 2 M Ω
R7 - 150 Ω
R8 - 150 KΩ
R9 - 20 Ω
R10 - 1500 Ω
R11 - 850 Ω
R5 - 1M Ω
R12 - 40K Ω



C1 -
C2 - .00025 MF.
C3 - .002 MF.
C4 - .0005 MF.
C5 -
C6 - .01 MF.
C14, C8 - .1 MF
C13
C15
C7
C11 - .05 MF.
C9 - 30 MF.
C10 - 70 MF.
C12 - 20 MF.

*On certain sets a 6-henry choke is used here, in which case C9 becomes 30 mf and C10 becomes 30 mf

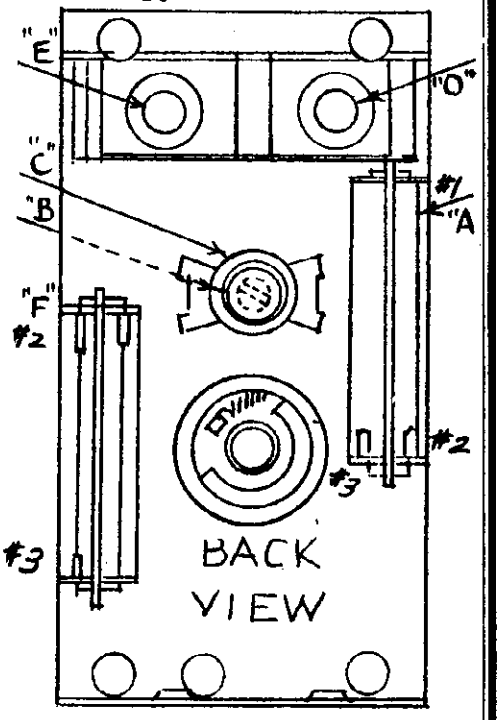
ALIGNMENT

Set volume control at maximum. Connect -B of chassis to ground post of signal generator through a 1-mf condenser. Connect output meter across output transformer secondary.

Dummy antenna --- 250-mmf condenser

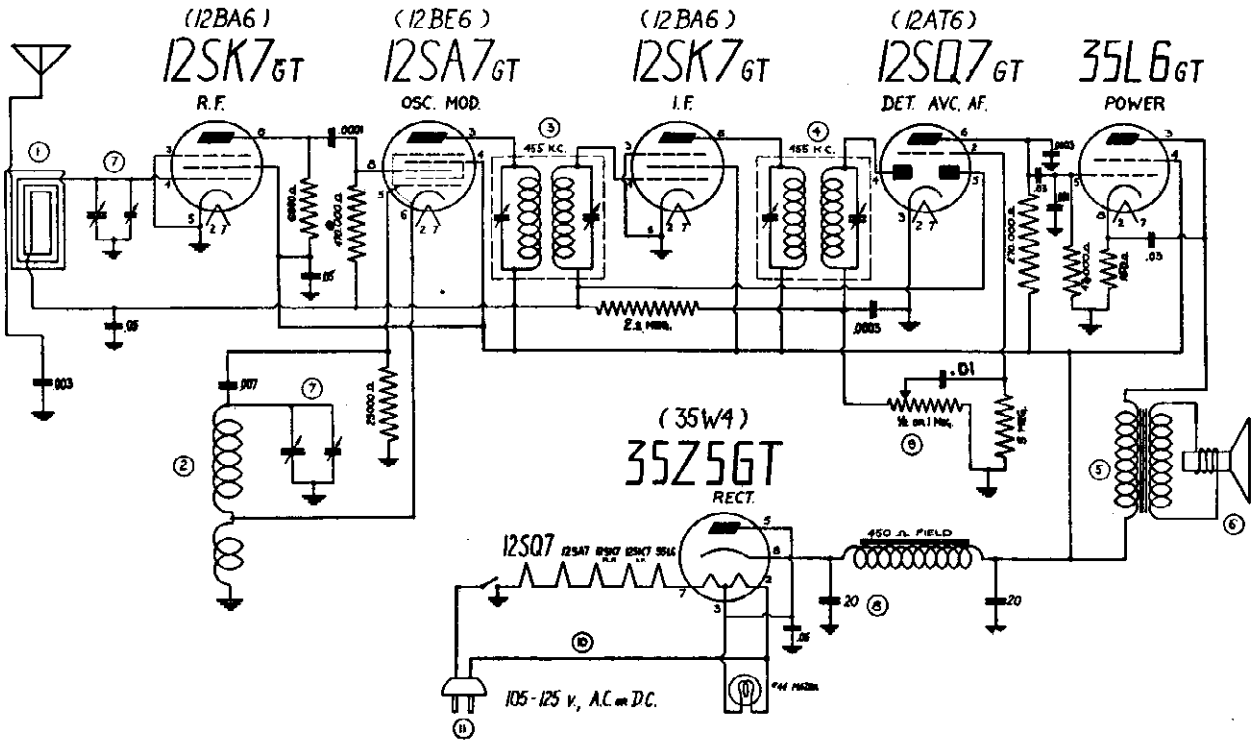
Connect AVC diodes(4 and 5 on 12SQ7 tube base) to chassis ground through a 1-megohm resistor. Set signal generator to 456 kc. Feed signal to No.8 pin on 12SK7 through the dummy antenna.
Adjust trimmers on the output i-f transformer to maximum signal.
Remove signal from 12SK7 tube base and place on No.5 pin on 12SA7 socket.
Adjust trimmers on input i-f transformer for maximum signal.
For overall alignment of the i-f transformers, connect the signal generator to the external antenna and retune for maximum output.

For tracking of the oscillator and r-f coils and trimmers on the tuning assembly proper, proceed as follows:



Center pointer on the scale, making sure that it does not over-ride the scale on either end of the band.
Set pointer to 1400 kc on the dial scale. Set signal generator to 1400 kc.
Connect signal generator to external antenna lead. Do not use dummy antenna.
Adjust oscillator trimmer "E" until maximum output is obtained.
Adjust antenna trimmer "O" until maximum output is obtained.
Reset dial pointer to 750 kc and reset signal generator to 750 kc.
Adjust antenna coil "A"(by loosening screws and sliding the coil form either up or down) until maximum output is obtained.
Reset dial pointer and signal generator to 550 kc.
Adjust screw plunger "B" in the center oscillator coil "C".(Clockwise to raise frequency and counterclockwise to lower frequency.)

PUROTONE RADIO CORP.



This model is a superheterodyne receiver for regular radio broadcast reception, using latest low drain tubes for low power consumption. A self-contained antenna loop is incorporated which makes the use of an outside antenna unnecessary in most localities. It will function on 105 to 125 volts, 40-60 cycles AC, or 105 to 125 volts DC. A range of 540 to 1600 kilocycles is covered by the receiver.

INSTALLATION

1. Make certain that all tubes are in their proper place and sit secure in their sockets. A sketch, showing their location will be found on this sheet. To exchange tubes, remove the antenna loop by unscrewing the 2 lower screws on the wooden bracket.

2. If found that additional radio signal pick-up is required than is obtained by the inbuilt antenna loop, it is advisable to attach an outdoor aerial to the flexible lead, extended from said loop antenna.

VOLUME CONTROL

The knob on the left hand side is the power switch and volume control. When the control is in the extreme counter-clockwise position the power is "off." From this position, a slight clockwise rotation turns the power "on," and rotating the knob in this direction will increase the volume until full output is obtained.

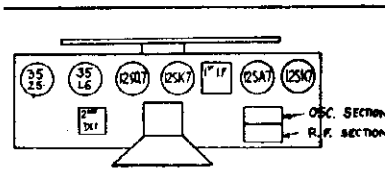
TUNING CONTROL

The knob on the right hand side is the tuning knob which operates the pointer and tuning condenser. A reduction drive insures easy and accurate selection of all stations within the range of the band. The pointer is phosphor luminous, and will maintain luminous power in the dark, when exposed regularly to bright daylight.

TO CALIBRATE RECEIVER

I. F. Connect antenna lead of the signal generator to R.F. section and ground lead of signal generator to receiver chassis. Connect an output meter across the voice coil. Rotate the volume control to maximum. Apply 455 K.C. signal to control grid of 12SK7 R.F. tube through a .05 capacitor. Second I.F. transformer to be aligned first, then 1st I.F. transformer, by adjusting trimmers.

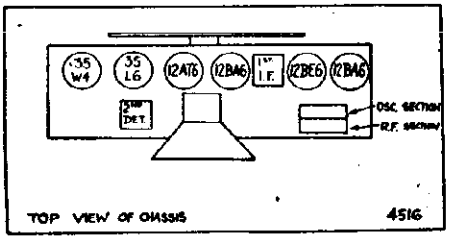
R.F. Connect antenna lead to antenna, and ground lead of signal generator to receiver chassis. Adjust both generator and receiver to 1600 K.C. Peak oscillator trimmer for maximum output. Set the signal and receiver dial to approximately 1300 K.C. Adjust the antenna trimmer for maximum output.



TOP VIEW OF CHASSIS 450

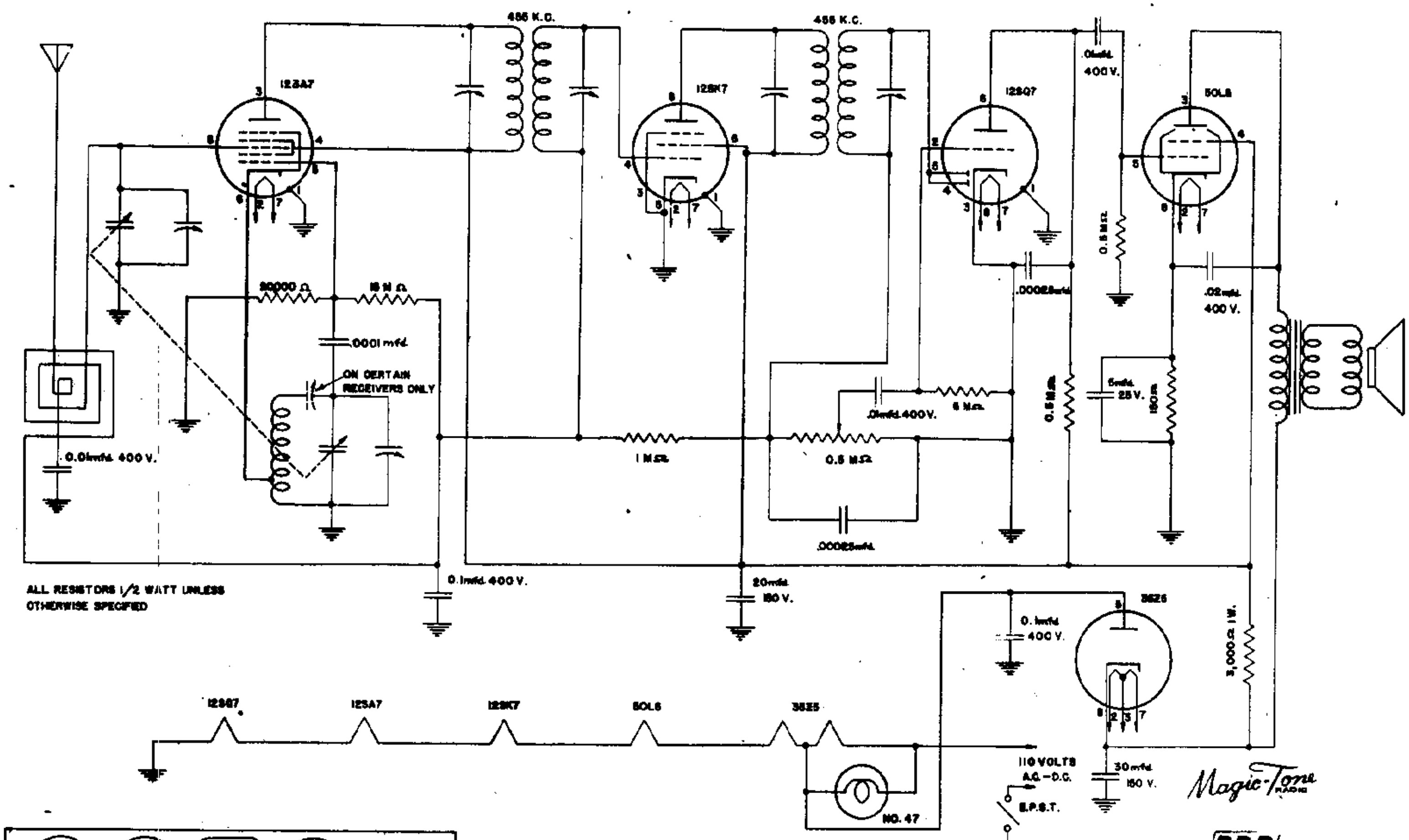
LIST PRICES OF REPLACEMENT PARTS

Item NR.	Description	Price
4506-1	Antenna Loop	$1.10
4506-2	Oscillator Coil	.55
4506-3	First I.F. Transformer	.93
4506-4	Second I.F. Transformer	.93
4506-5	Output Transformer	1.50
4506-6	5 in. Dyn. Speaker, without output	3.50
4506-7	2 Gang Variable Condenser	2.50
4506-8	Condenser 20 MFD + 20 MFD, 150 V.	1.20
4506-9	Volume Control—Switch	1.25
4506-10	Line Cord without Plug	.25
4506-11	Plug	.20
4506-12	Cabinet Back Cover	.30
4506-13	Dial Scale	.45
4506-14	Pulley	.35
4506-15	Octal Socket	.15
4506-16	Pilot Lamp Socket	.40
4506-17	Knob (Walnut or Dark)	.20
4506-18	Bushing	.25
4506-19	Dial Pointer	.36
4506-20	Drive Spring and Cord	.25

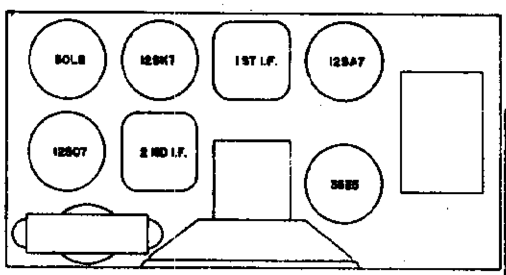


TOP VIEW OF CHASSIS 4516

RADIO DEVEL. & RESEARCH CORP.



RDR
RADIO DEVELOPMENT & RESEARCH CORP.
JERSEY CITY, N.J.



MODEL 500 USES LOCTAL TUBES
MODEL 501 USES OCTAL TUBES

LINE VOLTAGE: 117 VOLTS A.C.

TUBE OCTAL	TUBE LOCTAL EQUIV.	TUBE TYPE	PLATE-GROUND	SCREEN-GROUND	CATHODE-GROUND
12SA7	14Q7	OSC.	72	73	—
12SK7	14A7/12B7	I.F. AMPL.	72	73	—
12SQ7	14B6	DET. A.V.C.,A.F.	38	—	—
50L6	50A5	POWER AMPL.	123	73	4.2
35Z5	35Y4	RECT.	117 A.C.	—	123 D.C.

ALL VOLTAGE READINGS TAKEN WITH 20,000 OHM PER VOLT METER

ALIGNMENT

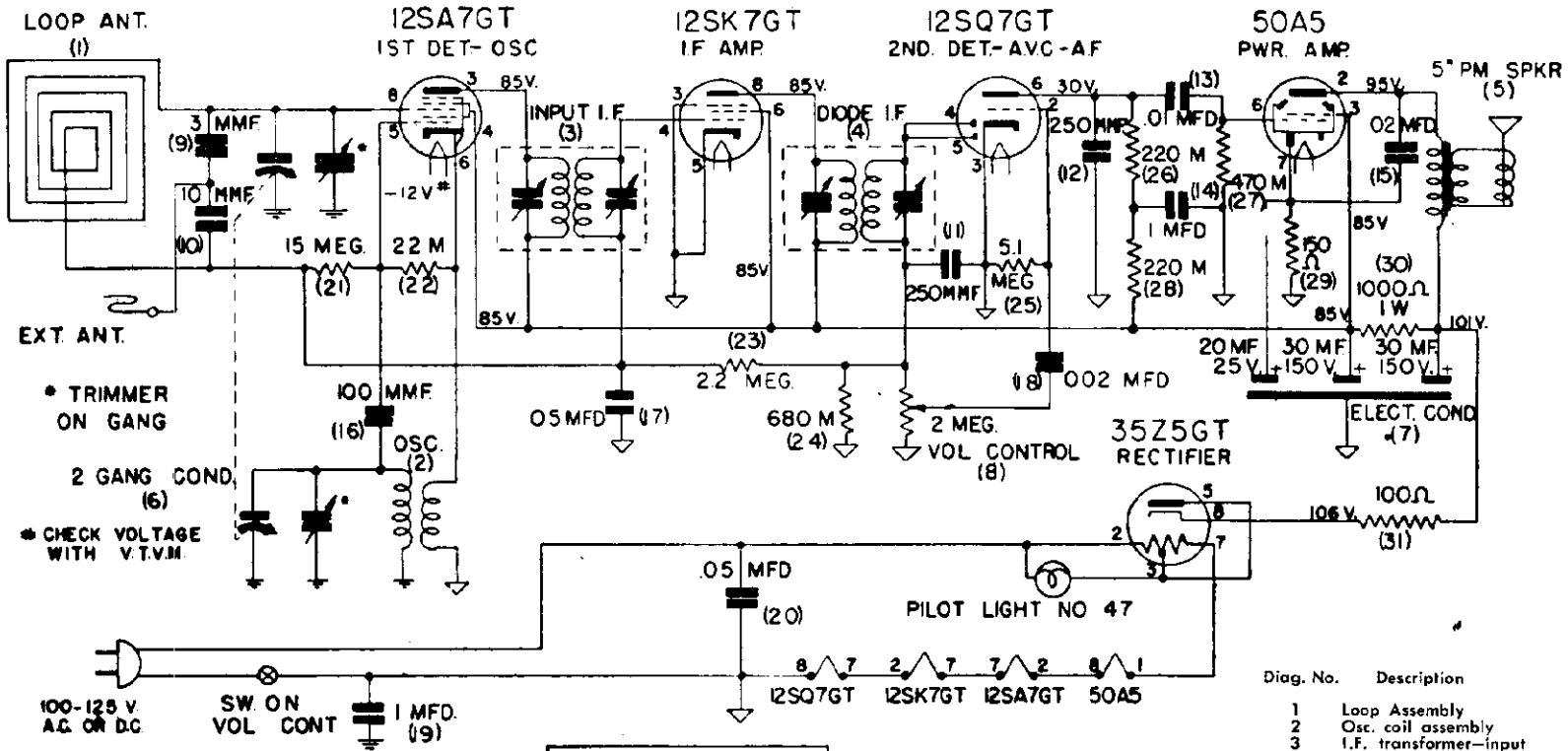
OPERATION	CONNECT TEST OSCILLATOR TO—	TEST OSCILLATOR FREQUENCY	DIAL SETTING	ADJUST THE FOLLOWING FOR MAX. OUTPUT
1	GRID OF I.F. AMPL. IN SERIES WITH 0.1mfd.	455 K.C.	QUIET POSITION ON RIGHT END OF SCALE	BOTH TRIMMERS ON 2ND I.F. TRANSFORMER
2	GRID OF MIXER OSC. IN SERIES WITH 0.1mfd.	455 K.C.	QUIET POSITION ON RIGHT END OF SCALE	BOTH TRIMMERS ON 1ST I.F. TRANSFORMER
3	ANTENNA LEAD IN SERIES WITH 0.0001mfd.	1500 K.C.	1500 K.C.	OSC. AND ANT. TRIMMERS ON GANG CONDENSER
4 (SEE NOTE)	ANTENNA LEAD IN SERIES WITH 0.0001mfd.	600 K.C.	600 K.C.	PADDING CONDENSER ROCK IN
5	REPEAT STEP NUMBER 3			

NOTE: ONLY ON RECEIVERS USING PADDING CONDENSER

FRACTIONAL TOLERANCES ± 1/64
DECIMAL TOLERANCES ± .005
UNLESS OTHERWISE SPECIFIED

REVISION 2 5-22-46 .0001 mfd. CONDENSER INSERTED

SCHEMATIC - MODEL 500 501
RADIO DEVELOPMENT & RESEARCH CORP., N.Y. C.
DR. HILL
CH.
ENG.
RDR
SCALE
DATE 3-15-46
400-100



I.F. = 455 KC.

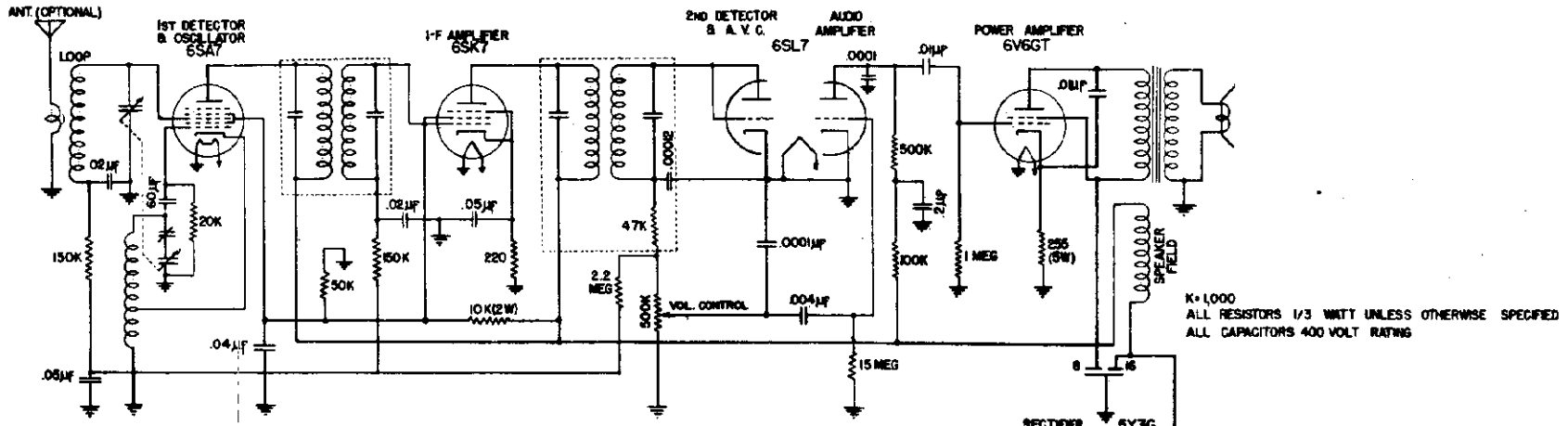
FREQ. RANGE 535 K.C. TO 1620 K.C.
VOLTAGES CHECKED TO COMMON B- WITH 1000 OHM PER VOLT METER ON 250 VOLT RANGE EXCEPT AS NOTED
ALL RESISTORS 1/2 WATT 20 %
UNLESS OTHERWISE SPECIFIED

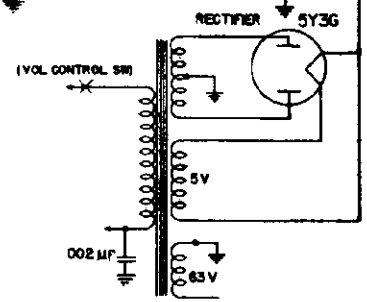
Diag. No.	Description	Part No.
1	Loop Assembly	VC-0444
2	Osc. coil assembly	LO-0089
3	I.F. transformer—input	LR-0007
4	I.F. transformer—diode	LR-0008
5	Speaker (5" PM) & output trans.	US-0036
6	Variable condenser—2 gang	CV-517
7	Elec. condenser 30-30/150v & 20/25v	CE-806F
8	Vol. control & switch—2 meg.	RP-205E
9	Mica condenser 3 mmf 20%	
10	Mica condenser 10 mmf 20%	
11,12	Mica condenser 250 mmf 20%	
13,14	Tub. paper condenser .01-200v 20%	
15	Tub. paper condenser .02-200v 20%	
16	Mica condenser 100 mmf 20%	
17,20	Tub. paper condenser .05-200v 20%	
18	Tub. paper condenser .002-400v 20%	
19	Tub. paper condenser .1-200v 20%	
21	Carbon resistor 15 meg. 20% 1/2w	
22	Carbon resistor 22,000 ohms 20% 1/2w	
23	Carbon resistor 2.2 meg. 20% 1/2w	
24	Carbon resistor 680,000 ohms 20% 1/2w	
25	Carbon resistor 5.1 meg. 20% 1/2w	
26,28	Carbon resistor 220,000 ohms 20% 1/2w	
27	Carbon resistor 470,000 ohms 20% 1/2w	
29	Carbon resistor 150 ohms 20% 1/2w	
30	Carbon resistor 1000 ohms 20% 1w	
31	Carbon resistor 100 ohms 20% 1/2w	
	Cabinet—white	VC-0321
	Cabinet—walnut	VC-0456
	Back—white	QP-0226
	Back—walnut	QP-0220

I.F. ALIGNMENT—Set the gang condenser to minimum capacity. Connect the hot side of the signal generator to stator lug of large condenser section through a .05 mf. condenser, and connect the ground lead of the generator to receiver B minus common. Adjust the four I.F. trimmers for maximum response at 455 kc.

R.F. ALIGNMENT—Set dial pointer at 160. Feed 1600 kc. from the signal generator into a loop of wire approximately one foot in diameter, located about one foot from the receiver loop. Adjust the oscillator trimmer for maximum response.

Set the dial to 140 and adjust the r.f. trimmer for maximum response at 1400 kc.





IF PEAK
455 KC

HOW TO SET PUSH BUTTONS TO FAVORITE STATIONS

1. Turn radio set on and allow it to warm up for at least 15 minutes. This is important.

2. Tune in one particular station carefully with the tuning control. Reduce the volume with the volume control and make sure that the tuning control is set so that the station is as loud and clear as possible.

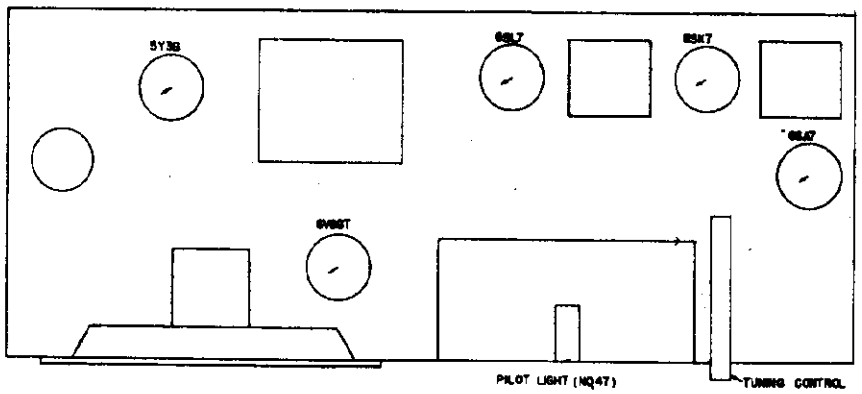
3. Unscrew the first button two full turns counterclockwise. Hold the tuning control in its exact position on the station.

4. Push the button all the way in and, while holding the tuning control rigidly, screw in the button clockwise tightening it securely.

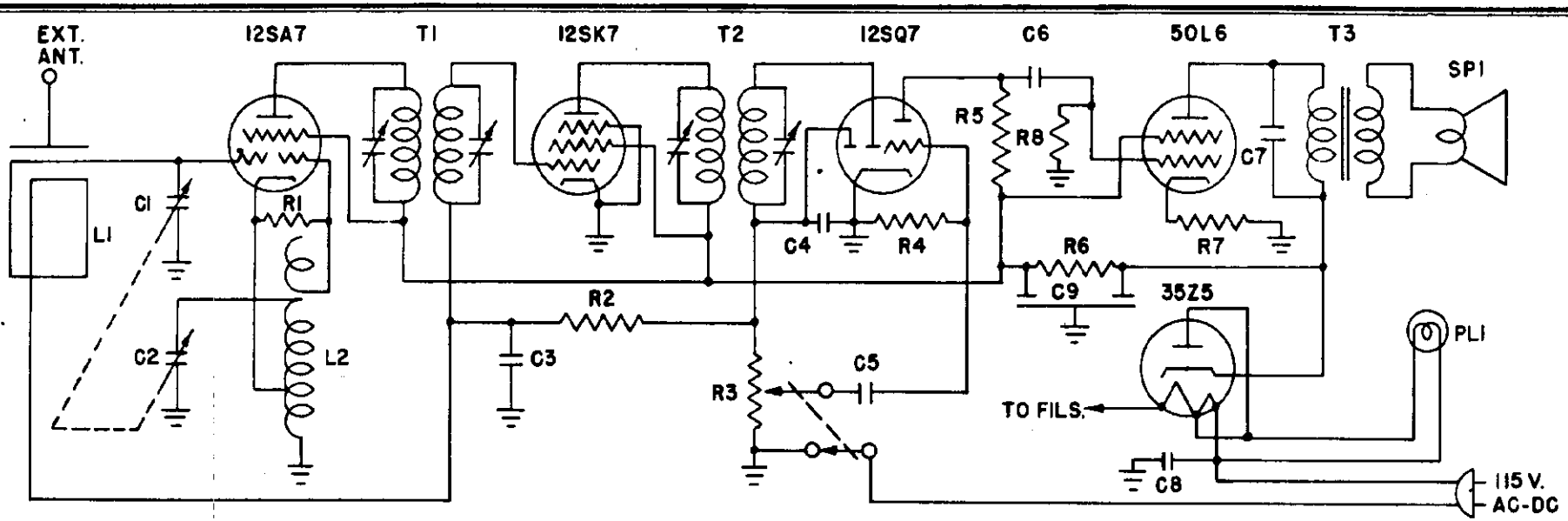
5. Check as follows: Detune the station with the manual tuning control; then push the button all the way in to tune in the station.

6. If the station is not tuned as loudly and clearly as possible, readjust as indicated in steps 2, 3, 4, and 5.

7. Readjust the other buttons, each for a different station, in the same manner.



TUBE LOCATIONS

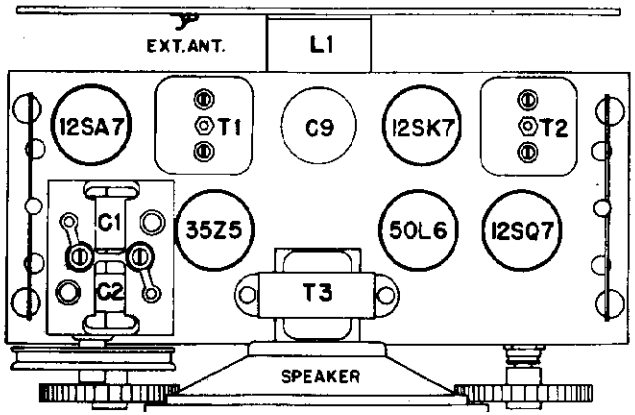


R 1 - 25M OHMS 1/3 WATT RESISTOR
R 2 - 5MEG " " " "
R 3 - 500M " POT. WITH SWITCH
R 4 - 5MEG " 1/3 WATT RESISTOR
R 5 - 200M " " " "
R 6 - 1200 " 1/2 " "
R 7 - 150 " " " "
R 8 - 500M " 1/3 " "

C 1 - ANT. SECTION GANG CONDENSER
C 2 - OSC. " " "
C 3 - .05 MFD. 200 V. CONDENSER
C 4 - .00025 MFD. 500 V. CONDENSER
C 5 - .006 MFD. 500 V. CONDENSER
C 6 - .01 " 400 V. "
C 7 - .02 " " "
C 8 - .05 " " "

C 9 - 50-50 MFD. 150 V. CONDENSER
L 1 - LOOP ANTENNA
L 2 - OSC. COIL
T 1 - 465 KC. I. F. TRANSFORMER
T 2 - " " " "
T 3 - OUTPUT TRANSFORMER
PL1 - NO. 44 PILOT LIGHT
SP1 - 5" P.M. SPEAKER

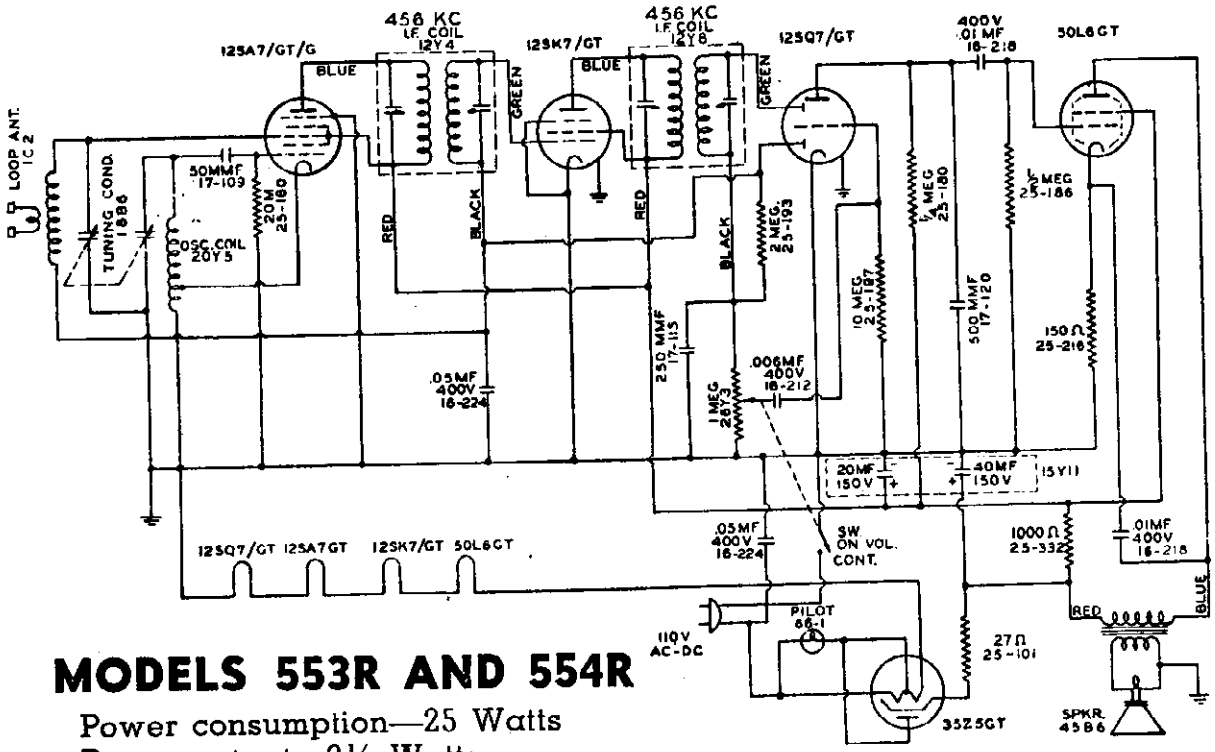
IF PEAK 465 KC



SETCHELL-CARLSON, INC.	
2233 UNIVERSITY AVE.	ST. PAUL 4, MINN.
SCHEMATIC DIAGRAM MODEL NO. 416	
MATERIAL	
DATE 11-21-45	DR. BY S.A.C.
SCALE NONE	CKD. BY B.T.S.

SETCHELL CARLSON INC.

SHERIDAN ELECTRONICS CORP.

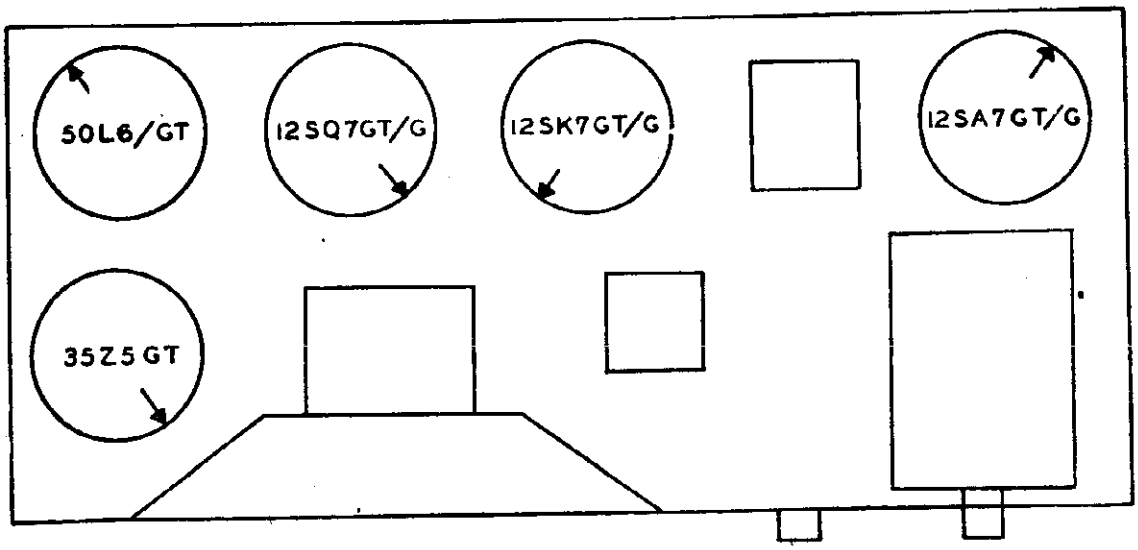


MODELS 553R AND 554R

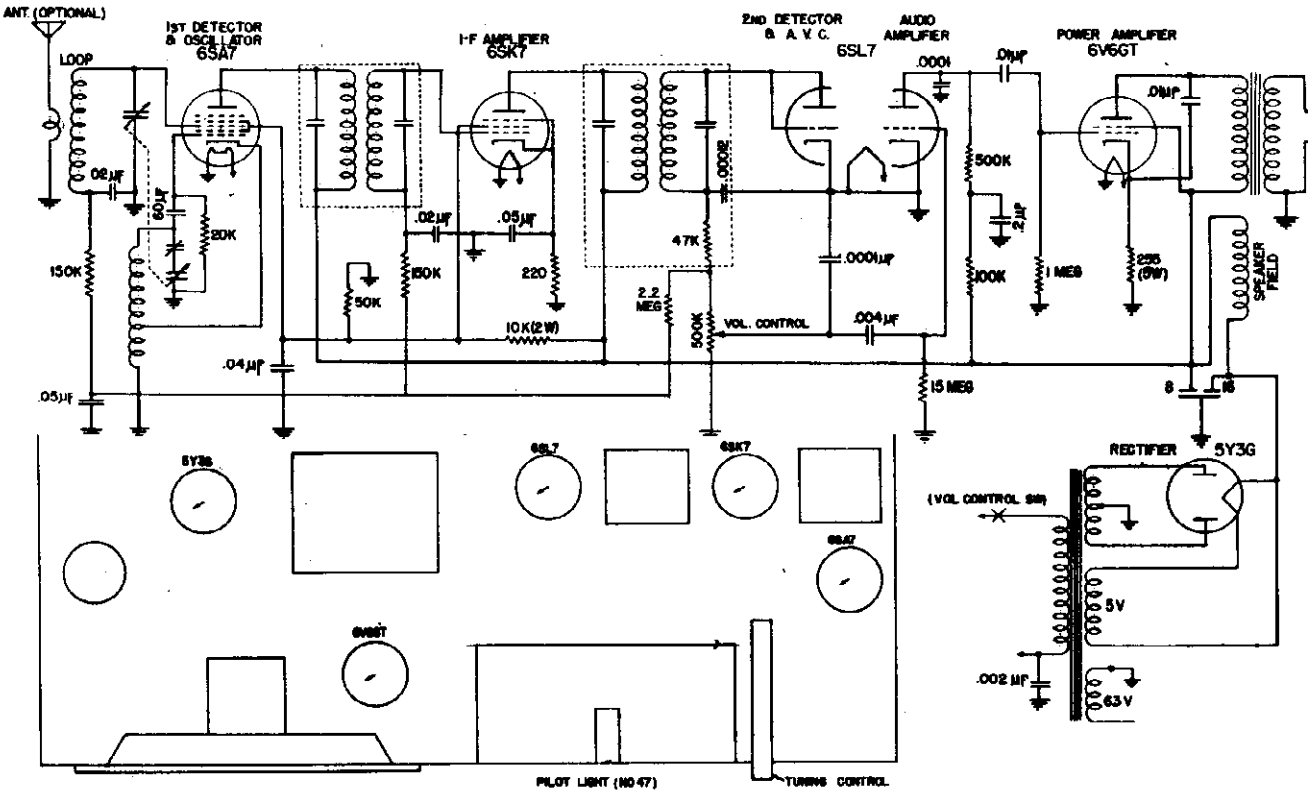
Power consumption—25 Watts
Power output—2½ Watts
Intermediate frequency—456KC

PARTS LIST

PART NO.	DESCRIPTION	PART. NO.	DESCRIPTION
1C2	Loop antenna assembly	26Y3	Vol. cont. & Switch 1 megohm
18B6	Tuning gang condenser	20Y5	Oscillator coil
12Y4	1st I.F. transformer 456KC	45B6	5" PM dynamic speaker
12Y8	2nd I.F. transformer 456KC	66-1	Pilot lamp 6-8 volt type 47
15Y11	Two section electrolytic cond.		



STANLEY SERVICE STATION



K= 1,000
ALL RESISTORS 1/3 WATT UNLESS OTHERWISE SPECIFIED
ALL CAPACITORS 400 VOLT RATING

HOW TO SET PUSH BUTTONS

1. Turn radio set on and allow it to warm up for at least 15 minutes. This is important.

2. Tune in one particular station carefully with the tuning control. Reduce the volume with the volume control and make sure that the tuning control is set so that the station is as loud and clear as possible.

IF PEAK
455 KC

3. Unscrew the first button two full turns counterclockwise. Hold the tuning control in its exact position on the station.

4. Push the button all the way in and, while holding the tuning control rigidly, screw in the button clockwise tightening it securely.

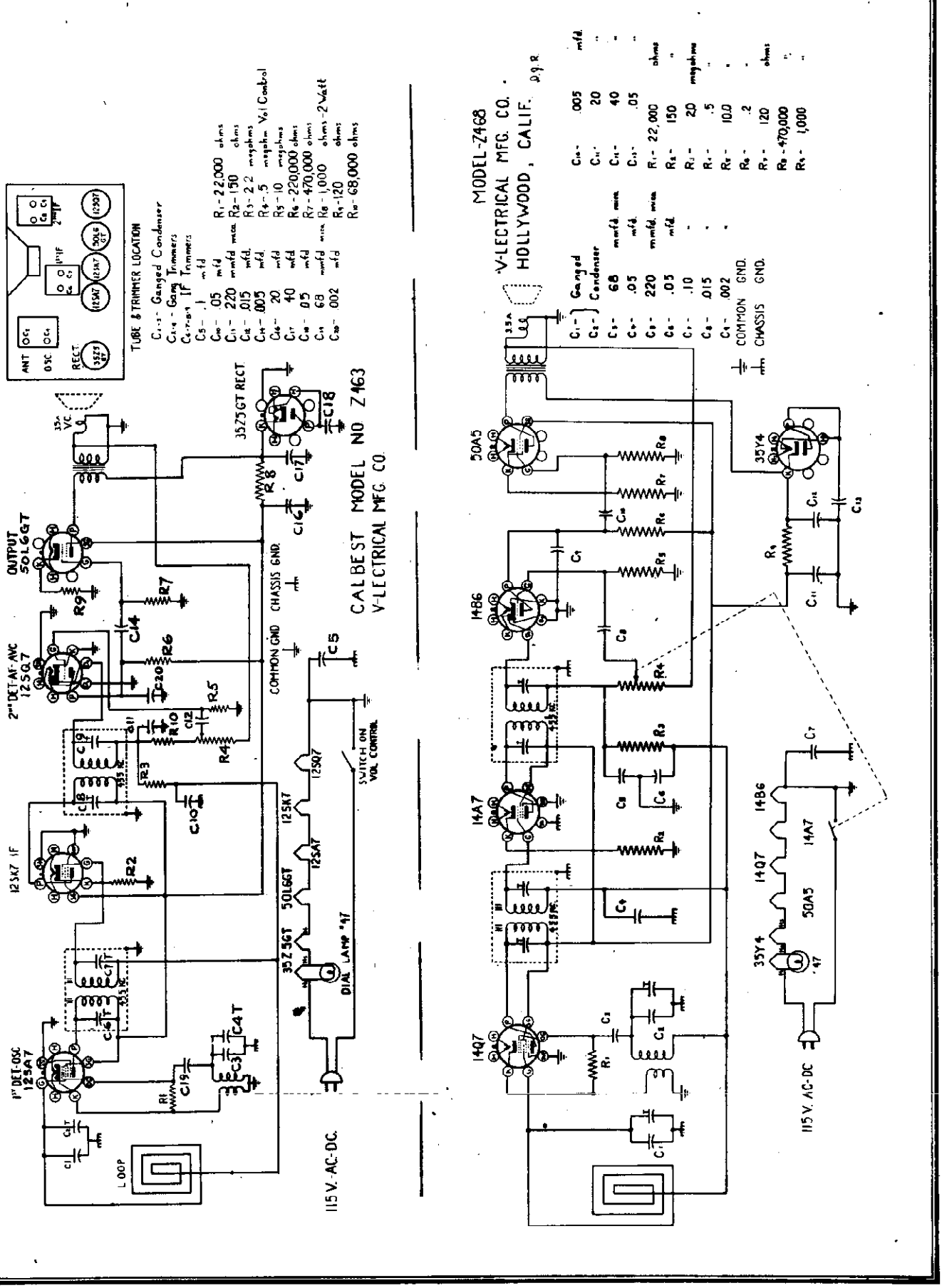
5. Check as follows: Detune the station with the manual tuning control; then push the button all the way in to tune in the station.

6. If the station is not tuned as loudly and clearly as possible, readjust as indicated in steps 2, 3, 4, and 5.

7. Readjust the other buttons, each for a different station, in the same manner.

MODEL Z463
MODEL Z468

V-LECTRICAL MFG. CO.



ADMIRAL CORPORATION

RC150 RECORD CHANGER

IMPORTANT: This manual does not apply to later Record Changers which are similar in appearance. The RC150 can be easily identified by removing the cover assembly (1) and noting the adjusting screws (10).

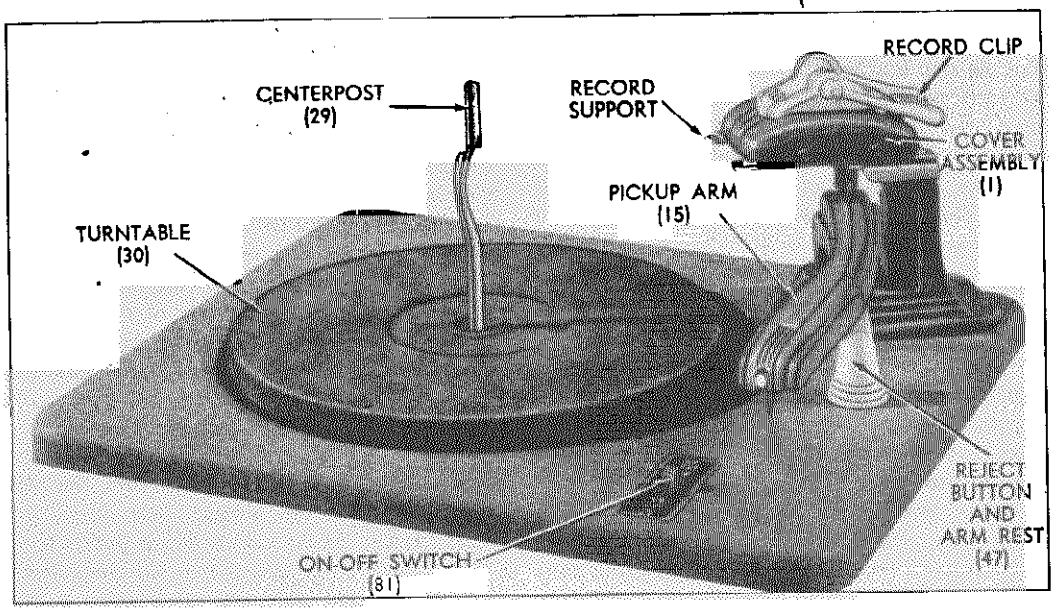


FIGURE 1. RECORD PLAYER, TOP VIEW

OPERATING INSTRUCTIONS

1. SETTING FOR SIZE OF RECORD.

The size of record for which the record changer is set to play is indicated by the number (on the top of the cover assembly) nearest the turntable. See Figure 1.

To change the setting, grasp the record support and cover assembly (1) and rotate it a half turn until it snaps into place with the correct record size toward the turntable. If the record support does not turn all the way around easily, return it to its previous position, and turn on the record changer until the pickup arm moves to its playing position. Turn the record changer off, and lift the pickup arm back to the arm rest. You should now be able to turn the record support to the correct position.

2. STARTING THE RECORD CHANGER.

Before starting the record changer, be sure to set the record clip so that it rests on the top record. Throw the switch to the "ON" position. Then firmly push down on the top of the pickup arm momentarily. This presses down on the reject button and starts a change cycle.

3. STOPPING AND UNLOADING.

(a) After you have finished playing the last record, allow the mechanism to go through its change cycle and begin playing the last record over again. Throw the switch to the "OFF" position and lift the pickup arm over to the arm rest. Turn the record clip to the position furthest away from the turntable.

(b) While holding the records loosely, lift the entire stack straight up, making sure the records are horizontal. This is important because tilting the records or holding them tightly may cause them to bind. The removal of records is made easier by rotating the record support a quarter turn.

CAUTIONS

1. **Never use force to stop the motor or turntable.**
2. **Do not turn off the record changer while it is going through its change cycle but wait until it is playing a record.**
3. **The record changer should always be level when in use.**
4. **When turning the record support, be sure to grip the entire record support and cover assembly and not just the plastic record clip.**

ADMIRAL CORPORATION

SERVICE INSTRUCTIONS

IMPORTANT: After the record changer or player is repaired, press down the reject button to minimize the danger of damaging the equipment during shipment.

4. DESCRIPTION OF CHANGE CYCLE.

(See Figures 3, 4, 6.)

As the pickup arm moves toward the center of the record, the retaining lever roller (59A) on the end of the trip linkage assembly (59) [which is connected to the pickup arm through the guide pin assembly (25) and lift guide assembly (26)] is gradually withdrawn from behind the stop bracket (40) on the eccentric cam (39). The cam, which no longer is held in place by the retaining lever roller (59A) is pulled over by the eccentric cam spring (43) until the rubber tire makes contact with the knurled roller (66) on the turntable shaft (30A). This knurled roller, which is driven by the turntable shaft, rotates the eccentric cam. This, in turn, will force the riser-plate assembly (60) back along its guide rods (65A) away from the centerpost. As soon as the riser plate begins to move back, the lower lift rod (24) will ride up the inclined surface and cause the pickup arm to be raised clear of the record. Then the motion bracket (60A) on the riser plate contacts the stop arm (59B) of the trip linkage assembly and pushes it back away from the centerpost. This motion of the stop arm (a) carries the pickup arm away from the centerpost and clear of the edge of the turntable; and (b) rotates (counterclockwise) the guide pin assembly (25), which is coupled through the upper lift rod and guide plate assembly (14) to the push-off arm (5). This push-off arm, which has also been raised by the vertical motion of the lower lift rod (24) so that it is in line with the set-down point adjusting screw (10), will push against the screw and cause the push plate (7B) to move forward at the instant that the needle is over the set-down point. Then the push plate will begin to push off the bottom record to the turntable. The pressure of the push plate springs (8 or 8X) will return the push plate (7B) to its normal position and at the same time force the push-off arm (5) back. This, in turn, will move the pickup arm to its playing position directly above the record and return the trip linkage assembly (59) to its normal position. The riser-plate assembly (60) which is propelled toward the centerpost by the guide rod recoil spring (36), will continue to slide forward at the same time that the eccentric cam (39) is completing its revolution. As the riser plate approaches the end of its travel, the lower lift rod (24) slides back down the inclined surface and drops the pickup arm onto the record. As the eccentric cam aided by the eccentric cam spring (43) completes its revolution, the rubber tire of the cam moves away from the knurled roller (66) on the turntable shaft and the stop bracket (40) comes to rest against the retaining lever roller (59A) of the trip linkage assembly. The change cycle is completed.

When the reject button is pressed, the reject trigger wire (50) pulls the trigger (54), releasing the reject slide (51A). As the reject slide is pulled forward by its spring (52) it carries with it the stop arm (59B) of the trip linkage assembly. This starts a change cycle in exactly the same manner as if the pickup arm had been moved to the centerpost. During the next cycle, the reject slide (51A) is forced back by the riser plate motion bracket (60A) and again locked in position by the reject trigger (54).

TOOLS REQUIRED

(Order from your Admiral distributor only)

#6 Bristol Set Screw Wrench (Admiral Part No. P-5805. List Price $0.05)

#8 Bristol Set Screw Wrench (Admiral Part No. P-5806. List Price $0.05)

1/4 inch open end wrench
3/16 inch open end wrench
} Two separate wrenches required. Can order two Admiral Part No. P-5807. Net price $0.35 each.

CAUTION

1. **Do not remove the turntable unless it is absolutely necessary. If its removal is required, take out the centerpost and loosen the set screw in the knurled roller (66) before carefully lifting the turntable.**

2. **See that the drive pulley (73A) and rubber tires on the idler wheel (74) and eccentric cam are kept clean and free from oil, grease, dirt, or any foreign material. Carbona or carbon tetrachloride may be used for cleaning these parts.**

3. **If replacement of any parts requires the removal of the push-off arm (5) or guide pin assembly (25), be sure to re-position or replace these parts as directed in paragraphs 8 and 9 respectively.**

ADMIRAL CORPORATION

ADJUSTMENTS

5. SET-DOWN POINT (See Figure 2).

Check paragraphs 12, 13 and 14 before making this adjustment.

Remove the cover assembly (1) by prying out the four round clips (2) at the lower edge of the cover. If the set screws in the push-off arm (5) are loose, see paragraph 8. If they are tight, adjust the set-down point for both ten-inch and twelve-inch records as follows:

(a) Turn the record support to the ten-inch position, place a ten-inch record on the turntable, and turn on the changer. Allow it to go through a change cycle by moving the pickup arm toward the center of the record. *Do not use the reject button.* Note the point on the record at which the needle first makes contact. This point should be 4⅝ inches from the side of the centerpost.

(b) If the set-down point is not correct, loosen the hex lock nut (9) on the set-down point adjusting screw (10) nearest the centerpost. Turn the screw clockwise if the set-down point is less than 4⅝ inches from the centerpost, and counterclockwise if the set-down point is more than 4⅝ inches from the centerpost. One full turn of the screw will move the set-down point about 7/32 inch.

(c) Tighten the hex nut (9), turn on the changer, and allow it to go through a change cycle, again noting the point at which the needle first touches the record.

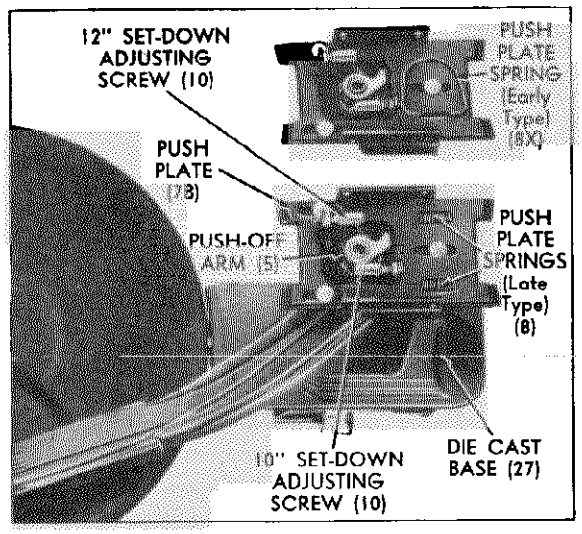


FIGURE 2. RECORD CHANGER, TOP VIEW SHOWING LOCATION OF PARTS

If the set-down point is still incorrect, repeat the above procedure.

(d) Rotate the record support to the twelve-inch position and place a twelve-inch record on the turntable. Repeat the above procedure to adjust the changer for the twelve-inch set-down point, using the other set-down point adjusting screw (10). Adjust it so that needle first touches the record 5⅝ inches from the side of the centerpost.

(e) Check the set-down points using the reject button. If satisfactory, seal the adjustments with a drop of speaker cement. If not, see paragraph 13.

NOTE

When replacing the cover assembly (1) be sure that the indicated record size corresponds to the size for which the record support is set.

6. PICKUP POINT (See Figure 3).

Adjust the pickup point by turning the pickup point adjusting screw (42) on the bottom of the eccentric cam (39). Turn the screw clockwise to delay the pickup point and counterclockwise to hasten it. The change cycle should start when the needle is 1⅝ inches from the side of the centerpost. After properly making this adjustment, seal it with speaker cement.

7. PICKUP ARM HEIGHT.

To vary the height of the pickup arm, adjust the knurled head adjusting screw (20) under the pickup arm (see figure 3). However, check and see if the needle (⅜ inch recommended) is set into the pickup cartridge as far as possible. The proper height of the needle, with the pickup arm hanging free, is 1/16 inch below the top of the turntable.

(a) If pickup arm is raised too high and does not properly make contact with a single record, turn the adjusting screw (20) in a clockwise direction until the pickup arm is at the proper height.

(b) If pickup arm is not raised high enough and results in either needle back-scratch or failure of the pickup arm to clear the arm rest (47), turn the knurled head adjusting screw (20) counterclockwise until the pickup arm is raised to the required height. Back-scratch may sometimes be eliminated by replacing an extra-long needle with a ⅝-inch needle.

ADMIRAL CORPORATION

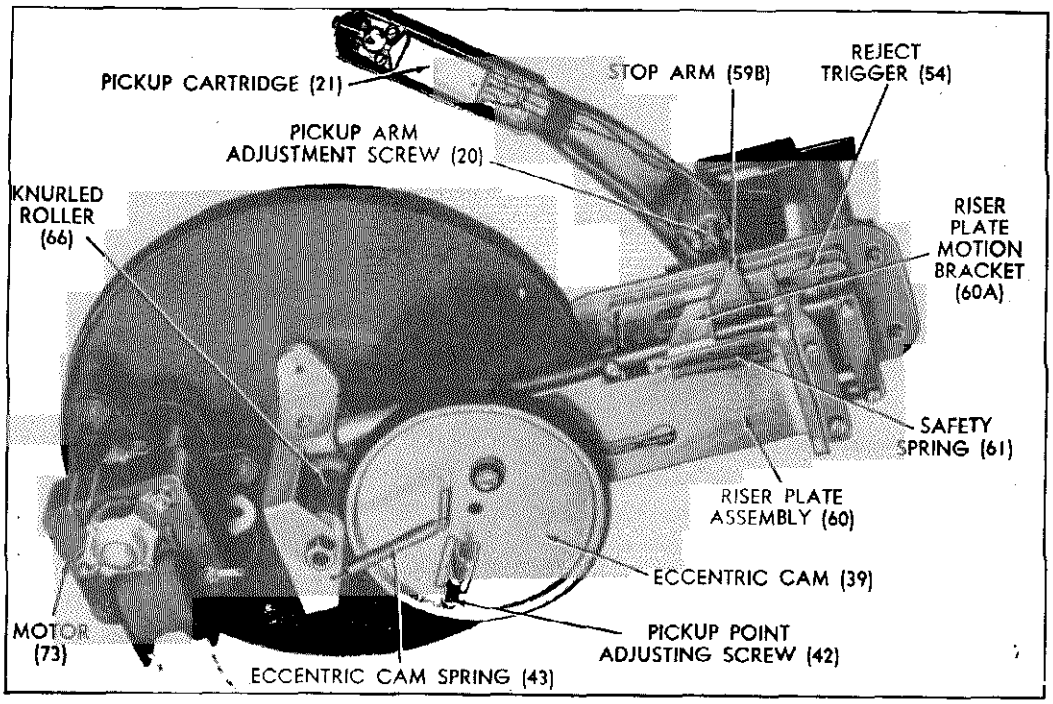


FIGURE 3. RECORD CHANGER, BOTTOM VIEW SHOWING LOCATION OF PARTS

SERVICING AND REPAIR

8. RE-POSITIONING PUSH-OFF ARM (Figures 2 and 4).

This must be carefully done if set screws are loose or push-off arm has been removed.

(a) Loosen the two set screws in the push-off arm (5) with the No. 6 Bristol wrench.

(b) Turn the record support to the 12-inch position.

(c) Place a 12-inch record on the turntable.

(d) Move the pickup arm to the centerpost. Rotate turntable by hand in its normal direction until the needle is directly over the point on the edge of the record at which it would set down at the beginning of the next playing cycle. Be sure the pickup arm is stopped when it is moving *away* from the centerpost.

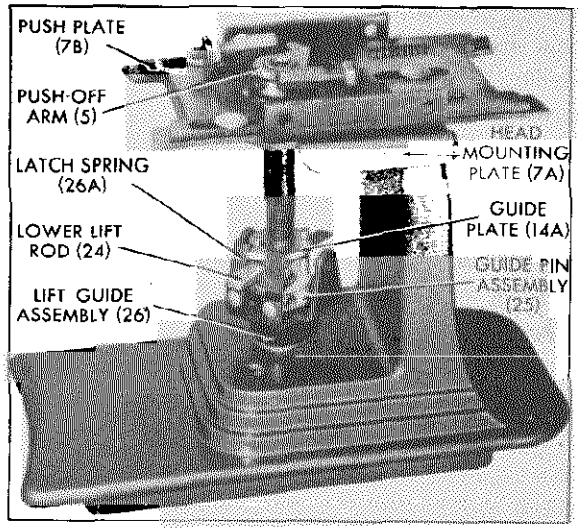


FIGURE 4. PUSH-OFF ARM, UPPER LIFT ROD, AND GUIDE PIN ASSEMBLY

(e) Set the point of the push-off arm (5) in light contact with and slightly below the center of the 12-inch set-down point adjusting screw (10). Now tighten both of the push-off arm set screws.

(f) Re-adjust the set-down points for both the 10-inch and 12-inch positions as outlined in paragraph 5.

9. RE-POSITIONING GUIDE PIN ASSEMBLY (Figure 5).

This must be carefully done if set screws are loose or guide pin assembly has been removed.

(a) Carefully remove the head assembly (7) as well as the upper lift rod and guide plate assembly (14) by taking out the two binder head screws (28) near the top of the die cast base (27).

(b) Remove the pickup arm by prying the pivot spring (17) away from the pins on the lift guide assembly (26).

(c) Press the reject button, and rotate turntable by hand in its normal direction until the riser plate assembly (60) underneath the changer (see figure 3) is moved to that point of its travel most distant from the centerpost. Rotate the turntable until the riser plate assembly goes back slightly (not over 1/32 inch).

(d) With the thumb of the left hand, push the stop arm (59B) as indicated at point "A" (figure 5) against the riser plate motion bracket (60A) and upward toward the base (27).

ADMIRAL CORPORATION

SERVICING AND REPAIR (Continued)

(c) Rotate the lift guide assembly (26) counterclockwise until it strikes the stop pin (27A) projecting from the base. Also rotate the guide pin assembly (25) counterclockwise as far as it will go until it strikes against the lower lift rod assembly (24).

(f) Maintain these positions as well as that of the stop arm (59B) of the trip linkage assembly (step d). Now press down on the guide pin assembly (25) as indicated at points "B" (figure 5) with the index finger of the right hand so as to leave very little play between the lift guide assembly (26) and the die cast base (27), and tighten the set screw in the guide pin assembly with the thumb and second finger of the right hand. While tightening this set screw, exert pressure on the Bristol wrench in a counterclockwise direction as indicated at "C" (figure 5). Then tighten the other set screw.

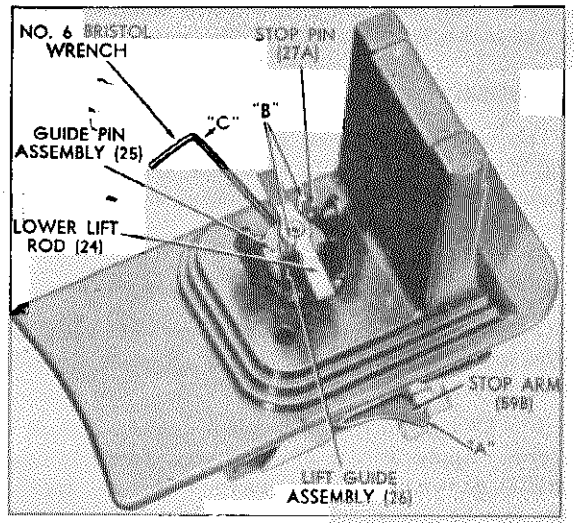


FIGURE 5. RE-POSITIONING GUIDE PIN ASSEMBLY

10. TURNTABLE FAILS TO ROTATE.

Check the following:

(a) Turntable may have worked up, allowing idler wheel (74) to slip out from under it. To correct this, press the idler wheel back in place with a screw-driver, and push the turntable down over it. To remove any play, loosen the set screw in the knurled roller (66), move the roller up on the turntable shaft (30A), and tighten the set screw.

(b) Changer may have been turned off during a change cycle. To start, rotate turntable by hand. Always allow the changer to complete a change cycle before turning it off.

(c) The motor mounting plate may be bent. Correct by removing motor and straightening plate; in some cases it may be necessary to install a new motor.

(d) The idler wheel mounting plate may be caught between the motor mounting plate and the top panel. It may be necessary to raise the motor by removing a shim washer from each of the three mounting screws (78).

(e) Motor may be stalled because its shaft is binding against the upper bearing. Due to some physical shock, the rotor has been forced against the upper bearing to the point where the tapered shoulder on the rotor shaft binds in the bearing itself. This condition may be corrected by dropping the entire changer gently to the surface of a table, thereby forcing the rotor away from the upper plate; or the rotor may be carefully pried down from the upper bearing with a screw-driver.

(f) Motor may be defective. Replace motor.

(g) Turntable shaft (30A) binds. Binding may result if the turntable has ever been removed. Check to see if a burr on the turntable shaft has scored the upper bearing in the turntable mounting (65).

Binding may also result if the turntable shaft (30A) fits too tightly into the bearing of the turntable mounting (65). To rectify this condition, remove turntable, clean the shaft with a piece of extremely fine emery cloth or polishing paper, and file off the burr left by the set screw. Also use a smooth blade of a pocket knife and carefully scrape out the bearing to remove loose zinc particles. Clean bearing and shaft with a solvent such as Carbona or lacquer thinner. Lubricate with a thin film of grease and re-assemble. DO NOT USE EMERY CLOTH OR ANY OTHER ABRASIVE ON THE BEARING.

11. PICKUP ARM REMAINS AT REST POSITION AFTER CHANGER BEGINS ITS CHANGE CYCLE OR REJECT BUTTON HAS BEEN PUSHED.

(a) If turntable is rotating, check for loose set screws in the push-off arm (5). To re-position the push-off arm follow the instructions given in paragraph 8.

(b) If the turntable is rotating, see if the brazed guide plate (14A) has come loose from the upper lift rod. If it has, replace the upper lift rod and guide plate assembly (14).

12. THE 12-INCH SET-DOWN POINT DIFFERS WITH COVER ASSEMBLY OFF AND ON.

The 12-inch set-down point adjusting screw (10) may be touching the cover assembly (1) during the change cycle. Correct by filing down the end of the screw until it clears.

13. PICKUP ARM SET-DOWN POINT DIFFERS FOR MANUAL REJECTION AND AUTOMATIC CYCLE.

(a) Latch spring (26A) requires adjustment. Raise the pickup arm and bend the left leg of flat "U"-shaped latch spring back as far as possible with a screw-driver so that the lip of the guide plate (14A) will engage the latch spring (26A). See figure 4.

(b) Loose or improperly set push-off arm (5). To re-position, see paragraph 8.

(c) Loose or improperly set guide pin assembly (25). To re-position, see paragraph 9.

ADMIRAL CORPORATION

SERVICING AND REPAIR (Continued)

14. SET-DOWN POINT IS ERRATIC ON BOTH 10-INCH AND 12-INCH RECORDS.

(a) Push plate springs (8 or 8X) may not provide sufficient tension. There should be no "slop" in the head assembly (7) between cycles. If there is any play, replace the push plate springs. See figure 2.

(b) Loose push-off arm (5). To re-position, see paragraph 8.

(c) Loose guide pin assembly (25). To re-position, see paragraph 9.

15. BOTTOM RECORD OF STACK FAILS TO DROP TO TURNTABLE.

(a) Check for a warped record and also see that the record clip (figure 1) is resting on the top record of the stack.

(b) If the record is not warped, and if the record clip is in the proper position, see if centerpost is bent toward the record support (see paragraph 16).

(c) Push plate (7B) may be inoperative. Check the push-off arm (5). If it is loose, re-position per instructions in paragraph 8.

16. CHECKING FOR A BENT CENTERPOST.

With a properly aligned centerpost, a new record (one whose center hole is not worn or enlarged), when pushed all the way into the offset on the centerpost, will rest on the record support and clear the push plate (7B) by 1/32 inch. This measurement should NOT be made during a change cycle because the push plate leaves its normal rest position and moves toward the centerpost to drop a record to the turntable.

If the clearance between the record and the pusher is not 1/32 inch or if the record rests unevenly on the record support, bend the centerpost until the proper clearance is obtained. When bending the centerpost, do not apply pressure above the offset or it may break.

17. RECORD SUPPORT CANNOT BE ROTATED FOR SIZE CHANGE.

Changer may have been turned off during a change cycle. Return the record support to its original position, start changer, and allow it to complete the change cycle. Turn the changer off and return the pickup arm to its rest position. The record support may now be rotated for size change.

18. CHANGER STARTS TO CYCLE WHEN RECORD SUPPORT IS ROTATED FOR SIZE CHANGE.

The push-off arm (5) is being tripped by the set-down point adjusting screw (10). This can be corrected by bending the adjusting screw upward until it clears the push-off arm, except during a change cycle. Now re-adjust set-down points as described in paragraph 5.

19. CHANGER WILL NOT GO INTO CHANGE CYCLE.

(a) Eccentric cam (39) may not be contacting knurled roller (66) on turntable shaft (30A). Eccentric cam spring (43) may be broken or have lost its tension; cam may be binding at its pivot. Correct by replacing spring or eliminating bind.

(b) Set screw on knurled roller (66) may be loose. Move up the knurled roller and tighten the set screw.

(c) Pickup point adjusting screw (42) is too far out of adjustment in a clockwise direction. Adjust the screw so that the change cycle starts when the needle is 1⅝ inches from the side of the centerpost.

20. CHANGER REPEATEDLY GOES INTO CHANGE CYCLE WITHOUT PLAYING RECORD.

Pickup point adjusting screw (42) is too far out of adjustment in a counterclockwise direction. Adjust the screw so that the change cycle starts when the needle is 1⅝ inches from the side of the centerpost.

21. WOBBLY PICKUP ARM.

The binder head screw on the rear of the pickup arm is loose and should be tightened. The more recent changers have eliminated this problem by replacing the screw with rivets (16).

22. NOISY OPERATION.

(a) The turntable may "ring" if the idler wheel tire is bumpy or slightly out of round. Replace the idler wheel (74).

(b) Changer may squeak when carrying a stack of records. Apply a coat of floor wax, furniture wax, paraffin or vaseline to the centerpost. Several applications may be necessary in order to eliminate the squeak.

(c) "Wow" may be due to a warped record, a sprung turntable, or a bumpy or out-of-round idler wheel tire. Replace defective part.

"Wow" may also be caused by an off-center or bent centerpost. If the centerpost is off-center in turntable hole, loosen hex nut (68) and re-position centerpost. If centerpost is bent, see paragraph 16.

(d) The metal of the eccentric cam may rub on the knurled roller (66). The rubber tire (44) on the cam should be replaced. The cam must be removed from the changer to make this replacement.

23. REPLACING DEFECTIVE PICKUP CARTRIDGE.

Before replacing a suspected defective pickup cartridge (21), check for a short or open circuit in the shielded output cable and output plug (79). Also check for an open or short circuit in the leads running from the pickup cartridge to the shielded cable.

ADMIRAL CORPORATION

SERVICING AND REPAIR (Continued)

Some changers have a flat metal plate mounted between the pickup cartridge (21) and the pickup arm. When replacing a pickup cartridge, this plate should be removed since replacement cartridges are designed to be used without it. If it is necessary to remove the pickup arm to gain access to the pickup cartridge, follow the procedure as outlined in steps (a) and (b) under paragraph 9.

24. TILTED TURNTABLE.

A tilted turntable does not necessarily indicate a defective changer, since this was normal on early models.

25. IDLER WHEEL POSITION.

The idler wheel (74) should contact the turntable halfway up the rim of the latter. This point of contact was somewhat below center on early models. If necessary, the idler wheel may be raised or lowered by removing or adding shim washers (63) between the motor mounting plate and top panel.

The turntable may be raised or lowered by adding or removing washers between the turntable thrust bearing (32) and the turntable.

26. LUBRICATION.

Under normal operating conditions, the motor should never require oiling. The rest of the changer, however, should be lubricated with grease whenever it comes into the shop for repairs or adjustment. Care should be taken to prevent any of the lubricant from coming into contact with the drive pulley (73A), the idler wheel tire, or the eccentric cam tire.

27. REPLACEMENT OF 60-CYCLE, COIL SPRING DRIVE PULLEY ON MOTOR 407B3.

Only earlier changers used this part.

(a) Remove the motor from the top panel by unscrewing the 3 mounting screws (78).

(b) Remove the 60-cycle, coil spring drive pulley with a pair of pliers. Using a screw-driver, carefully pry off the 9/16 inch diameter washer beneath the pulley.

(c) Next place the new cylindrical drive pulley (73A) on the motor shaft. Set the pulley so that the two ears will line up with the slot on the top of the shaft.

(d) Push the drive pulley down with a Spintite wrench or a piece of hollow tubing. Tap the Spintite wrench or tubing to force the pulley down until it is flush with the end of the motor shaft.

(e) Bend the ears down into the slot on the end of the shaft.

28. CONVERTING MOTOR FOR 50-CYCLE OPERATION.

(Conversion springs are listed at end of Parts List.)

(a) Remove the motor from the top panel by removing 3 mounting screws (78).

(b) If motor shaft has a 60-cycle, coil spring drive pulley, remove the coil spring. After removing coil spring from motor 407B3, be sure to replace it with a cylindrical drive pulley (73A) as per paragraph 27.

(c) Hold the idler wheel (74) away from the drive pulley with the index finger of the left hand, and prevent the armature from turning by holding the motor fan with the left thumb. Now install the 50-cycle conversion spring by twisting it counterclockwise and pushing it down over the cylindrical drive pulley (73A) until its end is flush with the motor shaft. If the conversion spring has a projecting end—cut it off smoothly with a pair of side cutters.

NOTE

Care should be taken to prevent any grease or oil from coming into contact with the idler wheel tire or the eccentric cam tire.

MODEL RC150

ADMIRAL CORPORATION

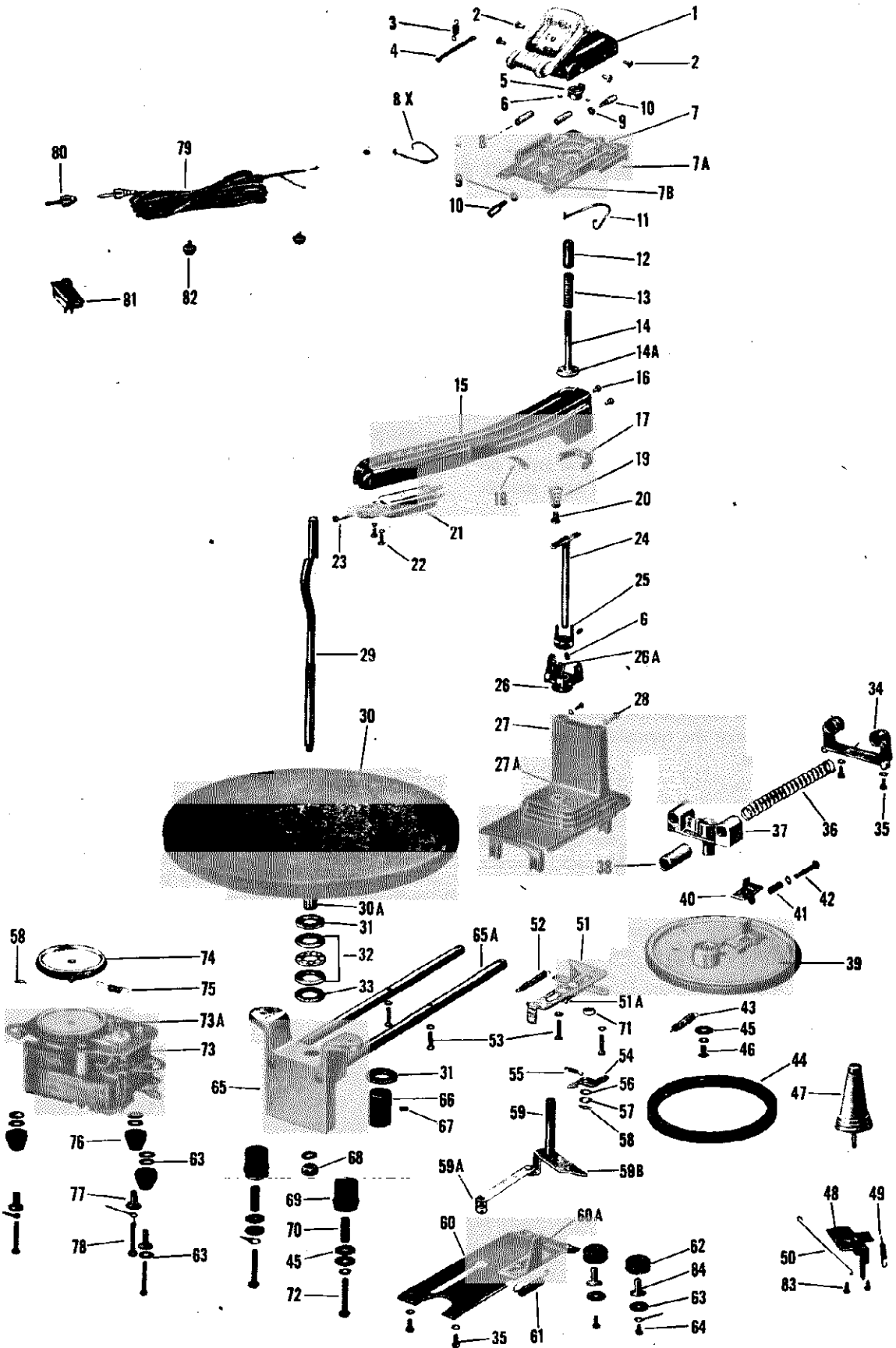


FIGURE 6. RECORD CHANGER, EXPLODED VIEW

ADMIRAL CORPORATION

SERVICE PARTS LIST

RC150 RECORD CHANGER

See Exploded View, Figure 6, for Identification of Parts

Ref. No.	Part Number	Description
1	G400A13-B	Cover assembly (Includes 3 and 4)
2	13A1-4-57	Snap buttons (cover)
3	405A4	Spring, record clip
4	414A4	Spring rod (record clip)
5	G400A31	Push-off arm assembly (When replacing, refer to paragraph 8)
6	1A44-38	Set screw (Bristol Head #6-32x3/16")
7	G400B51	Head assembly (Includes 7A, 7B, 8, 9, 10 and 11)
7A	G400A30	Head mounting plate assembly (Also part of 7)
7B		Push plate (Part of 7)
8	405A33	Spring, push plate (Also see 8X)
8X	405A17	Spring, push plate (Early type; located on top of push plate)
9	2A1-10-47	Hex nut (#6-32)
10	402A32	Adjusting screw, set-down point
11	405B18	Spring, head mounting plate (Located on bottom of head mounting plate assembly)
12	402A40	Spacer, upper lift rod
13	405A20	Spring, upper lift rod
14	G400A35	Upper lift rod and guide plate assembly
14A		Guide plate (Part of 14)
15	G400A62	Pickup arm and pivot spring assembly (Does not include 18, 19, 20 or 21)
16	6B1-36-47	Rivet (pickup arm pivot spring)
17	405A2	Pivot spring (pickup arm)
18	405A13	Spring clip (pickup arm)
19	405A29	Lock spring, pickup arm adjustment
20	402A17	Screw, knurled head (#8-32x9/32"; pickup arm adjustment)
21	409A3 Pickup cartridge 409A2 Pickup cartridge 409A1 Pickup cartridge	Interchangeable (Before replacing, see paragraph 23)
22	42-250-C2-47	Screw (Fil.H.M.S. #4-40x1/4"; for mtg. cartridge)
23	402A43	Needle screw for cartridge
24	G400A34	Lower lift rod assembly
25	G400A32	Guide pin assembly (When replacing, see par. 9)
26	G400A10	Lift guide assembly
26A		Latch spring, pickup arm (Part of 26)
27	G400A64	Base (die cast)
27A		Stop pin (Part of 27)
28	65-312-C2-47	Screw (B.H.M.S. #6-32x5/16"; for mtg. assembly 7)
29	G400A12	Centerpost
30	G400B49	Turntable
30A		Turntable shaft (Part of 30)
31	412A1	Cork washer (3/32" thick)
32	415A2	Thrust bearing assembly (Replace as a unit)
33	412A9	Cork washer (3/64" thick)
34	404A1	Riser plate support
35	62-250-C2-21	Screw (Fil.H.M.S. #6-32x1/4"; for mtg. riser plate)
36	405A9	Spring, recoil
37	404A3	Support, eccentric cam
38	401A27	Ferrule, guide rod stop
39	G400A45	Eccentric cam and tire assembly
40	401A58	Stop bracket
41	405A10	Spring, stop bracket
42	60-1125-C2-21	Screw (R.H.M.S. #6-32x1 1/8"; for adj. pickup point)
43	405A8	Spring, eccentric cam
44	406A1	Rubber tire, eccentric cam
45	4B1-57-47	Flat washer (eccentric cam)
46	84-250-C2-21	Screw (R.H.M.S. #8-32x1/4"; for mtg. eccentric cam)
47	G400A46-1 Reject housing assembly (For metal base) G400A46-2 Reject housing assembly (For wood or plastic base)	
48	G400A61	Reject lever assembly
49	405A25	Spring, reject lever
50	414A8	Reject trigger wire
51	G400A54	Reject bracket assembly
51A		Reject slide (Part of 51)
52	405A23	Spring, reject slide
53	62-500-C2-21	Screw (Fil.H.M.S. #6-32x1/4"; for mtg. guide rod)
54	401A70	Reject trigger
55	405A24	Spring, reject trigger
56	405A22	Spring washer (reject trigger)
57	4B1-68-47	Flat washer (reject trigger)
58	405A15	Spring, hairpin
59	G400A4	Trip linkage assembly (Some early models were furnished with a flat washer. Omit washer only if new part is installed.)
59A		Roller, retaining lever (Part of 59)
59B		Stop arm (Part of 59)
60	G400A9	Riser plate assembly
60A		Riser plate motion bracket (Part of 60)
61	405A7	Spring, safety
62	406A6 Rubber grommet (Small; used with metal base) 406A2 Rubber grommet (Used with wood or plastic base)	
63	4B1-36-47	Flat washer
64	60-250-C2-47 Screw (R.H.M.S. #6-32x1/4"; used for mounting record changer on metal base) 260-687-C2-2 Screw (R.H.M.S. Sems #6-32x11/16"; used for mounting record changer on wood or plastic base)	
65	G400B56	Turntable mounting and guide rod assembly
65A		Guide rods (Part of 65)
66	402A5	Knurled roller, turntable shaft (Two lengths are used: 29/32" and 31/32". Omit the cork washer above the roller when using the 31/32" roller.)
67	1A44-13	Set screw (Bristol #8-32x1/8"; for knurled roller)
68	402A41	Hex nut (1/4"-20; used on centerpost)
69	406A5 Rubber grommet (Large; used with metal base) 406A2 Rubber grommet (Used with wood or plastic base)	
70	402A36 Spacer, mounting (Used with metal base) 29A2-4-21 Spacer, mounting (Used with wood or plastic base)	
71	401A75	Spacer, reject trigger
72	80-1000-C2-47 Screw (R.H.M.S. #8-32x1"; used for mounting record changer on metal base) 280-875-C2-2 Screw (R.M.H.S. Sems #8-32x7/8"; used for mounting record changer on wood or plastic base)	
73	407B3	Motor; 105-125 volts, 60 cycle (Motors 407B1 and 407B2 are interchangeable with 407B3)
73A	401A48	Drive pulley (Part of 73. For motor 407B3 only.)
74	G400A23 Idler wheel assembly (Used with motor 407B3 only) G400A57 Idler wheel assembly (Used with motor 407B1 only) G400A59 Idler wheel assembly (Used with motor 407B2 only)	
75	405A14 Spring, idler wheel (Used with motor 407B3 only) 405A35 Spring, idler wheel (Used with motor 407B1 only) 405A36 Spring, idler wheel (Used with motor 407B2 only)	
76	406A4 Rubber grommet (motor mounting; for motor 407B3) 406A9 Rubber grommet (motor mounting; for motor 407B1) 406A10 Rubber grommet (motor mounting; for motor 407B2)	
77	401A53 Spacer, grommet (Used with motor 407B3) 402A44 Spacer, grommet (Used with motor 407B1) 402A45 Spacer, grommet (Used with motor 407B2)	
78	60-875-C2-4 Screw (R.H.M.S. #6-32x7/8"; used for mounting motor on metal base) 60-1125-C2-21 Screw (R.H.M.S. #6-32x1 1/8"; used for mounting motor on wood or plastic base)	
79	89A5-9	Shielded output cable and plug (Used on models 5RP47, 6RC45 and 6RC46 only)
80	88A2-1	Plug (output)
81	77A1-15	Switch, On-Off (Used on model 5RP47 only)
82	12A3-4	Rubber bumper (Used on model 5RP47 only)
83	1A20-14-21 Screw (#6x3/8" drive screw; used for reject lever mounting on metal base) 1A20-18-21 Screw (#6x7/8" drive screw; used for reject lever mounting on wood or plastic base)	
84	29A2-6-21	Spacer, mounting (Used with wood or plastic base)
	405A30	50 cycle conversion spring (For motor 407B1)
	405A31	50 cycle conversion spring (For motor 407B2)
	405A32	50 cycle conversion spring (For motor 407B3)

MODEL RC150

ADMIRAL CORPORATION
TROUBLE CHART

TROUBLE	CAUSE	REMEDY
Pickup arm sets down at wrong point on record even though the changer is reasonably level.	The set-down point requires adjustment.	See paragraph 5.
Pickup arm lifts at wrong point on record (change cycle starts too soon or too late).	Pickup point requires adjustment.	See paragraph 6.
Needle does not make contact when in playing position over a single record.	Pickup arm raised too high. Knurled adjusting screw (20) needs adjustment.	See paragraph 7(a).
Pickup arm does not clear arm rest.	Knurled adjusting screw (20) needs adjustment.	See paragraph 7(b).
Needle back-scratch.	Needle may be too long.	Use 1/8 inch needle.
	Pickup arm does not raise high enough.	See paragraph 7(b).
Push-off arm (5) in wrong position.	Loose or improperly set push-off arm.	See paragraph 8.
Guide pin assembly (25) in wrong position.	Loose or improperly set guide pin assembly.	See paragraph 9.
Turntable fails to rotate.	Various causes.	See paragraph 10.
Changer slows up while playing records.	Turntable shaft binds.	See paragraph 10(g).
	Centerpost is off-center or bent.	See paragraph 16.
Pickup arm remains at rest position after changer begins its change cycle or reject button has been pushed.	If turntable is rotating, look for loose set screws in the push-off arm (5).	See paragraph 8.
	Guide plate (14A) has come loose from upper lift rod.	Replace upper lift rod and guide plate assembly (14).
The 12-inch set-down point differs with cover assembly (1) off and on.	The 12-inch set-down adjusting screw may be touching cover assembly (1) during change cycle.	File down the end of the screw until it clears.
Pickup arm set-down point differs for manual rejection and automatic cycle.	Latch spring (26A) requires adjustment.	See paragraph 13.
	Loose or improperly set push-off arm (5).	See paragraph 8.
	Loose or improperly set guide pin assembly (25).	See paragraph 9.
Set-down point is erratic on both 10-inch and 12-inch records.	Push plate springs (8) may not provide sufficient tension.	See paragraph 14(a).
	Loose push-off arm (5).	See paragraph 8.
	Loose guide pin assembly (25).	See paragraph 9.
Bottom record of stack fails to drop to turntable.	Push-off arm may be loose.	See paragraph 8.
	Warped record. Record clip in wrong position.	See paragraph 15.
	Centerpost may be bent toward record support.	See paragraph 16.
Centerpost and record support too far apart.	Centerpost bent away from record support.	See paragraph 16.
Record support cannot be rotated for size change.	Changer turned off during a change cycle.	See paragraph 17.
Changer starts to cycle when record support is rotated for size change.	Push-off arm (5) is being tripped by the set-down point adjusting screw.	See paragraph 18.
Changer will not go into change cycle.	Eccentric cam may not be contacting knurled roller on turntable shaft.	See paragraph 19(a).
	Set screw on knurled roller may be loose.	See paragraph 19(b).
	Pickup point adjusting screw (42) is too far out of adjustment in a clockwise direction.	See paragraph 19(c).
Changer repeatedly goes into change cycle without playing record.	Pickup point adjusting screw (42) is too far out of adjustment in a counterclockwise direction.	See paragraph 20.
Wobbly pickup arm.	Binder head screw on rear of pickup arm is loose. (The later changers have eliminated this problem by using rivets (16) in place of this screw.)	Tighten screw.
Turntable "rings".	Idler wheel (74) bumpy or out-of-round.	Replace idler wheel.
Changer squeaks.	Centerpost needs lubrication.	See paragraph 22(b).
"Wow".	Warped record; sprung turntable; bumpy or out-of-round idler wheel.	Replace defective part.
	Centerpost off-center or bent.	See paragraph 22(c).
Hum.	Open shield lead of output cable (79).	Replace cable.
	Shorted or open pickup leads or shielded cable.	Replace defective part.
Changer operates mechanically but has weak or no electrical output.	Defective pickup cartridge.	See paragraph 23.
	Open shield lead of output cable (79).	Replace cable.
	High-resistance connection due to improper soldering.	Re-solder.
	Leakage through output plug (80).	Replace plug.
Changer operates mechanically but has a distorted electrical output.	Defective pickup cartridge.	See paragarph 23.

ADMIRAL CORPORATION

RC160 RECORD CHANGER

IMPORTANT

The RC160 Record Changer is similar in appearance to other Admiral changers. To be certain which model changer you are servicing, look for the changer model number which appears on the small label attached to the underside of the changer mechanism. The changer can be further identified by comparing Figures 3 and 5 with the actual changer.

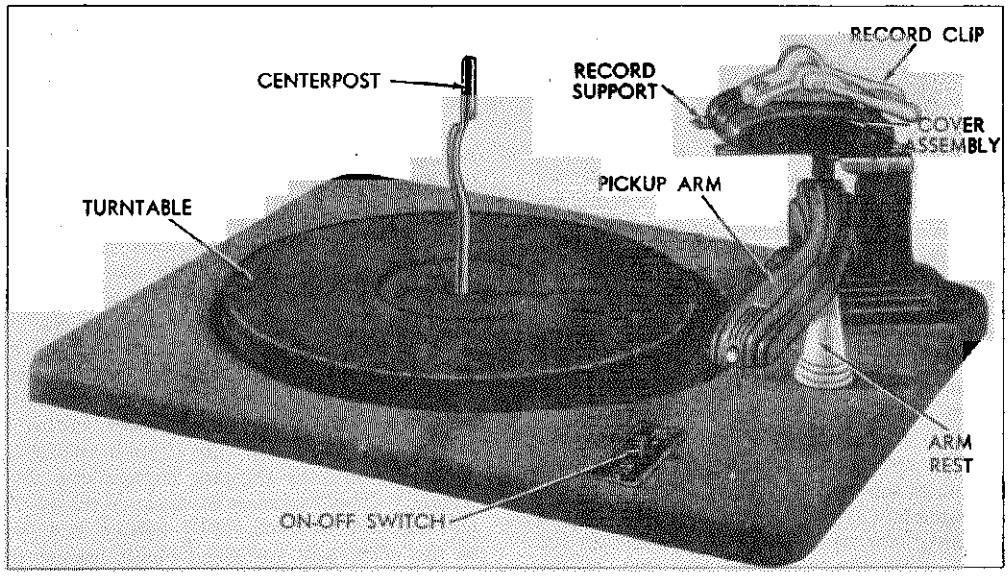


FIGURE 1. RECORD PLAYER, TOP VIEW

OPERATING INSTRUCTIONS

1. SETTING FOR SIZE OF RECORD.

The size of record for which the record changer is set to play is indicated by the number (on the top of the cover assembly) nearest the turntable. See Figure 1.

To change the setting, grasp the record support and cover assembly and rotate it a half turn until it snaps into place with the correct record size toward the turntable. **In changing the setting from 10-inch to 12-inch, rotate the assembly counterclockwise only; in changing from the 12-inch to the 10-inch setting, rotate the assembly clockwise only.**

2. STARTING THE RECORD CHANGER.

Load the record changer and set the record clip so that it rests on the top record. Before turning on the ON-OFF switch, firmly grasp the pickup arm, move it slightly to the right of the arm rest and then return the pickup arm to a point near the edge of the turntable before releasing it. While moving the arm, it should be held firmly enough to prevent it from snapping back and causing possible damage to the needle.

Now turn on the ON-OFF switch. The entire stack of records will then be played automatically.

3. REJECTING A RECORD.

To reject a record at any time and start playing the next one, firmly grasp the pickup arm, move it above and slightly to the right of the arm rest and return the pickup arm to a point near the edge of the record before releasing it. While moving the arm, it should be held firmly enough to prevent it from snapping back.

4. UNLOADING RECORDS.

To remove the records, it is advisable to have the changer mechanism out of cycle. However, it is possible to unload the changer while it is in cycle so long as the pickup arm is clear of the records.

Turn off the ON-OFF switch before lifting pickup arm to arm rest and removing records.

It is normal for early production RC160 changers to cycle if the pickup arm is moved to the arm rest while the turntable is rotating.

When removing records, hold them lightly and lift straight up.

CAUTIONS

1. **Never use force to stop the motor or turntable.**
2. **When turning the record support, be sure to grip the entire record support and cover assembly and not just the plastic record clip.**

ADMIRAL CORPORATION

THE CHANGE CYCLE

5. DESCRIPTION OF CHANGE CYCLE. (See Figures 2, 5, and 6.)

While a record is playing and as the pickup arm moves toward the center of the record, the arm control pin (31A) on the arm control assembly (31) moves along the portion of the arm control track (36B) as indicated at "P", figure 2. As the record reaches the pickup or trip point, the pin reaches point "T" on the track. As it moves into the recessed position in which it it shown in the illustration, it permits the trip spring (35) to pull the arm control plate (36) forward towards the centerpost (27). As the arm control plate is drawn forward, the stop tab (36A) on the arm control plate (36) is withdrawn from behind the stop bracket (43A) on the eccentric cam (43). The cam, which no longer is held in place by the stop tab (36A), is pulled over by the eccentric cam spring (44) until the rubber tire makes contact with the knurled roller (53) on the turntable shaft (28A). This knurled roller, which rotates with the turntable shaft, rotates the eccentric cam. In turn, this forces the riser plate assembly (37) back along its guide rods (51A) away from the centerpost (27). As soon as the riser plate begins to move, the push-off cam and shaft assembly (42) rides along the inclined track (37C) of the riser plate (37). This action causes the push-off cam and shaft assembly (42) to be drawn downward; as a result the pickup arm lift (19) presses down on the arm lift bearing pin (14) causing the pickup arm to be raised clear of the record. Then the riser plate tab (37B) contacts and moves the arm control assembly (31) which, since it is coupled to the pickup arm support assembly (22), carries the pickup arm away from the centerpost and clear of the edge of the turntable. As the riser plate (37) continues to travel further along the guide rods (51A), the riser plate motion bracket (37A) contacts and rotates the push-off cam and shaft assembly (42); as a result, the push-off arm (5), [which is coupled to the push-off cam and shaft assembly (42)] causes the push plate (7C) to drop a record to the turntable.

During the second half of the change cycle, the pressure of the push plate spring starts to return the push plate (7C) and push-off arm (5) back to their normal position. At the same time, the motion of the eccentric cam (43) and the guide rod recoil spring (38) propel the riser plate (37) toward the centerpost. The arm control assembly (31), and hence the pickup arm, are drawn back by the tension in the set-down spring (30). After the arm reaches this point directly above the set-down point, the riser plate (37) has moved far enough back towards the centerpost (27) to allow the push-off cam and shaft assembly (42) to ride down the inclined track (37C) of the riser plate (37). This lowers the pickup arm onto the record. (The following paragraph describes how the set-down point is determined for the 10-inch and 12-inch settings.) As the eccentric cam (43), aided by the eccentric cam spring (44) completes its revolution, the rubber tire of the cam moves away from the knurled roller (53) on the turntable shaft and the stop bracket (43A) comes to rest against the stop tab (36A) of the arm control plate (36). The change cycle is completed.

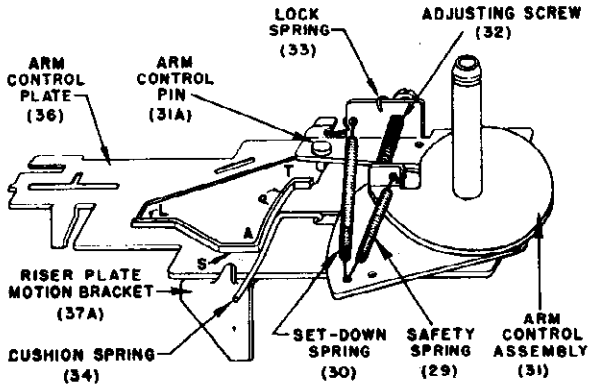


FIGURE 2.

6. DESCRIPTION OF DETERMINATION OF 10-INCH AND 12-INCH SET-DOWN POINTS.

During the early part of the change cycle, the arm control plate (36) has traveled (in a direction away from the centerpost) until the size change stop (36C) reaches the cam (42B) of the push-off cam and shaft assembly. The distance traveled by the arm control plate (36) will depend on the size of the record being played; the distance is less for a 12-inch setting than for a 10-inch setting. (This is true because the push-off cam (42B) presents its short radius to the size change stop (36C) for the 10-inch setting and presents its long radius to the size change stop for a 12-inch setting.) This variation in distance traveled means that the arm control track (36B) will be in a position closer to the centerpost for the 12-inch setting than for the 10-inch setting. This in turn means that during the change cycle the arm control pin (31A) [whose path is determined by the motion of the arm control assembly (31)] will leave its recessed position, and will ride along the "S" portion of the arm control track for the 12-inch setting and along the "L" portion for the 10-inch setting. (See Figure 2.)

As the pickup arm moves back towards the record during the second half of the change cycle, it will be stopped when the bracket (31C) reaches the adjusting screw (32). How far the arm returns before being stopped depends on whether the arm control pin (31A) has been riding in the "S" or "L" portion of the arm control track. If the pin has been riding in the "S" or 12-inch portion of the track, the arm will be stopped at a point directly above the 12-inch set-down point; if the pin has been riding in the "L" or 10-inch portion, the arm will be stopped at a point directly above the 10-inch set-down point.

7. REJECTING A RECORD.

When rejecting a record, the motion of the pickup arm moves the arm control assembly (31) so that the trip spring (35) tension is now permitted to move the arm control plate (36) slightly forward. This movement releases the stop bracket (43A) on the eccentric cam which was engaged by the stop tab (36A) on the arm control plate. The eccentric cam (43) then falls against the knurled roller (53) and the change cycle begins as if a record had just finished playing.

ADMIRAL CORPORATION

ADJUSTMENTS

CAUTIONS

1. **See that the drive pulley (60A), and the rubber tires on both the idler wheel (57) and the eccentric cam (43) are kept clean and free from oil, grease, dirt, or any foreign material. Carbona or carbon tetrachloride may be used for cleaning these parts.**

2. **If replacement of any parts requires the removal of the lift adjusting collar (10), pickup arm support assembly (22) or the push-off arm (5), be sure to re-position or replace these parts as directed in paragraphs 9, 10, and 11 respectively.**

TOOLS REQUIRED

#6 Bristol Set Screw Wrench. (Admiral Part No. P-5805. List Price $0.05.)
#8 Bristol Set Screw Wrench. (Admiral Part No. P-5806. List Price $0.05.)

8. SET-DOWN POINTS AND PICKUP OR TRIP POINT.

(If the pickup arm support assembly (22) has been removed or if its set screws are loose, it must be re-positioned as described in paragraph 10 before adjusting the set-down points and pickup or trip point.)

This changer is designed so that the 10-inch set-down point, the 12-inch set-down point, and the pickup or trip point are simultaneously adjusted in a single operation. It is recommended that you make the adjustment at either of the set-down points. This adjustment is made by means of the adjusting screw (32) shown in figure 1. Turning this screw counter-clockwise will cause the arm to set down closer to the centerpost; turning it clockwise will cause the arm to set down further away from the centerpost. One complete turn on the screw will move the arm about ¼ inch.

If the adjusting screw (32) will not change the setting sufficiently, the pickup arm support assembly (22) may be out of position. (See paragraph 10.)

The set-down points when using a straight-shank needle will differ slightly than when using an offset-shank needle such as the Admiral Lifetime Needle. If you do not know which type of needle is to be used by the customer, we suggest the following settings *when tested with a straight needle:* measuring from the side of the centerpost, 4⅝" for the 10-inch set-down point, 5⅝" for the 12-inch set-down point, and 1-19/32" for the pickup or trip point.

If you know which type of needle will be used by the customer, and test with that type of needle, the following settings are recommended: measuring from the side of the centerpost, 4-21/32" for the 10-inch set-down point, 5-21/32" for the 12-inch set-down point, and 1⅝" for the pickup or trip point.

When using an offset-shank needle, slight variations in set-down point can often be corrected by loosening the needle screw and rotating the needle slightly.

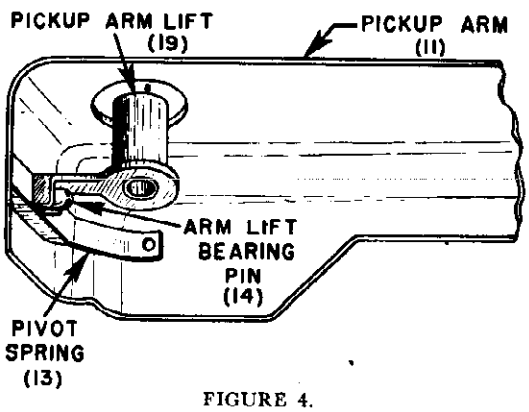


FIGURE 4.

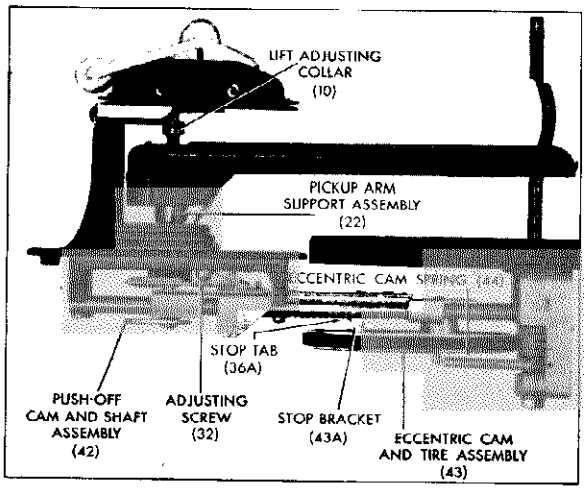


FIGURE 3.

9. PICKUP ARM HEIGHT.

When properly adjusted, the pickup arm height should be such that, without a needle and with a single record on the turntable, the arm should be about 1/32" above the record. The arm height depends on the location of the lift adjusting collar (10). As the collar is moved down, the arm is raised, and vice versa. When necessary, the pickup arm height may be adjusted by repositioning the lift adjusting collar (10) as follows:

(a) The changer should be out of cycle.

(b) Lift the pickup arm and check to see that the pickup arm lift (19) is positioned properly over arm lift bearing pin (14). (See Fig. 4.)

(c) Remove needle and place pickup arm on turntable close to its edge.

(d) Loosen set screw in lift adjusting collar (10).

(e) Remove slack by pushing up on push-off cam and shaft assembly (42). Do not compress the arm lift shaft spring (41).

(f) Using a #6-32 Bristol wrench, place it in the set screw and slide the lift adjusting collar (10) down until it is snug against the pickup arm lift (19).

(g) Tighten set screw in the lift adjusting collar.

(h) Check height.

If height is still incorrect, it may be necessary to repeat the adjustment. Before doing so, it may be advisable to examine the shaft (42A) of the push-off cam and shaft assembly for nicks and burrs caused by the set-screws. Smooth shaft with file if necessary. The upper portion of the shaft is accessible if the push-off arm (5), head assembly (7) and lift adjusting collar (10) are removed. To prevent shaft from falling out through bottom, keep in place with masking tape. When replacing the lift adjusting collar (10) and push-off arm (5), see paragraphs 9 and 11 respectively.

ADMIRAL CORPORATION

SERVICING AND REPAIR

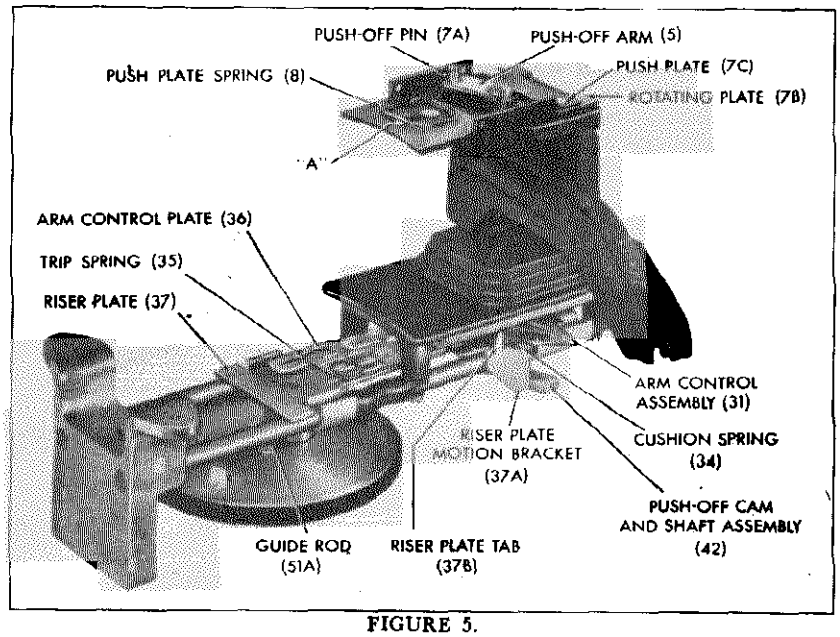


FIGURE 5.

10. RE-POSITIONING PICKUP ARM SUPPORT ASSEMBLY (22).

To assure proper set-down adjustment, this must be done carefully as follows if set screws are loose or if pickup arm support assembly (22) has been removed.

(a) Turn adjusting screw (32) (see paragraph 1) clockwise as far as it will go, then turn back counter-clockwise for 2 full turns.

(b) Place a 12" record on the turntable.

(c) With the changer out of cycle, manually move the arm control assembly (31) outwards as far as it moves freely. In this position, the arm control pin (31A) will be located as indicated at "A" in figure 2.

(d) Place pickup arm so that needle rests in first playing groove on the 12" record.

(e) Tighten the two set screws in pickup arm support assembly (22).

(f) Make the final set-down adjustment as described in paragraph 1.

11. RE-POSITIONING PUSH-OFF ARM (5).

This must be carefully done if set screws are loose or push-off arm (5) has been removed.

(a) Rotate the record support to the 10-inch position. Remove push-off arm (5).

(b) Manually slide the push plate (7C) over the rotating plate (7B) until a piece of metal 3/32 inch in diameter or a #8-32 Bristol wrench can be inserted into the opening at the front of the center slot in the push plate (see "A", figure 5). If the 12-inch push-off is faulty with this setting, try using a 1/16" piece of metal or a #6-32 Bristol wrench.

(c) Put the changer into cycle and manually rotate the turntable until the riser plate (37) has traveled along the guide rods (51A) to a position furthest away from the turntable.

(d) Now position push-off cam and shaft assembly (42) so that it is held tightly against riser plate motion bracket (37A).

(e) Put push-off arm in position, leaving about 1/16" clearance between the top of the push plate and the push-off arm.

(f) Tighten set screws in push-off arm.

12. CHANGER REPEATEDLY GOES THROUGH CHANGE CYCLE WITHOUT PLAYING RECORD.

(a) Mounting screw on eccentric cam (43) may be loose. Tighten.

(b) Cushion spring (34) has slipped out of position and is on wrong side of riser plate tab (37B). Re-position spring. (See figure 5.)

(c) In normal operation, the trip spring (35) holds the arm control plate (36) against the riser plate (37). If the trip spring is faulty, it permits the arm control plate to rise too high above the riser plate. This causes the stop bracket (43A) to pass underneath the stop tab (36A). To correct, bend the legs of the trip spring closer together. If necessary, replace trip spring.

(d) Eccentric cam (43) is bent so that stop bracket (43A) passes underneath stop tab (36A) on the arm control plate (36). To correct, straighten cam by putting changer out of cycle and pressing upward on cam near stop bracket.

(e) The stop bracket (43A) on the eccentric cam (43) is not properly bent and is failing to engage stop tap (36A) on arm control plate (36). To correct, bend stop bracket (43A) until it is at right angles to disc of eccentric cam.

13. NEEDLE SLIDES ACROSS PORTION OF RECORD AFTER SET-DOWN ON 12-INCH RECORD.

Cushion spring (34) has slipped out of position and is on wrong side of riser plate tab (37B). Re-position spring. (See figure 5.)

14. CHANGER CYCLES WHEN PICKUP ARM IS MOVED TO ARM REST.

It is normal for early production RC160 changers to cycle if the pickup arm is moved to the arm rest while the turntable is rotating. Turn off the ON-OFF switch before lifting pickup arm to arm rest.

ADMIRAL CORPORATION

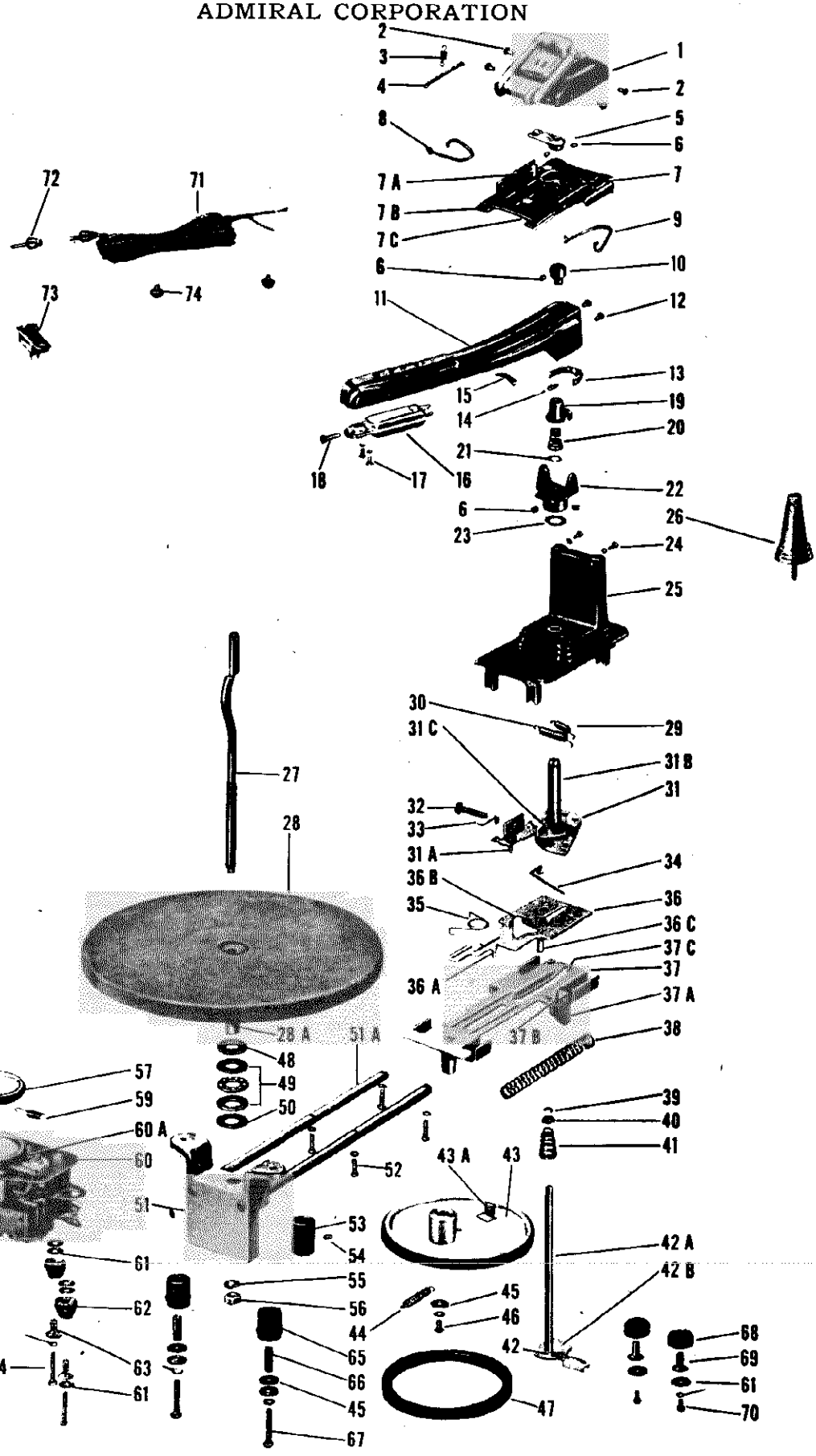


FIGURE 6. RECORD CHANGER, EXPLODED VIEW

MODEL RC160

ADMIRAL CORPORATION

SERVICE PARTS LIST

RC160 RECORD CHANGER

See Exploded View, Figure 6, for Identification of Parts.

Ref. No.	Part Number	Description
1	G400A109	Cover assembly (Includes 3 and 4)
2	13A1-3-57	Snap buttons (cover)
3	405A4	Spring, record clip
4	414A4	Spring rod (record clip)
5	G400A66	Push-off arm assembly (When replacing, refer to paragraph 11)
6	1A44-38	Set screw (Bristol Head #6-32x3/16")
7	G400B68	Head assembly (Includes 7A, 7B, 7C, 7D, 8 and 9)
7A		Push plate pin (Part of 7)
7B		Rotating plate (Part of 7)
7C		Push plate (Part of 7)
7D		Head mounting plate (Part of 7)
8	405A38	Spring, push plate (Located on top of push plate)
9	405B18	Spring, head mounting plate (Located on bottom of head mounting plate assembly)
10	402A57	Lift adjusting collar (When replacing, refer to paragraph 9)
11	G400A91	Pickup arm, pivot spring and arm lift bearing pin assembly (Does not include 15 and 16)
12		Rivet (pickup arm pivot spring) } Supplied as a group only; order part number 98A1
13		Pivot spring (pickup arm) } Supplied as a group only; order part number 98A1
14		Arm lift bearing pin } Supplied as a group only; order part number 98A1
15	405A13	Spring clip (pickup arm)
16	409A3 Pickup cartridge 409A2 Pickup cartridge 409A1 Pickup cartridge	} Interchangeable
17	42-250-C2-47	Screw (Fil.H.M.S. #4-40x1/4"; for mtg. cartridge)
18	402A43	Needle screw for cartridge
19	G400A86	Pickup arm lift assembly
20	405A46	Brake spring (5 turns)
21	405A37	Retaining ring (Used on arm support tube 31B)
22	G400A73	Pickup arm support assembly (When replacing, refer to paragraph 10)
23	405A27	Washer, spring
24	65-312-C2-47	Screw (B.H.M.S. #6-32x5/16"; for mtg. assembly 7)
25	G400B80	Base (die cast)
26	G400A46-1	Arm rest
27	G400A12	Centerpost
28	G400B49	Turntable
28A		Turntable shaft (Part of 30)
29	405A41	Safety spring
30	405A42	Set-down spring
31	G400A84	Arm control assembly
31A		Arm control pin (Part of 31)
31B		Arm support tube (Part of 31)
31C		Bracket (Part of 31)
32	60-875-C2-21	Adjusting screw
33	405A44	Lock spring (set-down adjustment)
34	405A45	Cushion spring
35	405A43	Trip spring
36	G400A112	Arm control plate
36A		Stop tab (Part of 36)
36B		Track (Part of 36)
36C		Size change stop (Part of 36)
37	G400A88	Riser plate assembly
37A		Riser plate motion bracket (Part of 37)
37B		Riser plate tab (Part of 37)
37C		Inclined track (Part of 37)
38	405A9	Spring, recoil
39		Retaining ring (arm lift shaft) } Furnished as an assembly only; order part number G400A98
40		Safety collar (arm lift shaft) } Furnished as an assembly only; order part number G400A98
41		Spring (arm lift shaft) } Furnished as an assembly only; order part number G400A98
42		Push-off cam and shaft assembly } Furnished as an assembly only; order part number G400A98

Ref. No.	Part Number	Description
42A		Arm lift shaft (Part of 42)
42B		Push-off cam (Part of 42)
43	G400A78	Eccentric cam and tire assembly
43A		Stop bracket (Part of 43)
44	405A47	Spring, eccentric cam
45	4B1-57-47	Flat washer (eccentric cam)
46	84-250-C2-21	Screw (R.H.M. #8-32x1/4"; for mtg. eccentric cam)
47	406A1	Rubber tire, eccentric cam
48	412A1	Cork washer (3/32" thick)
49	415A2	Thrust bearing assembly (Replace as a unit)
50	412A9	Cork washer (3/64" thick)
51	G400B56	Turntable mounting and guide rod assembly
51A		Guide rods (Part of 51)
52	62-500-C2-21	Screw (Fil.H.M.S. #6-32x1/4"; for mtg. guide rod)
53	402A5	Knurled roller, turntable shaft
54	1A44-13	Set screw (Bristol #8-32x1/8"; for knurled roller)
55	3A2-5-47	Lockwasher, split (1/4" diameter)
56	402A41	Hex nut (1/4"-20; used on centerpost)
57	G400A23 Idler wheel assembly (Used with motor 407B3 only) G400A57 Idler wheel assembly (Used with motor 407B1 only) G400A59 Idler wheel assembly (Used with motor 407B2 only)	
58	405A15	Spring, hairpin
59	405A14 Spring, idler wheel (Used with motor 407B3 only) 405A35 Spring, idler wheel (Used with motor 407B1 only) 405A36 Spring, idler wheel (Used with motor 407B2 only)	
60	407B3	Motor, complete with idler wheel; 105-125 volts, 60 cycle (Motors 407B1 and 407B2 are interchangeable with 407B3)
60A	401A48	Drive pulley (Part of 73. For motor 407B3 only.)
61	4B1-36-47	Flat washer
62	406A4 Rubber grommet (motor mounting; for motor 407B3) 406A9 Rubber grommet (motor mounting; for motor 407B1) 406A10 Rubber grommet (motor mounting; for motor 407B2)	
63	401A53 Spacer, grommet (Used with motor 407B3) 402A44 Spacer, grommet (Used with motor 407B1) 402A45 Spacer, grommet (Used with motor 407B2)	
64	60-875-C2-2 Screw (R.H.M.S. #6-32x7/8"; used for mounting motor on metal base) 60-1125-C2-21 Screw (R.H.M.S. #6-32x1 1/8"; used for mounting motor on wood or plastic base)	
65	406A5 Rubber grommet (Large; used with metal base) 406A2 Rubber grommet (Used with wood or plastic base)	
66	402A36 Spacer, mounting (Used with metal base) 29A2-4-21 Spacer, mounting (Used with wood or plastic base)	
67	80-1000-C2-47 Screw (R.H.M.S. #8-32x1"; used for mounting record changer on metal base) 280-875-C2-2 Screw (R.M.H.S. Sems #8-32x7/8"; used for mounting record changer on wood or plastic base)	
68	406A6 Rubber grommet (Small; used with metal base) 406A2 Rubber grommet (Used with wood or plastic base)	
69	29A2-6-21	Spacer, mounting (Used with wood or plastic base)
70	60-250-C2-47 Screw (R.H.M.S. #6-32x1/4"; used for mounting record changer on metal base) 260-687-C2-2 Screw (R.H.M.S. Sems #6-32x11/16"; used for mounting record changer on wood or plastic base)	
71	89A5-9	Shielded output cable and plug (Used on models 5RP47, 6RC45 and 6RC46 only)
72	88A2-1	Plug (output)
73	77A1-15	Switch, On-Off (Used on model 5RP47 only)
74	12A3-4	Rubber bumper (Used on model 5RP47 only)
	405A30	50 cycle conversion spring (For motor 407B1)
	405A31	50 cycle conversion spring (For motor 407B2)
	405A32	50 cycle conversion spring (For motor 407B3)

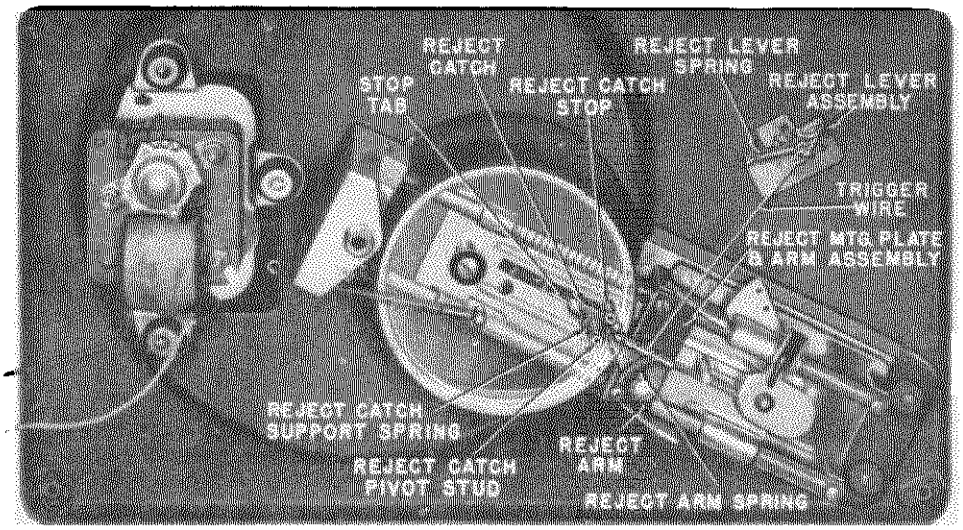
ADMIRAL CORPORATION

RC160A RECORD CHANGER

When servicing the RC160A, use this supplement with the RC160 Service Manual

IMPORTANT

The RC160A Record Changer is similar in appearance to other Admiral changers. To be certain which model changer you are servicing, look for the changer model number which appears on the small label attached to the underside of the changer mechanism.



ECCENTRIC CAM IN PHANTOM TO SHOW REJECT CATCH

The RC160A is a modification of the RC160 Record Changer. Hence, the Service Manual for the RC160 Record Changer may be used for servicing the RC160A if the following changes are noted:

THE REJECT MECHANISM

A push-button reject mechanism has been provided in the RC160A Record Changer.

The reject button is located on the top of the arm rest. The additional parts used to provide push-button rejection are shown in the illustration above; part numbers are listed below under "Service Parts List".

The illustration above shows the changer out of cycle, that is, when a record is playing. Note that the reject catch engages both the stop tab on the arm control plate, and the reject arm. If the changer is allowed to finish playing the record, the stop tab on the arm control plate is withdrawn from behind the reject catch; the eccentric cam is then pulled against the knurled roller and the change cycle begins. However, when the reject button is pressed, the reject trigger wire pulls the reject arm from behind the catch; the eccentric cam is pulled against the knurled roller and the change cycle begins.

TURNTABLE MOUNTING

The RC160A also features an improved turntable shaft bearing arrangement. Self-lubricating porous bronze bearings are now pressed into the turntable mount casting. This feature was also added to the later RC160 changers.

OPERATING INSTRUCTIONS

To start the RC160A Record Changer, load the record changer, set the record clip, and turn on the On-Off switch. Now press down on the reject button directly or push down on the pickup arm momentarily if it is setting on the arm rest. The entire stack of records will be played automatically.

To reject a record, merely press down on the reject button.

SERVICE PARTS LIST

(All parts not listed below are the same as in the RC160 and should be ordered from RC160 Service Manual)

Part Number	Description
G400A115	Reject lever assembly
405A25	Spring, reject lever
414A12	Reject trigger wire
G400A116	Reject mounting plate and arm assembly
	Reject arm (part of reject mtg. plate and arm assembly)
405A25	Reject arm spring
401A97	Reject catch
405A15	Hairpin spring (reject catch)
405A50	Reject catch support spring

Part Number	Description
G400A117	*Eccentric cam and tire assembly (Does not include reject catch support spring or hairpin spring)
	Reject catch pivot stud (part of cam)
	Reject catch stop (part of cam)
G400A111	*Turntable mounting and guide rod assembly
402A62	*Knurled roller
G400A46-1	Arm rest assembly (Mounted on metal only)
G400A46-2	*Arm rest assembly (Mounted on wood or plastic)

*These parts are not interchangeable with RC160 parts having same description but different part numbers.

CONCORD RADIO CORP.

Illustration 1

OPERATING INSTRUCTIONS

This changer is a simple, gearless, foolproof mechanism (See Illustration 3), designed to give the maximum convenience and pleasure with a minimum of attention and care. For the fullest enjoyment of your recordings and carefree operation of your changer, the following instructions should be observed.

This machine operates on 115 volt, 60 cycle alternating current only.

FOR AUTOMATIC OPERATION

This machine will play and automatically change a series of up to twelve 10-inch records or ten 12-inch records of the 78 r.p.m. type having an eccentric stopping groove. Recordings sold today for home use are of this type. Very old records that do not have an eccentric stopping groove can be played semi-automatically by operating the reject lever at the conclusion of each selection.

1. Raise the tone arm, loosen the needle thumb screw and insert the needle with the flat on the needle shaft toward the screw; tighten the screw. Sapphire point needles are recommended, but any long-wearing alloy-tip needle will give satisfactory performance. Ordinary steel needles are not advisable as they do not play more than a few records per needle. (See Illustration 2.)

2. On the tone arm hub are two detents (grooves) marked A and H. By holding the hub and moving the tone arm sidewise, these detents can be positively felt. Engage the detent marked A for automatic operation. (See Illustration 2.)

3. The record support shelf must be adjusted for 10-inch or 12-inch records. By firmly grasping the shelf and rotating it one-half revolution in either direction, positive detents can be felt. For 10-inch records the wider ledge should face the spindle. For 12-inch records rotate the shelf so that the narrower ledge is toward the spindle. (See Illustration 2.)

4. The toggle plate, which hinges between the 10-inch and 12-inch positions on the record shelf, should be flipped toward the back, away from the spindle. (See Illustration 2.)

5. Place the load of records on the changer; they should be supported at the center on the spindle, and at one side on the record shelf. (See Illustration 1.)

6. Flip the toggle plate over on to the top of the record stack. This must be done to provide the necessary tension to allow records to drop correctly. (See Illustration 1.)

7. Push the control lever to the "ON" position. If the changing action does not start at once, push the lever to the reject position and release. The changer will now automatically play the load of records.

If you should forget to turn the machine off after the last record has played, no harm will come to the mechanism, as the last record will continue to play until turned off.

TO REMOVE RECORDS

1. Move the control lever to the "OFF" position while the needle is still on the record. If the tone arm is lifting off the record, wait a moment until it moves back down onto the record before turning off the machine.

2. Lift the tone arm from the records and place on the tone arm rest.

3. Flip the toggle plate toward the back, away from the spindle.

4. Lift the records off the turntable until they completely clear the spindle.

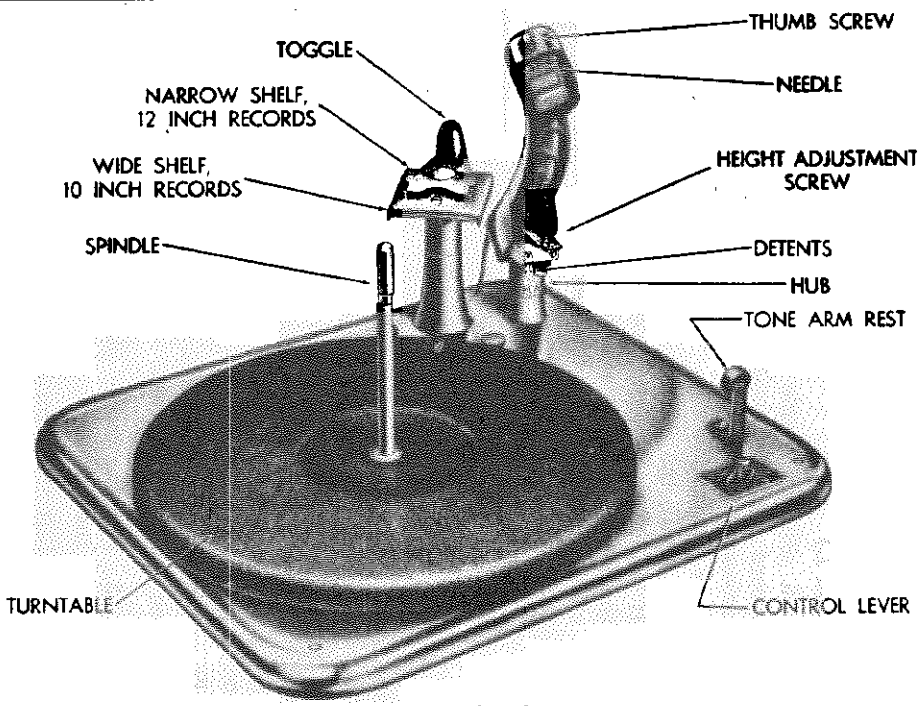


Illustration 2

The spindle used on this record changer is completely automatic. When removing the records from the turntable, the pressure of the records under the top section of the spindle causes it to rotate, automatically, into the correct position for removal of the records. As soon as the records are free of the spindle, the top section drops back into the correct position for reloading.

TO REJECT RECORDS

A record may be rejected at any time during playing by simply pushing the control lever momentarily to the reject position.

NON-STANDARD RECORDS

This machine has been designed to give excellent performance as a completely automatic record changer. Records, such as home recordings, children's records, etc., which are not intended for automatic playing, may be played manually. For satisfactory operation, carefully observe the following instructions:

1. Move the tone arm into "H" detent on the hub.
2. Rotate the record shelf to the 12-inch position.
3. Flip the toggle plate toward the back.
4. Put the selected record over the spindle and down onto the turntable.
5. Move the control lever to the "ON" position.
6. Wait a moment until the tone arm raises and completely lowers; the tone arm will then be free to be placed by hand on the starting edge of any size record on the turntable.
7. At the conclusion of the record, move the control lever to the "OFF" position and place the tone arm on the rest.

SPECIAL INSTRUCTIONS

Do not oil any part of the changer as it has been permanently lubricated at the factory.

Changer should be level as any tilt would cause the tone arm to fall in the direction of the tilt.

To adjust the height of the tone arm from the record: (If needle does not set down on record, or if it does not raise high enough to clear the top of the last record of a stack) Raise the tone arm and turn the height adjustment screw counterclockwise to increase the height of the tone arm, or turn clockwise to lower the tone arm. (Loosen the nut to adjust the screw; tighten again after resetting the screw.)

Do not attempt to make any other adjustment as mechanism has been adjusted at the factory.

CONCORD RADIO CORP.

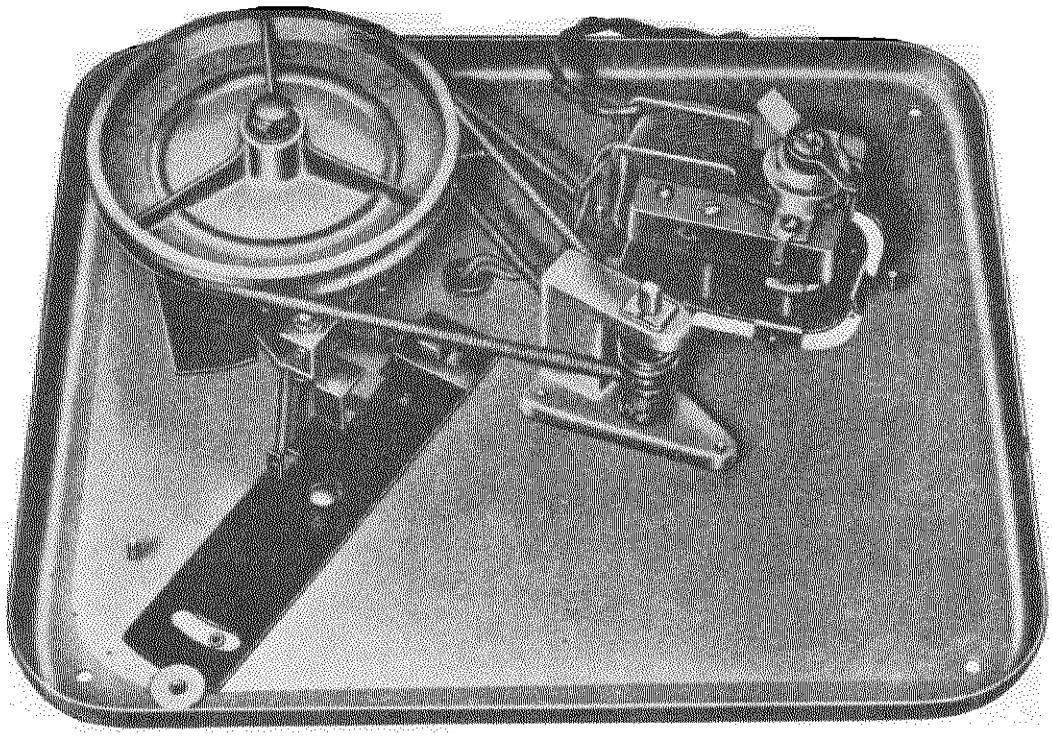


Illustration 3

SERVICE PARTS LIST

RECORD CHANGER

Part No.	Description
A-25121	Washer .625 O.D. x .375 I.D. x .010 brass (Tone Arm Trip Assy., and Cam and Drum Assembly)
A-50002	Cam, Record Ejector
A-50005	Washer, Cam Cover
A-50009	Washer, 5/16 O.D. x .156 I.D. x .025 brass (Ratchet Release Assy., and Index Arm on Ejector and Tone Arm Assy.)
C-50030	Spindle Bearing Assembly
A-25076	Screw, Set
A-50010	Turntable Bearing Assembly
A-50019	Ball Bearing, Thrust
A-50046	Clip
A-50053	Washer, Flat
A-50088	Washer, Felt
B-50127	Spindle Assembly
B-50181	Strut
A-50198	Pulley Bearing
BH1A1100	Tinnerman Fastener
BS014D05	Screw, No. 8-32 x 5/16
A-50032	Spring, Index
A-50035	Grommet (Tone Arm Lead)
A-50040	Spring, Toggle Plate
A-50055	Spring, Ejector
A-50066	Nut, Acorn
A-50069	Spring, Tone Arm Counterbalance
A-50076	Spring, Tone Arm Lead-in, and Reject
B-50085-1	Rest Assembly, Tone Arm
A-50187	Screw No. 8-32 x 5/16 Thread Cutting
C-50100	Motor Board Assembly
A-50097	Cover, Switch
A-50102	Switch
A-50104	Washer, Cup
B-50140	Lever, On-Off
A-50153	Escutcheon
A-50301	Rivet, Shoulder (On-off lever)
BV321E13	Rivet, Tubular 1/8 x 3/16
A-50110	Toggle Plate and Bumper Assembly
A-50015	Plate, Toggle
A-50025	Bumper
A-50162	Plate, Ejector
A-50176	Ejector Shelf Casting
C-50180	Cam and Drum Assembly
A-50058	Pad, Friction
A-50059	Stud
B-50060	Cam Assembly
B-50700	Drum Drive Wheel
B-50190	Plate Assy., Ejector and Tone Arm
BS014B05	Screw No. 8-32 x 3/16
A-50200	Ejector Shaft Assembly
B-50300	Tone Arm Trip Assembly
B-50400	Release Bracket Assembly
A-50406	Spring, Dog
A-50500	Lift Assembly, Tone Arm
B-50600	Hub Assembly, Tone Arm
B-50820	Tone Arm Assembly
A-50802	Crystal Pickup and Thumb Screw
A-50803	Insert
A-50804	Screw No. 4-40 x 1/4
A-50806	Lead, Shielded
A-50807	Clip
D-50808	Tone Arm
C-50910	Turntable
A-51163	Clip (Ratchet Release Assembly)
A-50136	Clip "C" (Index Arm and Tone Arm Trip Lever Assembly)
B-50137	Belt, Drive
A-50150	Record Adjustment Shaft Assembly
C-50154	Motor (for 60 cycle, 105-125 volts)
A-50186	Grommet
A-50038	Spacer
A-50188	Screw, No. 6-32 x 5/8 thread cutting hex washer head

Order parts not listed by specifying (1) Part Name, (2) Model Number and (3) Run Number.

FARNSWORTH TELEV. & RADIO CORP.

Due to the fact that a thorough understanding of the proper operation of a record changer is necessary before any attempt be made to repair or effect service adjustments, a description of the change cycle of the P-51 Record Changer is given.

The Record Shelf is set for the size record to be played by turning the Shelf to the position having the shortest distance from the Spindle for 10 inch records and to the position having the greatest distance from the Spindle for 12 inch records. Th the correct number of records should be placed the shelf. (Twelve 10" or ten 12" but not mixec Do not turn the Record Shelf until the changer h stopped automatically after all the records a dropped or removed from the Record Shelves.

Badly chipped records or records with brea should not be used.

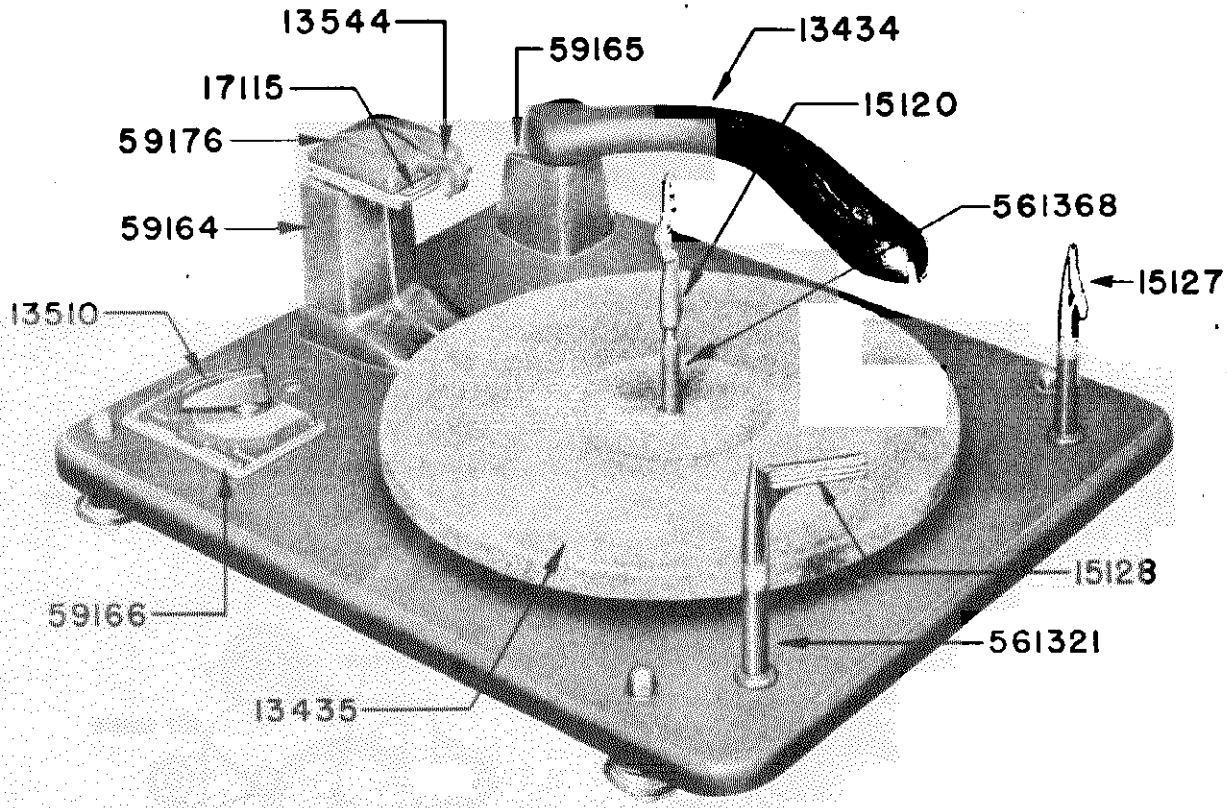


FIGURE 1

TOP VIEW OF P-51 RECORD CHANGER

13434	Tone Arm Assembly
13435	Turntable
13510	Control Knob Assembly
13544	Shelf Cover and Record Hold-Down Rubber Assembly
15120	Spindle Assembly
15127	Record Support and Crank Assembly(R.H.)
15128	Record Support and Crank Assembly(L.H.)
17115	Plunger and Shelf Assembly
59164	Record Support Post
59165	Tone Arm Support
59166	Escutcheon
59176	Shelf Cover
561321	Shelf Post
561368	Turntable Drive Shaft

FARNSWORTH TELEV. & RADIO CORP.

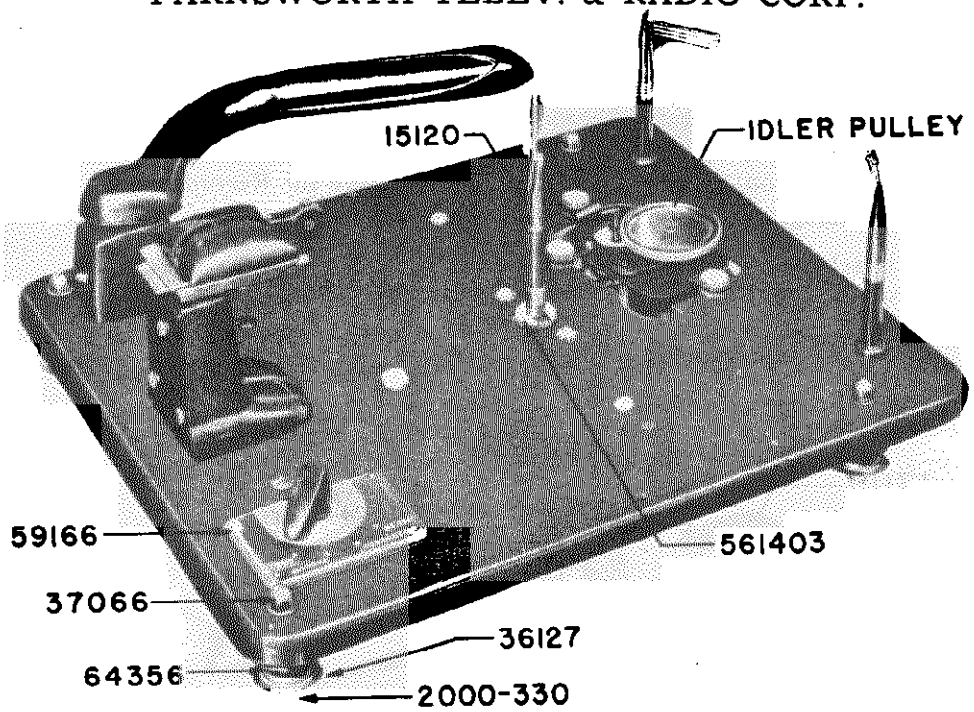


FIGURE 2

TOP VIEW WITH TURNTABLE REMOVED

09217	Mounting Spring Assembly	15120	Spindle Asssembly
36127	Cup	37066	Acorn Palnut
36137	Retainer Nut	59166	Escutcheon
64014	Upper Spring	561403	Turntable "C" Stop Washer
64356	Lower Spring		
2000-330	#10-32 x 1 7/8" Rd. Hd. M. S.		

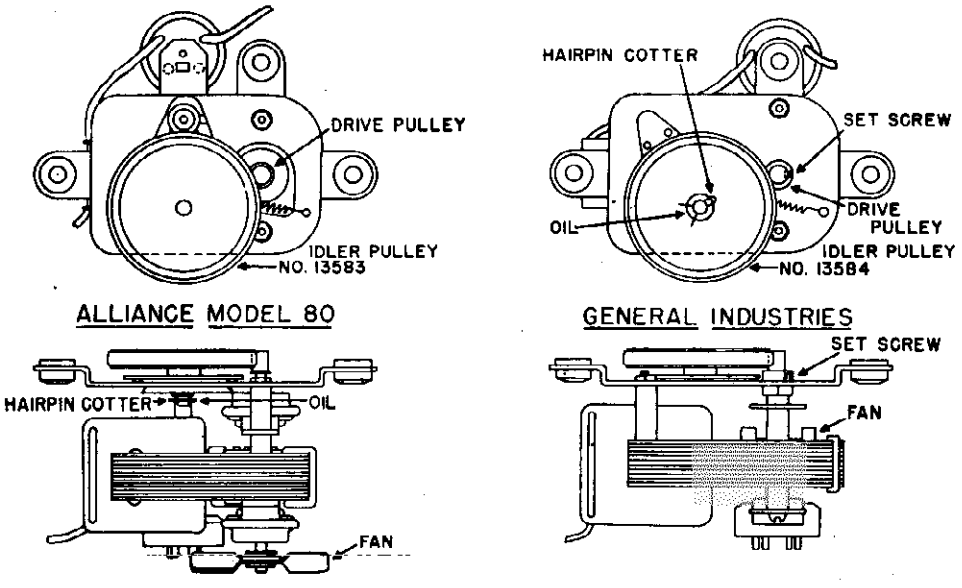


FIGURE 3

The Two makes of motors used on the P-51 Automatic Record Changers are the Alliance Motor and the General Industries Motor. The complete motors are interchangeable, but it is necessary to identify the make of motor when ordering an Idler Pulley. Either make may readily be distinguished by noting the location of the fan on the motor and the location of the hair pin cotter holding the Idler pulley as shown in above figure 3.

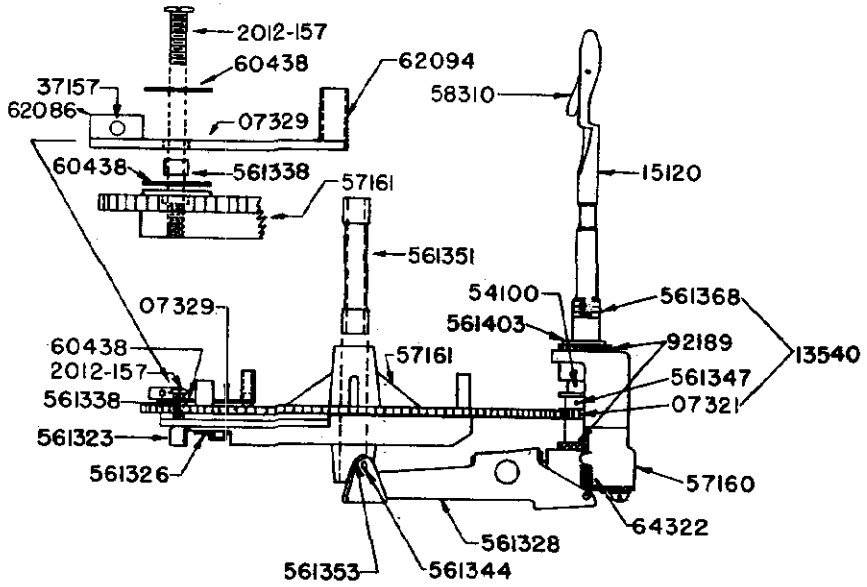
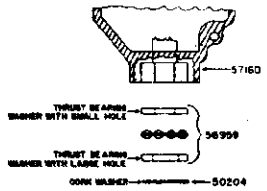


FIGURE 4
MAIN CAM AND SPINDLE SUPPORT BRACKET ASSEMBLY

Part No.	Description
07321	Spindle Gear Assembly
07329	Starting Lever Assembly
13540	Drive Shaft and Gear Assembly (561368 and 07321 assembled)
15120	Turntable Spindle Assembly
37157	Tubular Rivet .085" x ¼"
50204	Cork Washer ¾" O.D.
54100	Spacer
56959	Thrust Bearing
57160	Bracket
57161**	Main Cam
58310*	Automatic Record Latch
60438	Paper Washer
62086	Starting Lever Bumper
62094	Starting Lever Sleeve
64322	Record Lift Lever Spring
92189	Felt Washer
561311*	Tone Arm Lift Lever Rivet
561323*	Automatic Stop Pawl
561326*	Spring Washer
561328*	Record Lift Lever
561338	Spacer
561344*	Pin
561346*	Record Lift Lever Rivet
561347	Pin
561351	Main Cam Tube
561353*	Record Lift Lever Roller
561368	Turntable Drive Shaft
561403	Turntable Stop Washer
2012-157	#6-32 x 5/16" Bdg. HMS

* Not Sold Separately.
**Order Main Cam by Assembly No. 07332.



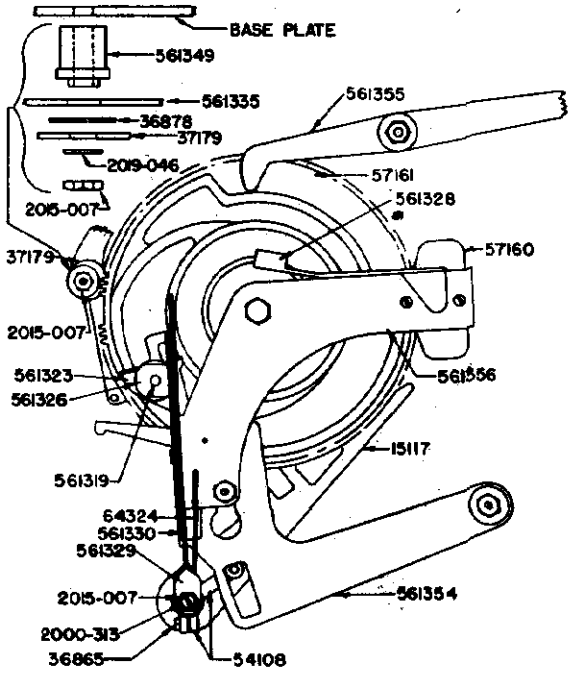
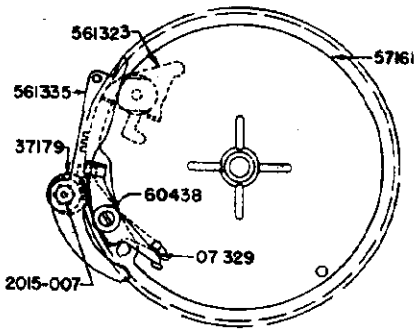


FIGURE 5

MAIN CAM AND ASSOCIATED ASSEMBLIES

07329	Starting Lever Assembly
15117	Trip Finger Assembly
36865	#10-24 x ½" HHMS
36878	Flat Washer
37179	Flat Washer 7/8 O. D. x 1/16 Th.
54108	Tone Arm Crank
57160	Spindle Support Bracket
57161**	Main Cam
60438	Paper Washer
64324	Spring
561319**	Stud
561323**	Automatic Stop Pawl
561326**	Spring Washer
561328*	Record Lift Lever
561329*	Tone Arm Lift Rocker
561330*	Tone Arm Stop Lever
561335	Record Ejector Lever
561349	Spacer
561354	Tone Arm Return Lever



561355*	Shelf Lever
561356*	Tie Plate
2000-313	#10-32 x ½" RHMS
2015-007	#10-32 Std. Hex Nut
2019-046	#10 SP Ext. Lockwasher

* Not Sold Separately. See Page 7
**Order by Assembly No. 07332.

MODEL P-51

FARNSWORTH TELEV. & RADIO CORP.

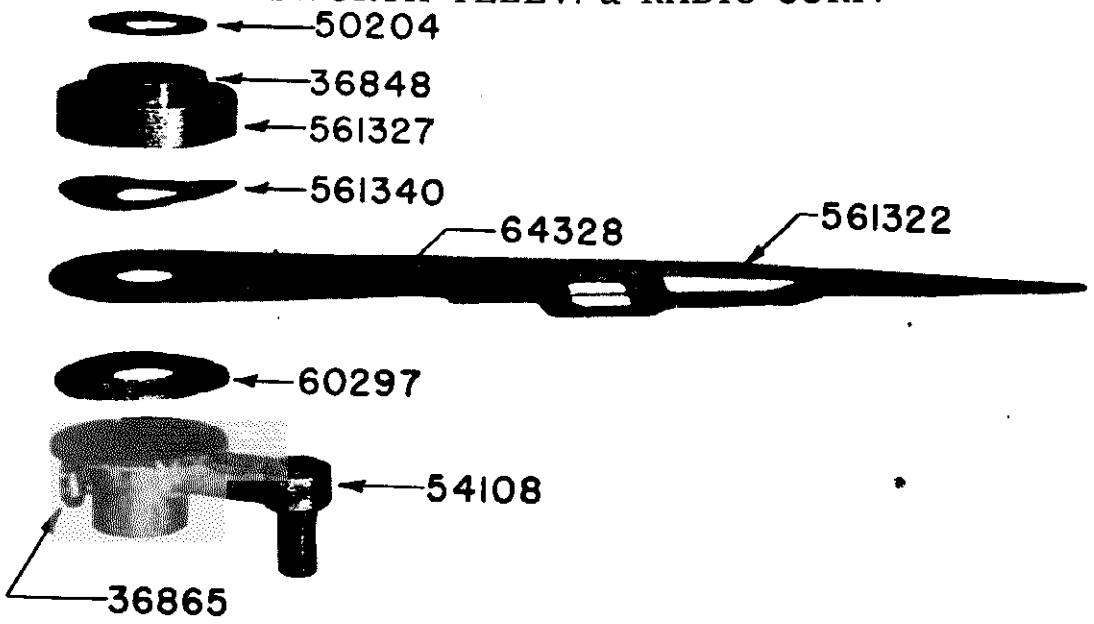


FIGURE 6

FRICTION TRIP ASSEMBLY

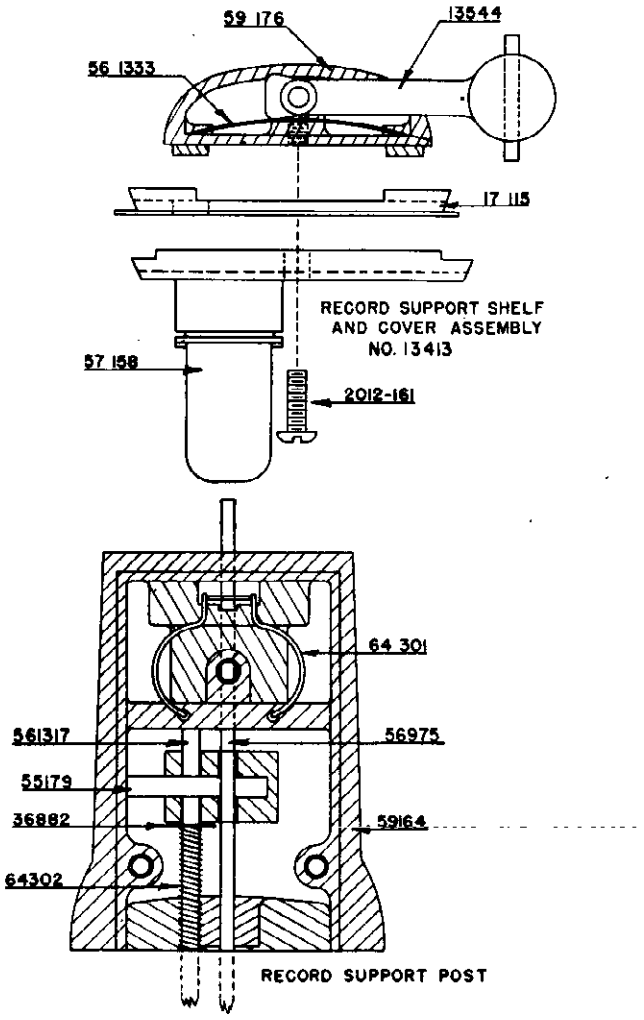


FIGURE 7

Part No.	Description
36848	6-32 x 3/8" Bristol Set Screw
36865	#10-24 x ½" HHMS
50204	Cork Washer ¾" O. D.
54108	Tone Arm Crank
60297	Cork Washer
64328**	Spring
561322**	Trip Finger
561327	Trip Finger Spacer
561340	Wave Washer

**Order by Assembly No. 15117.

FIGURE 7

RECORD SUPPORT POST AND SHELF

Part No.	Description
13544	Shelf Cover Arm & Record Hold Down Rubber Assembly
17115	Plunger and Shelf Assembly
36882	Hairpin Cotter
55179	Pin
56975	Record Plunger Rocker Arm
57158	Record Support Shelf
59164	Record Support Post
59176	Shelf Cover
64301	Record Support Post Hold Down Spring
64302	Interceptor Shaft Spring
561317	Interceptor Shaft
561333	Shelf Cover Spring
2012-161	#6-32 x 7/16" Bdg. HMS

NOTE:—Record Plunger Rocker Arm 56975 is inserted in the elongated hole in Ejector Plunger No. 17115.

FARNSWORTH TELEV. & RADIO CORP.

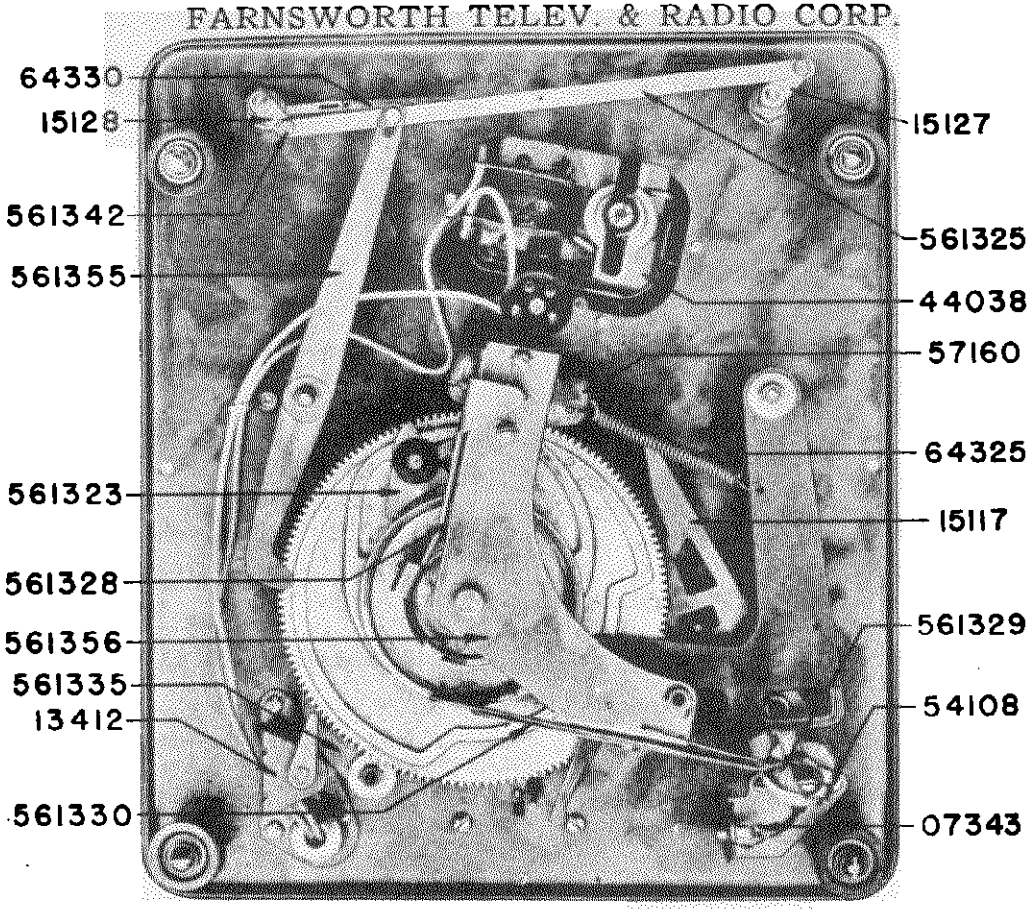


FIGURE 8

BOTTOM VIEW

07343	P. U. Socket Assembly
13412	Auto. Stop Switch and Bracket Assembly
15117	Trip Finger and Spring
15127	Record Shelf and Crank Assembly (R.H.)
15128	Record Shelf and Crank Assembly (L.H.)
44038	Phono Motor
54108	Tone Arm Crank
56975	Record Plunger Rocker Arm
57160	Bracket
57161**	Main Cam
64325	Tone Arm Return Lever Spring
64330	Shelf Link Spring
561323**	Automatic Stop Pawl
561325*	Shelf Crank Lever
561328*	Record Lift Lever
561329*	Tone Arm Lift Rocker
561330*	Tone Arm Stop Lever
561335	Record Ejector Lever
561342	Shelf Crank Rivet
561355*	Shelf Lever
561356*	Tie Plate

*Not sold separately. Part numbers 561325, 561355 with R.H. and L.H. crank sold as assembly #07330. Part numbers 561328, 561329, 561330 and 561356 sold as assembly #13414.

**Order by assembly No. 07332 which includes 57161 and 561323.

MODEL P-51

FARNSWORTH TELEV. & RADIO CORP.

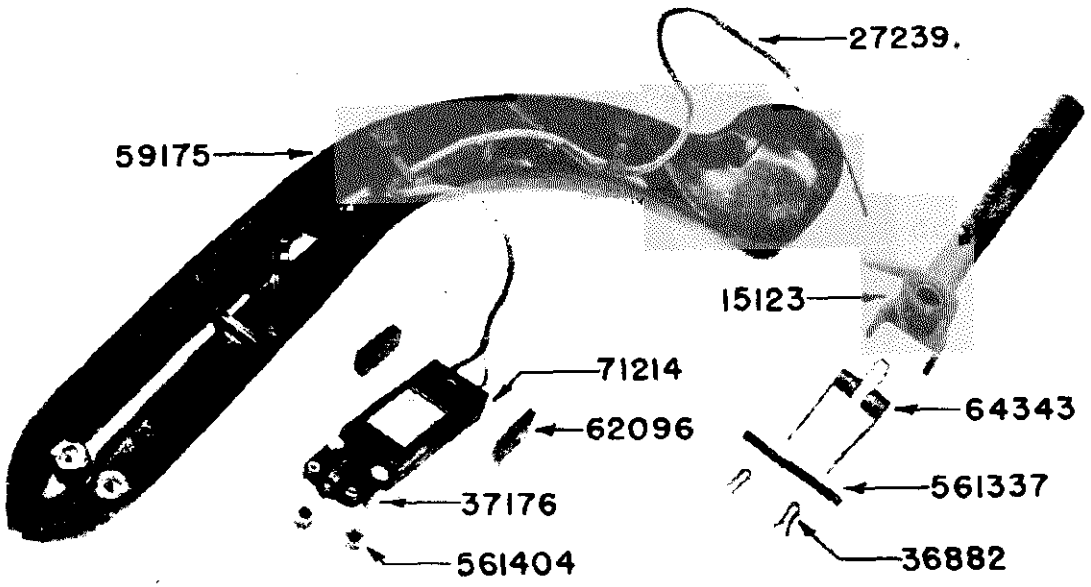


FIGURE 9 TONE ARM ASSEMBLY No. 13434

15123	Tone Arm Bracket and Support Tube Assembly	62096	P. U. Damping Shim
27239	Shielded P. U. Conductor	64343	Tone Arm Spring
36882	Hairpin Cotter Hubbard #111 x .026"	71214	Cartridge, Webster or Astatic
37176	#4-36 x 13/32 RHMS	561337	Hinge Pin
59175	Tone Arm Housing	561404	P. U. Spacer

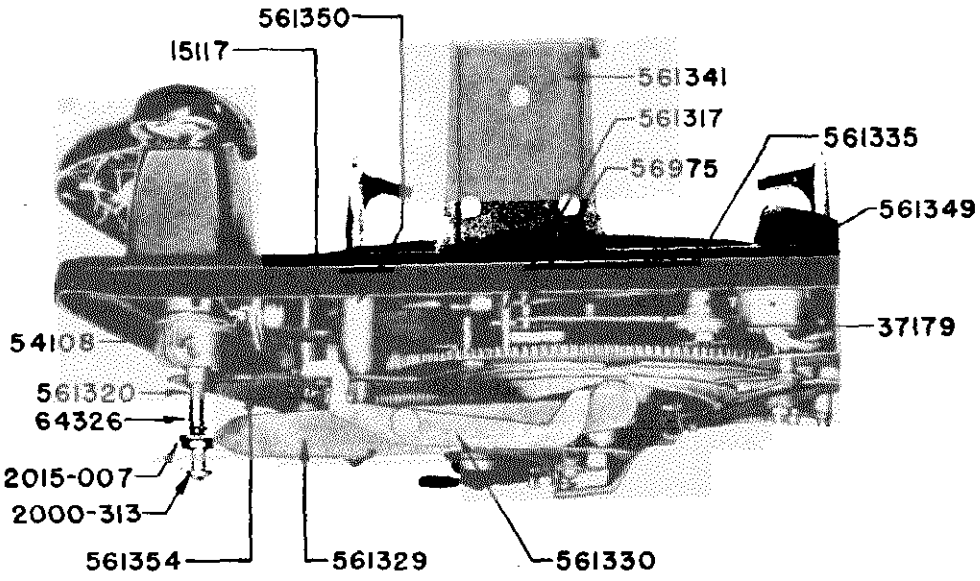


FIGURE 10 TONE ARM LIFT LEVER

15117	Trip Finger Assembly	561335	Record Ejector Lever
54108	Tone Arm Crank	561341	Record Support Post Cover
37179	Flat Washer	561349	Spacer
56975	Record Plunger Rocker Arm	561350	Tie Plate Mounting Spacer
64326	Tone Arm Brake Spring	561354	Tone Arm Return Lever
561317	Interceptor Shaft	2000-313	#10-32 x ½" RHMS
561320	Tone Arm Lift Rod	2015-007	#10-32 Std. Hex Nut
561329*	Tone Arm Lift Rocker		
561330*	Tone Arm Stop Lever		

* Sold only as part of assembly 13414.

FARNSWORTH TELEV. & RADIO CORP.

DO NOT LUBRICATE THE FOLLOWING PARTS:

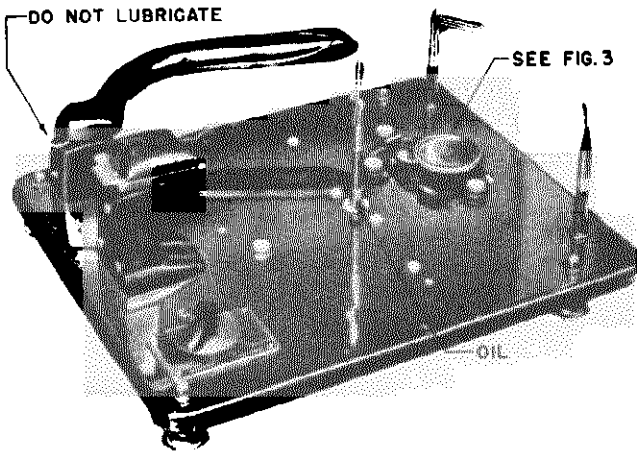
Friction Trip Assembly
Tone Arm Support Tube No. 15123
Starting Lever Assembly No. 07329
Tone Arm Hinge Pin No. 561337

LUBRICATION POINTS

(FIGURE 11)

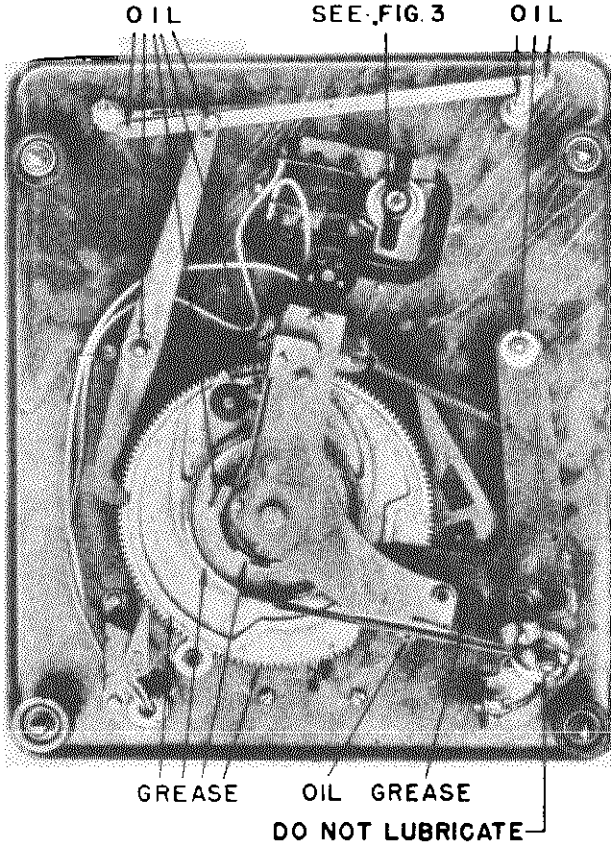
USE LIGHT MACHINE OIL ON FOLLOWING PARTS:

Turntable Drive Shaft Felts No. 92189
Tone Arm Lift Lever Rivet
Record Lift Lever Rivet and Roller Pin
Tone Arm Return Lever No. 561354 at the Spacer No. 561350
Phono Motor (one drop on felt at each end of shaft)
Idler Pulley (see fig. 3 page 3)
Crank Link Lever at Pivot Point
12" Interceptor Shaft at bearing in baseplate



USE LIGHT GREASE OF VASELINE TYPE AT FOLLOWING POINTS:

Very light film at Spindle and tube bearing surface
Main Cam Tube or Stud
Main Cam at Gear Teeth and Cam Track
Tone Arm Return Lever at Guide Spacer
At Record Lift Lever and Spindle Ball



LUBRICATION

The record changer should be lubricated and cleaned periodically or when a major part or assembly is replaced. Dirt, old oil or grease may be removed with carbon tetrachloride or other similar cleaning fluid.

Use only a good grade of machine oil with a viscosity of SAE 10.

Care should be exercised to prevent an excess of oil being used on any part and that no oil gets on the motor pulley, idler pulley or turntable rim.

Every six months or once a year a thin coat of light grease of the vaseline type may be applied to all surfaces of the main cam that contact lift levers and tone arm lift lever.

FARNSWORTH TELEV. & RADIO CORP.

CYCLE OF OPERATION

Turn on the control which starts the phonograph and move the Control Knob to reject position and hold until the Tone Arm begins to move toward the Turntable, then release the knob. The changer will go into cycle. The Tone Arm should swing clear of the stack, a record should drop to the Record Ejector Plunger, pause, then gently settle to the Turntable. The Tone Arm should swing over the record and be lowered to the starting groove on the record. When the record is played the above cycle is repeated until there are no records remaining on the Record Shelf. After the last selection has been played the changer will automatically stop.

The above cycle of operation for the P-51 Changer is explained in the following description and illustrations.

When the Control Knob is moved to reject position, the Reject Lever pulls the Starting Lever against the Starting Pawl on the Spindle Gear and Pawl Assembly, which makes the Main Cam mesh with the Spindle Gear.

Figure A. The Turntable is screwed onto the Spindle Gear and both are driven through the Idler Pulley by the motor. When the cycle is completed the Main Cam disengages from the Spindle Gear because several teeth are left off the Main Cam Gear . This is called the playing position.

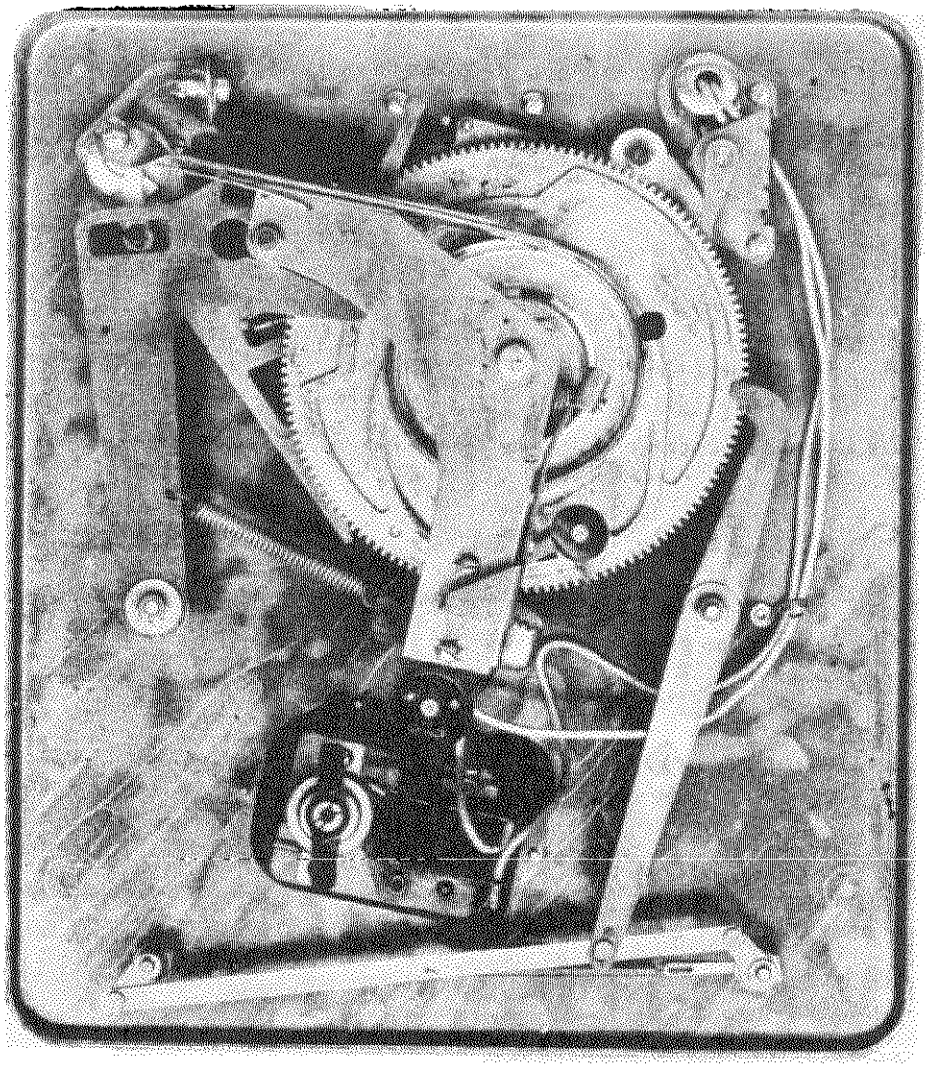


FIGURE A

FARNSWORTH TELEV. & RADIO CORP.

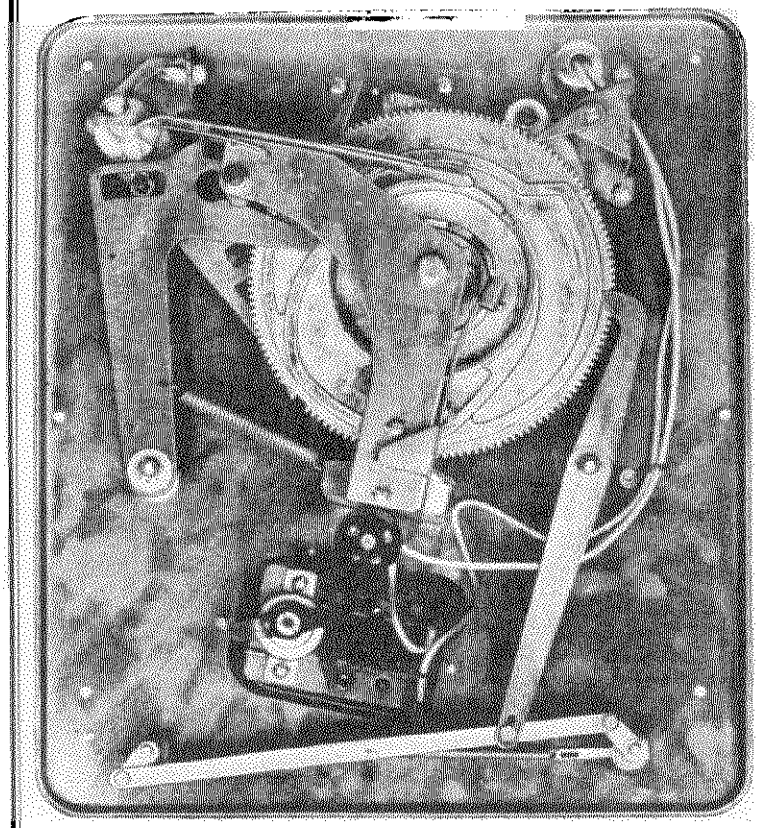


FIGURE B

Figure B. The change cycle has just started. The Tone Arm Lift Lever has raised the Tone Arm from the record and the Tone Arm Return Lever has started to move the Tone Arm away from the Turntable. The Record Lift Lever Assembly has started to raise the Spindle and stack of records resting on it.

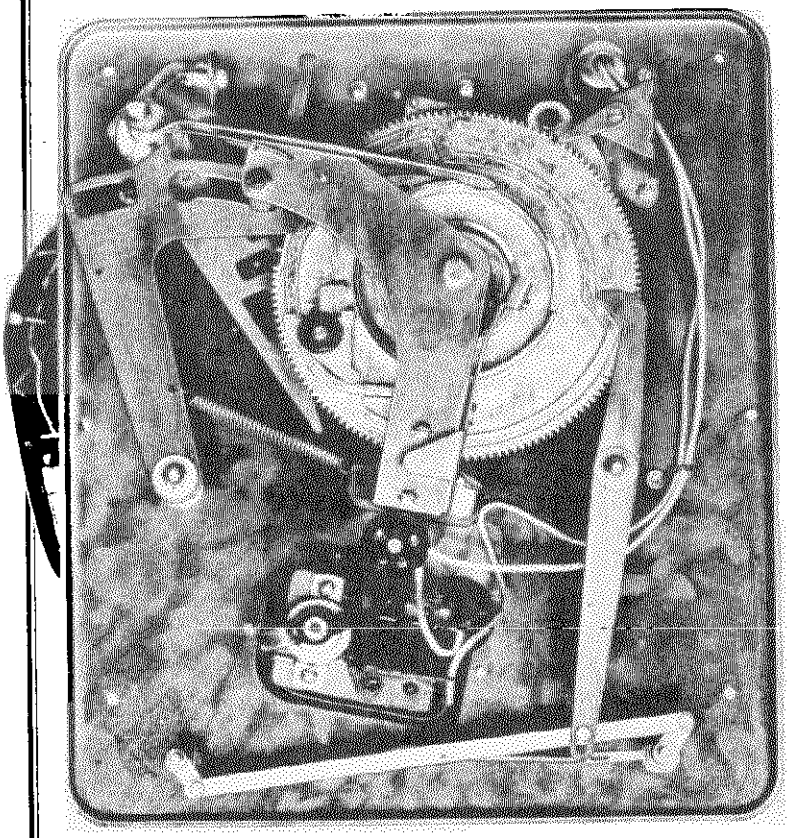


FIGURE C

Figure C. The Shelf Lever has moved in toward the center of the Main Cam which moves the Support Shelves in under the record stack. At the same time the Record Lift Lever has started to lower the Spindle and the stack of records.

MODEL P-51

FARNSWORTH TELEV. & RADIO CORP.

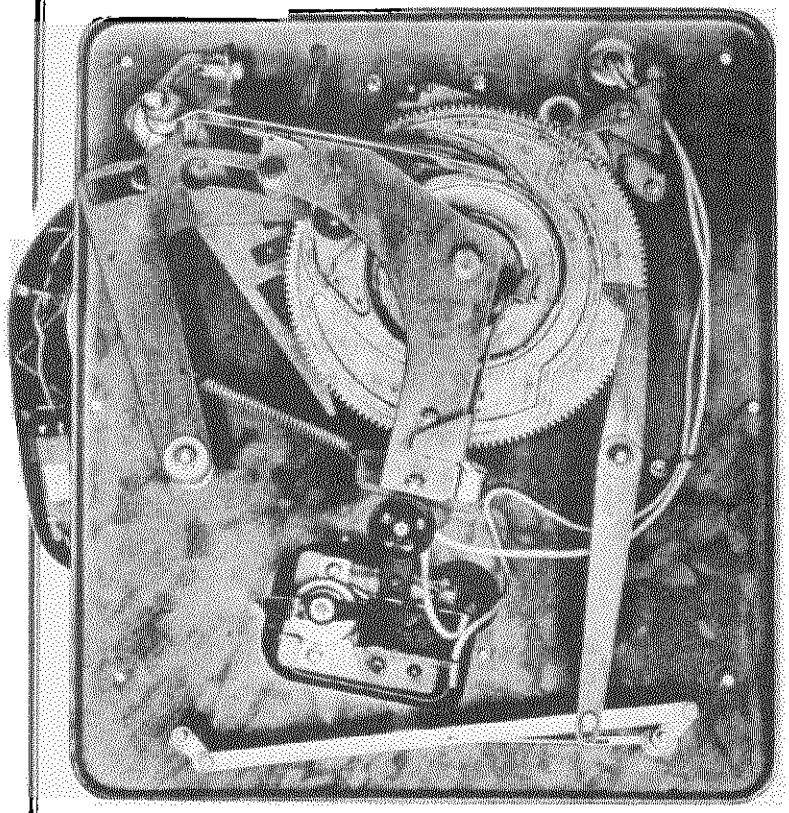


FIGURE D

Figure D. The record stack has been lowered to the Record Support Shelves. Simultaneously the bottom record has been pushed off the stationary shelf and rests on the Record Ejector Plunger.

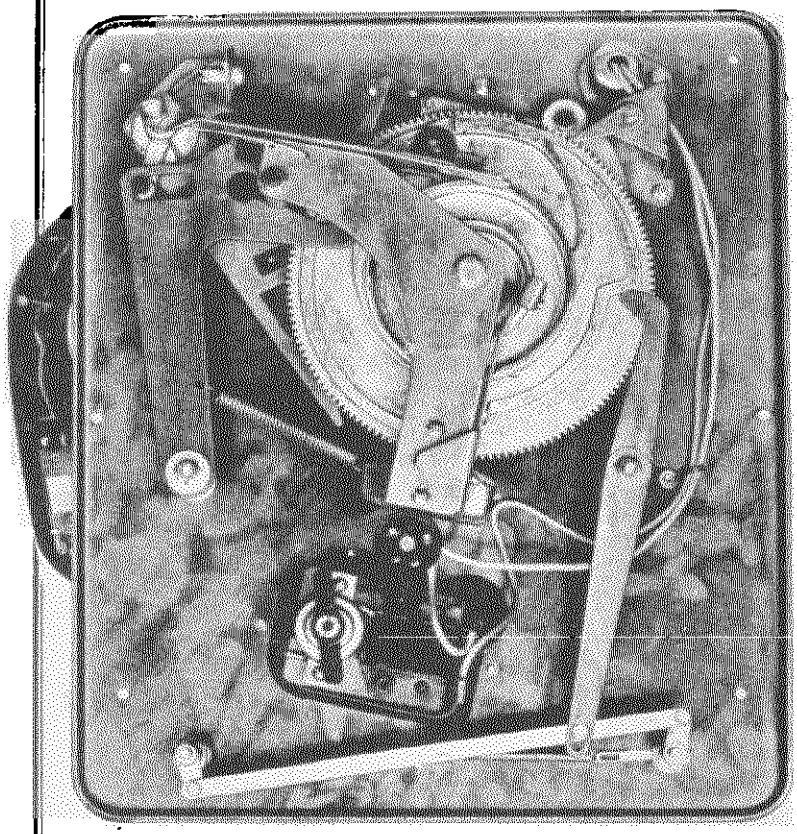


FIGURE E

Figure E. The Record Ejector Plunger retracts at the same time both of the Record Support Shelves move out from under the bottom record which then drops to the Turntable.

1. TO REMOVE TURNTABLE 13435.
See figure 1.

The Spindle Gear may be wedged by a wooden block or a wrapped screw driver between it and the Main Cam, to prevent it from turning while the Turntable is being unscrewed from the Spindle, (by rotating counter-clockwise). When replacing Turntable, see that the "C" Washer (No. 561403) remains fully inserted in the Turntable shaft and make sure the Turntable does not bind on the Idler Pulley. The Turntable may then be properly tightened. The Record Latch must be entirely in the recess in the Spindle to permit the Turntable to be replaced. NEVER USE GAS PLIERS TO HOLD SPINDLE.

2. TO REMOVE IDLER PULLEY.
See figure 3.

After the Turntable has been removed, the Idler Pulley can be removed by slipping off the small hairpin cotter on the end of the Idler Pulley shaft.

When replacing the Pulley a single drop of oil should be used on the pulley shaft.

CAUTION: Do not allow oil to get on either the Idler Pulley or the Turntable Rim.

3. FRICTION TRIP ASSEMBLY
See Figure 5.

The Trip Finger Spacer, part No. 56137, is set on the Tone Arm Support Tube (15123) with an allowance of eight thousandths of an inch clearance between the Cork Washer (50204) and the Baseplate. No attempt should be made to adjust the Friction Tip by changing this clearance. The Friction Trip is adjusted by raising or lowering the Tone Arm Crank (54108) on the Tone Arm Support Tube, after loosening Tone Arm Crank set screw.

4. STARTING TRIP ASSEMBLY

The Starting Lever (07329) is a part of the Main Cam Assembly (See fig. 4). This Lever is changed from trip position to play position by striking washer No. 37179 (see fig. 5) during the change cycle. If the washer does not move the Starting Lever far enough, the changer will trip again as soon as the change cycle is completed. To correct adjustment, loosen Lock Nut 2015-007 and move Washer 37179 in toward the Main Cam. Tighten Lock Nut securely after proper adjustment has been made.

5. TONE ARM DROP AND NEEDLE LANDING

The Needle should drop on the record at a position equi-distance from the outer edge and the first playing groove of a standard record. Make sure the changer is in playing position; that is, the Tone Arm has moved over so the Needle is on the record. To make adjustment for 10-inch records, loosen the Tone Arm Crank set screw and move the Tone Arm Crank (54108) clockwise to move the needle out. When making this adjustment, be careful not to disturb Friction Trip adjustment. After the 10-inch setting has been properly made and the set screw tightened, the 12-inch landing will usually be correct. If not it will be necessary to slightly bend the Tone Arm Return Lever (561354) near the point where it touches the 12-inch interceptor Shaft (561317), see fig. 10. In both adjustments, the Record Shelf must be in the corresponding 10-inch or 12-inch position.

6. TONE ARM HEIGHT See Fig. 10

The Tone Arm height during change cycle is adjusted by raising or lowering screw (2000-313) on the Tone Arm Lift Lever. With records on the Shelf and Spindle, the top of the Tone Arm at the highest point during change cycle should be 3/16" below the bottom of the lowest record of the record stack.

7. RECORD LATCH CHATTER

Any chatter developing in the Record Latch (56130) Figure 4, may be corrected by applying a drop of light oil between the moving part of the Turntable Drive Shaft (561368 and the stationary spindle, (15120).

8. When repairs are being made a careful check should be made of all moving parts in order to make sure that no binding occurs. Check all moving parts for binding before springs are connected.

All levers which operate on shoulder studs should be assembled with the burred side of the retaining washer away from the lever. This method is necesary to prevent the washer from binding on the lever.

9. CHECKING CHANGER IN CABINET

Before checking any P-51 record changer in the cabinet, make sure the mounting bolts are released and the cardboard spacers are removed; otherwise the changer will not properly feed records from the record support shelf and the tone arm will not position properly on the record. If any adjustments are made with the changer bolted down and the mounting bolts then released these adjustments will have to be remade.

When setting up a P-51 changer it should be checked for a needle landing with a full stack of records, both 10-inch and 12-inch. This is done by loading the record support shelf with 12 ten-inch records and moving the control knob to reject, allow the record to play through and trip, check the landing on the second record, then trip records up to and including eleven. Allow the eleventh record to play through and feed number twelve automatically, observe needle landing and automatic trip. Repeat above using ten 12-inch records, only instead of records eleven and twelve, substitute records nine and ten in the preceding section.

10. **CAUTION:** The use of force in an effort to raise the Tone Arm to a greater height than permitted by the Tone Arm Support may result in breaking of the Tone Arm.

11. REPLACING THRUST BEARING

When replacing Thrust Bearing 56959, see fig. 4, the thrust bearing washer having the smaller hole must be placed in the turntable drive shaft bracket 57160 first, that the shoulder on the turntable drive shaft may rest on the washer.

12. REPLACING INDEXING SPRING

Move control knob to Automatic position and pull off knob. Remove the two screws holding switch assembly to baseplate. Push the reject rod from hole and remove switch assembly. Remove the hairpin cotter from shaft and pull shaft forward so that pawl will not interfere with spring. Replace spring. Hold the spring against bracket away from pawl and push shaft into place. Be sure the lip on the pawl enters the slot in the switch. Replace hairpin cotter and assembly is ready to be replaced.

50 CYCLE CONVERSION

The Service Department will, upon request furnish information pertaining to the conversion of 60 cycle operated changers to 50 cycle operation.

PARTS PRICE LIST
P-51

Part No.	DESCRIPTION	List Price
05087	Shipping Shim Assembly	$ .10
07321	Spindle Gear Assembly	.35
07329	Starting Lever Assembly	.30
07330	Shelf Crank and Link Assembly	.75
07332	Main Cam Rivet Assembly	2.60
07343	P. U. Socket Assembly	.30
09217	Mounting Spring Assembly	.30
13410	Turntable Drive Shaft and Bracket Assembly	1.95
13412	Auto Stop Switch and Bracket Assembly	1.10
13413	Record Support Shelf and Cover Assembly	2.05
13414	Tie plate Assembly	1.05
13434	Tone Arm Assembly	7.55
13435	Turntable	2.15
13510	Control Knob Assembly	.20
13540	Drive Shaft and Gear Assembly	1.60
13544	Shelf Cover Arm & Record Hold-Down Rubber Assembly	.45
13583	Idler Pulley used with Alliance Motor (see Fig. 3 page 3)	
13584	Idler Pulley used with General Ind. Motor (see Fig. 3 page 3)	
13613	Adjustable Changer Rack	11.95
15117	Trip Finger Assembly	.10
15120	Spindle Assembly	2.25
15123	Tone Arm Support Tube & Bracket Assembly	.45
15127	Record Support and Crank (R. H.)	1.30
15128	Record Support and Crank (L. H.)	1.30
17115	Plunger and Shelf Assembly	2.95
27239	Shielded P. U. Lead Wire	.10
36127	Mounting Spring Cup	.10
36137	Mounting Spring Retainer Nut	.10
36347	#0 x ¼" Drive Screw	.10
36843	¼-28 x 2⅜ HHM Bolt	.10
36844	¼"-28 Hex Half Nut	.10
36845	#10 Flat Washer ¾ OD	.10
36847	Driv-Lok Pin Type B 5/64" Dia x 7/16" Lg	.10
36848	6-32 x ⅜" Bristol Set Screw	.10
36849	H. P. Cotter	.10
36865	#10-24 x ½" HHMS	.10
36878	Flat Washer	.10
36882	H. P. Cotter	.10
36888	#10-32 x 1" Bolt	.10
36914	#10-32 x 2¼ Carriage Bolt	.10
36934	H. P. Cotter	.10
36949	⅜-24 Std. Hex Nut	.10
37066	10-32 Acorn Palnut	.10
37067	Flat Washer	.10
37157	Tubular Rivet .085 x ¼"	.05
37176	4-32 x 13/32 RHMS	.10
37179	Flat Washer ⅞ OD x 1/16 thick	.10
41107	Record Changer Mounting and Shipping Kit	1.55
41117	Kit of 12 Paper Washers #60438	.25
44038	Phono Motor for 60 cycles	7.15
50204	Cork Washer ¾" OD	.10
54100	Spacer	.10
54108	Tone Arm Crank	.30
55179	Pin	.10
56959	Thrust Bearing	.50
56975	Record Plunger Rocker Arm	.15
57158	Record Support Shelf	.65
57160	Bracket	.15
59164	Record Support Post	1.00
59165	Tone Arm Support	.55
59166	Escutcheon	.85
59175	Tone Arm Housing	.70
59176	Shelf Cover	.25
60297	Cork Washer	.10

PARTS PRICE LIST
P-51

Part No.	DESCRIPTION	List Price
60438	Order by Kit (see #41117)	
62086	Starting Lever Bumper	.10
62094	Starting Lever Sleeve	.10
62096	P. U. Damping Shim	.10
64014	Upper Mounting Spring	.10
64298	Tone Arm Lift Lever Spring	.10
64301	Hold-Down Spring Record Support Post	.10
64302	Interceptor Shaft Spring	.10
64322	Record Lift Lever Spring	.10
64324	Spring	.10
64325	Tone Arm Return Lever Spring	.10
64326	Tone Arm Brake Spring	.10
64327	Reject Rod	.10
64329	Plunger Rocker Spring	.10
64330	Shelf Link Spring	.10
64343	Tone Arm Spring	.10
64356	Lower Mounting Spring	.10
71214	Crystal Astatic	5.20
90145	Switch	.30
92189	Felt Washer	.10
561312	Spring	.10
561317	Interceptor Shaft	.10
561320	Tone Arm Lift Rod	.20
561321	Shelf Post	.55
561327	Trip Finger Spacer	.30
561331	Indexing Spring	.10
561332	Shelf Lever, Spacer	.15
561333	Shelf Cover Spring	.10
561335	Record Ejector Lever	.20
561337	Tone Arm Hinge Pin	.10
561338	Spacer	.10
561340	Wave Washer	.10
561341	Record Support Post Cover	.15
561342	Shelf Crank Rivet	.05
561347	Pin	.10
561348	Spacer	.10
561349	Spacer	.10
561350	Tie Plate Mtg. Spacer	.15
561351	Main Cam Tube	.55
561354	Tone Arm Return Lever	.30
561368	Turntable Drive Shaft	1.10
561402	Auto Stop Switch Cover	.15
561403	Turntable Stop Washer	.15
561404	P. U. Spacer	.10
2000-209	#8-32 x ⅜" RHMS	.10
2000-313	#10-32 x ½" RHMS	.10
2000-327	#10-32 x 1½" RHMS	.10
2000-329	#10-32 x 1¾" RHMS	.10
2000-330	#10-32 x 1⅞" RHMS	.10
2012-151	#6-32 x ⅛ Bdg. HMS	.10
2012-157	#6-32 x 5/16" Bdg. HMS	.10
2012-161	#6-32 x 7/16" Bdg. HMS	.10
2012-209	#8-32 x ⅜ Bdg. HMS	.10
2015-007	#10-32 Std. Hex Nut	.10
2017-005	#10 Std. Flat Washer	.10
2019-007	¼" SP Int. Lockwasher	.10
2019-045	#8 SP Ext. Lockwasher	.10
2019-046	#10 SP Ext. Lockwasher	.10

Special prices on hardware ordered in gross lots.

Prices subject to change without notice.

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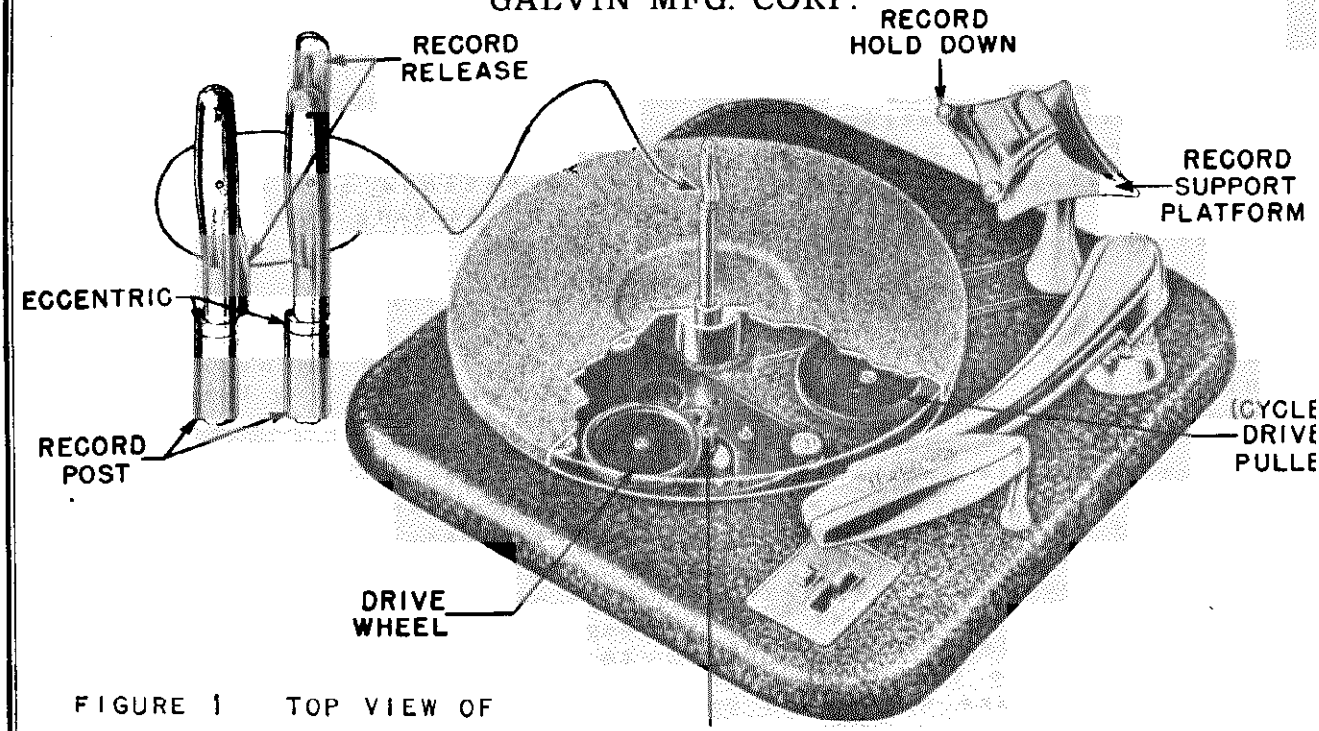

FIGURE 1 TOP VIEW OF RECORD CHANGER

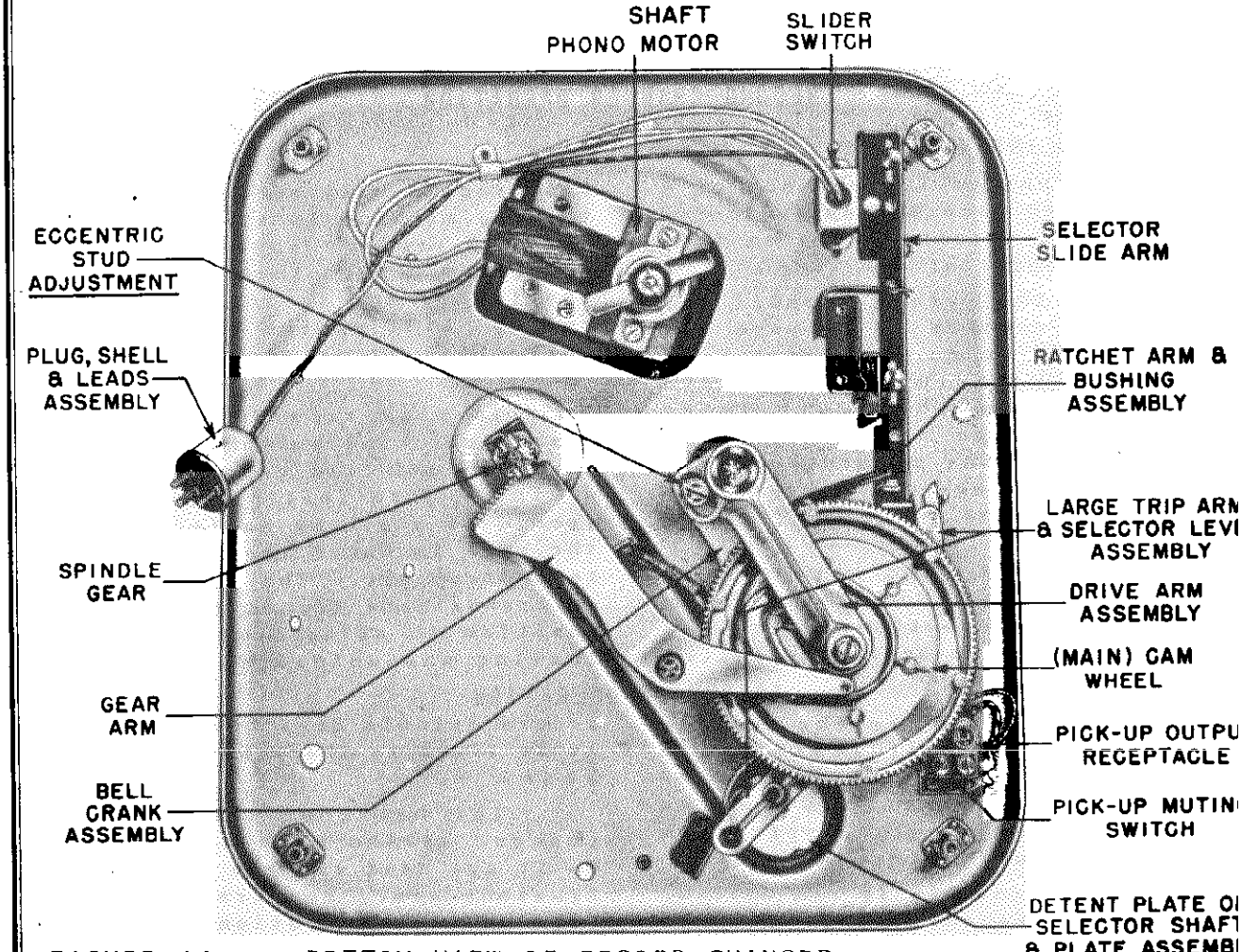

FIGURE 1A BOTTOM VIEW OF RECORD CHANGER

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All service adjustments on Motorola Record Changers should be made with the instrument in a normal operating position.

Therefore, the instrument should be supported in such a manner that parts underneath are accessible. A jig consisting of four corner support posts would be helpful. A mirror would also permit the service man to make observations and adjustments without getting into awkward positions.

CHECK THE RECORD FIRST

Before attempting to service or adjust the record changer check the records first to make sure they are not causing the trouble. This instrument will handle most of the 10 or 12 inch records available on the market, but it is not guaranteed to handle all of them. Records must be in good mechanical condition and should not be chipped, particularly around the center hole. Do not try to play automatically records that are too thick, too thin, or that are oversized or undersized, in regard to the diameter of record or center hole. Do not mix 10 and 12 inch records on the changer.

Warped records can slip on the turntable and introduce 'WOWS'. Such records may be flattened by placing between two pieces of flat plate glass and then heating in the sun or oven. Do not overheat. Allow record to cool for several hours before removing glass.

Old records made before the days of automatic record changers may not change automatically, due to the difference in thickness, or to lack of the proper eccentric groove at the finish. Most of the old records, however, may be played one at a time.

RECORD CHANGER OPERATION

SUMMARY OF OPERATION INSTRUCTIONS

As many as 10 ten-inch or 8 twelve-inch records may be loaded and played automatically on this record changer at one time.

Set the record support for the size records to be used and place records on spindle. Records will be supported above turntable by the small ledge formed by the off-set in the spindle and the record support. Steady the stack with the record hold down plate.

The left hand button will start the motor. Momentarily push the right hand button to the reject position to start the cycle. Last record will be repeated until the machine is stopped. When playing records automatically, never touch the pick-up arm when the instrument is in a changing cycle. Lift up the pick-up arm only while it is resting on the record.

To play records manually, push right hand button to MANUAL position and load records one at a time. When loading, hold the record at a slight angle so that the edge is under the lip of the record support. The record support should be turned to the 12" position to allow more room for loading and unloading records.

THEORY OF OPERATION

By referring to the various photographs and figures which will be found in the service manual, you can readily follow through the changing cycle from the continuity given hereafter:

The turntable is rim driven. Power is transmitted to it from the motor shaft by means of a rubber tired drive wheel. The record spindle does not revolve; it is fixed to the record changer base.

The heart of the record changer is the main cam wheel. On it are cast all the cams, extrusions etc., required to perform all the operations during the changing cycle. See Figure 2.

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The only mechanism that operates during the playing of a record is the motor and turntable. The changing mechanism is entirely disengaged until the change cycle starts.

In explaining the theory of operation, let us begin from the point where the record changer is just finishing a record.

The needle in the pick-up finishes the record and enters the eccentric groove. This imparts an oscillating motion to the pick-up arm, which in turn causes the trip pawl to release the trigger through its action against the ratchet arm. See Figures 3A & B. If the record does not have an eccentric groove, the limit stop will trip the trigger when the pick-up needle reaches a point 1-7/8" of the spindle center. See Figure 3C.

Tripping the trigger, releases the bell crank assembly, allowing its tension spring to push the cycle drive pulley up against the inside rim of the revolving turntable, starting the changing cycle. See Figures 3B & C. With the same motion of the bell crank, its roller leaves the detent notch in the rim of the main cam wheel and the main cam wheel revolves. The roller now rides on the rim of the main cam wheel and in this manner holdsthe cycle drive pulley firmly against the turntable.

As the main cam wheel revolves, the pick-up rod rides out of the inclined section, raising the pick-up clear of the record. See Figure 4. After the pick-up arm is elevated, continued rotation of the main cam wheel swings the pick-up arm outward, clear off the record. The lateral movement of the pick-up arm is controlled by the selector stud which rides in a specially shaped groove in the main cam wheel. See Figure 4.

At the same time the pick-up arm was being lifted and swung clear, the record release cam was rotated through 180° by the gear segment arm to pick up a record and then back to its normal position in line with the record post, to drop the record on the turntable. The movement of the segment gear is controlled by the specially shaped groove on the bottom of the main cam wheel. See Figure 5.

Continued rotation of the main cam wheel swings the pick-up arm (by the action of the selector stud riding in the top groove of the main cam wheel) back over the first groove in the record and the arm is gently lowered onto the record when the inclined section of the main cam wheel reaches the pick-up rod. See Figure 4.

As the main cam wheel approaches the full 360 degree point of its rotation, the trigger reset extrustion pushes against the trigger reset stud of the small trip arm, causing the trigger to be "cocked" ready for the next cycle, and in the same motion applies spring tension through the torsion spring to the bell crank lever so that when the main cam wheel detent notch reaches the bell crank lever roller, the roller falls into it, pulling the cycle drive pulley away from the turntable, causing the main cam wheel to stop, thus ending the cycle. See Figure 6.

A shorting switch, operated by the straight and inclined sections of the main cam wheel, shorts the pick-up cartridge whenever the record changer is in cycle. This keeps all unwanted noises from reaching the speaker.

Turning the record support post, to accommodate the size record being used, automatically sets the mechanism so the pick-up needle will come down in the middle of the blank area between the outer edge and the first groove of the record. Turning the record post, positions the large trip arm so that the attached pick-up arm will swing out farther for 12 inch records and closer in for 10 inch records. See Figure 4.

The right hand button controls a three position mechanical switch. Through it, it is possible to start the changing cycle at any time regardless of whether or not the record has been completely played. By this means a record can be rejected. This lever can also be pushed into the manual position at any time without damage to the mechanism. Figure 7 shows the mechanics behind the switch.

MODEL B-24RC

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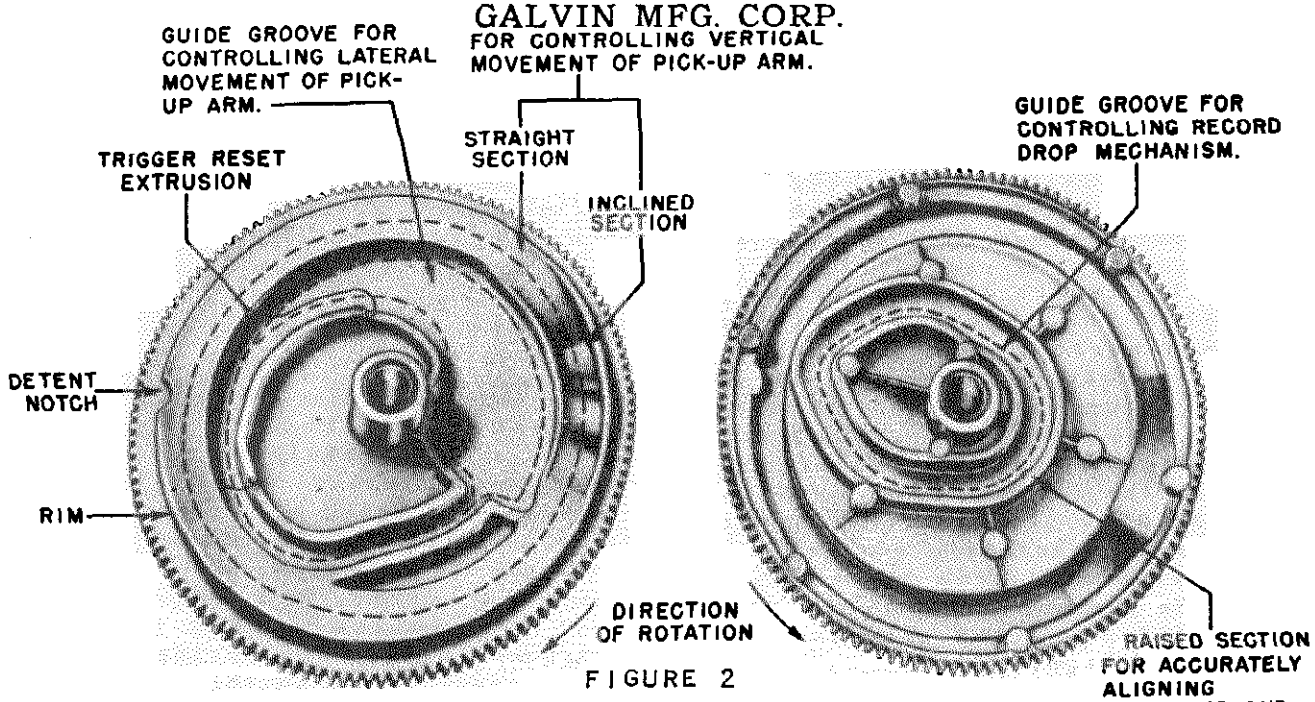
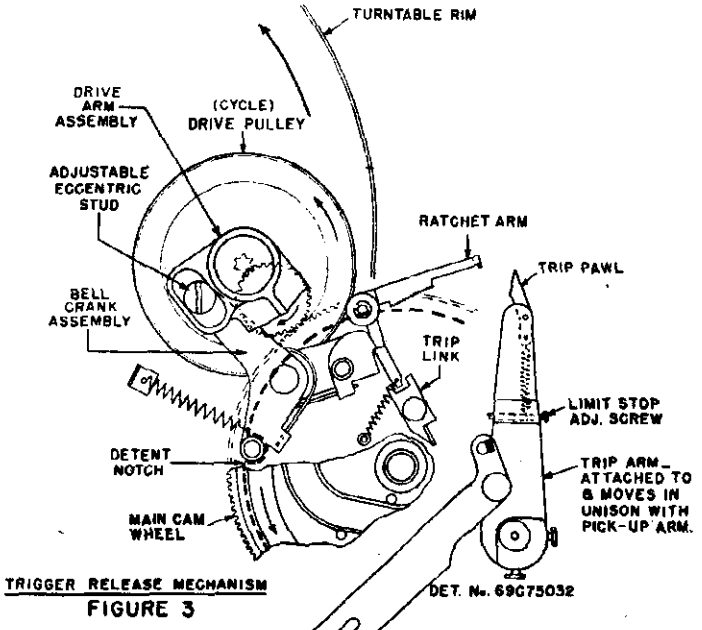
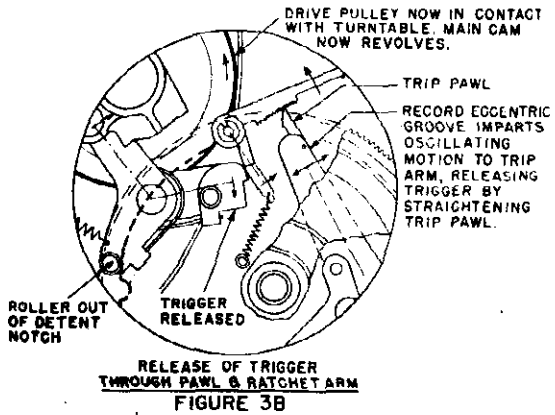


FIGURE 2

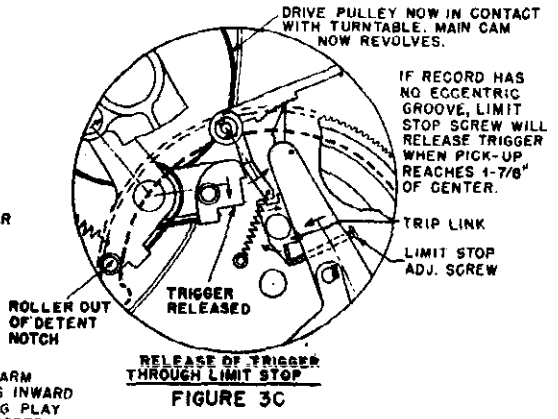
TOP VIEW MAIN CAM WHEEL BOTTOM VIEW



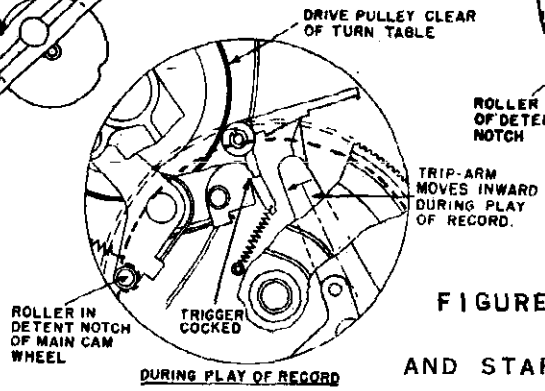
TRIGGER RELEASE MECHANISM
FIGURE 3



RELEASE OF TRIGGER THROUGH PAWL & RATCHET ARM
FIGURE 3B



RELEASE OF TRIGGER THROUGH LIMIT STOP
FIGURE 3C



DURING PLAY OF RECORD
FIGURE 3A

FIGURE 3 RELEASE OF TRIGGER AND START OF CYCLE (BOTTOM VIEW)

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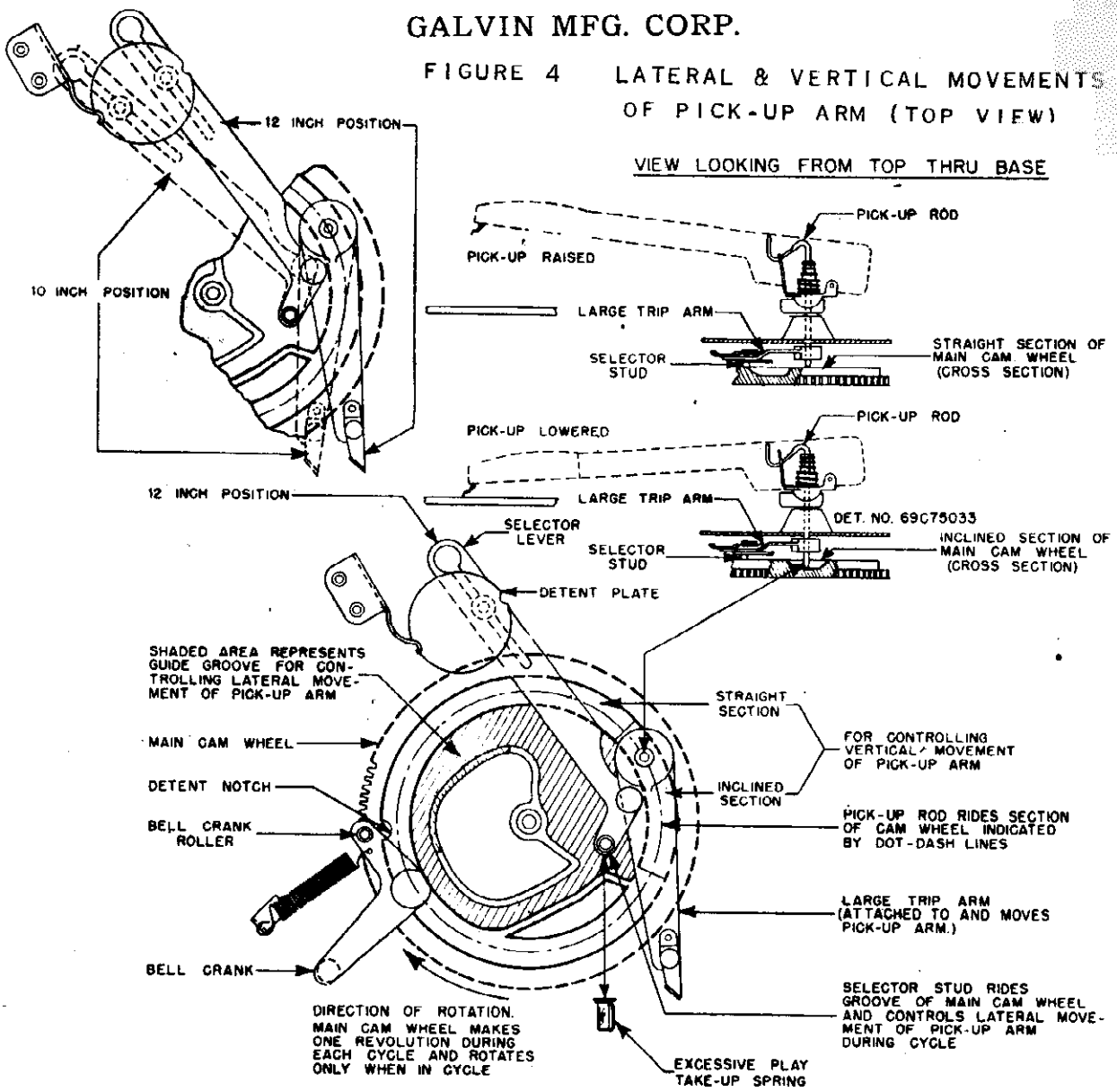
FIGURE 4 LATERAL & VERTICAL MOVEMENTS OF PICK-UP ARM (TOP VIEW)



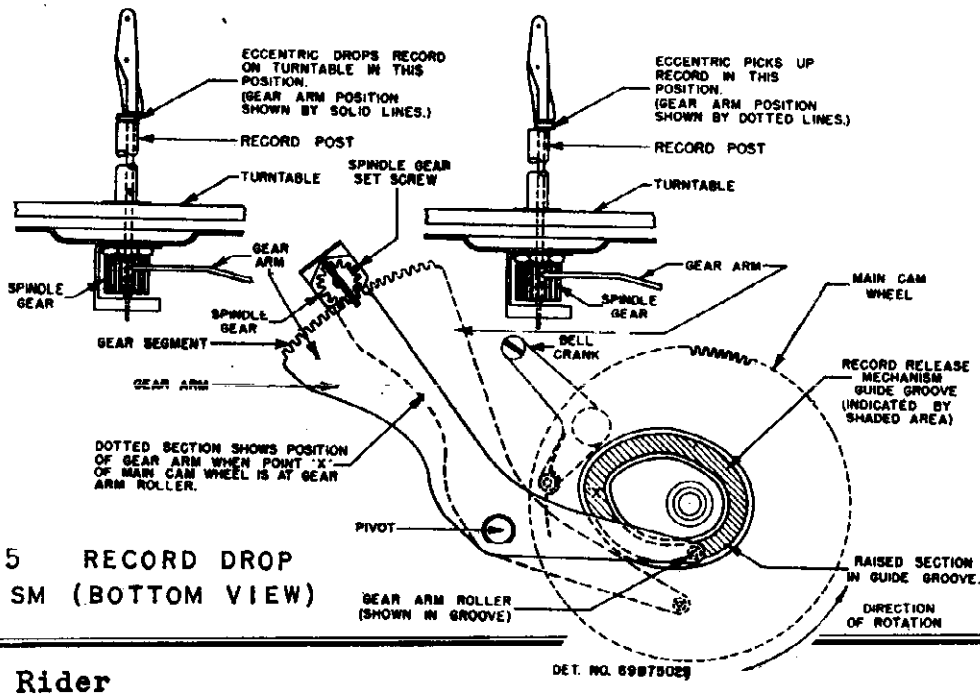


FIGURE 5 RECORD DROP MECHANISM (BOTTOM VIEW)

MODEL B-24RC

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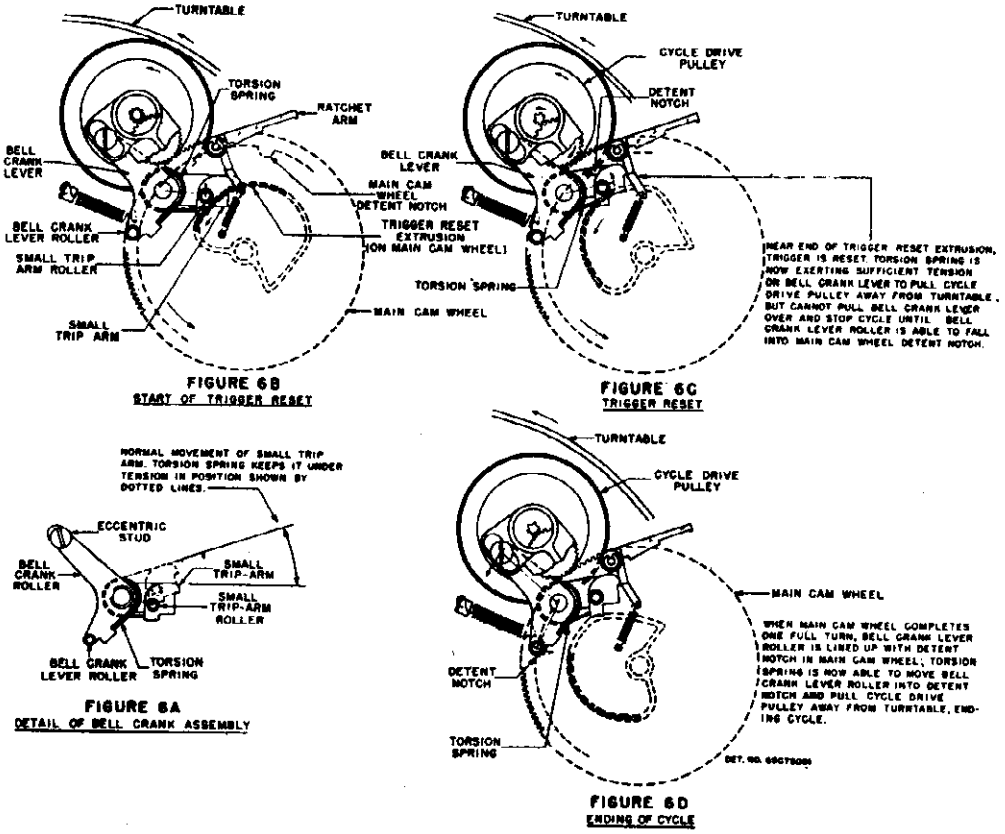

FIGURE 6 TRIGGER RESET AND CYCLE STOPPING MECHANISM (BOTTOM VIEW)

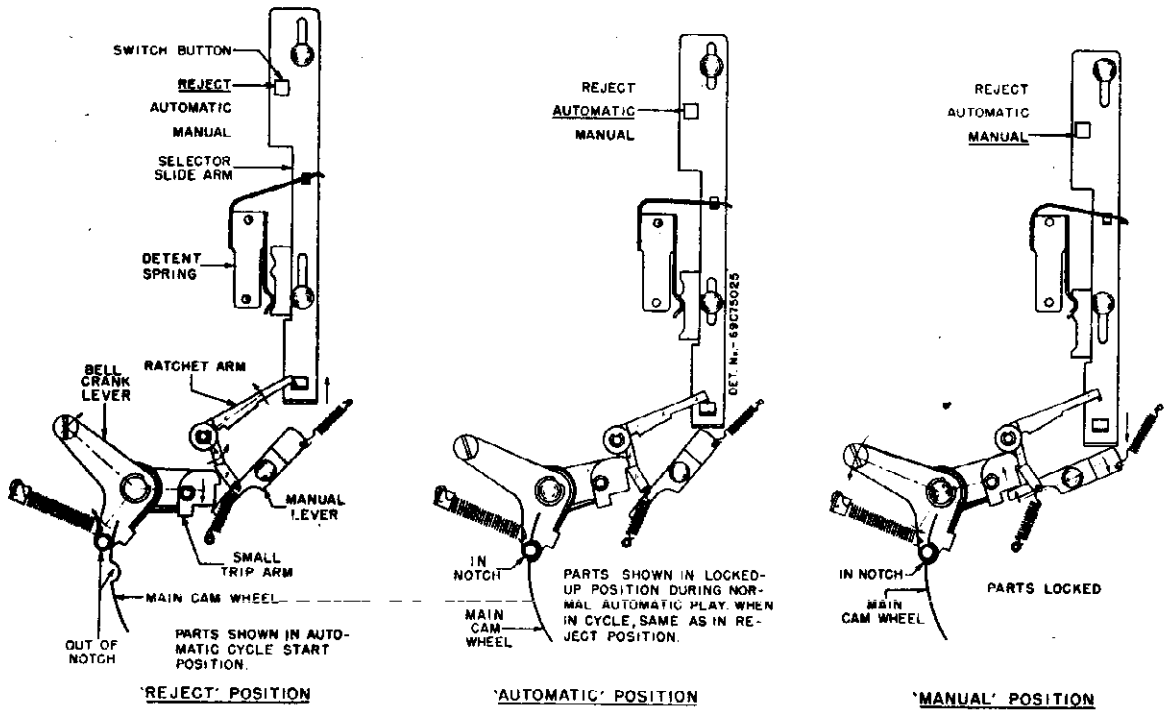

FIGURE 7 MECHANICS BEHIND REJECT-AUTOMATIC-MANUAL SWITCH (BOTTOM VIEW)

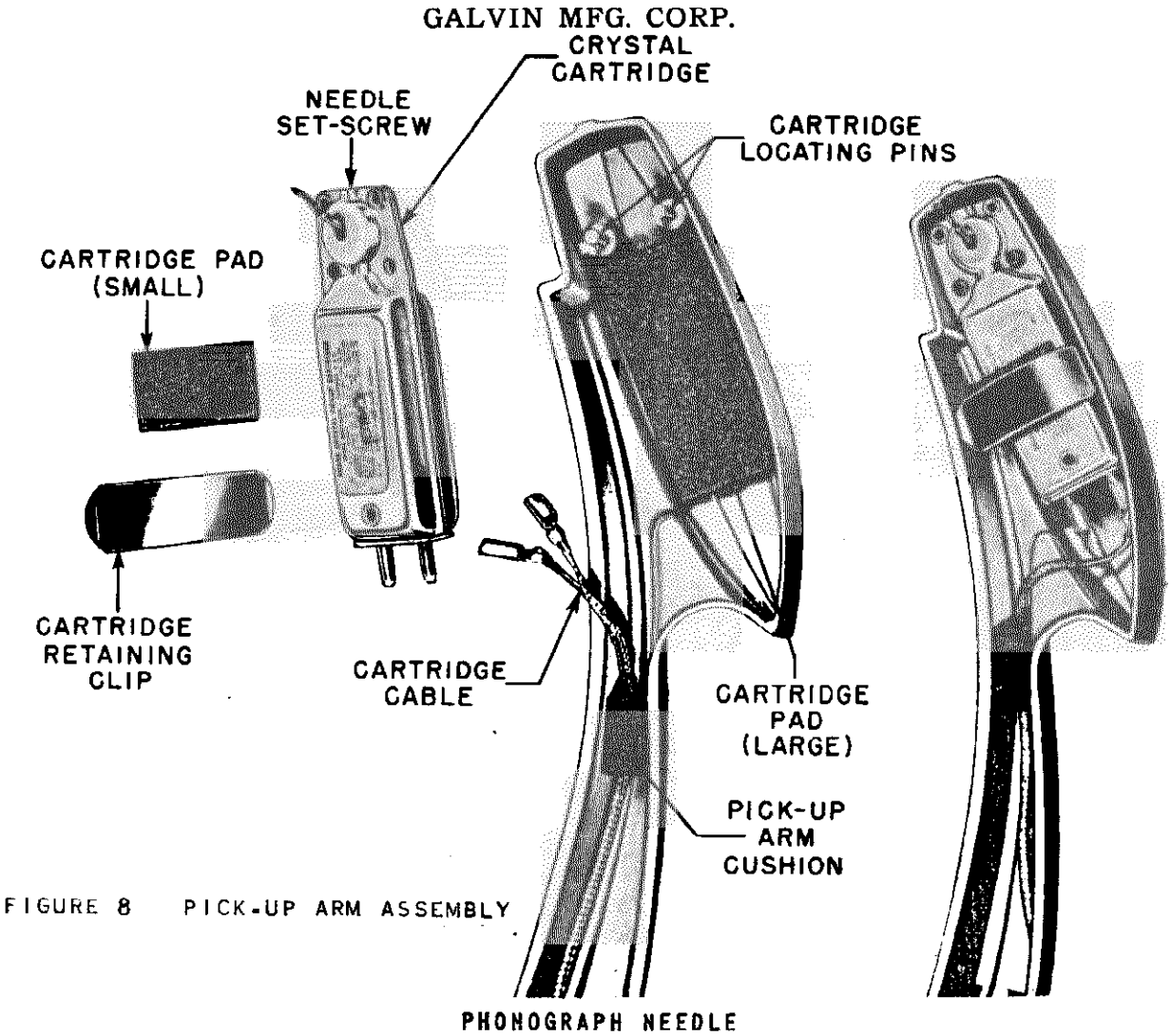

FIGURE 8 PICK-UP ARM ASSEMBLY

This changer is equipped with a permanent point (Sapphire or precious metal) long life needle and is good for several thousand plays, unless damaged by dropping or mishandling. For best results, use Motorola phonograph needles; they have been specially designed for use in these changers.

HOW TO REPLACE PHONOGRAPH NEEDLE

1. Models with external thumbscrew. - Obvious.
2. Models without thumbscrew. - Proceed as follows: Refer to Figure 8.
   a. Raise pick-up arm to a vertical position.
   b. With a pair of long nose pliers, remove the cartridge retaining clip.
   c. Lift the cartridge off the two rubber cartridge locating pins far enough to expose the setscrew on the end of the cartridge.
   d. Loosen setscrew and remove the old needle.
   e. Insert new needle, retighten setscrew, and reset cartridge on the two rubber locating pins.
   f. Place the rubber pad on the cartridge and replace the cartridge retaining clip. Use a pair of long nose pliers with which to replace clip.
   g. Lower pick-up arm to its original playing position.

MODEL B-24RC

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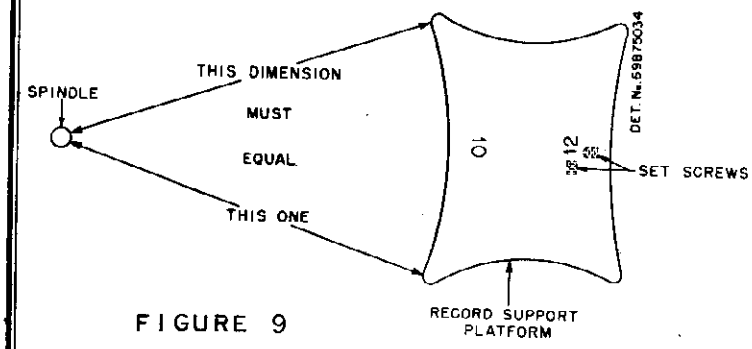

FIGURE 9

LINING UP THE RECORD SUPPORT PLATFORM

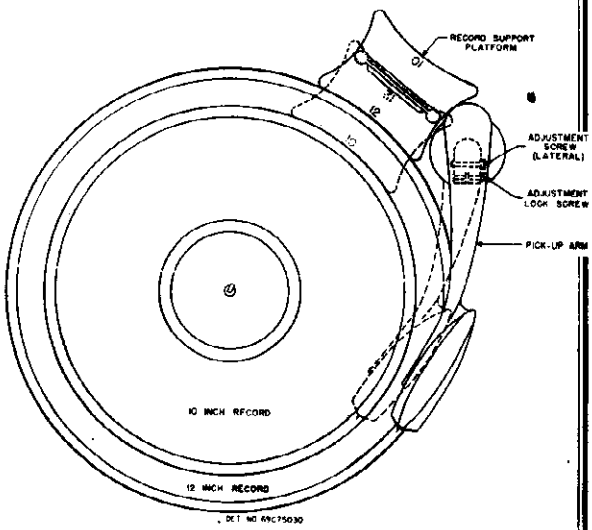

FIGURE 10 LATERAL ADJUSTMENT OF PICK-UP ARM

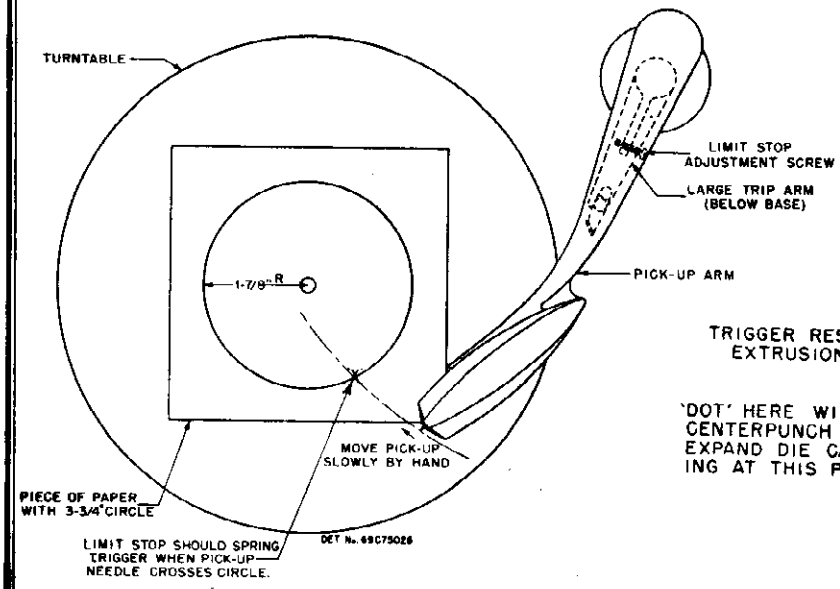

FIGURE 11 ADJUSTMENT OF LIMIT STOP

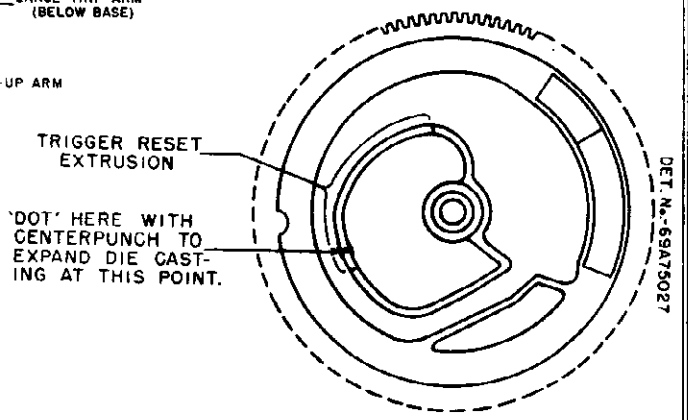

FIGURE 13

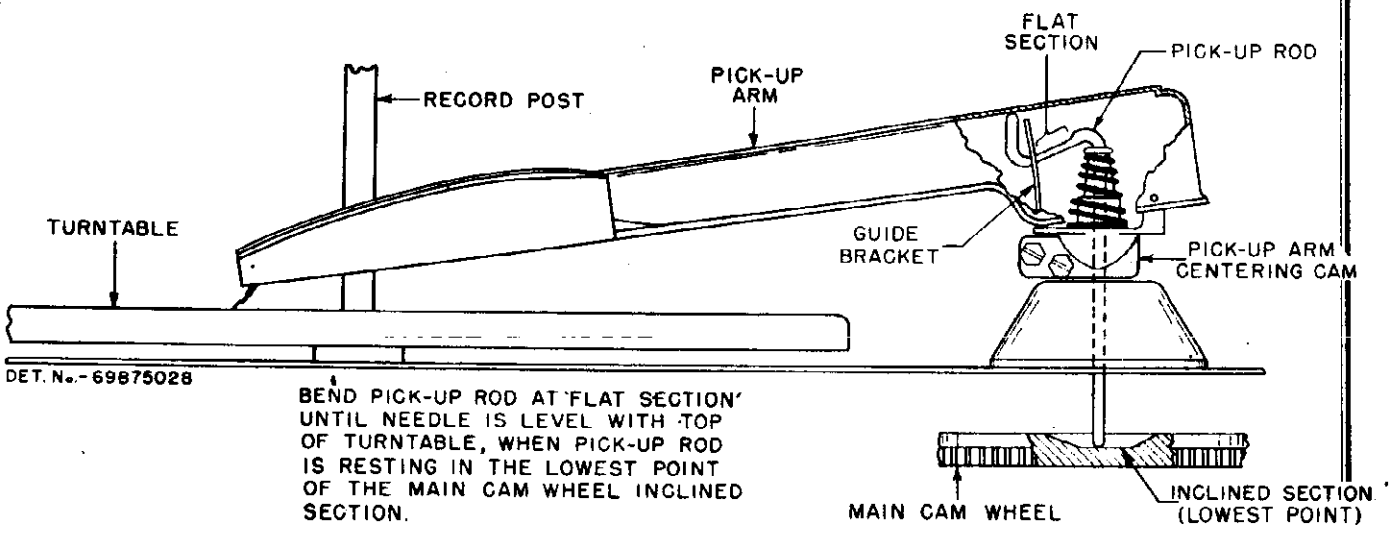

FIGURE 12 VERTICAL ADJUSTMENT OF PICK-UP ARM

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ROUTINE CHECKS AND ADJUSTMENTS

LINING UP THE RECORD SUPPORT PLATFORM

It is important that all points on the "lip" of the record support platform be equidistant from the center point of the spindle. This will assure that all points of the record will leave the platform at the same time. If the record support is too far out of alignment, the record would actually hang on the point nearest the spindle and fail to drop properly. See Figure 9.

TO CHECK ADJUSTMENT OF RECORD SUPPORT PLATFORM

1. Turn the record support platform to the ten-inch position making sure it is turned so that the selector spring falls into the detent notch.
2. The record release eccentric should be perfectly aligned with the record post. If it isn't aligned, cycle the record player. If at the end of the cycle it still isn't aligned, adjust as described in ADJUSTMENT OF RECORD DROP MECHANISM.
3. Slip a standard 10 inch record over the spindle and cycle the record changer once to allow the record to fall on the turntable; then stop the changer.
4. Lift the record so it is in line with the record release eccentric and check to make sure it clears the lip of the record support platform equally at all points.

TO ADJUST RECORD SUPPORT PLATFORM

1. If one point of the record support platform lip is nearer the record than the other, the position of the support may be adjusted after loosening the two allen head set screws, located directly under the record support platform.
2. TEST: After tightening the set screws, test the adjustment by running a ten-inch record through a complete cycle and check the point where the needle falls. If the needle misses the record by one inch, the record support platform is 180 degrees out of line with the detent plate and should be turned one half turn without turning the detent plate.

ADJUSTMENT OF RECORD DROP MECHANISM

For minimum wear around the centerhole of records and proper automatic dropping of records, it is important that the record release eccentric and record post line up perfectly at the end of each change cycle.

TO CHECK ADJUSTMENT OF RECORD DROP MECHANISM

1. Cycle the record changer once, by pulling the reject button.
2. At the end of the cycle, stop changer and carefully observe the position of the eccentric with respect to the record post. It should line up perfectly with the record post.
3. If at the end of a cycle the eccentric does not line up perfectly with the record post, re-adjust as described below.

TO ADJUST THE RECORD DROP MECHANISM

1. Pull the reject button and slowly revolve the turntable by hand until the gear arm roller is resting on the raised section of the record release guide groove. See Figure 5 for its location. The raised section of the groove is very small and resembles what is often taken for flash on castings. It serves to narrow down the guide groove at this point and in this manner insures closer alignment of eccentric and record post.
2. Loosen the slab head set screw in the spindle gear. The eccentric will now turn freely. See Figure 5.
3. Turn the eccentric so it is in perfect alignment with the record post.
4. Tighten slab head set screw in spindle gear.

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LATERAL ADJUSTMENT OF PICK-UP ARM

This adjustment is made to cause the needle to drop between the edge of the record and the first groove of the record as the changer completes a changing cycle.

TO CHECK & MAKE LATERAL ADJUSTMENT OF PICK-UP ARM

1. Turn the record support to the twelve-inch position.
2. Place a standard twelve-inch record on the turntable and a ten-inch record on top of it.
3. Start the changer and allow it to go through its cycle.
4. Note point at which the needle contacts record. It should fall into the middle of the area between the first groove and the edge of the record.
5. If it doesn't fall into the area, recycle the changer and stop the machine just as the pick-up comes down and is about to touch the record.
6. With a screwdriver, loosen the adjustment lockscrew (See Figure 10) and then turn the adjustment screw until pick-up is positioned correctly over the middle of the area between the edge and the first groove in the record. Turn the adjustment screw in a counter-clockwise direction to move the pick-up arm farther from center and in a clockwise direction to move it towards center of record.
7. Tighten the adjustment lockscrew. *Use care in locking, as too much pressure may crack the casting.*
8. Check the adjustment by putting the changer through its cycle.
9. If further adjustment is required, repeat above steps 1 through 7.
10. Turn the record support to the ten-inch position and cycle the changer. The needle should come down into the area between the first groove and the edge of the ten-inch record. If necessary, make minor compromise adjustment so needle will come down properly on both ten and twelve-inch records.

ADJUSTMENT OF THE LIMIT STOP

The limit stop mechanism permits the record changer to operate even though the record may not have an eccentric groove or if the eccentric groove is too close to the center hole.

Before checking or making adjustment on the limit stop, make sure the lateral adjustment is O.K.

TO CHECK LIMIT STOP ADJUSTMENT

1. Scribe a 3-3/4" diameter circle on a piece of stiff paper. Cut out a 1/4" hole at the center of the circle and slip the paper over the record post of the record player. See Figure 11.
2. Set up the record changer for twelve-inch records.
3. Turn on the record player, momentarily push the button to the reject position and allow the changer to complete one cycle. Stop the changer; the pick-up arm should now move freely.
4. Grasp the pick-up arm and slowly move it towards the record post. As the pick-up needle crosses the scribed circle line, the trigger should be heard to "click over".
5. Should the trigger mechanism be actuated before or after crossing the scribed line, re-adjust as described below.

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TO ADJUST THE LIMIT STOP

1. Move the pick-up arm to its resting post.

2. Reset the trigger mechanism by moving the button momentarily to the **MANUAL** position and then back to **AUTOMATIC** (center position).

3. With a screwdriver, adjust the limit stop adjustment screw, which is located on the trip arm. See Figure 11. Turn the screw clockwise if the trigger is tripped after the needle crosses the scribed line, and counter-clockwise if it trips too soon.

4. Check adjustment by moving the arm manually across the scribed line.

5. If the adjustment is still not correct, repeat above steps 1, 2, 3, 4 and 5 until it is correct.

VERTICAL ADJUSTMENT OF PICK-UP ARM

This adjustment assures that:

1. The pick-up arm rests properly on the first record.

2. The pick-up arm will clear a full stack of records (10 ten-inch or 8 twelve-inch) on the turntable, during the changing cycle.

3. There will be sufficient clearance between the top of the pick-up arm and a record in position on the record support, during the changing cycle.

4. There will be sufficient clearance between the pick-up arm and the pick-up resting post during the changing cycle.

TO CHECK VERTICAL ADJUSTMENT OF PICK-UP ARM

1. Turn the record support to the twelve-inch record position and cycle the record changer. As soon as the changing cycle is complete, turn off the changer by means of the left hand button. The pick-up arm should now be resting alongside the turntable. Correct adjustment is indicated if the pick-up needle is exactly level with the top of the turntable.

2. Fully load the record changer with records. Use 10 ten-inch or 8 twelve-inch records of standard manufacture only. Start the changer and drop one record on the turntable. The pick-up should come down and rest normally in the playing position on the record.

3. Push the left hand button to the **REJECT** position momentarily and release. Now as the pick-up is lifted off the record, carefully note that there is clearance between the top of the pick-up arm and the bottom record on the record support.

4. Drop the full load of records (10 ten-inch or 8 twelve-inch) on the turntable. As the record changer is cycled, note the clearance between the pick-up needle and the top record.

ADJUSTMENT OF VERTICAL TRAVEL OF PICK-UP ARM

The pick-up rod (Figure 12) controls the vertical movement of the pick-up arm.

1. After the changer has completed its cycle and pick-up arm is resting in playing position, stop the changer by pushing the left hand switch to **OFF**. The pick-up rod will now be resting on the bottom of the inclined section of the main cam wheel and the pick-up arm will be at its lowest point of vertical travel.

2. Lift the pick-up arm straight up, exposing the pick-up rod. With long nose pliers, bend the pick-up rod (along its straight portion) in the required direction till the pick-up needle point is level with the top of the turntable. See Figure 12.

3. Re-check as shown under TO CHECK VERTICAL ADJUSTMENT OF PICK-UP ARM. In some cases minor compromise adjustment will be required.

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ECCENTRIC STUD ADJUSTMENT

This adjustment varies the amount of pressure with which the drive pulley bears against the turntable rim, when the changer is in cycle. It is located on the bell crank arm; see figure1A for location.

If this adjustment is too loose, the record changer may not cycle; if too tight, it may keep cycling continuously or lock in cycle.

CHECK AND ADJUSTMENT OF ECCENTRIC STUD

1. Turn eccentric stud to minimum throw position.
2. Pull reject button and revolve turntable.
3. Slowly increase adjustment until drive wheel contacts inside rim of turntable for one complete revolution of turntable.
4. Then increase adjustment almost 1/8 turn to compensate for wear, etc.

SERVICE INFORMATION

MECHANISM IS SLOW IN STARTING OR MOTOR HEATS UP:

1. Check lubrication.
2. Dirt in bearings. - Wash dirt out with carbon tetrachloride or similar solvent and re-lubricate. Use a #10 motor oil in the phono motor and turntable bearings and Lubriplate #105 grease on all other bearings and moving parts.
3. Check line voltage and frequency.
4. Motor damaged. If found damaged, remove motor and return it to factory for repair or replacement.
5. Room temperature abnormally low.
6. Eccentric stud adjustment set at maximum throw causing cycle drive wheel to drag on turntable rim. Correct by setting eccentric stud per instructions under ECCENTRIC STUD ADJUSTMENT.
7. Loose sleeve on motor drive shaft. - Replace motor.
8. Slow motor. - Replace motor.
9. Turntable retaining washer too tight against turntable.
10. Defective turntable bearing. - Replace.
11. Grease on rubber rim idler wheel and/or inner rim of turntable. - Clean off with carbon tetrachloride.

MOTOR FAILS TO RUN:

1. Check to see that ON-OFF switch is OK and that power is being supplied to motor.
2. Trouble in motor winding. If easily seen, repair; otherwise, replace.
3. Damaged or frozen bearings. - Replace motor.
4. Gummed oil or foreign material between armature and pole-piece. - Clean out.

SQUEAKS OR OTHER NOISES, DURING PLAYING OF RECORDS

1. Check lubrication (if squeeks are heard, they will usually be found to come from the records - not from mechanism).
2. Compare the squeak with and without a load of records. If squeak disappears when records are removed, then noise is obviously from records. Correct by rubbing a little wax on the turntable record post.

CHANGER IS NOISY WHEN IN CYCLE:

1. Check lubrication.
2. See if any part has become loose or bent and is rubbing against a moving part.
3. Check center post eccentric shaft lubrication.

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"WOW" IN RECORD REPRODUCTION:

1. Record is warped or otherwise defective, or the instrument is not being operated at normal room temperature (70° F).
See CHECK THE RECORD FIRST on page 2.

2. May be caused by slippage due to grease on idler wheel or inside rim of turntable.

PICK-UP ARM TRIPS OUT OF OSCILLATING GROOVES.

1. Record changer not level.

2. Rough surface on catch surface of small trip arm. - Re-polish.

3. Ratchet arm bent too close to trip pawl. - Bend away slightly.

4. Pick-up arm main shaft binding in bearing.

(a) Ream out the hole. (b) Sometimes the trip arm may be too close to the base, causing a bind. - To remedy loosen its two setscrews and space lightly.

5. Selector lever may be bent out of shape and binding against detent plate. - Straighten.

6. Selector lever slot or retaining rivet on detent plate may be undersize or oversize respectively, effectively causing a binding feeling on the pick-up arm. - Correct by spreading slot in selector lever.

7. Record may have oscillating groove covered with paper nameplate. - Remove paper from oscillating groove.

8. Needle may be chipped. Replace.

CHANGER KEEPS CYCLING.

1. Eccentric stud adjustment set too tight. - Correct per instructions found under ECCENTRIC STUD ADJUSTMENT.

2. Catch surface of small trip arm or ratchet arm worn to improper angle causing slipping apart of mating surfaces. - Correct by replacing parts.

3. Bell crank torsion spring may be too weak. - Replace.

4. Small trip arm may not be lifted far enough by the trigger reset extrusion to reset the trigger and end the cycle. - Correct by "doting", with a center punch, the trigger reset extrusion of the main cam wheel as shown in Figure 13. This operation expands the die cast cam at that point and gives a greater lifting movement to the small trip arm during the trigger reset portion of the cycle.

5. Manual lever wedges itself between small trip arm and base. - Correct by slightly bending the manual lever away from the record changer base.

CHANGER WILL NOT CYCLE.

1. Weak pawl spring causing non-mating of pawl on ratchet arm teeth. - Replace spring.

2. Pawl frozen on trip arm. Check for cause; if other than due to dirt or grease, replace entire trip arm and selector lever assembly.

3. Binding drive arm or main cam wheel on shaft. - Replace parts or remove burrs.

4. Eccentric adjustment stud set at minimum throw. Cycling drive wheel is not against inner rim of turntable. - Correct by setting up as shown under ECCENTRIC STUD ADJUSTMENT.

5. Weak bell crank arm spring. - Bend bracket to tighten spring.

6. Bell crank arm binding on shaft.

NEEDLE SETS DOWN ON RECORD WITH A WHIP MOTION

1. Pick-up arm centering cam not seating properly during cycle caused by pick-up arm rod pushing against its guide bracket. Correct by bending guide bracket forward to relieve pressure. See Figure 12.

RECORD WILL NOT DROP WHILE CYCLING:

1. The record release in the spindle assembly may not be protruding out enough from the spindle assembly. It should stick out as far as the eccentric does when the eccentric is picking up a record. If it doesn't and trouble persists, replace spindle assembly.

2. Eccentric out of line with record post. - Correct as shown in ADJUSTMENT OF RECORD DROP MECHANISM.

3. Set screw loose on spindle gear. - Tighten.

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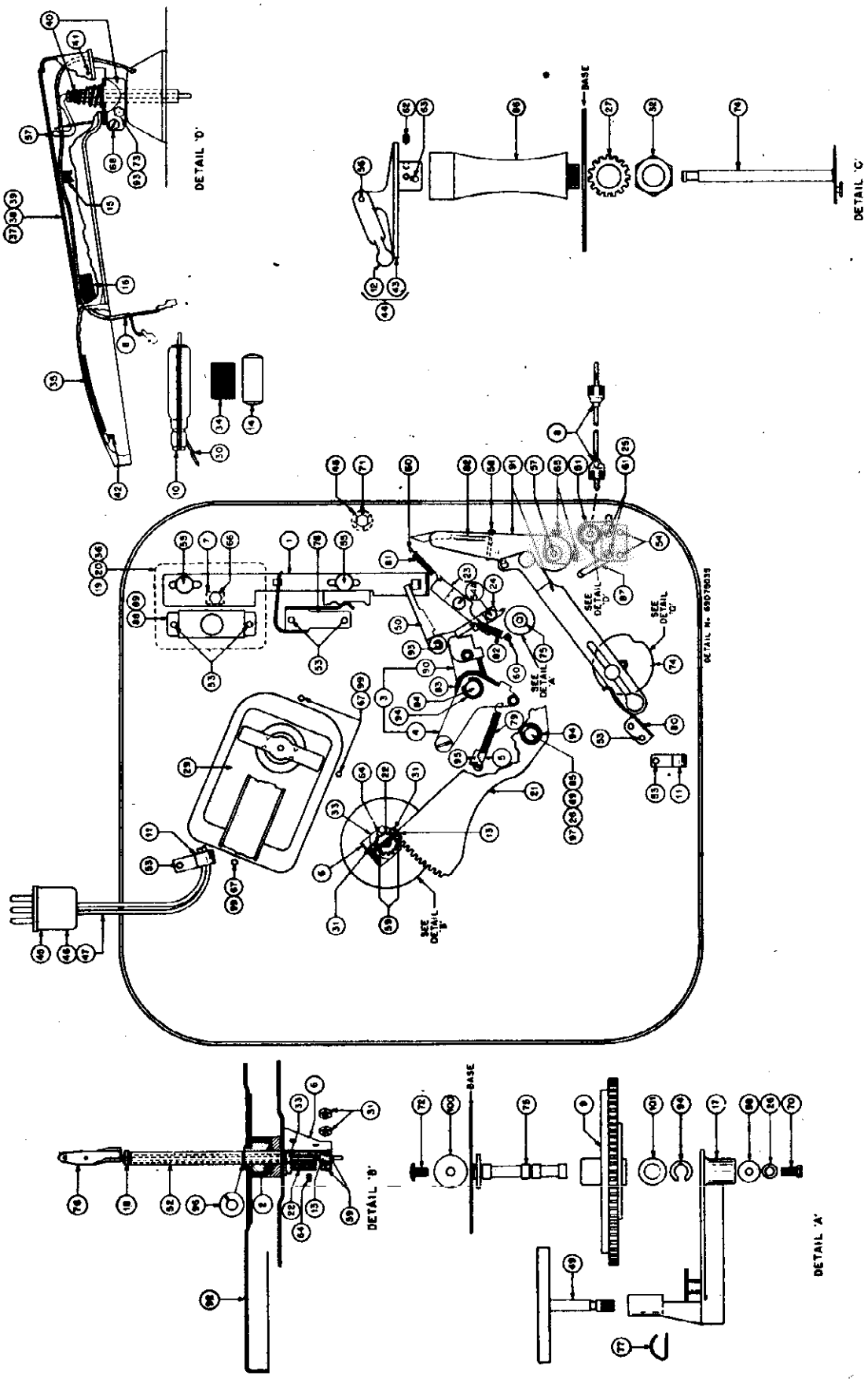

FIGURE 14 RECORD CHANGER B-24-RC PARTS LOCATION DETAIL

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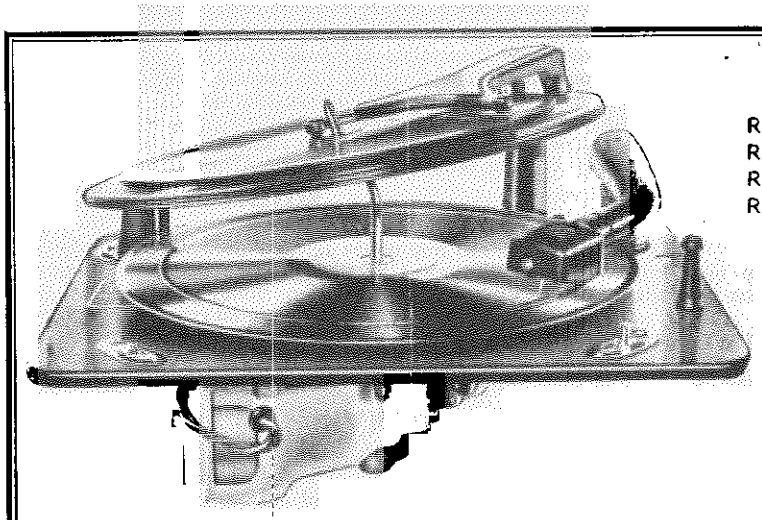
PARTS PRICE LIST

B-24-RC

REF. NO.	PART NO.	DESCRIPTION	LIST
1	45S27543	Arm, selector slide	.10
2	43X4554	Bearing, ball: .062 dia. (16 used in turntable bearing)	doz. .15
3	1B71785	Bell crank assembly: includes bell crank lever with eccentric stud and roller, torsion spring, and small trip arm	1.20
4	1X71786	Bell crank lever assembly: consists of bell crank lever with eccentric stud and roller.	.80
5	7A72465	Bracket, mounting (holds bell crank spring)	doz. .25
6	7A71688	Bracket, spindle	.10
7	38A27564	Button, switch	.05
8	1X72672	Cable & Pin Terminal Assembly (pick-up connecting lead)	.42
9	1B71679	Cam Wheel & Bearing Assembly: die cast cam wheel with pressed in Oilite bearing.	.85
10	59A71618 or 59A74887	Cartridge, crystal	4.50
11	42K15135	Clamp, cable: 1/2"; Cad. Pl. (cable support)	doz. .15
12	42B71643	Clamp, record: polished chrome finished	1.00
13	42A71690	Clamp, spindle	.05
14	42A75809	Clip, cartridge retainer: spring steel	doz. .25
15	42A72314	Clip, retainer: steel, 7/8 long (holds pick-up lead inside pick-up arm)	doz. .25
16	35A72628	Cushion, pick-up arm: sponge rubber, 19/64 x 3/8 x 1/2 long.	doz. .15
17	1X71794	Drive arm assembly: die cast; includes brass idler gear	.65
18	47A72662	Eccentric & Tube Assembly: antique copper finish.	.70
19	13A27714	Escutcheon, switch (B-24-RC)	.40
20	15A27526	Escutcheon, switch (B-25-RC)	.25
21	1X71798	Gear arm assembly: includes roller and bushing	.45
22	44B71634	Gear, spindle	.35
23	45A27549	Lever, manual	doz. .50
24	45A74582	Link, trip	.05
25	487695	Lockwasher, steel: #5 internal; Cad. Pl. (muting switch mounting)	doz. .45
26	487671	Lockwasher, steel: #8 split; Cad. Pl. (gear arm stud mtg.-drive arm mtg.)	per/c .25
27	488441	Lockwasher, steel: 1/2 external; Cad. Pl. (record support mtg.)	per/c..95
28	11M8605	Lubricant: Metal Lubriplate #105 (general lubricant)	per 2 oz. jar .30
29	59C71676 or 59C75524	Motor, Phono: complete; 117 V, 60 c.	9.40
30	47X72643 or 47X74920	Needle, phonograph: sapphire tipped Needle, phonograph: precious metal tipped	1.60 1.05
31	287019	Nut, steel: 4-40 x 1/4 Hex; Cad. Pl. (spindle clamp mtg.)	per/c .35
32	288397	Nut, steel: 1/2-28 x 5/8 Hex; Wht. Zinc Pl. (record support mtg.)	doz. .30
33	2A72311	Nut, special (record post mtg.)	.05
34	35A74665	Pad, cartridge (small): sponge rubber: 1/2 x 3/4 x 1/16 thk.	
	or 35K74908	Pad, cartridge (small): sponge rubber: 1/2 x 3/4 x 1/8 thk. (cushion between cartridge retainer clip and cartridge. 1/16 pad used with Shure cartridge; 1/8" pad is used with Webster cartridge.)	doz. .20
35	35A74664	Pad, cartridge (large): sponge rubber; 3/4 x 1-1/2 x 1/8 thick (Pad between pick-up arm and pick-up cartridge)	doz. .35
36	32A27776	Pad, escutcheon: paper	.05
37	1X76313	Pick-up Arm Assembly (less Needle): complete with crystal cartridge, cable, shaft, pick-up rod, guide bracket and cam assembly.	9.15
38	1X71792	Pick-Up Arm, Shaft & Arm Cam Assembly: complete, less crystal cartridge, lead and cartridge retaining parts.	4.00
39	45D71605	Pick-up Arm (only): less cartridge and all other parts	1.35
40	1X72338	Pick-up Shaft & Cam Assembly	2.60
41	47A71665	Pin, pick-up arm: steel (hinges pick-up arm to shaft & cam assembly)	doz. .30
42	47A74666	Pin, cartridge locating: rubber 7/64 dia. 5/16 long.	doz. .55
43	64B71647	Plate, record support	.70
44	1X71797	Platform & Flipper Assembly	1.80
45	28A27573	Plug: 3 pin	.05
46	1X72351	Plug, Shell & Leads Assembly: 3 pin plug with two leads. (B-24-RC)	.30
47	1X72498	Plug, Shell & Leads Assembly: 3 pin plug with three leads. (B-25-RC).	.30
48	46A27563	Post, pick-up resting: Lenite	.10
49	1X71795	Pulley & Shaft Assembly	1.00
50	1X75569	Ratchet Arm & Bushing Assembly	.25
51	1X75267	Receptacle, Bracket & Switch Assembly (pick-up output receptacle & muting switch on bracket).	1.85
52	47A71702	Record Post & Bearing Assembly: antique copper finish; powdered iron bearing	1.50
53	587716	Rivet, steel: .122 x 5/32; antique cop. (selector spring, selector slide arm, spring mounting bracket, slider switch, cable clamp)	per/c .45
54	587718	Rivet, steel: .122 x 3/16; antique cop. (output receptacle & muting switch bracket mtg.)	per/c .55
54A	6K21337	Rivet shoulder (trip link & manual lever mtg.)	per/c .50
*55	5K72597	Rivet, shoulder (selector slide arm mtg.)	doz. .25
56	47A71627	Rod, record clamp: steel, .062 dia. x 1-3/8 long	.05
57	47A71653	Rod, pick-up (pick-up arm elevating rod)	.30
58	382697	Screw, steel: #2 x 5/8 PKZ Sl Rnd H; Cad. Pl. (limit stop adj.)	per/c .50
59	382286	Screw, steel: lockscrew, 4-40 x 3/16 LK HHMS; Cad. Pl. (spindle clamp)	per/c .85
60	382669	Screw, steel: #4 x 5/16 PKZ Ph BH; antique cop. (spring studs)	doz. .25
61	381443	Screw, steel: 5-40 x 5/16 Sl BH MS; Nkl. Pl. (muting switch mtg.)	doz. .25
62	382672	Setscrew, steel: 6-32 x 3/16 Allen Hd, cone point (record support mtg.)	doz. .25
63	387900	Setscrew, steel: 6-32 x 3/16 Allen Hd. cup point; (record support mtg.)	doz. .25
64	387119	Setscrew, steel: 6-32 x 1/4 Slab HD MS; Cad. Pl. (spindle gear)	doz. .35

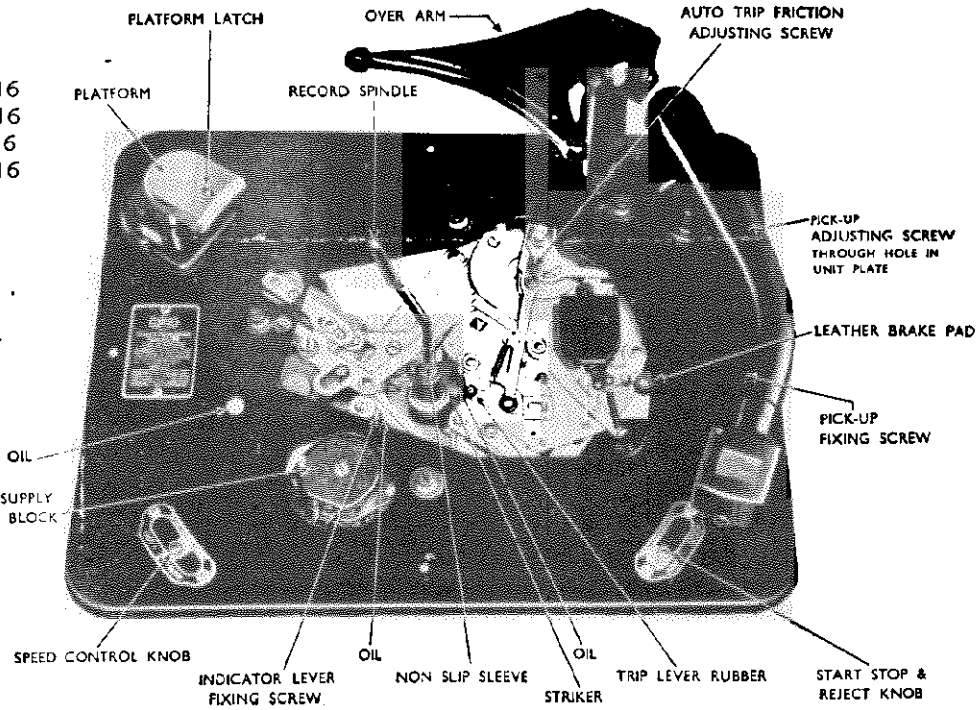
Prices Subject to Change Without Notice

REF. NO.	PART NO.	DESCRIPTION	LIST
65	387152	Screw, steel: 6-32 x 1/4 Sl HH MS; Cad. pl. (large trip arm mtg. setscrews)	per/c .95
66	387606	Screw, steel: #6 x 1/4 PKZ Pl HH; Cad. Pl. (switch button mtg.)	per/c .50
67	387342	Screw, steel: 6-32 x 5/8 Sl BHMS; Cad.Pl. (motor mtg.)	per/c .45
68	382288	Screw, steel: 6-32 x 3/4 Sl HHMS: Cad. Pl. (pick-up arm lateral adjustment lockscrew)	per/c .50
69	382291	Screw, steel: 8-32 x 5/16 Sl HHMS, antique cop. (gear arm stud mtg.)	per/c .60
70	387374	Screw, steel: 8-32 x 5/16 Sl HHMS; Cad. Pl. (drive arm mtg.)	per/c .50
71	382678	Screw, steel: #8 x 5/8 Pl Lk HH; Cad. Pl. (Pick-up resting post mtg.)	doz. .15
72	382287	Screw, steel: 12-24 x 1/4 Sl BHMS; antique cop. (cam shaft mtg.)	per/c .60
73	3A71612	Screw, adjustment: special; Cad. Pl. (pick-up arm lateral adj.)	.05
74	1X71788	Selector shaft & plate assembly: (10-12 inch record selector detent plate and shaft	.25
75	47A21298	Shaft, cam (For main cam wheel)	.35
76	1B71709	Spindle assembly	1.45
77	41A72568	Spring, clip (pulley retainer)	per/c .95
78	41B71660	Spring, detent (For selector slide arm)	.15
79	41A72337	Spring, drive arm tension	.05
80	41A71635	Spring, selector (For 10-12 inch selector detent plate)	.10
81	41A27775	Spring, tension (manual lever)	doz. .60
82	41A27491	Spring, tension (ratchet arm & pawl springs)	doz. .60
83	41A71676	Spring, torsion (used in bell crank assembly)	doz. .25
84	46A71620	Stud, bell crank lever	.10
85	46A71631	Stud, shoulder (Gear arm mtg. stud)	.22
86	46B71653	Support, record	.80
87	40A72571	Switch, pickup muting.	.40
88	40A27846	Switch, slider & shell: 2 position (B-24-RC)	.25
89	40A27545	Switch, slider & shell: 3 position (B-25-RC)	.40
90	1X71787	Trip arm assembly (small): small trip arm with roller	1.15
91	1X71789	Trip arm & selector lever assembly (large); Large trip arm and pawl with selector lever and stud attached; less trip pawl spring and all screws.	1.60
92	59C71664	Turntable, phono.	1.25
93	4K24125	Washer, "C" Spring (holds pick-up arm lateral adjustment screw in position and ratchet arm retainer)	per/c .85
94	4A21941	Washer, "C" spring (Bell crank retainer, main cam retainer & gear arm retainer)	per/c .90
95	4A19199	Washer, spring (used between mounting bracket that holds bell crank spring, and chassis base)	per/c .55
96	4A74646	Washer, spring steel: special (turntable retainer)	doz. .30
97	4S7623	Washer, steel: 3/8 x 11/64 x .033 thick; antique cop. (gear arm stud mtg.)	per/c .90
98	4S7597	Washer, steel: 7/16 x .171 x .033 thick; Cad. Pl. (drive arm retainer)	per/c .35
99	4S1765	Washer, steel: 1/2 x .147 x 1/64 thick; Cad. Pl. (motor mtg.)	per/c .60
100	4S7643	Washer, steel: 11/16 x 15/64 x .021 thick; antique cop. (on cam wheel shaft mtg. screw)	doz. .20
101	4A21491	Washer, thrust (Main cam wheel shaft.)	doz. .20



Types:

RC 60/D16
RC 60/H16
RC 60/L16
RC 60/U16



OPERATING INSTRUCTIONS.

The Garrard Model RC 60 Record Changer will play any number of records up to eight 10″ and 12″ mixed in any order.

To operate proceed in the following order:

1. If a permanent needle is not used insert a needle—the type that will play 10 or more records—in the pick-up; turn head to do this.
2. Place the record spindle in position, the sloping part leaning towards the record platform, raise overarm, and place any number up to eight records on the record spindle, their lower edge resting on the record platform, then lower overarm.
3. Move the right hand knob to "start". The motor will start and the changer operate. When the last record has been played the changer will automatically stop.

To remove records, raise overarm and withdraw the record spindle.

To reject a record, move the right hand knob to the reject position.

The Record Changer can be stopped by moving the right hand knob to the "stop" position.

Connected to the "start" and "stop" knob is the reject mechanism. If the changer is switched off while playing a record, the reject comes into operation when switching on again, the pick-up returning to its rest position.

NOTE.

If the Record Changer has been stopped for any reason, with the pick-up arm not on the rest, the arm should not be interfered with but

INSTALLATION.

DIMENSIONS.

The cabinet space required for fitting is 15½in. long by 13in. wide with 5½in. clearance above and 4½in. clearance below unit plate.

FITTING TO CABINET.

The "GARRARD" Model R.C.60 Record Changer is supplied with spring mounting to prevent mechanical feed-back occuring between the loudspeaker and the pick-up, and clearance should be left between the unit plate edges and the cabinet to allow the changer to float freely.

A template is supplied with each Record Changer and the instructions on it should be carefully followed.

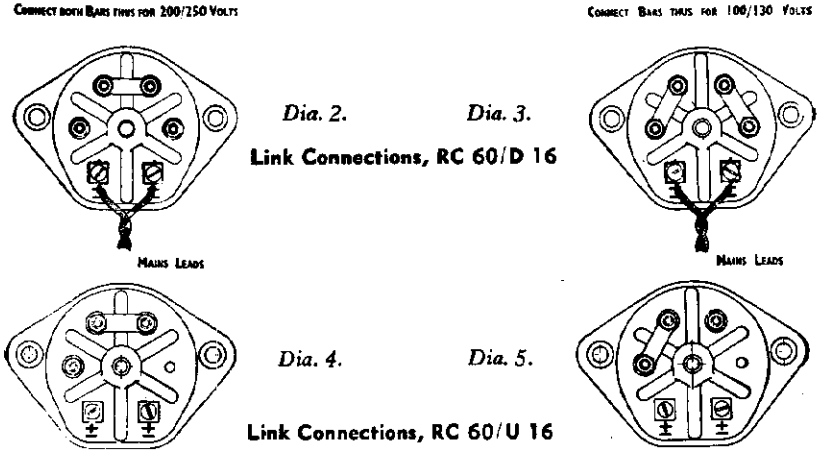
After installing, see that the Changer is level by placing a spirit level on a record on the turntable. If not level, adjust by means of the spring mounting fixing screws. Finally, the nuts and threads of the spring mounting fixing screws should be coated with a locking paint such as shellac varnish to prevent the nuts working loose due to vibration.

VOLTAGE.

The "GARRARD" Model R.C.60 Record Changer is supplied in the following types:—

R.C.60/D16 Dual Voltage Range 100/130 and 200/250 volts 40/60 cycles.
R.C.60/H16 High Voltage Range 200/250 volts 40/60 cycles.
R.C.60/L16 Low Voltage Range 100/130 volts 40/60 cycles.
R.C.60/U16 Universal Voltage Range 100/130 and 200/250 volts D.C. and

On installation, the links in the terminal block on types D16 and U16 should be set to the correct position to correspond with the voltage of the power supply, as shown in diagrams 2 to 5.



On types H16 and L16 connect the leads from the power supply to the terminals, taking care that the voltage is correct for the motor.

A red terminal block cover is fitted to the Universal type (R.C.60/U16).

A brown terminal block cover is fitted to the A.C. types (R.C.60/D16, R.C.60/H16 and R.C.60/L16.)

The motor should be earthed by connecting a lead from the earthing tag, located under one of the motor end cover screws and a good earth connection.

When adapting an AC/DC (Universal) Radio Receiver, Amplifier or one using a D.C. Power Pack for the reproduction of gramophone records, a pick-up transformer or condensers in series with the pick-up leads should be fitted, otherwise the pick-up circuit becomes alive. Also, the leads from the radio set or amplifier to the pick-up should be as short as possible in every case.

MAINTENANCE.

The motor only requires occasional lubrication at intervals, depending upon the length of time the Record Changer is used. Lift off the turntable and the oil holes (diagram 1) are accessible. A few drops of "GARRARD" or thin lubricating oil are sufficient.

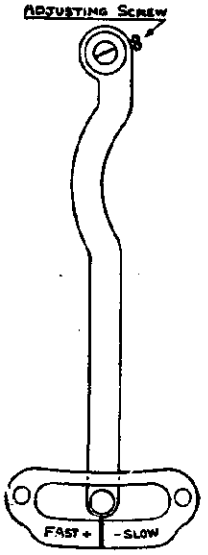
RECORDS should be reasonably flat and clean to obtain good reproduction. Care should be taken in storing to prevent contact with dirt and dust which sets up abrasive action and causes rapid wear.

RC 60/U 16 MOTOR.

Periodical examination of the carbon brushes should be made. If they are allowed to become dirty or worn, brush noise will occur. The brushes can be cleaned by lightly scraping the contact surface with a pen-knife. It is essential that the brushes be replaced in the same holder and the same way round New brushes are 9/16in. long under the springs. When worn down to 3/8in. they should be replaced. To remove the brushes, unscrew the brush caps and the brushes can be withdrawn.

SERVICE ADJUSTMENTS.

SPEED SETTING.



Due to the wide voltage range of the motors it may be necessary on some power supplies to make a slight re-adjustment of the speed indicator lever so that the speed of the turntable corresponds with that shown on the indicator scale.

To set the speed on alternating current power supply, 40/60 cycles, use the "GARRARD" Stroboscopic Speed Indicator enclosed with each Record Changer. To set speed on direct current power supply the turntable speed should be checked with a watch. Set speed so that turntable revolves at 78 r.p.m., remove the turntable and carefully loosen the screw holding the indicator lever to the vertical brake shaft, move the indicator lever to the centre position on the indicator plate and tighten up the screw. The speed should now be correct.

NOTE. One side of the stroboscopic speed indicator is designed for use in adjusting speed on a 50 cycle, and the other side a 60 cycle power supply.

MOTORS. If the motor fails to start when the control knob is turned to "start", first check the power supply and ascertain if current is reaching the motor terminals.

Next examine the terminal block and see that the leads and screws are tight; also examine the switch contacts, clean and adjust if necessary.

If a thick oil has been used to lubricate the motor bearings the motor will appear weak or will not start. It will be necessary to dismantle the motor and clean away all traces of the thick oil It is, therefore, essential to lubricate the motor bearings with a good quality thin oil.

Should the motor get too hot, first see that the voltage change-over links are set correctly to correspond with the voltage of the power supply.

To check the motor windings insert a milliameter in either motor lead. The maximum current consumption should not exceed:—

R.C.60/D16 { R.C.60/H16 200/250 volts 0.11 amp.
R.C.60/L16 { 100/130 volts 0.22 amp.
110 volts 60 cycles 0.24 amp.

If readings in excess of the above figures are obtained, the motor unit or coils should be returned for examination.

Wavy or watery reproduction from records is often due to dry governor pads. These should be lubricated by saturating the felt pads with oil.

To cure governor rattle, put a little thick oil on the shaft where the governor sleeve slides.

REMOVING MOTOR.

If the motor has to be removed from the Record Changer, disconnect the switch leads from the switch and remove the clips holding the leads, then remove the motor fixing screws and the motor can be withdrawn.

PICK-UP DROPPING POSITION.

The pick-up arm has been finely adjusted so that the needle comes on to 10in. records in a 9⅝in. diameter circle and 12in. records in a 11⅝in. diameter circle. These positions were arrived at after checking a very wide selection of records of various makes.

There may be a few records where the record track starts further away from the centre, (i.e., nearer the edge), and in these exceptional cases the

needle may alight on the record a few grooves from the start of the record. If the pick-up dropping position were set for these exceptional records it would not be suitable for average records.

Should the dropping position of the pick-up require adjustment the pick-up adjusting screw—accessible through a hole in the unit plate—should be turned with the Changer in its start position; that is, with the pick-up arm on its rest.

The pick-up adjusting screw should be turned either to the right or left, according to requirements. A quarter of a turn in either direction will give you the maximum adjustment. After adjustment, switch on, check the dropping position and re-adjust if necessary.

PICK-UP HEIGHT.

If desired the pick-up height can be adjusted by removing the screw in the collar at the bottom of the pick-up arm lifting spindle and turning the collar, whilst holding the spindle. Replace screw and tighten after adjustment.

CAUTION. When making any adjustments to the pick-up arm, it should NEVER on any account be forced into position. If the turntable is turned by hand it should NOT be turned backwards.

If the pick-up does not run into the record grooves after alighting on the record edge, see that the record changer is level by placing a spirit level on a record on the turntable. Also make sure that the flexible wire leading to the pick-up is not twisted or held in such a manner as to prevent the free movement of the pick-up arm; also see that the associated levers are free.

AUTO TRIP MECHANISM.

The satisfactory operation of the Record Changer depends upon the operation of the auto. trip. Occasional adjustment of the auto. trip friction spring may, therefore, be necessary.

If, at the end of a record, the auto. trip does not operate—that is, the pick-up remains at the end of a record—first see that the record has a run off groove in its centre, as only records with run off grooves can be played automatically on Record Changers. If the record is in order, increase the tension of the friction spring by turning the friction adjusting screw (on diagram 1) in a counter-clockwise direction; about half a turn is all that should be necessary. This screw is accessible on removing the turntable.

When the changer operates before the end of a record or a bumping or tapping noise is audible, first examine the trip lever rubber and, if worn, give it a half turn to present a new surface to the striker. If badly worn, renew. If trip lever rubber is in good condition then reduce the tension of the friction spring by giving the auto trip friction adjusting screw (diagram 1) half a turn in a clockwise direction.

RECORD PLATFORM ADJUSTMENT.

When despatched from our works the record platform is set to accommodate records of average dimensions. Occasionally, however, records may be found outside the normal limits; if necessary, therefore, the platform may be adjusted to take them.

To control the platform movement are two adjustable links, each fitted with two screws. One link, with its pivot at the bottom of the platform lever, controls the platform lift, whilst the other controls the distance the platform moves inward.

It is this latter link which may be adjusted to accept records differing from the normal in diameter. To do this, loosen the screw further away from the platform and remove the other screw.

Now refit this screw in an adjacent hole according to the adjustment required. Moving the screw to a hole nearer the platform lengthens the link and increases the inward movement of the platform. By moving the screw in the opposite direction the link is shortened and the outward movement

PICK-UP.

"GARRARD" Magnetic types of pick-up are interchangeable with the Crystal type or vice-versa without alteration to the pick-up arm on these Record Changers, provided the pick-up is fitted in a "GARRARD" head.

All "GARRARD" pick-up heads are of the plug-in type, connections being made by two plugs and sockets at the back of pick-up head.

To remove the pick-up head, unscrew the pick-up fixing screw, withdraw the pick-up, easing the pick-up lead under the arm, and remove the two plug connections from back of pick-up.

If reproduction ceases, or becomes distorted when fitted with a "GARRARD" standard magnetic pick-up, first make sure that the amplifier is in order. Should this be found satisfactory, a slight adjustment to the pick-up may be necessary or the damping rubber may need renewing.

To examine pick-up proceed as follows:—Remove the pick-up cover, and by viewing the front of the pick-up, examine armature to see that it is in the centre of the gap between the pole pieces.

If it is touching one of the pole pieces it must be re-centred. To do this, loosen the two screws holding the adjusting plate, sliding the latter until the armature is in the centre, then tighten the screws.

If the armature will not retain its centre position, it will be necessary to renew the damping rubber. This can be done by removing the adjusting plate, replacing the rubber and re-assembling the plate.

Adjust the plate until armature is centred before tightening the screws.

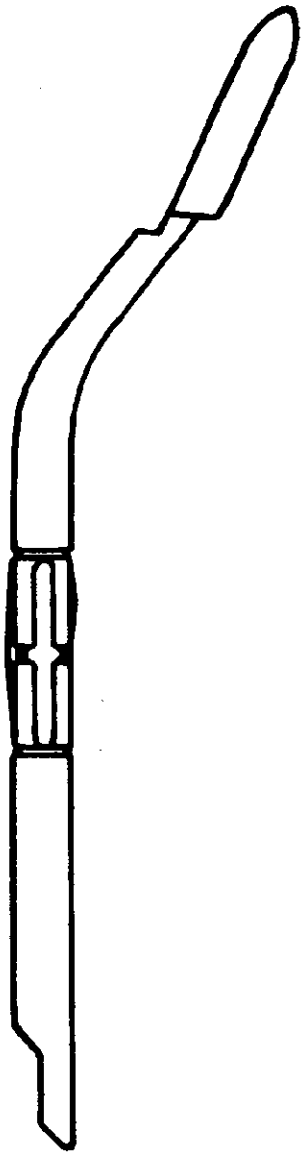
The top damping rubber tends to perish in time. It should, therefore, be replaced whenever it appears that the needle stiffness has increased, otherwise excessive record wear may occur.

Distortion can be caused by dirt or foreign matter in the gap between the pole pieces. To remedy, remove the adjusting plate and damping rubber and clean gap

The pick-up coil winding can be checked for continuity with an ohmmeter.

If a Crystal or High Fidelity pick-up is suspect the pick-up head should be returned for examination. A continuity test cannot be carried out on Crystal pick-ups with an ohmmeter.

Crystal Cartridges or High Fidelity pick-ups must not be opened or the Manufacturers will disclaim all responsibility.



TEMPLATE FOR RC 60 RECORD SPINDLE.

Should the record spindle be accidentally bent out of position through being dropped or other reasons, the record dropping will be affected. If trouble is experienced with erratic record dropping, lay the record spindle on template and check that it conforms to the shape thereof

MODEL RC60

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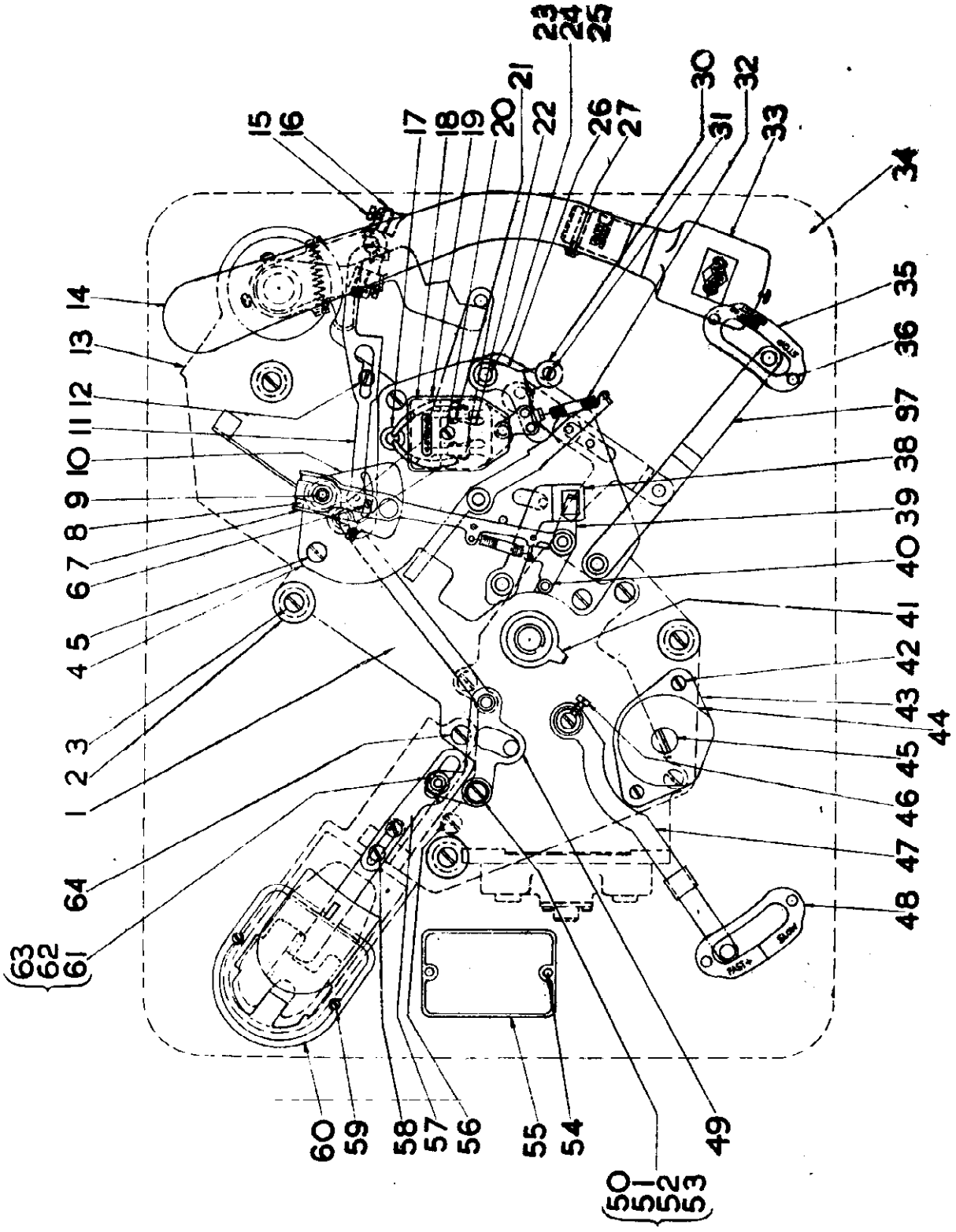

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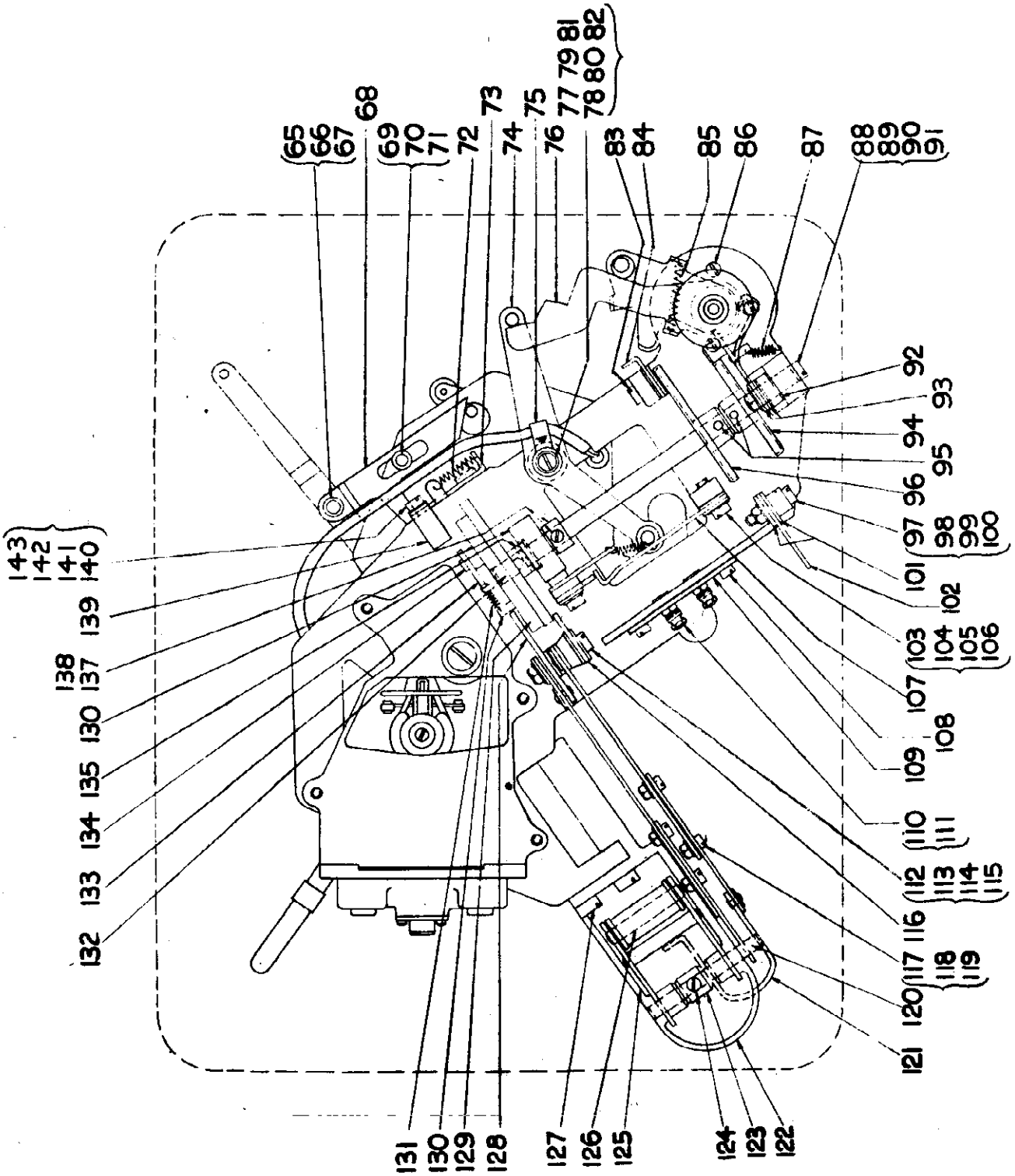
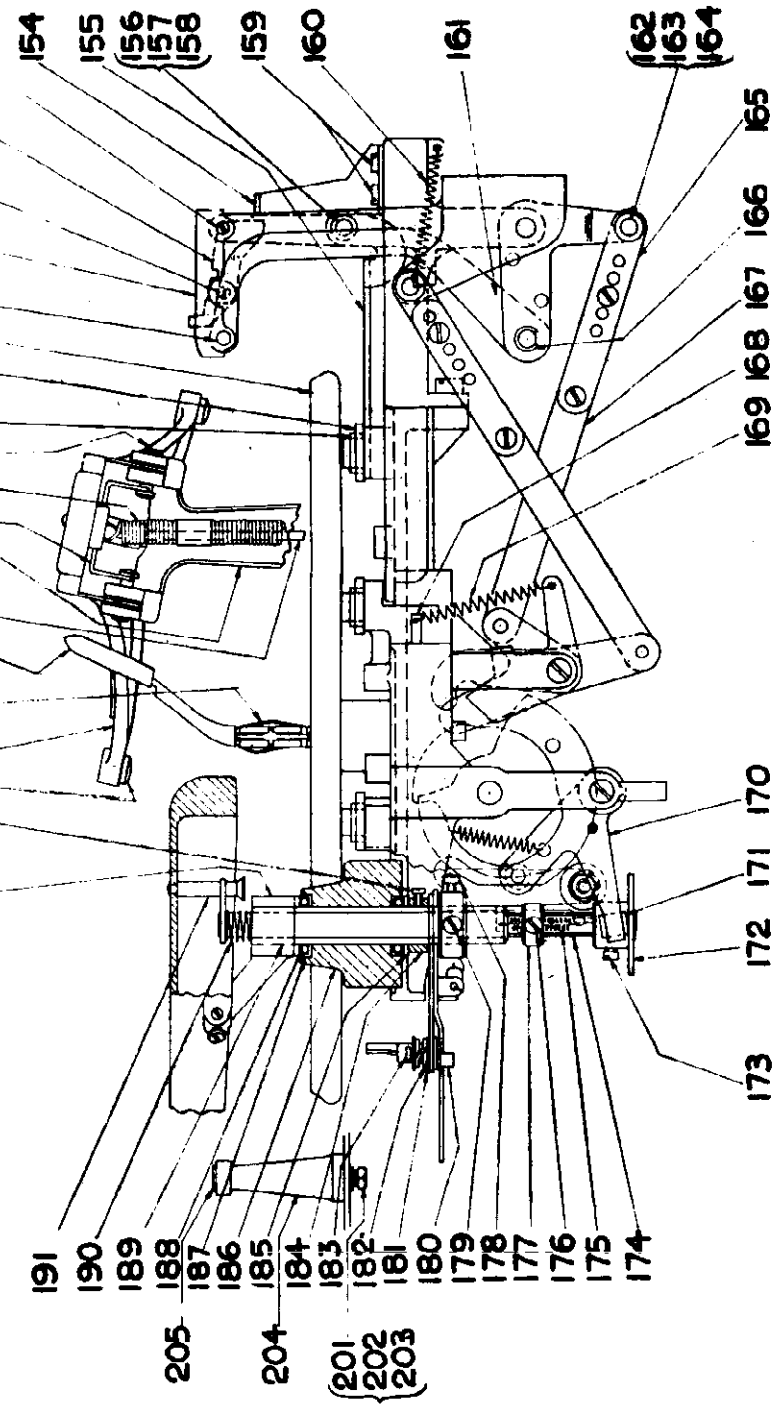


MODEL RC60

GARRARD ENG. & MFG. CO. LTD.



1.	SELECTOR LINK	45234	8.	FRICTION SPRING	A41513
2.	STEEL WASHER	A40508	9.	BASE PLATE SPRING PIN	A45208
3.	SCREW	A40018	10.	FRICTION PLATE	A45516
4.	BASE PLATE	A45172	11.	AUTO STOP LINK	A45184
5.	SCREW	A40033	12.	SCREW A40034 OR Screwm A40130 COLLAR A47103 WASHER A40509	
6.	SCREW	A40035			
7.	OPERATION LEVER UNIT	A45173	13.	BASE CASTING	45256

14.	PICK UP ARM COMPLETE WITH PIN	A45125
15.	LOCKING SCREW	A40020
16.	PIVOT SCREW	A40019
17.	GROMMET	A43101
18.	COVER	A45203
19.	SWITCH BLOCK	A45201
20.	COVER SCREW	A40036
21.	SCREW OR RIVET	A40003 A42009
22.	CONTACT SPRING	A41514
23.	A45210-COLLAR	
24.	A40514-WASHER	
25.	A42006-RIVET	
26.	SWITCH LEVER UNIT	A45193
27.	STOP SCREW	A40022
28.		
29.		
30.	BRAKE PAD	A45199
31.	SCREW	A40031
32.	SPRING	A41506
33.	PICK UP HEAD - 2,000 OHMS 6,000 OHMS. OR 700 OHMS FOR DETAILS SEE SEPARATE SHEET	
34.	UNIT PLATE	C45102
35.	SWITCH PLATE	A45105
36.	RIVET	A42002
37.	SWITCH CONTROL LEVER & KNOB.	A45189
38.	CLUTCH RELEASE LEVER WITH PIN	A45185
39.	TRIP LEVER & PIN.	A45521
40.	RUBBER PAD	A45179
41.	STRIKER ASSEMBLY	A45376
42.	SCREW FIXING CHANGE OVER BLOCK	A40002
43.	CHANGE OVER BLOCK	FOR DETAILS OF INTERNAL PARTS SEE SEPARATE SHEET.
44.	CHANGE OVER COVER	
45.	SCREW	
46.	FIXING SCREW FOR REGULATOR LEVER	A40020
47.	REGULATOR LEVER WITH KNOB & RUBBER SLEEVE	A45387
48.	INDICATOR PLATE	A45104
49.	INTER. SELECTOR LEVER	A45235
50.	SCREW	A40018
51.	SPRING WASHER	A42504
52.	WASHER	A40504
53.	COLLAR	A45283
54.	RIVET	A42002
55.	INSTRUCTION PLATE	L. 16 45103 H.16 45429 U. 16 45430 D. 16 45431
56.	SCREW FIXING MOTOR	A40018
57.	DELAY LEVER	A45236
58.	SCREW	A40031
59.	SCREW A40038 & NUT A41008	
60.	PLATFORM COVER	A45263
61.	COLLAR	A45161
62.	WASHER	A40514
63.	RIVET	A42005
64.	SCREW A40177	
65.	COLLAR	A45161
66.	WASHER	A40514
67.	RIVET	A42005
68.	SWITCH LINK	A45192
69.	COLLAR	A45161
70.	WASHER	A40514
71.	RIVET	A42005
72.	SPRING	A41503
73.	K.O. CLUTCH LEVER	A45261
74.	SELECTOR LEVER WITH PIN	A45231
75.	LEAD CLIP	A45399
76.	PICK UP ARM LEVER UNIT	A45241
77.	SCREW	A40018
78.	WASHER	A40504
79.	COLLAR	A45420
80.	SPRING WASHER	A42504
81.	SHAKEPROOF WASHER	A42520
82.		
83.	SCREW	A40018
84.	PICK UP CAM LEVER UNIT.	A45258
85.	SPRING	A41506
86.	SCREW FIXING PICK UP BASE	A40023
87.	SPRING	A41503
88.	SCREW	A40025
89.	SHAKE PROOF WASHER	A42520
90.	NUT	A41006
91.	COLLAR	A45161
92.	DISTANCE COLLAR	A45274
93.	WASHER	A40512
94.	LIFTING CAM UNIT	A45223
95.	GROOVED PIN	A43301
96.	SWING CAM UNIT	A45227
97.	SCREW	A40025
98.	NUT	A41006
99.	SHAKEPROOF WASHER	A42520
100.	COLLAR	A45161
101.	WASHER	A40512
102.	OVERTHROW LEVER	A45257
103.	SCREW	A40025
104.	SHAKE PROOF WASHER	A42520
105.	WASHER	A40512
106.	COLLAR	A45161
107.	K.O. RELEASE LEVER	A45260
108.	SCREW FIXING TERMINAL STRIP	A40021
109.	TERMINAL STRIP UNIT	A45253
110.	TERMINAL NUT	A41009
111.	TERMINAL WASHER	A40519
112.	SCREW	A40025
113.	WASHER	A40512
114.	COLLAR	A45161
115.	SHAKE PROOF WASHER NUT	A42520 A41006
116.	SUB. ASSEM. PLATFORM CAM LEVER	A45246
117.	SCREW	A40023
118.	SPRING WASHER	A42501
119.	NUT	A41012
120.	BOTTOM SPINDLE	A45165
121.	PLATFORM LEVER	B45163

122. PLATFORM BRACKET	B45168
123. OPERATING COLLAR	A45168
124. SCREW	A40024
125. TILTING LEVER UNIT	A45155
126. BOTTOM SPINDLE	A45165
127. SCREW FIXING PLATFORM BRACKET	A40028
128. SUB. ASSEM. TILTING CAM LEVER	A45150
129. PLATFORM CAM UNIT	A45213
130. SPRING PIN	A45218
131. SPRING	A41506
132. CAM SHAFT	A45219
133. CLUTCH LEVER	A45216
134. CLUTCH LEVER PIN	A45217
135. PIN	A43301
136. CAM SHAFT BEARING	A45221
137. CAM SHAFT COLLAR	A45222
138. FIXING SCREW	A40024
139. K.O. CATCH LEVER	A45262
140. SCREW	A40183
141. SHAKEPROOF WASHER	A42520
142. WASHER	A40504
143. COLLAR	A45161
144. K.O. SPINDLE UNIT	A45116
145. BRACKET	A45115
146. OVERARM SPRING UNIT	A45119
147. RUBBER SLEEVE	A45278
148. RUBBER COLLAR	A45279
149. RIVET	A42004
150. PLATFORM	A45150
151. SCREW	A40030
152. PAWL	A45169
153. SCREW	A40030
154. PLATFORM STOP	A45170
155. SELECTOR OPERATION LEVER	A45164
156. RIVET	A42005
157. WASHER	A40514
158. COLLAR	A45161
159. SCREW FIXING PLATFORM STOP	A40029
160. SPRING	A41508
161. PLATFORM SUPPORT UNIT	A45151
162. RIVET	A42005
163. WASHER	A40514
164. COLLAR	A45161
165. COUPLING LINK (SHORT)	A45160
166. RETAINING CLIP	A45166
167. COUPLING LINK (LONG)	A45249
168. ANCHOR PIN	A45282
169. SPRING	A41503
170. LIFTING LEVER UNIT	A45268
171. LIFTING LEVER PAD	A45858
172. FRICTION DISC UNIT	A45265
173. FIXING SCREW	A40021
174. LIFTING TUBE UNIT	A45134
175. SPRING	A41503
176. SCREW	A40021
177. STOP COLLAR	A45264
178. SCREW	A40000
179. SCREW	A40026
180. Eccentric Pin	A45245
181. WASHER	A40503
182. SPRING WASHER	A42502
183. SPLIT PIN	A43300
184. RETAINING COLLAR	A45145
185. THRUST WASHER	A40510
186. PICK UP BASE	A45143
187. BALL RACE	A45144
188. THRUST BALLS	A43200
189. PICK UP ARM SPINDLE	A45130
190. SPRING	A41504
197. RECORD SPINDLE	A45380
198. SPRING LEVER	A45121
199. PIVOT SPINDLE	A45123
200. TURN TABLE	A45390
201. NUT	A41012
202. WASHER	A40514
203. SPRING WASHER	A42501
204. RUBBER PAD	A45277
205. PICK UP REST	A45276

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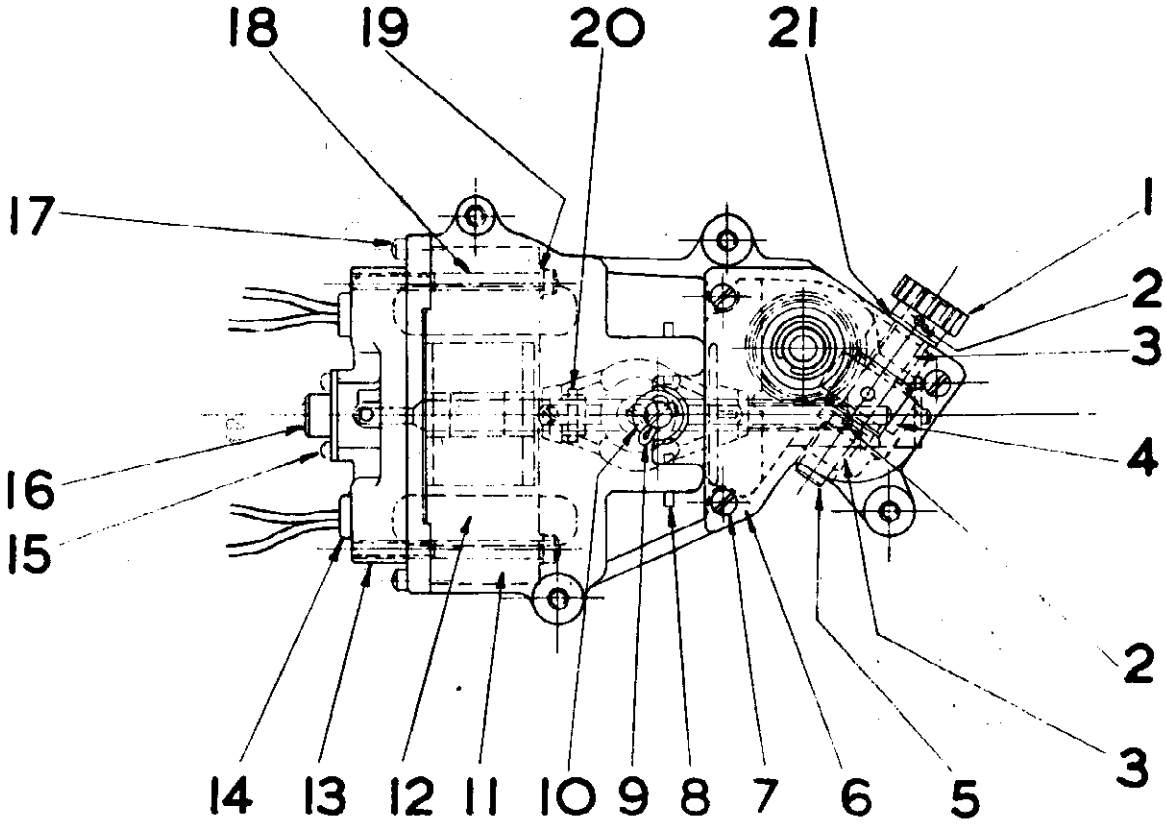
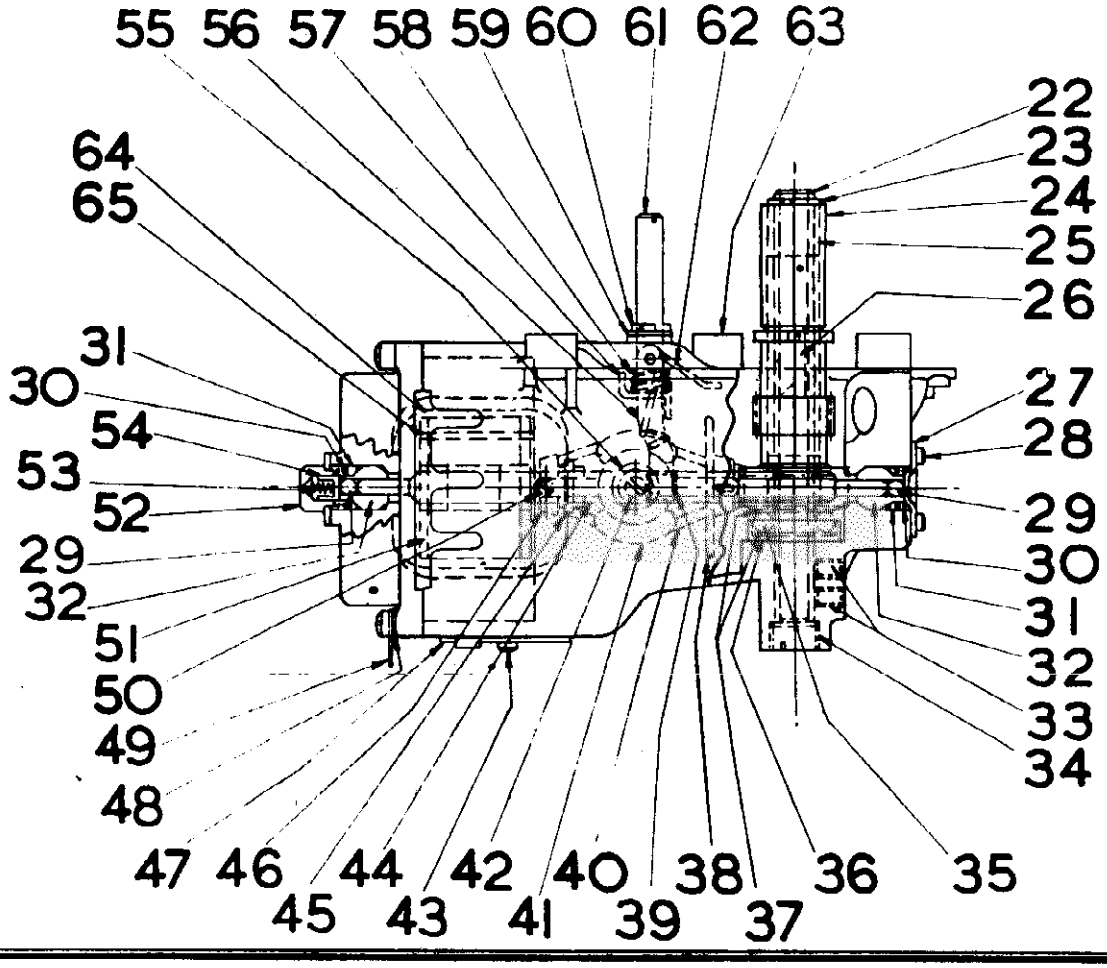




1. A45318 Clutch	23. A45493 Retaining Coil	45. A43307 Spring Pin
2. A43303 Pin Fixing, Clutch	24. A45363 Main Spindle	46. A45480 Collar
3. A45315 Cross Shaft Bearings	25. A45364 Bush	47. A45419 Name Plate
4. A45317 Gear	26. A45371 Fixed Spindle Insert	48. A40501 Washer
5. A45316 Cross Shaft	27. A45484 Bearing Plate (Frame)	49. A43000 Earthing Tag
6. A45375 Top Plate	28. A40040 Fixing Screw Bearing plate	50. A40010 Screw for Collar
7. A40029 Screw Fixing Top Plate	29. A43205 Thrust Ball	51. A45339 Rotor Assembly
8. A45324 Pivot Pin	30. A41510 Spring	52. A45349 Bush
9. A43300 Split pin	31. A45328 Cone	53. A41517 Spring
10. A40503 Washer	32. A45469 Rotor Bearing	54. A45350 Plunger
11. A45539 Stator Pack	33. A40043 Fixing Screw for fixed Spindle	55. A40502 Washer
12. A45687 Coils (with leads)	34. A45326 Screwed Plug	56. A45323 Regulating Brake
13. B45346 End Cover	35. A43203 Thrust Ball	57. A45321 Cam
14. A43101 Grommet	36. A45373 Ball Race	58. A41528 Spring
15. A40040 Fixing Screw for Bearing Cover	37. A40521 Thrust Washer	59. A40503 Washer
16. A45347 Bearing Place Assem: (Cover)	38. A45481 Gov: Sleeve Assem	60. A43300 Split Pin
17. A40002 Fixing Screw End Cover	39. A45684 Felt Pad	61. A45320 Regulating Shaft
18. A40118 Fixing Screw for Stator	40. A41520 Spring	62. A41518 Spring
19. A42501 Spring Washer	41. A45056 Gov: Ball	63. C45314 Frame
20. A43307 Spring Pin fixing, Governor	42. A40010 Fixing Screw for Ball & Collar	64. A45361 & A46605 Coil Insulation
21. A40520 Washer	43. A40042 Fixing Screw for Name Plate	65. A45359 Leakage Pins
22. A45370 Fixed Spindle	44. A45338 Rotor Shaft	

GENERAL INSTRUMENT CORP.

AUTOMATIC RECORD CHANGER SERVICE INSTRUCTIONS

MODEL 204

The Model 204 Record Changer is an automatic cam type changer, featuring Single Button Control, Automatic Shut-Off, and Eccentric Spindle Record Selection.

OPERATION

Single Button Control . . . Initial depression of the Single Button Control (6) not only actuates the Mercury Switch (13) but at the same time contacts the Automatic Trip Bar (14). The motion of the Automatic Trip Bar (14) causes the Carrier Lever (31) and its attached Drive Wheel (10) to swing outward until the Drive Wheel (10) comes in contact with the rim of the turntable. The consequent revolving motion of the Drive Wheel (10) is transmitted to the Main Cam (15) through a Drive Spring (16) and Worm Drive (17) assembly.

Cycling . . . A single revolution of the Main Cam (15) results in complete automatic cycling of the changer. This includes selection of record from stack, lifting Pick-Up Arm (1) from rest position and setting needle on edge of record. Upon completion of the revolution, the Automatic Trip Cam (24) engages with the block on the Trip Lever (43) and pulls the Carrier Lever (31) back to its original position so that the Drive Wheel (10) is no longer engaged with the turntable rim.

Record Feed . . . The lower side of the Main Cam (15) controls record selection. Motion of the Feed Cam Roller (36) about the cam results in a backward and forward movement of the Feed Sector Lever (19) thus engaging the Record Feed Pinion (20). This in turn causes the Eccentric (35) to first rotate to proper position for record selection and to then return, allowing record to drop over Spindle (3).

Pick-Up Arm Movement . . . The upper side of the Main Cam (15) controls Pick-Up Arm (1) movement. *Lift* is effected by motion of the Lift Pin (25) along the vertical edge of the cam as the latter rotates. *Direction* is controlled by the engagement of the Main Cam (15) with the Sweep Lever Pinion (26). The Sweep Lever (27) is attached to the Pick-Up Arm (1) by means of a Clamp (28) around the Pick-Up Arm Pivot Sleeve (29). A boss projecting from the upper side of the Main Cam (15) displaces the Stop Lever (30) at the end of the change cycle, thus permitting the Pick-Up Arm (1) to proceed across the record.

Positive Trip Action . . . As the Pick-Up Arm (1) approaches the spindle assembly, the Sweep Lever (27) hits the Positive Trip Screw (37) mounted on the Trip Lever Assembly (43). This action re-engages the Drive Wheel (10) with the turntable rim and starts a new cycle.

GENERAL INSTRUMENT CORP.

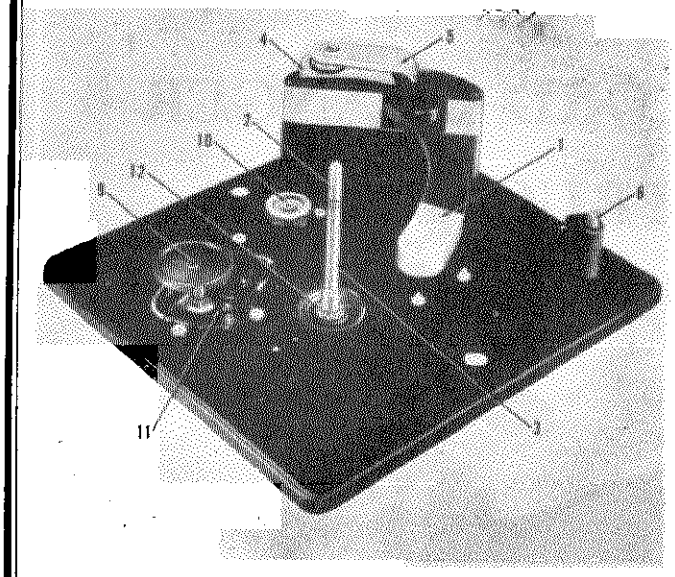


FIGURE 1

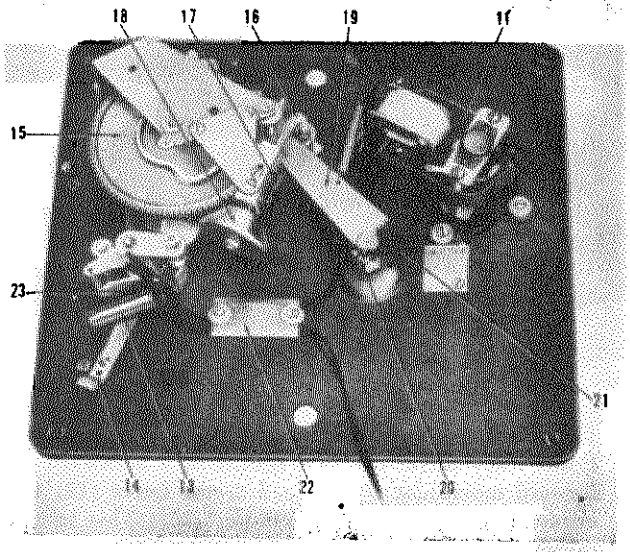


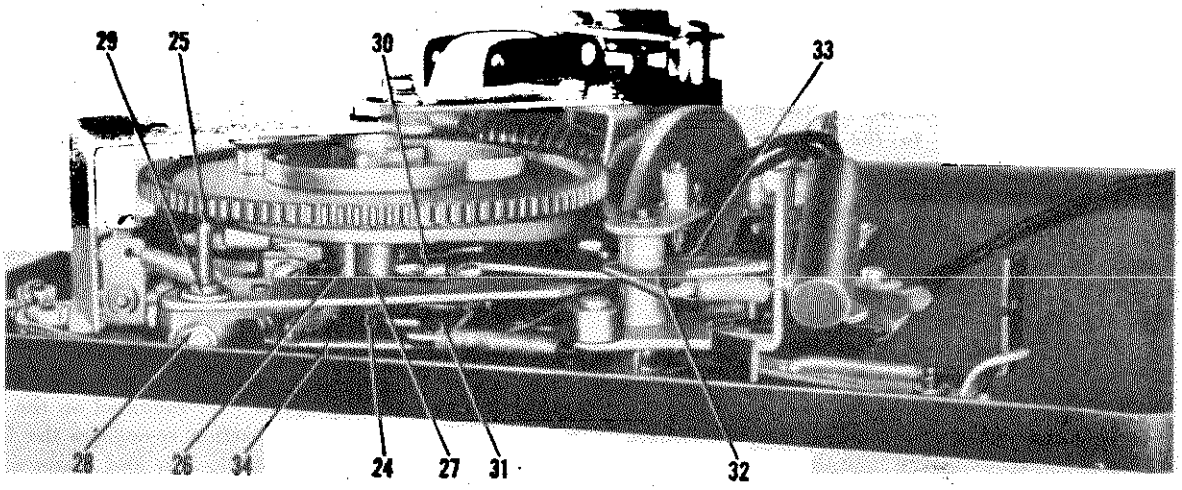
FIGURE 2

Pawl Trip Action . . . Any reversal of the direction of the Sweep Lever (27) travel before positive trip action takes place causes the Sweep Lever (27) to push forward the Pawl (38) mounted on the Auxiliary Trip Lever (34). This movement also has the effect of re-engaging the Drive Wheel (10) to start a new cycle. *(Pawl trip action is effective only after the Pick-Up Arm (1) reaches a distance of not more than four inches from Spindle (3).)*

Ten Inch or Twelve Inch Operation . . . Adjusting the Record Support (4) to the ten inch or twelve inch position lowers the Selector Rod (39) a definite degree. The length of the extension of this rod determines the position of the Stop Selector Lever (40) which in turn controls the Stop Lever (30). The latter is the means of regulating the distance the Sweep Lever (27) and its attached Pick-Up Arm (1) travel before the Pick-Up Arm (1) is lowered to the edge of the record. (Operation of this feature is dependent on proper positioning of Record Support (4). *Always turn Record Support (4) to full stop.)*

Automatic Shut-Off . . . Release of the Record Stabilizer Finger (5) lowers the Shut-Off Rod (41) and forces the Stop Selector Lever (40) completely clear of the Stop Lever (30). The latter is then able to move into a position which completely blocks any forward motion of the Sweep Lever (27). Consequently, the Sweep Lever (27) cannot perform its usual function of actuating the Switch Lever (32). Thus the Switch Lever Roller (33) remains in the path of the Stop Lever (30). On completion of the cycle, the Stop Lever (30), in returning to home position, hits the Switch Lever Roller (33) and forces the Mercury Switch (13) to the OFF position.

FIGURE 3



GENERAL INSTRUMENT CORP.

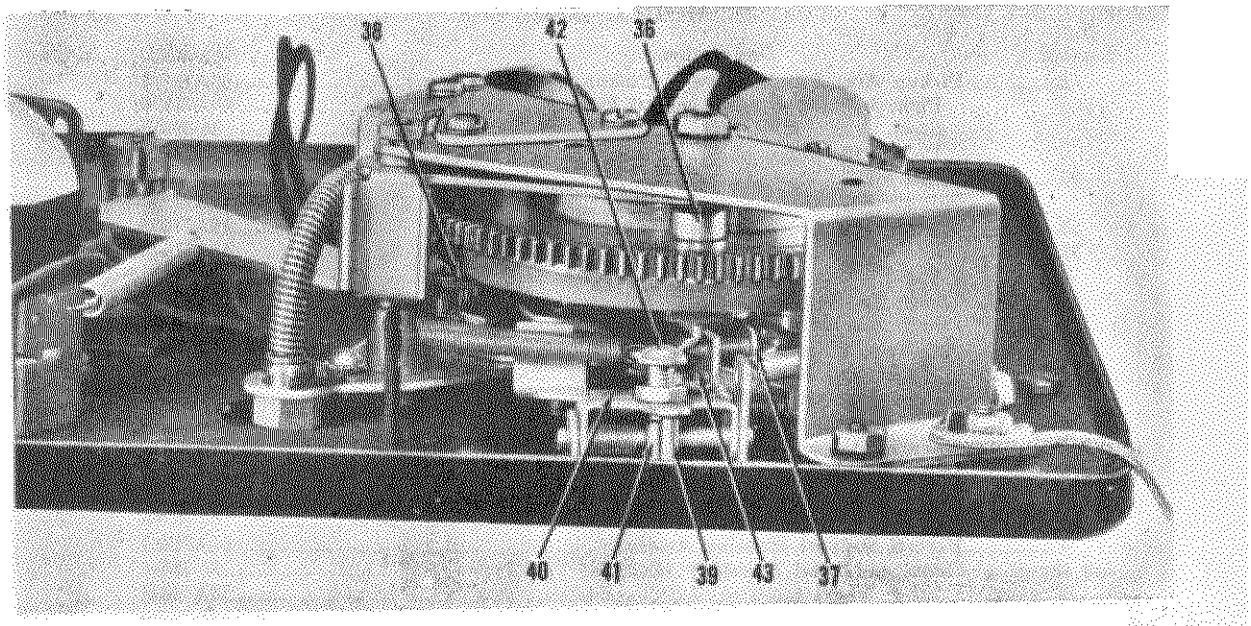


FIGURE 4

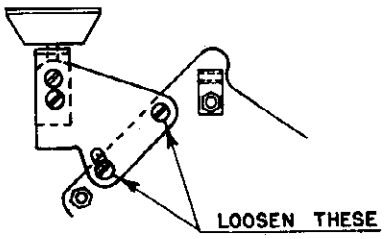


FIGURE 5

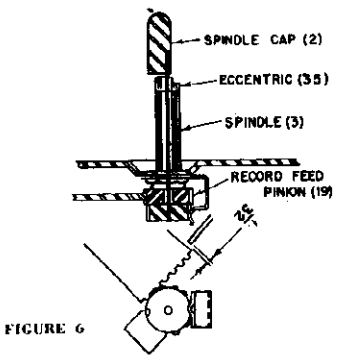


FIGURE 6

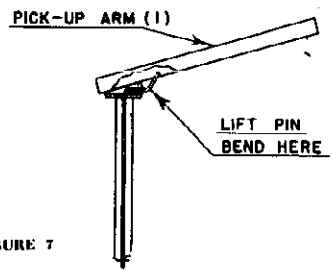


FIGURE 7

MISCELLANEOUS SERVICE ADJUSTMENTS

Changer trips before completion of record:

Turn Positive Trip Screw (37) clockwise.

Changer fails to trip after completion of record:

Turn Positive Trip Screw (37) counterclockwise.

Drop point of Pick-up Arm is not at proper point on record:

Loosen screw on Sweep Lever Clamp (28) slightly and reposition Pick-up Arm (1) with respect to Sweep Lever (27).

Slow turntable speed:

Make sure Drive Wheel (10) does not strike rim of turntable. If necessary, readjust eccentric bushing on Drive Wheel (10). (Note: This adjustment should be exceedingly slight as a large movement may cause continuous trip.)

Check for grease or oil on Idler Wheel (9) of Motor (11) and inside of turntable. Wipe with carbon tetrachloride.

Check for sticky Idler Wheel (9) plate on Motor (11). Free with screw driver.

Stalls in cycle:

Remove any grease on Drive Wheel (10) or inside of turntable with carbon tetrachloride.

Check mesh of Worm Drive (17) and Main Cam (15) for proper clearance. Loosen screws on main bracket and tighten. (See Figure 5.)

Check for bind in Spindle Assembly (See Figure 6). Disassemble index collar and Record Feed Pinion (20), remove Spindle Cap (2), Eccentric (35) and eccentric rod.

Check for freeness and remove binds.

The following cautions should be observed in reassembling Spindle Assembly:

(a) Reassemble with a maximum end play of .005 between Eccentric (35) and Spindle Cap (2).

(b) The Eccentric (35) should be in line with the Spindle (3) when the changer has completed its cycle.

(c) The Feed Sector Lever (19) should mesh with the Record Feed Pinion (20) as shown in Figure 6.

(d) Align Spindle Cap (2) with Spindle (3) in detent position.

Records fail to drop:

Check meshing of Feed Sector Lever (19) with Record Feed Pinion (20). Reset as shown in Figure 6.

First record does not play:

Readjust end of Lift Pin (25) so the needle will play first record. (See Figure 7.)

(Note: Do not bend Lift Pin (25) too much as this will prevent playing of top record on full stack.)

Make certain that pick-up lead does not hit top of Lift Pin (25) or hinge.

Automatic Shut-Off fails to operate:

Make certain that the Automatic Shut-Off Adjusting Screw (42) mounted on Stop Selector Lever (40) makes contact with the Shut-Off Adjusting Rod (41) when the Stabilizer Finger (5) is released. Adjust as required. Check leads on Mercury Switch (13) for interference with Switch Lever (32) motion. Check Mercury Switch (13) continuity.

GENERAL INSTRUMENT CORP.

TABLE OF REPLACEABLE PARTS

MODEL 204

Ref. Symbol	Description	Part No.
1	Pickup Arm Assembly (with Pickup Cartridge Assy.)	69A71907
	Pickup Arm Assembly (minus Pickup Cartridge Assy.)	69A71970
	Steel Balls (9)	36-80656
	Pickup Cartridge	Specify Model
25	Lift Pin	12-72687
	Spindle Kit	19A72912
3	Spindle and Bearing Assembly	19A71536
35	Eccentric Assembly	43A71646
2	Spindle Cap Assembly	21A71637
12	Thrust Bearing Assembly	30A72491
20	Pinion Assembly	28A71289
	Stabilizing Finger Assembly	55A71627
	Finger and Rod Assembly	55A71628
5	Record Stabilizer Finger	55-71604
17, 18	Drive Assembly (with Vibration Dampener)	29A71376
17	Worm Assembly	29A71377
16	Drive Spring Assembly	33A71196
10	Drive Wheel Assembly	19A71206
36	Feed Cam Roller	65-70566
4	Record Support Housing Assembly	21A71867
not shown	Motor and Lead Assembly (External Fan Type)	56-72092
	Idler Wheel	28A72833
	Fan	37-72839
	Spring	33-72841
	Pin	12-72851
11	Motor and Lead Assembly (Internal Fan Type)	56-72092
9	Idler Wheel	28A72869
	Spring	33-72879
	Drive Pinion Spring	33-72873
	Pin	12-72877
13	Housing and Mercury Switch Assembly	21A72762
14	Trip Bar	41A71263
19	Feed Sector Assembly	27A71293
22	Terminal Assembly	78A72777
	Terminal Board	78-72774
	Terminal Cover	58-72780
32	Switch Lever Assembly	55A72543
23	Switch Bracket Assembly	58A72555
30	Stop Lever Assembly	55A71298
40	Stop Selector Lever Assembly	55A71328
39	Stop Selector Rod Assembly	12A71623
	Carrier Trip Lever Assembly	55A71395
43	Trip Lever Assembly	55A71394
31	Carrier Lever Assembly	55A71379
	Turntable	Specify Model and Color
34	Auxiliary Trip Lever Assembly	55A72653
15	Cam Assembly	43A71301
	Indexing Spring Assembly	59A71305
	Sweep Lever Assembly	55A71295
28	Clamp Lever Assembly	55A71176
27	Sweep Lever Sub-Assembly	55A71296
	Mounting Spring	33-70582
	Lead Retainer Spring	33-71183
	Pawl Spring	33-71172
	Switch Lever Roller Spring	33-71256
	Stop Lever Spring	33-71316
	Control Button Spring	33-71317
	Trip Bar Spring	33-71318
	Trip Spring	33-71173
	Auxiliary Trip Spring	33-72578
	Record Feed Spring	33-71341
	Carrier Lever Spring	33-71342
	Mercury Switch Spring	33-72699
	Finger Spring	33-71613
	Stop Selector Lever Spring	33-71768
	Sweep Lever Spring	33-72210
	Pickup Arm Spring	33-71611
	"C" Washer (5/16")	32-16901
	"C" Washer (9/32")	32-50745

GENERAL INSTRUMENT CORP.

AUTOMATIC RECORD CHANGER SERVICE INSTRUCTIONS

MODEL 205

The Model 205 Record Changer is an automatic cam type changer, featuring Single Button Control and Eccentric Spindle Record Selection.

OPERATION

Starting . . . After the Switch Button Control (6) has been turned ON, thus supplying power to rotate the turntable, automatic cycling may be started by depressing the button. This movement pushes the Trip Bar (14) forward, causing engagement with the Carrier Lever (27) and its attached Drive Wheel (10). The latter thus contacts the rim of the turntable and rotates with it. This motion is transmitted through the Drive Spring (16) to the Worm Drive (17), which in turn drives the Main Cam (15).

Cycling . . . A single revolution of the Main Cam (15) results in complete automatic cycling of the change This includes selection of record from stack, lifti Pick-Up Arm (1) from rest position and setting need on edge of record. Upon completion of the revolutio the Automatic Trip Cam (26) engages with the blo on the Trip Lever (34) and pulls the Carrier Lever (2 back to its original position so that the Drive Whe (10) is no longer engaged with turntable rim.

Record Feed . . . The lower side of the Main Ca (15) controls record selection. Motion of the Feed Ca Roller (32) about the cam results in a backward a forward movement of the Feed Sector Lever (19) th engaging the Record Feed Pinion (20). This in tu causes the Eccentric (35) to first rotate to the prop position for record selection and to then return, allo ing record to drop over Spindle (3).

GENERAL INSTRUMENT CORP.

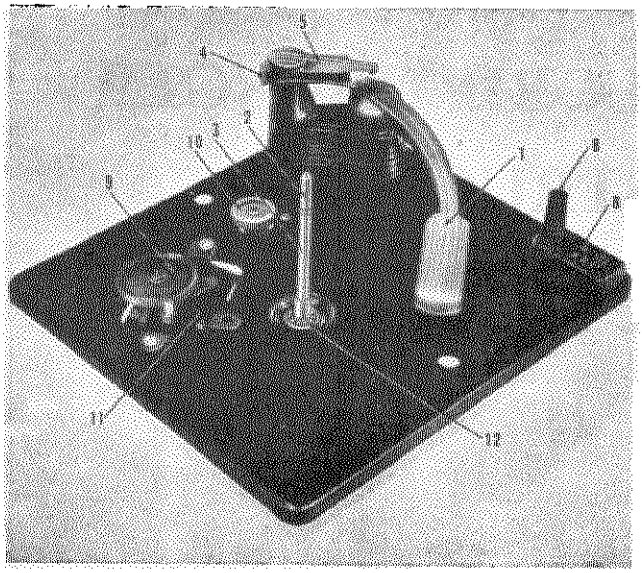


FIGURE 1

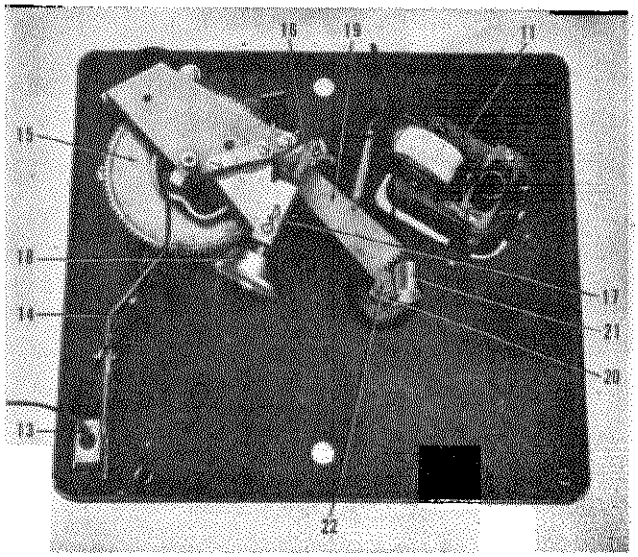


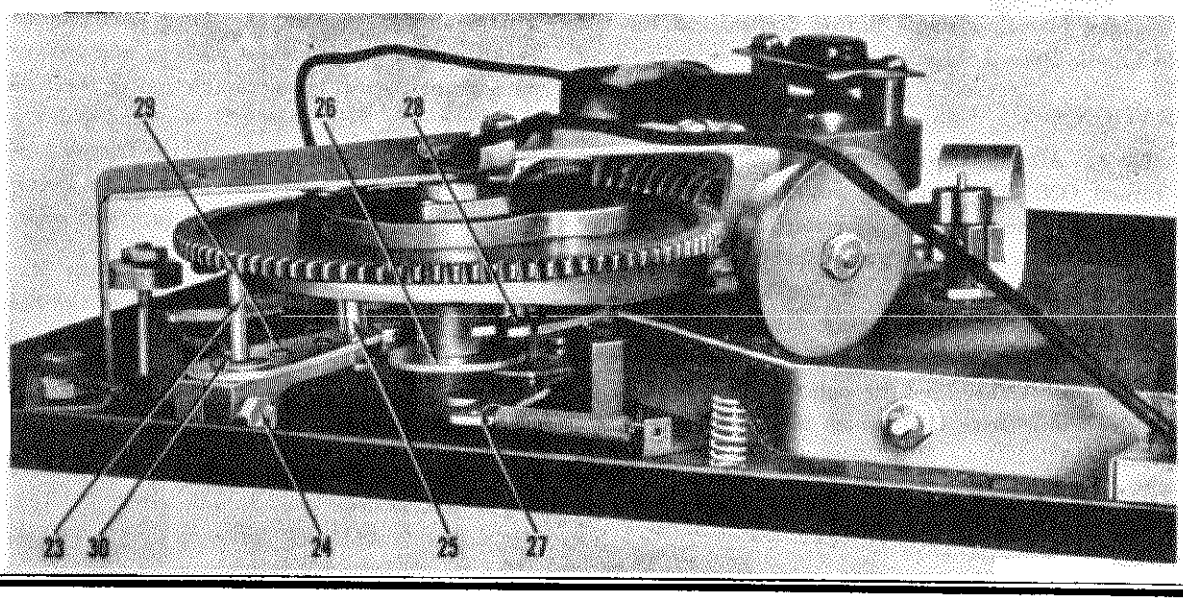
FIGURE 2

Pick-Up Arm Movement . . . The upper side of the Main Cam (15) controls Pick-Up Arm (1) movement. *Lift* is effected by motion of the Lift Pin (23) along the vertical edge of the cam as the latter rotates. *Direction* is controlled by engagement of the Main Cam (15) with the Sweep Lever Pinion (25). The Sweep Lever (29) is attached to the Pick-Up Arm (1) by means of a Clamp (24) around Pick-Up Arm Pivot Sleeve (30). A boss projecting from the upper side of the Main Cam (15) displaces the Stop Lever (28) at the end of the change cycle, thus permitting the Pick-Up Arm to proceed across the record.

Positive Trip Action . . . As the Pick-Up Arm approaches the Spindle (3), the Sweep Lever (29) hits the Positive Trip Screw (31) mounted on the Trip Lever (34). This action re-engages the drive wheel with the turntable rim and starts a new cycle.

Ten Inch or Twelve Inch Operation . . . Adjusting the Record Support (4) to the ten inch or twelve inch position lowers the Selector Rod (33) a definite degree. The length of the extension of this rod determines the positioning of the Stop Lever (28). The latter is the means of regulating the distance the Sweep Lever (29) and its attached Pick-Up Arm (1) travel before the Pick-Up Arm (1) is lowered to the edge of the record. (Operation of this feature is dependent on proper positioning of Record Support (4). *Always turn Record Support (4) to full stop.)*

FIGURE 3



GENERAL INSTRUMENT CORP.

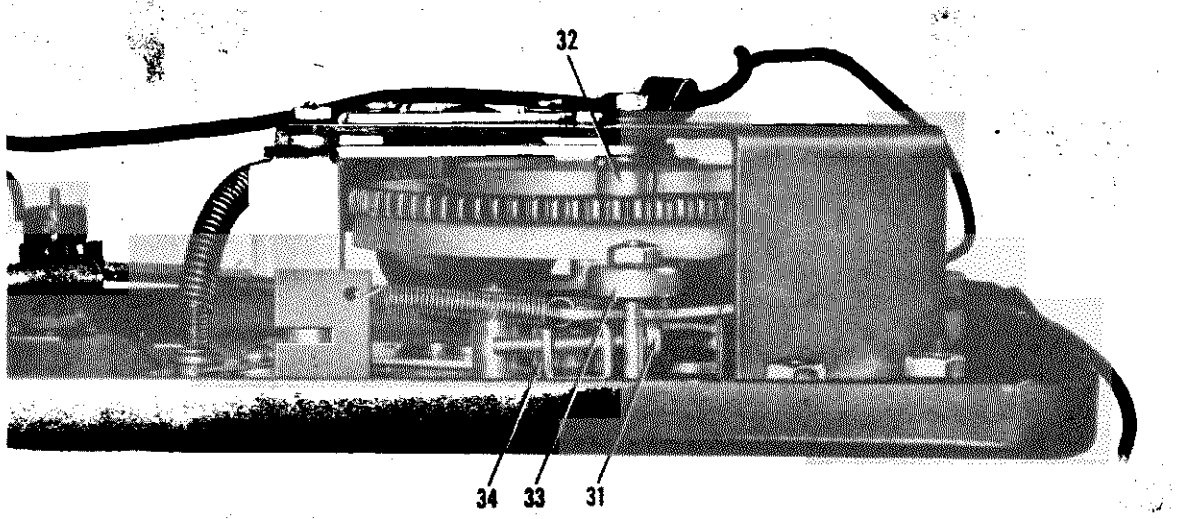


FIGURE 4

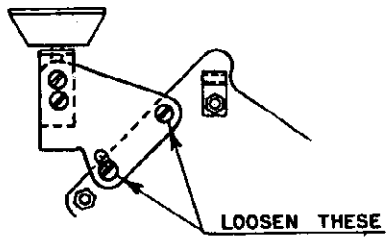


FIGURE 5

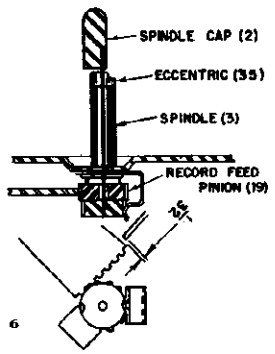


FIGURE 6

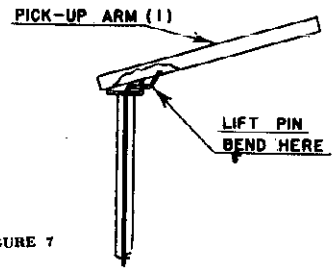


FIGURE 7

MISCELLANEOUS SERVICE ADJUSTMENTS

Changer trips before completion of record:

Turn Positive Trip Screw (31) clockwise.

Changer fails to trip after completion of record:

Turn Positive Trip Screw (31) counter-clockwise.

Drop point of Pick-Up Arm (1) is not at proper point on record:

Loosen screw on Sweep Lever Clamp (24) slightly and reposition Pick-Up Arm (1) with respect to Sweep Lever (29).

Slow turntable speed:

Make sure Drive Wheel (10) does not strike rim of turntable. If necessary, re-adjust eccentric bushing on Drive Wheel (10). (Note: this adjustment should be exceedingly slight as a large movement may cause continuous trip.)

Check for grease or oil on Idler Wheel (9) of Motor (11) and inside of turntable. Wipe with carbon tetrachloride.

Check for sticky Idler Wheel (9) plate on Motor (11). Free with screw driver.

Stalls in Cycle:

Remove any grease on Drive Wheel (10) or inside of turntable with carbon tetrachlorides.

Check mesh of Worm Drive (17) and Main Cam (15) for proper clearance. Loosen screws on main bracket and tighten. (See Figure 5.)

Check for bind in Spindle Assembly (See Figure 6). Disassemble Index Collar (22) and Record Feed Pinion (20), remove Spindle Cap (2), Eccentric (35) and ec centric rod. Check for freeness and remove binds.

The following cautions should be observed in reassembling Spindle Assembly:

(a) Reassemble with a maximum end play of .005 between Eccentric (35) and Spindle Cap (2).

(b) The Eccentric (35) should be in line with the Spindle (3) when the change has completed its cycle.

(c) The Feed Sector Lever (19) should mesh with the Record Feed Pinion (20 as shown in Figure 6.

(d) Align the Spindle Cap (2) with th Spindle (3) in detent position.

Records fail to drop:

Check meshing of Feed Sector Lever (19 with Record Feed Pinion (20). Reset a shown in Figure 6.

First Record does not play:

Readjust end of Lift Pin (23) so the needle will play first record. (See Figur 7.) (Note: Do not bend Lift Pin (23) to much as this will prevent playing of to record on full stack.)

Make certain that pick-up lead does no hit top of Lift Pin (23) or hinge.

GENERAL INSTRUMENT CORP.

TABLE OF REPLACEABLE PARTS

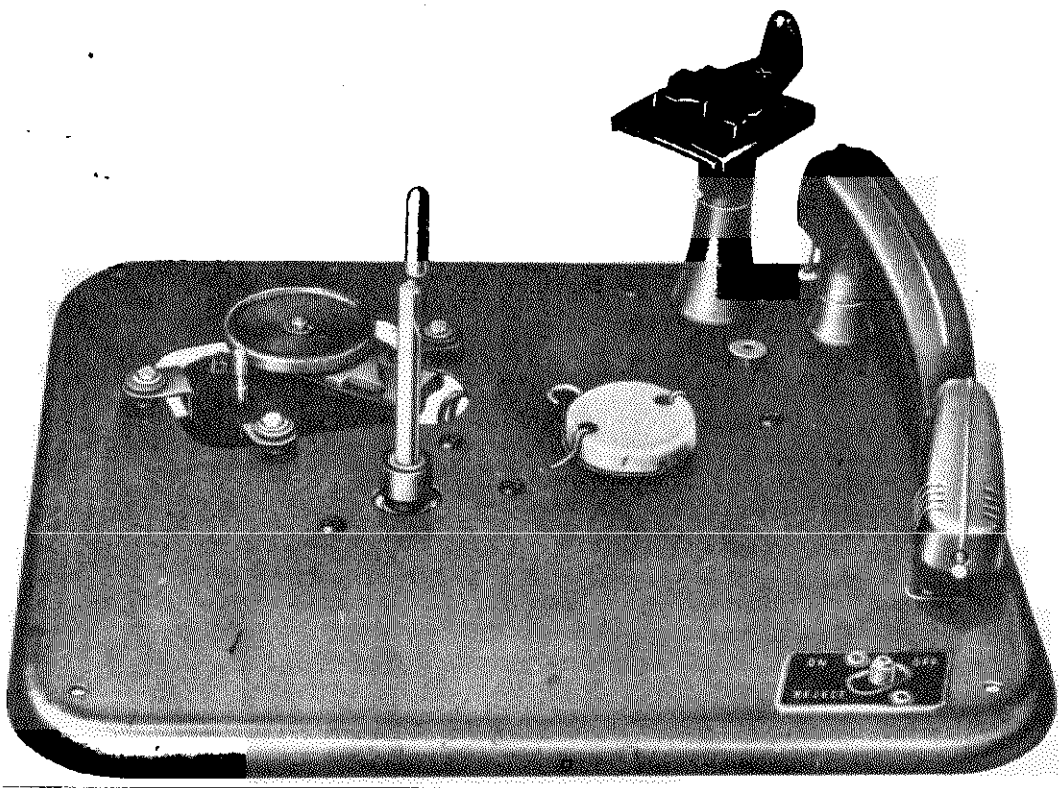
MODEL 205

Ref. Symbol	*Description*	*Part No.*
1	Pick-Up Arm Assy. (With Pickup Cartridge)	69A72000
	Pick-Up Arm Assy. (Minus Pickup Cartridge)	69A71995
	Steel Balls (9)	36-80656
	Lift Pin	12-71406
	Pickup Cartridge	Specify Model
	Spindle Kit	19A72912
3	Spindle and Bearing Assy.	19A71536
35	Eccentric Assy.	43A71646
2	Spindle Cap Assy.	21A71637
	Stabilizer Finger Rod Assy.	12A72696
5	Stabilizer Finger	55-72021
4	Record Support Housing Assy.	21A72035
17, 18	Drive Assy. (With Vibration Dampener)	29A71516
17	Worm Assy.	29A71377
16	Drive Spring Assy.	39A71196
	Turntable	Specify Model and Color
20	Pinion Assy.	28A71289
10	Drive Wheel Assy.	19A71206
32	Feed Cam Roller	65-70566
Not Shown	Motor and Lead Assy. (External Fan Type)	56-72092
	Idler Wheel	28A72833
	Fan	37-72839
	Spring	33-72841
	Pin	12-72851
11	Motor and Lead Assy. (Internal Fan Type)	56-72092
9	Idler Wheel	28A72869
	Spring	33-72879
	Drive Pinion Spring	33-72873
12	Thrust Bearing Assy.	30A72491
	Carrier-Trip Lever Assy.	55A71395
27	Carrier Lever Assy.	55A71379
34	Trip Lever Assy.	55A71394
33	Selector Rod Assy.	12A71510
	Trip Bar Assy.	41A71512
14	Manual Trip Bar	41-71483
13	Switch	58-71435
19	Feed Sector Assy.	27A71293
28	Stop Lever Assy.	55A71513
	Sweep Lever Assy.	55A71400
29	Sweep Lever Sub-Assy.	55A71399
24	Clamp Lever Assy.	55A71176
15	Cam Assy.	43A71301
21	Indexing Spring Assy.	59A71305
	Mounting Spring	33-70582
	Trip Lever Spring	33-71173
	Spring Retainer	33-71183
	Pull-In Spring	33-71205
	Record Feed Spring	33-71341
	Carrier Lever Spring	33-71342
	Finger Spring	33-71388
	Counter Balance Spring	33-71405
	Trip Bar Return Spring	33-71438
	Selector Rod Spring	33-71511
	"C" Washers (5/16")	32-50745
	"C" Washers (9/32")	32-16901

INTERNATIONAL DETROLA CORP.

GENERAL

This manual may be used for all versions of the Model 550 Automatic Record Changer. Some models require an insulated tone arm lead, readily identified on the unit. Model 550D has an extra lead to the switch. Models 550E and 550H have a special crystal cartridge, listed in the replacement parts list. Models 550F, 550G and 550H may be used on line current other than specified in this manual, by using a special motor. This changer is designed to operate on 105 to 125 volts, 60 cycle alternating current. It will play and automatically change twelve 10-inch or ten 12-inch records, not mixed. It is designed to have a minimum of moving parts, all readily accessible for adjustment and service.



INTERNATIONAL DETROLA CORP.

OPERATING INSTRUCTIONS

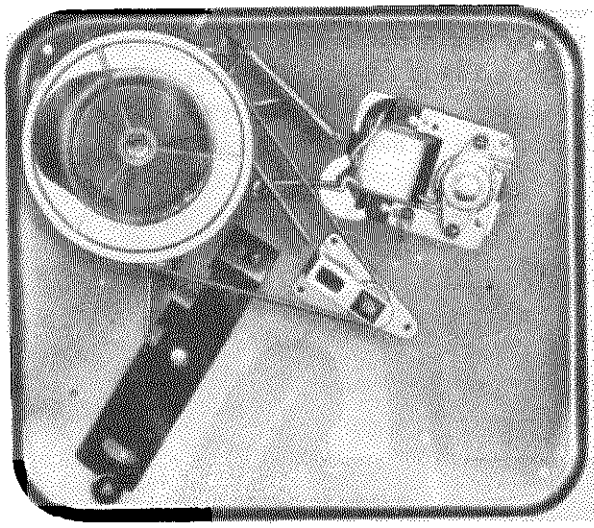
A brief summary of the Operating Instructions Manual, as supplied to the customer, is included below:

For automatic operation, engage the detent "A" on the tone arm hub. Position the record support shelf for the size records selected. (The wide ledge should be toward the spindle for 10-inch records; rotate 180° for 12-inch records.) Place a load of records on the support shelf and spindle; flip the toggle plate onto the stack of records. Push the control lever to the "On" position. After the conclusion of the last record, while the tone arm is still on the record, push the control lever to the "Off" position, place the tone arm on the rest.

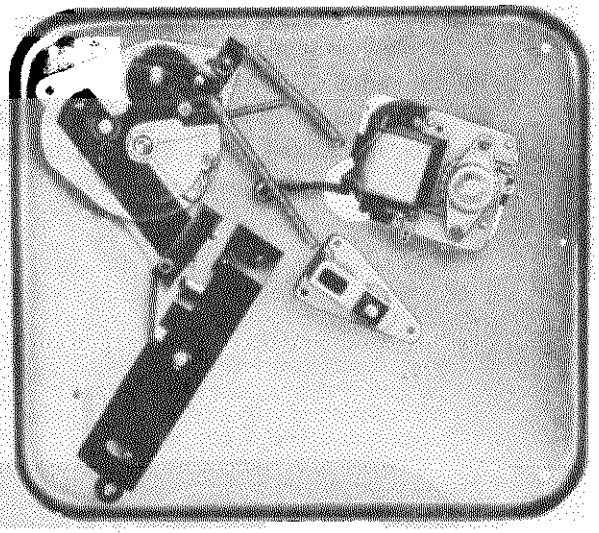
For playing single records, engage detent "H" on the tone arm hub; the record shelf should be in the 12" position. Turn the control to "On", allowing the tone arm to raise and lower. Then place the tone arm by hand on the edge of the record.

Note: This changer has been designed to operate automatically, using all standard commercial records with an eccentric stopping groove, even those with an unusually large diameter stopping groove.

Manual operation is a secondary function of the unit and is included solely for playing home recordings or other non-standard records. Each time such a record is played, the tone arm must be allowed to raise and lower before it is positioned by hand on the record.



Bottom View—Cam phantomed through Drum.



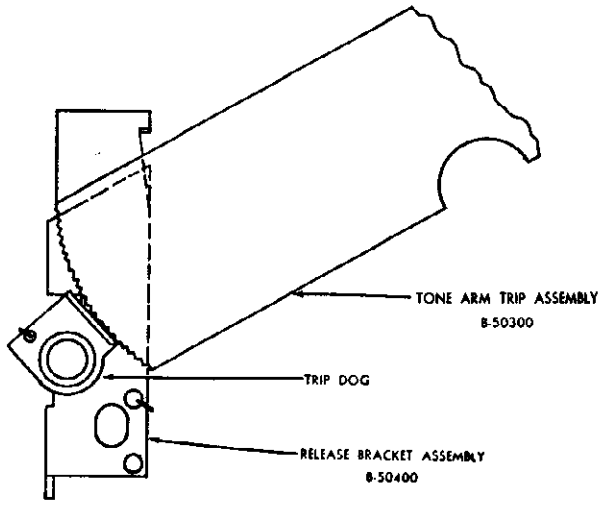
Bottom View—Drum and Spring removed. Mechanism phantomed through Cam.

THE CHANGE CYCLE

An understanding of the methods used to accomplish the necessary mechanical motions will aid greatly in the diagnosis of any disorders of the mechanism. A careful study of the following outline should prove extremely valuable.

The mechanical functions of the change cycle, raising, moving and lowering the tone arm, and the ejection of records, are controlled by a cam. This cam is driven, during the change cycle only, by a drive dog on the cam engaging one of the bosses on the constantly revolving drum wheel. This wheel is driven from the turntable bearing by means of a belt. The turntable is rim driven from the motor.

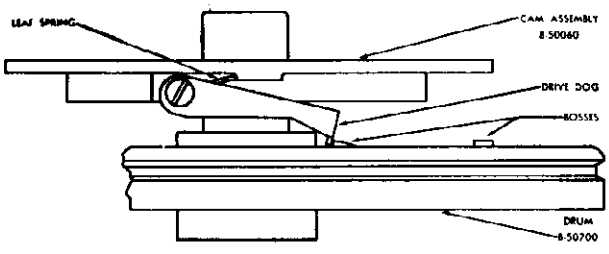
INTERNATIONAL DETROLA CORP.



The Change Cycle Sequence is as follows:

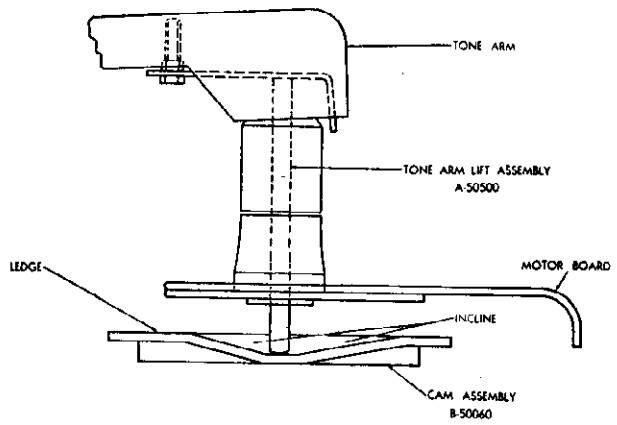
1. As the needle in the tone arm nears the end of a record, a lever with a serrated end moves with the tone arm and engages a trip dog pivoted on a release bracket.

2. The eccentric groove in the record causes the tone arm to oscillate. The backward motion of the tone arm and lever causes the trip dog to push against its pivot point, thus moving the release bracket away from the cam.

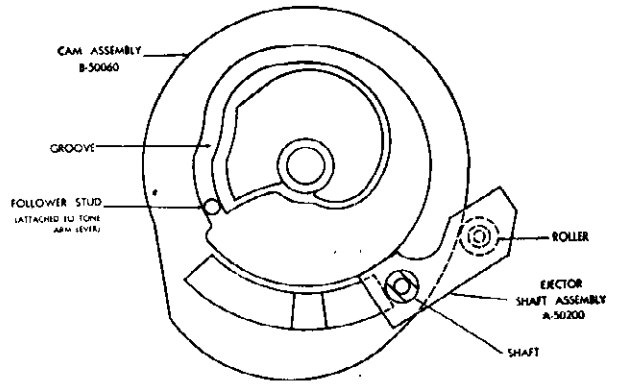


3. This allows the drive dog on the cam (which had been held by the release bracket) to drop down onto the drum and engage one of the bosses; the cam then rotates with the drum.

4. As the cam turns, the tone arm lift shaft rides up an incline to a ledge on the periphery of the cam, and thus raises the tone arm off the record. During most of the remainder of the cycle, the lift shaft rides this ledge, keeping the tone arm elevated.



5. A follower stud on the tone arm lever is pulled into a groove on the cam. As the cam rotates, this stud follows the groove and causes the tone arm to swing out beyond the edge of the record.

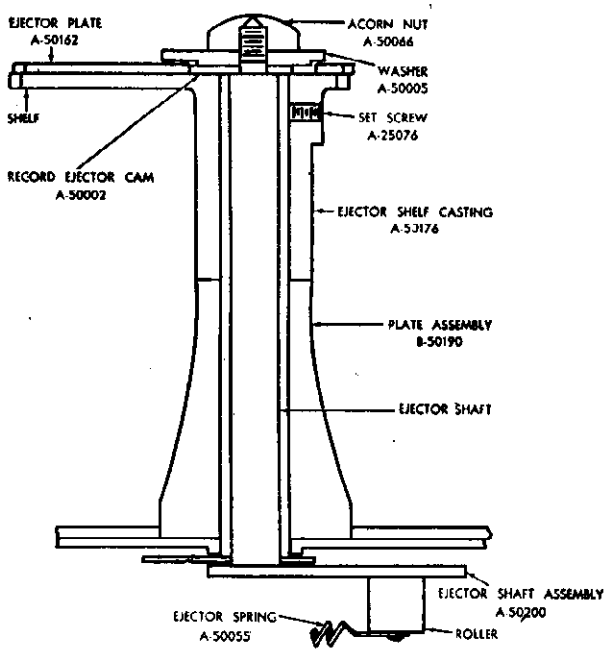


6. The shape of the cam is elliptical at one portion of the outer periphery. A roller attached to an ejector lever and shaft follows the outside periphery of the cam. As the cam revolves, the elliptical portion begins to push against the roller, causing the lever to move, thereby turning the shaft.

7. This shaft extends up through a casting to the record ejector shelf. A small record ejector cam, turned by this shaft, moves the ejector plate, pushing a record off the shelf.

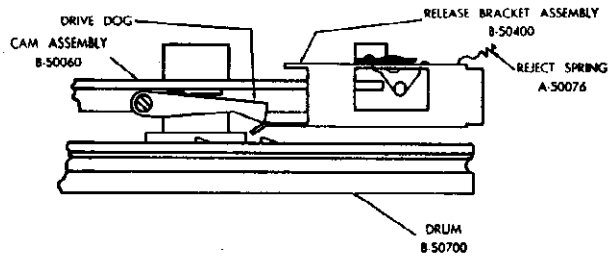
8. The main cam continues to revolve; the roller rides around the elliptical portion of the cam, back to its original position, returning the lever, shaft, small cam and ejector plate to their original position.

INTERNATIONAL DETROLA CORP.



9. The tone arm follower stud, still riding in the groove on the cam, causes the tone arm to return to a position over the outside edge of a record.

10. The tone arm lift shaft now rides down an incline from the ledge to a flat, thus lowering the tone arm to the record.



11. At this point, the drive dog on the cam is lifted off the boss on the drum by the release bracket, the cam ceases rotating and the change cycle is completed. The tone arm is now in position for reproduction of the record.

CAUTIONS

1. Before attempting to make any adjustments or replacements of parts on a changer, examine the records being used. Faulty records are frequently the source of trouble in these mechanisms. The machine will handle satisfactorily all standard 10-inch and 12-inch records in reasonable condition, but it cannot function properly with records that are too large or too small on their outer diameter, too thick or too thin, or which are chipped, especially around the center hole.

Standard specifications for 12-inch records are: diameter—11-27/32 to 11-29/32; thickness—1/16 minimum to 3/32 maximum; starting groove—11-1/2 diameter.

Standard specifications for 10-inch records: diameter—9-27/32 to 9-29/32; thickness—1/16 minimum to 3/32 maximum; starting groove—9-1/2 diameter.

2. Check all parts and springs to see if they are in place and in good condition before attempting any adjustments. Springs may suddenly go dead despite all factory precautions; set screws may work loose; rivets may have loosened, or parts may be damaged due to external tampering.

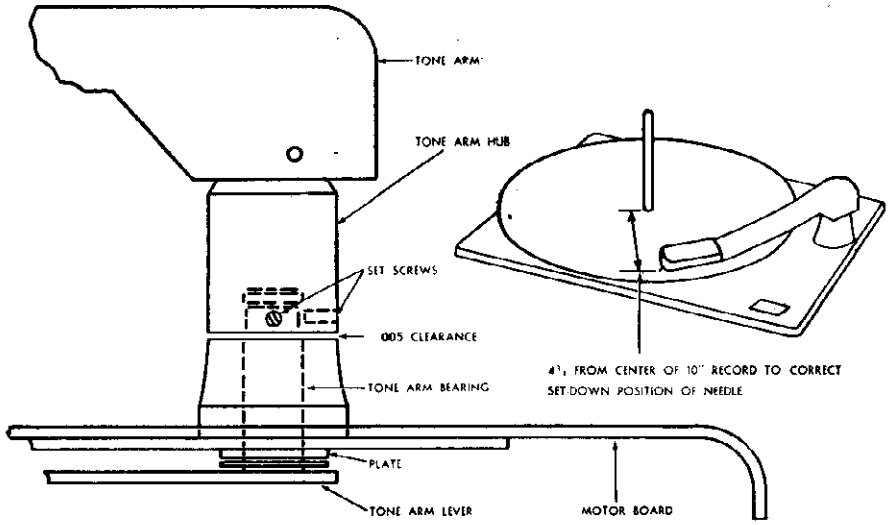
3. Never use force on any part of the changer. It is essential that all parts be straight and square for the proper operation of this mechanism. It is advisable to replace a bent part rather than to attempt to straighten it.

4. Factory lubrication of this changer is adequate for the normal life of the unit. However, if it is subjected to severe operating conditions, it is well to clean and relubricate the moving parts. A fine, light oil should be used on all bearing surfaces, except the main cam, which should be heavily lubricated with Lubriplate 105. AVOID "GUMMING" THE PRECISION FITTED PARTS. DO NOT APPLY TOO MUCH, OR TOO VISCOUS A LUBRICANT.

5. Exercise care when removing the cam and drum assembly, as the stud which holds this assembly to the plate assembly has a LEFT HAND THREAD.

INTERNATIONAL DETROLA CORP.

ADJUSTMENTS



A–PICKUP POSITION

This adjustment is for correct positioning of the tone arm needle in the first groove of a record. The needle should set down at approximately 4-3/4 inches from the center of the spindle on 10-inch records. (Adjustment for 12-inch records is automatic when the 10-inch adjustment is made. Also see Note under Paragraph C

1. Position the record shelf for 10-inch records.

2. Place a standard 10-inch record on the turntable and start the change cycle.

3. Stop the mechanism while still in cycle, just as the tone arm begins its descent onto the record. At this point the tone arm follower stud will still be securely held by the groove in the cam, thus retaining all the working parts in their correct relationship.

4. Loosen the two set screws on the tone arm hub. The tone arm can now be moved carefully sideways, without disturbing any part of the mechanism.

5. Push upwards on the tone arm lever (near the bearing) from beneath the motor board, and hold it tightly against the plate.

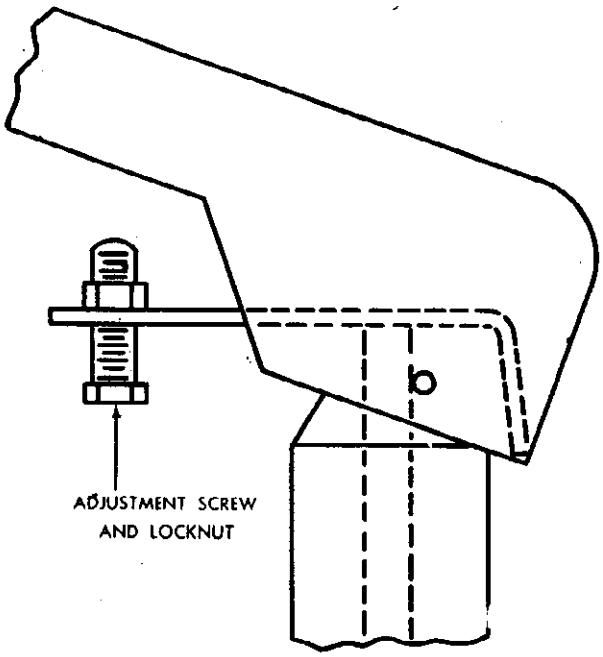
6. On the top, insert a .005 shim between the tone arm hub and the boss on which it rests to obtain the necessary clearance.

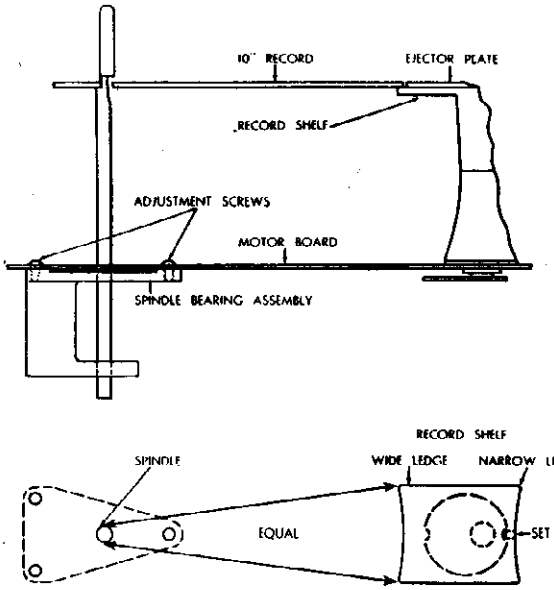
7. Place the tone arm in its correct position above the record. (Be sure to hold the lever firmly against the plate.) Tighten one set screw on the hub.

8. Run the changer through a few cycles, using several records to check the adjustment. Make a minor correction if necessary.

9. Tighten the other set screw on the hub and remove the shim.

INTERNATIONAL DETROLA CORP.





B—HEIGHT OF TONE ARM

This adjustment is made so that the tone arm will clear a stack of records when in cycle, yet will set down properly on the first record of a stack.

1. To increase the rise of the tone arm, lift the tone arm and loosen the nut on the tone arm lift assembly. Turn the screw counter-clockwise. Tighten the nut.

2. To decrease the rise, turn the adjustment screw clockwise.

C—RECORD SHELF POSITION

This shelf must be adjusted for the correct distance from the spindle as well as for correct alignment with the spindle.

(I) To Adjust the Distance

1. Remove the turntable by lifting upward. Loosen the three Phillips head screws that hold the spindle assembly to the motor board. Remove the drive-spring belt from the turntable bearing and the drum wheel.

2. With the record shelf in the 10-inch position (wide ledge toward spindle), carefully place a standard 10-inch record so that it rests on the shelf and on the ledge on the spindle.

3. Adjust the distance by sliding the spindle assembly toward or away from the shelf. The position should be such that the record will not fall off of either the spindle or the shelf, nor jam when the ejector plate pushes it, and when ejected, will fall clear of both shelf and spindle ledge. (See the Standards for record sizes listed under "Cautions'

4. Carefully tighten the screws and check the adjustment again, using several records. Replace the turntable, being careful to push the idler wheel of the motor under the edge of the turntable. Replace the belt.

(II) To Adjust Alignment

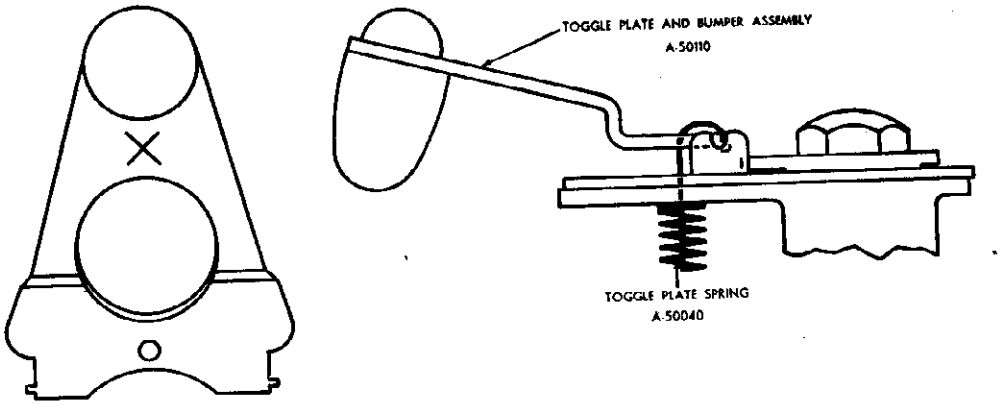
1. Loosen the set screw beneath the 12-inch shelf (narrow ledge). Have the 10-inch shelf toward the spindle.

2. Place a 10-inch record over the spindle, allowing it to rest on the spindle ledge and record shelf.

3. Rotate the shelf slightly in either direction to line up the record edge and the shelf. Tighten the set screw.

Note: Be sure the record shelf is in the correct position in relation to the adjustment cam which is under the motor board. When the 10-inch ledge is toward the spindle, the wider section of the adjustment cam should also be toward the spindle.

INTERNATIONAL DETROLA CORP.



D—TOGGLE PLATE

The toggle plate is held to the ejector shelf by a spring; this spring also exerts tension on the toggle plate to keep the records in place on the shelf. If too much tension is exerted the spring should be distorted slightly.

The rubber bumper should be assembled to the plate with the large side of the bumper on the side of the plate marked with an "X" or an "O".

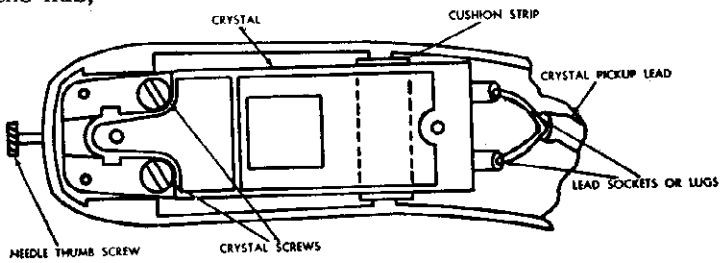
Put the assembly on the ejector shelf, locating the tabs on the plate in the bosses on the shelf. Push the end of the spring through the slot in the shelf with the open end of the spring toward the nut. (The spring will have to compress.) Fasten the end of the spring in the small center hole on the plate. The large side of the bumper is to be placed over the 10-inch records.

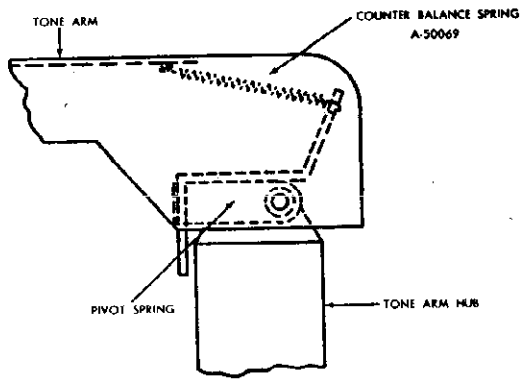
E—THE TONE ARM

The pressure of the tone arm at the needle point should be 1-1/4 ounces. The counter balance spring, which is fastened to the tone arm and to the hub, should be adjusted to secure this tension.

The tone arm may be removed to facilitate changing the crystal cartridge. Simply squeeze the pivot spring and lift off the tone arm. To change the crystal, remove the needle thumb screw and the two screws which hold the crystal to the tone arm. Slip the lead sockets off the plugs on the crystal or unsolder the leads if there are lugs on the crystal. (Caution: Crystals become damaged by excessive heat.) Remove the crystal and replace with a new one in the same manner. Be sure the rubber or plastic cushion strip is placed under the crystal.

The lead which emerges from the tone arm at the back, should have some slack at all times, or it will bind the tone arm and prevent its free movement across the record.





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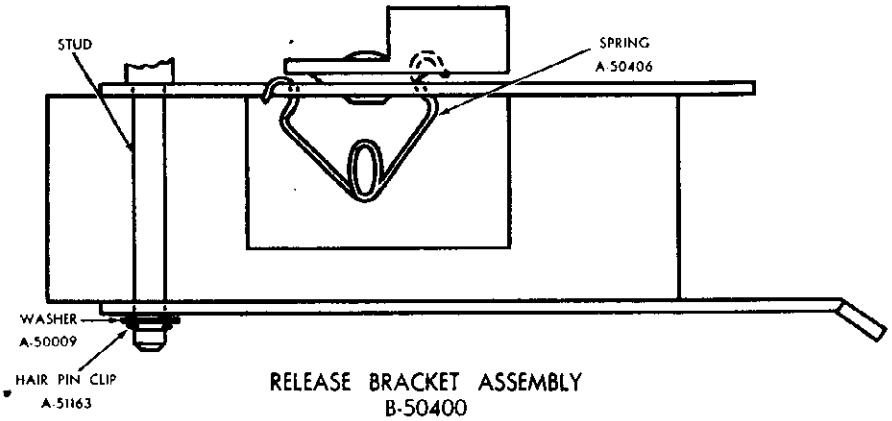
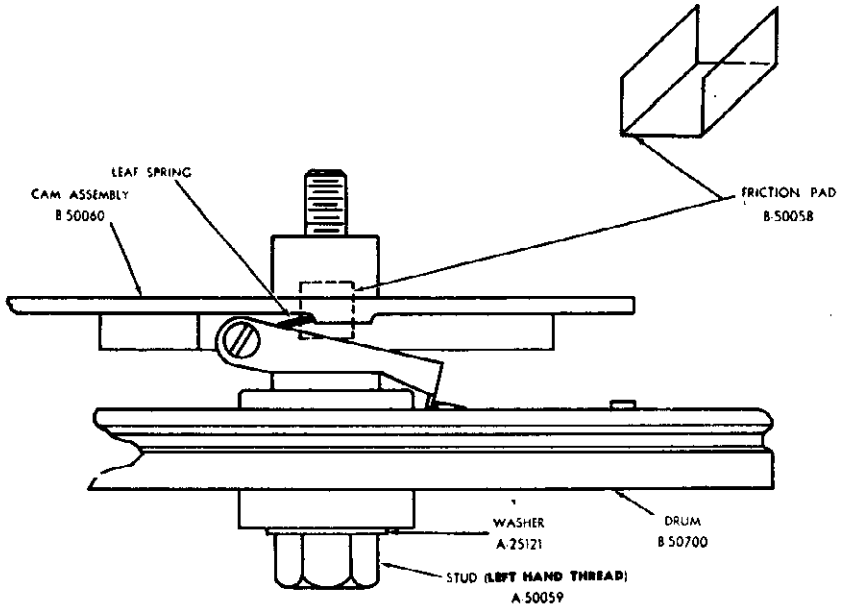


RELEASE BRACKET ASSEMBLY
B-50400

F—RELEASE BRACKET ASSEMBLY

This bracket, with the dog and grasshopper spring assembled to it, is one of the critical items in the unit. It should pivot freely on the stud to which it is assembled. It may be easily removed by slipping the hairpin clip and washer off the stud, and carefully turning the bracket so it will clear the main cam and drum drive wheel.

The dog should pivot very freely. If it does not, clean and relubricate with fine oil. If it is still sluggish, replace the entire assembly.

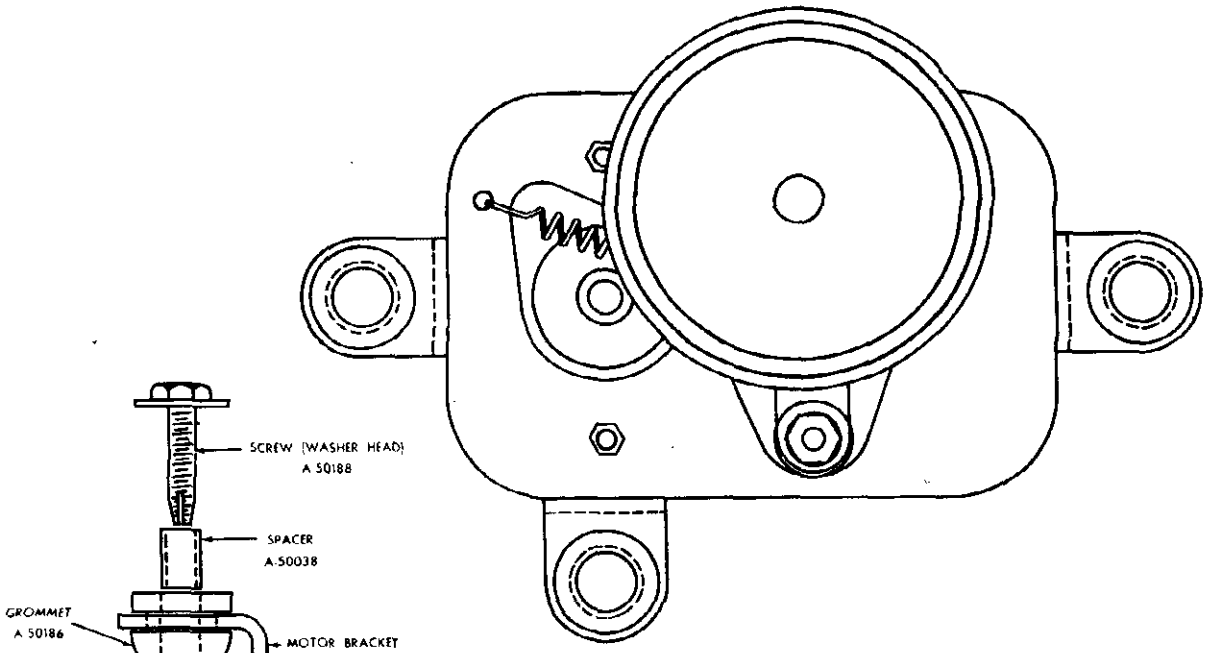


G—CAM AND DRIVE WHEEL ASSEMBLY

This assembly consists of a stud which screws into the main motor board assembly. (NOTE: THIS STUD HAS A LEFT HAND THREAD), a washer, a drive wheel, a main cam and a friction pad. The pad is necessary to provide some drag on the cam for smooth action. It must be assembled carefully so as to prevent deforming. The center holes of the drum and cam are counter sunk for easier assembly of the friction pad.

The drive dog on the cam should pivot freely; the leaf spring exerts a downward pressure on the drive dog into contact with the bosses on the drum. Exerted pressure of the leaf spring should not exceed 2 grams. Deform slightly if required.

INTERNATIONAL DETROLA CORP.



MOTOR MOUNTING DETAIL

H—MOTOR

The speed of the turntable should be within the limits of 76 to 81 R.P.M.

If the changer runs slow, and after careful examination there is no evidence of binding of any mechanical parts, the motor should be checked. (Low line voltage should also be considered.)

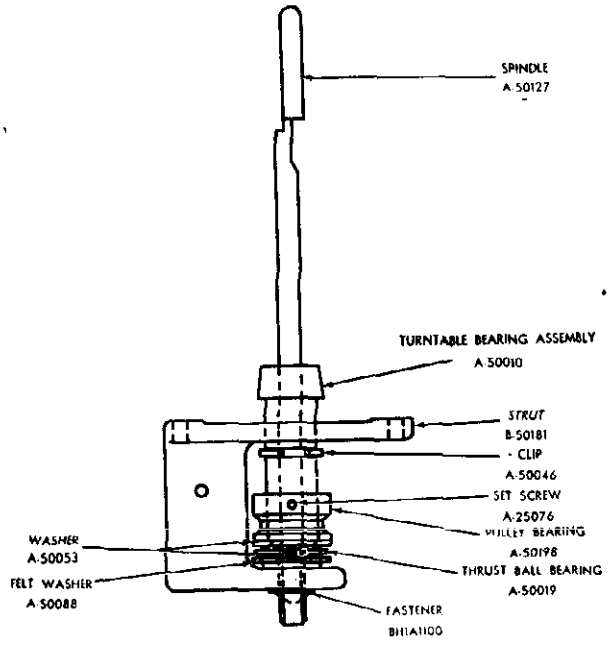
It is better to order a new motor if it should prove defective. Replacement of pulleys, or rewinding of coils is never very satisfactory.

After a new motor has been assembled to the motor board with its screws, washers, spacers and grommets, and wired to the switch and line cord, be sure to fasten the index spring over one of the mounting screws. Attach the other end of the spring to the index lever.

Caution: Check for the correct relationship of the adjustment cam and record shelf when fastening the spring. In the 10-inch position, the larger side of the cam should be toward the spindle.

J—SPINDLE AND BEARING ASSEMBLY

This should always be replaced as an assembly, as it is a precision assembly carefully put together at the factory. See Paragraph C for adjustment after assembly.



(HALF SIZE)

TROUBLE SYMPTOMS and ADJUSTMENTS

SYMPTOM	ADJUSTMENT
(a) Changer fails to trip at end of record.	(a) See Adjustment F, Lubrication on tone arm bearing may be gummy. Clean and relubricate. Tone arm may be in "H" detent. Put in proper "A" detent. Tone arm lead may be too tight. Pull up to allow some slack.
(b) Changer cycles continuously, i.e., tone arm lifts immediately from record without playing.	(b) See Adjustment F, and G, Spring from release bracket to tab on "On-Off" lever may be missing or loose. Replace. Drive dog on cam may be stuck or stiff. Relubricate, and check leaf spring.
(c) Tone arm drops too far in on record, or misses record.	(c) See Adjustment A, Tone arm may be in "H" detent. Change to "A" detent. Adjustment cam may be out of phase with record shelf. See Adjustment 3,
(d) Tone arm fails to clear top record of stack, or does not set down on first record.	(d) See Adjustment B, Tone arm lift lever may be bent. Straighten carefully.
(e) Record jams between shelf and spindle.	(e) See Adjustment C,
(f) Record fails to drop from shelf.	(f) Toggle plate may not be flipped onto records. This must be done to provide tension on records. See item "g" below.
(g) Unit stalls when ejecting a record.	(g) See Adjustment C, Spring belt may be weak. Replace. Motor torque may be low. Replace motor.
(h) Turntable speed is slow, or not constant.	(h) See Adjustment H, Turntable bearing may be frozen. Clean and relubricate or replace bearing. See Adjustment G,
(j) Action of unit is very jerky during cycle.	(j) Belt damping core may be worn. Replace with new belt. Friction pad in cam and drum assembly may be deformed. Replace.
(k) Tone arm may be loose in detents on hub.	(k) Flat spring for retaining ball in detent in hub may be deformed. Replace the hub assembly.

SERVICE PARTS LIST

Part No.	Description
A-25121	Washer .625 O.D. x .375 I.D. x .010 brass (Tone Arm Trip Assy., and Cam and Drum Assembly)
A-50002	Cam, Record Ejector
A-50005	Washer, Cam Cover
A-50009	Washer, 5/16 O.D. x .156 I.D. x .025 brass (Ratchet Release Assy., and Index Arm on Ejector and Tone Arm Assy.)
C-50030	Spindle Bearing Assy.
A-25076	Screw, Set
A-50010	Turntable Bearing Assembly
A-50019	Ball Bearing, Thrust
A-50046	Clip
A-50053	Washer, Flat
A-50088	Washer, Felt
B-50127	Spindle Assembly
B-50181	Strut
A-50198	Pulley Bearing
BH1A1100	Tinnerman Fastener
BS014D05	Screw, No. 8-32 x 5/16
A-50032	Spring, Index
A-50035	Grommet (Tone Arm Lead)
A-50040	Spring, Toggle Plate
A-50055	Spring, Ejector
A-50066	Nut, Acorn
A-50069	Spring, Tone Arm Counterbalance
A-50076	Spring, Tone Arm Lead-in, and Reject
B-50085-1	Rest Assembly, Tone Arm
A-50187	Screw No. 8-32 x 5/16 Thread Cutting
C-50100	Motor Board Assembly
A-50097	Cover, Switch
A-50102	Switch
A-50104	Washer, Cup
B-50140	Lever, On-Off
A-50153	Escutcheon
A-50301	Rivet, Shoulder (On-off lever)
BV821E13	Rivet, Tubular 1/8 x 3/16

Part No.	Description
A-50110	Toggle Plate and Bumper Assy.
A-50015	Plate, Toggle
A-50025	Bumper
A-50136	Clip "C" (Index Arm and Tone Arm Trip Lever Assembly)
B-50137	Belt, Drive
A-50150	Record Adjustment Shaft Assy.
C-50154	Motor (For 60 cycle, 105-125 v.)
A-50186	Grommet
A-50038	Spacer
A-50188	Screw, No. 6-32 x 5/8 thread cutting, hex washer head
A-50162	Plate, Ejector
A-50176	Ejector Shelf Casting
C-50180	Cam and Drum Assembly
A-50058	Pad, Friction
A-50059	Stud
B-50060	Cam Assembly
B-50700	Drum Drive Wheel
B-50190	Plate Assy., Ejector and Tone Arm
BS014B05	Screw No. 8-32 x 3/16
A-50200	Ejector Shaft Assembly
B-50300	Tone Arm Trip Assembly
B-50400	Release Bracket Assembly
A-50406	Spring, Dog
A-50500	Lift Assembly, Tone Arm
B-50600	Hub Assembly, Tone Arm
B-50820	Tone Arm Assembly
A-50802	Crystal Pickup and Thumb Screw or
A-50812	Crystal Pickup for 550E & 550H
A-50803	Insert
A-50804	Screw No. 4-40 x 1/4
A-50806	Lead, Shielded or
A-50197	Lead, Insulated
A-50807	Clip
D-50808	Tone Arm
C-50910	Turntable
A-51163	Clip (Ratchet Release Assembly)

MAGUIRE INDUSTRIES INC.

A—10 Inch Position
B—12 Inch Position
C—Unloading Position

D—Spindle
E—Pickup Arm

F—Start-Reject Switch
Turn in Direction of Arrow
G—Turntable

MAGUIRE INDUSTRIES INC.
PARTS MUST MOVE FREELY

The following parts must move freely:

a. Slide (53) check friction by removing turntable and turntable hub and relieve pressure produced by springs. Slide should then move freely along top mounting plate (54). If slide binds, clean off any dirt that is present and check that slide or top plate is not bent. Relubricate between slide and top plate, and slide shafts with Houghton's stayput #320 oil. If not available use SAE 30 or 40 motor oil.

b. Automatic stop lever (40) - remove friction washer (41) and see that lever does not bind.

c. Cranks (32 and 39) in support posts (28 and 51) - check that cranks are not bent. Pushers (80 and 77) should be flush with record guides (58 and 68) when machine is out of cycle. Right pusher, crank, and pusher control lever must move freely when slide is ½ way through cycle.

d. Pickup lifting lever (8) - check for binding in bearing.

e. Pickup actuating lever (50) - check for binding in bearing.

f. Pickup return lever (43) - check for binding in bearing.

g. Trip lever must move freely.

h. Dog must fall freely.

i. Idler plate must slide freely, wheel must rotate freely.

j. Turntable hub - be sure cam does not rub slide. If necessary add a shim washer

k. Motor must turn freely.

In cases where levers are controlled by springs remove springs before checking for binding.

CYCLE OF OPERATION

CAUTION: In any adjustment which requires that the turntable be removed, be careful not to strike the trip lever (52) or dog (30), either when removing or replacing turntable.

Remove cover plates (55 and 72) and turntable (74). The Changer can then be rotated manually through a change cycle by pushing Start-Reject knob (F) and rotating the turntable hub (79) clockwise by hand.

NOTE: Alphabetical references are to figure 1, numerical to figure 5.

	FUNCTION	EXPLANATION
OPERATOR	Turn Record Supports to 10″ or 12″ Positions (A or B).	Record support posts (56 and 71) automatically align themselves by means of index springs (23).
	Place Records on Posts (see figures 2 and 3).	Records rest on support shelves (78) in position to be separated.
	Turn the Start-Reject Knob (F).	Pickup arm (E) rises, releasing pressure on switch (11); circuit of turntable motor (21) is closed and motor starts. Tripping link (47) is pushed in and moves dog trip lever (52) permitting dog (30) to fall. Cam on turntable hub (79) pushes dog (30), moving slide (53) forward and engaging gear.
CHANGE CYCLE	Pickup Arm (E) Rises.	Incline on slide (53) rotates pickup lifting lever (8) through stud, raising pickup arm (66 or E).
	Bottom Record Is Separated.	Left hand pusher (80) pushes record off shelf (78) on to spindle shelf (34). Record pushes right hand pusher (77) which moves crank (39), rotating automatic stop lever (40). Right hand pusher (77) pushes record off spindle shelf (34) on to turntable (74).

MAGUIRE INDUSTRIES INC.

FUNCTION	EXPLANATION
Pickup Arm (65) Moves in.	Pickup actuating lever (50) rotates and latch engages pin on pickup return lever (43). Slide (53) starts back rotating pickup arm (66) to 10" or 12" position.
Pickup Arm Lowers Stylus on to Record.	Pickup return lever (43) moves against index stop lug on index plate (71) to insure correct landing position. Pickup lifting lever (8) rotates counter-clockwise lowering pickup arm; this frees pickup latch (50) allowing arm to feed into music. Pushers (77 and 80) return to original position permitting next record to rest on record shelves (78). Slide (53) moves dog (30) along edge of dog trip lever (52). Dog trip lever (52) raises dog (30) permitting cam on turntable hub (79) to revolve without contacting dog (30).
Pickup Arm Rises at End of Record.	Stylus enters fast spiral at center of record and moves in at rate of 1/8" or more per turntable revolution. Pickup lifting pin (part of 65) moves friction finger (part of 52). Friction finger moves dog trip lever (52). Vertical cam on turntable hub (79) drives trip lever (52) back once per revolution. When the pickup (65) moves in at a rate exceeding 3/32" per revolution, the trip lever will move far enough to allow the dog (30) to fall. Dog (30) drops in path of cam on turntable hub (79). Cam on hub (79) pushes slide (53) into gear. Incline on slide (53) rotates pickup lifting lever (8) by means of stud.
Next Record Drops on to Turntable.	Left hand pusher (80) moves next record on to spindle shelf. Record pushes right hand pusher, which through crank rotates automatic stop lever (40) out of path of pickup actuating lever latch (part of 50). Pickup actuating lever (50) rotates pickup arm outwards. Right hand pusher (77) moves record off spindle shelf.
Automatic Stop.	After last record pickup arm rises as above. Left hand pusher (80) moves out. Absence of record prevents actuation of right hand pusher (77). Automatic stop lever (40) remains in path of pickup return lever latch (43). Pickup arm is lowered not on to record but on to Start-Reject. Pickup arm stud (part of (65) opens turntable motor switch (11) shutting off machine.

LOADING: The record changer will play up to ten 12 inch records or twelve 10 inch records. Load as follows:

1. Turn record support posts to 10 or 12 inch position as desired. See figure 1.
2. Place records (any number up to 10-12's or 12-10's) on the small shelves on record support posts, with the turntable shaft through the holes. Make sure all records rest flat on top of shelves.

Do not attempt to force oversize records between record support posts, as machine may jam. Home recordings or other SPECIAL records should not be played automatically as they or the machine may be damaged.

OPERATION: Start the machine by pulling the "Start-Reject" knob towards the front of the machine. Hold knob for a second. The pickup arm will lift, the first record will drop to the turntable, the pickup arm will land near the edge of the record and start to play.

TRIPPING: At the end of a record a fast leadout or eccentric groove will trip the machine automatically, and a change cycle will follow, dropping the next record.

AUTOMATIC STOP: After the last record has played, the pickup arm will land on the "Start-Reject" knob, thus shutting off machine.

REMOVING RECORDS: Turn record support posts one-quarter turn either direction remove records by lifting straight up from turntable.

MANUAL OPERATION: To play special records (home recordings, etc.) turn record support posts to unloading position, place record on turntable. Lift pickup arm from "Start-Reject" knob, starting turnatble. Place pickup on record.

MAGUIRE INDUSTRIES INC.

TROUBLES AND ADJUSTMENTS

RECORD JAMMING CAUSED BY FAULTY RECORD LOADING OR ODD-SIZED RECORD

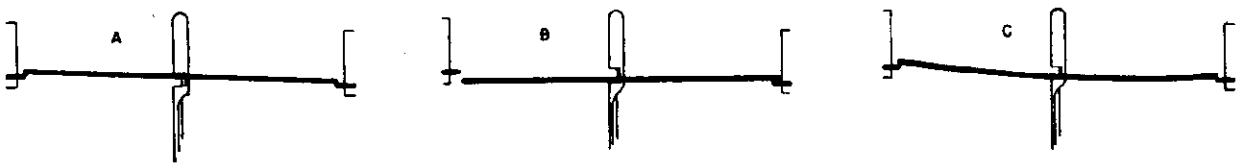


Figure 2

EXPLANATION

a. Correct record loading procedure: record rests on left and right hand support.

b. If records are loaded improperly the machine may jam. When the record rests on spindle and right hand support (78) and not on left hand support (78), as shown in figure, left hand pusher (80) will push second record against right hand guide (68).

c. If record is warped so badly that center hole lies below spindle shelf, record cannot be pushed by left hand pusher (80) and machine will jam.

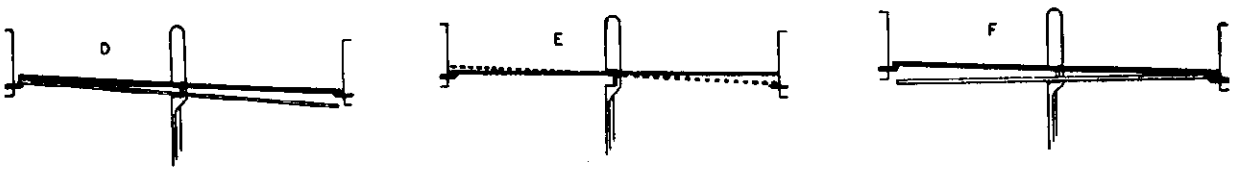


Figure 3

EXPLANATION

d. If record is loaded below right hand support (78) it will not be dropped from spindle shelf.

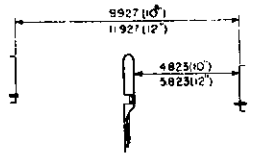
e. If record is oversized it may not fit between guides (58 and 68) or right hand pusher (77) may not move far enough to allow record to clear left hand shelf (78).

f. If center hole of record is undersized, record will be pinned against spindle. If second record is undersized or if cycle is very slow, second record will drop in front of right hand pusher (77) and machine will jam. This should not occur if cycle speed is more than approximately 40 rpm (normal speed is approximately 80 rpm). Cycle speed is normally 2-4 rpm less than no load speed.

NOTE: Edges of Records badly damaged or highly irregular will also cause jamming.

TROUBLE	CAUSE	REMEDY
Record Jamming Can be Caused by Friction.	1. Friction in right hand pusher (77), plunger (75), etc.	NOTE: Record will not drop from left hand shelf to spindle shelf. When machine is about half way through cycle right hand pusher should move in and out freely. 1. Clean any dirt. 2. Check if crank is bent. 3. Check alignment of record guide. 4. Retaining ring holding crank may be turned. Crank should fit in gap.

TROUBLE	CAUSE	REMEDY
Failure To Trip (Con't)	5. Record does not have eccentric groove or fast leadout spiral of 1/8" per turn.	1. Use Start-Reject to trip.
Pre-tripping.	1. Friction too great.	1. Relieve friction on friction finger by loosening screw (part of 52).
	2. Spring (38) on trip clutch finger too weak.	1. Adjust spring to six ounces tension. Shorten or replace if necessary.
	3. Trip clutch finger on trip lever should be pushed outward by turntable hub so that there is no play at shoulder with dog.	1. Adjust vertical tab on trip lever.
Continuous Cycling.	1. Tripping link finger (47) bent too far toward trip lever (52).	1. Adjust to proper position.
	2. Pickup actuating lever stop stud may touch trip lever.	1. Bend away.
Pickup Arm Moves Too High or Low in Cycle.	1. Pickup lifting pin (part of 65) bent.	1. Straighten as necessary.
Pickup Latch (part of 50) Fails to Engage Pin in Pickup Return Lever (43).	1. Pickup return lever (43) bent.	1. Straighten as necessary.
	3. Actuating lever (50) not rotated far enough.	1. Twist tail end of slide. 2. Rotate stop lever (40) out of way of pickup latch (50). Actuating lever and pickup return lever (43) when latched should be parallel; there should be minimum of play between these and pickup lifting pin. Twist end of return lever to obtain minimum play.
Sloppy or Indefinite Landing of Pickup Arm.	1. Play between actuating lever (50) and pickup return lever (43).	1. Twist end of return lever. 2. Make sure there is no friction and minimum play between pivot shaft assembly (66) and pickup arm. Adjust pivot screw if necessary.
Incorrect Landing.	1. Lug on record shelf assembly (71) needs adjusting.	1. Bend lugs in or out as required.
Failure to Play More Than One Record.	1. Stop lever (40) not moved properly.	1. Check play between crank (39) and lever. Maximum of 1/16" 2. Right hand pusher (77) not flush with record guide (69) (note: by flush is meant flush to 1/32" maximum back of flush). Bend crank if necessary. 3. See "Pickup Latch Fails to Engage Pin," above.
Failure to Stop After Last Record.	1. Lack of play between crank (39) and stop lever (40). 2. Stop lever (40) bent.	1. Jars during cycle may move stop lever. 1. Slide does not return stop lever to proper position at end of cycle. Decrease stop lever angle by bending.

TROUBLE	CAUSE	REMEDY
Record Jamming Can Be Caused By Friction (Con't)	2. Friction in pusher control (10) or stop lever (40). 3. Record posts or guides out of alignment (56, 71, 58, 68)	1. Clean out any dirt. 2. Check for bent parts. 1. Align and space record guides (58 and 68) as in figure.  Figure 4 A line of sight can be drawn from center of record guide through spindle to center of opposite record guide when posts and spindle are correctly aligned. NOTE: Make sure notch on spindle is in right place and spindle shelf is at correct height, i.e., record is horizontal when resting on spindle and right shelf.
Slow, Stalling or Failure to Start.	1. On-off motor switch.	1. Disengage idler (18) and lift pickup arm off switch (11). 2. Check wiring to and from switch. 3. Replace switch.
	2. Slippage between idler (18) and turntable (74).	1. When turntable is stopped manually, motor should stop (with power on). If motor does not stop, clean oil from turntable and the idler wheel with carbon tetrachloride.
	3. Idler does not contact turntable firmly.	1. Idler plate (19) should not hit either side of T slot in motor bracket when wheel is touching turntable. Bend motor bracket if necessary.
	4. Turntable bearing stiff.	1. Push idler plate back so tire does not touch turntable. If turntable does not spin freely, lubricate; look for a bent spindle. Make sure hub does not drag on slide.
	5. Idler bearing stiff.	1. Check lubrication.
	6. Motor bearings stiff.	1. Motor bearings are self-aligning type; if motor turns stiffly by hand, tap motor lightly with hammer on side of stator. 2. Lubricate with 3 in 1 oil.
	7. Defective motor coils.	1. Replace motor if motor smokes or smells.
	8. Low voltage.	1. Check voltage; 100 volts satisfactory. 2. If voltage is low turntable can be pushed by hand to help start.
Failure to Trip.	1. Dog sticks.	1. Dog bent, dirt, dog cover out of adjustment.
	2. Friction on friction finger (part of 52) out of adjustment.	1. Adjust screw on trip lever for just enough friction to move assembly as a unit when pushing fan shaped friction finger.
	3. Insufficient friction.	1. Friction spring bent or trip lever (52) bent.
	4. Slide (53) failed to return to out of cycle position after preceding cycle.	1. Check for friction between slide (53) and top plate (54), or pusher control levers (9 and 10) and slide post; or tail on slide binds ridge on top plate. 2. Tampering with springs is a cause of this. Replace springs. 3. Lubricate slide, top plate and slide latch shafts (7) (Houghton's Stayput #320 or SAE 30 motor oil). 4. If stop lever (40) is bent, there may be friction between slide and stop lever. If machine trips automatically but not with reject knob, check finger on tripping link (47).

MODEL ARC-1

MAGUIRE INDUSTRIES INC.

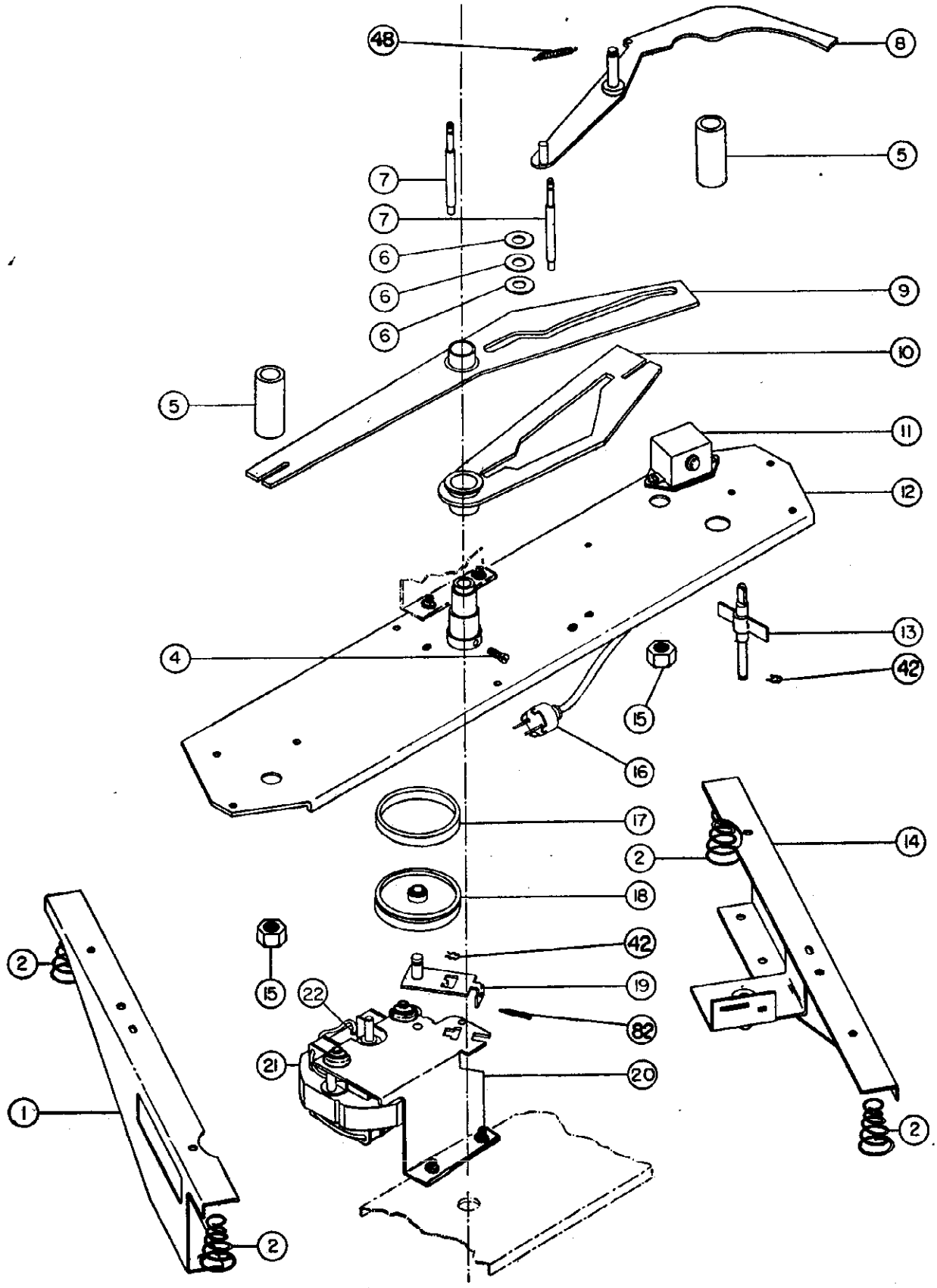


FIGURE 5

MAGUIRE INDUSTRIES INC.

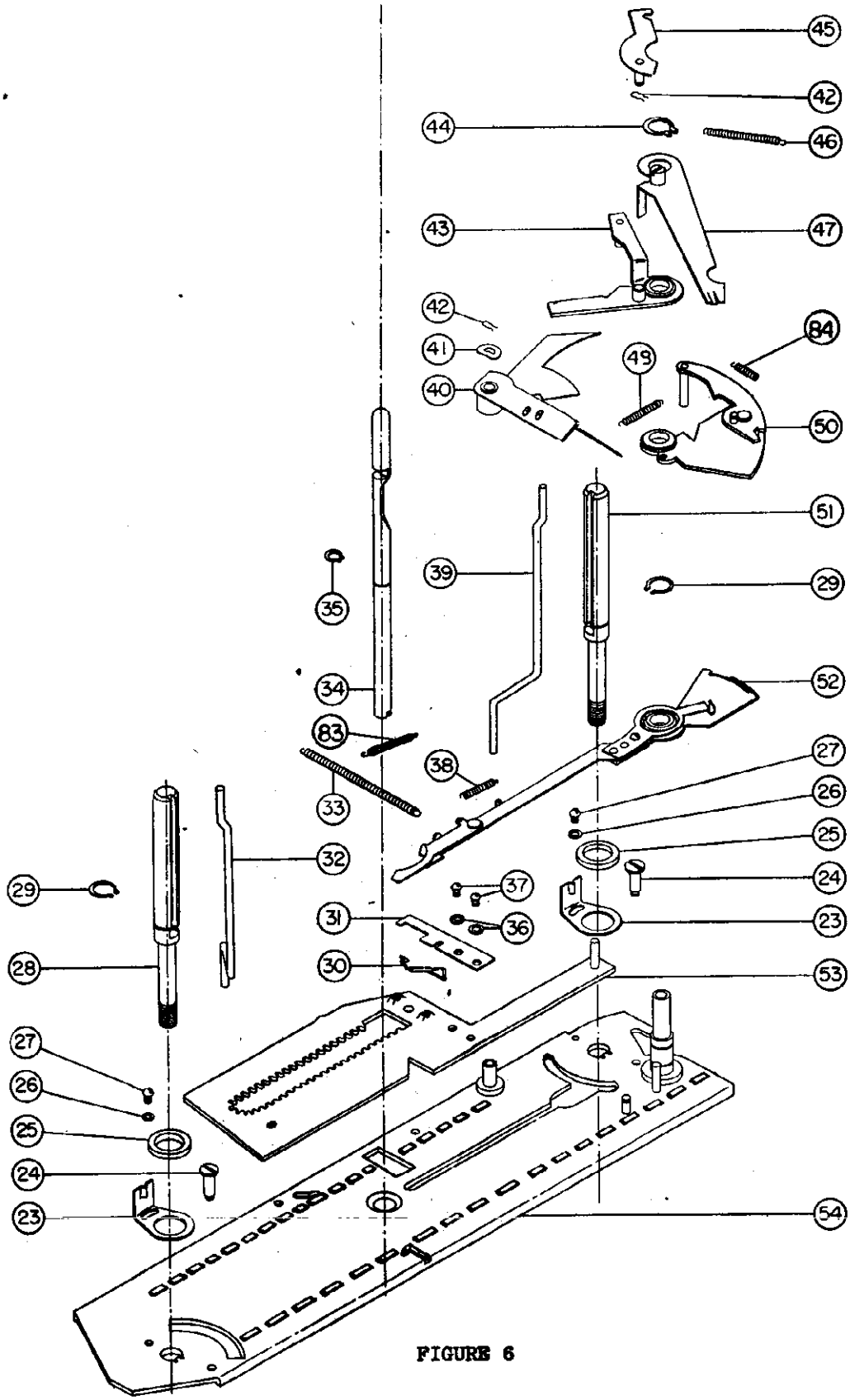


FIGURE 6

MODEL ARC-1

MAGUIRE INDUSTRIES INC.

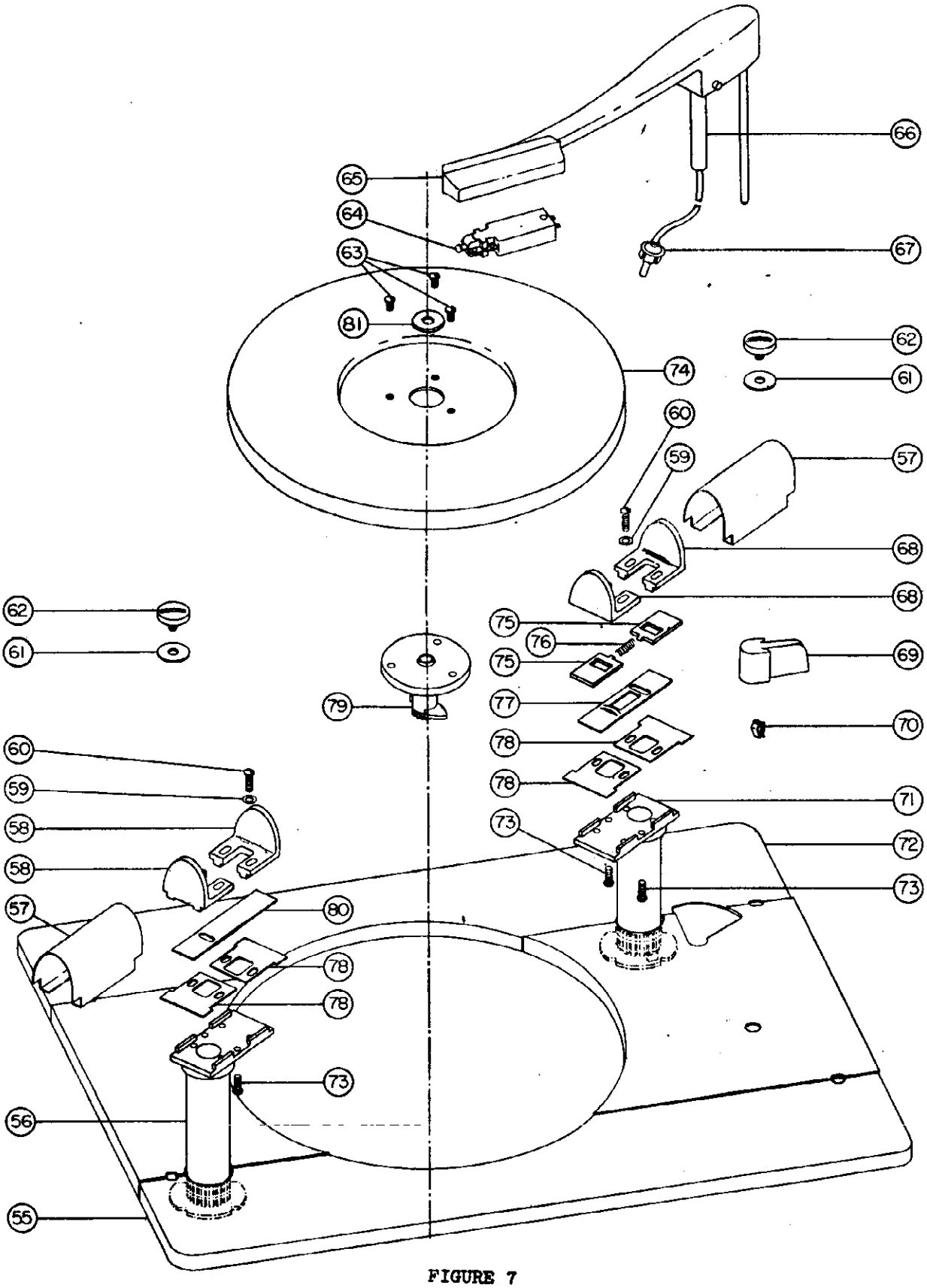


FIGURE 7

MAGUIRE INDUSTRIES INC.

LIST OF REPLACEABLE PARTS

FOR EXPLODED VIEWS OF THESE PARTS SEE FIGURES 5, 6, and 7.

Assem. No.	Name of Part	Maguire's Dwg. No.
1.	Left hand cover support assembly	C-14050-2
2.	Suspension spring	A-20176-1
3.		
4.	Screw (for clamping spindle) No. 6-32 x 5/16" fil. hd.	A-10109-64
5.	Spacer	A-20177-2
6.	Turntable thrust washer—.01"	A-20178-3
	Shim washer—.005"	A-20178-7
	Shim washer—.010"	A720178-8
7.	Slide latch shaft	A-20171-1
8.	Pickup lifting lever assembly	A-14048-1
9.	Left pusher control lever assembly	B-14051-1
10.	Right pusher control lever assembly	B-14052-1
11.	Switch assembly	C-14271-1
12.	Bottom mtg. plate assembly	C-14044-1
13.	Knob shaft assembly	A-14047-1
14.	Right hand cover support assembly	C-14050-1
15.	Hex. nut—7/16"	A-10209-1
16.	Motor plug assembly	A-20638-1 / A-20638-2
17.	Idler tire	A-40007-1
18.	Idler wheel assembly	A-14038-1
19.	Idler plate assembly	A-14079-1
20.	Motor mounting bracket	C-20285-1
21.	Motor	DL-10542-503
22.	Motor spring bushing—60 cycle	A-27014-1
	50 cycle	A-27014-2
23.	Index spring	A-20173-1
24.	Stop screw	A-20180-1
25.	Spacer (for stop screw)	A-20177-3
26.	Lock washer No. 4	A-10145-11
27.	Screw—bd. hd. No. 4—40 x 3/16"	A-10124-32
28.	Post left and	B-20165-1
29.	Retaining ring for posts	A-20184-3
30.	Dog	A-20135-1
31.	Dog cover	A-20136-1
32.	Record pusher crank, L.H.	A-20169-2
33.	Slide latch shaft spring	A-20213-1
34.	Spindle	A-20172-1
35.	Retaining ring (for spindle)	A-20184-1
36.	Lock washer (for dog) No. 4	A-10145-11
37.	Dog screw, bd. hd. No. 4-40 x 3/16"	A-10124-32
38.	Trip lever spring	A-20199-1
39.	Record pusher crank, R.H.	A-20169-1
40.	Stop lever assembly	A-14041-1
41.	Stop lever washer	A-20178-5
42.	Hairpin retainer	A-20183-1

Assem. No.	Name of Part	Maguire's Dwg. No.
43.	Pickup return lever assembly	A-14045-1
44.	Retaining ring (for pickup bearing)	A-20184-2
45.	Starting lever assembly	A-14342-1
46.	Tripping link spring	A-20211-1
47.	Tripping link assembly	A-14341-1
48.	Lifting lever spring	A-20216-1
49.	Actuating lever spring	A-20215-1
50.	Pickup actuating lever and latch assembly	A-14046-1
51.	Post right hand	B-20165-2
52.	Trip lever assembly	C-14039-1
53.	Slide assembly	C-14040-1
54.	Top plate assembly	C-14043-1
55.	Front cover plate	D-20179-1
56.	Record shelf assembly, L.H.	A-14042-2
57.	Record post cap	A-20170-1
58.	Record guide, L.H.	A-20166-2
59.	Record guide washer	A-20178-2
60.	Record guide screw No. 4-40 x 7/16"	A-10124-36
61.	Cover plate washer	A-20178-4
62.	Cover plate screw	A-20181-1
63.	Turntable screws	A-10124-63
64.	Pickup cartridge—ARC-ICB-11	A-28178-1
	ARC-ICA-11	A-28178-2
	ARC-IDB-11	A-28178-3
	ARC-IFA-11	A-28174-1
	ARC-IFB-11	A-28174-2
	ARC-IA, ARC-IB	A-20609-1
65.	Pickup arm assembly, less cartridge	C-14356-4
66.	Pivot shaft and collar assembly	A-14277-1
67.	Loudspeaker plug	A-10303-4
68.	Record guide, R.H.	A-20166-1
69.	Knob assembly	A-14056-1
70.	Knob spring	A-15082-1
71.	Record shelf assembly, R.H.	A-14042-1
72.	Back cover plate	D-20179-2
73.	Record post cap screw No. 4x40 x 3/16"	A-10124-32
74.	Turntable	C-20161-1
75.	Plunger	A-20168-1
76.	Plunger spring	A-20214-1
77.	Right and pusher	A-20167-1
78.	Record shelf	A-20163-1
79.	Hub assembly	A-15053
80.	Left and pusher	A-20164-1
81.	Washer 13/16" x 9/32"	A-20178-10
82.	Idler spring	A-20198-1
83.	Slide latch shaft spring	A-20216-1
84.	Latch spring	A-20192-1

This Automatic Record Changer is a precision built, gearless, beltless, simple operating mechanism, designed to give you foolproof, trouble free record reproduction with minimum effort by means of a new, exclusively designed, operating mechanism. This machine is built to automatically change and play a maximum of twelve ten inch records or ten twelve inch records, with a minimum of needle and record wear. Will automatically play records of standard R.M.A. size and dimensions. Records not standard or without trip grooving can be played in manual operating position.

Machine designed to operate on 115 volt, 60 cycle alternating current unless otherwise specified on motor.

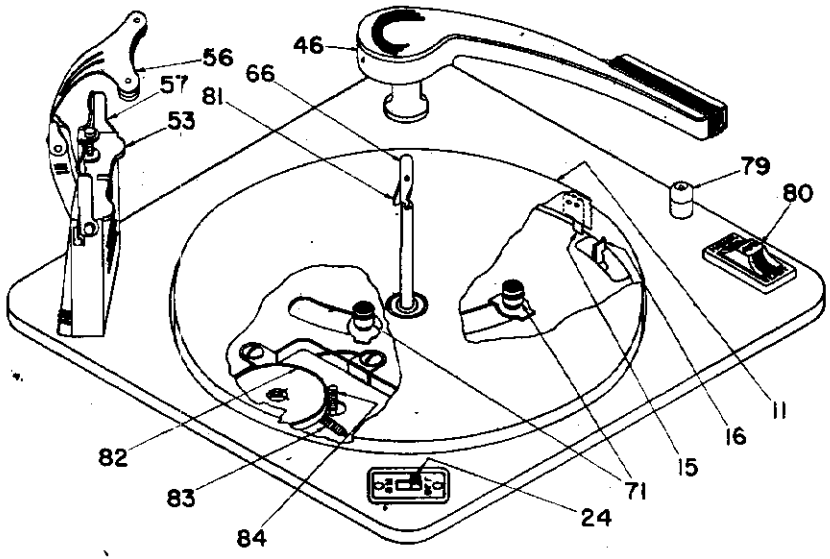


FIG. 1 TOP VIEW

OPERATING INSTRUCTIONS

For transportation and shipping purposes the changer plunger mechanism is locked in cycle or changing position. Push starting switch to "ON" position. If changer turntable does not rotate, push turntable clockwise until turntable rotates by motor power. Your changer now is in permanent operating position. Care must be taken to prevent pickup arm from dropping onto turntable in order to prevent needle from injuring surface of turntable.

Automatic Operation

1. Loading The Changer
   a. Before placing records onto changer be sure pickup arm is placed on pickup arm rest.
   b. If 10 inch records are to be played, lower hinged 10 inch record support to rest horizontally on ejector box. For 12 inch records raise the hinged 10 inch record support into vertical position and rest records on 12 inch record support ears on ejector box.
   c. Place stack not to exceed twelve 10 inch records or ten 12 inch records over center post supported in the center on the center post and at one side on the record support.
   d. Place balance arm to rest on top record, this steadies the records and assures correct dropping of records.
2. Starting The Changer
   a. Push starting switch to "ON" position.
   b. To bring pickup arm into playing position pull reject button into reject position and changer will automatically drop first record and enter playing cycle.
   c. If the machine has been stopped in cycle position and turntable does not rotate after above instructions have been followed, push turntable clockwise until machine returns into normal operating cycle.
3. Rejecting Records
   Records may be rejected any time during playing operation by pulling reject button into reject position.
4. Shutting Off The Changer
   a. Before removing records it is advisable to drop all unplayed records onto turntable by repeatedly pulling reject button into reject position until all unplayed records have dropped onto turntable.
   b. Lift pickup arm and place it on pickup arm rest while turntable and records are rotating. Push starting switch to "OFF" position
   c. Caution. If above procedure is not followed changer will replay last record.
5. Unloading The Changer
   a. Raise balance arm and 10 inch record

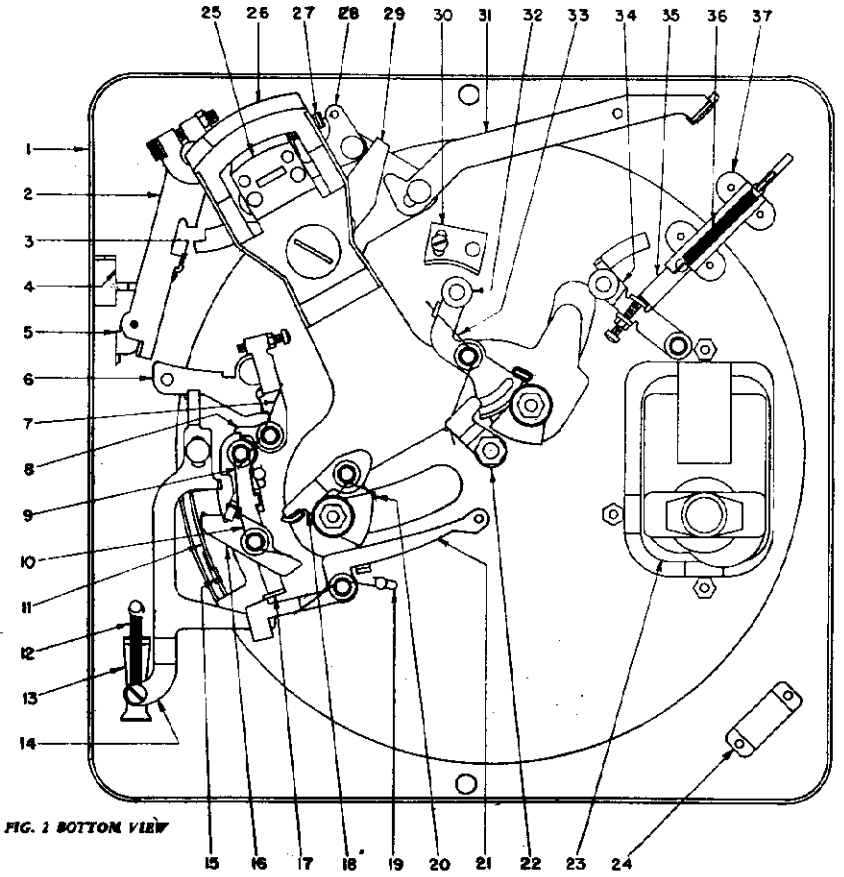


FIG. 2 BOTTOM VIEW

MILWAUKEE STAMPING CO.

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MODEL 10700 SERIES

support upward to permit easy record removal.

b. Lift played records from turntable.

Manual Operation

1. Raise hinged 10 inch record support into vertical position.
2. Place record over spindle onto the turntable.
3. Push starting switch to "ON" position.
4. Push reject button into manual playing position.
5. Place pickup arm at beginning of record to start playing operation.
6. When through playing place pickup arm on pickup arm rest and push starting switch to "OFF" position.

Cycle of Operation of Correctly Adjusted Mechanism

1. With pickup arm (46) on pickup arm rest (79) and center post dogs (81) and 10" record support down, place stack of 10" records on center post (66) and 10" record support (57) ears. See Fig. (1).
2. Place balance arm (56) on records. See Fig. (1).
3. Push motor switch (24) to "ON" position. See Fig. (1).
4. Pull reject button (80) to reject position and release. See Fig. (1).
   a. Drops 1st record.
   b. Places pickup arm (46) in playing position.
5. Play 1st record.
6. Needle approaches center grooves carrying ratchet arm (2) towards adjusting stop lever (8). See Fig. (2).
7. Contact of ratchet arm (2) and adjusting stop lever (8) disengages jaws of adjusting stop lever (8) & kickoff lever arm (17). (See Fig. (2).
8. Jaws release kickoff lever arm (17) assembly, rotating it into path of kickoff spring (15) which rotates on turntable (11). See Fig. (2).
9. Contact of kickoff spring (15) & kickoff lever (16) rotates kickoff lever arm (17) assembly into lockout position with locking lever (21). See Fig. (2).
10. Further movement of turntable (11) causes kickoff lever (16) to disengage dropping lever (18). See Fig. (2).

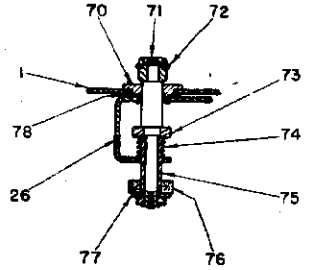
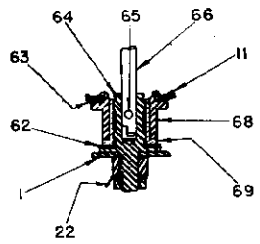


FIG. 3 LEAD OR RETURN DROPPING ROLLERS

11. Lead roller assembly Fig. (3) drops into turntable spiral (85). See Fig. (4).
12. Disengagement of kickoff spring (15) & kickoff lever (16) rotates kickoff lever to original position. See Fig. (2, 5).
13. Swing arm (26) assembly Fig. (2) is driven through first half of cycle by turntable spiral (85). See Fig. (4).
    a. Adjusting plunger pin (50), riding on swing arm (26) cam, elevates pickup arm (46). See Fig. (6).
    b. Assembly in Fig. (7) is set by arm cam (40) so as to position ratchet arm (2) Fig. (9) on return stroke for proper set down of needle.
    c. Ratchet arm friction springs (25) engage ratchet arm (2) rotating pickup arm (46) to clearance position. See Fig. (2).
    d. Ejector idler lever (34) driven by swing arm (26) Fig. (2) actuate record ejector assembly Fig. (8). Dropping next record from stack.
    e. Swing arm (26) ear, cams locking lever (21) resetting kickoff lever assembly (17). See Fig. (2).
    f. Cammed dropping lever (32) Fig. (2) releases return roller assembly Fig. (3) dropping it into turntable spiral (85) Fig. (4).
    g. Inner spiral cam (63) Fig. (4) raises lead roller assembly Fig. (3) permitting dropping lever (18) to rotate to setting position. See Fig. (2).
14. Swing arm (26) assembly Fig. (2) is driven through second half of cycle by turntable spiral (85) Fig. (4).
    a. Pickup arm (46) is positioned for set down driven by engaged ratchet arm friction springs (25) and ratchet arm (2) and located by interference of ratchet arm lever (29). See Fig. (2, 9)
    b. Record ejector assembly Fig. (8) is reset to original position.
    c. Swing arm (26) ear releases locking lever (21) allowing it to assume original position. See Fig. (2).
    d. Operation of brake spring (22) prevents acceleration of swing arm (26) at completion of cycle. Gentle set down of pickup arm (46) is so effected. See Fig. (2).

FIG. 4 CENTER POST AND TURNTABLE ASSEMBLIES



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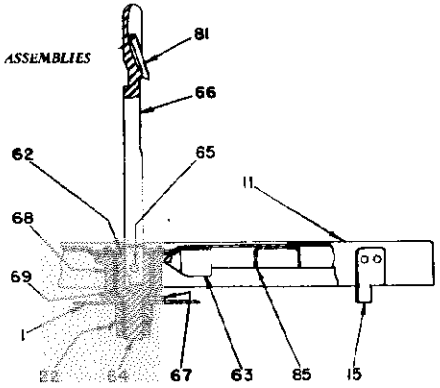

IMPROVED DESIGN

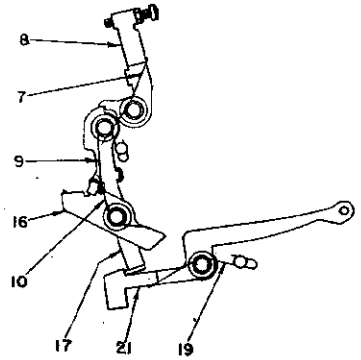

FIG. 5 TRIPPING LEVERS IN LOCKED POSITION

    e. Adjusting plunger pin (50) riding on swing arm (26) cam causes pickup arm (46) to descend to playing position. See Fig. (6).
    f. Assembly in Fig. (7) is released by arm cam (40) resetting ratchet arm lever (29) in clearance position as shown in Fig. (2).
    g. Inner spiral cam (63) Fig. (4) raises return roller assembly Fig. (3). Rotation of cammed dropping lever (32) Fig. (2) provides clearance between inner spiral cam and return roller assembly. This completes the change cycle.
15. Tripping of mechanism by eccentric grooves in center of record.
    a. As record is being played ratchet dog (5) and ratchet lever (6) make contact. See Fig. (2).
    b. Eccentric grooves in record produce oscillation of ratchet arm (2) and ratchet dog (5). See Fig. (2).
    c. Oscillation of ratchet dog (5) across ratchet lever (6) lengthens ratchet arm (2) assembly, rotating ratchet lever (6). See Fig. (2).
    d. Rotating ratchet lever (6), rotates adjusting stop lever (8) disengaging jaws of adjusting stop lever (8) and kickoff lever arm (17). See Fig. (2).
16. For remainder of cycle see parts 8 through 14 above.

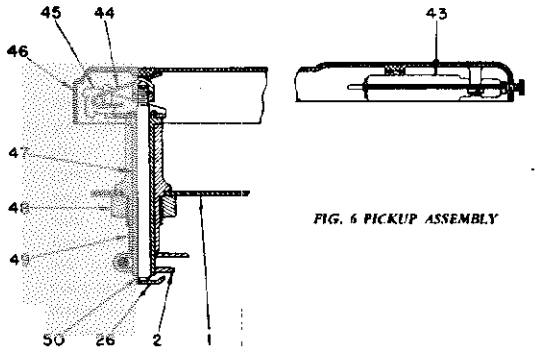

FIG. 6 PICKUP ASSEMBLY

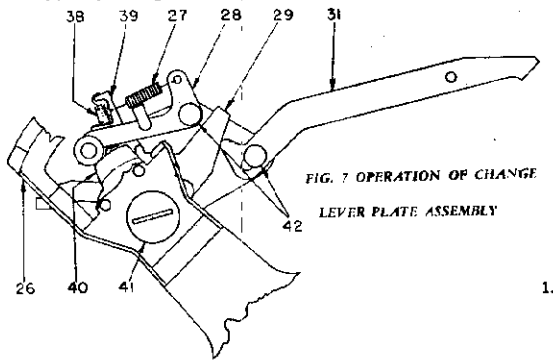

FIG. 7 OPERATION OF CHANGE LEVER PLATE ASSEMBLY

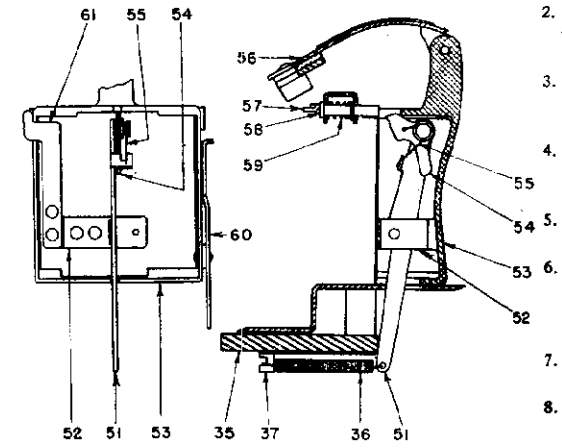

FIG. 8 EJECTOR BOX ASSEMBLY

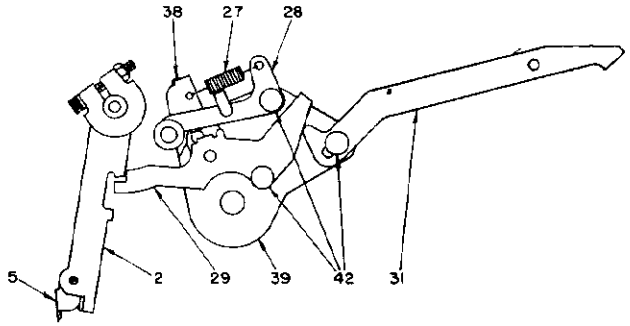

FIG. 9 POSITIONS OF LEVERS FOR NEEDLE SETDOWN

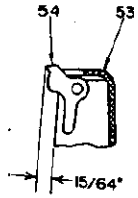

FIG. 10 FINGER TRAVEL OUT OF EJECTOR BOX

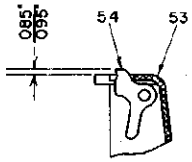

FIG. 11 FINGER TRAVEL ABOVE EJECTOR BOX

ADJUSTMENTS & PROCEDURES

1. Check power supply to motor. Motor operates at 115 volts 60 cycle alternating current unless otherwise specified on motor.
2. Remove turntable (11), move motor idler pulley (82) away from motor shaft (84) and check for motor performance Fig. (1).
3. Check for freedom of motion of motor idler pulley (82) and motor spring (83) tension on same. Fig. (1).
4. Check for grease or foreign matter on motor idler pulley (82) or turntable (11) rim which may cause slippage. Fig. (1).
5. Check for worn motor idler pulley (82) tire. Fig. (1).
6. Check for grease or foreign matter in bearing for turntable collar (62) and mechanism plate center stud (64). Fig. (4).
7. Check for absence of adjusting plunger pin (50). Fig. (6).
8. Adjusting plunger pin (50) incorrect length. Place pickup arm (46) in upright position and remove adjusting plunger pin (50) with acorn nut. Adjust overall length of pin assembly to give approximately ¼" clearance between top of pickup arm and bottom record of stack of unplayed records when unit is in change cycle. Fig. (6).
9. Trip mechanism and rotate turntable (11) by hand until swing arm (26) completes half of its cycle. Loosen screw in cam trip bracket (30) and rotate bracket until there is .012" to .014" clearance between leading edge of cam dropping lever (32) all in Fig. (2) and bearing pin shoulder nut (73) Fig. (3) of dropping roller. Return swing arm to original position. Retighten screw. Recheck this setting by tripping mechanism and rotating turntable by hand observing whether return roller assembly Fig. (3) enters turntable spiral (85) Fig. (4) at formed flat on turntable spiral at completion of half of swing arm cycle.
10. Back up turntable (11) turning it counter clockwise slightly and remove turntable. Push both rollers (71) of swing arm (26) down and push rollers (71) towards reject button (80) to the end of their travel. Replace turntable and rotate by hand for at least one revolution. Fig. (1).
11. Check drop lever torsion spring (20) and cammed dropping lever torsion spring (33) for adequate tension. Fig. (2).
12. Check for worn or frayed rubber on dropping lever (18), replace if necessary. Grease rubber sleeve after installation. Fig. (2). This sleeve, above (73) Fig. 3, may be eliminated entirely for better operation.
13. Check for defective ratchet arm friction springs (25). Fig. (2). If found to be loose or weak, return changer to factory for adjustment.
14. Check ratchet arm (2) for tight engagement with pickup arm swing post (47). Fig. (2,6).
15. Trip mechanism and rotate turntable (11) by hand until swing arm (26) completes half of its cycle. Loosen lock nut on ejector idler lever (34) Fig. (2). Adjust screw until finger (54) protrudes outside of ejector box (53) 15/64". See Fig. (10). Tighten lock nut.
16. Check proper height from ejector box (53) ears to maximum rise of finger (54) top is .085" to .095". See Fig. (11). File to give proper dimension.
17. Check 10" record support (57) Fig. (8) for height differential between ears of 10" record support (57) and top of pusher pin (58). Pin should engage record by .080" to .090". Bend to suit.
18. Put a 10" record on turntable (11), loosen screw on ratchet arm (2) and place pickup needle approximately ⅛" from outside edge of record. Rotate by hand ratchet arm lever (29) and ratchet arm (2) to position shown on Fig. (9) and retighten screw. This setting will automatically set needle down correctly for 12" records also.
19. Move swing arm (26) away from reject button (80) for about 1" of its travel. Check movement of ratchet arm lever (29) which should assume position shown on Fig. (7 or 9) when 10" record support (57) is in down position. Hampered movement may be caused by defective ratchet arm extension spring (38) or excess friction.

20. Remove brake spring (22) and inspect for possible fracture. Replace fractured spring, use two springs if necessary. Fig. (2).
21. Check for defective cam lever extension spring (27) and possible excess friction in parts. Fig. (7).
22. Check for adequate freedom of pickup cartridge wire.
23. Pickup arm (46) should weigh 1¼ oz. when scale is applied at set screw. To adjust weight rotate ratchet for pickup arm (45) so to decrease or increase tension on pickup arm balance spring (44). See Fig. (6).
24. Needle may be worn beyond use.
25. Check to see that changer is level.
26. Check freedom of movement of adjusting stop lever (8) Fig. (2 or 5).
27. Check for presence of all springs See Fig. (2).
28. Tripping levers may assume position shown in Fig. (5). Reset levers by pulling reject button (80). If occurance is frequent observe for extreme wear of nib at point where kickoff spring (15) contacts kickoff lever (16). Fig. (2). Replace kickoff lever arm (17) assembly and remove 1/32" of mechanism plate (1) increasing size of hole which limits outward travel of kickoff lever arm (17). Remove material from farthest edge from center post (66) allowing greater movement of kickoff lever arm (17) assembly.
29. Set pickup needle at a point 1⅞" from center of record, loosen lock nut and turn screw on adjusting stop lever (8) Fig. (2) until kickoff lever arm (17) releases allowing 1/64" clearance between jaws of adjusting stop lever (8) and kickoff lever arm (17). See Fig. (12). Tighten lock nut.
30. Check for distorted or fractured kickoff spring (15) Fig. (4).
31. Records not manufactured under R.M.A. specifications may not trip changer.
32. Bend the ear on the adjusting stop lever (8) slightly towards heel of ratchet lever (6), to produce increased interference of ratchet dog (5) and teeth of ratchet lever (6). Fig. (2).

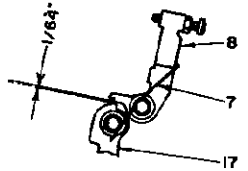

FIG. 12 ADJUSTMENT FOR TRIPPING

33. Apply force with pliers to bend ratchet arm stop bracket (4) away from reject button (80), until pickup arm (46) will rotate to a position allowing 12" record to drop without interference. Fig. (2).
34. Check cabinet cutout for adequate clearance of ratchet arm (2). Fig. (2).
35. Check for worn roller tires (72). Fig. (3).
36. Remove friction spring washer (62) and replace with .010" friction spring washer (62) or eliminate if necessary. Fig. (4).
37. With starting switch (24) "OFF", trip mechanism and rotate turntable (11) by hand. Check that lead roller assembly and return roller assembly Fig. (3) drops into turntable spiral (85) Fig. (4) without touching flange of turntable spiral. Check for foreign matter which would prevent roller assembly from dropping full extent of travel.
38. Lubricate bearing for turntable collar (69). Fig. (4). Use very light machine oil, 3 in 1 or equivalent.
39. Check for foreign matter between turntable (11) and mechanism plate (1). Fig. (1).
40. Defective records.
41. Defective cartridge and amplifier circuit.

Instructions

When ordering parts for Model #10700 Record Changer, specify changer serial number, item number, part number, and description. When ordering motor parts be sure to specify the motor number stamped on each motor. Order special rivets from respective part numbers.

Item No.	Description	Part Number
1.	Mechanism Plate	10701
2.	Ratchet Arm	10759
3.	Ratchet Extension Spring	10761
4.	Ratchet Arm Stop Bracket	10843
5.	Ratchet Dog	10760
6.	Ratchet Lever	10777
7.	Adjusting Stop Lever Spring	10783
8.	Adjusting Stop Lever	10780
9.	Kickoff Lever Arm Spring	10789
10.	Kickoff Lever Spring	10790
11.	Turntable	10702
12.	Reject Arm Tension Spring	10826
13.	Reject Arm Spring	10814
14.	Reject Arm	10812
15.	Kickoff Spring	10707
16.	Kickoff Lever	10786
17.	Kickoff Lever Arm	10785
18.	Dropping Lever	10731
19.	Locking Lever Spring	10795
20.	Drop Lever Torsion Spring	10734
21.	Locking Lever	10793
22.	Brake Spring	10741
23.	Motor	10825
24.	Motor Switch	10824
25.	Ratchet Arm Friction Spring	10791
26.	Swing Arm	10729
27.	Cam Lever Extension Spring	10774
28.	Cam Lever	10769
29.	Ratchet Arm Lever	10772
30.	Cam Trip Bracket	10811
31.	Change Lever	10767
32.	Cammed Dropping Lever	10730
33.	Cammed Dropping Lever Torsion Spring	10733
34.	Ejector Idler Lever	10813
35.	Record Ejector Lower Push Pin	10804
36.	Ejector Arm Extension Spring	10728
37.	Ejector Pin Guide	10724
38.	Ratchet Arm Extension Spring	10775
39.	Change Lever Plate	10768
40.	Arm Cam	10737
41.	Fulcrum Bearing Nut	10738
42.	Change Lever Fulcrum Pin	10773
43.	Pickup Cartridge	10753
44.	Spring for Pickup Arm Balance	10764
45.	Ratchet for Pickup Arm Balance	10766
46.	Pickup Arm	10752
47.	Pickup Arm Swing Post	10755
48.	5/8"-18 Light Jam Nut	10835
49.	Pickup Arm Stationary Post	10756
50.	Adjusting Plunger Pin	10757
51.	Finger Lever for Ejector	10718
52.	Lever Pivot	10719
53.	Ejector Box	10708
54.	Finger	10717
55.	Finger Torsion Spring	10721
56.	Balance Arm	10712
57.	10"Record Support	10713
58.	Pusher Pin for 10" Ejector	10714
59.	Ejector Compression Spring	10715
60.	Change Lever—Ejector	10722
61.	Pressure Spring—Ejector	10720
62.	Friction Spring Washer	10823
63.	Inner Spiral & Cam	10703
64.	Mechanism Plate Center Stud	10821
65.	Center Stud Taper Pin	10822
66.	Center Post	10820
67.	Reinforcement Washer for Center Stud	10828
68.	Turntable Collar	10705
69.	Bearing for Turntable Collar	10706
70.	Swing Arm Clamp	10745
71.	Roller Pin Assembly	10743
72.	Roller Tire	10748
73.	Bearing Pin Shoulder Nut	10742
74.	Compression Spring for Arm	10750
75.	Bearing Pin Spacer	10751
76.	Roller Cushion Washer	10744
77.	Washer for Bearing Pin	10801
78.	Swing Arm Slide Washer	10747
79.	Pickup Arm Rest	10803
80.	Reject Button	10816
81.	Center Post Dog	10802
82.	Motor Idler Pulley	10825
83.	Motor Spring	10825
84.	Motor Shaft	10825
85.	Turntable Outer Spiral	10704

Servicing Procedure

1. The following procedure, when followed, will provide the service man with a method of repair which will save him much unnecessary time and effort. Start servicing the changer by performing adjustment #10. This will assure the service man that the changer is in the correct position for proper operation.

2. With pickup arm (46) on pickup arm rest (79) and center post dogs (81) down, place stack of 12 new 10" records on center post (66) and 10" record support (5() ears. See Fig. (1).
3. Push starting switch (24) to "ON" position. See Fig. (1).

4. Pull reject button (80) Fig. (1) to reject position and release, observing changer action for any of following possible difficulties. Difficulties encountered may be corrected by following the respective procedure and adjustments indicated.

Procedure & Adjustments	
	a. Turntable does not rotate.
#1,2,3,4,5,6	b. Pickup arm does not rise.
#7,8	c. Pickup arm rises but does not rotate into playing position and remains suspended in air. Turntable continues to turn. Click heard on each revolution.
#9	d. Pickup arm rises but does not rotate into playing position and remains suspended in air. Turntable comes to a dead stop cannot be turned by hand.
#10,9,11,12	e. Pickup arm rises but does not rotate into playing position, then sets to rest on pickup arm rest.
#13,14	f. Bottom record does not drop off of supporting ears of 10" record support (57) and center post (66) Fig. (1).
#15,16,17	g. Pickup arm hits bottom record of not played records.
#8	h. Needle does not set down correctly for 10" or 12" records.
#18,19	i. Pickup arm drops fast when setting needle on record.
#20	j. Pickup arm needle does not track in groove.
#21,22,23,24,25	k. Pickup arm needle jumps out of recording grooves and doesn't trip mechanism.
#22,23,24,25,26	l. Mechanism does not trip at end of record.
#26,27,28,29,30,31	m. Eccentric groove on 10" records does not trip mechanism.
#31,32	n. Changer does not play entire record.
#29	o. Pickup arm does not lift high enough to clear stack of 12-10" records on turntable.
#8	

5. With pickup arm (46) on pickup arm rest (79) and center post dogs (81) down, place stock of 10 new 12" records on center post (66) and 12" record support ears of ejector box (53). Fig. (1).

6. Push starting switch (24) to "ON" position. See Fig. (1).

7. Pull reject button (80) Fig. (1) to reject position and release, observing changer action for any of following possible difficulties.

	a. Bottom record does not drop off of supporting ears of ejector box (53) and center post (66).
#15,16	b. 12" record hits pickup arm when record drops to playing position.
#33,34	c. Eccentric groove on 12" records does not trip mechanism.
#31,32	

8. Play any record. Observe and listen for noises which not not seriously hamper operation of changer but detract from performance of changer.

	a. Click is encountered on each revolution of turntable during playing cycle.
#11	b. Apparent growl or scroll noise caused by improper operation of roller (71) Fig. (3) on turntable spiral (85) Fig. (4) during change cycle.
#8,12,35,36,37	c. Extreme variation of turntable speed.
#3,4,5,6,38,39	d. Distortion of tone quality of recording.
#3,4,5,6,24,38,39,40,41	e. Excessive wear of records.
#23,24	f. Turntable vibrates or chatters.
#38	

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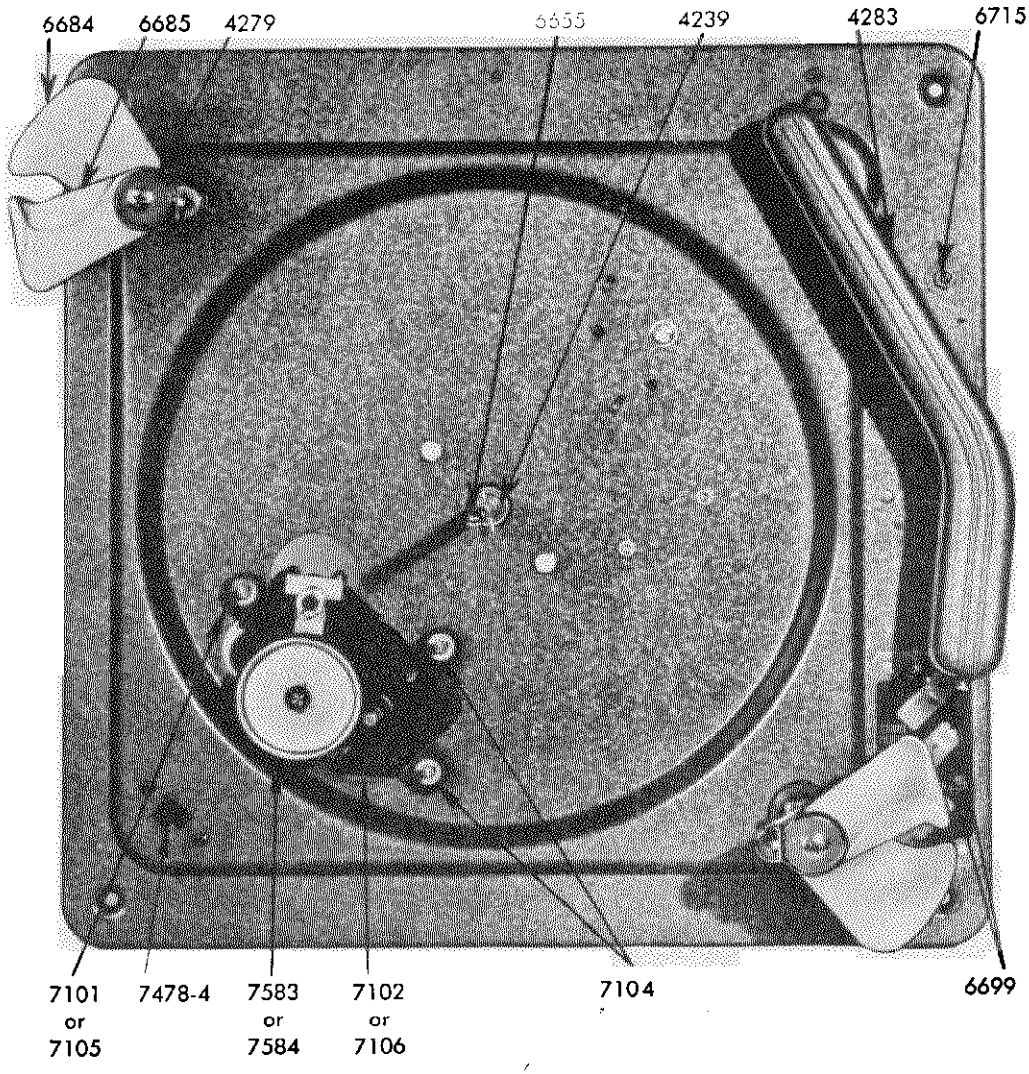

TOP VIEW, COMPLETE CHANGER, TURNTABLE REMOVED.

This changer automatically plays ten 12″ records or twelve 10″ records. Service information contained in this bulletin covers the operation, care, and adjustments that may be necessary if the mechanism fails to operate properly.

OPERATION

The motor shaft presses against its idler wheel which turns the turnable (7103 or 7107) from the inside rim. The turntable rests on a pin through the turntable shaft 6655 and causes the turntable shaft to turn. The pinion 4246 at the base of the turntable shaft turns in a notch in the drive cam 4207 while records are playing. When the pickup arm 4283 reaches the inside groove of a record the bracket 6697 on the pickup crank 6694 presses against the trip screw 7555 which is mounted in the pawl latch assembly 7809. The opposite end of the pawl latch assembly releases the starting pawl 6643 allowing the starting pawl to engage the pinion. This starts the drive cam 4207 and the change mechanism.

As the cam begins to turn, the lift pin 6876 is forced upward by the raised portion of the cam. This lifts the tone arm off the record. The cam follower 6695 then rides its groove on the cam and swings the tone arm outward. During this outward swing the indexing pin 6862 slides off the index stop 6856 and is pushed upward by the indexing pin spring 4272. While the tone arm is all the way out, the starting pawl 6643 is cocked into position by the bracket 6697 on the pickup crank 6694.

The cam follower swings the tone arm in until the index pin 6862 contacts the index pin stop thus getting the proper needle drop position.

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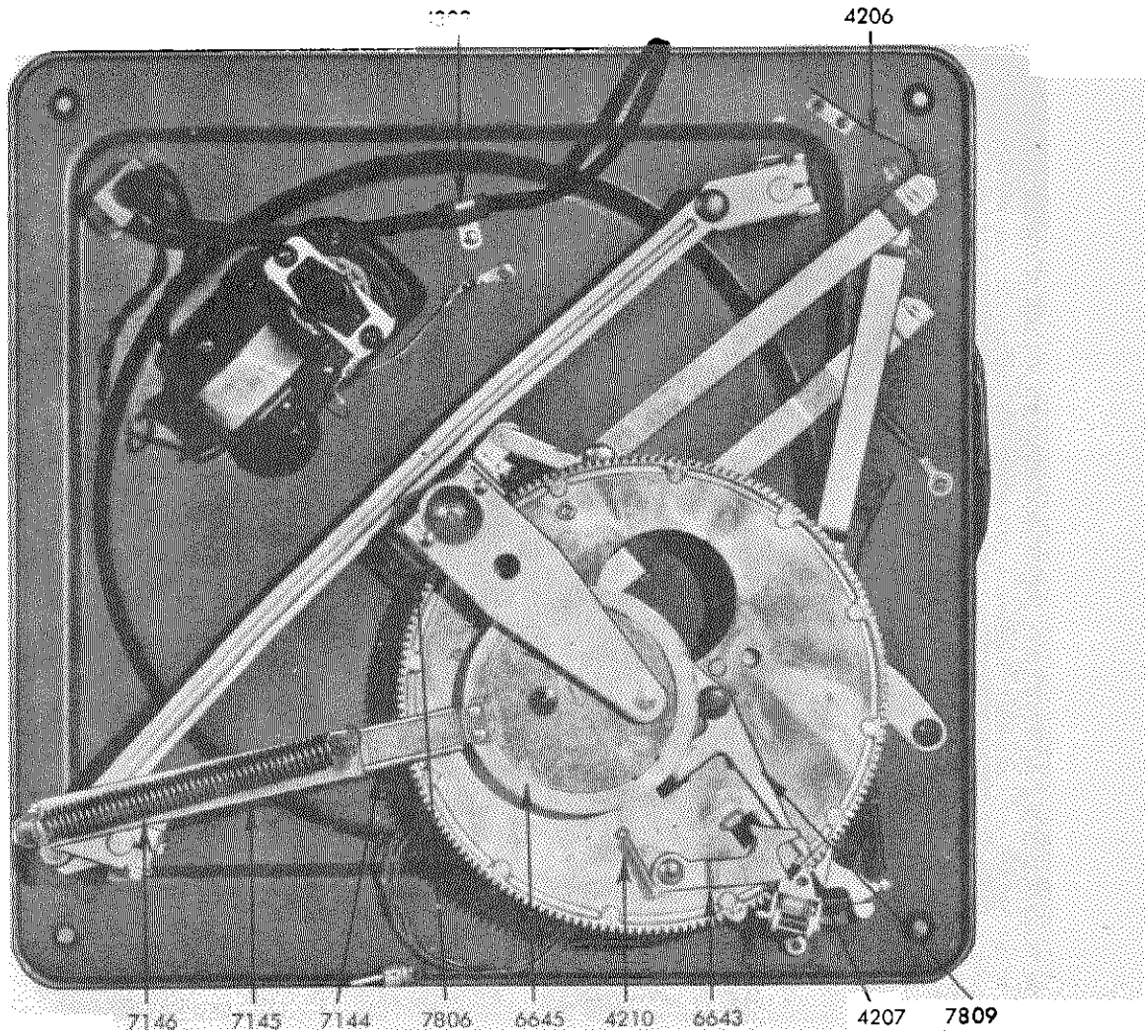

BOTTOM VIEW, ONE HALF CHANGE CYCLE.

the the same screw so adjusting for one or the other should be sufficient. When completed, tighten locking nut.

If the landing position is out of range for the adjusting screw, the clamp 6858 may have loosened. With the drive cam 4207 in the rest position, move the cam follower 6695 in towards center as far as possible. Then move the tone arm in approximately 1½ inches from center and tighten the clamp 6858. For fine adjustment, readjust the needle drop adjustment screw.

If the tone arm is bent it may require straightening. After straightening, run the changer through a change cycle manually and make sure the tone arm has proper height. (For height adjustment see paragraph B.)

B. Adjusting the Tone Arm Height

The needle should clear the turntable by 1¼ inches when at maximum height during change cycle. Adjustments can be made by turning the lift adjusting screw 4245. Before the power switch is turned on the changer should be run through its cycle manually to make sure that the tone arm passes underneath the lower change blade and does not jam.

If this adjustment is correct and the tone arm doesn't drop low enough to play the bottom record, inspect the main cam and see that the tone arm lift pin 6876 is all the way down in the hollow on the cam. If not, inspect the cam stop roller 6660 and see that it is in the proper position. Grasping the eccentric arm 7144 and pulling downward may help if the trouble is due to binding.

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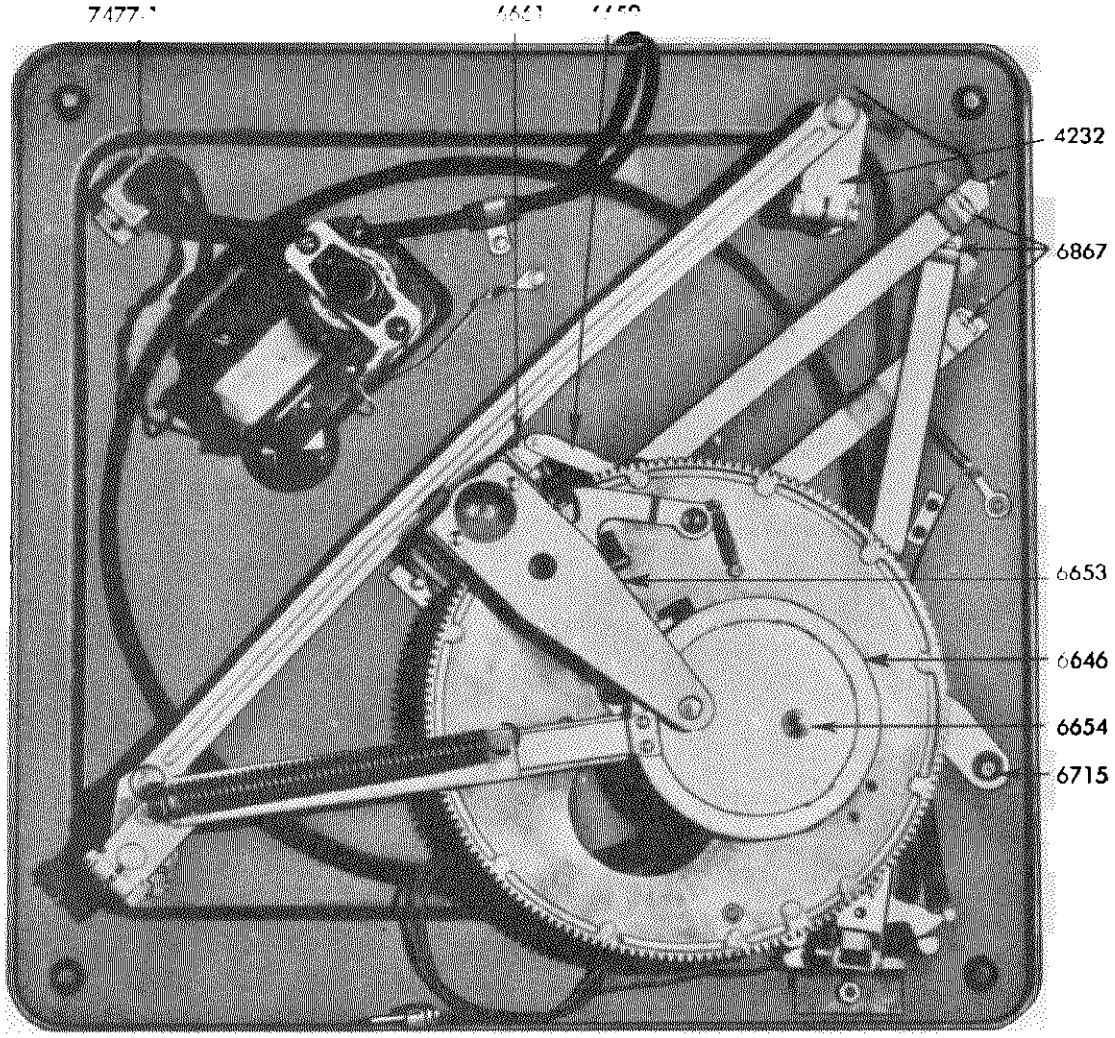

BOTTOM VIEW, IN OPERATION.

C. Adjusting the Position of Trip

The change mechanism should start when the tone arm is approximately 1⅛ inches from center. The trip occurs when the tone arm lever presses against the trip screw 7555 on the pawl latch assembly 7809. This screw can be adjusted to change the trip position.

D. Adjusting the Record Drop

Both lower change blades are adjusted to drop a record simultaneously. A loosened driving crank 4224 would allow a record to drop on one side before the other. To reset, turn the turntable manually until the record is just about to drop, loosen the the driving crank 4224 and adjust change blades so they are even. Then tighten clamp.

E. Adjusting Needle Pressure

The needle pressure can be adjusted by turning the pickup spring adjusting washer 4308-1 which changes the pressure of the pickup spring 7818. This adjustment is made for the particular cartridge being used and adjustment may be advisable if a substitute cartridge is used.

TROUBLE SHOOTING

SQUEAKS & NOISES

Squeaks sometimes occur due to friction between the unplayed stack of records and the spindle. This may be eliminated by applying a thin coat of wax or vaseline to the spindle at the point of contact.

Check the oil wick 4228 on the main cam, perhaps it needs oil. If the wick appears dirty or gummy it

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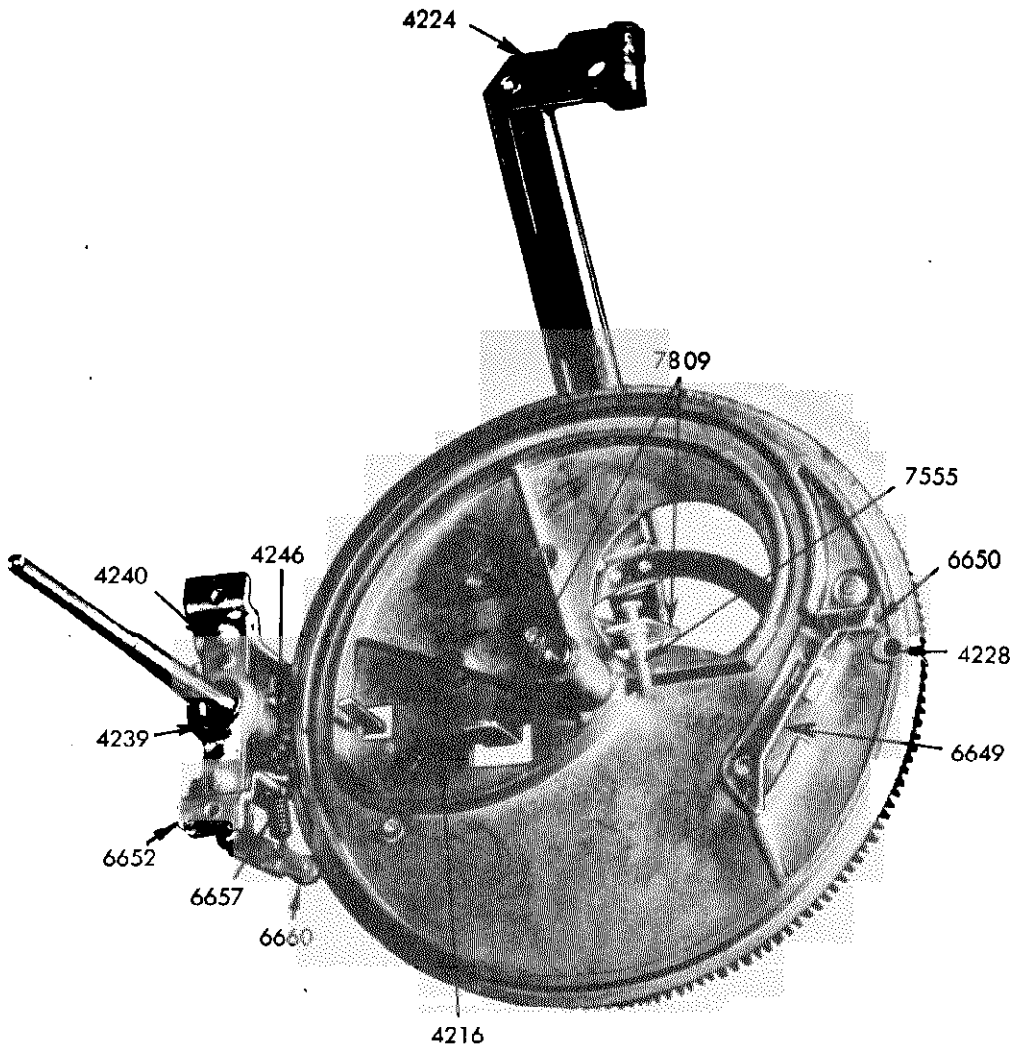

MAIN GEAR ASSEMBLY.

should be removed, thoroughly cleaned, and replaced.

WEAK OR NO OUTPUT

Check the pickup lead from the pickup to the amplifier.

If the amplifier is O.K. replace crystal pickup.

TURNTABLE WILL NOT TURN

No power applied to the changer.
Faulty switch 7478-4.
Burned out motor winding. (See replacing motor.)
Idler wheel spring disconnected.
Foreign material jamming motor armature.

If in change cycle—cam jammed or tie bar 7562 rubbing against the sub frame assembly 7806.

IMPROPER SPEED

Improper voltage or frequency.
Drag on turntable or motor.
Motor or turntable bearings binding.

FAILS TO TRIP

Starting pawl spring disconnected.
Trip screw missing or set improper.
Bent starting pawl or pawl latch.
Dirt binding starting pawl or pawl latch rivets.
Tone arm lever loosened. (See adjustment A.)

The pickup lead wire which emerges from the rear of the tone arm and goes down through the metal base is so placed that it will not hinder the movement of the tone arm. This lead should be free at all times, do not attempt to push excess wire through the base.

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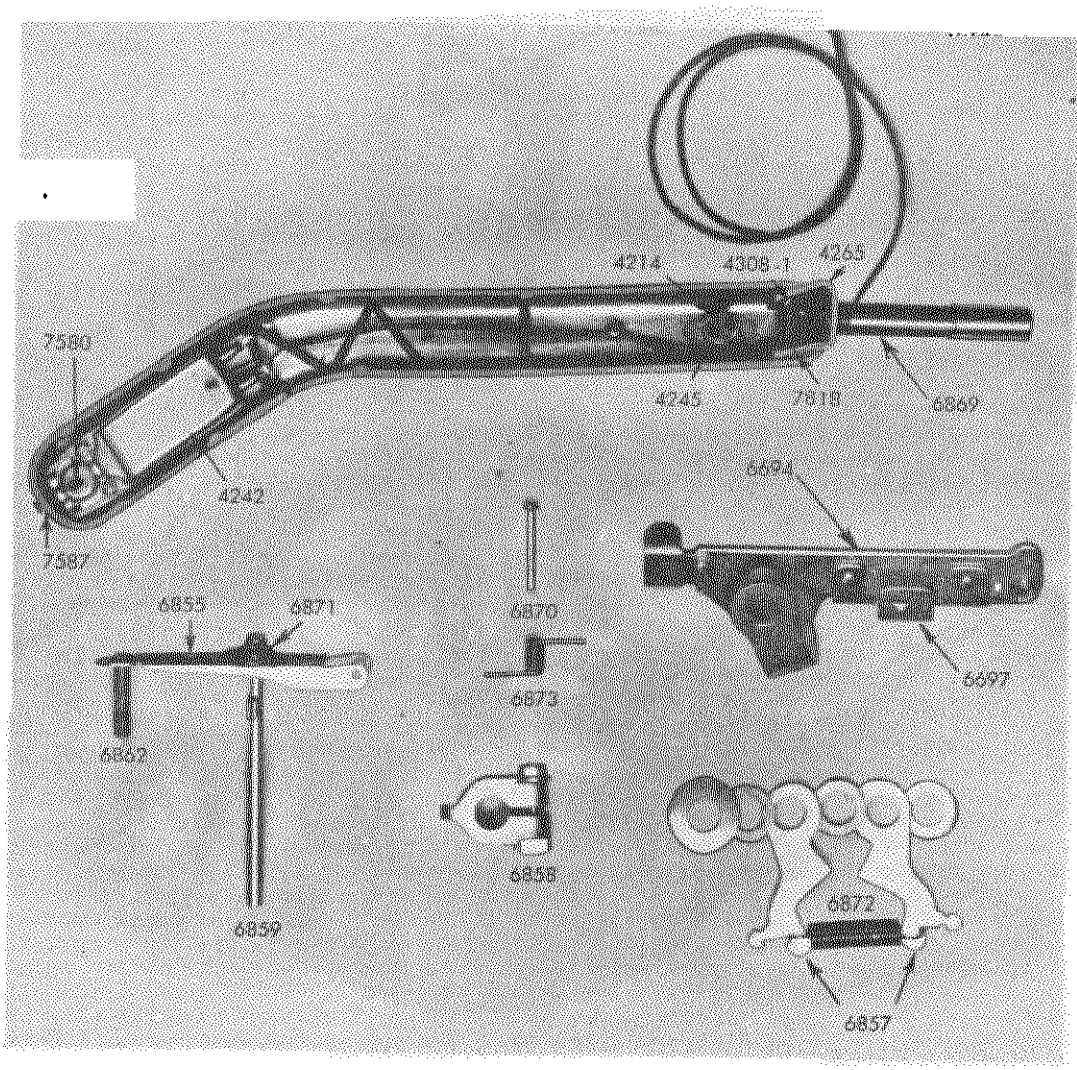

TONE ARM ASSEMBLY WITH BRACKET, WASHERS, ETC.

CHIPS RECORDS

Warped records are the most common cause for jamming or chipping records. Should the change blades chip flat records they should be bent to have a .06" clearance between them.

RECORDS DROP ON ONE SIDE ONLY

This is most likely due to the driving crank 4224 having loosened. For resetting instructions see Adjustment D.

REPLACING A MOTOR

Remove the turntable by lifting and giving the spindle a sharp tap to release it. Remove the power switch by taking out the two Phillips screws. Remove the switch cover and disconnect the motor wires. Disconnect the motor ground connection, remove motor and replace with a new one.

LUBRICATION

Normally, this mechanism should require no additional lubrication. However, a drop of any good machine oil on the turntable shaft bearings, motor bearings, and frictional surfaces once a year will do no harm.

CAUTION: Do not lubricate the trip mechanism or allow any oil to come in contact with the idler wheel.

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SERVICE PARTS LIST

Part No.	Description
1842-3	Steel Ball $\frac{3}{16}$" Diameter
4206	Control Spring
4207	Drive Cam
4210	Starting Pawl Spring
4214	Pickup Adjusting Spring
4215-37	# 10-24 x ⅜" Phillips Oval Hd. M. Sc. (Chrome Plate)
4216	Latch Spring
4224	Driving Crank
4228	Oil Wick
4229	Changer Blade Driving Shaft
4231	Pickup Hinge Pin
4232	Changer Blade Driven Shaft
4239	Turntable Bearing
4240	Bearing Support
4241	Bearing Support
4242	Pickup Cartridge
4245	Lift Adjusting Screw
4246	Pinion
4251	Mounting Clip
4252	Mounting Screw
4253	Mounting Spring
4262	Reject Spring
4265-2	Pickup Hinge
4272	Indexing Pin Spring
4279	Changer Shaft Cap
4283	Pickup Arm
4292	Pickup Rest Bumper
4302	Motor Cord Clamp
4308-1	Pickup Spring Adjusting Washer
6630-1	Base
6638	Cable Clamp
6641-1	Post
6641-2	Post
6642	Pickup Rest
6643	Starting Pawl
6645	Eccentric
6646	Eccentric Ring
6649	Cam Extension
6650	Cam Extension Spring
6652	Sub Frame
6653	Sub Frame Bracket
6654	Cam Shaft
6655	Turntable Shaft
6657	Cam Stop Spring
6659	Cam Stop Lever
6660	Cam Stop Roller
6661	Bracket
6667	Reject Link
6668	Manual Link
6683	Escutcheon
6684	Lower Change Blade
6685	Upper Change Blade
6693	Guide, Index Lever

Part No.	Description
6694	Pickup Crank
6695	Cam Follower
6697	Bracket
6699	Control Button
6715	Index Bushing Assembly
6855	Indexing Lever
6856	Indexing Stop
6857	Scissors Arm
6858	Clamp
6859	Tube
6862	Indexing Pin
6867	Knob Insert
6869	Pickup Shaft
6870	Pin
6871	Spring
6872	Spring
6873	Spring
6874	Index Link
6875	Spring (Pickup Crank)
6876	Lift Pin
6877	Pickup Hinge Pin Tube
7101	Rubber Grommet
7102	Phonomotor
7103	Turntable
7104	"C" Washer
7105	Rubber Grommet
7106	Phonomotor
7107	Turntable
7144	Eccentric Arm
7145	Eccentric Arm Slide
7146	Slide Spring
7477-1	Switch Cover Assembly
7478-4	Slider Switch Assembly
7555	6-32 Hex. Hd. Mach. Screw
7562	Tie Bar
7563	Trust Bearing Disc
7580	Needle
7583	Idler Pulley Kit (For 7102 Motor)
7584	Idler Pulley Kit (For 7106 Motor)
7587	Needle Screw
7800	Base Assembly
7801	Index Stop and Link Assembly
7802	Pickup Crank Assembly
7803	Pickup Arm and Shaft Assembly
7804	Index Lever Assembly
7805	Tie Bar Assembly
7806	Sub-Frame Assembly
7807	Eccentric Arm Assembly
7808	Drive Cam Assembly
7809	Pawl Latch Assembly
7810	Changer Blade Assembly
7818	Spring Pickup Crank)

PACKARD BELL CO.

AUTOMATIC RECORD CHANGER — RECORDER COMBINATION

GENERAL INFORMATION

LEVELING OF INSTRUMENT

Keeping the record changer-recorder in a level position is of maximum importance. If the floor under the cabinet is not level, shims should be placed under the feet of the cabinet until the base plate of the instrument is level.

Failure to level the instrument may result in improper feed-in of the pick-up arm when the automatic record changer is in use, and during recording, the proper balance of the cutter head would be disturbed.

LUBRICATION

Frequent lubrication of the record changer is not required, however, certain points should receive attention at least two or three times a year. Lubricate with SAE 20 automobile engine oil the following points: Motor bearings (52) and (53), turntable shaft bearing under cam (16) and idler bearing (51) CAUTION: MAKE SURE THAT NO OIL, GREASE, OR SOLVENT GETS ON THE RUBBER TREAD OF IDLER (54). Oil other parts of the mechanism whenever advisable. Keep the working surfaces of cam (16) and the various cams on cam shaft (19) covered with a thin film of petroleum jelly (vaseline).

Whenever the follower arm post (56) shows any tendency to stick or bind in the pivot post bushing (57), apply petroleum jelly to the follower arm post above and below the pivot post bushing. Work the lubricant in by alternately raising and lowering the recording arm (58). Never oil the follower arm post. Work petroleum jelly into the bearing surfaces between the straddle plate (59) and the pivot post bushing (57). This can best be done by raising the recording arm (58) until it is free of the feed screw after which it can be swung from side to side until the lubricant is well worked into place.

It is quite possible that threads or shavings resulting from the recording process will gather on the various components of the instrument. This debris should, of course, be removed. Particular care should be given to cleaning the threads of the feed screw (60). A brush is recommended for this process. At no time use a sharp instrument to clean the threads of the lead screw. Scratches on this component would have a detrimental effect.

AUTOMATIC RECORD CHANGER MECHANISM

ADJUSTMENT OF SPIRAL TRIP MECHANISM

(1) To adjust the spiral trip to operate farther from the center of the record, loosen the set screw (46) holding dog (7) away from the end of the trip rod (45). (Read paragraph 2 before making adjustment).

(2) Dog (7) is set at the factory to trip when the pick-up needle is 1¾" from the edge of the hole in the record center. This standard setting is correct for all late recordings and all but a very few of the older ones. To facilitate the location of dog (7) it is best to hold a scale with the end touching the turntable pin (5) and in such a manner that the pick-up needle will swing directly above the scale graduations. As noted above, the trip should release when the pick-up needle reaches the 1¾" graduation. NOTE: If for any reason the position of the pick-up arm (13) with relation to the pick-up base becomes changed, the trip dog (7) may require resetting. For this reason always make certain the pick-up is being lowered correctly onto the edge of the record before adjusting dog (7). (This pick-up adjustment is covered in paragraph 16).

MECHANISM FAILS TO TRIP

(3) If the mechanism fails to trip always examine the trip grooves on the record first before attempting to make any adjustments. The record grooves may be badly worn or scratched in such a manner as to cause the pick-up needle to jump the grooves. Also examine the pick-up needle for damage.

(4) The trip rod (45) is held in contact with trip latch (24) by the trip rod tension spring (6). If the eccentric trip fails to operate, it may be necessary to increase the pressure of spring (6) against trip rod (45). Before changing this adjustment, make sure the trip rod does not bind in the bearing where it is linked to the pick-up base. Now, make certain the trip rod floats freely. Examine the serration at (11) making certain the sharp edges have not been damaged. Remove any dirt that may be embedded in the serrations that would prevent the trip latch (24) from being engaged. Examine the knife edge of the trip latch (24) to see if it has become damaged. Inspect the spring (6) to see that its long leg clears that part of supporting bracket (36) on which rests trip rod (45). Make sure the

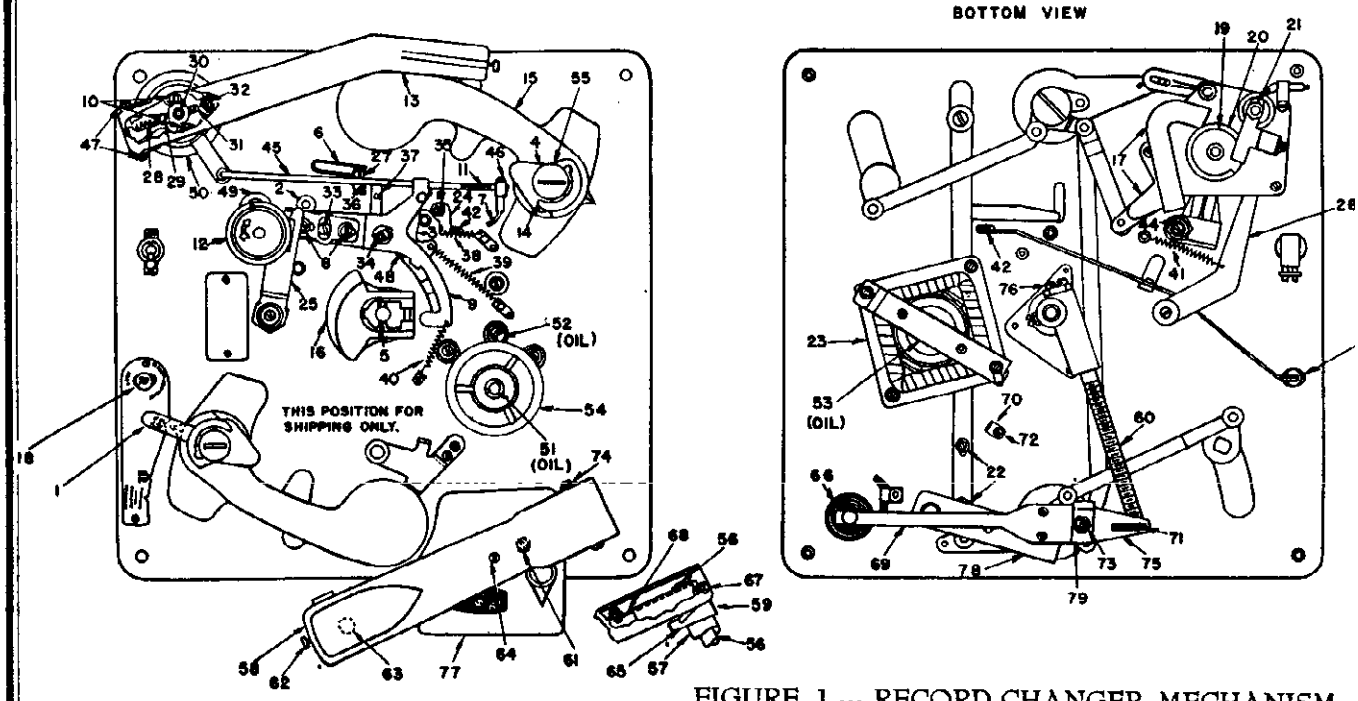

FIGURE 1 — RECORD-CHANGER MECHANISM

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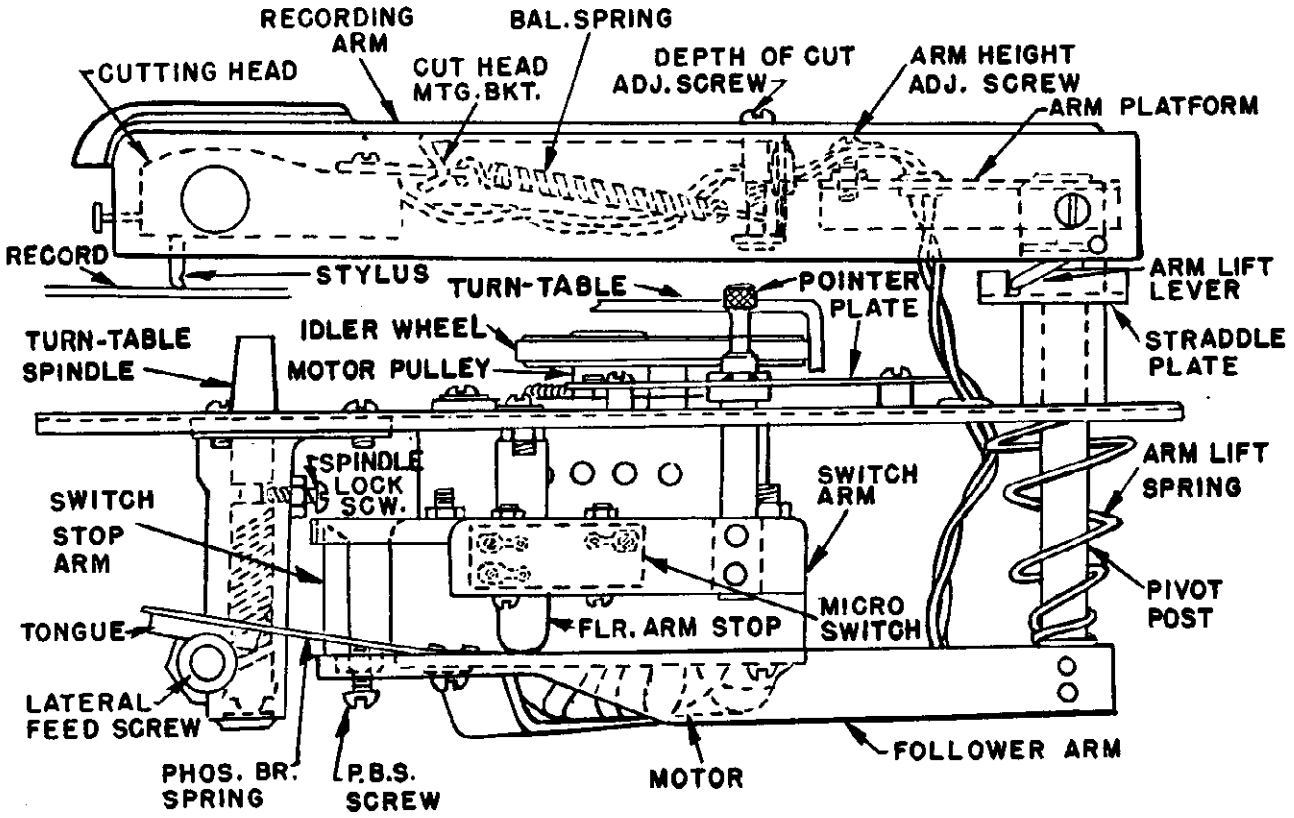
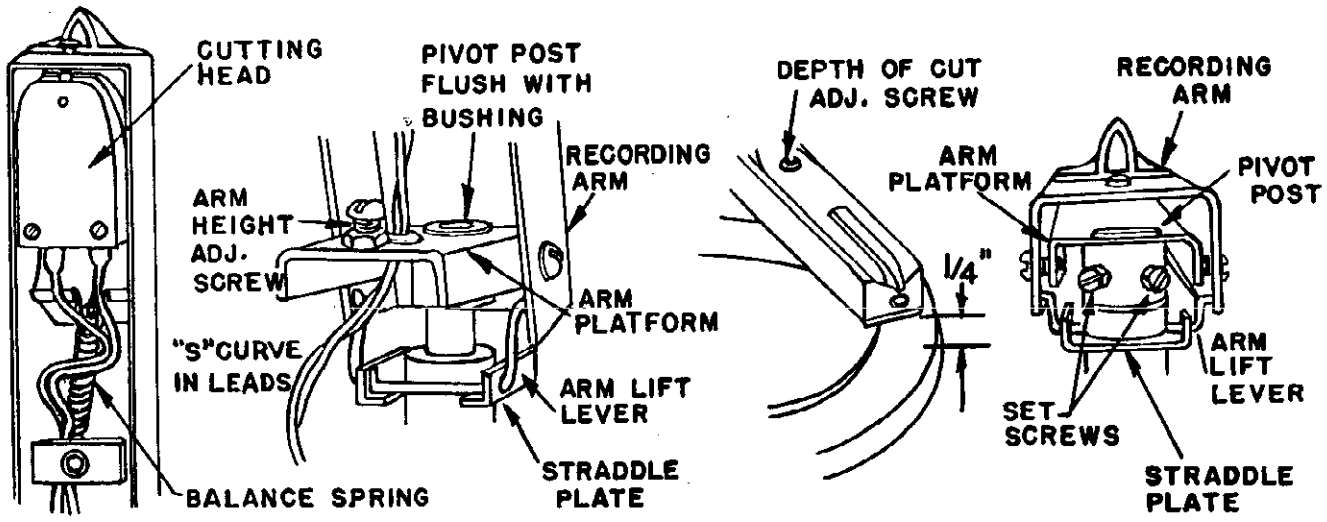


FIGURE 2

OUTLINE DRAWINGS of RECORDER MECHANISM



pick-up needle is not jumping out of the trip grooves on the record. Hold pick-up base firmly with one hand, then press gently sideways on head of pick-up arm (13) to detect any unusual amount of lost motion or play which might be caused by lock screws (10) not holding firmly, or pivot screws (47) not being correctly adjusted. Sight along the length of the trip rod (45) to make sure it is not bent. This would seriously interfere with adjustment of spring (6). If trip rod (45) is found to be bent, always disassemble it before attempting to straighten it. NOTE: Do not increase the pressure of spring (6) against trip rod (45) any more than is necessary to insure operation of the eccentric trip, because excessive spring pressure will cause the pick-up needle to jump the record grooves. To increase the tension of spring (6) against trip rod (45), loosen screw (27) and turn spring bracket (36) in a clockwise direction.

(5) If the pick-up needle shows a tendency to jump grooves on all records and fails to trip, make sure the pick-up arm (13) swings freely. Next check the pressure of the pick-up needle against the record to make sure that counter balance spring (28) is properly adjusted. The needle pressure should be 1½ Oz. To correct insufficient needle pressure, loosen lock nut on adjusting screw (29) and turn adjusting screw (29) in a clockwise direction until needle pressure is correct. CAUTION: Before changing adjusting screw (29) make certain that push rod (30) moves up and down freely and is not supporting the pick-up arm (13) while the needle is apparently resting on the record. Also make sure that pick-up arm (13) is not resting on the head of screw (32). If the pick-up needle only jumps grooves when one record is on the turntable, pick-up arm (13) is almost certainly resting on push rod (30) or screw (32) SEE PARAGRAPH 15. As a final precaution, make sure pivot screws (47) are not too tight; this would interfere with the free vertical motion of pick-up arm (13).

(6) If the trip mechanism still operates in a faulty manner, check the trip latch (24) and the trip cam lever (3) to make sure they are operating freely and do not bind on studs (35) and (48). If either of these levers are scraping on the base plate, make sure the studs have not worked loose.

(7) If lever (3) moves freely when it clears the trip latch (24) but does not swing into the path of the trip cam (16). Spring (39) which connects to lever (3) is either stretched or missing. If lever (3) makes a loud click when it drops in. The rubber bumper, against which it should strike, has worked up and should be pressed back into place.

NOTE: Do not attempt to make the trip mechanism operate from home recorded discs.

CHANGE MECHANISM DRIVE PULLEY FAILS TO ENGAGE

(8) If the trip mechanism functions in a satisfactory manner and pulley (12) is latched in position to engage the turntable rim, but does not contact the turntable rim with sufficient pressure to insure operation, loosen two lock screws (8) and turn eccentric (33) so as to move the pulley control lever extension (49) outwardly a distance which will bring pulley (12) into positive frictional engagement with the turntable rim.

CAUTION: This adjustment is very critical and should be carefully made. If pulley (12) is forced too tightly against turntable rim, the latch (25) will stick at the completion of the change cycle and prevent the pulley from becoming disengaged from the turntable rim. Before making any adjustment it is also advisable to check the set screw in pulley (12) to make sure that pulley (12) is tight and not turning on the shaft which carries it.

(9) If latch (25) fails to hold pulley (12) in position, check the latch to make sure the latch fingers have not been bent. Next, check spring (41) on lever (26) to make sure the spring is not defective or missing. If pulley (12) is riding off the lower edge of the turntable rim or so high as to cause it to scrape against the underside of the turntable, the height of pulley (12) may be adjusted by means of thrust screw (44). Before trying to turn screw (44) always loosen the provided lock nut.

MECHANISM REPEATS

(10) If the mechanism repeats (continues to change records without playing them), the pulley (12) may not be disengaging from the turntable rim. This failure to disengage may be due to the following: Faulty action of the latch (25). (See "Caution" in paragraph 8). A defective or missing return spring (40) on pulley control lever (9). A defective or missing spring (41) on lever (26). Lever (26) may be bent so that it is not contacting the pulley release cam. See paragraph 17).

((1) If pulley (12) disengages at the completion of the change cycle and immediately re-engages, the trip mechanism is at fault and it is suggested that the following be checked: Reject lever (42) may be bearing against trip latch (24) or it might be caught under trip latch (24). Pulley control lever (9) may be bent down so that it engages cam (16) even when cam (16) is not elevated by lift lever (3). Cam (16) may be sticking in the raised position. The re-set spring (38) on trip latch (24) may be defective or missing. The stud (34) on which pulley control lever (9) is mounted may have worked loose and should be tightened.

MECHANISM TRIPS DURING PLAYING CYCLE

(12) If the mechanism trips during the playing of a record and before the pick-up arm has swung inwardly to the point where the trip is adjusted to operate on spiral trip groove records, the following conditions should be checked: Weak or missing re-set spring (38) on latch (24). Defective shoulder on trip latch (24) or rounded corner on cam lift lever (3), permitting lever (3) to slip off the shoulder on trip latch (24). If the mechanism trips when the pick-up is moved by hand to the outside edge of the turntable and beyond, the trip rod (45) may be bent.

MECHANISM TRIPS OR PICK-UP ARM BINDS IN MANUAL POSITION

(13 When lever (1) is moved to the manual position, the pick-up arm (13) should be capable of free motion between the normal limits of its travel without tripping the mechanism. If the pick-up arm binds or trips the mechanism under these conditions check the following: Trip rod (45) may be bent or disengagement finger (37) bent or broken. If rubber bumper (2) becomes pushed up away from the base plate, this will permit lever (9) to overtravel and may jam trip rod (45).

RECORDS FAIL TO DROP PROPERLY FROM RECORD SUPPORTS

(14) If two or more records are dropped at the same time or one edge of the record drops and the other edge does not, then the rear record support (15) may not be correctly adjusted or record separating fingers (14) may be bent. Also check the records to make sure they are of standard diameter or thickness. Should record separating fingers (14) be bent, refer to paragraph 17 for corrective measures. An examination of the unit will disclose that the front record support has fixed positions determined by dedents which are located by lever (1). The rear record support (15) however is adjustable. If the record supports are not the correct distance apart, loosen screws (22) and move the rear record support (15) to the proper position.

CAUTION: Before making this adjustment always make sure the lever (1) is firmly located in the proper dedent.

NOTE: Due to the fact that home recording discs differ from standard records in thickness and diameter, they cannot be handled by the record supports.

PICK-UP ARM LIFT AND REST ADJUSTMENTS

(15) The height to which pick-up arm (13) is lifted during the change cycle may be adjusted by screw (21). In making this adjustment make sure it will not lift high enough to strike bottom record on the record supports. Also make sure that the pick-up needle drops low enough to rest properly on the record on the turntable. If the pick-up arm (13) is in contact with the push rod (30) or the pick-up rest (32) when the pick-up needle is resting on one record on the turntable, the needle will not exert sufficient pressure against the record for proper operation. Before adjusting the pick-up lift the pick-up rest (32) should be checked to see that it is correctly adjusted. Pick-up rest (32) is correctly adjusted when the pick-up needle just touches the top of the turntable. As a final check be sure

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that the pick-up will track properly when reproducing the thinnest home recorded disc likely to be used.

ADJUSTMENT OF PICK-UP LOWERING POINT

(16) To adjust the pick-up arm (13) so that it will be lowered to the correct point on the outside of the record: First shift lever (1) to the 10" position and then stop the mechanism with the pick-up positioning cam follower at the point of maximum rise of the pick-up positioning cam. Now raise the pick-up arm to the vertical position and loosen two screws (10) so that the arm (13) can be moved with relation to the pick-up base (50). Next holding the pick-up base (50) so that it will not turn, force the pick-up arm (13) toward the record centering pin (5). Now place a scale under the pick-up needle with the end of the scale touching the record centering pin (5). Next, carefully pull the pick-up arm outwardly until the pick-up needle is 4-45/64" from the pin (5). Raise the pick-up arm (13) and tighten the two locking screws (10), being careful not to move arm (13) outwardly past the correct setting before tightening the screws. This adjustment will automatically take care of 12" records as well as 10". This will be seen by moving lever (10) to the 12" position and running the unit through its cycle. If the pick-up arm (13) always lowers in the 12" position, regardless of the position of lever (1), the pick-up positioning cam follower is sticking in the down position. Some pick-ups are equipped with an eccentric (31) for rotating the pick-up arm (13) with relation to the pick-up base (50). On such units the two locking screws (10) are loosened, and eccentric (31) turned a small amount at a time until the pick-up needle is lowered to the correct point on the record.

CHIPPING OF RECORDS

(17) The record supports (4) and the record separating fingers (14) are so designed that no chipping of standard records will take place, unless, through rough handling the fingers (14) become bent. For proper operation the fingers (14) must be perfectly flat. To straighten the fingers (14) it is necessary to remove the large headed screws (55) that hold the fingers in place, after which the fingers (14) can be disassembled. Ordinarily, straightening can be accomplished by holding the main part of finger (14) through which the clamping screw passes with one hand, and then taking hold of the sickle shaped part of (14) with the fingers of the other hand, bending the sickle shaped part until it is lined up with the main body. After bending, lay the finger (14) on a flat surface to make sure the straightening has been properly done.

RECORDER MECHANISM

GENERAL INFORMATION

(18) This model is designed to utilize the "Short Shank" cutting stylus. The overall length of the "Short Shank" stylus is 9/16" to ⅝". Do not attempt to use the "Long Shank" stylus under any circumstances, because it will be found impossible to adjust the "Stylus Angle".

CUTTING HEAD ADJUSTMENTS

(19) The cutter head pressure may be adjusted by screw (64). This adjustment should be made carefully in quarter or half turns. The screw (64) is turned clockwise to increase the cutting depth and counter-clockwise to decrease the cutting depth. The proper cutting pressure is one and one-quarter ounces. To assure that the correct cutting depth has been attained, make a trial cut. The shaving left by the cutting stylus will be continuous and slightly elastic, and its thickness will be about the same as a human hair.

STYLUS ANGLE ADJUSTMENT

(20) The stylus angle is controlled by the length of the stylus and the distance from the top of the recording blank to the recording arm (58). Referring to Figure — it will be noted that this distance is approximately one-quarter inch. This distance may be regulated by raising or lowering stylus angle screw (61). Keep in mind, when making this adjustment, that the stylus must be inserted as far as possible into the stylus chuck.

(21) CAUTION: Because of the wide variation of the thickness of record blanks (.020" to .100"), the variation of the length of cutting stylii (9/16" to ⅝") and the possibility of warped or bent recording blanks, be sure that the stylus clamping screw (62) does not strike the bottom of the slot in the end of the recording arm as the stylus follows the surface of the recording blank.

(22) WARNING: Never allow the stylus to rest on a stationary recording blank if energy is being fed into the cutting head. The stylus will dig through the record coating and damage its cutting edges.

PROPER ENGAGEMENT OF FEED SCREW

(23) Engagement between the knife edge (71) and the feed screw (60) usually starts to take place when the nose of the recording arm is around two inches above the turntable. When the recording arm (58) is raised to a greater height than this, unhampered horizontal motion of the recording arm is possible between the normal limits of its travel. To permit disengagement of the recording arm from the feed screw at a minimum height above the turntable, stop screw (73) has been provided. Adjustment of screw (73) should be made with the recording arm in lowered position and with the feed screw engaged. Adjust screw (73) so that it barely touches spring blade (75) when the knife edge (71) is engaged at any point in the length of feed screw (60).

(24) Normally the full pressure of knife edge (71) against feed screw (60) is desirable. If this pressure is sufficient to cause uneven turntable speed, the pressure of knife edge (71) can be reduced by turning screw (73) in a clockwise direction. Great care should be used in reducing the blade pressure, as uneven groove spacing may result.

UNEVEN SPACING OF RECORD GROOVES

(25) If screw (73) is turned too far in a clockwise direction, it will reduce the pressure of the knife blade (71) against feed screw (60), to where the knife blade (71) will climb the sides of the thread in the feed screw and cause uneven spacing of the recorded grooves. Always be sure that the threads of feed screw (60) are free of dirt or other foreign matter, as these particles will cause uneven spacing of record grooves. Excessive end play in the feed screw will also cause uneven groove spacing.

(26) Thrust screw (76) is provided to keep the end play out of feed screw (60). Care must be used in adjusting screw (76) to prevent binding feed screw (60) between the end thrusts, as this would put an excessive load on the motor and cause speed variations on the turntable.

(27) Lost motion or play between the follower arm (69) and recording arm (58) in the horizontal direction, will prevent the recording arm from accurately following the follower arm. This play should be eliminated.

HOW TO REPLACE CUTTER HEAD

(28)
1. Remove stylus screw (62).
2. With the arm (58) in the vertical position, press the balance spring against the top of the arm which will throw the cutter head out where it can be firmly grasped.
3. Pull the cutter head upwards until the knife edge at the back of cutter clears its seat in the arm.
4. Unhook the balance spring from the cutter head.
5. Hook the balance spring to the new cutter head and extend the spring sufficiently so that the cutter head knife can be placed in its seat in the arm.
6. Replace stylus screw.
7. Thread the cutter leads through the arm and the arm platform. Clamp the leads on the underside of the base plate and arrange them exactly as before.

AUTOMATIC CUTTER STOP FAILS TO OPERATE

(29) The automatic cutter stop (77) is almost completely devoid of parts that are likely to fail. The only part that is at all likely to fail is the micro-switch (78). Since this micro-switch is completely sealed in, it must be replaced in its entirety.

MODELS 960001-1, 960001-2, 960001-3

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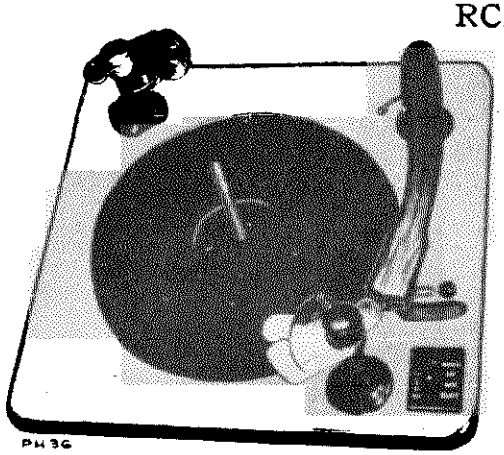

Model Nos. 960001-1, 960001-2, 960001-3

Automatic Record Changer

SERVICE DATA

—1945 No. 12—

RADIO CORPORATION OF AMERICA
RCA VICTOR DIVISION
CAMDEN, N. J., U. S. A.

Pickup Cartridge Data

Model	Cartridge
960001-1	39851
960001-2	70332
960001-3	39851

96000-2 and 96000-3 have an additional pickup shorting switch which contacts roller on tone arm lever (17) and shorts out pickup while tone arm is in the rest position.

Manual Operation

Old, odd sized and home recording records should be played in "Manual" position.

1. Lift and turn selector arm until selector arms point outward as for unloading records.
2. Place records to be played on turntable and move control knob to "Manual" position.
3. Place pickup on record.
4. When selection is finished playing, return the tone arm to rest position and move control knob to "off" position.

Note: Do not move control knob to "off" position before placing tone arm in rest position, or cycling will result. If this should occur do not handle tone arm. Place control knob in automatic position and allow cycle to continue until tone arm comes to rest before continuing with manual operation.

Cautions

1. Never use force to stop or rotate turntable or any other part of the mechanism.
2. Do not play a chipped or cracked record as damage to sapphire may result.
3. Warped records may slide upon one another while playing and cause unsatisfactory reproduction.
4. Do not attempt to handle tone arm while mechanism is in cycle.
5. Do not allow records to remain on selector arms when not in use, particularly in warm climate.
6. Do not allow oil or grease to come in contact with the rubber tire on drive idler or any other rubber parts.
7. Do not attempt to move the tone arm horizontally when in the rest position, unless control knob is in the manual position.

Lubrication

1. GREASE—Gears, all cams on large gear, tapered end of tone arm latch and tone arm lever with LUBRIPLATE #105 (Lubriplate Corp., 3211 South Wood St., Chicago).
2. OIL—All shafts before inserting into bearing and all moving parts, except those to be greased, with AIRCRAFT INSTRUMENT AND MACHINE GUN OIL, SPEC. 2-27E (Delta Oil Products, Milwaukee, Wis.).

Note: Keep grease and oil away from rubber parts such as drive idler, bumpers, etc.

Do not oil or grease clutch engagement lever.

Features

1. This record changer is a two post drop type, non-intermixing mechanism designed to play automatically a series of twelve 10-inch or ten 12-inch records of the standard 78 RPM type.
2. The mechanism uses a light weight, low noise, crystal pickup cartridge, equipped with a long life sapphire point.
3. The tone arm is automatically returned to the rest position and the power removed from the drive motor, after the mechanism has finished playing the last selection of the stack.
4. The changer is equipped with an eccentric and closed circle tripping device.
5. A pickup shorting switch is incorporated which shorts out the pickup during record change cycle. This prevents noise from gears, cams and other moving parts from being amplified through the reproducing system.
6. The mechanical linkage between record support posts makes possible a single and simple operation on the part of the operator to change from 10 to 12-inch records or vice versa.
7. The changer can be used on either a 50 or 60 cycle power supply by the use of the proper spring sleeve slipped over the shaft of the drive motor.
8. All gears and cams are disconnected while the records are being played. This removes the load on the motor and eliminates excessive friction and noise from moving parts which otherwise have a tendency to produce wow or rumble.

Automatic Operation

1. Lift and turn the selector arm #1 in the front right-hand corner of the changer panel to a position engaging the slots in the selector sleeve. In so doing the arrows and numbers designating record size should be pointing toward the turntable spindle.
2. Load the records to be played on the separator arms with the desired selections upward and in the proper sequence. The last record should be on top.
3. Move control knob to "reject" position and release it. The changer will play the selections in the entire stack at which time the control knob will return to "off" position automatically.
4. Lift and turn the selector arm to facilitate the removal of records on turntable.

Note: To stop mechanism before the selections in the entire stack have been played, move the control knob to "off" position, remove records on selector arms and lift and move the tone arm to rest position.

MODELS 960001-1,960001-2, 960001-3

RCA MFG. CO.

Functions of Main Parts

I. Motor

The function of the motor is to serve as a power source for the changer. Power is transmitted from motor to turntable through the rubber-tired idler wheel.

II. Control slide and associate parts

A. General function is to provide a single knob control for the various operations shown on the escutcheon plate through its interaction with the changer mechanism.

B. The power switch is mechanically operated by the control slide through a linkage to correspond to the various positions on the escutcheon plate.

C. **Manual Reject Slide (27), fig. (3)**

1. Manual position—With the control slide in the "manual" position the formed end of the reject slide (27) fig. (16) engages the clutch engagement lever (33) and holds it in an up position so that the trip mechanism is inoperative.
2. Reject position—The short formed end of the reject slide (27), near the mid-section, contacts part of trip lever (28) and trips the mechanism.

D. **Tone Arm Latch (14), fig. (3)**

1. Functions as a positive lock, fig. (12), for the tone arm whenever the latter is moved to the outside of the panel in all positions of the control slide other than "manual".
2. Also functions as a partial lock, fig. (12), or detent, for the tone arm lever (17) while the control slide is in "manual".

E. **Manual Lock Out (4), fig. (3)**

Function is to engage and retain the tone arm locator (16), fig. (15), in its outermost position while the control slide is set in the "manual" position.

F. **10 and 12-Inch Set Lever (19), fig. (3)**

Function is to index the tone arm properly for 10 or 12-inch records, fig. (19).

III. Spindle Housing, Gear Assembly, and Associated Parts

These two main castings are assembled with other component parts into a major sub-assembly, which includes a spindle and pinion. The assembly operates only in a counter-clockwise direction (viewed from bottom side) and provides a clutching and driving action for all automatic operation. Large gear rotates in a clockwise direction (viewed from bottom). One revolution of this large gear carries the mechanism through a complete change cycle.

A. **Pinion Gear (37), fig. (5)**

1. Operates as part of the clutch.
2. Operates as a gear to drive the main gear through a change cycle.
3. Serves as a vertical stop for the spindle to which it is pinned.

B. **Clutch Engagement Lever (33), fig. (5)**

1. Function is to engage projection on pinion gear to start change cycle.

C. **Trip Lever Assembly (28), fig. (4)**

1. Function is to hold the clutch engagement lever (33), fig. (4) in a position such that it clears the pinion gear (37), fig. (5), except when tripping for cycling.

IV. Selector Arm and Blades

1. Function is to support the records and, together with the selector blades, to separate the lowest record of the stack and allow it to drop to the turntable during the change cycle.

V. Tone Arm Lever and Associated Parts

A. **Tone Arm Lever (17), fig. (3)**

Controls the horizontal movement of the tone arm.

B. **Tone Arm Locator Lever (16), fig. (3)**

Function is to control the tone arm lever in determining landing position of the pickup, fig. (8).

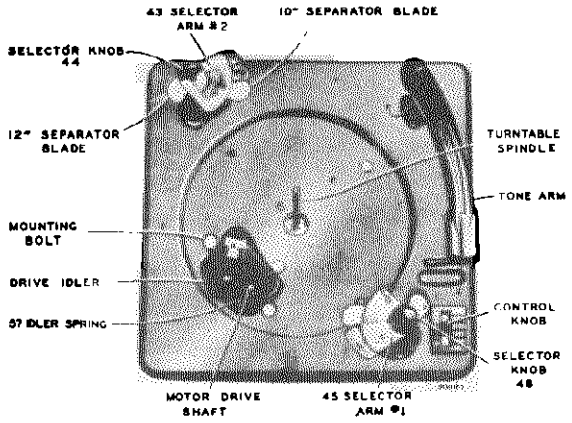

FIG. 1

C. **Booster Spring (67), fig. (3)**

A small piece of round spring wire which provides a limited amount of spring tension inward, tending to push the pickup into the starting groove.

VI. Tone Arm Lift Pin (51), fig. (24)

Function is to control vertical motion of tone arm.

VII. Selector or Support Arm Gears (35), (36), fig. (3)

Function is to transmit energy from drive mechanism to selector arm and knives.

VIII. Trip Plate (Knurled) (30), fig. (3)

Contacts trip dog (31), fig. (4), for eccentric tripping.

IX. Trip Shoe (29), fig. (3)

Functions as part of the closed circle tripping device.

X. Segments (23), (25) and Tie Plate (24), fig. (3)

Constitute the mechanical linkage between separator arms.

XI. Drive Gear Stop Lever (34), fig. (6)

Functions to stop and position drive gear after cycling.

XII. Tone Arm Retard Lever (26), fig. (4)

Stabilizes horizontal movement of tone arm while in cycle.

Miscellaneous Service Hints

1. Rumble

A. Remove turntable by lifting straight up and inspect the drive mechanism for a defective idler wheel. (Rough rubber tire or very sloppy bearing.)

B. Inspect the mounting of the changer to determine whether or not the mounting clamp nuts have been loosened.

C. Check and replace any microphonic tubes in the reproducing system.

2. "Wow" or Speed Variation

A. Make certain the turntable is free to rotate and not rubbing on motor board or portion of drive mechanism.

B. With the mechanism out of cycle remove the turntable by lifting straight up. The spindle being disengaged from all portions of the drive mechanism should rotate freely when turned by hand.

C. Check for badly worn idler as described in Item (1A).

D. Check for presence of grease on rubber tire of drive idler and the inner rim of the turntable. (Naphtha or carbontetrachloride will remove harmful grease.)

E. Bent turntable spindle.

F. Insufficient tension of drive idler spring (57), fig. (1).

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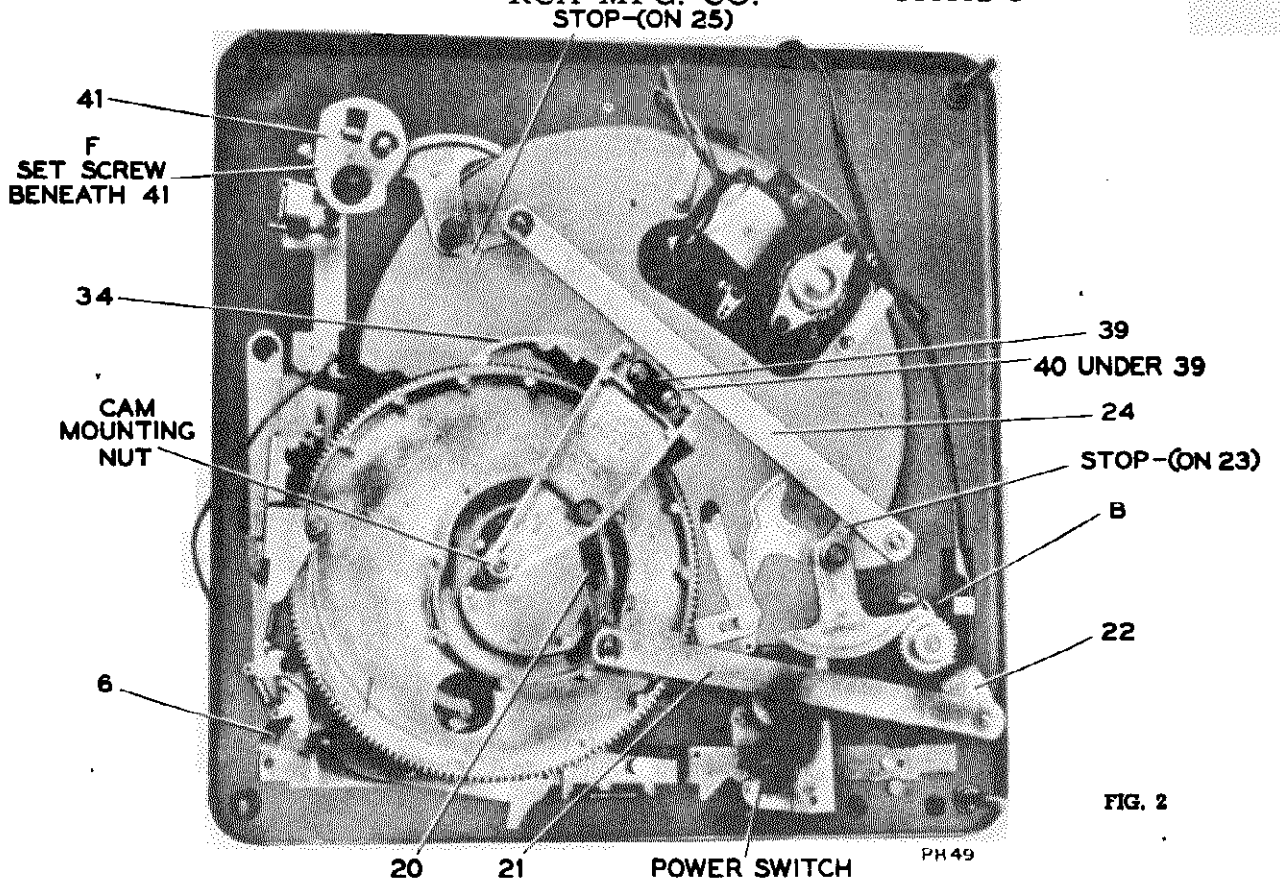


FIG. 2

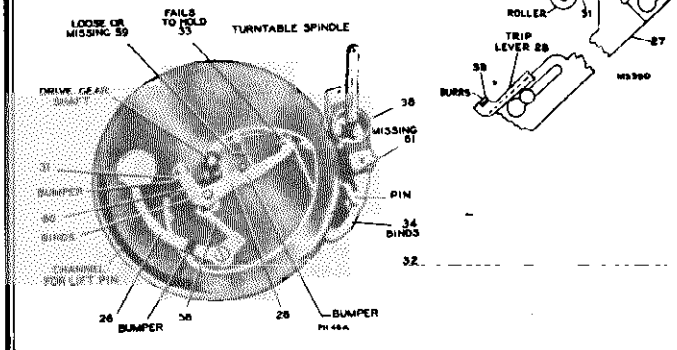
3. Continuous Tripping (see sketches below)

A. Trip lever (28) fails to hold clutch engagement lever (33).
   a. Loose or missing trip lever spring (59).
   b. Bind in trip lever bearing.
   c. Formed edge on manual reject slide (27) touching trip dog (31) (bend away).

B. Bind in stop lever (34), fig. (2).

C. Missing stop lever spring (61).

D. Control knob fails to return to automatic position due to bind in control slide, and associated parts. Missing spring (64), fig. (3).



4. Feed-back or Howl

This condition is caused by sound from the speaker getting back into the input of the amplifier.

A. Inspect motor board mounting to determine whether the clamp nuts have been loosened.

B. Make certain no portion of the mechanism is touching the cabinet. The mechanism should be free floating on mounting springs.

C. Check and replace any microphonic tube in reproducing system.

5. Failure to Trip (see sketches below)

A. Pickup jumping grooves due to improper pickup pressure, or foreign material clogging up sapphire guard.

B. Bind in trip dog (31), bearing or missing spring (60).

C. Tripping adjustments improperly set.

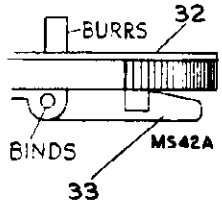
D. Trip lever spring (59) having too much tension.

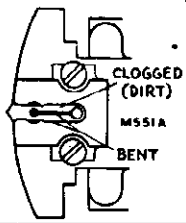
E. Burrs on trip lever (28).

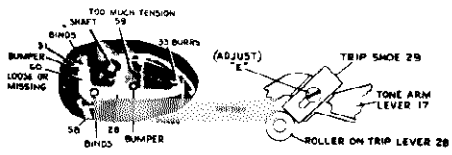
F. Bind in trip lever bearing.

G. Bind in tone arm bearing.

H. Clutch engagement lever (33) bent or binding. (It should be free to drop under its own weight when disengaged from trip lever.)







MODELS 960001-1, 960001-2, 960001-3

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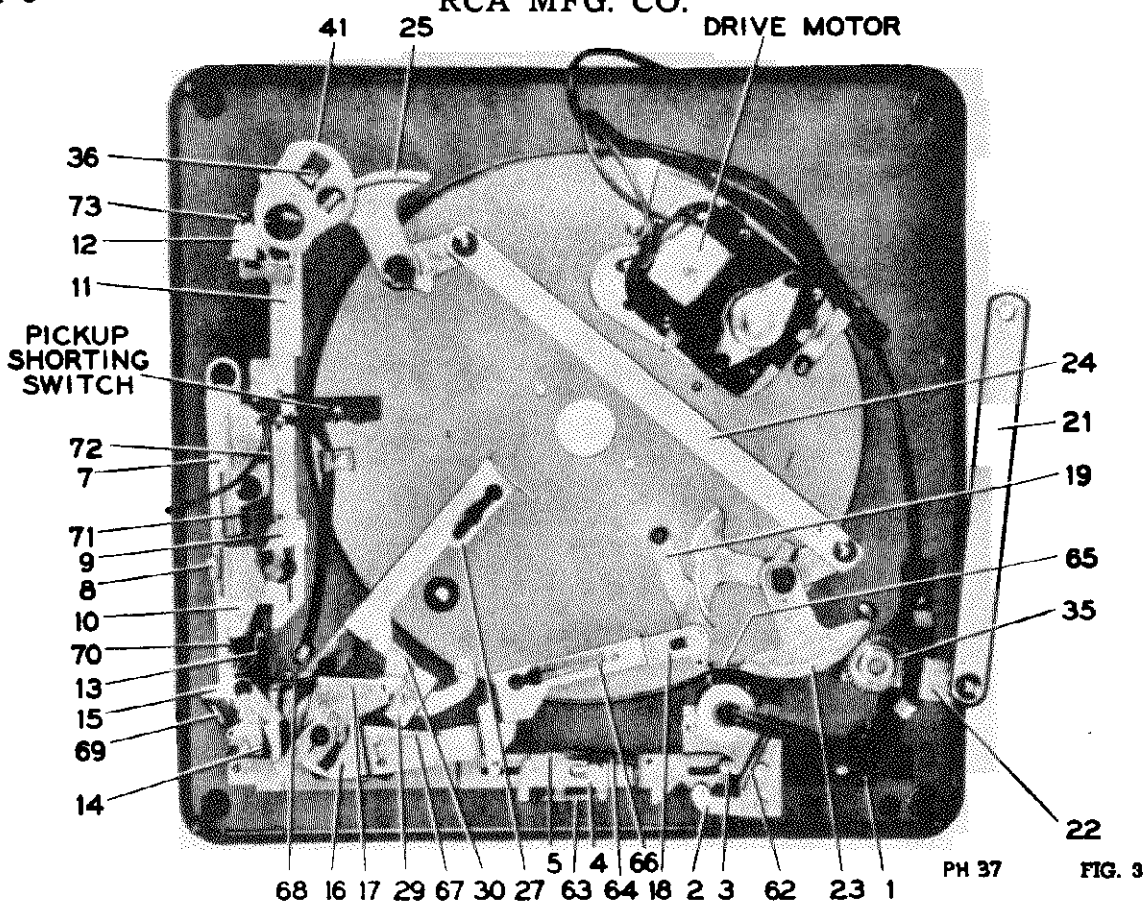


FIG. 3

6. Insufficient power to complete cycle.

A. Grease or oil on inner rim of turntable and rubber tire idler.

B. Insufficient tension of spring (57), fig. (1), on drive idler.

C. Defective drive motor.

D. Binding in series of levers, pivots, etc.

a. Drive link assembly (20), fig. (2).

b. Selector arm shaft assembly, fig. (1).

c. Drive gear (32), fig. (4), shaft.

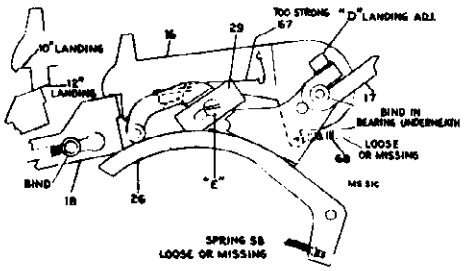
d. Poor gear mesh due to misalignment or defective teeth.

e. Bent record separator blades causing a jam, fig. (1).

G. Spring (66) having more tension than spring (65).

H. Spring (67) out of position causing false edge on lever (16).

I. Tone arm fails to move in because of bind in slide (4), or missing spring (64) keeping lever (16) latched.

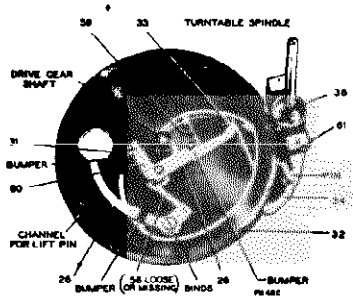


7. Records do not drop properly.

A. Separator arms improperly timed. (See timing adjustments.)

B. Bent separator blades.

C. Bent turntable spindle.



8. Improper pickup landing (adjacent sketches)

A. Landing adjustment improperly set.

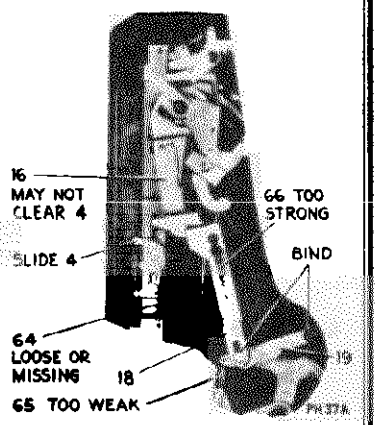
B. Bind in tone arm bearing.

C. Bind of slide (18) and lever (19) on studs.

D. Missing spring (65) or (66).

E. Bent or improperly shaped lever (16).

F. Missing or loose spring (68).



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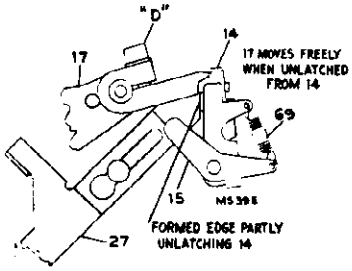
9. Repeating grooves (see sketches below)

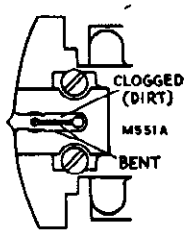
A. Insufficient pickup pressure.

B. Bind in tone arm pivot.
Place control knob in "manual" position and move tone arm in toward spindle and back. After the end of the tone arm lever (17) (functioning as a detent) leaves latch (14) the tone arm should have free and smooth action.
(If latch (14) is too positive, bend formed edge on manual reject slide (27) which contacts latch (14).)

C. Check for bind in tone arm lift pin (51).

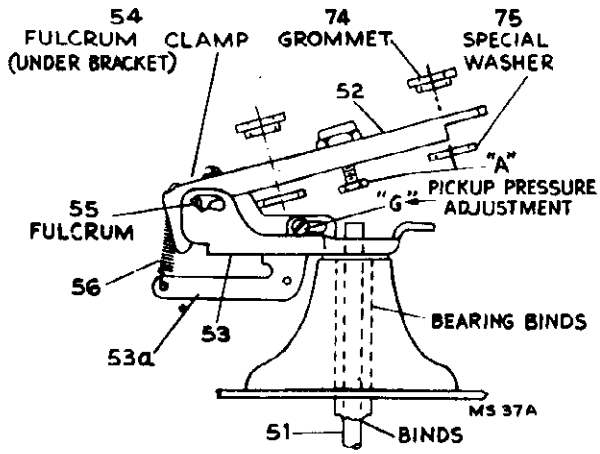


SHOWN IN MANUAL POSITION



D. Sapphire shield filled with foreign material, preventing sapphire from setting into grooves.

E. Bent sapphire mounting thereby allowing sapphire guard to ride on record.



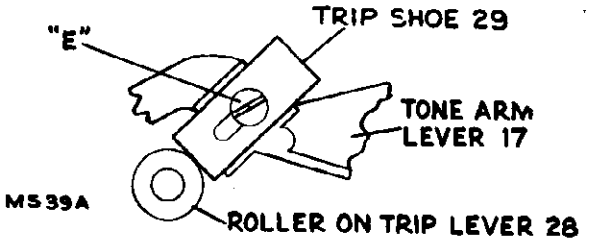


FIG. 23

Tripping Adjustment

No eccentric tripping adjustment is necessary. It is automatically adjusted when landing adjustment is made.

For closed circle trip, loosen set screw "E" fig. (23), and set trip shoe (29) so as to contact roller on trip lever (28) when the sapphire is approximately 1⅝" from side of turntable spindle.

Tone Arm Height Adjustment

1. The height of the tone arm while in the rest position is that which will allow the bottom edge of the tone arm and cartridge to clear the turntable surface by 1/16".
   The height is adjusted by bending the formed edge on lower half of tone arm bracket fig. (24).
2. Tone arm height adjustment screw "A", fig. (24), should be so adjusted to allow a clearance of 1/16 inch between tone arm and record on selector arm while mechanism is in cycle.

Pickup Pressure Adjustment

By the use of a pocket postal scale hooked on the sapphire end of the tone arm, loosen set screw "G", fig. (24), and move slide until tension of spring (56) allows 1 to 1¼ oz. pickup force for model 960001-2 and 1½ to 1¾ oz. for models 960001-1 and 960001-3.

Landing Adjustment

1. With the power removed from the mechanism, place a 10-inch record on the turntable and turn the selector cam to 10-inch position.
2. Push selector knob to reject and release.
3. Push down on the small section of lever (50), fig. (20), which protrudes through selector arm #2 and rotate turntable by hand until the pickup is about to land.
4. Loosen set screw "D", fig. (25).
5. Hold tone arm lever (17) against tone arm locator (16) with just enough force so as not to have tone arm locator (16) move away from slide (18).
6. While holding the position as stated in "5," move pickup to the landing point on the record. Leave very little vertical play in tone arm bearing but just enough to have free motion of tone arm. Tighten set screw "D".
7. Apply power to mechanism and test by playing through a stack of records.

Note: Twelve-inch record landing will automatically be adjusted while adjusting 10-inch landing.

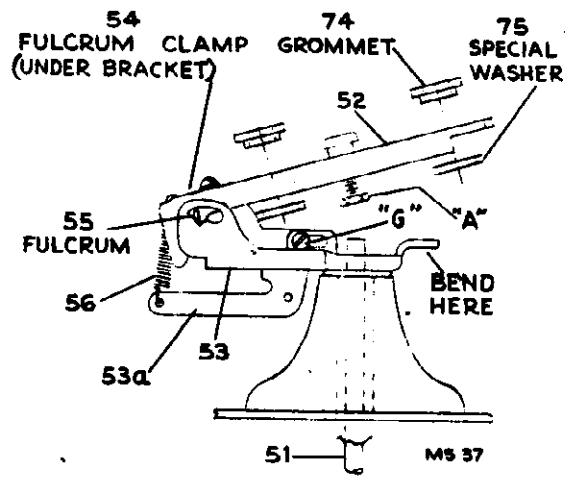


FIG. 24

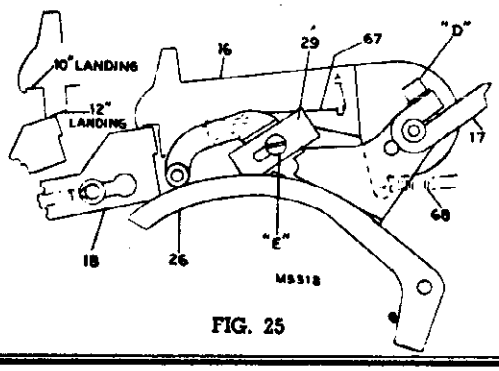


FIG. 25

MODELS 960001-1, 960001-2, 960001-3

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10. Premature tripping.

A. Defective record.
B. Trip shoe (29), fig. (3), improperly set.
C. Trip lever spring (59), fig. (4), insufficient tension.
D. Bind in trip dog (31), fig. (4), pivot.

11. Noise coming from speaker during record change cycle.

Pickup shorting switch failing to short out pickup.

12. No output.

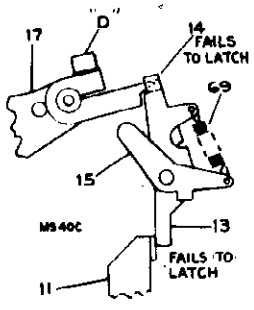
A. Defective crystal cartridge.
B. Broken or bent sapphire mounting.
C. Broken or shorted pickup cable.
D. Pickup shorting switch making contact.
E. Inoperative reproducing system.

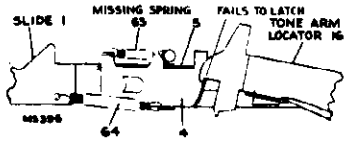
13. Distorted output.

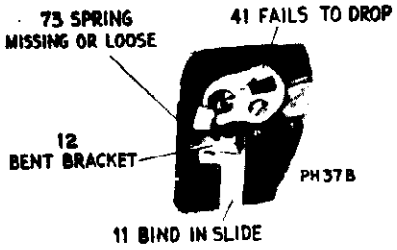
A. Defective pickup cartridge.
B. Bent or loose sapphire mounting, allowing sapphire to ride irregular in groove.
C. Sapphire guard filled with foreign material such as dust and lint which accumulates on the records while in storage.
(Remove with small brush.)

14. Tone arm fails to go to rest position at the finish of the last selection (see sketches below)

A. Control knob fails to return automatically to "off" position.
1. Cam (41) fails to drop down, thereby preventing stud on stop bracket (12) from contacting it.
2. Missing stop bracket spring (73).
3. Missing stud on bracket (12).
4. Bind in shut off dog (8), fig. (3), and trip (9).
5. Formed edge on slide (11) not locking tone arm latch (13).
6. Tone arm latch (14) bent thereby not locking tone arm and allowing it to be pushed in by lever (16).

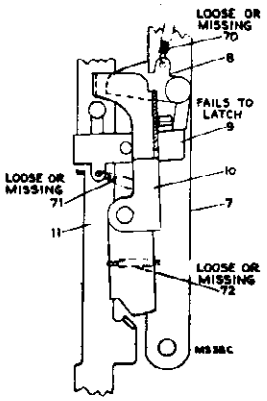


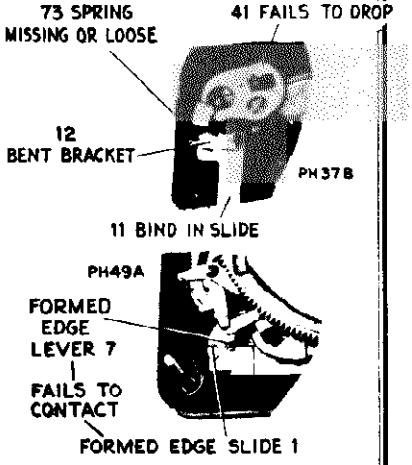




15. Turntable fails to stop at the end of the last selection (see sketches below)

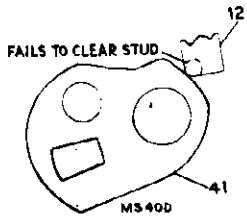
A. Defective motor switch.
B. Bind in levers actuating drive motor power switch, fig. (2).
C. Control lever fails to move automatically to "off" position as described in 14A—one to five.
D. Small formed edge on lever (7) may fail to contact formed edge on slide (1) thereby not pulling slide (1) and not moving control to "off" position.

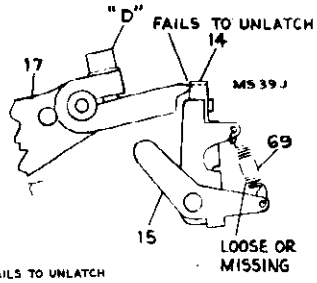


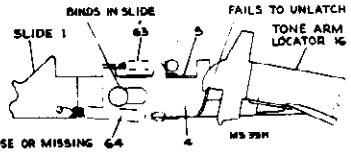


16. Pickup fails to move in for landing (see sketches below)

A. Tone arm locator (16) lever fails to unlatch from slide (4).
B. Tone arm lever (17) fails to unlatch from tone arm latch (14).
C. Missing spring (69).
D. Bent shut off slide bracket (12) which may allow cam (41) to contact at incorrect time.
E. Weak or missing spring (73), fig. (3), thus allowing slide (11) to move in and lock latch (13).







17. Power is removed from motor as pickup lands on record.

A. Shut off slide bracket (12), fig. (3), may be bent.
B. Low tension or missing spring (73), fig. (3).

Removing Main Assemblies

Removing Turntable

To remove turntable, lift straight up with a rotary motion.

Removing Separator Arms

To remove separator arm, loosen set screws and lift off.

Removing 12 in. Separator Blade

Remove Separator arm and by the use of a small screw driver remove the small screw up inside the separator sleeve (see fig. (21)). This removes the knob and 12 in. blade. The 10 in. blade is not removable.

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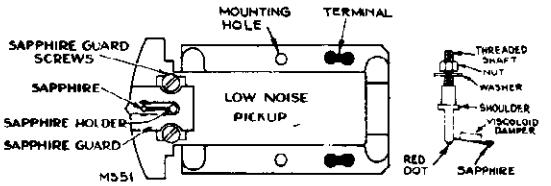
Removing Sub-assembly

To remove the large gear sub-assembly, remove the turntable and remove the two small screws on either side of the turntable spindle. Also remove the large nut holding the gear shaft. The entire gear bracket, etc., can be removed easily.

Removing Tone Arm

To remove the tone arm from the mounting bracket, it is necessary to remove the two screws located under the pivot end of the tone arm. These screws are more accessible if the bracket and shaft are removed by loosening bolt "D" as indicated in fig. (16).



LOW NOISE PICKUP

Note: Stock #39851 has red dot on bottom of sapphire holder, 13.5 mil. dia. sapphire mounting wire, but no viscoloid damper. Stock #70332 has viscoloid damper on sapphire mounting wire.

Repalcement of Sapphire

Caution: Never bend the sapphire support wire.
The nut on the sapphire holder assembly is locked by a light cement (such as Glyptal). Extreme care should be used when loosening the nut so that the twisting motion does not break the crystal.

Remove the two screws holding the sapphire guard in place and remove guard. Remove the small nut and washer on the threaded shaft of the sapphire holder and push the shaft through the hole in the mounting until the sapphire holder assembly comes free.

Use of a drop or two of acetone will facilitate the removal of the nut and shaft. Do not use force as the crystal may be broken.

Insert threaded shaft of replacement sapphire holder through mounting and replace the washer and nut. Make sure that the sapphire is in the correct position. Take hold at the lower end of the shaft with a pair of pliers while tightening the nut, being very careful so as not to strip the threads or break the crystal. Replace the sapphire guard, positioning it by means of the oversize screw slots. Make certain that the sapphire and its supporting wire are centered in the guard. Tighten the guard screws. Before using, check to see that the sapphire projects far enough (approx. .020) beyond the guard so that the guard will not strike the record. If necessary, bend the guard a little. Apply a drop of light cement (such as Glyptal) to the sapphire nut holder.

Replacement Parts

STOCK No.	DESCRIPTION
	PICKUP AND ARM ASSEMBLIES
71294	Arm—Pickup arm shell only
71311	Bracket—Hinge bracket and shaft assembly (53), fig. (24)
71327	Bracket—Tone arm bracket assembly (52), fig. (24)
71325	Clamp—Fulcrum clamp (54), fig. (24)
39851	Crystal—Pickup crystal cartridge for Models 960001-1 and 960001-3
70332	Crystal—Pickup crystal cartridge for Model 960001-2
71326	Fulcrum—Tone arm fulcrum (55), fig. (24)
31048	Plug—Pin plug for pickup cable
38449	Sapphire—Sapphire and holder for #70332
39863	Sapphire—Sapphire and holder for #39851
71312	Slide—Counter balance adjusting slide (53a), fig. (24)
71307	Spring—Counter balance spring (56), fig. (24)
	MOTOR ASSEMBLIES
	Stamped L230231
71138	Spring—Spring to convert 60 cycle motor stamped L230231 to 50 cycle
71391	Wheel—Idler wheel for motor L230231
	MOTOR ASSEMBLIES
	Stamped L230161
71410	Motor—Motor, 117 volt 60 cycle, complete
71412	Spring—Idler wheel tension spring for motor #L230161
71137	Spring—Spring to convert 60 cycle motor stamped L230161 to 50 cycle
71411	Wheel—Idler wheel for motor #L230161
	MOTOR ASSEMBLIES
	Stamped L230200
71414	Spring—Idler wheel tension spring for motor #L230200
71138	Spring—Spring to convert 60 cycle motor stamped #L230200 to 50 cycle
71413	Wheel—Idler wheel for motor #L230200
	OPERATING MECHANISM
71353	Arm—Detent arm assembly (2), fig. (3)
71375	Arm—Drive arm assembly (22), fig. (3)
71377	Arm—Selector arm #1 and blade (10 in.) assembly (45), fig. (1) (minus knob)
71381	Arm—Selector arm #2 and blade (10 in.) assembly (43), fig. (1) (minus knob)
71357	Blade—Pickup shorting switch blade assembly, fig. (3)
71379	Blade—Selector blade, 12 in. (49), fig. (20)
71344	Bracket—Shutoff bracket (10), fig. (3)
71383	Bracket—Shutoff selector bracket assembly (50), fig. (20)
71327	Bracket—Shutoff slide bracket assembly (12), fig. (3)
71314	Bumper—Retard lever rubber bumper (on lever 26), fig. (4)
71359	Bumper—Tone arm rubber bumper (on motor board)
71317	Bumper—Trip dog rubber bumper (on trip dog 31) fig. (4)
71318	Bumper—Trip lever rubber bumper, fig. (4)
71373	Cam—Shutoff cam shaft assembly (41), fig. (21) or fig. (3)
71330	Cover—Switch cover
71331	Escutcheon—Control escutcheon
71365	Gear—Pinion gear (37), fig. (5)
71386	Gear—#1 post gear (35), fig. (3)
71388	Gear—Drive gear sub-assembly (32), fig. (4)
71374	Gear—Post gear #2 (36), fig. (22) and fig. (3)
71328	Grommet—Rubber mounting grommet (motor) (3 required)
71321	Grommet—Tone arm mounting grommet (74), fig. (24)
71363	Housing—Spindle housing and bushing assembly (38), fig. (4)
71335	Hub—Tone arm locator hub (die cast hub bolted to motor board beneath tone arm bearing)
71328	Insulator—Switch cover insulator
71334	Knob—Control knob assembly
71378	Knob—Selector arm knob #1 assembly (48), fig. (1)
71382	Knob—Selector arm knob #2 (44), fig. (1)
71346	Latch—Tone arm latch (center) (13), fig. (12)
71347	Latch—Tone arm latch (inner) (14), fig. (12)
71348	Latch—Tone arm latch (outer) (15), fig. (12)
71350	Lever—Reset lever assembly (18 and 19), fig. (8)
71305	Lever—Drive gear stop lever assembly (34), fig. (4)
71340	Lever—Shutoff lever assembly (7), including shutoff dog (8), fig. (3)
71358	Lever—Tone arm lever assembly (17), including roller and knurled edge (30), fig. (3)
71368	Lever—Trip lever assembly (28), including trip dog (31) and roller, fig. (4)
71370	Lever—Tone arm retard lever (26), fig. (4)
71368	Lever—Clutch engagement lever (33), fig. (5)
71309	Link—Connecting link (6), fig. (2)
71367	Link—Drive link assembly (20), fig. (2)
71336	Locator—Tone arm locator (16), fig. (3)
71332	Lockout—Manual lockout assembly (4 and 5), including slide (1), fig. (3)
71319	Pin—Stop lever pivot pin (mounting pin), fig. (4)
71316	Pin—Tone arm lift pin (51), fig. (24)
71362	Plate—Segment tie plate (24), fig. (3)
71352	Plate—Switch plate assembly
71297	Plate—Thrust plate (39), fig. (2)
71376	Rod—Drive link connecting rod (21), fig. (2)
71315	Roller—Drive link roller on link (20), fig. (2)
71303	Screw—Retard lever screw (mounting screw for lever (26)), fig. (4)
71360	Segment—Segment #1 assembly (23), fig. (3)
71361	Segment—Segment #2 assembly (25), fig. (3)
71366	Shaft—Drive gear shaft, fig. (4)
71371	Shaft—Selector shaft #1 assembly (46), fig. (17)
71380	Shaft—Selector shaft #2 (42), fig. (21)
71313	Shoe—Trip shoe (29), fig. (3)
71372	Sleeve—Selector shaft sleeve (47), fig. (17)
71333	Slide—Manual reject slide (27), fig. (3)
71338	Slide—Shutoff slide (11), fig. (3)
71364	Spindle—Turntable spindle assembly
71355	Spring—Detent arm spring (62), fig. (3)
71308	Spring—Manual lockout spring (inner) (64), fig. (3)
71298	Spring—Manual lockout spring (outer) (63), fig. (3)
71399	Spring—12 in. reset slide spring (66), fig. (3)
71351	Spring—Reset lever spring (65), fig. (3)
71345	Spring—Shutoff bracket spring (72), fig. (3) or fig. (14)
71341	Spring—Shutoff lever spring (70), fig. (3)
71339	Spring—Shutoff slide spring (73), fig. (3)
71343	Spring—Shutoff trip spring (71), fig. (3)
71300	Spring—Stop lever spring (61), fig. (4)
71223	Spring—Tone arm booster spring (67), fig. (3)
71349	Spring—Tone arm latch spring (outer) (69), fig. (3) or fig. (12)
71306	Spring—Tone arm locator and latch spring (68), fig. (3)
71301	Spring—Trip dog spring (60), fig. (4)
71304	Spring—Trip lever spring (59), fig. (4)
71302	Spring—Retard lever spring (58), fig. (4)
71356	Strip—Contact mounting strip assembly (part of pickup shorting switch), fig. (3)
71320	Switch—Power switch, fig. (2)
71342	Trip—Shutoff trip assembly (9), fig. (3)
71385	Turntable—Turntable assembly
71322	Washer—Tone arm special washer (75), fig. (24)
71298	Wafer—Thrust wafer (40), fig. (2)
71292	Washer—"C" washer (large)
71295	Washer—"C" washer (small)

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MODELS 960001-1,960001-2,
960001-3

RCA MFG. CO.

Automatic Cycle of Operation

Function	Explanation
Lift and turn selector arm as required for 10- or 12-inch records. Place stack of records on arms.	1. The rotation of selector arm #1 moves selector arm #2 through the mechanical linkage of gear (35), fig. (19), segment (23), tie plate (24), segment (25) and gear (36). 2. Portion of segment (23), fig. (19), slides against set lever (19) thereby determining the point of contact of slide (18), fig. (8), with tone arm locator (16), which in turn governs the pickup landing position.
Push control lever to reject position and release.	1. Control slide (1), fig. (3), actuates manual reject slide (27) through coupling link (6), fig. (2). 2. Manual reject slide (27), fig. (3), pushes against stud above small roller on trip lever (28), fig. (4). 3. The action of trip lever (28), fig. (4), unlatches clutch engagement lever (33) allowing it to drop and engage projection on pinion gear (37), fig. (5). This engagement between lever (33) and pinion gear (37) causes the teeth of drive gear (32) to engage the teeth of pinion gear (37) starting cycle.
Drive gear (32) rotates.	1. Gear (32), fig. (6), rotates with stop lever (34), leaving notch and at the same time pickup shorting switch leaving raised portion of gear causing it to close, shorting out the pickup. 2. Roller on drive link (20), fig. (19), follows channel in drive cam. 3. Energy is transferred from drive link (20) to separator arm #1 through drive link (21), arm (22) and sleeve (47), fig. (17). 4. Separator arm #1 connected to gear (35), fig. (19), starts rotating. 5. Separator arm #2 mechanically linked through gear (35), segment (23), tie plate (24), segment (25) and gear (36) follows in rotation.
Tone arm moves out.	1. As the channel cut in rotating gear (32), fig. (9), moves, lift pin (51) raises contacting adjustment screw "A", fig. (24), on tone arm and raising tone arm. 2. Roller located on end of tone arm lever (17), fig. (8), comes in contact with portion of cam on gear (32), fig. (4), and is pushed outward and against tone arm locator lever (16), fig. (8), which is held under tension of spring (58). 3. Tone arm is locked by tone arm latch (14), fig. (12), and held from being pushed in by locator lever (16), fig. (8). 4. As drive gear continues to rotate, clutch engagement lever (33), fig. (5), is returned to normal position by sliding against edge of tone arm lever (17), fig. (8), as gear supporting it passes by.
Separator arms rotate and drop record to turntable.	1. Blades separate lower record from stack and support the stack while the record is being dropped. 2. Record drops. 3. Tone arm lever (17) is unlatched from latch (14), fig. (7), due to latch (15) making a momentary contact with raised portion of gear.
Tone arm moves in.	1. Tone arm lever (17), fig. (8), which is connected to tone arm is being moved in by locator lever (16) which is working under the tension of spring (68). During this motion tone arm lever (17) is stabilized by tone arm retard lever (26) until locator lever (16) engages slide (18) to determine 10- or 12-inch landing position. 2. Pickup is lowered to the record by lift pin (51), fig. (9), moving into channel in gear. 3. An instant before rotating gear comes to the rest position and stop lever (34), fig. (4), engages notch in gear (32), the pickup shorting switch is opened due to the blade coming in contact with raised portion of gear (32). 4. As pickup is landing and gear is returning to normal position the stud located on underside of gear (32) pushes shut-off bracket (10), fig. (13), outward. The action at this point is not transferred since shut-off dog (8), fig. (10), and shut-off trip (9) are not latched thereby allowing shut-off bracket (10) to slip by over the curved portion of the shut-off dog (8). If shut-off bracket (10) should contact straight edge of shut-off dog (8) as it does when latched to shut-off trip (9), shut-off lever (7) would pull slide (1), fig. (3), and remove power from drive motor. 5. The instant pickup lands, feed-in spring (67), fig. (8), pushes pickup into starting groove.

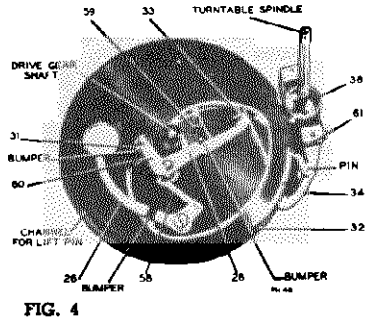

FIG. 4

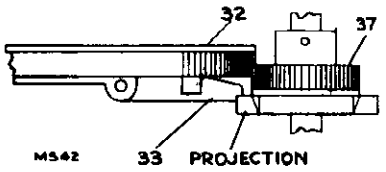

FIG. 5

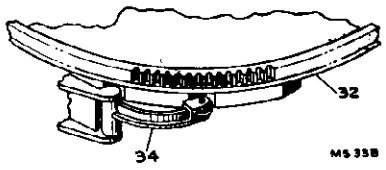

FIG. 6

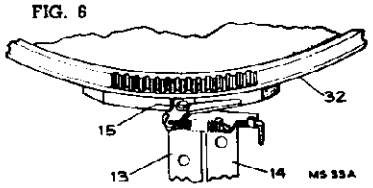

FIG. 7

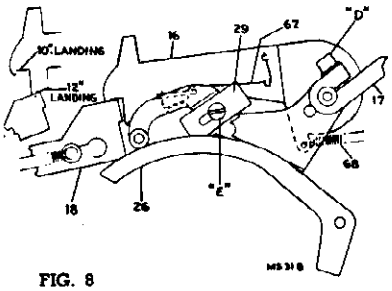

FIG. 8

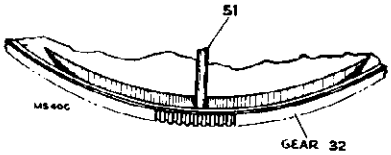

FIG. 9

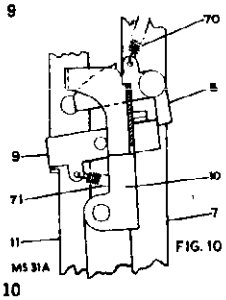

FIG. 10

FIG. 10

RCA MFG. CO.

MODELS 960001-1, 960001-2
960001-3

Function	Explanation
Record plays.	1. Pickup moves toward center of record and into trip groove. 2. In the case of an eccentric groove the tone arm lever (17), fig. (3), moves in and the trip plate (30), fig. (4), engages trip dog (31) moving trip lever (28) and starting cycle. 3. In the case of a record with a closed circle trip the trip shoe (29), fig. (23), pushes against roller on trip lever (28), fig. (4), thus starting cycle.
Mechanism plays entire stack automatically.	Separating and dropping records, tripping, etc.
Last record has dropped and record plays.	1. Up to this time shut-off cam (41), fig. (21), located on bottom end of selector arm #2 has been held up by weight of records on selector arm applying pressure on the small raised portion of shut-off selector bracket (50), fig. (20), which is protruding through selector arm. 2. Pickup moves into trip, and drive gear (32), fig. (4), starts rotating. 3. Since cam (41), fig. (11), has dropped and is rotating with selector arm #2 its surface contacts stud on shut-off slide bracket (12). This transmits energy to shut-off slide (11), fig. (14), which permits shut-off dog (8) and shut-off trip (9) to latch. 4. Shut-off slide (11), fig. (12), locks tone arm latch (13) during the time, portion of the rotating drive gear is contacting tone arm latch (15), fig. (7), and tending to unlatch it. The tone arm remaining latched, prevents it from being pushed in by locator lever (16), fig. (8). 5. Tone arm is lowered to rest as lift pin (51), fig. (9), goes into channel in gear (32). 6. As gear (32) comes to rest stud, fig. (13), located on underside of gear (32) contacts and pushes shut-off bracket (10) outward. Since shut-off dog (8), fig. (14), and shut-off trip (9) are latched, shut-off bracket (10) contacts flat surface of shut-off dog (8) pushing shut-off lever (7) outward. 7. Shut-off lever (7) in its outward movement contacts lip on slide (1), fig. (3), pulling control knob to "off" position, cutting off the power to the drive motor. During this action, shut-off dog (8), fig. (14), and shut-off trip (9) are unlatched.

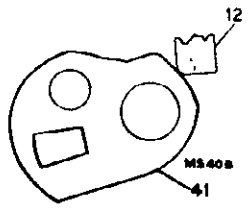

FIG. 11

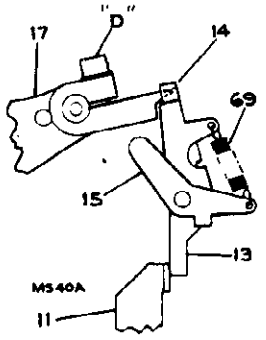

FIG. 12

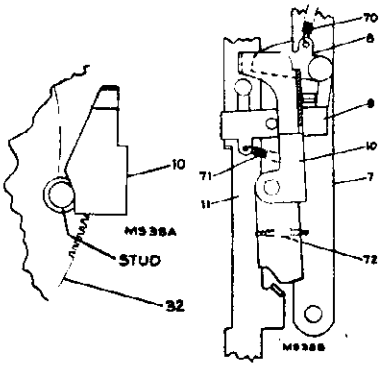

FIG. 13 FIG. 14

Manual Cycle

Function	Explanation
Push control knob to manual.	1. Slide (1), fig. (3), supporting-control knob moves and positions "manual" lock-out slides (4) and (5), fig. 15), so as to have slide (4) engage and hold tone arm locator (16) and prevent it from pushing tone arm lever (17), fig. (8), in for pickup landing. 2. Slide (1), fig. (3), also energizing manual reject slide (27), fig. (16), so as to have the lip on slide (27) push against tone arm latch (14), moving the point of contact on tone arm lever (17) to the very edge. This permits tone arm lever (17) to slip by when tone arm is moved manually. 3. The movement of manual reject slide (27) has so positioned the slide so as to lock the clutch engagement lever (33) and prevent it from engaging offset in pinion gear (37), fig. (5), when trip lever (28), fig. (16), is moved. 4. All portions of the cycling mechanism are locked during manual operation and remain stationary with the pickup shorting switch in the off position at all times, excepting Models –2 and –3 which have an additional switch, shorting out pickup when tone arm is in the rest position. Note: When operating manually the tone arm should always be returned to rest position before moving control knob to the off position. If this procedure is not followed the trip lever (28) may not hold the clutch engagement lever (33) allowing it to drop and start cycle.
Allen wrenches required for adjustments.	3/32 in. between flats, for Allen wrenches required for adjustments on set screws #10 and 12, stock #22111. 5/32 in. between flats, for 5/16 in. set screws, stock #22113. 3/16 in. between flats, for ⅜ in. set screws, stock #26581.

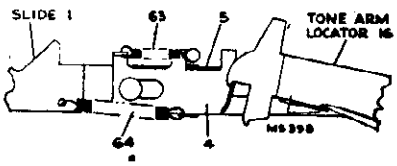

FIG. 15

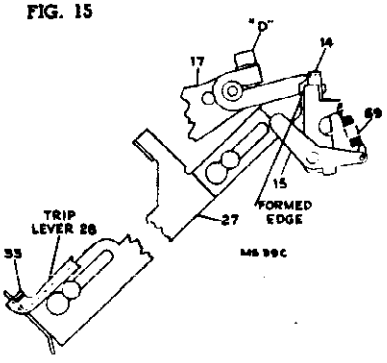

FIG. 16

MODELS 960001-1, 960001-2, 960001-3 RCA MFG. CO.

Check on Timing Adjustments

A quick check for correct timing of mechanism can be made by:

1. Have mechanism out of cycle.
2. Lift and turn separator arm #1 to 10 in. position and place a 10 in. record on arms.
3. The 10 in. separator blade should have a definite relation to record as illustrated in fig. (18) when segment (23) is against tie plate (24) as illustrated in fig. (19). If so, selector arm #1 is correctly timed.
4. If the 10 in. blades of both arms have the same distance from the record, remove record and lift and turn selector arm #1 counterclockwise as far as it will go (viewed from top).
5. Segment (25) should be against tie plate (24) when the teeth of segment (25) and gear (36) are meshed as shown in fig. (22). If this exists, timing of selector arm #2 is correct.

Timing Adjustments for Record Separators

1. Make certain mechanism is out of cycle and all parts in their proper place by comparing the mechanism with sketches and photographs.
2. Remove "C" washer on bearing of segment (23), fig. (19), and disengage the teeth of segment (23) and selector arm gear (35).
3. Selector arm #1, fig. (17), should be in place with the pin of selector shaft engaged in the large slot of selector arm and the small projection of selector arm sleeve (47) engaged in the small slot of the selector arm. Arm (22), fig. (19), should also be in place and connected to the drive link (20) and drive link connecting rod (21).
4. Loosen set screw "B", fig. (17), and wedge some object such as a screw driver in the clamp of arm (22) so as to allow free movement of selector arm sleeve (47).
5. Place 10-inch record on selector arms and turn selector arm #1, fig. (18), until the 10-inch blade is approximately ¼ inch from the edge of the record.
6. Tighten set screw "B", fig. (17).
7. Rotate the disengaged segment (23), fig. (19), clockwise until tie plate (24) comes against stop on segment (23). Hold in this position while engaging teeth of segment (23) and teeth of gear (35).
8. Replace "C" washer on segment (23).
9. Remove "C" washer on rod (41), fig. (21) (under selector arm #2) and remove cam and rod (41).
10. Remove "C" washer on bearing of segment (25), fig. (22), and disengage teeth of segment (25) and gear (36).
11. Lift and rotate selector arm #1, fig. (22), counter-clockwise until stop on segment (25) is against tie plate (24).
12. Engage teeth of segment (25) and gear (36) so as to have the first tooth of segment gear (25) engage the gear (36) between the first and second tooth next to slot as shown in sketch, fig. (22). Replace "C" washer or bearing of segment (25).
13. Loosen set screw "F" and rotate selector arm #2 until ten-inch separator blade is the same distance from the edge of the record as selector arm #1, fig. (18).
14. Tighten set screw "F", fig. (22).

    Note: Do not try to position separator arm #2 by loosening small set screws on arm proper. The factory has countersunk the shaft, seating the set screws.

15. Replace cam (41), fig. (21), with the end going up through hole in plate (50), fig. (20). Insert "C" washer, fig. (21), to hold in place.

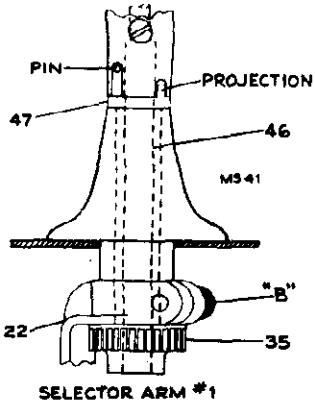

FIG. 17

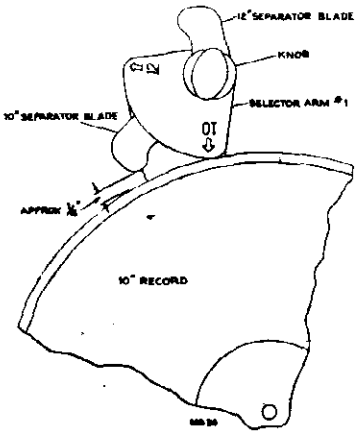

FIG. 18

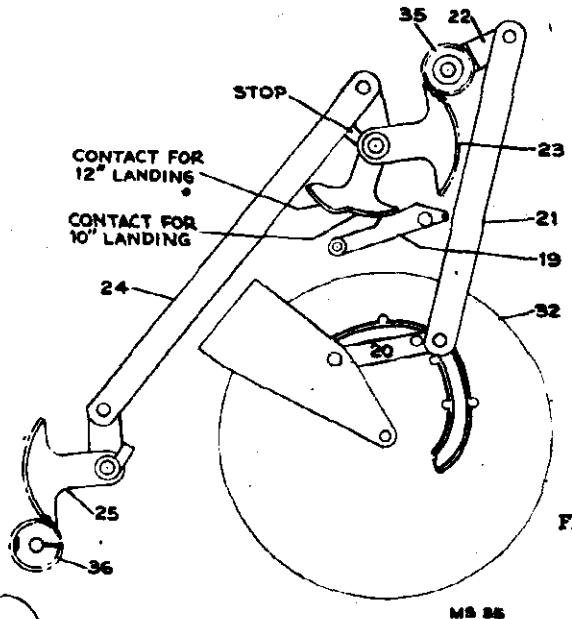

FIG. 19

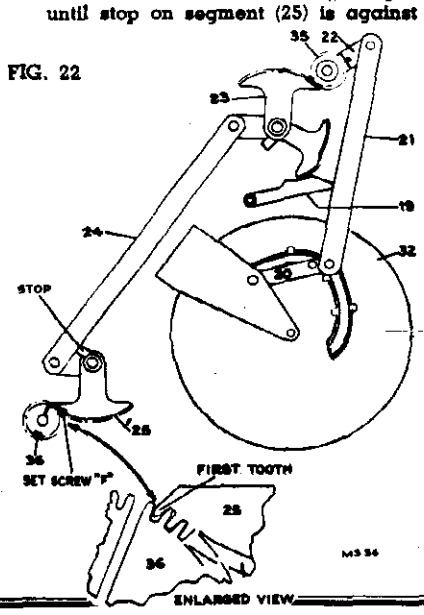

FIG. 22

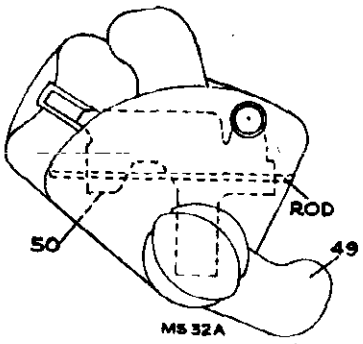

FIG. 20

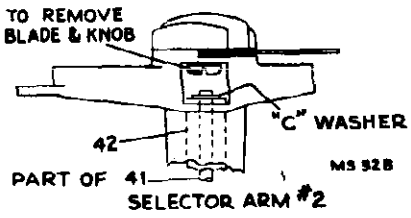

FIG. 21

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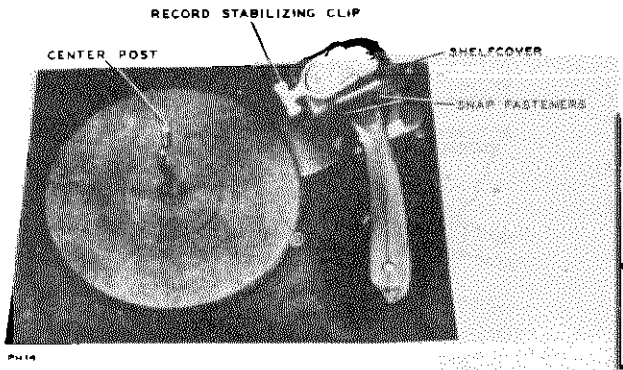

Model No. 960015

Automatic Record Changer

SERVICE DATA

— 1945 No. 11 —

RADIO CORPORATION OF AMERICA
RCA VICTOR DIVISION
CAMDEN, N. J., U. S. A.

Alternate tone arm provided with a long life semi-permanent needle

Features

1. This mechanism is designed to play automatically a series of twelve 10-inch or ten 12-inch standard records of the 78 r.p.m. type.
2. It will play manually records up to 12 inches in diameter.
3. Tripping system is of "constant diameter" type, insuring reliable automatic operation on all records made to RMA proposed standards.
4. It is a simple operation of turning one record support to change from 10 to 12-inch records or vice versa.
5. Cycling mechanism is disconnected completely while records are being played. This reduces the load on the drive motor, thereby reducing the tendency for "wow" or rumble.
6. Mechanism can be adapted for 50 cycle operation by interchanging the spring sleeve slipped over the shaft of the drive motor.
   On motors provided with a solid sleeve on drive shaft, slip the correct conversion spring sleeve over solid sleeve.

Automatic Operation

1. With the power switch in the off position rotate the record support shelf as required for 10 or 12-inch records until the record size indicated on the support cover is pointing toward the center post.
2. Place the records to be played in a stack with desired selections upward and in proper sequence with the last record on top. Load them on the changer by placing them over the center post and resting on the record support shelf. Place record stabilizing clip on top of the record stack.
3. Turn power switch on and press down firmly but momentarily on the end of the tone arm and let go. The changer will continue to play the entire stack automatically.
   The tone arm can be moved to the rest position any time the mechanism is not in cycle.
4. Turn the power switch off and remove the stack from the turntable by placing fingers of both hands directly opposite and under the stack. Then lift straight up—"don't tilt" or squeeze stack. Turning the support shelf one-fourth turn facilitates removal of records.

   NOTE: DO NOT OPERATE MECHANISM WITH THE RECORD SEPARATOR SHELF TURNED TO ANY POSITION OTHER THAN THE NORMAL 10-INCH OR 12-INCH OPERATING POSITION.

   When the mechanism is not in use, it should be out of cycle and the tone arm on the rest.

   No attempt should be made to turn record separator shelf while mechanism is in cycle.

Manual Operation

1. Rotate the record separator shelf to 10 or 12-inch position (numerals 10 or 12 pointing towards center post).
2. Place the record to be played on the turntable and turn the power switch on.
3. Place the pickup on the start of the record.
   Note: The mechanism should be allowed to complete cycle before attempting to move tone arm to the rest position.
4. Turn power switch off manually.
5. Remove the record by raising straight up without tilting.

Cautions

1. Do not attempt to handle tone arm while mechanism is in cycle.
2. Never turn the power switch off, leaving the mechanism in cycle for an extended period of time.
3. Do not allow the records to remain on supports when not in use.
4. Do not allow oil or grease to come in contact with any rubber parts.
5. Do not install instrument near source of heat. Excessive heat may damage the pickup cartridge.
6. Do not pack and ship changer without first pushing down on reject button to release catch.
7. When replacing the needle do not tighten set screw excessively as the twisting may crack the crystal.

Functions of Principal Levers

Trip Lever (fig. 4)
When the pickup has moved beyond the end of the recorded section of the record, the trip lever pulls stud (15) past trip catch to start automatic cycle.
Cycling Drive Cam (fig. 5)
Transfers motion from turntable for cycling action.
Cycling Slide (fig. 5)
Provides mounting for cycling cam bearing and transfers energy to tone arm elevating rod and separator slide.
Tone Arm Lever (fig. 6)
Directs the horizontal movement of tone arm.
Tone Arm Locking Cam (fig. 3)
Locks tone arm to record slide actuating lever to provide landing movement.
Tone Arm Elevating Rod (fig. 1)
Transfers motion from cycling slide to elevate tone arm while cycling.
Actuating Lever Shaft (fig. 1)
Transfers motion to and from separator slide.
Record Separator Slide (fig. 2)
Pushes records off support notch on center post.
Center Post (fig. 7)
Main record support incorporating the separator latch.
Separator Latch (fig. 7)
Small slide set in a vertical keyway in the top end of the center post, provides means for separating the records.
Lubrication
Under normal operating conditions the motor should never require oiling.
On points of contact on slides and levers and on all bearing surfaces except the motor bearing use a light application of Lubriplate No. 107.

MODEL 960015

RCA MFG. CO.

Preliminary Adjustments in Assembling Mechanism

1. Make certain the mechanism is out of cycle and all the levers, cams, springs, etc., on the underside of the mechanism are in place by comparing it with sketches and photographs.
2. Latch the reject actuating slide by pulling slide in guide until it engages the reject latch (fig. 4).
3. With the tone arm and record separator shelf removed, assemble the parts shown in fig. 3.
4. Rotate tone arm mounting bracket assembly counterclockwise against stop stud (16), (fig. 3).
5. Studs 17 should be in the position indicated in fig. 3, when the trip stud (15) (fig. 4) is pulled toward the record center post as far as it will go.
6. Tighten set screws "E" (fig. 3), allowing very little vertical play in tone arm pivot (but not binding).
7. Place record separator shelf in position, with the tone arm locking cam in the position indicated in fig. 3.
8. Mount separator shelf with mounting screws "i" (fig. 1).
9. Adjust record slide actuating lever to a position approximately 3/8 inch from bracket as indicated in sketch (fig 2). Tighten set screws "G." Slide actuating lever should be under adjustment studs (A or B) and have enough clearance to prevent touching.
10. When the foregoing adjustments have been made, remove record slide assembly by removing screws "i" and assemble tone arm by snapping mounting hinge over bearing studs.
11. Replace slide assembly by feeding tone arm locking cam, down through the hole in tone arm and engaging studs (17). Make certain all levers remain in correct position while engaging cams and studs (17) and replacing mounting screws "i."
12. Mechanism can now be turned by hand to check its action. It should require only minor adjustments for tone arm height, landing and tripping. A description of these adjustments may be found under their respective heading.

Adjustments

A—12" landing.
B—10" landing.
D—Tone arm height adjustment screw.
E—Locking (set screw) for positioning elevating rod in relation to tone arm.
F—Tripping adjustment.
G—Locking (set screw) for positioning record slide separator actuating lever and landing positioning lever.

Landing Adjustment

1. It is necessary to remove record support cover by prying out the four round clips at the lower edge of the cover.
2. Turn the record support to 10 or 12-inch position and place record on turntable.
3. With power removed from mechanism, push down on reject button and allow to cycle while rotating it by hand. Note where the needle lands.
4. Loosen lock nuts and adjust (B) for 10-inch landing and (A) for 12-inch landing. Turning studs counterclockwise moves the landing in, and turning clockwise moves the landing to the outer edge.
5. Turn power on and allow mechanism to cycle by pressing down on reject button. This should be repeated several times and adjusted until the pickup lands consistently at the beginning of the record.
6. Hold adjustment bolts with wrench and tighten lock nut. Test by playing through a stack of records.

Tripping Adjustment

Tripping should occur when the needle is approximately 1 5/8 inches from the side of center post. If the mechanism fails to trip at the proper point, turn adjustment screw (F) clockwise to delay, and turn counterclockwise to advance the tripping point. Try a few standard records to determine whether tripping is properly adjusted.

Tone Arm Height Adjustment

1. Remove the power from the mechanism.
2. Place a stack of ten 12-inch or twelve 10-inch records on the turntable. With the mechanism in cycle, rotate the turntable by hand. The tone arm should clear the top record without touching the record on support post above.
3. Adjust screw (D) for this condition.

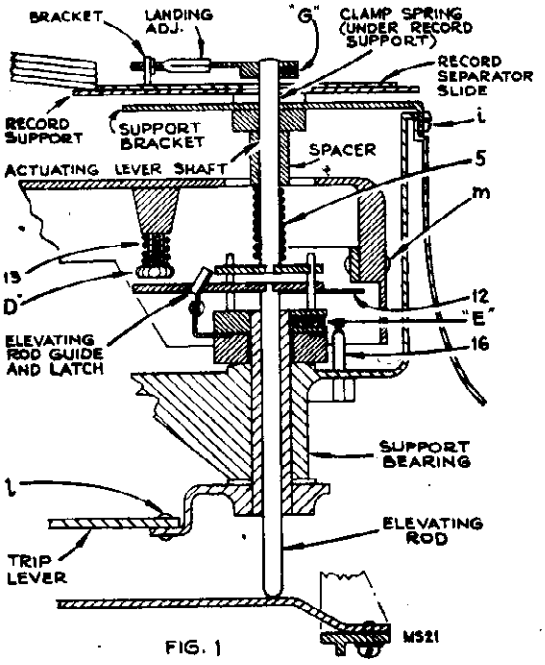

FIG. 1

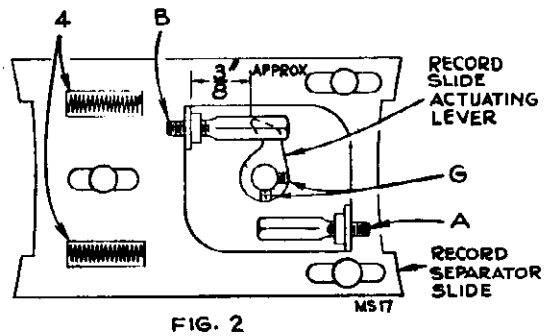

FIG. 2

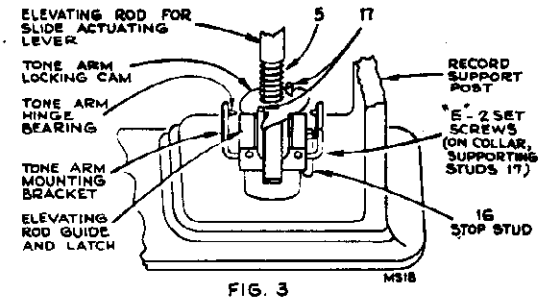

FIG. 3

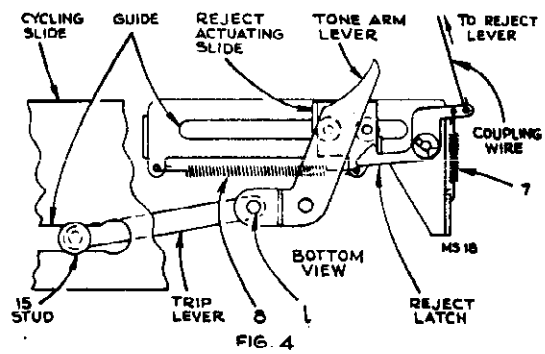

FIG. 4

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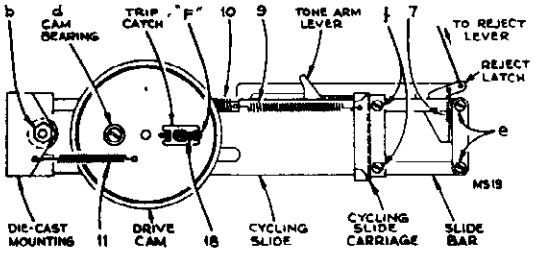

FIG. 5

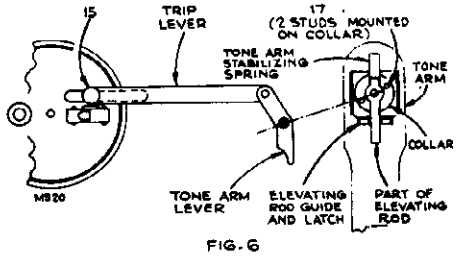

FIG. 6

Cycle of Operation

FUNCTION	EXPLANATION
Power Switch.	1. Energizes drive motor, causing turntable to rotate.
Reject Button.	1. Tone arm is resting on reject button, therefore pushing down on arm actuates reject button. 2. Reject button pushes down on reject lever. 3. Reject lever transfers action to reject latch lever through coupling wire. 4. Reject actuating slide being unlatched, is pulled against tone arm lever by spring (8).
Trip lever moves away from center post.	1. Energy is transferred from tone arm lever to trip lever through hinge bearing (1). 2. Stud (15) slides in guide cut in cycling slide. 3. Stud (15) slides past trip catch.
Cycling cam rotates.	1. Trip catch being free, spring (11) pulls the eccentric drive cam around causing the rubber tire rim to contact the knurled drive roller. 2. The bearing of cycling cam is mounted on cycling slide, therefore rotation of the eccentric cam causes the slide to move on the slide bars, against the tension of spring (10) and away from center post.
Cycling Slide moves away from Center Post. Tone arm raises.	1. Cycling slide being curved at the tone arm bearing end, it starts to push up on tone arm elevating rod. 2. Elevating rod in raising, pushes against adjustment screw (D) causing the tone arm to raise on hinge bearing. 3. Tone arm elevating rod in raising, pushes against record slide actuating lever rod, thus raising the record slide actuating lever. 4. Slide moving further, causes takeup safety slide to push against tone arm lever, thereby moving tone arm out and transferring energy through record slide actuating lever shaft to slide actuating lever. 5. Tone arm locking cam, latches on inner edge of tone arm elevating rod guide. This couples the tone arm to record slide actuating lever through record slide actuating lever shaft. 6. Record slide actuating lever pushes against stud (A or B) causing record slide to push record forward off the center post rest. 7. Record drops and springs (4) cause slide to return to normal position. 8. Stud (A or B) on record slide returning, pushes against slide actuating lever, transferring the motion to tone arm which moves the tone arm in for landing. 9. When cycling slide is moving away from center post towards its limits, slide takeup lever resets the reject actuating slide.
Slide returns and pickup lands.	1. Tension of spring (10) keeps cam in contact with rotating knurled roller, thereby causing cycling slide to return towards its normal position. 2. Cycling cam moving towards minimum diameter is pulled off center and away from knurled roller by spring (11). Stud (15) engages trip catch and holds cam from engaging knurled roller. 3. During operation (2) above, the tone arm elevating rod lowers, unlatching tone arm locking cam and allowing the pickup to land on the record.
Playing cycle.	1. Trip catch is held against stud (15), until pickup moves in close enough to center post for stud (15) to clear the trip catch, thereby starting a new cycle.

Record Separation

It is necessary that some provision be made to prevent the record adjacent to the record being released from dropping at the same time. This is accomplished by the separator latch located at the end of the center post. It may be found necessary to bend the center post if the records do not separate properly. There should be 1/32 to 1/16 inch clearance between the edge of the lower record and the end of the slide.

Removing Tone Arm

First it is necessary to remove the record support shelf by removing the two mounting screws (1). Then tilt and raise slowly.

The entire record slide actuating lever, bearing rod, and spring will come off with the record support assembly. The tone arm may then be removed by disengaging the hinge bearing. This may be done by prying with a screw driver through the opening in the top of the arm.

Removing Turntable

Remove the center post by removing nut (b) (fig. 7) and tapping end of center post. The turntable can then be removed by loosening set screw (c) on knurled roller and pulling upward with a rotary motion.

Removing Pickup Cartridge

Remove the two screws holding the cartridge and unsolder shielded leads.

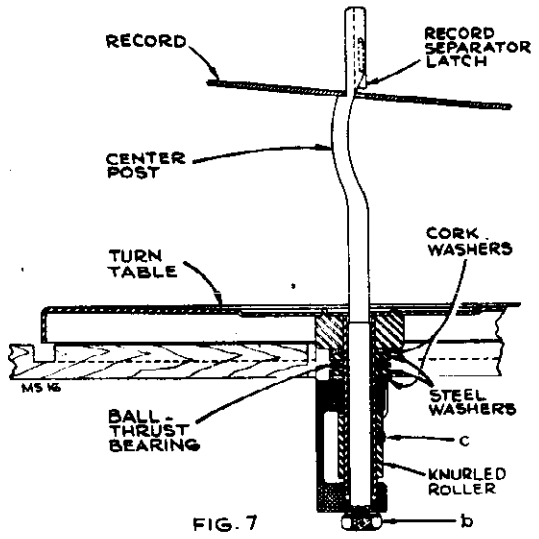

FIG. 7

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Miscellaneous Service Hints

(1) **Rumble**

(A) Remove motor assembly (mounting bolts "K," fig. 9) and inspect rubber tire idler for rough spots.

(B) Make certain rubber shock supports (a) on drive motor and mechanism are not drawn up too tight.

(C) Make certain cork washers are in place on turntable bearing (fig. 7).

(D) Check for microphonic tube in amplifier.

(2) **"Wow" or Speed Variation**

(A) With mechanism out of cycle remove motor assembly (bolts "K," fig. 9) and examine rubber drive idler and rim of turntable for grease or oil. (Oil or grease can be removed with carbontetrachloride or naphtha.)

(B) Check for bent motor shaft.

(C) Check for bent motor mounting plate.

(D) Check for irregularity in rubber tire idler.

(E) With the drive motor removed, the turntable should rotate freely when turned by hand. Bind in turntable may be caused by:

1. Burrs in bearing support casting.
2. Bent center post.
3. Improperly seated center post.
4. Gummed grease in thrust bearing.
5. Under side of turntable rubbing due to insufficient clearance. (It may be necessary to add an additional washer on turntable bearing to elevate it sufficiently to clear mounting bracket, etc.)
6. Cycling knurled drive roller set too low on turntable shaft thereby acting as a thrust bearing and making the ball thrust bearing ineffective. Loosen adjustment screw "C" and allow turntable to seat on thrust bearing making certain steel and cork washers aren't missing. In positioning the knurled roller about 1/32 inch vertical play should be allowed.
7. Friction between a stack of records and center post may cause squeaking. It may also place an additional load on drive motor, causing "wow." An application of wax on the center post should remedy this condition.

(3) **Continuous Tripping** may be caused by:

(A) Trip stud "15" not engaging trip catch.

(B) Reject button sticking.

(C) Reject latch lever spring (7) being loose or missing.

(D) Worn reject latch lever.

(E) Bent reject actuating lever at point of contact to latch. (Will not remain latched.)

(F) Missing or broken safey spring (9).

Special Tools Required for Servicing Mechanism

1. #6 Bristo set screw wrench.
2. #8 Bristo set screw wrench.
3. 3/16 inch open end wrench. } Two separate wrenches re-
4. 1/4 inch open end wrench. } quired.

(4) **"Feedback or Howl"**

This trouble is caused by energy from the speaker getting back into the input of the amplifier.
Check for:

(A) Microphonic tube.

(B) Gain control advanced too far.

(C) Mounting rubber "shocks" bolted down too tight.

(5) **Failure to Trip may be caused by:**

(A) Pickup not following grooves due to:

1. Bind in tone arm bearing. (Will also cause erratic landing.)
2. Improper adjustment of trip catch (F).
3. Binding in hinge bearing. (May also cause repeating of grooves.)
4. Bind in trip stud guide. (May also cause repeating of grooves.)
5. Tone arm height adjustment (D) set too high. (May cause tone arm to hit the records on support post.)

(6) **Improper Landing of Pickup**

(A) Landing adjustments (A or B) improperly set. (See landing adjustments.)

(B) Spring (9) loose or missing.

(C) Springs (4) out of position. (Separator slide will also fail to return.)

(D) Loose adjustment bolts (E or G). (Records will also fail to drop.)

(E) Broken or bent elevating rod guide. (Tone arm locking cam (fig. 3) should remain locked to elevating rod guide until the very instant before pickup lands.)

(F) Bind in tone arm support bearing.

(G) Tone arm locking cam may not engage catch.

(H) Tone arm locking cam may not disengage catch. (Bend elevating rod guide.)

(G) Tone arm mounting rivets loose.

(7) **Repeating Grooves on Record**

(A) Height adjustment (D) set too high.

(B) Bind in tone arm support bearing.

(C) Bind of trip stud (15) in guide.

(D) Bind in tone arm hinge bearing (I) (fig. 4).

(8) **Premature Tripping**

(A) Adjustment (F) improperly set. (See trip adjustment.)

(B) Loose trip stud (15).

(9) **Changer will not complete cycle**

(A) Worn rubber tire on drive cam.

(B) Loose cycling knurled drive gear or roller.

(C) Defective drive motor.

(D) Bent or improperly assembled parts.

(10) **Changer starts cycling when support post is rotated for size. May be caused by:**

Slide actuating lever contacting landing adjustment bolts. (Bend landing adjustment bolt bracket to allow clearance for lever when not in cycle.)

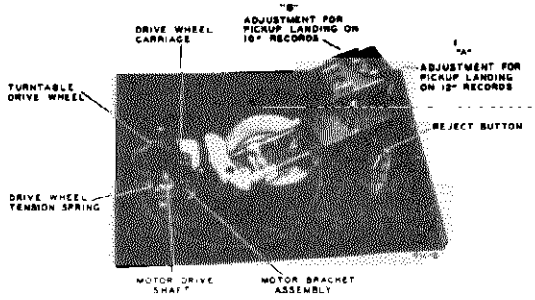

FIG. 8

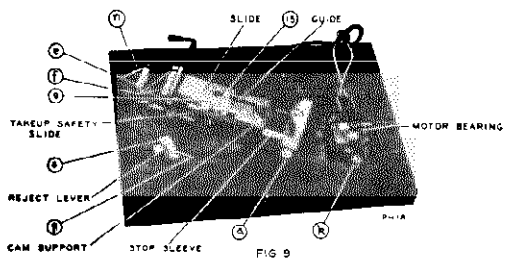

FIG 9

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Functional Parts

(See illustrations for identification)

Drive wheel tension spring (1).
Record stabilizing clip spring (2).
Clamp spring to hold record separator support bracket to record separator (3).
Record separator slide return spring (4).
Lowering spring for record slide actuating lever (5).
Reject lever return spring (6).
Reject latch spring (7).
Reject actuating slide spring (8).
Cycling slide take-up safety spring (9).
Slide return spring (10).
Drive cam actuating spring (11).
Tone arm stabilizing spring (12).
Elevating adjustment screw locking spring (13).
Snap fasteners on support shelf cover (14).
Trip stud (15).
Tone arm stop stud (16).
Tone arm and slide actuating lever connecting studs (17).
Tripping adj. bolt, lock spring (18).

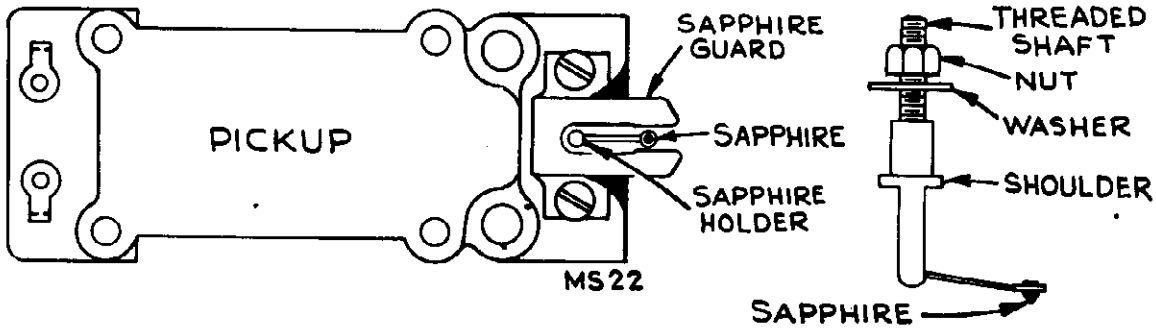
Small letter Part Designation:

a—Rubber shock mounts.
b—Center post mounting nut.
c—Knurled drive roller mounting screw.
d—Cycling drive gear mounting screw.
e—Slide rod mounting screws.
f—Cycling slide carriage mounting screws.
g—Reject lever mounting screws.
h—Reject button mounting nut.
i—Record support post mounting screws.
j—Pickup mounting screws.
k—Mounting bolts on motor.
l—Trip lever hinge bearing.
m—Tone arm mounting rivets.
n—Main assembly mounting bolts.

Names of Levers and Parts

Cycling slide carriage.
Cycling slide carriage stop sleeve.
Cycling slide bars.
Cycling drive cam bearing.
Cycling drive cam.
Turntable mounting support.
Turntable thrust bearings.
Steel washers (bearing race).
Cork cushioning washers.
Record separator latch (located on center post).
Cycling knurled drive roller.
Take-up safety slide for reject reset and tone arm levers.
Reject actuating slide.
Reject actuating slide guide.
Reject latch.
Reject lever coupling wire.
Reject lever.
Reject button.
Trip lever. } All one lever, coupled together.
Trip lever stop stud (15). } All one lever, coupled together.
Tone arm lever. } All one lever, coupled together.
Guide for trip stud.
Tone arm elevating rod.
Tone arm support bearing.
Tone arm hinge bearing.
Tone arm hinge.
Trip catch.
Turntable drivewheel carriage.
Motor bracket assembly.
Motor bearing.
Motor drive shaft.
Record stabilizing clip.
Record support.
Record separator slide.
Record support cover.
Elevating rod guide and tone arm lock catch.
Record separator slide actuating and landing positioning lever.
Tone arm locking cam.
Actuating lever shaft.

Replacing Sapphire in Pickup



Replacement of Sapphire

Caution: Never bend the sapphire support wire.

The nut on the sapphire holder assembly is locked by a light cement (such as Glyptal). Extreme care should be used when loosening the nut so that the twisting motion does not break the crystal.

Remove the two screws holding the sapphire guard in place and remove guard. Remove the small nut and washer on the threaded shaft of the sapphire holder and push the shaft through the hole in the viscoloid until the sapphire holder assembly comes free.

Use of a drop or two of acetone will facilitate the removal of the nut and shaft. Do not use force as the crystal may be broken.

Insert threaded shaft of replacement sapphire holder through viscoloid and replace the washer and nut. Make sure that the sapphire is in the correct position. Take hold at the lower end of the shaft with a pair of pliers while tightening the nut, being very careful so as not to strip the threads or break the crystal. Replace the sapphire guard, positioning it by means of the oversize screw slots. Make certain that the sapphire and its supporting wire are centered in the guard. Tighten the guard screws. Before using, check to see that the sapphire projects far enough (approx. .020) beyond the guard so that the guard will not strike the record. If necessary, bend the guard a little. Apply a drop of light cement (such as Glyptal) to the sapphire nut holder.

MODEL 960015

RCA MFG. CO.

Replacement Parts

STOCK No.	DESCRIPTION
	PICKUP AND ARM ASSEMBLIES
71172	Arm—Tone arm complete less crystal, shielded lead, height adjusting screw and spring
71169	Clamp—Spring clamp to hold pickup leads in arm
71173	Crystal—Pickup crystal cartridge
71170	Screw—Height adjusting screw (D) (fig. 1)
71174	Screw—Needle screw
71171	Spring—Lock spring for height adjusting screw (13) (fig. 1)
71283	Arm—Tone arm complete less crystal, shield lead, height adjusting screw and spring (used with crystal cartridge 70338 only)
70338	Crystal—Pickup crystal cartridge (permanent sapphire type used in arm 71283 only)
	MOTOR ASSEMBLIES Stamped 407B1
71177	Pin—Cotter pin (hairpin spring) for drive idler wheel for motor stamped 407B1
71178	Shim—Drive idler wheel thrust shim for motor stamped 407B1
71176	Spring—Drive idler wheel tension spring for motor stamped 407B1 (1)
71175	Wheel—Drive idler wheel for motor stamped 407B1
	MOTOR ASSEMBLIES Stamped 407B2
71181	Pin—Cotter pin (hairpin spring) for drive idler wheel for motor stamped 407B2
71182	Shim—Drive idler wheel thrust shim for motor stamped 407B2
71180	Spring—Drive idler wheel tension spring for motor stamped 407B2
71179	Wheel—Drive idler wheel for motor stamped 407B2
	MOTOR ASSEMBLIES Stamped 407B3
71186	Bushing—Motor shaft drive pulley for motor stamped 407B3
71183	Motor—Motor complete 117 volts 60 cycle
71226	Pin—Cotter pin (hairpin spring) for drive idler wheel for motor 407B3
71187	Shim—Drive idler wheel thrust shim for motor 407B3
71185	Spring—Drive idler wheel tension spring for motor stamped 407B3 (25 turns—1½" long x 5/32" O. D.)
71184	Wheel—Drive idler wheel for motor stamped 407B3
	MOTORBOARD ASSEMBLIES
71233	Bar—Record stablizing clip support bar
71203	Base—Operating mechanism mounting base and support bearing (fig. 1)
71238	Bearing—Turntable thrust bearing (fig. 7)
71210	Bracket—Record separator support bracket (fig. 1)
71218	Bracket—Tone arm mounting bracket (fig. 3)
71230	Button—Reject button and tone arm rest (fig. 8)
71240	Cable—Shielded output cable complete with plug
71194	Cam—Main cam complete (fig. 5)
71213	Cam—Tone arm locking cam (fig. 3)
71206	Carriage—Cycling slide carriage (fig. 5)
71195	Catch—Trip catch mounted on main cam (fig. 5)
71211	Clamp—Clamp spring to hold record separator support bracket to record separator (3) (fig. 1)
71219	Collar—Collar support for guide studs (17) (fig. 1)
14086	Cord—Power cord
71231	Cover—Shelf cover and record stablizing clip
71234	Fastener—Push fastener for record holder cover (4 req'd)
71245	Grommet—Rubber grommet to mount changer (4 req'd)
71244	Grommet—Rubber grommet to mount motor (3 req'd)
71222	Latch—Reject latch (fig. 4)
71214	Lever—Record slide actuating lever—pushes adjusting screws mounted on record separator to drop records (fig. 2)
71227	Lever—Reject lever (fig. 9)
71229	Link—Reject lever (wire) link (fig. 4)
71202	Link—Trip link and tone arm lever assembly (fig. 4)
71236	Nut—Centre post locknut (b) (fig. 7)
71226	Pin—Cotter pin to mount reject latch (fig. 4)
31048	Plug—Plug for output cable
71235	Post—Centre post (fig. 7)
71189	Rail—Guide rail (cycling slide bar) (2 req'd) (fig. 5)
71217	Rod—Tone arm elevating rod
71199	Roller—Main cam drive roller (knurled) (fig. 7)
71201	Screw—No. 6-32 x 3/16" bristo head screw for mounting guide pin and collar assembly (2 req'd) or mounting the separator adjusting screws actuating rotor (2 req'd) G
71192	Screw—No. 6-32 x ½" fillister head screw to mount guide rails (4 req'd)
71200	Screw—No. 8-32 x ⅛" bristo head set screw for main cam drive roller (C)
71197	Screw—Adjusting screw—mounted on main cam—No. 6-32 x ⅛" round head machine screw (F)
71212	Screw—Adjusting screw and locknuts for tone arm landing (2 req'd) (A, B)
71208	Separator—Record separator (fig. 2)
71207	Slide—Cycling slide (fig. 5)
71220	Slide—Reject actuating slide and bracket—less reject latch and spring (fig. 4)
71216	Spacer—Lowering spring spacer (fig. 1)
71224	Spacer—Reject latch mounting spacer
71205	Spring—Drive cam actuating spring (11) (55 turns—1½" long x 7/32" O. D.)
71191	Spring—Guide rail recoil spring (10) (23 turns—4½" long x 13/32" I. D.)
71215	Spring—Lowering spring for record slide actuating lever (5) (10 turns—11/16" long x ¼" O. D.)
71209	Spring—Record separator return spring (2 req'd) (4) (10 turns—¾" long x .244" O. D.)
71232	Spring—Record stabilizing clip tension spring (2) (10 turns—½" long x 3/16" O. D.)
71223	Spring—Reject latch spring (7) (20 turns—11/16" long x ⅛" O. D.)
71228	Spring—Reject lever spring (25 turns—⅞" long x 5/32" O. D.)
71204	Spring—Safety spring (9) (30 turns—1 7/32" long x 7/32" I. D.)
71221	Spring—Spring for reject slide and bracket (8) (31 turns—⅜" long x 3/16" O. D.)
71140	Spring—Spring to convert motor stamped "407B1" from 60 to 50 cycle operation
71141	Spring—Spring to convert motors stamped "407B2" from 60 to 50 cycle operation
71142	Spring—Spring to convert motors stamped "407B3" from 60 to 50 cycle operation
71196	Spring—Tripping adjustment bolt lock spring mounted on main cam (18) (7 turns—23/32" long x .203" O. D.)
71190	Stop—Stop sleeve for guide rail (fig. 9)
71188	Support—Turntable mounting support and guide rails support (fig. 7)
71193	Support—Main cam support (fig. 9)
71198	Tire—Main cam rubber tire
71237	Turntable—Finished turntable plate
71225	Washer—Reject latch spring washer
71239	Washer—Cork washers (1 set) for turntable (fig. 7)

APPLY TO YOUR RCA DISTRIBUTOR FOR PRICES OF REPLACEMENT PARTS

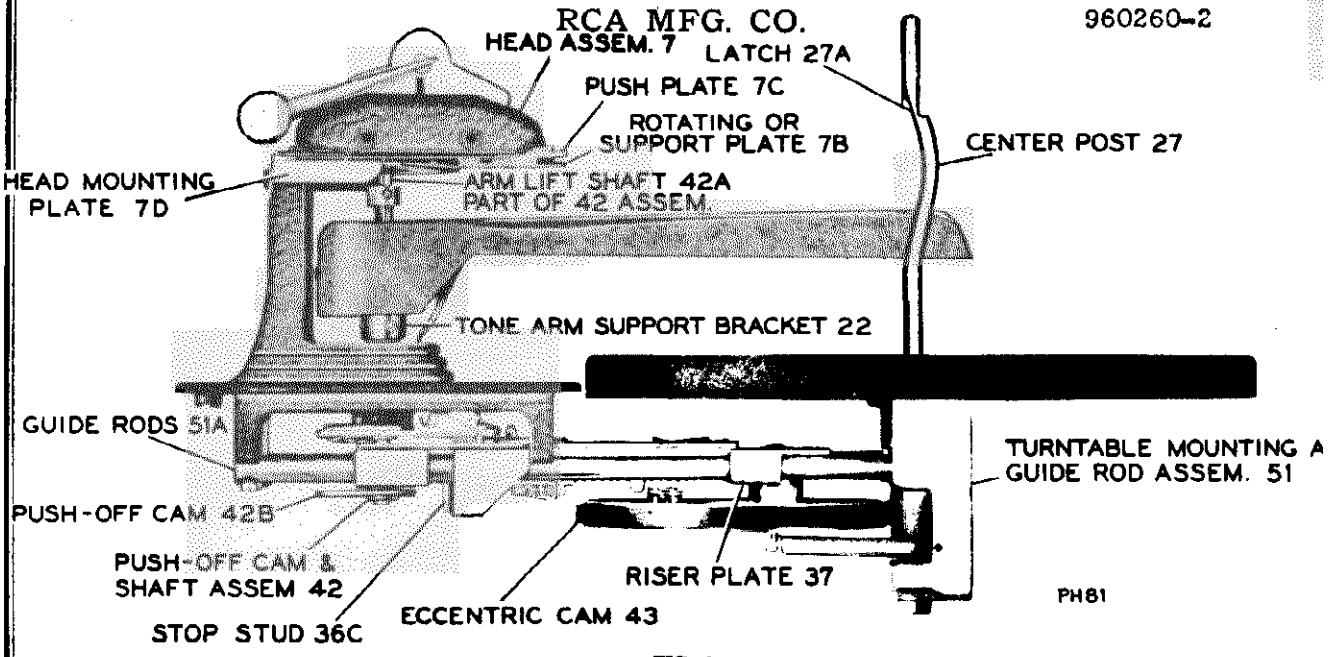


FIG. 1

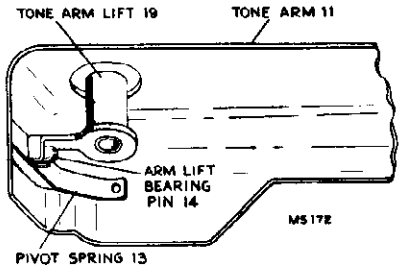


FIG. 3

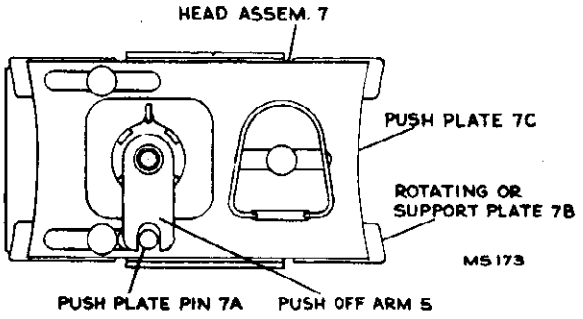


FIG. 4

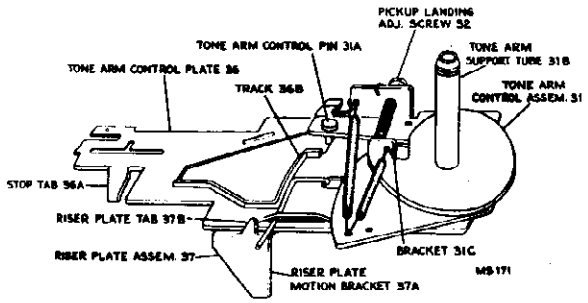


FIG. 2

FUNCTIONS OF PRINCIPAL PARTS

Head Assembly—7, 7A, 7B, 7C

Supports outer edge of record stack and pushes the record off notch in center post and allows it to drop to the turntable while the mechanism is going through cycle.

Center Post—27, 27A

Supports the entire stack of records, and together with the offset notch and latch in the center post, provides a means for separating records.

Tone Arm Lift Assembly—19

Couples tone arm to riser plate 37 through arm lift shaft 42A, thereby transferring the action for the vertical motion of the tone arm during change cycle.

Arm Control Assembly—31, 31A, 31B, 31C

Provides a tie between tube 31B, bracket 31C and tone arm support bracket 22, thereby directing the horizontal movement of the tone arm during change cycle. Arm control pin 31A slides along track in arm control plate 36, and in so doing, determines the point of landing of the pickup and the point o trip of the mechanism. It also incorporates landing adjustin screw 32.

Arm Control Plate Assembly—36, 36A 36B 36C

Incorporates a track 36B which controls the pickup landing an the tripping of the mechanism.
Stop tab 36A functions as portion of the tripping device, stu 36C, contacting push-off cam 42 controls, the point of landin for both 10- and 12-inch records.

Riser Plate Assembly—37, 37A, 37B, 37C

Provides mounting for eccentric cam 43, and incorporates a inclined track 37C, which controls the vertical movement of th tone arm.
Riser plate tab 37B pushes against curved portion of cam o arm control assembly 31, providing a control for the horizonta movement of tone arm during change cycle.
Riser plate bracket 37A contacting push-off arm 42B provide the necessary motion for push plate 7C.

Eccentric Cam—43

Transfers motion from turntable to riser plate 37 during cyclin

Push-Off Cam and Shaft Assembly—42, 42A, 42B

Provides a means of mechanically coupling tone arm lift 19 an push plate 7 assemblies to main cycling mechanism.
Cam 42B contacting stud 36C controls the position of arm con trol plate while in cycle, which determines the landing poin of the pickup on 10- or 12-inch records.

Turntable Mounting and Guide Rod Assembly—51, 51A

Incorporates the main bearings for the turntable and provide a mounting for guide rods 51A.

MODELS 960260-1, 960260-2

RCA MFG. CO.

ADJUSTMENTS

Tone Arm Adjustment

The tone arm height should be so adjusted as to permit the sapphire to engage and ride in the grooves of one record placed on the turntable, but at the same time prevent the tone arm from touching the records on the supports while the mechanism is going through cycle, fig. 5.

1. With the mechanism out of cycle, lift tone arm and check and make certain tone arm lift 19 engages pin 14 as shown in fig. 6.
2. With the pickup near the edge of the record, loosen the set screw (with Bristo Wrench #6), holding collar 10, fig. 9, and moving it up or down on shaft 42A, so as to have the conditions indicated in sketch, fig. 5.

Preliminary Landing Adjustments

An accessible landing adjustment screw 32 is provided, but if for any reason the tone arm support bracket has become loose or removed, proceed as follows:

1. With the mechanism out of cycle, turn adjustment screw 32, fig. 8, clockwise as far as it will go, then turn counterclockwise two or three full turns.
2. Set head assembly for 12-inch position; place a 12-inch record on turntable.
3. Press down on the reject button and rotate the turntable by hand, causing the mechanism to cycle until the pickup is about to land on the record. In this position, the arm control pin 31A is in a position on track 36B as indicated by "s" and adjustment screw 32 remains against bracket 31C as indicated in fig. 8.
4. Loosen the two set screws holding the tone arm support bracket.
5. While holding this position, place the sapphire in the starting groove of the record, and tighten two set screws in the tone arm support bracket.

Final Landing Adjustment

The exact landing adjustment can be made by pressing the reject button and rotating the turntable by hand until the pickup is about to land. Then turn adjustment screw 32, fig. 8, until the sapphire is directly above the starting groove of the record. If the mechanism continues to land incorrectly after this adjustment has been made, compensate the difference by turning the screw 32 slightly. Turning screw counter-clockwise will move the landing towards the center post.

Positioning Push-off Arm

1. With the mechanism out of cycle, turn the push-off cam to such a position, so that the arm makes a 90° angle with the slide bars as shown in fig. 10. Make certain the large radius side of cam is toward the stud 36C when the support post is in the 12-inch position.
2. Place push-off arm 5 over push-off cam shaft 42A, and engage push-off plate pin 7A near the top edge, fig. 7. Tighten set screws.
3. Press down on reject button and rotate the turntable slowly by hand, making certain push plate does not reach its limit, or push-off arm does not come down against push plate when the riser plate is in its outermost position. If push plate should reach limit, or push-off arm should come down against push plate before riser plate reaches its outermost position, back-off either one until corrected.
4. Check this for both 10- and 12-inch setting.

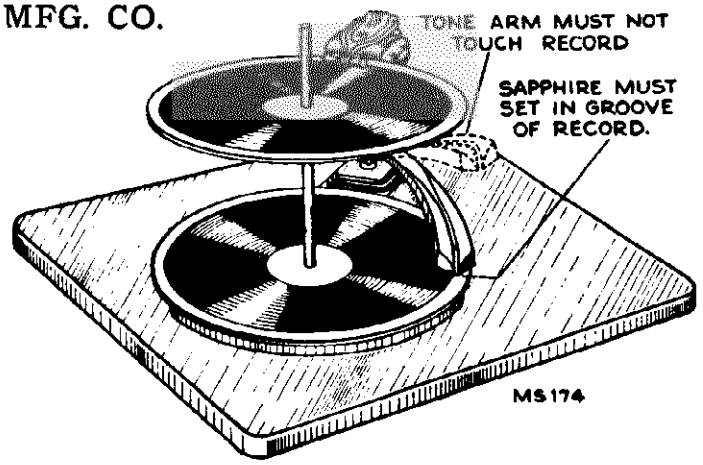


FIG. 5

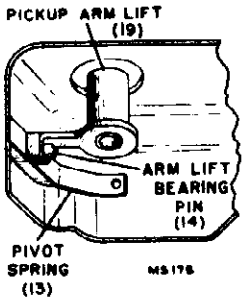


FIG. 6

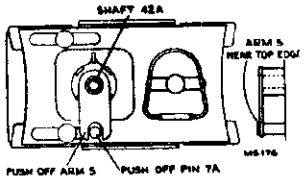


FIG. 7

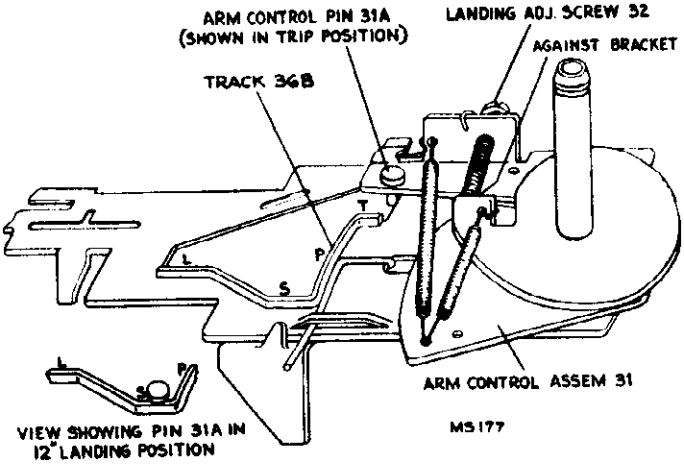


FIG. 8

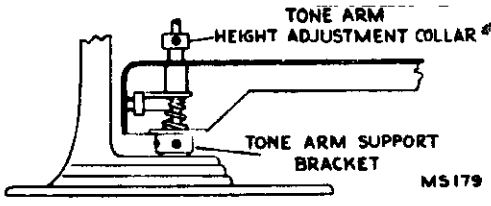


FIG. 9

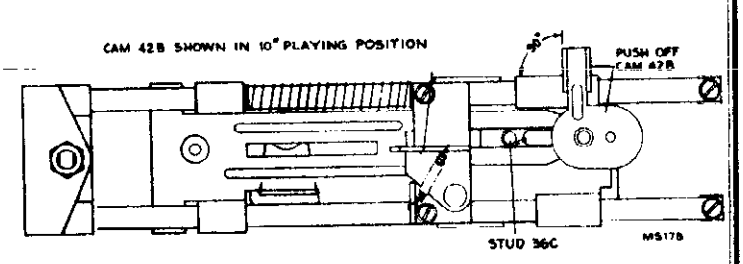


FIG. 10

RCA MFG. CO.

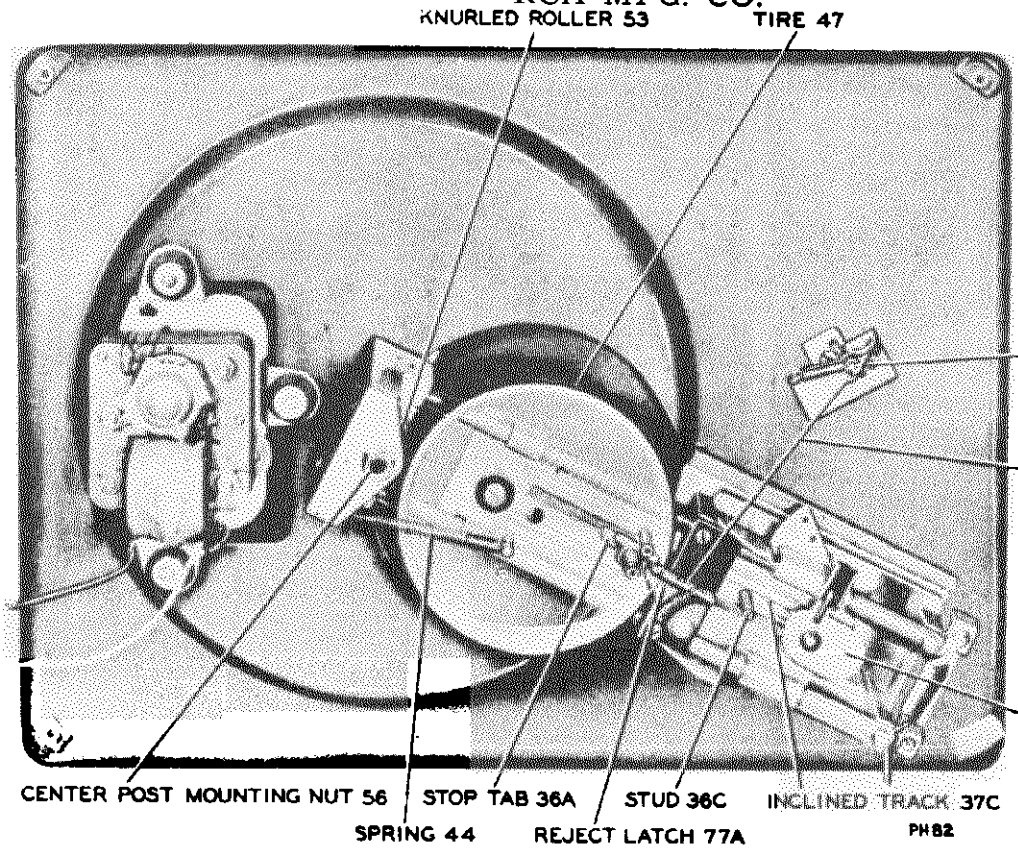


FIG. 11

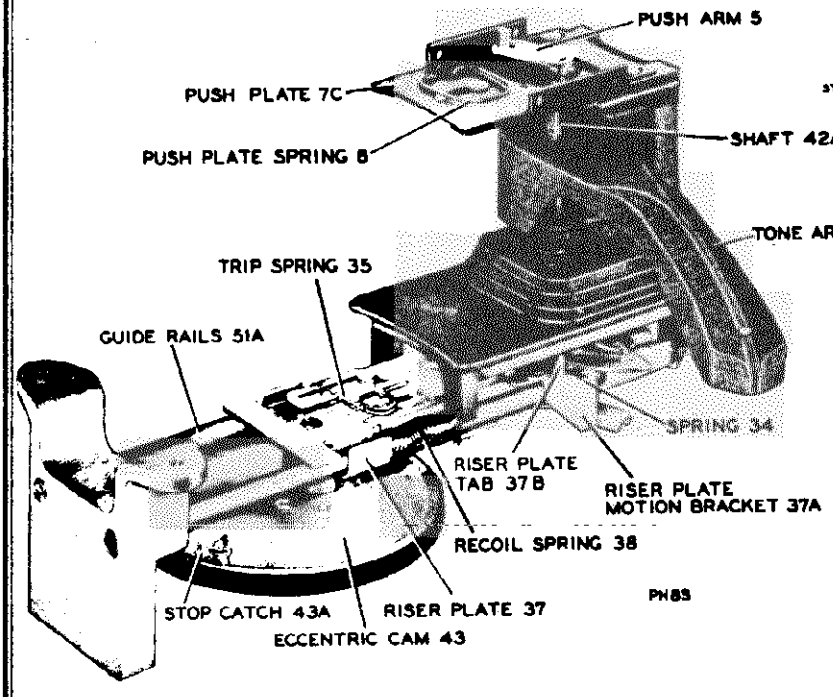


FIG. 12

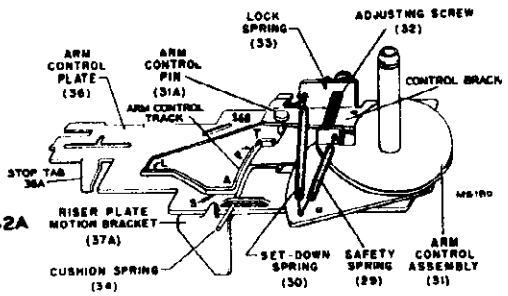


FIG. 13

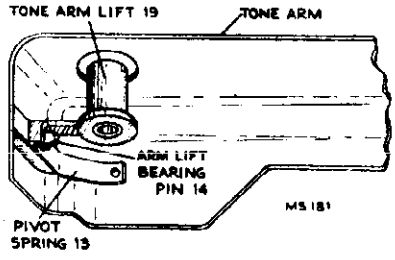
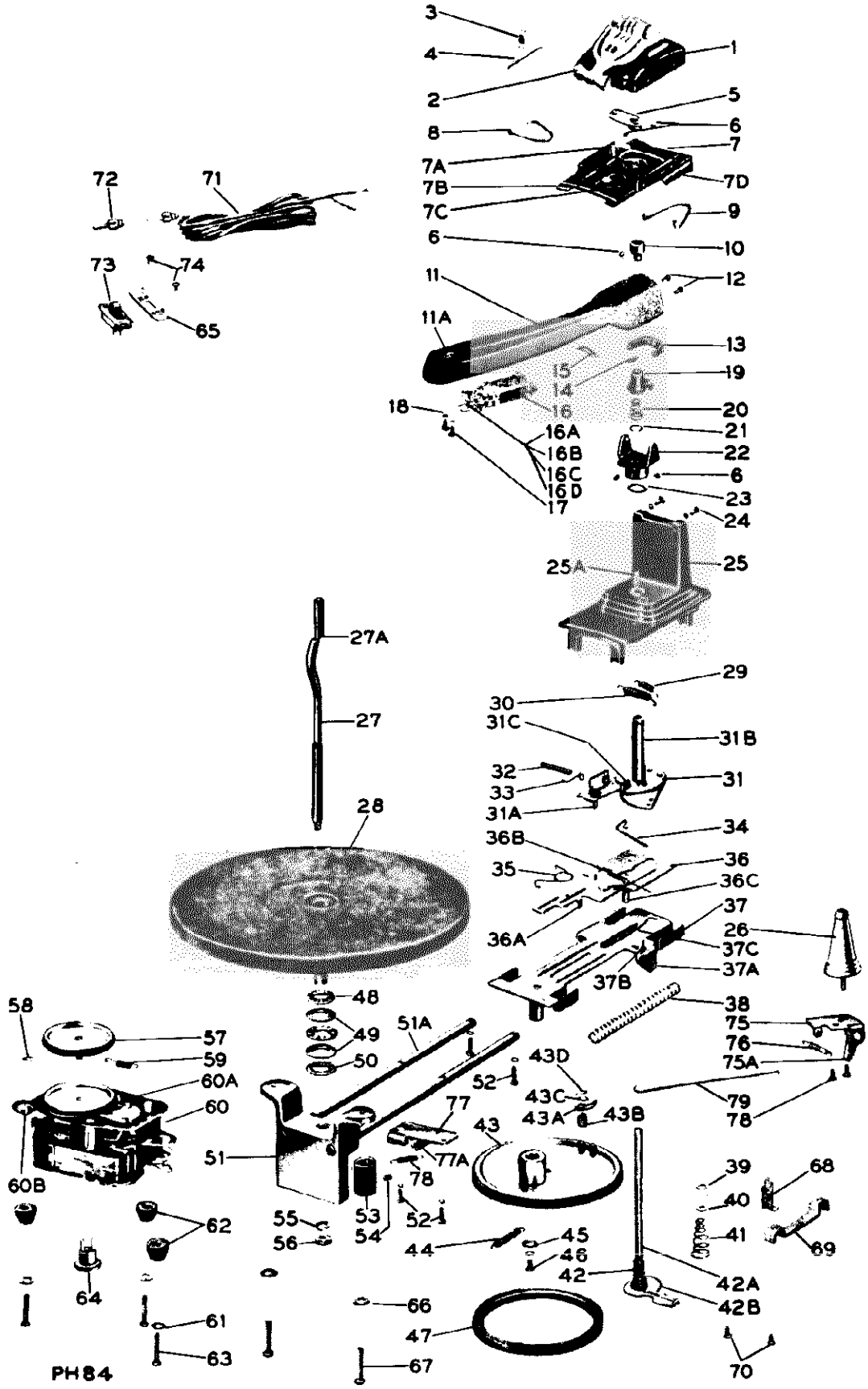


FIG. 14

MODELS 960260-1,
960260-2

RCA MFG. CO.



PHOTOGRAPH OF PARTS
FIG. 15

RCA MFG. CO.

Changer Will Not Complete Cycle

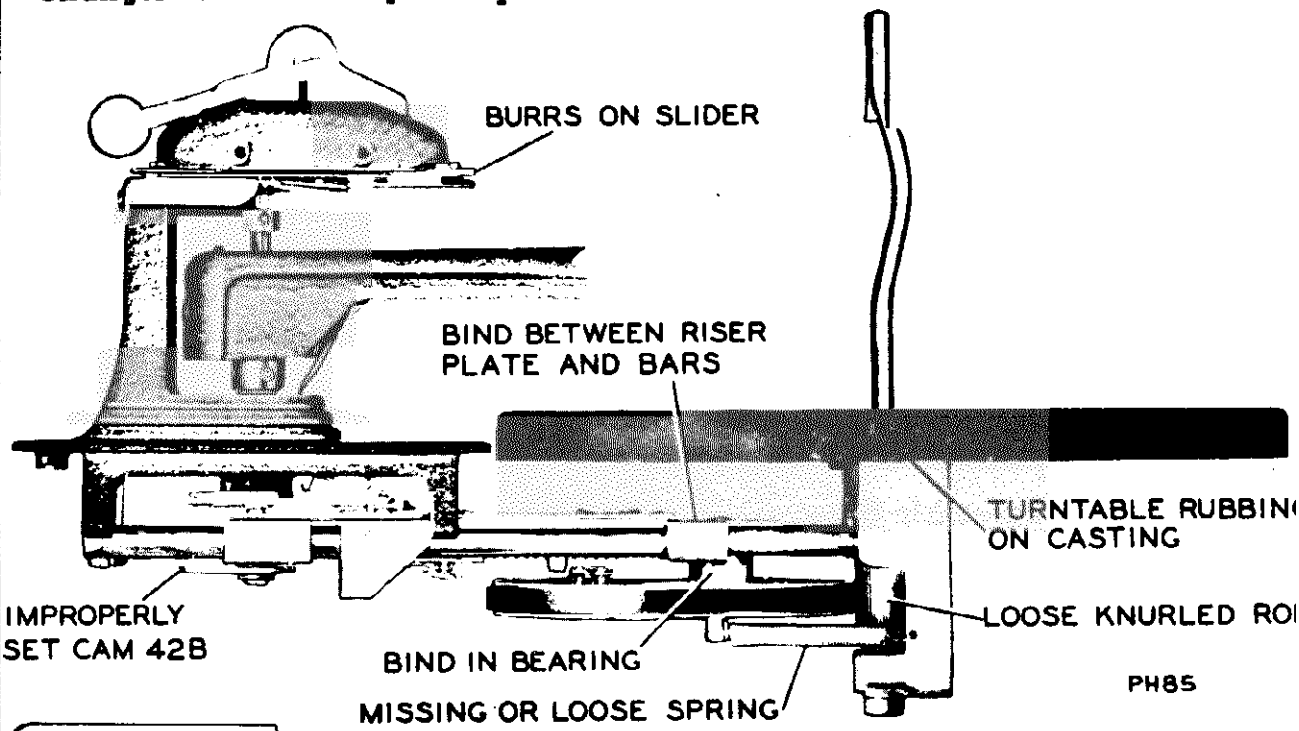


FIG. 16

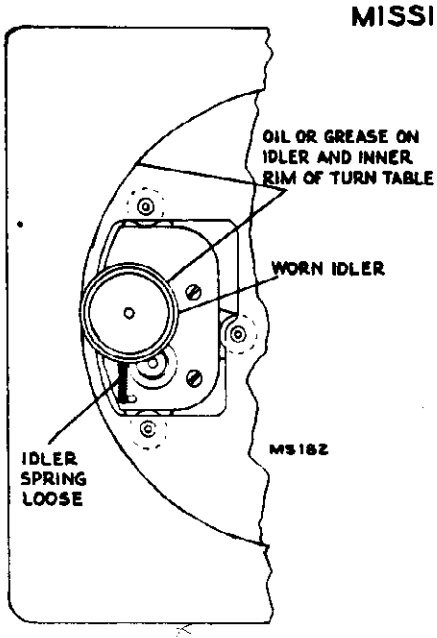


FIG. 17

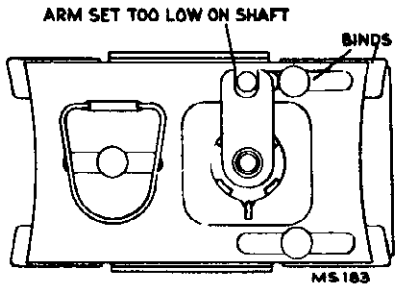


FIG. 18

Records Do Not Separate or Drop Properly

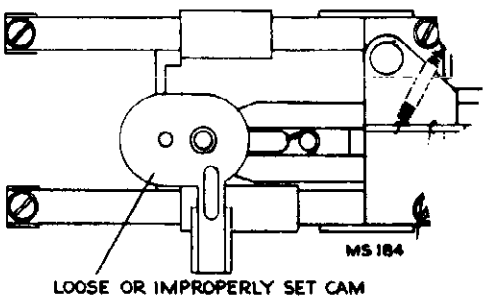


FIG. 19

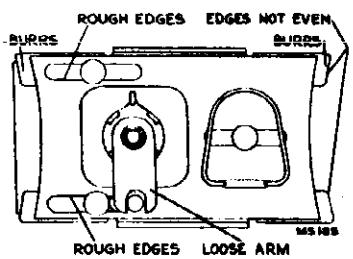


FIG. 20

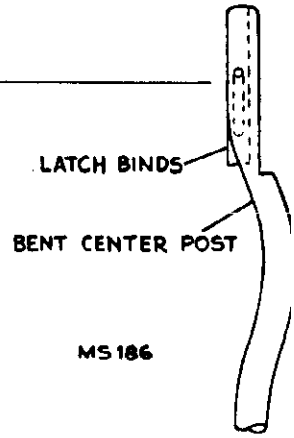


FIG. 21

MODELS 960260-1, 960260-2

RCA MFG. CO.

Pickup Repeats Groove?

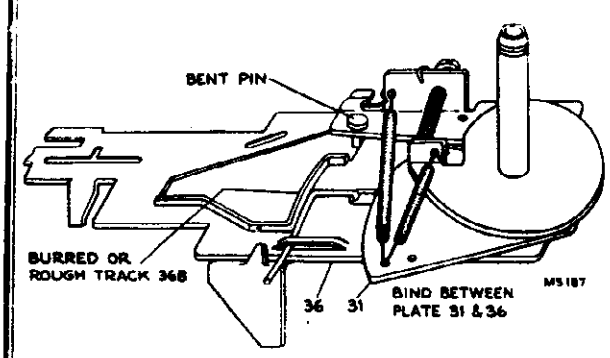


FIG. 22

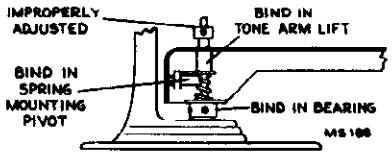


FIG. 23

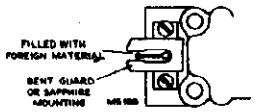


FIG. 24

"Wow" or Slow Turntable Speed

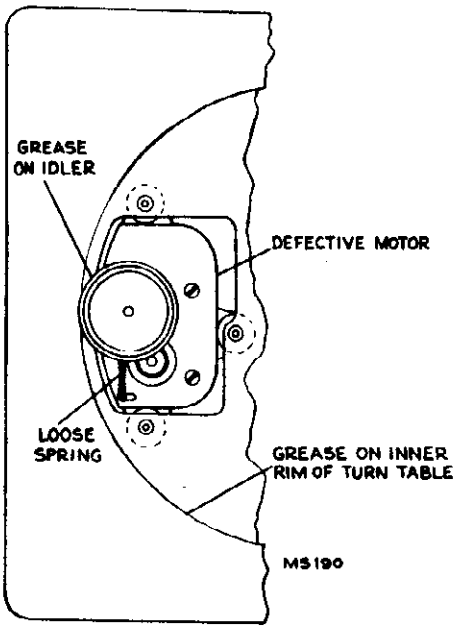


FIG. 25

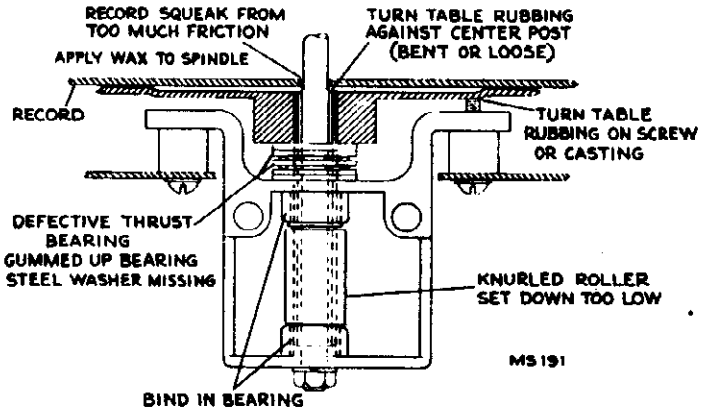


FIG. 26

Continuous Tripping

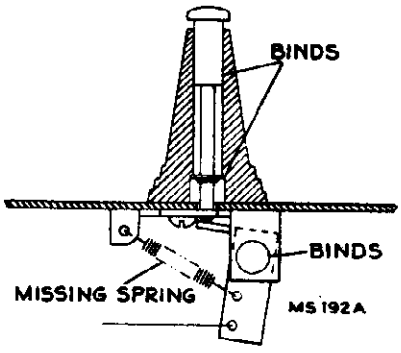


FIG. 27

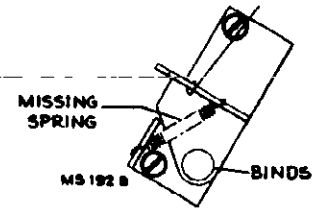


FIG. 28

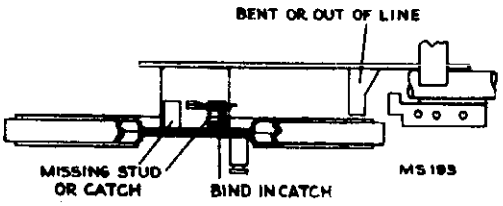


FIG 29

RCA MFG. CO.

Improper Pickup Landing

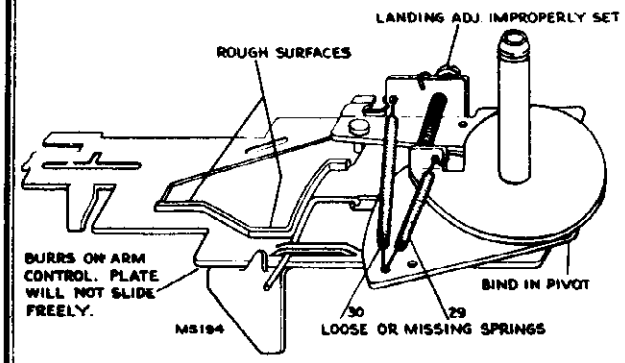


FIG. 30

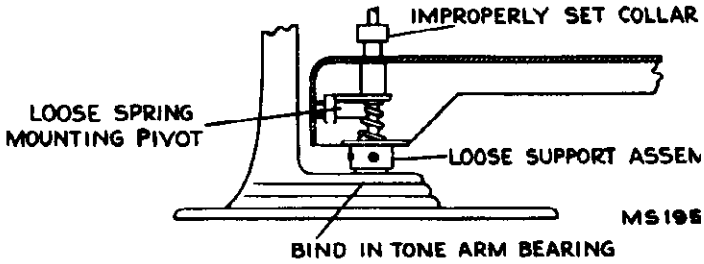


FIG. 31

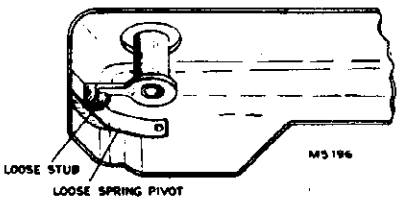


FIG. 32

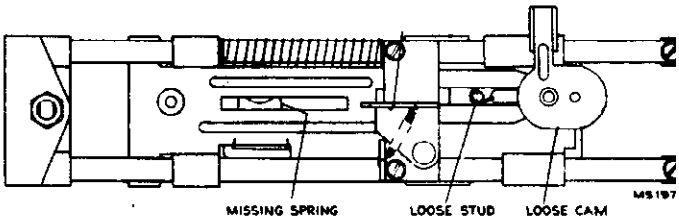


FIG. 33

Failure to Trip or Go into Cycle

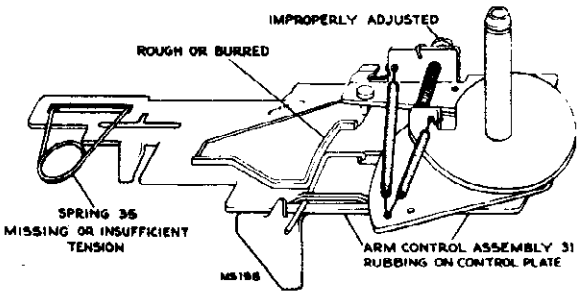


FIG. 34

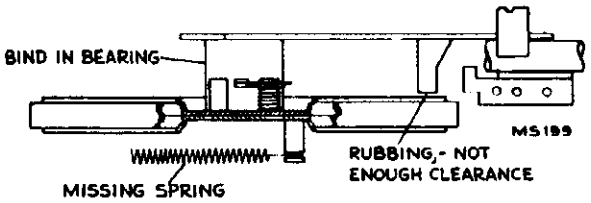


FIG. 35

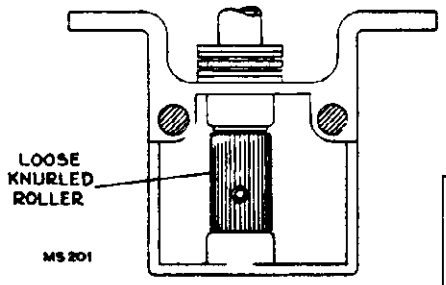


FIG. 37

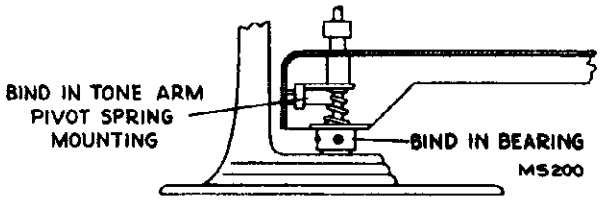


FIG. 36

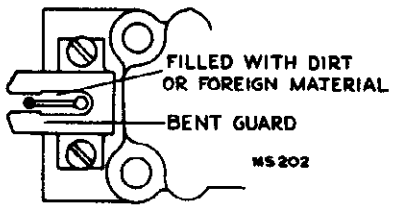


FIG. 38

Tone Arm Fails to Leave Rest Automatically

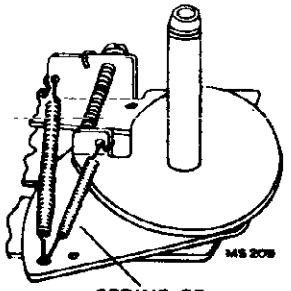


FIG. 39

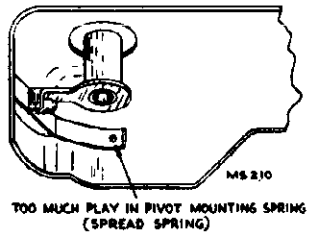


FIG. 39A

MODELS 960260-1,
960260-2

RCA MFG. CO.

Premature Tripping

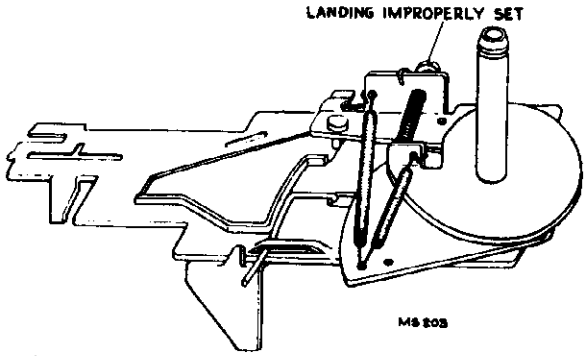


FIG. 40

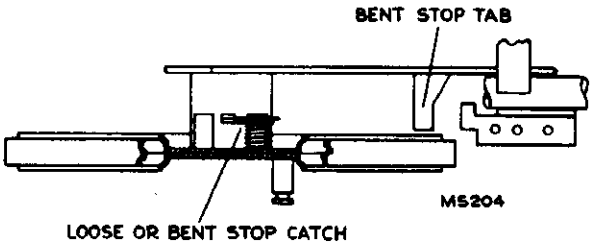


FIG. 41

Distorted or No Output

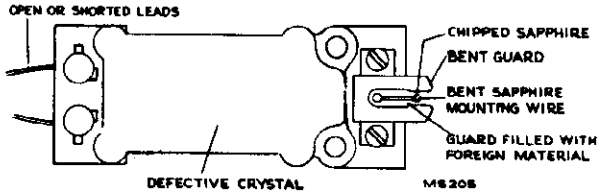


FIG. 42

Feedback or Howl

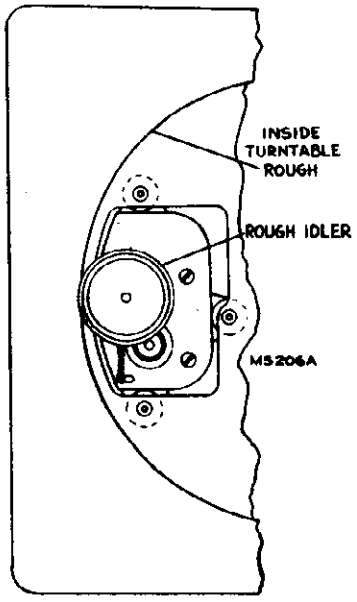


FIG. 43

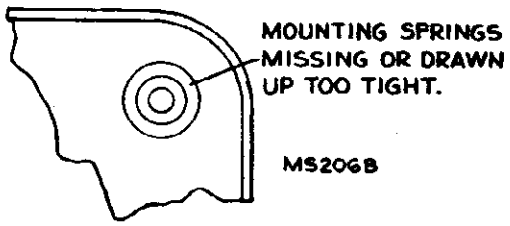


FIG. 44

Rumble

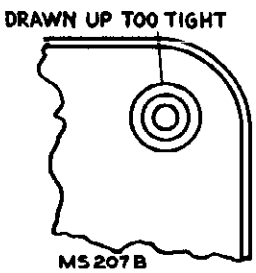


FIG. 45

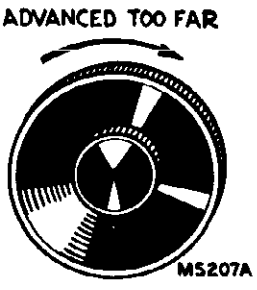


FIG. 46

RCA MFG. CO.

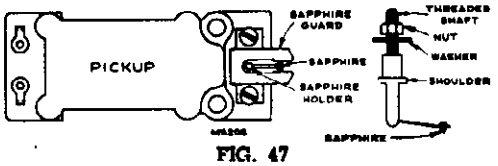


FIG. 47

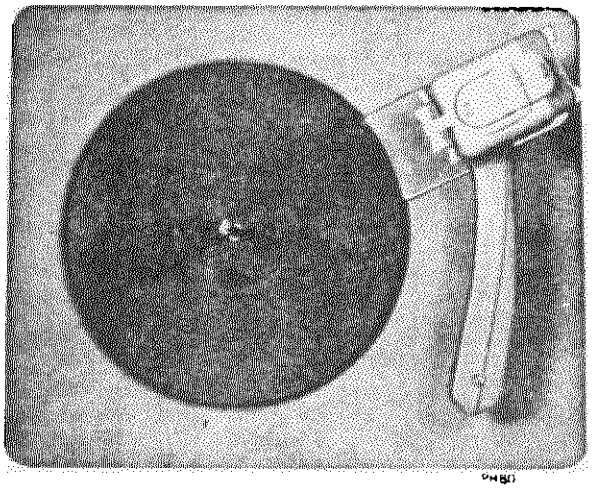
Caution: Never bend the sapphire support wire.

The nut on the sapphire holder assembly is locked by a light cement (such as Glyptal). Extreme care should be used when loosening the nut so that the twisting motion does not break the crystal.

Remove the two screws holding the sapphire guard in place and remove guard. Remove the small nut and washer on the threaded shaft of the sapphire holder and gently push the shaft through the hole in the armature shaft until the sapphire holder assembly comes free.

Use of a drop or two of acetone will facilitate the removal of the nut and shaft. Do not use force as the crystal may be broken.

Insert threaded shaft of replacement sapphire holder through armature shaft and replace the washer and nut. Make sure that the sapphire is in the correct position. Take hold at the lower end of the shaft with a pair of pliers while tightening the nut, being very careful so as not to strip the threads or break the crystal. Replace the sapphire guard, positioning it by means of the oversize screw slots. Make certain that the sapphire and its supporting wire are centered in the guard. Tighten the guard screws. Before using, check to see that the sapphire projects far enough (approx. .020) beyond the guard so that the guard will not strike the record. If necessary, bend the guard a little. Apply a drop of light cement (such as Glyptal) to the sapphire nut holder.



NOTE: The major difference between the two models is the addition of an "Off-On" switch on the motorboard on Model 960260-1.

Features

1. This mechanism is designed to play automatically a series of twelve 10-inch or ten 12-inch standard records of the 78 r.p.m. type.
2. It will play manually records up to 12 inches in diameter.
3. Tripping system is of "constant diameter" type, insuring reliable automatic operation on all records made to RMA proposed standards.
4. It is a simple operation of turning one record support to change from 10- to 12-inch records or vice versa.
5. Cycling mechanism is disconnected completely while records are being played. This reduces the load on the drive motor, thereby reducing the tendency for "wow" or rumble.

Manual Operation

1. Rotate the record separator shelf clockwise for 10-inch or counterclockwise for 12-inch position (numerals 10 or 12 pointing towards center post).
2. Place the record to be played on the turntable and turn the power switch on.
3. Place the pickup on the start of the record.

   Note: The mechanism should be allowed to complete cycle before attempting to move tone arm to the rest position.
4. Turn power switch off manually.
5. Remove the record by raising straight up without tilting.

Automatic Operation

1. With the power switch in the off position rotate the reco support shelf as required for 10- or 12-inch records until t record size indicated on the support cover is pointing ward the center post. (Rotate clockwise for 10-inch a counterclockwise for 12-inch records.)
2. Place the records to be played in a stack with desired s lections upward and in proper sequence with the last re ord on top. Load them on the changer by placing them ov the center post and resting on the record support she Place record stabilizing clip on top of the record stack.
3. Turn power switch on and press down firmly but m mentarily on the end of the tone arm and let go. T changer will continue to play one side of the entire sta automatically.

   The tone arm can be moved to the rest position any time t mechanism is not in cycle.
4. Turn the power switch off and remove the stack from t turntable by placing fingers of both hands directly opposi and under the stack. Then lift straight up—"don't tilt" squeeze stack. Turning the support shelf one-fourth tu facilitates removal of records.

Cautions

1. Avoid handling the tone arm or rotating record support a sembly while mechanism is in cycle.
2. Never turn the power switch off, leaving the mechanism cycle for an extended period of time.
3. Do not allow the records to remain on supports when n in use.
4. Do not allow oil or grease to come in contact with an rubber parts.
5. Do not install instrument near source of heat. Excessi heat may damage the pickup cartridge.

Replacement Parts

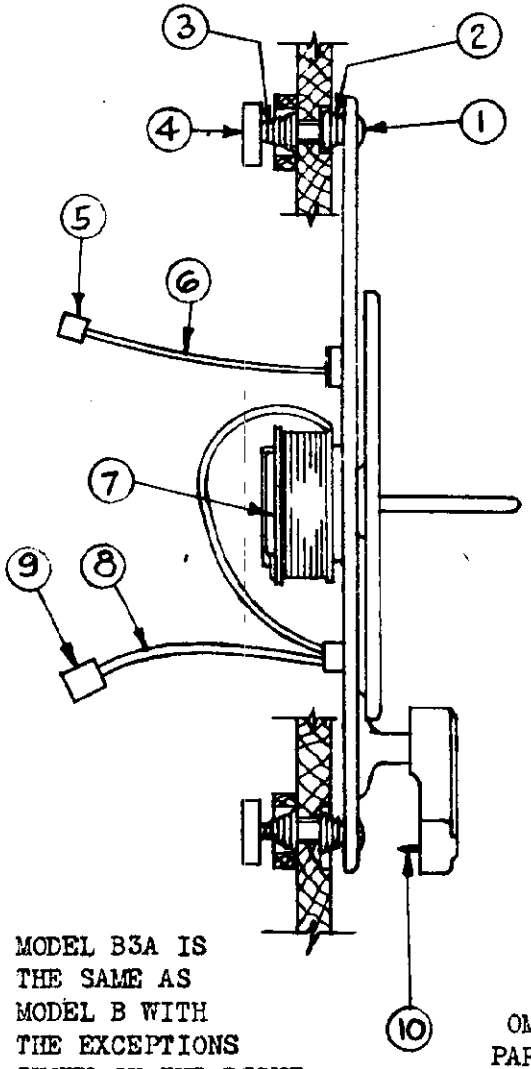
REF. No.	STOCK No.	DESCRIPTION
		OPERATING ASSEMBLIES
1*	72456	Cover—Cover assembly, including record clip rod (4) and spring (3)
2†	—	Clip—Plastic clip, part of item (1)
3	71232	Spring—Record clip spring
4	71233	Rod—Record clip spring rod
5*	72458	Arm—Push-off arm
6†	—	Screw—Adjusting screw for collar (10) and arm (5)
7*	72459	Slide—Slide assembly, including push plate pin (7A), rotating plate (7B), push plate (7C), mounting plate (7D), push plate spring (8), mounting plate spring (9)
8*	72460	Spring—Push plate spring (located on top of push plate)
9	71211	Spring—Head mounting plate spring (located on bottom of mounting plate)
10*	72461	Collar—Lift adjusting collar
11	71283	Arm—Tone arm, including tone arm eye (11A), pivot spring (13), arm lift bearing pin (14)
12†	—	Rivets—Included in item (11)
13†	—	Spring—Spring pivot, included in item (11)
14†	—	Stud—Arm lift bearing pin, included in item (11)
15	71169	Clip—Spring clip to hold pickup leads in arm
16	70338	Crystal—Crystal cartridge complete with guard and sapphire
16A	72345	Sapphire—Sapphire and holder assembly
16B	36452	Guard—Sapphire guard
16C	37763	Screw—2-56 x 1/4" screw for sapphire guard
16D	70341	Nut—Mounting washer and nut for sapphire
17†	—	Screw—Mounting screws for pickup
18†	—	Washer—Lockwasher for mounting pickup
19*	72462	Lift—Tone arm lift
20*	72463	Spring—Brake spring
21*	72464	Ring—Arm control support tube retaining ring
22*	72465	Support—Tone arm support
23*	72466	Washer—Spring washer
24†	—	Screw—Mounting screws for item (7)
25*	72467	Base—Operating mechanism mounting base, less all removable parts
26*	72468	Rest—Tone arm rest and reject button
27	71235	Centerpost
28	71237	Turntable
29*	72469	Spring—Safety spring
30*	72470	Spring—Landing tension spring
31*	72471	Control—Arm control comprising bracket (31C), support tube and arm (31B), control pin (31A)
32*	72472	Screw—Landing adjustment screw
33*	72473	Spring—Lock spring (for landing adjustment)
34*	72474	Spring—Cushion spring
35*	72475	Spring—Trip spring
36*	72476	Plate—Arm control plate, including stop tab (36A), track (36B), size change stop stud (36C)
37*	72477	Riser—Riser plate assembly, including motion bracket (37A), plate tab (37B), inclined track (37C)
38	71191	Spring—Recoil spring
39†	—	Washer—Included with item (42)
40†	—	Washer—Included with item (42)
41†	—	Spring—Included with item (42)
42*	72478	Cam—Push-off cam (42B) and shaft (42A)
43*	72479	Cam—Eccentric cam and tire, including 43A, B, C, D
43R*	72485	Catch—Reject catch
43B*	72486	Spring—Reject catch support spring
44*	72480	Spring—Eccentric cam spring
45†	—	Washer—Used for mounting eccentric cam
46†	—	Screw—Eccentric cam mounting screw
47	71198	Tire—Rubber tire only for eccentric cam
48	71238	Washer—One set of cork washers for turntable
49	71238	Bearing—Turntable thrust bearing
50†	—	Washer—Included with item (49)
51	71188	Support—Turntable mounting support, including guide rods
52†	—	Screw—Mounting screws for guide rods
53*	72481	Roller—Turntable shaft knurled roller
54	71200	Screw—#8-32 x 1/8" Bristol set screw for knurled roller
55†	—	Washer—Lockwasher for mounting center post
56	71236	Nut—Hex nut for centerpost
57	71175	Wheel—Drive idler wheel for motor stamped 407B1
	71178	Wheel—Drive idler wheel for motor stamped 407B2
	71184	Wheel—Drive idler wheel for motor stamped 407B3
58	71177	Pin—Cotter pin (hairpin spring) for drive idler wheel on motor stamped 407B1
	71182	Pin—Cotter pin (hairpin spring) for drive idler wheel on motor stamped 407B2
	71177	Pin—Cotter pin (hairpin spring) for drive idler wheel on motor stamped 407B3
59	71176	Spring—Drive idler wheel tension spring for motor stamped 407B1
	71180	Spring—Drive idler wheel tension spring for motor stamped 407B2
	71185	Spring—Drive idler wheel tension spring for motor stamped 407B3
		NOTE: When replacing complete motor, order RCA 71183
60	71183	Motor—Motor complete with drive idler (57), tension spring (59), mounting grommets (62), shaft bushing (60A), mounting bracket (60B), less power cord
60A	71186	Bushing—Motor shaft drive pulley for motor stamped 407B3
61†	—	Washer—Motor mounting washer
62†	—	Grommet—Motor mounting grommet
63†	—	Screw—Motor mounting screw
64	30870	Plug—2-prong male plug for motor cable
65*	72488	Escutcheon—"On-Off" switch escutcheon for 960260-1
66†	—	Washer—Used in mounting support (51)
67†	—	Screw—Used to mount support (51)
68†	—	Terminal—Pickup lead terminal strip
69†	—	Bracket—Base mounting bracket
70†	—	Screws—Mounting screws for bracket (69)
71	39386	Cable—Shielded output cable with pin plug
72	31048	Plug—Pin plug for pickup cable
73*	72487	Switch—"On-Off" switch for 960260-1
74†	—	Screw—Mounting screw for switch (73)
75*	72482	Lever—Reject lever
76†	—	Spring—Reject lever spring
77*	72484	Plate—Reject mounting plate and arm
78†	—	Screw—Reject lever mounting screws
79*	72483	Wire—Reject trigger wire.

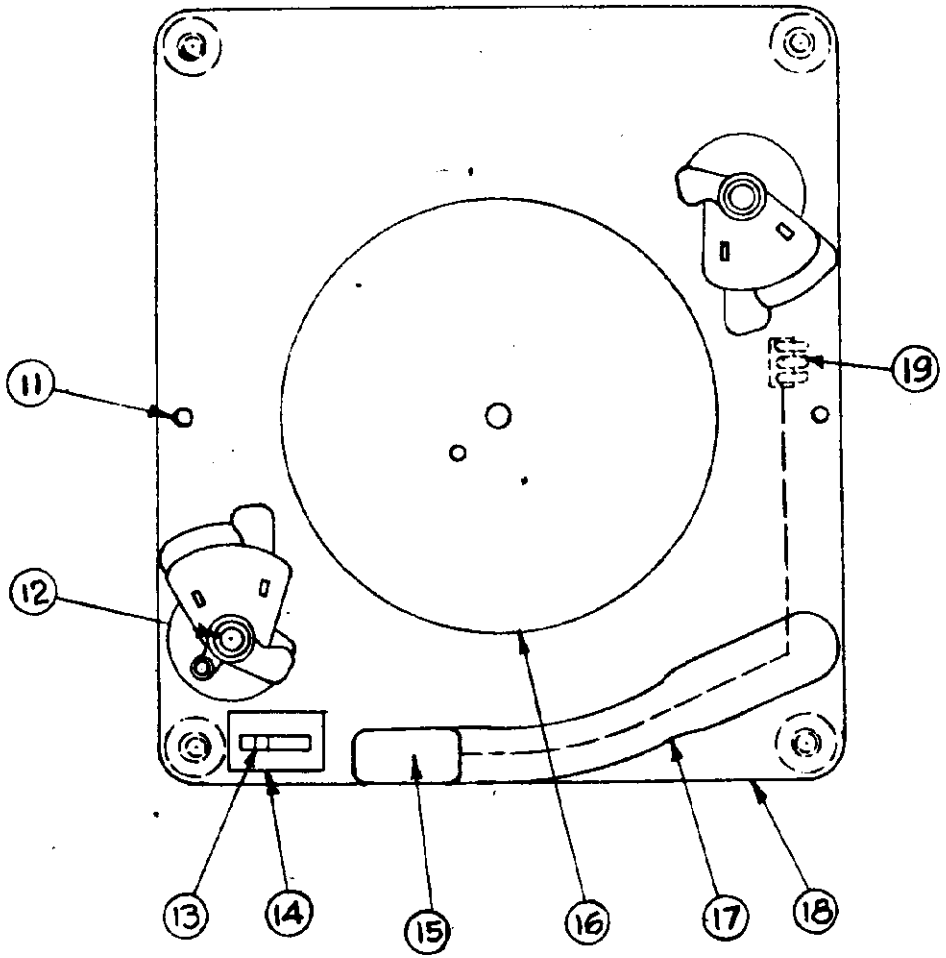
* This is the first time this Stock No. has appeared in Service Data.

† These parts are not stocked.

CYCLE OF OPERATION

Turn record support to 10- or 12-inch position as desired and place a stack of records on supports.	1. Turning record support positions the push-off cam 42B through the linkage of push-off arm 5 and push-off shaft 42A. In so doing it determines the distance of movement of control plate 36 which governs pickup landing.
Reject button.	1. Press down on tone arm; this actuates reject button on which it is resting. 2. Reject button actuates reject lever. 3. Reject lever transfers action to reject latch 77A through coupling wire 79. 4. The unlatching of reject latch allows eccentric cam 43 to be pulled against rotating knurled roller 53 which starts cycle.
Record plays.	1. While the record is being played and the tone arm moves toward the center of the record, the arm control pin 31A on arm control assembly 31 moves along track 36B as designated by "P," fig. 13. 2. As pickup moves into trip groove on record, tone arm control pin 31A moves into recess in control plate 36 at point indicated by "T," fig. 13. 3. Trip spring 35 pulls arm control plate 36 towards center post 27, and in so doing allows stop tab 36A on arm control plate 36 to stop catch 43A on eccentric cam 43.
Cycling starts.	1. Spring 44 pulls eccentric cam 43, causing rubber tire 47 to engage rotating knurled roller 53. 2. Eccentric cam 43 mounted on riser plate transfers energy to force the riser plate assembly back along the guide rails 51A away from center post 27. 3. As riser plate moves, the push-off cam and shaft assembly 42 rides along the inclined track 37C of the riser plate 37. 4. This action results in the push-off cam and shaft assembly 42 being pulled down.
Tone arm raises and moves out.	1. The tone arm lift 19 sliding on shaft 42A is pulled downward, contacting lift bearing pin 14, and causing tone arm to raise and clear record. 2. The riser plate tab 37B contacting curved portion of arm control assembly 31, which is coupled to tone arm support bracket assembly, causes the tone arm to be moved outward away from, and clears the edge of the records. Arm control plate is also being carried along by tab 37B contacting spring 34.
Record is separated and drops to turntable.	1. As riser plate 37 continues to travel further along guide rods 51A, the riser plate motion bracket 37A contacts and rotates the push-off cam and shaft assembly 42. 2. Push-off arm 5, being coupled to push-off cam and shaft assembly 42, is rotated, causing push plate 7C to push record off of projection on center-post and dropping it to the turntable. **Note:** The small separator latch 27A in the end of the center post functions as a thickness gauge, allowing only one record to be pushed off the projection at one time.
Mechanism continues to cycle, returning tone arm and positioning it for landing.	1. As eccentric cam 43 is returning to minimum diameter (out of cycle position), riser plate is being pushed back to normal position by recoil spring 38. At the same time, the push plate spring 8 is pushing the push plate 7C and push-off arm 5 back to normal position. 2. The portion of arm control assembly mounting the control pin 31A, and the control bracket 31C, are hinged on the plate forming part of assembly 31. Since the pin 31A has followed the track 36B and the curved portion of bracket 31C was forced out by motion of tab 37B, the tension of spring 30 is tending to pull them together as the riser plate is returning to normal position. The governing factor in determining how far the bracket will be pulled in, is the setting of the landing adjustment screw 32.
Pickup lands.	1. During part of the change cycle when riser plate was in the outermost position, and carrying arm control plate along by tab 37B contacting spring 34, the stud 36C is stopped by cam 42B. This acts as a gauge to determine the point of contact of pin 31A on arm control track 36B. This cam having two different radii will govern the distance arm control plate can travel since this is set when the record size change is made. If the smaller radius side of cam 42B is toward stud 36C, the arm control pin 31A will ride portion of track 36B designated by "L", causing the pickup to land on 10-inch records. On the other hand, if the larger radius portion of cam is toward the stud, the pin will ride along track designated by "S", which determines landing point on 12-inch records.





MODEL B3A IS THE SAME AS MODEL B WITH THE EXCEPTIONS SHOWN ON THE RIGHT. FOR COMPLETE DATA, SEE PAGES 551 TO 566 INCLUSIVE IN RIDER'S "AUTOMATIC RECORD CHANGERS AND RECORDERS".

OMIT THE FOLLOWING PARTS:

PART NO.	IDEN.	DESCRIPTION
B-27085	1	Panel Mtg.Stud
H-20198	3	Mtg.Spring(lower)
H-20199	4	Clamp nut
	5	Pickup plug
	9	Line plug
	10	Needle(see Pickup)
B-27090	15	Pickup cartridge

ADD THE FOLLOWING PARTS:

PART NO.	IDEN.	DESCRIPTION
B-27545	1	Spring Mtg.Stud
B-27404	6	Pickup lead-plug assembly
B-27415	8	Motor lead-plug assembly
J-22404	15	Pickup cartridge (LP-6)

MODEL K

J. P. SEEBURG CORP.

Instructions
AUTOMATIC RECORD CHANGER

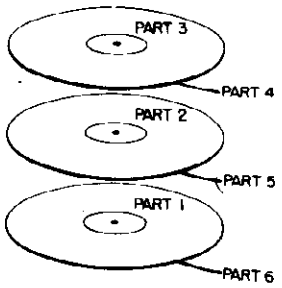
LOAD. Lift and turn both Selector Arms for 10 or 12 inch records as desired (Arrows pointing *directly* at spindle). Load changer with up to fourteen 10 inch records or up to ten 12 inch records, not intermixed.

START AND STOP. Turn radio switch "ON" and set Radio-Phono switch to "PHONO". Move Control Knob to "REJECT" and release it. The changer will now play the entire stack and keep repeating the last record until shut off. (To shut off before entire stack has been played move Control Knob to "OFF', lift Tone Arm and move out to Rest Position.)

UNLOAD. Move Control Knob to "OFF". Remove unplayed records on Selector Arms. Lift and turn Selector Knobs until Arms clear the records. Remove records from Turntable. The changer can now be reloaded as described above.

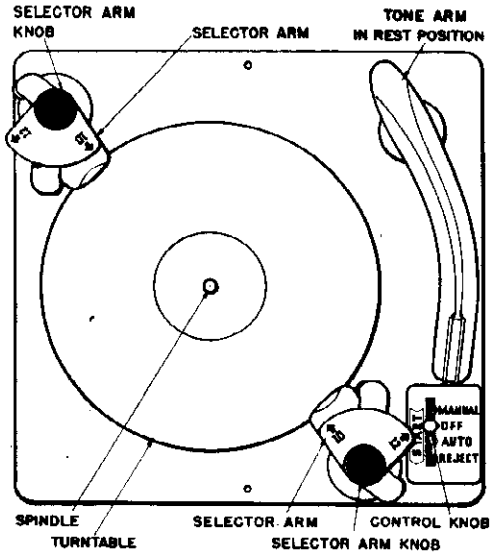
REJECTING A RECORD. To reject a record before it has finished, move Control Knob to "REJECT" and release it. The changer will reject that record and continue to play the remainder of the stack.

RECORD SEQUENCE (Automatic playing). Complete operatic or symphonic works usually require two or more records. When ordering such records, specify that they are for a "Drop Type" changer and arrange them in the sequence illustrated. Example:



A 3 record-6 part recording. After parts 1, 2 and 3 have been played, turn the stack over and the remaining half will be in proper sequence.

MANUAL OPERATION. Odd-sized or very old records and home recordings should be played manually. Lift and turn Selector Knobs as for unloading. Place record on turntable. Move Control Knob to "MANUAL" position. Place tone arm on record and when finished playing return by hand to rest position. To stop, move Control Knob to "OFF" position.



CARE OF RECORDS. Wherever possible, records should be kept in albums and away from domestic heating units. Remove records from changer when through playing. Remove dust with a soft, dry cloth.

PHONOGRAPH NEEDLES. Any needle that is designed to play fifteen or more records can be used. It is more economical to purchase a needle rated at 1,000 plays or more. Do not exceed the maximum allowable plays on such needles.

HELPFUL HINTS.

POOR TONE QUALITY—EXCESSIVE NEEDLE SCRATCH is usually due to a damaged or worn needle or record. Replacing either, or both, is the obvious remedy.

RECORD CATCHING ON SELECTOR ARMS may be caused by using defective or badly warped records. These should be played manually.

SLIPPING ON TURNTABLE is caused by a warped record that does not present enough contact surface to the record below it, producing an uneven sound.

LUBRICATION applied at the time of manufacture is usually sufficient for several years of normal operation. If, after a prolonged period, there is reason to believe that further oiling is necessary, it is recommended that you consult your dealer.

SQUEAKS AND CHAFING NOISES can be corrected by aligning unplayed records on the spindle.

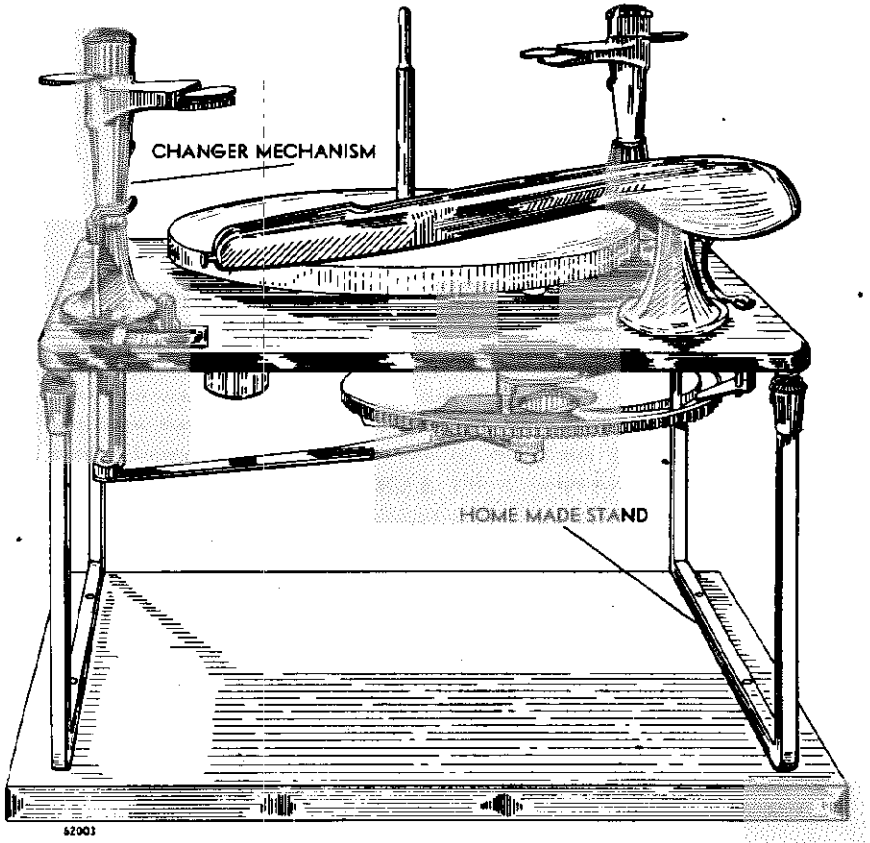


FIGURE 3.

A home-made work stand, indicated above, permits easy access to all parts of changer mechanism.

I CYCLE OF OPERATION

After placing changer in operating position, with records on the selector arm posts, the control knob governs all subsequent automatic operations.

A. CONTROL SLIDE—Moving the control slide from "OFF" to "REJECT" starts the changer into "AUTOMATIC" operation in three steps:

1. As the control slide moves from "OFF" past "AUTOMATIC", slot "a" in the control slide (1) turns on the power switch (2) starting the motor and turntable.

2. When the control knob reaches "reject", the changer is manually "tripped" as follows:

   The control slide pushes connecting link (3), moving the reject slide (4) in direction of arrow. Surface "b" strikes trip lever stud "c". Trip lever (5) movement releases the clutch engagement lever (6). (Levers 5 & 6 are mounted on drive gear (8).

3. When the control knob is released, it returns from "REJECT" to "AUTOMATIC".

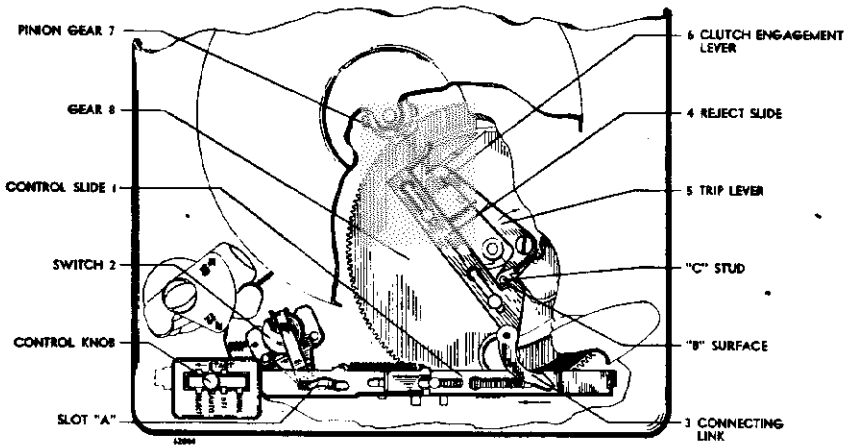


FIGURE 4. CUT AWAY TOP VIEW

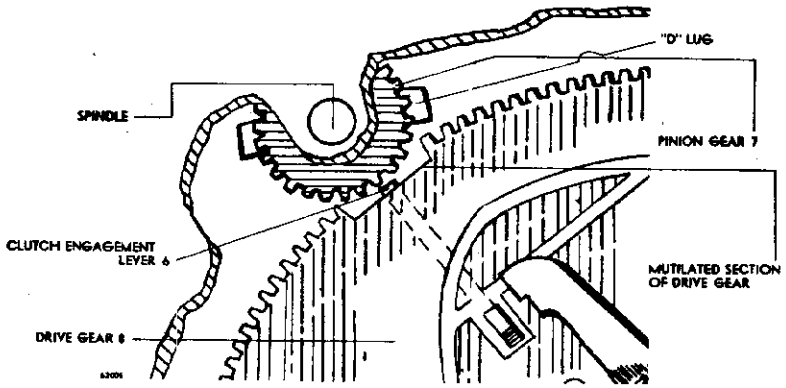


FIGURE 5. CUT AWAY TOP VIEW

B. CLUTCH ENGAGEMENT Lug "d" on the rotating pinion gear (7) strikes extended portion of clutch engagement lever (6) causing drive gear (8) to rotate and mesh with pinion gear (7). (Open tooth or "mutilated" section of drive gear (8) permits pinion gear (7) to rotate freely, EXCEPT during change cycle.)

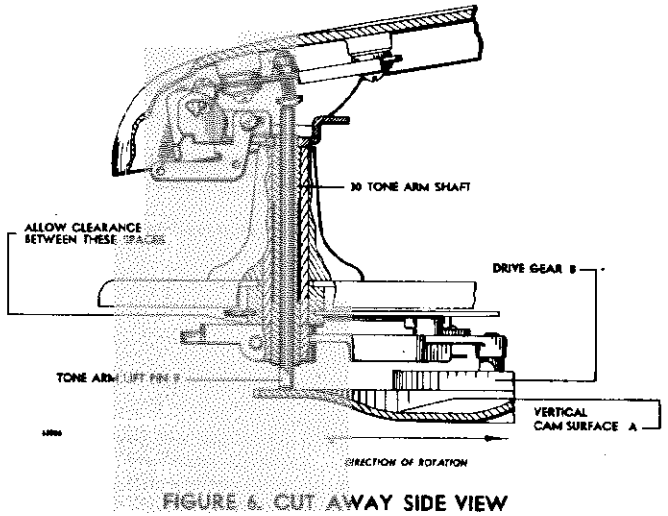


FIGURE 6. CUT AWAY SIDE VIEW

C. ROTATION OF DRIVE GEAR (8) results in the following cam actions:

1. Vertical cam "e" moves the tone arm lift pin (9) and raises the tone arm.

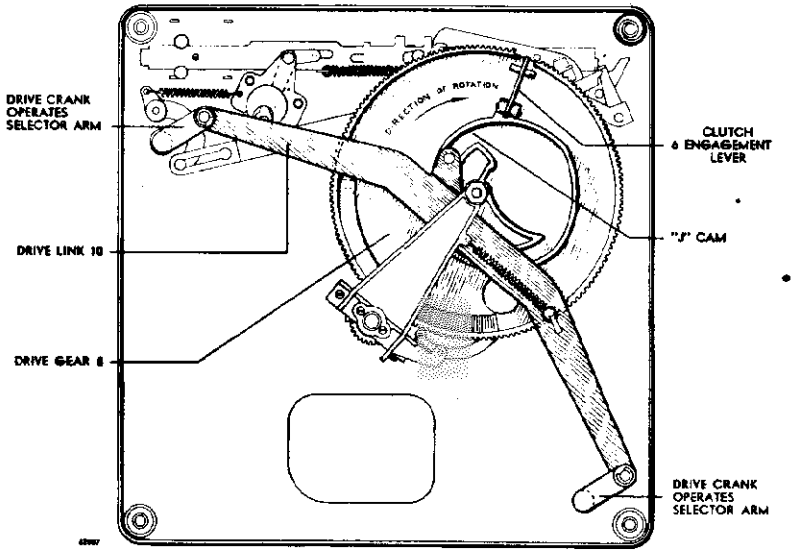


FIGURE 7. BOTTOM VIEW

2. Cam "J", (bottom surface of drive gear) actuates the drive link (10) that induces the quarter turn by which the selector arms release a record.

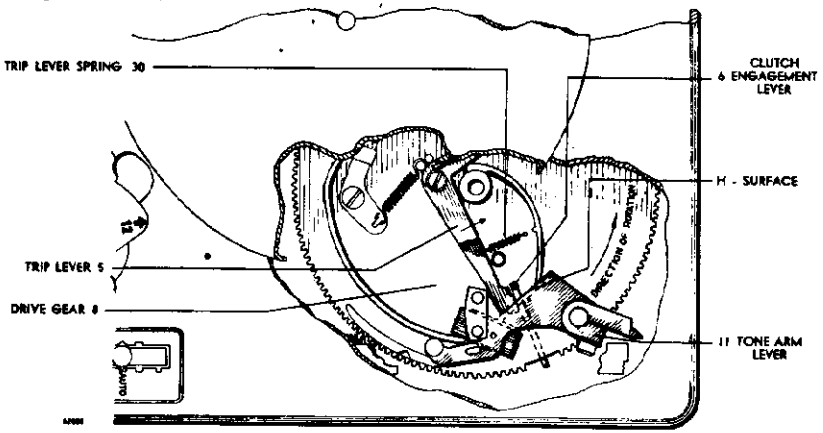


FIGURE 8. CUT AWAY TOP VIEW

3. Surface "h" on the locked tone arm lever (11) resets the trip by latching the clutch engagement lever (6) to the trip lever (5).

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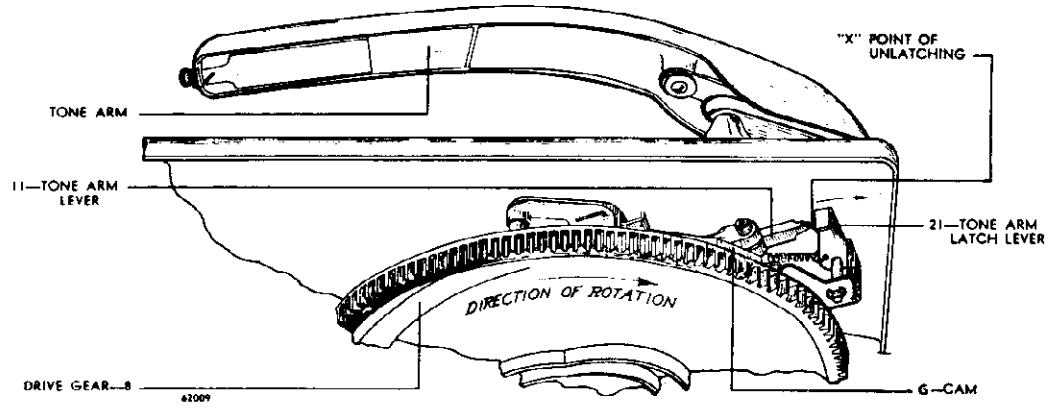


FIGURE 9. BOTTOM VIEW

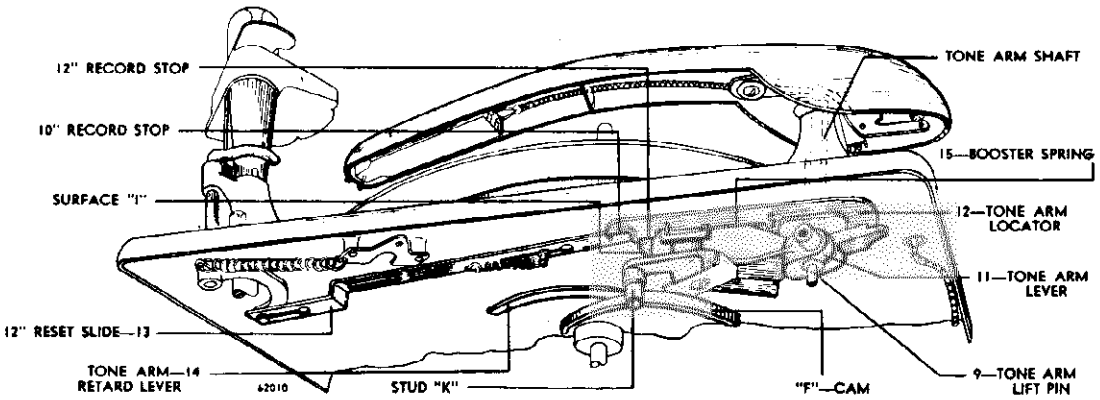


FIGURE 10. CUTAWAY BOTTOM VIEW DRIVE GEAR

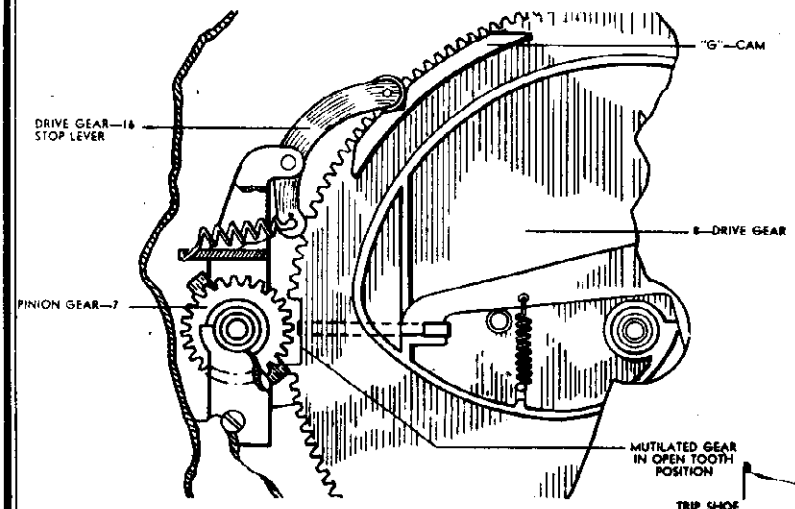
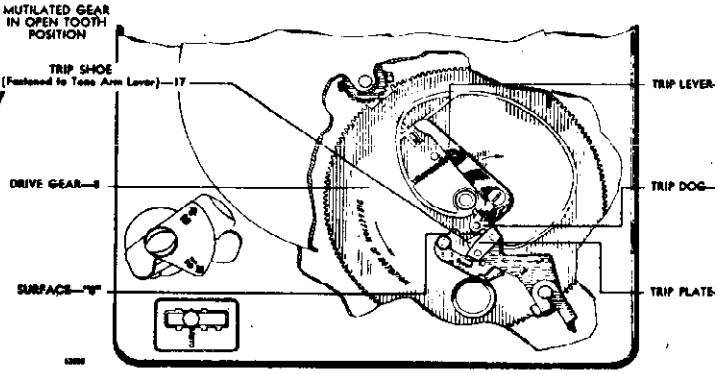


FIGURE 11. CUT AWAY TOP VIEW

FIGURE 12. CUT AWAY TOP VIEW



4. Cam surface "g" moves the tone arm latch lever (21) so as to unlatch the tone arm lever (11) at point "x". Thereafter the stud "k" on the tone arm lever follows the receding cam "f", shown in figure 10.

5. Spring pressure from tone arm locator (12) moves the tone arm lever (11) and tone arm toward the record. Selector arm settings determine the point at which the tone arm locator (12) stops at surface "i" on the 12" reset slide (13). Sketch above shows 10" and 12" record stops.

6. Stud "k" is contacted by the retard lever (14) holding it in position during the time of lowering the needle on the record. (See retard lever.)

7. Tone arm lift pin (9) follows vertical cam on drive gear and lowers tone arm to the record. After the needle has touched the record, booster spring (15) exerts a slight pressure, causing the needle to enter starting groove.

8. As the needle starts in the groove, drive gear (8) completes its rotation and is locked in open-tooth position by the drive gear stop lever (16) in detent in cam "g".

D. AUTOMATIC TRIPPING—At the end of a record, the needle enters the cut-off groove and a new change cycle is set in motion by either of two actions releasing the clutch engagement lever (6).

1. MINIMUM DIAMETER CUT-OFF occurs when trip shoe (17) strikes trip lever (5) at point "o".

2. ECCENTRIC GROOVE CUT-OFF occurs when the tone arm is moved away from the spindle. The sawtooth edge of the trip plate (18) engages and moves the trip dog (19), causing the trip lever (5) to function.

The changer has now completed one cycle of automatic operation.

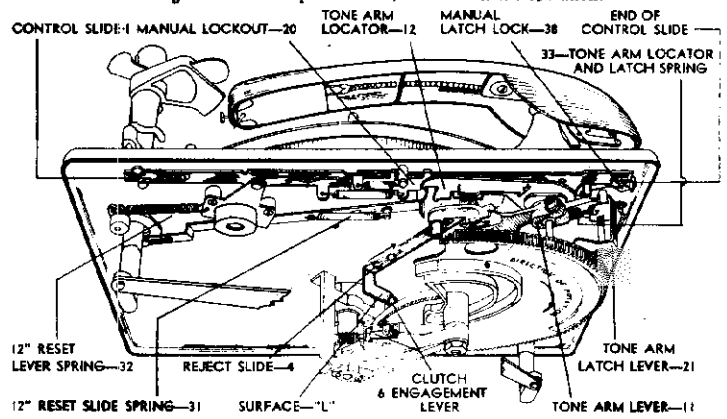


FIGURE 13. BOTTOM VIEW

II MANUAL OPERATION

With the control knob in "MANUAL", the control slide (1) sets up 4 conditions:

A. Motor switch is on.

B. The end of the control slide (acting through the manual latch lock (38) partially disengages the tone arm latch lever (21) from its locked position. It now serves as a detent for the tone arm while in rest position and prevents its movement due to accidental bumping.

C. The manual lockout (20) on the control slide prevents the tone arm locator (12) from moving inward, thereby permitting free movement of the tone arm by hand.

D. The reject slide (4) is in position so that surface "1" holds the clutch engagement lever (6) and prevents tripping.

III DETAILED DESCRIPTION OF CERTAIN FUNCTIONS AND PARTS

A. TONE ARM LATCH LEVER (21)

1. *Functions and Positions:*

a. A positive lock for the tone arm when the latter is swung to the outside of the panel in all positions of the control slide other than "MANUAL". This is brought about by the engagement between the tone arm lever (11) and the tone arm latch lever (21).

b. A partial lock, or detent, for the tone arm while the control slide is in "MANUAL". This results when the control slide is moved to the "MANUAL" position. The back edge of the control slide strikes the manual latch lock (38), which in turn moves the tone arm latch lever (21).

c. Complete disengagement results through the cam "g" on the outside edge of the drive gear during the Automatic change cycle. It is this unlatching action which puts the tone arm back into AUTOMATIC operation when the control slide is moved to the REJECT position.

2. *Actions*

a. When the tone arm is playing a record in "AUTOMATIC" position and is moved to the rest position, the tone arm latch lever (21) must positively lock the tone arm lever (11).

b. When the control slide is moved to "MANUAL" the turned down portion of the control slide must contact the manual latch lock (38) which pulls the tone arm latch lever (21) and changes its contact with the tone arm lever (11) from a positive lock to a partial lock, giving a light, smooth detent action when the tone arm is in the rest position. (See Fig. 13)

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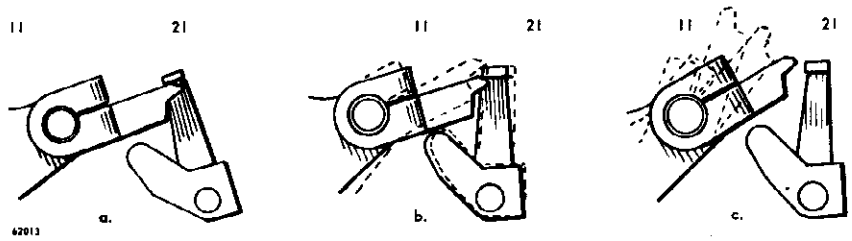

FIGURE 14.

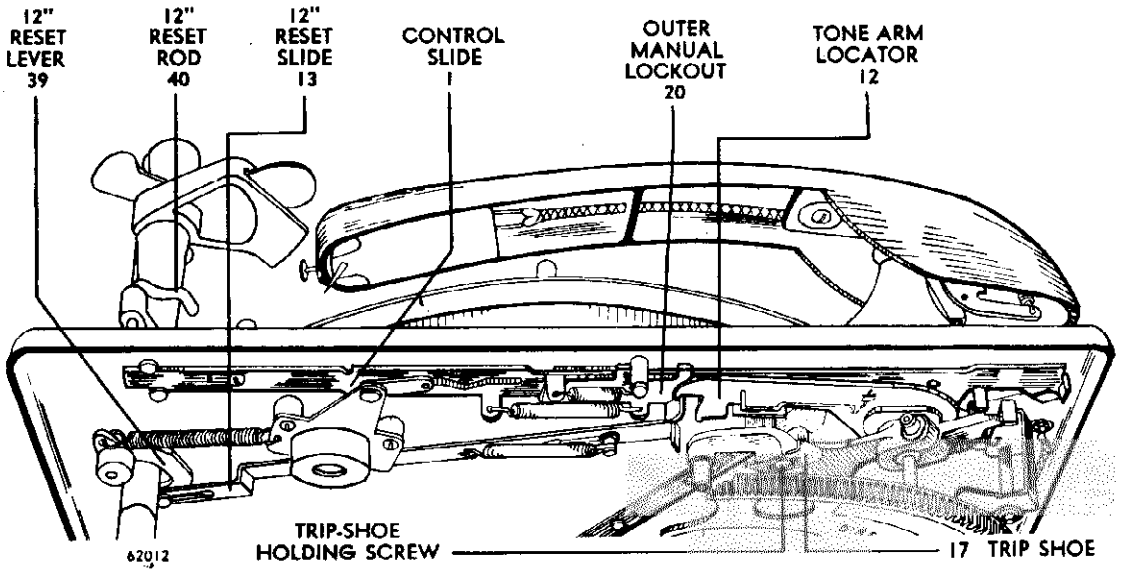

FIGURE 15. CUTAWAY BOTTOM VIEW

B. MANUAL LOCKOUT ASSEMBLY (20) engages and retains the tone arm locator (12) in its outermost position while the control slide is set in the "MANUAL" position. There are three actions involved:—

1. When the tone arm is in the rest position, and the control slide is moved into MANUAL, the outer manual lockout (20) moves to hold the tone arm locator from moving inward.

2. The manual lockout (20) and the tone arm locator (12) must remain engaged, while the control slide is moved into any other position, until automatically released by the Drive Gear Cam.

3. With the tone arm lever in "MANUAL" position the manual lockout will slide back and allow the lockout engagement described in "1" above if the tone arm is being moved into the rest position.

C. 12" RESET SLIDE (13), 12" RESET LEVER (39), AND 12" RESET ROD (40) indexes the tone arm properly for a 10" or 12" record, depending upon the setting of the selector arm. This is accomplished by transmitting the motion (due to the reset rod contacting the smooth surface or the rib) on the selector arm to the 12" Reset Lever. (See Fig. 14

D. TONE ARM RETARD LEVER (14).

1. Maintains a light pressure outwards during that part of the cycle after tone arm lever (11) leaves the cam surface of the large gear. The purpose is to prevent overswinging of the tone arm and hold it at the radius previously determined by the locator lever (12) immediately prior to and during the time of lowering the needle on to the record.

2. Prevents action of the booster spring (15) until such time as the needle has actually landed on the margin of the record.

EXCESSIVE TENSION on the tone arm retard lever spring (26) would tend to cause a jerky motion of the tone arm during the part of the cycle described in "1" above. Extreme tension might even cause incorrect indexing by not allowing the tone arm to go into the proper diameter as determined by the locator lever (12).

INSUFFICIENT TENSION on the retard lever spring (26) would result in a premature booster spring (15) action so that the needle would land inside the margin of the record. Extremely weak pressure, or no spring pressure at all, would result in an overswing of the tone arm causing the needle to land some place in the middle of the record.

E. BOOSTER SPRING (15)—Its purpose is to move the needle into the first playing groove on records which do not have a lead-in groove. Booster spring pressure is correctly adjusted when it causes the needle to move from the index point to the starting groove and no further. Excess pressure may cause the needle to scrape across the first few grooves. See tie in with retard lever action.

F. TONE ARM KNIFE EDGE HINGE In order to reduce vertical friction of the tone arm to a minimum as required for best operation with light pressure pickups, the hinge bracket is of the knife edge type. A hardened steel knife edge "m" seats, under spring (24) pressure, into v's, "n", in the lower bracket.

1. The knife edge must not be broken or damaged.
2. There must be a slight amount of sidewise play between the bracket and the lower part of the knife edge shoulder, and also between the brackets themselves.

NOTE:

Side clearance of the knife edge shoulder "p" in its bracket will give correct performance during playing since the knife edge is held solidly seated in the bracket by a spring. Also the movement of the knife in the bracket, when the arm is handled manually, has no significance since the knife edge reseats itself due to the spring action when released.

3. INCORRECT SIDE PLAY OR CLEARANCE

a. Insufficient sidewise play will result in rubbing or vertical friction.

b. Excessive clearance will result in erratic tone arm landing and cut-off operation, since the whole arm may shift slightly during the change cycle.

G. HOW TO REMOVE TURNTABLE

It should be removed, by lifting *carefully*, tapping spindle *lightly* if necessary. This will expose top spindle bearing. When replacing turntable, slot in hub (28) must seat properly over spindle pin. (Rotate 180° for best fit). Push idler wheel in while lowering, so rubber rim will not be damaged by turntable edge.

IV ADJUSTMENTS

A. MOTOR FAILURE, *possible causes:*

1. Power supply off, worn or broken wire, or defective plug.
2. Faulty switch.
3. Linkage between switch and control slide.

CAUTION: The control slide must operate an over-center action of the switch when it is moved *slowly* in either of the positions adjacent to "OFF".

4. Burned out, or open motor coils.

B. MECHANICAL BINDS

1. During change cycle:
   a. Rotate turntable by hand, clockwise.
   b. If it seems to bind at one point only, examine the drive and pinion gears for foreign matter between the teeth.
   c. Examine the turntable spindle and selector arm bearings for lack of lubrication.
2. During playing cycle: Idler wheel slide should move freely and its spring tension must be positive so that idler wheel maintains constant contact with turntable rim and motor shaft.

CAUTION: Excessive tension on this spring will cause rapid wear of idler wheel and "rumble" when playing.

J. P. SEEBURG CORP.

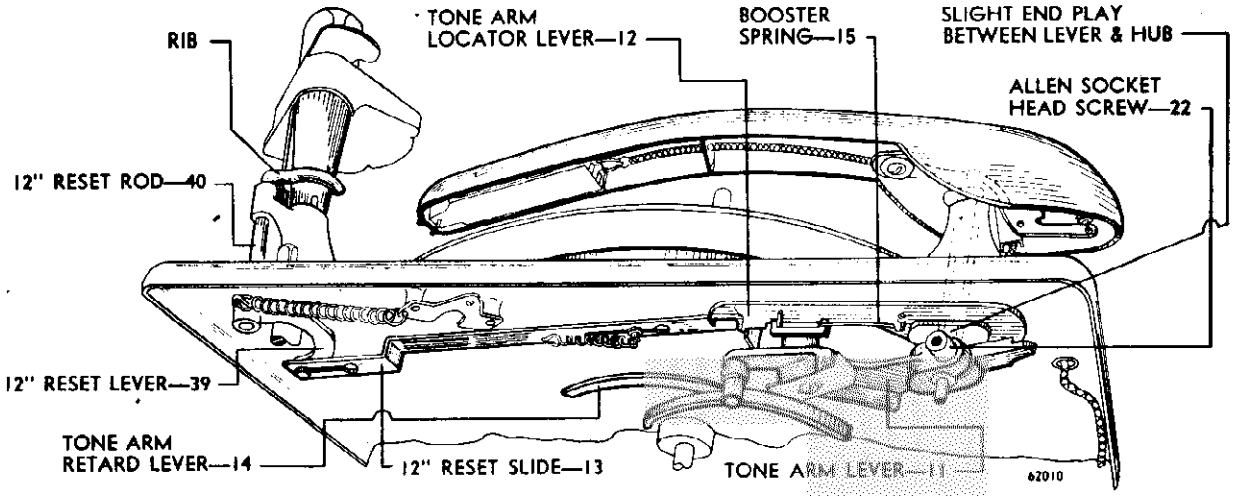

FIGURE 16. BOTTOM VIEW

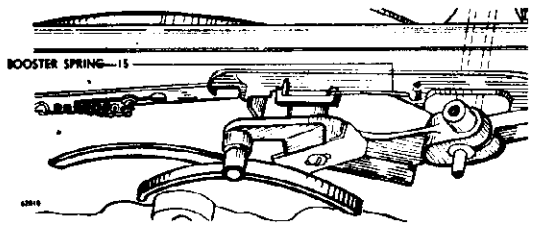

FIGURE 17. BOTTOM VIEW

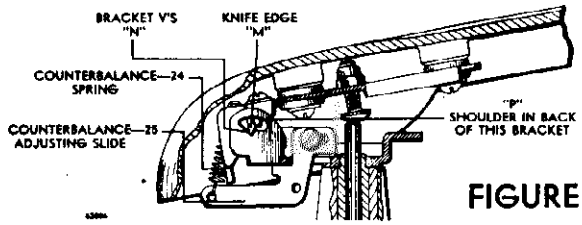

FIGURE 18. CUTAWAY END VIEW

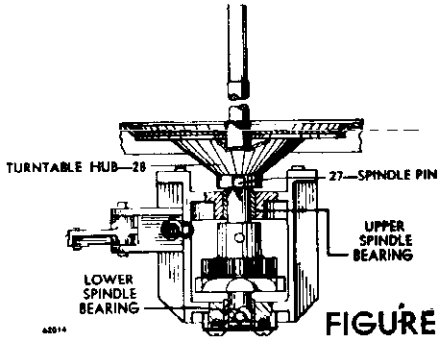

FIGURE 19. CUTAWAY SIDE VIEW

C. MECHANICAL JAMS—Shut off power and proceed as follows:

1. Rotate the turntable counter-clockwise slightly. This should free it.
2. Examine the mechanism for loose, bent parts or foreign matter.
3. A bent clutch engagement lever (6) will cause a failure in the meshing of drive and pinion gear teeth at the start of a change cycle.
4. As a further aid, it is recommended that the text and sketches, starting with Fig.4, be studied.

D. RECORD JAMS *are caused by:*

1. Selector arms improperly set.
2. Odd-sized, badly warped or damaged records. Play these in "MANUAL" position.
3. Selector blades damaged or improperly adjusted. See next page.

E. RECORD DROPS ON ONE SIDE ONLY if it has an unusually large center hole or a broken edge. Also examine the mechanism for a bent spindle or selector arm post, due to rough handling.

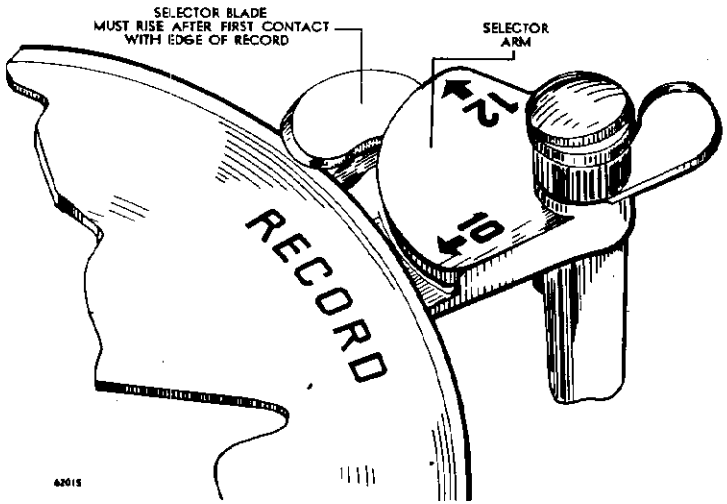

FIGURE 20. TOP VIEW

F. SELECTOR ARMS AND BLADES

1. BLADE ADJUSTMENT *(see fig. 20)*

a. If an adjustment is necessary, place a 10" record of average thickness (.074") on the selector arms and manually rotate the turntable clockwise until the selector blade contacts the record. The blade must rise after it first contacts the edge of the record. This rising cam action results whenever pressure is applied to the leading edge of the selector blade. The blade may be adjusted by bending, very slightly, to correct position (use pliers with tape lined jaws). The height to which blades are set must be less than the minimum record thickness, otherwise the blade will attempt to change two records at a time, due to the cam action which *always* operates in an *up direction*. When necessary, make the same adjustment on the 12" selector blades, using a 12" record (approximately .090" thick).

b. The leading edge of blade must be smoothly rounded and well polished.

c. Blade must be very free in its mounting so that it will return to normal position by its own weight.

2. SELECTOR ARMS must be parallel with each other, and must be synchronized so that a record will drop evenly onto the turntable.

G. INCORRECT TONE ARM INDEXING

1. Study the text concerning Fig. 13. Examine the following two springs for being loose, of improper tension or missing: 12" Reset Slide Spring (31), 12" Reset Lever Spring (32).
2. Incorrect Locator Spring Tension (33)

   a. Insufficient spring tension will produce erratic or incorrect tone arm landing since the locator will not seat in the fixed 10" or 12" indexing position. (See page 8) It will also result in a jerky action of the tone arm, since the tone arm lever will not accurately follow the cam surface of the large gear.

   b. Excessive spring tension will result in a stiff, heavily loaded "feel" as the tone arm is moved into the rest position. It may also produce a stiff action of the control slide (when the manual lockout is engaged) and cause increased wear on moving parts.

3. Tone arm retard lever (14) binds. Examine its pivot point for foreign matter between gear casting and shoulder screw. Also, examine retard lever spring (26) for proper action. (See Fig. 16.)
4. EXCESSIVE CLEARANCE at tone arm hinge bracket. (See Fig. 18.)

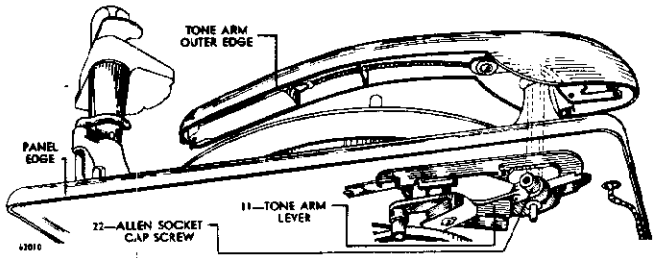

FIGURE 21. BOTTOM VIEW

H. TONE ARM POSITIONING *is as follows:*

Note: Before attempting the following procedure in order to correct tone arm landing, check previous page, since any one of these reasons may be the actual cause of incorrect landing.

1. Set the control knob in the "OFF" position (power plug out).
2. Place a 10" record on the turntable and set the selector arms (10" arrows pointing directly at the spindle).
3. Loosen the Allen socket cap screw (22) just enough to allow the tone arm lever to still hold its position.
4. Line up the tone arm's outer edge evenly with the panel edge. This gives the tone arm an approximate setting.
5. Push the control knob to "REJECT" and release it. Rotate the turntable clockwise and observe where the needle first touches the record. This should be about one-eighth inch from the edge. Variations should be corrected by slipping the tone arm lever (11) in the correct direction.

Caution: Before tightening the Allen screw, make certain that there is enough vertical clearance in the tone arm shaft to avoid binding while the tone arm swings.

6. Replace the 10" with a 12" record and set selector arms accordingly. If the 10" adjustment was made correctly, the 12" indexing should be automatically correct.

I. TONE ARM HEIGHT *adjustment:*

1. The height to which the tone arm rises is correct when there is an approximate 1/16" clearance between it and the bottom of a 10" record on the selector arms. This clearance is regulated by the tone arm adjusting screw (23).

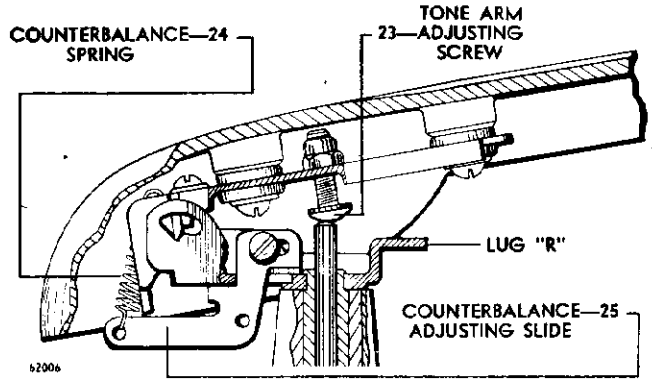

FIGURE 22. CUTAWAY SIDE VIEW

2. The down position of the tone arm is fixed by lug "r" on the tone arm hinge assembly. The correct height is that which will allow the bottom edge of the tone arm and cartridge to clear the turntable surface by approximately 1/16". This adjustment may be corrected by a slight bend of the lug "r".

J. NEEDLE PRESSURE is controlled by the counter-balance spring (24) in back of the tone arm. The pressure is variable through the counter-balance adjusting slide (25). The needle pressure should not be less than 1-1/8 oz.

K. FAILURE TO TRIP *may be caused by the following:*

1. Old style records without proper cut-off grooves. These should be played in "MANUAL" position.
2. Broken, worn or improper needle which does not follow cut-off groove.
3. Closed-circle trip is incorrectly set. The trip shoe (17) is moveable and loosening its holding screw allows it to be adjusted as required. This adjustment is correct when the needle is 1-7/8 inches from the record center and the trip shoe pushes the trip lever which releases the clutch engagement lever. (See Fig. 15)
4. Tight tone arm lead wire. The shielded wire emerging from the back of the tone arm should be draped so as to permit free movement of the tone arm. Never pull it tight or tie down.
5. The clutch engagement lever (6) not unlatching. This lever has a loose fit at its pivot point and operates by gravity. It is intended to operate dry and must never be lubricated. Keep free from dust and lint. Rotate drive gear 180° from rest position for detailed examination of lever (see fig. 7)
6. Trip lever (5) binding at its pivot point and failing to unlatch engagement lever. Examine for foreign matter between gear casting, lever and shoulder screw.
7. Tone arm binds when moved toward spindle as a result of insufficient vertical clearance for tone arm shaft (30). This is caused by tone arm lever (11) being too close to underside of panel; loosen Allen socket cap screw (22), reset and retighten. (See fig. 6)
8. Trip failure with eccentric cut-off groove records. This can best be analyzed by studying the text concerning Fig. 4.

L. REPEATED TRIPPING IS *caused by:*

1. FAILURE OF CLUCH ENGAGEMENT LEVER (6) TO LATCH. With the mechanism stopped in the playing position (pinion in open tooth portion of drive gear), latch the clutch engagement lever with the aid of a pencil and unlatch by moving the control knob to "REJECT". Repeat this several times. If it fails to latch:

- **a.** Examine the trip lever (5) for binds or insufficient tension in the trip lever spring (30). Replacement of a weak spring will give a positive latch-up. Do not increase tension to a point where it will cause a *trip failure.* (See fig. 8)
- **b.** Control knob binding in "REJECT" position due to sticking control slide (1) or its associated levers and springs. Examine for loose or missing springs.
- **c.** Manual reject slide incorrectly positioned so that it fails to clear the trip lever while in "AUTOMATIC" operation.

2. FAILURE OF STOP LEVER to properly detent drive gear. See Fig. 11 Examine for proper spring tension.

M. TURNTABLE SPEED should be checked with a stroboscopic disc under running conditions and with the needle on a record. Slow speed may be produced by lack of lubrication in the spindle bearings (35) or slipping of the idler wheel (36). In the latter case, examine for a weak idler spring (37) or for oil in the rubber rim which must be clean and dry. (See fig. 23)

V REPRODUCTION FAULTS

A. NO RESPONSE

1. Pickup cartridge dead.
2. Short in shielded lead circuit.
3. Failure of amplifier system.

B. POOR TONE QUALITY

1. Broken or worn needle. Replace with a new, approved needle.
2. Defective pickup cartridge (try a new cartridge).
3. Improper needle pressure. Adjust needle pressure to that recommended by the pick-up manufacturer and in no case less than 1-1/8 oz.
4. Vertical friction. Examine tone arm hinge (34) for binds while moving arm up and down. (See Fig.18) The shielded wire emerging from back of tone arm should be draped so as to allow free movement of the arm.

C. NEEDLE JUMPS GROOVES

1. Worn, broken or improper needle. Replace with new, approved needle.
2. Booster spring too strong. Relax booster spring (15) pressure slightly bending outward (fig. 17).
   NOTE: Booster spring does not operate after first 1/2" of record.
3. Vertical friction. Examine tone arm hinge (34) for binds while moving arm up and down. (See Fig.18) The shielded wire emerging from back of tone arm should be draped so as to allow free movement of the arm.
4. Lateral friction. Examine tone arm shaft (30) for insufficient vertical clearance and reset as required (See Fig.6) The shielded wire emerging from back of tone arm should be draped so as to allow free movement of the arm.

D. FEEDBACK or microphonism is produced if the changer is not floating freely on its four mounting springs or output volume is too high. (Hold down devices should have been loosened or removed as required.)

E. "QUAVER" OR "WOW" is usually due to quick variations in turntable speed. With the drive gear in open-tooth or playing position, remove turntable and check.

1. Rotation of spindle—examine for a bind at any point. Oil sparingly if required, after cleaning.
2. Idler wheel rubber rim should be undamaged and perfectly free from oil or grease.
3. Idler wheel mounting and slide should move freely. Spring tension on slide must be maintained. Oil slide sparingly if necessary.

F. RUMBLE *is caused by:*

1. Damaged or badly worn rubber rim on idler wheel.
2. Motor plate loose on panel, or motor loose on plate.
3. Damaged motor—rotor knocked out of alignment.

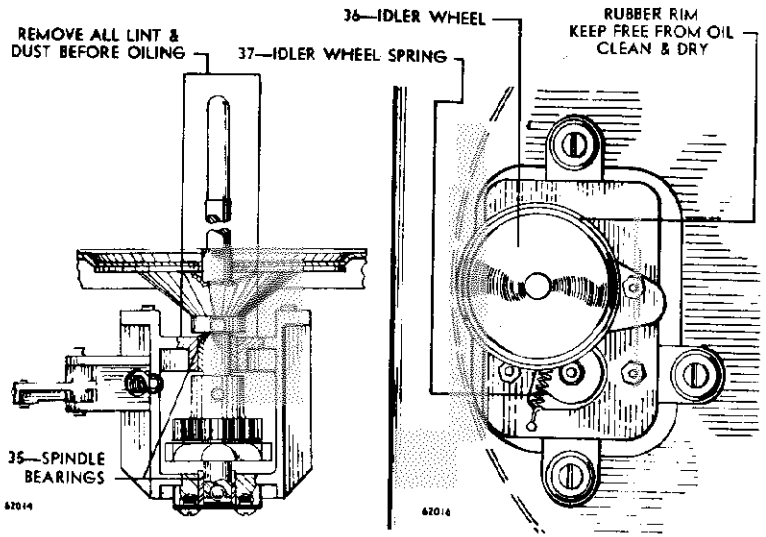

FIGURE 23.

CUTAWAY SIDE VIEW TOP VIEW—TURNTABLE REMOVED

VI LUBRICATION

A. DO NOT *lubricate*

1. Clutch engagement lever
2. Idler wheel rim and turntable rim

B. OIL, *if necessary*

1. All shafts
2. Turntable spindle

C. GREASE, *if necessary*

Cam surfaces and gear teeth

WIPE OFF all excess lubricants—over lubricatio n is dangerous.

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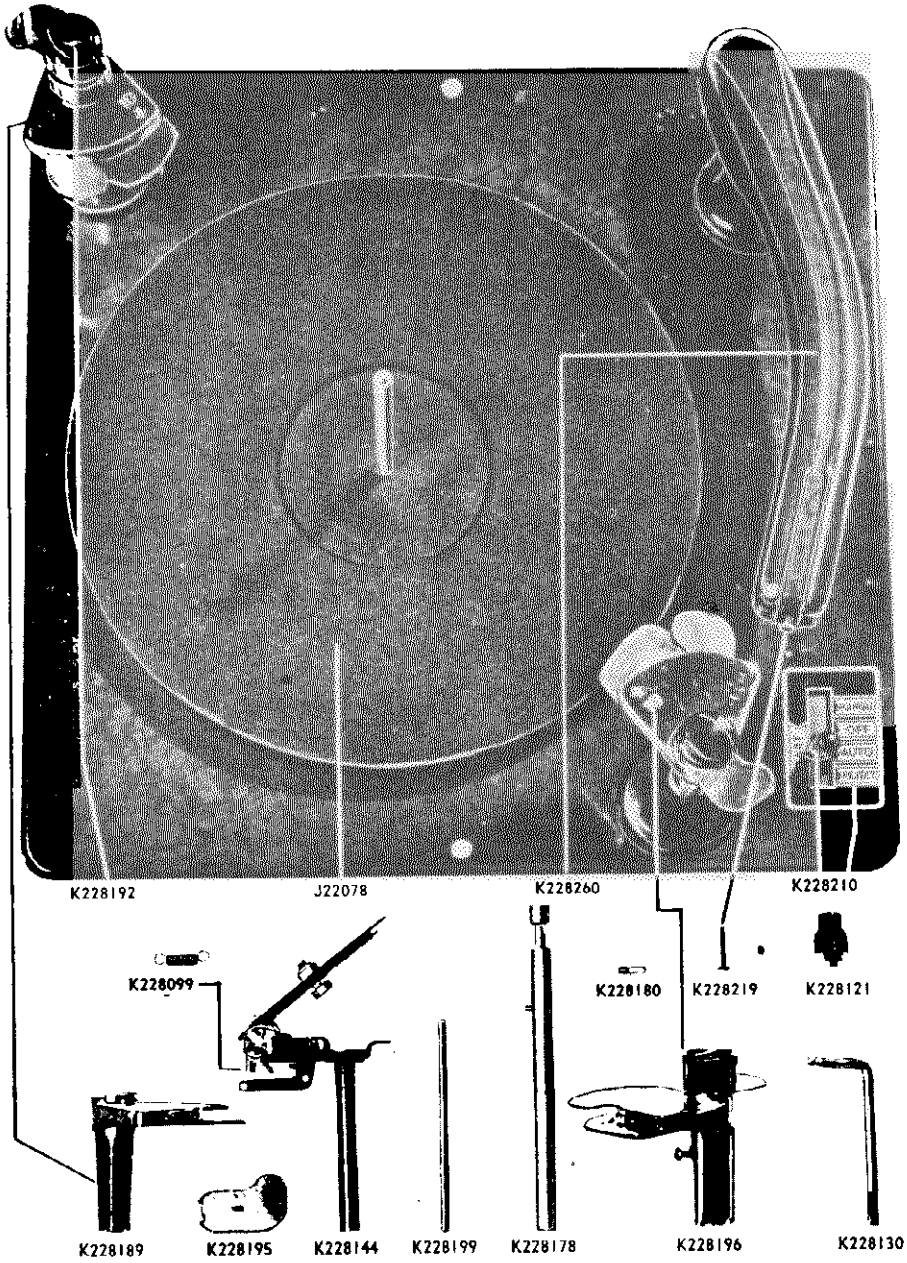
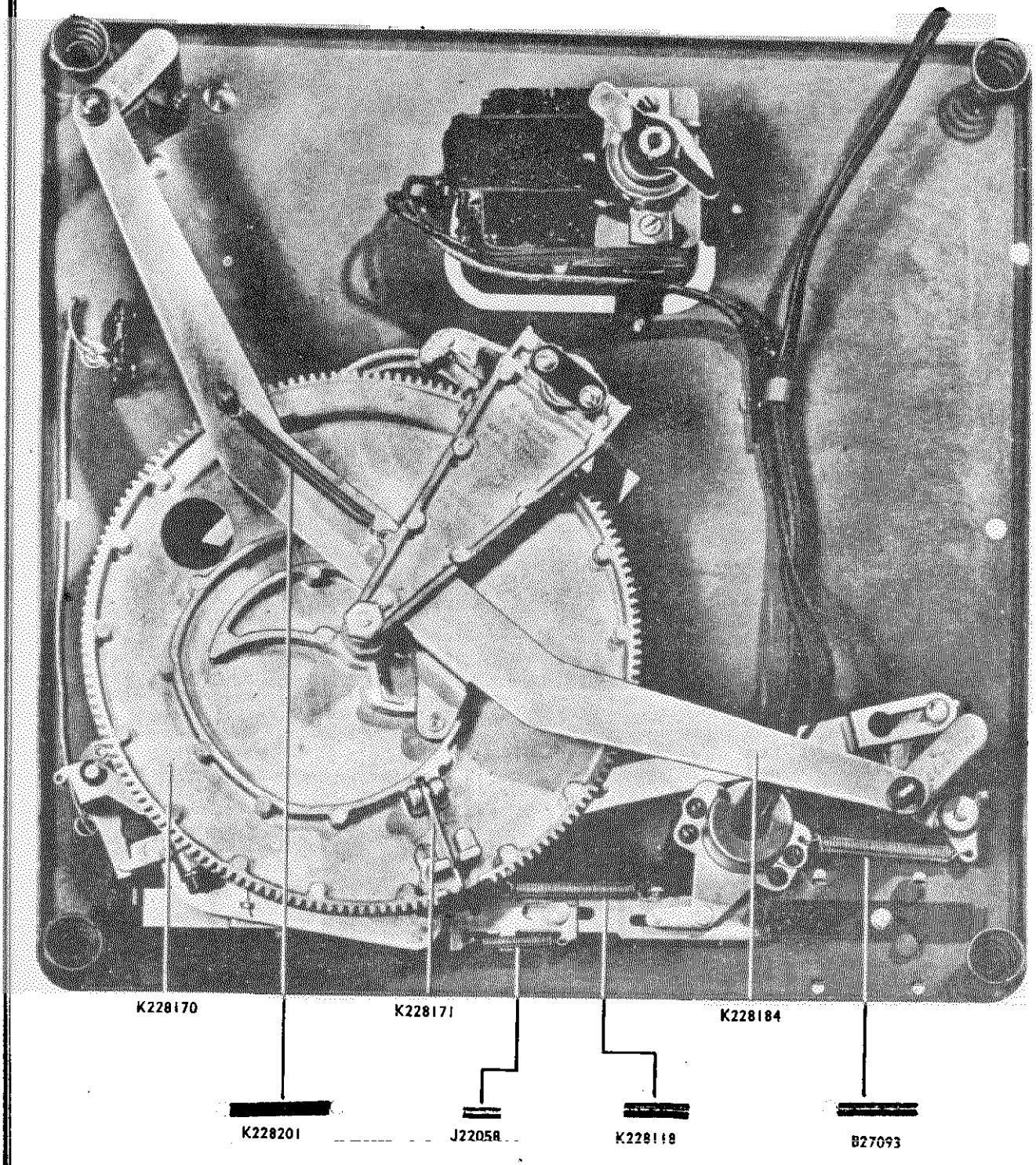


K228192 Selector Arm Knob Assembly
J22078 Turntable Assembly
K228260 Tone Arm
K228210 Control Escutcheon
K228099 Counterbalance Spring
K228180 Pin
K228219 Needle Screw
K228121 Control Knob Assembly
K228189 Selector Arm #1 & Blade Assembly
K228195 Selector Blade (12")
K228144 Tone Arm Hinge Assembly
K228199 Tone Arm Lift Pin
K228178 Selector Shaft #2 Assembly
K228196 Selector Arm #2 Assembly
K228130 12" Reset Rod

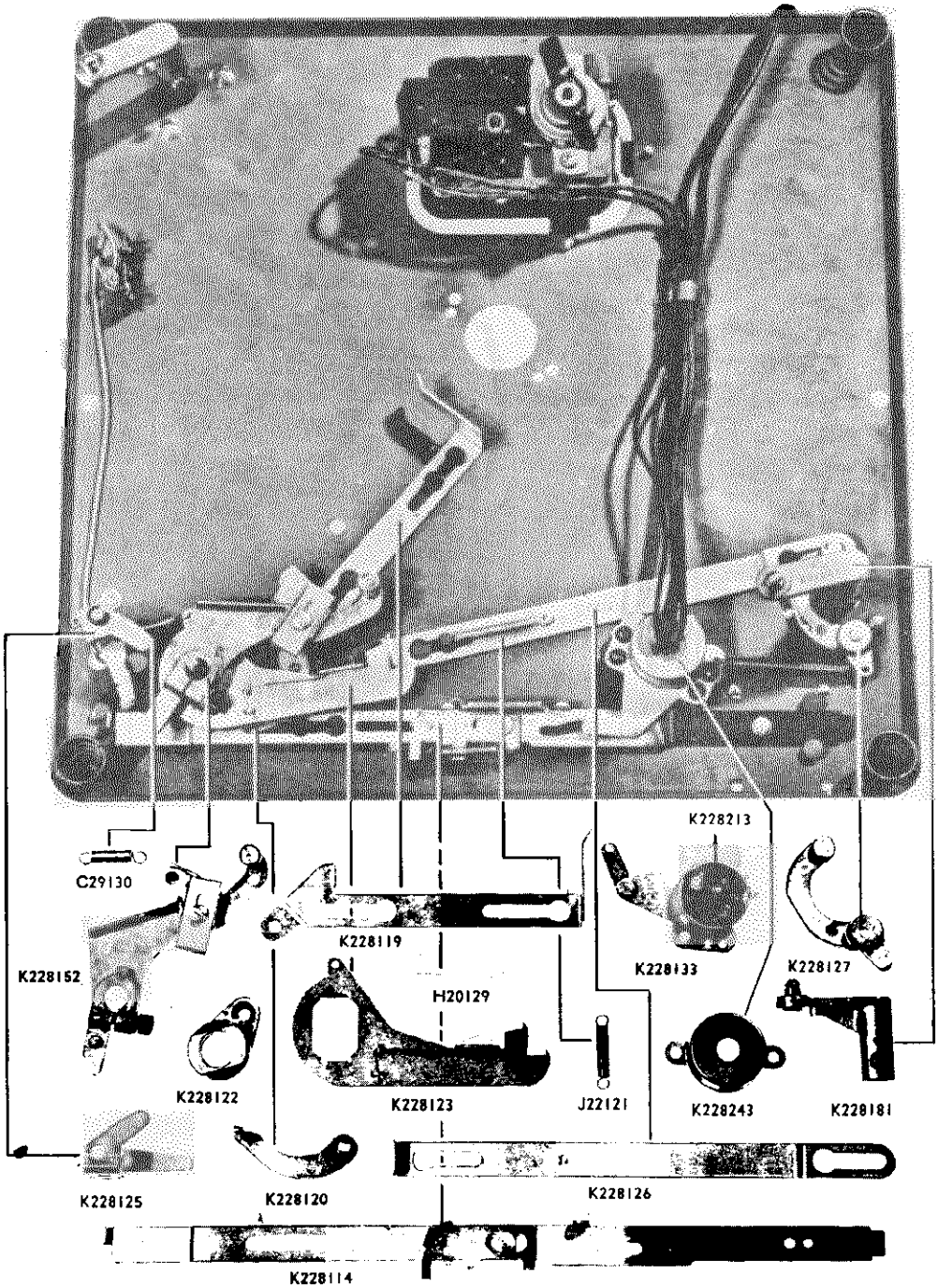
MODEL K

J. P. SEEBURG CORP.



K228170 Drive Gear
K228171 Clutch Engagement Lever
K228184 Drive Link Assembly
K228201 Drive Link Spring
J22058 Manual Lockout Spring, Outer
K228118 Manual Lockout Spring, Inner
B27093 12" Reset Lever Spring

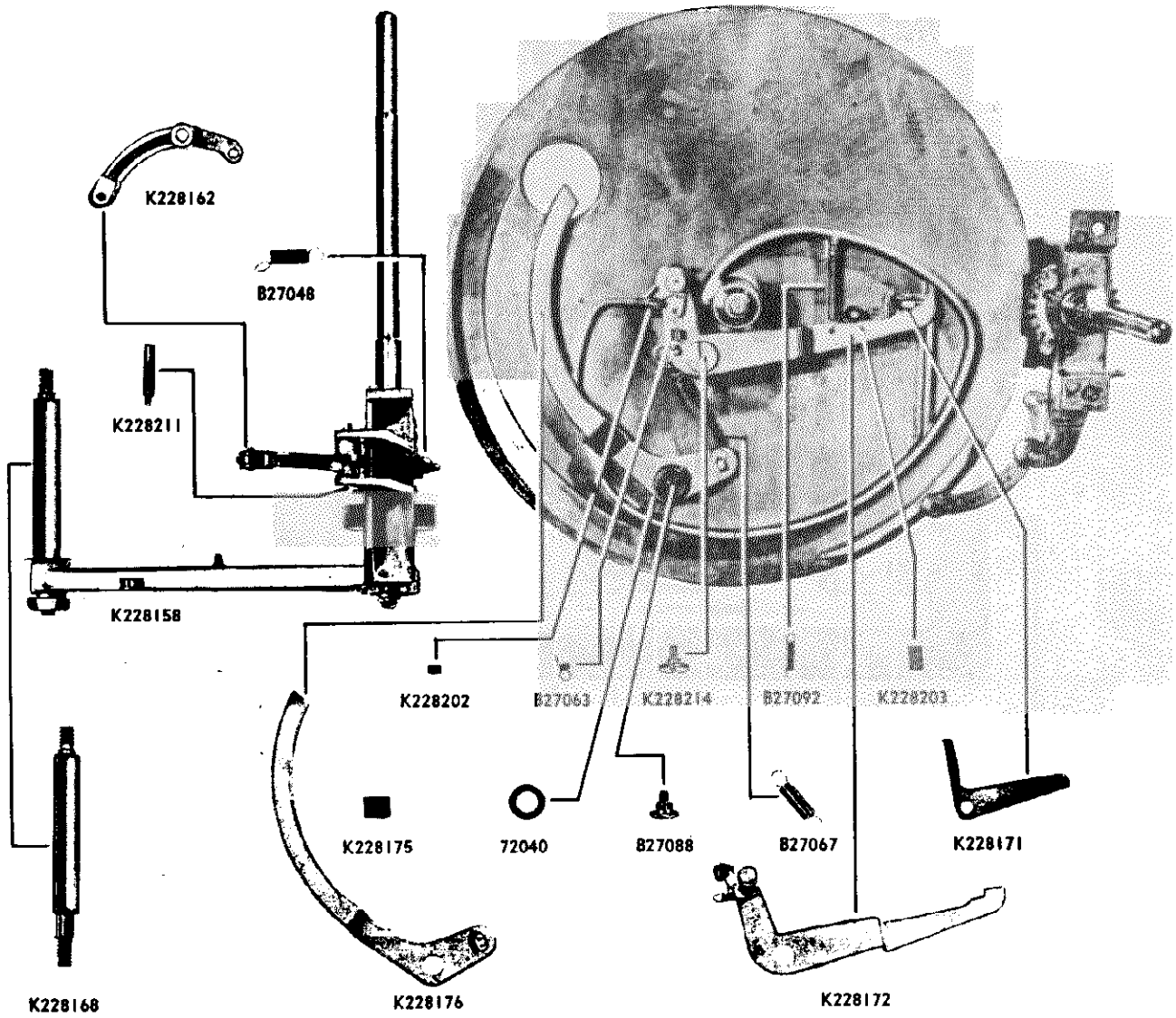
J. P. SEEBURG CORP.



- C29130 Tone Arm Locator and Latch Spring
- K228119 Manual Reject Slide
- H20129 Tone Arm Booster Spring
- K228133 Switch Plate Assembly
- K228127 Reset Lever Assembly
- K228122 Tone Arm Locator Hub
- K228123 Tone Arm Locator Assembly
- J22121 12" Reset Slide Spring
- K228243 Switch Cover
- K228181 Drive Crank Assembly
- K228125 Tone Arm Latch Lever
- K228120 Connecting Link
- K228126 12" Reset Slide
- K228114 Manual Lockout Assembly
- K228152 Tone Arm Lever Assembly
- K228213 Switch

MODEL K

J. P. SEEBURG CORP.



K228162 Drive Gear Stop Lever Assembly
B27048 Stop Lever Spring
K228211 Stop Lever Pivot Pin
K228158 Spindle and Housing Assembly
K228202 Trip Dog Bumper
B27063 Trip Dog Spring
K228214 Trip Lever Screw
B27092 Trip Lever Spring
K228203 Trip Lever Bumper
K228175 Retard Lever Bumper
72040 Retard Lever Spring Washer
B27088 Retard Lever Screw
B27067 Retard Lever Spring
K228171 Clutch Engagement Lever
K228168 Drive Gear Shaft
K228176 Tone Arm Retard Lever

K228172 Trip Lever Assembly

CROSS REFERENCE OF PART NUMBERS REFERRED TO IN TEXT

ITEM NO.	DESCRIPTION	PART NUMBER
1.	Control Slide, Part of K228114 Manual Lockout Assembly	
2.	Switch	K228213
3.	Connecting Link	K228120
4.	Reject Slide	K228119
5.	Trip Lever Assembly	K228172
6.	Clutch Engagement Lever	K228171
7.	Pinion Gear, Part of K228158 Spindle & Housing Assembly	
8.	Drive Gear	K228170
9.	Tone Arm Lift Pin	K228199
10.	Drive Link Assembly	K228184
11.	Tone Arm Lever Assembly	K228152
12.	Tone Arm Locator Assembly	K228123
13.	12" Reset Slide	K228126
14.	Tone Arm Retard Lever	K228176
15.	Tone Arm Booster Spring	H20129
16.	Drive Gear Stop Lever Assembly	K228162
17.	Trip Shoe	K228156
18.	Trip Plate, Part of K228152 Tone Arm Lever Assembly	
19.	Trip Dog, Part of K228172 Trip Lever Assembly	
20.	Manual Lockout Assembly	K228114
21.	Tone Arm Latch Lever	K228125
22.	Allen Socket Cap Screw	75047
23.	Tone Arm Adjusting Screw	K228238
24.	Counter-balance Spring	K228099
25.	Counter-balance Adjusting Slide	K228150
26.	Retard Lever Spring	B27067
27.	Spindle Pin, Part of K228164 Turntable Spindle Assembly	
28.	Turntable Hub, Part of J22078 Turntable Assembly	
29.	Trip Lever Spring	B27092
30.	Tone Arm Shaft	K228147
31.	12" Reset Slide Spring	J22121
32.	12" Reset Lever Spring	B27093
33.	Tone Arm Locator and Latch Spring	C29130
34.	Tone Arm Hinge Assembly	K228144
35.	Spindle Bearings, Part of K228158 Spindle & Housing Assembly	
36.	Idler Wheel — See numerical parts list.	
37.	Idler Wheel Spring — See numerical parts list.	
38.	Manual Latch Lock	K228111
39.	12" Reset Lever	K228128
40.	12" Reset Rod	K228130

All part numbers shown are for a "Standard" Changer. Radio Companies which have used special pickup cartridges, tone arms, leads, or any other special parts should order them for their service stock instead of the Standard parts. Part numbers of the special items can be obtained from the Seeburg Service Dept. Motor Assemblies: Since each changer has alternate motor sources, it will be necessary to stock a quantity of service parts for each type. When ordering, be sure and give the motor assembly number stamped on the motor mounting plate.

MODEL "K" RECORD CHANGER PARTS LIST

SEEBURG PART NO.	ITEM
H-20065	"C" Washer
H-20129	Tone Arm Booster Spring
J-22021	Small "C" Washer
J-22058	Manual Lockout Spring—Outer
J-22078	Turntable Assembly
J-22096	Thrust Plate
J-22117	Thrust Wafer
J-22121	12" Reset Slide Spring
B-27048	Stop Lever Spring
B-27063	Trip Dog Spring
B-27067	Retard Lever Spring
B-27088	Retard Lever Screw
B-27093	12" Reset Lever Spring
B-27092	Trip Lever Spring
C-29130	Tone Arm Locator and Latch Spring
70069	7/16" x 12-24 Nut
71018	1/4 x 6-32 F.H.M.S.
71050	1/4 x 6-32 B.H.M.S.
71066	1/4 x 4-36 R.H.M.S.
71096	1/4 x 4-36 Oval. Fil. H.M.S.
71418	1/8 x 4-36 R.H.M.S.
71501	3/16 x 6-32 R.H.M.S.
71502	5/8 x 6-32 B.H.M.S.
71533	1/2 x 6-32 B.H.M.S.
71563	1/2 x 4-36 R.H.M.S.
71750	Shakeproof Sems (3/16 x 6-32 R.H.M.S.)
71752	Shakeproof Sems (3/16 x 4-36 R.H.M.S.)
71758	Shakeproof Sems (3/8 x 6-32 R.H.M.S.)
71759	Shakeproof Sems (1/4 x 6-32 R.H.M.S.)
71760	Shakeproof Sems (5/16 x 8-32 R.H.M.S.)
72040	Retard Lever Spring Washer
72117	Flatwasher 9/16 o.d. x .316 i.d. x .032 th.
72139	Flatwasher 1/2 o.d. x 9/64 i.d. x .015 th.
73076	#10 Kantlink lockwasher
73084	#1506 C'Sunk Shakeproof washer
73087	1/4 Kantlink Lockwasher
73094	#1104 Shakeproof lockwasher
75042	Allen Head Set Screw 1/4 x 10-32 Cup Point
75047	Allen Socket Head M.S. 5/8 x 10-32
79102	Tubular Rivet .125" dia. x 9/16
80036	Taper Pin 3/4 x 3/0
80061	Taper Pin 1/2 x 3/0
K228095	Selector Drive Crank Assembly
K228099	Counter Balance Spring
K228111	Manual Latch Lock
K228114	Manual lockout assembly
K228118	Manual Lockout Spring (Inner)

SEEBURG PART NO.	ITEM
K228119	Manual Reject Slide
K228120	Connecting Link
K228121	Control Knob Assembly
K228122	Tone Arm Locator Hub
K228123	Tone Arm Locator Assembly
K228125	Tone Arm Latch Lever
K228126	12" Reset Slide
K228127	Reset Lever Assembly
K228128	12" Reset Lever
K228130	12" Reset Rod
K228133	Switch Plate Assembly
K228143	Pickup Lead * See note #1
K228145	Hinge Bracket and Shaft Assembly
K228150	Counter Balance Adjusting Slide
K228152	Tone Arm Lever Assembly
K228156	Trip Shoe
K228158	Spindle & Housing Assembly
K228162	Drive Gear Stop Lever Assembly
K228164	Turntable Spindle Assembly
K228167	Pinion Gear
K228168	Drive Gear Shaft
K228170	Drive Gear
K228171	Clutch Engagement Lever
K228172	Trip Lever Assembly
K228175	Retard Lever Bumper (Rubber)
K228176	Tone Arm Retard Lever
K228177	.032 Fibre Thrust Washer
K228178	Selector Shaft Assembly
K228181	Drive Crank #1 Assembly
K228184	Drive Link Assembly
K228187	Drive Link Roller
K228189	Selector Arm #1 & Blade Assembly (10")
K228192	Selector Arm Knob Assembly
K228195	Selector Blade (12")
K228197	Selector Arm #2 & Blade Assembly (10")
K228199	Tone Arm Lift Pin
K228201	Drive Link Spring
K228202	Trip Dog Bumper (Rubber)
K228203	Trip Lever Bumper (Rubber)
K228210	Control Escutcheon
K228211	Stop Lever Pivot Pin
K228212	Wire Clip
K228213	Switch
K228214	Trip Lever Screw
K228215	Plug Button
K228216	Tone Arm Mounting Grommet
K228217	Tone Arm Special Washer
K228219	Needle Screw * See note #1
K228221	Pickup Cartridge Assembly * See note #1
K228223	Fulcrum Clamp
K228224	Tone Arm Fulcrum
K228225	Tone Arm Bracket Assembly
K228238	Tone Arm Adjusting Screw
K228239	Rubber Grommet
K228240	Brass Bushing
K228243	Switch Cover
K228244	Insulating Disc
K228260	Tone Arm * See note #1

60 cycle motors can be converted to 50 cycle by slipping a conversion spring over the motor shaft. These springs are listed below. Following is a list of motor parts showing the corresponding parts available for each type.

Motor	50 Cycle Conversion Spring	Idler Wheel	Idler Wheel Spring	Idler Wheel Fastener
K228231	K228229	J22143	K228237	L230244 Clip L230225 Washer
K228250	K228249	K228256	K228257	L230198 "C" Washer

LOAD

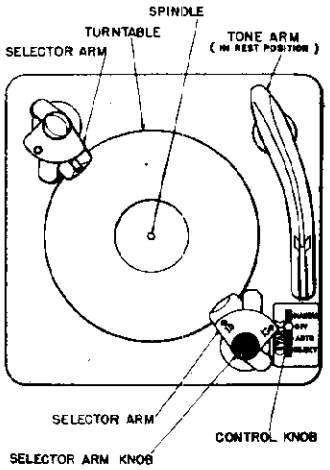
Lift and rotate Selector Knob for 10 or 12 inch records, as desired (Arrow pointing DIRECTLY at spindle). Load changer with up to fourteen 10 inch or up to ten 12 inch records. Do not intermix 10 and 12 inch records.

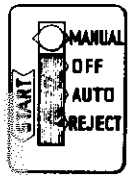
START AND STOP

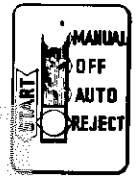
Turn radio switch "ON" and place RADIO-PHONO switch to "PHONO" setting. Move Control Knob to "REJECT" position and release it. The changer will now play the entire stack and shut off automatically. (To shut off the phonograph before entire stack has been played, move Control Knob to "OFF", lift Tone Arm and move out to Rest Position.)

UNLOAD

Control Knob at "OFF" position. Remove any remaining records on Selector Arms. Lift and turn Selector Knob until arms clear the records. Remove record stack from turntable. The changer can now be reloaded as described above.







REJECTING A RECORD

To reject a record before it has finished playing, move Control Knob to "REJECT" and release it. The changer will reject the record and then continue to play the remainder of the stack.

MANUAL OPERATION

Odd-sized or very old records and home recordings should be played in "MANUAL" position. Lift and turn Selector Knob as for unloading. Place record on turntable. Move control knob to "MANUAL" position. Place tone arm on record and when finished playing return by hand to rest position. To stop motor, move control knob to "OFF" position.

PHONOGRAPH NEEDLES

It is well to keep in mind that even though the amplifying system, speaker and tone arm are of the best quality, a faulty needle will result in poor reproduction of music.

Various types and kinds of needles are available for use in automatic phonographs. Any needle can be used that is designed to play fifteen or more selections. No attempt should be made to use ordinary steel or fibre needles, since continued use of a worn needle will damage the records being played.

There are a number of good semi-permanent types of needles on the market which are rated in number of plays. It is usually more economical to use one of these needles which is rated at 1,000 plays or more. It is also good economy from the standpoint of record wear not to exceed the maximum allowable plays on such needles.

Due to careless handling of the tone arm, needles are accidentally broken or chipped at the point. A chipped or broken needle will do far more damage to either commercial or home recordings than one which is badly worn.

The condition of the needle can sometimes be determined by the clarity of the reproduction of the higher tones. The needle should be replaced with the same type as originally supplied to insure the best tone quality and record life.

This manual presents the operational cycle of the "L" Changer. A comprehensive cross index permits reference to all parts illustrated.

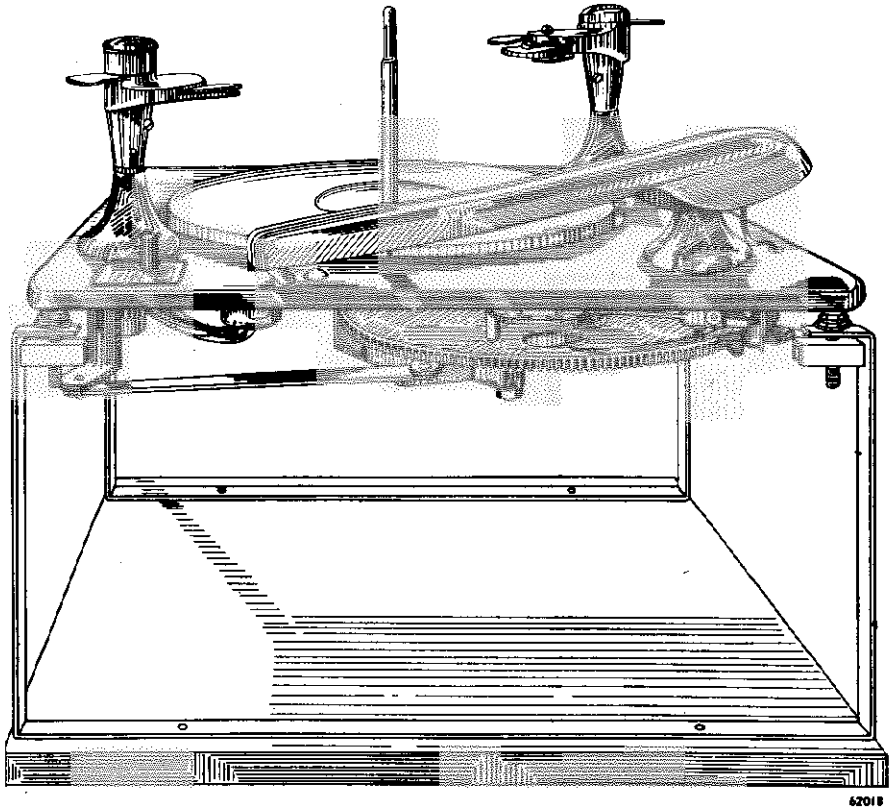


FIG. 1

A home made work stand, indicated above, permits easy access to all parts of the changer mechanism.

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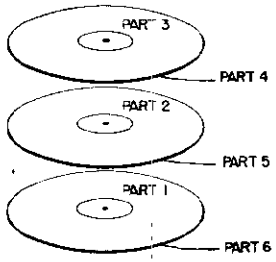
RECORD SEQUENCE

Automatic Playing



Complete operatic or symphonic works usually require two or more records. When ordering such records, specify that they are for a "Drop Type" changer and arrange them in the sequence illustrated. Example:

A 3 record - 6 part rendition;

After parts 1, 2 and 3 have been played, turn the stack over and the remaining half will be in proper sequence.

CARE OF RECORDS

It takes very little care to greatly increase the life of your records. Whenever possible they should be kept in albums made for that purpose, and when these are not available, the records should be kept in their envelopes and, if possible, standing vertically on edge. Keep them in a cool dry place, out of the sun and away from stoves, radiators, etc. Excessive heat will soon warp them. Do not leave records on the selector arms for prolonged periods and remove records from the turntable when through playing.

Keep records clean by wiping them occasionally with a soft dry cloth, using a circular motion. The use of oily preparations for cleaning is not recommended as this tends to collect dust which has an abrasive action when the needle is run through the grooves.

Occasionally records become warped due to incorrect storage; particularly in warm weather or if they have been left near a radiator. Such warped records will wear rapidly and cause undesirable needle noise when being played. These records can be straightened by placing them between two pieces of plate glass and leaving them for a day or two in a warm (not hot) place. Put a weight, such as a book, on top of the upper glass.

Very dirty records are cleaned best by using soap and water at room temperature with a hand brush. Scrub gently with a circular motion and rinse thoroughly with cool tap water and wipe dry.

HELPFUL HINTS

POOR TONE QUALITY EXCESSIVE NEEDLE SCRATCH

Usually due to a damaged or worn needle or record. Replacing either, or both, is the obvious remedy.

RECORD HANGING OR CATCHING ON SELECTOR ARMS

May be caused by using defective or badly warped records. These should be played manually.

SLIPPING ON TURNTABLE

Is caused by a warped record that does not present enough contact surface to the record below it and slips, producing an uneven sound.

SQUEAKS AND CHAFING NOISES

Can be corrected by aligning unplayed records on the spindle.

DO NOT STALL

The turntable by hand while it is in motion.

LUBRICATION

A. DO NOT lubricate:

1. Clutch engagement lever.
2. Idler wheel rim and turntable rim.

B. OIL, if necessary:

1. All shafts.
2. Spindle.

C. GREASE, if necessary:

Cam surfaces and gear teeth.

WIPE OFF ALL excess lubricant—over lubrication is dangerous.

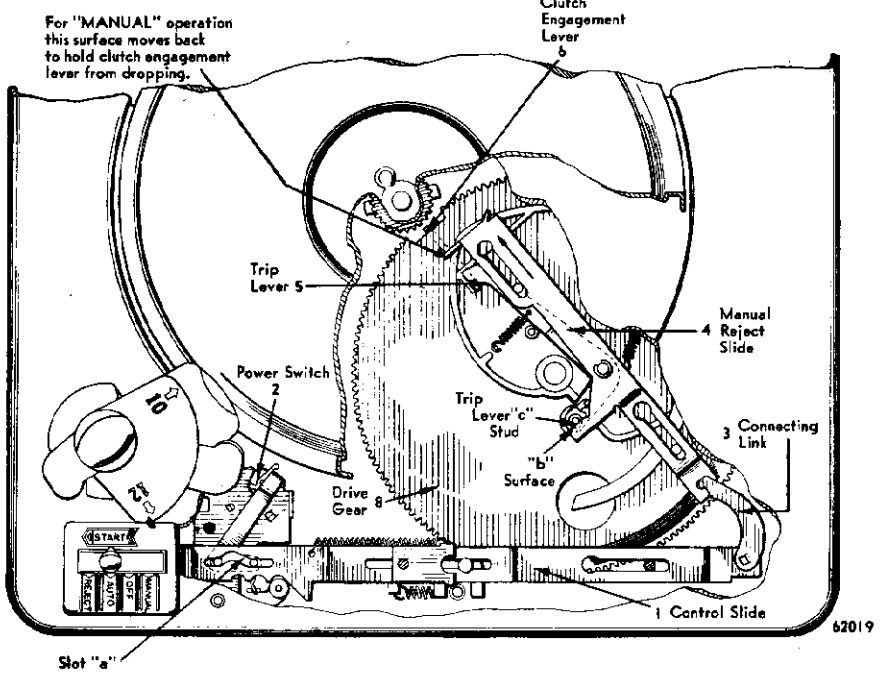


FIG. 2. CUTAWAY—TOP VIEW

I CYCLE OF AUTOMATIC OPERATION—

After placing changer in operating position, with records on the selector arm posts, the control knob governs all subsequent automatic operations.

A. CONTROL SLIDE (1)—Moving the control slide from "OFF" to "REJECT" starts the changer into "AUTOMATIC" operation in three steps:

1. As the control slide moves from "OFF" past "AUTOMATIC", slot "a" in the control slide (1) turns on the power switch (2) starting the motor and turntable.
2. When the control knob reaches "REJECT," the changer is manually "tripped" as follows:

   The control slide pushes connecting link (3), moving the reject slide (4) in the direction of arrow. Surface "b" strikes trip lever stud "c." Trip lever (5) movement releases the clutch engagement lever. (6). Levers 5 & 6 are mounted on drive gear (8).

3. When the control knob is released, it returns from "REJECT" to "AUTOMATIC."

B. CLUTCH ENGAGEMENT—

Lug "d" on the rotating pinion gear (7) strikes extended portion of clutch engagement lever (6) causing drive gear (8) to rotate and mesh with pinion gear (7). (Open tooth or "mutilated" section of drive gear (8) permits pinion gear (7) to rotate freely, EXCEPT during the change cycle). As the drive gear (8) rotates, the muting switch blade (58) leaves the cam "g," and shorts out the pick up lead.

C. ROTATION OF DRIVE GEAR (8)—results in the following cam actions:

1. Vertical cam "e" moves the tone arm lift pin (9) and raises the tone arm.
2. Cam "j" (bottom surface of drive gear) actuates the drive link (10) that induces the quarter turn by which the selector arms release a record.
   The motion is transmitted from the gear to the selector arms through the following parts: connecting rod (11), drive crank (12), selector shaft sleeve (59), pin "z," selector shaft No. 1 (60), post gear No. 1 (13), segment No. 1 (14), segment tie plate (15), segment No. 2 (16), post gear No. 2 (17). (The sleeve and pin are shown in figure 8)

   All of the parts listed above operate as a unit. Whenever the selector arm No. 1 is raised this action declutches the drive portion of the mechanism from the part which provides synchronism between the two arms.
3. Surface "h" on the locked tone arm lever (11) resets the trip by latching the clutch engagement lever (6) to the trip lever (5).
4. Cam surface "g" moves the tone arm latch lever assembly (18) so as to unlatch the tone arm lever (19) at point "m." Thereafter the stud "k" on the tone arm lever follows the receding cam "f," shown in Figure 8.
5. Spring pressure from tone arm locator (20) moves the tone arm lever (19) and tone arm in toward the record. Selector arm settings determine the point at which the tone arm locator (20) stops at surface "n" on the 12″ reset slide (21). Sketch above shows 10″ and 12″ record stops
6. The retard lever (22) contacts stud "k" and holds it in position during the time of lowering the needle on the record.
7. Tone arm lift pin (9) follows vertical cam on drive gear and lowers tone arm to the record. After the needle has touched the record, booster spring (23) exerts a slight pressure, causing the needle to enter the starting groove.
8. As the needle starts in the groove, drive gear (8) completes its rotation and is locked in open-tooth position by the drive gear stop lever (24) in detent in cam "g." Cam "g" also engages the muting switch blade (58) and restores pick up lead circuit to normal position.

D. AUTOMATIC TRIPPING—at the end of a record, the needle enters the cut-off groove and a new change cycle is set in motion by either of two actions releasing the clutch engagement lever (6).

1. **MINIMUM DIAMETER CUTOFF** occurs when trip shoe (25) strikes trip lever (5) at point "o." This should take place at approximately 1⅞″ radius on the record.
2. **ECCENTRIC GROOVE CUTOFF** occurs when the tone arm is moved away from the spindle. The sawtooth edge of the trip plate (26) engages and moves the trip dog (27), causing the trip lever (5) to function. This trip operates at all positions of the tone arm, after it has played approximately half of the record.

The changer has now completed one cycle of automatic operation.

II A. AUTOMATIC SHUTOFF is of the gravity triggered type and, upon completion of its cycle, has performed the following functions: (a) Moved the tone arm into a positive locked position at the outside edge of panel. (b) Moved the control knob to the "off" position. (c) Turned off the motor switch. After the last record has dropped from the selector arm posts, the following actions occur:

1. Release of weight of record from the selector bracket button (28) permits the shutoff cam shaft (29) and the shut-off cam (30) to drop down into position for engaging the shut-off slide bracket (31) through the rivet "p." The last record having finished, the drive gear is set in motion by automatic tripping action.
2. As the drive gear (8) rotates, the stud "r" leaves contact with the shutoff bracket (32), which moves in toward the drive gear (8) by the action of the shut-off bracket spring (57). Tone arm is moved out to the rest position, and locked there by the tone arm inner latch (33).
3. The segment tie plate (15) and segment No. 2 (16) move the No. 2 post gear (17), rotating the shut-off cam (30) against the rivet "p" attached to the shut-off slide bracket (31), permitting the shut-off slide (34) to be moved by the shut-off slide spring (35).
4. The shutoff slide (34) moves against the shut-off trip (36) at surface "s." This permits the shutoff dog (37) to align itself with the shut-off bracket (32). The end of the shutoff slide (34) moves behind the tone arm center latch (38), at point "t," preventing the tone arm from unlocking when the tone arm outer latch (39), is engaged by the cam on the outer edge of the drive gear.

   After the cam has passed the outer latch (39) the shut-off slide moves back to its normal position.

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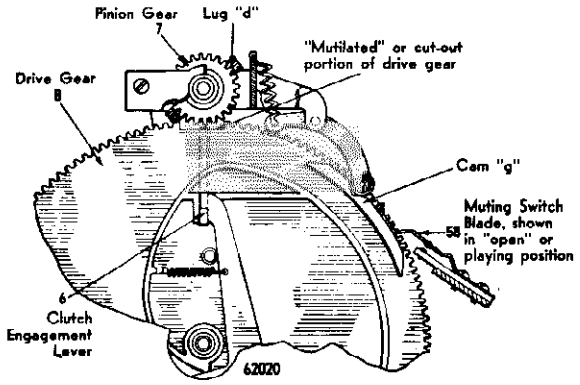

FIG. 3. CUTAWAY—BOTTOM VIEW

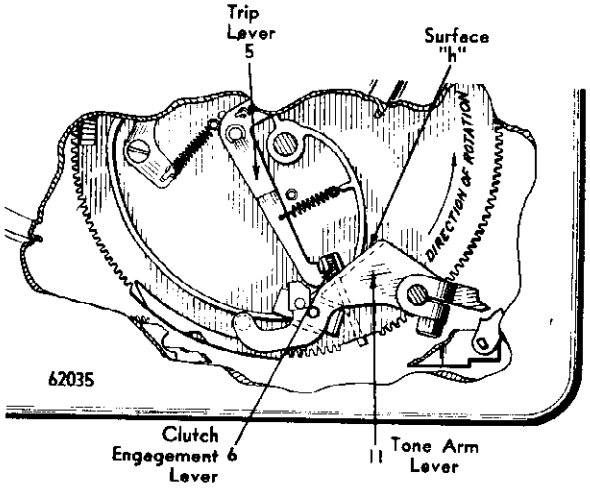

FIG. 6. CUTAWAY—BOTTOM VIEW

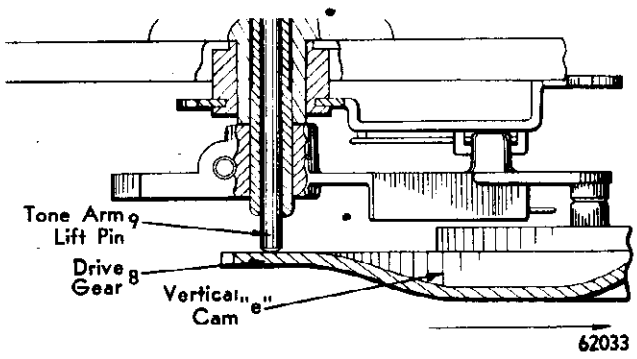

FIG. 4. CUTAWAY—SIDE VIEW

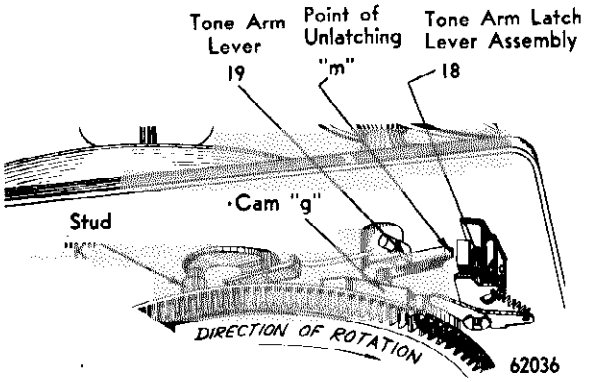

FIG. 7. CUTAWAY—SIDE VIEW

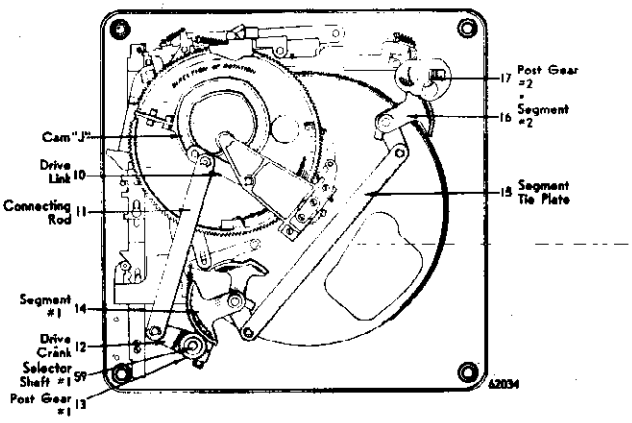

FIG. 5. BOTTOM VIEW

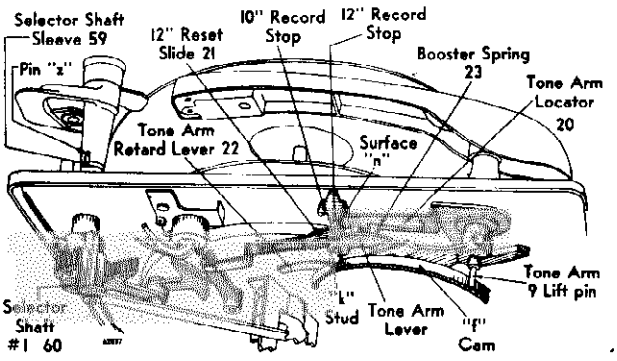

FIG. 8. CUTAWAY—BOTTOM VIEW

5. Just at the end of the drive gear cycle, the stud "r" engages the shutoff bracket (32), moves the latter to its extreme outer position, and through the locked shut off dog (37), moves the shutoff lever (40). This latter movement forces the control slide (1) into the "OFF" position and turns off the power switch (2). The completion of the drive gear cycle permits the shutoff bracket (32) to resume its rest position. As the shutoff lever (40) moves to the rest position, the shutoff dog (37), pivoted thereon, is caught by the shutoff trip (36) and reset in its rest position.

B. SHUTOFF GUARD ACTION is necessary to prevent tripping the automatic shutoff mechanism when the selector arms are manually rotated.

When the shutoff cam (3) is manually operated, through the selector arm knob, while the drive gear is in the rest position, and there are no records on the selector arms, an important action takes place. The shutoff slide (34) moves forward and contacts the shut off bracket (32) at point "y," preventing the tripping of the shutoff dog (37) by action of the shutoff trip (36). The preceding motions prevent operation of the automatic shut off mechanism.

This guard action is cleared during an automatic shutoff cycle as soon as the shutoff bracket moves in, and disengages from the stud on the drive gear. The shutoff bracket moves in, until it is stopped by contact with the stud which acts as a bearing for the trip dog. Movement of the shutoff slide is then possible because the formed down tip on the shutoff slide can move until it strikes the tapered portion instead of the flat portion at the rear of the shutoff bracket.

C. CLEARANCE POINTS:

1. SHUTOFF CAM

a. Lateral clearance—There must be no side pressure between the shutoff cam and the stud on the shutoff slide bracket for either a 10″ or 12″ setting of the selector arms, otherwise the cam will rub against the stud with enough friction so as to prevent free up and down motion of the cam due to the weight of a record.

b. Vertical clearance—There must be sufficient vertical clearance when either a 10″ or 12″ record is placed on the selector arms. The cam must be raised above the stud on the shutoff slide bracket so that there is no engagement between the two as the changer starts into a change cycle (See fig. 11)

2. SHUTOFF SLIDE—(refer to part II-A-4 for action of the shutoff slide during normal automatic shutoff cycle, and to part II-B for the guard action of the shutoff slide). There are two clearance positions that must be checked at point 2.

a. The first of these occurs when the shutoff bracket is resting against the stud on the drive gear. Under this condition the tail of the shutoff bracket must clear the formed down portion of the slide if the bracket is moved manually, but this same clearance must be sufficiently small so that the slide cannot move forward far enough to take up the clearance at points 3 or 4 (the first of which would actuate the shutoff trip and the second of which would block the movement of the tone arm center latch).

b. The second condition under which this clearance point 2 must be checked occurs when the stud on the drive gear has rotated just far enough into a change cycle so as to move out of contact with the shutoff bracket and allow the bracket to rotate into its extreme position against the stud on the panel. Under this condition there is additional clearance at point 2. This additional clearance must *now* be sufficient to:

1. Allow the shutoff slide to actuate the shutoff trip at point 3. If the clearance at point 2 is too small to allow sufficient motion of the slide the shutoff trip may fail to operate (since it will not completely clear the shutoff dog and set up the mechanism for an automatic shutoff cycle). The shutoff slide must move far enough so that the shutoff trip completely clears the shutoff dog and the dog is free to rotate against the stop.

2. Block the tone arm center latch at point 4. Excessive clearance at this point will allow the inner latch lever to be partially disengaged by the rotation of the drive gear. Insufficient clearance might cause a wedging action which would prevent smooth operation of the shutoff slide.

C-3. SHUTOFF TRIP AND SHUTOFF DOG:

Point 5 is the point of contact between the shutoff bracket and the shutoff dog. As described above in Part II-C-2-B-1, the shutoff slide actuates the shutoff trip clearing the shutoff dog, and allowing it to rotate from the position shown in figure 16a to the position in figure 16b. At point 5 and in the position shown in figure 16b, it is necessary that there be sufficient clearance between the formed up end of the shutoff bracket and end of the shutoff dog at point ("ac") so that the dog can assume the position shown in figure 16b.

It should be understood that the shutoff trip is fastened to the changer panel and is spring loaded, while the shutoff dog is attached to the shutoff lever and is also spring loaded. As the automatic shutoff cycle progresses, the drive gear stud rotates until it strikes the shutoff bracket with the cam action forcing it out

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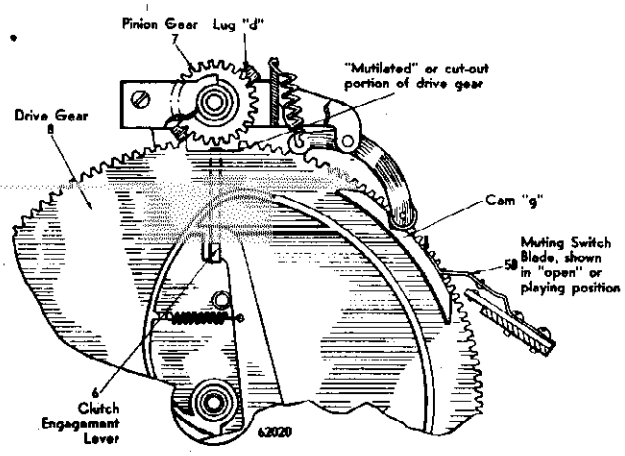

FIG. 9. CUTAWAY—BOTTOM VIEW

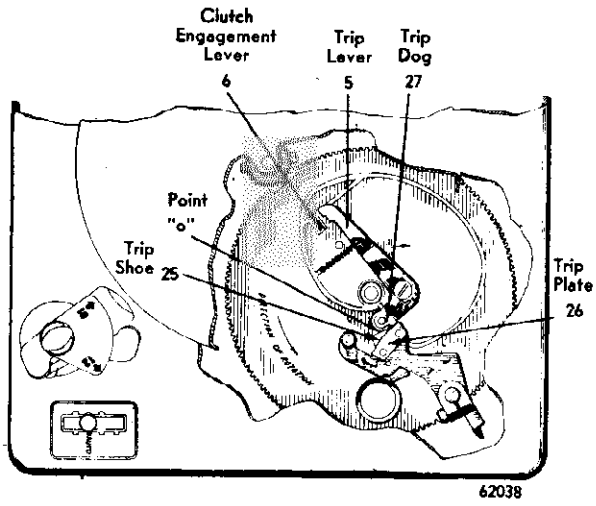

FIG. 10. CUTAWAY—TOP VIEW

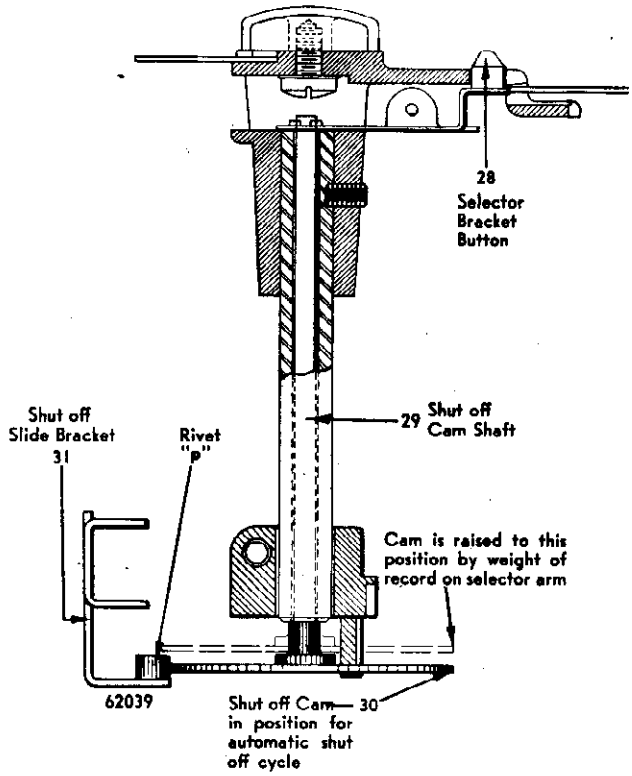

FIG. 11. CUTAWAY—SIDE VIEW

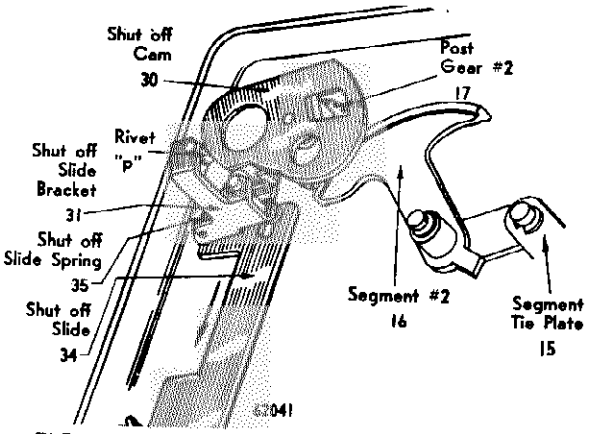

FIG. 13. CUTAWAY BOTTOM VIEW

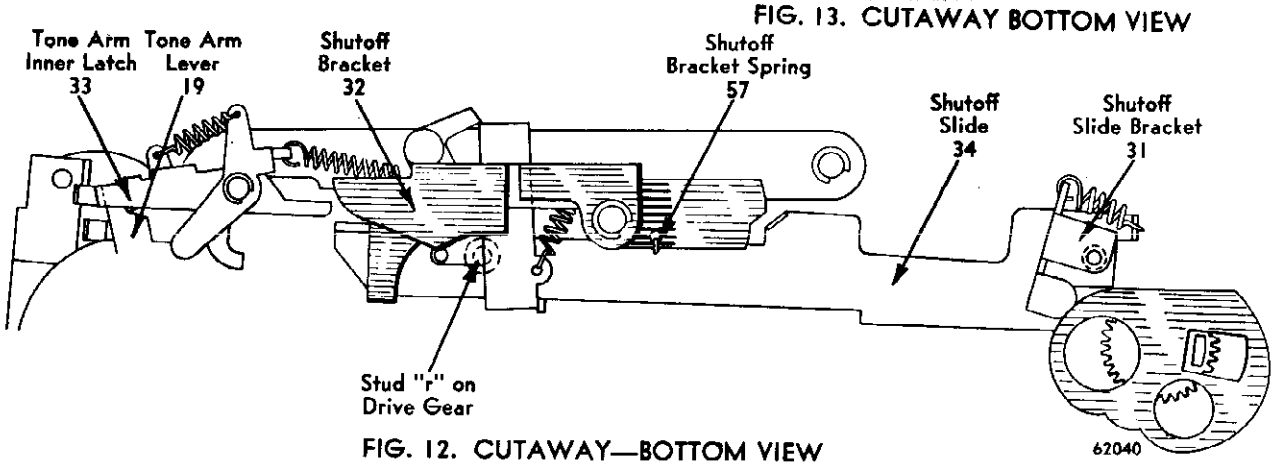

FIG. 12. CUTAWAY—BOTTOM VIEW

MODEL L

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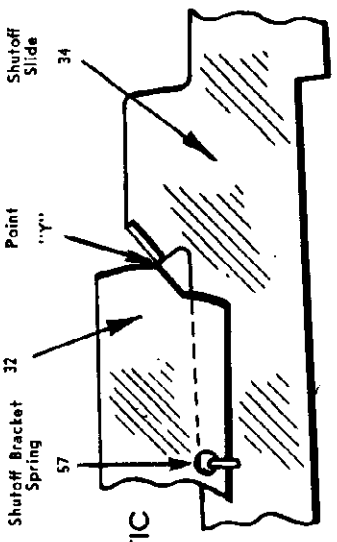


FIG. 16. DIAGRAMATIC

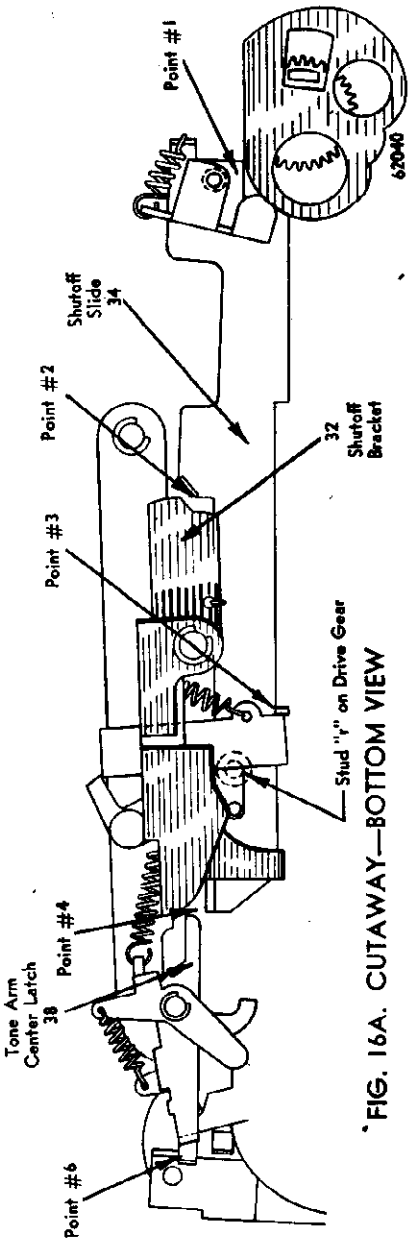


FIG. 16A. CUTAWAY—BOTTOM VIEW

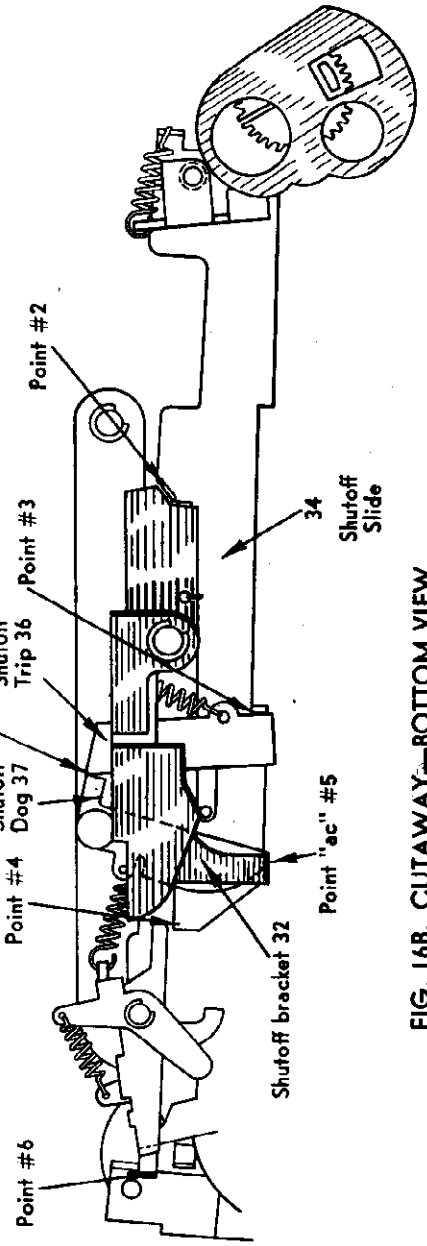


FIG. 16B. CUTAWAY—BOTTOM VIEW

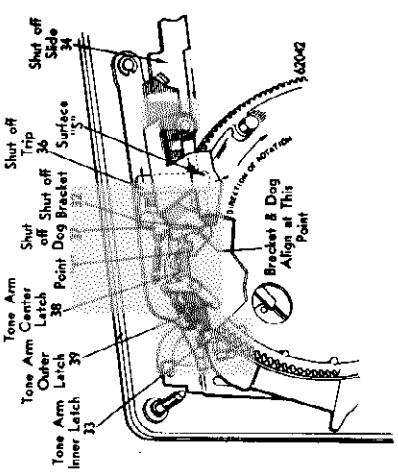


FIG. 14. CUTAWAY—BOTTOM VIEW

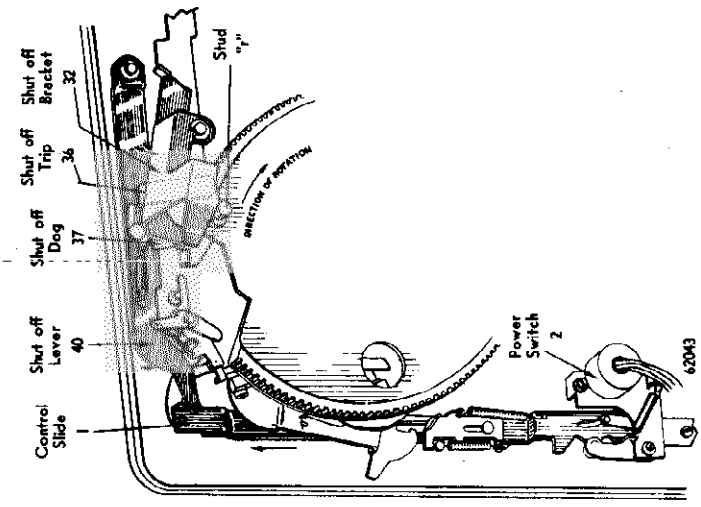


FIG. 15. CUTAWAY—BOTTOM VIEW

toward the edge of the panel. This outward motion of the shutoff bracket is transmitted to the shutoff lever because of the abutment shown in figure 16b at point ("ac".) (Remember that this alignment occurs only during an automatic shutoff cycle. At any other time, the shutoff dog does not engage the shutoff bracket.) Further movement of the shutoff bracket and the shutoff lever toward the outer edge of the panel will result in the shutoff dog completely clearing the shutoff trip. This position is shown in figure 16c. When this occurs the shutoff trip is free to rotate slightly so that when the shutoff bracket, shutoff lever and the shutoff dog return, the shutoff dog will engage the trip at point ("ab") and will return to the position in figure 16a. Until such a time as movement of the control slide again operates the shutoff trip, the automatic shutoff mechanism will remain inoperative since the shutoff dog is not in a position to line up with the shutoff bracket and engage it at point ("ac".) The maximum outward motion of the shutoff bracket and the shutoff lever must be sufficient so that the shutoff dog is carried far enough to completely clear the shutoff trip at point ("ab") in figure 16c.

Failure of the shutoff dog to return to the position shown in figure 16a will result in repeated automatic shutoff cycles. This condition may result from insufficient clearance at either point ("ab") or point ("ac").

4. SHUTOFF LEVER—CONTROL SLIDE:

Point 6 is the point of contact between the automatic shutoff mechanism and the control slide. It is through this contact that the control slide is moved to the "OFF" position (which also turns off the motor switch). This operation occurs when the automatic shutoff lever is moved toward the outside edge of the panel as described in the preceding paragraph.

The tip of the shutoff lever in normal position must permit free movement of the control slide into the "REJECT" position. During shutoff cycle the shutoff lever must move the control slide into "OFF." Incorrect clearance will result in:

1. Moving the control slide too far into "MANUAL" or
2. Moving slide not enough and leave it in "AUTO."

III MANUAL OPERATION—With the control knob in "MANUAL", the control slide (1) sets up four conditions:

a. The motor switch is on.

b. The end of the control slide (1) acting through the connecting link (see fig. 2) and the manual reject slide (4), partially disengages the tone arm inner latch (33) from its locked position. It now serves as a detent for the tone arm while in the rest position, and prevents its movement due to accidental bumping.

c. The manual lockout (42) on the control slide (1) prevents the tone arm locator (20) from moving inward, thereby permitting free movement of the tone arm by hand.

d. The manual reject slide (4) is pulled back so that the clutch engagement lever (6) is held, and prevented from engaging the pinion gear. (See fig. 2)

IV DETAILED DESCRIPTION OF CERTAIN FUNCTIONS AND PARTS

A. TONE ARM LATCH LEVER (also see fig. 14)

1. Functions and Positions:

a. A positive lock for the tone arm when the latter is swung to the outside of the panel, in all positions of the control slide other than "MANUAL." This is brought about by the engagement between the tone arm lever (19) and the tone arm inner latch (33).

b. A partial lock, or detent, for the tone arm while the control slide is in "MANUAL." This results when the control slide is moved to "MANUAL" position. The back end of the control slide moves the connecting link, which in turn moves the manual reject slide and the tone arm inner latch (33).

c. Complete disengagement results through the cam "g" on the outside edge of the drive gear, acting on the tone arm outer latch (39) during the AUTOMATIC change cycle. It is this unlatching action which puts the tone arm back into AUTOMATIC operation when the control slide is moved to the "REJECT" position.

IV-A-2 ACTIONS

a. When the tone arm is playing a record in AUTOMATIC position and is moved to the rest position, the tone arm inner latch (33) must positively lock the tone arm lever (19).

b. When the control slide is moved to "MANUAL," the end of the slide must work through the connecting link and the manual reject slide to move the tone arm inner latch (33), and change its contact with the tone arm lever (19) from a positive lock to a partial lock, giving a light smooth detent action when the tone arm is in rest position.

c. When the changer goes through an automatic shutoff cycle, the tone arm must remain latched in the outermost position. Normally, the tone arm would attempt to follow the cam surface of the drive gear

MODEL L

J. P. SEEBURG CORP.

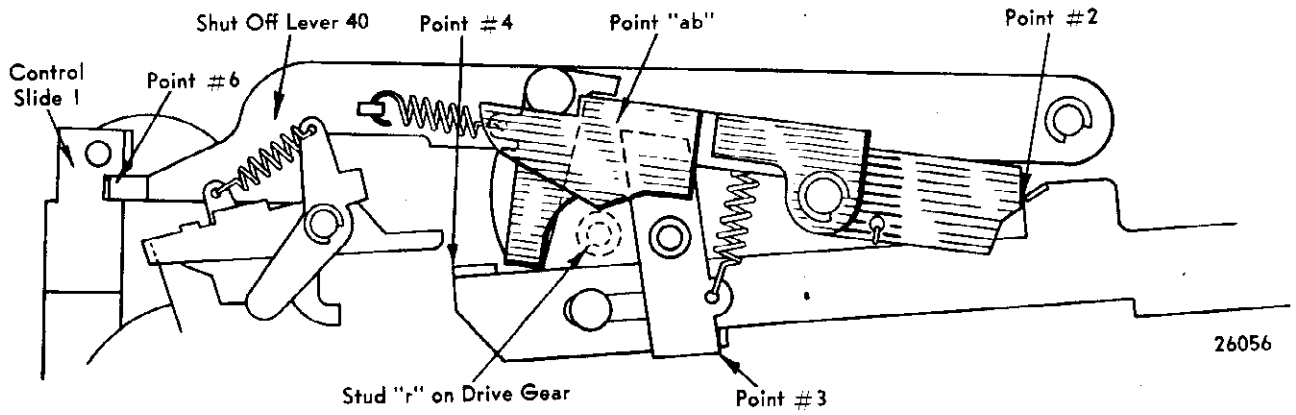


FIG. 16C. CUTAWAY—BOTTOM VIEW

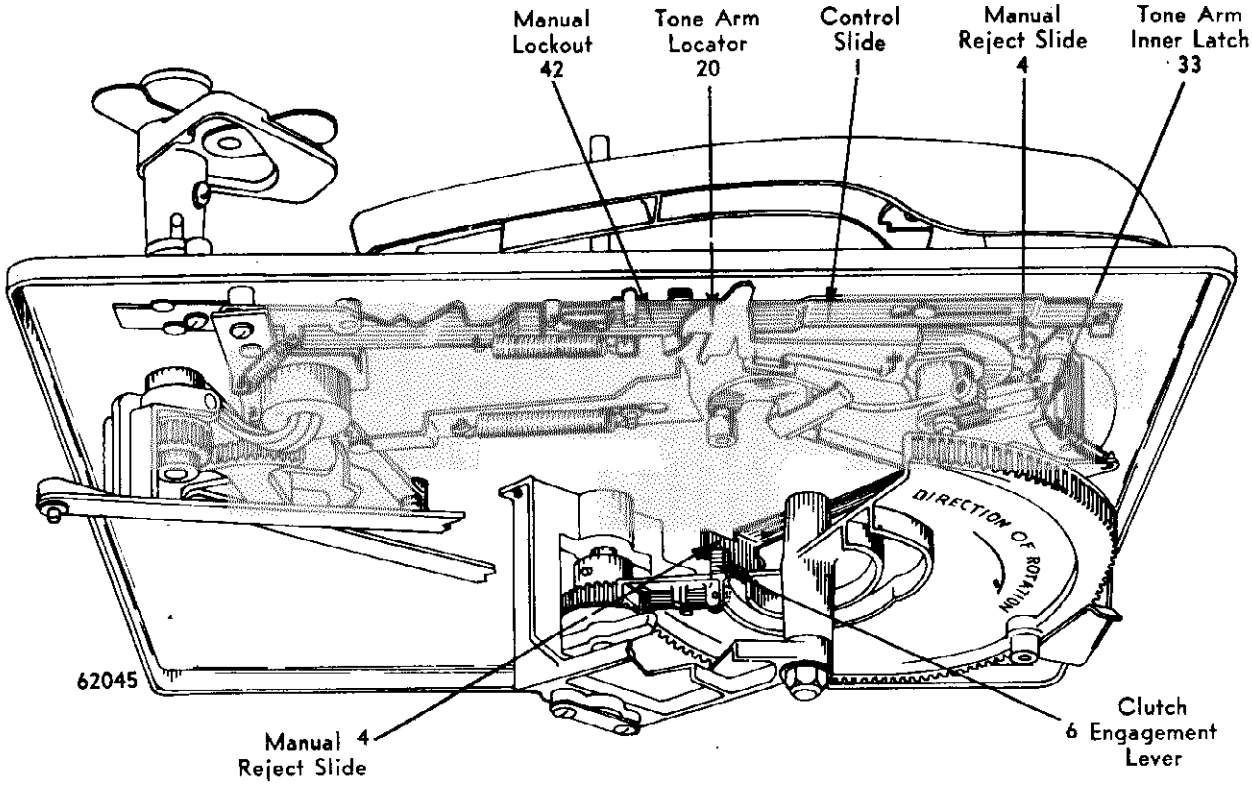


FIG. 17. CUTAWAY—BOTTOM VIEW

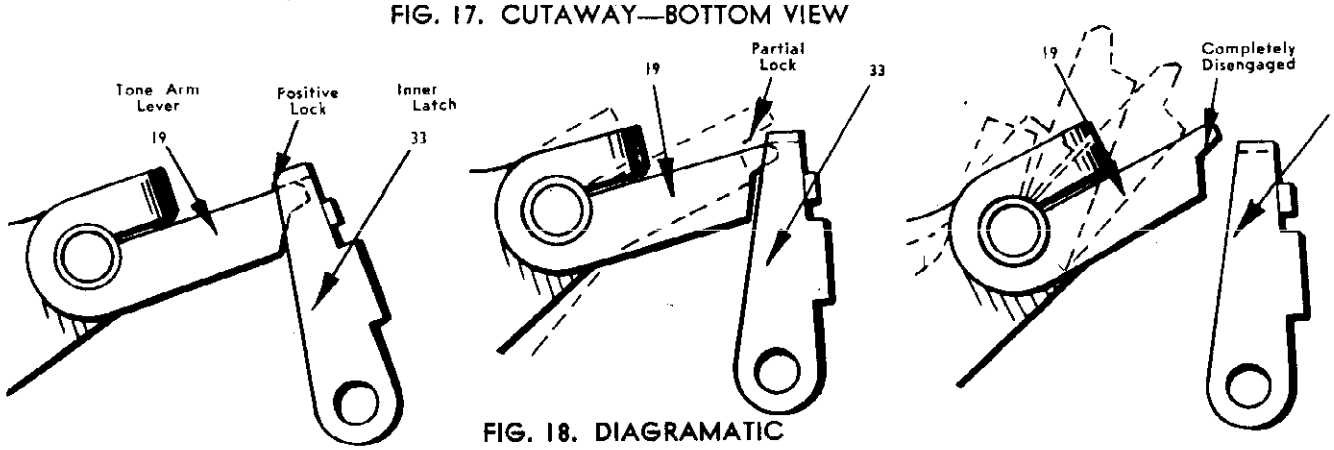


FIG. 18. DIAGRAMATIC

During the automatic shutoff cycle, it is therefore necessary to prevent this automatic disengagement by allowing the outer tone arm latch lever to move with the cam surface of the drive gear but disengaging it from the inner latch lever (and hence maintaining the positive lock on the tone arm lever).

The disengagement between the outer and inner latch levers is accomplished by holding the center latch lever in position by blocking its movement with the shutoff slide. This blocking action allows:

1. The outer latch lever to move independently, its movement being absorbed by a spring.
2. Inner latch lever to operate as a "positive" tone arm latch.
3. The center tone arm latch lever to serve as a limit device and as a connecting linkage between the outer and inner latch levers.

CAUTION: The blocking action between the shutoff slide and the center latch lever during an automatic shutoff cycle must be such that the center latch lever cannot rotate enough to disengage the positive tone arm latch. The assembly of the inner and center tone arm latch levers is held against a stop stud by means of the tone arm latch lever spring.

B. MANUAL LOCKOUT ASSEMBLY (42) engages and retains the tone arm locator (20) in its outermost position while the control slide is set in the MANUAL position. There are three actions involved:

1. When the tone arm is in the rest position, and the control slide is moved into MANUAL, the outer manual lockout (42) moves to hold the tone arm locator from moving inward.

2. The outer manual lockout (42) and the tone arm locator (20) must remain engaged while the control slide is moved into any other position, until automatically released by the drive gear cam.

3. With the tone arm lever in "MANUAL" position the manual lockout will slide back and allow the lockout engagement described if the tone arm is being moved into the rest position.

C. 12″ RESET SLIDE (21), 10″ and 12″ SET LEVER (43) and GEAR SEGMENT No. 1 (14) index the tone arm properly for a 10″ or 12″ record, depending upon the setting of the selector arms. This is accomplished by transmitting the motion of the selector knob through segment No. 1, and the 10″ and 12″ set lever to the 12″ reset slide. The engagement of the 12″ reset slide with the tone arm locator, determines the indexing of the tone arm. (See fig. 19)

CAUTION: This engagement must be such that the hook on the tone arm locator prevents manual changing of the setting. All parts above must return freely.

D. TONE ARM RETARD LEVER (22) has two functions:

1. Maintains a light pressure outwards during that part of the cycle after tone arm lever (19) leaves the cam surface on the drive gear. The purpose is to prevent overswinging of the tone arm and, hold it at the radius previously determined by the tone arm locator (20), immediately prior to and during the time of lowering the needle on to the record.

2. To prevent action of the booster spring (23) until such a time that the needle has actually landed on the margin of the record. (See fig. 28)

EXCESSIVE TENSION—on the tone arm retard lever spring (56) would tend to cause a jerky motion of the tone arm during the part of the cycle described in "1" above. Extreme tension might even cause incorrect indexing by not allowing the tone arm to go into the proper diameter as determined by the tone arm locator (20).

INSUFFICIENT TENSION on the retard lever spring would result in a premature booster spring action so that the needle would land inside the margin of the record. Extremely weak pressure, or no pressure at all, would result in an overswing of the tone arm causing the needle to land some place in the middle of the record.

E. BOOSTER SPRING (23)—Its purpose is to move the needle into the first playing groove on records which do not have a lead-in groove. Booster spring pressure is correctly adjusted when it causes the needle to move from the index point to the starting groove and no further. Excess pressure may cause the needle to scrape across the first few grooves. See "D" for tie-in with retard lever action.

F. TONE ARM KNIFE EDGE HINGE:

In order to reduce vertical friction of the tone arm to a minimum, as required for best operation with light pressure pickups, the tone arm hinge bracket (41) is of the knife edge type. A hardened steel knife edge "u" seats, under spring (50) pressure, into "v's" in the lower bracket.

1. The knife edge must not be broken or damaged

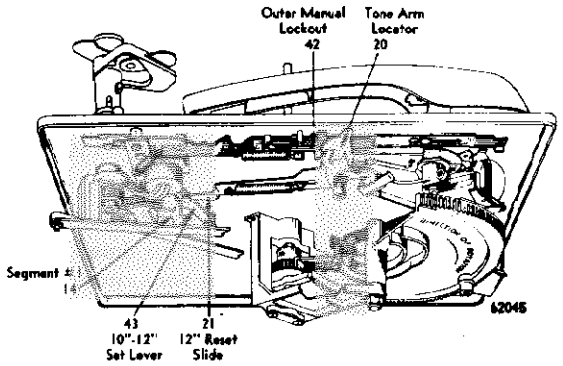


FIG. 19. CUTAWAY—BOTTOM VIEW

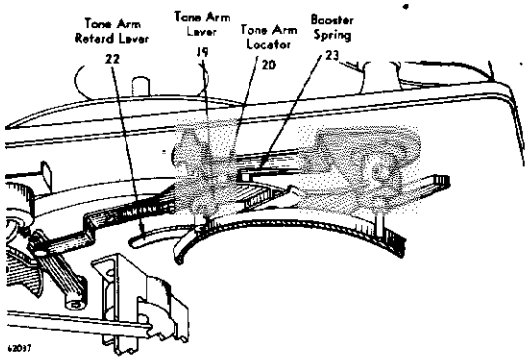


FIG. 20. CUTAWAY—BOTTOM VIEW

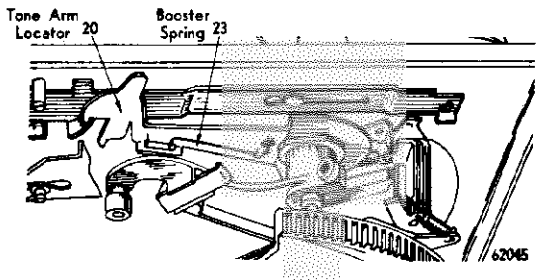


FIG. 21. CUTAWAY—BOTTOM VIEW

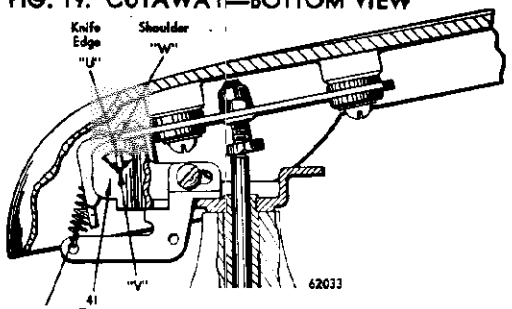


FIG. 22. CUTAWAY—SIDE VIEW

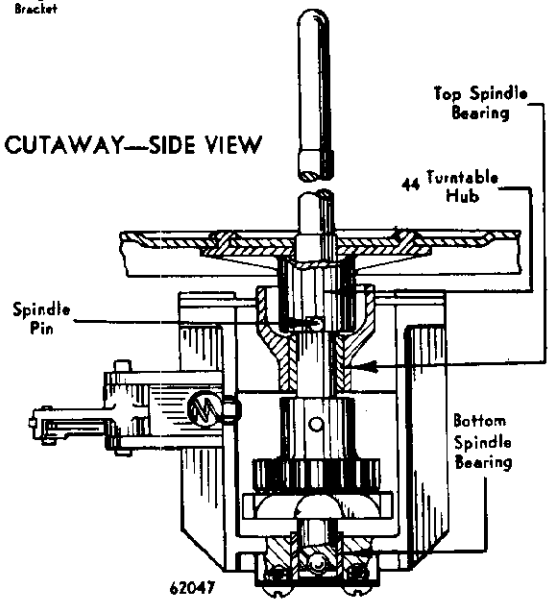


FIG. 23. CUTAWAY—SIDE VIEW

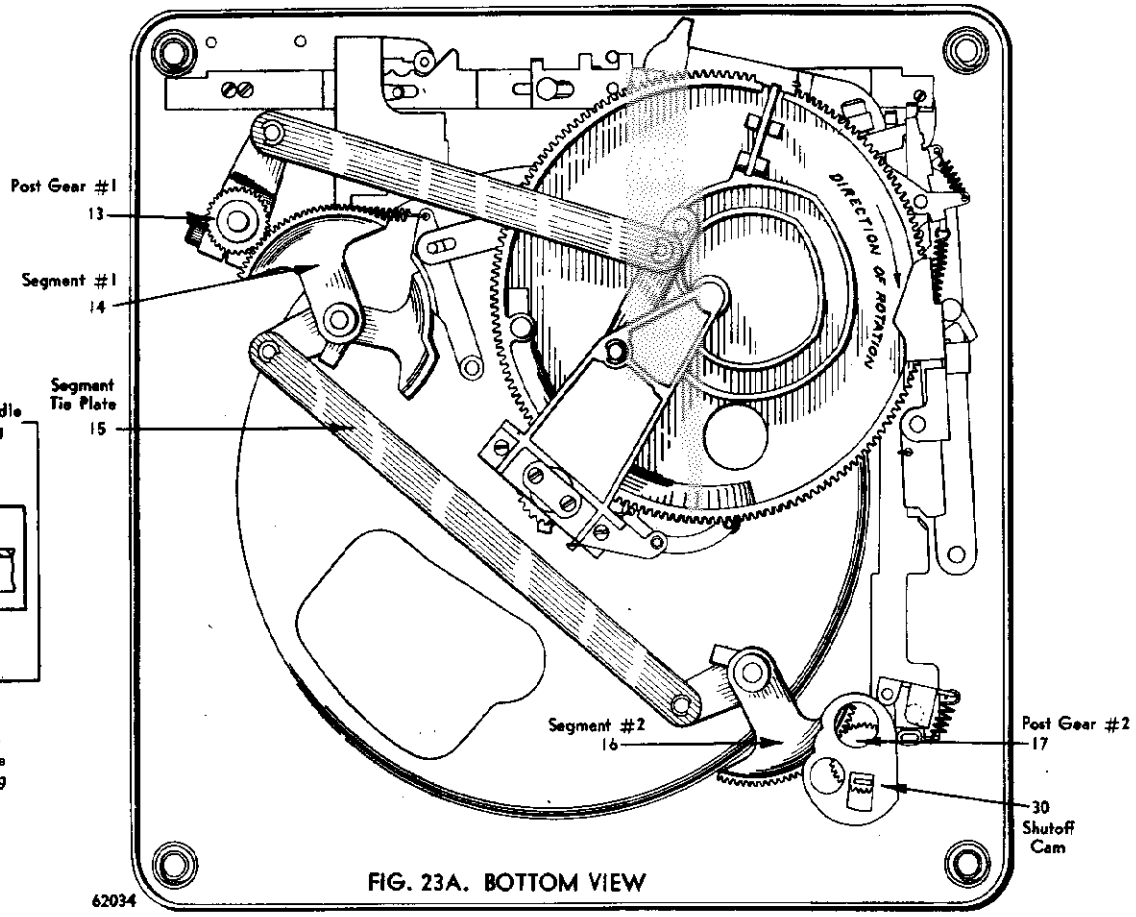


FIG. 23A. BOTTOM VIEW

2. There must be a slight amount of sidewise play between the bracket and the lower part of the knife edge shoulder, and also between the brackets themselves.

NOTE: Side clearance of the knife edge shoulder "w" in its bracket will give correct performance during playing since the knife edge is held solidly seated in the bracket by a spring. Also, the movement of the knife in the bracket, when the arm is handled manually, has no significance since the knife edge reseats itself due to the spring action when released.

3. Incorrect side play or clearance.

a. Insufficient sidewise play will result in rubbing or vertical friction.

b. Excessive clearance will result in erratic tone arm landing and cut-off operation, since the whole arm may shift slightly during the change cycle.

G. HOW TO REMOVE TURNTABLE (45)

It should be removed, by lifting carefully, tapping spindle lightly if necessary. This will expose top spindle bearing. When replacing turntable, slit in hub (44) must seat properly over spindle pin. (Rotate 180° for best fit). Push idler wheel in while lowering, so rubber rim will not be damaged by turntable edge.

V. MECHANICAL ADJUSTMENTS

A. MOTOR FAILURE, possible causes:

1. Power supply off, worn or broken wire, or defective plug.
2. Faulty switch.
3. Linkage between switch and control slide.

CAUTION:

The control slide must operate an over-center action of the switch when it is moved *slowly* in either of the positions adjacent to "OFF".

4. Burned out, or open motor coils.

B. MECHANICAL BINDS

1. During change cycle:

a. Rotate turntable by hand, clockwise.

b. If it seems to bind at one point only, examine the drive and pinion gears for foreign matter between the teeth.

c. Examine the turntable spindle and selector arm bearings for lack of lubrication.

2. During playing cycle idler wheel slide should move freely and its spring tension must be positive so that idler wheel maintains constant contact with turntable rim and motor shaft. See fig. 27,

CAUTION:

Excessive tension on this spring will cause rapid wear of idler wheel and "rumble" when playing.

C. MECHANICAL JAMS

Shut off power and proceed as follows:

1. Rotate the turntable counterclockwise slightly. This should free it.

2. Examine the mechanism for loose or bent parts or foreign matter.

3. A bent clutch engagement lever (6) would cause a failure in the meshing of drive and pinion gear teeth at the start of a change cycle.

D. RECORD JAMS are caused by:

1. Selector arms improperly set.

2. Odd-sized, badly warped or damaged records. Play these in "MANUAL" position.

3. Selector blades damaged or improperly adjusted. See G.

E. RECORDS DROP ONE SIDE ONLY if it has an unusually large center hole or a broken edge. Also examine the mechanism for a bent spindle or selector arm post, due to rough handling.

F. SELECTOR ARMS must be parallel with each other, and must be synchronized so that a record will drop evenly onto the turntable.

a. Movement of selector arms is described in paragraph 2, (fig. 5).

b. Setting of Selector Arms, Gears, and Segments.

1. Set drive gear in neutral position. Set selector arms No. 1 for 10" records, and align the sleeve with the proper notch in the arm, tighten the cap screw on the drive crank, to the sleeve.

2. With mechanism set as described above, segment No. 1 (14) and post gear No. 1 (13) are meshed so that stop on segment No. 1 just clears the segment tie plate (15). With segment No. 2 (16) connected to the segment tie plate, the position of segment No. 2 is fixed by dimensions of the parts.

Post gear No. 2 (17) must be properly related to the automatic shutoff cam (30). When rotated in the extreme counter-clockwise position, four teeth should remain disengaged between segment No. 2 (16) and the split in post gear No. 2 (17). Or, when rotated in the extreme clockwise position, one tooth remains between the end of segment No. 2 and the split in post gear No. 2.

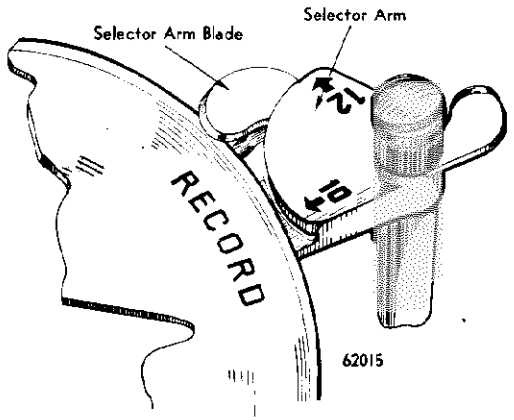
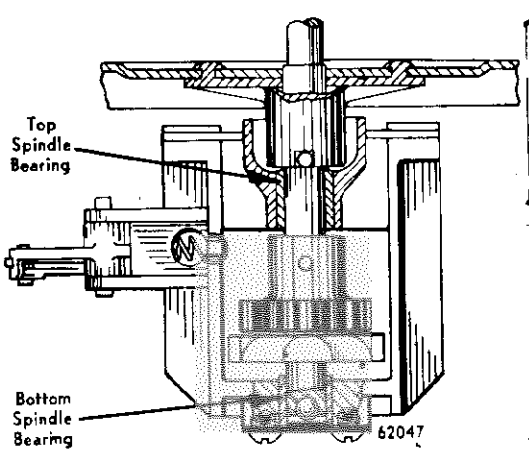


FIG. 24. TOP VIEW



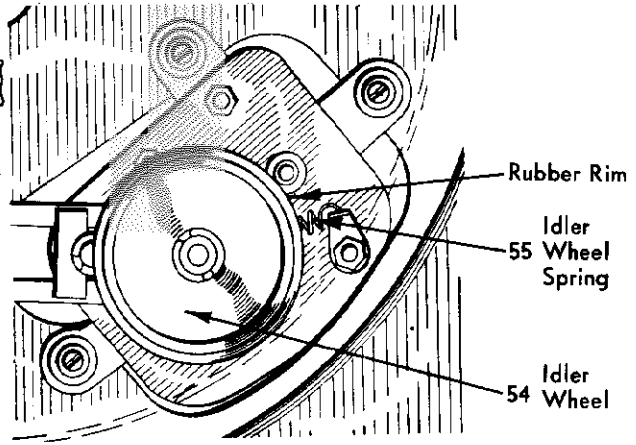


FIG. 27.

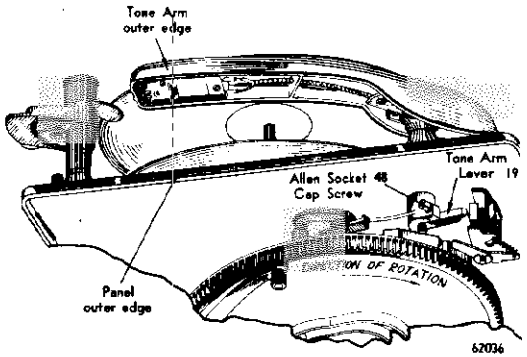


FIG. 25. CUTAWAY—BOTTOM VIEW

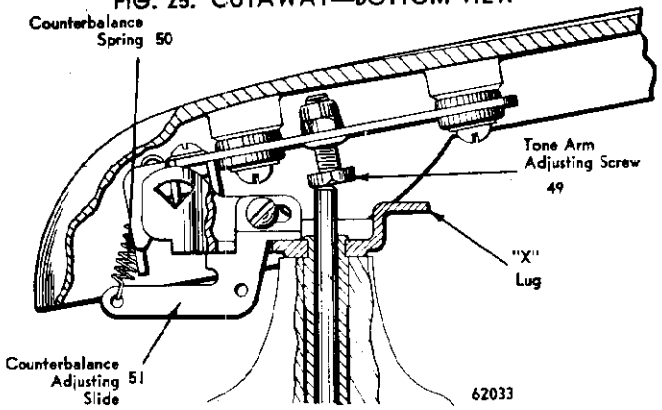


FIG. 26. CUTAWAY—SIDE VIEW

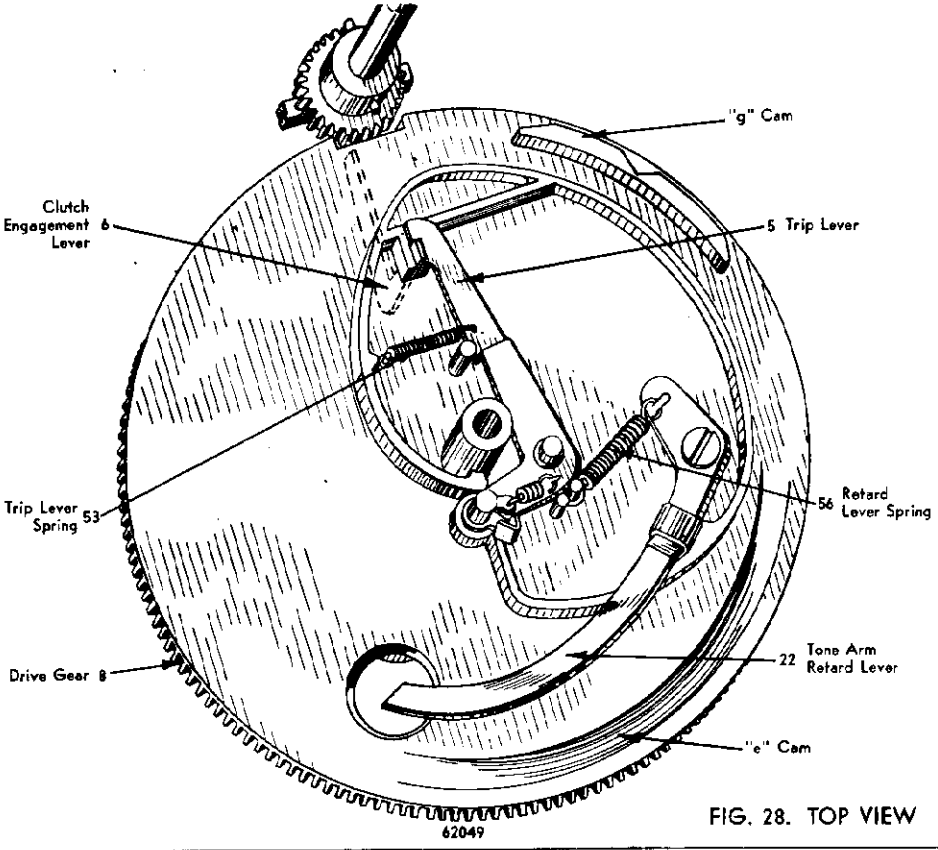


FIG. 28. TOP VIEW

G. SELECTOR BLADES:

a. If an adjustment is necessary, place a 10″ record of average thickness (.074″) on the selector arms and manually rotate the turntable clockwise until the selector blade contacts the record. The blade must rise after it first contacts the edge of the record. This rising cam action, results whenever pressure is applied to the leading edge of the selector blade. The blade may be adjusted by bending, very slightly, to correct position (use pliers with tape lined jaws). The height to which blades are set must be less than the minimum record thickness, otherwise the blade will attempt to change two records at a time, due to the cam action which *always* operates in an *up direction.* When necessary, make the same adjustment on the 12″ selector blades, using a 12″ record (approx. .090″ tk.).

b. The leading edge of blade must be smoothly rounded and well polished.

c. Blade must be very free in its mounting so that it will return to normal position by its own weight.

H. INCORRECT TONE ARM INDEXING:

Examine the 12″ Reset Slide Spring (46) for being loose, of improper tension or missing.

2. Incorrect spring tension of locator spring (47).

a. Insufficient spring tension will produce erratic or incorrect tone arm landing since it will not seat in the fixed 10-12″ indexing position. It will also result in a jerky action of the tone arm, since the tone arm lever will not accurately follow the cam surface of the drive gear.

b. Excessive spring tension will result in a stiff, heavily loaded "feel" as the tone arm is moved into the rest position. It may also produce a stiff action of the control slide (when the manual lockout is engaged) and cause increased wear on moving parts.

3. Tone arm retard lever (22) binds. Examine its pivot point for foreign matter between gear casting and shoulder screw. Also examine retard lever spring (56) for proper action. (Fig. 28

4. Excessive Clearance at tone arm hinge bracket.

I. TONE ARM POSITIONING is as follows:

NOTE: Before attempting the following procedure in order to correct tone arm landing, be sure to check section "H", since any one of those reasons may be the actual cause of incorrect landing.

1. Set the control knob in the "OFF" position (power plug out).

2. Place a 10″ record on the turntable and set the selector arms (10″ arrows pointing directly at the spindle).

3. Loosen the Allen socket cap screw (48) just enough to allow the tone arm lever to still hold its position.

4. Line up the tone arm's outer edge evenly with the panel edge. This gives the tone arm an approximate setting.

5. Push the control knob to "REJECT" and release it. Rotate the turntable clockwise and observe where the needle first touches the record. This should be about one-eighth inch from the edge. Variations should be corrected by slipping the tone arm lever (11) in correct direction.

CAUTION: Before tightening the Allen screw, make certain that there is enough vertical clearance in the tone arm shaft to avoid binding while the tone arm swings.

6. Replace the 10″ with a 12″ record and set selector arms accordingly. If the 10″ adjustment was made correctly, the 12″ indexing should be automatically correct.

J. TONE ARM HEIGHT adjustment:

1. The height to which the tone arm rises is correct when there is an approximate 1/16″ clearance between it and the bottom of a 10″ record on the selector arms. This clearance is regulated by the tone arm adjusting screw (49).

2. The down position of the tone arm is fixed by lug "x" on the tone arm hinge assembly. The correct height is that which will allow the bottom edge of the tone arm and cartridge to clear the turntable surface by approximately 1/16″. This adjustment may be corrected by a slight bending of lug "x."

K. NEEDLE PRESSURE is controlled by the counterbalance spring (50) in back of the tone arm. The pressure is variable through the counterbalance adjusting slide (51). The needle pressure should not be less than 1⅛ oz.

L. FAILURE TO TRIP may be caused by the following:

1. Old style records without proper cut-off grooves. These should be played in "MANUAL" position.

2. Broken, worn or improper needle which does not follow cut-off groove.

3. Closed-circle trip is incorrectly set. The trip shoe (25) is moveable and loosening its holding screw allows it to be adjusted as required. This adjustment is correct when the needle is 1⅞ inches from the record center and the trip shoe pushes the trip lever which releases the clutch engagement lever.

4. Tight tone arm lead wire. The shielded wire emerging from the back of the arm should be draped so as to permit free movement of the tone arm. Never pull it tight or tie it down.

5. The clutch engagement lever (6) not unlatching. This lever has a loose fit at its pivot point and operates by gravity. It is intended to operate dry and must never be lubricated. Keep free from dust and lint. Rotate drive gear 180° from rest position for detailed examination of lever. (See fig. 5)

6. Trip lever (5) binding at its pivot point and failing to unlatch engagement lever. Examine for foreign matter between gear casting, lever and shoulder screw. (See fig. 28)

7. Tone arm binds when moved toward spindle as a result of insufficient vertical clearance for tone arm shaft (52). This is caused by tone arm lever (19) being too close to underside of panel; loosen Allen socket cap screw (48) reset and retighten. (See fig. 26.)

M. REPEATED TRIPPING IS caused by:

1. **FAILURE OF CLUTCH ENGAGEMENT LEVER (6) TO LATCH.** With the mechanism stopped in the playing position (pinion in open tooth portion of drive gear), latch the clutch engagement lever with the aid of a pencil and unlatch by moving the control knob to "REJECT." Repeat this several times. If it fails to latch:

   a. Examine the trip lever (5) for binds or insufficient tension in the trip lever spring (53). Replacement of a weak spring will give a positive latch-up. Do not increase tension to a point where it will cause a trip failure. (See fig. 28)

   b. Control knob binding in "REJECT" position due to sticking control slide (1) or its associated levers and springs. Examine for loose or missing springs.

   c. Manual reject slide incorrectly positioned so that it fails to clear and trip lever while in "AUTOMATIC" operation.

2. **FAILURE OF STOP LEVER** to properly detent drive gear. (See fig. 9) Examine for proper spring tension.

N. TURNTABLE SPEED should be checked with a stroboscopic disc under running conditions and with the needle on a record. Slow speed may be produced by lack of lubrication in the spindle bearings or slipping of idler wheel (54). In the latter case, examine for a weak idler wheel spring (55) or for oil on the rubber rim which must be clean and dry.

VI. REPRODUCTION FAULTS:

A. NO RESPONSE due to:

1. Pickup cartridge dead.
2. Short in shielded lead circuits.
3. Failure of amplifier system.

B. POOR TONE QUALITY

1. Broken or worn needle. Replace with a new, approved needle.
2. Defective pickup cartridge (try a new cartridge).
3. Improper needle pressure. Adjust needle pressure to that recommended by the pickup manufacturer and in no case less than 1⅛ oz.
4. Vertical friction. Examine tone arm hinge for binds while moving arm up and down. The shielded wire emerging from back of the tone arm should be draped so as to allow free movement of the arm.

C. NEEDLE JUMPS GROOVES due to:

1. Worn, broken or improper needle. Replace with new, approved needle.
2. Booster spring too strong. Relax booster spring (23) pressure slightly, by bending outward. (Fig. 21)
3. Vertical friction. Examine tone arm hinge for binds while moving arm up and down. The shielded wire emerging from back of the tone arm should be draped so as to allow free movement of arm.
4. Lateral friction. Examine tone arm shaft (52) for insufficient vertical clearance and reset as required. (See par. L-7) The shielded wire emerging from back of tone arm should be draped so as to allow free movement of the arm.

D. FEEDBACK or microphonism are produced if the changer is not floating freely on its four mounting springs, or output volume is too high. (Hold down devices should have been loosened or removed as required.)

E. "QUAVER" OR "WOW" is usually due to quick variations in turntable speed. With the drive gear in open tooth or playing position, remove turntable and check:

1. Rotation of spindle—examine for bind at any point, and oil sparingly if required, after cleaning.
2. Idler wheel rubber rim should be undamaged and perfectly free from oil and grease.
3. Idler wheel mounting and slide should move freely. Spring tension on slide must be maintained. Oil slide if necessary. (See fig. 27.)

F. RUMBLE is caused by:

1. Damaged or badly worn rubber rim on idler wheel.
2. Motor plate loose on panel, or motor loose on plate.

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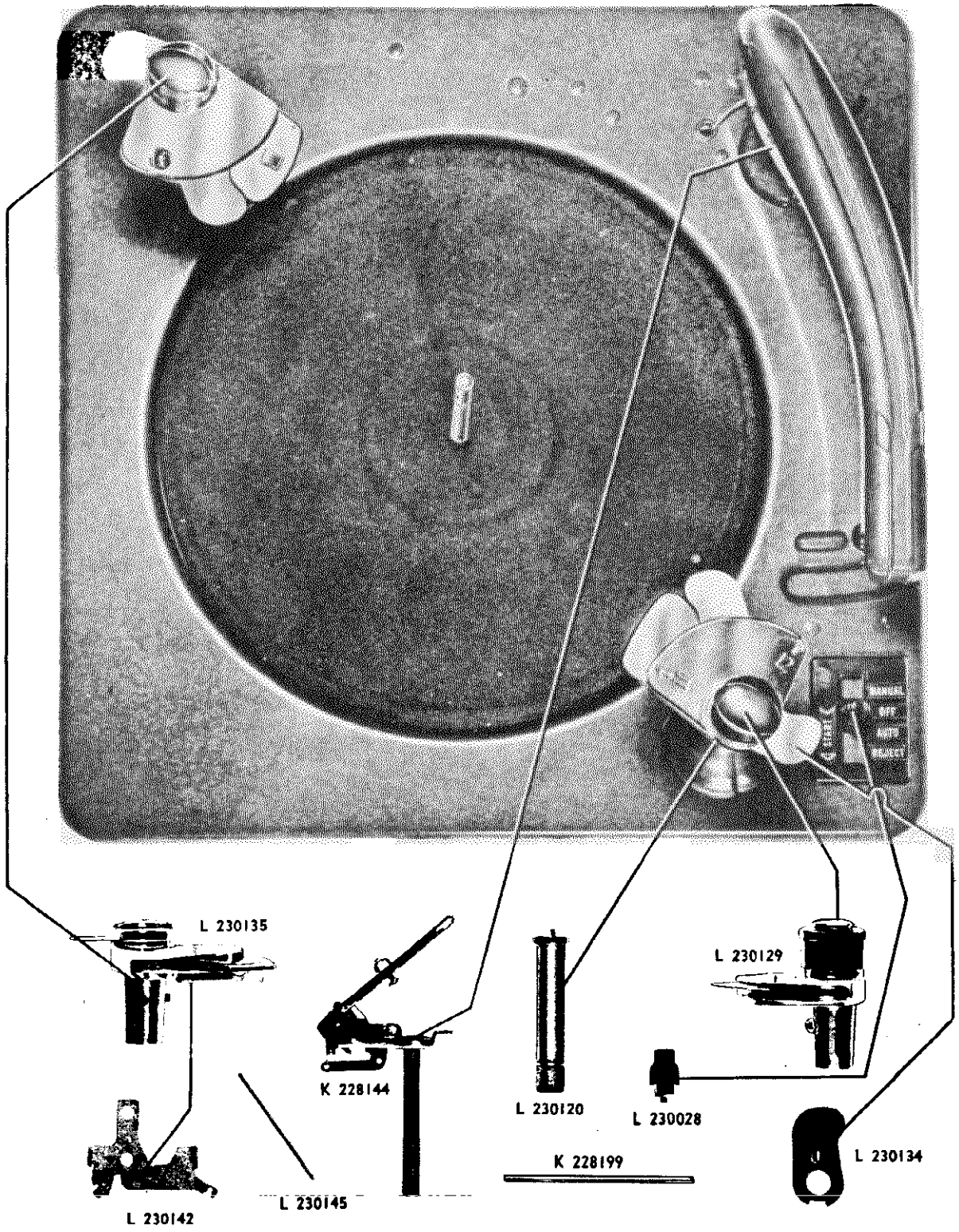

K-228144	Tone Arm Hinge Assembly	L-230134	12" Blade
K-228199	Lift Pin	L-230135	Selector Arm No. 2 Assembly
L-228028	Control Knob Assembly	L-230142	Shut Off Selector Bracket Assembly
L-230120	Selector Shaft Sleeve	L-230145	Shut Off Selector Bracket Rod
L-230129	Selector Arm No. 1 Assembly		

MODEL L

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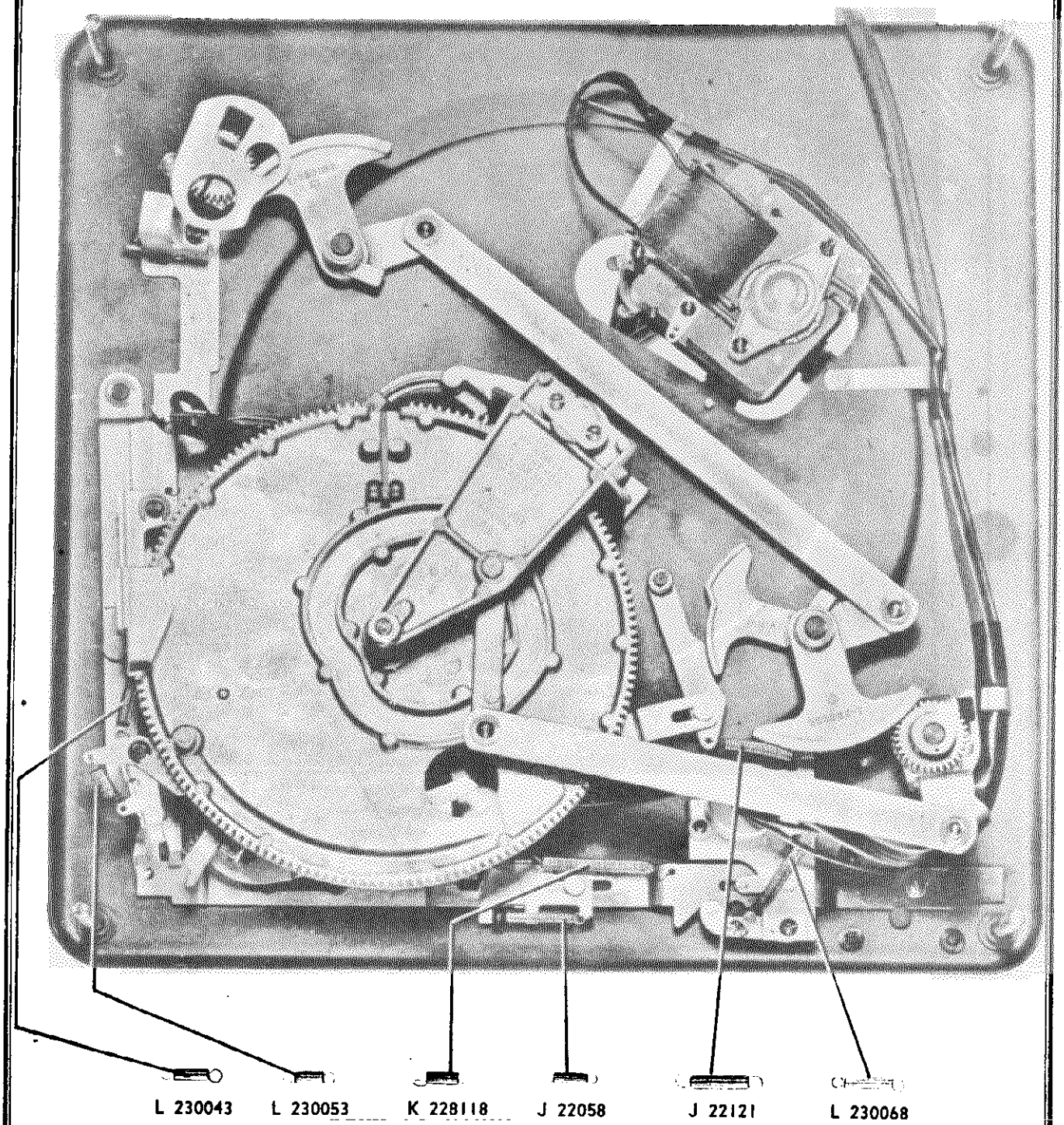

J-22058	Manual Lockout Outer Spring	L-230043	Shut Off Lever Spring
J-22121	12" Reset Slide Spring	L-230053	Tone Arm Latch Spring (Outer)
K-228118	Manual Lockout Inner Spring	L-230068	Detent Arm Spring

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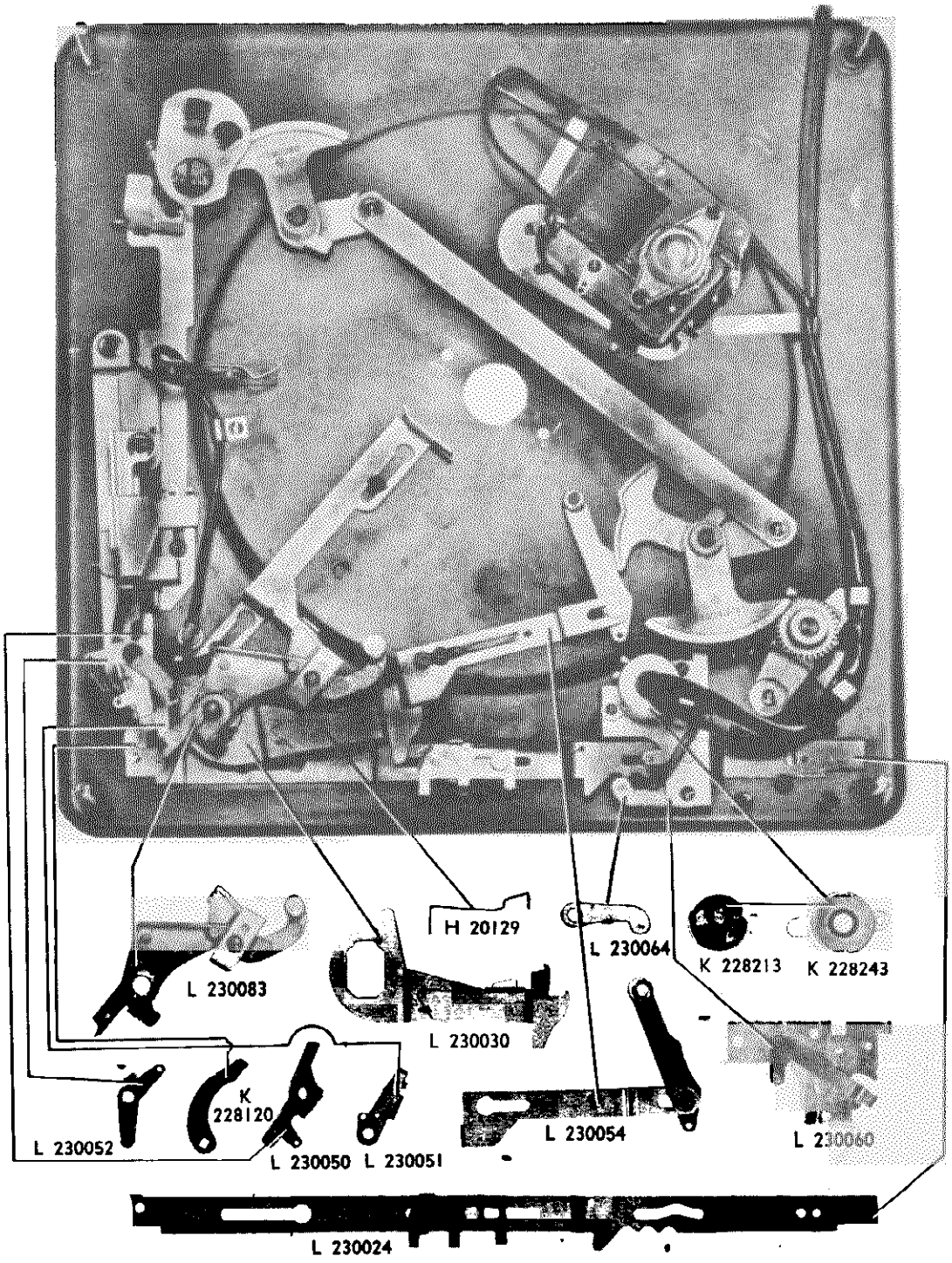

H-20129	Booster Spring
K-228120	Connecting Link
K-228213	Switch
K-228243	Switch Cover
L-230024	Manual Lockout Assembly
L-230030	Tone Arm Locator Assembly
L-230050	Tone Arm Center Latch
L-230051	Tone Arm Inner Latch
L-230052	Tone Arm Outer Latch
L-230054	Reset Lever Assembly
L-230060	Switch Plate Assembly
L-230064	Detent Arm Assembly
L-230083	Tone Arm Lever Assembly

MODEL L

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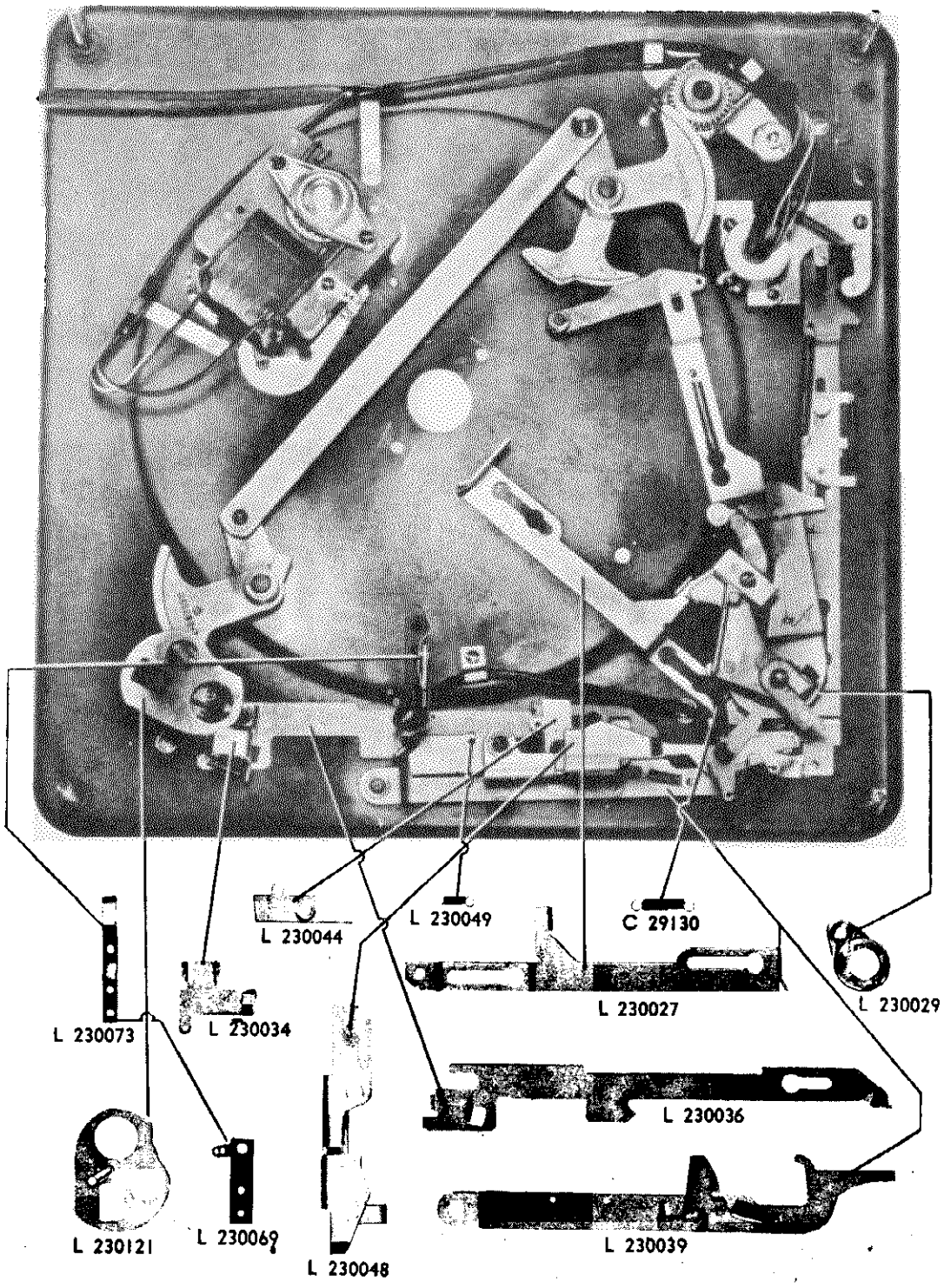

C-29130	Tone Arm Locator and Latch Spring	L-230044	Shut Off Trip Assembly
L-230027	Manual Reject Slide	L-230048	Shut Off Bracket
L-230029	Tone Arm Locator Hub	L-230049	Shut Off Bracket Spring
L-230036	Shut Off Slide	L-230069	Contact Mounting Strip Assembly
L-230034	Shut Off Slide Bracket	L-230073	Muting Switch Blade Assembly
L-230039	Shut Off Lever Assembly	L-230121	Shut Off Cam Shaft Assembly

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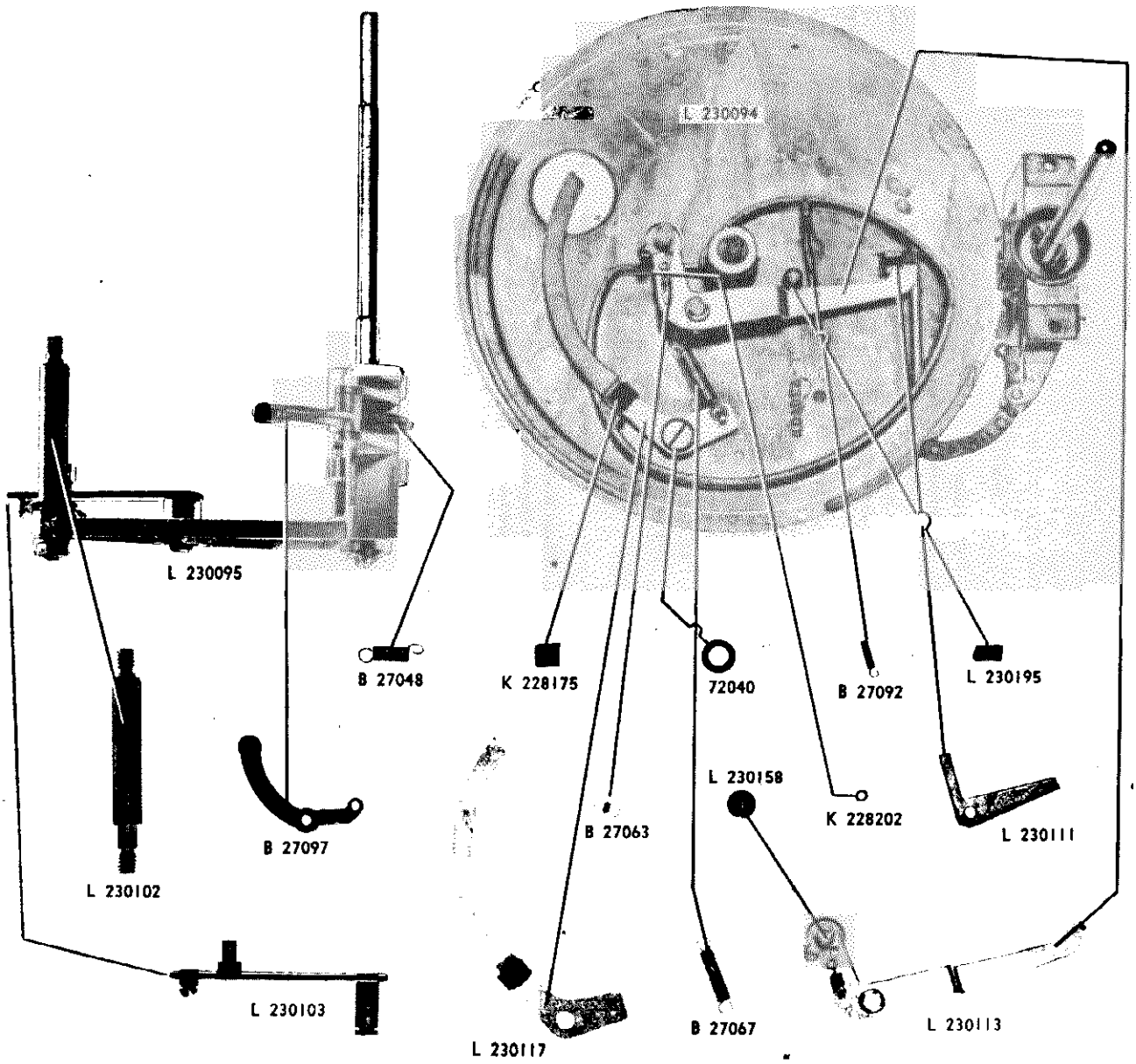

B-27048	Stop Lever Spring	L-230095	Spindle Housing Assembly
B-27063	Trip Dog Spring	L-230102	Drive Gear Shaft
B-27067	Retard Lever Spring	L-230103	Drive Link Assembly
B-27092	Trip Lever Spring	L-230111	Clutch Engagement Lever
B-27097	Drive Gear Stop Lever Assembly	L-230113	Trip Lever Assembly
72040	Retard Lever Spring Washer	L-230117	Retard Lever
K-228175	Retard Lever Bumper	L-230158	Trip Roller
K-228202	Trip Dog Bumper	L-230195	Trip Lever Bumper
L-230094	Drive Gear and Housing Assembly		

CROSS REFERENCE TO PARTS IN FIGURES AND TEXT

Ref. No.	Description	Part No.
1	Control slide assy	230023
2	Power switch	K228213
3	Connecting link	K228120
4	Manual reject slide	230027
5	Trip lever assy	230113
6	Clutch engagement lever	230111
7	Pinion gear	230101
8	Drive gear	230109
9	Tone arm lift pin	230147
10	Drive link	230104
11	Drive link conn. rod	230128
12	Drive crank assy	230126
13	Post gear No. 1	230148
14	Segment No. 1 assy	230089
15	Segment tie plate	230093
16	Segment No. 2 assy	230091
17	Post gear No. 2	230125
18	Tone arm latch lever assy	230050, 1, 2
19	Tone arm lever	230085
20	Tone arm locator	230031
21	12" reset slide	230055
22	Tone arm retard lever	230117
23	Booster spring	H20129
24	Drive gear stop lever	B27097
25	Trip shoe	K228156
26	Trip plate	B27037
27	Trip dog	K228174
28	Selector brkt. button assy	230142
29	Shut off cam shaft assy	230121
30	Shut off cam assy	230121
31	Shut off slide bracket assy	230033
32	Shut off bracket	230048
33	Tone arm inner latch	230051
34	Shut off slide	230036
35	Shutoff slide spring	230038
36	Shutoff trip	230045
37	Shutoff dog	230041
38	Tone arm center latch	230050
39	Tone arm outer latch	230052
40	Shutoff lever	230040
41	Tone arm hinge bracket	K228146
42	Manual lockout (outer)	B27016
42	10" & 12" set lever	230056
44	Turntable hub	230149
45	Turntable assembly	230146
46	12" Reset slide spring	J22121
47	Tone arm locator spring	C29130
48	Allen socket cap screw	75047
49	Tone arm adjusting screw	K228238
50	Counterbalance spring	K228099
51	Counterbalance adj. slide	K228150
52	Tone arm shaft	K228147
53	Trip lever spring	B27092
54	Idler wheel assy. See numerical parts list.	
55	Idler wheel spring. See numerical parts list.	
56	Retard lever spring	B27067
57	Shutoff brkt. spring	230049
58	Muting switch blade	230074
59	Selector shaft sleeve	L230120
60	Selector shaft No. 1 assy	L230118

PARTS LIST

Part Number	Item
H-20065	"C" Washer
H-20129	Tone Arm Booster Spring
H-20143	Panel Support Spring (Upper)
H-20199	Clamp Nut
J-22021	"C" Washer (Small)
J-22058	Manual Lockout Spring (Outer)
J-22096	Thrust Plate
J-22117	Thrust Wafer
J-22121	12" Reset Slide Spring
B-27048	Stop Lever Spring
B-27050	Thrust Washer
B-27063	Trip Dog Spring
B-27067	Retard Lever Spring
B-27088	Retard Lever Screw
B-27092	Trip Lever Spring
B-27097	Drive Gear Stop Lever Assembly
C-29130	Tone Arm Locator & Latch Spring
70000	6-32 Nut
70077	¼-20 Nut
71018	¼x6-32 Flat Head Machine Screw
71036	3/16x6-32 Round Head Machine Screw
71050	¼x6-32 Round Head Machine Screw
71055	3/16x4-36 Round Head Machine Screw
71066	¼x4-36 Round Head Machine Screw
71096	¼x4-36 Oval Fil. Head Machine Screw

Part Number	Item
71418	1/8x4-36 Round Head Machine Screw
71468	3/4x10-32 Allen Socket Head Cap Screw
71469	7/8x¼-20 Allen Socket Head Cap Screw
71502	5/8x6-32 Binding Head Machine Screw
71750	Shakeproof Sems (3/16x6-32 Round Head Machine Screw)
71752	Shakeproof Sems (3/16x4-36 Round Head Machine Screw)
71754	Shakeproof Sems (¼x6-32 Round Head Machine Screw)
71755	Shakeproof Sems (3/8x8-32 Round Head Machine Screw)
71760	Shakeproof Sems (5/16x8-32 Round Head Machine Screw)
71788	Shakeproof Sems (5/16x8-32 Binding Head Machine Screw)
71789	Shakeproof Sems (½x4-36 Round Head Machine Screws)
72040	Retard Lever Spring Washer
72130	Flatwasher (Steel)
72138	Flatwasher (Brass)
73076	No. 10 Kantlink Lockwasher
73084	Countersunk Lockwasher
73087	¼ Kantlink Lockwasher—Cadmium
73094	Shakeproof Lockwasher
73117	No. 10 Kantlink Lockwasher No. 1184 .040 thick
74058	Solder Lug
75042	¼x10-32 Allen Socket Set Screw Cup Point
75047	5/8x10-32 Allen Socket Head Cap Screw
75067	¼x8-32 Headless Set Screw Cup Point
80035	3/8x3/0 Taper Pin
80036	3/4x3/0 Taper Pin

PARTS LIST

Part Number	Item
K-228099	Counter Balance Spring
K-228118	Manual Lockout Spring (Inner)
K-228120	Connecting Link
K-228143	Shielded Pick Up Lead
K-228145	Hinge Bracket and Shaft Assembly
K-228150	Counter Balance Adjusting Slide
K-228156	Trip Shoe
K-228175	Retard Lever Rubber Bumper
K-228187	Drive Link Roller
K-228199	Tone Arm Lift Pin
K-228202	Trip Dog Rubber Bumper
K-228211	Stop Lever Pivot Pin
K-228212	Wire Clip
K-228213	Switch
K-228216	Tone Arm Mounting Grommet
K-228217	Tone Arm Special Washer
K-228221	Pick Up Cartridge Assembly
K-228223	Fulcrum Clamp
K-228224	Tone Arm Fulcrum
K-228225	Tone Arm Bracket Assembly
K-228238	Tone Arm Adjusting Screw
K-228239	Rubber Grommet (Motor)
K-228240	Bushing (Motor)
K-228242	Switch Cover Insulator
K-228243	Switch Cover

Part Number	Item
L-230021	Control Escutcheon
L-230022	Speed Nut
L-230023	Control Slide Assembly
L-230024	Manual Lockout Assembly
L-230027	Manual Reject Slide
L-230028	Control Knob Assembly
L-230029	Tone Arm Locator Hub
L-230031	Tone Arm Locator
L-230033	Shut Off Slide Bracket Assembly
L-230036	Shut Off Slide
L-230038	Shut Off Slide Spring
L-230039	Shut Off Lever Assembly
L-230043	Shut Off Lever Spring
L-230044	Shut Off Trip Assembly
L-230047	Shut Off Trip Spring
L-230048	Shut Off Bracket
L-230049	Shut Off Bracket Spring
L-230050	Tone Arm Latch (Center)
L-230051	Tone Arm Latch (Inner)
L-230052	Tone Arm Latch (Outer)
L-230053	Tone Arm Latch Spring (Outer)
L-230054	Reset Lever Assembly
L-230058	10-12" Set Lever Spring
L-230060	Switch Plate Assembly
L-230064	Detent Arm Assembly
L-230067	Clamp—Pickup Lead
L-230068	Detent Arm Spring
L-230069	Contact Mounting Strip Assembly
L-230073	Muting Switch Blade Assembly
L-230076	Clamp—Muting Switch

PARTS LIST

Part Number	Item
L-230084	Tone Arm Lever Plate Assembly
L-230087	Tone Arm Rubber Bumper
L-230089	Segment No. 1 Assembly
L-230091	Segment No. 2 Assembly
L-230093	Segment Tie Plate
L-230096	Housing and Bushing Assembly
L-230098	Turntable Spindle Assembly
L-230101	Pinion Gear
L-230102	Drive Gear Shaft
L-230103	Drive Link Assembly
L-230111	Clutch Engagement Lever
L-230113	Trip Lever Assembly
L-230117	Tone Arm Retard Lever
L-230118	Selector Shaft No. 1 Assembly
L-230120	Selector Shaft Sleeve
L-230121	Shut Off Cam Shaft Assembly
L-230125	Post Gear No. 2
L-230126	Drive Crank Assembly
L-230128	Drive Link-Connecting Rod
L-230130	Selector Arm No. 1 & Blade (10") Assembly
L-230133	Selector Arm Knob No. 1 Assembly
L-230134	Selector Blade 12"
L-230136	Selector Shaft No. 2
L-230137	Selector Arm No. 2 & Blade (10") Assembly
L-230140	Selector Arm Knob No. 2
L-230142	Shut Off Selector Bracket Assembly
L-230145	Shut Off Selector Bracket Rod
L-230146	Turntable Assembly
L-230148	No. 1 Post Gear
**L-230161	Motor Assembly—60 cycle (See Note No. 2 below)
**L-230163	Idler Wheel Assembly (See Note No. 2 below)
L-230170	Double Wire Clamp
L-230189	Drive Gear Sub-Assembly
L-230193	Panel Retainer Spring
L-230195	Trip Lever Bumper
*L-230210	Tone Arm—Aluminum

NOTE 1. * All part numbers shown are for a standard changer. Companies ordering special parts should order them for their service stock instead of the standard parts. Part numbers of the special parts can be obtained from Seeburg Service Department.

NOTE 2. ** CONVERSION SPRINGS: a. 60 cycle motors can be converted for 50 cycle operation by the addition of a "conversion" spring. Since each changer has alternate motor sources it will be necessary to stock a quantity of conversion springs for each type motor; the motor used in any one changer can only be determined from the part number stamped on the motor mounting plate at the time the service man does the actual work.

b. Following is a list of the motor part numbers showing the corresponding conversion spring which must be used for that particular motor:

Motor	50 Cycle Conversion Spring	Idler Wheel	Idler Wheel Spring	Idler Wheel Fastener
L-230161	L-230221	L-230163	L-230223	L-230224 Clip & L-230228 Washer
L-230200	L-230222	L-230197	K-228257	L-230198 "C" Washer — L-230199 Washer
L-230231	L-230237	J-22143	K-228237	L-230225 Washer & L-230244 Clip

I. Adjustment of pick-up

1. The pick-up lands too much outside or inside at the beginning of an audition:

a) Too much outside:
Turn the screw N° 1 very gently in a clockwise direction. This screw can be reached through the hole N° 2 of the unit plate when the pick-up is placed on the first groove of a 10" record.

b) Too much inside:
Turn the screw N° 1 very slightly in a counter clockwise direction.

2. The pick-up remains on the edge of a record:

This only happens when records have no running-in groove.

a) Verify that the Record Changer is mounted in a perfectly horizontal position. This can be adjusted by means of the suspension screws and nuts of the unit plate.

b) The small spring N° 3 should be slightly bent towards the interior of the aperture N° 4.

3. The pick-up lands too much inside but only for the first records:

a) Verify if the record changer is perfectly horizontal.

b) The spring N°.3 should be slightly bent towards the outside of the aperture N° 4.

4. The pick-up does not rise enough to play the last record of the pile:

Bend slightly upwards the steel wire N° 43 situated under the pick-up arm. The normal adjustment is reached when a medium needle touches the velvet of the turntable.

5. The pick-up lands and rises up immediately without playing a record:

a) Verify that the lever N° 5 turns perfectly free on its pivot, so that it is very vigorously brought into position by its spring N° 6. If this is not the case, clean the friction surfaces.

b) If this is insufficient, bend slightly upwards the arm N° 7 of lever N° 5 (hidden beneath the mounting plate) by means of a screw-driver. The arm is accessible through the hole N° 8.

6. The pick-up rises up before the end of a record:

a) This irregularity is due to the hole in the record being out of centre in relation to the grooves, or the hole is too large. Such records are not suitable for record changers.

b) If the auto-trip mechanism is considered too sensitive, bend slightly the free end of the trip lever N° 9 in a clockwise direction.

7. The pick-up does not operate immediately before being dropped on a record:

a) The tension of the flat spring N° 10 should be slightly increased so that it leans more on the cam.

b) The spiral spring N° 46 (fig. I) should be reinforced.

8. The pick-up remains on the record at the end of an a dition:

The record feeding mechanism is actioned by the auto-trip mechanism. If, at the end of an audition, the mechanism does not operate, i. e. the pick-up remains in the last groove, proceed as follows:

a) Verify if the record in question has a running-off groove. Only records with a running-off groove can be played automatically on a record changer.

b) Action the "reject" button:

1st case: The automatic cycle mechanism starts:

Remove the turntable and examine the leather of the striker N° 11. If this is worn, give it half a turn to present a new surface to the auto-trip lever N° 9 or replace it by a new one. If this leather is in good condition, then increase the tension of the friction spring by turning the adjusting screw N° 12 about half a turn in a counter-clockwise direction.

2nd case: The automatic cycle mechanism does not start:

This means that the record changer is blocked owing to the hardening of the grease on the cams, the presence of an erratic particle, or an important distortion of one of the organs. Clean the cams and gears and control the whole mechanism.

9. The 12" records rub the pick-up arm when dropping from the record spindle:

Verify the record feeding mechanism according to § II, 1 *a)* and *b)*. Adjust accordingly.

II. Record feeding mechanism

1. Records fail to drop from the record spindle:

a) Examine the thickness at the *centre* of the record. The standard thickness is between 1,5 and 2,6 mm. Thinner or thicker records do not drop correctly from the spindle. A too thin record can be played alone or on the top of the pile.

b) The correct adjustment of the push-lever N° 45 of the record spindle N° 44 is shown on fig. II. For this control, turn slowly the record changer turntable until the push-lever is out at its maximum point. If the dimension of 6,9 mm is not reached, give half a turn to the bolt N° 13 in a clockwise direction after having unscrewed nut N° 14. If the dimension of 7,1 mm is exceeded, turn in the opposite direction bolt N° 13.

2. Two records drop together from the record spindle:

In such a case, these two records are too thin at the centre or out of shape.

3. The record central hole enlarges or splits:

This only happens when the records are too thin at the centre.

III. Turntable brake, auto switch and pause

1. The record changer does not stop after the last record:

a) Verify if the lever N° 15 is free in the loop N° 16. If such is not the case, adjust this lever until it is perfectly free to move.

b) If the trouble does not come from this, verify when there are no records on the platform N° 26 if the lever N° 15 abuts against the feeler N° 17. If this is not the case, lengthen the lever N° 15 by loosening the regulating screws.

c) The irregularity may also come from an erroneous oiling of the feelers 17 and 18. Remove the oil with benzine by means of a brush.

2. The starting button does not remain on "start":

a) The lever N° 15 is engaged on the extremity of the feeler N° 17, disengage it and adjust.

b) The lever N° 18 on which is the leather of the turntable stop strikes against the edge of the hole N° 19. — Adjust.

3. The last record cannot be repeated, the record changer stops:

Bend slightly the small tongue N° 20 by means of a screw-driver in the slot N° 21.

4. The pause lasts indefinitely:

Examine firstly if the pause spring N° 22 is broken. In such a case proceed as follows:

a) Remove the motor by unscrewing nuts N° 23, place the pause button on "pause" and turn the large toothed wheels until the pause spring is quite visible. Remove the fixing screw N° 24, the broken pause spring can then be removed and replaced.

b) If the pause spring is intact, the extremity of this spring should be slightly bent towards the outside of the large toothed wheel so that this extremity meshes more effectively to the star N° 25.

c) If that is not sufficient, increase the pressure of the flat spring N° 10 against the cam.

IV. Selecting mechanism for 10" and 12" records

When the pick-up does not land into a position corresponding to the diameter of the record placed on the turntable (this record should have previously fallen from the platform N° 26 and have actioned the feelers N°s 17 and 18) proceed as follows:

a) Verify the mechanism of the record feeding following § II, 1 *a)* and *b)*.

b) If the irregularity does not arise from a faulty adjustment of the record feeding mechanism, examine if the unit plate of the apparatus has been bent by a shock in the angle of the platform N° 26. Should such be the case, carefully adjust the unit plate.

c) Verify if the lever in the form of U N° 27 does not touch the mounting board. The aperture of this mounting board should be executed following the template supplied with each apparatus.

d) Verify that the elbowed lever N° 28 is not bent or twisted, it should be perfectly free in its two articulations.

e) The lever in the form of U N° 27 should not contact the lever N° 28, but must be free to follow the motion of feeler N° 18 when a 12" record descends on the record spindle.

f) The feeler N° 18 should be perfectly free at the time when the feeding mechanism is in action. This feeler should not be oiled.

g) If all the preceding points are in order, increase the tension of the friction spring N° 29, by means of the blocking nuts N° 30.

h) The position of the abutment 10"-12" N° 31 can be adjusted by means of the two screws N° 32 if its position does not correspond to the diameter of the record descending the spindle (only modify this adjustment if all the preceding points are in order).

V. Motor

1. The speed varies during the reproduction of certain records:

a) Control these records. Records that are not flat slip over each other and thus do not correctly follow the movement of the motor.
If this difficulty does not come from the records, verify the points 2., *b)* and 3.

2. The motor does not start when the button is placed on "Start":

a) The motor can only start by itself when the pick-up is on a record or if at rest outside the turntable. When the turntable is not stopped with sufficient force, the mechanism overruns the normal rest position and the motor does not start. Change the position of the leather N° 18 to present a new surface, or renew.

b) The record spindle N° 44 should be perfectly free in the hole N° 46 of the centre shaft. Control carefully this point when in the normal playing position. This hole should be oiled from time to time.

c) Verify the lubrication of the motor following § A.

d) The stator received a shock that put it out of centre, adjust accordingly.

3. The motor stops suddenly and remains blocked:

Verify firstly if it is really the motor that is blocked and not the record changer mechanism. The stoppage of the motor is often due to the friction of the principal bearing owing to lack of oil in the hole N° 33. It may be necessary to dismantle the motor (see § B & C) to liberate the bearing.

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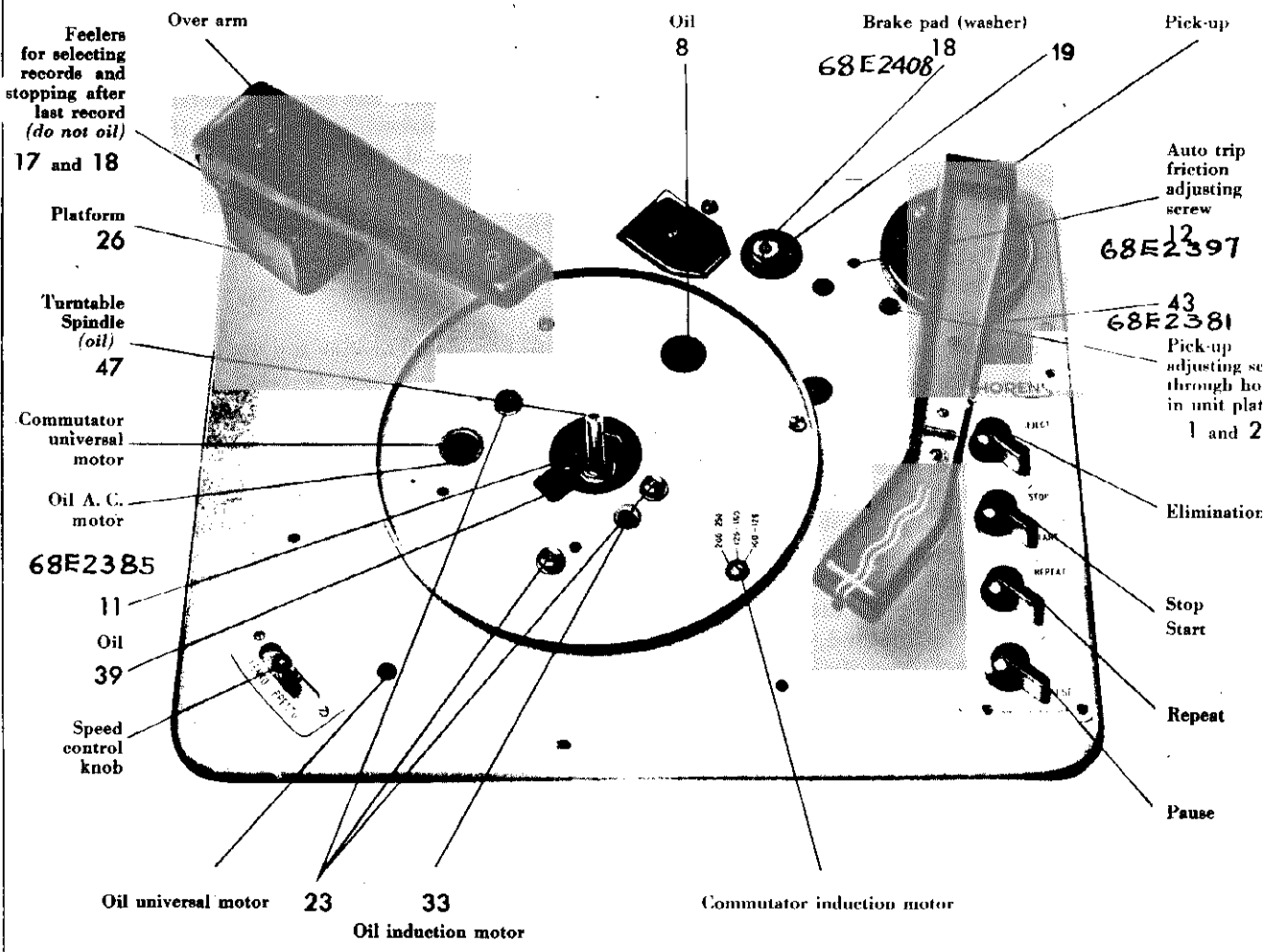

Fig. III

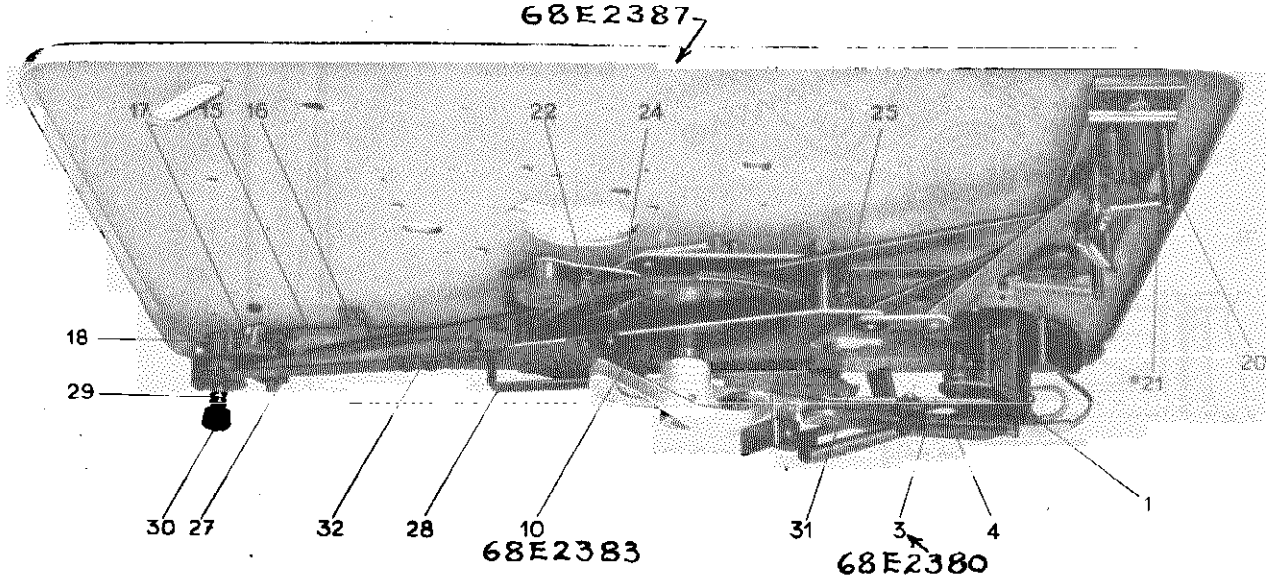

Fig. IV

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4. The motor is noisy (hissing):

a) Verify the point 2. *b).*

b) The axial abutment ball N° 34 situated at the extremity of the rotor is worn also the steel plate N° 35 placed in the abutment N° 36 fixed to the motor casing. Dismantle the motor as shown under § B & C and replace the ball and metal plate. At the same time insert a small tube N° 37 furnished by the factory if not already supplied (see diagram N° V). The tube should be filled with vaseline or a graphite lubricant.

Remark : If the worn ball cannot be removed from the rotor with a magnet, it should be slightly ground and then removed with an awl. Do not grind the axle of the rotor.

5. The motor runs by fits and starts:

The motor should be dismantled following § B. Remove the top motor plate N° 38 by unscrewing the 3 screws. Verify if the fibre wheel is faulty (broken teeth). The centre shaft with the fibre wheel will be replaced by the factory. Lubricate before mounting the new shaft.

A. Lubrication of the motor:

The motor should be regularly lubricated generally after 100 hours use. To do this remove the turntable and introduce a few drops of good quality thin oil into the lubricating holes (coloured red), by means of an oil-can or a needle. Do not use consistent oil.

B. Dismantling of the motor from the unit plate of the record changer:

Remove the toothed wheel with the striker N° 11 by a simple pull. Loosen the 3 nuts N° 23 also the screw N° 39 of the speed regulator lever.

C. Dismantling the motor:

Unscrew the 4 fixing screws of the stator. Remove *the entire block* formed by the housing N° 41 and the stator N° 42. To reach the commutator and the abutment, *remove very carefully* the housing, leaving the block of the commutator with the stator. *Press against the commutator by the medium of the terminals to make it slide by pressure, out of the housing, which should be withdrawn at the same time.*

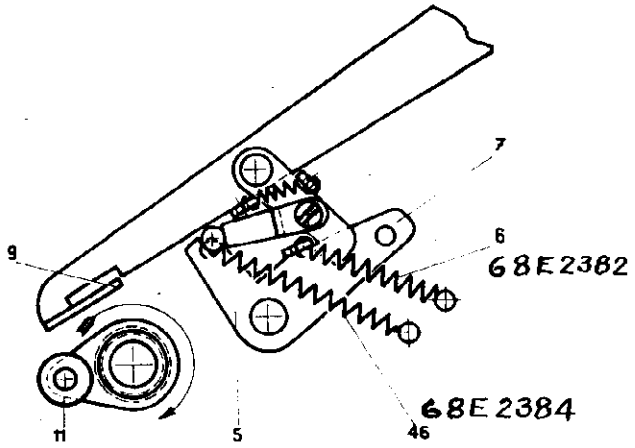


Fig. I

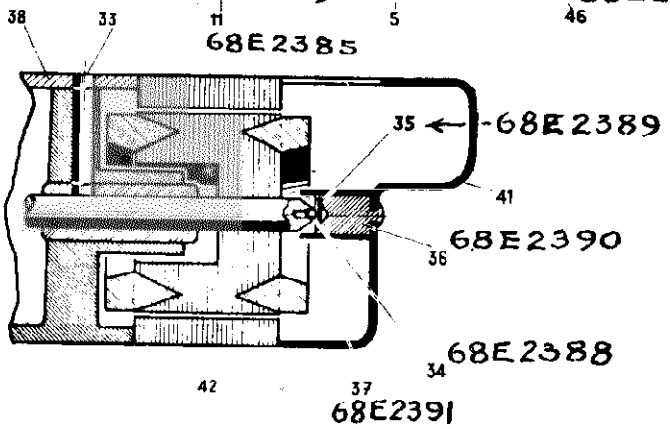


Fig. V

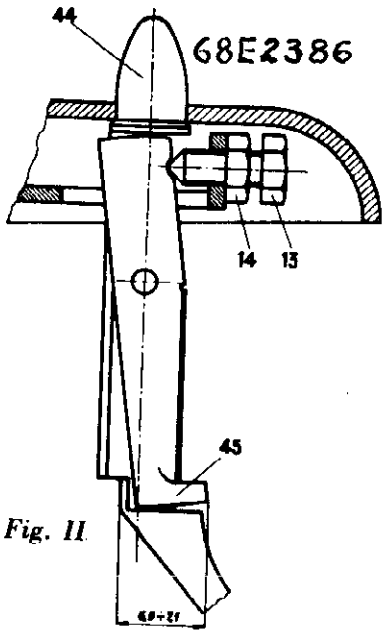


Fig. II

THORENS INC.

THORENS AUTOMATIC MIXED RECORD CHANGER
Mod. „CONCERT" CD 40

DESCRIPTION, INSTALLATION AND SERVICE INSTRUCTIONS

General description

Dimensions

The *unit plate is 15 in. (380 mm.) by 12 in. (300* mm.) wide. It requires a clearance of 16 1/2 in. (420 mm.) × 14 in. (350 mm.) surface, 6 in. (150 mm.) above the unit plate, 3 1/4 in. (80 mm.) below the unit plate. Minimum height required for placing the pile of records into position before the audition : 7 1/2 in. (190 mm.) above the unit plate.

Motor

The motor is fixed rigidly to the record unit. This prevents any interference with the pick-up and eliminates all vibrations. The Record Changer "Concert" is equipped with one of the following types :

1. AC motor. The AC motor is of the induction type entirely encased. Its high pulling capacity ensures perfect functioning of the changer mechanism and its silent operation as well as its patent regulator contribute to give a faultless reproduction of your records. It causes no interference on the pick-up and the heating is reduced to a minimum.

Commutator for adaptation to the following voltages :

100 - 125
125 - 150
200 - 250 } volts AC 50 to 60 cycles.

Consumption : 15 watts maximum.

2. DC motor. The universal motor for AC and DC current presents, with a particularly high pulling capacity, the same characteristics of regularity and silence.

Commutator for adaptation to the following voltages :

Model 950 100 - 130
130 - 160
200 - 250 } volts DC and AC 50 and 60 cycles.

Special Model 912 : 6 and 12 volts DC.

Consumption : 10 watts maximum.

Caution ! The universal motor must be connected to the earth as shown on the connection plan supplied with each record changer, otherwise noise will develop.

Speed

The turntable speed is normally set at 78 r.p.m. It can be varied by means of the indicator lever.

Pick-up

The " Concert " record changer is equipped with the new highest precision Thorens pick-ups " Rondo ", " Gavotte ", " Fugue Special " or " Crystal Special " types which guarantee the best audition and the minimum wear of your records.

" RONDO "	a good quality pick-up of electro-magnetic type with high impedance in arm made of stamped metal, light and rigid, which can be connected directly to radio receivers. Minimum impedance required for this connection : 50,000 ohms.
" GAVOTTE "	a high-class pick-up of electro-magnetic type with low impedance also in arm of stamped metal which must be connected to the radio receiver by the medium of its coupling transformer. Minimum impedance for this connection : 200,000 ohms.
" FUGUE SPECIAL "	a professional type pick-up, electro-dynamic with low impedance, also in arm made of stamped steel. This pick-up must be connected to the radio receiver by means of its coupling transformer. Minimum impedance for this connection : 0,5 megohms.
" CRYSTAL SPECIAL "	a high quality piezo-electric pick-up light and flexible which can be connected directly to the radio-receiver. Minimum impedance for this connection : 0,5 megohms.

These four models play with interchangeable needles.

When fixing the coupling transformer to the cabinet, see that a sufficient distance is left in relation to the motor (8 in. = 20 cm. minimum).

NOTE : Detailed technical characteristics of the above-mentioned pick-ups are described in special leaflets.

Installation

To ensure a perfect functioning of the record changer it is very important that the installation and mounting should be made in a correct manner.

A template is supplied with each apparatus. The aperture to be made in the mounting board must be executed with precision as also the drilling of the fixation holes so as to give the mechanism the necessary freedom and to obtain perfect operation. *Any effort to force or any torsion exercised on the unit plate may provoke a faulty functioning.*

The mounting on springs, following the mounting diagram, eliminates this risk and ensures a flexible and floating suspension of the unit plate. This prevents any interference with the pick-up and loud-speaker and eliminates all vibrations.

REMARK : If in the case of a very sensitive amplifier the hum level is considered too high, the apparatus should be mounted rigidly on the mounting plate. To avoid any flexion of the unit plate, it should be made rigid by means of suitable washers. If then interferences with loud-speaker do occur, this latter should be mounted on springs.

Adaptation to the tension of mains

For both types of motors the commutator permitting instantaneous adaptation to voltage of mains is placed under the turntable. After having removed the turntable, turn the commutator screw by means of a screw-driver until the slot corresponds with the desired voltage.

CAUTION. Do not proceed with any connecting or adjustment to the record changer before disconnecting mains current.

Maintenance

Motor and record changer mechanism

Motor and mechanism only need lubricating from time to time, generally after 100 to 150 hours use. To do this remove the turntable and introduce a few drops of good quality thin oil into the lubricating holes (coloured red). Do not use consistant oil which might block the motor. After a few years use it would be advisable to replace the hardened grease of the cams, gears and other rubbing surfaces by fresh and clean grease.

Do not oil the selecting feelers.

Record spindle

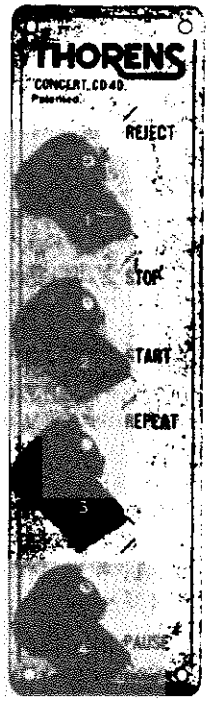
Apart from cleaning the push-lever periodically, it is necessary when oiling the motor *to introduce also a drop of oil into the hole of turntable spindle* where the record spindle pivots.

Pick-up

The pick-up being a high precision instrument, any repairs should be made through the competent services of Thorens Agencies.

Operating instructions

The " Concert " record changer CD 40 will play a maximum of ten 10 in. records or eight 10 in. and 12 in. mixed in any order. To operate, proceed in the following manner :



1. Raise overarm, place record spindle in position and place the records on the spindle shoulder. The lowest record of the pile will be played first.
2. Turn the record spindle on which the records are placed so that the lower edge of the pile of records rests on the platform. Lower the overarm, the hole in the free end then holds the top of record spindle into position in the direction of the platform. *Make sure that the overarm is completely lowered on to the record spindle.*
3. Insert needle in pick-up either a sapphire needle for record changers fitted with " GAVOTTE ", " FUGUE " and " CRYSTAL " pick-ups only, or a semi-permanent type needle that will play 10 or more records (reverse pick-up head to do this).
4. Move No. 2 knob to the position " start " From this moment, the changer functions automatically until all the records are played and at the end of last record it will stop automatically.

Any record not required to be played may be automatically *rejected* by moving knob No. 1 to position " reject ". The following record is then brought into playing position.

When the knob No. 3 is placed on position " repeat ", the record being played will be *repeated* once more as soon as the pick-up has reached the final groove.

A part only of record can be repeated if knob No. 3 being on position " repeat ", knob No. 1 is moved to position " reject ".

A *pause* of $2\frac{1}{2}$ minutes duration can be introduced between two records by placing knob No. 4 on position " Pause ".

The audition can be resumed at any moment by moving knob to its initial position.

The record changer can be stopped by moving knob No. 2 to position " stop ". It will start again if the knob is placed on position " start ", resuming playing at the place where it was interrupted.

Pause

Do not force the button into position when it resists. It can always be set going as soon as the record changing mechanism operates.

Important remarks

Placing records on record spindle

Do not place roughly the pile of records on the record spindle. This risks to deteriorate their central holes.

Pick-up changing mechanism

The movements of the pick-up are actioned by the record changer mechanism. The pick-up should therefore never on any account be forced into position by hand. The overarm should not be raised from the record spindle while playing to avoid risk of deteriorating the records.

Record spindle

It is essential that the record spindle should fit perfectly free in the hole of the turn table spindle when the overarm is in playing position. This hole should be kept quite clean.

Records

The " Concert " record changer provides for standardized records in thickness and diameter. If a thinner record or one deteriorated at the centre is employed, it may happen that it will not drop from the record spindle, and cause it to lift up. In such a case it will suffice to change the position of the record in the reserve pile in order to ensure a normal feeding.

It may happen that new records have a slight burr around the centre hole ; this burr may provoke jamming of the push-lever thus hindering the release of the records. To avoid this, care should be taken to pare off the burr.

The push-lever and record spindle should be cleaned from time to time.

It is recommended to play only flat and quite clean records. The records deteriorate and wear out quickly if not kept sheltered from the dust.

Transport of record changers

Care should be taken, when forwarding, to place the apparatus in the exact position in the special packing with all the securing wedges in their correct position. The turntable shaft and record spindle should be removed from their playing position and packed separately.

Adjustment

If the record changer does not function correctly verify in the first place that the unit plate is in no manner distorted by the mounting device and that the weight is equally distributed between the four fixing screws.

Pick-up landing position

The pick-up arm has been finely adjusted so that the needle comes on to the 10" (25 cm.) record on a 9-9/16" (245 mm.) diameter circle, and on a 12" (30 cm.) record on 11-9/16" (295 mm.) diameter circle. These positions were arrived at after checking a very wide selection of records of various makes.

However, if an adjustment becomes necessary, regulate by means of the special screw near the base of the pick-up arm. The pick-up should never on any account be forced into position.

Height of pick-up

The pick-up is adjusted in such a way that a medium needle arrives at level with the turntable velvet. If another adjustment is necessary it must be executed by bending slightly the extremity of the steel wire forming the vertical abutment. The pick-up should be raised for access to this abutment.

Auto-trip mechanism

The record feeding mechanism is actioned by the auto-trip mechanism. If at the end of a record, the auto-trip does not operate, that is the pick-up remains in the last groove, examine first of all, if the record in question has a run-off groove in its centre. Only records with run-off grooves can be played on a record changer. If this is not the cause, proceed as follows :

Operate the " reject " button.

Case No. 1. The record changing mechanism starts : Take off the turntable and examine the trip lever leather. If this is worn, give it half a turn to present a new surface to the striker. If badly worn renew entirely. If the leather is in good condition, then increase the tension of the friction spring by turning the friction adjusting screw in a counter-clockwise direction, about half a turn is sufficient.

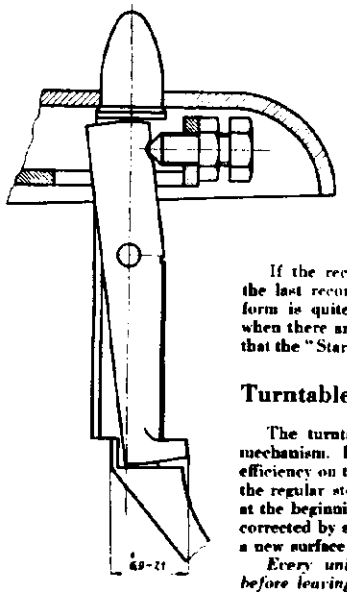
Case No. 2. The record changing mechanism remains immobile : This shows that the record changer is blocked owing to the hardening of the grease on the cams, or the presence of an erratic particle. Clean the cams and gearings and lubricate again.

Record feeding mechanism

If a record does not drop from the record spindle or drops late, examine first of all if its thickness at the *centre* is standard (1.5 to 2.6 mm.) and if the centre hole is in order and without a burr. Verify also if the record spindle is clean.

If the defect is not caused by this, remove the records, start the record changer mechanism and then stop it just at the moment when the push-lever is out at its maximum point. Then verify by means of a calibre that the course of the push-lever is in conformity to the dimensions indicated on the sketch beneath.

If the contrary is the case, adjust this course by means of the bolt situated in front of the overarm. To do this, raise the overarm, loosen the lock-nut and turn the bolt as far as necessary. Tighten up again by means of the lock-nut and verify if the course is correct.



Selecting mechanism for 10" and 12" records

If an error occurs when the pick-up lands on the edge of the mixed records, verify in the first place the record feeding mechanism as shown on the sketch. If the adjustment of this latter is correct, control the freedom of the smallest feeler of the platform during the feeding operation.

Last record stop

If the record changer does not stop after playing the last record, verify if the larger feeler on the platform is quite free and emerges to its proper extent when there are no records on the platform. Verify also that the " Start-Stop " button is quite free in all positions.

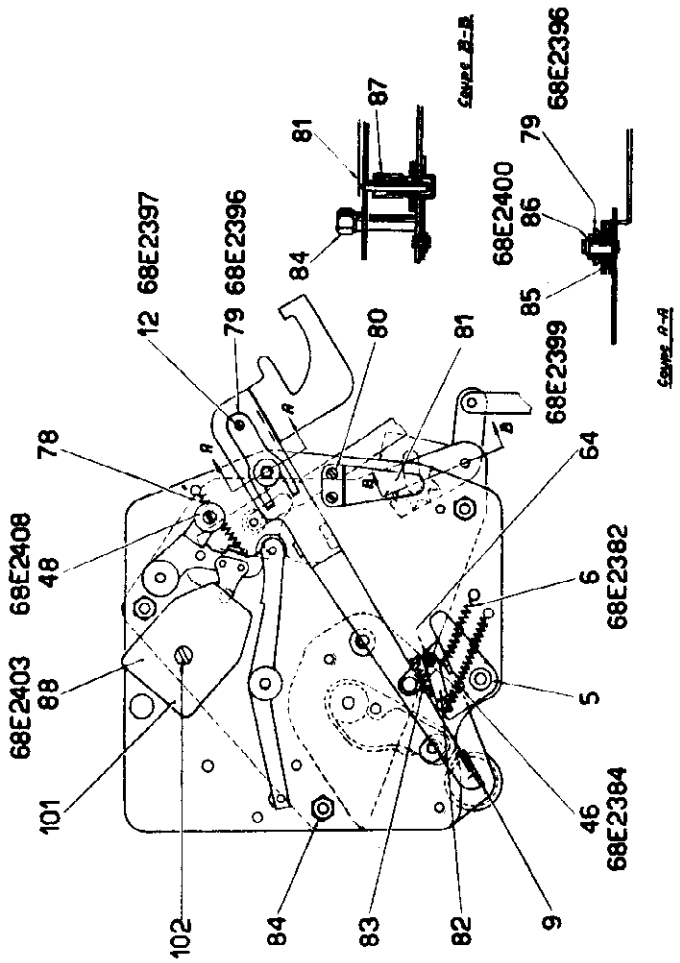
Turntable brake

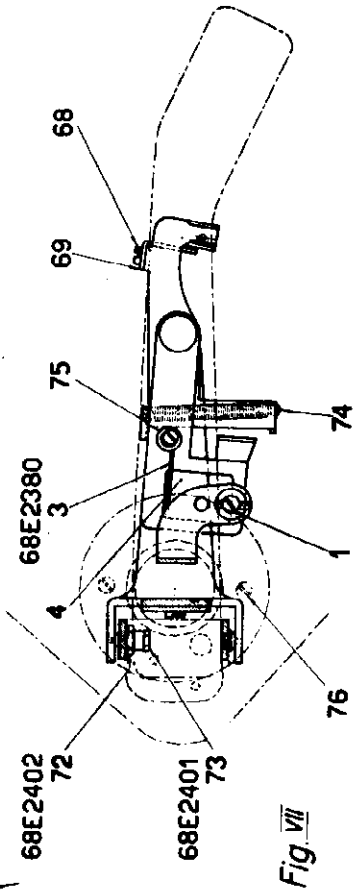
The turntable brake is actioned by the auto-trip mechanism. If the brake does not work with sufficient efficiency on the turntable, the mechanism will overrun the regular stop position and the motor will not start at the beginning of a new pile of records. This can be corrected by slightly turning the leather pad to present a new surface to the turntable.

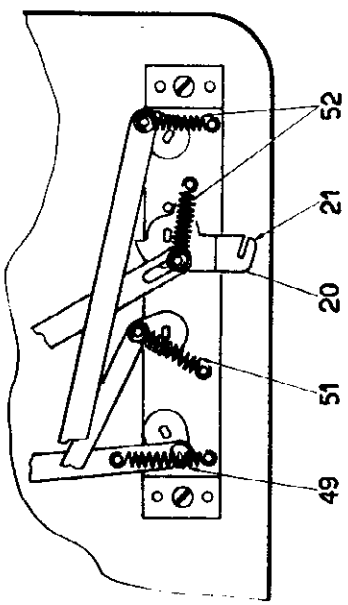
Every unit is thoroughly tested and lubricated before leaving the factory.

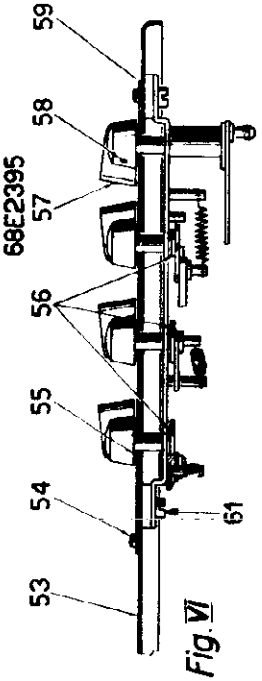
MODEL CD40

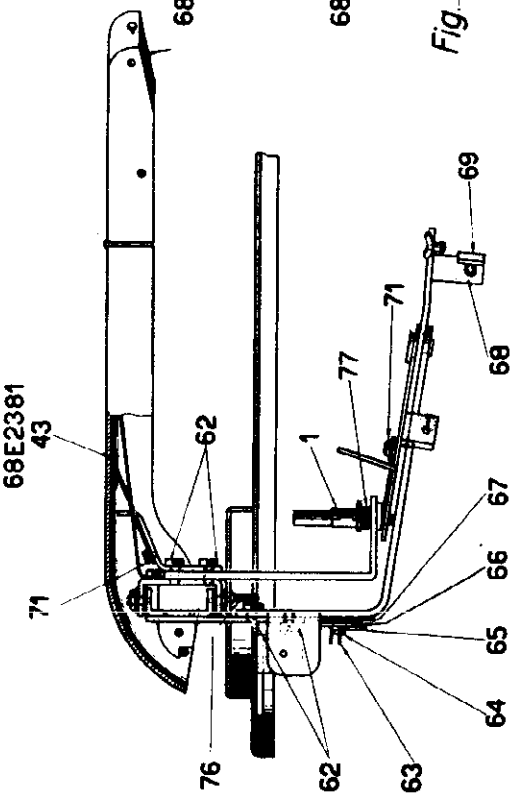
THORENS INC.











THORENS INC.

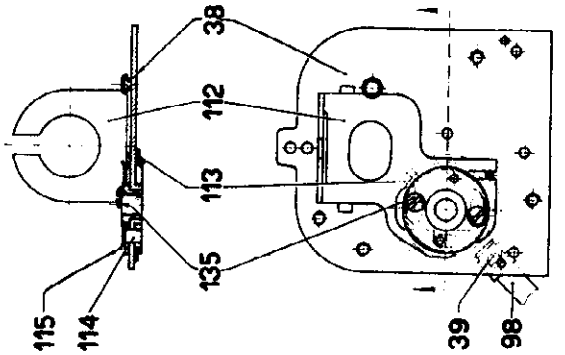


Fig. XI

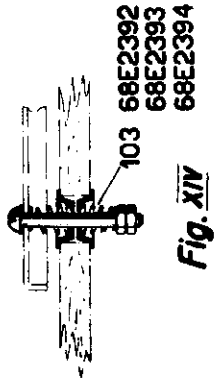


Fig. XIV

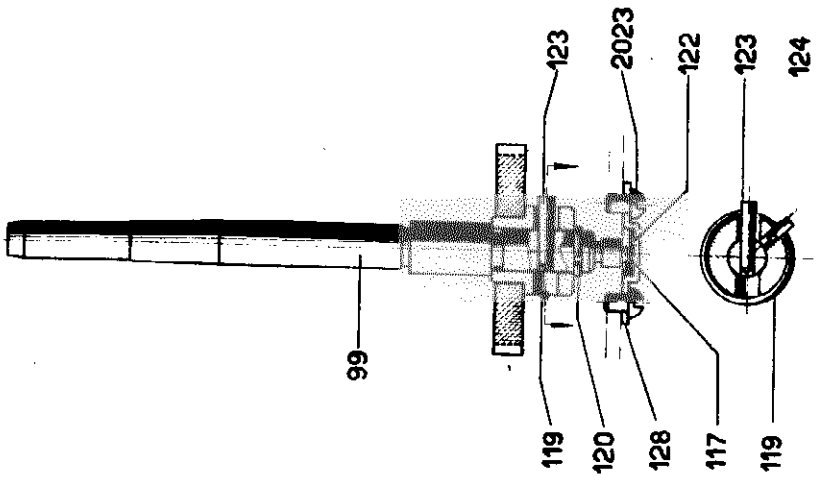


Fig. X

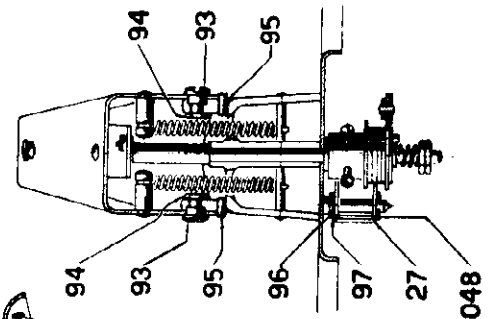


Fig. IX

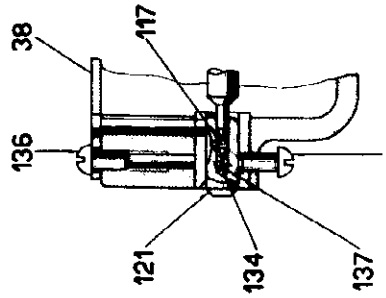
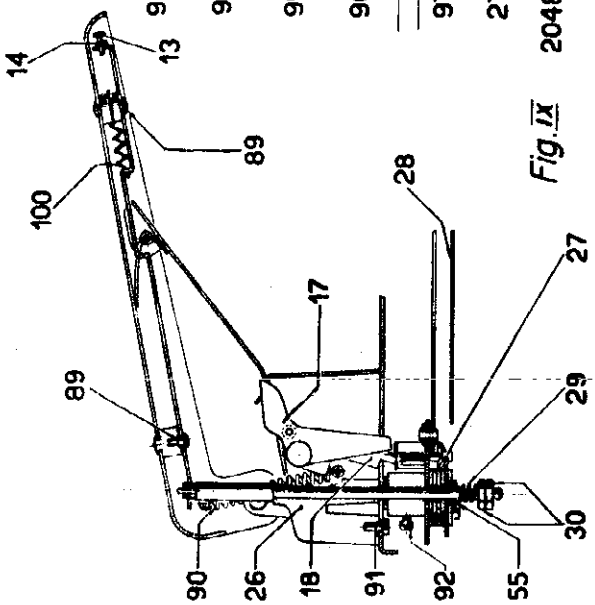


Fig. XIII



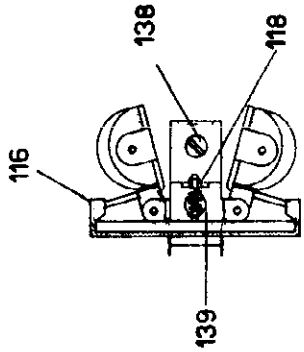


Fig. XII

MODEL CD40

THORENS INC.

SPARE PARTS LIST FOR THORENS RECORD CHANGER CD 40

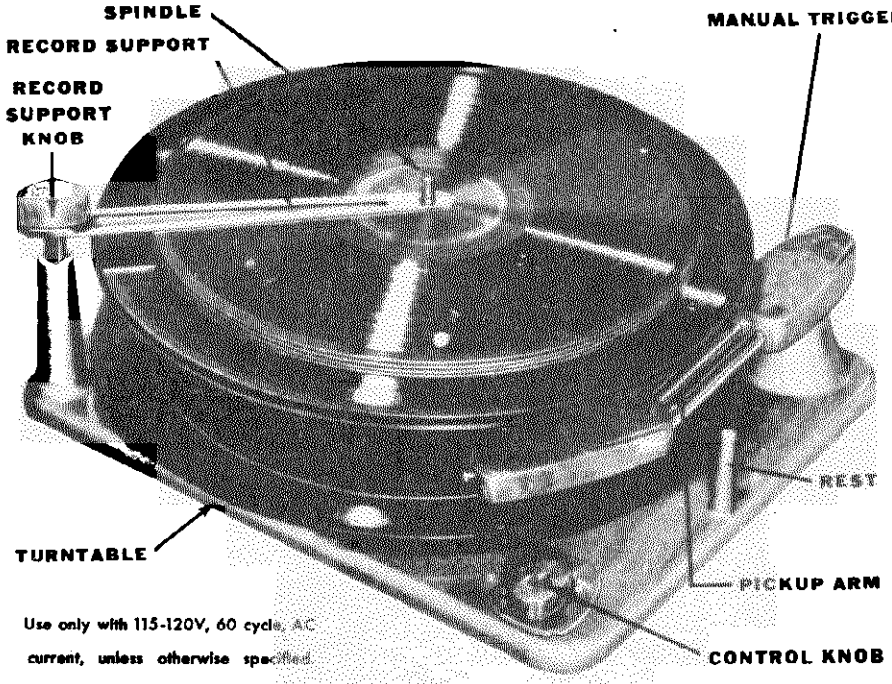
Fig. No.	Reference No.	Description
III-IV-VII	1	Pick-up adjusting screw
IV-VII	3	Pick-up feed-in spring
I-VIII	5	Clutch stop lever
I-VIII	6	Spring for clutch stop lever
IV	10	Impulse spring
I-III	11	Striker leather pad
III-VIII	12	Auto trip adjusting screw
II-IX	13	Record feeding adjusting screw
II-IX	14	Record feeding adjusting nut
IV	15	Stop operating lever
IV	16	Loop for stop operating lever
IV-IX	17	Stop feeler
III-IX	18	Selecting feeler
IV-VI	20	Repeat lever
IV	22	Pause actuating spring
III	23	Motor fixing nut
IV	24	Screw for pause actuating spring
IV	25	Pause star wheel
III-IX	26	Platform
IV-IX	27	Selecting latch
IV-IX	28	Selecting link
IV-IX	29	Friction spring for selector
IV-IX	30	Selector friction adjusting nut
IV	31	Pick-up landing stop
IV	32	Screw for selecting link
III-VII	43	Pick-up rest spring
II	44	Record spindle complete
II	45	Record push lever
I-VIII	46	Clutch plate spring
III-VIII	48	Leather pad for turntable brake
VI	49	Reject lever spring
VI	51	Start lever spring
VI	52	Repeat and pause lever spring
VI	53	Unit plate
VI	54	Fixing screw for control plate
VI-IX	55	Control knob washer
VI	56	Control lever washer
VI	57	Control knob
VI	58	Control knob fixing screw
VI	59	Main control plate
VI	61	Screw for control knob bearing plate
VII	62	Pick-up fixing screw
VII	63	Pick-up connecting tag
VII-VIII	64	Connecting tag fixing screw
VII	65	Earthing tag
VII	66	Connecting plate
VII	67	Insulating plate
VII	68	Screw for retaining bracket
VII	69	Cam lever retaining bracket
VII	71	Screw for spring wire
VII	72	Pivot screw nut
VII	73	Pivot screw
VII	74	Pick-up lateral displacement spring
VII	75	Washer for spring wire
VII	76	Screw for pick-up base cover
VII	77	Spring for pick-up ajusting screw
VIII	78	Switch spring
VIII	79	Auto trip friction spring
VIII	80	Fixing screw for pause pinion spring
VIII	81	Spring for pause pinion
VIII	82	Stop for trip lever
VIII	83	Spring for trip lever
VIII	84	Assembling nut
VIII	85	Washer for operating lever
VIII	86	Stop spring for operating lever
VIII	87	Screw for pause pinion
VIII	88	Switch cover
IX	89	Screw for push-lever actuating link
IX	90	Overarm spring
IX	91	Platform fixing screw
IX	92	Fixing screw for feading mechanism shaft
IX	93	Pivot screw for overarm
IX	94	Nut for overarm pivot screw
IX	95	Stop screw for overarm
IX	96	Spring washer for selecting latch
IX	97	Washer for selecting latch
XI	98	Speed indicator lever
IX	100	Spring for push lever actuating link
VIII	101	Switch block
VIII	102	Screw for switch block
XIV	103	Spring mounting
IX	2048	Pin for selecting latch

SPARE PARTS LIST FOR RS MOTOR FOR THORENS RECORD CHANGER CD 40

Fig. No	Reference No.	Description
V	34	2 mm thrust ball
V	35	Rotor shaft thrust plate
V	36	Bearing stud
V	37	Bearing lubrication tube
V-XI-XIII	38	Motor cover
III-XI	39	Fixing screw for regulator lever
V	41	Motor frame
V	42	Stator (complete with coils)
X	99	Motor main spindle
XI	112	Regulator brake
XI	113	Friction fork
XI	114	Adjusting ring
XI	115	Spring washer
XII	116	Governor complete
X - XIII	117	3/32" thrust ball for rotor shaft and main spindle
XII	118	Governor spring
X	119	Spring for elastic coupling
X	120	Stop spring for elastic coupling
X	121	Rotor shaft bearing
X	122	thrust plate for main spindle
X	123	Longer pin for elastic coupling
X	124	Shorter pin for elastic coupling
X	128	Cover plate for thrust bearing
XIII	134	Stop pin for rotor shaft bearing
XI	135	Fixing screw for spring washer
XIII	136	Screw for motor cover
XIII	137	Spring for rotor shaft bearing
XII	138	Governor fixing screw
XII	139	Governor mounting screw
X	2023	Cover plate fixing screw

V-M CORP.

OPERATION PROCEDURE
MODEL 400 AUTOMATIC RECORD CHANGER



Use only with 115-120V, 60 cycle, AC current, unless otherwise specified.

LOADING

1. Pull straight up on RECORD SUPPORT KNOB until RECORD SUPPORT clears SPINDLE. Swing RECORD SUPPORT in either direction until pin in shaft drops into locating groove.
2. As many as ten 12 inch, twelve 10 inch or ten intermixed records may be loaded at one time. Arrange selected records in desired order.
3. Carefully place records on SPINDLE and lower to off-set shoulder. Steady records with one hand and replace RECORD SUPPORT over SPINDLE. Gently push down on RECORD SUPPORT KNOB until records are held parallel with TURNTABLE.

STARTING

To start operation of Record Changer, turn CONTROL KNOB clockwise to "REJ." and release. Changer will operate automatically until last record has been played. CONTROL KNOB then turns to "OFF" position, PICK-UP ARM returns to REST and machine automatically stops.

REJECTING

To reject a record at any time while it is playing, turn CONTROL KNOB to "REJ." and release.

UNLOADING

To remove records from TURNTABLE, lift up on RECORD SUPPORT KNOB and swing RECORD SUPPORT in either direction until pin in shaft drops in locating groove. Carefully lift entire stack of records straight up. Caution: When loading or unloading Changer use care to prevent bending SPINDLE. Records should never be left on the off-set portion of the SPINDLE as they may warp. If Changer is turned off before all records have been played, remove unplayed records from SPINDLE — or — operate "reject" until all records have dropped to TURNTABLE.

STOPPING

To turn off Changer before last record has been played, turn CONTROL KNOB to "OFF.," lift PICK-UP ARM from record and place on REST.

MANUAL OPERATION

To play single records or home recordings, pull straight up on RECORD SUPPORT KNOB until RECORD SUPPORT clears SPINDLE. Swing RECORD SUPPORT in either direction until pin in shaft drops into locating groove. Lower record to off-set shoulder of SPINDLE and tilt toward back of PICK-UP ARM. Carefully work record past off-set shoulder. Turn CONTROL KNOB to "ON" and push down on MANUAL TRIGGER located near back of PICK-UP ARM. Machine will then operate independently of cycling mechanism *provided* — PICK-UP ARM is moved all the way into the SPINDLE *before* it is returned to REST after record is played. When playing "inside-out" records, move PICK-UP ARM all the way into SPINDLE before setting it down on first playing grooves of record.

REPEATING

To repeat a record, any records remaining above off-set shoulder of SPINDLE must be removed. Pull straight up on RECORD SUPPORT KNOB until RECORD SUPPORT clears SPINDLE. Swing RECORD SUPPORT in either direction until pin in shaft drops into locating groove. Carefully lift records from SPINDLE. *Do not replace RECORD SUPPORT over SPINDLE.* Changer will repeat top record on TURNTABLE until CONTROL KNOB is turned to "OFF."

SUGGESTIONS

For best results use a good standard semi-permanent type needle.

Poor reproduction may be caused by a poor or damaged needle or worn, warped, dished or dirty records.

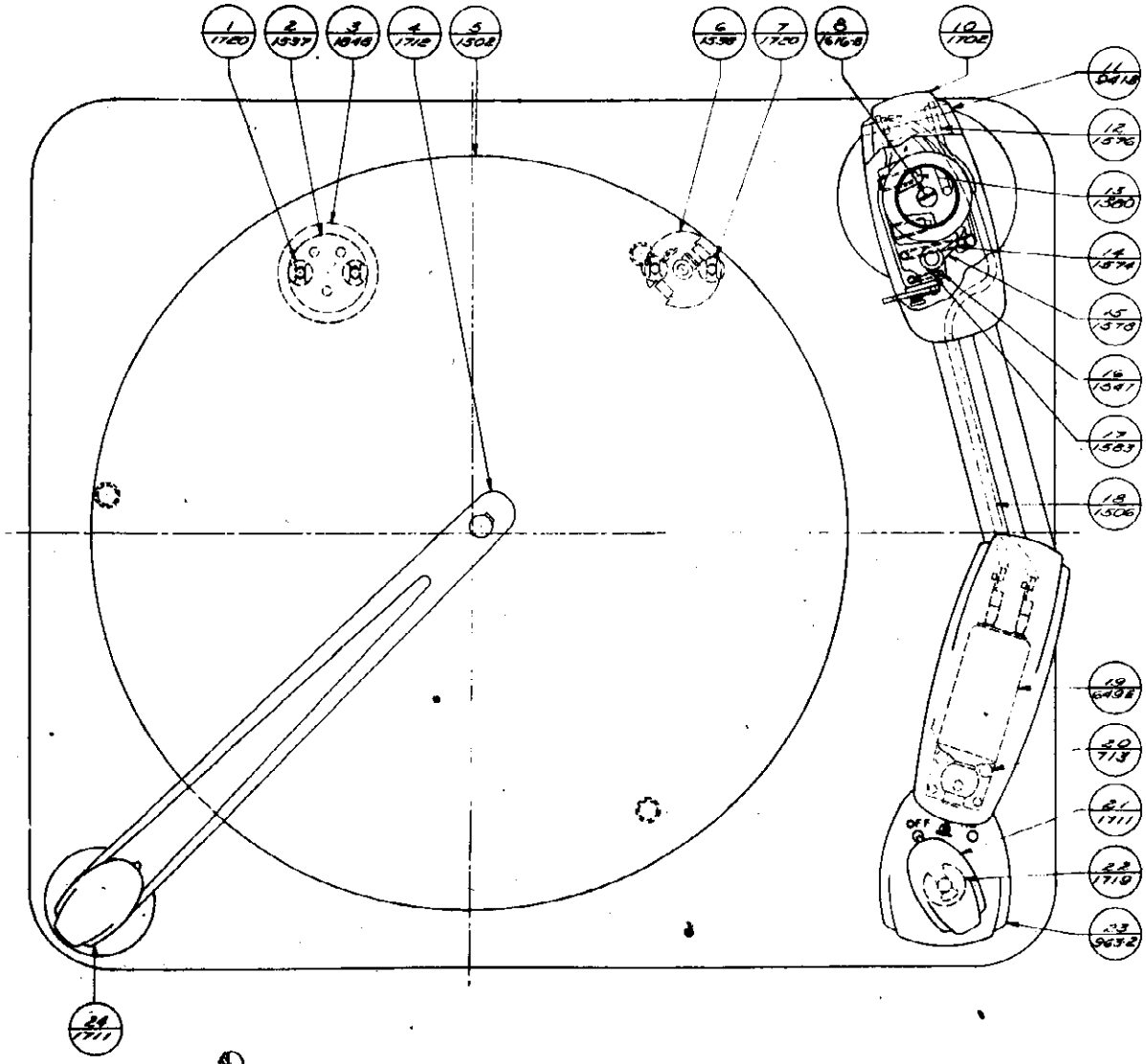
Records should be stored away from heat, in a record album or laid flat. Clean records periodically with a soft, lint-free cloth.

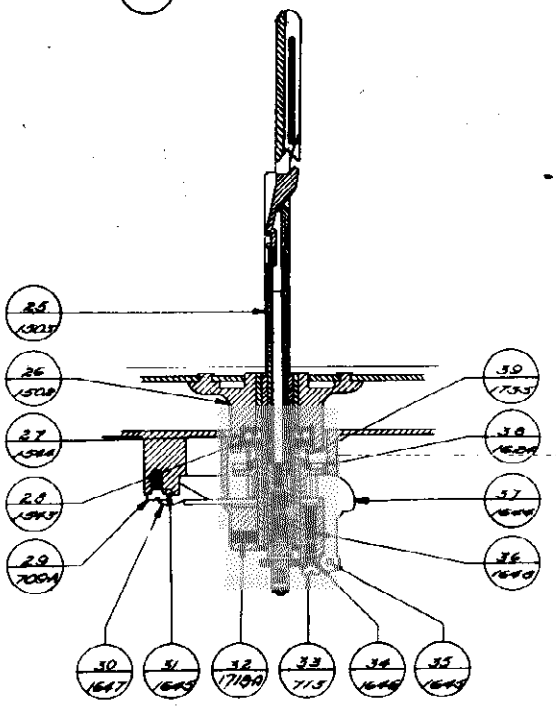
Avoid dropping PICK-UP ARM on record. Needle or record or both may be damaged.

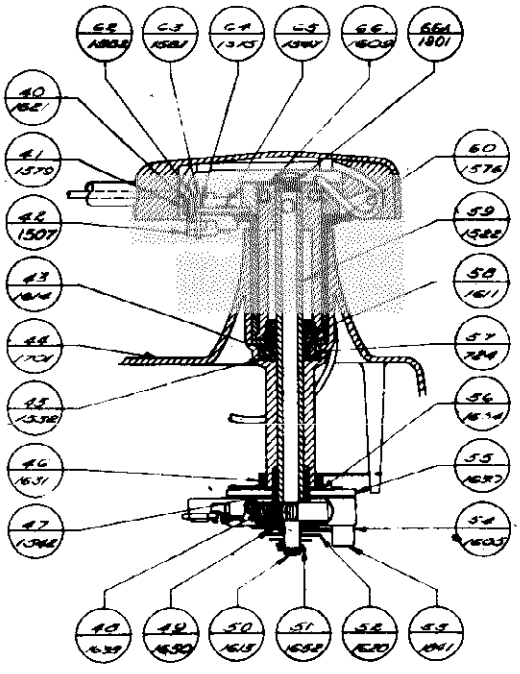
Mechanism will operate automatically on all *standard* records. In case of records not having the standard "trip groove," (a spiral groove near center of record), when PICK-UP ARM reaches end of record, turn CONTROL KNOB to "REJ." to bring next record into playing position.

MODEL 400

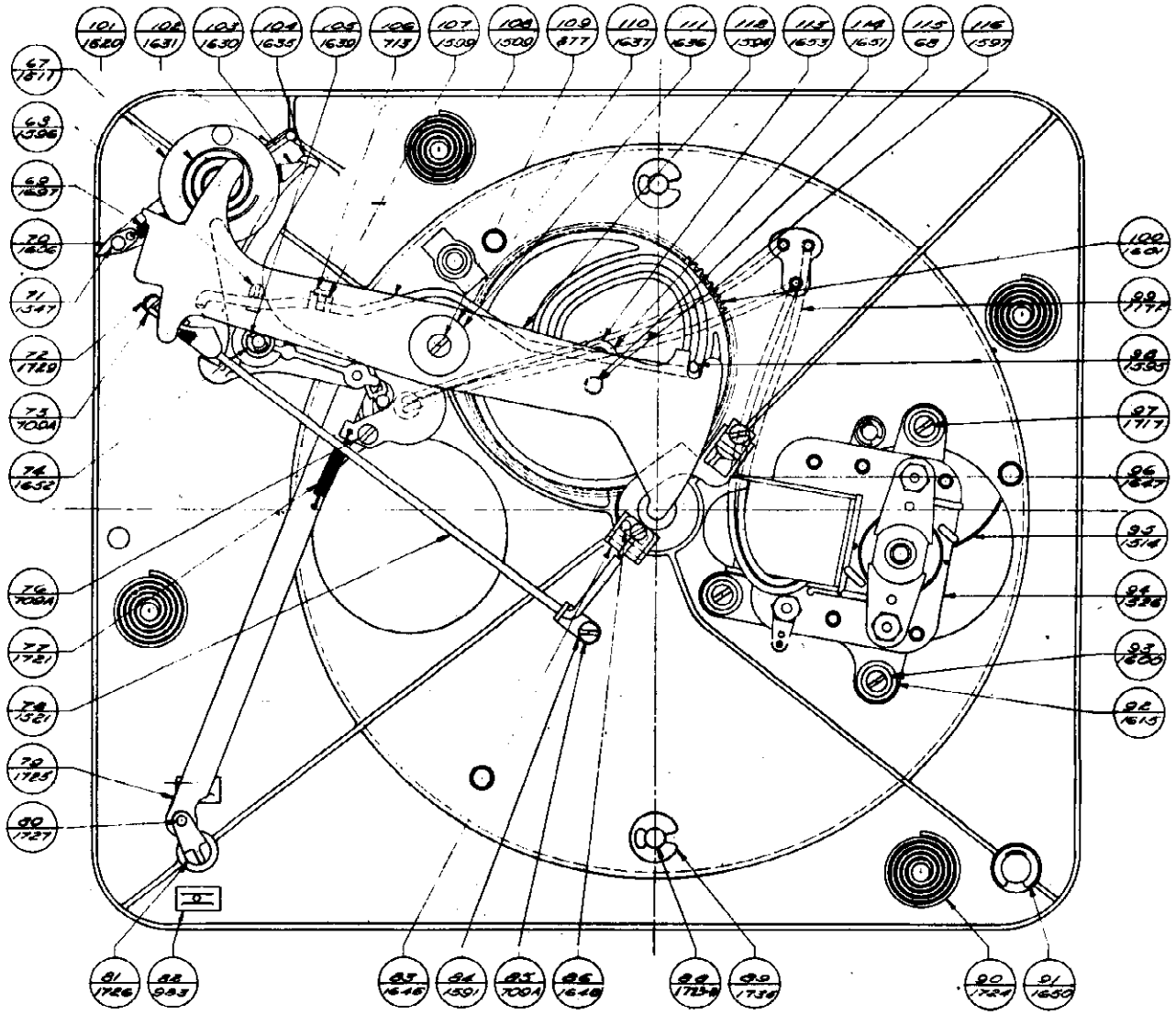
V-M CORP.







V-M CORP.



MODEL 402

REPLACEMENT PARTS LIST

PART NO	LOCATION	DESCRIPTION
68	115	ROLLER DRIVE PIN
1171 F	99	A.C WIRE
277	109	#6-32 x 3/16 BINDING HD ST SCR
649 E	19	CRYSTAL CARTRIDGE
700-A	89,73,76,85	SCREW #6 x 1/4 TYPE "Z"
713	20,106,33	SCREW #4 x 1/4 TYPE "Z"
724	37	BEARING BALL
941-B	11	HINGE PIN
963-2	23	ESCUTCHEON
983	82	SPEED NUT
1302	5,86	TURNTABLE ASSY
1303	25	SPINDLE ASSY
1306	18	CABLE & CLIP ASSY
1307	42	HINGE ASSY
1309	109	LIFT ARM ASSY
1311	67	RATCHET ARM
1314	93	DRIVE DISC
1321	78	RATCHET ASSY
1322	39	TONE ARM LOCATOR ASSY
1326	24	MOTOR ASSY
1332	43	BALL CUP
1337	8	A.C OUTLET
1339	6	PICKUP SOCKET
1342	47	"C" WASHER
1343	28	TURNTABLE WASHER
1344	27	TURNTABLE BEARING
1347	16,65,71	DRIVE PIN
1374	14	RING SPRING
1375	64	CAM SPRING
1376	12,60	HINGE BODY
1378	15	CATCH
1379	41	DRIVE PIN
1380	13	ADJUSTING SCREW
1381	63	HINGE CAM
1382	62	TRIP LEVER
1383	17	CATCH SPRING
1391	84	TRIP ROD BEARING
1394	112	LIFT ARM
1395	88	
1396	48	
1397	116	
1398	107	
1600	95	GROMMET SPACER
1601	100	CAM
1603	34	RATCHET ARM
1606	70	RATCHET PAWL
1609	66	HINGE BEARING
1611	58	BEARING CONE
1613	30	LIFT ROD
1614	45	BEARING SPACER
1615	92	GROMMET
* 1620	52, 101	LIFT ROD SPRING
1621	40	LEVER RETURN SPRING
1624	33	PINION GEAR
1630	53, 103	SET DOWN LOCATOR
1631	102	RETURN SPRING
1633	104	CONTROL LEVER
1636	111	LIFT ARM WASHER
1637	110	FIBRE WASHER
1638	103	SAFETY SPRING
1639	105	FIBRE WASHER
1644	37	CATCH
1645	31, 55	CATCH PIN
1646	36, 83	CATCH PLATE
1647	30, 96	LATCH
1648	35, 85	LATCH SPRING
1650	49, 91	"C" WASHER
1651	114	"C" WASHER
1652	51, 74	"C" WASHER
1653	113	FIBRE WASHER
1654	56	FIBRE WASHER
1667	69	PAWL SPRING
1701	44	BASE PLATE ASSY
1708	10	TONE ARM ASSY
1711	81, 24	KNOB
1712	4	RECORD SUPPORT ASSY
1717	97	#6 x 9/16 TYPE Z SCREW
1718-A	32	SPINDLE SET SCREW
1719	22	"E" WASHER
1720	17	SPEED NUT
1721	77	REJECT SPRING
1723-A,B	28	SHIPPING BOLT
1724	90	MOUNTING SPRING
1725	79	CONTROL LINK
1726	81	CONTROL CRANK
1727	80	TUBULAR RIVET
1729	72	TRIP ROD BEARING
1733	39	PINION SPRING
1736	89	"C" WASHER
1841	35	RATCHET LOCATOR
1848	3	LIFT PIN ASSY
1901	66A	INSULATOR
		LOCK SPRING

* 1616-B 8 SCREW, "5-40 x 1/4 BINDING HD.

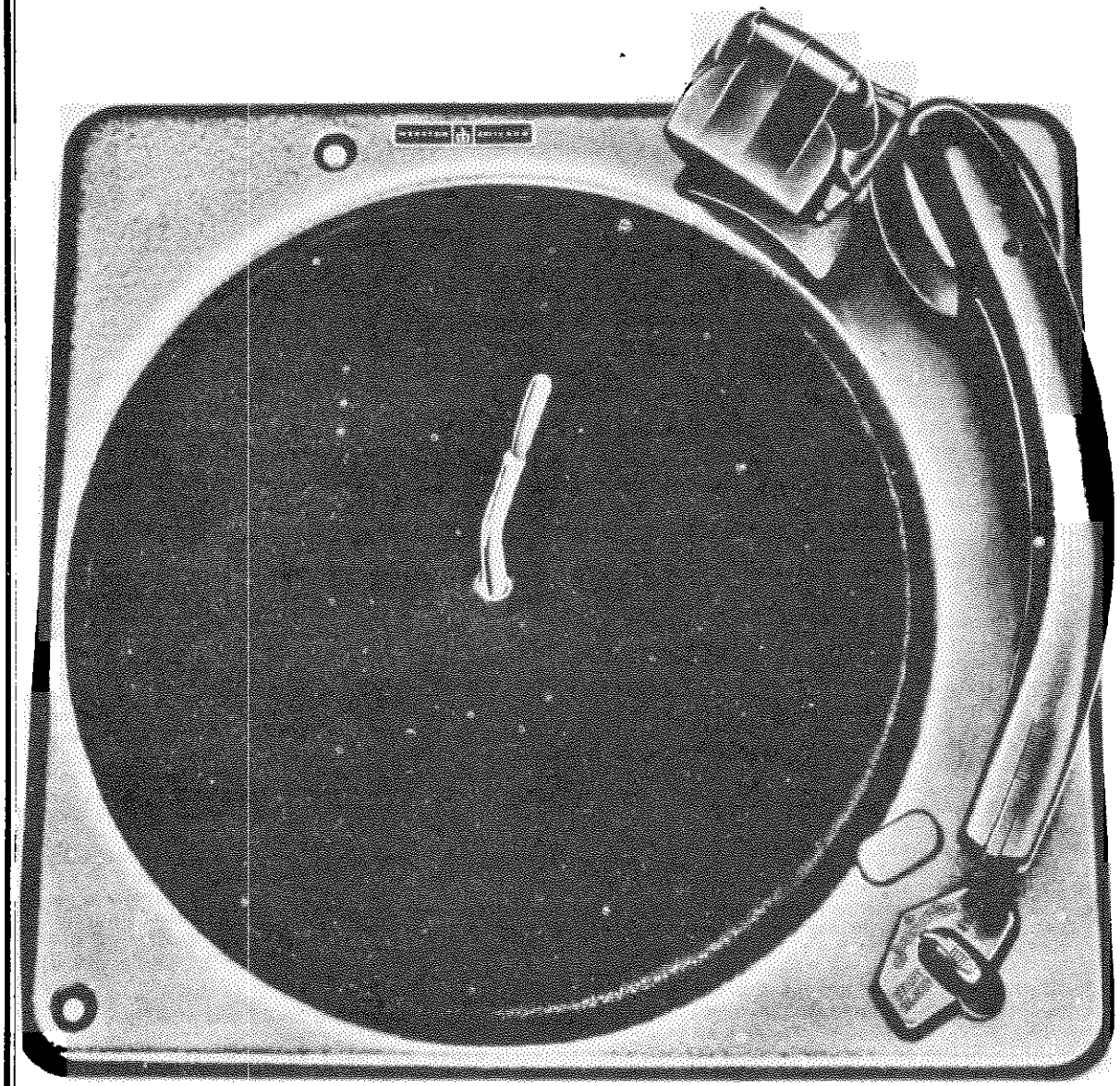


FIG. 1 - MODEL 50 RECORD CHANGER

I MODEL 50 RECORD CHANGER

The Webster Model 50 is a single post, Spring cushioned Spindle, Automatic Record Changer. Simple in design and operation, it provides manual or automatic playing of standard ten or twelve inch records with a minimum of waiting time between records during automatic operation. Home recording or "Inside Out" records up to the 12 inch size may be played manually. This machine will change warped or rough-edge records, at the same time assuring maximum protection to the finest discs. When set for automatic operation, Model 50 will continue to repeat a single record placed on the turntable (or the last record of a stack) until the control knob is returned to the "STOP" position.

II OPERATION

A - MOTOR

Connect the motor cord to a source of 105-125 volt 60 cycle current only. For 105-125 volt 50 cycle operation, a special motor pulley (Part 17X412-4) must be used in place of the one supplied with the changer in order to drive the turntable at the required speed of 78 R.P.M.

Do not under any circumstances connect the motor to a source of direct current or alternating current of any other frequencies.

B - PICKUP

The pickup cartridge supplied with this unit is of the high impedance crystal type. This means that it may be connected to the average amplifier, radio set or public address system without using coupling transformers or impedance matching devices. Generally speaking, it is customary to connect the crystal from grid to ground of the first audio tube so that at least two stages of amplification are available. Most modern radio receivers have the volume control in the audio circuit and in such cases, the pickup may be connected directly across the volume control. In radio

II OPERATION (Cont'd)

B - PICKUP - Cont'd.

receivers having other than the audio type control, an auxiliary control will be required to adjust the record volume.

The crystal supplied with this unit may be of the fixed permanent point or the removable needle type. If it is the latter, use a needle which is 11/16 inches long for most satisfactory results.

The choice of a needle is largely a matter of personal preference since all needles have their good features.

There are many types of permanent point needles available for use with automatic record players. These may be straight shank, offset, solid or hollow shank, floating point, sapphire or hard metal point types.

Some desirable qualities of a good needle are faithful reproduction, low surface scratch or hiss, long wearing qualities, minimum record wear and rugged construction.

Do not use single play or cactus needles for Automatic Operation.

C - OPERATION - Automatic

1.- Turn the Record Selector Post to TEN or TWELVE for ten or twelve inch records.

2 - With the Record Ballast Weight turned back, place up to ten 12" records or twelve 10" records on the Spindle so that the bottom record rests on the step of the Spindle and on the shelf of the Record Selector Post

3 - Turn the Record Ballast Weight forward to rest on the top record.

4 - Move the Control Knob from the STOP position (nearest the pickup arm rest) to the START-REJECT position (farthest from the pickup arm rest) and release. The control will then drop back into the automatic playing position and the mechanism will continue to operate automatically until the control is returned to the STOP position.

5 - To reject any record while playing in the automatic position, move the control knob momentarily to the START-REJECT position and release.

NOTE: The mechanism may be turned off at any time or during any portion of the change cycle by moving the Control Knob to the STOP position. The pickup arm may be moved horizontally at any time without damage to the mechanism. However, the pickup arm cannot be returned to the pickup arm rest until the change cycle has been completed.

6 - After the last record has been played, the entire stack may be removed from the turntable at one time. The simplest procedure is as follows:

a - Place the Pickup Arm on the Pickup Arm Rest.

b - Turn the Record Ballast Weight back out of position.

c - Place the fingers of both hands under opposite edges of the bottom record.

d - Do not apply pressure to the top record. (Keep your thumbs free.)

e - Lift the stack of records straight up following the contours of the spindle. This permits the stack of records to follow the curve of the spindle without binding and greatly facilitates the removal of the stack.

D - OPERATION - Manual

1 - Turn the Record Selector Post to the TWELVE inch position (this is not essential but permits more clearance in loading and unloading records).

2 - Place a record on the turntable. It may facilitate this operation if the record is placed over the spindle at an angle, with one edge of the record held below the level of the record selector post shelf. Records may be removed in the same manner.

3 - Move the Control Knob from the STOP position to the MANUAL position (toward the spindle). No harm will result if the knob is accidently moved to the START-REJECT position while moving it from STOP to MANUAL. If a twelve inch record is on the turntable, the arm will automatically index to the edge of the record. If a ten inch record is on the turntable, the needle will be set down gently on the rubber pad and the arm may then be moved manually to the edge of the record.

4 - Place the needle gently on the edge of the record.

Particular care should be exercised if your pickup has a sapphire point needle. Although the sapphire is very hard and long wearing, it is extremely brittle and may be fractured or chipped if dropped on the record.

5 - To stop the mechanism at any time, move the Control Knob to the STOP position.

III SERVICE INFORMATION

This unit has been accurately adjusted, lubricated and tested at the factory and should require no further adjusting in the field. If service repairs become necessary, this bulletin should be studied carefully before making any adjustments or replacing parts.

Service parts are available at the factory. All parts must be ordered by Part Number, Model Number and Production Number stamped on the under side of the main plate.

IV SERVICE REPAIRS

Service repairs and adjustment on the Model 50, listed by the apparent condition are as follows:

A - AUTOMATIC TRIP FAILS TO FUNCTION

When the movement of the pickup arm toward the spindle is greater then 1/8 inch in 1/2 revolution of the turntable, the Automatic Trip Arm trips the Velocity Trip and Roller Assembly. This releases the Actuating Pawl on the Main Cam Assembly, allowing it to engage the Main Cam Actuating Gear and driving the mechanism through the change cycle.

The automatic trip arm follows the movement of the pickup arm through a spring compression clutch. This clutch must be kept free of oil or grease.

Should it become necessary to clean the clutch, loosen the lock (Point "A" Figure 8) to relieve the spring tension and clean the clutch parts with carbon tetrachloride. Reset the clutch spring tension by setting the lock at least 1/4 inch below the main plate. This tension should be just sufficient to operate the trip mechanism without placing undue drag on the movement of the pickup arm.

Also check for:

1 - Velocity Trip and Roller assembly binding (Illus.44 Fig. 7)

2 - Actuating pawl stuck (Part of Main Cam assembly, Illus. 42 Fig.7, engaged by hook end of Velocity Trip and Roller Assembly.)

3 - Automatic Trip Arm (Illus. 26 Fig. 6) bent and not hitting the Velocity Trip and Roller Assembly.

4 - No velocity lead-in groove or eccentric groove in center of record.

5 - Foreign matter in record groove.

6 - Badly worn record.

7 - Badly worn or bent needle.

B - MANUAL TRIP FAILS TO FUNCTION

The manual trip is operated by the control knob. When the control knob is moved to the start-reject position, the Manual Trip Lever is actuated, tripping the Velocity Trip and Roller Assembly and putting the mechanism in cycle.

Check for:

1 - Manual Trip Lever (Illus. 29 Fig. 6) hair spring bent or broken.

2 - Velocity Trip and Roller Assembly binding (Illus. 44 Fig. 7.)

3 - Actuating pawl stuck.

C - NEEDLE SKIPS GROOVE

With the pickup arm in playing position, the arm is practically free-floating on its pivot. There is no lead-in spring which might drag the needle over the first few grooves of the record or minimum radius device to jam the arm on the inside grooves.

The pressure required to actuate the trip mechanism is negligible.

Should the needle skip grooves at any time, check for:

1 - Record Changer not level.

2 - Pickup Arm binding.

3 - Foreign matter in record groove.

4 - Badly worn record groove.

5 - Badly worn or bent needle.

6 - Pickup cord caught in hinge.

D - MECHANISM CONTINUES TO CYCLE

At the completion of the change cycle the actuating pawl is engaged by the hook end of the Velocity trip and Roller Assembly which has been returned to its normal position by the reset points on the main cam drive gear. This hook should be adjusted for about .005 - .015 clearance from the bottom of the main cam drive gear. Greater clearance may permit the pawl to bounce past the hook and re-engage. Also check for:

1 - Velocity Trip and Roller Assembly (Illus. 44 Fig. 7.) rubbing on Main Cam Actuating gear (Illus. 42 Fig. 7.)

2 - Manual Trip Lever (Illus. 29 Fig. 6.) binding.

3 - Disengage roller broken on Velocity Trip and Roller Assembly.

E - PICKUP ARM LIFT TOO HIGH OR TOO LOW

1 - The Needle should approach the top record of a full stack on the turntable with approximately 1/8 inch clearance. Adjust by bending the Pickup arm Raising Lever at Point C., Fig. 8. Do not attempt to move Pickup Arm Raising Disc up or down.

F - NEEDLE LET DOWN INDEXING INCORRECT

The eccentric screw, accessible through the top of the pickup arm, should take care of any normal adjustment. Turn this screw clockwise to index the needle in toward the spindle and counter-clockwise to index the needle out away from the spindle.

Should further adjustment be necessary, proceed as follows:

1 - Set the Record Selector Post to the TEN inch position.

2 - Operate the mechanism by revolving the turntable manually until the needle drops to within 1/8 inch of a ten inch record on the turntable.

3 - With a #8 Bristol wrench in each of the set screws (Points D and E, Fig. 8) alternately loosen one and tighten the other until the needle rests

IV SERVICE REPAIRS (Cont'd)

F - NEEDLE LET DOWN INDEXING INCORRECT Cont'd.

above the record lead-in groove at the desired point.

4 - Turn the Record Selector Post to TWELVE and check the needle drop on a twelve inch record.

5 - Be sure that both set screws are tight when this adjustment is completed.

G - PICKUP ARMS DROPS OFF REST

When the Pickup Arm is moved to the Rest position, the lip of the Pickup Arm Raising Disc rests in the groove formed by the inside bevel of the lower Pickup Arm Pivot Shaft Bracket touching the Stud post. (Fig. 8) On units prior to Production No.375613 this function was performed by a chamfered and grooved collar on the stud post.

Adjust the position of the bracket (or collar) so that the lip of the Pickup Arm Raising Disc rests in the groove with the Pickup Arm Pivot Shaft touching the sub plate. When properly adjusted, there should be .010 clearance between the lip of the Pickup Arm Raising Disc and the bottom of the groove. The position of the Pickup Arm on the Pickup Arm Rest is adjusted by bending the lip of the Pickup Arm Raising Disc, so that when the Pickup Arm is resting on the Pickup Arm Rest Assembly, the lip of the Pickup Arm Disc rests in the groove formed by the bracket and stud. After making this adjustment, check the setdown of the needle on a 12" record to be certain that the lip of the Pickup Arm Raising Disc does not hit the beveled side of the bracket.

H - RECORD SELECTOR POST ANGLE INCORRECT

The Record Selector Post should be so adjusted that the curve of the shelf matches the curve of the record. To adjust this angle:

1 - Turn the Record Selector Post to the TEN inch position.

2 - Place a ten inch record on the spindle in the normal position for automatic playing.

3 - With a #8 Bristol wrench in each of the set screws (Point H and J, Fig. 8) alternately loosen one and tighten the other until the Record Selector post angle is correct. Be sure that both set screws are tight at the completion of this adjustment.

I - SPINDLE DROPS MORE THAN ONE RECORD

The floating latch at the top of the spindle is so spaced that only one record at a time can slide between the heel of the latch and the step of the spindle. The hole in the latch is elongated so that the latch can slip into the spindle recess when records are being removed.

If more than one record is dropped at a time, it will be found to be due to

1 - Foreign matter in spindle recess causing the latch to stick.

2 - Exceptionally thin records. Standard records are 0.070 to 0.100 in thickness.

J - RECORD DROPS ON PICKUP ARM

As the change cycle is started by the needle riding in the center lead-in groove of the record, the first motion of the cam causes the Record Selector Post to move toward the spindle about 3/32 inches. This position is maintained until the Pickup Arm has made its full lateral excursion at which time the Record Selector Post again moves toward the spindle, causing the bottom record to drop into playing position.

If the Record Selector Post has been bent back, away from the spindle, it is possible for a standard record to rest on the spindle step with its edge just over the edge of the Record Selector Post shelf. Then as the change cycle is started, the record is pushed off the spindle by the initial movement of the Record Selector Post, so that it drops on the Pickup Arm.

To correct this condition, The Rocker Arm Assembly must be bent so that the Record Selector Post is brought nearer to the spindle.

1 - With the mechanism at rest, wedge the Rocker Arm firmly by inserting a screwdriver between the Rocker Arm and the Sub Plate at a point between the Rocker Arm Pivot (Illus. 36 Fig. 5) and the stud.

2 - With the heel of the hand, press the Record Selector Post toward the spindle, so that a standard record rests at least half way over the Record Selector Post ledge when placed on the spindle step.

It is recommended that the distance between the edge of the record and the step of the Record Selector Post be held to 1/32 of an inch so that records with rough or sharply beveled edges will not catch on the outer edge of the Record Selector Post.

CAUTION: Be certain that a standard size record is used in making this adjustment. A standard 10" record measures 9-7/8" ± 1/32" dia. A standard 12" record measures 11-7/8" ± 1/32" dia.

V LUBRICATION

Model 50 Record Changer leaves the factory completely oiled and lubricated. Under normal conditions this should be sufficient for approximately one year or 1,000 hours of operation. When operated under extreme conditions of dust or heat, this operation should be performed more frequently as required.

NOTE: AVOID EXCESSIVE LUBRICATION

Do not permit any oil or grease to get on the rubber idler drive wheel or the Motor Sleeve (Illus. 11 and 21, Fig. 4), on turntable drive rim or on the automatic trip arm clutch. Any oil or grease on these points should be removed using Carbon Tetrachloride.

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FIG. 2 - ALTERNATE NEEDLE LET DOWN INDEXING ADJUSTMENT

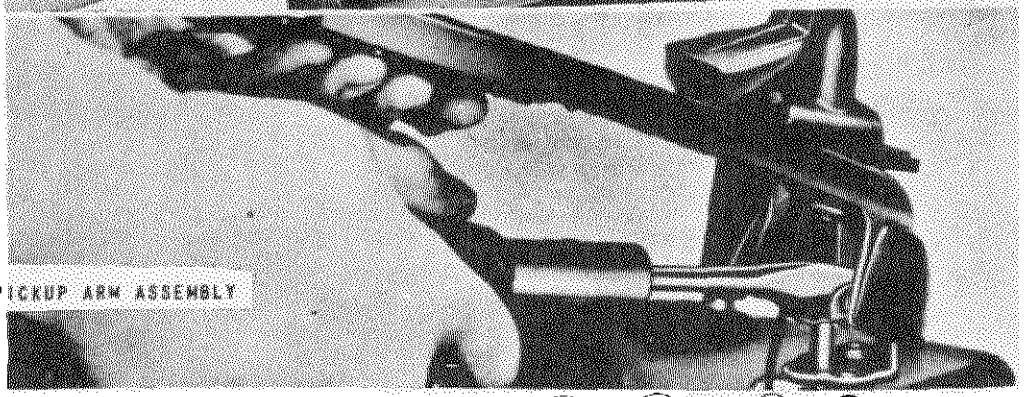
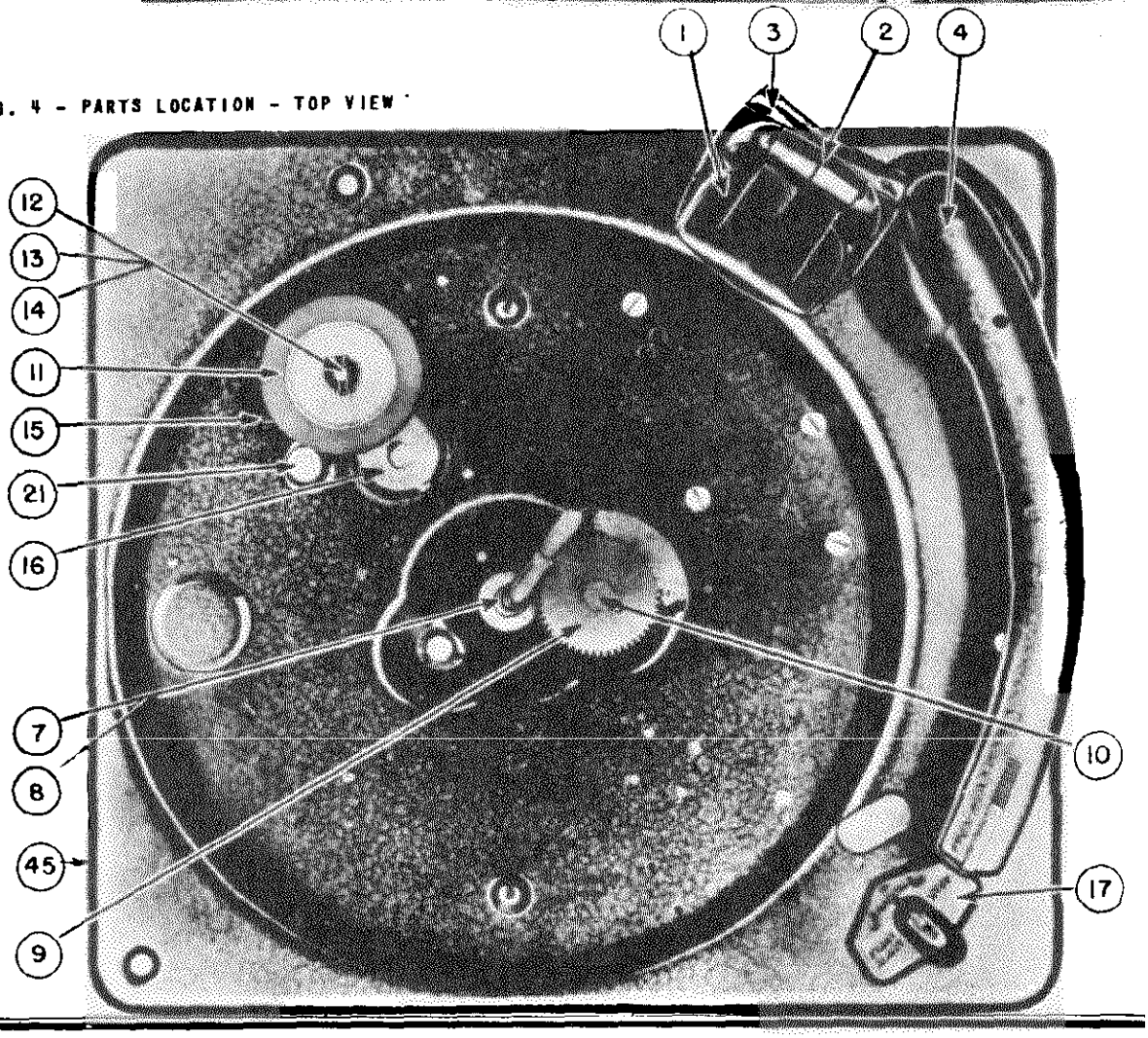


FIG. 3 - REMOVING PICKUP ARM ASSEMBLY

FIG. 4 - PARTS LOCATION - TOP VIEW



V LUBRICATION (Cont'd)

The recommended lubricants and points of lubrication are as follows:

A - #10 oil (apply with small oil can or medicine dropper)

1 - Motor Bearings. Saturate top and bottom felts.

2 - Pickup Arm Shaft (Illus. 22 Fig. 6). Apply one drop each to bottom bearing point, bracket hole and hole through Main Base Plate.

3 - Ball Bearing Assembly (Illus. 7 Fig. 4).

4 - Idler Wheel Felt (Illus. 13 Fig. 4)

B - LUBRIPLATE (APPLY WITH SMALL BRUSH)

1 - Idler Wheel Link (Illus. 16 Fig. 4).

2 - Turntable Shaft Stud.

3 - Pickup Arm Hinge Pins.

4 - Knife edge of Raising Lever (Illus. 33 Fig. 7).

5 - Main Cam bearing. (It is necessary to remove the sub-plate assembly to lubriplate this bearing. See paragraph VI-C)

C - STA-PUT (APPLY WITH SMALL BRUSH)

1 - Teeth of Main Cam Actuating Gear (Illus. 43 Fig 7).

2 - Track of Main Cam Gear (Illus. 42. Fig. 7)

3 - Teeth of Large and Small idler Gears (Illus. 9 Fig. 4).

4 - Raising Lever Bracket bearing surfaces (Illus. 33 Fig. 7).

5 - Selector Lever Stop (Illus. 40 Fig. 5).

VI MECHANICAL REPAIRS

A - TO REPLACE A PICKUP CARTRIDGE

A Pickup cartridge can be most easily replaced by first removing the Pickup Arm.

1 - Hold the Pickup Arm firmly with left hand.

2 - Using a tool such as a screwdriver, press in on one of the blue steel Pickup Arm hinge brackets while lifting up on the arm. (Fig. 3). This will release the Pickup Arm Hinge pin.

On the models later than Production No. 375613 a spring is inserted between the pins of the Hinge Bracket. This spring must be removed before the hinge can be taken apart.

3 - Repeat on the other pickup arm bracket.

4 - The Pickup Arm, when released from the hinge brackets, may then be turned over and laid on the turntable for easy access to the cartridge.

B - TO REPLACE THE PICKUP ARM

The Pickup Arm may be replaced on its bracket as follows:

1 - Line up the guide slots in the Shaft Bracket, with the pins in the Pickup Arm Bracket.

2 - Hook the roller (on the rear of the hinge assembly) under the Pickup Arm Lift Stop Bracket keeping the guide slots and pins in line.

In performing this operation, be sure that the pickup cord lies outside of the hinge and does not become wedged in the bracket.

3 - Press down firmly on the Pickup Arm base until the hinge pins fall into the bracket holes.

On models after Production No. 375613, the hinge should be re-assembled, using a pair of long-nosed pliers to place the Pickup Arm Hinge Bracket over the pins in the Shaft Bracket. The retaining spring need not be replaced unless the unit is to be reshipped.

C - TO REMOVE THE SUB-PLATE ASSEMBLY

In the event that it becomes necessary to replace any of the major parts in the sub-plate assembly (Fig. 7) the entire assembly should first be removed from the main plate.

1 - Remove the spindle which is held in by a cotter pin under the sub-plate.

2 - Remove the Turntable.

3 - Remove the Pickup Arm.

4 - Unhook the Rocker Arm Return Spring.

5 - Remove the Rocker Arm Pivot Pin.

6 - Remove the five #8 - 32x1/4 screws holding the sub-plate studs and the #8-32x3/8 screw holding the center post to the main plate.

D - TO REPLACE THE SUB-PLATE ASSEMBLY

Reverse the above procedure making certain that all parts fall into their proper positions. Particularly note The Selector Lever and Selector Lever Compression Spring to see that they are in position with the lever through the slot in the Pickup Arm Raising Lever Bracket.

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E - TO REMOVE THE RECORD POST AND ROCKER ARM ASSEMBLY

1 - Unhook the Rocker Arm Return Spring. (Illus. 37 Fig. 5).

2 - Remove the Rocker Arm Pivot Pivot Pin. (Illus 38 Fig. 5).

3 - Unfasten the Trim Plate

4 - Lift out the Selector Post, Rocker Arm and Trim Plate as a unit.

5 - In replacing the Rocker Arm assembly, note Paragraph VI, D "To Replace Sub-Plate Assembly."

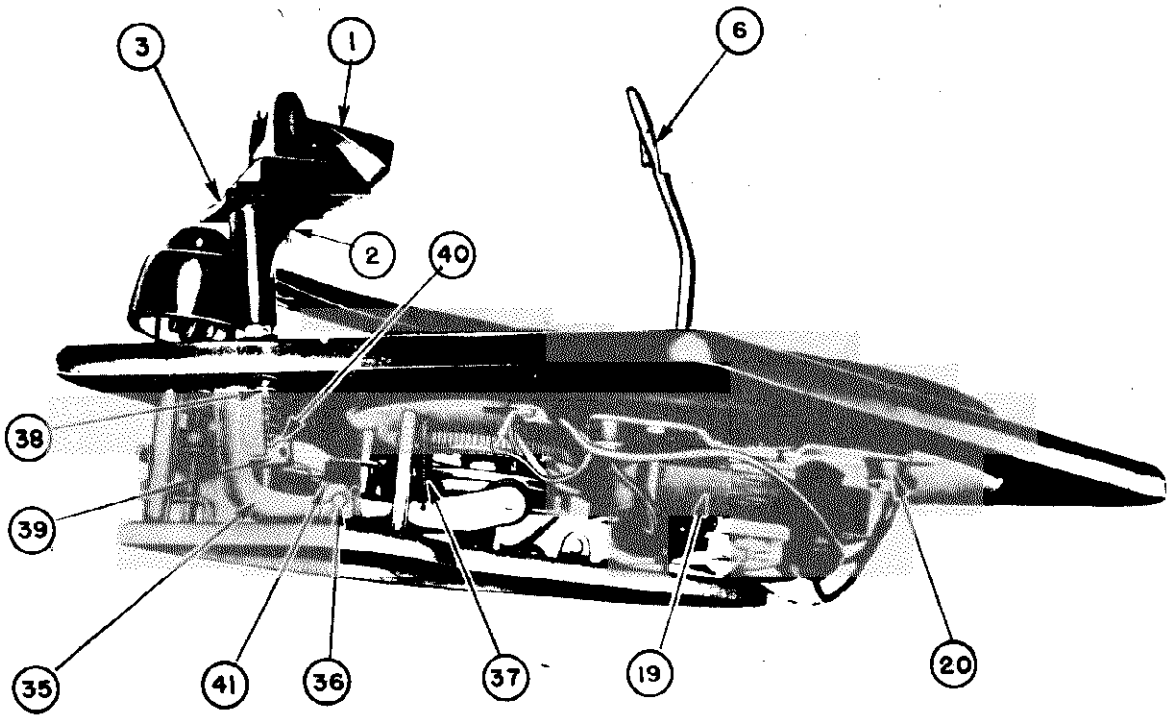

FIG. 5 - PARTS LOCATION -- LEFT SIDE VIEW

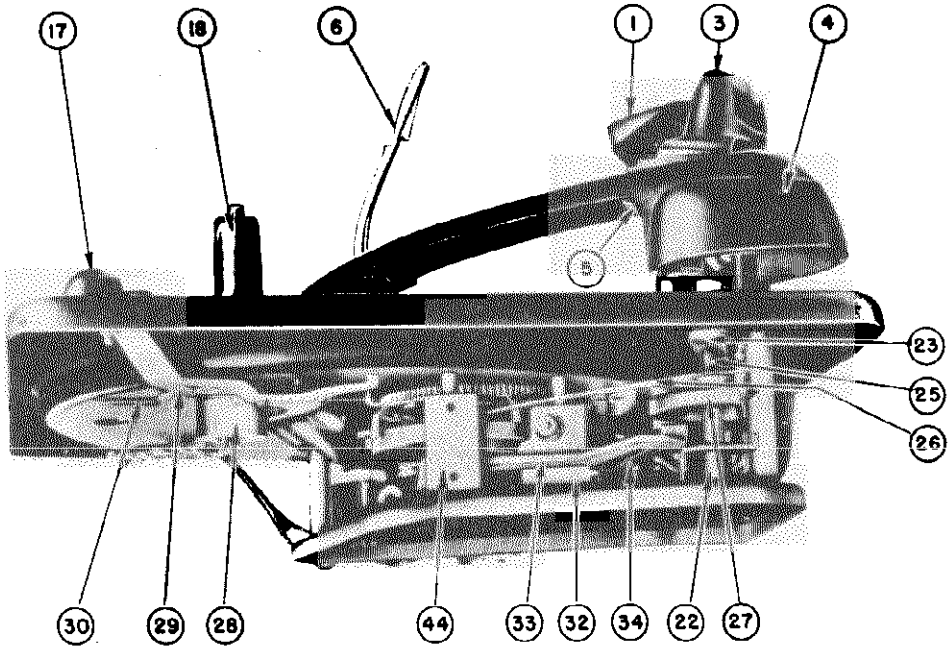

FIG. 6 - PARTS LOCATION -- RIGHT SIDE VIEW

MODEL 50

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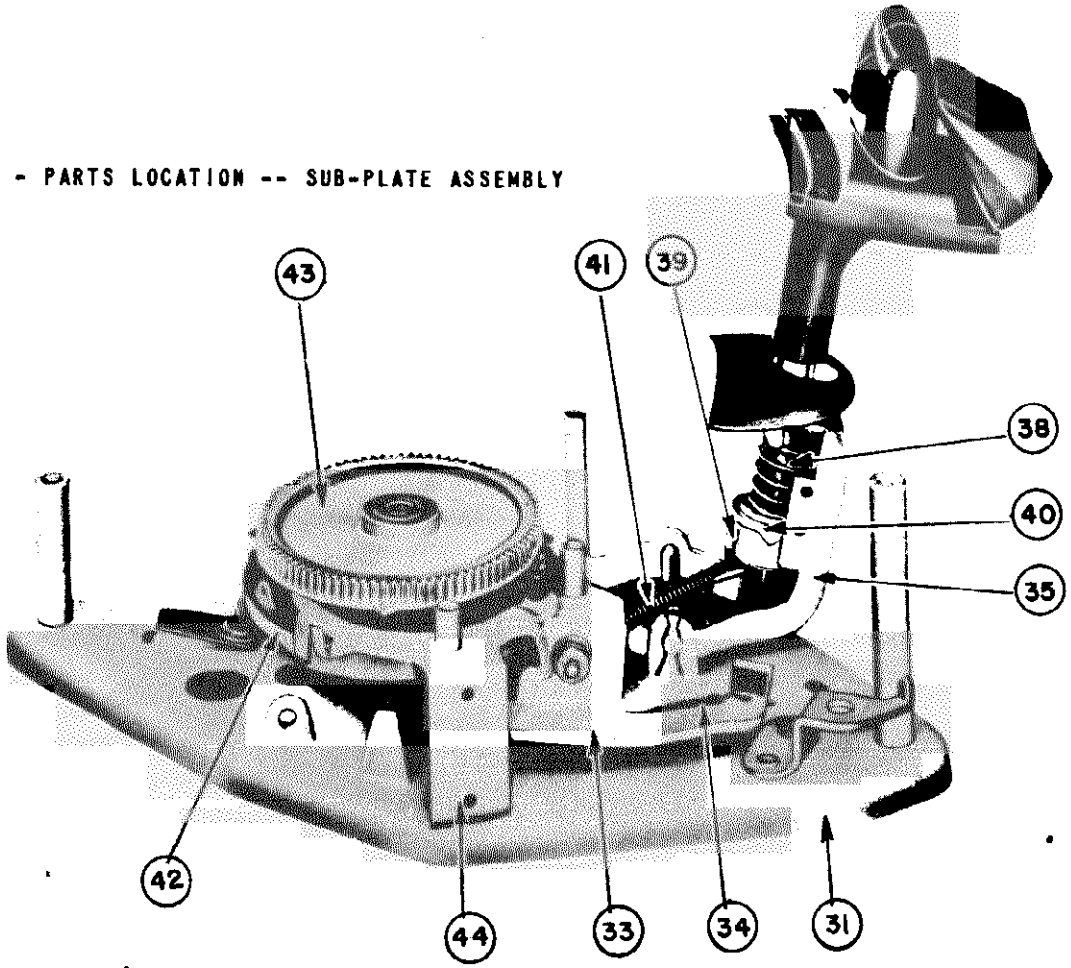
FIG. 7 - PARTS LOCATION -- SUB-PLATE ASSEMBLY



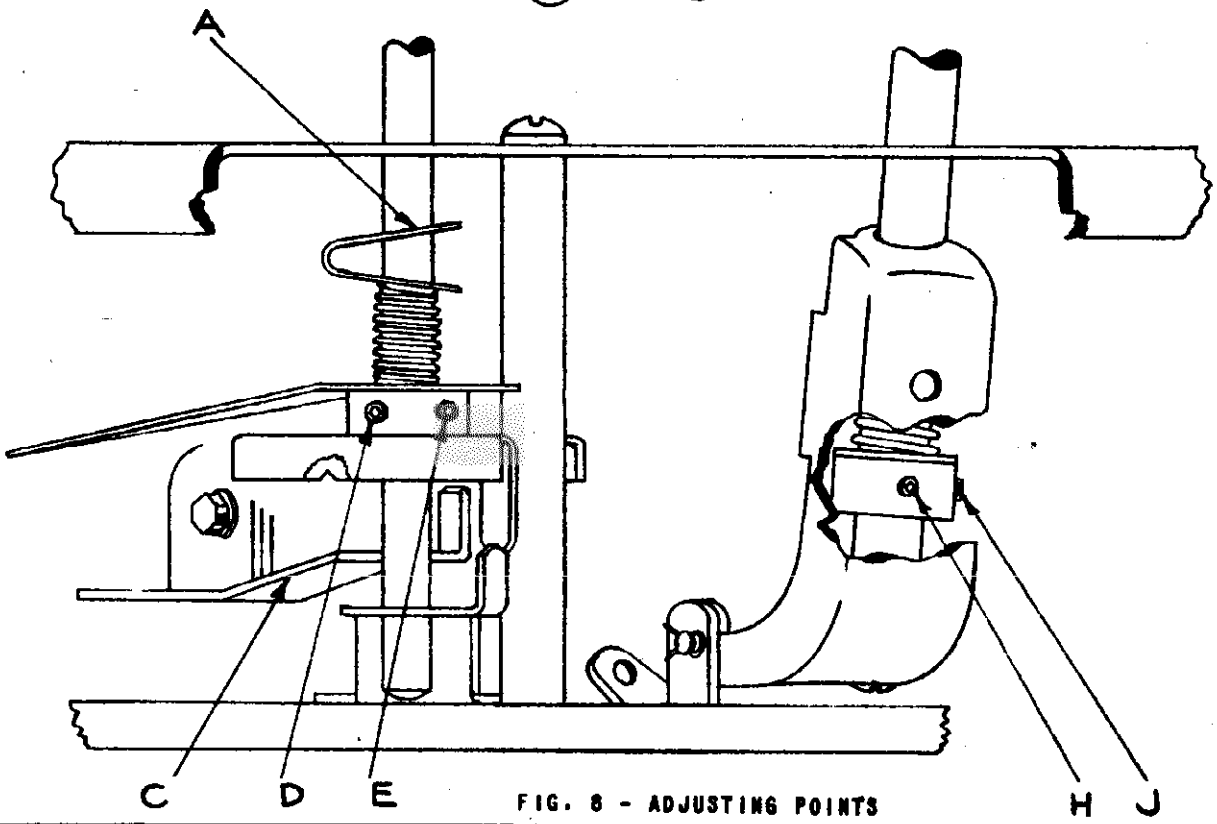


FIG. 8 - ADJUSTING POINTS

VII SERVICE PARTS LIST

ILLUS. NO.	FIG.	PART NAME	DESCRIPTION	PART NO.
1	4-5-6	Ballast	Record Weight	49P037-C
2	4-5	Spring	Record Ballast Tension	46P126
3	4-5-6	Post assy.	Record Selector	49X035-C
4	4-6	Pickup Arm	Arm & Hinge Assy.	220065
5	6	Hinge Assy.	Pickup Arm Mtg.	*
		Spring	Hinge Spacing	46P015**
		Cord	Pickup Cord 36"	20X256
		Cartridge	Pickup Crystal	Use Mfgr's No.
		Turntable	Turntable & Hub Assy.	11X138-C
6	6	Spindle	Spindle & Pawl Assy.	11X133
		Stud	Turntable Bearing	41P414
		Nut	Bearing Stud Mtg.	26P687
7	4	Bearing	Turntable Roller Assy.	11X058
8	4	Washer	Bearing Race	25P269
9	4	Gear	Fibre Idler (Large)	47P024
		Gear	Fibre Idler (Small)	47P023
10	4	Screw	Shoulder, Idler Mtg.	41P333
11	4	Idler	Idler Wheel Assy.	11X003
12	4	Clip	Idler Retaining	50P125
13	4	Washer	Idler Felt	25P030
14	4	Washer	Idler Fibre	25P046
15	4	Spring	Idler Tension	46P112
16	4	Link Assy.	Idler Mounting	*
17	4-6	Knob	Control	49X036-C
18	6	Rest	Pickup Arm Rest	42P144-C
19	5	Motor	105-125 Volt	15X084-12
20	5	Grommet	Motor Mounting	25P281
		Sleeve	Motor Mounting	41P530
		Screw	Motor Mounting	26P241
21	4	Sleeve	Turntable Drive (60 cycle)	17X412-1
		Sleeve	Turntable Drive (50 cycle)	17X412-4
22	6	Shaft Assy.	Pickup Arm Pivot	42X074
		Shaft Assy.	Pickup Arm Pivot	11X136**
		Bracket	Pickup Arm Lift Stop	45P191
23	6	Lock	Clutch Spring Tension	45P436
25	6	Spring	Clutch Compression	46P127
26	6	Lever	Automatic Trip	45P345
27	6	Disc	Pickup Arm Raising	11X031
28	6	Switch	A.C. Power	32P036
29	6	Lever	Manual Trip Assy.	11X083
30	6	Spring	Manual Trip Tension	46P117
31	7	Sub Plate	Sub Plate & Stud Assy.	*
32	6	Bracket	Raising Lever Pivot	11X044
33	6-7	Lever	Pickup Arm Raising	11X045
34	6-7	Spring	Raising Lever Tension	46P044
35	5-7	Arm	Rocker Arm & Roller Assy.	11X086
36	5	Pin	Rocker Arm Pivot	41P421
		Clip	Pivot Retaining	50P125
37	5	Spring	Rocker Arm Tension	46P122
38	5-7	Spring	Selector Shaft Compression	46P012
39	5-7	Collar Assy.	Selector Lever	11X049
40	5-7	Stop	Selector Lever	45P194
41	5-7	Spring	Selector Lever Compression	46P011
42	7	Cam	Main Cam Assy.	11X033
43	7	Gear	Main Cam Actuating	11X032
44	6-7	Trip Assy.	Velocity Trip & Roller	11X047
45	4	Main Plate	Main Base Plate	*

NOTE: All parts must be ordered by Part Number, Name, Model Number and Production Number stamped on the under side of the Main Plate.

* - Not Stocked for Service

** - Used after Production #375613

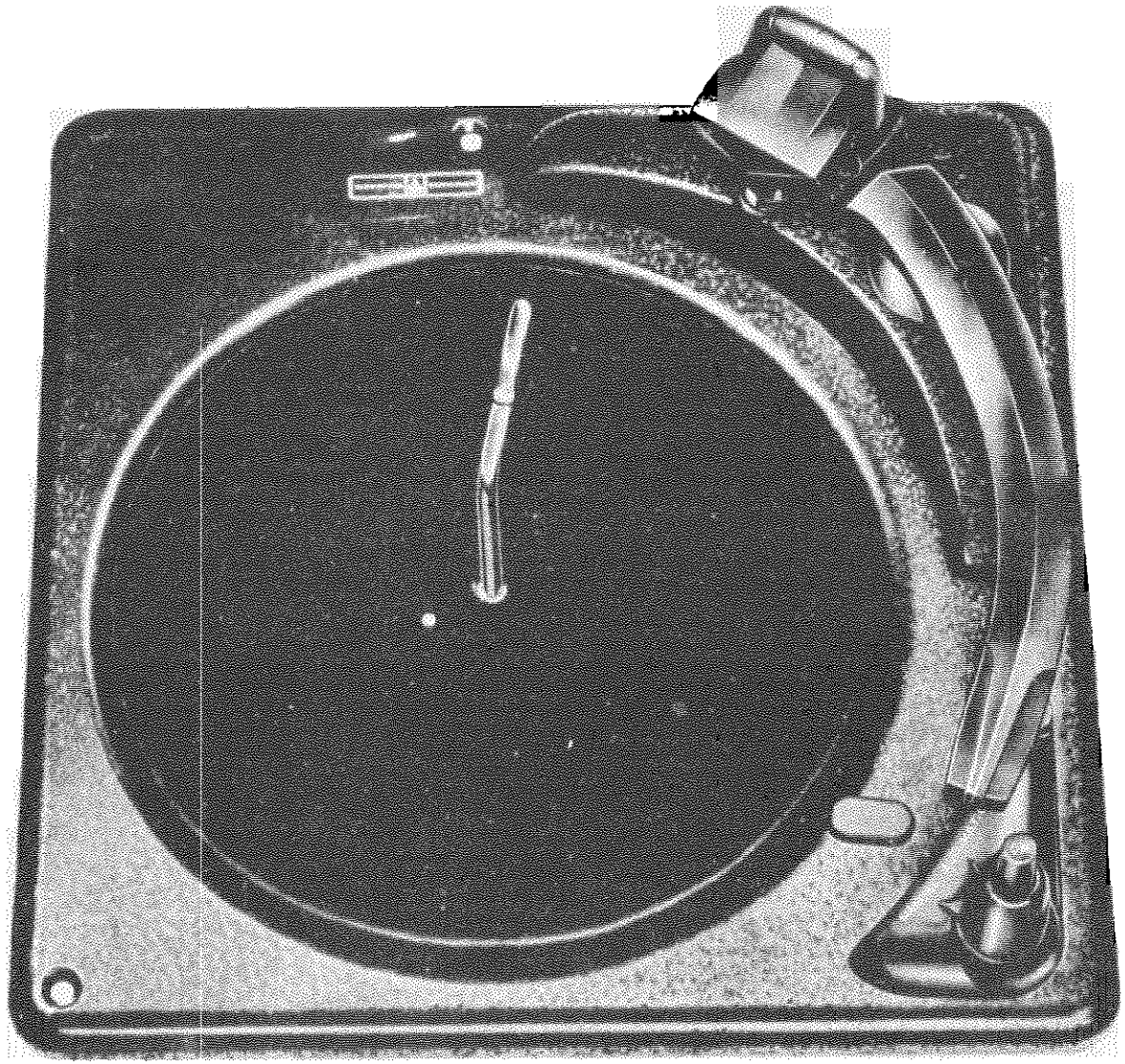


FIG. 1 - MODEL 56 RECORD CHANGER

I MODEL 56 RECORD CHANGER

The Webster Model 56 is a single post, Spring Cushioned Spindle, Automatic Record Changer. Simple in design and operation, it provides manual or automatic playing of standard ten or twelve inch records with a minimum of waiting time between records during automatic operation. Home recording or "Inside Out" records up to the 12 inch size may be played manually. This machine will change warped or rough-edged records, at the same time assuring maximum protection to the finest discs. Model 56 automatically shuts off after the last record has been played.

II OPERATION

A - MOTOR

Connect the motor cord to a source of 105-125 volt 60 cycle current only. For 105-125 volt 50 cycle operation, a special motor pulley (Part 17x412-4) must be used in place of the one supplied with the changer in order to drive the turntable at the required speed of 78 R.P.M.

Do not under any circumstances connect the motor to a source of direct current or alternating current of any other frequencies.

B - PICKUP

The pickup cartridge supplied with this unit is of the high impedance crystal type. This means that it may be connected to the average amplifier, radio set or public address system without using coupling transformers or impedance matching devices. Generally speaking, it is customary to connect the crystal from grid to ground of the first audio tube so that at least two stages of amplification are available. Most modern radio receivers have the volume control in the audio circuit and in such cases, the pickup may be connected directly across the volume control. In radio receivers having other than the audio type control, an auxiliary control will be required to adjust the record volume.

B - PICKUP - Cont'd.

The crystal supplied with this unit may be of the fixed permanent point or the removable needle type. If it is the latter, use a needle which is not more than 11/16 inches long for most satisfactory results.

The choice of a needle is largely a matter of personal preference since all needles have their good features.

There are many types of permanent point needles available for use with automatic record players. These may be straight shank, offset, solid or hollow shank, floating point, jewell or hard metal point types.

Some desirable qualities of a good needle are faithful reproduction, low surface scratch or hiss, long wearing qualities, minimum record wear and rugged construction.

Do not use single play or cactus needles for Automatic Operation.

C - OPERATION - Automatic

1 - Turn the Record Selector Post to TEN or TWELVE for ten or twelve inch records.

2 - Turn the Selector Switch (sleeve of ON button) to AUTOMATIC.

3 - With the Record Ballast Weight turned back, place up to ten 12" records, or twelve 10" records on the spindle so that the bottom record rests on the step of the spindle and the shelf of the Record Selector Post.

4 - Turn the Record Ballast Weight forward to rest on the top record.

5 - Press the ON button.

To reject any record while playing in the AUTOMATIC position, press the ON button.

NOTE: The OFF button may be pressed during any portion of the change cycle. The Pickup Arm may be moved manually at any time without damage to the mechanism. However, after the last record has been played, the Pickup Arm is automatically locked in position and should not be handled until it has come to rest on the OFF button.

6 - After the last record has been played, the entire stack may be removed from the turntable at one time. The simplest procedure is as follows:

a - Turn the Record Ballast Weight back out of position.

b - Place the fingers of both hands under opposite edges of the bottom record.

c - Do not apply pressure to the top record. (Keep your thumbs free.)

d - Lift the stack of records straight up, following the contours of the spindle. This permits the stack of records to follow the curve of the spindle without binding and greatly facilitates the removal of the stack.

D - OPERATION - Manual

1 - Turn the Record Selector Post to the TWELVE inch position. (This is not essential but permits more clearance in loading and unloading records.)

2 - Turn the Selector Switch (sleeve of ON button) to MANUAL.

3 - Place a record on the turntable. It may facilitate this operation if the record is placed over the spindle at an angle, with the edge of the record held below the level of the Record Selector Post Shelf. Records may be removed in the same manner.

4 - Press the ON button.

5 - Place the needle gently on the edge of the record. Do not lift the pickup arm too high as this will cause it to catch in the Automatic Stop Lock position. Particular care should be exercised if your pickup has a sapphire point needle. Although the sapphire is very hard and long wearing, it is extremely brittle and may be fractured or chipped if dropped on the record.

6 - To stop the mechanism at any time, press the OFF button.

III SERVICE INFORMATION

This unit has been accurately adjusted, lubricated and tested at the factory and should require no further adjusting in the field. If service repairs become necessary, this bulletin should be studied carefully before making any adjustments or replacing parts.

Service parts are available at the factory. All parts must be ordered by Part Number, Model Number and production number stamped on the under side of the main plate.

IV SERVICE REPAIRS

Service repairs and adjustment on the Model 56, listed by the apparent condition are as follows:

A - AUTOMATIC TRIP FAILS TO FUNCTION

When the movement of the pickup arm toward the spindle is greater than 1/8 inch in 1/2 revolution of the turntable, the Automatic Trip Arm trips the Velocity Trip and Roller Assembly. This releases the Actuating Pawl on the Main Cam Assembly, allowing it to engage the Main Cam Actuating Gear and driving the mechanism through the change cycle.

A - AUTOMATIC TRIP FAILS TO FUNCTION - Cont'd.

The automatic trip arm follows the movement of the pickup arm through a spring compression clutch. This clutch must be kept free of oil or grease.

Should it become necessary to clean the clutch, loosen the lock (Point "A" Figure 8) to relieve the spring tension and clean the clutch parts with carbon tetrachloride. Reset the clutch spring tension by setting the lock at least 1/4 inch below the main plate. This tension should be just sufficient to operate the trip mechanism without placing undue drag on the movement of the pickup arm.

Also check for:

1 - Velocity Trip and Roller assembly binding (Illus. 51 Fig. 7).

2 - Actuating pawl stuck. (Part of Main Cam assembly, Illus. 49 Fig. 7, engaged by hook end of Velocity Trip and Roller Assembly.)

3 - Automatic Trip Arm (Illus. 33 Fig. 6) bent and not hitting the Velocity Trip and Roller assembly.

4 - Insufficient compression on clutch spring (Illus. 32 Fig. 6).

5 - Manual Trip Lever binding at rivet (Illus. 36 Fig. 6).

6 - Manual Trip Lever rubbing on switch mounting bracket.

7 - No velocity lead-in groove or eccentric groove in center of record.

8 - Foreign matter in record groove.

9 - Badly worn record.

10 - Badly worn or bent needle.

B - MANUAL TRIP FAILS TO FUNCTION

The manual trip is operated by the ON button. When the button is pressed, the Manual Trip Lever is actuated, tripping the Velocity Trip and Roller Assembly and putting the mechanism in cycle.

1 - Manual Trip Lever (Illus. 36 Fig. 6) hair spring bent or broken.

2 - Velocity Trip and Roller Assembly binding (Illus. 51 Fig. 7).

3 - Actuating pawl stuck.

C - NEEDLE SKIPS GROOVE

With the pickup arm in playing position, the arm is practically free-floating on its pivot. There is no lead-in spring which might drag the needle over the first few grooves of the record or minimum radius device to jam the arm on the inside grooves.

The pressure required to actuate the trip mechanism is negligible.

Should the needle skip grooves at any time, check for:

1 - Record Changer not level.

2 - Pickup Arm binding.

3 - Foreign matter in record groove.

4 - Pickup cord pulled too tight or caught in hinge assembly.

5 - Badly worn record groove.

6 - Badly worn or bent needle.

D - MECHANISM CONTINUES TO CYCLE

At the completion of the change cycle the actuating pawl is engaged by the hook end of the Velocity trip and Roller Assembly which has been returned to its normal position by the reset points on the main cam drive gear. This hook should be adjusted for about .005 - .015 clearance from the bottom of the main cam drive gear. Greater clearance may permit the pawl to bounce past the hook and re-engage. Also check for:

1 - Velocity Trip and Roller Assembly (Illus. 51 Fig. 7.) rubbing on Main Cam Actuating gear (Illus. 50 Fig. 7).

2 - Manual Trip Lever (Illus. 36 Fig. 6.) binding at rivet.

3 - Hook end of Velocity Trip and Roller assembly bent and not engaging pawl.

4 - Bakelite disengage roller broken on Velocity Trip and Roller Assembly.

E - CONTINUES TO PLAY LAST RECORD AND DOES NOT SHUT OFF

1 - Check floating spindle to be sure that it moves up and down freely.

2 - With no records on spindle, check Automatic Shut Off Lock Lever (Point B, Fig. 8.) Hook end of this arm should catch the Pickup Arm Raising Disc at the beginning of the cycle to prevent travel of the arm and to cause it to drop on the OFF button. With no records on the Spindle, this hook should clear the Pickup Arm Raising Disc by 1/32 inch with the mechanism at rest. Bend lip (Point G Fig. 8) if necessary to make this adjustment. Do not attempt to move Pickup Arm Raising Disc up or down.

F - MOTOR DOES NOT SHUT OFF

1 - OFF button stuck.

2 - Defective switch mechanism.

3 - Defective switch.

NOTE - Do not attempt repairs on the Switch Mechanism or the Switch. If either becomes

defective, the entire assembly should be replaced.

G - PICKUP ARM LIFT TOO HIGH OR TOO LOW

1 - The needle should approach the top record of a full stack on the turntable with approximately 1/8 inch clearance. Adjust by bending the Pickup Arm Raising Lever at Point C., Fig. 8. Do not attempt to move Pickup Arm Raising Disc up or down.

H - NEEDLE LET DOWN INDEXING INCORRECT

The eccentric screw, accessible through the top of the Pickup Arm, should take care of any normal adjustment. Turn this screw clockwise to index the needle in toward the spindle and counter-clockwise to index the needle out away from the spindle.

Should further adjustment be necessary; proceed as follows:

1 - Set the Record Selector Post to the TEN inch position.

2 - Operate the mechanism by revolving the turntable manually until the needle drops to within 1/8 inch of a ten inch record on the turntable.

3 - With a #8 Bristol wrench in each of the set screws (Points D and E, Fig. 8) alternately loosen one and tighten the other until the needle rests above the record lead-in groove at the desired point.

4 - Turn the Record Selector Post to TWELVE and check the needle drop on a twelve inch record.

5 - Be sure that both set screws are tight when this adjustment is completed.

I - PICKUP ARM DROPS OFF "OFF" BUTTON

When the Pickup Arm is indexed to the OFF position, the lip of the Pickup Arm Raising Disc rests in the groove formed by the inside bevel of the lower Pickup Arm Pivot Shaft Bracket touching the Stud post. (Fig. 8) On units prior to Production No. 375614 this function was performed by a chamfered and grooved collar on the stud post.

Adjust the position of the bracket (or collar) so that the lip of the Pickup Arm Raising Disc rests in the groove with the Pickup Arm Pivot Shaft touching the sub plate. When properly adjusted, there should be .010 clearance between the lip of the Pickup Arm Raising Disc and the bottom of the groove. The position of the Pickup Arm on the Off Button is adjusted by bending the lip of the Pickup Arm Raising Disc, so that when the Pickup Arm is resting on the Off Button, the lip of the Pickup Arm Disc rests in the groove formed by the bracket and stud. After making this adjustment, check the set-down of the needle on a 12" record to be certain that the lip of the Pickup Arm Raising Disc does not hit the beveled side of this bracket.

J - RECORD SELECTOR POST ANGLE INCORRECT

The Record Selector Post should be so adjusted that the curve of the shelf matches the curve of the record. To adjust this angle:

1 - Turn the Record Selector Post to the TEN inch position.

2 - Place a ten inch record on spindle in the normal position for automatic playing.

3 - With a #8 Bristol wrench in each of the set screws (Point H and J, Fig. 8) alternately loosen one and tighten the other until the Record Selector post angle is correct. Be sure that both set screws are tight at the completion of this adjustment.

K - SPINDLE DROPS MORE THAN ONE RECORD

The floating latch at the top of the spindle is so spaced that only one record at a time can slide between the heel of the latch and the step of the spindle. The hole in the latch is elongated so that the latch can slip into the spindle recess when records are being removed.

If more than one record is dropped at a time, it will be found to be due to

1 - Foreign matter in spindle recess causing the latch to stick.

2 - Exceptionally thin records. Standard records are 0.070 to 0.100 in thickness.

L - RECORD DROPS ON PICKUP ARM

As the change cycle is started by the needle being on the center lead-in groove of the record, the first motion of the cam causes the Record Selector Post to move toward the spindle about 3/32 inches. This position is maintained until the Pickup Arm has made its full lateral excursion at which time the Record Selector Post again moves toward the spindle, causing the bottom record to drop into playing position.

If the Record Selector Post has been bent back, away from the spindle, it is possible for a standard record to rest on the spindle step with its edge just over the edge of the Record Selector Post shelf. Then as the change cycle is started, the record is pushed off the spindle by the initial movement of the Record Selector Post, so that it drops on the Pickup Arm.

To correct this condition, the Rocker Arm Assembly must be bent so that the Record Selector Post is brought nearer to the spindle.

1 - With the mechanism at rest, wedge the Rocker Arm firmly by inserting a screwdriver between the Rocker Arm and the Sub Plate at a point between the Rocker Arm Pivot (Illus. 43 Fig. 5) and the stud.

2 - With the heel of the hand, press the Record Selector Post toward the spindle, so

at least half way over the Record Selector Post ledge when placed on the spindle step.

It is recommended that the distance between the edge of the record and the step of the Record Selector Post be held to 1/32 of an inch so that records with rough or sharply beveled edges will not catch on the outer edge of the Record Selector Post.

CAUTION: Be certain that a standard size record is used in making this adjustment. A standard 10" record measures 9-7/8" ± 1/32" dia. A standard 12" record measures 11-7/8" ± 1/32" dia.

V LUBRICATION

Model 56 Record Changer leaves the factory completely oiled and lubricated. Under normal conditions this should be sufficient for approximately one year or 1,000 hours of operation. When operated under extreme conditions of dust or heat, this operation should be performed more frequently as required.

NOTE: AVOID EXCESSIVE LUBRICATION.

Do not permit any oil or grease to get on the rubber idler drive wheel or the Motor Pulley (Illus. 15 and 29, Fig. 4), on turntable drive rim or on the automatic trip arm clutch. Any oil or grease on these points should be removed using Carbon Tetrachloride.

The recommended lubricants and points of lubrication are as follows:

A - #10 Oil (apply with small oil can or medicine dropper)

1 - Motor Bearings. Saturate top and bottom felts.

2 - Pickup Arm Shaft (Illus. 30 Fig. 6). Apply one drop each to bottom bearing point, bracket hole and hole through Main Base Plate.

3 - Ball Bearing Assembly (Illus. 12 Fig. 4).

4 - Idler Wheel Felt (Illus. 19 Fig. 4).

B - LUBRIPLATE (APPLY WITH SMALL BRUSH)

1 - Idler Wheel Link (Illus. 16 Fig. 4).

2 - Turntable Shaft Stud.

3 - Pickup Arm Hinge Pins (Illus. 7 Fig. 6).

4 - Knife edge of Raising Lever (Illus. 40 Fig. 7).

5 - Main Cam bearing. (It is necessary to remove the sub-plate assembly to lubriplate this bearing. See paragraph VI-C)

C - STA-PUT (APPLY WITH SMALL BRUSH)

1 - Teeth of Main Cam Actuating Gear (Illus. 50 Fig. 7).

2 - Track of Main Cam Gear (Illus. 49. Fig. 7).

3 - Teeth of Large and Small idler Gears (Illus. 13 Fig. 4).

4 - Raising Lever Bracker bearing surfaces (Illus. 39 Fig. 7).

5 - Selector Lever Stop (Illus. 48 Fig. 5).

VI MECHANICAL REPAIRS

A - TO REPLACE A PICKUP CARTRIDGE

A Pickup cartridge can be most easily replaced by first removing the Pickup Arm.

1 - Hold the Pickup Arm firmly with left hand.

2 - Using a tool such as a screwdriver, press in on one of the blue steel Pickup Arm hinge brackets while lifting up on the arm. (Fig. 3). This will release the Pickup Arm Hinge pin.

3 - Repeat on the other pickup arm bracket.

4 - The Pickup Arm, when released from the hinge brackets, may then be turned over and laid on the turntable for easy access to the cartridge.

On the models later than Production No.375614 a spring is inserted between the pins of the Hinge Bracket. This spring must be removed before the hinge can be taken apart.

B - TO REPLACE THE PICKUP ARM

The Pickup Arm may be replaced on its bracket without the use of tools.

1 - Line up the guide slots in the Shaft Bracket; with the pins in the Pickup Arm Bracket.

2 - Hook the roller (on the rear of the hinge assembly) under the Pickup Arm Lift Stop Bracket (under the Crescent Assembly) keeping the guide slots and pins in line.

In performing this operation, be sure that the pickup cord lies outside of the hinge and does not become wedged in the bracket.

3 - Press down firmly on the Pickup Arm base until the hinge pins fall into the bracket holes. On models after Production No. 375614, the hinge should be re-assembled, using a pair of long-nosed pliers to place the Pickup Arm Hinge Bracket over the pins in the Shaft Bracket. The retaining spring need not be replaced unless the unit is to be reshipped.

C - TO REMOVE THE SUB-PLATE ASSEMBLY

In the event that it becomes necessary to replace any of the major parts in the sub-plate assembly (Fig. 7) the entire assembly should first be removed from the main plate.

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C - TO REMOVE THE SUB-PLATE ASSEMBLY - Cont'd.

1 - Remove the spindle which is held in by a cotter pin under the sub-plate.

2 - Remove the Turntable.

3 - Remove the Pickup Arm.

4 - Unhook the Rocker Arm Return Spring.

5 - Remove the Rocker Arm Pivot Pin.

6 - Remove the five #8-32x1/4 screws holding the sub-plate studs and the #8-32x3/8 screw holding the center post to the main plate.

NOTE that one of the 8-32x1/4 screws is accessible through the Pickup Arm hole in the Crescent Assembly.

It should not be necessary to remove the Crescent Assembly except for replacement or to remove the complete Rocker Arm Assembly.

D - TO REPLACE THE SUB-PLATE ASSEMBLY

Reverse the above procedure making certain that all parts fall into their proper positions. Particularly note The Selector Lever and Selector Lever Compression Spring to see that they are in position with the lever through the slot in the Pickup Arm Raising Lever Bracket.

E - TO REMOVE THE RECORD POST AND ROCKER ARM ASSEMBLY

1 - Remove the Pickup Arm Assembly.

2 - Remove the four nuts under the main plate which hold the Crescent Assembly.

3 - Unhook the Rocker Arm Return Spring. (Illus. 44 Fig. 5).

4 - Remove the Rocker Arm Pivot Pin. (Illus. 43 Fig. 5).

5 - Lift out the Selector Post, Rocker Arm and Crescent Assembly as a unit.

6 - In replacing the Rocker Arm assembly, note paragraph VI, D "To Replace Sub-Plate Assembly."

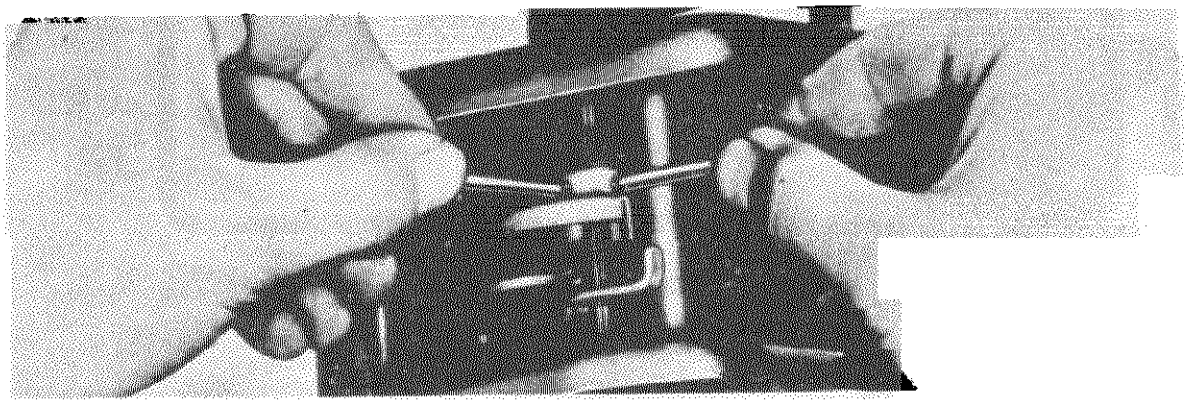

FIG. 2 - ALTERNATE NEEDLE LET DOWN INDEXING ADJUSTMENT

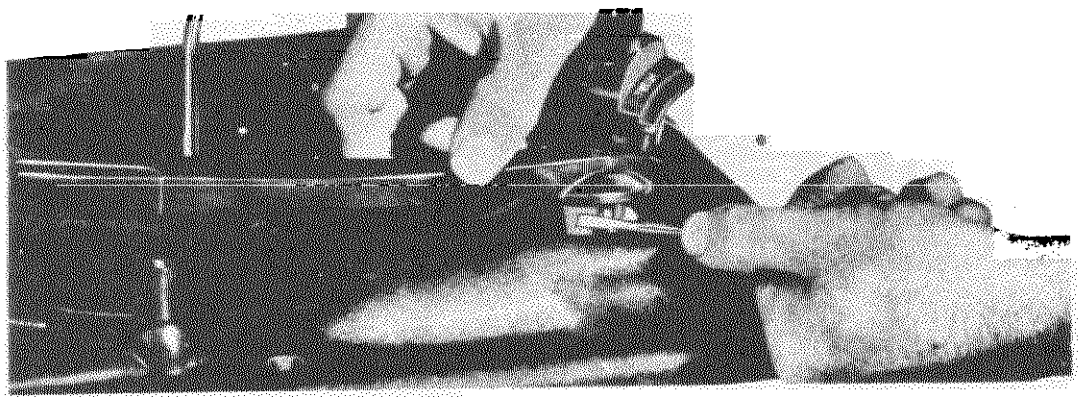

FIG. 3 - REMOVING PICKUP ARM ASSEMBLY

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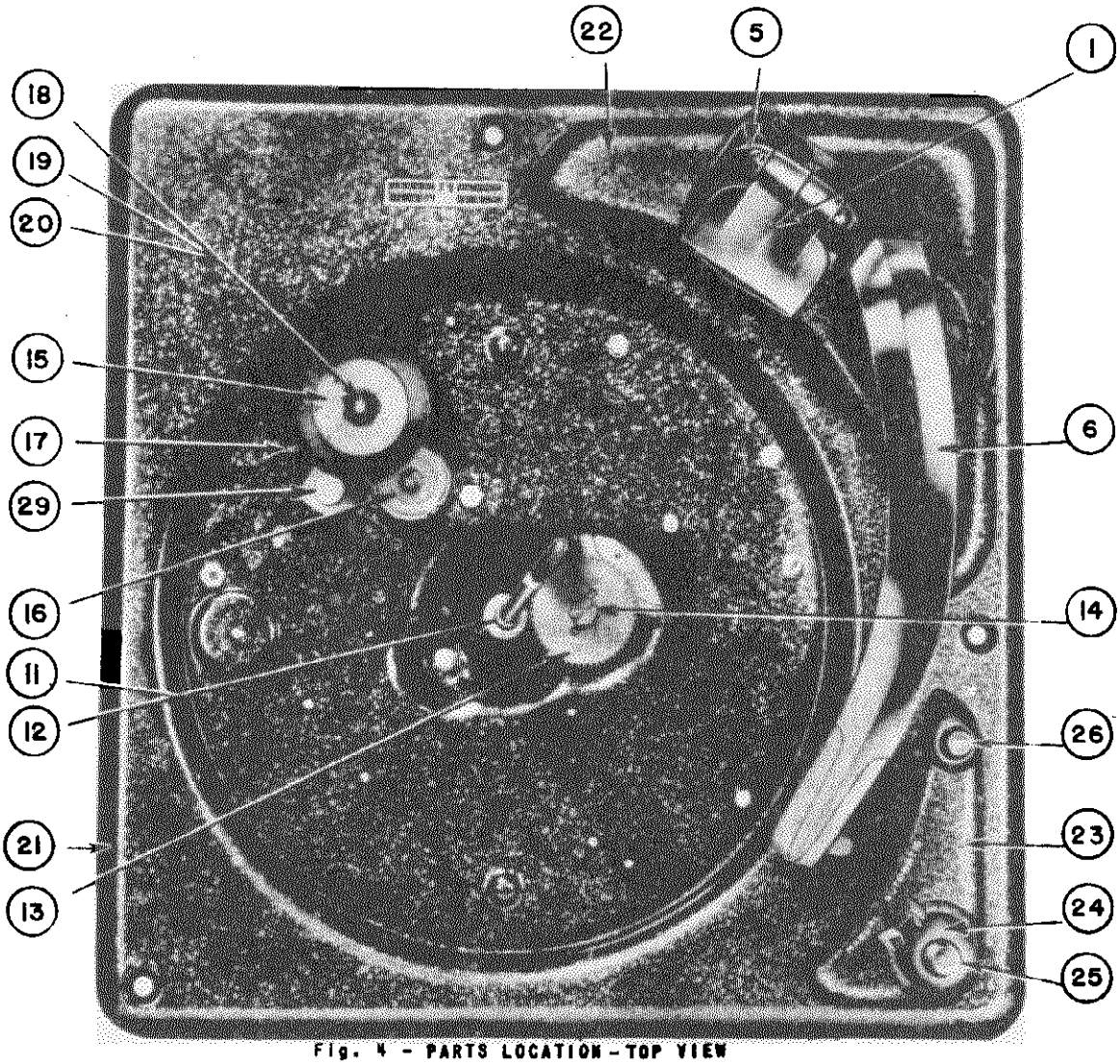

Fig. 4 - PARTS LOCATION - TOP VIEW

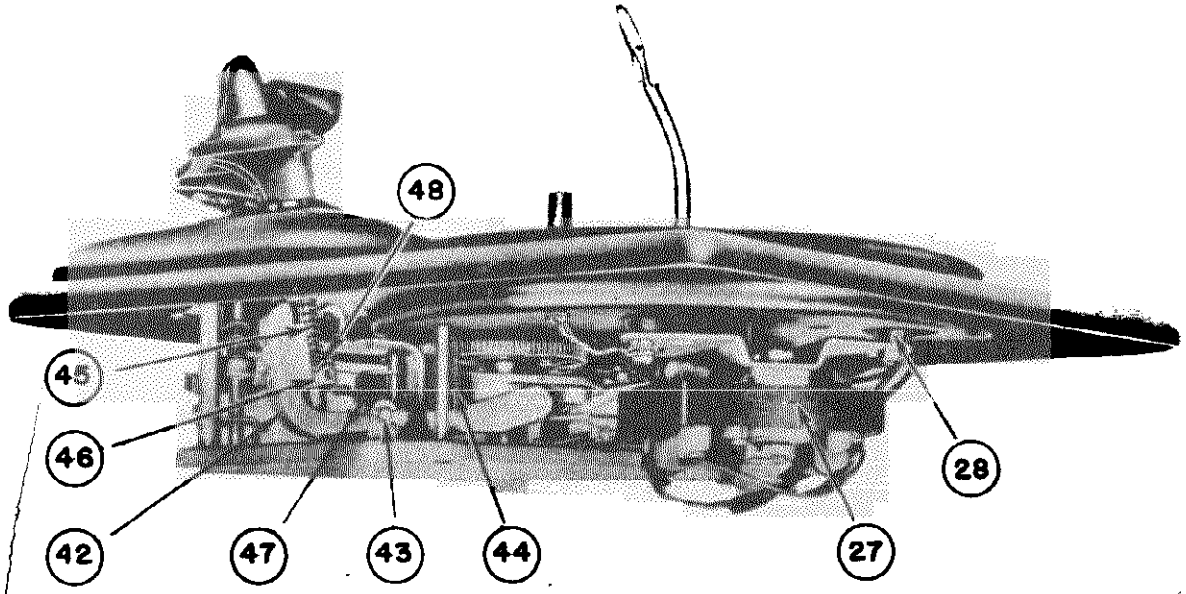

FIG. 5 - PARTS LOCATION -- LEFT SIDE VIEW

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FIG. 6 - PARTS LOCATION -- RIGHT SIDE VIEW

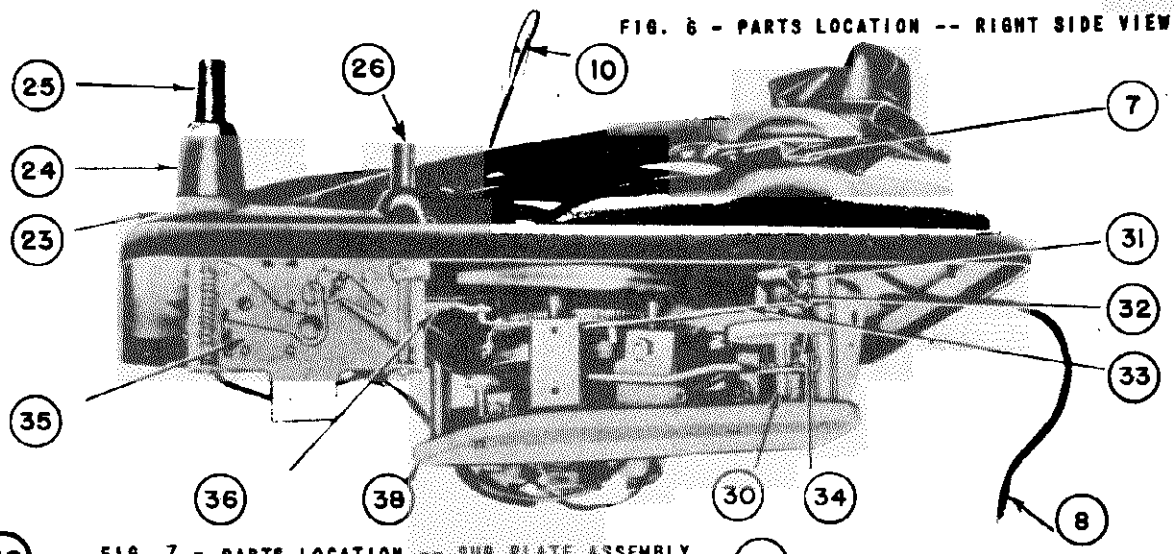


FIG. 7 - PARTS LOCATION -- SUB PLATE ASSEMBLY

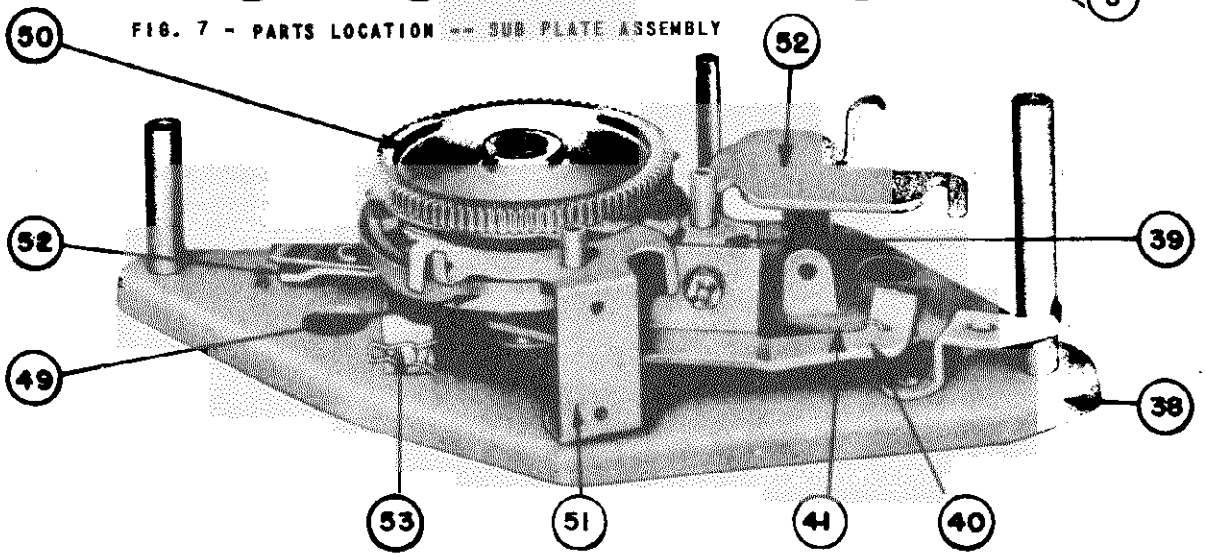
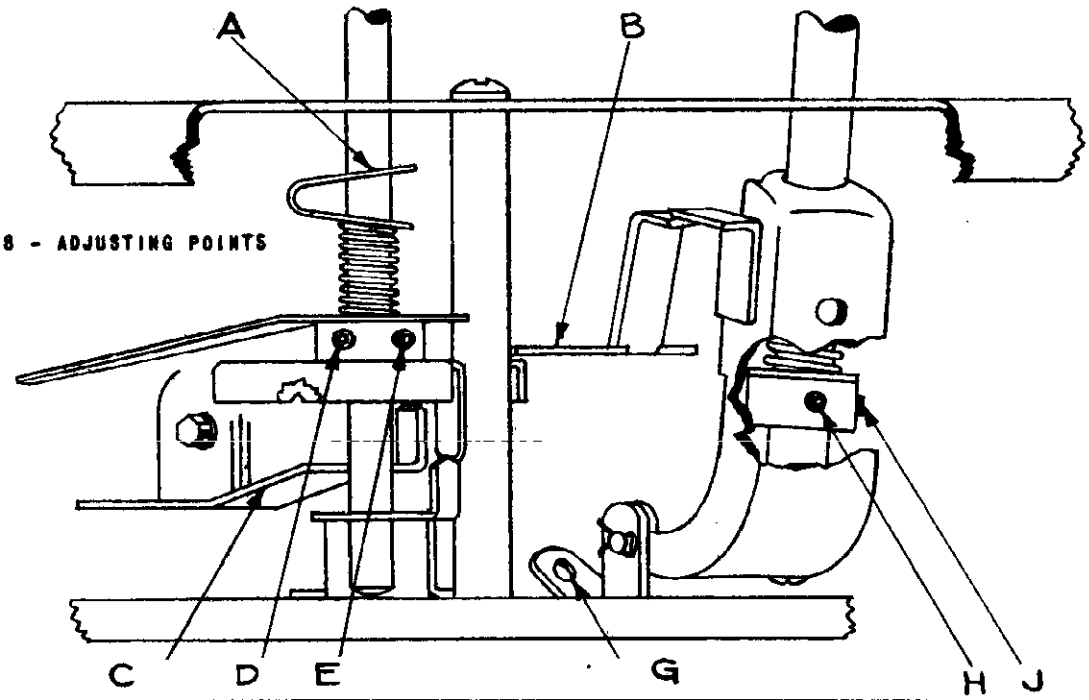


FIG. 8 - ADJUSTING POINTS



VII SERVICE PARTS LIST

ILLUS. NO.	FIG.	PART NAME	DESCRIPTION	PART NO.
1	4	Weight	Record Stabilizer	49P037-C
		Spring	Stabilizer Weight Tension	46P126
		Pin	Spring Retaining	45P464
5	4	Post	Record Selector	49X029-C
6	4	Pickup Arm	Less Hardware & Cartridge	49X021-2C
		Spring	Hinge Spacing	46P015**
		Hinge	Pickup Arm Mounting	21X199
7	6	Hinge	Pickup Arm Mounting	21X258**
		Cartridge	Crystal Pickup (Use Mfgr. No.)	
8	6	Cord	Pickup Assembly	20X256
		Bracket	Pickup Arm Lift Stop	45P191
10	6	Spindle Assembly	Including Pawl	11X133
11	4	Washer	Bearing Race	25P269
12	4	Bearing	Ball and Retainer Assembly	11X058
		Stud	Turntable Shaft Bearing	41P414
		Nut	Turntable Stud Mounting	26P687
		Turntable	Including Gear	11X138-C
13	4	Gear	Large Idler	47P024
		Gear	Small Idler	47P023
		Coupling	Idler Gear	45P342
14	4	Rivet	Shoulder, Idler Mounting	27P102
15	4	Wheel	Idler Drive Assembly	11X003
16	4	Link	Idler Mounting Assembly	*
17	4	Spring	Idler Tension	46P112
18	4	Washer	Fibre	25P046
19	4	Washer	Felt	25P030
20	4	Clip	Idler Retaining	50P125
21	4	Plate	Main Base Plate	*
22	4	Crescent Assembly	Pickup Arm, Record Post-Base	*
23	4-6	Escutcheon	Control	*
24	4-6	Knob	Control	49P024-C
25	4-6	Button	"ON"	49P026-C
26	4-6	Button	"OFF"	49P025-C
27	5	Motor Assembly	50-60 Cycle 110 Volt	15X084-12
28	5	Mounts	Rubber Shock	25P281
29	4	Pulley	60 Cycle	17X412-1
		Pulley	50 Cycle	17X412-4
30	6	Shaft Assembly	Pickup Arm Base	42X074
		Shaft Assembly	Pickup Arm Base	11X136**
31	6	Lock	Clutch Spring Tension	45P436
32	6	Spring	Clutch Tension	46P127
33	6	Arm	Automatic Trip	45P345
34	6	Disc & Hub Assembly	Pickup Arm Raising	11X031
		Bracket - Hub Assembly	Pickup Arm Raising	45P472≠
		Screw	Cone Point Set #8-32 x 1/4	26P629
		Switch	AC Power	32P002
35	6	Switch Assembly	Complete - Less Buttons	11X052
36	6	Manual Trip Lever	Lever & Wire Assembly	11X063
		Rivet	Shoulder - Trip Lever Mtg.	27P102
38	6-7	Plate	Sub Plate & Stud Assembly	*
39	7	Bracket	Pickup Arm Raising Lever	11X044
40	7	Lever	Pickup Arm Raising Lever & Stud	11X045
		Lever Assembly	Pickup Arm Raising Lever & Bracket	11X046+
41	7	Spring	Raising Lever Tension	46P044
42	5	Lever	Rocker Arm Assembly	11X043
43	5	Pin	Rocker Arm Pivot	41P421
44	5	Spring	Rocker Arm Return	46P122
45	5	Spring	Selector Shaft Compression	46P012
46	5	Collar Assembly	Selector Lever	11X049
47	5	Spring	Selector Lever Compression	46P011
48	5	Stop	Selector Lever	45P194
49	7	Cam	Main Cam Assembly	11X033
50	7	Gear	Main Cam Actuating	11X032
51	7	Trip	Velocity Trip & Roller Assembly	11X047
52	7	Lever	Automatic Shut Off Lock	11X079
53	7	Pin	Automatic Shut Off Lock Pivot	41P443

* - Not Stocked for Service
** - Used after Production #375614
+ - Used after Production #375622
≠ Used after Production #375638

NOTE: All parts must be ordered by Part Number, Name, Model Number, and Production Number stamped on the under side of the Main Plate.

ZENITH RADIO CORP.

GENERAL

TO THE SERVICE MAN:

This Service Manual has been prepared for the purpose of assisting the Service Man in his work of caring for the Record Changer mechanism, whether he is called to remedy some difficulty, or to insure its continued satisfactory operation. The Zenith Automatic-Record Changers are constructed with a minimum of working parts, and in operation are simple and reliable. However, as is the case with all mechanical units, misalignment and trouble may occasionally develop. The information presented in this book will enable the Service Man to render quick and accurate service. For convenience, the Operating Instructions supplied with each Record Changer are summarized as follows:

The Record Changer will automatically play up to twelve 10 inch or ten 12 inch records at one loading. The Record Stack rests on the Spindle and the Record Shelf. The Selector Sprocket drives the Ejector Plate which pushes the records off the Shelf and Spindle allowing them to drop on the Turntable. To load for automatic operation, set the Record Size Selector Knob to 10 or 12, raise the Pressure Bar, press down lightly and turn the Spindle counter-clockwise to the load position, place the stack of records on the Spindle, lower the Pressure Bar until it rests on the Record Stack. Set the AUTO-MAN-OFF switch to AUTO and press the Record Change button. The Changer will play the entire selection of records and will repeat the last record until it is turned off. For manual operation set the AUTO-MAN-OFF switch to MAN and play the records singly as on a non-automatic record player.

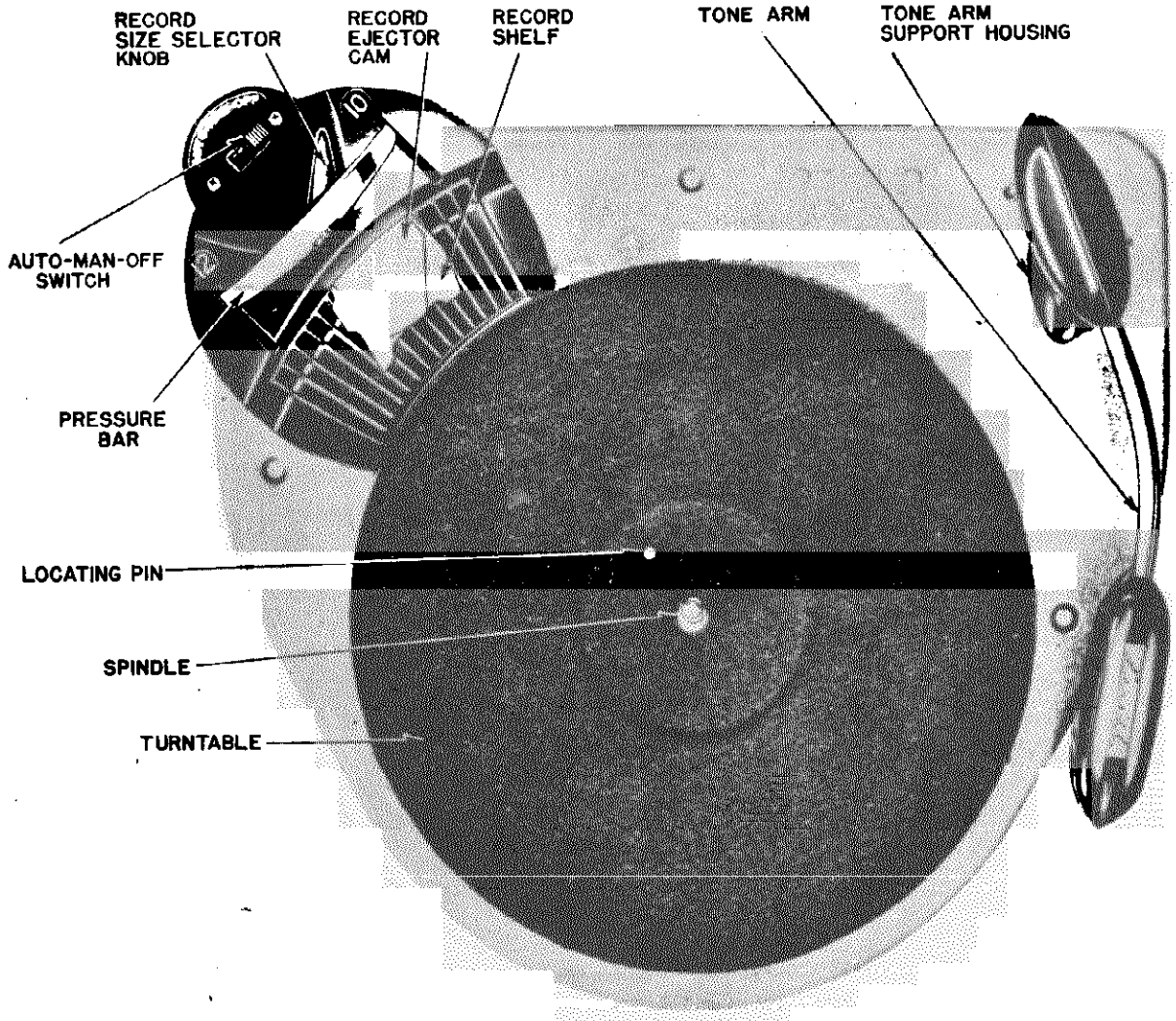


Fig. 1. Top View of Record Changer.

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DESCRIPTION OF CYCLING

The Motor drives an Idler Wheel which rim drives the Turntable and the upper section of the Clutch mechanism. The Spindle is fixed and does not turn with the Turntable.

When the Record Changer button on the receiver panel is pressed, an electric circuit is completed through the Solenoid (the current being supplied by a winding on the motor) causing the solenoid armature to trip. This action engages the lower section of the Clutch with the rotating upper section. (After the Clutch is tripped a cut-out switch in the solenoid circuit is opened, breaking the current flow through it, eliminating chatter.) When the Clutch is engaged the Turntable turns the Drive Sprocket and the Chain. The Chain turns the Timing Sprocket which, due to its construction, pushes the Lift Pin up and raises the Tone Arm off the record. The Locating Bushing Pin on the Timing Sprocket then engages the Tone Arm Control Lever which swings the Tone Arm clear of the record. (The action of the Locating Pin and Bushing against the Tone Arm Control Lever governs the lateral swing of the Tone Arm. For 12 inch records the small diameter Pin rides against the Tone Arm Control Lever and the Bushing drops to the lower end of the pin out of contact with the Tone Arm Control Lever. However, on 10 inch records the landing position of the Tone Arm is one inch nearer the Spindle than for 12 inch records, and the bushing, which has a greater diameter, is pushed upward by the Record Size Lever until it rides against the Tone Arm Control Lever giving the Tone Arm an additional swing for 10 inch records.)

When the Timing Sprocket is turned, the Selector Sprocket, which operates the Record Ejector Cam is also turned, causing the record to be pushed off the Spindle and dropping on the Turntable. After one-half cycle, an emboss on the Timing Sprocket re-sets the clutch trigger mechanism and closes the anti-chatter switch. The Locating Bushing Pin then brings the Tone Arm over the starting groove of the record, and the Lift Pin slides into its groove in the Timing Sprocket, lowering the Tone Arm on the record. At the same time the Lift Pin slides into its groove, a slot in the Timing Sprocket approaches the Clutch Release Lever and when the tip of the Clutch Release Lever drops into this slot the Clutch is disengaged.

As the record is played the Tone Arm is gradually moving toward the center of the record and a Pawl attached to the Tone Arm Control Lever is moving toward the Cycling Switch Trip Lever. When the record has finished its play, the needle enters the eccentric groove and the Pawl engages the Cycling Switch Trip lever. The oscillating action of the Pawl against the Cycling Switch Trip Lever causes the Cycling Switch to close, complete the circuit, and start the cycle over again. If the record does not have an eccentric groove, the Position Trip will close the Cycling Switch and start the next cycle.

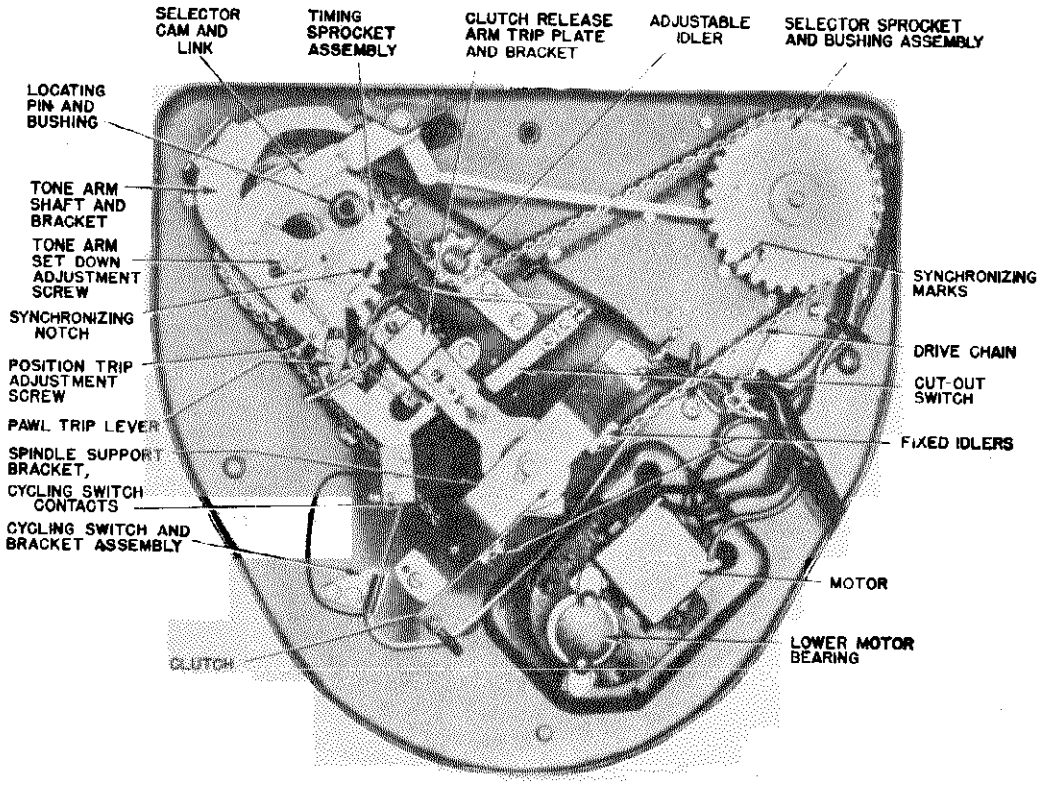

Fig. 2. Bottom View of Record Changer.

ZENITH RADIO CORP.

LUBRICATION

Figures 3 and 4 indicate the points to be lubricated and the type of lubricant to use. The Motor has two oil wicks that should be saturated with oil. The Record Spindle Guide Bearing, Idler Wheel Bearing, Lower Drive Shaft Bearing, Drive Shaft Thrust Bearing and the Motor Bearings are of

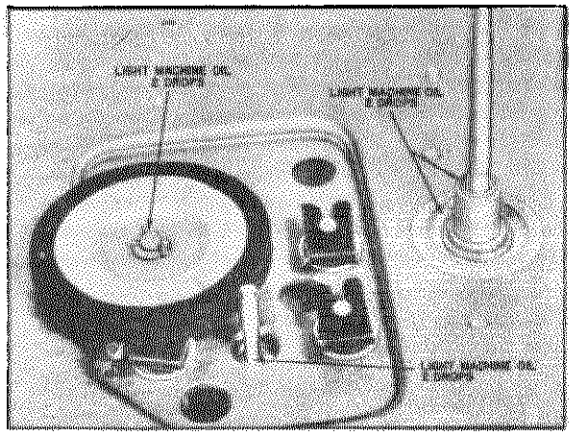

Fig. 3. Lubrication Top of Record Changer.

the OILITE type and require very little attention. If squeaks develop, make certain that they are not caused by friction between the Spindle and records on the Turntable. A thin coat of wax on the Spindle will remedy this condition.

ADJUSTMENTS

1. Tone Arm Set Down Adjustment.

Before the set down adjustment is made, study Figure 5 and proceed as follows:

a. Set the Record Size Selector Knob to 12.

b. Place a standard 12 inch record on the Turntable.

c. Trip the Clutch by hand and turn the turntable clockwise until the tone arm just starts to come down on the record.

d. Loosen the Tone Arm Adjustment Lock Screw on the Tone Arm Control Lever "D."

e. Remove the Lift Pin "E."

f. Move the Tone Arm until the Tone Arm Control Lever and the Locating Bushing Pin are in contact "B."

g. While holding the Tone Arm Control Lever against the Locating Bushing Pin, set the needle on the record about

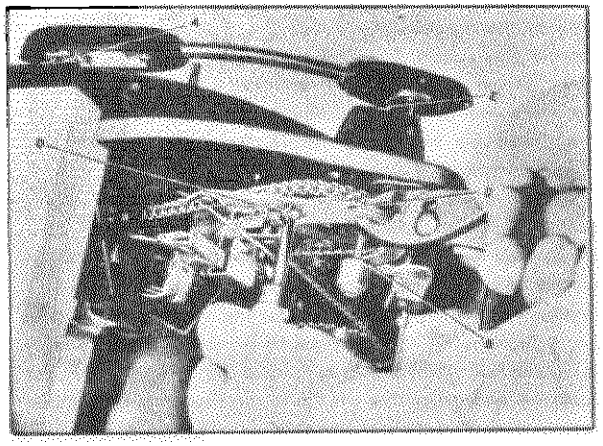

Fig. 5. Tone Arm Set Down Adjustment.

1-32" from where the run-in groove ends and the playing grooves begin "A," grasp the Tone Arm Control Lever with

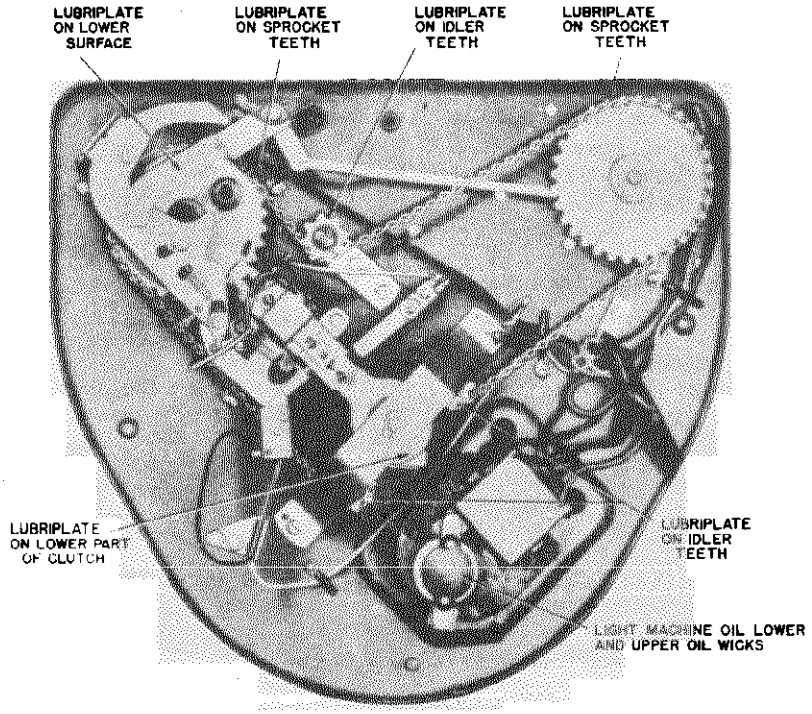

Fig. 4. Lubrication Bottom of Record Changer.

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pliers "C" and tighten the Tone Arm Adjustment Lock Screw "D."

h. Replace Lift Pin and check operation on 10 and 12 inch records.

i. An alternate method for making the adjustment is to loosen and move the Tone Arm Adjustment Lock Screw "D" in its slot inward to bring the Tone Arm in, or outward to bring it out, determining the proper amount experimentally.

2. Tone Arm Height Adjustment.

The Tone Arm vertical rise is governed by the Lift Pin. The Lift Pin is adjustable (see Fig. 6). Too long a Lift Pin will cause the Tone Arm to hit the underside of the records on the Spindle. If the Lift Pin is short the needle will not clear twelve records on the Turntable. To make the proper adjustment, trip the Clutch by hand and rotate the Turntable clockwise until the Tone Arm starts to swing toward the Spindle. Gently push the Tone Arm as close to the Spindle as it will go, place a record on the Spindle and observe the spacing between it and the Tone Arm. The spacing "A" should be approximately the thickness of a record. If the spacing is incorrect, lift the Tone Arm, remove the Lift Pin, loosen the Lock Nut and adjust the Lift Pin to the proper length. Make certain that the Lock Nut is tightened after adjustment.

Fig. 6. Lift Pin.

3. Cycling Switch Adjustment.

When a record has completed its play and the needle enters the eccentric groove, Pawl "C" engages the Trip Plate "D," closing contacts "A" and completing the circuit through the solenoid which trips the record change mechanism.

To adjust the Cycling Switch, move the Tone Arm until Pawl "C" is clear of the Trip Lever Plate "D" (as shown in Fig. 8). Loosen the two Lock Screws "B", move the Cycling Switch bracket until there is approximately .02 inch spacing between contacts "A" and tighten the Lock Screws.

4. Position Trip Adjustment.

The Position Trip does not depend on an eccentric groove in the record to start the record change cycle, but will trip the mechanism whenever the needle comes within a pre-determined distance from the Spindle. Older type records that do not have an eccentric groove can in most cases be played automatically by the proper adjustment of the Position Trip. Under normal conditions with the needle approximately 1¾" from the center of the Spindle adjust "E" (Fig. 8) until the contacts "A" close. This distance is generally satisfactory since no modern record will be cut off before it has completed its play, and none will fail to trip the mechanism at the end. In special cases screw the adjustment "E" clockwise for earlier tripping and counter-clockwise for later tripping as the individual cases may be.

It may be impossible to find an adjustment that will always trip the mechanism and never cut off all type records, and in these special cases the record must be played manually.

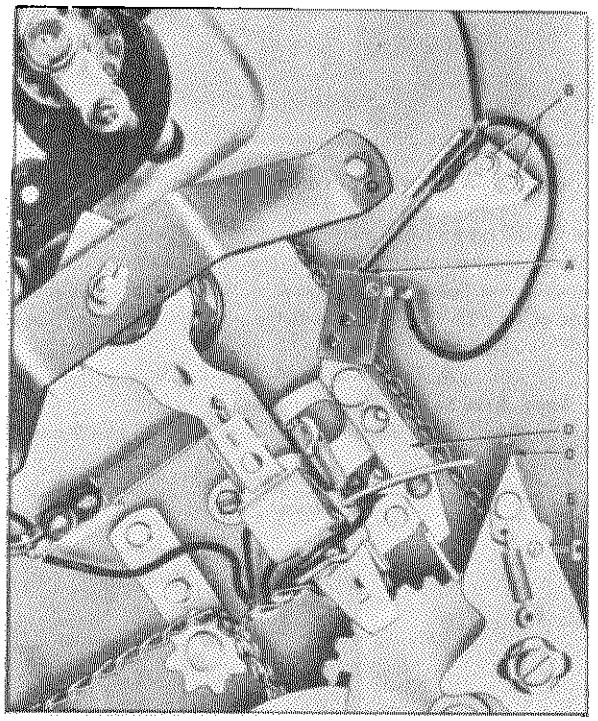

Fig. 8. Cycling Switch and Position Trip Adjustments.

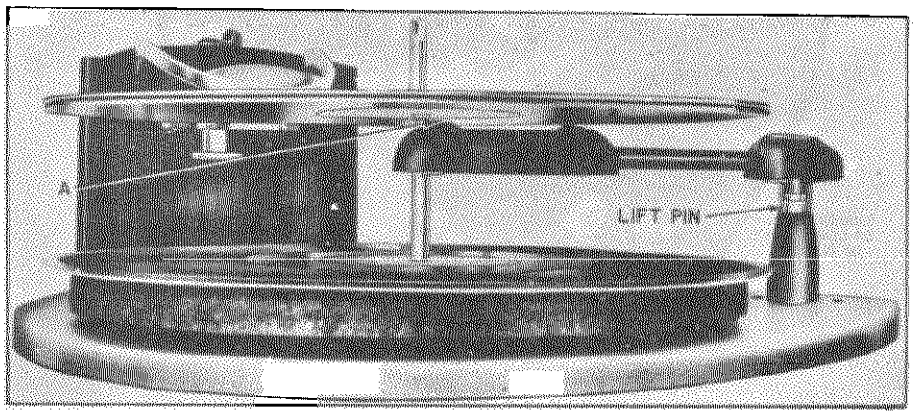

Fig. 7. Tone Arm Height Adjustment.

ZENITH RADIO CORP.

REMOVING THE TURNTABLE

To remove the Turntable, hold the Clutch with one hand, and turn the Turntable with the other (see Fig. 9).

To avoid damage when the Turntable is replaced, make certain that the Idler Wheel is pushed inside the rim before the Turntable is seated.

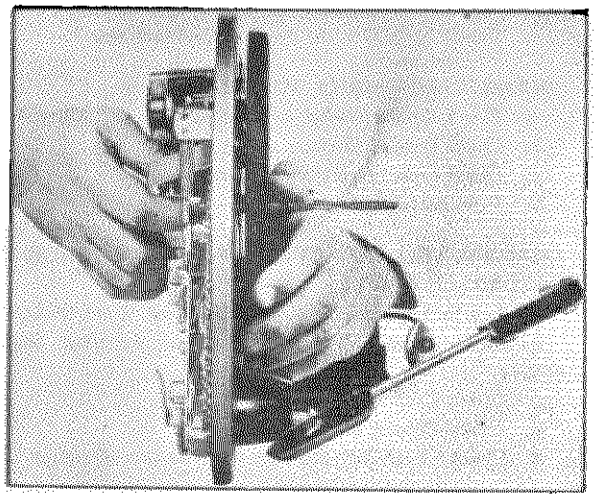

Fig. 9. Removing the Turntable.

REPLACING THE MOTOR

The Motor is designed for operation on 50 or 60 cycle Alternating Current (AC) depending on the spring bushing installed on its shaft. For 50 cycle operation a 80-452 spring bushing is used. For 60 cycle, use a 80-453 bushing. For operation on 25 cycle current a 25 cycle motor must be installed. When a replacement Motor is ordered, make certain that the line voltage and frequency of the receiver are given.

To replace the Motor, unsolder the connecting leads, remove the Turntable, the three spring mounting clips and allow the Motor to drop out. Remove the spring bushing from the shaft of the defective Motor and install it on the new one. When the new Motor is installed do not draw the connecting leads tight as this will prevent the Motor from "floating" on its spring mounts. Make certain that all the leads are securely soldered and taped.

REPLACING THE CHAIN

To replace the Chain, loosen the adjustable idler (see Fig. 10) and remove the Chain. Open a link, and pull the Chain out. Open a link in the replacement Chain and thread it in place making certain that the open ends of the links face outward from the Base Plate (see Fig. 2). (This will prevent the Chain from being installed in reverse.) Carefully close the link in the new Chain and make certain that there is no stiffness in its action. Read the paragraph on synchronization before the Chain is permanently installed.

SYNCHRONIZATION

When the Chain is removed or replaced, the Timing Sprocket and the Selector Sprocket must be synchronized. The Selector Sprocket has a synchronizing mark that must line up with the mark on the Base Plate (see Fig. 2). The Timing Sprocket has a small slot. The Clutch Release Lever Tip must drop into this slot at the same time the Selector Sprocket is lined up with the synchronizing mark on the Base Plate (Fig. 2). To sychcronize hold the Timing Sprocket and Selector Sprocket in position, thread the chain over the Drive Sprocket, two fixed idlers, Timing Sprocket, Selector Sprocket and over the adjustable idler. Set the adjustable idler for medium tension on the Chain and tighten the two holding screws.

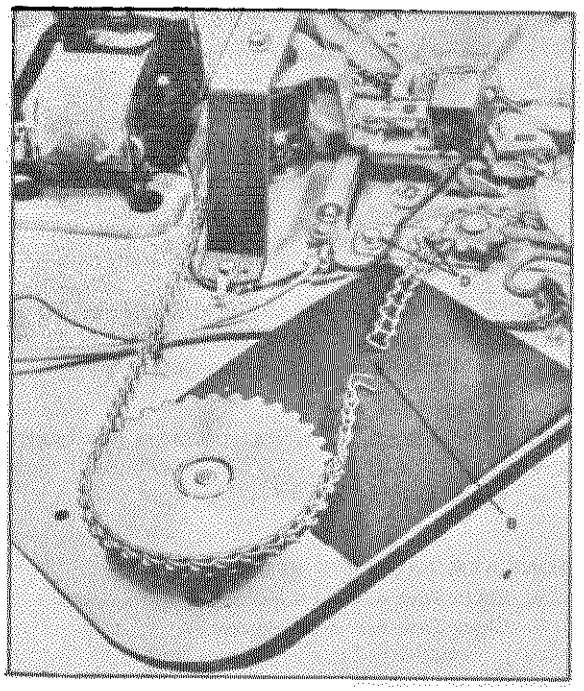

Fig. 10. Replacing the Chain.

TROUBLE SHOOTING

SQUEAKS OR NOISES DURING PLAYING OF RECORDS.

a. Friction between the records on the turntable and the spindle will occasionally cause squeaks. A thin coat of wax applied to the spindle will remedy this condition.

b. Check lubrication.

MECHANISM STARTS SLOWLY AND MOTOR GETS HOT.

a. Check line voltage and frequency.
b. Check lubrication.
c. Motor windings damaged.
d. Toom temperature abnormally low.

PRESSING RECORD CHANGE BUTTON ON RECEIVER PANEL DOES NOT START RECORD CHANGE CYCLE.

a. See that the AUTO-MAN-OFF switch is set to AUTO.
b. Check Record Change Switch.
c. Check Muting Switch.
d. Check electrical continuity of solenoid circuit.
e. Check solenoid energizing voltage on motor.

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MOTOR FAILS TO RUN EVEN WHEN IT IS ENTIRELY DISCONNECTED FROM CHANGER AND PROPER VOLTAGE AND FREQUENCY APPLIED DIRECTLY TO THE TWO INPUT LEADS OF THE WINDING.

a. Open windings.
b. Damaged or frozen bearings.

RUMBLE AND MICROPHONICS DURING REPRODUCTION.

a. Changer not "floated" properly. Loosen mounting bolts.
b. Motor mounting Spring Clips rubbing on the idler wheel.
c. Motor leads pulled tight preventing motor from "floating" freely on its spring.

NEEDLE SETS DOWN PROPERLY ON REORD BUT SLIDES OVER THE RECORD GROOVES.

a. Cabinet tilted.
b. Badly worn needle.

NEEDLE FAILS TO CLEAR MAXIMUM LOAD OF RECORDS ON THE TURNTABLE.

a. Check Tone Arm height adjustment No. 2.

CHANGER CYCLES WITH AUTO-MAN-OFF SWITCH ON MAN.

a. Check AUTO-MAN-OFF switch.

TONE ARM FALLS OFF RECORD.

a. Check Tone Arm set down adjustment screw.
b. Check Tone Arm mounting screws.

RECORD IS NOT HEARD ALTHOUGH CHANGER OPERATES.

a. See that the Phono Radio switch is on Phono.
b. Check receiver audio by listening to radio.
c. Check Crystal Pickup Cartridge.

TONE ARM SETS DOWN TOO FAR IN OR OUT ON RECORD,

a. Check Tone Arm set down adjustment No. 1.

CHANGER CONTINUES TO CYCLE.

a. Check Cycling switch adjustment.
b. Check Record Change switch.
c. Clutch release mechanism sticks.
d. Tight drive chain.

CHANGER WILL NOT CYCLE UPON COMPLETION OF RECORD.

a. See that the AUTO-MAN-OFF switch is set to AUTO.
b. Make certain the record has an eccentric center groove.
c. Check Cycling switch.
d. Check Cut-out switch.
e. Check Clutch Release Arm for freedom of action.

SQUEAKS WHEN CHANGER IS IN CYCLE.

a. Friction between Lift Pin and Timing Sprocket. Apply a thin coat of lubriplate.

FAILS TO EJECT RECORDS ACCOMPANIED BY A CLICKING SOUND.

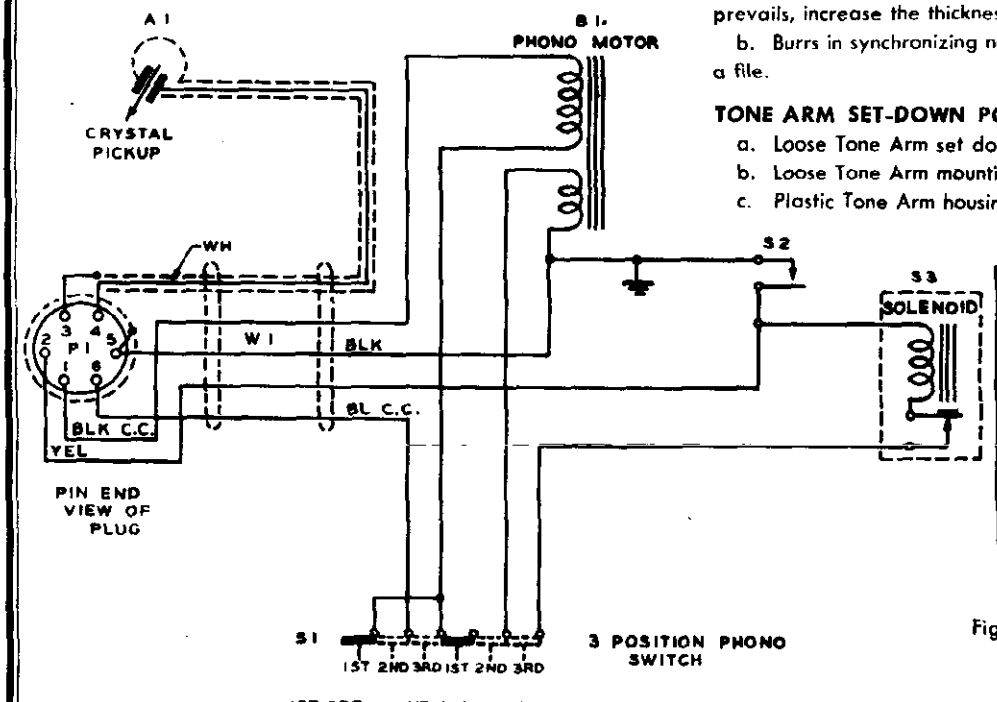
a. Clutch slips. A slight upward bend of the Clutch trip lever will correct this condition.

TONE ARM STICKS OR HANGS UP DURING CYCLE.

a. Clutch Release Lever pressure on Timing Sprocket too great. Loosen the solenoid bracket and insert a very thin shim between it and the base plate. If the condition still prevails, increase the thickness of the shim.
b. Burrs in synchronizing notch or trip lever. Remove with a file.

TONE ARM SET-DOWN POSITION VARIES.

a. Loose Tone Arm set down adjustment lock screw.
b. Loose Tone Arm mounting screw.
c. Plastic Tone Arm housing broken.



DIAG. NO.	PART NO.	DESCRIPTION
A-1	142-62	CRYSTAL PICKUP
B 1	141-92	PHONO MOTOR
P 1	58-132	6 PRONG CONNECTOR
S 1	65-371	3 POSITION SWITCH
S 2	S11604	TRIP CONTACT ASSY.
S 3	S11458	SOLENOID MAGNET
W 1	S11951	CABLE & PLUG ASSY.

Fig. 12. Schematic Diagram.

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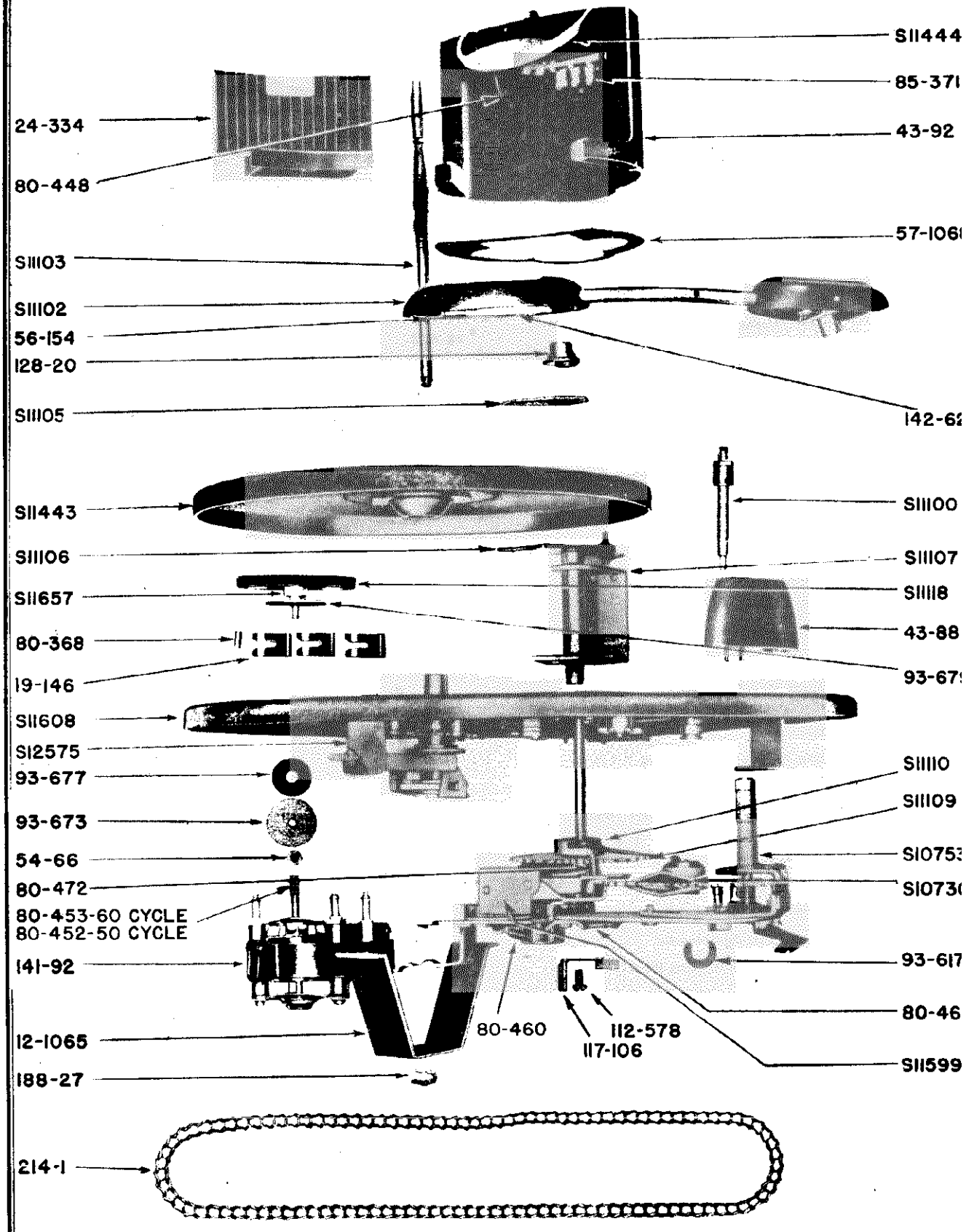


Fig. 11. Exploded View of Record Changer.

MODEL S-11468

ZENITH RADIO CORP.

PARTS LIST

S-10730	Timing Sprocket Assembly
S-10753	Tone Arm Pivot Shaft and Bracket Assembly
S-11100	Tone Arm Lift Pin Assembly
S-11102	Tone Arm Assembly
S-11103	Record Spindle Assembly
S-11105	Record Ejector Plate and Pin Assembly
S-11106	Record Support Plate—Shaft and Pin Assembly
S-11107	Record Support and Ejector Bracket Assembly
S-11109	Selector Sprocket and Bushing Assembly
S-11110	Selector Cam and Link Assembly
S-11118	Idler Wheel Assembly
S-11441	Record Changer Lever and Stud Assembly
S-11443	Turntable and Record Locating Stud Assembly
S-11444	Record Pressure Arm Assembly
S-11559	Clutch Release Arm—Trip Plate and Bracket Assembly
S-11608	Base Plate, Sprocket and Drive Shaft Bearing Assembly
S-11657	Idler Stud and Washer Assembly
S-11951	Cable and Plug Assembly
S-12541	Contact Assembly
S-12542	Contact Assembly
S-12575	Trip Contact and Bracket Assembly
12-1065	Record Spindle Support Bracket
19-146	Motor Mounting Clip
24-334	Record Ejector Housing Cover (Black Polystyrene)
43-88	Tone Arm Support Housing (Casting)
43-92	Record—Ejector Housing (Black Polystyrene)
46-563	Record Selector Knob (Black Tenite)
54-66	No. 10-32 x 5/16" x 1/8" Hex Nut—Steel N.P.
56-122	Record Selector Bracket Pin
56-128	Groove Pin (Sprocket Bushing)
56-154	Phono Cartridge Needle
57-1068	Record Ejector Housing Plate
73-24	No. 8-32 x 1/4" Hex Head Set Screw
73-71	No. 8-32 x 5/16" Allen Head Set Screw Steel—Conepoint
73-72	No. 8-32 x 5/8" Allen Head Set Screw Steel—Conepoint
76-409	Record Ejector Cam Shaft
80-138	Idler Wheel Retaining Spring
80-317	Trip Lever Plate Return Spring
80-368	Idler Wheel Tension Spring
80-448	Pressure Arm Spring
80-452	Spring Bushing (50 Cycle Operation)
80-453	Spring Bushing (60 Cycle Operation)
80-460	Trip Lever Tension Spring
80-464	Pawl Spring
80-472	Trip Lever Plate Accuating Spring
85-371	3 Position Slide Switch
93-35	.032 x .144 x 3/8 Flat Washer—N.P.
93-487	1/16 x .144 x 3/8 Washer Steel Cad. Pl.
93-534	.015 x 25/64 x 9/16 Brass or Steel Washer—Cad. Pl. Steel
93-582	.025 x .129 x 5/16 Steel Washer—Cad. Pl.
93-617	Sprocket Shaft Retaining Washer
93-673	Idler Wheel Stud Washer—Threaded
93-677	Idler Wheel Stud Fishpaper Washer (Large)
93-678	Idler Wheel Stud Fishpaper Washer (Small)
93-679	Idler Wheel Stud Felt Washer (Large)
93-719	7/16" x 3/16 x .031" Flat Washer—N.P.
93-752	No. 4 Internal Shakeproof Lockwasher—Steel N.P.
93-764	Spring Washer No. 3759-14
93-770	Spring Washer
94-475	Insulating Bushing (Cutout Contact)
112-413	Weight Lever Pivot Screw
112-415	No. 8-32 x 3/8 Flat Head Shakeproof Type 1 Self Tapping Screw—Steel Cad.
112-450	No. 4-40 x 1/8 Phillips Binding Hd. M.S.—Steel—Cad. Pl.
112-530	4-40 x 5/8 R.H. Self Tapping Screw Steel—Cad Pl.—Stan-Tap
112-578	6-32 x 1/4 Oval Binding H.M.S.—Steel N.P.
112-579	8-32 x 3/8 Round Head Type 1—Self Tapping Screw—Steel—Cad. Pl.
114-200	No. 6-32 x 5/16" Hex Head Slotted Stan-Tap—Thread Forming Screw—Cad. Pl.
114-201	No. 8-32 x 5/16" Hex Head Slotted—Stan-Tap—Thread Forming Screw—Cad. Pl.
114-217	No. 8-32 x 1/4" Hex Head Slotted—Stan-Tap—Thread Forming Screw—Cad. Pl.
114-252	No. 4-40 x 3/16" Hex Acorn Head M.S.—Steel N.P.
114-253	No. 6-20 x 3/8" Hex Head Slotted Shakeproof (Type 25) Self Tapping Screw—Steel—Cad.
117-85	Record Selector Lever
117-106	Position Trip Lever
128-20	Record Ejector Cam
141-92	A.C. Motor
142-62	Crystal Pickup
188-27	Record Spindle Retaining Washer
188-55	Selector Coupling Arm Retaining Washer
214-1	Sprocket Drive Chain

ZENITH RADIO CORP.

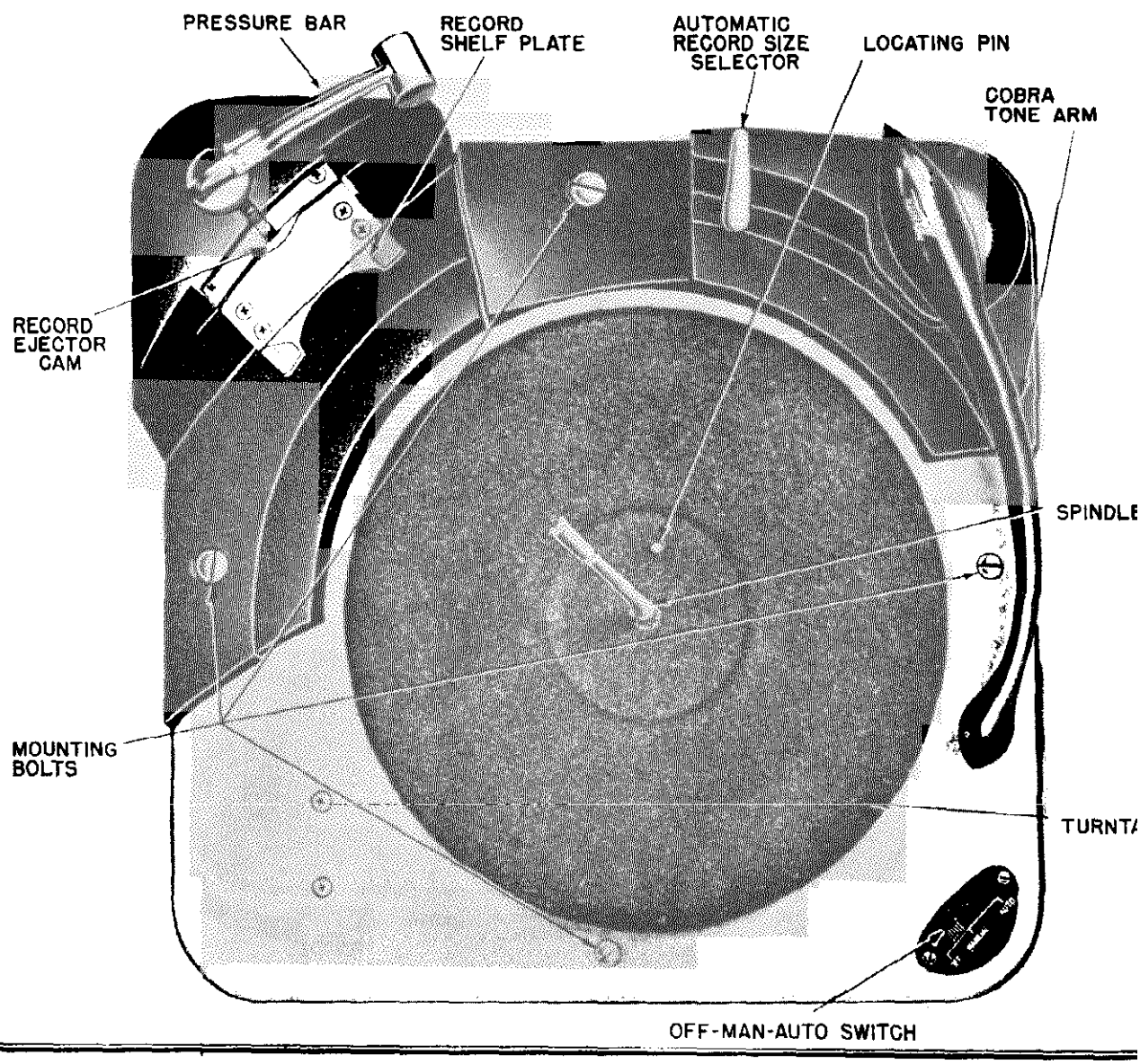
GENERAL

TO THE SERVICE MAN:

This Service Manual has been prepared for the purpose of assisting the Service Man in his work of caring for the Record Changer mechanism, whether he is called to remedy some difficulty, or to insure its continued satisfactory operation. The Zenith Automatic Record Changers are constructed with a minimum of working parts, and in operation are simple and reliable. However, as is the case with all mechanical units, misalignment and trouble may occasionally develop. The information presented in this book will enable the Service Man to render quick and accurate service. For convenience, the Operating Instructions supplied with each Record Changer are summarized as follows:

The Record Changer will automatically play up to fourteen 10 inch or twelve 12 inch records at one loading, or to twelve 10 and 12 inch records intermixed. The Record Stack rests on the Spindle and the Record Shelf. The Selector Sprocket drives the Ejector Cam which pushes records off the Shelf and Spindle allowing them to drop to the Turntable. To load for automatic operation, swing the Pressure Bar to the right, place the stack of records on the Spindle, swing the Pressure Bar to the left until it rests on the record stack, set the OFF-MAN-AUTO switch to AUTO and press the Record Change button. The Changer will play the entire selection of records and will repeat the last record until it is turned off. For manual operation set the OFF-MAN-AUTO switch to MAN and play the records singly as on a non-automatic record player.

Fig. 1. Top View of Record Changer.



ZENITH RADIO CORP.

DESCRIPTION OF CYCLING

The Motor drives an Idler Wheel which rim drives the Turntable and the lower section of the Clutch mechanism. The Spindle is fixed and does not turn with the Turntable.

When the Record Change button on the receiver panel is pressed, an electric circuit is completed through the Solenoid (the current being supplied by a winding on the motor) causing the solenoid armature to trip. This action engages the upper section of the Clutch with the rotating lower section. After the Clutch is tripped a cut-out switch in the solenoid circuit is opened breaking the current flow through it, eliminating chatter. When the Clutch is engaged the Turntable turns the Drive Sprocket and the Chain. The Chain turns the Timing Sprocket which, due to its construction, pushes the Lift Pin up and raises the Tone Arm off the record. The Locating Bushing Pin on the Timing Sprocket then engages the Tone Arm Control Lever which swings the Tone Arm clear of the record. (The action of the Locating Pin and Bushing against the Tone Arm Control Lever governs the lateral swing of the Tone Arm. For 12 inch records the small diameter Pin rides against the Tone Arm Control Lever and the Bushing drops to the lower end of the pin out of contact with the Tone Arm Control Lever. However, on 10 inch records the landing position of the Tone Arm is one inch nearer the Spindle than for 12 inch records, and the bushing, which has a greater diameter than the pin, is pushed upward by the Record Size Lever until it rides against the Tone Arm Control Lever giving the Tone Arm an additional swing for 10 inch records.

When the Timing Sprocket is turned, the Selector Sprocket, which operates the Record Ejector Cam is also turned, causing the record to be pushed off the Spindle, and to drop on the Turntable. After one-half cycle an emboss on the Timing Sprocket re-sets the clutch trigger mechanism and closes the cut-out switch. The Locating Bushing Pin brings the Tone Arm over the starting groove of the record and the Lift Pin slides into its groove in the Timing Sprocket, lowering the Tone Arm on the record. At the same time the Lift Pin slides into its groove, a slot in the Timing Sprocket approaches the Clutch Release Arm and when the tip of the Clutch Release Arm drops into this slot the Clutch is disengaged.

As the record is played the Tone Arm is gradually moving toward the center of the record and a Pawl attached to the Tone Arm Control Lever is moving toward the Cycling Switch Trip Lever. When the record has finished its play, the needle enters the eccentric groove and the Pawl engages the Cycling Switch Trip Lever. The oscillating action of the Pawl against the Cycling Switch Trip Lever causes

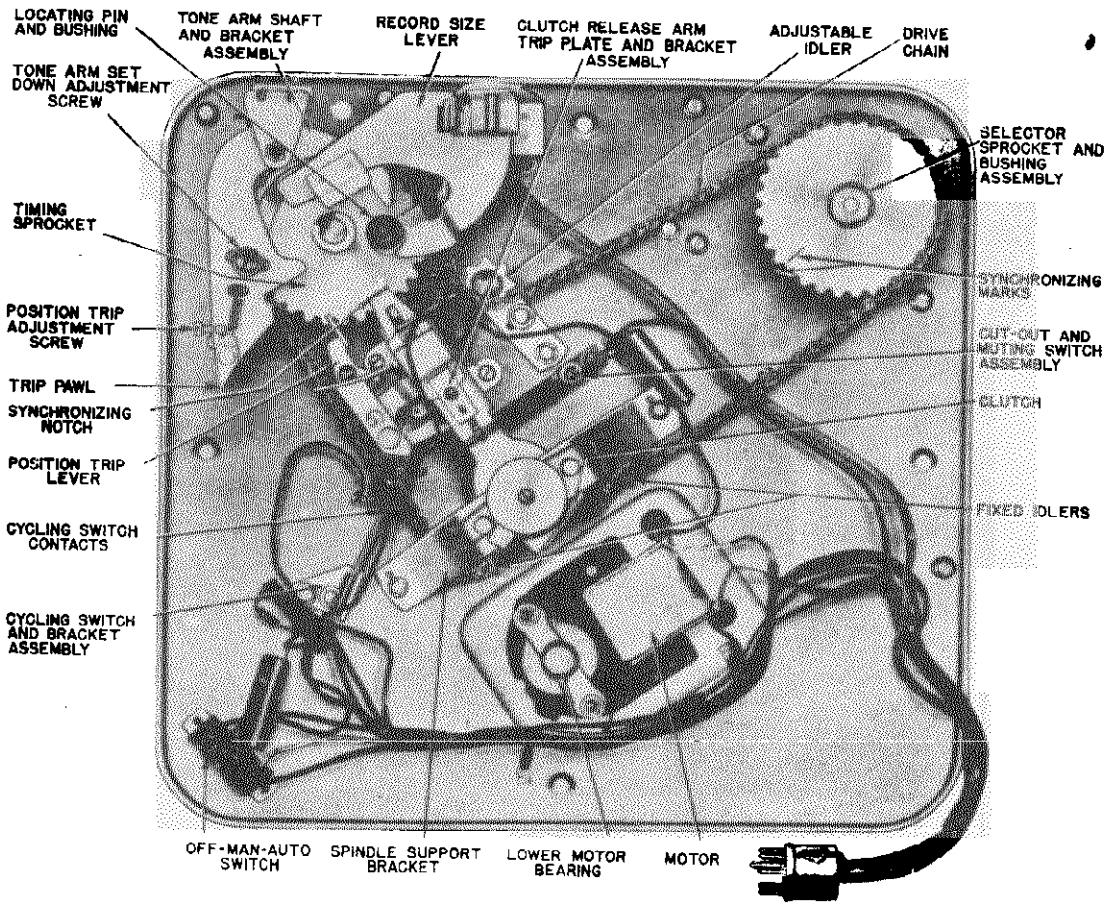


Fig. 2. Bottom View of Record Changer.

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the Cycling Switch to close, completes the circuit, and start the cycle over again. If the record does not have an eccentric groove, the Position Trip will close the Cycling Switch and start the next cycle.

LUBRICATION

Figures 3 and 4 indicate the points to be lubricated and the type of lubricant to use. The Motor has two oil wicks that should be saturated with oil. The Record Spindle Guide Bearing, Idler Wheel Bearing, Lower Drive Shaft Bearing, Drive Shaft Thrust Bearing and the Motor Bearings are of the OILITE type and require very little attention. If squeaks develop, make certain that they are not caused by friction between the Spindle and records on the Turntable. A thin coat of wax on the Spindle will remedy this condition.

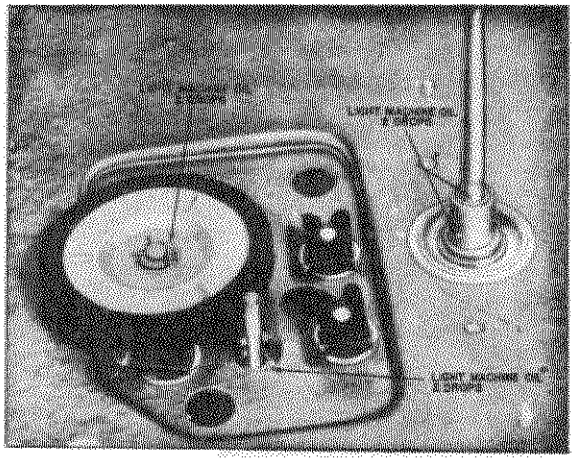

Fig. 3. Lubrication Top of Record Changer.

ADJUSTMENTS

1. TONE ARM SET DOWN ADJUSTMENT

Before the set down adjustment is made, study Figure 5 and proceed as follows:

a. Place a standard 12 inch record on the Turntable.

b. Trip the clutch by hand and turn the Turntable clockwise until the Tone Arm just starts to come down on the record.

c. Loosen the Tone Arm Adjustment Lock Screw on the Tone Arm Control Lever "D."

d. Remove the Lift Pin "E."

e. Move the Tone Arm until the Tone Arm Control Lever "Y" and the Locating Bushing Pin "X" are in contact "B."

f. While holding the Tone Arm Control Lever against the Locating Bushing Pin, set the needle on the record about 1/32" from where the run-in groove ends and the playing grooves begin "A," grasp the Tone Arm Control Lever with pliers "C" and tighten the Tone Arm Adjustment lock Screw "D."

g. Replace Lift Pin and check operation on 10 and 12 inch records.

h. In case the operation is repeated it will be necessary to trip the Automatic Record Size Selector (Fig. 1) by hand,

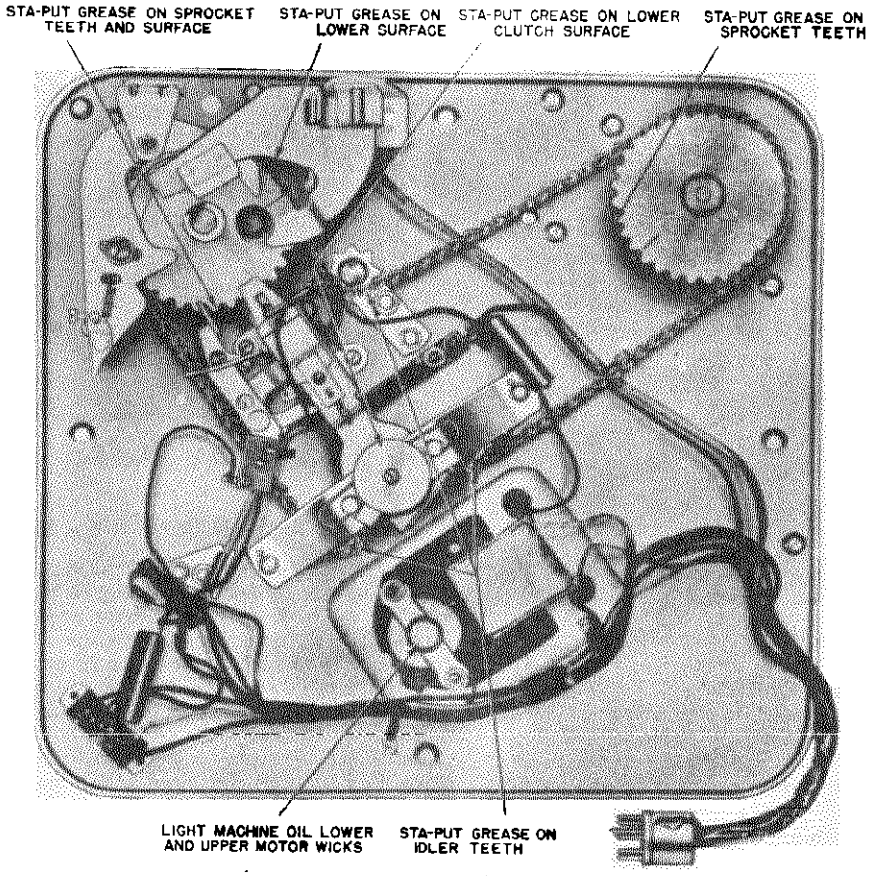

Fig. 4. Lubrication Bottom of Record Changer.

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otherwise the needle will land in the 10 inch position.

1. An alternate method for making the adjustment is to loosen and move the Tone Arm Lock Screw "D" in its slot inward to bring the Tone Arm in, or outward to bring it out, determining the proper amount experimentally.

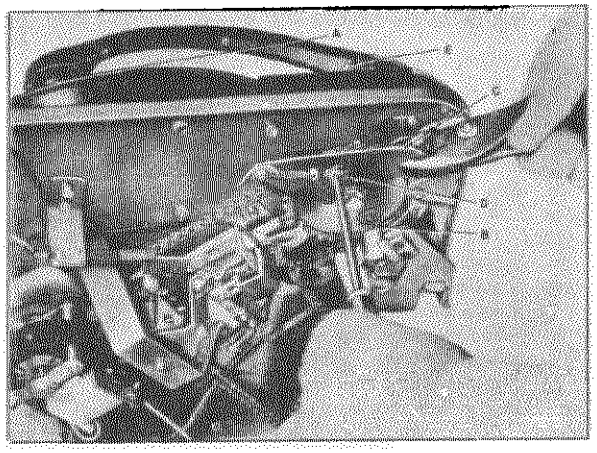

Fig. 5. Tone Arm Set Down Adjustment.

2. TONE ARM HEIGHT ADJUSTMENT

The Tone Arm vertical rise is governed by the Lift Pin. The Lift Pin is adjustable (see Fig. 6). Too long a Lift Pin will cause the Tone Arm to hit the underside of the records on the Spindle. If the Lift Pin is short the needle will not clear fourteen records on the Turntable. To make the proper adjustment, trip the Clutch by hand and rotate the Turntable clockwise until the Tone Arm starts to swing toward the Spindle. Gently push the Tone Arm as close to the Spindle as it will go, place a record on the Spindle and observe the spacing between it and the Tone Arm. The spacing "A" should be approximately the thickness of a record. If the spacing is incorrect, lift the Tone Arm, remove the Lift Pin, loosen the Lock Nut and adjust the Lift Pin to the proper length. Make certain that the Lock Nut is tightened after adjustment.

Fig. 6. Lift Pin.

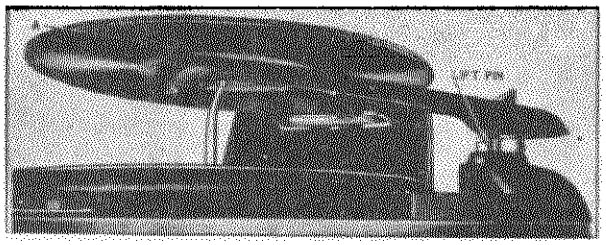

Fig. 7. Tone Arm Height Adjustment.

3. CYCLING SWITCH ADJUSTMENT

When a record has completed its play and the needle enters the eccentric groove, Pawl "C" engages the Trip Plate "D" closing contacts "A" and completing the circuit through the solenoid which trips the record change mechanism.

To adjust the Cycling Switch, move the Tone Arm until Pawl "C" is clear of the Trip Lever Plate "D" (as shown in Fig. 8). Loosen the two Lock Screws "B," move the Cycling Switch bracket until there is approximately .03 inch spacing between contacts "A" and tighten the Lock Screws.

4. POSITION TRIP ADJUSTMENT

The Position Trip does not depend on an eccentric groove in the record to start the record change cycle, but will trip the mechanism whenever the needle comes within a predetermined distance from the Spindle. Older type records that do not have an eccentric groove can in most cases be played automatically by the proper adjustment of the Position Trip. Under normal conditions with the needle approximately 1 3/4" from the center of the Spindle adjust "E" (Fig. 8) until the contacts "A" close. This distance is generally satisfactory since no modern record will be cut off before it has completed its play, and none will fail to trip the mechanism at the end. In special cases screw the adjustment "E" clockwise for earlier tripping and counterclockwise for later tripping as the individual case may be.

It may be impossible to find an adjustment that will always trip the mechanism and never cut off with all type records, and in these special cases the record must be played manually.

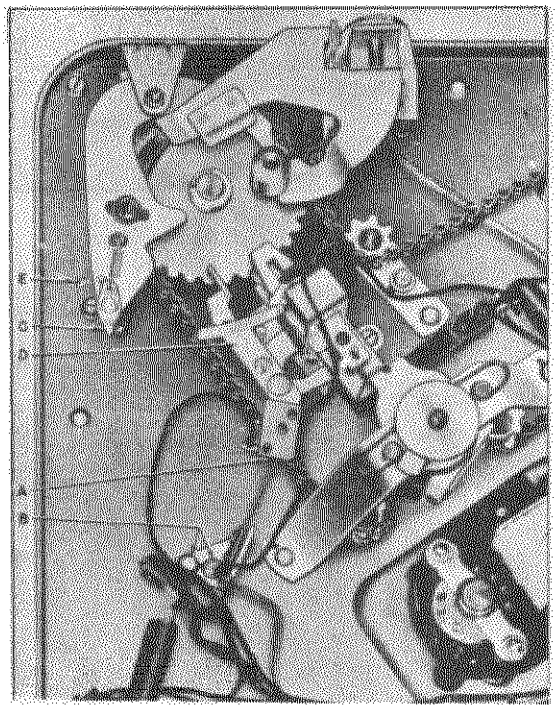

Fig. 8. Cycling Switch and Position Trip Adjustments.

REPLACING THE MOTOR

The Motor is designed for operation on 50 or 60 cycle Alternating Current (AC) depending on the spring bushing installed on its shaft. For 50 cycle operation a 80-452 spring bushing is used. For 60 cycle, use a 80-453 bushing. For operation on 25 cycle current a 25 cycle motor must be installed. When a replacement Motor is ordered, make certain that the line voltage and frequency of the receiver are given.

To replace the Motor, unsolder the connecting leads, remove the Turntable, the three spring mounting clips and allow the Motor to drop out. Remove the spring bushing from the shaft of the defective Motor and install it on the new one. When the new Motor is installed do not draw the connecting leads tight as this will prevent the Motor from "floating" on its spring mounts. Make certain that all the leads are securely soldered and taped.

ZENITH RADIO CORP.

REMOVING THE TURNTABLE

To remove the Turntable, hold the Clutch with one hand, and turn the Turntable with the other (see Fig. 9).

To avoid damage when the Turntable is replaced, make certain that the Idler Wheel is pushed inside the rim before the Turntable is seated.

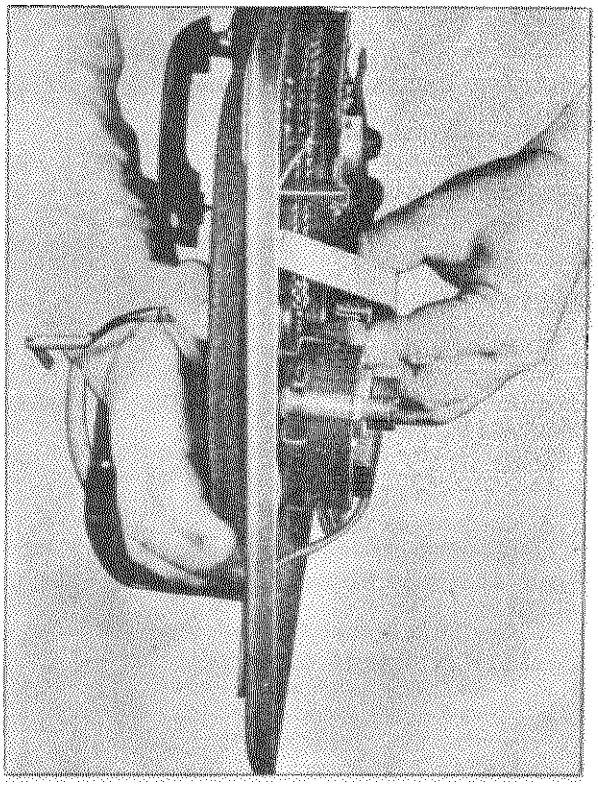

Fig. 9. Removing the Turntable.

REPLACING THE CHAIN

To replace the chain, loosen the adjustable idler (Screws "D," Fig. 10) and remove the chain. Open a link, "B," and pull the chain out. Open a link in the replacement chain and thread it in place. Be certain that the open ends of the links face outward from the Base Plate. (This will prevent the chain from being installed in reverse.) Carefully close the link and make certain that there is no stiffness in its action. Read the paragraph on synchronization before the chain is permanently installed.

SYNCHRONIZATION

When the chain is removed or replaced, the Timing Sprocket and the Selector Sprocket must be synchronized. The Selector Sprocket has a synchronizing mark that must line up with the mark on the Base Plate (see Fig. 2.) The Timing Sprocket has a small slot. The Clutch Release Lever Tip must drop into this slot at the same time the Selector Sprocket Synchronizing Mark is lined up with the mark on the Base Plate (Fig. 2). To synchronize, hold the Timing Sprocket and Selector Sprocket in position, thread the chain over the Drive Sprocket, the two fixed idlers, Timing Sprocket, Selector Sprocket and over the adjustable idler. Set the adjustable idler for medium tension on the chain and tighten the two holding screws.

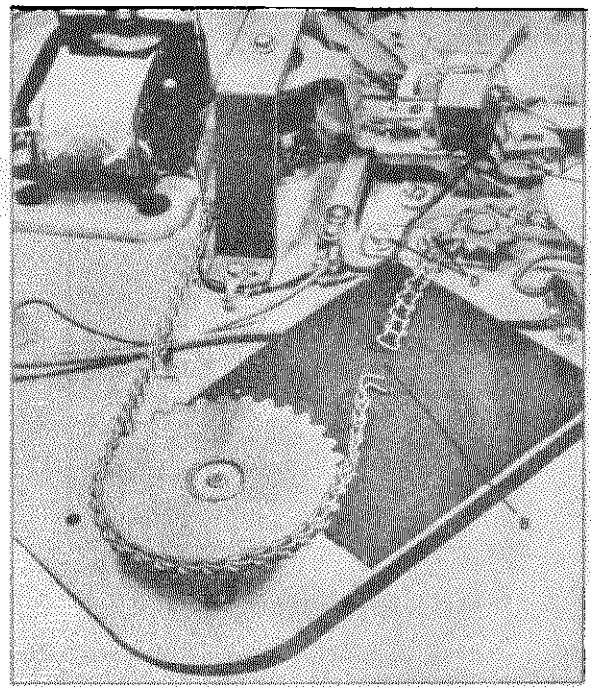

Fig. 10. Replacing the Chain.

THEORY OF THE COBRA RADIONIC PICKUP

The operation of the Cobra pickup is considerably different from Crystal and Dynamic pickups. These pickups generate audio power, while the Cobra controls power generated by a radio frequency oscillator. The 7F7 twin triode tube is a modulated oscillator, detector and audio amplifier. The oscillator operates at a frequency of 2.5 Mc. Modulation is accomplished by changing the energy losses in a tuned circuit. These losses may be represented by an equivalent resistance in series with the reactance of the coil. The ratio of the resistance to the reactance determines the efficiency or Q of the coil. The amplitude of the RF voltage developed across this coil by an oscillator will vary with changes in Q.

The grid coil L_1 and other components of the oscillator are mounted in the oscillator pre-amp chassis, while the plate coil L_2 is in the Needle Cartridge with the vane and needle assembly. The coil is fixed and has 40 turns of No. 40 wire (approximate DC resistance 2½ ohms). The stainless steel vane, which is in the field of the coil, is spot welded to the osmium-iridium tipped stylus.

Any movement of the stylus will cause a corresponding movement of the vane. As the stylus and vane follow the modulations in the record, changes in the mutual inductance between the vane and coil occur (see Fig. 11). In position 2 the vane is at rest; and a constant RF voltage appears across the plate coil. As the vane is set in motion and reaches position 1, it is at its greatest outward swing from the coil, resulting in low mutual inductance, low reflected resistance, higher Q, and a higher RF voltage across the coil. In position 3 it is at its greatest inward swing; resulting in a high mutual inductance, high reflected resistance, lower Q and a lower RF voltage. It can be seen that the amplitude of the RF voltage which appears across the coil will vary with changes in Q, satisfying the condition for amplitude modulation. The position of the vane changes both the Q and L of the coil. Changes in L shift the frequency slightly, and a certain amount of frequency modulation is present, but

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since there is no frequency discrimination it remains undetected.

Since the grid and plate coils are part of a single tuned circuit any variations of amplitude of the RF voltage brought about by the changes in Q across the plate coil will also appear across the grid Coil L_1 causing a shift in the average plate current through the plate load resistor

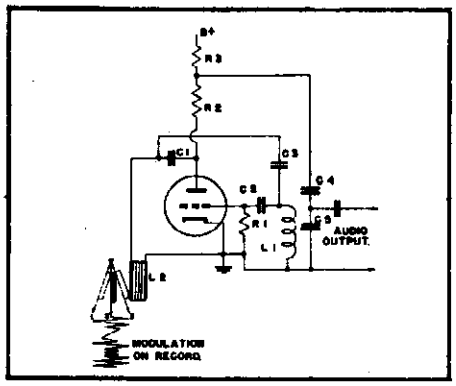

Fig. 11. Simplified Circuit of Oscillator.

across which the audio output voltage is developed. Plate bend detection takes place since only the positive half of the grid swing causes an increase in the average plate current. These changes in the average plate current appear as audio voltage across the plate load resistor.

The 2.5 Mc. RF voltage and the audio voltage both appear at the plate (pin 6) of the oscillator triode. R_2, C_4 and C_5 filter out the RF voltage allowing only the audio component to the grid (pin 4) of the amplifier triode where it is amplified, fed through a shielded lead to the audio amplifier of the receiver and reproduced by the loudspeaker.

TROUBLE SHOOTING

SQUEAKS OR NOISES DURING PLAYING OF RECORDS.

a. Friction between the records on the turntable and the spindle will occasionally cause squeaks. A thin coat of wax applied to the spindle will remedy this condition.

b. Check lubrication.

MECHANISM STARTS SLOWLY AND MOTOR GETS HOT.

a. Check line voltage and frequency.
b. Check lubrication.
c. Motor windings damaged.
d. Room temperature abnormally low.

PRESSING RECORD CHANGE BUTTON ON RECEIVER PANEL DOES NOT START RECORD CHANGE CYCLE.

a. See that the AUTO-MAN-OFF switch is set to AUTO.
b. Check Record Change Switch.
c. Check Cut-Out Switch.
d. Check electrical continuity of solenoid circuit.
e. Check solenoid energizing voltage on motor.

MOTOR FAILS TO RUN EVEN WHEN IT IS ENTIRELY DISCONNECTED FROM CHANGER AND PROPER VOLTAGE AND FREQUENCY APPLIED DIRECTLY TO THE TWO INPUT LEADS OF THE WINDING.

a. Open winding.
b. Damaged or frozen bearings.

RUMBLE AND MICROPHONICS DURING REPRODUCTION.

a. Changer not "floated" properly. Loosen mounting bolts and remove packing block from pre-amp.
b. Motor mounting Spring Clips rubbing on the idler wheel.
c. Motor leads pulled tight preventing motor from "floating" freely on its springs.
d. Noisy 7F7 tube.

NEEDLE SETS DOWN PROPERLY ON RECORD BUT SLIDES OVER THE RECORD GROOVES.

a. Cabinet tilted.
b. Badly worn needle.

NEEDLE FAILS TO CLEAR MAXIMUM LOAD OF RECORDS ON THE TURNTABLE.

a. Check Tone Arm height adjustment No. 2.

CHANGER CYCLES WITH AUTO-MAN-OFF SWITCH ON MAN.

a. Check AUTO-MAN-OFF switch.
b. Chain too tight.

TONE ARM FALLS OFF RECORD.

a. Check Tone Arm set down adjustment No. 1.
b. Check Tone Arm Mounting screws.
c. Changer not level.

TONE ARM SET-DOWN POSITION VARIES.

a. Loose Tone Arm Set-Down adjustment lock screw.
b. Loose Tone Arm mounting screw.
c. Loose needle cartridge socket holding screw.

RECORD IS NOT HEARD ALTHOUGH CHANGER OPERATES.

a. See that the Phono Radio switch is on Phono.
b. Check receiver audio by listening to radio.
c. Check 7F7 tube in Pre-Amp.
d. Check Needle Cartridge.
e. Check Needle Cartridge housing for broken connection.

TONE ARM SETS DOWN TOO FAR IN OR OUT OF RECORD.

a. Check Tone Arm Set Down adjustment No. 1.

CHANGER CONTINUES TO CYCLE.

a. Check Cycling switch adjustment No. 3.
b. Check Record Change switch.
c. Clutch release mechanism sticks.
d. Tight drive chain.

CHANGER WILL NOT CYCLE UPON COMPLETION OF RECORD.

a. See that the AUTO-MAN-OFF switch is set to AUTO.
b. Make certain the record has an eccentric center groove.
c. Check Cycling switch.
d. Check Cut-out switch.
e. Check Clutch Release Arm for freedom of action.

SQUEAKS WHEN CHANGER IS IN CYCLE.

a. Friction between Lift Pin and Timing Sprocket. Apply a thin coat of STA-PUT grease.

FAILS TO EJECT RECORDS ACCOMPANIED BY A CLICKING SOUND.

a. Clutch slips. A slight upward bend of the Clutch Release Arm will correct this condition.

RECORD HANGS BETWEEN SPINDLE AND SHELF.

a. Bent Spindle, or rubber pads on Record Shelf have expanded, causing a decrease in space between Record Shelf and Spindle.

CHANGER DROPS TWO RECORDS.

a. Sharp edge on record. Smooth out with fine sandpaper.
b. Bent Spindle.

TONE ARM STICKS OR HANGS UP DURING CYCLE.

a. Clutch Release Lever pressure on Timing Sprocket too great. Loosen the solenoid bracket and insert a very thin shim between it and the base plate. If the condition still prevails, increase the thickness of the shim.

b. Burrs in synchronizing notch or trip lever. Remove with a file.

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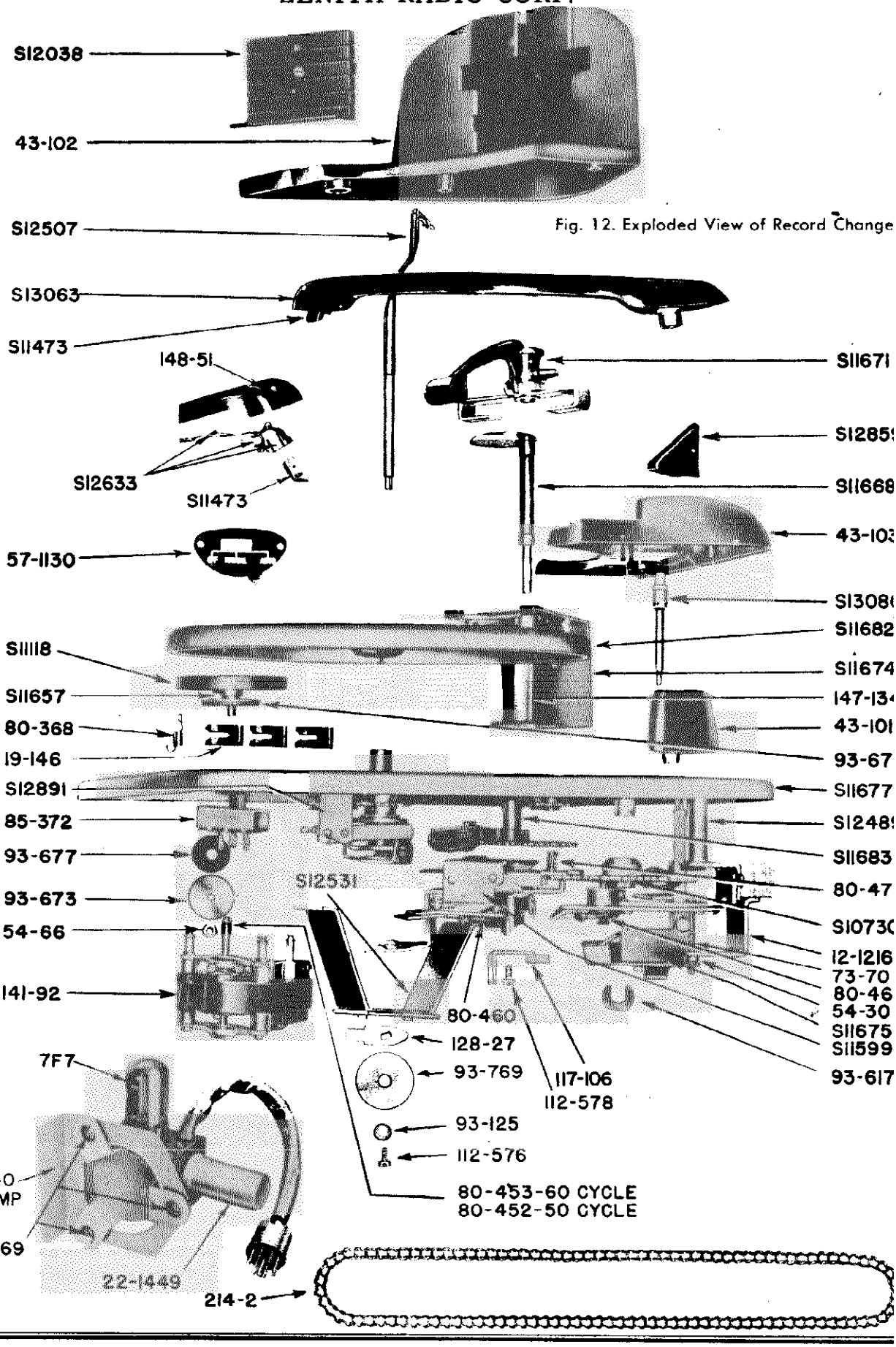

Fig. 12. Exploded View of Record Change

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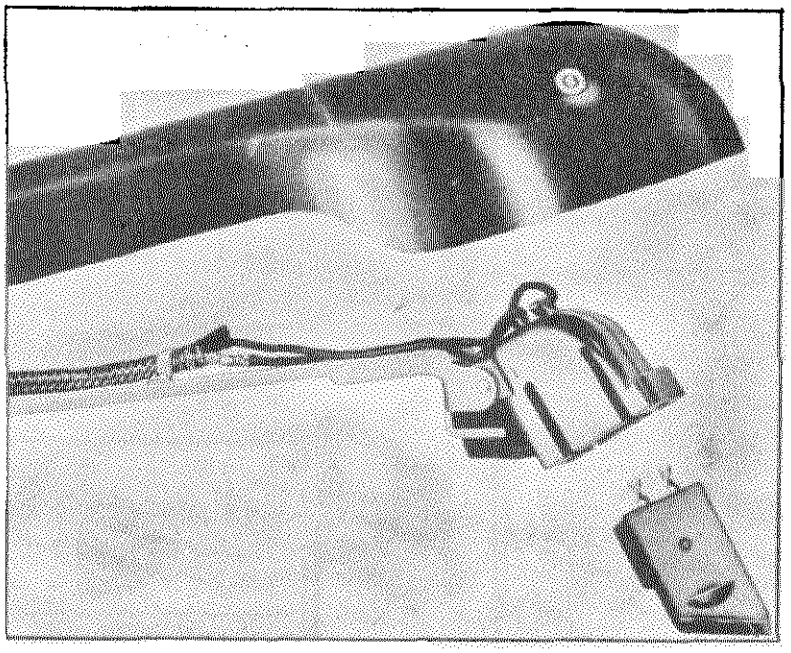
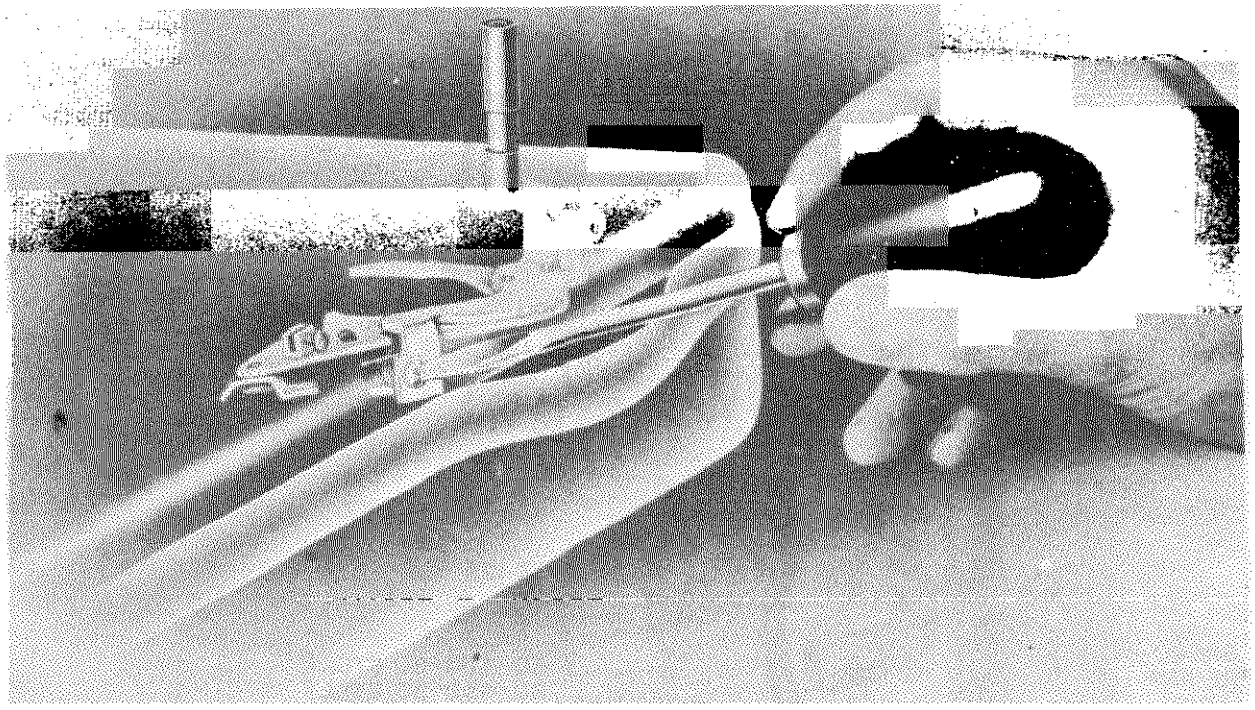
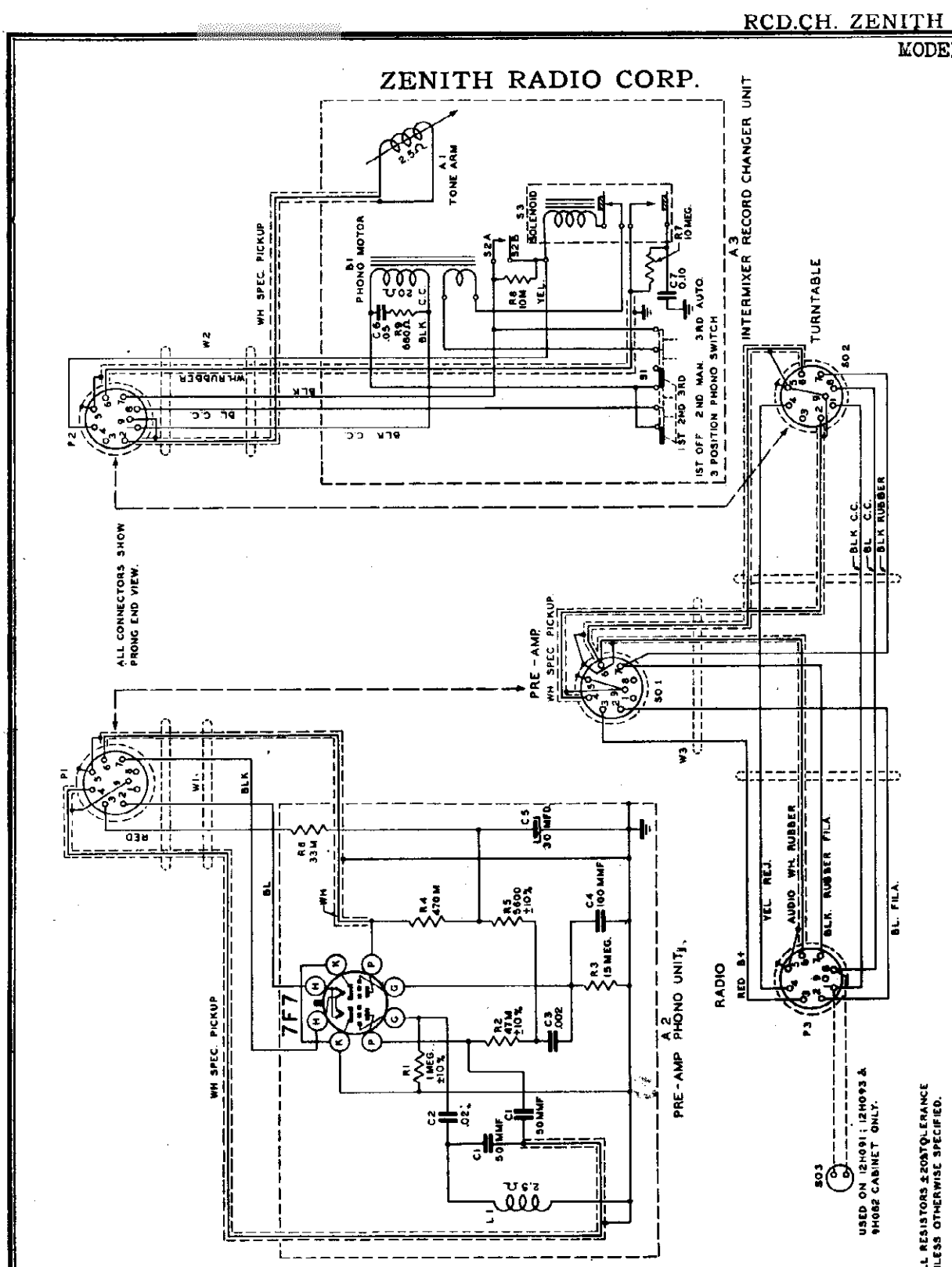


Fig. 14. Exploded View—Needle Cartridge and Socket Assembly.

ADDENDA



For convenience, a screwdriver tone arm set-down adjustment has been added to all later production record changers. The adjustment screw can be reached with a screwdriver by pushing aside the ethocel trim strip. The tone arm must be held in the rest position while the adjustment is made. Clockwise rotation of the screw will move the tone arm in, while counter-clockwise rotation will move it out.



DIAG NO.	PART NO.	DESCRIPTION
C1	22-1532	50 MMF 500V.
C2	22-327	.02 MFD. 200V.
C3	22-1220	.002 MFD. 600V.
C4	22-162	100 MMF 600V.
C5	22-1449	30 MFD ELECTRO. 300V.
C6	22-1570	.05 MFD. 400V.
C7	22-417	0.10 MFD. 600V.
R1	63-441	1 MEGOHM 1/4 W.
R2	63-648	47 M OHM 1/4 W.
R3	63-976	15 MEGOHM 1/4 W.
R4	63-597	470 M OHM 1/4 W.
R5	63-638	5600 OHM 1/4 W.
R6	63-592	33 M OHM 1/4 W.
R7	63-604	10 MEGOHM 1/4 W.
R8	63-589	10 M OHM 1/4 W.
R9	63-582	680 OHM 1/4 W.
A1	511475	TONE ARM COMPLETE
A2	511640	PRE-AMP PHONO UNIT
A3	511680	INTERMIXER RECORD CHANGER UNIT
B1	141-92	PHONO MOTOR
L1	512603	42.5 MICRO HENRY
P1	538-133	PHONO PLUG
P2		
P3		
SO1	78-582	PHONO SOCKET
SO2	78-582	PHONO SOCKET
SO3	52-186	2 PRONG RECEPTACLE
S1	85-372	3 POS. SWITCH
S2A	512691	TRIP CONTACT ASS'Y.
S2B	512579	INSULATOR STRIP "
S3	511456	SOLENOID ASS. "
W1	512601	CABLE ASSEMBLY
W2	512602	CABLE ASSEMBLY
W3	512604	CABLE - USED ON MODELS 12H0901 12H092; 12H094; 9H086
W3	512605	CABLE - USED ON MODELS 12H091; 12H093
W3	512606	CABLE - USED ON MODELS 9H081; 9H079
W3	512607	CABLE - USED ON MODEL 9H082

Fig. 15. Schematic Diagram of Pre-Amplifier Phono Unit.

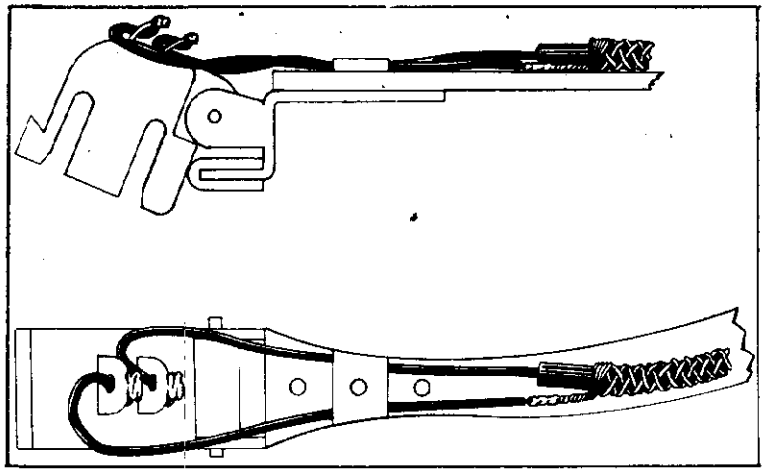


Fig. 13 shows how the leads are connected to the Needle Cartridge Socket. The lead and insulation are run through the hole in the contact and the lead is soldered with a light soldering iron. Great care must be exercised, and very little heat applied as the socket is made of lucite and will burn easily. The complete lead and socket are supplied as S12633.

NUMERICAL PARTS LIST

S-10730	Timing Sprocker Assembly
S-10732	Idler Assembly
S-11118	Idler Wheel Assembly
S-11458	Solenoid and Bracket Assembly
S-11473	Needle Cartridge
S-11580	Trip Contact and Support Strip Assembly
S-11599	Clutch Release Arm—Trip Plate and Bracket Assembly
S-11640	Pre-Amp. Phono Unit Assembly
S-11657	Idler Wheel Stud and Washer Assembly
S-11668	Record Ejector Cam and Shaft Assembly
S-11671	Pressure Arm and Bracket Assembly
S-11674	Record Support Plate and Bracket Assembly
S-11675	Discriminator Lever and Bracket Assembly
S-11677	Base Plate, Sprocket and Drive Shaft Bearing Assembly
S-11682	Turntable and Record Locating Stud Assembly
S-11683	Selector Sprocket and Bushing Assembly
S-12038	Record Ejector Housing Cover Assembly
S-12489	Tone Arm Pivot Shaft and Bracket Assembly
S-12493	Spring Contact and Insulator Assembly
S-12507	Record Spindle Assembly
S-12531	Bracket and Spring Assembly
S-12541	Contact Assembly
S-12542	Contact Assembly
S-12633	"Cobra" Socket and Cable Assembly
S-12859	Discriminator Knob and Plate Assembly.
S-12891	Trip Contact and Bracket Assembly
S-13063	Complete Cobra Tone Arm Assembly with Needle Cartridge
S-13086	Tone Arm Lift Pin Assembly
12-1216	Tone Arm Pivot Bracket
22-417	.1 Mfd. Paper Dielectric Capacitor
22-1449	30 Mfd. Electrolytic Capacitor
22-1570	.05 Mfd. Paper Dielectric Capacitor 400 v.
43-101	Tone Arm Support Housing (Casting)
43-102	Record Ejector Housing (Black Polystyrene)
43-103	Tone Arm Housing (Black Polystyrene)
54-30	8-32 x 5 16 x 7 64 Hex Nut—Steel N.P.
54-34	No. 6-32 x 1 4 Hex Nut—Steel N.P.
54-66	No. 10-32 x 5 16 Hex Nut—Steel N.P.
57-1117	Discriminator Trip Plate
57-1130	Switch Escutcheon
63-582	680 Ohm Carbon Resistor—1 4 W. ± 20%
63-589	10,000 Ohm Carbon Resistor—1 4 W.
63-604	10 Meghohm Carbon Resistor—1 4 W.
69-36	8-32 x 1 4 R.H.M.S.—Steel N.P.
71-71	No. 6-32 x 1 4 Phillips Flat Head M.S. Steel—Bright N.P.
73-59	8-32 x 5 16 Slotted Headless Set Screw—Steel—Cuppoint
73-70	No. 8-32 x 1 2 Allen Head Set Screw
80-138	Idler Wheel Retaining Spring
80-368	Idler Wheel Tension Spring
80-452	Spring (50 cycle Operation)
80-453	Spring (60 cycle Operation)
80-460	Trip Lever Tension Spring
80-464	Pawl Spring
80-472	Trip Lever Plate Return Spring
83-341	Single Lug Terminal Strip
83-420	Three Lug Terminal Strip
83-1091	Insulating Strip
83-1107	Insulator Strip
84-65	Tone Arm Rest
85-372	Slide Switch (3 Position)
86-81	Shakeproof Lug No. 2101-8
93-35	3 8 x .144 x .032 Flat Washer—N.P.
93-125	No. 6 Internal Shakeproof Lockwasher No. 1206
93-126	No. 8 Internal Shakeproof Lockwasher No. 1208
93-415	No. 6 External Shakeproof Lockwasher No. 1106
93-582	5 16 x .129 x .025 Steel Washer—Cad. Pl.
93-617	Sprocket Shaft Retaining Washer
93-673	Idler Wheel Stud Washer—Small
93-677	Idler Wheel Stud Fishpaper Washer—Large
93-678	Idler Wheel Stud Fishpaper Washer—Small
93-679	Idler Wheel Stud Flat Washer—Large
93-719	7 16 x 3 16 x .031 Flat Washer—N.P.
93-754	No. 4 Internal Shakeproof Lockwasher Steel—N.P. No. J204-3
93-767	Cam Spacer Washer (.020 x .385 x 5 8 Steel Cad. Pl.)
93-769	7 8 x .140 x .043 Steel Washer Cad. Pl.
93-819	Motor Mounting Washers (3)
94-334	Mounting Bushing
94-505	Insulating Bushing (Cutout Contact)
112-415	8-32 x 3 8 Flat Head Shakeproof Type 1 Self Tapping Screw Steel—Cad. Pl.
112-548	6-32 x 1 2 Recessed Stove Head M.S. Steel—Bronze
112-562	4-40 x 7 8 R.H. Stan-Tap Thread Forming Screw—Steel—Cad. Pl.
112-576	5-40 x 1 4 Oval B.H.M.S. Steel N.P.
112-578	6-32 x 1 4 Oval B.H.M.S. Steel N.P.
112-579	8-32 x 3 8 R.H. Shakeproof Type Self Tapping Screw—Steel—Cad. Pl.
112-581	6-20 x 3 8 R.H. Self Tapping Screw Steel Cad. Pl.—Shakeproof Type 25
114-89	8-32 x 5 16 Hex Acorn Head M.S. Steel N.P.
114-180	No. 6 x 1 4 Hex Head Slotted Self Tapping Screw—Steel Cad. Pl.
114-199	6 x 3 16 Hex Head Slotted—Stan-Tap Sheet Metal Screw—N.P.
114-200	6-32 x 5 16 Hex Head Slotted—Stan-Tap Thread Forming Screw—Cad. Pl.
114-201	8-32 x 5 16 Hex Head Slotted—Stan-Tap Thread Forming Screw—Cad. Pl.
114-217	8-32 x 1 4 Hex Head Slotted Stan-Tap Thread Forming Screw—Cad. Pl.
114-248	6-20 x 5 16 Hex Head Slotted Shakeproof—Type 25—Self Tapping Screw
115-24	4-40 x 3 16 Fillister H.M.S.—Steel N.P.
117-106	Position Trip Lever
125-16	Gum Rubber Grommet
126-470	Chassis Shield
128-27	Cam
141-92	A.C. Phono Motor
147-134	Cylindrical Spacer (Drive Shaft Bracket)
148-51	Tone Arm Housing
188-27	Record Spindle Retaining Washer
188-32	Motor Mounting Retaining Rings (3)
214-2	Sprocket Drive Chain