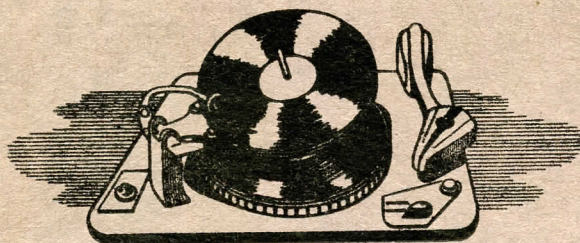


**AUTOMATIC
RECORD CHANGER
MANUAL**



P H I L C O

**PHILCO CORPORATION
PHILADELPHIA**

PHILCO

AUTOMATIC RECORD CHANGER MANUAL



PHILCO CORPORATION
PHILADELPHIA

Charles W. Drees - Supreme Radio Service - 2670 Tracy Ave.

FOREWORD

This book has been prepared to give Philco dealers and servicemen useful information on the servicing of the Philco Automatic Record Changer and Home Recorder.

After careful study of the contents of this manual, the serviceman will be in a better position to give intelligent and efficient service for improved operation of Philco record changers.

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PHILCO AUTOMATIC RECORD CHANGER

I. GENERAL DESCRIPTION OF CHANGE CYCLE

The automatic record changer performs three principal functions:

1. Places record on turntable.
2. Lowers tone arm on record in playing position.
3. Raises tone arm at end of record or on reject.

These functions are controlled by three mechanisms, interconnected and built together, but each separate in its operation. The motion for each is originated in one central cam gear which has three different and individual cam surfaces. The cam gear is normally at rest while a record is being played, but is put into operation by a saw tooth clutch which takes its power from the turntable and drives an intermediate drive gear. This only takes place when the record changer is put into a change cycle. The cam gear then makes one full revolution to complete the change cycle and comes to rest in a normal position.

The record changing mechanism which places a record on the turntable is brought into operation by a lever with a roller at one end. The lever is attached to the shelf plate mounting post and is operated by a notch under the cam gear. This causes the mounting post to move slightly, pushing the bottom record off the stack onto the turntable.

The pick-up operating mechanism is likewise brought into operation by the cam gear surface on the top side of the cam gear. The raising lever, when removing the pick-up from the record, receives a swinging motion from the cam gear through an eccentric track on the top outside surface of the cam gear. This eccentric track causes the pick-up to be carried out beyond the turntable while a

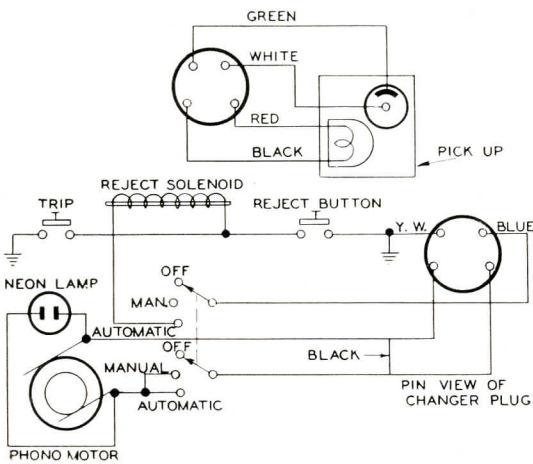
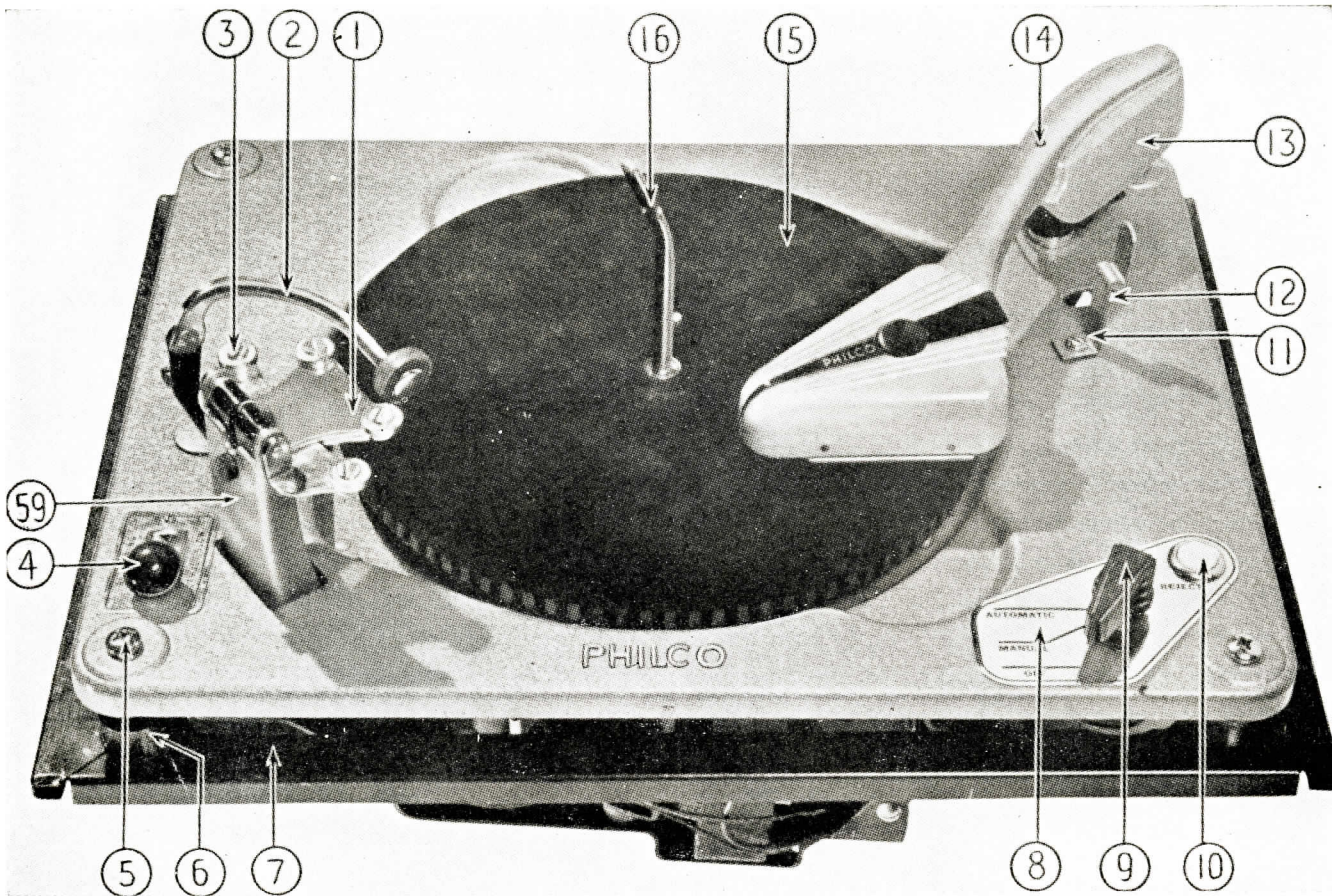
record is being dropped on the turntable. The light beam pick-up is then brought back into playing position for 10" or 12" records (depending on the shelf positions on the shelf carrier).

The travel of the pick-up arm towards the turntable for lowering on a 10 or 12-inch record is stopped at the proper point for lowering by a movable track on the cam gear. This movable track is operated by a lever which is moved by a spring lever connected through a cord and spring attached to the 10" shelf plate. When the 10" shelf plate is lifted up, the movable track is allowed to shift to the outer groove of the cam gear surface so that the pick-up needle will set properly on the outer edge of a 12" record. When the 10" shelf plate is in place for playing 10" records, the cord holds the spring lever and causes the movable track lever to shift to the inner groove as the cam gear revolves.

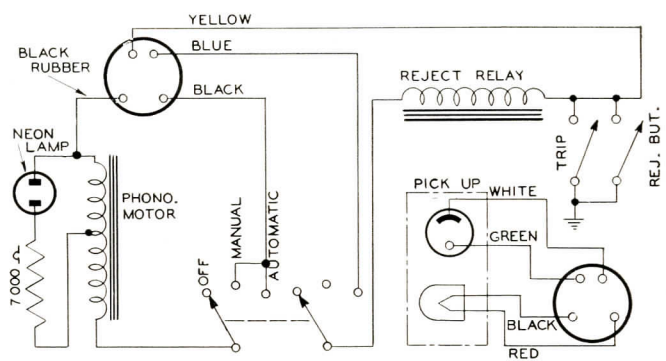
The electric reject trip causes the clutch to engage and allow the tone arm to be removed from the record by the cam gear. The reject trip operates through a pulsating plate and movable contact on the tone arm raising lever. When the pulsating plate and movable contact make connection, the solenoid is energized, releasing the clutch so that the cam gear can be revolved.

OILING

These record changers should be lubricated once a year with a few drops of good light machine oil at the following points: Motor bearings, drive disc bearings and cam gear bearings.



ELECTRICAL WIRING
Changer Part Nos. 35-1285, 35-1289



ELECTRICAL WIRING
Changer Part No. 35-1286

FIG. 1

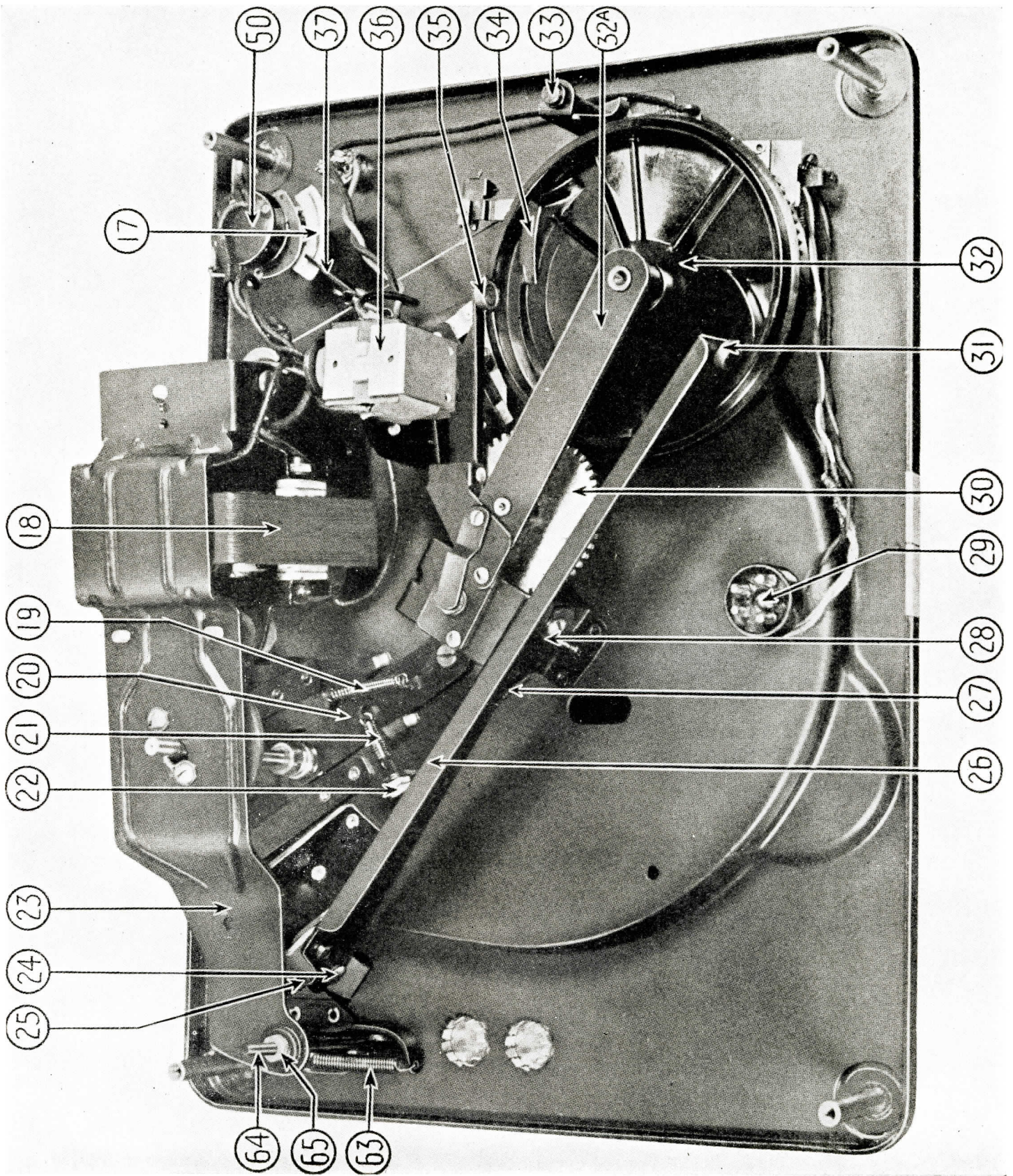


FIG. 2

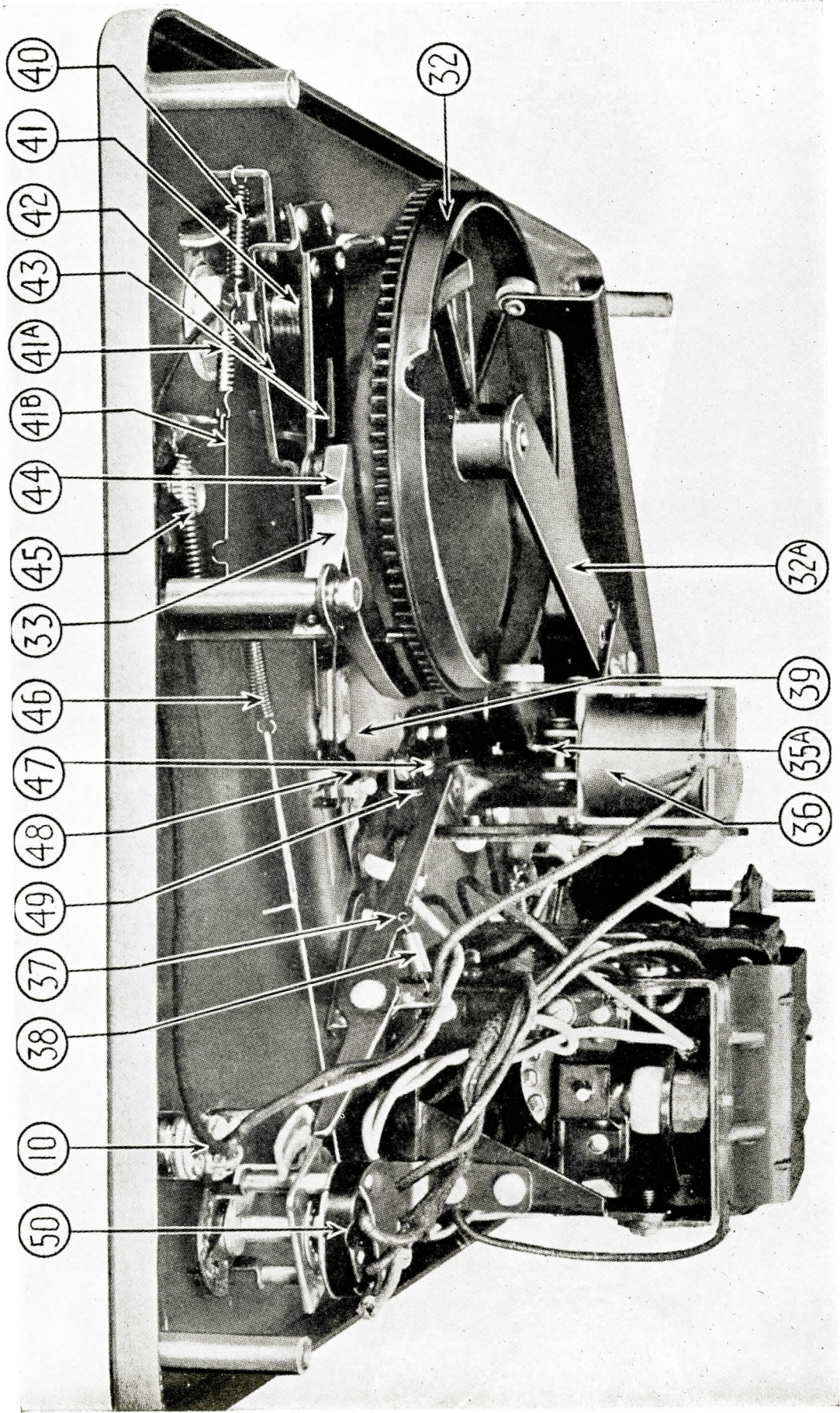


FIG. 3

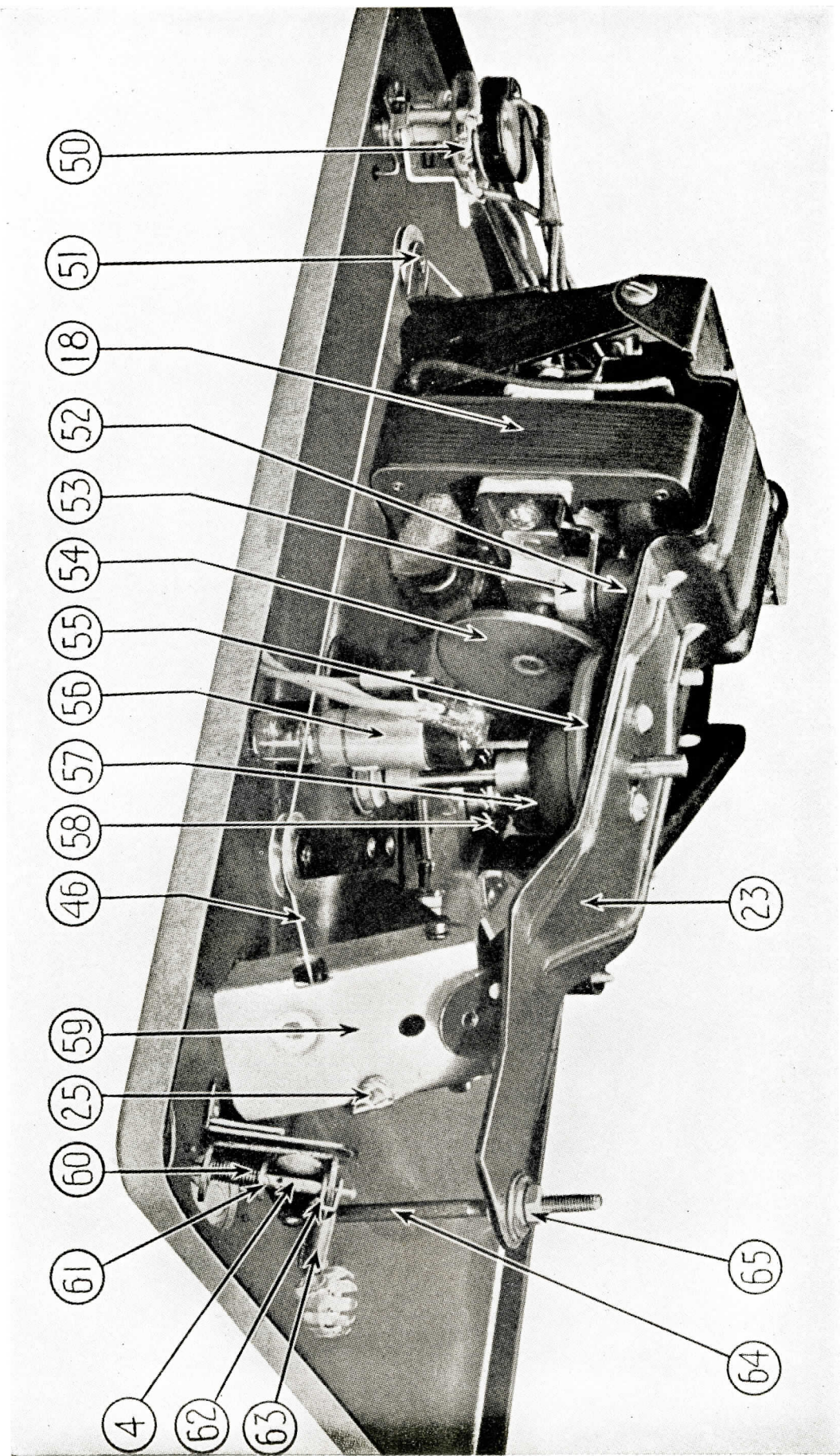


FIG. 4

REPLACEMENT PARTS - - AUTOMATIC RECORD CHANGER

PART NUMBERS 35-1285, 35-1286, 35-1289

<i>Photo No.</i>	<i>Description</i>	<i>Part No.</i>	<i>Photo No.</i>	<i>Description</i>	<i>Part No.</i>
1.	10-inch Record Shelf (Changer 35-1285)	318-2805		Tone Arm Bracket	218-1424
	10-inch Record Shelf (Changer 35-1286)	35-2545		Tone Arm Stem	218-1425
	10-inch Record Shelf (Changer 35-1289)	35-2545		Screw (Adjusting Tone Arm)	218-1428
	String Guide (Plastic)	218-1438		Nut (Adjusting Screw)	218-1426
2.	Record weight assembly (Changer 35-1285)	318-2804		Snap Ring	218-1431
	Record weight assembly (Changer 35-1286, 1289)	35-2559		Ratchet Spring	218-1427
	Mtg. Screws	W-685FA9		Counter Weight	318-2799
3.	12-inch Record Shelf (Changer 35-1285)	318-2806		Mtg. Screw	218-1432
	12-inch Record Shelf (Changer 35-1286, 1289)	35-2546		Tone Arm Ball Bearings	218-1466
	Mtg. Shaft (Changer 35-1285)	218-1440		Retainer Assembly (Balls)	218-1465
	Mtg. Shaft (Changer 35-1286, 1289)	35-2550		Washer (For Bearing Retainer)	218-1464
	Mtg. Spring	218-1439		Tone Arm Shaft Bearing (Deluxe)	35-2551
4.	Speed Control Knob (Changer 35-1285)	318-2815		Tone Arm Shaft Bearing (Standard)	218-1467
	Speed Control Knob (Changer 35-1286, 1289)	35-2548	14.	Mtg. Nut	218-1468
	Escutcheon (Changer Standard)	218-1473		Mtg. Lockwasher	218-1469
	Escutcheon (Changer Deluxe)	35-2558	14.	Tone Arm Height Adjusting Screw	218-1428
	Mtg. Screws	218-1474	15.	Turntable (For Record Changer 35-1285)	318-2838
5.	Mtg. Screws	218-1471		Turntable (For Record Changer 35-1286)	35-2554
6.	Mtg. Springs	218-1470	16.	Spindle Assembly (Standard)	318-2794
7.	Changer Carrier Assembly	318-2818		Spindle Assembly (Deluxe)	35-2606
8.	Automatic-Manual-Off Plate (For Changer Standard)	218-1444		Spindle Nut	218-1408
	(For Changer Deluxe)	35-2557		Spindle Sleeve Nut	218-1409
9.	Knob (Standard)	217-1393		Ball Bearing and Retainer Assembly	318-2793
	Knob (Deluxe)	35-2552		Washer	218-1406
9.	Reject Switch (For Changer Standard)	412-1025		Clutch and Gear (Bakelite)	218-1401
	(For Changer Deluxe)	35-2555		Spring	218-1403
11.	Tone Arm Support (For Changer 35-1285)	318-2796		Washer	218-1405
	(For Changer 35-1286)	35-2549		Sleeve (For top of spindle) (For Deluxe New Type)	218-1500 35-2607
	Mtg. Rivet	W-2293FA3		Turntable Cone and Spindle Sleeve	318-2795
12.	Tone Arm Positioning Adjusting Hole		17.	Manual-Automatic Positioning Plate (Part of 50)	
13.	Tone Arm Assembly (For Changer 35-1285)	35-2518	18.	Motor (115 volts, 60 cycles, for changer 35-1285)	318-2802
	Tone Arm Assembly (For Changer 35-1286, 1289)	35-2519		(115 volts, 60 cycles for changer 35-1286, 35-1289)	35-2553
	Bakelite Head	35-2540		Connectors Solderless (cable)	217-1395
	Tone Arm Support Bracket	318-2790		Motor Mtg. Plate Assembly	318-2803
	Tone Arm Adjusting Ratchet and Shaft Assy.	318-2800		Mtg. Washers (Copper)	218-1433
				Rubber Mtg. Grommets (Light Color)	217-1390
				Rubber Mtg. Grommets (Black)	217-1391
				Mtg. Sleeves	218-1434
				Mtg. Screws	W-1649FA3
			19.	Spring (Drive Tension)	218-1458
			20.	Upper Bearing Support	218-1520
			21.	Spring (Upper Bearing Support)	218-1459
				Rivet	56-6189

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<i>Photo No.</i>	<i>Description</i>	<i>Part No.</i>	<i>Photo No.</i>	<i>Description</i>	<i>Part No.</i>
22.	Screw	218-1460	45.	Spring (Cam Switch)	35-2562
	Nuts	W-317FA3	46.	Spring (Shelf Plate String)	318-2817
	Bushing	218-1441	47.	Adjusting Screw (Pulsating Lever)	218-1384
23.	Motor Mtg. Plate	318-2803		Spring Adjusting Screw	218-1382
	Tension and Bearing Assembly	35-2604	48.	Trip Switch Assembly	318-2786
	Screws	W-1475FA3		Trip Hub	218-1387
	Nuts	W-317FA3		Screw	218-1385
24.	Screw (Shelf Lever)	W-1475FA3		Lock Nut	218-1386
	Nut (Shelf Lever)	W-544FA3		Contact Lever	318-2770
25.	Shelf Lever Adjusting Screw	35-2567		Contact Lever Shaft	218-1388
	Nut	35-2568		Insulator	217-1383
26.	Shelf Lever and Roller	318-2814		Pigtail	218-1375
27.	Spring	35-2603		Rubber Roller	217-1385
28.	Eccentric Cam (Adjusting Shelf Lever)	218-1404	49.	Pulsating Lever (Part of 39)	
	Mtg. Screw	W-453FA3	50.	Automatic Changeover Switch	35-2547
29.	Male Plug (Phono Input)	217-1396	51.	Pulley Assembly (Cord Guide)	318-2798
30.	Intermediate Gear (2 required)	218-1391		Mtg. Screw	218-1415
	Screw	W-2150FA3	52.	Rubber Grommet (Black)	217-1391
	Washer	218-1392		Grommet Sleeve	213-1434
	Spring Washer	218-1507	53.	Rubber Grommet (Light Color)	217-1390
31.	Shelf Lever Roller (Part of 26)			Mtg. Screw	W-1649FA3
32.	Cam Gear Assembly	318-2787		Grommet Sleeve	218-1434
	Mtg. Screw	W-2284	54.	Drive Disc Assembly (Motor)	35-2564
	Late type washer on hub	217-1419	55.	Turntable Drive Disc Assembly	318-2811
32A.	Mtg. Bracket (Intermediate and Cam			Vertical Shaft	218-1521
	Gears)	318-2768		Bearing	218-1449
	Mtg. Screw (Brackets to spindle			Brass Cup Washer	218-1447
	bracket)	W-685FA3		Collar and Screw	318-2812
33.	Cam Switch Assembly	318-2816		Washer (2 required)	218-1446
	Mtg. Ring	218-1461		Turntable Drive Wheel	218-1448
34.	Shelf Lever Bump (Part of 32)			Screw	218-1450
35.	Clutch Lever and Roller Assembly	318-2810	56.	Neon Lamp Socket	318-2808
	Mtg. Screws	W-685FA3		Neon Lamp (Standard)	34-2482
35A.	Solenoid Armature (Part of 35)			Neon Lamp (Deluxe)	35-2556
36.	Reject Solenoid	318-2875	57.	Clutch and Gear (Part of 16)	
	Mtg. Screws	218-1398	58.	Turntable Hub and Core (Part of 15)	
	Mtg. Washers	218-1397	59.	Shelf Carrier and Stud Assembly	
37.	Manual Switch Lever and Bracket Assy.	318-2813		(Standard)	318-2755
	Mtg. Screws	W-2150FA9		Shelf Carrier and Stud Assembly	
38.	Spring (Manual Switch Lever)	35-2565		(Deluxe)	35-2561
39.	Pulsating Plate and Lever Assembly	318-2785		Carrier Shaft	218-1451
	Mtg. Screws	W-2150FA3		Carrier Clips	218-1452
	Pulsating Spring	218-1378		Rubber Bump	217-1392
40.	Spring (Positioning Lever)	35-2566	60.	Spring (Speed Adjusting Knob)	218-1453
41.	Trip and Positioning Assembly	318-2786	61.	Washer (Holds 60 in place)	218-1456
41A.	Lead in Spring	218-1463		Wire Pin (Holds 60 in place)	218-1457
41B.	Lead in Spring Link	218-1462	62.	Speed Control Hook	218-1454
42.	Velocity Trip Lever (Part of 41)		63.	Spring (Speed Lever)	218-1455
43.	Tone Arm Positioning Lever		64.	Motor Control Assembly (Includes	
	(Part of 41)			Shaft and Bracket)	318-2820
44.	Selector Cam	217-1386	65.	Motor Control Adjusting Nuts	W-317
	Mtg. Screw	97-0138FA3		Washers	218-1442
	Spring	218-1393			

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II. RECOMMENDED TEST OF PHILCO AUTOMATIC RECORD CHANGERS

1. TEST PUSH-OFF ADJUSTMENT

A. *Test maximum push-off.* Manually start a change cycle and turn the turntable until the push-off mechanism roller is at the top of the push-off cam (on the master cam). This is the maximum "push" position. (FIG. 5.) Slip the Part No. 45-2959 push-off gauge over the center spindle with the 12" index towards the record shelves. Drop the gauge below the record shelf on the center spindle and set the end of the gauge on the 12" record shelf.

Move the gauge up and down on the spindle. You should be able to lower and raise the gauge until the top of the gauge is level with the shelf on the center spindle. Raising the gauge to this position should require firm pressure but there must be no binding. All play in the spindle with this test should be taken up away from the shelf. If binding is present or if the gauge fits loosely against the center spindle, the 12" record shelf cam must be readjusted so that the gauge may be moved freely but not loosely up to the shelf on the center spindle. This test should be repeated on the other 12" record shelf and the gauge should then be reversed and the 10" push-off record shelves checked in the same manner. (Fig. 6.)

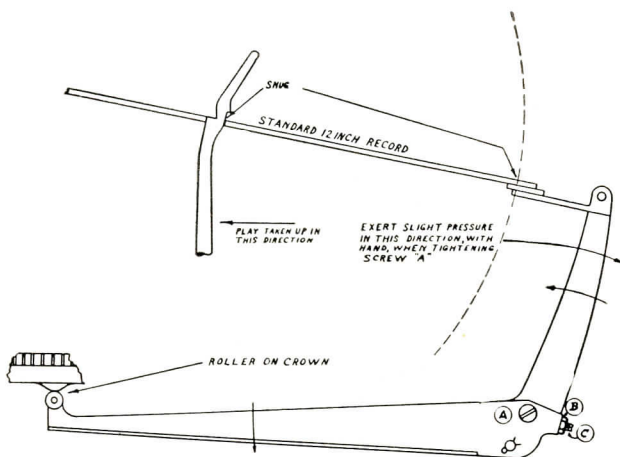


FIG. 5

If the adjustments are very far out it is advisable to reset the push-off arm assembly by setting the 12" record shelf cams in neutral and resetting the forward shelf motion adjustment screw (See "C", Fig. 5), so that the gauge fits snugly against the record shelf cams and the center spindle. Be sure that the adjustment you

make holds after the locking screw B, in Fig. 5, is tightened.

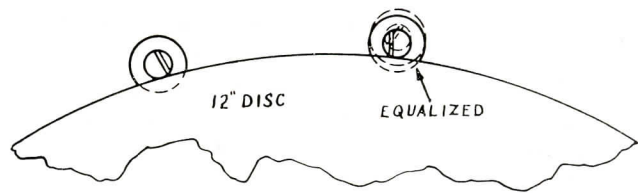


FIG. 6

B. Check adjustment of record shelf mechanism in the record playing position. Manually complete the change cycle, slip the push-off gauge over the center spindle with the 12" index towards the record shelf and rest the end of the gauge on the 12" record shelf. The end of the gauge should fit down over the eccentric onto the shelf. If it does not, adjust the eccentric cam No. 28 (Fig. 2), until the gauge fits firmly but freely onto both 12" record shelves. Reverse the gauge and drop the 10" shelves into position. The gauge should fit firmly but freely onto the 10" record shelves.

The shelf on the spindle is approximately .090 inch, although some spindles are working satisfactorily with slightly less shelf depth. Even though the shelf might be less than .090 inch, do not replace it unless trouble is encountered with more than one record dropping continuously. The depth is checked by laying the push-off gauge edgewise on the shelf.

NOTE I: Overpushing causes more than one record to drop at a time and enlarges the hole in the center of the record rapidly. Correct adjustment of the push-off mechanism overcomes this trouble.

NOTE II: Observe whether a 12" record rests on both record shelves without the record weight assembly (No. 2 in Fig. 1). The record may be as much as $\frac{1}{4}$ " off one of the shelves without affecting the operation of the unit, but if it is more than that, the center spindle may have been installed off its vertical position and requires reassembling.

NOTE III: The pressure roller should be in line with center of shelf and spindle.

2. TEST THE DRIVE ASSEMBLY

A. Push the vertical drive back (clear of the turntable) and spin the turntable. The latter should

revolve smoothly without chatter or vibration. If it vibrates it should be removed and the bearing washers checked to make certain that the cup-shaped washer is in the right position. The bearing washers and the turntable spindle should be lubricated with an application of light grease.

- B. Remove the turntable and hold the motor armature back against its end thrust spring. Spin the vertical drive. It should revolve freely after a hard spin. If there is friction in the vertical drive remove the upper pulley and drop the motor mounting bracket down so that the vertical drive may be removed from the mechanism. Check the fit of the upper bearing to the vertical shaft. If this is tight or rough, dress the vertical drive shaft with crocus cloth so that its surface is smooth. If friction exists between the shaft and the upper bearing, the bearing may turn and make the changer noisy or slow up the motor and cause erratic speed.

Check the trunnion bearing which is mounted on the main motor bracket. This bearing must be freely mounted in its supporting frame assembly. When raised it should drop readily and move freely on its shaft. If this bearing is restricted, bend the supporting frame slightly until the trunnion bearing is free to move. After this operation, check to make sure that when the vertical drive shaft is in place through the trunnion bearing, it will clear the hole in the motor mounting base. Reassemble the vertical drive and lubricate the upper and lower bearing with light grease or 20 S.A.E. oil.

- C. Check friction in the motor by holding the armature shaft assembly away from the driving bell by means of the fibre piece at the end of the motor shaft. Turn the motor on and then turn it off. The motor should run freely and gradually lose speed until it stops. If there is friction in the bearings the motor will stop quickly and will not turn freely when checked by hand. If the self-aligning bearings in the motor are restricted, push the shaft against the sides of the bearings in a rotary motion so that the self-aligning motor bearings free themselves.
- B. Visually inspect the angle of the vertical drive from the front. Replace the turntable and watch the vertical drive for motion from the side. If there is no motion present, this means that the vertical drive assembly is restricted and is not following the inside surface of the turntable. If this motion is excessive, check the inside rim of the turntable for roughness or flats.

The vertical drive must be adjusted so that it is three degrees past vertical and the supporting bracket should move freely. Also check the position of the vertical drive. The trunnion bearing must be located directly beneath the upper bearing. If it is not so located, use bending tool, Part No. 45-2957 to reform the motor base so that the trunnion bearing is properly located with respect to the upper bearing. This can also be checked by turning on the turntable and setting the stroboscope so that the lines stand still. Move the motor base forward and back. If the lines speed up while you are moving the base you can be sure that the lower bearing is binding. Bend the motor base until this binding is eliminated.

3. CHECK TONE ARM

- A. Weigh the needle pressure and adjust for $1\frac{1}{4}$ oz. weight, with Part No. 45-2958 two-ounce scale.
- B. Check vertical friction in the tone arm. With the pick-up resting on the turntable, raise the pick-up head with the 2-oz. scale to a height equal to the top of a full stack of records. Observe the weight recorded by the scale as the tone arm is raised. Now, lower the scale and observe the weight recorded as the tone arm is lowered to the table. The difference in reading between raising and lowering represents vertical friction in the assembly. This must not exceed $\frac{1}{4}$ oz. If it does, make sure that the tone arm housing does not touch any part of the support mechanism. Also make sure that there is no friction between the U supporting brackets.
- C. Measure the tone arm horizontal drag. This should be measured with Part No. 45-2953 pendulum scale. This resistance should be measured over the area the tone arm is moved when playing a complete 10" record. Measure tone arm drag on the scale both from the outside to the inside and then from the center of the record back to where the lead-in spring affects the reading. Average the readings obtained in both directions. It must not exceed $\frac{1}{8}$ oz. (2 divisions on the scale). Excess friction may be caused by rough ball race washers, incorrect assembly of the ball race (burrs on the edge of the ball race must be up) or a tight fit between the tone arm shaft and the tone arm bushing. It may also be caused if the tone arm shaft assembly has been assembled too tightly. It should be reassembled with a five thousandths of an inch clearance between the bottom ball race washers and the brass bearing bushing so that sufficient vertical play is allowed.

The lift pin which the cam engages in order

to raise the tone arm for the automatic change cycle must not touch the cam throughout the travel of the tone arm. To check this make sure that the pin can be depressed slightly before it touches the cam in all parts of the tone arm travel.

There must be no lubricant in the tone arm assembly other than a light oil to prevent rusting. Shaler Rislone added to 20 W motor oil will not run away from these surfaces, and is therefore recommended.

Some plastic tone arms were assembled with incorrect counterbalance weights. If all parts in the tone arm assembly are perfect this will have no effect on the amount of tone arm drag. The tone arm will be much less critical with respect to the parts in the assembly if the correct counterbalance is put into the tone arm. Therefore, before disassembly of the tone arm mechanism, check the counterbalance and put in a 3-oz. weight (Part No. 218-1531) in plastic arms.

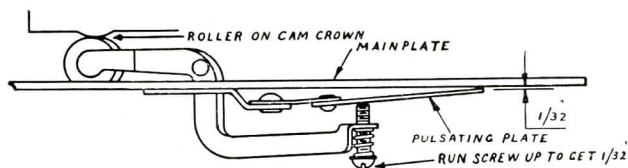
CAUTION: If it is necessary to take the tone arm shaft assembly apart, do so by first removing the trip assembly and then removing the nut and lockwasher beneath the turntable base so that the complete shaft assembly is removed, including the bearing bushing. Burrs on the tone arm shaft are drawn through the bearing bushing. If these burrs are drawn through the bushing, they will score it permanently and ruin it.

- D. Inspect the light on the cell for—
- Width. It may be necessary to twist the bulb socket slightly so that creep of the rubber bushing around the lamp assembly can be overcome. **CAUTION:** *Hold lamp barrel with thumb while adjusting.* By twisting the fibre socket holder with long nose pliers, it is possible to twist the bulb assembly much closer to the lens and consequently bring the image of the filament to a much wider image on the photo-cell. Where this does not provide enough adjustment, remove the lamp and turn it 180° in its socket. If the image is still too narrow (it should be 5/32" wide) replace it with another lamp (Part No. 34-2478).
 - Location. The light should fall on the side of the photo-cell towards the center spindle, and should be 1/2 on the cell. If this is impossible, rotate the bulb 180°.
 - Brightness. Check the adjustment of the oscillator light control to make sure that sufficient light is developed.
 - Test the flexibility of the mirror assembly. Rest the needle in a record groove and meas-

ure the pull required (away from the spindle) to move the light fully onto the cell. This should not exceed 3/4 oz. Stiff rubber bushings would require replacement of the mirror assembly. In making this test you automatically check for loose screws in the mirror assembly which would be indicated if the light is pulled onto the cell with considerably less than 3/4 oz.

4. TEST THE TRIP WITH THE SWITCH IN AUTOMATIC POSITION AND POWER OFF

- A. Visually inspect the clearance of the trip pulsating plate from the base plate by turning the turntable until the cam pulses the plate to its maximum position. The plate must not touch the changer base plate. (Fig. 7.)



- B. With the trip pulsating plates fully pulsed, move the tone arm by hand throughout its full range of operation.
- The gap between the pulsating plate and the rubber wheel must be uniform throughout the full range of movement of the tone arm. If necessary, reform the springs that support the plate. Improper adjustment of trip arm or pulsating plate may cause light to be pulled off cell.
 - Rotate the turntable manually until the pulsating plate is unpulsed and check the rubber tire height by moving the tone arm in and out to make sure that there is sufficient pressure on the trip rubber tire to guarantee positive trip action.

With the tone arm on the rest, depress the trip arm and allow it to return to its normal upward position. If the trip arm returns to its normal position without binding or hanging up in several spots and if the normal position is positive, the "V" spring in the assembly is performing its function and has taken up all looseness in the trip arm mechanism. If this action is not positive, bend the "V" spring bracket.

5. TEST THE CLUTCH

Attach an 8-oz. scale (Part No. 45-2851) to the clutch roller at the master cam as close to the roller as possible. With the changer running in the automatic position, the change cycle should be started with a five to eight-ounce pull on the clutch roller. If more than 8 oz. is required to start the change cycle, the trouble may be due to tight fit between the idler and clutch gears. This fit can be freed by loosening the idler gear bracket mounting screws and forcing the idler gear bracket away from the clutch gear by prying the bracket against the spindle nut. It is necessary to keep pressure on the idler gear bracket while the mounting screws are tightened. Only a few thousandths of an inch are required in order to loosen any binding that may be present. The condition may also be caused by too great tension of the clutch release spring.

Manually start the changer in a change cycle and make sure that some looseness exists between the clutch roller and the master cam. If the roller is tight on the master cam, the forked clutch is raising the lower clutch gear too far and is actually raising the turntable in operation. There should be a slight gap between the lower and upper clutch gears which can be obtained with a bending tool in case the fit is too snug. The part number of this bending tool is 45-2948.

6. CHECK OPERATION OF SOLENOID

When the reject button is pressed, the solenoid should bottom without vibration or humming. To correct trouble in the solenoid put the changer in a change cycle position manually, loosen its mounting screws and energize the solenoid coil electrically. This will raise the solenoid field to its correct position. Holding the circuit closed so that the field stays in the right position, tighten the mounting screws and lock them firmly in place.

III. TESTS AND ADJUSTMENTS

The Record Changer is an electrically powered, mechanical device performing a varied number of functions. It must be used by all kinds of people, on all kinds of records and under these conditions, the mechanical adjustments are quite critical. It is only reasonable to assume that a record changer must be tried out in the owner's home by the dealer and re-adjustments made wherever necessary.

The first requisite when installing a radio-phonograph is to remove all of the packing material. Then loosen the four shelf-mounting screws. The record changer must float freely on the four mounting springs.

All adjustments are carefully made at the time the record changer is assembled and it is given other thorough check tests when it is installed in the phonograph cabinet. These

When the record changer under test is connected to the phonograph, the "PHONO" button is depressed to permit operation of the changer. When any other reception button is depressed, the 110-volt supply is disconnected from the changer, but the 6-volt supply is not. Therefore, the solenoid adjustment is greatly simplified by depressing a station push button and then holding down the REJECT button on the changer. The solenoid assumes the correct position but the changer will not run even though the changer switch is in AUTOMATIC position.

7. CLEAN AND LUBRICATE

Dress the rubber tire on the driving bell to approximately $1/32$ " tread. Dress the rubber pulley which drives the turntable, with a file to smooth the tire surfaces and remove roughness. It is also advisable to dress the surface of the metal driving disc with crocus cloth or No. 400 sandpaper so that its area is clean and free from the uneven or rough areas.

Move the motor on its rubber mounting. This moves the contact point between the driving disc and the rubber driving bell. With the changer running, there should be an increase in the sound of tire scrubbing. If a noticeable decrease is obtained it would be advisable to shim the motor so that the driving disc engages the rubber tire of the bell at the angle where tire scrubbing noise is lowest. Apply a small amount of light grease to the upper bearing of the vertical drive assembly and also to the washers and shaft of the center spindle beneath the turntable. Check the bottom surface of the turntable cam for smoothness. If necessary smooth down with fine sandpaper (No. 400) and lubricate lightly with light grease. Check the location of the trip pulsating plate fibre pulley to make sure that the trip arm fibre engages the turntable in the middle of the cam. The fibre must not rub against the body of the turntable cam.

checks are actual working checks using records, and the operation of the record changer is carefully observed. When a record changer is finally delivered and set up in the home, it is possible that it may be necessary to touch up some of the adjustments.

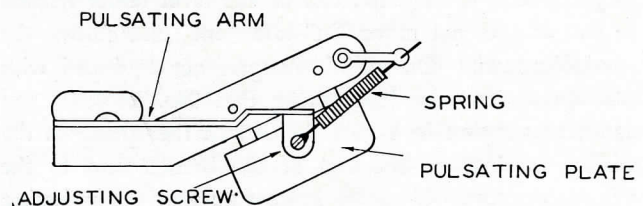


FIG. 8

Basically, changes were made to overcome three conditions:

- A—Rumble in the early production sets, particularly on the Models 42-1010 and 1016.
- B—Erratic operation of the trip mechanism.
- C—Flutter and change of speed.

A. The rumble in the Models 42-1010 and 1016 can be easily corrected by replacing the turntable bearing. Remove the turntable and the spindle and then take out the brass cone and the ball bearings and washers. Rebuild the bearing, using the old washers and the new flat fibre washer and the concave steel washer. Add "Stay-Put Grease" or light grease between the washers to eliminate friction. When replacing the spindle assembly, the spindle must be more than $\frac{1}{2}$ turn loose while lining it up with the record support shelf.

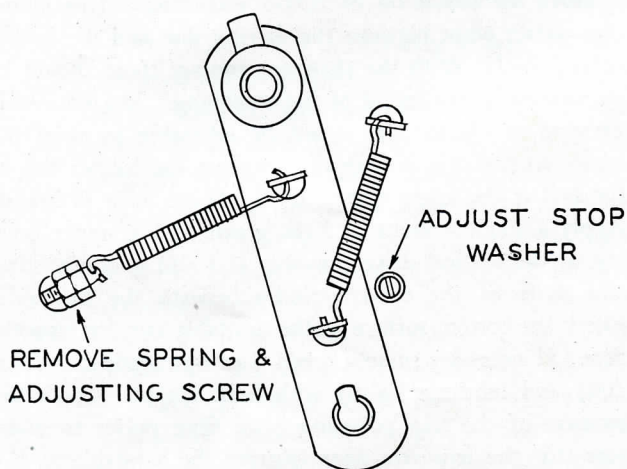


FIG. 9

B. The pulsating plate in the trip mechanism is actuated by the pulsating arm and the cam on the underside of the turntable. If the pulsating arm is loosely riveted to the bracket, the screw on the end of the pulsating arm will move back and forth over the pulsating plate. This changes the distance the plate is lifted by the pulsating arm and affects the trip adjustment. A spring has been added in production to hold the end of the lever under tension so that it does not move "in" and "out" and change the trip adjustment. On record changers not equipped with this spring, use the lead spring Part No. 28-8919 and connect as shown in Figure 8. Attach the spring to the wiring terminal on the end of the bracket and to the adjusting screw. Check to make sure that the pulsating roller does not scrape the hub on the underside of the turntable.

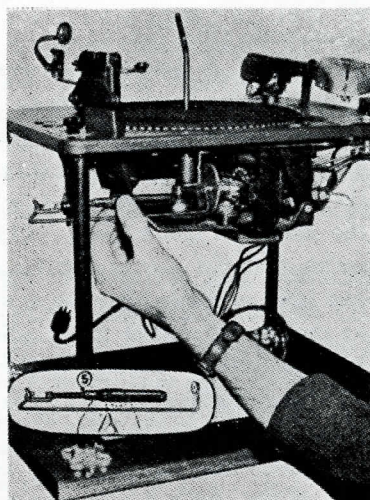


FIG. 10

C. Flutter and change of speed is caused by friction in the vertical drive assembly and by the action of the regeneration spring. The following changes involving the regeneration spring and the vertical drive assembly should be made on every changer on which there is an opportunity to do so.

Remove the regeneration spring and the threaded adjusting screw and nuts.

Loosen the two bell-drive-disc bearing screws on the bottom of the motor mounting bracket.

Push the motor drive-disc and armature to the extreme right, against the thrust spring. Allow $\frac{1}{16}$ " clearance between the rim of the bell drive-disc and the motor drive-disc and tighten the two bearing screws securely.

The change consists of removing the cupped washer and the flat washer below the upper bearing plate. The collar should be reset allowing approximately $\frac{1}{32}$ " clear-

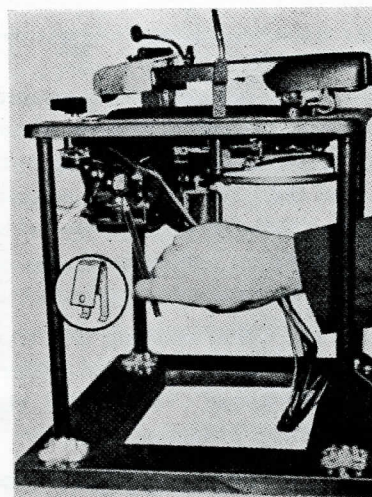


FIG. 11

ance between the collar and the upper bearing support. The oilless bearing should seat in the upper bearing support and should not turn with the vertical shaft.

Erratic speed with resulting power loss in the record changer can be traced to incorrect pressure between the drive disc and the rubber tread of the vertical drive. The condition is indicated by a glazing of the tire tread due to friction and gradual loss of speed during a two or three week period after adjustment.

Another cause of glazing and slipping is improper placement between the disc and the rubber tire, noticeable by the excessive amount of tire scrub noise. Check to be sure that the center line of the rotor is at right angles to the center line of the vertical shaft when viewed from the end of the motor.

The next step is to check the pressure between the disc and the rubber tire. This should be 5 ounces. Less pressure will produce slipping and glazing and greater pressure will produce a flat on the tire during periods of shutdown. The first condition produces power loss and slowing down of speed, and the second condition causes flutter in the reproduction.

The 5-ounce pressure between the disc and the rubber bell is not necessarily the end thrust spring pressure at the opposite end of the rotor shaft. In fact, this spring pressure will, in most cases, be greater than 5 ounces in

order to overcome gravity on the motor and some of the magnetic pull in centering the rotor.

Before starting to measure the actual thrust between the disc and the bell, clean the edge of the rubber tread with a sharp file and polish the disc face with crocus cloth.

Now proceed as follows:

1. Place the brass collar of the special end thrust spring adapter, Philco Part No. 56-6202, over the small cone in the center of the drive disc. (See Fig. 10.)
2. Hook the Philco 8-ounce scale onto the adapter as shown in figure 10.
3. Measure the pull required to just disengage the disc from the rubber bell so that the latter stops revolving. This reading should be 5 ounces.
4. If less than 5 ounces, additional end thrust pressure should be applied at the fibre end-piece on the opposite end of the motor. This can be accomplished by inserting the special flat spring, Philco Part No. 56-6201, as shown in figure 11. The slot of the spring is placed in back of the bracket which supports the fibre end-piece, and the portion of the spring with the indent hole bears against the fibre end.
5. Again check the end thrust pressure between the bell and the disc as described above. Adjust the spring pressure by bending with the fingers or with long nose pliers until the correct pressure of 5 ounces is obtained at the drive disc.

IV. RECOMMENDED TESTS WHEN INSTALLING PHILCO HOME RECORDER MODEL HR-2

1. DRIVE MECHANISM

- A. Drive sector must clear the push off arm of record changer. A notch has been provided for this purpose, but incorrect adjustment of push off arm and/or the use of too many spacing washers in the mounting at Hole "C" of the drive mechanism may cause the point of sector to strike push off arm. Readjust this arm in accordance with Figure 12. Check mounting of drive mechanism. Push-off arm may be filed slightly to clear if necessary.

On some of the early production changers the notch in the record push off arm for drive sector clearance was not provided. In this case it will be necessary to remove the push off arm from the changer and cut out this notch.

- B. Check recording index release mechanism. As cutting arm is lowered from upright position, index positioning should release when the arm is about 1" from turntable. Check cutting arm to see that its mounting bracket is pressed down firmly on the cutting arm shaft. Check index

adjusting screw position. (See figure 12.) Screw should be pressing push rod down when needle is approximately 1" above record. Slot in head of index adjusting screw on under side of cutting arm must be parallel to length of cutting arm. This index release causes throw-out bar to engage drive pulley with driving sector.

- C. Throw-out bar must operate smoothly to engage drive pulley with driving sector. Should bar be bent, burred or lack sufficient spring tension, slip-page will result.

2. CUTTING ARM

- A. Turn on motor. Tune in radio program, lift cutting arm at least 2" and swing cutting arm over turntable toward spindle. Needle should be vibrating and both neon lights should be flashing when volume is raised to high level. At the same time, speaker should be operating at a low volume level. Reduce volume to proper level before attempting to make a recording.

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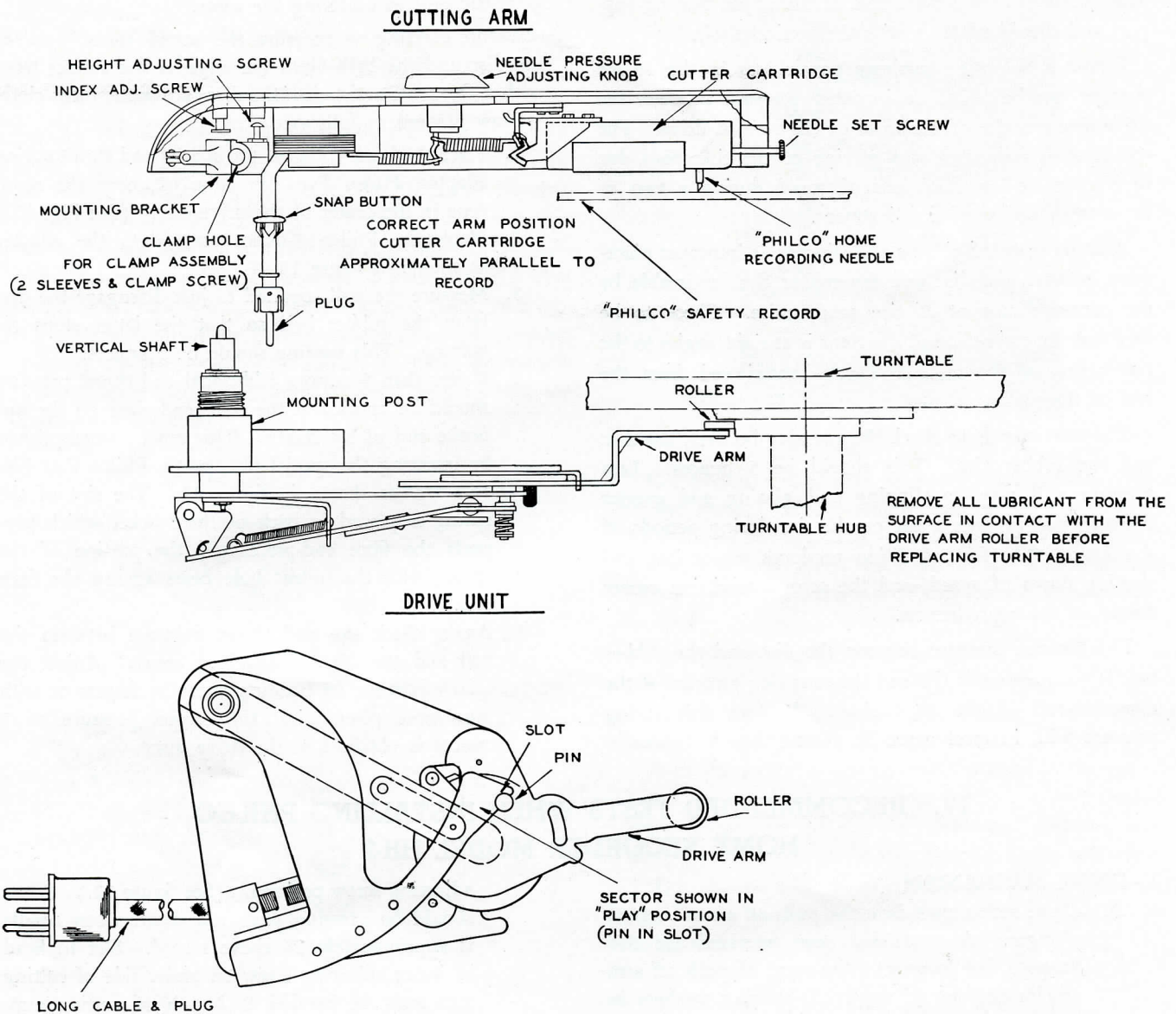


FIG. 12

- B. Check operation of "play-recording" switch. Move cutting arm all the way out to play position. Cutting needle should stop vibrating, neon lights should stop flashing, set speaker should resume full volume operation, and motor should stop.
- C. Check cutting arm height. Place a Philco Home Recording Blank on turntable, a Philco Home Recording Needle in cutting cartridge. Rest the needle on the record, pressing arm down snugly on height adjusting screw. Cutter cartridge should be parallel with the record. It should also have

some vertical play without touching cutting arm during entire cutting process and without striking the needle guard.

- D. Check cutting needle pressure. This is done by use of a two-ounce scale, Part No. 45-2958. Rest the needle on the record. Set the knob on top of the cutting arm to the middle position. Hook the scale under the needle screw and lift the scale slowly. At the moment the needle is lifted off the record by the scale, the most desirable condition is for the indicated weight to be one

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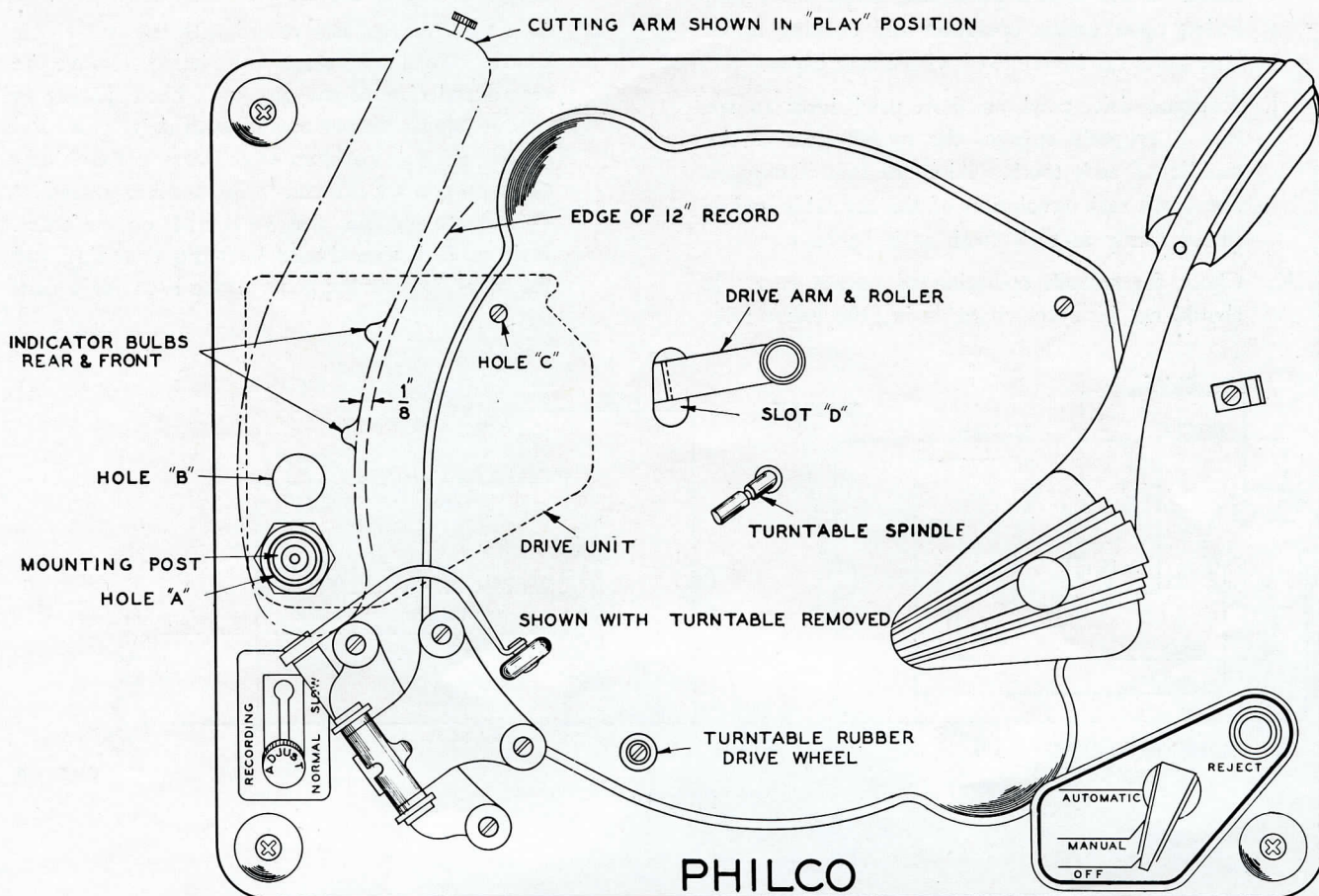


FIG. 13

ounce, with the knob in the middle position or in one notch either side. Lowest pressure will be with knob pointed toward cutter cartridge.

- E. Check for three indexing positions. Flat spring on throw-out bar must press ball indent into holes of driving sector when cutting arm is above a point about 1" over turntable. Check location of index positions with proper sized home recording blanks. Readjust location of cutter arm on shaft, slightly as required to secure proper indexing. In some cases where the ridges on the tapered sleeve have cut deeply into the vertical shaft, it may be necessary to remove both sleeves and reverse them, placing the tapered sleeve on the opposite side of the vertical shaft so that a new bite can be obtained.
- F. Check cutting arm clamp assembly for tightness. This must be very securely clamped.
- G. Check cutting arm shaft and driving sector for free smooth operation. Rotating sector should re-

main in line with drive pulley. Philco Lubricant, Part No. 45-2806, may be used to secure smooth operation.

- H. Check drive arm roller to be sure that it is riding the cam of the turntable hub assembly properly. This roller should ride fully on the cam, with the top approximately 9/16" above base plate of record changer when the roller is in its downward position. It should also move freely back and forth without binding in Slot D, Fig. 13. With the cutting arm in the "play" position and the turntable revolving, reach under the mechanism and touch the drive arm. If it is free, there will be no vibration, but if the roller is touching the under side of the turntable, scraping will be felt. With the cutting arm in the "recording" position, observe if there is an even pulse of the drive arm on each revolution of the turntable. Light grease should be used wherever any metal surfaces touch, but should not be used on the rubber roller.

PHILCO

- I. Examine turntable hub assembly for burrs at rivet holes. Burrs at this point may strike drive arm roller, cause erratic operation and clicking noise. Any burrs can be removed with emery paper.
- J. Examine drive-pawl on drive-pawl lever to see that it properly engages the ratchet gear in the middle of each tooth. Also see that it engages one tooth each revolution of the turntable and is seated firmly in each tooth as it operates.
- K. Check for smooth operation of ratchet gear. It should not bind anywhere during the entire rota-

tion. Make sure that there is no foreign matter caught in any of the teeth of the ratchet gear.

- L. As a final test, cut one record with the set volume control turned off. After completion, remove the record and observe the grooves. Even spacing of grooves shows proper operation of drive pawl and ratchet gears. Freedom from wavy pattern indicates proper adjustment. Cut another record at 78 R.P.M. one side and 39 R.P.M. on the other. Half of each side should be radio recording and the other half microphone. Play back for a final test.

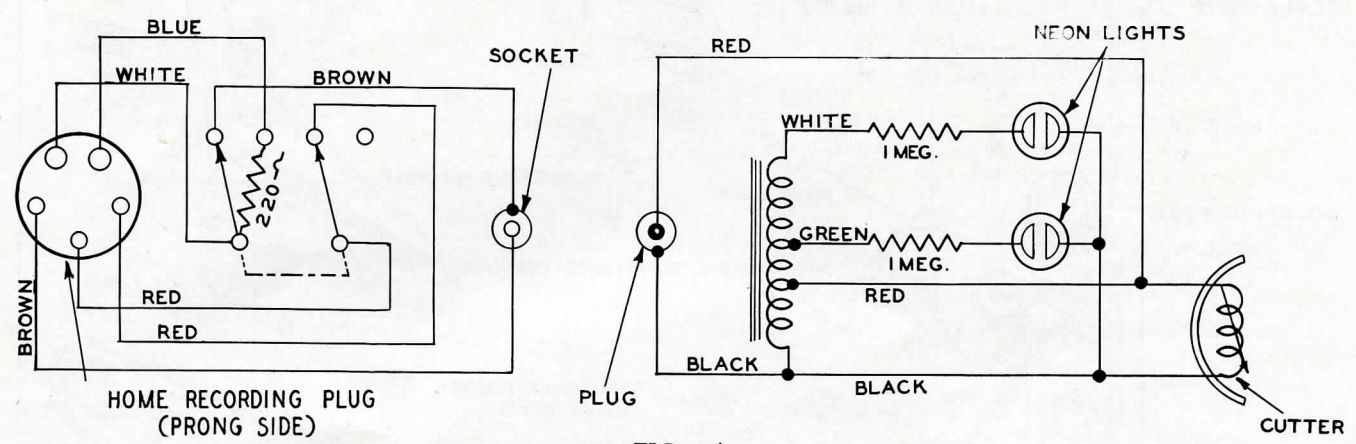


FIG. 14