

MODEL 2100 ELECTRIC SELECTOR SYSTEM

1. GENERAL DISCUSSION

The electric selector system combines the electrical functions of components contained in program units just described, the slug rejector assembly, the playrak, the selector button switch assembly, the electric selector assembly, the junction box and stepper assembly, and the power supply components of the Model 532 Amplifier. All of these units are interconnected electrically through cables, plugs, and sockets to form the electric selector system. As a complete system, it receives coins, sets up selection credits, cancels credits as selections are made, and accumulates the individual plays so selected on a selector drum capable of accumulating 200 separate selections. The function of the electric selector system is complete at this point.

2. DESCRIPTION

a. The slug rejector assembly (Fig. 23) is a product of National Rejectors, Inc. as described on page 4. The Wurlitzer electrical components consisting of the four unit coin switch (Item 2) and the plug and cable assembly (Item 1) provide the first electrical function of the electric selector system.

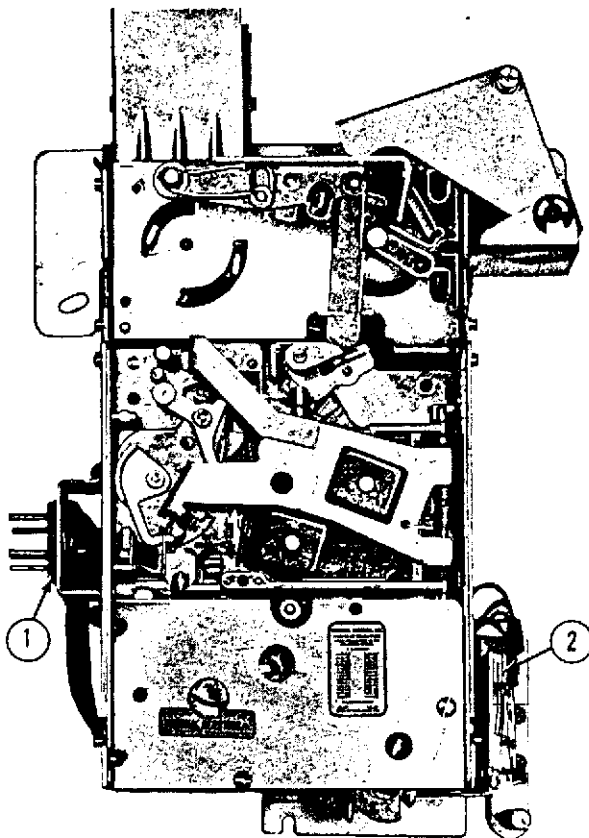


Fig. 23. SLUG REJECTOR

- 1. Plug, Wire, and Coin Switch Assembly
- 2. Coin Switch

68124

68550

68311

b. The playrak assembly (Fig. 24) receives one of four different electrical impulses from the coin switch each time a proper coin is deposited. The playrak mechanism (described on pages 5, 6, and 7) consists of two accumulator (escapement) wheels, a cancel wheel (Item 1) and cancel solenoid (Item 5), two stop levers, and two relays (Items 3 and 4). The functions of the playrak are: (1) To convert the various coin switch impulses to selection credits in accordance with the pre-determined price per play as set up on the stop levers and the 10 or 50¢ switch setting. (2) To establish the initial selection circuit for operation of the selector switch panel. (3) To cancel one of the credits racked up on the accumulator wheels each time a selection is made at the selector switch buttons. (4) To open the key switch (Item 2) and release timing relay No. 1 (Item 4) thus preventing further selection after all credits have been used and cancelled.

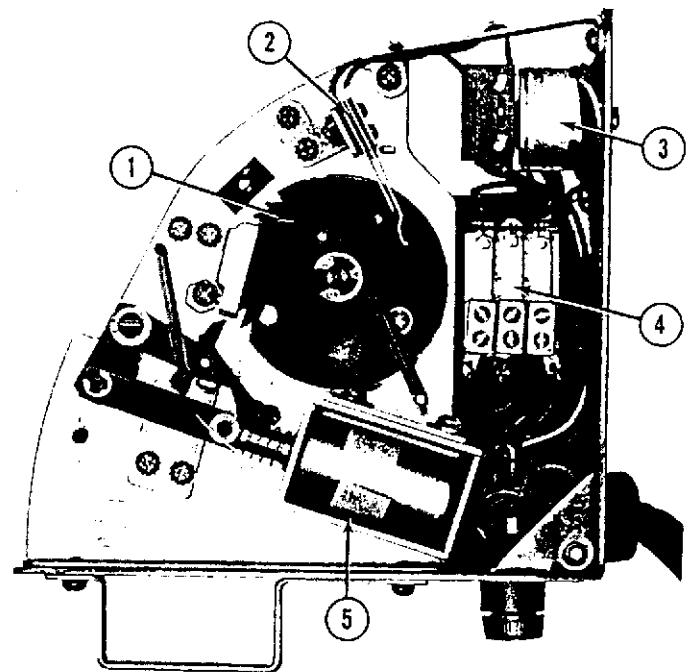


Fig. 24. PLAYRAK

68123

- 1. Cancel Wheel Assembly
- 2. Key Switch Assembly
- 3. Pulse Relay
- 4. Timing Relay No. 1
- 5. Cancel Solenoid

66124

66082

64796

68211

65069

c. The selector button switch assembly (Figs. 25 and 26) is made up of two letter switch banks of ten switches each and one number switch bank of ten switches. The two letter switch banks are mechanically linked to provide locking action for both switch banks while selection is being completed. The latch solenoid (Fig. 26) functions to provide latching action for

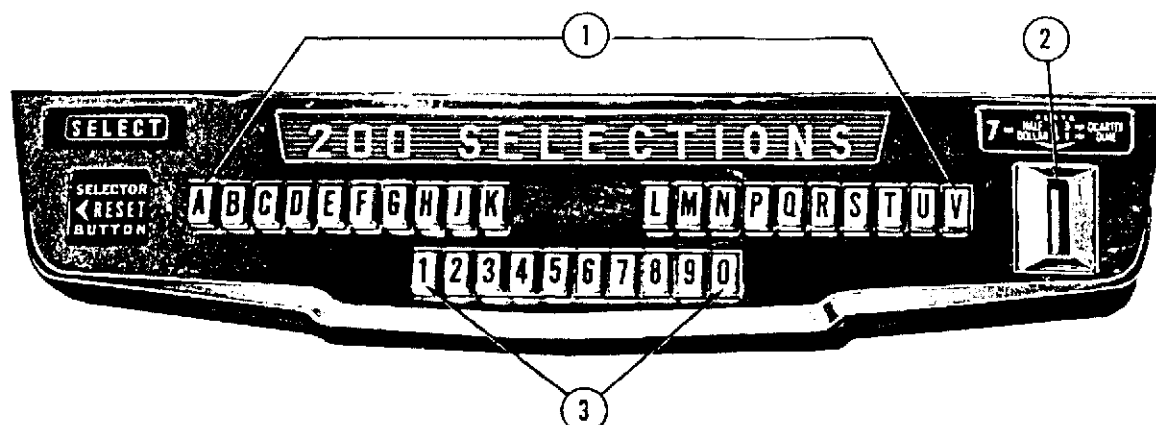


Fig. 25. SELECTOR SWITCH ASSEMBLY

68122

1. Letter Buttons
2. Coin Entry Casting 5, 10, 25, 50

65657 to 65676
67935

3. Number Buttons

65677 to 65686

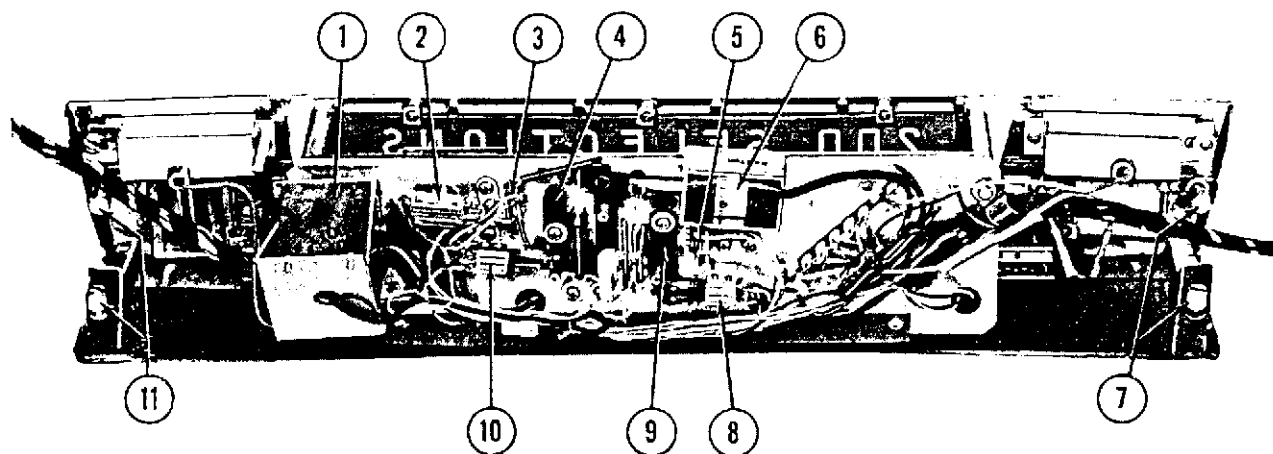


Fig. 26. SELECTOR SWITCH ASSEMBLY

1. Electric Counter
2. Free-Play Switch
3. Series Switch, Letters
4. Letter Latch (Trip Lever and Spacer Assembly)
5. Series Switch, Numbers
6. Latch Solenoid

45345
56233
64982
65010
64981
60717

7. Thumb Screw
8. Latch Switch, Numbers
9. Number Latch (Pawl, Stud, and Spacer Assembly)
10. Latch Switch, Letters
11. Thumb Screw

65124
60518
65745
60518
67129

any letter or number switch when it is pressed all the way in. Unless the "selector button release switch", located in the left hand cheek casting, is used, the letter or number selector switch will remain latched until the other number or letter switch is pressed and the selection completed. The "selector button release switch" permits the release of either a letter or a number switch any time before selection has been completed. The wiring of both the letter and number switches is a continuous series circuit, therefore, all letter or number switches beyond the one being used, will be isolated from the source of power and only the switch being used may receive the selection pulse. Both the number and the letter latch linkage (Fig. 26) are accompanied by the conventional latch switches. The latch switches are mechanically closed by their respective button linkages at the time the buttons are fully depressed for latching. As the latch levers of

either or both letter and number links engage their respective latches, the series switch for either or both will be opened by the corresponding latch arm. The letter and number series switches open to isolate the initial selection circuit until the selection has been electrically completed and the selector switches have been released for further selection. As the selection is made by the manual operation of the selector buttons as described above, a 28V D.C. circuit is completed to timing relay No. 2 and the series connected number solenoid. Following this relay circuit all selection circuits and associated functional circuits are electrically handled by the electric selector system.

Included in the selector switch assembly is the electric counter (Fig. 26) and a free-play switch for convenience in servicing.

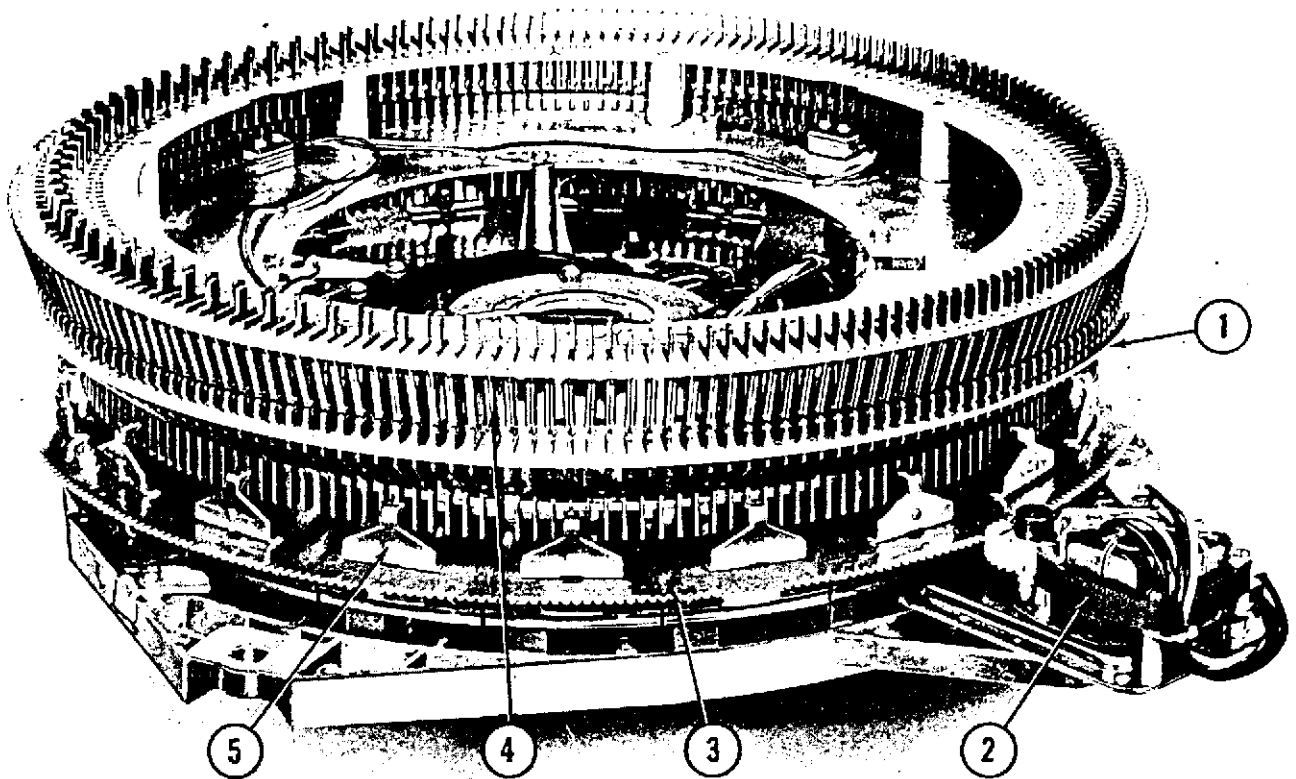


Fig. 27. ELECTRIC SELECTOR ASSEMBLY

68127

- 1. Selector Plates and Latch Pin Assembly
- 2. Motor and Gear Assembly
- 3. Rotating Plate and Rocker Assembly

68794
68796
68245

- 4. Spring, Latch Pin
- 5. Rocker and Bracket Assembly

110480
68807

d. The electric selector assembly (Fig. 27) consists of a circular drum containing 200 latch pins (Item 1) with their accompanying 200 retracting springs (Item 4). These latch pins are actuated by 20 rocker arms (Item 5) mounted on a rotating plate (Item 3) which is rotated about the latch pins by the selector

motor (Item 2). The selection or release of the latch pins is governed by the following components of the electric selector assembly:

- (1) The selector plates and latch pin assembly (Fig. 28) is made up of three types of latch pins

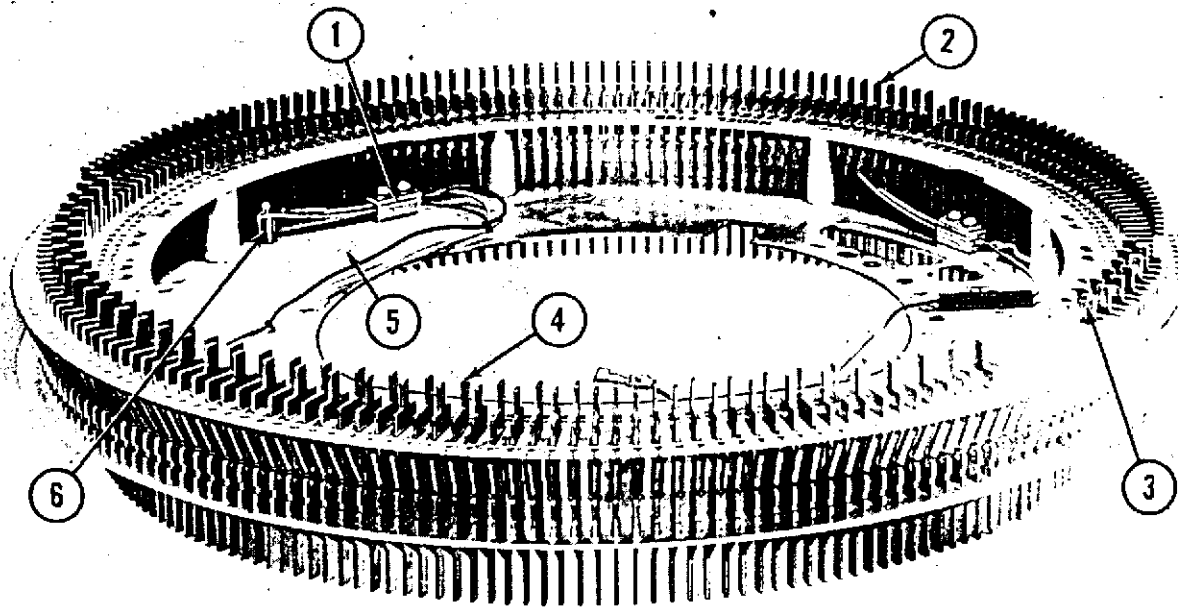


Fig. 28. SELECTOR PLATES AND LATCH PIN ASSEMBLY

- 1. Over-ride Switch
- 2. Latch Pin, Outer
- 3. Latch Pin, Intermediate

65952
67924
67923

- 4. Latch Pin, Inner
- 5. Lower Plate and Spacer Assembly
- 6. Spacer, Wobble Ring

67925
69492
68650

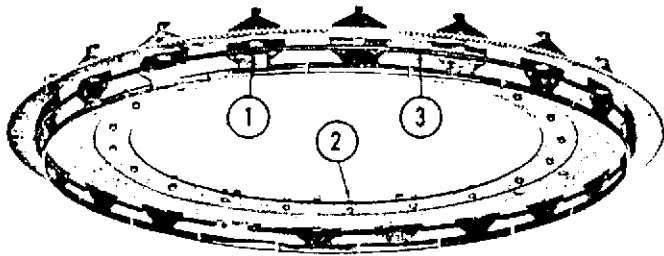


Fig. 29. ROTATING PLATE AND ROCKER ASSEMBLY 68245

1. Rocker and Bracket Assembly	68807
2. Stop Pin	68648
3. Spring	68755

ie. 100 latch pins, outer (Item 2) 50 latch pins, intermediate (Item 3) and 50 latch pins, inner (Item 4). Mounted on its lower plate and spacer assembly (Item 5) are four over-ride switches (Item 1) that are actuated by a wobble ring mounted on four spacers (Item 6). The wobble ring rests on the inner shoulder of the 200 latch pins, underneath the lower plate and spacer assembly. When one or more latch pins are released, the wobble ring will be displaced and will actuate one

or more of the four over-ride switches to start the playing cycle of the record changer.

(2) The rotating plate and rocker assembly (Fig. 29) serves to release the selected latch pin with one of its 20 rocker arm and bracket assemblies (Item 1). The entire rotating plate and rocker assembly rotates from power supplied by the selector drive motor indicated in Figure 27. The selector drive motor is a 24V A.C. reversible, capacitor type motor, mounted to a speed reducing gear box. The output drive gear which engages the rotating plate and rocker assembly is a moulded nylon gear. The 20 stop pins (Item 2) mounted in the rotating plate are provided for proper indexing of the 20 rocker arms. The long spring (Item 3) surrounding the 20 rockers keeps the rockers in a retracted position to permit free searching action of the rotating plate and rocker assembly.

(3) The selector casting (Item 2, Fig. 30) and the 20 letter solenoids (Item 1) function as a mounting base for all of the electric selector components. The 20 letter solenoids are equally spaced so that each

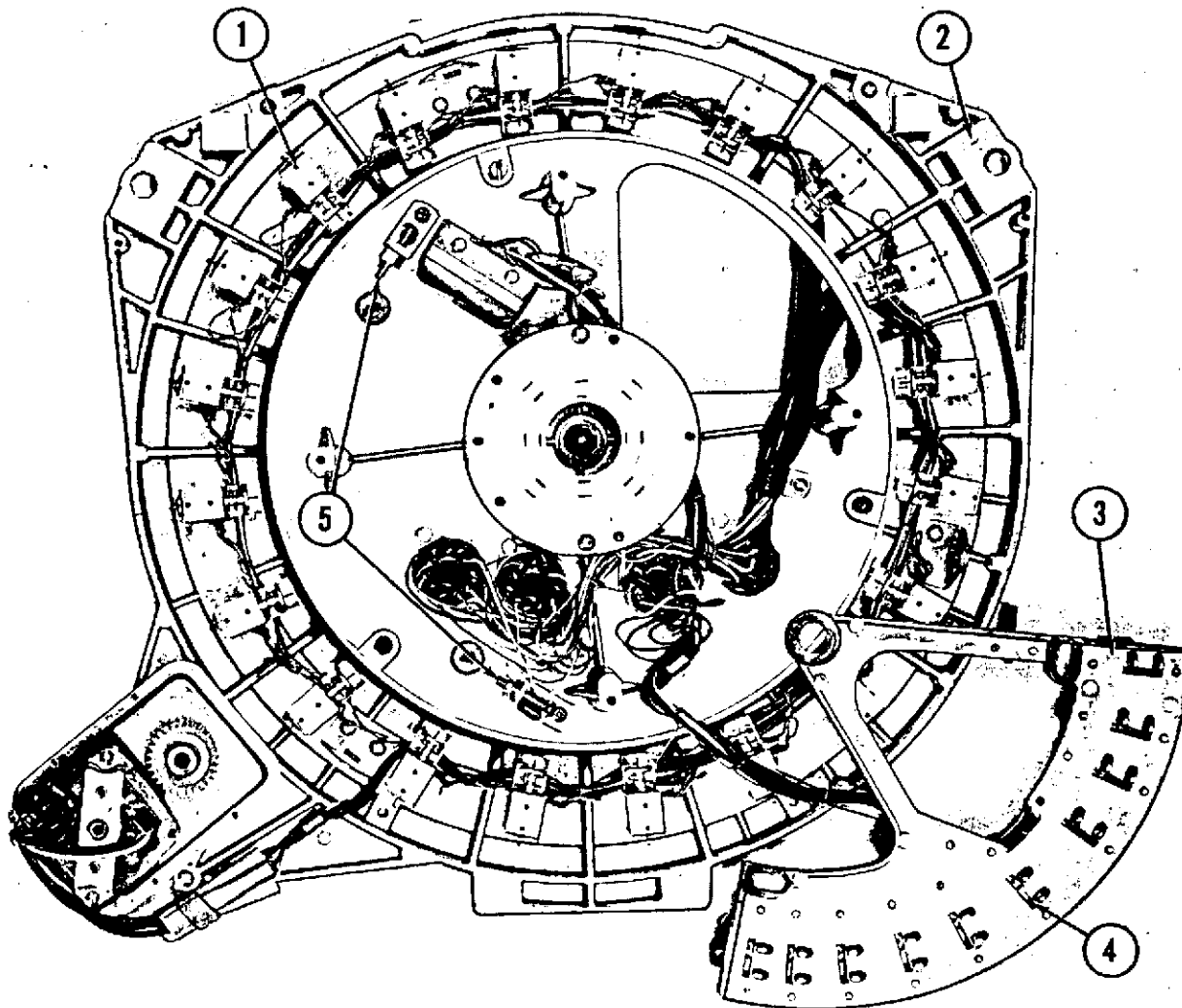


Fig. 30. MOUNTING CASTING AND STOP SOLENOID ASSEMBLY 68127

- | | | | |
|--|-------|------------------------------|----------|
| 1. Letter Solenoid | 68594 | 4. Stop Plate End of Plunger | 68608 |
| 2. Selector Casting | 67921 | 5. Stop Screws | 73575-95 |
| 3. Mounting Casting and Stop Solenoid Assembly | n8793 | | |

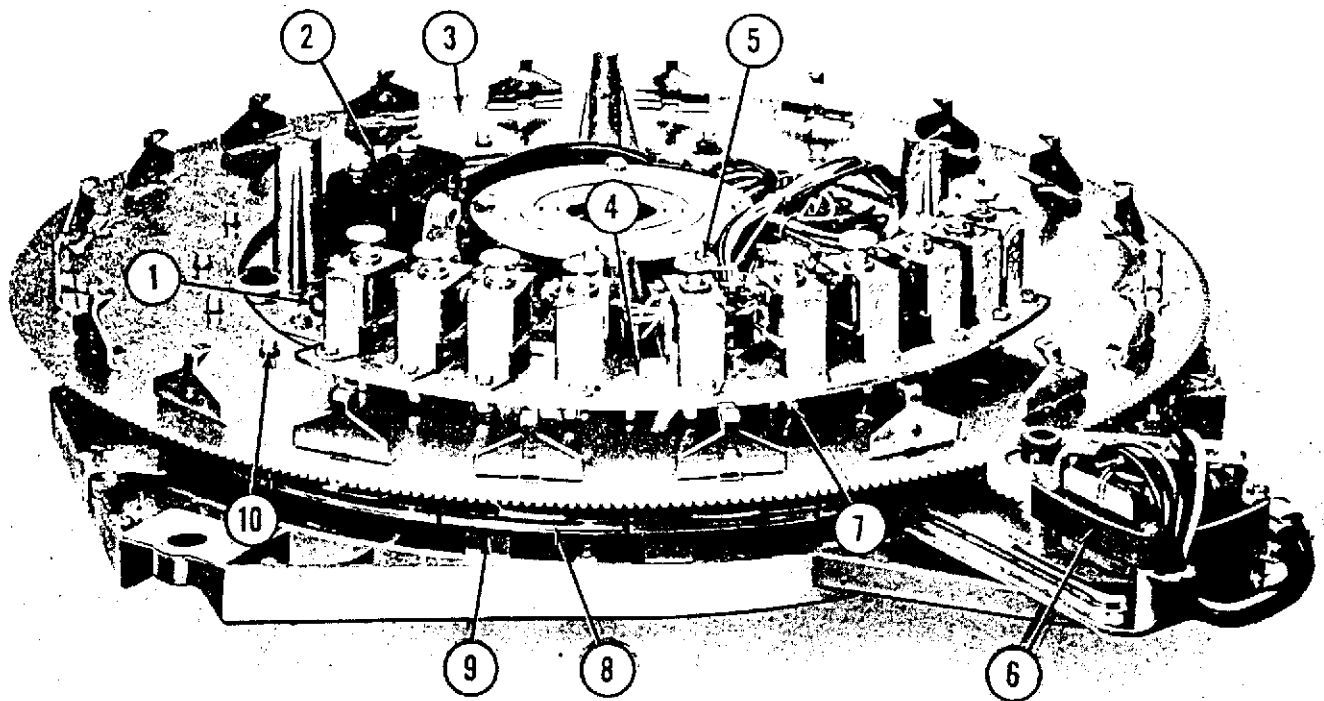


Fig. 31. ELECTRIC SELECTOR, SELECTION COMPONENTS

1. Stop Screw	73575-95	6. Selector Motor	68796
2. Reverse and Start Switches	61596	7. Plunger	68608
3. Rotating Plate and Rocker Assembly	68245	8. Rocker and Bracket Assembly	68807
4. Mounting Casting and Number Solenoids	68276	9. Letter Solenoid	68594
5. Number Solenoid	68617	10. Stop Pin	68648

solenoid plunger may engage the long arm of any one of the rocker arm and bracket assemblies, indicated in Item 1 of Fig. 29, in any one of 10 latch pin positions.

(4) The mounting casting and stop solenoid assembly (Fig. 30) is so arranged that the stop plate ends of the solenoid plungers (Item 4) may stop the

rotating plate and rocker assembly (Fig. 29) in any one of the 10 number positions selected. The entire assembly may pivot slightly on its mount at the center of the selector casting. Its range is governed by the two stop screws indicated at Item 5 and is provided to permit indexing, switch operation, and retracting action under spring loading.

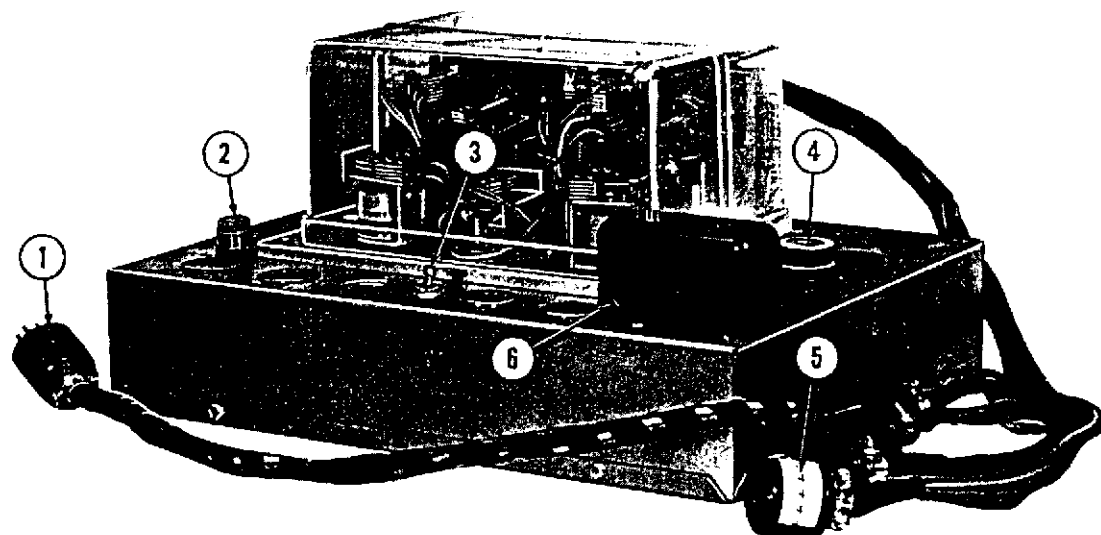


Fig. 32. JUNCTION BOX AND STEPPER UNIT

68125

1. Plug, 11 Prong	54878	4. Fustat, 3 Amp.	61858
2. Fuse Post	51485	5. Socket, 11 Prong	58898
3. Switch, Toggle	53648	6. Cover, Terminal Strip	44943

(5) The assembly of the above components as shown in Figure 31 provides the means for selection and release of any one of the 200 selector latch pins described in paragraph (1).

e. The junction box and stepper unit (Figs. 32, 33, and 34) is provided with plugs and sockets for inter-connection of the various components of the electric selector system, the record changer, and the power supply. The stepper unit for remote selection is mounted on the upper side of the junction box as shown in Figure 32. Details for stepper and wall box service will be published in another group. The inside of the junction box, Fig. 34, contains the wall box pulse relay, the reversing relay, timing relay No. 2, timing relay No. 3, the 5V panel light transformer, and several capacitors for stepper operation and filter circuits.

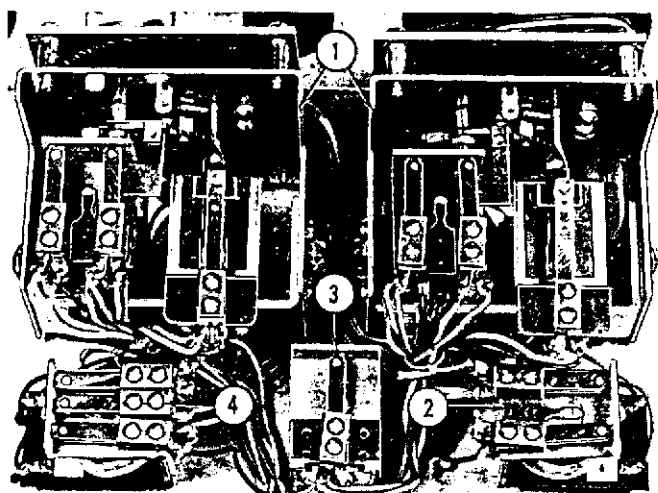


Fig. 33. STEPPER COMPONENTS

1. Stepper Switch Assembly	68823
2. Timing Relay, Letters	68941
3. Transfer Relay	65748
4. Timing Relay, Numbers	68940

3. OPERATION (See Fig. 31)

As soon as both a letter and a number button are engaged at the key board, a number solenoid (Item 5) is actuated according to the numeral depressed at the key-board. The selector drive motor (Item 6) is then started and drives the "rotating plate and rocker assembly" (Item 3) in a clockwise direction, as viewed from the top. One of the 20 stop pins (Item 10) mounted on the rotating plate engages the stop tab of the plunger (Item 7) that has been pulled down into its path by the number solenoid (Item 5). After engaging the stop tab of the number solenoid plunger the stop pin on the rotating plate rotates the mounting casting (Item 4) until it is halted by the forward stop screw (Item 1). Just before striking the stop, the reverse and start switches (Item 2) are actuated. The motion of the mounting casting and the rotating plate is arrested by the forward stop but the stalled motor remains energized to hold the rotating plate and mounting casting against the stop, thus accurately positioning the rocker arms so that all 20 rocker arms are perfectly aligned

with all letter selector pins bearing the same numeral as the selected number solenoid and the depressed button at the key-board. Delay relay circuits en-

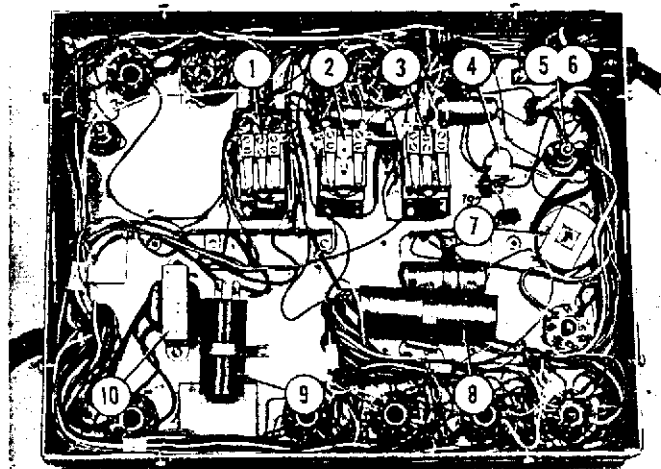


Fig. 34. JUNCTION BOX AND STEPPER COMPONENTS

1. Relay, Reverse	65750
2. Timing Relay No. 3	68943
3. Timing Relay No. 2	68942
4. Pulse Relay	65752
5. Fuse Post	45352
6. Fuse, 0.3 Amp.	45588
7. Socket, Fustat	61857
8. Capacitor, 500 Mfd., 50V	71816
9. Capacitor, 65 to 93 Mfd., 50V	70901
10. Transformer, Panel Lights	58357

energized by the start switch now allow a pulse to be given to the letter solenoid coil corresponding to the letter button depressed at the key-board. The energized letter solenoid (Item 9) strikes the long arm of the rocker arm (Item 8) and pivots the rocker arm at the rotating plate. This causes the finger at the top of the rocker arm to move in and release the selector latch pin corresponding to both the letter and the number selected at the key-board. The unlatched pin provides over-ride switch action as described in paragraph (1).

Immediately after the letter solenoid has been actuated, the selector drive motor is reversed to back the "rotating plate and rocker arm assembly" away from the stop and take the mechanical load off the number solenoid plunger and permit it to retract under its spring loading. The time required for the complete selection cycle indicated by depressing a number and a letter button at the key-board may vary from .090 to .625 seconds, the maximum and minimum times being controlled by the initial position of the "rotating plate and rocker arm assembly" with respect to the number solenoid actuated.

A detailed description of the electrical sequence which occurs in the fractional part of a second, as described above, is provided as an aid to service in checking the continuity and voltage of the various circuits involved and helping to isolate and locate electrical mal-functions. The several circuits involved are shown individually in heavy solid or heavy dotted lines in their order of happening.

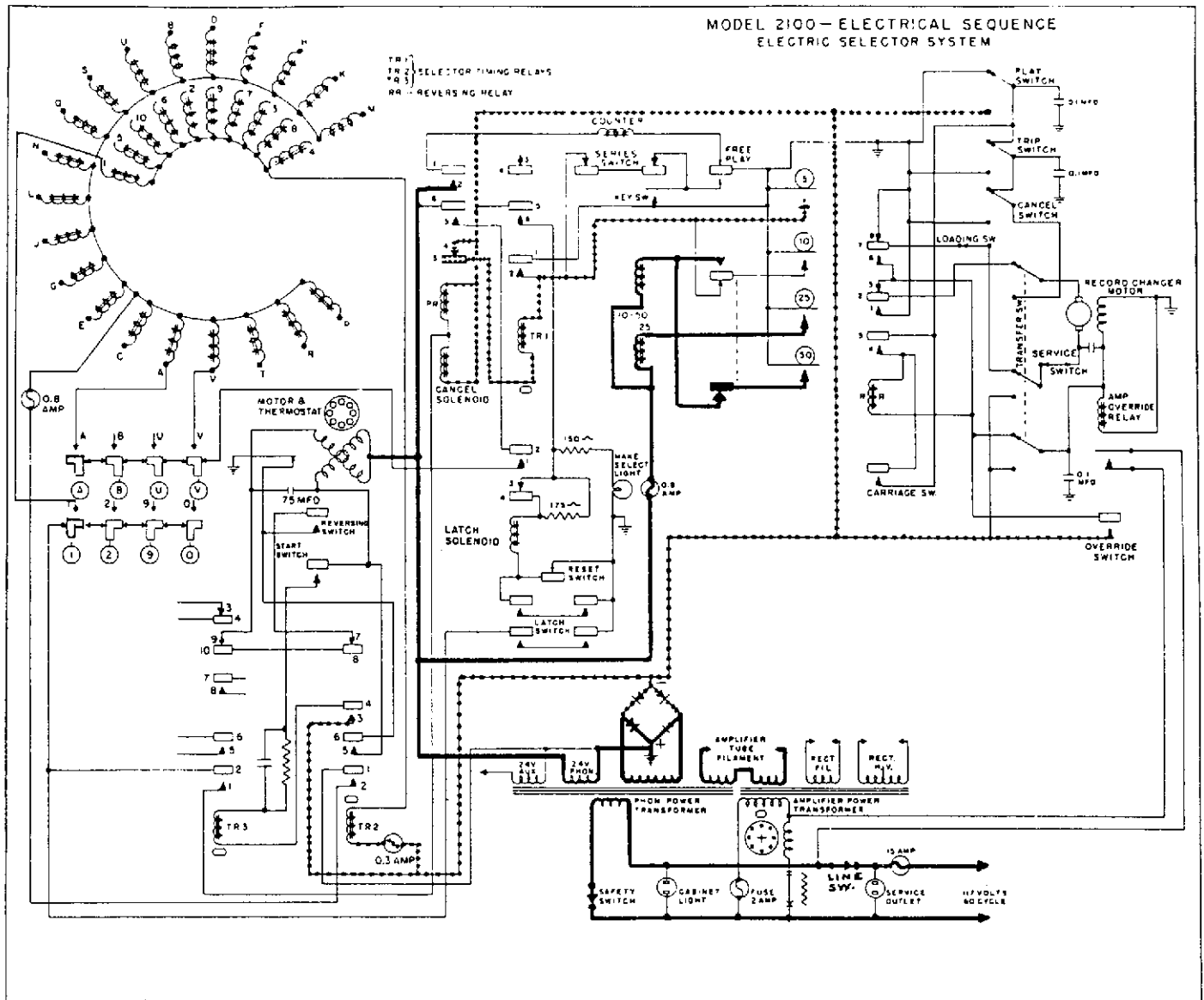


Fig. 35. PHASE 1 - STAND-BY CIRCUITS

a. Closing of the line switch provides 110V A.C. to the primary of the phonograph transformer only. Therefore, as shown in heavy line, 24V A.C. is available at the coin switches for accumulator function and 28V D.C. shown in dotted line, is available for single play function.

b. Under the above conditions these same two

sources of power supply are available for stepper and wall box operation. Also 110V A.C. is available at the booster socket of the stepper and junction box assembly.

c. Power is available at the service outlet whether the line switch is on or off.

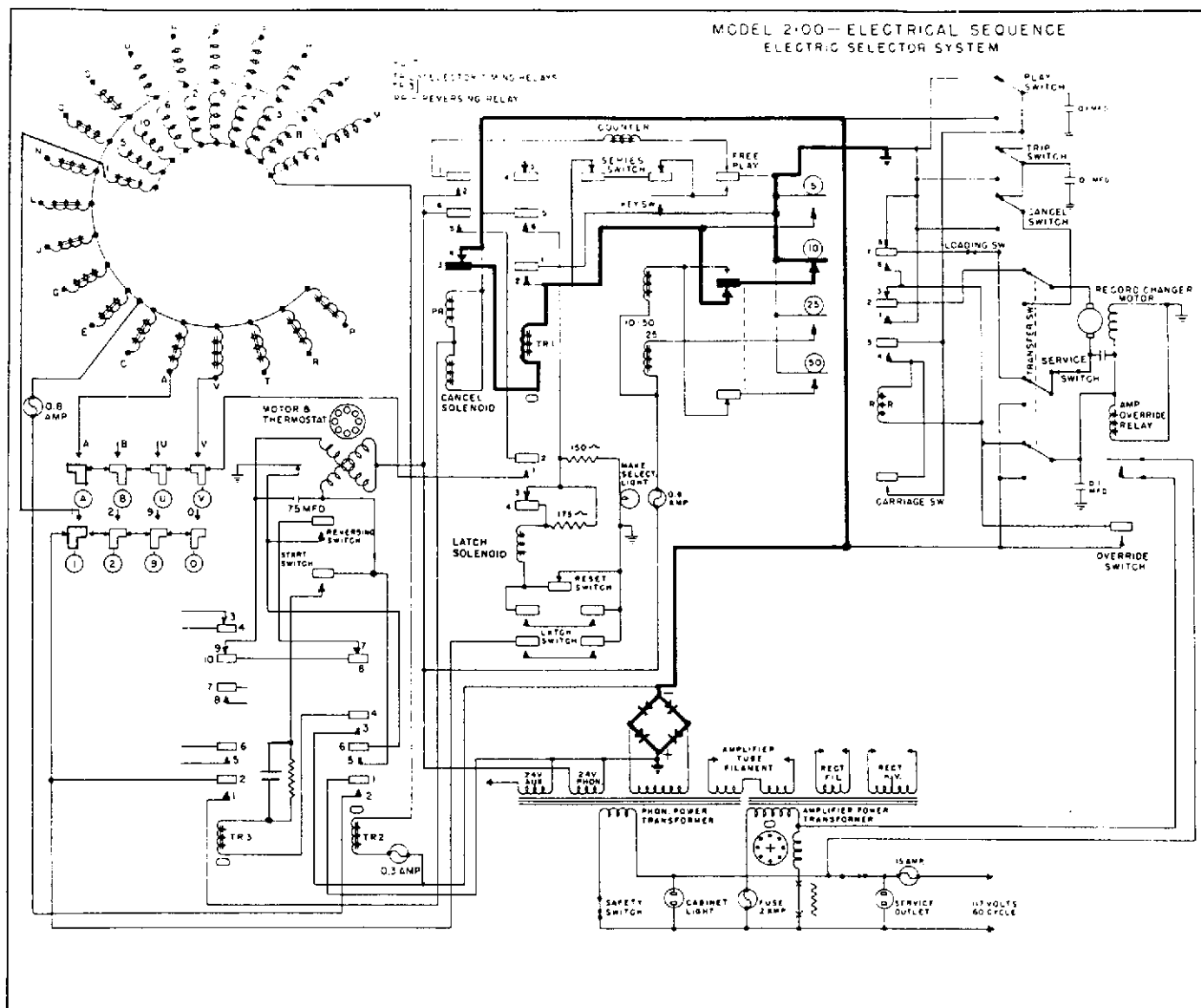


Fig. 36. PHASE 2 - COIN SWITCH CIRCUIT, SINGLE PLAY

a. The Playrak is provided with a double pole sliding switch to change the coin switch circuits to either 5, 10, 25 cent play or 10, 25, 50 cent play. In either case the "5, 10, 25¢" component of the slug rejector may be set to require either 1 nickel or 2 nickels for 1 play. (See Adjustments).

b. When a dime is accepted on the 10¢ coin switch, a 28V D.C. circuit is completed, as shown in heavy line, from the negative side of the rectifier,

thru normally closed contacts 4 & 3 of the pulse relay, the coil of timing relay No. 1, and the 10¢ coin switch to common ground and the positive side of the 28V D.C. rectifier.

c. If the slide switch is set for 5, 10, 25¢ operation, the electrical circuit will be identical except that the 5¢ coin switch instead of the 10¢ coin switch will close the circuit.

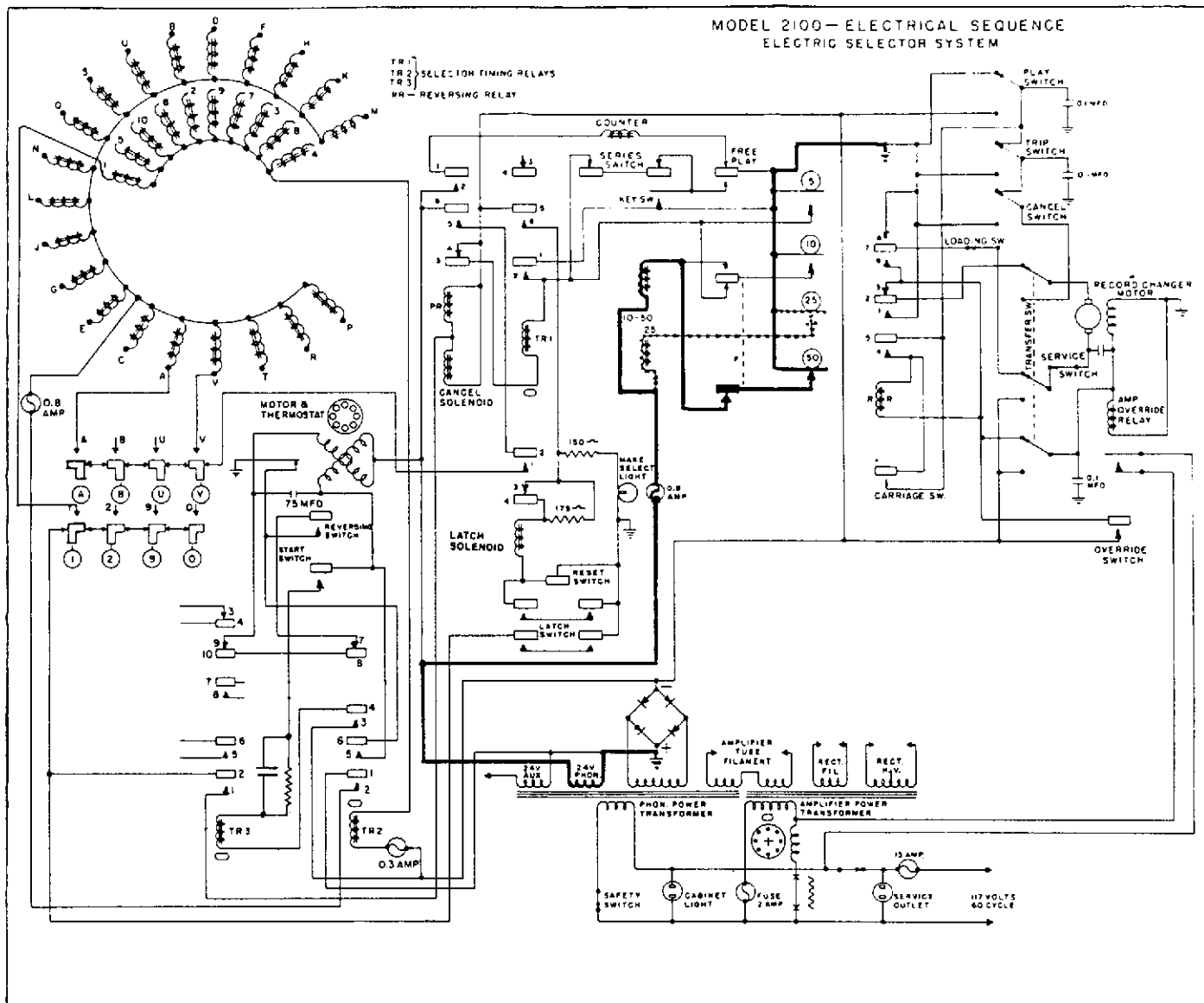


Fig. 37. PHASE 3 - COIN SWITCH AND ACCUMULATOR, MULTIPLE PLAY

a. A half dollar on the coin switch completes a 24V A.C. circuit, as shown in heavy line, from the hot side of the 24V A.C. winding, thru the 0.8 Amp. protective fuse, the coil of the 10-50¢ coin magnet, the slide switch, and the 50¢ coin switch to common ground and the other side of the 24V A.C. source of power.

b. With the slide switch in the 5-10-25¢ position, a dime on the 10¢ coin switch will produce a circuit identical with that described in paragraph "a" above, except that the 10¢ coin switch will make the contact.

c. With the slide switch in either of the positions described above, a 24V A.C. circuit will be completed to the 25¢ coin magnet as shown in dotted line.

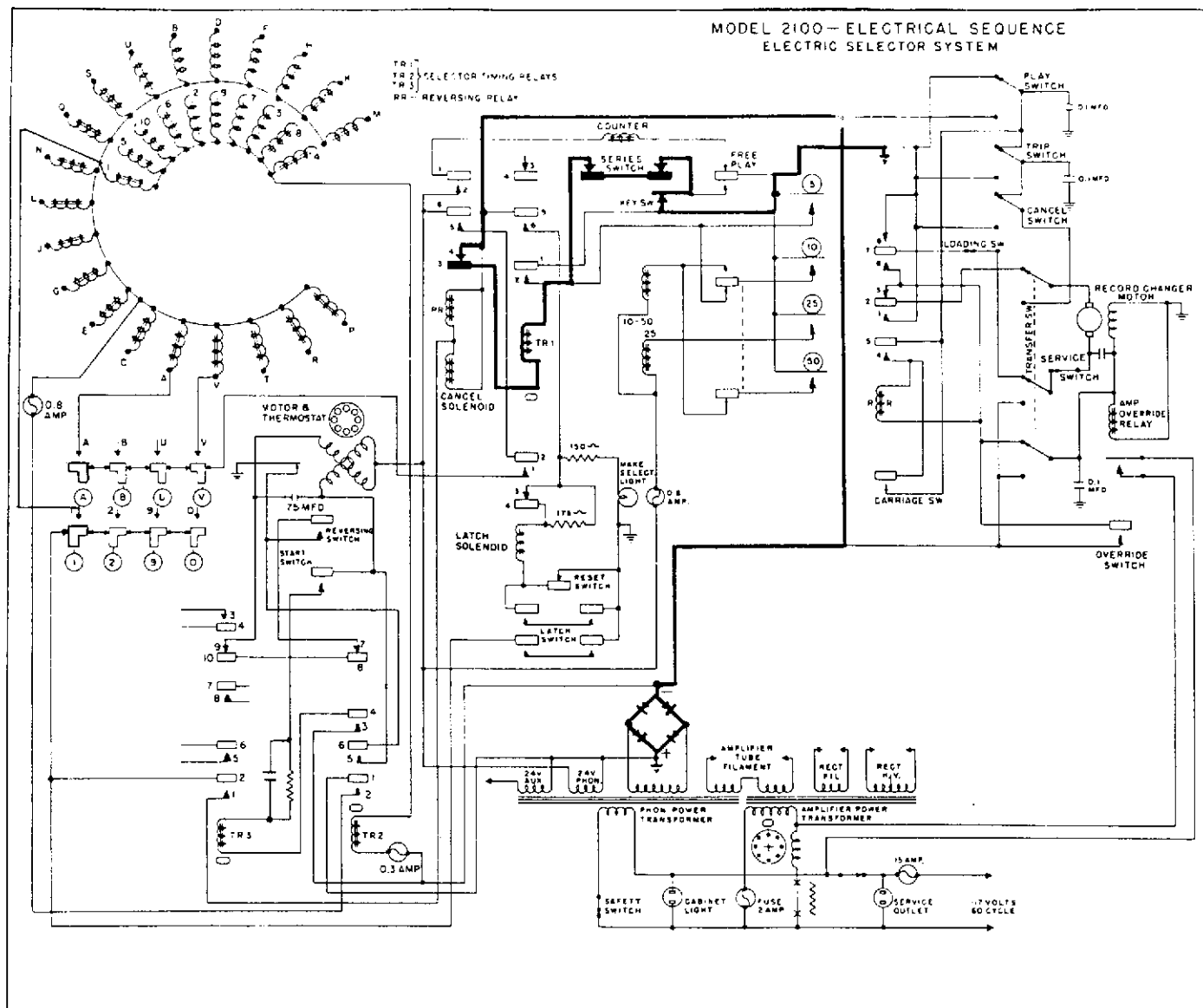


Fig. 38. PHASE 4 - KEY SWITCH AND NO. 1 TIMING RELAY CIRCUIT.

a. When either of the two coin magnets is energized, its corresponding accumulator wheel is released and advances to a credit position as determined by the quadrant setting of the "accumulator stop arm". Advance of either accumulator wheel from one to ten plays will permit the key switch to close and remain closed until all credits have been cancelled by the cancel solenoid and cancel wheel.

b. Closing of the key switch completes a cir-

circuit shown in heavy line from the negative side of the rectifier, thru contacts 4 & 3 of the pulse relay, the coil of timing relay No. 1, the number and letter series switches, and the key switch to common ground and the positive side of the rectifier. The circuit to timing relay No. 1 is thus established as in the previous phases except that it will be re-energized by the series switches after each selection until cancel action has re-opened the key switch.

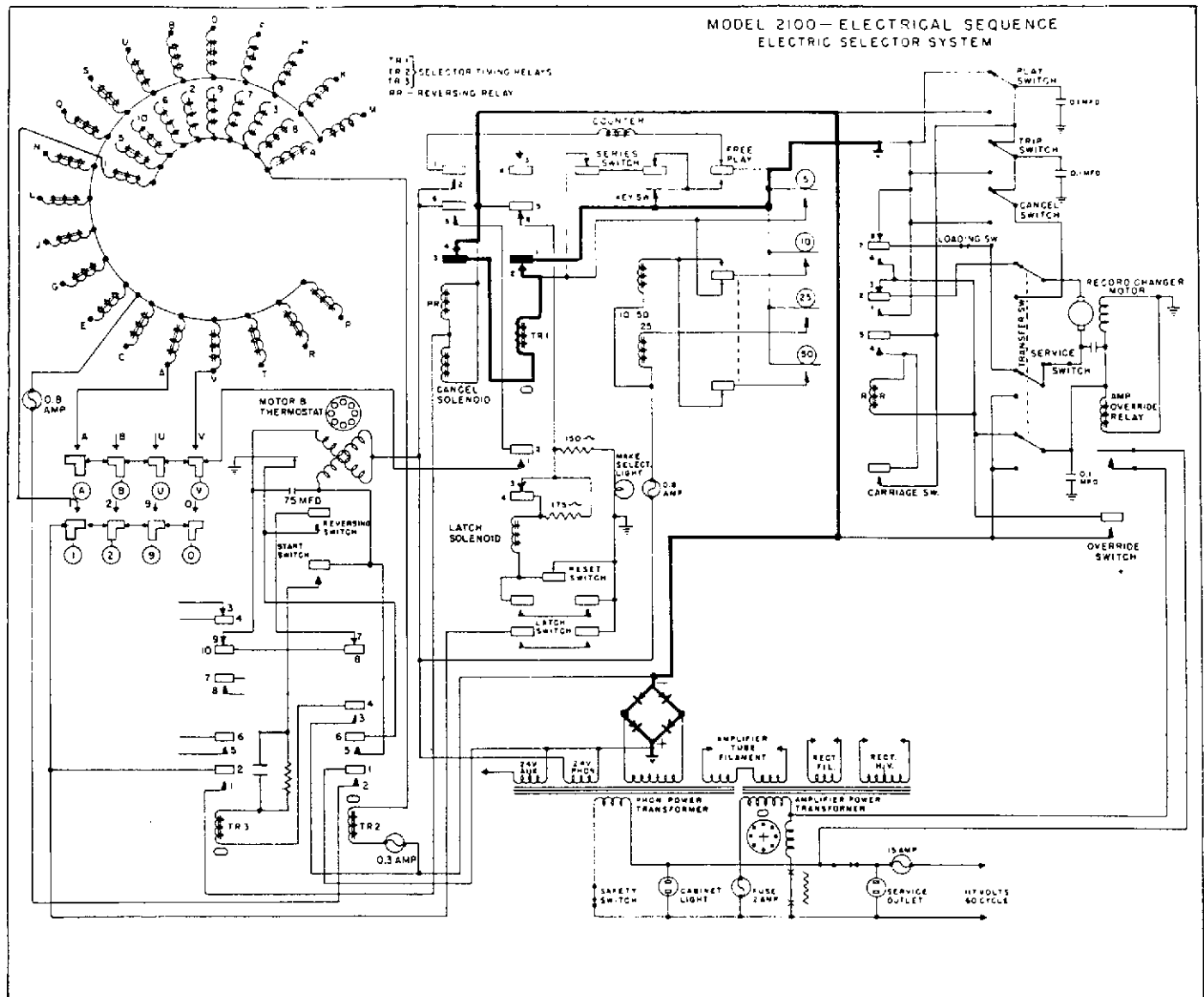


Fig. 39. PHASE 5 - INTERLOCK CIRCUIT, TIMING RELAY NO. 1

a. The closing of contacts 1 & 2 of timing relay No. 1 completes a 28V D.C. circuit, as shown in heavy line from the negative side of the rectifier, thru. contacts 4 & 3 of the pulse relay, the coil of timing relay No. 1, and contacts 2 & 1 of timing relay No. 1

to common ground and the positive side of the rectifier. An interlock circuit is thus established for timing relay No. 1 which will hold until actuation of the pulse relay and opening of its contacts 3 & 4.

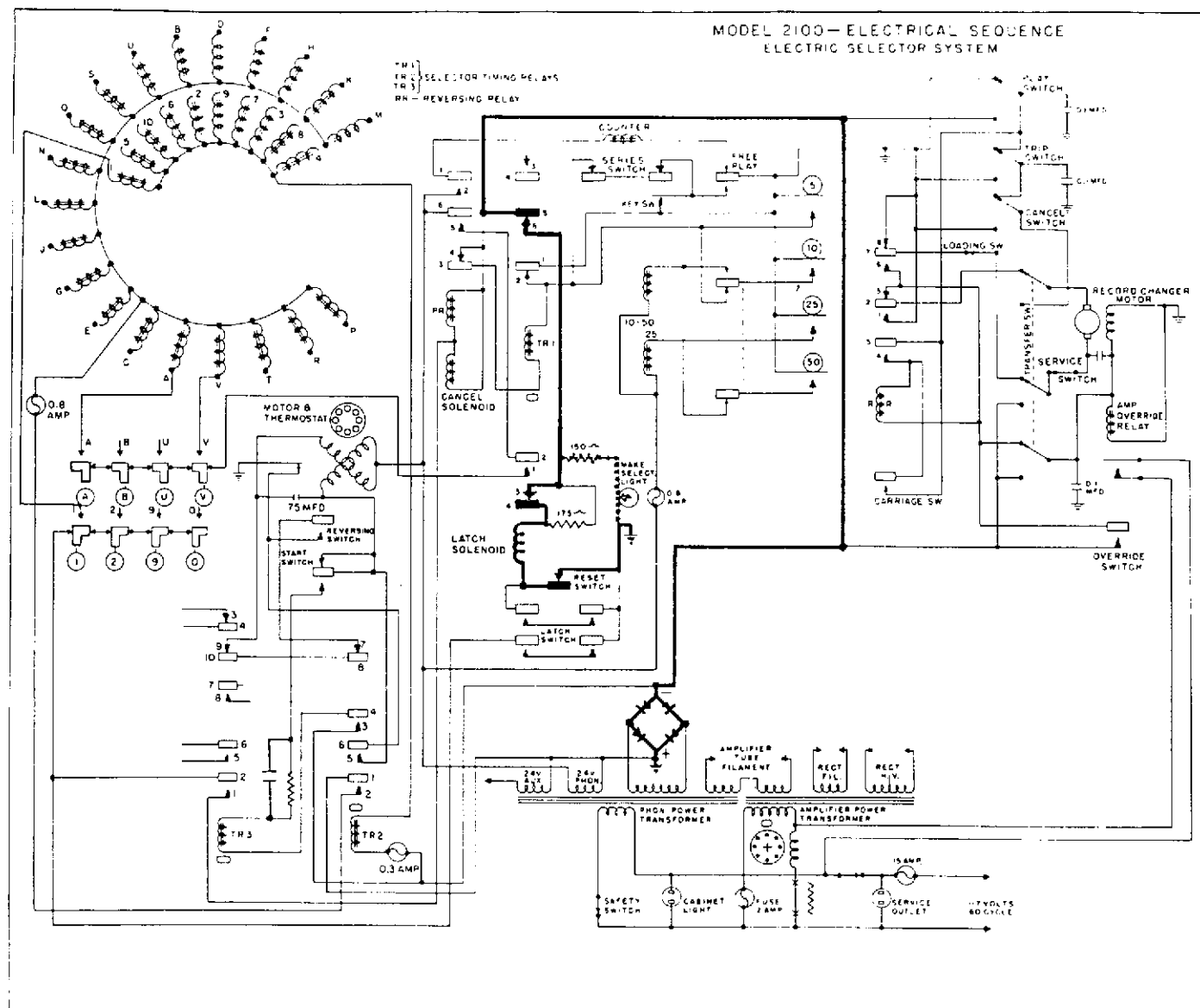


Fig. 40. PHASE 6 - LATCH SOLENOID AND MAKE SELECTION LAMP CIRCUITS

a. The closing of contacts 5 & 6 of timing relay No. 1 completes a 28V D.C. circuit as shown in heavy line from the negative side of the rectifier, thru contacts 5 & 6 of timing relay No. 1, contacts 3 & 4 of the latch solenoid switch, the coil of the latch solenoid, and the reset switch to common ground and the positive side of the rectifier. At the end of the plunger stroke the latch solenoid switch is engaged by the plunger linkage and actuated. Contacts 3 & 4 of the latch solenoid switch will open, however, the latch solenoid will remain energized, at reduced current flow, via the 175 ohm resistor. In this way continuous holding of the latch solenoid will not overheat its coil.

b. When the latch solenoid is energized, as described in "a", its plunger operates linkage to provide latching action for both the number and letter buttons when either or both are pressed. The button switches are thus held firmly engaged during the selection phases.

c. At the same time contacts 5 & 6 of timing relay No. 1 also provide a 28V D.C. circuit shown in dotted line for the make selection lamp.

d. The closing of contacts 1 & 2 of the latch solenoid switch prepares a part of a 24V A.C. circuit to be used in following phases.

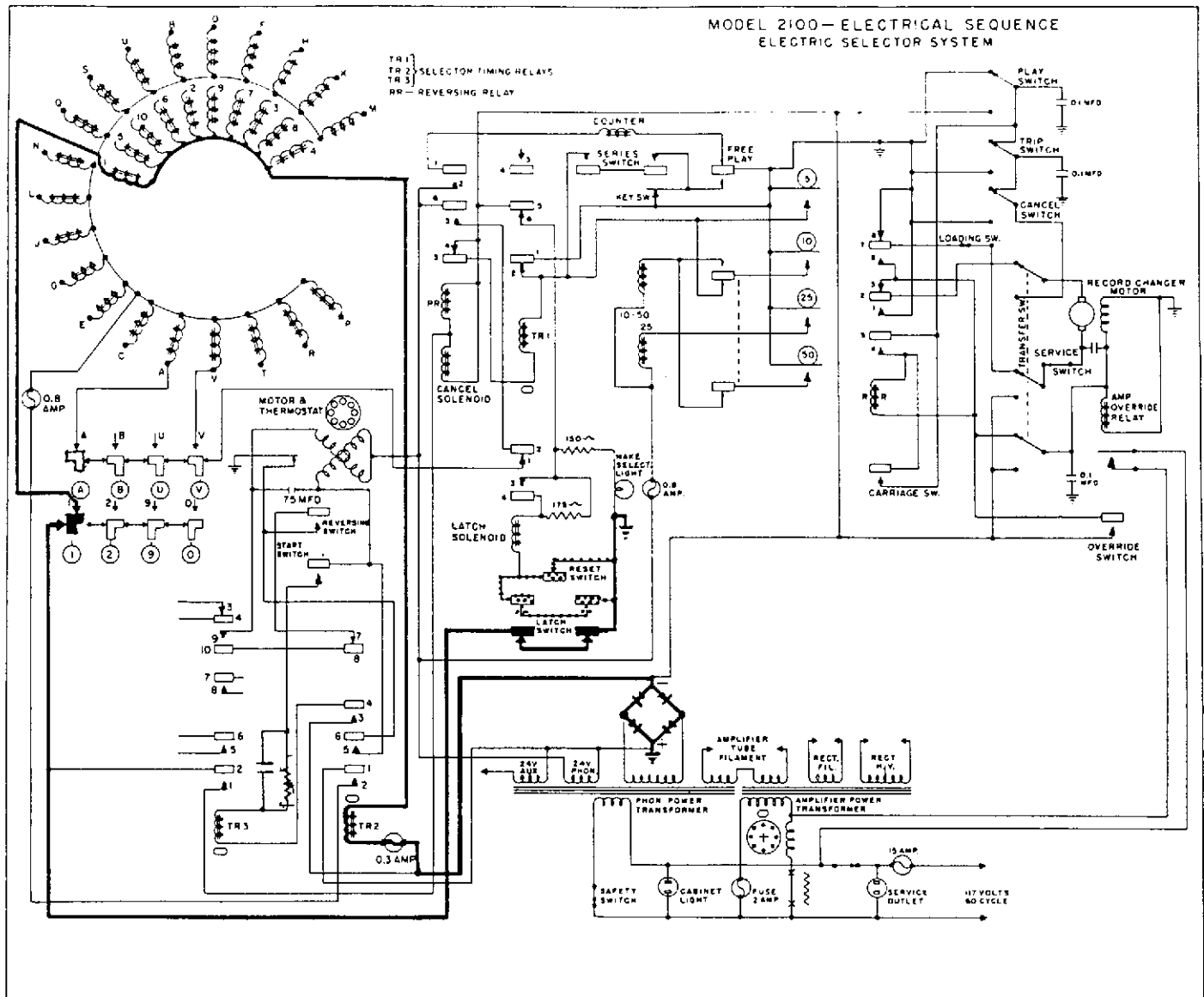


Fig. 41. PHASE 7 - NUMBER SOLENOID SELECTION

a. When both the number and the letter latch switches are closed, a 28V D.C. circuit is completed as shown in heavy line from the negative side of the 28V D.C. rectifier, thru the 0.3 Amp. protective fuse, the coil of timing relay No. 2, selected number solenoid No. 1, number button switch No. 1, and the number and letter latch switches, to common ground and the positive side of the 28V D.C. rectifier.

b. It should be noted at this time that the power circuits and stepper "hold-out" circuits, for the Model 2100 Stepper, have been by-passed to provide a clarified electrical sequence for the phonograph only. The electrical sequence for the Model 2100 Stepper will be treated separately.

c. As described in "a", the selected number solenoid and timing relay No. 2 are energized, however, timing relay No. 2 is delayed, due to the top shorting rings, to insure number solenoid function before the contacts of timing relay No. 2 go into action to start the selector motor.

d. The above circuits have been shown in solid line thru only one pair of latch switches, however, the second pair of latch switches provide another path, shown in dotted line. The purpose of the two paths is to prevent tampering with the sequence of selection by manipulation of the reset button.

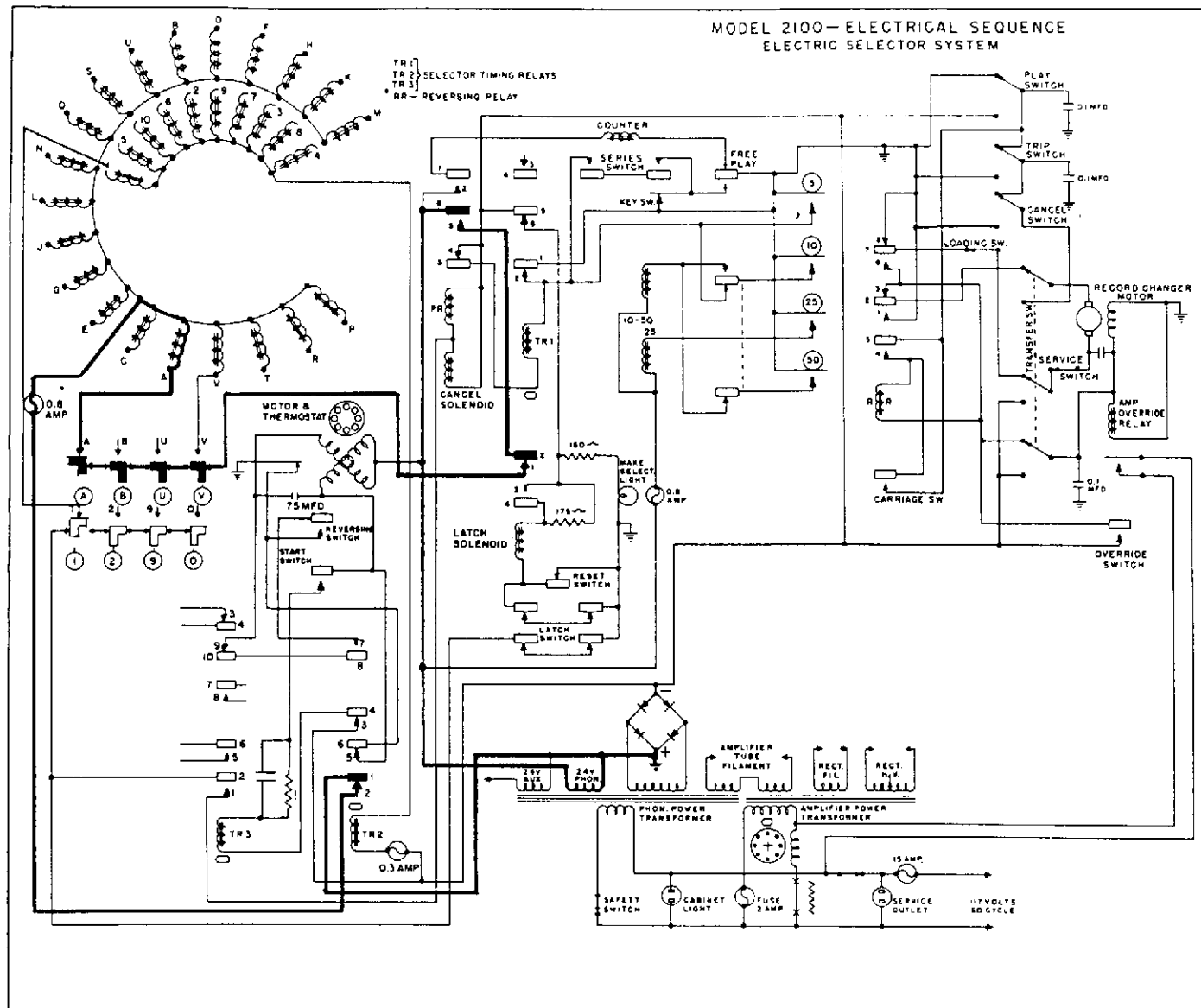


Fig. 42. PHASE 8 - PREPARATION OF 24V A.C. LETTER COIL CIRCUIT

a. As soon as timing relay No. 2 is actuated, its contacts 1 & 2, 5 & 6, and 3 & 4 close and contacts 7 & 8 open.

b. The closing of contacts 1 & 2 of timing relay No. 2 prepares a 24V A.C. circuit as shown in heavy line from the hot side of the 24V A.C. winding

to open contacts 6 & 5 of the pulse relay. From contact 5 the preparation continues thru contacts 2 & 1 of the latch solenoid switch, the letter button switches, letter coil A, the 0.8 Amp. protective fuse, and contacts 2 & 1 of timing relay No. 2 to common ground and the other side of the 24V A.C. source of power.



dition, energize the other two field coils of the motor . The result is clock-wise rotation to properly index the "rotating plate and rocker arm assembly" in accordance with the number solenoid selected as a stop.

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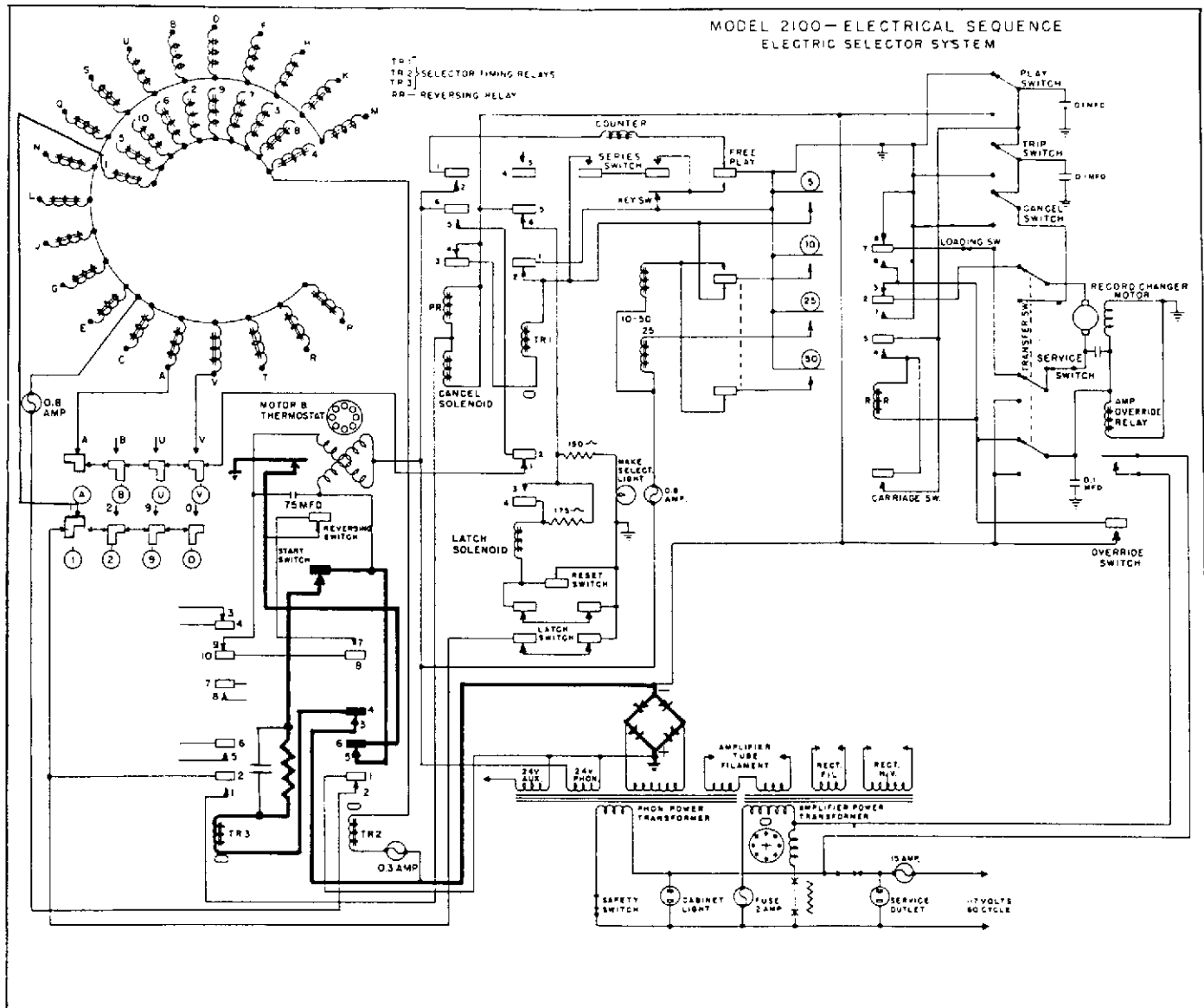


Fig. 44. PHASE 10 - TIMING RELAY NO. 3

a. When one of the 20 stop pins on the "rotating plate and rocker arm assembly" engages the selected number stop solenoid plunger, the number quadrant will be driven to its indexed stop position. At this point the start switch and the reverse switch will be actuated by the quadrant.

b. The reverse switch functions to prepare a section of a 24V A.C. counter-clockwise circuit for the selector motor.

c. Actuation of the start switch completes a

28V D.C. circuit, shown in solid line, from the negative side of the 28V D.C. rectifier, thru contacts 3 & 4 of timing relay No. 2, the coil of timing relay No. 3, the actuated contacts of the start switch, contacts 5 & 6 of timing relay No. 2, and the thermostat switch of the motor to common ground and the positive side of the 28V D.C. rectifier.

d. When timing relay No. 3 is energized, its contacts 1 & 2, and 7 & 8 close, and contacts 9 & 10 open. Contacts 3 & 4, and 5 & 6 may be disregarded as they are components of the stepper sequence.

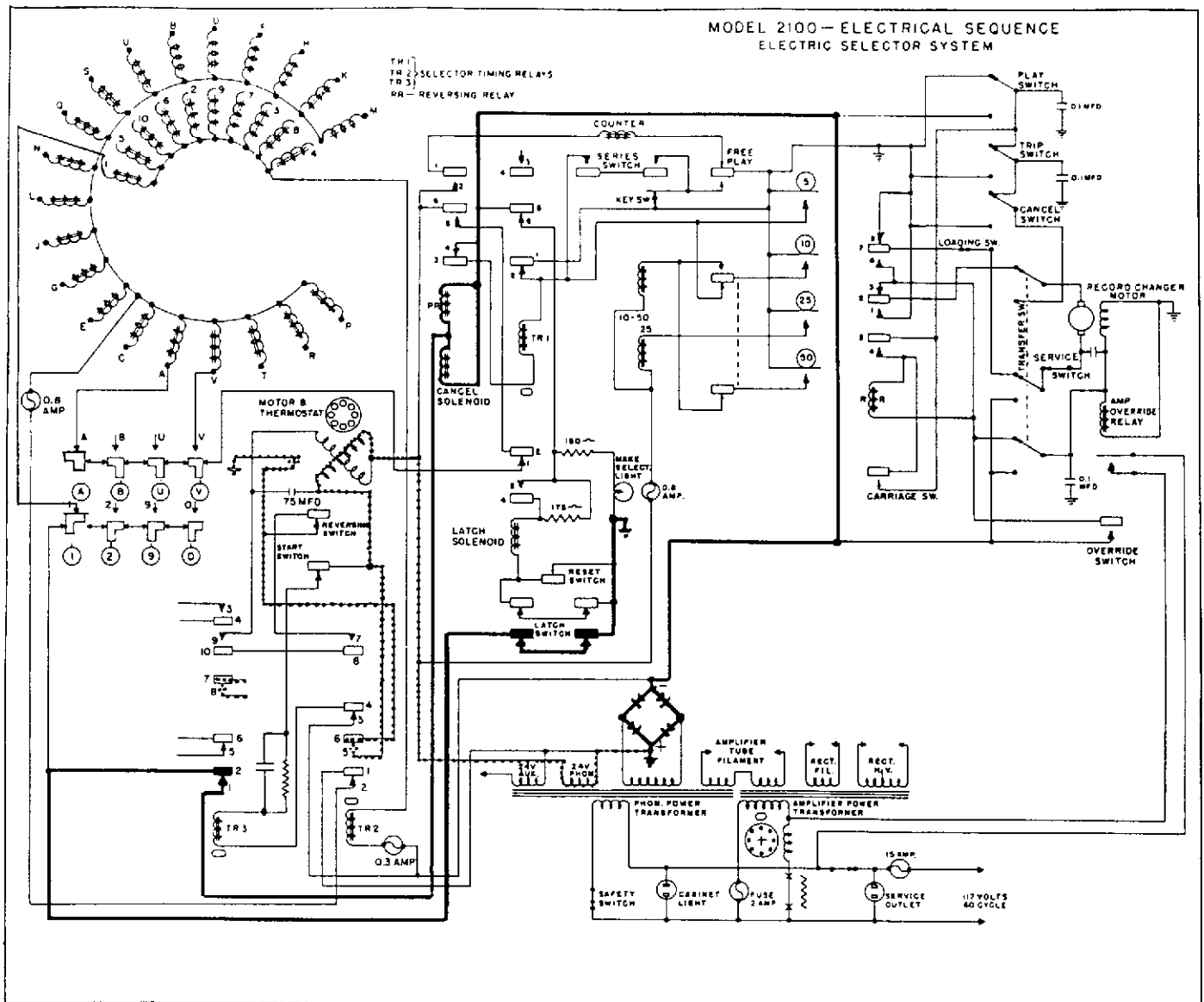


Fig. 45. PHASE 11 - TIMING RELAY NO. 3 FUNCTIONS

a. Closing of contacts 1 & 2 of timing relay No. 3 completes a 28V D.C. circuit as shown in heavy line, from the negative side of the 28V D.C. rectifier, thru the parallel connected cancel solenoid and pulse relay, contacts 1 & 2 of timing relay No. 3 and the number and letter latch switches to common ground and the positive side of the 28V D.C. rectifier.

b. The clockwise circuit for the selector drive motor, shown in dotted line is maintained in the same condition described in phase 9 until the following selection circuits have been completed.

c. The opening of contacts 9 & 10 of timing relay No. 3 isolates the counter-clockwise circuit for the selector motor.

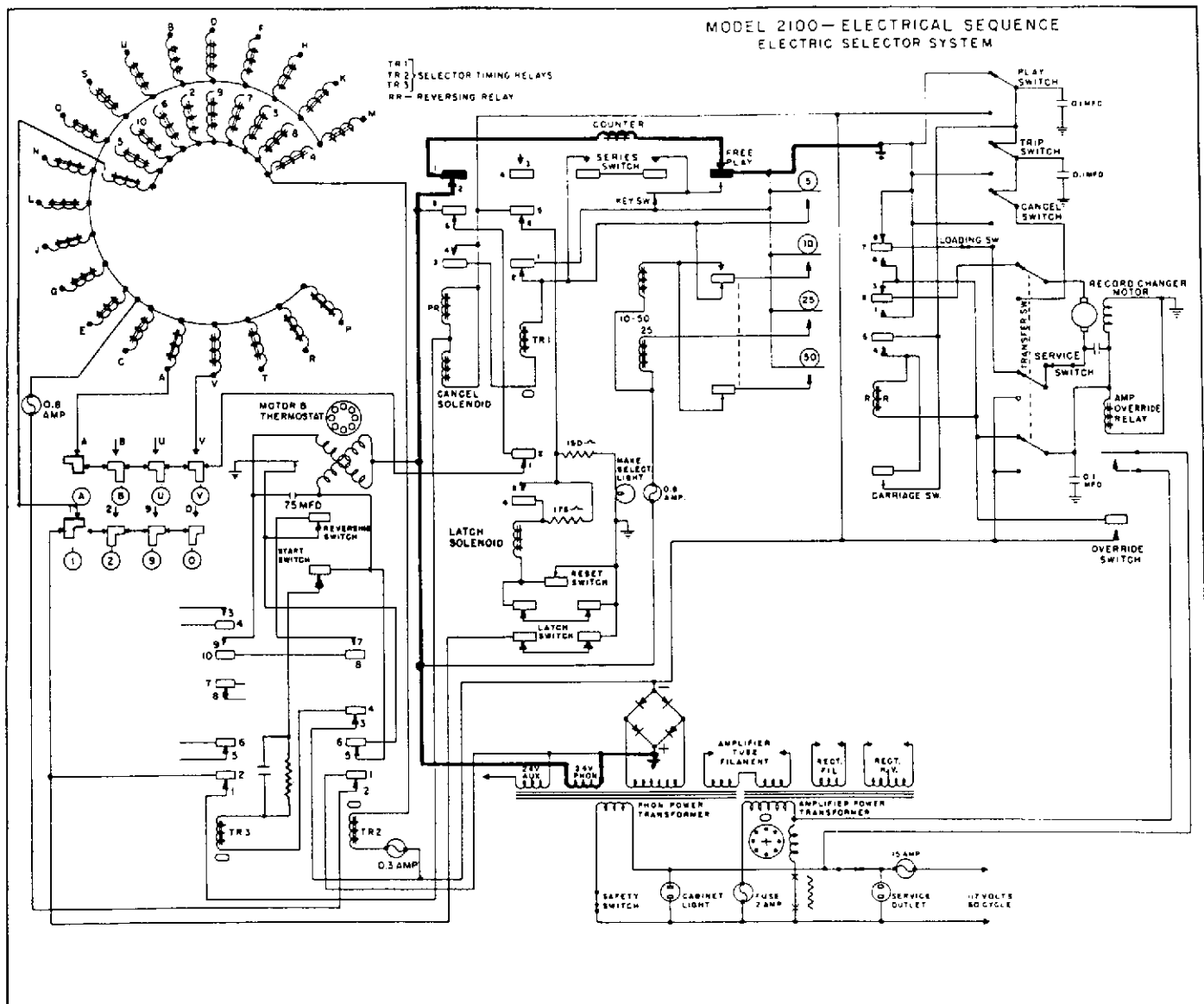


Fig. 46. PHASE 12 - CANCEL SOLENOID AND PULSE RELAY FUNCTIONS

a. When the cancel solenoid is energized, its function is mechanical to retard the accumulator one play each time a selection is made. However, when all credits have been cancelled, the cancel wheel opens the key switch to prevent further selection.

b. When the pulse relay is energized, as described in Phase "11, a", its contacts 1 & 2, and 5 & 6 close and contacts 3 & 4 open.

c. The closing of contacts 1 & 2 of the pulse relay completes a 24V A.C. circuit as shown in heavy

line from the hot side of the 24V A.C. winding, thru contacts 2 & 1 of the pulse relay, the coil of the electric counter, and the free-play switch to common ground and the other side of the 24V A.C. source of power. The electric counter is thus advanced one unit to record the perpetual count of selections.

d. Opening of contacts 3 & 4 of the pulse relay breaks the interlock circuit, of timing relay No. 1 described in Phase 5. Due to shorting rings at the bottom of its coil timing relay No. 1 will not disengage immediately.

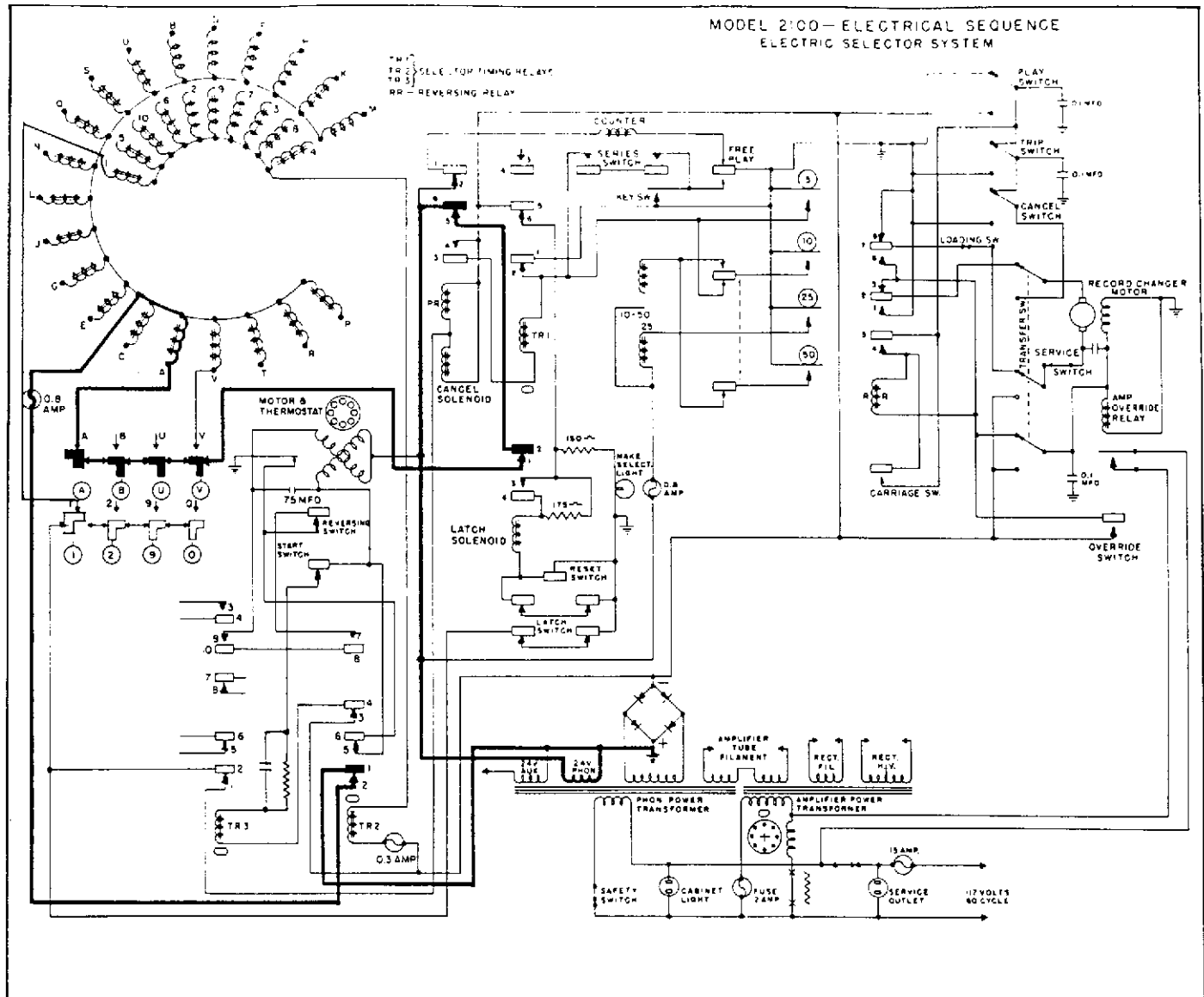


Fig. 47. PHASE 13 - PULSE RELAY FUNCTION

a. As previously described in Phases 9 and 11, the selector motor is holding the "rotating plate and rocker arm assembly" indexed to 20 latch pins No. 1, however, the letter solenoid "A" has been selected at the selector switch button and a 24V A.C. circuit has been prepared as described in Phase 8.

b. Closing of contacts 5 & 6 of the pulse relay completes the 24V A.C. circuit as shown in heavy line from the hot side of the 24V A.C. winding, thru contacts 6 & 5 of the pulse relay, contacts 2 & 1 of the latch solenoid switch, the series connected se-

lector button switches and letter switch "A", the coil of letter solenoid "A", the 0.8 Amp. protective fuse, and contacts 2 & 1 of timing relay No. 2, to common ground and the other side of the 24V A.C. source of power.

c. The selection pulse is thus held until the delayed release of timing relay No. 1 has occurred. The release of timing relay No. 1 will open the latch solenoid circuit described in Phase 6, to terminate the 28V D.C. selector pulse and also release timing relay No. 2 and the number solenoid energized in Phase 7.

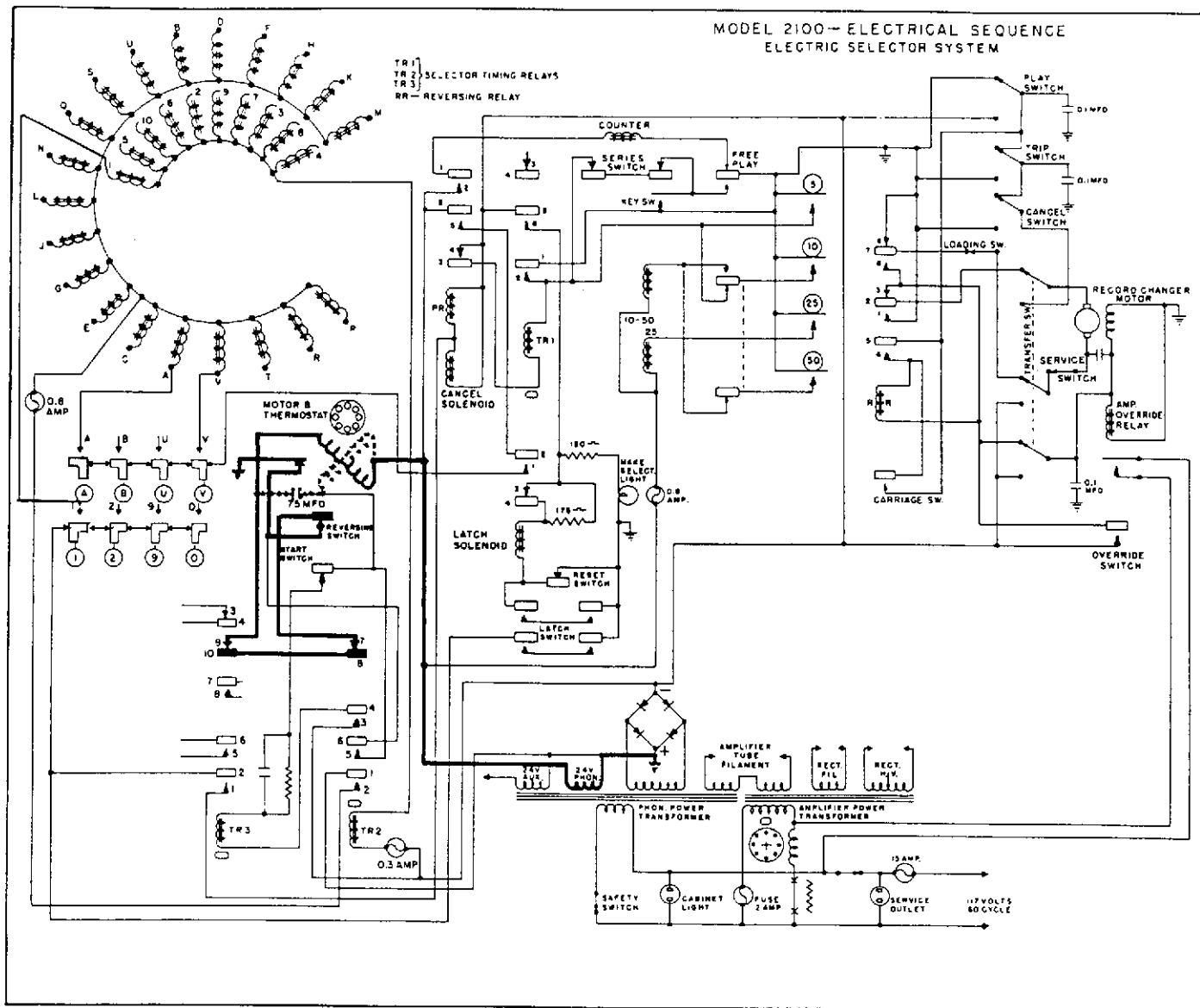


Fig. 48. PHASE 14 - SELECTOR MOTOR "COUNTER-CLOCKWISE" CIRCUIT

a. When timing relay No. 2 is released, its contacts 3 & 4 and 5 & 6 will open and contacts 7 & 8 will close. Contacts 3 & 4 and 5 & 6 open the circuit to timing relay No. 3 shown in Phase 10. Contacts 7 & 8 close to prepare the counter-clockwise selector motor circuit.

b. The final release of timing relay No. 3 closes its contacts 9 & 10 to complete a 24V A.C. circuit as shown in heavy line from the hot side of the 24V A.C. winding, through the two counter-clockwise field coils of the selector motor (see Phase 9), contacts 9 & 10 of timing relay No. 3, contacts 8 & 7 of timing relay No. 2, the actuated reverse switch, and the selector motor thermostat switch to common ground and the other side of the 24V A.C. source of power.

c. Shown in dotted line, the 75 Mfd. capacitor furnishes "phase shifted" current to the other two field coils of the selector motor to produce counter-clockwise rotation.

d. The counter-clockwise rotation will release the number quadrant and permit the reverse switch and the start switch to retract to their original condition as shown in Phase 1.

e. When no credits remain on the Playrak, the electrical and mechanical conditions revert to those represented in Phase 1. When there is one or more credits remaining on the Playrak the electrical and mechanical conditions of the electric selector system revert to those represented in Phase 6.

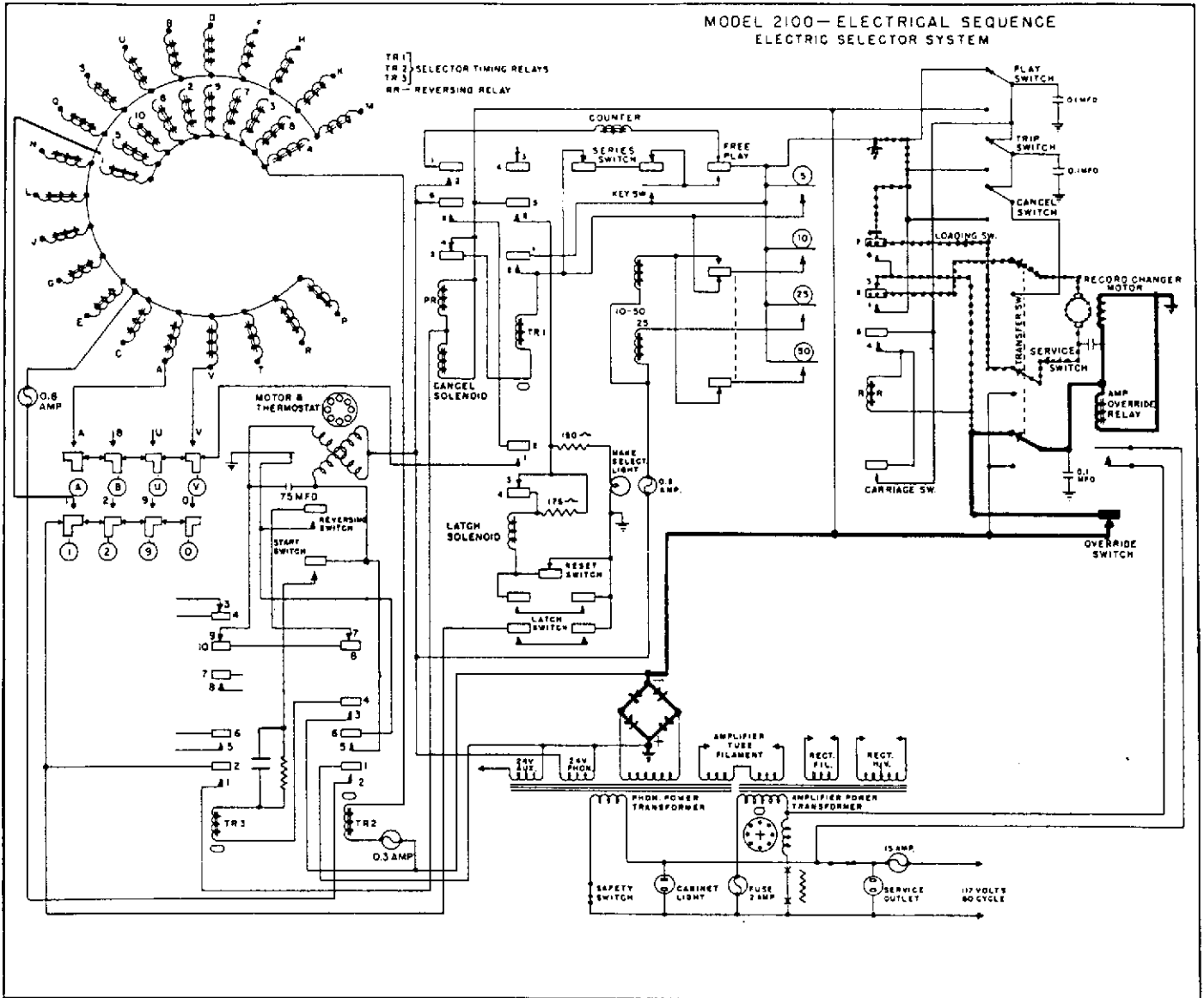


Fig. 49. PHASE 15 - SELECTOR LATCH PIN FUNCTION

a. When one or more selector latch pins are released, under their spring loading, the selector wobble ring is displaced. Displacement of the wobble ring will actuate one or more of the four over-ride switches located around the selector plate.

b. Closing of one or more of the over-ride switches completes a 28V D.C. circuit as shown in heavy line from the negative side of the rectifier thru the over-ride switch, one pole of the transfer switch and thru the coil of the "amplifier over-ride relay" and the field of the changer motor to common ground and the positive side of the 28V D.C. rectifier.

c. At the same time closing of the over-ride

switch completes a 28V D.C. circuit shown in dotted line from the negative side of the rectifier thru the over-ride switch, contacts 3 & 2 of the reversing relay, a second pole of the transfer switch, the armature of the changer motor, the service switch, the third pole of the transfer switch, the loading switch, and contacts 7 & 8 of the reversing relay to common ground and the positive side of the 28V D.C. rectifier.

d. The changer motor is thus energized and the cycle of operation of the record changer will start. The electrical and mechanical sequence of this cycle will be discussed in detail under Record Changer Operation.

4. ADJUSTMENTS

SELECTOR SWITCH ASSEMBLY, FIGS. 50 AND 51

a. It is essential that both the letter and number button switches, as well as their latch bars, operate without any friction, from maximum depressed

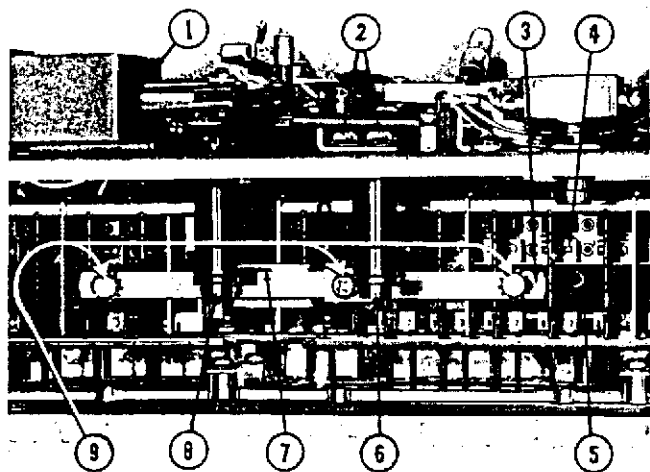


Fig. 50. SELECTOR SWITCH ADJUSTMENTS

1. Latch Solenoid	60717
2. Stop Bracket, Latch Solenoid	56628
3. Linkage, Latch Bars	65617
4. Switch Contact, Movable	
5. Latch Bar, Selector Switch, Letters	65646
6. Shaft, Link, and Lever Assembly, Letters	60452
7. Latch Bar, Selector Switch, Numbers	65646
8. Shaft, Link, and Lever Assembly, Numbers	60454
9. Adjustment Points	

position to complete retracted position. Their respective latch bars (Items 5 and 7, Fig. 50) must engage freely with all of the switch "push rods" and retract freely when the switch "push rods" are fully retracted. The two letter switch latch bars are linked together by Item 3 and coupled to the "shaft, link and lever assembly" (Item 6) with an adjustable plate and the adjustment screws shown in Item 9. The adjustment of these links should provide accurate synchronization of the two latch bars and minimum play, consistent with freedom of operation, between button action and latching action. The latch bar of the number switch is coupled directly to its "shaft, link, and lever assembly", Item 8. There should also be a minimum of play consistent with freedom of operation, between the number buttons and the number latch.

b. With the latch solenoid resting against the stop bracket loosen the two screws (Item 2, Fig. 51) and set the bracket to provide 1/32" clearance between the letter latch pin (Item 12, Fig. 51) and the letter pawl (Item 13, Fig. 51).

c. Both the letter latch pawl and the number latch pawl (Items 3 and 4, Fig. 51) have adjusting screws. These latch pawls should be adjusted to engage fully with their respective latch pins (Item 10 and 12) when their respective selector buttons are fully depressed and their release levers are permitted to make engagement by manually actuating the latch solenoid.

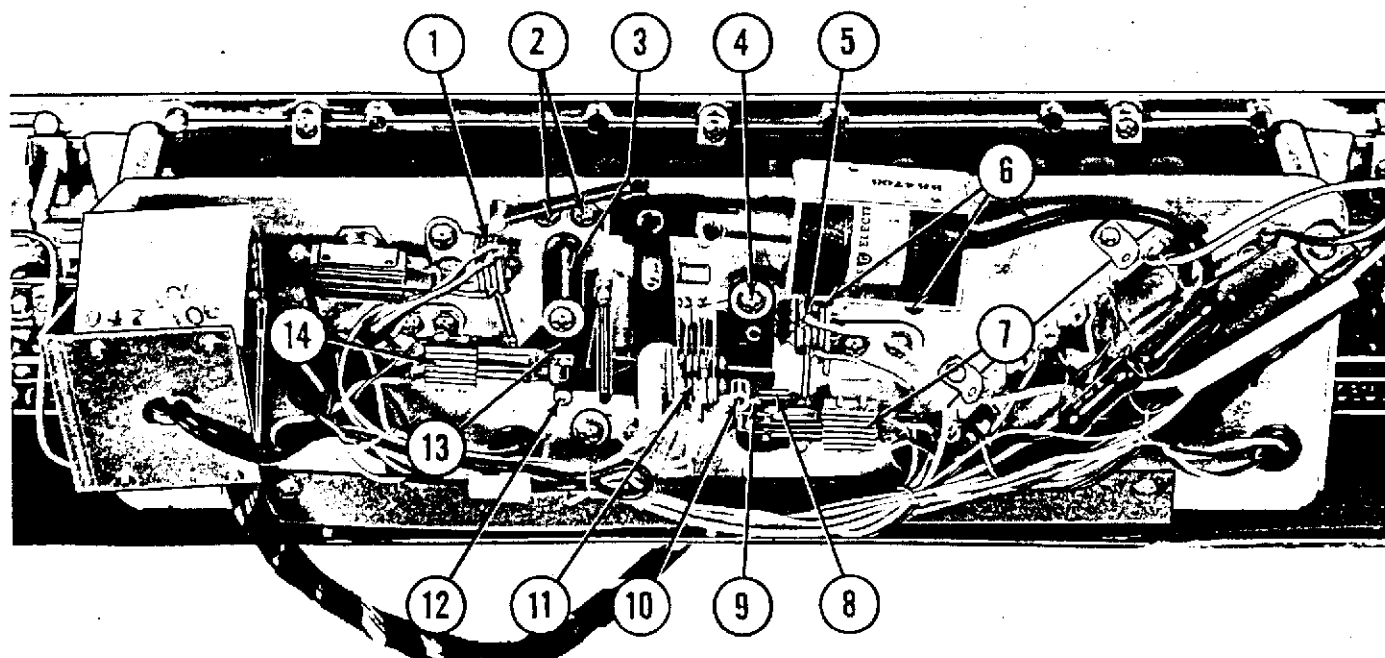


Fig. 51. SELECTOR SWITCH ADJUSTMENTS

1. Series Switch, Letters	64982	8. Clearance 1/32"	
2. Stop Bracket, Latch Solenoid	56628	9. Release Lever Tab (Lever, Stud, and Spacer Assembly)	56713
3. Letter Latch	65010	10. Latch Pin, Numbers (Lever, Stud and Spacer Assembly)	56714
4. Number Latch, (Pawl, Stud, and Spacer Assembly)	65745	11. Latch Solenoid Switch	66113
5. Series Switch, Numbers	64981	12. Latch Pin, Letters	56712
6. Adjusting Screws, Latch Solenoid	73533-22	13. Pawl, Letter Latch	65010
7. Latch Switch, Numbers	60518	14. Latch Switch, Letters	60518

d. Adjustment of the release lever clearance (Item 8) is accomplished by the position of the latch solenoid (Item 6), however, it is recommended that the latch solenoid switch (Item 11) be loosened at its mounting bracket to prevent bending of its blades when the latch solenoid is moved.

(1) The latch solenoid may now be moved on its elongated mounting holes to provide clearance of the closest release tab (Item 9) of $1/32$ " from its corresponding latch lever when the solenoid plunger is held firmly at the bottom of its stroke and the latch pins are fully engaged as described in "c" above. Tighten the latch solenoid mounting screws and re-inspect for correct action and clearance.

(2) The latch solenoid switch may now be adjusted to provide $1/32$ " to $1/16$ " opening of its normally closed contacts when the latch solenoid is held in its fully actuated position. At the same time the normally open contacts should close and over-travel enough to provide good wiping action.

e. The letter and number series switches (Items 1 and 5) should be adjusted to provide $1/32$ " opening of their contacts when one of their respective buttons is pressed and fully latched. When the buttons are released these switches must close and over-travel enough to provide good wiping action of the contacts.

f. The letter and number latch switches (Items 14 and 7) should be adjusted to provide contact opening of $1/32$ " when at rest. When the latch solenoid is energized or manually held in its actuated position, and a letter and number button is fully depressed, the letter and number latch switches should close and over-travel enough to provide good wiping action of the switch contacts.

ELECTRIC SELECTOR ASSEMBLY, FIGS. 52 AND 53

a. Over-ride Switch Setting.

The over-ride switch consists of four leaf type switches (Item 2, Fig. 52) mounted on the lower plate and spacer assembly (Item 5). One blade of each of these four switches is used for connection with the wobble ring by means of the four nylon spacers (Item 6). Upward movement of one or more latch pins raises the wobble ring which in turn will actuate one or more of the over-ride switches.

With the selector latch pins all latched (the non-selected position) the four over-ride switches should be set to provide freedom of movement of the wobble ring as it rests on the inner shoulders of the 200 latch pins. In this condition, the four switches should be open $1/32$ " to $1/16$ ".

When the selector is electrically connected with phonograph switch action may readily be identified by listening for over-ride relay action when

contact is made. The relay action should occur at about one third of the travel distance of the selector latch pin. Also the relay should be released at about the same point when the latch pin is reset. Good wiping action of the switch contacts is essential. Make tests electrically by release of latch pins located half way between each two over-ride switches.

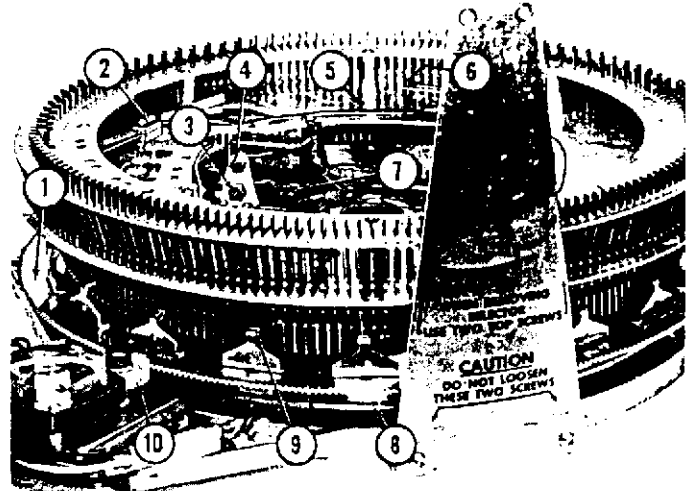


Fig. 52. ELECTRIC SELECTOR ADJUSTMENTS

1. Rotating Plate and Rocker Assembly	68245
2. Over-ride Switch	65952
3. Adjusting Screw, Start Switch	73515-38
4. Adjusting Screw, Reverse Switch	73515-36
5. Lower Plate and Spacer Assembly	68448
6. Nylon Spacer	68650
7. Start Switch	61596
8. Actuating Bar, Rocker Arm	
9. Hardened Bracket, Rocker Arm	69013
10. Nylon Gear, Selector Motor	68717

b. Forward Mechanical Stop of Number Quadrant - Item 2, Fig. 53.

To accomplish this setting, depress number solenoid No. 0 (Item 6, Fig. 53) and turn the rotating plate and rocker assembly (Item 1, Fig. 52) in a clockwise direction by turning the nylon gear of the selector drive motor (Item 10, Fig. 52). One of the twenty stop pins (Item 3, Fig. 53) will engage the depressed plunger of stop solenoid No. 0 and begin moving the number quadrant assembly (Item 1, Fig. 53). Continue rotation until the quadrant stops against the forward stop screw (Item 2, Fig. 53). At this point the hardened brackets at the top of the rockers (Item 9, Fig. 52) should all be aligned with twenty corresponding latch pins designated as No. "0" eg. A0, B0, C0 etc. Also the rocker actuating bars (Item 8, Fig. 52) must be aligned with their respective letter solenoid plungers at the forward stop position of both number stop "0" and number stop "1".

NOTE: It may be necessary in some cases to justify the above requirements to provide correct indexing under electrical operation.

c. Start Switch Setting. Item 7, Fig. 52

The start switch (Item 7, Fig. 52) should be set to actuate by the forward motion of the number

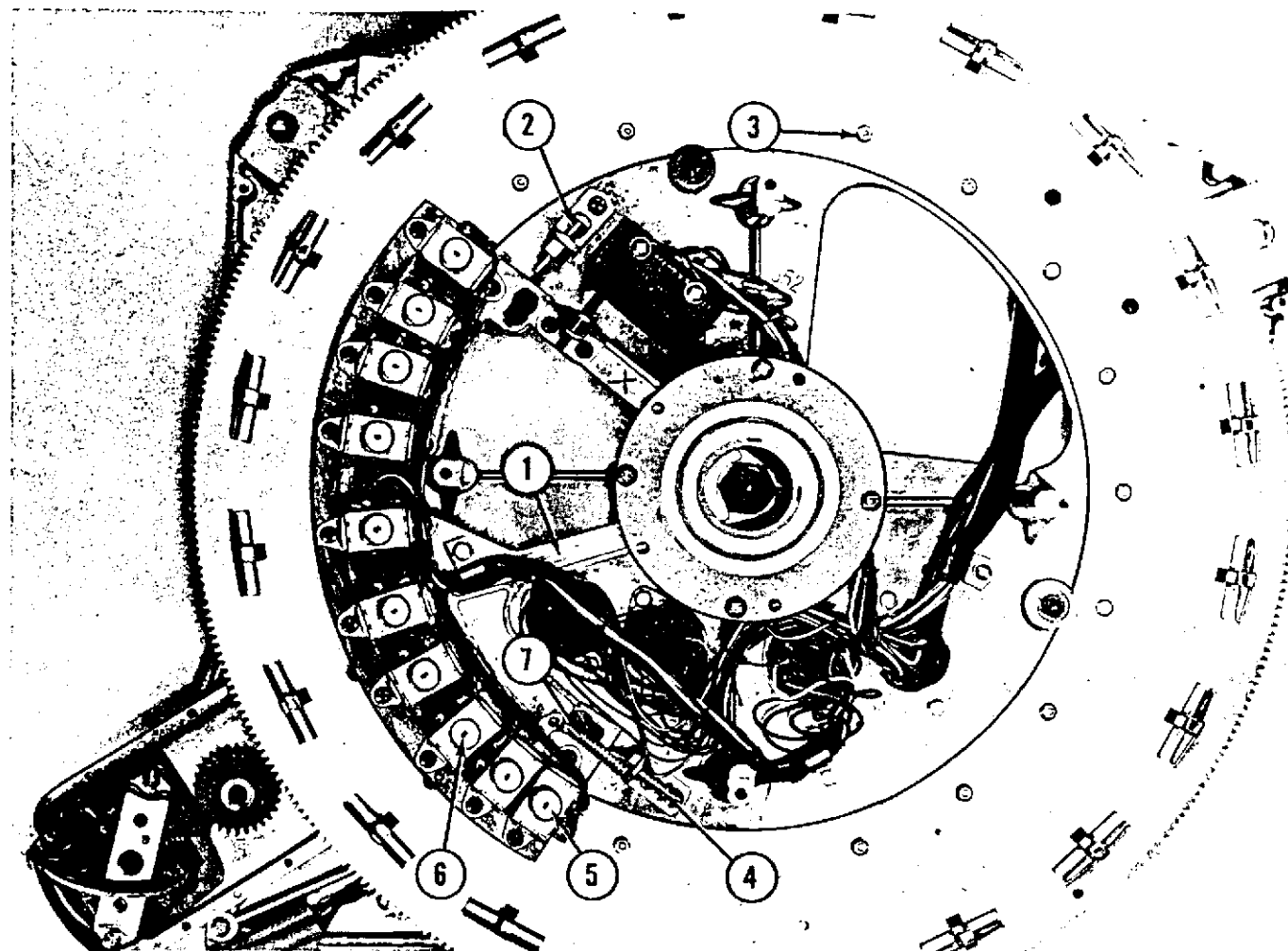


Fig. 53. ELECTRIC SELECTOR ADJUSTMENTS

1. Number Quadrant Assembly (Mounting Casting)	68793	5. Number Stop Solenoid No. 1	68804
2. Screw, Forward Stop	73793-125	6. Number Solenoid No. 0	68617
3. Stop Pin, Rotating Plate	68648	7. Spring, Retracting	62773
4. Back Stop	73575-95		

quadrant. Set the adjusting screw (Item 3, Fig. 52) to provide switch action at the forward stop adjustment, established in "b", with $1/32" \pm 1/64"$ over-travel.

NOTE: The over-travel of the start switch may be extended to $1/16"$ in phonographs that have been wired in accordance with Service Slant W-276 or in others that have been modified in accordance with W-276.

d. Back Mechanical Stop of Number Quadrant.

When the quadrant is released, the back stop (Item 4, Fig. 53) for the number quadrant should be set to provide $1/16"$ over-travel of the quadrant, after the start switch actuates. The spring (Item 7, Fig. 53) provides retracting action for the number quadrant.

e. Reverse Switch Setting. Item 4, Fig. 52

The reverse switch adjusting screw (Item 4, Fig. 52) should be set to provide over-travel in the

following manner: With the number quadrant against the back stop adjustment established in "d" turn the adjusting screw (Item 4, Fig. 52) clockwise until the switch is actuated and then counter-clockwise until the switch is again actuated. Continue the counter-clockwise adjustment $1/4$ turn of the adjusting screw after the switch actuates.

f. Adjustments for the selector crank will be covered after installation and alignment of the electric selector with the record changer.

5. LUBRICATION

The electrical contacts are made of silver and are naturally quite soft. Cleaning should be accomplished with carbon tetrachloride and the contacts burnished with a tool for that purpose or a strip of heavy bond paper. Avoid abrasives. Mechanical linkage and shaft bearings should be lightly lubricated with a wax free and acid free S.A.E. No. 10 oil.

WURLITZER MODEL 2100 RECORD CHANGER

1. GENERAL DISCUSSION

The Wurlitzer Model 2100 record changer (Fig. 54) is scientifically designed and fabricated. It is calculated to function without interruption throughout its service life. All components and systems have been carefully factory-adjusted and tested, thus minimizing the possibility of breakdown or malfunctioning. The record changer accommodates 100 seven inch, 45 R.P.M. records, which provide a choice of 200 selections. Outstanding features of the Model 2100

record changer mechanism are simplicity of design and built-in timing. Normally, only minor field adjustments may be required. However, this service manual, if studied carefully, will equip service personnel for meeting practically all service requirements that may arise. The Model 2100 Wurlitzer record changer is a precision-built mechanism, and although sturdily constructed, it should be handled like any other finely made instrument.

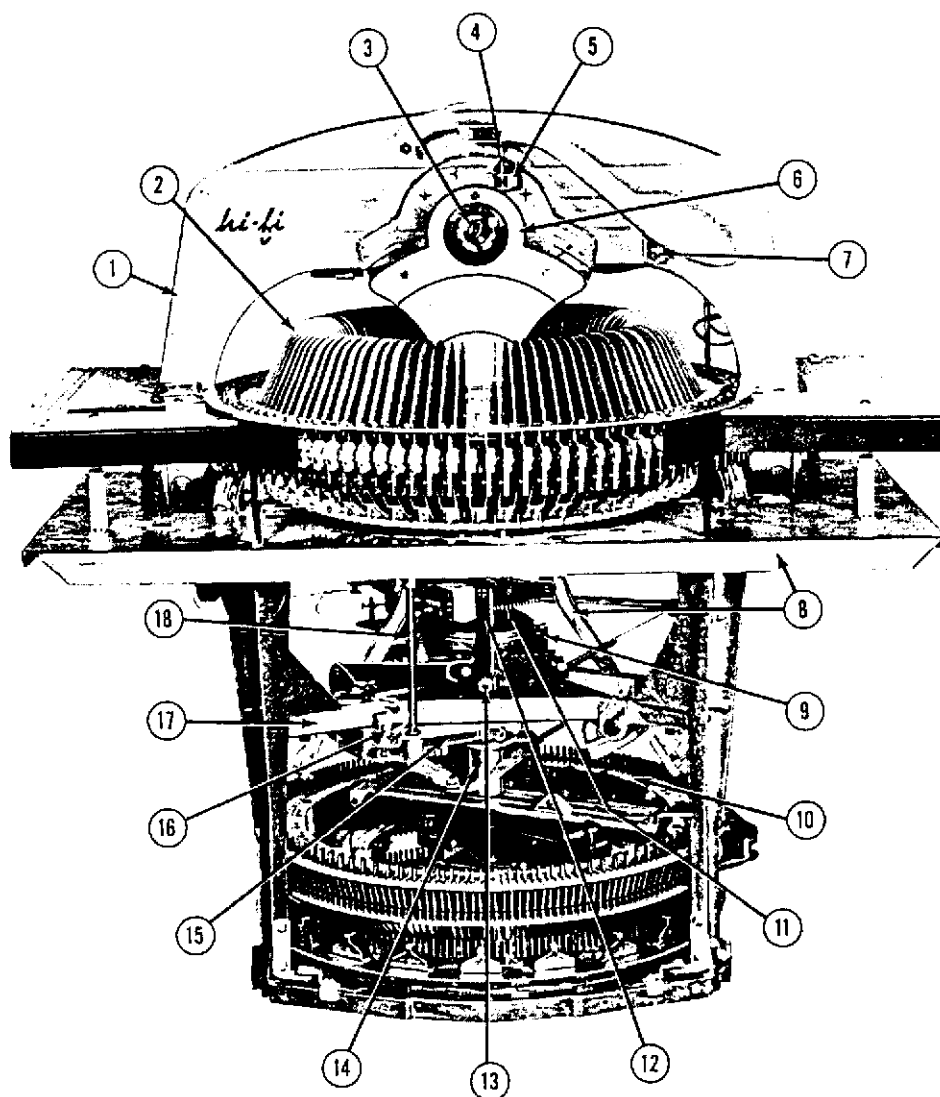


Fig. 54. MODEL 2100 RECORD CHANGER (FRONT VIEW)

1. Top Support Casting Assembly	68581	10. Electric Selector Assembly	68127
2. Record Carrier Assembly	68576	11. Gear and Ratchet Wheel Assembly	59732
3. Turntable and Shaft Assembly	68102	12. Link and Lever Assembly, Record Arms (Whiffletree)	59599
4. Feed-in Adjusting Screw (Pin, Tone Arm Stop)	64422	13. Cam Follower, Bearing	60991
5. Release Lever, Tone Arm	64530	14. Sleeve and Bushing Assembly, (Loading)	68483
6. Record Guide Assembly	68025	15. Stop Lever and Roller Assembly, (Loading)	68525
7. Mounting Casting, Tone Arm	64574	16. Switch, Loading	53648
8. Chassis Mounting Plate and Record Lift Arm Assembly	68459	17. Chassis Frame Assembly	68462
9. Main Cam, Bushing, and Pawl Assembly	69596	18. Release Lever and Shaft Assembly	68557

2. DESCRIPTION

Five major assemblies, or groups of assemblies make up the record changer, Figure 54. The top support casting assembly (Item 1) includes the turntable assembly, the tone arm assembly, and the turntable motor and bracket assembly. Item 2, the record carrier assembly. Item 8, the chassis mounting plate and record lift arm assembly. Item 17, the chassis frame assembly, includes the main shaft assembly, Item 12 and the electric selector assembly, Item 10. Each of these assemblies is described separately in the following paragraphs.

a. The top support casting assembly is attached to the chassis mounting plate with four screws. The

entire top support casting assembly may be detached as a unit by removing the four screws, disconnecting the electrical connections and two actuating cables.

The sub assemblies and components of the top support casting assembly (See Figs. 54 and 55) are as follows:

(1) Tone Arm Assembly.

A bracket on the right front side of the top support casting mounts the tone arm assembly (Item 7, Fig. 54). The complete tone arm assembly consists of the tone arm casting, mounting casting and

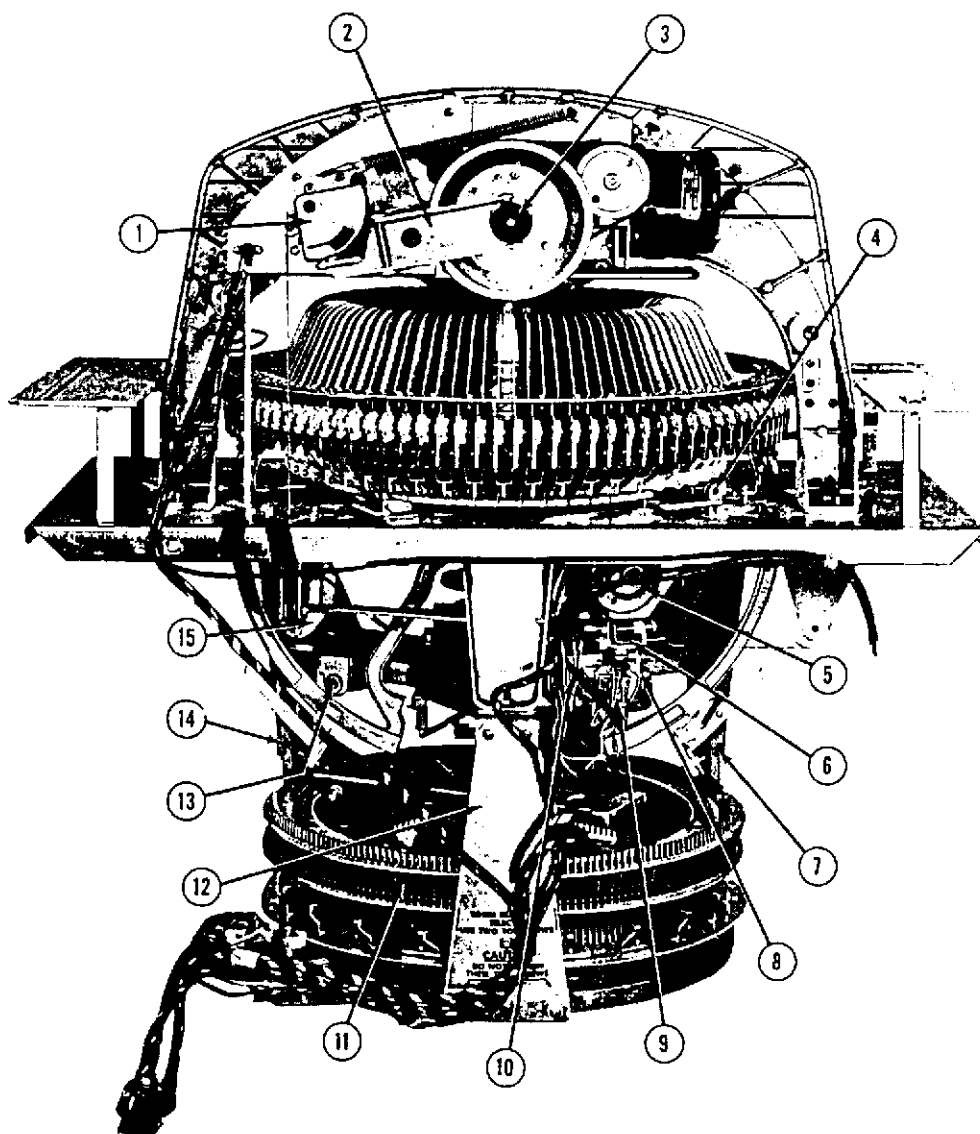


Fig. 55. MODEL 2100 RECORD CHANGER (REAR VIEW)

1. Cam, Record Clamp	59464	9. Mute and Play Switch and Bracket Assembly	65170
2. Arm and Roller Assembly, Turntable Release	59922	10. Transfer Switch and Bracket Assembly	59569
3. Plate, Record Clamp	63205	11. Electric Selector Assembly	68127
4. Back Stop Pawl Assembly	63890	12. Support Plate	68520
5. Motor, Record Changer	65625	13. Shaft and Cancel Arm Assembly	59632
6. Actuator Arm, Transfer Switch	59691	14. Support Casting, R.H.	67928
7. Support Casting, L.H.	68700	15. Lever Assembly, Record Clamp	59688
8. Actuator Arm, Mute and Play Switch	62761		

pin assembly, gimbal and stop nut assembly, feed-in guide bracket, counterweight, speed clip, and output wiring harness.

(2) Tone Arm Release Lever Shaft.

The tone arm release lever shaft is mounted in two bearings -- one in the support casting and one in the back plate. Mounted on the shaft are the feed-in guide lever actuating cam, the actuating pulley, and the record clamp cam. The actuating pulley, to which is connected the record clamp cable, serves to operate the record clamp lever, tone arm release and feed-in lever, the tone arm, and the record clamp cam.

(3) Tone Arm Release Lever and Bracket Assembly. (Fig. 54)

The tone arm release lever, (Item 5, Fig. 54) is mounted behind the tone arm on the upper right side of the support casting (Fig. 54). The function of the release lever is to guide the tone arm needle to the feed-in groove of the record to be played. The tone arm release and feed-in lever function to guide the tone arm through the tone arm feed-in guide bracket. The feed-in adjusting screw is located in one end of the tone arm release bracket and functions to engage the needle with the feed-in groove of the record.

(4) Record Guide Assembly.

The record guide assembly (Item 6, Fig. 54) is attached to the lower center of the support casting by a shaft through a pivot casting. This method of mounting allows the complete assembly to pivot and operate a safety switch if a broken or warped record becomes jammed against it. The record track, in turn, is pivoted laterally at the bottom of the record guide assembly and functions as a stop for a record from either side of the record carrier. The safety switch is operated by a bracket and stop nut assembly attached to the record guide assembly. The record guide assembly is spring-loaded to assure return to its normal position when obstruction has been removed.

(5) Turntable Motor and Mounting Bracket Assembly. (Fig. 55)

The turntable motor and mounting bracket assembly is mounted on the left rear of the top support casting assembly (Fig. 55). The motor operates on 115 volt, 60 cycle current. Power is supplied to the turntable motor when over-ride relay has been actuated by over-ride switch action. See Page 31, Phase 15.

(6) Turntable Shaft and Record Clamp Assembly. (Figs. 54 and 55)

The turntable shaft and record clamp assembly is made up of two shafts, one fitted inside

the other. These two shafts are assembled inside a removable sleeve, which in turn, is mounted in the top support casting. The inner, sliding shaft operates the record clamp mechanism. The outer shaft operates the turntable and clamp assembly. A drive pulley and fly wheel assembly is mounted on the rear end of the outer shaft. The record clamp plate (Item 3, Fig. 55) is mounted on the rear end of the inner, record clamp shaft.

(7) Record Clamp Lever and Bracket Assembly.

The record clamp, arm and roller assembly (Item 2, Fig. 55) is mounted on the right of the back plate of the top support casting. The record clamp arm is pivoted on its mounting bracket to transfer action of the record clamp cam to the sliding shaft (Item 3) which operates the record clamps. The record clamp cam, (Item 1, Fig. 55) in turn, is actuated by the pulley and cable which is connected to the record clamp lever, operated by the main cam.

(8) Tone Arm Brush Assembly.

The tone arm brush assembly is mounted at the upper left center of the top support casting and is actuated by a cable linked to the transfer switch actuator arm. Since the transfer switch is actuated each time a record is played, the needle brush is also operated once for each record played. The brush moves away from the path of the tone arm after brushing the tip of the needle.

(9) Tone Arm Brush Cable Guide Pulley.

A plastic guide pulley and bracket assembly is mounted at the rear left side of the support casting (Fig. 55) to guide the cable linked to the tone arm brush assembly and the actuating arm of the transfer switch.

(10) Trip Switch.

The trip switch is mounted on a bracket which is pivoted to the rear side of the support casting. The pivot mounting of the trip switch and bracket assembly serves to provide adjustment for trip action at the cut-off groove of the record.

(11) Safety Switch.

As described in paragraph (4), the safety switch is the means by which power is shut off in case of a record jam at the record guide assembly. It is a normally open micro switch, mounted on the rear side of the support casting, slightly to the right of the record guide assembly.

b. Record Carrier Assembly. (Item 2, Fig. 54)

The record carrier assembly is made up of the record carrier casting, the carrier drive pawl arm, carrier drive pawl arm spring, 100 individual

record holders, with record play counters, and the four carrier ring and silk screen assemblies.

The record carrier assembly is mounted on the upper end of the selector shaft assembly and is held in place by a large retaining ring. The record carrier assembly is removable as a complete unit. The individual record holders, with their accompanying play counters, however, may be removed separately. The sub assemblies of the record carrier assembly may be described as follows:

(1) Record Carrier Casting and Drive Pawl.

The record carrier casting and drive pawl assembly is the foundation for the carrier and mounts the 100 record holder and counter assemblies which are held in place by the indexing teeth on the circumference of the casting. These teeth function to engage the back stop pawls to provide accurate indexing of the carrier when its searching action is stopped to present the selected record for engagement with the turntable. The carrier drive pawl and spring are mounted on the under side of the carrier casting engaging the carrier drive arm assembly to provide rotation of the record carrier in a clockwise direction only. The record carrier casting is fitted with a rubber ring and clamping plate that serve to hold the record holders in place at the center of the casting.

(2) Record Holders.

The record holder assemblies are replaceable units. The play counters which are a riveted part of the holders count up to 40 plays for each of the 100 records.

(3) Carrier Ring and Silk Screen Assembly.

The carrier ring is made up of four equal segments which together form the complete carrier ring. Twenty-five record holders are fastened in pairs to each segment by small screws and speed nuts or tapping plates where the segments join. The four segments are identified by the last number at the ends of the segment as A1-L1, L2-B1, M1-A2, B2-M2, A1-B1, A3-B3, A5-B5 etc. Each side of every record is identified on the carrier ring by a letter and a number such as A1. These numbers are silk screened on the carrier ring segments.

c. Chassis Mounting Plate and Record Lift Arm Assembly. (Item 8, Fig. 54)

The chassis mounting plate is the supporting member of the record changer. The following items are considered integral parts of the chassis mounting plate; reinforcement plates, spring cups, hold-down clamps, and lift arm spring brackets. Attached to the mounting plate to complete the assembly are three carrier rollers, the tone arm brush cable guide pulley and bracket assembly (See Fig. 55).

Although the record lift arm assembly may be considered a sub assembly, it is included in the chassis mounting plate and lift arm assembly. The record lift arms are attached to the chassis mounting plate by a bracket and three screws. The chassis mounting plate supports the top support casting, the record changer motor and the chassis frame assembly. The chassis frame assembly is hung from the chassis mounting plate by three chassis frame supports shown in Figure 55. The loading levers and switch are mounted at the front of the chassis mounting plate. The loading lever and linkage turns off power to the changer motor and releases the selector crank from engagement with any selector pins which may be released. The record carrier is thus free to be rotated for changing of records, even though selector latch pins are released.

d. Chassis Frame Assembly.

The chassis frame assembly includes the chassis frame casting, the selector shaft assembly, the three chassis frame supports, and the casting for the electric selector. This assembly serves as a mount for the main cam and shaft assembly, the record lift arm link and lever assembly, the record clamp and tone arm lever, the shaft and cancel arm assembly, the mute and play switch actuator arm, the transfer switch actuator arm assembly, the transfer switch, and the mute and play switch (See Figs. 54 and 55).

(1) Link and Lever Assembly. (Item 12, Fig. 54)

The function of the link and lever assembly is to transmit the movement of the cam follower (roller) from the main cam record lift surface to either one of the two record lift arms that has been selected to raise. The link and lever assembly is attached to the chassis frame casting by a bracket. A roller guide track is provided to assure vertical movement of the link and lever assembly.

(2) Record Clamp and Tone Arm Lever. (Item 15, Fig. 55)

The record clamp and tone arm lever is mounted separately on the rear of the chassis frame casting. It actuates the record clamp and the tone arm cam and shaft.

(3) Shaft and Cancel Arm. (Item 13, Fig. 55)

The cancel arm is pinned on a shaft mounted through the right front member of the chassis frame casting. Also pinned to this shaft is the cancel lever and roller which operates off the main cam. The function of the cancel arm is to actuate the lower cancel arm and cancel sleeve on the selector shaft to reset the selector pin and release the carriage switch after a selection has been made.

(4) Mute and Play Switch Actuator Arm and Transfer Switch Actuator Arm.

These two actuator arms (Items 6 and 8, Fig. 55) are mounted on and pivot on the same shaft on the back of the chassis frame casting. This function is to operate the transfer switch and tone arm brush, and the mute and play switch.

(5) Transfer Switch - Mute and Play Switch.

The transfer switch, (Item 10, Fig. 55) functions to change operation of the record changer from record handling operation to searching operation. The mute and play switch (Item 9, Fig. 55) functions to stop the record handling operation at the correct position for playing of the selected record. Its muting function is to reduce amplifier out-put until the needle has reached the playing groove of the record.

e. Selector Shaft Assembly.

The selector shaft assembly includes the arm and hub assembly on which the record carrier is mounted, the selector drive clutch and hub, the drive clutch spring and felt washers, gear and ratchet wheel assembly, (Item 11, Fig. 54) main cam and bushing assembly, thrust bearing and spacers, and the main selector shaft assembly.

(1) Arm and Hub Assembly.

The arm and hub assembly is pinned to the upper end of the main selector shaft with a roll pin. The arm of this unit engages the record carrier drive arm on the under side of the record carrier casting and drives the record carrier through its searching phase.

(2) Drive Clutch Hub.

The drive clutch hub is pinned to the main selector shaft and functions to hold the drive clutch spring and act as the driven member of the drive clutch.

(3) Drive Clutch Spring.

The drive clutch spring functions as the idler member of the clutch and fits snugly around the drive clutch hub. The hub of the main gear thus becomes the driving member of the clutch. The clutch will, without lost motion, drive the main selector shaft in a clockwise direction only. It automatically releases on reverse action of the main gear.

(4) Gear and Ratchet Wheel Assembly.

The gear and ratchet wheel assembly, (Item 11, Fig. 54) is bearing mounted on the main selector shaft directly above and close to the main cam. As stated above, the selector shaft is clutch driven by the hub of this gear only when it turns in a clockwise direction. When the changer motor (Item 5, Fig. 55)

reverses and turns the main gear and ratchet wheel assembly in a counter-clockwise direction, the ratchet wheel on the under side of the main gear will be engaged by the pawl assembly on the main cam. Thus the main cam may be turned only in a counter-clockwise direction to perform its record handling function.

(5) Pawl Assembly.

Although the pawl assembly is included here as a component of the main selector shaft assembly, it is actually attached to the main cam. As stated above, the pawl will engage the ratchet wheel to drive the main cam in a counter-clockwise direction only.

(6) Strap and Spring Assembly.

The strap and spring assembly is composed of two semi-circular metal straps, riveted together at one end. The coil spring provides tension for the strap around the lower end of the hub of the "main gear and ratchet wheel assembly". When the gear and ratchet wheel assembly is turning in a clockwise direction, the strap and spring assembly engages the pawl assembly and holds the driving dog of the pawl assembly away from the ratchet wheel teeth. This action of the strap and spring assembly eliminates any ratchet noise. During this phase of operation the strap and spring assembly remains stationary and slips on the hub of the moving main gear and ratchet wheel assembly. When the changer motor reverses and the main gear and ratchet wheel assembly turns in a counter clockwise direction, the strap and spring assembly releases the pawl assembly to engage with the ratchet wheel and drive the main cam through its record handling phase.

(7) Main Cam and Bushing Assembly.

The main cam and bushing assembly is mounted on a hollow "shaft, plate, and bushing assembly" riveted to the chassis frame. It is held down on this hollow shaft by means of a thrust bearing assembly and retaining ring. The main selector shaft has its lower bearings contained in the hollow shaft and bushing assembly. The main gear and ratchet wheel is thus concentric with and directly over the main cam and bushing assembly. The cam is provided with five accurately timed cam tracks for operation of five arm and roller assemblies as follows: record lift arm link and lever assembly, cancel arm, transfer switch actuating lever, mute and play switch actuating lever, record clamp and tone arm cam actuating lever.

(8) Cancel Mechanism. (Fig. 54)

The cancel action created by the cancel cam is transferred by the "shaft and cancel arm assembly" through the lower cancel arm and cancel sleeve to the selector crank. Cancel action is thus provided for the selector crank.

(9) Release Lever and Shaft Assembly. (Fig. 55)

The release lever and shaft assembly, (Item 18, Fig. 54) consists of a mounting bracket, the operating lever, a shaft and the actuating arm. It is used to turn the "sleeve and bushing assembly" (Item 14, Fig. 54) and allow the selector crank to raise above its searching position. The actuator arm also engages the loading switch (Item 16, Fig. 54) to intercept the changer motor circuit. In this way the record carrier may be turned freely for loading records and the record changer may not be started until the release lever has been returned to the play position. The selector crank is accurately synchronized with the record carrier. Its first function is to actuate the carriage switch when the tip of the crank is interrupted, in its searching cycle, by a released selector latch pin.

(10) Motor Reversing Function.

When the selector crank is interrupted by a released selector latch pin, the carriage switch actuates the reversing relay and causes the searching action to stop and the record handling action to start. At this time the clutch spring exerts some counter-clockwise influence on the selector shaft, also the loading influence of the selector crank "kick-off" spring tends to turn the selector shaft counter-clockwise. The record carrier will therefore back up slightly and engage one of the back stop pawls (Item 4, Fig. 55) to properly index the record carrier for record handling.

f. Electric Selector Assembly. (Figs. 55 and 56)

The electric selector and its mounting casting (Item 11, Fig. 55) are mounted on the two support castings (Items 7 and 14) and the support plate (Item 12, Fig. 55). The components of the electric selector assembly (Fig. 56) and their respective functions are described under the heading "Electric Selector Assembly, Figs. 52 and 53", pages 33 and 34.

g. Junction Box and Stepper Unit. (Figs. 32, 33, and 34)

The junction box and stepper assembly is mounted on the floor of the phonograph. At the front of the junction box are mounted the sockets for the selector switch assembly and the socket for the program motor. At the rear are the sockets for the coin register mechanism, the chassis socket, two switch sockets, and the changer motor socket. For convenience the service switch and the wall box terminal strip are mounted at the rear also. On the left is a socket for installation of a Model 222 Booster, a 3 Amp. Fustat for protection of the line to the first group of wall boxes, and an 0.3 Amp. Fusetron for

protection of the number coils and timing relay No. 2. On the right is a cable and plug assembly for connection to the electric selector and an 0.8 Amp. Fusetron for protection of the letter coils. The cable and plug at the left end of the junction box provides connection to the source of power supply furnished by the amplifier. Under the chassis pan are mounted the reversing relay, the pulse relay, 2 timing relays, the 5.5V panel light transformer and several components of the stepper. The electrical function of the relays will be discussed in detail in the following paragraph on Operation.

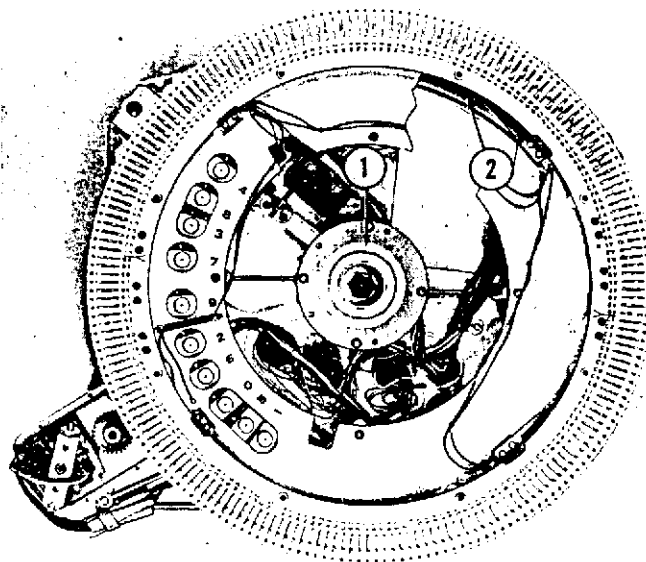


Fig. 56. ELECTRIC SELECTOR ASSEMBLY (SOLENOID ARRANGEMENT)

- 1. Contact Plate Assembly
- 2. Wobble Ring

66186
67927

3. OPERATION (Figs. 57 thru 64)

The model 2100 record changer goes through a complete operating cycle each time a record is played. This cycle begins with the phonograph in its normal "at rest" position and passes through nine distinct phases of operation until the phonograph returns to its original "at rest" position. All of the mechanical operation of the record changer depends upon the operation, in proper sequence, of the over-ride switch, the carriage switch, the transfer switch, the mute and play switch, and the trip switch or the cancel switch. The following description of the operation of the phonograph is therefore, divided into nine phases based on the sequential operation of the foregoing electrical switches. These nine phases are as follows:

a. Phase 1 -- Phonograph at Rest. (Fig. 57)

In describing the electrical and mechanical conditions of the record changer during its first phase of operation, it is assumed that the phonograph has been plugged in and is ready for insertion of a coin.

In this "stand-by" condition the fluorescent lights and the coin entry lights are on and low temperature voltage is applied to the heater elements of the amplifier tubes.

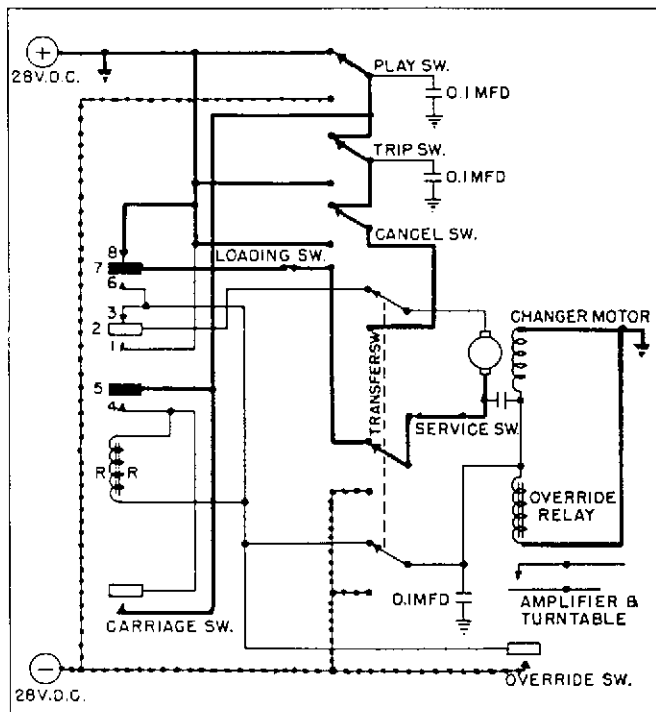


Fig. 57. PHASE 1

(1) Electrical Condition -- Phase 1.

The electrical condition of the record changer during the stand-by or (at rest) phase is shown in Figure 57. Common ground (or positive D.C. voltage) as shown in heavy line is present at one side of the motor armature, one side of the motor field, one side of the over-ride relay, one open contact of the transfer switch, one open contact of the reverse relay, and one open contact of the trip switch, cancel switch, and carriage switch. Negative D.C. voltage (or the hot side) is present as shown in dotted line, at one contact of the over-ride switch, two open contacts of the transfer switch and one open contact of the play switch. No action therefore will take place until the over-ride switch is closed as described under "Electric Selector System", page 31, and Figure 58.

(2) Mechanical Condition -- Phase 1.

When the phonograph is at rest, the record lift arms are held in their full downward position by record lift arm track of the main cam. The transfer switch is actuated by the transfer switch track of the main cam. The play switch cam track has no function at this time. The tone arm and turntable cam track of the main cam is at its fully actuated position, holding the tone arm cam and the turntable cams at their maximum actuated positions.

b. Phase 2 -- Over-ride Switch and Over-ride Relay. (Fig. 58)

When a coin is registered on the playrak and a selection is made as shown in the sequence schematics on the electric selector system, one or more of the over-ride switches close and energize the over-ride relay and record changer motor as shown in heavy line.

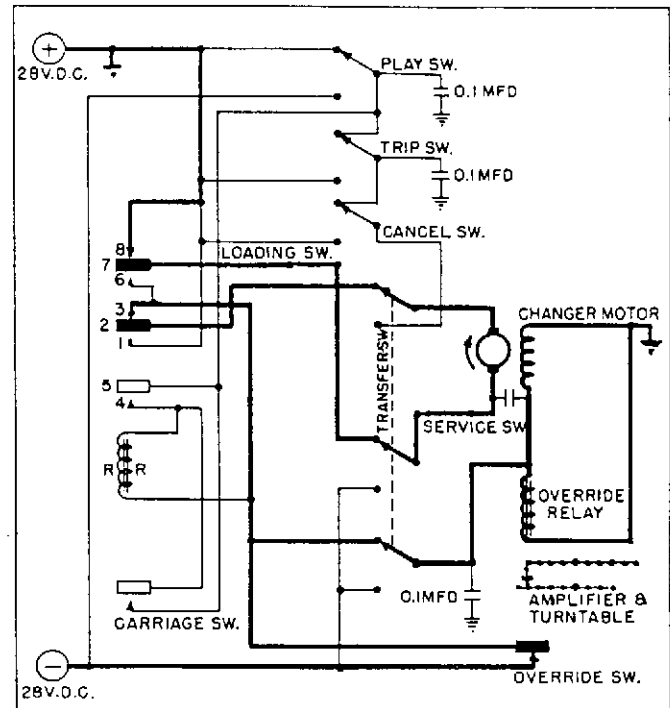


Fig. 58. PHASE 2

(1) Electrical Condition -- Phase 2.

When the over-ride relay is energized, 28V D.C. circuits are completed as shown in solid line to the changer motor armature and the changer motor field. Thus, the changer motor starts its clockwise operation to drive the record carrier and selector crank through the searching phase of the cycle, while its normally open contacts close, as shown in Fig. 58, completing the A.C. circuit to the turntable motor and the amplifier as shown in dotted line.

(2) Mechanical Condition -- Phase 2.

When the selector shaft turns in a clockwise direction, the record carrier rotates in a clockwise direction, and the selector crank rotates in a clockwise direction until the selector crank is intercepted by the released selector latch pin. Meanwhile the main cam remains in its original "at rest" position. The searching phase is therefore the only action to take place up to this time.

c. Phase 3 -- Carriage Switch and Reversing Relay. (Fig. 59)

When the searching selector crank is intercepted by a released selector latch pin, the selector crank shifts under spring loading on its mounting bracket. The shifting motion of the selector crank actuates the carriage switch, also mounted on the selector crank mounting bracket. The shifting motion continues slightly further and stops against the selector stop bracket.

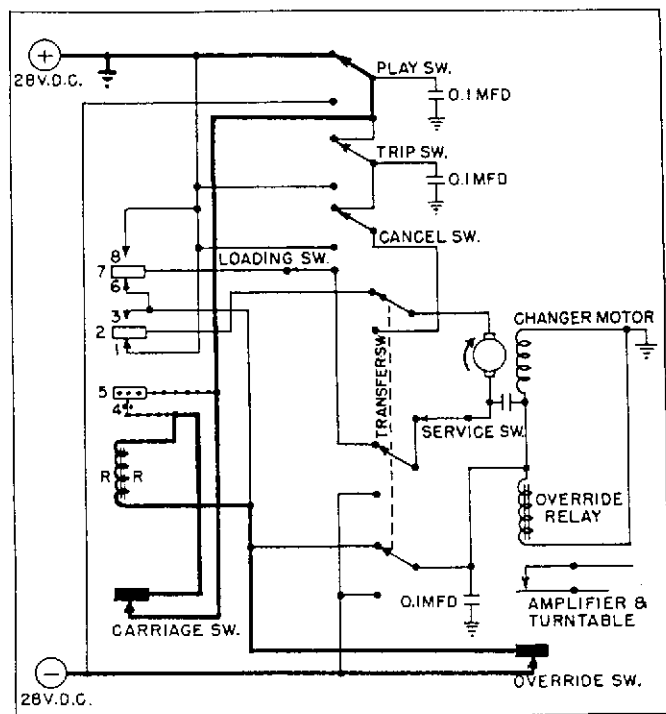


Fig. 59. PHASE 3

(1) Electrical Condition -- Phase 3.

The closing of the carriage switch completes a D.C. circuit to the reversing relay coil, as shown in solid line. The reversing relay has two singlepole, double throw switches and one singlepole, single throw switch. It functions as a pole changer for the armature of the record changer motor. As shown in heavy line the pole changing circuit is the principal electrical change as shown in Figure 60, solid line. The polarity of the armature has been reversed, however the motor field retains its original polarity as shown in dotted line and in Figure 58. The closing of contacts 4 & 5 of the reversing relay (Fig. 59, dotted line) prepare an interlock circuit to continue the reversing relay function after release of the carriage switch.

(2) Mechanical Condition -- Phase 3.

When the reversing relay is actuated, the direction of the changer motor is reversed. The clutch spring on the hub of the main gear and the

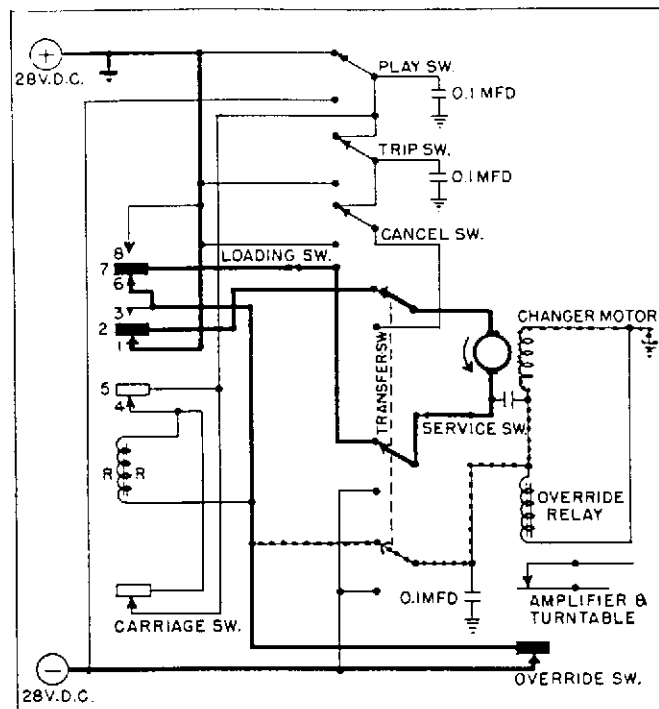


Fig. 60. PHASE 4

drive clutch hub will therefore release its hold and the record carrier will be free to stop against one of the two back-stop pawls. Meanwhile, the ratchet wheel on the under side of the main gear will engage the driving pawl on the top side of the main cam. Counter-clockwise rotation of the changer motor and the main gear produces engaging action of the driving pawl. Thus, the main cam turns in a counter-clockwise direction and the various cam follower rollers are affected by their respective cam tracks. After a few degrees of rotation, of the main cam, the roller of the actuator arm for the transfer switch drops off the lobe on its cam track and the transfer switch retracts to its normal position.

d. Phase 4 -- Transfer Switch. (Fig. 61)

The transfer switch functions to change control of the changer motor circuit from the over-ride and reversing switch controls, to the play switch, trip switch, and cancel switch controls. During the following portion of the cycle of operation these former switches will be reset to again perform their initial functions in the next cycle of operation.

(1) Electrical Condition -- Phase 4.

An examination of Figure 61 shows the changer motor circuit following the operation of the transfer switch. Although the two motor circuits have been maintained without interruption and in the same polarity as shown in phase 3, the initial switching components have been entirely isolated. The field circuit is shown in dotted line and the armature cir-

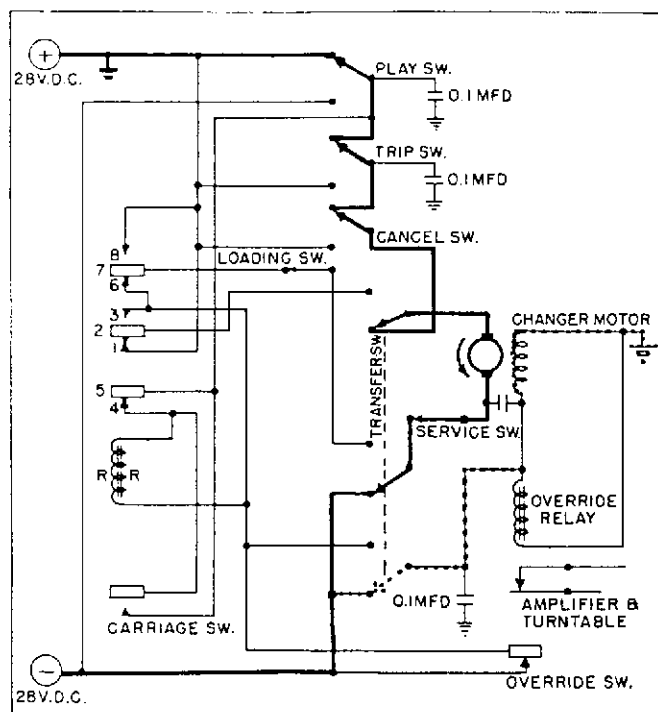


Fig. 61. PHASE 4

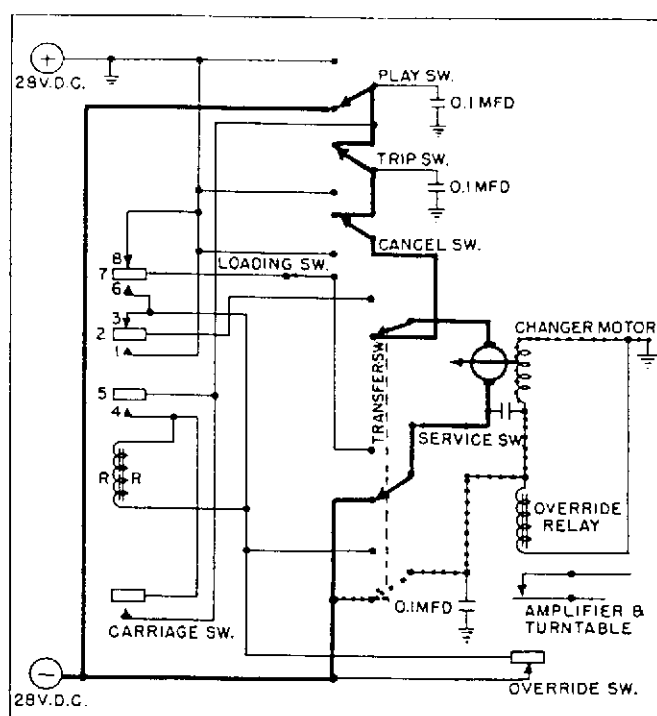


Fig. 62. PHASE 5

cuit in solid line with the same polarity as indicated in Fig. 60.

(2) Mechanical Condition -- Phase 4.

After the transfer switch operates, the main cam continues to turn in a counter-clockwise direction. At this point one record lift arm is indexed to be intercepted by a record holder while the other is indexed to raise a record to the playing position. The link and lever assembly is actuated by the main cam outer vertical track to raise the free record lift arm and the cancel lever is actuated by the main cam inner vertical track to operate the cancel linkage and reset the selected latch pin. The changer motor continues and the upper lateral cam track will operate the tone arm actuator and linkage to engage the tone arm with the record and release it for compliance with the record groove. At this point the adjustable lobe on the lower lateral cam track will operate the mute and play switch to stop the mechanism in this "play position".

e. Phase 5 -- Mute and Play Switches Function. (Fig. 62)

When the play switch operates, positive 28 volt D.C. is removed from one side of the armature of the record changer motor, and negative 28 volt D.C. is applied to that side, thus forming a direct shunt across the armature. This condition produces a strong resistance to rotation of the armature and is in effect a dynamic brake. The record changer accordingly is stopped quickly in the play position and held stationary during the playing cycle.

(1) Electrical Condition -- Phase 5.

Figure 62 shows the active circuits in solid lines from both sides of the armature through the cancel switch, the trip switch, and the play switch forming a complete shunt as explained above. Negative 28 volt D.C. is still applied to one side of the motor field and positive 28 volt D.C. to the other side as shown in dotted line. Not shown in solid or dotted lines, the over-ride relay is still energized to maintain turntable, and amplifier operation. The muting switch not shown, actuates in conjunction with play switch to reduce the amplifier out-put during the record changing cycle and pre-set the automatic level control to provide gradual increase in volume from needle contact to the playing grooves of the record. The interlock circuit for the reversing relay as established in Phase 3, Figure 59 will be released when the play switch actuates as described in this phase of operation.

(2) Mechanical Condition -- Phase 5.

During this phase the D.C. record changer motor remains stationary with dynamic braking in force, as described in (1) and the record lift arms remain stationary, one against the record carrier and the other in its raised position. Meanwhile, the turntable operates until the tone arm has reached the cut-off groove of the record where the trip switch will be actuated.

f. Phase 6 -- Trip Switch Function. (Fig. 63)

The function of the trip switch, as shown in heavy lines, Figure 63, is to open the shunt circuit

and apply positive 28 volt D.C. to one side of the armature of the changer motor. As the motor resumes its counter-clockwise rotation the mechanism cycle will advance. Within several degrees, mechanical action releases the play switch and then releases the trip switch.

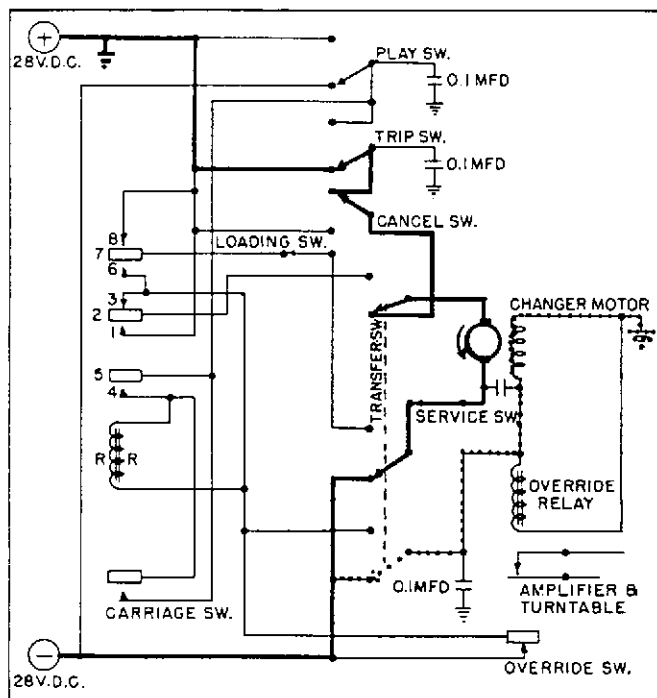


Fig. 63. PHASE 6

(1) Electrical Condition -- Phase 6.

An examination of Figure 63, shown in heavy lines, finds negative 28 volt D.C. is present at one side of the changer motor field and one side of the changer motor armature. Positive 28 volt D.C. is present at the opposite sides of both. The over-ride relay, not shown in heavy lines, still remains energized due to the position of the transfer switch.

(2) Mechanical Condition -- Phase 6.

As explained above, when the trip switch operates, the record changer motor starts the main cam turning in a counter-clockwise direction. After it has turned a few degrees, the play switch lobe leaves the actuating arm to release the play switch. At this point the play switch is in position to take over the trip switch function as the tone arm swings away from its trip position. With the exception of the reversing relay, the electrical condition is again as shown in Figure 61.

g. Phase 7 -- Return Functions of Main Cam.

(1) Electrical Condition -- Phase 7.

As described in Phase 6, the reversing relay has been released to its "at rest" position, the play switch and trip switch have been returned to their "at rest" position and the mechanism is being driven by the counter-clockwise rotation of the changer motor. Only the transfer switch remains to be reset.

(2) Mechanical Condition -- Phase 7.

During this phase of the cycle of operation, the main cam continues in its counter-clockwise rotation to return the tone arm to its original position, release the turntable clamp, lower the record into its holder in the record carrier, and retract both record lift arms to their original "at rest" position. The last function of the main cam, in the cycle of operation, is to reset the transfer switch to its "at rest" position.

h. Phase 8 -- Transfer Switch Function at Full Cycle. (Fig. 64)

As described in "g" all functions of the cycle of operation have been completed under the conditions shown in solid and dotted lines, Figure 64.

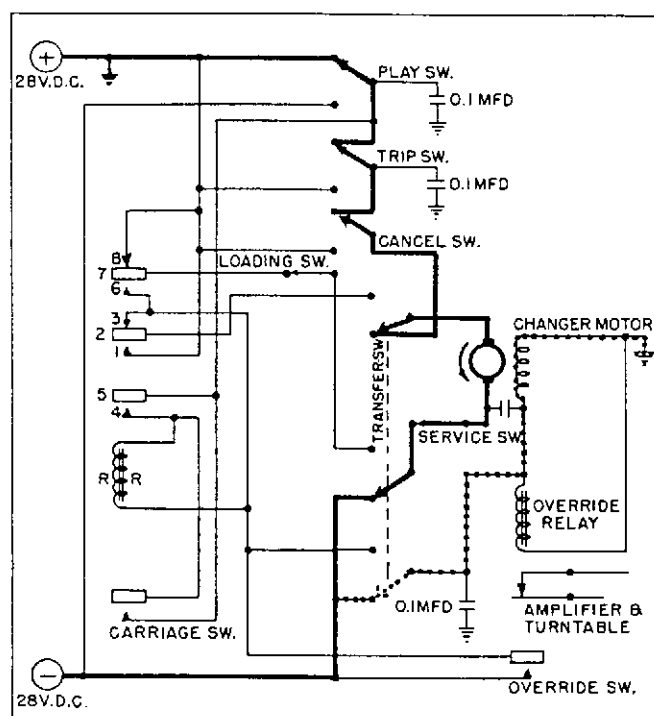


Fig. 64. PHASE 8

(1) Electrical Condition -- Phase 8.

In this full cycle condition the active circuits are now dependent on the position of the transfer switch. Therefore, when the transfer lobe on the main cam actuates the transfer switch all circuits will be open as shown in Phase 1, Fig. 57 and the mechanism will come to a stop.

(2) Mechanical Condition -- Phase 8.

At the completion of the cycle, the mechanism has returned to its "at rest" position. Should other latch pins be released, the over-ride switch will be closed as shown in Figure 58, and another cycle of operation will immediately start. Should no other latch pins be released, the mechanism will remain "at rest" until a selection has been made at the key-board of the selector switch assembly.

4. ADJUSTMENTS

Although each Wurlitzer Model 2100 Phonograph is carefully adjusted at the factory, various factors such as rough handling during shipment may make it necessary to check adjustments. Before making adjustments it should be remembered that the mechanical operation of the phonograph depends primarily upon the proper operation of a number of switches. Therefore, if the phonograph fails to function properly, check the adjustment of the various control switches first. When it is certain that all switches are operating properly, it will be easier to locate the reason for a mechanical malfunction.

The following paragraphs (a to g inclusive) are provided in a group at this point, only as a matter of convenience in checking a phonograph that is assumed to be in normal mechanical adjustment. All, except the service switch, and the loading switch, have their adjustments dependent on proper mechanical adjustment of the components which serve to produce their operation. The failure, therefore, of a switch may indicate some change in mechanical adjustment since final inspection at the factory.

a. Safety Switch. (Fig. 65)

The record guide being in proper adjustment will pre-determine the following switch setting:

(1) Turn the safety switch adjusting screw counter-clockwise until the safety switch is released.

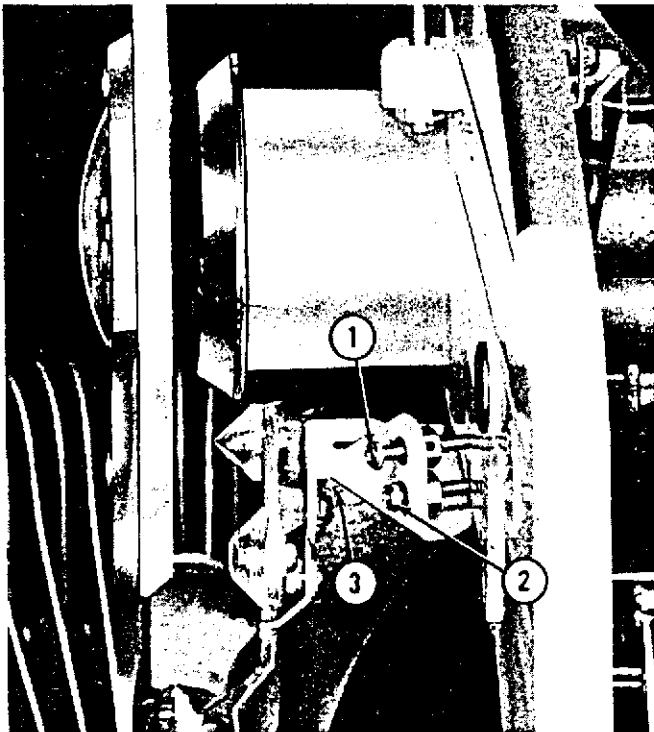


Fig. 65. SAFETY SWITCH AND RECORD GUIDE ADJUSTMENT

- | | |
|------------------------------------|----------|
| 1. Screw, Safety Switch Adjusting | 73800 |
| 2. Screw, Record Guide Adjusting | 73656-72 |
| 3. Spring, Record Guide Retracting | 59606 |

(2) Now turn the safety switch adjusting screw back in a clockwise direction until the safety switch again actuates.

(3) Continue the clockwise movement of the adjusting screw for one half to one full turn to provide reasonable overtravel of the switch.

b. Over-ride Switches, Electric Selector. (Figs. 56 and 66)

When a selector latch pin (Item 5) is released, the "wobble ring and spacer (actuator) assembly" will be displaced, causing one or more of the actuators to actuate their respective over-ride switches as shown in Figure 66. The wobble ring is out of view on the under side of the selector drum, however, it appears as Item 2, Fig. 56. There is no adjustment provided for the over-ride switches, however, the forming of the blades should enable positive contact with good wiping action of one or two of the switches when the wobble ring is displaced by any single selector latch pin.

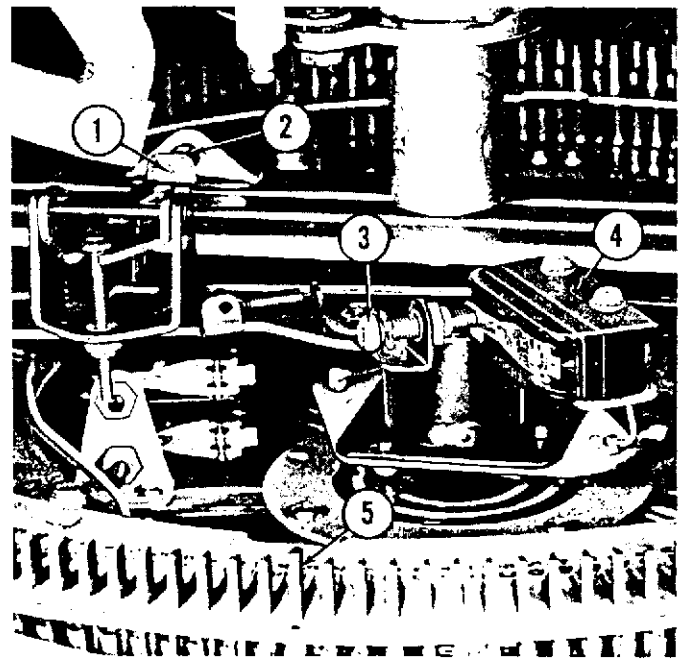


Fig. 66. CARRIAGE SWITCH ADJUSTMENTS

- | | |
|--|----------|
| 1. Stop Bracket, Selector Crank | 65906 |
| 2. Screw, Selector Crank Stop Adjustment | 65702 |
| 3. Adjusting Screw, Carriage Switch | 73502-95 |
| 4. Micro Switch, Carriage | 66002 |
| 5. Latch Pin, Selector | 67924 |

Check for proper over-ride switch action by using several different selector pins one at a time. Switch action may be readily identified by listening for over-ride relay action when contact is made. The relay action should occur at about one third of the travel distance of the selector latch pin. Also the relay should be released at about the same point when the pin is reset. Also see paragraph 4, a, page 33.

c. Carriage Switch and Reversing Relay.
(Fig. 66)

The carriage switch (Item 4) functions as the actuating component for the reversing relay, therefore, its operation must be closely synchronized with the position of the record carrier and, as stated before, its adjustment is dependent on the proper mechanical adjustment of several other sub-assemblies of the record changer. Adjustment of the carriage switch, if necessary, may be accomplished as follows;

With the record carrier and selector crank approaching a selected latch pin, set the carriage switch actuating screw to produce switch action, when the corresponding back stop pawl drops into the proper tooth of the carrier ring. An over-travel tolerance of 1/64" to 1/32" of the tooth beyond the back-stop pawl, should be provided.

NOTE: This adjustment should be verified and, if necessary, justified at twelve different latch pins.

d. Transfer Switch Adjustment. (Fig. 67)

The transfer switch is mounted on the chassis casting and is located under the record changer motor at the rear of the phonograph. The transfer switch actuating arm has two adjusting screws, one of which regulates the tension of the needle brush actuating cable and the other regulates the amount of throw used to actuate the transfer switch. The transfer switch actuating arm (Item 6, Fig. 67) is pivoted on the chassis casting and is operated by the lateral lobe (Item 4) on the main cam. An approved method for adjusting the transfer switch is described below:

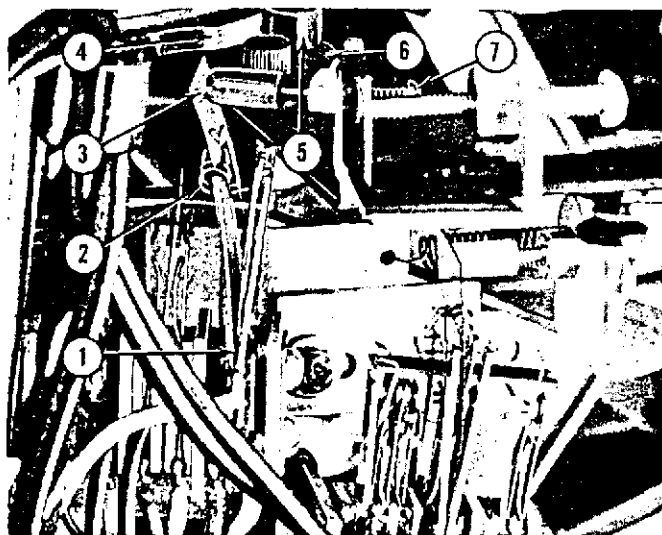


Fig. 67. TRANSFER SWITCH ADJUSTMENT

- | | |
|---|----------|
| 1. Transfer Switch | 59569 |
| 2. Over Center Spring | 59569-1 |
| 3. Position of Switch to Start Adjustment | |
| 4. Lobe, Transfer Switch | |
| 5. Roller, Actuating Arm | 56592 |
| 6. Actuating Arm, Transfer Switch | 59691 |
| 7. Adjusting Screw, Transfer Switch | 73574-31 |

(1) Advance the record changer cycle until the roller (Item 5) of the transfer switch actuating arm is at the base of the long lateral lobe on the main cam. In this position the adjusting screw for the transfer switch (Item 7) should be backed off enough to clear the retracted actuating tab of the switch. This is the normal position of the transfer switch.

(2) The main cam should now be advanced until the roller of the transfer switch actuating arm rides up on the lobe of the cam.

(3) Set the transfer switch adjusting screw to throw the transfer switch to its over-center position. After the switch has actuated, continue to advance the adjusting screw enough to provide 1/32" to 1/16" over-travel at the actuating tab.

(4) Turn on the service switch to test for operation.

NOTE: As described under Operation, Phase 8, when the roller is raised to the lobe of the cam, the transfer switch functions to terminate the cycle, and the mechanism is then in a position to again start the searching phase as described in Phase 2 or to stop as described in Phase 1. This position is generally referred to as the "at rest" position of the record changer.

e. Mute and Play Switch Adjustments. (Figs. 68, 69, and 70)

The cam lobe that operates the mute and play switch is fastened to the lateral surface of the main cam with two locking screws and is movable to permit advance or delay in the action of the mute and play switch. Figure 68 shows index lines that appear on the main cam and the mute and play cam. An adjustment of the cam as shown is accurate in the majority of cases, however, the following method may be used for this adjustment:

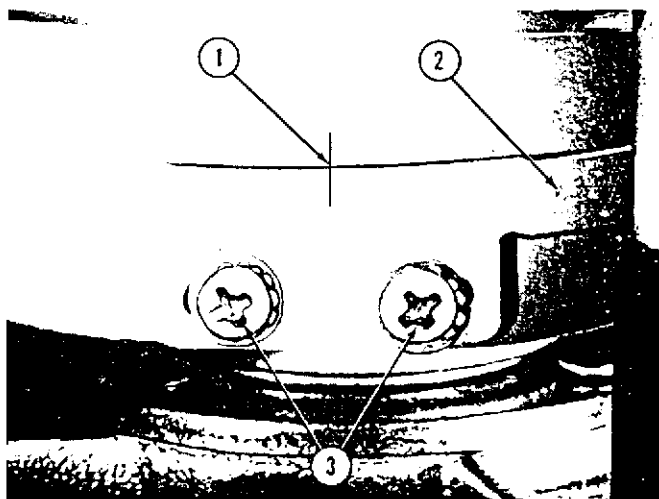


Fig. 68. MUTE AND PLAY SWITCH TIMING

- | | |
|--|----------|
| 1. Timing Marks, Main Cam and Adjustable Cam | |
| 2. Adjustable Cam, Mute and Play Switch | 62768 |
| 3. Locking Screws, Adjustable Cam | 73534-14 |

(1) Set the mute and play cam lobe so that its timing mark (Item 1, Fig. 68) aligns with the mark on the main cam.

(2) With the roller (Item 3, Fig. 70) of the mute and play switch actuating arm at the base of the mute and play cam but still on the main cam adjust the stop plate (Item 2, Fig. 69) to provide 0 to 1/64" clearance between the roller and the cam as shown in Item 2, Fig. 70.

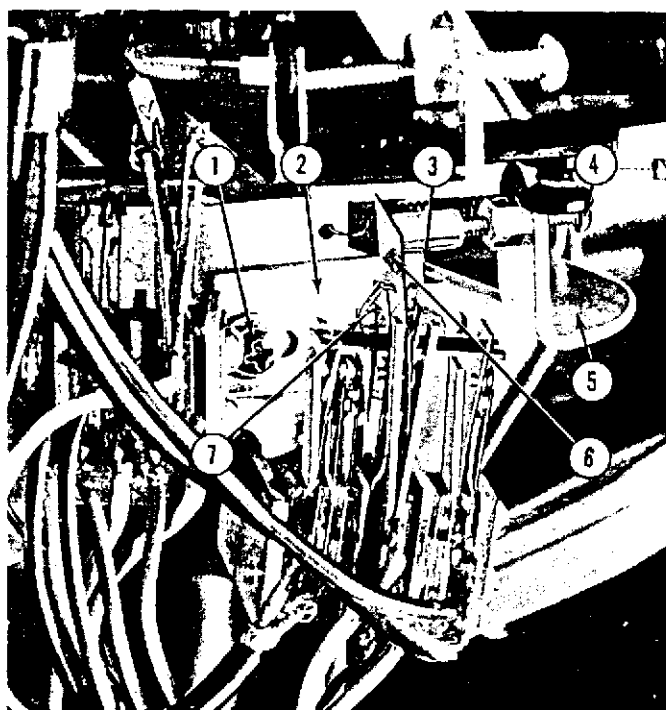


Fig. 69. STOP PLATE SETTING, MUTE AND PLAY SWITCH ACTUATING ARM

- | | |
|---|----------|
| 1. Locking Screw | 73534-14 |
| 2. Stop Plate | 62769 |
| 3. Stop Position | |
| 4. Adjusting Screw | 73574-31 |
| 5. Actuating Arm, Mute and Play Switch | 62761 |
| 6. Switch Tab, Over-travel Measured at this Point | |
| 7. Over-center Spring | 59569-1 |

(3) Set the actuating screw of the mute and play switch actuating arm (Item 4, Fig. 69) to allow 1/32" to 1/16" over-travel of the switch tab after the switch has actuated over-center, under the spring loading of the actuator arm. Check for proper action with the roller of the arm on top of the mute and play lobe in the play position. Too much over-travel of the switch at the original setting may produce improper action of the switch in the play position. In some cases it may be necessary to slightly reduce switch over-travel to obtain proper action in the play position.

(4) To check for proper action under operating conditions, cycle the mechanism to the play position and observe the turntable cam during trip switch operation. If there is any forward movement of the turntable cam when the trip switch actuates, the

mute and play switch is stopping the mechanism in its play position, too early. In this case move the cam lobe (Item 2, Fig. 68) slightly in the direction opposite to the rotation of the main cam. Also observe the turntable cam when the mechanism stops in the play position. If there is any reverse action of the turntable cam at the play position, the mute and play switch is stopping the mechanism too late. In this case move the cam lobe slightly in the direction of rotation of the main cam. It may be necessary to repeat one or the other of these operations to insure the best play position and provide maximum freedom of the tone arm for compliance with the record grooves.

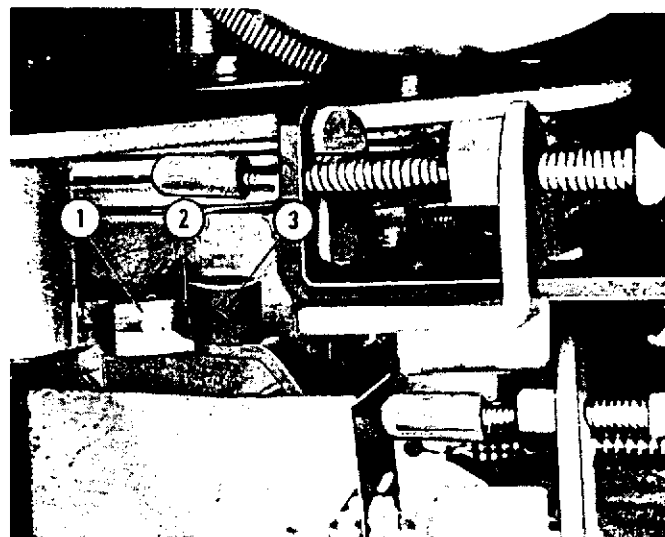


Fig. 70. STOP PLATE SETTING, MUTE AND PLAY SWITCH

- | | |
|---|-------|
| 1. Mute and Play Switch Cam | 62768 |
| 2. Zero to 1/64" Clearance (Stop Plate Setting) | |
| 3. Roller, Mute and Play Switch Actuating Arm | 56592 |

f. Trip Switch.

The trip switch is located at the right rear of the support casting assembly. Examination of Figures 60 to 64 indicates the phases of the cycle of operation in which the trip switch has a specific function. For detailed instructions on trip switch adjustment and timing, see paragraph v, page 56.

g. Service Switch.

The service switch, shown at the rear of the junction box in Item 3, Fig. 32, serves as an aid in making adjustments at the back of the phonograph. It stops the changer motor at any phase of the cycle.

h. Loading Switch.

The loading switch is also in the motor circuit, however, it functions as an aid to loading the record carrier at the front of the phonograph. The release lever and shaft assembly (Item 18, Fig. 54) operates the loading switch and stops the changer motor only when it is in the searching phase of the cycle.

i. Record Lift Arm Roller Guides. (Figs. 71 and 72)

Mounted at the upper ends of the record lift arms are two guide tips, mounted on a pivot pin or shaft - (Item 4, Fig. 71). These guide tips are spring loaded by a spring (Item 10) to spread them apart. With the lift arms down in their normal position these guide tips are squeezed together by the "bracket and roller assembly" (Fig. 72). One of these rollers is mounted on a stationary shaft, which is part of the bracket and pin assembly (Item 10, Fig. 72) and the other is mounted on an eccentric shaft (Item 11, Fig. 72). As the lift arm moves upward to take out a record, these guide tips spread apart, as they leave the compressing effect of the two guide rollers, to engage and raise the record. The pivot pin (shaft) of the guide tips extends inward from the lift arm to engage with the slot in the adjustable plate (Item 4, Fig. 72) when the lift arms are in their normal lowered position. This slot in the adjustable plate serves to accurately position the lift arm for indexing with the center of the record holders of the carrier. The guide plate (Item 11, Fig. 71) serves as

spreaders between record holders to insure clearance for the record guide tips as they raise and lower the record.

(1) Advance the record changer cycle to a point where the lift arms are free to be moved up and down between the guide rollers.

(2) Adjust the eccentric shaft (Item 11, Fig. 72) to provide clearance of the guide tips, as they are raised and lowered between the rollers, of .003" to .006".

(3) Carefully position the adjustable plate (Item 4, Fig. 72) to guide the tips of the lift arm in the center of the maximum .006" clearance provided in (2). When the lift arm moves up or down, the pivot pins of the guide tips leave or enter the slots in the adjustable plates and the guide tips move out or into engagement with the guide rollers. During these two phases of operation the guide tips should move freely with no drag whatsoever and should remain straight up. When raising, they should spread evenly on both sides of the axis of the lift arms.

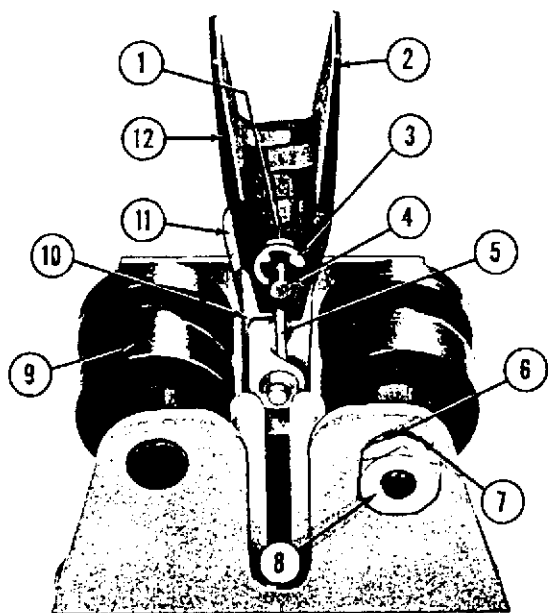


Fig. 71. BRACKET AND ROLLER ASSEMBLY, LIFT ARM GUIDE

1. Washer (2 Used)	65887
2. Guide Tip, R.H.	65937
3. Retaining Ring	65730
4. Shaft	73724-9
5. Stop, Guide Tips	65938
6. Washer	65526
7. Lock Washer	65937
8. Nut, 6-32 Hex.	73605-5
9. Roller, Lift Arm Guide (2 Used)	73601-6
10. Spring, Guide Tips	65939
11. Guide Plate	65812
12. Guide Tip, L.H.	68290
	65731

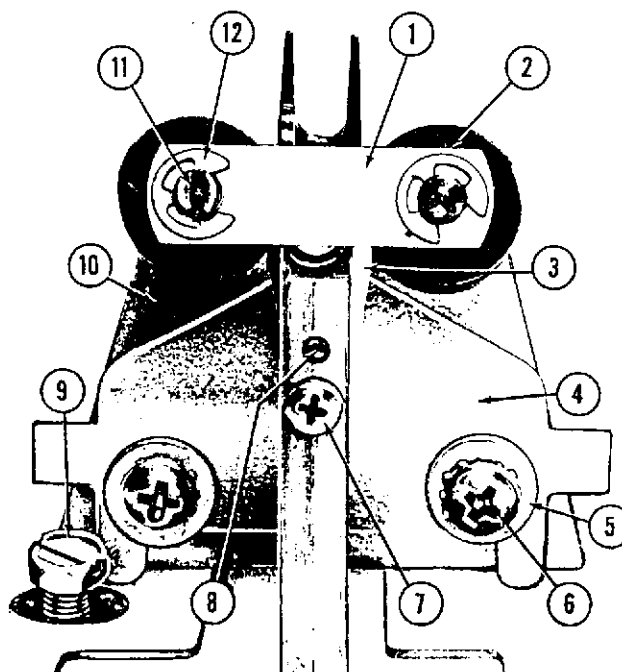


Fig. 72. BRACKET AND ROLLER ASSEMBLY, LIFT ARM GUIDE

1. Strap	65940
2. Spacer (2 Used)	65942
3. Guide Plate	68290
4. Plate, Adjustable, Lift Arm Guide	66182
5. Washer (4 Used)	49387
6. Screw, Adjusting	73533-34
7. Screw, 4-40 x 5/8"	73533-7
8. Roll Pin	73782-32
9. Adjusting Screw, Lift Arm Centering	73660-161
10. Bracket and Pin Assembly, Lift Arm Guide	65888
11. Stud, Eccentric, Lift Arm Guide	66181
12. Retaining Ring (2 Used)	73724-18

(4) The lift arms should now be properly positioned by adjusting the "bracket and roller assemblies" at their elongated mounting holes. The lift arms should be down, the pivot pin (shaft) of the guide tips in the slots of the adjusting plates, and the center line of lift arms must be equally displaced to the rear of the radial line from the main center support casting. The position described above has been established during assembly by means of a fixture to provide displacement of $0^{\circ} - 54'$ for each lift arm. This position is scribe marked on the mounting plate for the bracket and roller assembly and on the bracket for the adjustable plate.

j. Record Lift Arm Setting. (Fig. 73)

Each record lift arm is equipped with a bracket, stop nut and screw assembly (Item 1, Fig. 73). The adjusting screw (Item 2) stops against the under side of the mounting plate to control the height to which the record lift arm may be raised. The height at which the adjusting screw stops the lift arm is determined by the lift action necessary to properly position the record for turntable handling. Due to the combined effect of both the "record stop" (See Item 2, Fig. 74) and the record lift arm, it will be necessary to adjust the record stop before proceeding with the record lift arm setting. These two adjustments may be accomplished as follows:

(1) Clamp record disc X42226 or equivalent on the turntable.

(2) Loosen the two screws (Item 4, Fig. 74) that hold each record stop bracket.

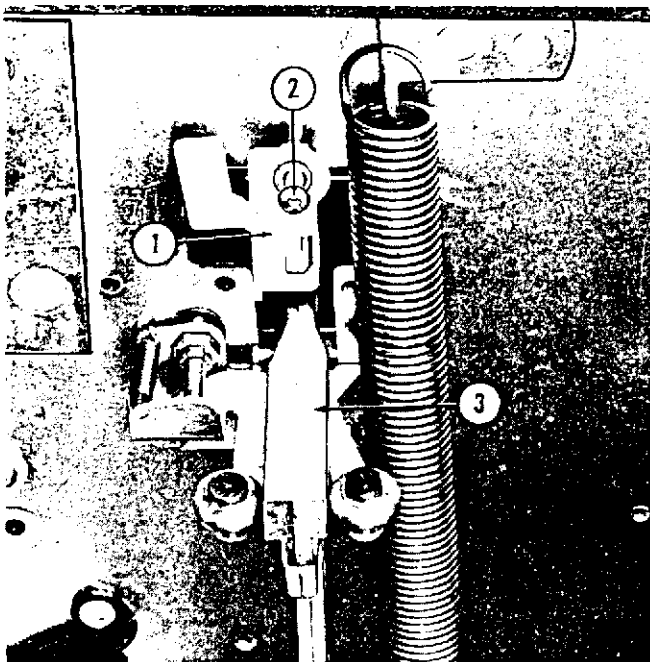


Fig. 73. RECORD LIFT ARM SETTING

- | | |
|--|----------|
| 1. Bracket and Stop Nut Assembly, L.H. | 65831 |
| 2. Adjusting Screw, Record Lift Arm Height | 73503-91 |
| 3. Record Lift Arm, L.H. | 65487 |

(3) Move the stop bracket (Item 3) until the record track rests lightly against the outside edge of the record disc (X42226).

(4) Tighten the screws holding the stop bracket.

(5) Remove the record disc and move the record track (Item 2) to the opposite side of the record guide.

(6) Make the same record stop bracket adjustments described in steps (3) and (4).

(7) Adjust the screw (Item 2, Fig. 73) in each "record lift arm bracket and stop nut assembly" to stop the upward movement of the arm at a point where the top of the arm just touches the outer edge of the record disc X42226.

NOTE: To make the above adjustments without the aid of record disc X42226, adjust the record stop brackets to position the track about $1/16"$ from the outside edge of an average size record when it is clamped on the turntable. Adjust the record lift arm stop screws to limit the raising action of the arms to about $1/16"$ between the outside edge of the record and the top end of the left arm.

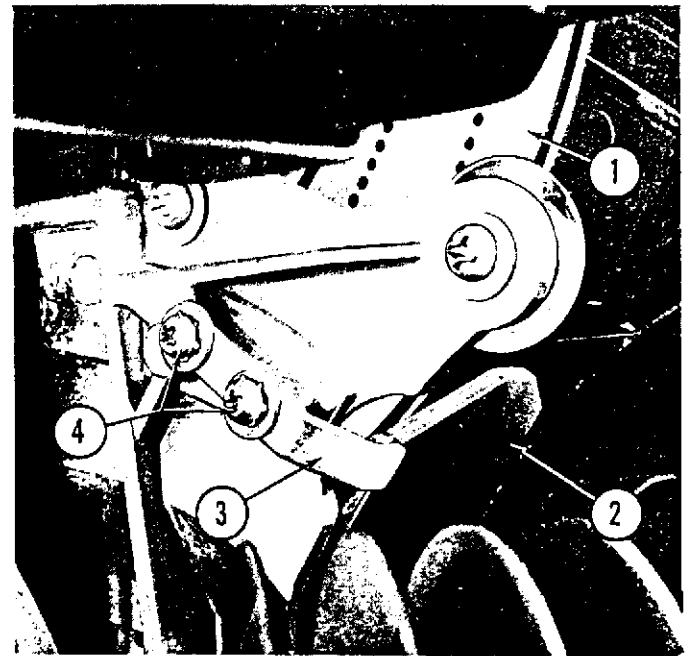


Fig. 74. RECORD STOP BRACKET ADJUSTMENT

- | | |
|------------------------|---------|
| 1. Record Disc | X42226 |
| 2. Record Track | 59425 |
| 3. Record Stop Bracket | 59434 |
| 4. Adjusting Screws | 73533-3 |

k. Record Lift Arm Centering Adjustment. (Figs. 75 and 76)

Mounted to the under side of the chassis mounting plate are two bracket and roller assemblies which serve to center the tips of the record lift arms with respect to a record being played. On each

of these two brackets one guide roller is mounted on a fixed stud (Item 5, Fig. 75) and the other is mounted on an eccentric stud (Item 2). Thus, the roller on the eccentric stud may be adjusted to bring the rollers into engagement with the ramp (Item 1) on the lower end of the lift arm.

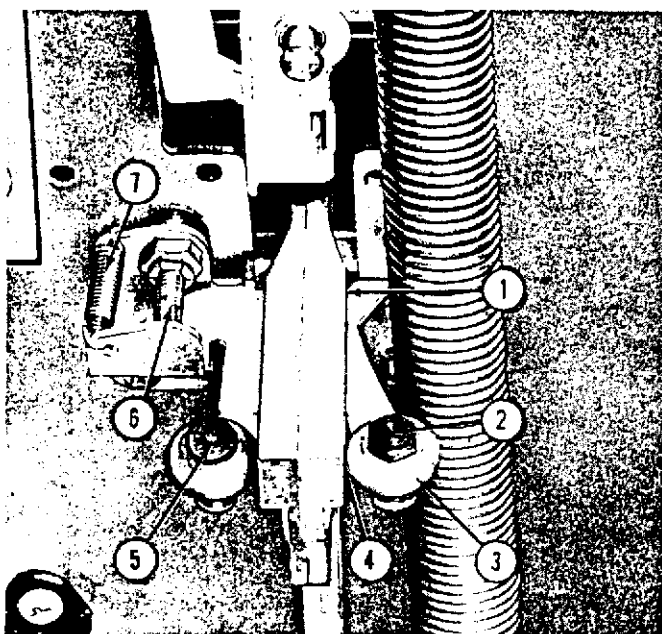


Fig. 75. RECORD LIFT ARM CENTERING ADJUSTMENTS

- | | |
|-----------------------------------|-----------|
| 1. Ramp, Record Lift Arm | |
| 2. Stud, Eccentric | 65986 |
| 3. Roller, Lift Arm Guide | 65989 |
| 4. Clearance .005" | |
| 5. Stud, Fixed (Shoulder Riveted) | 65985 |
| 6. Screw, Centering Adjustment | 73660-161 |
| 7. Spring | 65958 |

(1) With the ramp (Item 1) on the lower end of the record lift arm between the two rollers, in the play position, set and tighten the eccentric stud to provide free passage of the ramp between the rollers with .005" max. clearance (Item 4) between the ramp and the rollers.

(2) With a record clamped on the turntable and the corresponding lift arm in its raised position, (Fig. 76) set the adjusting screw (Item 6, Fig. 75) for the centering roller and bracket assembly so that the guide tips of the record lift arm are equally spaced on either side of the record as shown in Figure 76.

- Setting for Loading Switch and Lever. (Figs. 77 and 78)

After assembly of the selector crank, the loading switch and release lever group may be adjusted. The main cam should be in its "at rest" phase of the cycle or a position where there is no cancel action on the sleeve and bushing assembly (Item 5, Fig. 77).

(1) In this position set the release lever (Item 2) against the stop pin (Item 14) and tighten the set screws in the hub of the release lever.

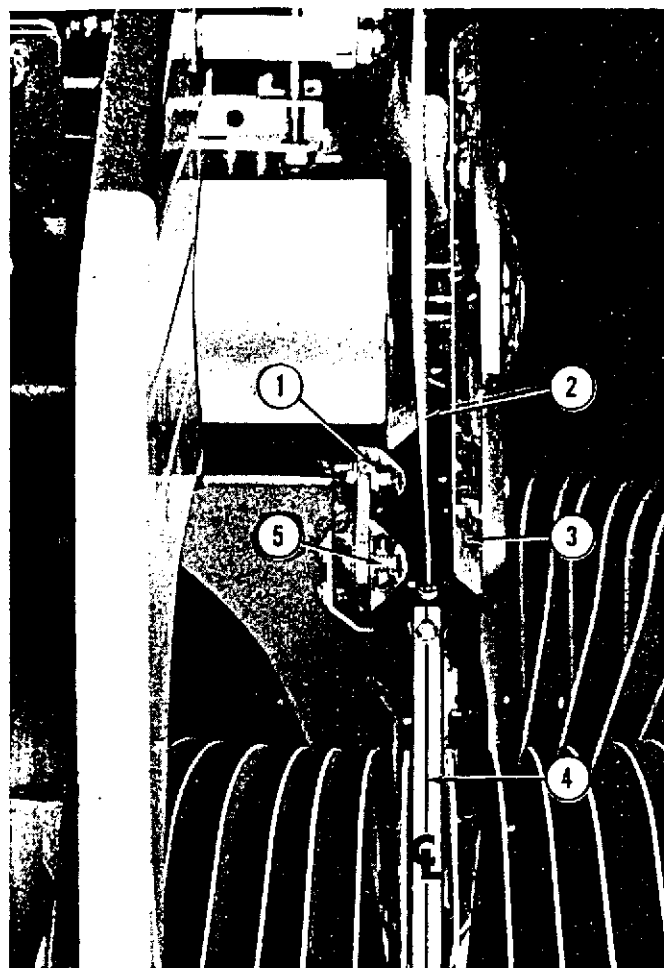


Fig. 76. RECORD LIFT ARM CENTERING ADJUSTMENTS

- | | |
|---------------------------------|-------|
| 1. Bumper, Inner, Record Guide | 59396 |
| 2. Record Disc on Turntable | |
| 3. Record Guide Plate | 59548 |
| 4. Center Line, Record Lift Arm | |
| 5. Bumper, Outer, Record Guide | 59743 |

(2) When the release lever is pulled forward to the loading position, the link (Item 7) should stop against the lower end of the shaft (Item 9) without pressure against the actuated switch handle (Item 12) and the rollers of the "stop lever and roller assembly" (Item 4) must be entirely off the cam surface of the flange on the "sleeve and bushing assembly" as shown at Item 4, Fig. 78. With the loading lever in the operating position as shown in Figure 77, the lever (Item 2) should be against the stop pin (Item 14). The loading switch should be actuated by the switch tab (Item 11) without pressure against the actuated switch handle (Item 12). The actuator arm and hub assembly is pinned to the shaft (Item 9) with a roll pin (Item 13). Adjustment will therefore be made at the hub of the release lever (Item 2) by means of the two allen set screws shown at Item 1. Over-center action of the "release lever and shaft assembly" is provided by the retracting spring (Item 6). When the release lever is in the operating position as shown in Figure 77 the rollers of the stop lever (Item 4) should be on the ramps of the flange as shown at Item 5, Fig. 77). When the release lever is in the

forward (released) position, the rollers of the stop arm should be off the ramps as shown at Item 4, Fig. 78.

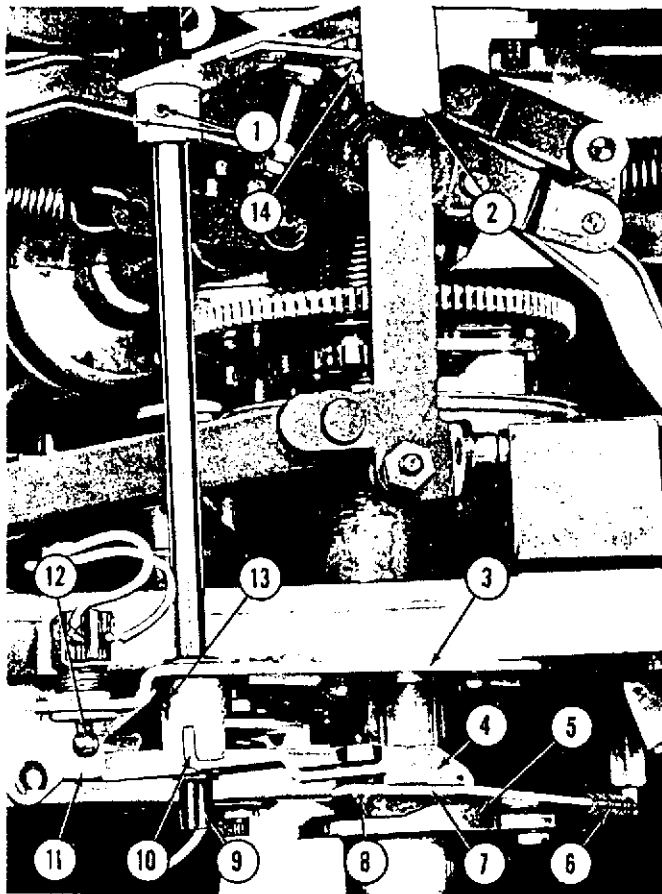


Fig. 77. LOADING SWITCH AND RELEASE LEVER ADJUSTMENT

- | | |
|--|----------|
| 1. Set Screws, Allen Hd. | 73511-29 |
| 2. Release Lever and Shaft Assembly | 68557 |
| 3. Mounting Bracket | 65728 |
| 4. Stop Lever and Roller Assembly | 68525 |
| 5. Sleeve and Bushing Assembly | 68483 |
| 6. Spring, Retracting | 68782 |
| 7. Link | 68567 |
| 8. Retaining Ring | 73724-18 |
| 9. Shaft | 68558 |
| 10. Switch Tab, Loading, Actuator Arm and Hub Assembly | 68559 |
| 11. Switch Tab, Operating | |
| 12. Handle, Loading Switch | 53648 |
| 13. Roll Pin, Actuator | 73782-48 |
| 14. Stop Pin, Release Lever | 65516 |

m. Selector Crank Clearance. (Figs. 78 and 79)

Aided by the "stop lever and roller assembly" (Item 2), the "sleeve and bushing assembly" (Item 4) has three functions:

(1) It rests directly on the selector crank and positions the tips of the selector crank vertically with relation to the selector latch pins.

(2) It is free to slide downward when actuated by the cancel arm to reset latch pins after selection has been made.

(3) It may be rotated about the selector shaft by means of the release lever as described in (1) to change its upward limit of travel.

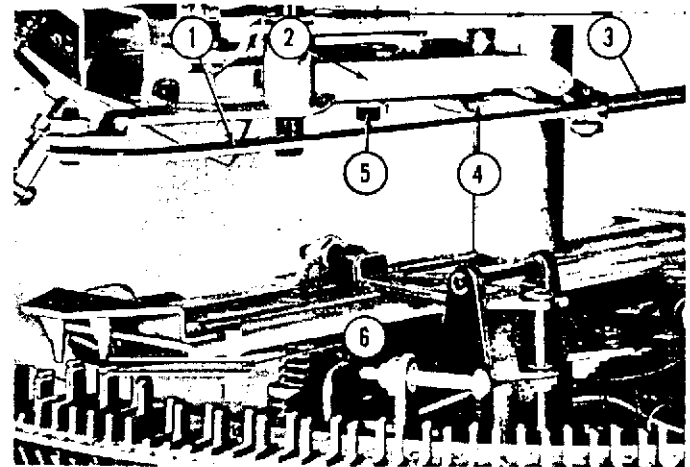


Fig. 78. RELEASE LEVER, LOADING POSITION

- | | |
|-----------------------------------|----------|
| 1. Link | 68567 |
| 2. Stop Lever and Roller Assembly | 68525 |
| 3. Retracting Spring | 68782 |
| 4. Sleeve and Bushing Assembly | 68483 |
| 5. Adjusting Screw, Stop Lever | 73571-22 |
| 6. Clearance, Released Latch Pins | |

Adjustment of the upward limit is provided by means of the adjusting screw (Item 5). The setting of this adjustment should be made with the release lever in its operating position as shown in Figure 77 with the rollers on the ramps of the flange as indicated at Item 5. With selector latch pins reset as shown in Fig. 79 the tips of the selector crank should clear the latch pins by $1/16''$ to $3/32''$ as indicated at Item 1, Figure 79. Assuming the electric selector to be properly aligned, this dimension should be constant for all selector latch pins when in their reset position. When the release lever is moved to the loading position as shown in Figure 78 the tips of the selector crank should be well clear of any released latch pins as shown at Item 6.

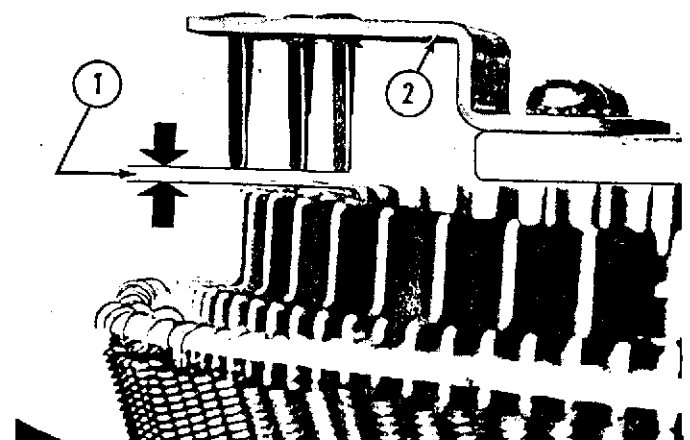


Fig. 79. SELECTOR CRANK CLEARANCE, ADJUSTMENT

- | | |
|--|-------|
| 1. Clearance, Tip to Latch Pins $1/16''$ to $3/32''$ | |
| 2. Tip and Mounting Bracket Assembly | 68762 |

n. Cancel Lever Setting. (Fig. 80)

As stated in paragraph "o" the sleeve and bushing assembly is movable up and down. The lower end of the sleeve rests on the selector crank, which enables the sleeve and bushing to push the selector crank downward. Thus, when one of the tips of the "tip and mounting bracket assembly" (Item 2, Fig. 79) is engaged with a released selector latch pin, the selector crank and tip may be depressed by the cancel lever to reset the latch pin. An approved method for adjustment of the cancel lever (Item 1, Fig. 80) follows:

(1) With a latch pin released as shown at Item 6, advance the cycle of operation until the cancel cam is at its maximum point as shown at Item 3.

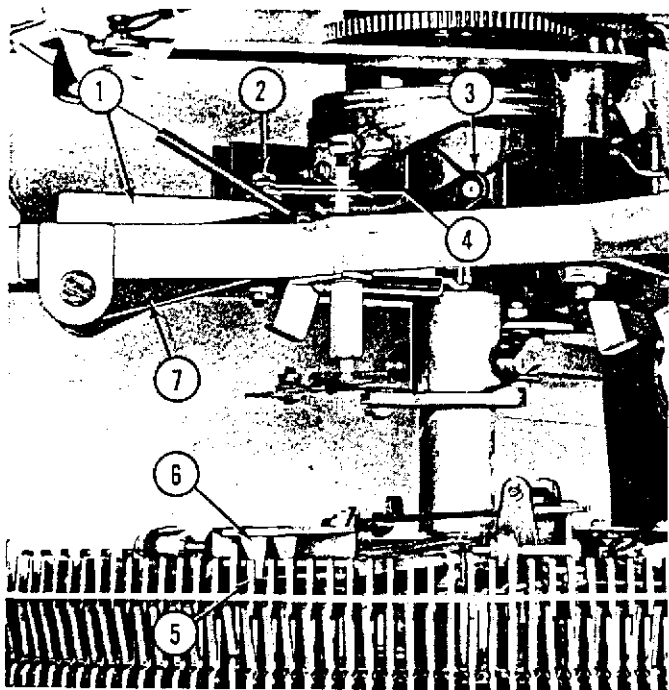


Fig. 80. CANCEL LEVER SETTING

- | | |
|--------------------------------|----------|
| 1. Cancel Lever | 59632 |
| 2. Adjusting Screw | 73571-23 |
| 3. Maximum Point of Actuation | |
| 4. 1/32" Dimension | |
| 5. Reser (Cancelled) Latch Pin | |
| 6. Selecotr Crank Tip | |
| 7. Lower Cancel Arm | 59661 |

(2) Adjust the screw (Item 2) which links the cancel lever (Item 1) with the lower cancel arm (Item 7) to provide 1/32" overtravel of cancel action, as measured under the head of the adjusting screw at Item 4. This adjustment has no effect on the adjustments described in paragraphs "l and m" above.

o. Record Lift Arms, Retracted Adjustment. (Fig. 81)

When the main cam of the record changer is in its "at rest" position, the cam roller of the "link and lever assembly" (Item 2, Fig. 81) will be at its

highest position on the cam track and the record lift arms will be held in their lowered position. In this position, the top of the record lift arm guide tips (Items 2 and 12, Fig. 71) should clear the under side of the record holders by approximately 1/4". The record lift arms should bottom against their stop brackets without tension against the brackets and without any looseness. Adjustment may be accomplished as follows:

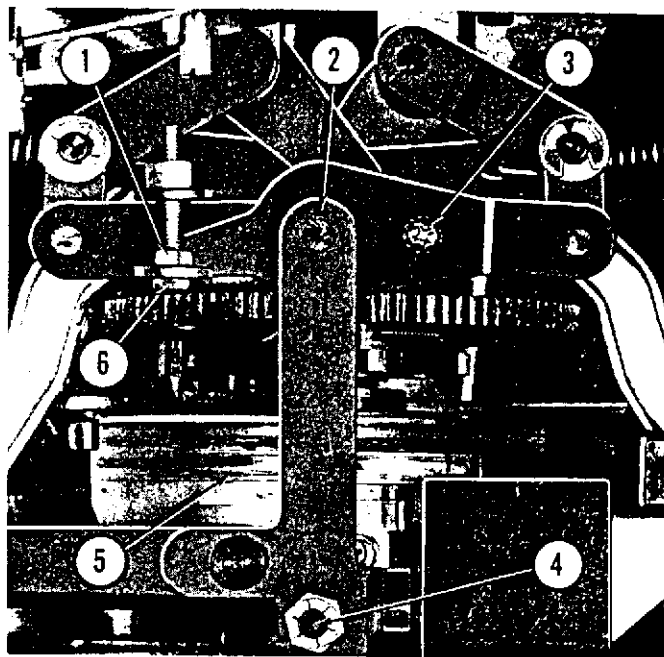


Fig. 81. RECORD LIFT ARM RETRACTED ADJUSTMENT

- | | |
|--|-----------|
| 1. Lock Nut | 73785 |
| 2. Link and Lever Assembly, Record Lift Arms | 59599 |
| 3. Clamping Screw | 73533-34 |
| 4. Roller Shaft, Link and Lever Assembly | 73571-66 |
| 5. Main Cam Assembly | 69596 |
| 6. Adjusting Screw, Hex. Hd. | 73660-161 |

(1) Loosen the lock nut and clamping screw (Items 1 and 3, Fig. 81).

(2) Turn the hex head adjusting screw into the stop nut to lower the lift arms or back it out to permit them to raise, thereby obtaining the requirement as stated above. If necessary, the lower stop brackets may be adjusted slightly to meet the requirements.

(3) Tighten the lock nut and the clamping screw and re-inspect the position of the arms after the mechanism has been operated.

p. Back Stop Pawl Adjustments. (Figs. 82 and 83)

The two back stop pawls are located on top of the chassis mounting plate to the right and left of the center as shown in Item 4, Fig. 55. Each of these pawls will be adjusted independent of the other. However, the adjustment procedure will be the same for both of the pawls. Before proceeding with adjust-

ment of the back stop pawls, the record changer should be in normal operating condition.

(1) Loosen the two screws (Item 4, Fig. 83) that hold the back stop pawl and bracket assembly to the chassis mounting plate.

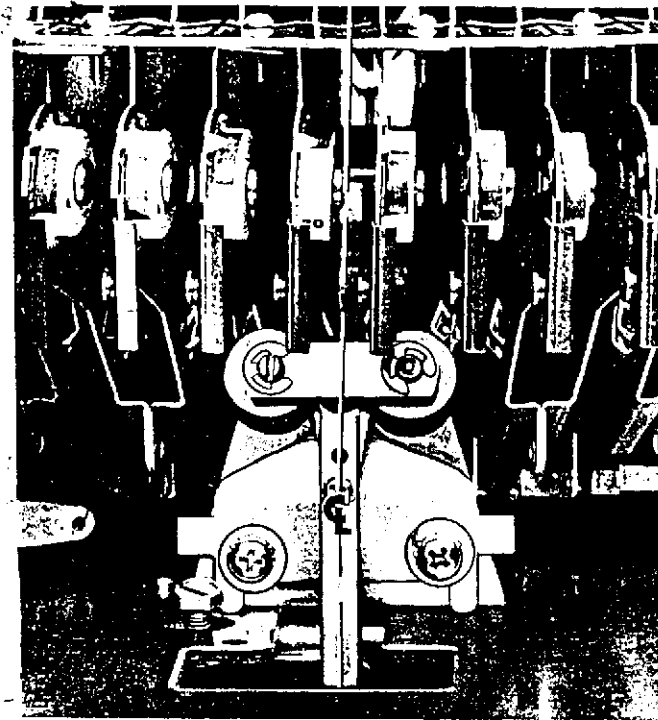


Fig. 82. CENTER LINE FOR BACK STOP PAWL SETTING

(2) Turn the record carrier slowly in a clockwise direction until the center line of one of the record compartments is in accurate alignment with the left hand record lift arm as shown in Fig. 82.

(3) Carefully maintain this condition of alignment and set the left hand back stop pawl to engage with the adjacent tooth of the record carrier casting to a depth of $1/32$ " to $1/16$ " as shown in Fig. 83.

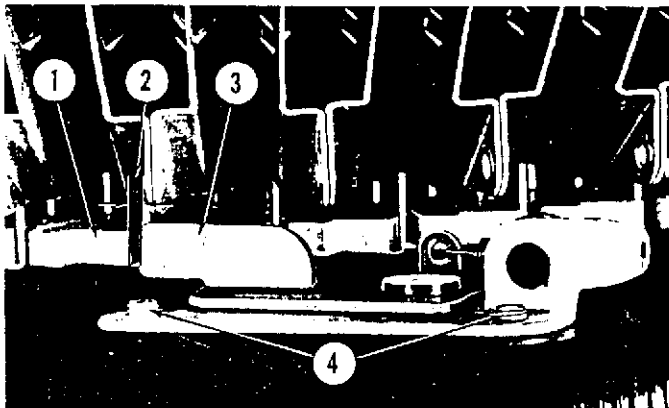


Fig. 83. BACK STOP PAWL SETTING

- | | |
|---|----------|
| 1. Record Carrier Casting | 65496 |
| 2. Depth of Engagement $1/32$ " to $1/16$ " | |
| 3. Back Stop Pawl | 65891 |
| 4. Adjusting Screws | 73676-46 |

(4) Using the method described in (1), (2), and (3), align and set the right hand back stop pawl.

(5) Now check the alignment of the record lift arms with their respective record compartments in twelve or more various indexed positions of the record carrier. At each check point make sure that the correct tooth of the record carrier is firmly against the corresponding back stop pawl. Alignment of the record compartments with the record lift arms must be kept within a tolerance of $1/32$ ".

q. Selector Crank and Carriage Switch Settings. (Fig. 84)

The selector crank (Item 2, Fig. 84) is mounted on the "adjusting bracket and stop nut assembly" (Item 10) which is an integral part of the selector shaft assembly. The selector crank is mounted on pivots which enable it to move a limited amount laterally and vertically. The vertical "at rest" position of the selector crank is determined by adjustments of the stop lever as described in paragraph "m". The vertical actuated position of the selector crank is governed by the cancel lever setting, paragraph "n". The lateral adjustment for the selector crank may be accomplished as follows:

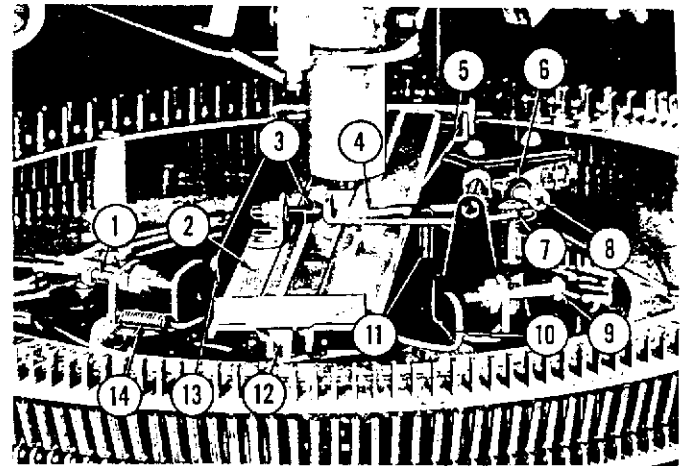


Fig. 84. SELECTOR CRANK AND CARRIAGE SWITCH SETTINGS

- | | |
|---|----------|
| 1. Adjusting Screw, Kick-Off | 73503-95 |
| 2. Selector Crank and Stop Nut Assembly | 68494 |
| 3. Adjusting Screw and Bearing Assembly | 65702 |
| 4. Stop Bracket | 68716 |
| 5. Mounting Plate and Stop Nut Assembly | 68499 |
| 6. Switch Lever and Stop Nut Assembly | 68562 |
| 7. Screw, 6-32 x 1-1/2, Stop Bracket | 73790-78 |
| 8. Screw, 10-32 x 1", Switch Lever | 73502-95 |
| 9. Screw, 8-32 x 1", Selector Crank Stop | 73503-95 |
| 10. Adjusting Bracket and Stop Nut Assembly | 68538 |
| 11. Spring, Stop Bracket | 68774 |
| 12. Tip and Bracket Assembly | 68762 |
| 13. Selector Shaft and Bracket Assembly | 68464 |
| 14. Spring, Kick Off | 68774 |

(1) With the service switch off, the record changer in the "at rest" position and with searching action manually produced one of the tips (Item 12) of the selector crank will engage a released latch pin. At this point adjust the stop bracket positioning screw

(Item 7) to provide alignment of the tab on the stop bracket (Item 4) with the ball bearing in the head of the adjusting screw (Item 3). The ball bearing must engage the tab on its flat surface as shown at Item 4.

(2) Without pressure against the released latch pin adjust the screw (Item 3) to make light contact with the tab of the stop bracket (Item 4).

(3) As previously treated under switch settings, paragraph "c" adjust the carriage switch screw (Item 8) in the end of the switch lever (Item 6) to provide carriage switch action at a point where continued searching action permits the correct back stop pawl to engage the correct tooth of the carrier casting. To insure engagement with any one of the 200 teeth overtravel of the tooth beyond the tip of the back stop pawl may be $1/64"$ to $1/32"$.

(4) As searching is manually continued the selector crank will continue to shift laterally on its pivot. Adjust the selector crank stop screw (Item 9) to stop the shifting action at a point where the tooth on the carrier casting has passed the tip of the back-stop pawl $1/16"$ to $3/32"$.

NOTE: The same latch pin used for adjustment (3) must also be used for adjustment (4).

(5) Set the kick-off screw (Item 1) so that after the pin has been cancelled the selector crank will advance to a position that will allow the pin just cancelled and the next adjacent pin to be selected.

NOTE: All these settings (1) to (5) inclusive should be checked at twelve positions around the selector, care being taken to try six positions using one back stop pawl and six positions using the other back stop pawl.

r. Record Clamp Setting. (Figs. 85, 86, and 87)

The turntable release arm is pivoted on a bracket which is mounted on the back plate of the top support casting. The turntable release arm rollers must be centered around the hub of the record clamp plate. This is done by loosening the two mounting screws (Item 6, Fig. 85) and shifting the mounting bracket to provide equal distance of the two rollers from the hub of the record clamp plate, as shown in (Fig. 86), and re-tightening the mounting screws. The centering of the release arm rollers, described above, should be carefully re-checked before completing the record clamp adjustments which follows:

(1) Advance the cycle of the record changer to the full extent of the record clamp cam rotation as shown in Figure 85, and at the same time, clamp record disc X42226 on the turntable.

(2) Loosen the lock nut (Item 1, Fig. 85) and adjust record clamp plate (Item 2) to provide $1/32"$ to $1/16"$ clearance as shown at Items 2 and 5

of Figure 86. Maintain the clearance described above, tighten the lock nut, and re-check the adjustment.

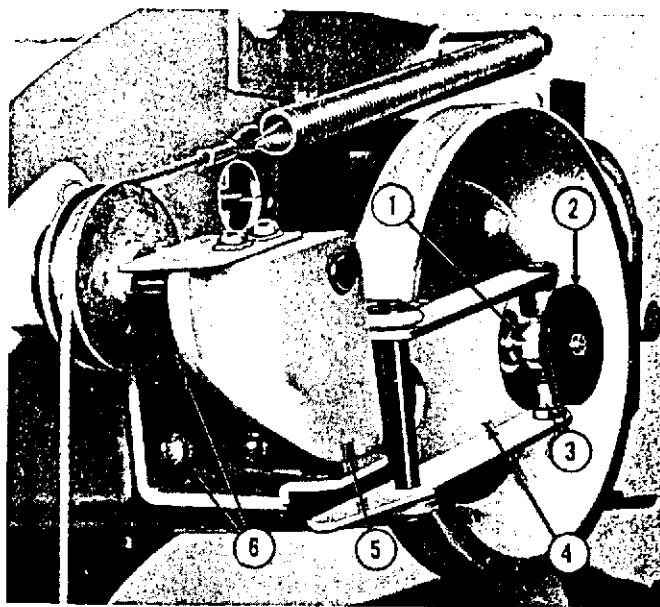


Fig. 85. RECORD CLAMP SETTING

- | | |
|---|----------|
| 1. Lock Nut | 73601-10 |
| 2. Record Clamp Plate | 63205 |
| 3. Turntable Release Rollers | 59485 |
| 4. Turntable Release Arm | 59484 |
| 5. Record Clamp Cam | 59464 |
| 6. Mounting Screws, Turntable Release Arm Bracket | 73533-34 |

(3) Advance the cycle of the record changer or manually operate the record clamp cam about 90° to the position which completely retracts the turntable pilot (See Item 2, Fig. 87). In this position, the turntable pilot should be retracted beyond the forward surface of the turntable (Item 3) $1/32"$ to $1/16"$.

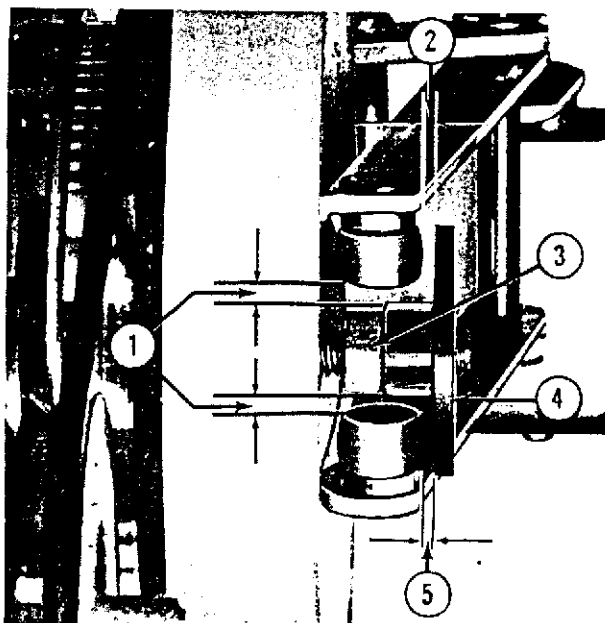


Fig. 86. RECORD CLAMP SETTING

- | | |
|---|----------|
| 1. Equal Distance | |
| 2. Clearance, Record Clamp Plate $1/32"$ to $1/16"$ | |
| 3. Lock Nut | 73601-10 |
| 4. Record Clamp Plate | 63205 |
| 5. Clearance, Record Clamp Plate $1/32"$ to $1/16"$ | |

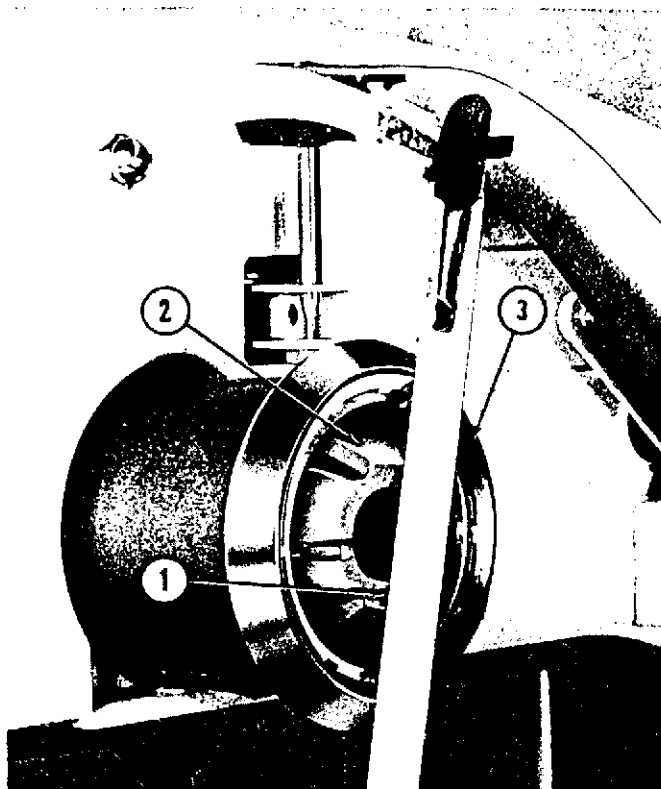


Fig. 87. RECORD CLAMP SETTING

- | | |
|---|-------|
| 1. Clearance, Turntable Pilot, 1/32" to 1/16" | |
| 2. Turntable Pilot | 59449 |
| 3. Turntable Assembly | 68031 |

(4) The record clamp setting, described in step (2) may be varied to minimum, if necessary, to accomplish the requirements of step (3).

s. Tone Arm Feed-in Adjustments. (Fig. 88)

There are two methods of making the tone arm feed-in adjustment. One of these methods utilizes record disc X42226 and the other depends upon measurements made from the turntable pilot to the pick-up needle. Record disc X42226 should be used when available. However, both methods described below:

Method 1 - Using Record Disc X42226.

(1) From the "at rest" position, advance the cycle of the record changer to a point where the record clamp just actuates to hold the record in place on the turntable, and turn off the power.

(2) Manually release the record clamp by pulling back on the record clamp plate (Item 4, Fig. 86) and clamp disc X42226, facing to the rear, on the turntable.

(3) Manually advance the cycle by turning the record changer motor counter-clockwise until the pick-up needle is close to or touching the record disc. The tone arm latch bracket (Item 3, Fig. 88) should still be engaged with the feed-in screw (Item 2).

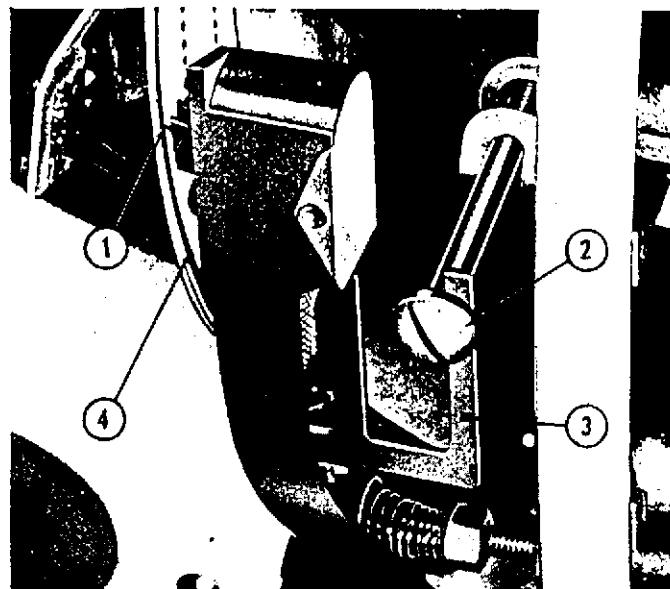


Fig. 88. TONE ARM FEED-IN ADJUSTMENT

- | | |
|-------------------------------------|-------|
| 1. Needle of Pick-Up | |
| 2. Tone Arm Feed-in Adjusting Screw | 64422 |
| 3. Tone Arm Latch Bracket | 64423 |
| 4. Outer Ring (Feed-in Groove) | |

(4) Adjust the tone arm feed-in screw to position the pick-up needle in the center of the outer ring of record disc X42226.

Method 2 - Adjust Tone Arm Feed-in by Measurement.

(1) Follow step (1) of method 1.

(2) Follow step (2) of method 1, using a conventional record on the turntable.

(3) Adjust the tone arm feed-in screw to position the pick-up needle 2-5/8" to 2-11/16" from the outside circumference of the turntable pilot.

The above method as well as method 1 provides a feed-in position satisfactory for a majority of 7" - 45 R.P.M. records.

t. Tone Arm Latch Bracket Clearance. (Fig. 89)

When the tone arm is released for compliance with the record grooves, the clearance (Item 2, Fig. 89) should be equal on both sides of the feed-in adjusting screw (Item 6). Adjustment may be accomplished as follows:

(1) Advance the cycle to a point where the tone arm is completely released for playing.

(2) With the needle resting on the record, adjust the allen head stop screw (Item 4) to position the release bracket (Item 5) to provide equal clearance of the bracket from the feed-in screw as described above.

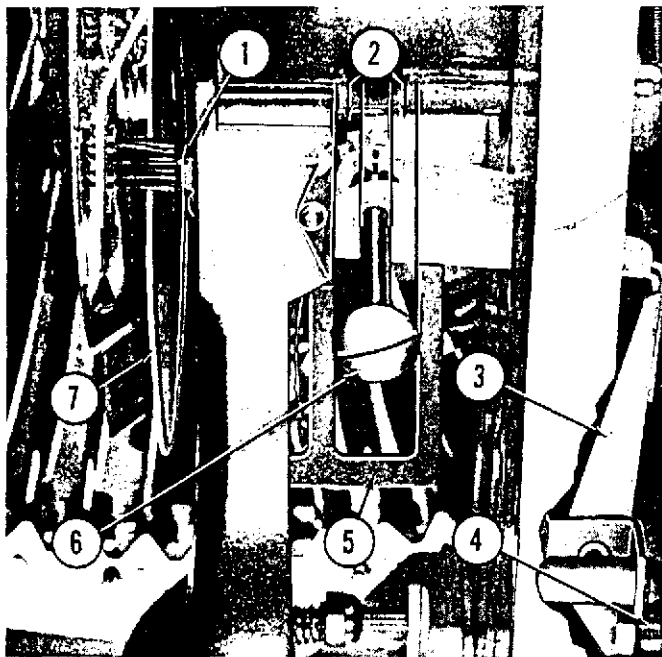


Fig. 89. TONE ARM LATCH BRACKET CLEARANCE

- | | |
|--------------------------------------|-------|
| 1. Pick-Up Needle | 57525 |
| 2. Equal Distance | |
| 3. Release Bracket, Tone Arm | 64530 |
| 4. Screw, Allen Head, Adjusting | 64427 |
| 5. Latch Bracket, Tone Arm | 64423 |
| 6. Adjusting Screw, Tone Arm Feed-in | 64422 |
| 7. Record | |

u. Needle Pressure Adjustment. (Fig. 90)

The needle pressure adjustment is obtained by turning the needle pressure adjusting nut (Item 3, Fig. 90) in a clockwise direction to increase the pressure. The pressure of the needle against the record should be adjusted to measure 10 to 12 grams as shown in Item 1, Figure 90, and may be accomplished in the following manner:

- (1) Advance the record changer cycle to its playing position and turn the power off, leaving the needle on the record.

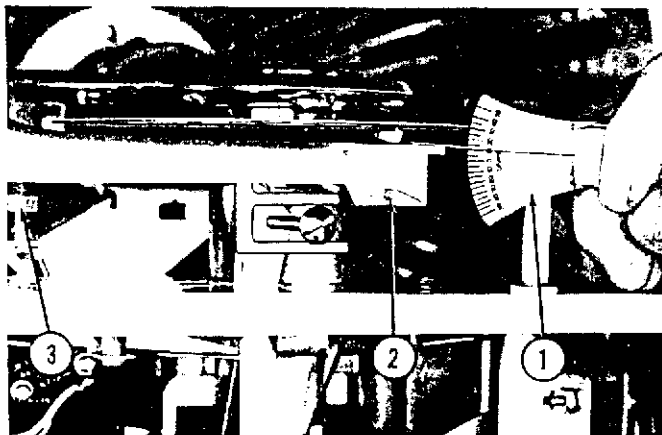


Fig. 90. NEEDLE PRESSURE ADJUSTMENT

- | | |
|---------------------------------------|---------|
| 1. Gram Scale | |
| 2. Tone Arm, Free for Compliance | 68100 |
| 3. Needle Pressure Adjusting Stop Nut | 73865-8 |

- (2) Using a sensitive gram scale, as shown in Figure 90, to measure the pressure required to just lift the needle from the record, adjust the stop nut (Item 3) to provide the desired pressure as described above.

v. Trip Switch Adjustment. (Fig. 91)

The trip switch is actuated by a bracket on the tone arm (Item 6, Fig. 91). The action of the trip switch is advanced or retarded by turning the adjustable stop screw (Item 9). The operation of the trip switch should occur when the record has completed its playing. However, some records must use more record space than others, therefore the trip action should be delayed long enough to accommodate the majority of records. As in making the tone arm feed-in adjustment, there are two methods presented for making the adjustments of the trip switch. As before, one method utilizes record disc X42226, and the other depends on measurement as follows:

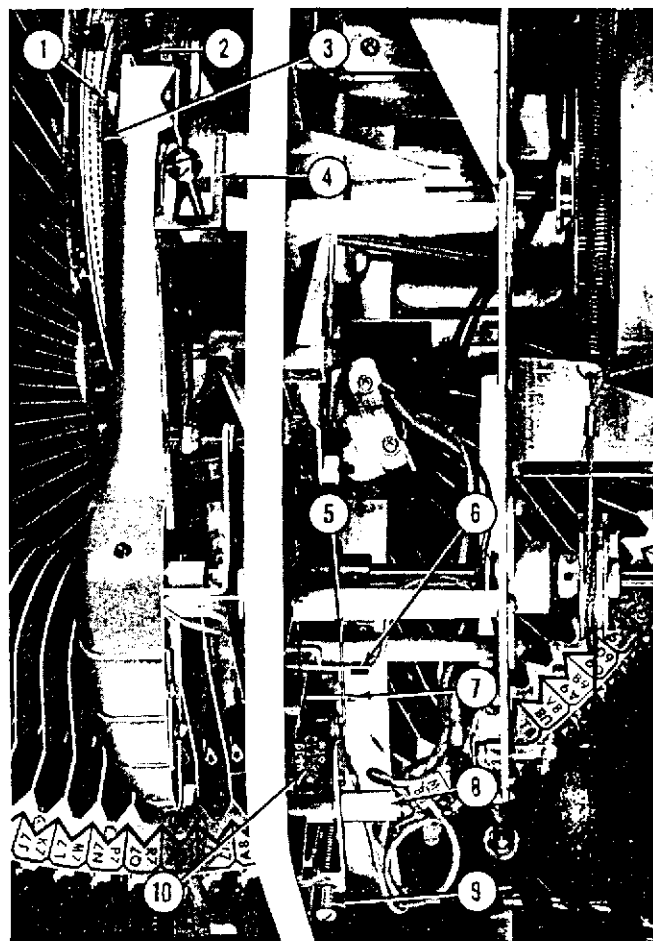


Fig. 91. TRIP SWITCH ADJUSTMENT

- | | |
|---|---------|
| 1. Pick-up Needle | 57525 |
| 2. Record Disc | X42226 |
| 3. Trip Groove | |
| 4. Tone Arm Latch Bracket and Feed-in Screw | |
| 5. Arm, Trip Switch | 59583 |
| 6. Actuating Bracket, Part of Tone Arm | |
| 7. Stop Bracket, Trip Switch | 59432 |
| 8. Mounting Bracket, Trip Switch | 59739 |
| 9. Adjusting Screw, Trip Switch | 73571-4 |
| 10. Micro Switch, Trip | 57851 |

Method 1 - Using Record Disc X42226.

(1) Advance the cycle of the record changer only until the turntable clamps have actuated, and then turn off the power.

(2) Operate the record clamp manually by pulling back on the record clamp plate, and clamp record disc X42226, face to the rear, on the turntable.

(3) Manually advance the cycle of the record changer by turning the motor shaft counter-clockwise until the tone arm is completely released for compliance with the record grooves. The tone arm latch bracket should be entirely free from the feed-in adjusting screw as shown in Figure 89.

(4) The trip switch adjusting screw may now be adjusted to a point where inward movement of the tone arm will actuate the trip switch exactly where the pick-up needle has reached the inner groove of record disc X42226, as shown at Item 1, Figure 91.

Method 2 - Adjusting the Trip Switch by Measurement.

(1) Advance the cycle of the record changer as indicated in step 1 of method 1.

(2) Using any standard record instead of record disc X42226, perform steps 2 and 3, method 1.

(3) The trip switch adjusting screw may now be adjusted to a point where inward movement of the tone arm will cause the trip switch to actuate exactly at a point where the pick-up needles is $1-11/32$ " to $1-13/32$ " from the outer circumference of the turntable pilot.

NOTE: The above two methods for trip switch setting provide trip action for a majority of 7" 45 R.P.M. records.

w. Tone Arm Balancing. (Fig. 92)

The tone arm should be very carefully balanced on its gimbal by means of the balancing weight and bracket assembly shown in Item 5, Figure 92. When in good balance and otherwise in good adjustment, the tone arm should have no greater than 1 gram tendency to move in either direction from any point in its normal travel. Also, its tendency to remain in one place should be no greater than 1 gram. To properly balance the tone arm proceed as follows:

(1) Without a record, advance the cycle of the record changer to its playing position and turn off the power.

(2) Tie a short piece of fine thread around the tone arm and gimbal bracket as shown in Item 3, Figure 92. This tie should be drawn just tight enough to free the tone arm latch equally from either side of the feed-in screw (Item 1).

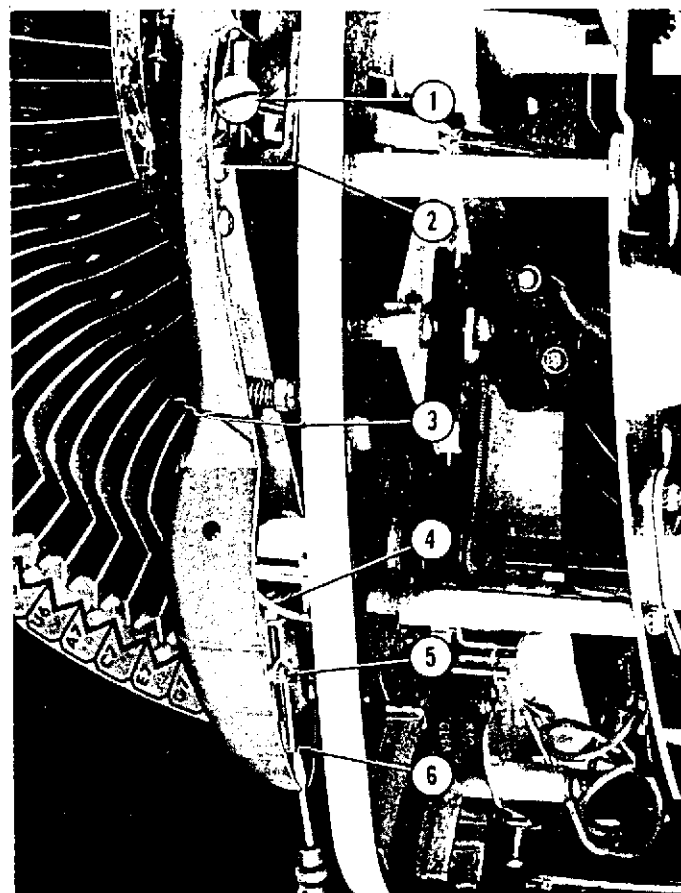


Fig. 92. TONE ARM BALANCING

1. Feed-in Screw, Tone Arm	64422
2. Latch Bracket, Tone Arm	64423
3. Thread, Tie-down	
4. Stop Nut, Tone Arm Balance	23879
5. Balancing Weight and Bracket Assembly	65273
6. Screw, Adjusting	73575-100

(3) Using a sensitive gram scale (0 - 10 grams) at the pick-up end of the tone arm, measure the swinging tendencies of the tone arm and adjust the balancing weight (Item 5) to bring the balance within the requirements as described above. The adjusting screw (Item 6) serves to move the balancing weight and bracket assembly in either direction as required.

x. Turntable Drive Gear Adjustments. (Fig. 93)

The turntable drive gears must operate freely at all times. The tension of the thrust spring (Item 4, Fig. 93) against the ball bearing in the end of the rotor shaft should be $2-1/2$ to $3-1/2$ ounces. Adjust the mesh of the gear and worm to obtain minimum back lash without drag, as follows:

(1) Remove the motor and mounting plate assembly from the top support casting.

(2) Loosen the three screws (Items 3 and 6) that mount the motor to the mounting plate (Item 2), and shift the motor and worm gear assembly (Items 7 and 5) to obtain a minimum of back lash consistent with perfect freedom of operation.

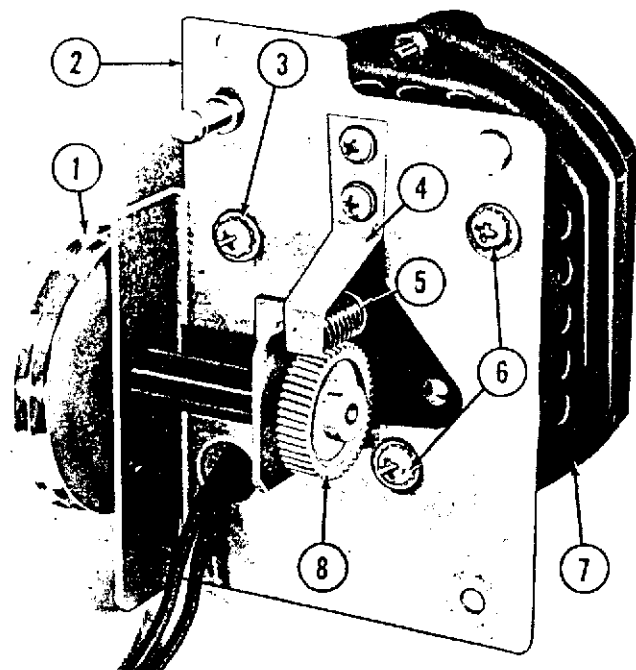


Fig. 93. TURNTABLE DRIVE GEAR ADJUSTMENT

1. Drive Pulley	64189
2. Motor Mounting Plate	60946
3. Mounting Screw, Motor	73533-33
4. Thrust Spring	60893
5. Worm Gear	60869
6. Mounting Screws	73533-33
7. Motor	66174
8. Driver Gear	65203

(3) Tighten the three mounting screws, re-check the setting, and re-install the motor and mounting plate assembly.

y. Main Shaft Drive Gear and Pinion Adjustment. (Fig. 94)

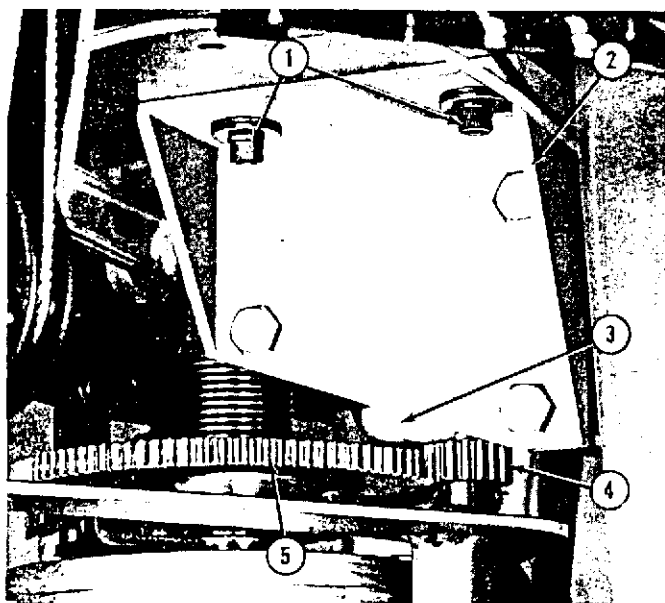


Fig. 94. MAIN SHAFT DRIVE GEAR AND PINION

1. Mounting Screws, Adjustment	73571-16
2. Mounting Bracket and Motor Assembly	64539
3. Motor, Record Changer	64541
4. Drive Pinion	59621
5. Main Shaft Drive Gear	59623

The mounting bracket (Item 2, Fig. 94) for the record changer motor is provided with one elongated mounting hole to permit adjustment of the depth of mesh of the drive pinion (Item 4) with the main drive gear (Item 5). Mesh adjustment may be accomplished as follows:

(1) Loosen the two allen head screws (Item 1) and set the position of the motor and mounting bracket assembly to provide a minimum of back lash consistent with freedom of operation.

(2) After tightening the two mounting screws, check the adjustment by operation in the searching phase of operation.

z. Actuating Arm and Cable, Tone Arm and Turntable. (Fig. 95 and 96)

The cable that operates both the tone arm and the turntable should be set to operate the turntable cam (Item 3, Fig. 95) through an arc of about 90° when the main cam moves from the "at rest" position to the play position. For installation of a new cable or re-adjustment of the turntable actuating linkage, proceed as follows:

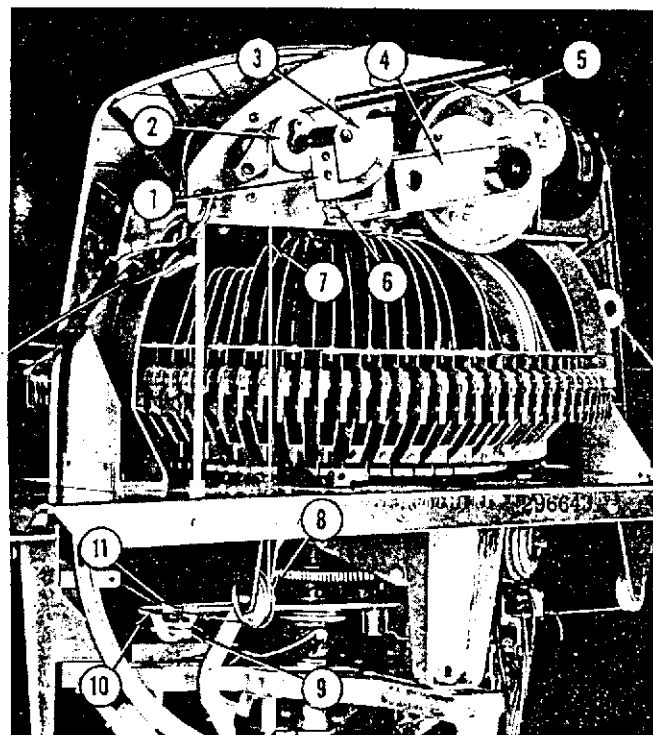


Fig. 95. ADJUSTMENT, ACTUATING ARM AND CABLE TONE ARM AND TURNTABLE.

1. Stop Plate, Turntable Cam	60599
2. Drive Pulley, Turntable and Tone Arm Cams	59415
3. Turntable Cam	59464
4. Turntable Release Lever	59922
5. Spring, Tension	61174
6. Roller, Turntable Release Lever	59485
7. Cable, Record Clamp and Tone Arm	59871
8. Guide Pulley	59487
9. Adjusting Screw	73502-99
10. Actuating Arm	59688
11. Slide Pin	59686

(1) Pass the cable through the hole in the drive pulley (Item 2, Fig. 95) and form loops on the cable ends in accordance with measurements shown in Fig. 96.

(2) Using the set screw (Item 5, Fig. 96) lock the cable firmly in the pulley in accordance with the measurements (Items 6 and 7, Fig. 96).

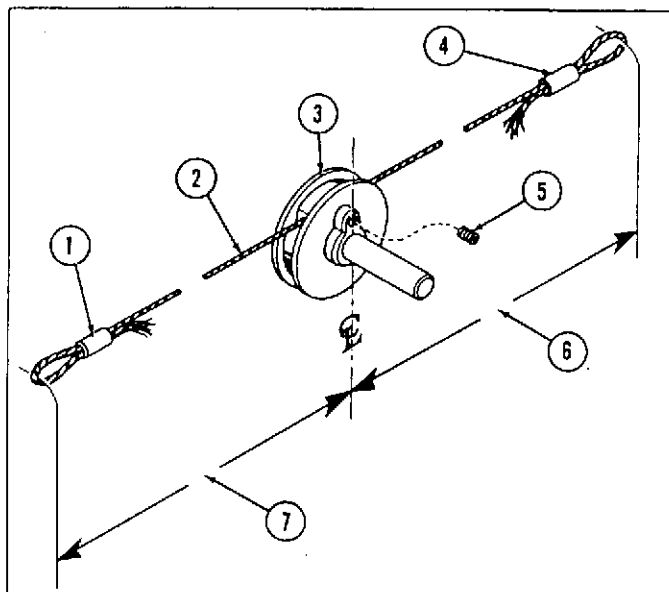


Fig. 96. TURNTABLE CABLE AND DRIVE PULLEY

1. Collar (Sleeve)	61658
2. Cable	59871
3. Drive Pulley	59415
4. Collar	61658
5. Set Screw	64427
6. 6 3/16" From Center Line to Inside of Loop	
7. 18 7/8" From Center Line to Inside of Loop	

(3) Take out the two screws and remove the stop plate (Item 1, Fig. 95).

(4) Rotate the turntable cam counter-clockwise to obtain enough slack in the cable to allow hooking the loop of the cable over the slide pin (Item 11, Fig. 95). The cable should be dressed around the guide pulley as shown in Fig. 95.

(5) The short end of the cable will be wound once around the drive pulley and the loop of the cable hooked to the tension spring (Item 5, Fig. 95) as shown.

(6) Place the roller of the turntable release lever back of the cam as shown at Item 6, Figure 95, and rotate the turntable cam back in a clockwise direction. Re-install and fasten the stop plate (Item 1).

NOTE: In cases where the cable is already properly adjusted and installed in accordance with the above instructions, steps 1 to 6 may be deleted.

(7) Turn the adjusting screw (Item 9, Fig. 95) to take up on the cable and position the turntable cam so that the roller of the turntable release lever is well onto the flat portion of the turntable cam.

NOTE: Check operation of the turntable cam in the playing position for complete freedom of the tone arm. In case the tone arm is not completely released, back out the cable adjusting screw to allow further clockwise rotation of the turntable cam and shaft assembly. This will advance the tone arm release cam to its highest point and provide release of the tone arm.

a.a. Record Guide and Safety Switch Adjustment. (Fig. 97)

The record guide assembly is mounted on a vertical pivot and is positioned by its adjusting screw (Item 4, Fig. 97) with relation to the record lift arms, right and left. A recommended adjustment procedure follows:

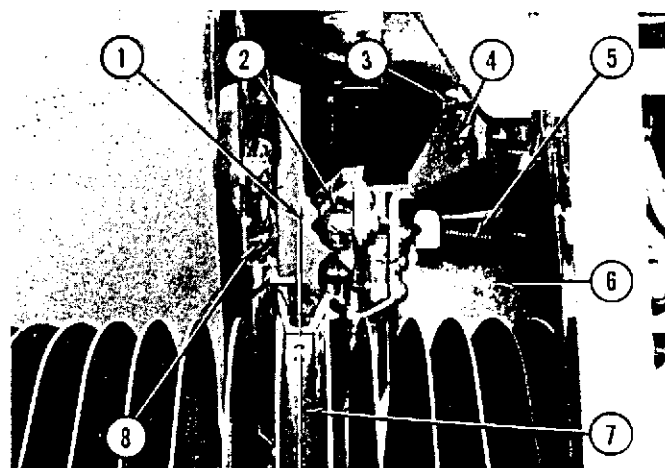


Fig. 97. RECORD GUIDE AND SAFETY SWITCH SETTINGS

1. Center Line, Record Lift Arm	
2. Plastic Guide Tip	59743
3. Screw, Safety Switch Adjusting	73800
4. Screw, Record Guide Adjusting	73656-72
5. Spring, Record Guide Retracting	59606
6. Casting, Record Guide	59892
7. Record Lift Arm	65487
8. Plastic Guide Plate	59548

(1) Turn the adjusting screw (Item 4) in or out as required to provide equal alignment of the surface of the plastic guide plate (Item 8) with the parallel surface of the front of the top support casting.

NOTE: If the record lift arms have been accurately aligned as described in paragraphs i, j, and k, page 48, and the plastic guide plate is parallel, the angular variation of each lift arm will be 0°, 54 to the rear of parallel as stated in paragraph (4).

(2) After the record guide assembly has been set as described in step (1) and its retracting spring (Item 5) holding the adjusting screw (Item 4) against the support casting, set the safety switch adjusting screw (Item 3) as described in paragraph a, page 45.

a.b. Tone Arm Brush Setting. (Figs. 98 and 99)

The tone arm brush is operated by a cable attached to the actuating arm for the transfer switch. The action of the tone arm brush may be governed as follows:

(1) This procedure should start with the record changer in its normal "at rest" position and the tone arm should be latched in the recess in the "feed-in adjusting screw".

(2) Set the "brushholder arm" (Item 1, Fig. 98) so that when the arm is actuated, the bristles of the brush will sweep across the needle at a depth of not more than 1/16" beyond the needle point, as shown in Item 3, Figure 98.

NOTE: The pick-up characteristics of the Cobra cartridge will be seriously impaired by brushing out any of the damping material around the vane inside the cartridge.

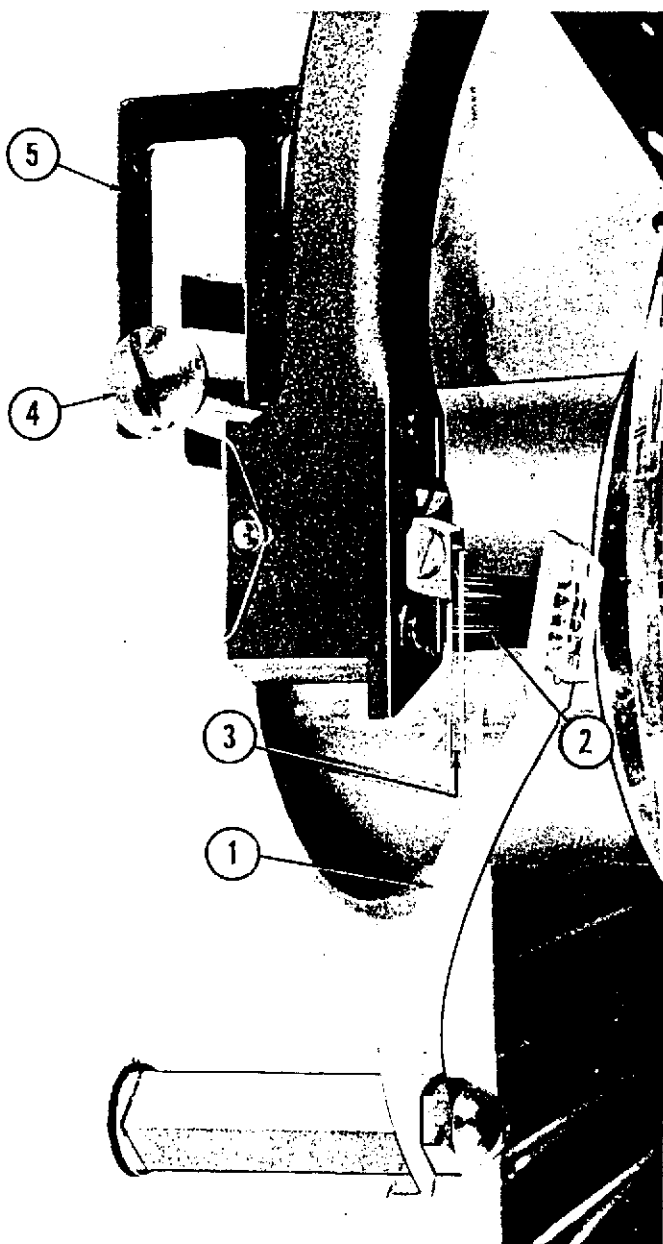


Fig. 98. TONE ARM BRUSH SETTING

- | | |
|---------------------------|-------|
| 1. Arm, Brush Holder | 64560 |
| 2. Tone Arm Brush | 59830 |
| 3. 1/16" Maximum Depth | |
| 4. Feed-in Screw | 64422 |
| 5. Tone Arm Latch Bracket | 64423 |

(3) With the record changer mechanism in the "at rest position", turn the adjusting screw (Item 2, Fig. 99) for the tone arm brush to take up or release the actuating cable as required to position the brush 1/4" to 1/2" below the cartridge.

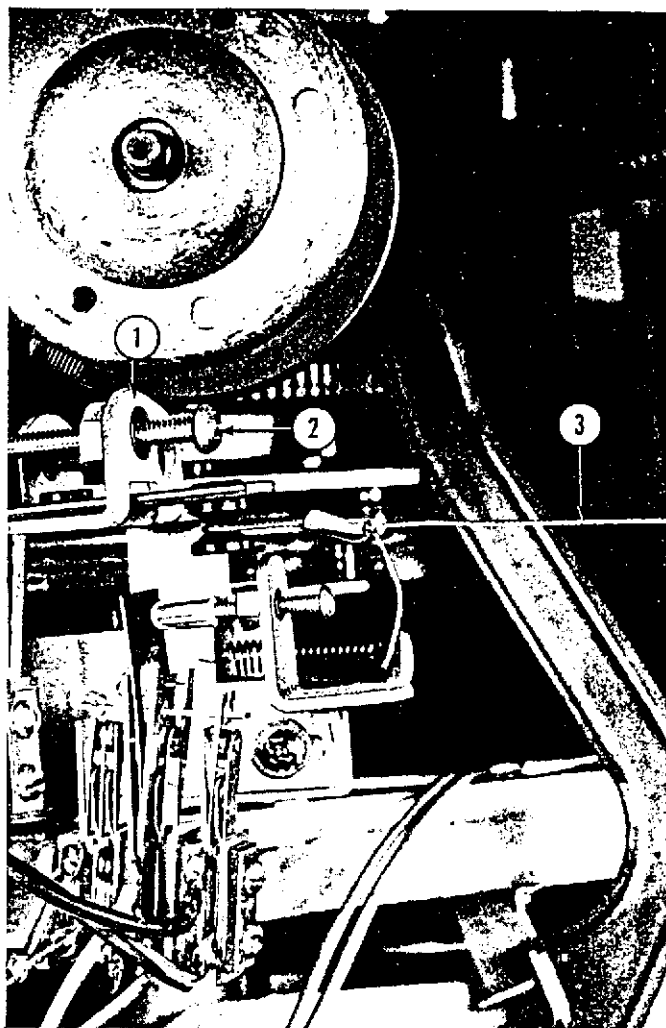


Fig. 99. TONE ARM BRUSH SETTING.

- | | |
|------------------------------------|----------|
| 1. Actuating Arm, Transfer Switch | 59691 |
| 2. Adjusting Screw, Tone Arm Brush | 73503-95 |
| 3. Actuating Cable, Tone Arm Brush | 59888 |

a.c. Shim Procedure for Assembling the Turntable Shaft. (Fig. 100)

After the thrust bearing group, Items 6, 7, and 8, Fig. 100, has been installed next to the turntable, three fiber washers and two metal washers (shims) should always be used on the turntable end of the turntable shaft in the same order as shown in Items 9, 10, 11, 12, and 13. The fiber washers and metal shims should always be oiled before assembly. The final washer assembly on the fly wheel end of the turntable shaft may vary in the number used to provide proper end play, however, the same rule applies as to the position of the fiber washers and oiling. This washer group should always start and finish with a fiber washer.

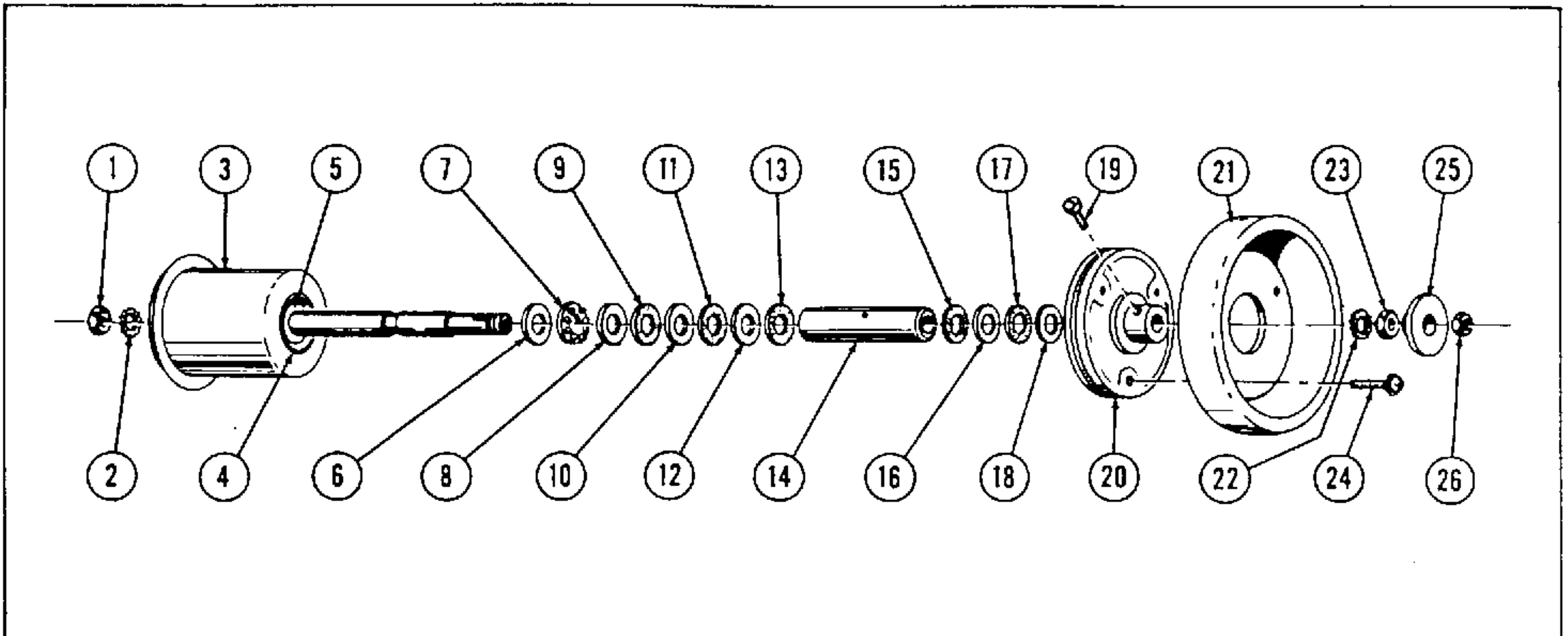


Fig. 100. SHIM PROCEDURE FOR ASSEMBLING THE TURNTABLE SHAFT

1. Nut	59470	14. Sleeve and Bushing Assembly	64520
2. Lockwasher	73607-12	15. Washer, Fiber	63732
3. Turntable and Shaft Assembly	68102	16. Washer, Metal Shim	63731
4. Oil Slinger	59571	17. Washer, Fiber	63732
5. Washer on Shoulder of Shaft	56530	18. Washer, on Shoulder of Shaft	56530
6. Washer	59864	19. Screw, Special	59399
7. Ball Race	59867	20. Pulley	64190
8. Washer	59864	21. Fly Wheel	59456
9. Washer, Fiber	63732	22. Lockwasher	73607-12
10. Washer, Actual Shim	63731	23. Nut	59470
11. Washer, Fiber	63732	24. Screws, Sems	73533-38
12. Washer, Actual Shim	63731	25. Plate, Record Clamp	63205
13. Washer, Fiber	63732	26. Nut	73601-10

5. LUBRICATION

Lubrication of the record changer should be checked periodically to insure continuous operation. Oil and other lubricants should be used as recommended below:

b. S.A.E. No. 10 and waxfree, should be used at the following points:

Record Actuator Guide Bearings
Annular Bearings under the Record Carrier
Turntable Drive Shaft and Motor
Tone Arm Actuator Shaft Assembly
Record Carrier Shaft and Bearings
Main Cam Shaft
Selector Shaft
Turntable Sleeve
Fulcrum Points of all Light Weight Linkage and Levers

a. Houghton Absorbed Oil, Type L3 (Part No. 54070) should be used at points where a non-fluid type of oil is required, such as:

Main Cam Working Surfaces (Cam Tracks)
Gear and Pinions

Turntable Worm Gear and Pinion
All Spring and Anchor Points

c. A one-half inch hole, located one and one half inches off center, will be found in the record carrier casting. This hole should be aligned with a corresponding hole in the chassis mounting plate. These two holes will coincide squarely at the front of the record changer when the hole in the record carrier is brought to that position. Oil applied at this point will be absorbed by a felt pad which in turn lubricates the record lift actuator arms and linkage at their fulcrum points where the heaviest load is applied.

d. The reduction gears of the record changer motor assembly are packed with a non-fluid lubricant (Alvania No. 55206A). There is one oiler on top of the motor to supply the center bearing. The main cam shaft may be lubricated by placing a small quantity of light oil at the top and center of the main cam.

e. The right and left program selector contact plate assemblies should be lubricated with a special Silicone protective compound which may be obtained from our parts department under Part No. 67887-A. The gear assemblies should be lubricated with Keystone No. C.P. Soft (Part No. 67500-A).