AMi

SERVICE MANUAL

for

AMi 40 SELECTION WALL BOXES AND STEPPERS

FOREWORD

The AMI 40-Selection Wall Box and Stepper is a unique and brilliant engineering advance in the field of coin operated phonographs. Totally new in principle, it succeeds in incorporating 40 selections in a wall box unit, scarcely larger than other types now on the market.

There are many special advantages of this new wall box which makes it ideal from the operator's standpoint. First and foremost it is extremely reliable. Like the AMI 40-Selection Phonograph Mechanism, it can be depended upon to give many years of trouble free uninterrupted service. Equally important, it is simple in its principle of operation, once this principle is understood.

The purpose of this manual is to place in the users hands, a carefully worded explanation of how it operates, which together with various diagrams and illustrations, will make it easy to service this equipment should such servicing be necessary.

We earnestly urge that before attempting to make any adjustments on either the wall box or stepper, that you read this manual carefully. Naturally, neither AMI nor its agents can be held responsible for damage done to equipment through thoughtless tinkering with adjustments.

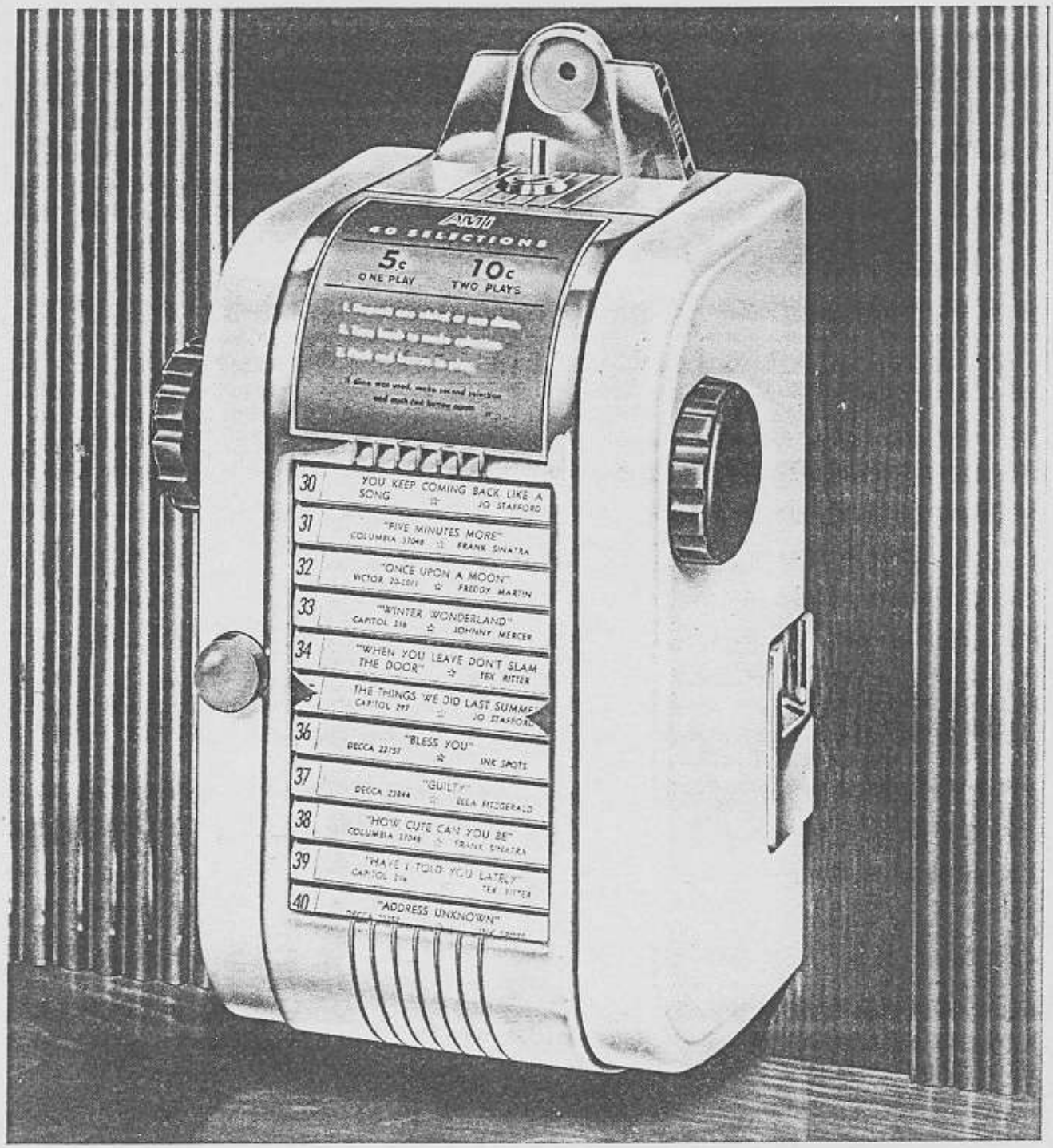
If you need any special information, contact your nearest AMI distributor or write us direct, attention, Service Department. When asking for information, be sure to furnish serial number of the wall box or stepper. Explain fully the difficulty you are experiencing.

FACTORY

AMI INCORPORATED
1500 Union Avenue, S. E.
Grand Rapids 2, Michigan

General Sales Office

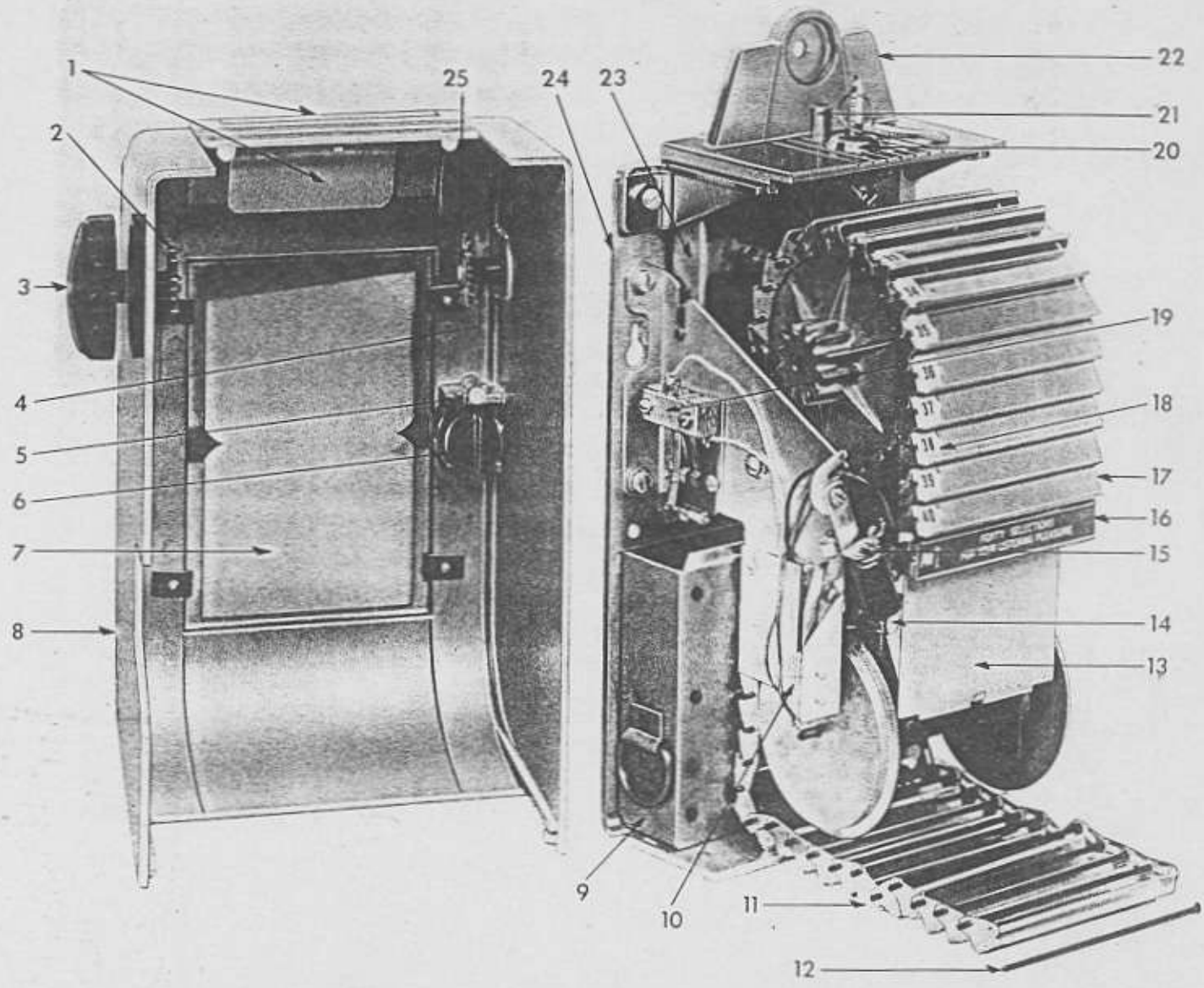
AMI INCORPORATED
127 North Dearborn Street
Chicago 2, Illinois



AMI

40 SELECTION
WALL BOX

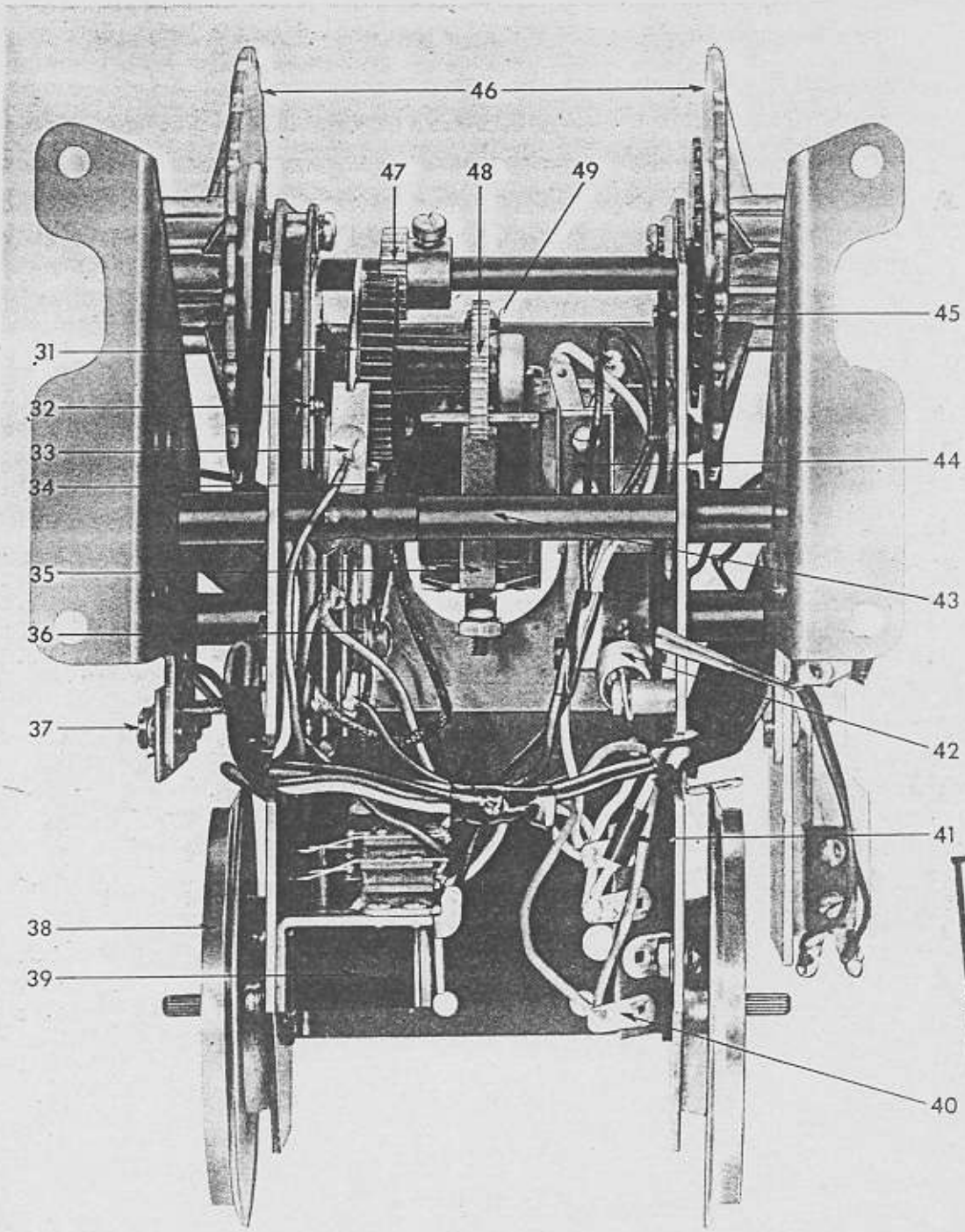
Compact -- 12-3/8" by 7-3/4" by 6-1/8".
Lightning fast -- selects in 3/4 second.
Three wire system -- easily installed.
Only three moving parts to send signal.
Less parts, less connections, the ultimate in reliability.



WALL BOX
PARTS LIST

CODE NO.	PART NO.	DESCRIPTION
1	L-101	5¢ Name Plate (5¢ & 10¢ Name Plate Part No. FX-120)
2	F-1183	Gear
3	F-1281	Selection Knob
4	F-1173	Bushing
5	F-1175	Retaining Pin, Push Button
6	F-1176	Push Button
7	F-1191	Window
8	R-56	Housing Cover
9	H-122	Coin Box
10	F-1144	Switch Assembly, Push Button
11	H-139	Title Holder Chain Assembly Complete
12	F-1165	Pin, Title Holder

CODE NO.	PART NO.	DESCRIPTION
13	F-1168	Light Diffuser
14	F-1188	Lamp, 6-8 Volt No. 51 Mazda
15	F-1177	L. H. Twin Lamp Socket
	F-1178	R. H. Twin Lamp Socket
16	F-1445	Title Strip for Extra Card Holder
17	H-113	Title Holder (41 - Required)
18	H-138	Title Strip Numbers 1 to 40
19	H-121	Coin Switch Assembly
20	S-1600D	Lock
21	F-1174	Coin Return Button
22	H-129	Coin Inlet Assembly and Lock
23	H-128	5¢ Slug Rejector Assembly
24	L-98	Back Plate
25	5133-25	Truarc Retaining Ring



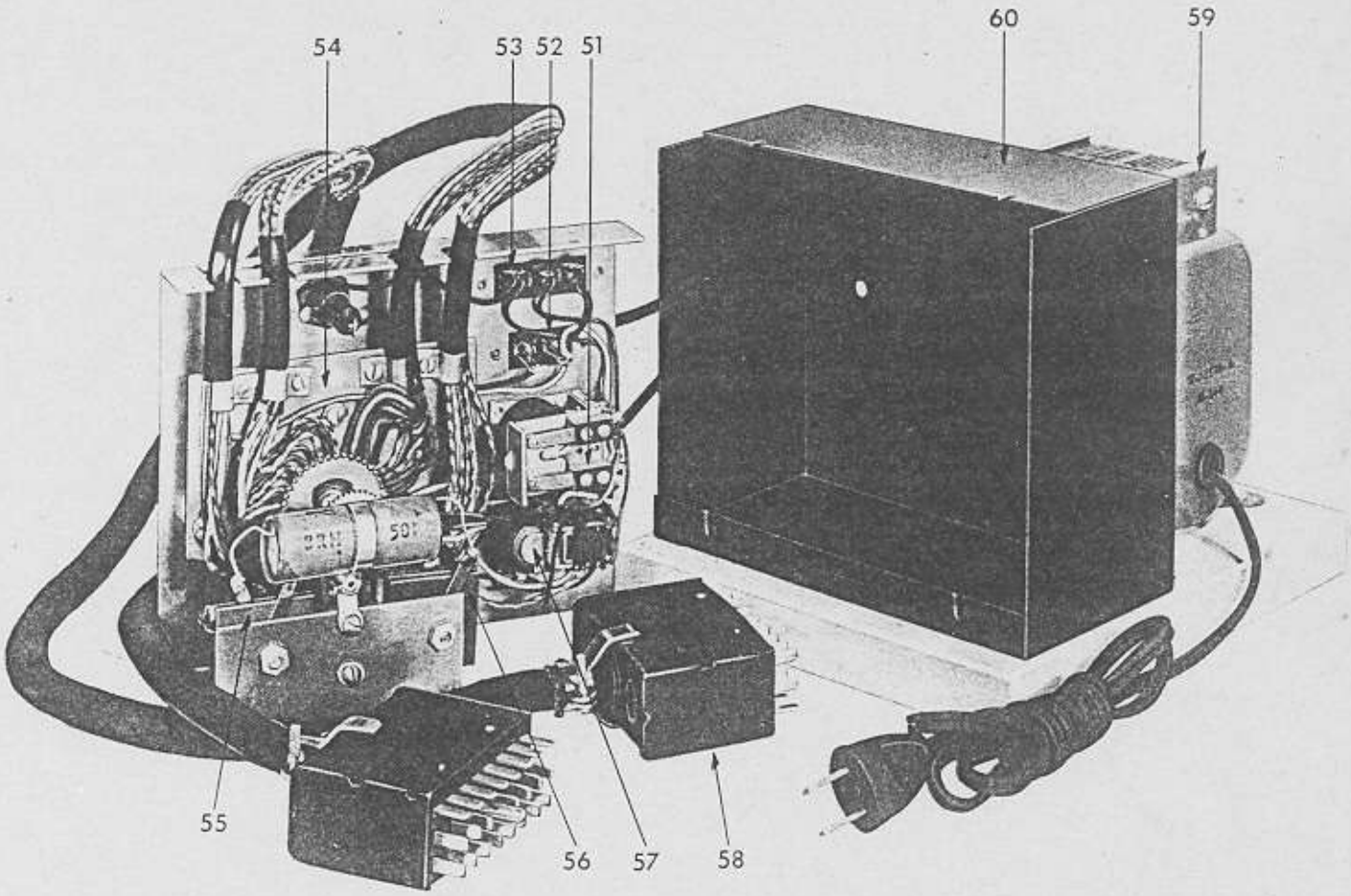
CORRECTION

Resistor (41) is shown in incorrect position. Resistor is actually in circuit of wire to the right—that is, the wire attached to bottom terminal on Terminal Strip No. 40.

WALL BOX
PARTS LIST (Con't)

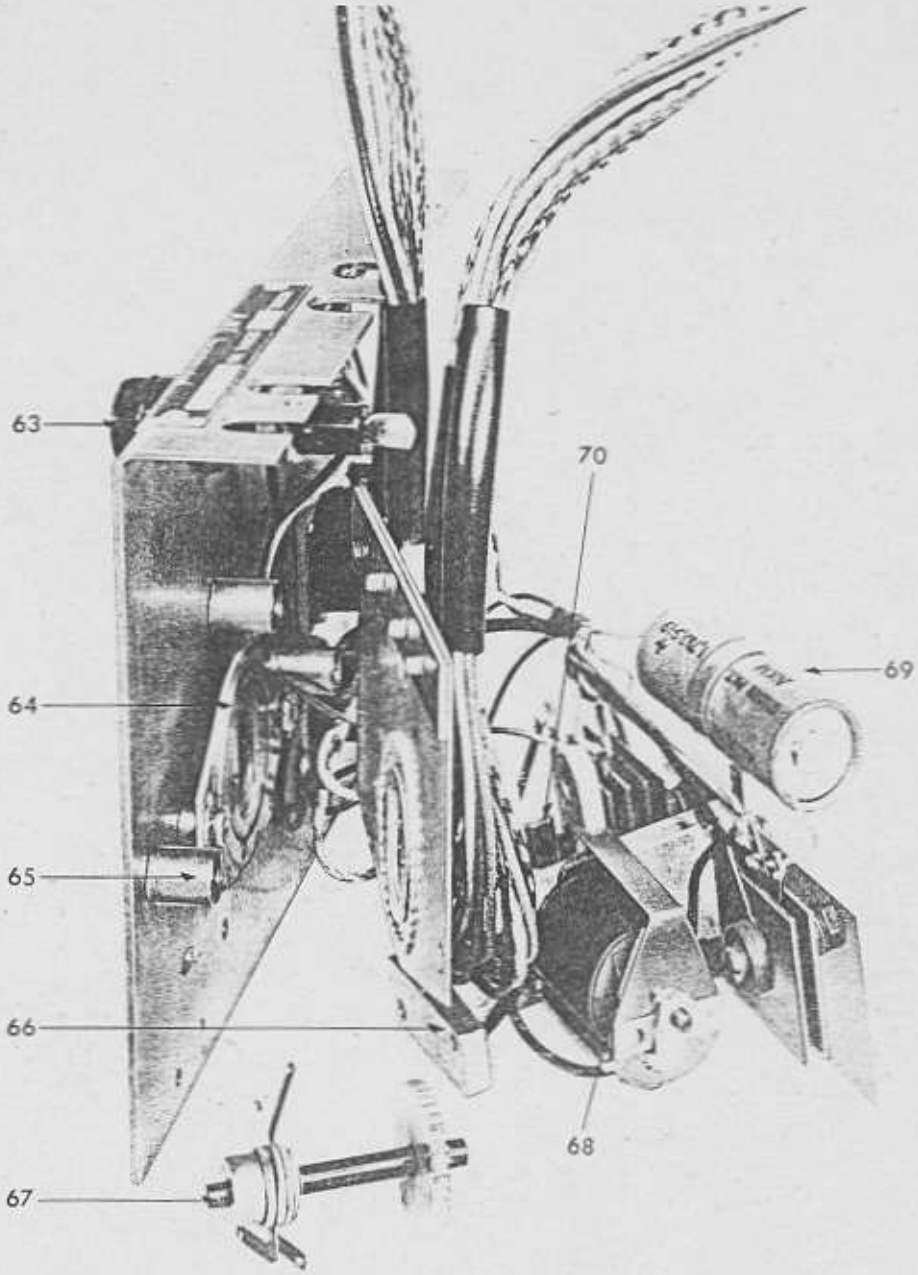
CODE NO.	PART NO.	DESCRIPTION
31	F-1134	Stepping Relay Wheel Shaft Assembly (Includes Interrupter Commutator & Gear, Rotary Contacts)
32	F-1118	Homing Commutator
33	F-1154	Stationary Interrupter Contact
34	F-1180	Stepping Relay Magnet & Bracket
35	F-1169	Drive Spring Assembly
36	F-1219	Rectifier
37	F-1189	Terminal Strip
38	F-1147	Roller Assembly
39	F-1190	Credit Circuit Relay

CODE NO.	PART NO.	DESCRIPTION
40	F-1441	Terminal Strip
41	S-103-C	15 Ohm 1 Watt Resistor
42	F-1187	Detent Spring
43	F-1166	Tie Bar Assembly
44	F-1157	Detent Switch Assembly
45	F-1152	Detent Roller
46	F-1143	Sprockets, Star Wheel, Pinion Gear & Shaft Assembly
47	F-1140	Pinion Gear
48		Stepping Relay Ratchet Wheel (Part of F-1134 Assembly)
49	F-1160	Stepping Relay Detent Spring



SL AND SM STEPPERS
PARTS LIST

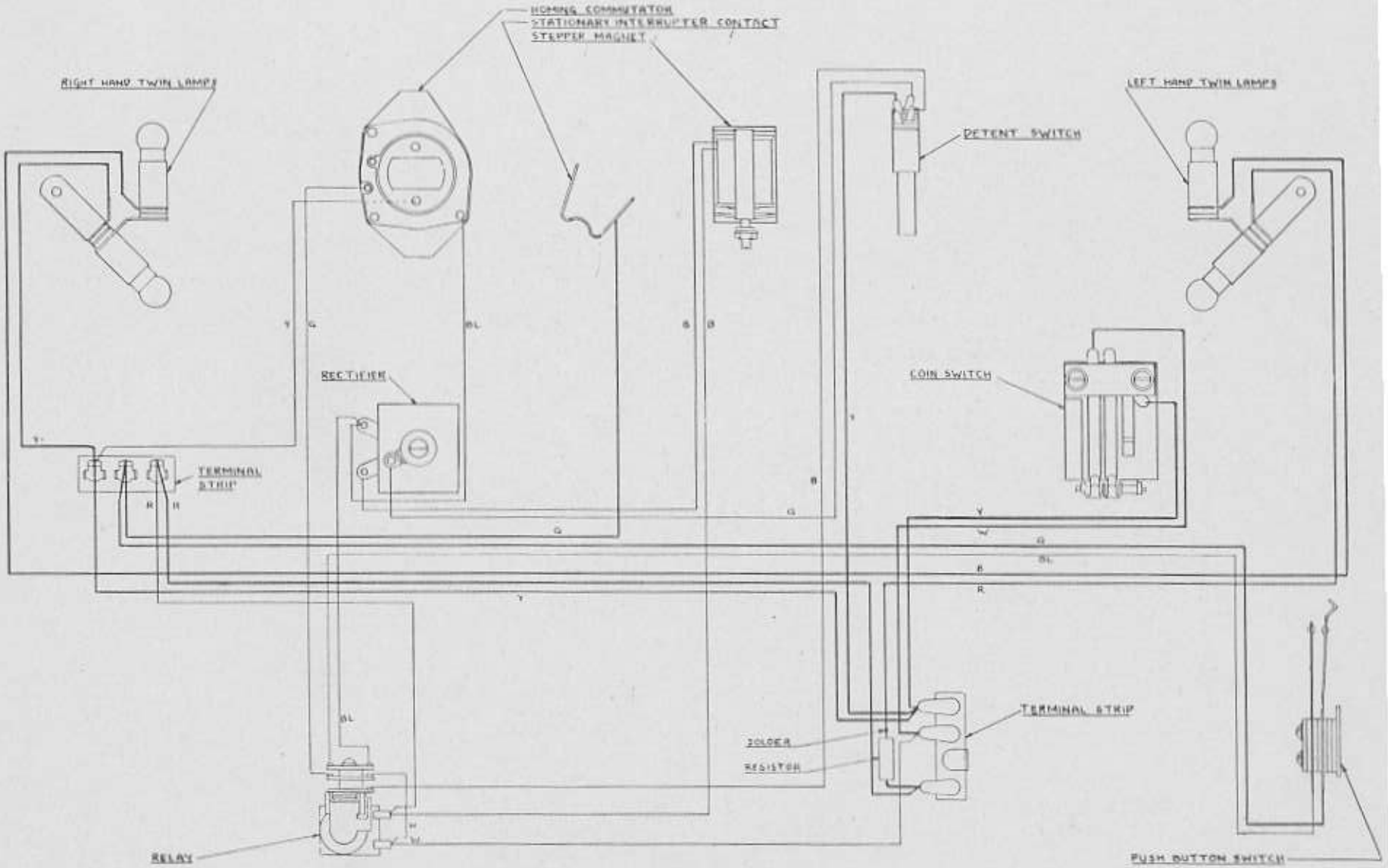
CODE NO.	PART NO.	DESCRIPTION
51	F-1271	Time Delay Relay
52	F-1298	Terminal Strip
53	F-1189	Terminal Strip
54	R-84	Selection Commutator, Harness & Plugs
55	F-1219	Rectifier
56	F-1542	Rectifier, 4 Plate
57	F-1449	Control Relay
58	F-227	Connector Plug
59	H-143	Transformer, SL Stepper
	H-144	Transformer, SM Stepper
60	L-115	Housing



SL AND SM STEPPERS
PARTS LIST (Con't)

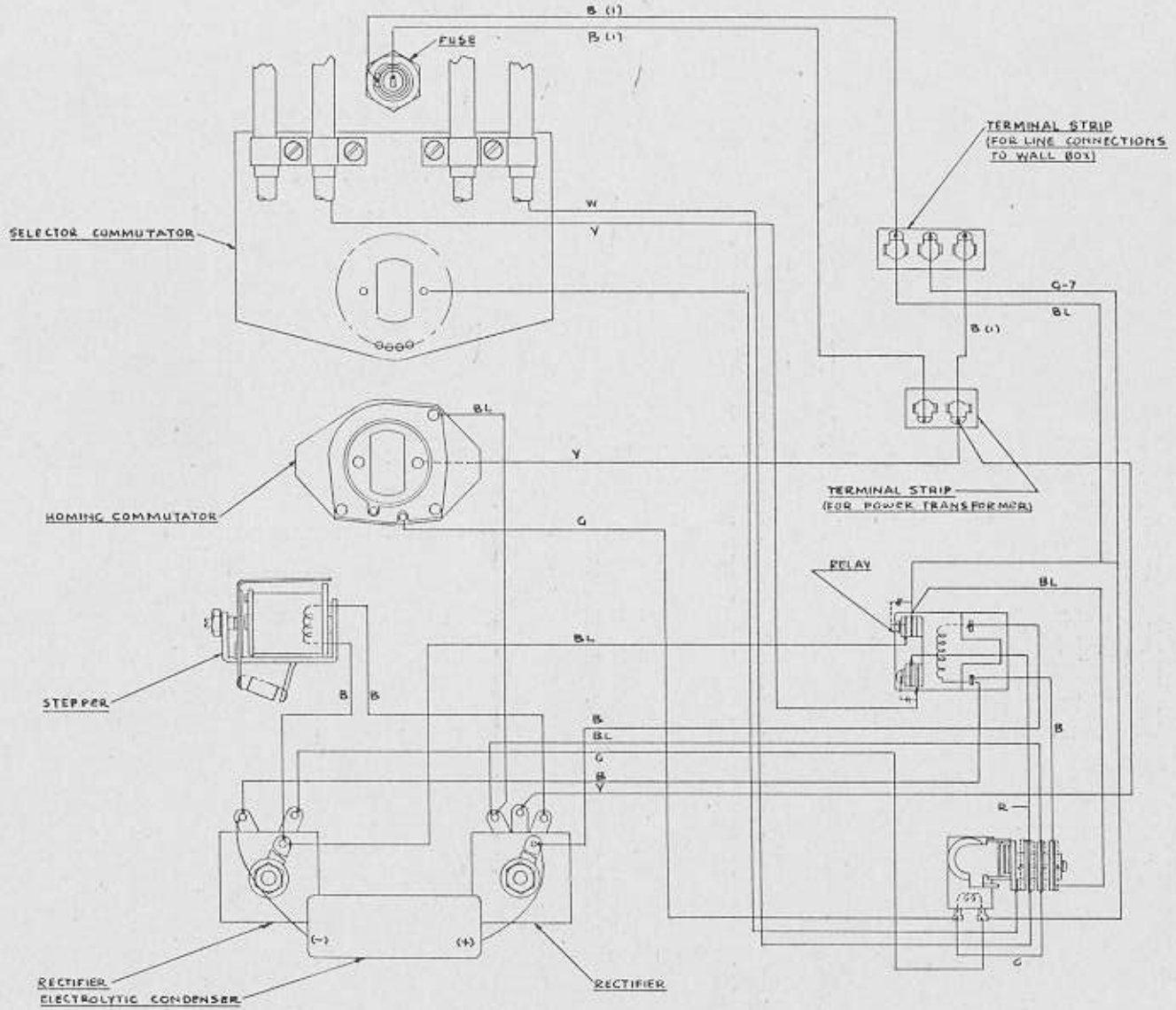
CODE NO.	PART NO.	DESCRIPTION
63	F-861	Fuse Holder
	S-720 D	Fuse, 4 Amp.
	S-720 E	Fuse, 10 Amp.
64	F-1118	Homing Commutator Assembly
65	F-1199	Spacer
66	L-92	Stepping Relay Magnet Mounting Frame (Same as used in Wall Box)
67	F-1195	Stepping Relay Wheel Shaft Assembly (For Stepper)
68	F-1180	Stepping Relay Magnet & Bracket
69	F-1272	Condenser, 100 Mfd., 50-Volt
70	F-1160	Stepping Relay Detent Spring

WIRING DIAGRAM - WALL BOX



CODE	COLOR
B	BLACK
R	RED
W	WHITE
G	GREEN
BL	BLUE
Y	YELLOW

WIRING DIAGRAM - STEPPER



CODE	COLOR
B	BLACK
R	RED
G	GREEN
BL	BLUE
Y	YELLOW
W	WHITE

B (1) BLACK

DETAIL DRAWINGS
of
Four Relays in AMI WALL BOX SYSTEM

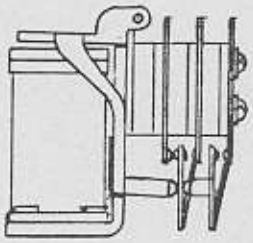


FIG. 1

CREDIT CIRCUIT RELAY CC
COIL RESISTANCE - 40 OHMS APPROX.
ALL NORMALLY OPEN CONTACTS SHOULD JUST MAKE WITH A .003 SHIM BETWEEN ARMATURE AND SHADED HALF OF CORE. CONTACTS SHOULD MAKE SIMULTANEOUSLY.
MINIMUM CONTACT PRESSURE - 15 GRAMS.

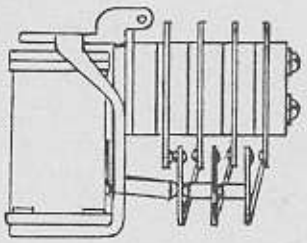


FIG. 2

CONTROL RELAY CR
COIL RESISTANCE - 40 OHMS APPROX.
ALL NORMALLY OPEN CONTACTS SHOULD JUST MAKE WITH A .003 SHIM BETWEEN ARMATURE AND SHADED HALF OF CORE. CONTACTS SHOULD MAKE SIMULTANEOUSLY.
MINIMUM CONTACT PRESSURE - 15 GRAMS.

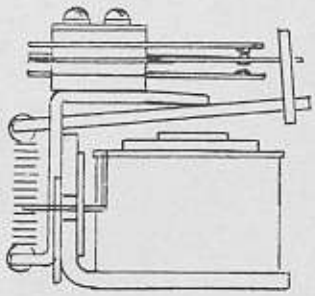


FIG. 3

TIME DELAY RELAY TD
COIL RESISTANCE - 400 OHMS APPROX.
MINIMUM CONTACT PRESSURE - 15 GRAMS.

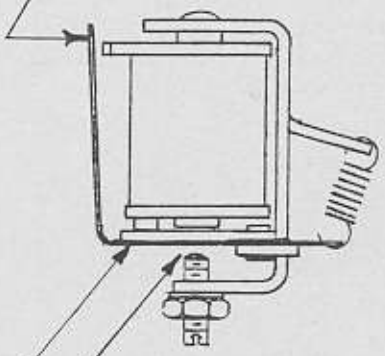


FIG. 4

MAGNET OF STEPPING RELAYS S(1) & S(2)
COIL RESISTANCE - 32 OHMS APPROX

PRINCIPLE OF OPERATION

All 40 selections on the AMI Wall Box are made over three wires, but unlike other three wire systems, no pulses are sent. The selection, which is to be made, is determined by the time which a circuit is held closed, there being a different length of time for each different selection made. The function of the mechanism in the wall box itself is to see that the circuit is held closed the proper length of time, and the function of the stepper in the phonograph is to translate this length of time to the corresponding selection. The timing is done by means of "stepping relays."

These stepping relays are actuated through half-wave rectifiers from the low voltage A. C. line, also used for the wall box lights. The function of the rectifier is to derive a pulsating D. C. current from the A. C. voltage. There are sixty D. C. pulses per second, corresponding to the 60 cycle A. C. voltage.

A magnet in the stepping relay is operated by each D. C. pulse and through a ratchet device, moves a 41-tooth ratchet wheel one tooth, or one forty-first part of a revolution. The magnet releases after each pulse so that as long as the circuit to the stepping relay is closed, the magnet will step the ratchet wheel around at the rate of 60 teeth per second.

These stepping relays are so designed that they always come to rest in one position, which we will call the "home position," and they make one revolution for each selection that is to be made. They are brought to rest in the home position by having the circuit pass through a "homing contact" in each stepping relay, which slides against a commutator ring and is actuated by the ratchet wheel. In the home position the homing contact slides off the commutator ring and onto a stationary contact, which breaks the circuit and causes the stepping relay to stop. Thus each stepping relay will always stop in the home position, and when subsequently started, will start from that position.

In the stepper, which is in the phonograph, the ratchet wheel also actuates a rotary switch which has a moving contact sliding over forty-one stationary contacts. The first of these stationary contacts is not connected (for reasons of convenience in the circuit), but each one thereafter is connected to a different selector coil in the phonograph selecting mechanism so that each contact corresponds to a separate selection. Inasmuch as there are forty-one teeth in the ratchet wheel and forty-one contacts on the rotary switch, it is evident that each step of the stepping relay will move the rotary switch from the contact it is on to the adjacent one. Therefore, by holding the circuit to the stepping relay magnet closed the proper length of time, it is possible to make the rotary switch stop on any contact desired.

The function of the stepping relay in the wall box is to hold the circuit closed the proper length of time. The ratchet wheel of this stepping relay actuates not only the homing contact previously mentioned, but also a special type of rotary switch. This switch consists of an "interrupter contact," which slides on a circular metal plate. The plate extends all the way around except for an insulating button which occupies a space approximately equal to one forty-first (1/41) of the total travel of the interrupter contact. This plate and insulating button will be called the "interrupter." The interrupter contact is actuated by the ratchet wheel. Its circuit is completed through the commutator previously mentioned, except in the home position, where the circuit is open. The circuit is also open when the interrupter contact rests on the insulating button of the interrupter.

The interrupter itself may be rotated manually as a unit by means of gearing, which connects through a set of sprocket wheels to a movable chain which carries the names of the selections. Thus, as the chain is moved, bringing the names of different selections in front of the indicating arrow provided, the interrupter is rotated to a different position for each selection. The gearing is such that each of these positions corresponds to a tooth in the ratchet wheel. For each separate selection a different number of steps of the stepping relay will be required to bring the interrupter contact from its home position to a position on the insulating button of the interrupter, thus breaking the interrupter circuit. By means yet to be described, the breaking of this circuit stops the stepping relay in the stepper.

The two stepping relays step at the same rate. If they are started at the same time, the number of steps the stepping relay in the stepper makes before it stops, will equal the number of steps the stepping relay in the wall box makes in bringing the interrupter contact onto the insulating button. Thus the position of the interrupter determines which contact the rotary switch in the stepper stops on. By proper wiring, this contact can be made to correspond to the selection whose name is adjacent to the indicating arrow in the wall box.

In order to be sure that the two stepping relays start at the same time, they are both started by one control relay, which is in the stepper. This relay is actuated by a push button switch in the wall box through an appropriate credit circuit, also in the wall box. After the relay has pulled in and the stepping relays have started, the relay circuit is maintained on alternating current through the interrupter contact in the wall box. The relay drops out when this contact moves onto the insulating button.

The same push button switch and credit circuit, mentioned above, provide the connection through which the wall box stepping relay is started. Thus,

even though several wall boxes may be connected to the same phonograph, only the one from which the selection was made will have its stepping relay started.

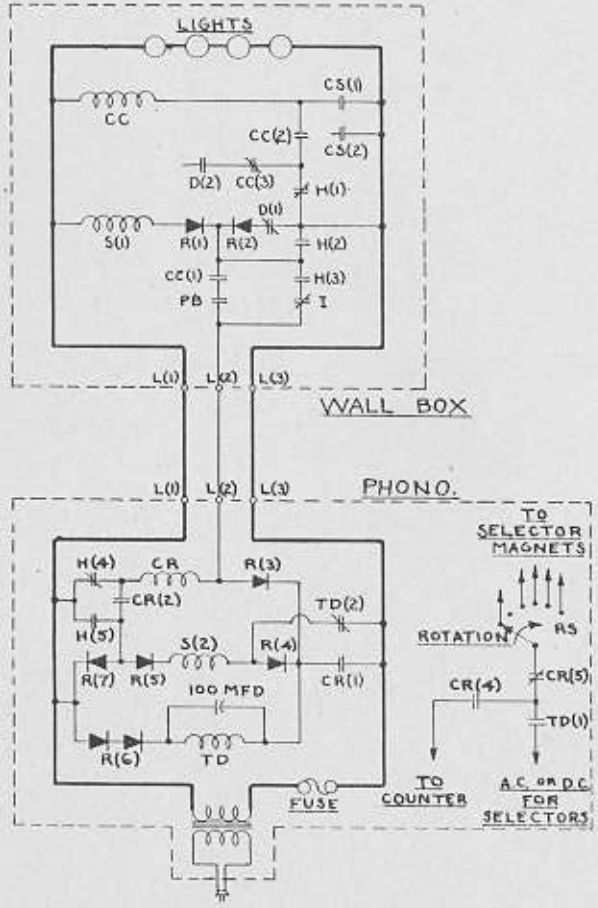
The credit circuit is such that it opens between the first and second steps of the wall box stepping relay and will remain open until another coin is dropped. The interrupter will not function until the credit circuit is open, so the first step is not made to correspond to any selection.

When the control relay pulls in, it not only starts the stepping relays but, also pulls in a direct current time delay relay, which is also in the stepper. The function of this relay is to complete the selection circuit and hold it closed the proper length of time. The selection circuit is such that a selection will be made only when the control relay is out and the time delay relay in. This condition occurs after the control relay has dropped out, breaking the circuit to the time delay relay, but before the time delay relay has dropped out.

The time delay relay has one other function, which is to hold open the circuit through the homing contact in the stepper, so that the stepping relay in the stepper will stop when the control relay drops out. It will remain stopped while the selection is being made and until the time delay relay drops out. The time delay relay's dropping out closes the circuit through the homing contact. Then the stepping relay in the stepper returns to its home position in the manner previously described. The time delay relay does not effect the circuit through the homing contact in the wall box; therefore the stepping relay in the wall box does not stop when the control relay falls out, but continues without interruption to its home position. Thus, the circuit to the control relay is broken only momentarily by the interrupter contact. However, the relay is so wired that it will not pull in again during the remainder of the cycle. After the cycle is over, credit can be re-established and another selection made, each selection requiring a cycle similar to the above.

CYCLE OF OPERATION
AMI WALL BOX SYSTEM

Follow Diagrams Numerically

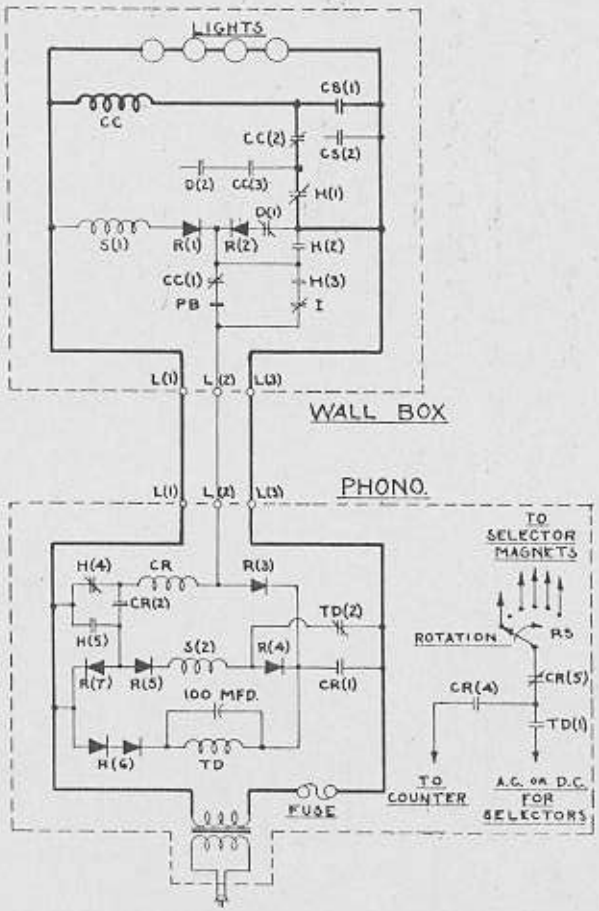


NO. 1. NORMAL CONDITION

Lights are on, nothing else is connected. Current is shown flowing in either direction.

Note #1. Current flows from line L(1) to line L(3) and then from line L(3) to line L(1) continuously reversing (that is, it alternates), in all connected parts except those connected through a rectifier.

Note #2. Contacts D(2), CC(3), and CS(2) play no part in the operation of a single coin wall box and will be ignored.

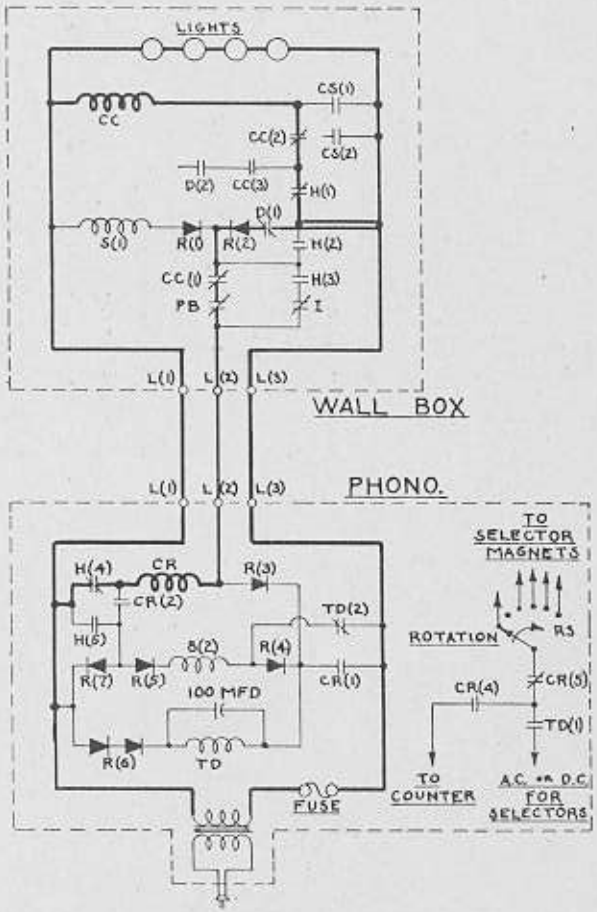


NO. 2. ESTABLISHING CREDIT

The coin momentarily closes contact CS(1), which actuates relay CC. Relay CC pulls in closing contacts CC(1) and CC(2). Circuit is maintained through contact CC(2) as shown by heavy lines.

Contact CC(1) is the credit contact through which the operation may be started.

Current is shown flowing in either direction.



NO. 3. CHOOSING SELECTION

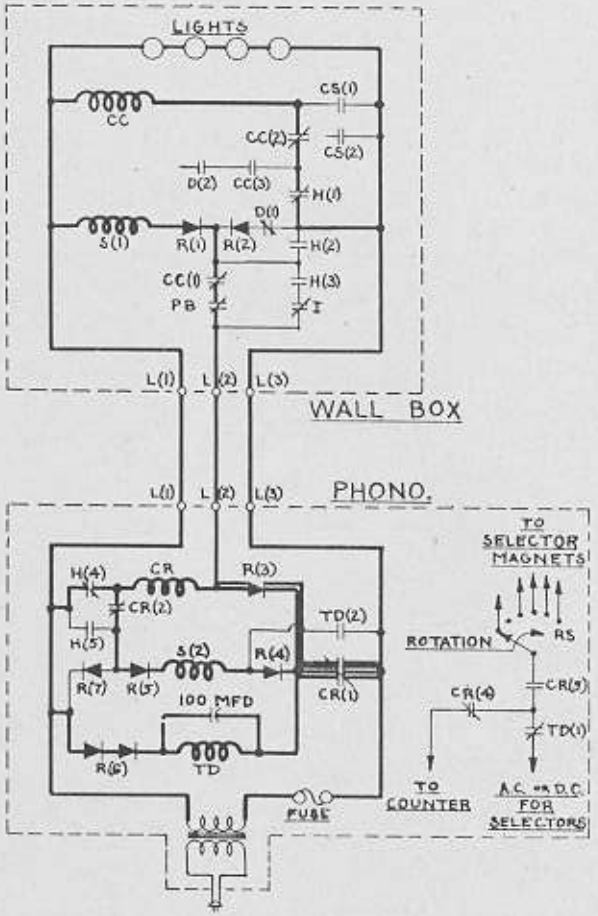
Knobs are moved until selection desired is behind indicating arrow.

Switch PB is closed by push button, completing circuit through line L(2) and actuating relay CR.

Current is shown flowing from line L(3) to line L(1).

Note #3. If selection is not properly centered, switch D(1) will be open and operation will not be started.

CYCLE OF OPERATION (Con't)



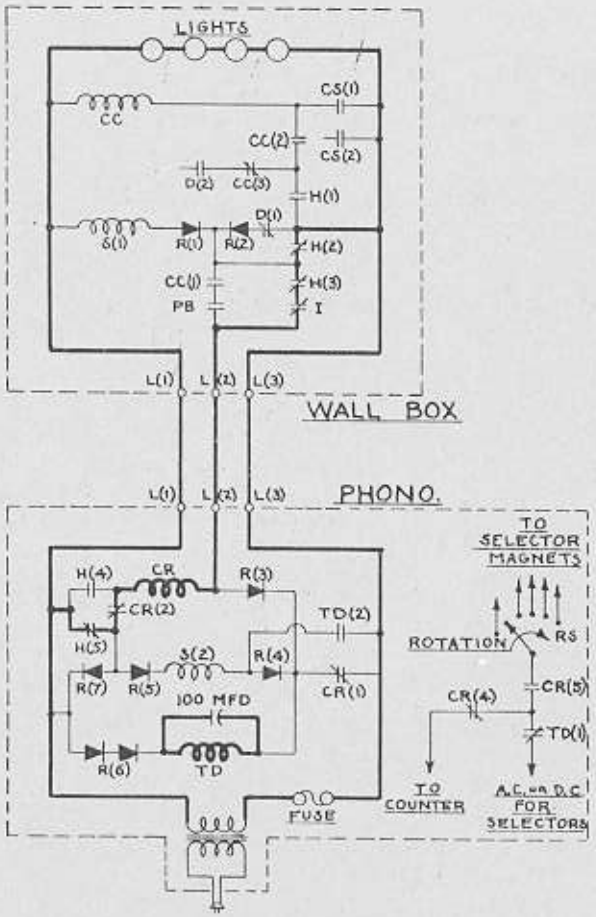
NO. 4. START OF OPERATION

Relay CR pulls in closing contacts CR(1), CR(2), and CR(4) and opening contact CR(5).

Relay TD is actuated and pulls in closing contact TD(1) and opening contact TD(2).

Stepping relays are actuated but have not yet stepped.

Current shown flowing from line L(1) to line L(3).



NO. 5. AFTER FIRST STEP

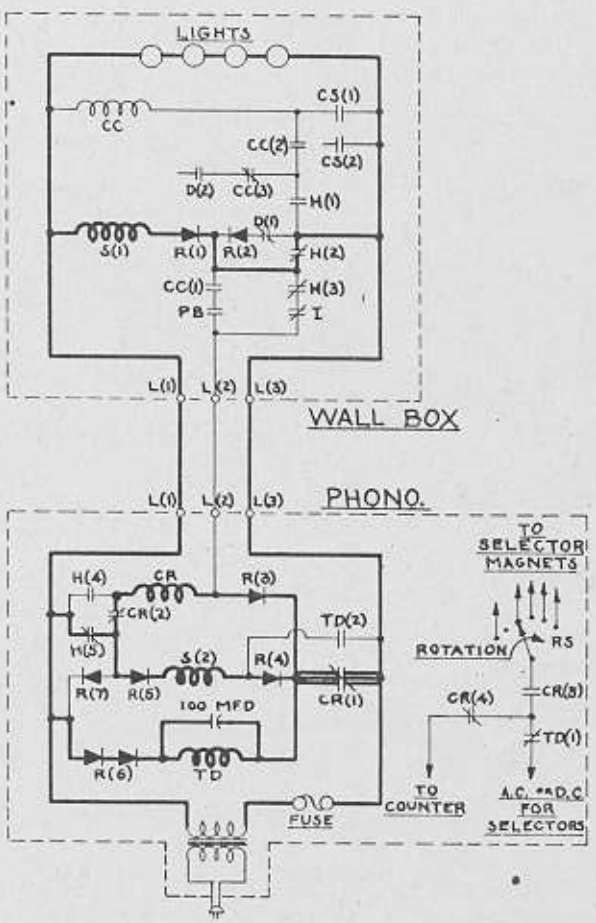
Stepping relays S(1) and S(2) each make one step closing contacts H(2), H(3) and H(5) and opening contacts H(1) and H(4). Stepping relay S(2) also moves rotary switch RS one contact.

Opening contact H(1) causes relay CC to drop out, opening contacts CC(1) and CC(2).

Relay CR is maintained through interrupter contact I.

Relay TD is maintained by current from condenser.

Current shown flowing from line L(3) to line L(1).

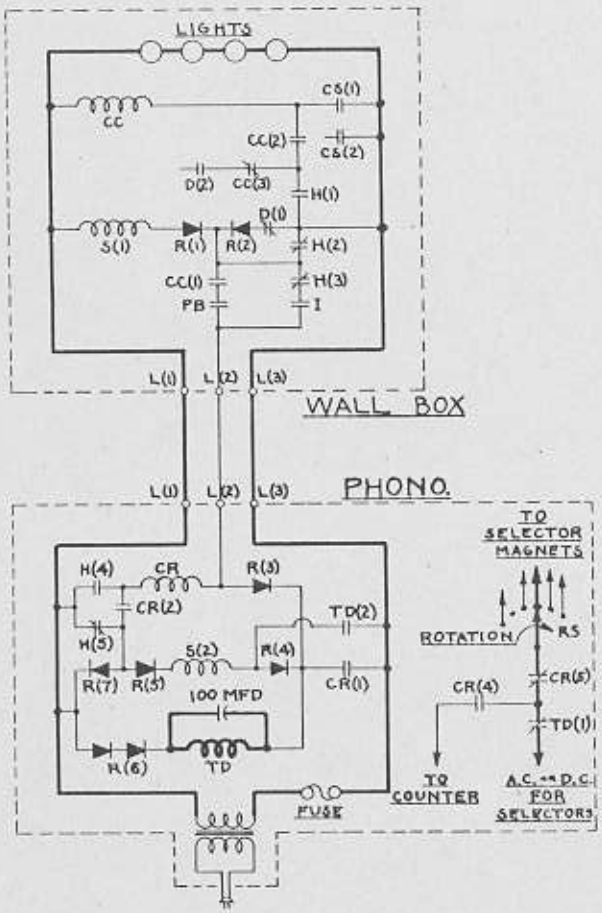


NO. 6. SUBSEQUENT STEPS

Stepping relays are again actuated by reversal of current causing stepping relays to make second step and moving rotary switch RS to second contact.

Current shown flowing from line L(1) to line L(3).

Note #4. Diagrams for subsequent reversals of current will be the same as diagrams #5 and #6, except that each repetition of diagram #6 will cause stepping relays to step and rotary switch RS to advance one contact until contact I is opened by stepping relay S(1).



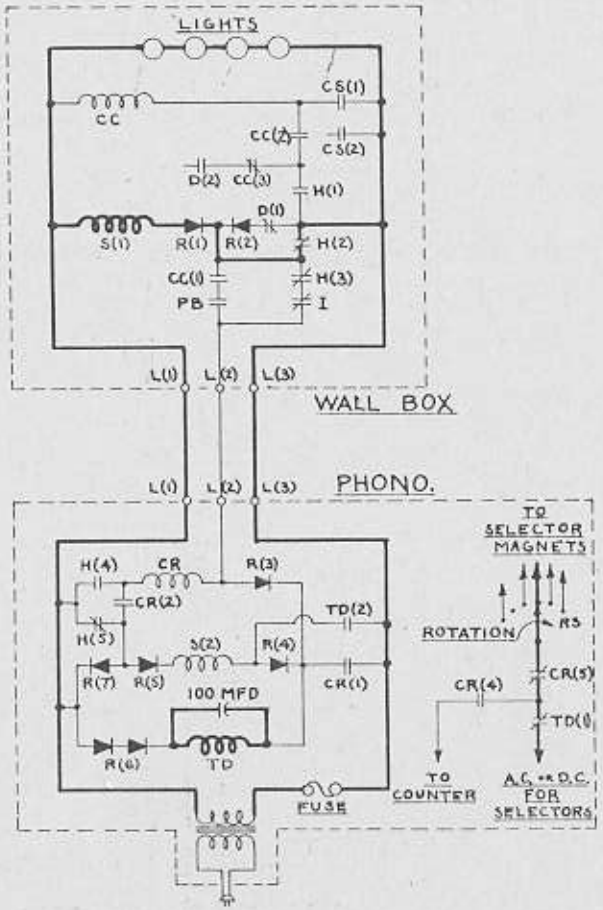
NO. 7. CLOSING SELECTION CIRCUIT

Circuit to relay CR is broken by opening of contact I.

Relay CR falls out opening contacts CR(1), CR(2), and CR(4), and closing contact CR(5).

Contact CR(5) completes selection circuit.

Current is shown flowing from line L(3) to line L(1).



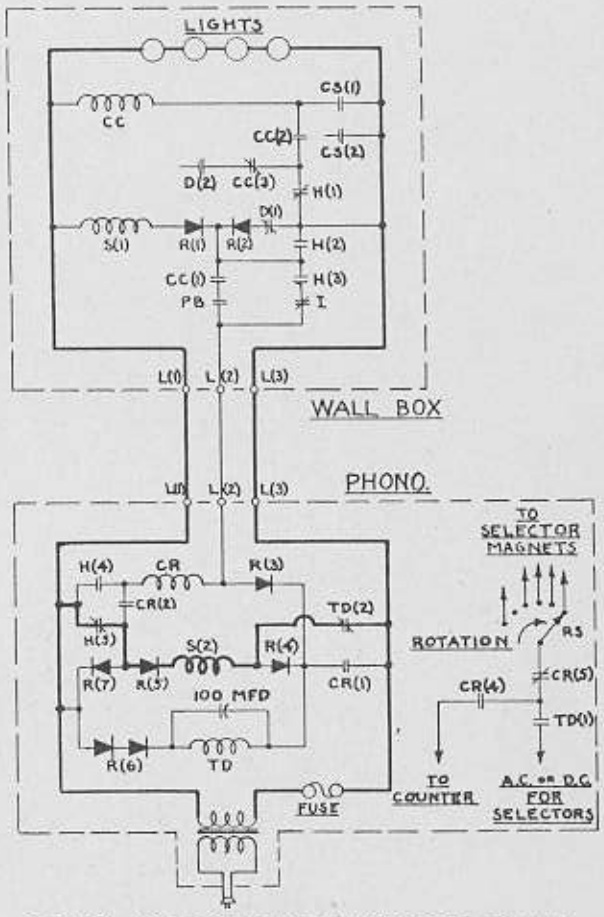
NO. 8. WALL BOX STEPPING RELAY HOMES

Stepping Relay S(1) continues to step on subsequent current reversals until it reaches its home position which opens H(2) and H(3) and closes H(1). (Diagram shown before S(1) reaches home position.)

Relay TD is maintained a short period of time by condenser.

Current shown flowing from line L(1) to line L(3).

Note #5. Relay TD has no effect on Stepping Relay S(1) so it is unimportant whether TD falls out before or after S(1) reaches home position.



NO. 9. PHONOGRAPH STEPPER HOMES

Relay TD falls out when condenser is discharged, opening contact TD(1) and closing contact TD(2).

Contact TD(1) breaks the selection circuit.

Contact TD(2) closes homing circuit of Stepping Relay S(2).

Stepping Relay S(2) steps on subsequent current reversals until it reaches its home position, opening contacts H(5) and closing contact H(4). (Diagram shown before S(2) reaches its home position.)

Current shown flowing from line L(1) to line L(3) before stepping relay S(2) is home.

Note #6. When both Stepping Relays are in home position, everything is returned to normal as shown in diagram No. 1.

INSTALLATION INSTRUCTIONS

The two slotted holes in the backplate of the wall box are to allow the installer to hang the box on two screws that have already been started into the wall. There are two additional holes for screws to hold the box firmly. The box should be level to allow slug rejector to operate properly. If not level, coins will be rejected.

The box should be mounted on an even surface. Permanent damage may result from securing the wall-box against a curved surface. If the wall is uneven, provide suitable wooden blocks against which the wall box can be mounted. If the backplate is bent when the screws are pulled tight, it may cause incorrect operation and make the replacing of cover and locking difficult.

The best results are obtained when the operating voltages are maintained at 27 to 28 volts A. C., measured across terminals 1 and 3. The limits of voltages which will insure proper operation are 25 to 30 volts on the stepper and 23 to 30 volts on the wall box. The voltage measurements on the wall box are made at the terminals of the end box, i.e., the box that is last on the line.

In order to insure the proper voltages, the gauge size of the wire must not be smaller than #18. Larger wire is better if it can be easily installed. No more than 10 boxes should be connected on any one cable run of #18 wire.

It is preferable to install separate cable runs for each ten boxes. It is further recommended that each cable run be limited to 75 feet when using #18 gauge wire. Generally speaking, this maximum length can be extended to 120 feet by using #16 gauge, or to 188 feet by using #14 gauge wire. This should not be generally necessary if separate runs are used for each ten boxes.

There are two models of the stepper. The "SL" is for installations of up to 10 wall boxes. The "SM" is for installations up to 25 wall boxes.

The transformer used on the "SM" stepper provides considerable flexibility in locations where the house supply voltage is low. If difficulty is experienced in getting the proper voltage on the wall boxes because of low house supply voltage, and this voltage is consistently under 107 volts, the red wire (which will be found stapled to the mounting board) should be connected to the terminal where the yellow wire is normally connected.

CAUTION

Improper usage of this tap can result in excessive voltage on the wall box installation. Make certain that it is not possible to obtain sufficient voltage from the normal connection before proceeding with this step. Always tape up the unused tap when it is not in use.

Locate the stepper in the phonograph and insert the Jones Plugs marked "C" and "D" into the proper Jones receptacle. Plug the transformer cord into the receptacle on the main junction box marked "WALL BOX." Check to see that the Black and the Yellow Leads from the transformer are securely fastened to the lower screw terminal strip. The line or lines from the wall boxes must be kept in proper relation by keeping the color codes in order. Normally, the color code is #1 Red, #2 White, and #3 Blue.

WALL BOXES may be mounted on bars with a suitable fixture. The AMI bar bracket assembly #F-1083 is recommended.

NOTE. The numerals in brackets refer to the Code Numbers in the illustrations on pages 2 through 5.

MAINTENANCE AND SERVICE

The AMI 40 Selection Wall Box is designed to operate with the AMI 40 Selection Stepper. Before attempting to make adjustments on any of the equipment for incorrect or no operation, it would be well to become familiar with the principle and cycle of operation. Careful consideration and analysis of possible causes, before repairs are undertaken, will save time and future trouble.

If all wall boxes of an installation are nonoperative or are all operating erratically, the cause would most likely be located in the stepper. Where the complaint is about one particular wall box, the cause would most likely be located in that particular box.

Where all boxes are nonoperative and all lights are out, but the phonograph is operating, check the power cord and fuse of the stepper. Also check lines 1 and 3 for a loose connection or an open.

Should all boxes and stepper appear to be operating correctly but no selection is made, the 1/2 amp. fusetron in the main junction box of the phonograph may be blown.

Upon determining whether the trouble is in a particular wall box or in the stepper, the trouble can usually be eliminated quickly by making a complete check of the few adjustments, and at the same time applying the small amount of service and maintenance necessary, such as cleaning, oiling and tightening all screws, nuts and bolts.

Naturally, all wiring should be checked for broken connections and shorts. All relays and contacts should be checked for correct operation.

After having completely checked the wall box and it still fails to operate correctly, check the rectifier. In the case of the stepper, check the rectifiers and 100 MFD. condenser (69).

Failure of the time delay relay (51) to pull in may be caused by a shorted condenser. "Chattering" of this relay may be caused by the condenser being open.

LIGHTS:

Burned out lamps may be replaced without removing the title holder chain. Loosen the screw holding the twin lamp socket and swing socket from behind chain.

The AMI 40 Selection Wall Box comes equipped with 4 No. 51 6-8 volt, minature bayonet type, light bulbs. These lights are in series and in replacing, if necessary to use a lamp of a different number, replace all 4 lamps in the wall box with the same number.

WARNING

Do not use lamps rated higher than 1 candle power or .25 amps.

FUSES:

The "SL" Stepper requires a 4 amp. fuse and the "SM" Stepper a 10 amp. fuse.

WARNING

Do not use fuses having higher ratings.

SLUG REJECTOR:

The Slug Rejector should be kept clean and level for correct operation. To remove the slug rejector from the wall box, unlock and remove cover. Remove the two screws holding the coin inlet assembly (22) and remove assembly. Lift out the slug rejector.

LUBRICATION:

Whenever servicing a wall box, clean the contact surface of the homing commutator (32), the contact surface of the interrupter commutator (31) and the rotary contacts with carbon tetrachloride.

Put a drop of sewing machine oil on the bearing at each end of the stepping relay shaft and a drop on the teeth of the stepping relay ratchet wheel (48). Spread a drop of oil over the contact surfaces of the homing and interrupter commutators.

Put one drop of oil on each sprocket shaft bearings (46), one drop on the detent roller (45) and one drop on its bearing.

Lubriplate may be used on the shafts of the selection knobs (3). Whenever servicing a stepper, clean the contact surface of the homing commutator (64), the contacts of the selection commutator (54) and the rotary contacts (67) with carbon tetrachloride.

Put a drop of sewing machine oil on the bearing at each end of the stepping relay shaft and a drop on the teeth of the stepping relay ratchet wheel. Spread a drop of oil over the contact surface of the homing commutator.

NOTE: No oil should be used in the contacts of the selection commutator (54) or the moving contacts bearing upon them.

WARNING

Do not over oil. Use minimum amount of oil in all cases.

WALL BOX ADJUSTMENTS

1. Coin Switch (19)

The coin outlet in the slug rejector should line up with the rear leaf of the coin switch and this leaf should bear against the slug rejector with a slight tension, maintaining a gap of approximately 1/32 inch at the contacts. Holding the leaf of the coin switch against the slug rejector, drop a nickel into the coin inlet slot. When the switch blade is released slowly, the coin should pass through the slug rejector opening, closing the switch, and fall free.

2. Push Button Switch (10)

The blades of the push button switch should be adjusted so that the lamp socket bracket, when swung out, just clears the long blade of the switch and the gap between contacts is 5/32 inch. With the cover on, the push button switch should bear against the push button with enough force to return the push button to its limit of movement, when pressed in and released slowly.

3. Detent Switch (44)

Adjust the position of the detent switch so that when the sprocket (46) is turned from a normal position, to a position half way between normal positions, the two contacts reverse; that is, the one which was closed in the normal position is now open and the one which was open in normal position, is now closed. The movement of the moving blades of the two contacts should be approximately equal, in which condition the contacts should have a minimum pressure of 15 grams when closed and a minimum gap of 1/64 inch when open.

4. Rotating Homing and Interrupter Contacts

Adjust the three rotating contacts so that they bear against the homing commutator with a pressure of 12 to 17 grams. Adjust the moving interrupter contact so that it bears against the interrupter disc with a pressure of 20 to 25 grams.

NOTE: In the stepper, contact pressures are 15 to 20 grams.

5. Stepping Relay Magnet Assembly

After the adjustments shown in Figure (4), Page (8), are made, tighten the two magnet holding screws, which are nearest to the ratchet wheel, so that the magnet is held firmly, but its position can be shifted. Hold the drive spring (35) against the rubber stop, move the stepping relay magnet (34) toward the ratchet wheel (48) until there is no backlash present in the ratchet wheel. Tighten the two magnet holding screws. See that the drive spring and ratchet wheel are lined up and square with each other.

NOTE; If wall box gives free plays, check the adjustments of the wall box stepping relay (Fig. 4, Page (8). Also check pressure of stationary interrupter contact.

6. Stepping Relay Detent Spring (49)

With the power off, hold the drive spring (35) of the stepping relay magnet against the rubber stop and deflect detent spring over first tooth on the ratchet wheel. Then slide it forward until it clears, by .002 to .005, the vertical portion of the next tooth. In this position it should press against the ratchet wheel with 10 to 20 grams pressure. Make sure that it is centered with the ratchet wheel and then tighten the screw holding it. It should now be possible to step the ratchet wheel completely around by alternately pressing on and releasing the drive spring. There should be no binding nor excessive backlash in the ratchet wheel.

7. Homing Commutator (32)

With the power off, operate the stepping relay manually until the two moving contacts, which bear against the outer ring of the commutator, are as close as possible to the two stationary contacts, which are set into the outer ring of the commutator. Then without moving the ratchet wheel, move the commutator until the stationary contacts are directly under the moving contacts. Tighten the two screws holding the commutator. To check the adjustment, step the stepping relay around again, and in one revolution the moving contacts should again stop directly on the stationary contacts. When the ratchet wheel is backed up against the detent spring (49), the moving contacts should still line up well with the stationary contacts. On the first step the moving contact makes off of the stationary contact, the moving contact should break connection with the stationary contact at least a quarter step before the detent spring drops into the next tooth.

8. Interrupter

Part of the Stepping Relay Wheel Shaft Assembly (31)

With the power off, operate the stepping relay manually to a point where the moving contact, that bears against the interrupter, is clearly visible, and without moving the ratchet wheel, turn the interrupter until the insulating button is directly under the moving contact. Holding the interrupter in this position, mesh the pinion gear (47) with the gear teeth on the interrupter so that the pinion gear overlaps the interrupter gear teeth by approximately 1/8 inch. At several widely separated positions of the interrupter, check to see that the moving contact will stop on the center of the insulating button, when the stepping relay is stepped by alternately pressing and releasing the drive spring.

9. Stationary Interrupter Contact (33)

Check the stationary interrupter contact to see that it is seated properly and has a contact pressure on the interrupter disc of 30 to 40 grams. Make sure that the wire, attached to the contact, does not tend to force contact from its seat on the tie bar or off the interrupter disc.

10. Title Holder Chain (11)

To replace chain, set the rotary contacts on the stationary contacts of the homing commutator (32). In this position the rotary homing and interrupter contacts are in the homing position.

NOTE: If the power is connected to the wall box, the rotary contacts will automatically return to homing position. Rotate the interrupter commutator (31) to the position where the insulating button is directly beneath the rotary interrupter contact. Replace chain so that the two pins (12) of the number 31 title holder are in the two top notches of the chain sprockets (46). Insert pin and lock in position. Without moving chain, replace wall box cover. Number 1 selection should be directly behind the selection arrows.

STEPPER ADJUSTMENTS

1. Rotating Homing and Selection Contacts (67)

Adjust the four rotating contacts so that they bear against the homing and selection commutators with a pressure of from 15 to 20 grams.

2. Stepping Relay Magnet Assembly

Same as adjustment No. 5 of Wall Box Adjustments.

3. Stepping Relay Detent Spring (70)

Same as adjustment No. 6 of Wall Box Adjustments.

4. Homing Commutator (64)

Same as adjustment No. 7 of Wall Box Adjustments.

5. Selection Commutator (54)

With the power off, first check adjustment No. 4, Homing Commutator. Manually step the ratchet wheel one step beyond the position where the moving contact is on the stationary contact of homing commutator (64). Then without moving the ratchet wheel, shift the selection commutator until the unwired contact is directly over the second rotary contact. Tighten the three screws holding the selection commutator. Manually step the stepping relay around and check at several positions, to see that the moving contact always stops on the center of a contact of the selection commutator.