

## PLUNGER-TYPE SWITCHES AND BANKS

### PRIMARY AND SECONDARY LINE SWITCHES AND OUT TRUNK SWITCHES

### PIECE-PART DATA AND REPLACEMENT PROCEDURES

#### 1. GENERAL

**1.01** This section covers the information necessary for ordering parts to be used in the maintenance of plunger-type switches and banks: Primary and secondary line switches and out trunk switches. It also covers approved procedures for replacing these parts.

**1.02** This section is reissued to add ordering information and replacement procedures for plunger-type line switch banks and to revise title.

**1.03** Part 2 of this section covers the piece-part numbers and the corresponding names of the parts which it is practicable to replace in the field in the maintenance of plunger-type switches and banks. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts. This information is called Piece-Part Data.

**1.04** Part 3 of this section covers the approved procedures for the replacement of the parts covered in Part 2. This information is called Replacement Procedures.

#### 2. PIECE-PART DATA

**2.01** The figures included in this part show the various piece-parts in their proper relation to other parts of the switch. The piece-part numbers are given with their corresponding names. Piece-parts designated by P-code numbers are Western Electric Company parts. Piece-parts designated by D-code numbers are Automatic Electric Company parts.

**2.02** Information enclosed by parentheses ( ) is not ordering information. This information may be reference to notes, parts referred to in other portions of the section and not con-

sidered replaceable, or part names in general use in the field if these names differ from those assigned by the manufacturer.

**2.03** When ordering parts for replacement purposes, give both the piece-part number and the name of the part followed by the name of the manufacturer (Automatic Electric Company) when the piece-part number is a D-code, for example: "D-67147 Left Plunger and Armature Extension Assembly, Automatic Electric Company."

**2.04** Where a piece-part is designated "Right" or "Left" in the figures contained in this part of the section, it indicates that they apply respectively to a right mounted line switch or a left mounted line switch. For example: If it is necessary to replace a plunger and armature assembly for an ES-65075-01 (KS-2421) line switch which mounts on the right side of the line switch shelf, order the D-67146 plunger and armature extension assembly designated "Right" in Fig. 1.

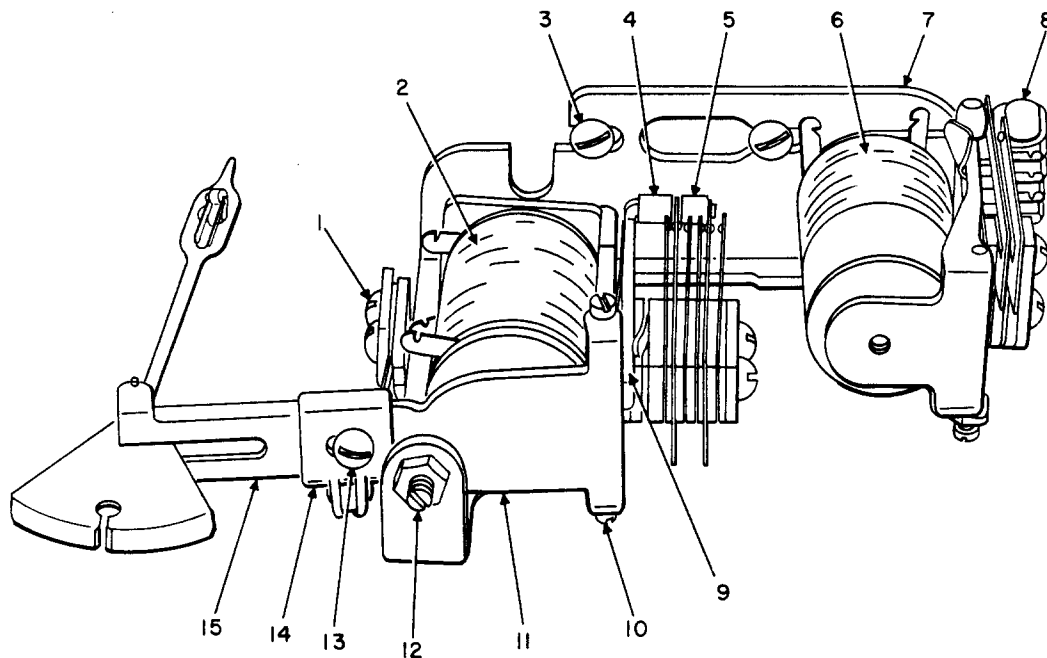
**2.05** The D-number primary and secondary line switches and out trunk switches covered in this section are stamped with the following markings. Where a switch is stamped with a KS, ES, or other number and "L" (left) or "R" (right) is not part of that number, when ordering for replacement purposes, specify the number of the switch and indicate whether it is a left or right switch.

SWITCH		MARKING	
PRIMARY	DRAWING NO.	KS NO.	
LEFT			
D-87599A	14163-A	—	
D-87709	—	KS-1707-L	
D-87719A	—	KS-1716-L	
D-87719B	—	KS-2421	

## SECTION 030-761-801

SWITCH (Cont)			MARKING (Cont)			SWITCH			MARKING		
PRIMARY	DRAWING NO.	KS NO.	PRIMARY	DRAWING NO.	KS NO.	PRIMARY	DRAWING NO.	KS NO.	PRIMARY	DRAWING NO.	KS NO.
LEFT			RIGHT			SECONDARY AND OUT TRUNK					
D-87719D	ES-65075-01	KS-2421	D-87728B	*14148-A	—	D-87731A	ES-241883	KS-2106	D-87728D	ES-241828	—
D-87721	—	KS-1715-L	D-87728E	ES-30180-01	—	D-87731B	ES-241883	—	D-87725A	—	—
D-87725A	—	KS-1727-L	D-87742A	ES-241821	—	D-87733A	ES-241884	KS-2104	D-87729A	ES-359646	KS-2109
D-87729A	ES-359646	KS-2109							D-87729B	*14148-A	—
D-87729B	*14148-A	—							D-87729D	ES-241828	—
D-87729D	ES-241828	—							D-87729E	ES-30180-01	—
D-87729E	ES-30180-01	—							D-87743A	ES-241821	—
D-87743A	ES-241821	—									
RIGHT			RIGHT								
D-87598A	14163-A	—	D-87730A	ES-241883	KS-2107						
D-87708	—	KS-1707-R	D-87730B	ES-241883	—						
D-87718A	—	KS-1716-R	D-87732A	ES-241884	KS-2105						
D-87718B	—	KS-2422									
D-87718D	ES-65075-01	KS-2422									
D-87720	—	KS-1715-R									
D-87724A	—	KS-1727-R									
D-87728A	ES-359646	KS-2108									

\*Indicates the circuit in which the switch is used. The switch is not stamped with any reference indication.



## LEGEND

- 1- PLUNGER SPRING AND RESTORING BRACKET ASSEMBLY  
(D-87742A SWITCH) D-73438  
(D-87743A SWITCH) D-73439  
ALL OTHER SWITCHES  
D-73384 RIGHT D-73385 LEFT
- 2- "B" RELAY COIL D-28932
- 3- SWITCH MOUNTING SCREW P-205653
- 4- ARMATURE STUD D-7512
- 5- BCO SPRING ASSEMBLY  
FOR PIECE-PART DATA ON D-87708, D-87709,  
D-87718A, D-87718B, D-87718D, D-87719A,  
D-87719B, AND D-87719D SWITCHES (SEE FIG. 6)  
FOR PIECE-PART DATA ON D-87720 AND D-87721  
SWITCHES (SEE FIG. 7)  
FOR PIECE-PART DATA ON D-87598A, D-87599A,  
D-87728A, D-87728B, D-87728D, D-87728E,  
D-87729A, D-87729B, D-87729D, D-87729E,  
D-87742A, AND D-87743A SWITCHES (SEE FIG. 8)
- 6- "A" RELAY ASSEMBLY  
D-81152 RIGHT D-81153 LEFT  
(PIECE-PART DATA FOR THESE RELAYS IS GIVEN IN  
SECTION 040-236-801)

- 7- FRAME  
D-3082 RIGHT D-3083 LEFT
- 8- MALE JACK ASSEMBLY  
D-42109 (D-87708, D-87728A, D-87728B,  
D-87728D, D-87728E, AND D-87742A SWITCHES)  
D-42110 (D-87709, D-87729A, D-87729B,  
D-87729D, D-87729E AND D-87743A SWITCHES)  
D-42134 (D-87598A, D-87718A, D-87718B,  
D-87718D AND D-87720 SWITCHES)  
D-42135 (D-87599A, D-87719A, D-87719B, D-87719D  
AND D-87721 SWITCHES)
- 9- BCO ARMATURE  
D-71151 RIGHT D-71152 LEFT
- 10- "B" RELAY PIVOT SCREW D-76028
- 11- PLUNGER ARMATURE D-71031
- 12- PLUNGER ARMATURE BACKSTOP SCREW AND LOCKNUT  
D-76108
- 13- SCREW P-92619
- 14- PLUNGER RESTORING SPRING ROLLER AND BRACKET  
D-73176
- 15- PLUNGER AND ARMATURE EXTENSION ASSEMBLY (SEE  
FIG. 5)  
D-67146 RIGHT D-67147 LEFT

## PARTS NOT ILLUSTRATED

SCREW P-129732 (PLUNGER RESTORING SPRING  
AND BRACKET ASSEMBLY MOUNTING SCREW)  
SCREW P-226071 ("A" RELAY MOUNTING SCREW)  
4-36 X 3/16 IN. R. H. M. SCREW, ZINC PLATE,  
.0002 IN. THICK (MALE JACK ASSEMBLY  
MOUNTING SCREW)  
SCREW P-205652 ("B" RELAY COIL MOUNTING SCREW)  
NUMBER PLATE HOLDER D-54024  
TEST JACK ASSEMBLY (SEE FIG. 10) (D-87598A AND  
D-87599A SWITCHES ONLY)

PRIMARY LINE SWITCHES  
(SEE 2.05)

LEFT	RIGHT	LEFT	RIGHT
D-87599A	D-87598A	D-87729A	D-87728A
D-87709	D-87708	D-87729B	D-87728B
D-87719A	D-87718A	D-87729D	D-87728D
D-87719B	D-87718B	D-87729E	D-87728E
D-87719D	D-87718D	D-87743A	D-87742A
D-87721	D-87720		

Fig. 1 — Primary Line Switches

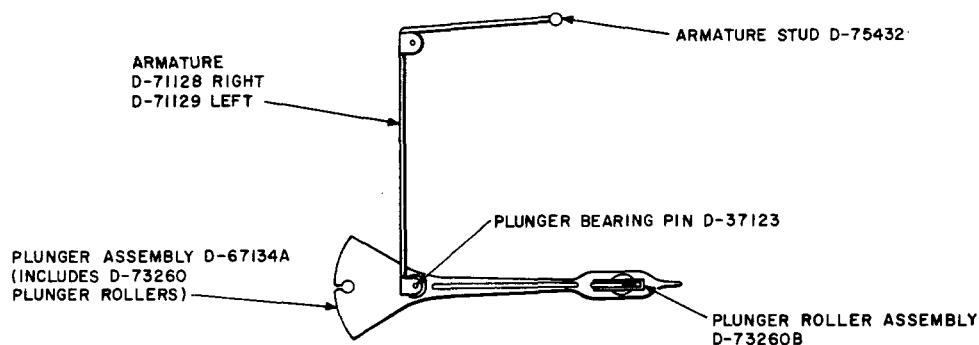
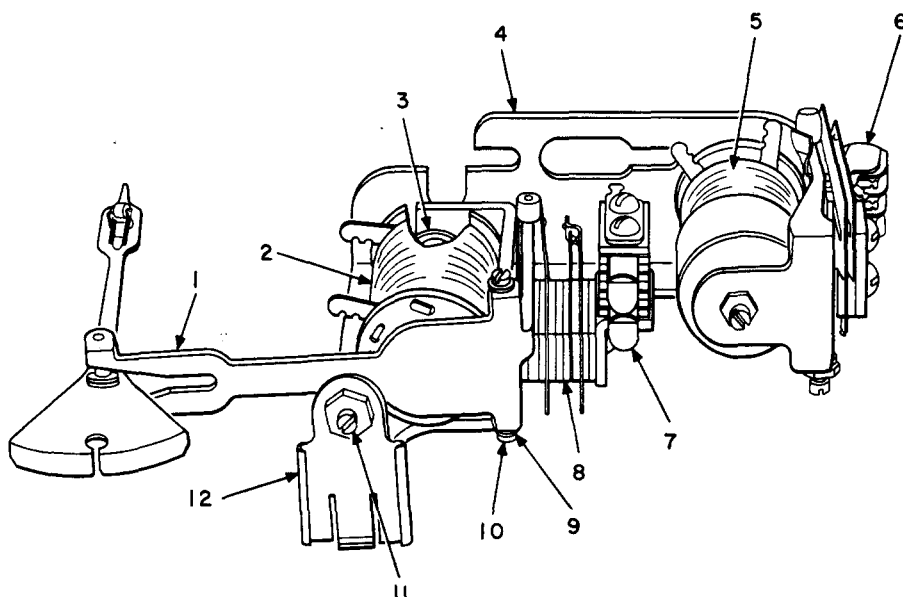


Fig. 2 — D-71315A and D-71316A Plunger and Armature Assembly



# LEGEND

1-PLUNGER AND ARMATURE ASSEMBLY (SEE FIG. 2)  
D-71316A RIGHT D-71315A LEFT  
2-"B" RELAY COIL D-28967  
3-"B" RELAY COIL WASHER D-17136  
4-FRAME  
D-3082 RIGHT D-3083 LEFT  
5-"A" RELAY ASSEMBLY (USED ON SECONDARY LINE  
SWITCHES ONLY) (PIECE-PART DATA FOR THESE  
RELAYS IS GIVEN IN SECTION 040-236-801)  
D-811292 RIGHT D-811291 LEFT

## PARTS NOT ILLUSTRATED

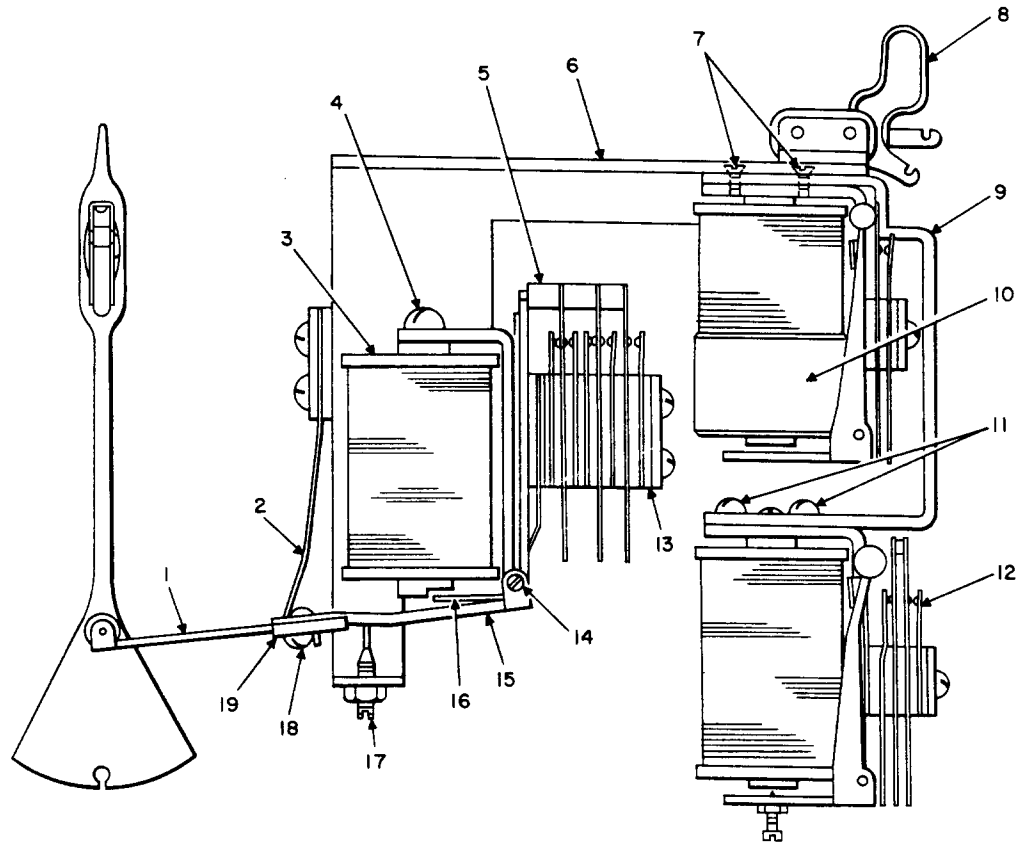
SCREW P-205653 (SWITCH MOUNTING SCREW)  
SCREW P-205652 ("B" RELAY COIL MOUNTING SCREW)  
SCREW P-226071 ("A" RELAY MOUNTING SCREW)  
4-36 X 3/16 IN. R. H. M. SCREW, ZINC PLATE, .0002 IN. THICK  
(MALE JACK ASSEMBLY MOUNTING SCREW)

6-MALE JACK ASSEMBLY  
D-42109 RIGHT D-42110 LEFT  
7-TEST JACK ASSEMBLY (SEE FIG. 11)  
8-"B" RELAY SPRING ASSEMBLY (SEE FIG. 9)  
9-WASHER D-17053  
10-"B" RELAY PIVOT SCREW D-76027  
11-PLUNGER ARMATURE BACKSTOP SCREW AND LOCKNUT D-76142  
12-NUMBER PLATE HOLDER D-54024

## SECONDARY LINE AND OUT TRUNK SWITCHES (SEE 2.05)

RIGHT	LEFT
D-87731A	D-87730A
D-87731B	D-87730B
D-87733A	D-87732A

Fig. 3 — Secondary Line and Out Trunk Switches



### LEGEND

- 1- PLUNGER AND ARMATURE EXTENSION ASSEMBLY  
(SEE FIG. 5)  
D-67146A RIGHT      D-67147 LEFT
  - 2- PLUNGER RESTORING SPRING AND BRACKET ASSEMBLY  
D-73384 RIGHT      D-73385 LEFT
  - 3- "B" RELAY COIL D-28932
  - 4- SCREW P-205652
  - 5- ARMATURE STUD D-7512
  - 6- FRAME  
D-3082 RIGHT      D-3083 LEFT
  - 7- SCREW P-210167
  - 8- MALE JACK ASSEMBLY  
D-42134 RIGHT      D-42135 LEFT
  - 9- BRACKET D-730044
  - 10- "A" RELAY ASSEMBLY  
D-811216 RIGHT      D-811217 LEFT  
(PIECE-PART DATA FOR THESE RELAYS IS GIVEN  
IN SECTION 040-236-801)
  - 11- SCREW P-129732
  - 12- "C" RELAY ASSEMBLY  
D-811214 RIGHT      D-811215 LEFT  
(PIECE-PART DATA FOR THESE RELAYS IS GIVEN  
IN SECTION 040-236-801)
  - 13- BCO SPRING ASSEMBLY (SEE FIG. 7)
  - 14- "B" RELAY PIVOT SCREW D-76028
  - 15- PLUNGER ARMATURE D-70131
  - 16- BCO ARMATURE  
D-71151 RIGHT      D-71152 LEFT
  - 17- PLUNGER ARMATURE BACKSTOP SCREW AND LOCKNUT  
D-76108
  - 18- SCREW P-92619
  - 19- PLUNGER RESTORING SPRING ROLLER AND  
BRACKET D-73176

PARTS NOT ILLUSTRATED

4-36 X 3/16 IN. R. H. M. SCREW, ZINC PLATE,  
.0002 IN. THICK (MALE JACK ASSEMBLY MOUNTING  
SCREW)  
SCREW P-129732 (PLUNGER RESTORING SPRING AND  
BRACKET ASSEMBLY MOUNTING SCREW)  
SCREW P-205653 (SWITCH MOUNTING SCREW)

PRIMARY LINE SWITCHES  
(SEE 2.05)

D-87724A RIGHT    D-87725A LEFT

**Fig. 4 — Primary Line Switches**

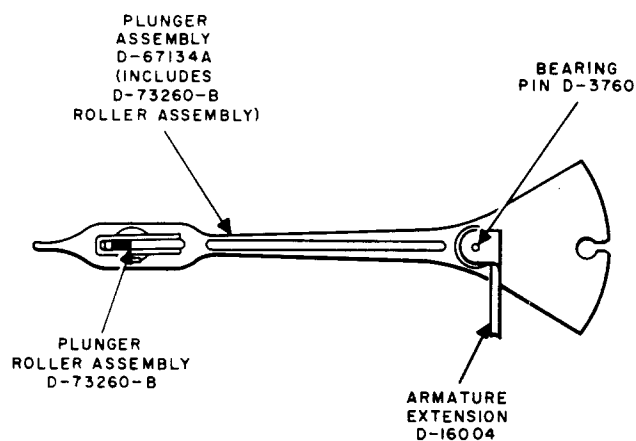
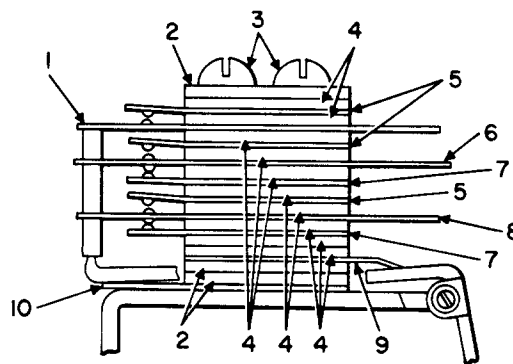


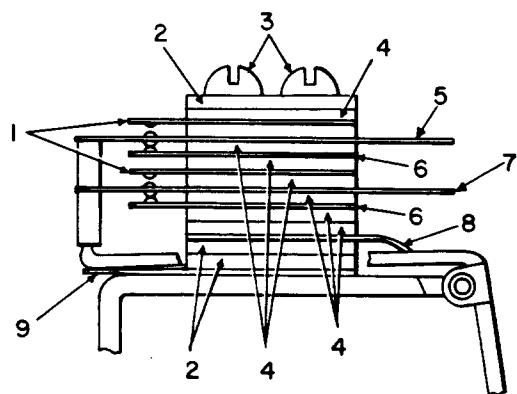
Fig. 5 — Plunger and Armature Extension Assembly  
[D-67146 (Right) and D-67147 (Left)]



LEGEND

- |  |  |
|--|--|
| 1. SPRING<br>D-105956 RIGHT<br>D-105955 LEFT | 7. SPRING<br>D-106608 RIGHT<br>D-106607 LEFT           |
| 2. WASHER D-1756                             | 8. SPRING<br>D-105952 RIGHT<br>D-105952 LEFT           |
| 3. SCREW P-297395                            | 9. RESTORING SPRING<br>D-100266 RIGHT<br>D-100248 LEFT |
| 4. INSULATORS D-44384                        | 10. ARMATURE STOP<br>SPRING D-10760                    |
| 5. SPRING<br>D-106612 RIGHT<br>D-106611 LEFT |  |
| 6. SPRING<br>D-105954 RIGHT<br>D-105953 LEFT |  |

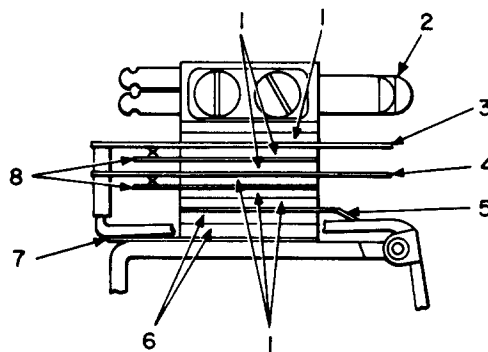
Fig. 7 — BCO Spring Assembly



LEGEND

- |  |  |
|--|--|
| 1- SPRING<br>D-106612 RIGHT<br>D-106611 LEFT           | 6- SPRING<br>D-106608 RIGHT<br>D-106607 LEFT |
| 2- WASHERS D-1756                                      | 7- SPRING<br>D-105952 RIGHT<br>D-105952 LEFT |
| 3- SCREW P-297395<br>(D-87708 AND D-87709<br>SWITCHES) | 8- RESTORING SPRING<br>D-100266<br>D-100248  |
| 4- INSULATORS D-44384                                  | 9- ARMATURE STOP<br>SPRING D-10760           |
| 5- SPRING<br>D-105954 RIGHT<br>D-105953 LEFT           |  |

Fig. 6 — BCO Spring Assembly



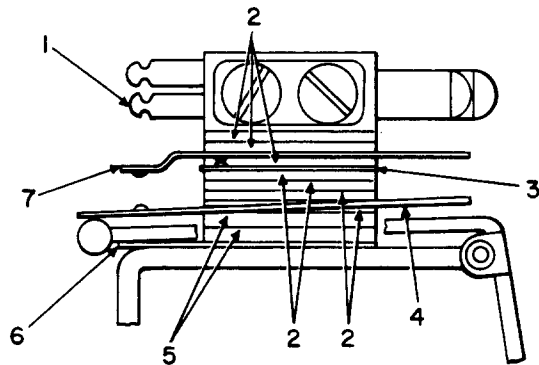
LEGEND

- |  |  |
|--|--|
| 1- INSULATORS D-44384  | 5- RESTORING SPRING<br>D-100266 RIGHT<br>D-100248 LEFT |
| 2- TEST JACK ASSEMBLY<br>(D-87598A AND D-87599A<br>SWITCHES-SEE FIG. 10) | 6- WASHERS D-1756                                      |
| 3- SPRING<br>D-106829 RIGHT<br>D-106637 LEFT                             | 7- ARMATURE STOP<br>SPRING D-10760                     |
| 4- SPRING<br>D-106786 RIGHT<br>D-106771 LEFT                             | 8- SPRING<br>D-106608 RIGHT<br>D-106607 LEFT           |

PARTS NOT ILLUSTRATED

SCREW P-138380 (SPRING ASSEMBLY  
MOUNTING SCREW)

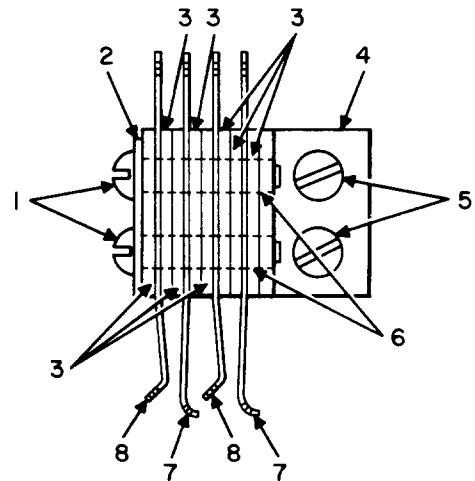
Fig. 8 — BCO Spring Assembly



## LEGEND

- |  |  |
|--|--|
| 1- TEST JACK ASSEMBLY<br>(SEE FIG. 11)       | 5- WASHERS D-1756                            |
| 2- INSULATORS D-44384                        | 6- ARMATURE STOP<br>SPRING D-10760           |
| 3- SPRING<br>D-106558 RIGHT<br>D-106639 LEFT | 7- SPRING<br>D-106773 RIGHT<br>D-106636 LEFT |
| 4- SPRING<br>D-109893 RIGHT<br>D-109892 LEFT |  |

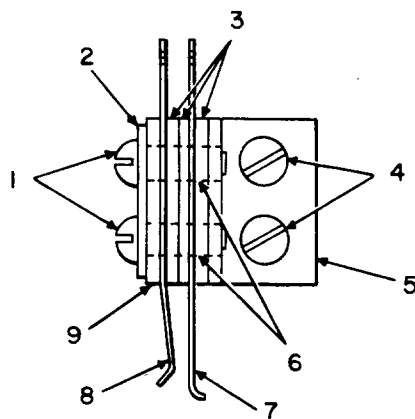
Fig. 9 — "B" Relay Spring Assembly



## LEGEND

- |  |   |
|--|---|
| 1- 6-32 X 11/16 IN. R. H. M.<br>SCREW, ZINK PLATE, .0002<br>IN. THICK (D-87735A<br>SWITCH) | 5.- SCREW P-160750<br>(D-87734A SWITCH)<br>SCREW P-138380<br>(ALL OTHER SWITCHES) |
| 2- WASHER D-1780   | 6.- BUSHINGS D-75050  |
| 3- INSULATORS D-44343  | 7.- SPRINGS D-10643   |
| 4- BRACKET D-73419   | 8.- SPRINGS D-10644   |

Fig. 11 — Test Jack Assembly



## LEGEND

- |                       |                      |
|-----------------------|----------------------|
| 1- SCREW P-252632     | 6- BUSHINGS D-75103  |
| 2- WASHER D-1761      | 7- SPRING D-10643    |
| 3- INSULATORS D-44343 | 8- SPRING D-10644    |
| 4- SCREW P-138380     | 9- INSULATOR D-44360 |
| 5- BRACKET D-73419    |                      |

Fig. 10 — Test Jack Assembly

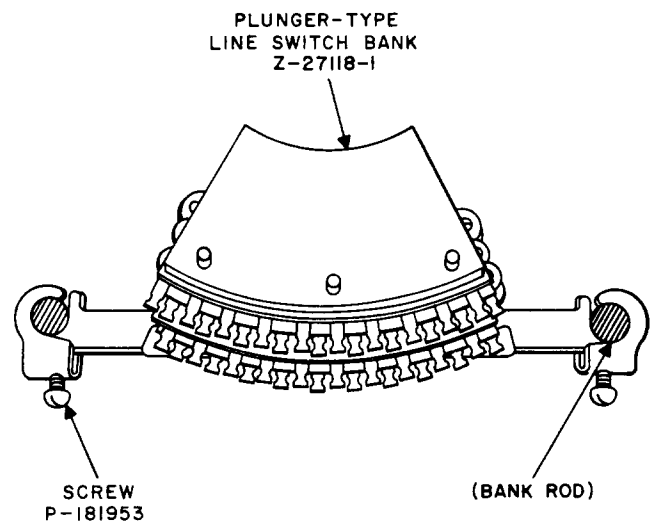


Fig. 12 — Plunger-Type Line Switch Bank

**3. REPLACEMENT PROCEDURES****3.001 List of Tools and Materials**

CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>	
338	Contact Spring Insulator
405A	Bumper
418A	7/32- and 5/16-Inch Hex Open Double-End Wrench
563A	90 Degree Offset Screwdriver
564A	45 Degree Offset Screwdriver
KS-6854	Screwdriver
→ R-2512	Wrench
—	4-Ounce Riveting Hammer
—	5-Inch Diagonal Pliers
—	P Long-Nose Pliers
—	3-Inch C Screwdriver
—	4-Inch E Screwdriver
—	Tweezers, American Piano Supply Company No. 91 or Equivalent
<b>MATERIALS</b>	
—	Rubber Band

**3.002** No replacement procedures are specified for screws or other parts where the replacement consists of a simple operation.

**3.003** Before making any replacement of parts, remove the switch from service. In order to gain access to the part or parts to be replaced, remove the switch from the shelf except where otherwise specified in the procedures.

**3.004** After making any replacement of parts, the part or parts replaced shall meet the requirements involved as specified in Section 030-761-701. Other parts whose adjustments may have been disturbed by the replacing operations shall also meet the requirements and an overall operation check shall be made before restoring the switch to service.

**3.01 Plunger Armature Backstop Screw, Locknut, and Number Plate Holder: Fig. 13 —**

Replacement of these parts can be made without removing the switch from the shelf as follows:

- (a) Using the 418A wrench, loosen the plunger armature backstop locknut and remove the backstop screw with the locknut and number plate holder if provided.
- (b) Substituting new parts as required, position the number plate holder on the frame and mount the backstop screw and locknut but do not tighten the locknut.
- (c) Make the necessary adjustments in accordance with Section 030-761-701. Then securely tighten the locknut.

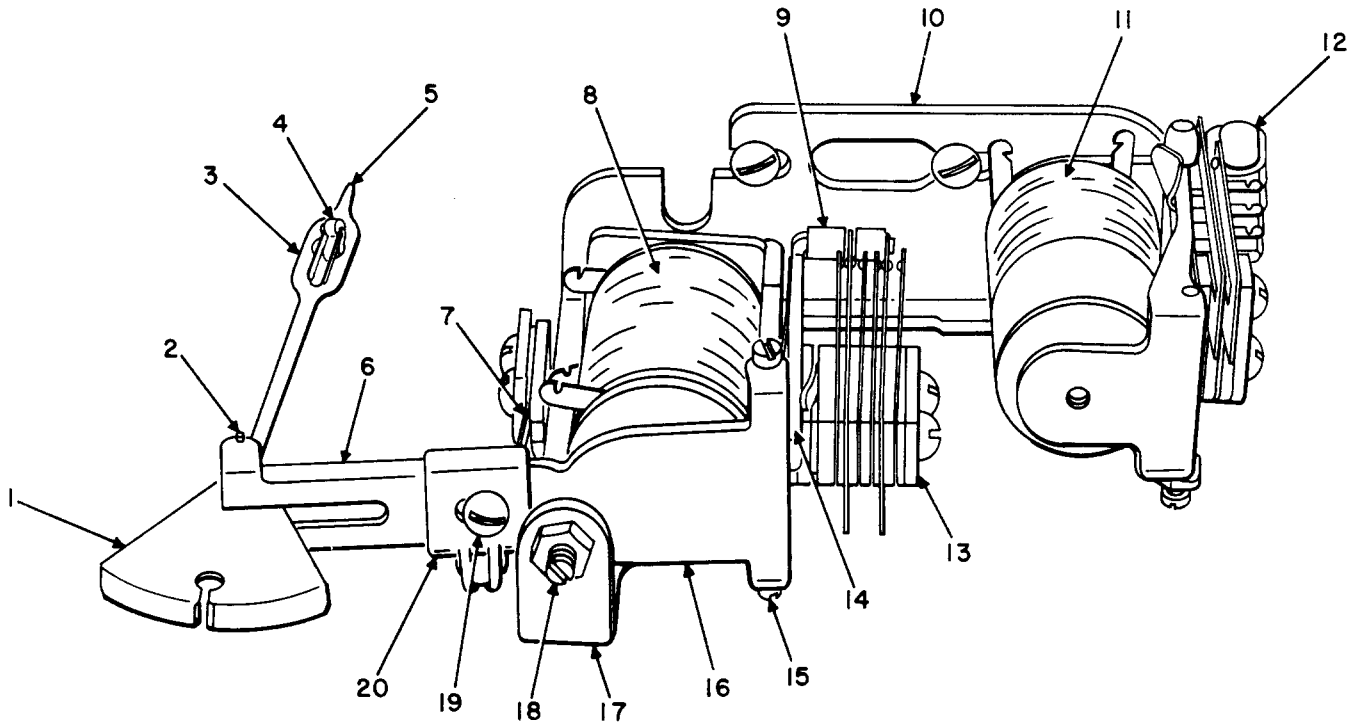
**3.02 Plunger Roller Assembly (Fig. 14):**

- (a) To remove the plunger roller assembly, press the free ends of the mounting piece together using the tweezers as shown in Fig. 14 and raise the ends above the plane of the plunger. Then withdraw the assembly by pulling it toward the fantail.
- (b) To mount the new plunger roller assembly, press the free ends of the mounting piece together and insert the assembly into the slot in the plunger in reverse order of removal. Make sure the tab on the plunger is fully inserted into the slot at the closed end of the mounting piece.

**3.03 Plunger and Plunger Bearing Pin (Fig. 13):**

- (a) To remove the plunger bearing pin, clip off one end of the pin with the diagonal pliers. Then grasp the other end of the pin with the P long-nose pliers and, while holding the plunger, withdraw the pin. If the plunger is to be replaced, substitute the new plunger.
- (b) Insert the new plunger bearing pin through the bearing pin holes in the armature or armature extension and plunger so the head of the pin is on top when the switch is in its normally mounted position. Then, using the P long-nose pliers, flatten the lower end of the pin for a distance of approximately 1/16 inch from the end.





## LEGEND

- |                             |  |
|-----------------------------|--|
| 1- PLUNGER FANTAIL          | 12- MALE JACK ASSEMBLY                                   |
| 2- PLUNGER BEARING PIN      | 13- BCO SPRING ASSEMBLY                                  |
| 3- PLUNGER                  | 14- BCO ARMATURE   |
| 4- PLUNGER ROLLER ASSEMBLY  | 15- "B" RELAY PIVOT SCREW                                |
| 5- PLUNGER TIP              | 16- PLUNGER ARMATURE                                     |
| 6- ARMATURE EXTENSION       | 17- ARMATURE BACKSTOP BRACKET                            |
| 7- PLUNGER RESTORING SPRING | 18- PLUNGER ARMATURE BACKSTOP SCREW AND LOCKNUT          |
| 8- "B" RELAY COIL           | 19- CLAMP SCREW  |
| 9- BCO ARMATURE STUD        | 20- PLUNGER RESTORING SPRING ROLLER AND BRACKET ASSEMBLY |
| 10- FRAME                   |  |
| 11- "A" RELAY ASSEMBLY      |  |

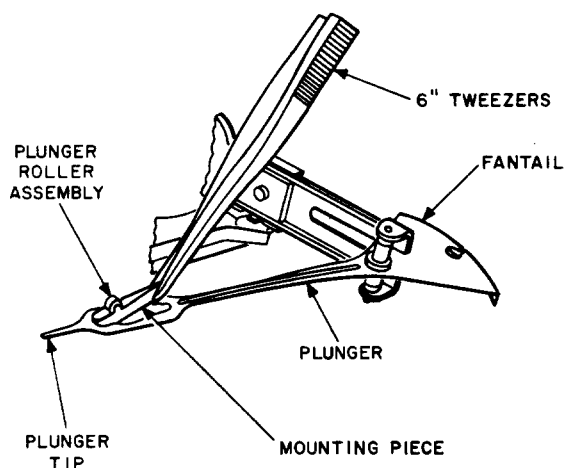
Fig. 13 — Primary Line Switch

**3.04 Plunger Restoring Spring Roller and Bracket Assembly, and Armature Extension:** Fig. 13 — Replacement of these parts can be made without removing the switch from the shelf as follows:

(a) Mark a line on the plunger armature and plunger armature extension at each side of the plunger restoring spring roller and bracket assembly to obtain the same relation between these parts when mounting the new

parts. Then, while holding the armature extension and plunger assembly, remove the clamp screw using the 3-inch C screwdriver and remove the bracket assembly.

(b) If replacement of the armature extension is not required, mount the new restoring spring roller and bracket assembly as covered in (f). If the armature extension is to be replaced, remove the extension and plunger assembly and proceed as follows:



**Fig. 14 — Method of Replacing Plunger Roller Assembly**

(c) Remove the plunger bearing pin in accordance with 3.03(a) and remove the armature extension. Position the extension alongside the new extension so the bearing pin holes in both extensions are in line and, referring to the mark on the extension being replaced, mark a line in the same location across the new extension.

(d) Referring to Fig. 13, position the plunger assembly in the slot of the armature extension so the bearing pin holes are in line. Then insert and secure a new bearing pin as covered in 3.03(b).

(e) Position the armature extension and plunger assembly on the switch so the mounting slot in the extension is in line with the mounting hole in the plunger armature and the plunger tip is resting in the bank comb slot.

(f) Mount the restoring spring roller and bracket assembly but do not tighten the clamp screw. Referring to the marks on the plunger armature and armature extension, work the armature extension and bracket assembly into their proper positions. Make sure the plunger tip rests in the bank comb slot and the restoring spring roller rests against the surface of the restoring spring nearest

the relay coil. Then, securely tighten the clamp screw.

### **3.05 Plunger Armature, BCO Armature, and BCO Armature Stud for Primary Line Switches (Fig. 13) :**

#### **(a) Plunger Armature**

(1) Using the KS-6854 screwdriver, remove the "B" relay pivot screws and remove the plunger armature and BCO armature.

(2) Mark a line on the inside surface of the armature extension adjacent to the plunger armature and on the outside surface of the armature extension adjacent to the plunger restoring spring roller and bracket assembly to obtain the same relation between these parts when mounting the new plunger armature. Then, using the 3-inch C screwdriver, remove the clamp screw and remove the armature.

(3) Referring to the marks on the plunger armature extension, assemble the armature extension, the new plunger armature, and the restoring spring roller and bracket assembly and securely tighten the clamp screw.

(4) Referring to Fig. 6, 7, or 8, position the BCO armature on the switch so the arm is between the restoring spring of the BCO spring assembly and the armature stop spring, and the pivot holes in the armature are in line with the pivot holes in the frame. Then position the plunger armature so the restoring spring roller is between the restoring spring and the frame, and the pivot holes in the plunger armature are in line with the pivot holes in the BCO armature. Mount and securely tighten the pivot screws.

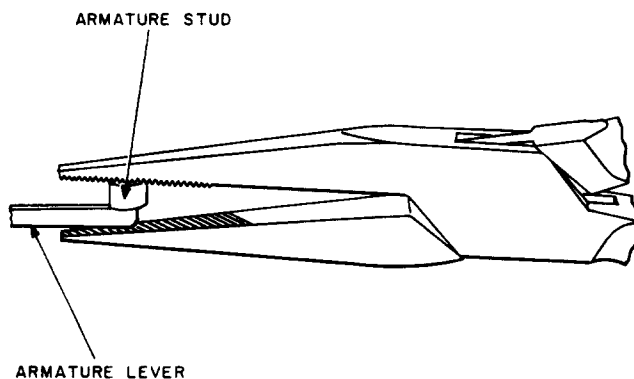
(b) **BCO Armature:** To replace the BCO armature, proceed as covered in (a) (1) and (4).

#### **(c) BCO Armature Stud**

(1) Remove the BCO armature as covered in (a) (1). Then, using the diagonal pliers, cut and remove the stud from the lever arm of the BCO armature.

(2) Referring to Fig. 15, press the new BCO armature stud onto the lever arm, using the P long-nose pliers, just far enough to hold the stud in position. Then heat the lever arm slightly with a soldering copper ← and press the stud into place with the pliers.

(3) Remount the BCO armature in accordance with (a) (4).



**Fig. 15 — Method of Pressing Armature Stud Onto Lever Arm**

### **3.06 Plunger Armature and Plunger Armature Stud for Secondary Line and Out Trunk Switches:**

#### **(a) Plunger Armature**

(1) Using the KS-6854 screwdriver, remove the "B" relay pivot screws and remove the plunger and armature assembly.

(2) Remove the plunger assembly from the armature and mount the assembly on the new plunger armature in accordance with 3.03.

(3) With the lever arm between the first lever spring of the "B" relay spring assembly and the armature stop spring (Fig. 9), mount the plunger and armature assembly and securely tighten the pivot screws.

#### **(b) Plunger Armature Stud**

(1) Remove the plunger and armature assembly as covered in (a) (1). Then using the diagonal pliers, cut and remove the stud from the lever arm.

(2) Mount the new stud on the lever arm in accordance with 3.05(c) (2). Remount the plunger and armature assembly as covered in (a) (3).

### **3.07 Plunger Restoring Spring and Bracket Assembly for Primary Line Switches (Fig. 1):**

(a) Using the 3-inch C screwdriver, remove the screw that secures the restoring spring bracket to the frame and remove the assembly.

(b) Making sure the dowel pin hole in the bracket engages the dowel pin, mount the new assembly and securely tighten the screw.

### **3.08 Male Jack Assembly (Fig. 13):**

(a) Tag the leads for reference when connecting them to the terminals of the new male jack assembly. Using a soldering copper, ← disconnect the leads from the terminals. Then, using the 3-inch C screwdriver, remove the screw that secures the male jack assembly bracket to the frame and remove the assembly.

(b) Making sure the dowel pin hole in the bracket engages the dowel pin, mount the new assembly and securely tighten the screw. Solder the leads to their respective terminals in accordance with approved procedures.

### **3.09 "A" Relay Assembly (Fig. 13):**

(a) Tag the leads for reference when connecting them to the contact spring terminals and coil terminals of the new "A" relay assembly. Then, using a soldering copper, ← disconnect the leads from the terminals.

(b) Using the 3-inch C screwdriver, remove the screw that secures the male jack assembly bracket to the frame and move the assembly away from the frame in order to

gain access to the screws that secure the "A" relay assembly and, if provided, "C" relay bracket (Fig. 4). Using the 4-inch E screwdriver, remove the screws and remove the "A" relay assembly while holding the "C" relay bracket in place.

(c) Mount the new "A" relay assembly and, if provided, "C" relay bracket and securely tighten the screws. Remount the male jack assembly in accordance with 3.08(b).

(d) Solder the leads to their respective terminals on the "A" relay assembly in accordance with approved procedures.

### 3.10 "C" Relay Assembly (Fig. 4):

(a) Tag the leads for reference when connecting them to the contact spring terminals and coil terminals of the new "C" relay assembly. Using a soldering copper, disconnect the leads from the terminals.

(b) Using the 563A offset screwdriver, remove the "C" relay assembly mounting screws and remove the assembly.

(c) Mount the new "C" relay assembly and securely tighten the screws. Solder the leads to their respective terminals on the assembly in accordance with approved procedures.

### 3.11 "C" Relay Bracket (Fig. 4):

(a) Using the 563A and 564A offset screwdrivers, remove the "C" relay assembly mounting screws and move the relay away from the bracket.

(b) Using the 3-inch C screwdriver, remove the screw that secures the male jack assembly bracket to the frame and move the assembly away from the frame in order to gain access to the screws that secure the "C" relay bracket and "A" relay assembly. Using the 4-inch E screwdriver, remove the screws and remove the bracket while supporting the "A" relay assembly.

(c) Mount the "A" relay assembly and the new bracket and securely tighten the screws. Remount the male jack assembly in accordance with 3.08(b). Then mount the "C" relay assembly on the bracket and securely tighten the screws.

### 3.12 "B" Relay Contact Springs, BCO Contact Springs, Armature Stop Spring, Restoring Spring, and Insulators (Fig. 6, 7, 8, or 9):

(a) Carefully note the arrangement of the springs and insulators so as to remount them in their proper order when mounting the new part. If the contact springs are to be replaced, tag the leads to the spring terminals for reference when connecting the leads to the new springs. Then, using a soldering copper, disconnect the leads from the terminals.

(b) Using the 3-inch C screwdriver or the 563A and 564A offset screwdrivers, remove the screws that secure the "B" relay or BCO spring assembly and, if provided, test jack assembly bracket to the frame, move the test jack assembly aside, and remove the spring assembly.

(c) Substitute the new part or parts and place the test jack assembly, if provided, and the springs and insulators in their proper order on the mounting screws. Then mount the assembly and securely tighten the screws. If the contact springs were replaced, solder the leads to their respective terminals in accordance with approved procedures.

### 3.13 Test Jack Springs, Insulators, and Washer (Fig. 10 and 11):

(a) Note the arrangement of the springs, insulators, and washer and disconnect the leads to the springs, if necessary, in accordance with 3.12(a).

(b) Using the 3-inch C screwdriver, remove the spring assembly screws, substitute the new part or parts, and remount the spring assembly, securely tightening the screws. If the springs were replaced, solder the leads to their respective terminals in accordance with approved procedures.

### 3.14 *Test Jack Assembly Bracket* (Fig. 10 and 11):

- (a) While holding the test jack spring assembly in place, remove the assembly screws using the 3-inch C screwdriver and place a rubber band around the spring assembly to hold the parts in their proper relation to each other.
- (b) Using the 563A and 564A offset screwdrivers, remove one of the screws that secures the test jack bracket and the contact spring assembly to the frame, loosen the other screw, and, while holding the contact spring assembly in place, rotate the bracket approximately 180 degrees. Then secure the contact spring assembly to the frame with the removed screw, remove the other screw, and remove the bracket.
- (c) Mount the new bracket in reverse order of removal and securely tighten the screws. While holding the test jack assembly parts together, remove the rubber band and mount the assembly on the bracket, securely tightening the screws.

### 3.15 *"B" Relay Coil and Washer* (Fig. 13):

- (a) Tag the leads for reference when connecting them to the terminals of the new "B" relay coil. Using the soldering copper, disconnect the leads from the coil terminals.
- (b) Using the 4-inch E screwdriver, remove the "B" relay coil mounting screw and remove the coil and washer if provided.
- (c) Mount the new coil and washer on the switch with the washer, if provided, between the coil and the relay bracket and securely tighten the screw.
- (d) Solder the leads to the coil terminals in accordance with approved procedures.

**3.16 *Frame:*** Fig. 3, 4, or 13 — To replace the frame, it will be necessary to dismount all of the parts and remount them on the new frame. This can be done without disconnecting any leads as follows:

- (a) Remove the plunger restoring spring and bracket assembly, if provided, and mount it on the new frame as covered in 3.07.
- (b) Remove the plunger armature and, for primary line switches, the BCO armature, as covered in 3.05(a)(1) and mount them on the new frame, securely tightening the pivot screws. Make sure the plunger restoring spring roller, if provided, engages the surface of the plunger restoring spring nearest the frame.
- (c) Remove the plunger armature backstop screw, locknut, and, if provided, number plate holder and mount them on the new frame as covered in 3.01(a) and (b).
- (d) Using the 4-inch E screwdriver, remove the "B" relay coil mounting screw to dismount the coil and remove the washer.
- (e) Dismount the male jack assembly, the "A" relay assembly, and, if provided, the "C" relay assembly and bracket in accordance with 3.09(b).
- (f) Using the 3-inch C screwdriver, unscrew the screws that secure the BCO or "B" relay spring assembly and, if provided, test jack assembly to the frame and, while holding these parts on the screws, remove the frame and mount the parts on the new frame, securely tightening the screws. Make sure that the lever arm of the BCO or "B" relay armature is positioned between the restoring spring or first lever spring and armature backstop spring (Fig. 8 or 9) of the spring assembly.
- (g) Mount the "B" relay coil and washer, if provided, on the new frame as covered in 3.15(c), making sure that the coil terminals project towards the plunger.
- (h) Mount the male jack assembly, "A" relay assembly, and, if provided, "C" relay assembly on the new frame as covered in 3.09(c).
- (i) Adjust the armature backstop screw in accordance with Section 030-761-701 and make sure the switch meets the applicable requirements in the section before restoring the switch to service.

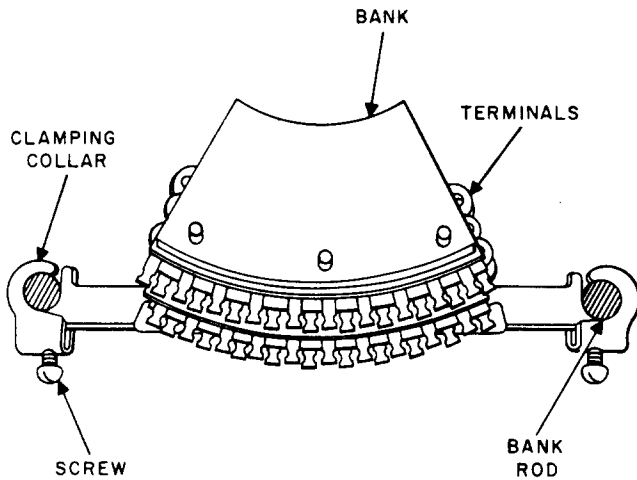


Fig. 16 — Plunger-Type Line Switch Bank

### 3.17 *Plunger-Type Line Switch Bank* (Fig. 16) :

(1) **General:** Banks for plunger-type line switches have been manufactured with three, four, and five clamping screws. Replacement banks, however, are now furnished with four clamping screws to facilitate bank adjustments. To replace a bank on a switch gate, proceed as covered in (2) through (7).

(2) Remove the 9/16-inch bolts at the top and bottom of the gate to be worked on, using the adjustable wrench, and rotate the gate to gain access to the rear of the switches.

(3) Loosen the collar clamping screws on the bank to be replaced and move each clamping collar sufficiently to disengage it from the bank rod. To do this, rotate each collar so its clamping screw moves toward the center of the bank. Remove the clamping collars from the bank.

(4) Withdraw the bank approximately 1 inch from the bank rods. Then disconnect the leads from the four terminals at the side of the bank. Solder these leads to the corresponding terminals on the new bank and suspend this bank by the leads, taking care not to short-circuit adjacent wires or terminals.

(5) Unsolder the trunk leads from the rear terminals of the bank being replaced. If the bank is the first (top) or last (bottom) bank of the group, tag each unsoldered lead.

(6) Withdraw the old bank from the gate and partly insert the new bank in position. Solder the trunk leads to their respective bank terminals. Then place the bank on the bank rods, mount the clamping collars, and securely fasten the bank to the bank rods by tightening the collar clamping screws.

(7) Check that all requirements for bank mounting and bank clearances are met as covered in Section 030-761-701.