

INSTRUCTIONS

HAND-RESET
A-C AND D-C AUXILIARY RELAYS

TYPE HEA

Switchgear

GENERAL  ELECTRIC
SCHENECTADY, N.Y.

AUXILIARY RELAYS - HAND RESET

TYPE HEA

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

Application

The HEA multicontact, hand reset auxiliary relays are applicable where it is desired that a number of operations be performed simultaneously. Some of the functions that can be performed by these relays are: trip the main circuit breaker of a system, operate an auxiliary breaker, open a neutral line breaker, trip main and auxiliary field discharge breakers, and operate other relays which in turn perform various functions. Another important use of the Type HEA relay is in conjunction with differential relays which protect transformers, rotating apparatus, buses, etc.

A typical application is illustrated Fig. (12).

Construction and Operation

These relays are built from parts the Type SB-1 control and transfer switch (Figs. 4 - 4A).

The operating shaft is held in the reset position by a positive latch. It is released through the action of the operating coil, in attracting a hinged armature element. The time required to trip the relay from the point of energization of the coil to the closing of the contacts, is approximately 20 milliseconds (1-1/4 cycles on cycle basis) - slightly less for opening the contacts.

The arrow on the handle indicates the position of the relay. In addition to 6, 10 or 16 sets of contacts as provided each relay is equipped with one normally closed contact for opening the operating coil circuit, and one normally open contact that can be used for energizing a trip coil or operating an auxiliary relay. The 12 volt and higher rated d-c relays are supplied with a small capacitor, mounted under the coil which is used to reduce arcing of the coil circuit contacts.

TABLE 1

| <u>Type</u> | <u>Figure</u> | <u>No. of Contacts</u> |
|-------------|---------------|------------------------|
| HEA11A | 7 | 6 + 2 for Trip Coil |
| HEA11B | 7 | 10 + 2 for Trip Coil |
| HEA11C | 8 | 16 + 2 for Trip Coil |
| HEA11D | 9 | 10 + 2 for Trip Coil |
| HEA11E | 9 | 10 + 2 for Trip Coil |
| HEA11J | 10 | 6 + 2 for Trip Coil |
| HEA11K | 11 | 10 + 2 for Trip Coil |

The type HEA11D relay is similar to the type HEA11B relay except that the two contacts for the T. C. (trip coil) are both open when the relay is reset.

The type HEA11E relay is similar to the type HEA11B relay except that the normally closed contacts overlap all normally open contacts for position 1 thru 10.

The type HEA11J relay is similar to the type HEA11A relay except that all normally closed contacts overlap all normally open contacts in position 1 to 6.

The type HEA11K Relay is similar to the Type HEA11B relay except that it doesn't have a cover and is provided with a small front support mounted in an explosion proof housing.

TABLE 2

Ratings

Coil Ratings:

| <u>Intermittent Rating</u> | <u>Freq.</u> | <u>Resistance Ohms 25°C</u> | <u>A. C. Inrush Current Amps.</u> |
|----------------------------|--------------|-----------------------------|-----------------------------------|
| 12 | D.C. | .330 | |
| 24 | D.C. | 1.75 | |
| 32 | D.C. | 2.90 | |
| 48 | D.C. | 7.50 | |
| 60 | D.C. | 11.5 | |
| 125 | D.C. | 49.2 | |
| 220 | D.C. | 122.0 | |
| 250 | D.C. | 200.0 | |
| 115 | 60 Cyo. | | 21.2 |
| 230 | 60 Cyo. | | 9.42 |
| 230 | 25 Cyo. | | 2.88 |

Contact Ratings

The current closing rating of the contacts is 50 amperes for voltages not exceeding 600 volts. The contacts have a current carrying capacity of 20 amperes continuously or 50 amperes for one minute. The interrupting rating varies with the inductance of the circuit. The following values for d-c inductive circuits are based on the average trip coil.

rying capacity of 20 amperes continuously or 50 amperes for one minute. The interrupting rating varies with the inductance of the circuit. The following values for d-c inductive circuits are based on the average trip coil.

TABLE 3

(Interrupting Capacity of Contacts Based on Inductance of Average Trip Coil.)

INTERRUPTING RATINGS - AMPERES

| <u>Circuit Volts</u> | <u>Non-Inductive Circuit</u> | | | <u>Inductive Circuit</u> | | |
|----------------------|------------------------------|--------------------|--------------------|--------------------------|--------------------|--------------------|
| | <u>Number of Contacts</u> | | | | | |
| | <u>1</u> | <u>2 in Series</u> | <u>4 in Series</u> | <u>1</u> | <u>2 in Series</u> | <u>4 in Series</u> |
| 24 d-c | 6.0 | 30.0 | | 4.0 | 20.0 | 30.0 |
| 48 d-c | 5.0 | 25.0 | 40.0 | 3.0 | 15.0 | 25.0 |
| 125 d-c | 2.7 | 11.0 | 25.0 | 2.0 | 6.25 | 9.5 |
| 250 d-c | 0.75 | 2.0 | 8.0 | 0.7 | 1.75 | 6.5 |
| 600 a-c | 0.25 | 0.45 | 1.35 | 0.15 | 0.35 | 1.25 |
| 115 a-c | 40.0 | 75.0 | | 24.0 | 50.0 | |
| 220 a-c | 25.0 | 50.0 | | 12.0 | 25.0 | 40.0 |
| 440 a-c | 12.0 | 25.0 | | 5.0 | 12.0 | 20.0 |
| 550 a-c | 6.0 | 12.0 | | 4.0 | 10.0 | 15.0 |

SHIPPING AND PACKING

Transportation Damage

This relay is shipped in a carton designed to protect it against damage. Immediately upon receipt an examination should be made for any damage sustained during shipment. If any injury or rough handling is evident, a damage claim should be filed at once with the transportation company and the nearest General Electric Sales Office notified.

Unpacking

When removing the relay from its carton performing the operation on a table or

a bench will minimize the chances of the relay getting a bad bump.

INSTALLATION

The relay may be mounted on panels having thicknesses of 2 inches, 1-1/2 inch, 1 inch, or 5/32 inch. The shaft has tapped holes provided to secure the handle to it, the holes being properly located to accommodate the various panel thicknesses. For a 5/32 inch panel mounting, the shaft must be shorted by cutting through the hole used for 1" panels. For intermediate thicknesses of panels, spacers are furnished to fill the excess space between the front support and panel.

Two sets of mounting screws are provided for securing the relay to any of the above mentioned panel sizes.

Connections

Internal connections are shown in Figs. 7 to 11 for the various types of HEA relays.

Inspection

At the time of installation the relay should be inspected for any mechanical defects, such as cracked or broken parts, loose screws and binding parts. The relay should be operated by hand before and after mounting to insure a fine working mechanism.

ADJUSTMENT AND MAINTENANCE

At regular intervals switches should be inspected for burning of the contacts, for broken shunts on the moving contacts and for contact wipe.

If contacts are slightly pitted, or coated with sulphide, scrape them gently with a sharp knife or dress with a fine file, such as No. 00 dental file.

If the shunts are broken or the contacts badly pitted, they should be replaced as directed in the section on "Installation of Renewal Parts".

Contacts have sufficient wipe as long as there is an appreciable opening, with the contact closed, between the moving contact and the moving contact support. See Fig. (5). If there is no opening, it indicates that the part of the moving contact support that bears on the cam or the cam itself has become worn and needs replacing. The relay must be removed from the panel for repairs.

Installation of Renewal Parts

To remove the moving contact, position the switch so that the contact is open. Remove screw (E) (Fig. 4) which holds the shunt to the terminal. Press in on the top of the contact to release the torque at its lower end (Fig. 6) and pull the contact upward and off.

The moving contact has a shoe that is assembled between the contact spring and the contact. When assembling a new moving contact, the end of the moving contact support must be inserted between the shoe and the moving contact. Then the contact may be slid down into place and screw (E) replaced. When replacing screw (E) be sure the plain washer and lockwasher are replaced and be careful to avoid creasing the thin metal strips of the shunt. Operate the switch and observe whether the contacts meet squarely and simultaneously. The contacts can be adjusted by bending slightly with smooth faced pliers. After adjustment there should be an appreciable gap, with the contacts closed between the moving contact and the moving contact support.

Damage to a fixed contact requires re- placement of the complete assembly of fixed contacts and support. Remove screws (F (Fig. 4), change assemblies and replace screws. Check alignment of contacts.

When cams, barriers, moving contact supports, etc., need to be replaced, the switch should be removed from the panel and disassembled on a bench and reassembled

Disassembly

Before disassembling the switch, secure a drawing showing the cam arrangement in all the stages of the switch. (Refer to Figs. 1 to 3). Turn the switch shaft to the switch position corresponding to the cam arrangement. This is the 12 o'clock position unless otherwise noted on the drawing. Remove the handle and fixed contact support. Unscrew the tie bolts from the front support, but leave them in the switch. Stand the switch on the bench resting on the rear support and slip the front support off the shaft, being careful to hold the shaft in the switch so as not to pull it out of the cams in the rear stage. Slide the shaft out just enough to remove the pin through the shaft, which rests in the counterbore in the indent wheel or spring stretcher. Push the shaft back into the switch and slip off the indent wheel and the thin washer that is assembled between the indent wheel and front support. Remove the first barrier to expose the cams for contacts No. 1 - 2.

The cams and barriers may now be removed until the damaged part is reached,

Caution:- The parts of the last contact stage adjacent to the latch mechanism should preferably not be removed, as they are formed differently from the others in order to facilitate operation of series targets in the coil circuit, and therefore are not interchangeable.

Conversion from 2 N.O. to 2 N.C. or vice versa

No new parts are required. The cams of the stage to be converted are removed and reassembled as directed below, under Assembly.

Conversion from 2 N.O. or 2 N.C. to 1 N.O. and 1 N.C.

To do this the B cam - with the number 5 molded in it must be replaced with a new B cam K-6178519 (which has no number molded on it). The same A and C cams (see Fig. 1 to 3) will be used.

Conversion from 1 N.O. and 1 N.C. to 2 N.O. or 2 N.C.

Replace B cam with no number on it with one new B cam M-6015923 P5 (number 5 molded on it).

CAM ARRANGEMENT - (FRONT VIEW)

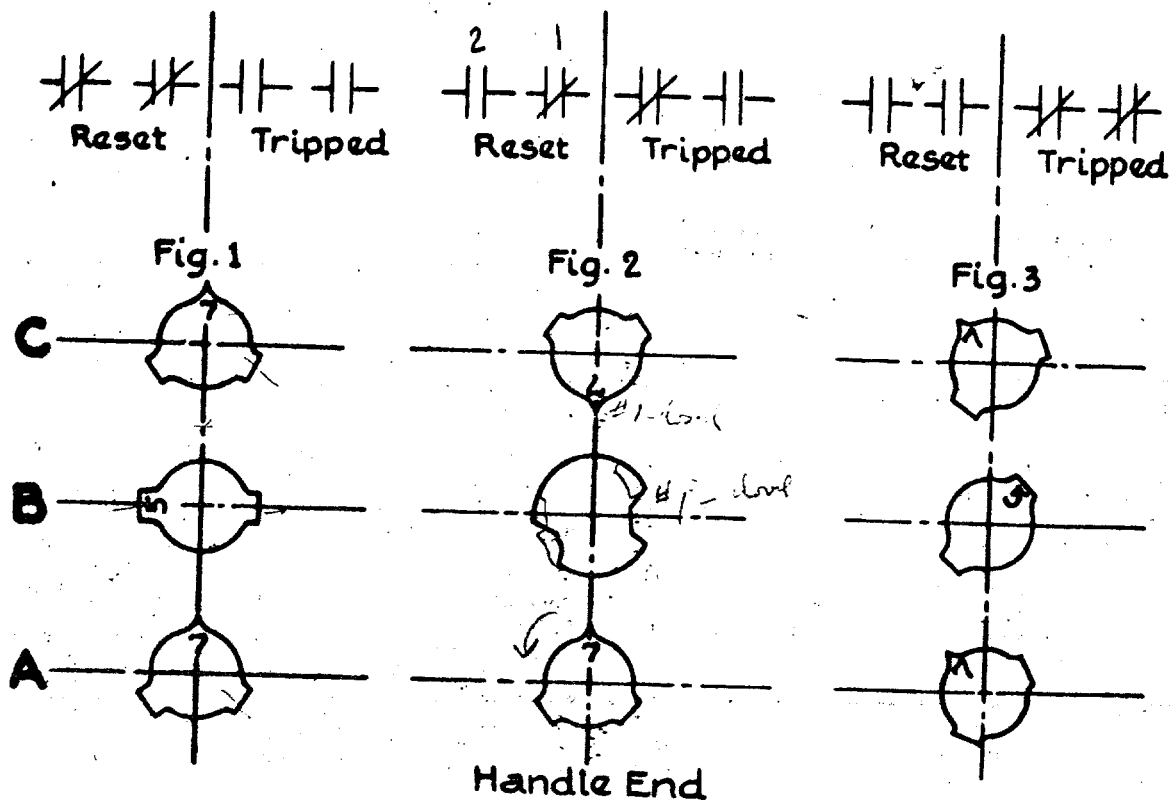


FIG. 1
2 NORMALLY CLOSED CONTACTS
(CLOSED IN RESET POSITION)

FIG. 2
1 N.O.
1 N.C.
(N.O. - ODD NOS.)
(N.C. - EVEN NOS.)
Shown in Tripped position

FIG. 3
2 N.O. CONTACTS
(OPEN IN RESET POSITION)

Note: The preceding description of contact conversion does not apply to 12HEA11E and 12HEA11J relays. These relays are designed for overlap between N.O. and N.C. contacts. It is recommended that the relay be returned to the factory if contact conversion is necessary.

Assembly

Place the end of the shaft in the rear support so that the shaft stands vertically. With the shaft turned in the operated position (spring spreader toward top of switch) assemble the cams for each stage in the order C, BA and in the positions shown in Figs. 1 to 3, depending on the contact arrangement desired for the individual stage. Assemble first all the stages that are to have 2 N.C. contacts, then the one stage (if any) that is to have 1 N.O. and 1 N.C. contacts, and finally all stages that are to have 2 N.O. contacts.

When the front barrier, which carries no contacts, is in place, assemble the indent wheel (or spring spreader and torsion spring) with the counterbored end toward the front support. Pull the shaft out just enough to permit the locking pin to be inserted through the shaft then push the shaft back into the switch and slide the thin washer over the shaft. Slide the front support in place. Hold the stack of barriers together and turn the switch to the horizontal with the moving contacts pointed up. Before tightening the tie bolts be sure the barriers are all properly rested. The fixed contacts and support may now be assembled.

Renewal Parts

Refer to part bulletin GEG-2207.

To order renewal parts, address the nearest Sales Office of the General Electric Company, giving the description and quantity of the parts wanted and the relay model number from the nameplate.

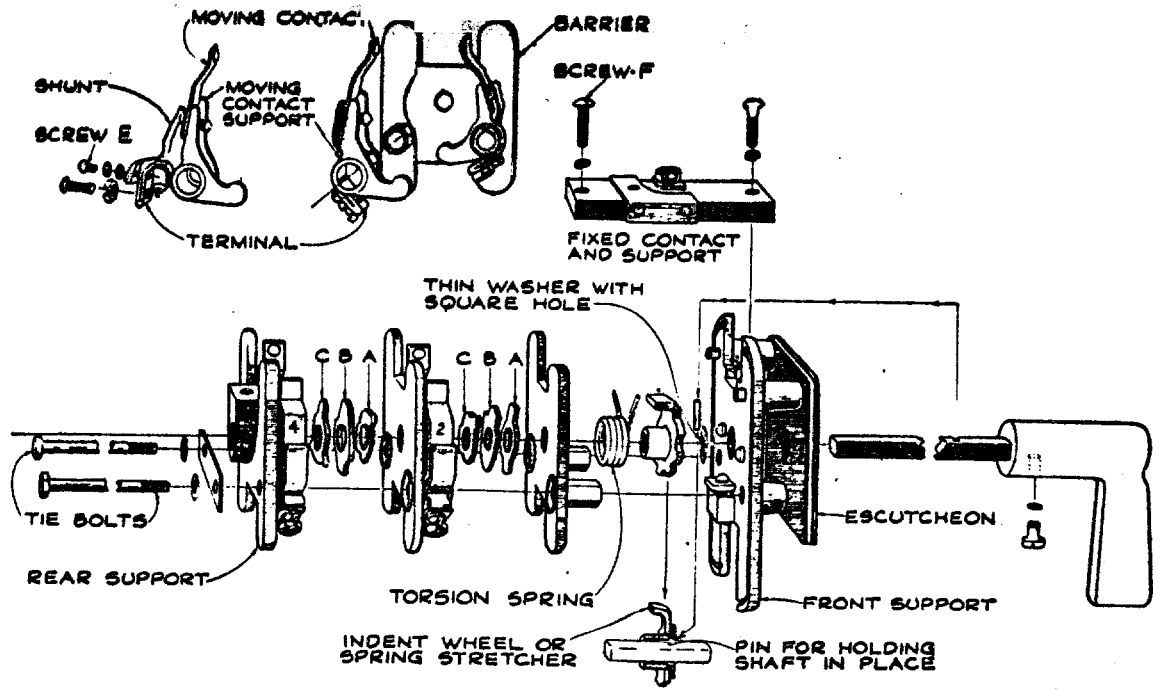


FIG. 4
EXPLODED VIEW OF TYPE SB-1 SWITCH
(OPERATING COIL AND HINGED ARMATURE ELEMENT WITH LATCHING
ASSEMBLY NOT SHOWN).

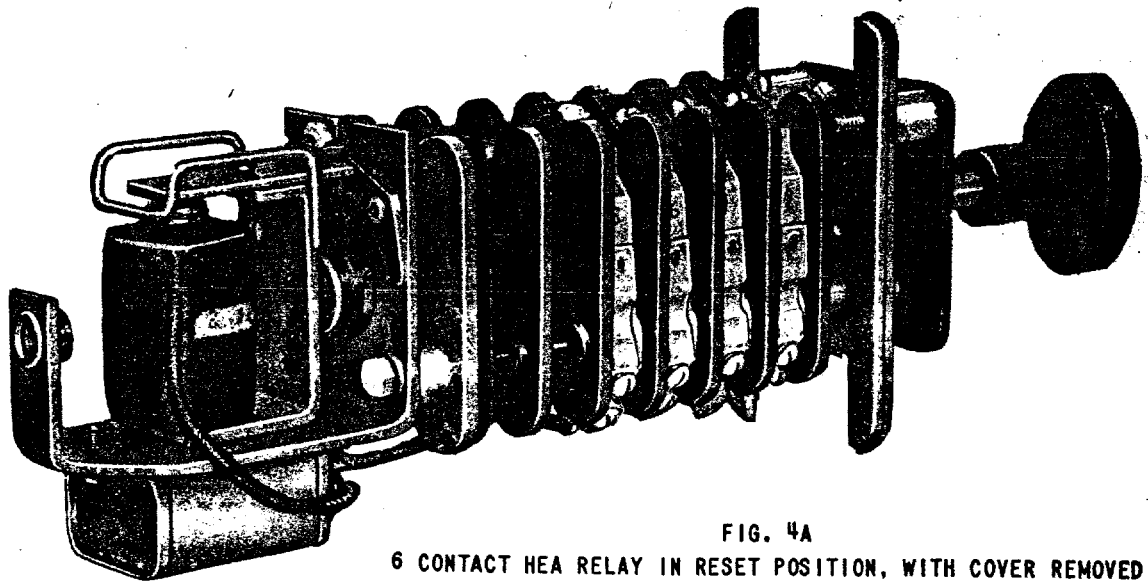


FIG. 4A
6 CONTACT HEA RELAY IN RESET POSITION, WITH COVER REMOVED

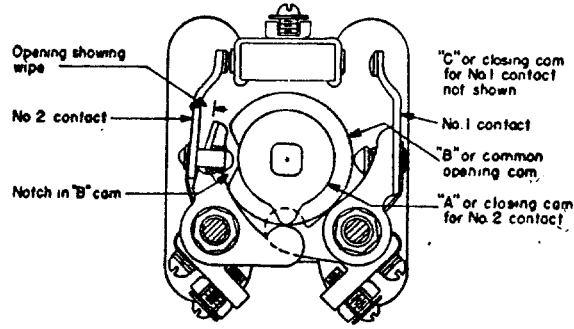


FIG. 5
TYPICAL SECTION SHOWING OPERATION OF
CAMS - FRONT VIEW

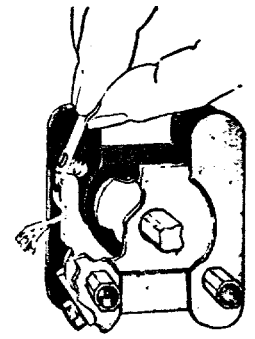
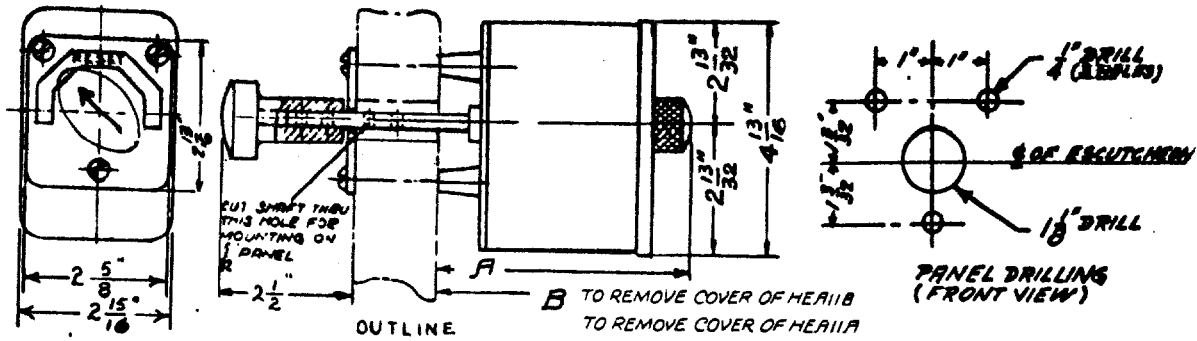


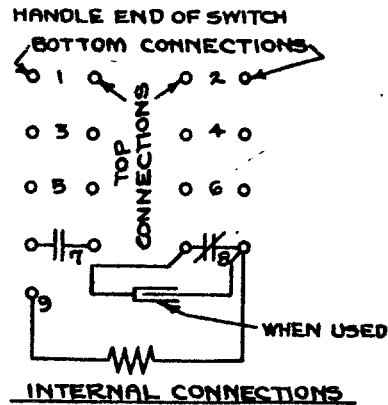
FIG. 6
REMOVING AND REPLACING MOVING CONTACT.



| RELAY | A | B |
|--------|----------|----------|
| HEA11A | 11 5/16" | 21" |
| HEA11B | 12 9/16" | 23 1/16" |

| CYCLES | RELAY | | | | | | | | CONTACT ARRANGEMENT RESET POSITION | |
|--------------------|--------------|----|----|----|----|----|----|--------|------------------------------------|--------|
| | FORM NUMERAL | | | | | | | | | |
| | DC | DC | DC | DC | DC | DC | DC | DC | OPEN | CLOSED |
| 250 | 125 | 48 | 24 | 60 | 32 | | | | | |
| MODEL 12 HEA11A | 10 | 20 | 30 | 40 | 50 | 60 | | NONE | 1 TO 6 | |
| | 11 | 21 | 31 | 41 | 51 | 61 | | 1 | 2 TO 6 | |
| | 12 | 22 | 32 | 42 | 52 | 62 | | 1 & 2 | 3 TO 6 | |
| | 13 | 23 | 33 | 43 | 53 | 63 | | 1 TO 3 | 4 TO 6 | |
| | 14 | 24 | 34 | 44 | 54 | 64 | | 1 TO 4 | 5 & 6 | |
| | 15 | 25 | 35 | 45 | 55 | 65 | | 1 TO 5 | 6 | |
| | 16 | 26 | 36 | 46 | 56 | 66 | | 1 TO 6 | NONE | |

FOR FORM NUMERALS HIGHER THAN SHOWN IN ABOVE TABLE (FOR ANY RATING) THE CONTACT ARRANGEMENT IS FOUND BY SELECTING THE HORIZONTAL COLUMN OF FORM NUMERALS WHICH IF EXTENDED IN STEPS OF 10 WOULD INCLUDE THE FORM NUMERAL IN QUESTION
EXAMPLE: FORM 80 SIMILAR TO 10 THEREFORE CONTACTS 1 TO 6 CLOSED



| MODEL | RELAY | | | | | | | | CONTACT ARRANGEMENT RESET POSITION | |
|-----------|--------------|-----|----|----|--|--|--|--|------------------------------------|---------|
| | FORM NUMERAL | | | | | | | | | |
| | 250 | 125 | 48 | 24 | | | | | OPEN | CLOSED |
| 12 HEA11B | 10 | 30 | 50 | 70 | | | | | NONE | 1 TO 10 |
| | 11 | 31 | 51 | 71 | | | | | 1 | 2 TO 10 |
| | 12 | 32 | 52 | 72 | | | | | 1 & 2 | 3 TO 10 |
| | 13 | 33 | 53 | 73 | | | | | 1 TO 3 | 4 TO 10 |
| | 14 | 34 | 54 | 74 | | | | | 1 TO 4 | 5 TO 10 |
| | 15 | 35 | 55 | 75 | | | | | 1 TO 5 | 6 TO 10 |
| | 16 | 36 | 56 | 76 | | | | | 1 TO 6 | 7 TO 10 |
| | 17 | 37 | 57 | 77 | | | | | 1 TO 7 | 8 TO 10 |
| | 18 | 38 | 58 | 78 | | | | | 1 TO 8 | 9 & 10 |
| | 19 | 39 | 59 | 79 | | | | | 1 TO 9 | 10 |
| | 20 | 40 | 60 | 80 | | | | | 1 TO 10 | NONE |

FOR FORM NUMERALS HIGHER THAN SHOWN IN ABOVE TABLE (FOR ANY RATING) THE CONTACT ARRANGEMENT IS FOUND BY SELECTING THE HORIZONTAL COLUMN OF FORM NUMERALS WHICH IF EXTENDED IN STEPS OF 20 WOULD INCLUDE THE FORM NUMERAL IN QUESTION
EXAMPLE FORM 110 SIMILAR TO FORM 10 THEREFORE CONTACT ARRANGEMENT 1 TO 10 CLOSED

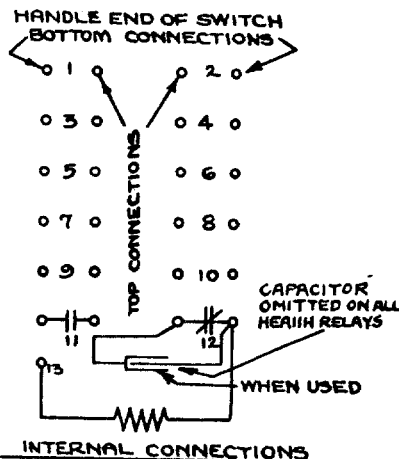
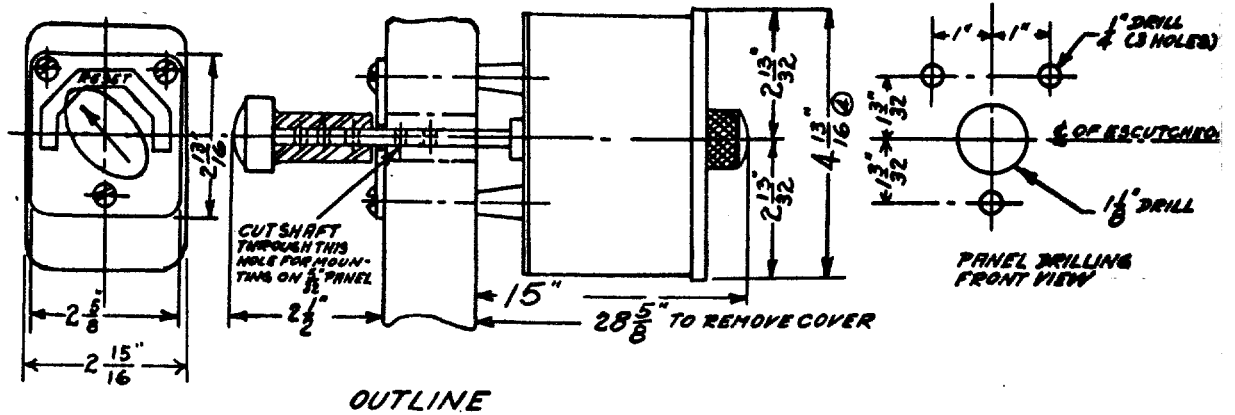


FIG. 7

OUTLINE, PANEL DRILLING AND INTERNAL CONNECTIONS FOR TYPE HEA11A AND HEA11B RELAYS.



| MODEL | RELAY | | | | | | | | CONT. ARRANGEMENT | |
|----------|--------------|-----|----|----|-------|--|--|--|-------------------|----------|
| | FORM NUMERAL | | | | VOLTS | | | | RESET POSITION | |
| | 250 | 125 | 48 | 24 | | | | | OPEN | CLOSED |
| 12 HEATC | 10 | 30 | 50 | 70 | | | | | NONE | 1 TO 16 |
| | 11 | 31 | 51 | 71 | | | | | 1 | 2 TO 16 |
| | 12 | 32 | 52 | 72 | | | | | 1 & 2 | 3 TO 16 |
| | 13 | 33 | 53 | 73 | | | | | 1 TO 3 | 4 TO 16 |
| | 14 | 34 | 54 | 74 | | | | | 1 TO 4 | 5 TO 16 |
| | 15 | 35 | 55 | 75 | | | | | 1 TO 5 | 6 TO 16 |
| | 16 | 36 | 56 | 76 | | | | | 1 TO 6 | 7 TO 16 |
| | 17 | 37 | 57 | 77 | | | | | 1 TO 7 | 8 TO 16 |
| | 18 | 38 | 58 | 78 | | | | | 1 TO 8 | 9 TO 16 |
| | 19 | 39 | 59 | 79 | | | | | 1 TO 9 | 10 TO 16 |
| | 20 | 40 | 60 | 80 | | | | | 1 TO 10 | 11 TO 16 |
| | 21 | 41 | 61 | 81 | | | | | 1 TO 11 | 12 TO 16 |
| | 22 | 42 | 62 | 82 | | | | | 1 TO 12 | 13 TO 16 |
| | 23 | 43 | 63 | 83 | | | | | 1 TO 13 | 14 TO 16 |
| | 24 | 44 | 64 | 84 | | | | | 1 TO 14 | 15 & 16 |
| | 25 | 45 | 65 | 85 | | | | | 1 TO 15 | 16 |
| | 26 | 46 | 66 | 86 | | | | | 1 TO 16 | NONE |

FOR FORM NUMERALS HIGHER THAN SHOWN IN ABOVE TABLE (FOR ANY RATING) THE CONTACT RATING IS FOUND BY SELECTING THE HORIZONTAL COLUMN OF FORM NUMERALS WHICH IF EXTENDED IN STEPS OF 20 WOULD INCLUDE THE FORM NUMERAL IN QUESTION. EXAMPLE FORM 90 SIMILAR TO 10 THEREFORE CONTACT ARRANGEMENT 1 TO 16 CLOSED

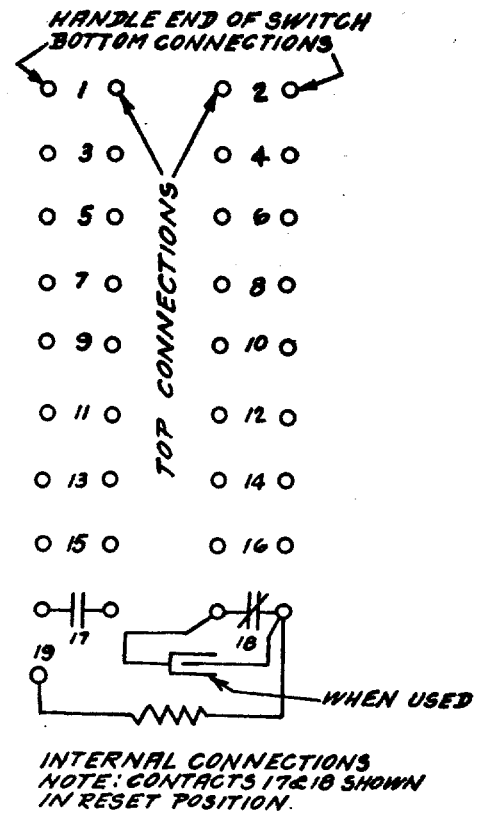
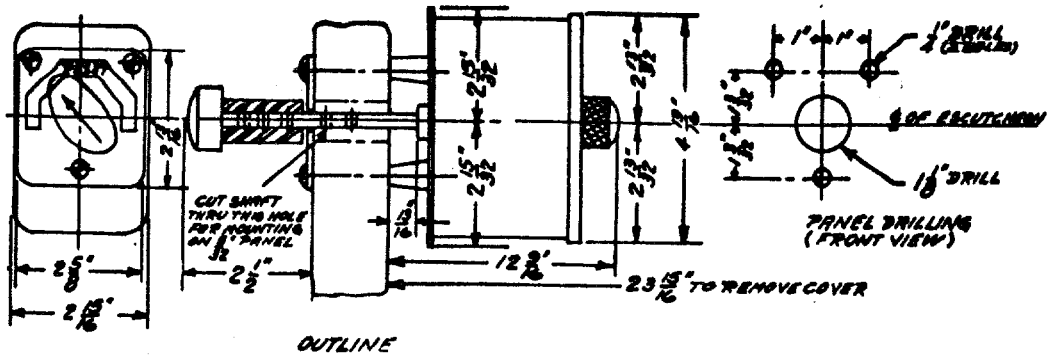
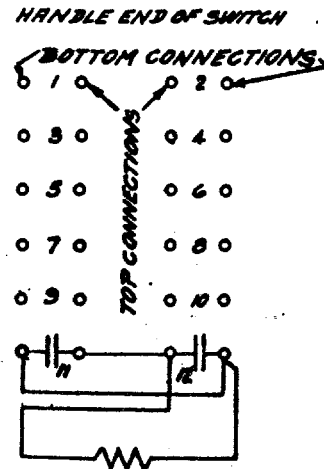


FIG. 8
OUTLINE, PANEL DRILLING, AND INTERNAL CONNECTIONS FOR TYPE HEATC RELAY



OUTLINE

| RATING | | FORM NUMERAL | | CONTACT ARRANGEMENT | | RESET POSITION | |
|-----------|--------|--------------|----|---------------------|---------|----------------|--|
| MODEL | CYCLES | | | OPEN | CLOSED | | |
| 12 HEA11D | 5 | 60 | 10 | NONE | 1 TO 10 | | |
| | | | 11 | 1 | 2 TO 10 | | |
| | | | 12 | 1 & 2 | 3 TO 10 | | |
| | | | 13 | 1 TO 3 | 4 TO 10 | | |
| | | | 14 | 1 TO 4 | 5 TO 10 | | |
| | | | 15 | 1 TO 5 | 6 TO 10 | | |
| | | | 16 | 1 TO 6 | 7 TO 10 | | |
| | | | 17 | 1 TO 7 | 8 TO 10 | | |
| | | | 18 | 1 TO 8 | 9 & 10 | | |
| | | | 19 | 1 TO 9 | 10 | | |
| | | | 20 | | 1 TO 10 | NONE | |

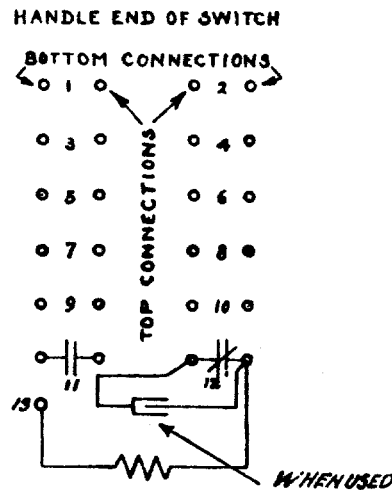


INTERNAL CONNECTIONS

NOTE: CONTACTS 11 & 12 SHOWN IN RESET POSITION

FOR FORM NUMERALS HIGHER THAN SHOWN IN ABOVE TABLE (FOR ANY RATING) THE CONTACT ARRANGEMENT IS FOUND BY SELECTING THE HORIZONTAL COLUMN OF FORM NUMERALS WHICH, IF EXTENDED IN STEPS OF 20 WOULD INCLUDE THE FORM NUMERAL IN QUESTION EXAMPLE: FORM 50 SIMILAR TO 10 THEREFORE CONTACT ARRANGEMENT 1 TO 10 CLOSED

| RATING | | FORM NUMERAL | | CONTACT ARRANGEMENT | | RESET POSITION | |
|-----------|--------|--------------|----|---------------------|---------|----------------|--|
| MODEL | CYCLES | VOLTS | | OPEN | CLOSED | | |
| 12 HEA11E | 5 | 25 | 31 | 2 | 2 TO 10 | | |
| | | | 32 | 1 & 2 | 3 TO 10 | | |
| | | | 33 | 1 TO 3 | 4 TO 10 | | |
| | | | 34 | 1 TO 4 | 5 TO 10 | | |
| | | | 35 | 1 TO 5 | 6 TO 10 | | |
| | | | 36 | 1 TO 6 | 7 TO 10 | | |
| | | | 37 | 1 TO 7 | 8 TO 10 | | |
| | | | 38 | 1 TO 8 | 9 & 10 | | |
| | | | 39 | 1 TO 9 | 10 | | |
| | | | | | | | |



INTERNAL CONNECTIONS

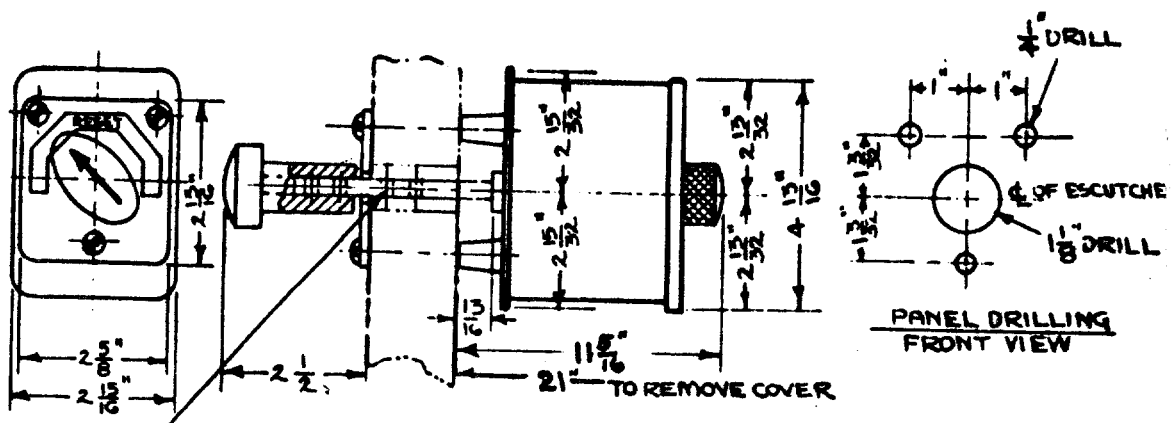
NOTE: CONTACTS 11 & 12 SHOWN IN RESET POSITION

NORMALLY CLOSED CONTACTS OVERLAP ALL NORMALLY OPEN CONTACTS FOR POSITIONS 1 THRU 10

FOR FORM NUMERALS HIGHER THAN SHOWN IN ABOVE TABLE (FOR ANY RATING) THE CONTACT ARRANGEMENT IS FOUND BY SELECTING THE HORIZONTAL COLUMN OF FORM NUMERALS WHICH, IF EXTENDED IN STEPS OF 20 WOULD INCLUDE THE FORM NUMERAL IN QUESTION EXAMPLE: FORM 51 SIMILAR TO 31 THEREFORE CONTACT ARRANGEMENT 2 TO 10 CLOSED

FIG. 9

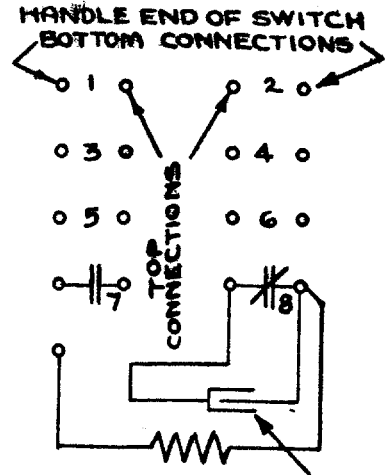
OUTLINE, PANEL DRILLING AND INTERNAL CONNECTIONS FOR THE TYPE HEA11D AND HEA11E RELAYS



CUT SHAFT THRU THIS OUTLINE HOLE FOR MOUNTING ON 5" PANEL

| RELAY | | | CONTACT ARRANGEMENT | |
|----------|--------------|--|---------------------|--------|
| MODEL | FORM NUMERAL | | RESET POSITION | |
| | VOLTS | | OPEN | CLOSED |
| 12HEA11J | 21 | | 1 | 2 TO 6 |
| | 22 | | 1 & 2 | 3 TO 6 |
| | 23 | | 1 TO 3 | 4 TO 6 |
| | 24 | | 1 TO 4 | 5 TO 6 |
| | 25 | | 1 TO 5 | 6 |

FOR FORM NUMERALS HIGHER THAN SHOWN IN ABOVE TABLE (FOR ANY RATING) THE CONTACT ARRANGEMENT IS FOUND BY SELECTING THE HORIZONTAL COLUMN OF FORM NUMERALS WHICH, IF EXTENDED IN STEPS OF 10 WOULD INCLUDE THE FORM IN QUESTION
 EXAMPLE: FORM 31 SIMILAR TO 21 THEREFORE CONTACT ARRANGEMENT 2 TO 6 CLOSED

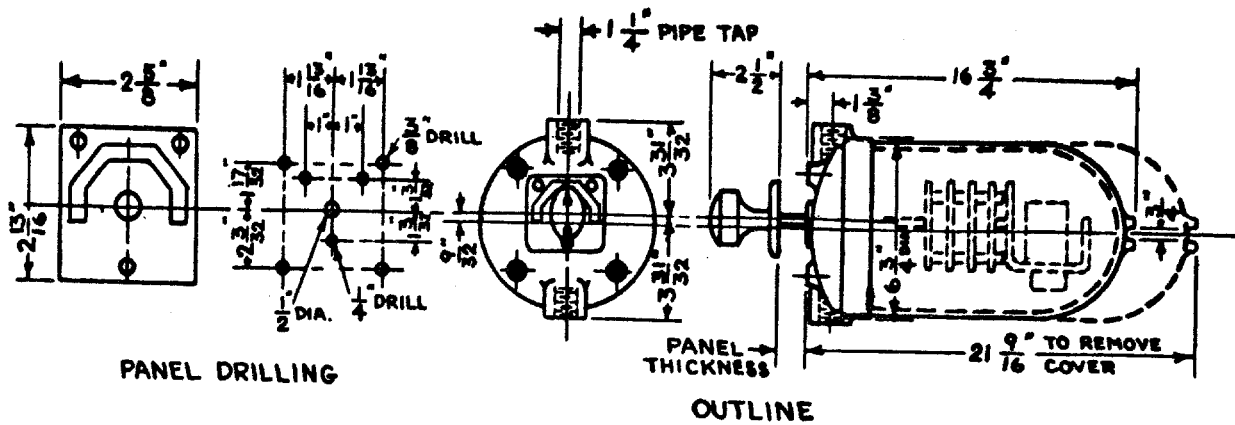


INTERNAL CONNECTIONS

NOTE: NORMALLY CLOSED CONTACTS OVERLAP NORMALLY OPEN CONTACTS IN POSITIONS 1 THRU 6.

NOTE: CONTACTS 7 & 8 SHOWN IN RESET POSITION

FIG. 10
 OUTLINE, PANEL DRILLING AND INTERNAL CONNECTIONS FOR TYPE HEA11J RELAY

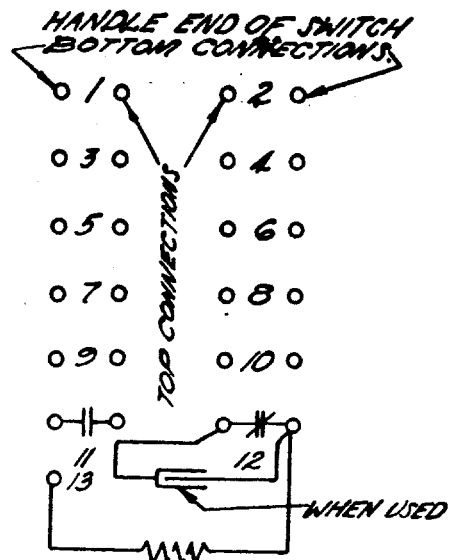


PANEL DRILLING

OUTLINE

| | | RELAY | | | | CONTACT ARRANGEMENT RESET POSITION | |
|-------|--------------|-------|------------|--|--------|------------------------------------|---------|
| MODEL | FORM NUMERAL | | VOLTS D.C. | | OPEN | CLOSED | |
| | 12-HEA11K | 10 | 30 | | | NONE | 1 TO 10 |
| 11 | | 31 | | | 1 | 2 TO 10 | |
| 12 | | 32 | | | 1 2 | 3 TO 10 | |
| 13 | | 33 | | | 1 2 3 | 4 TO 10 | |
| 14 | | 34 | | | 1 2 4 | 5 TO 10 | |
| 15 | | 35 | | | 1 2 5 | 6 TO 10 | |
| 16 | | 36 | | | 1 2 6 | 7 TO 10 | |
| 17 | | 37 | | | 1 2 7 | 8 TO 10 | |
| 18 | | 38 | | | 1 2 8 | 9 TO 10 | |
| 19 | | 39 | | | 1 2 9 | 10 | |
| 20 | | 40 | | | 1 2 10 | NONE | |

FOR FORM NUMERALS HIGHER THAN SHOWN IN ABOVE TABLE (FOR ANY RATING) THE CONTACT ARRANGEMENT IS FOUND BY SELECTING THE HORIZONTAL COLUMN OF FORM NUMERAL WHICH IF EXTENDED IN STEPS OF 20 WOULD INCLUDE THE FORM NUMERAL IN QUESTION
 EXAMPLE FORM 70 SIMILAR TO 10 THEREFORE CONTACT ARRANGEMENT 1 TO 10 CLOSED



INTERNAL CONNECTIONS

NOTE:
 CONTACTS 11 & 12 SHOWN IN RESET POSITION

FIG. 11

OUTLINE, PANEL DRILLING AND INTERNAL CONNECTIONS FOR TYPE HEA11K RELAY.

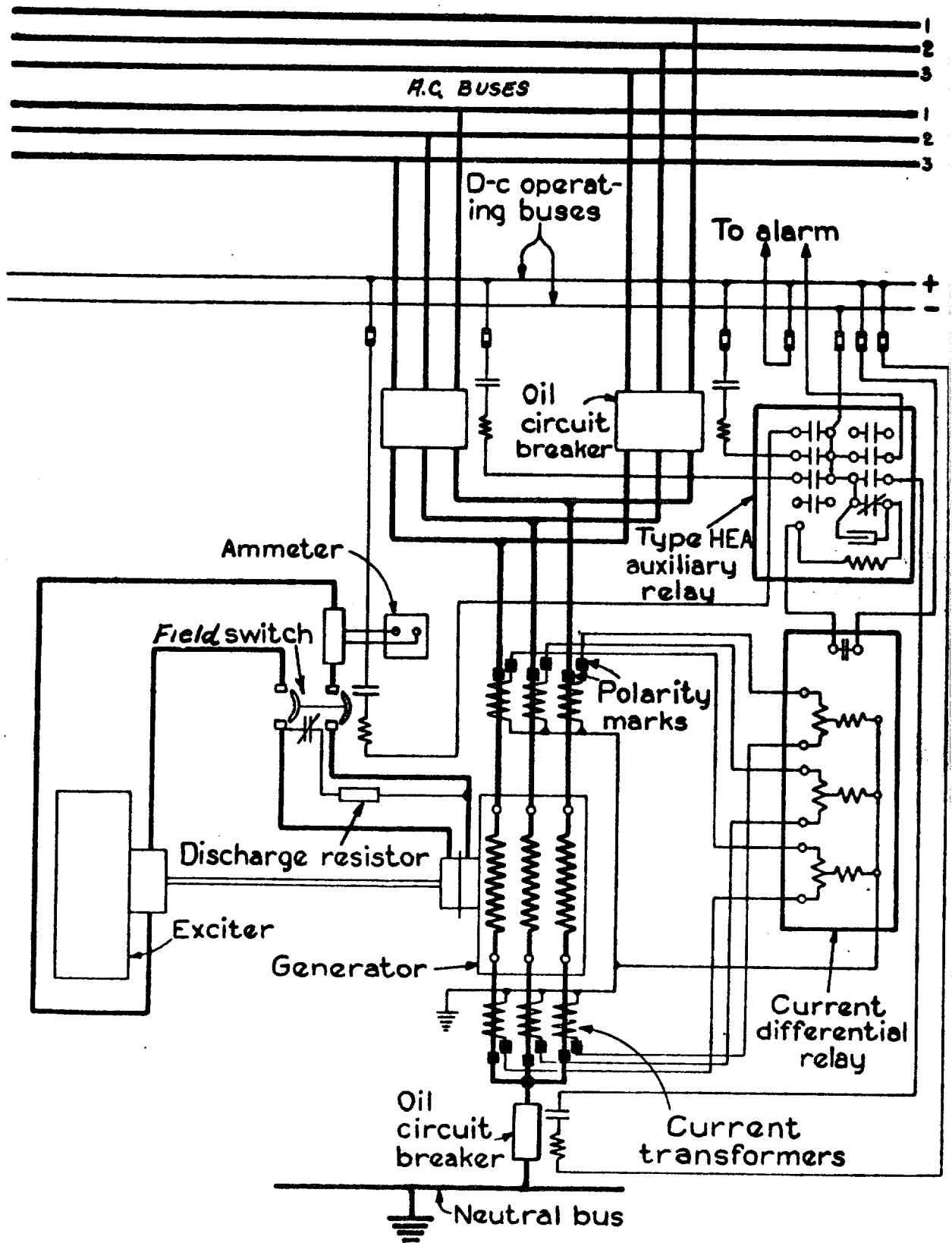


FIG. 12
 TYPICAL APPLICATION OF TYPE HEA RELAYS AS AUXILIARY DEVICE IN
 THE DIFFERENTIAL PROTECTION OF A GENERATOR