

**INSTRUCTIONS**

**GEI-25302C**  
SUPERSEDES GEI-25302B

# **CLOSING RELAYS - HEAVY DUTY**

**Types**

**HKA29EM**

**HKA29FM**

**HKA29HM**

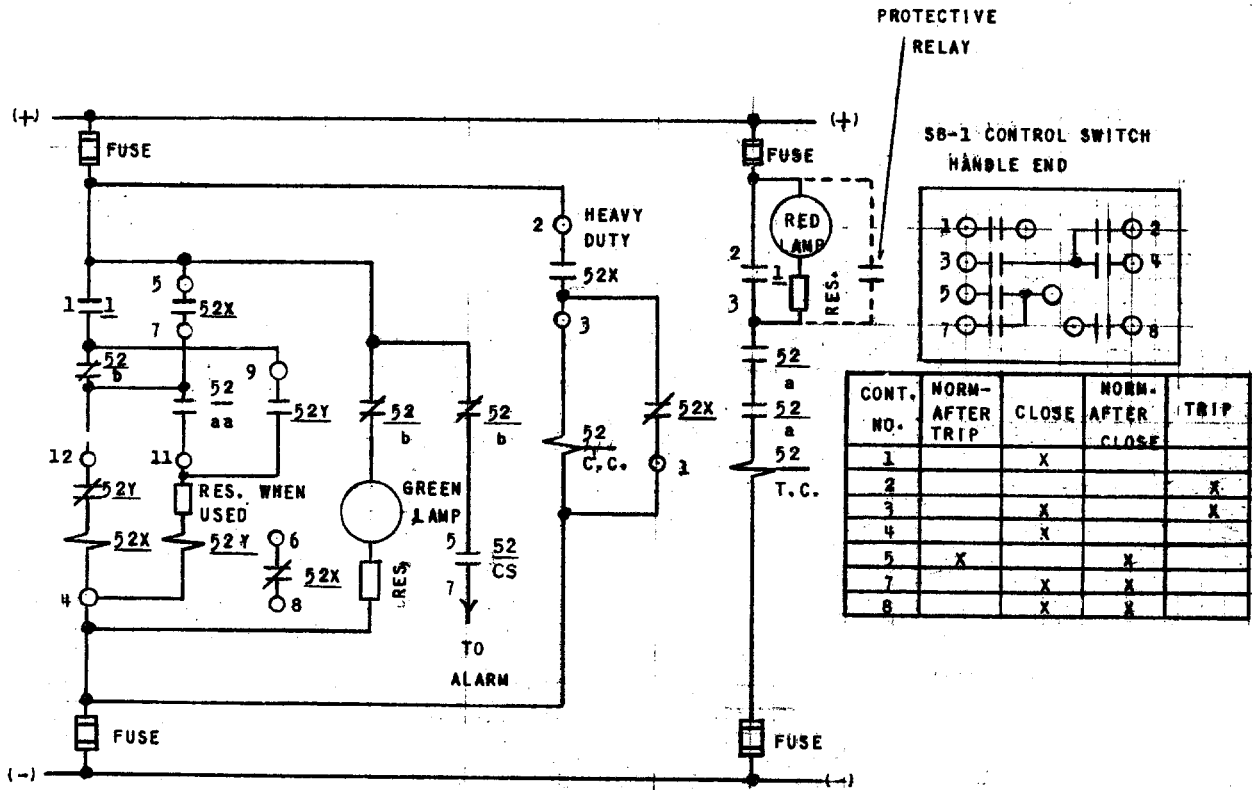
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**POWER SYSTEMS MANAGEMENT DEPARTMENT**

**GENERAL  ELECTRIC**

**PHILADELPHIA, PA.**

GEI-25302 Closing Relays Type HKA29



DEVICE	DESCRIPTION
1	TYPE SB-1 CONTROL SW.
52	CIRCUIT BREAKER
52X	UPPER UNIT
52Y	LOWER UNIT
a	AUX. SW. CLOSED WHEN BKR. IS CLOSED.
aa	AUX. SW. CLOSED WHEN BKR. CLOSING MECH. IS OPERATED
b	AUX. SW. OPEN WHEN BKR. IS CLOSED
CC	CLOSING COIL OF BKR.
TC	TRIP COIL OF BKR.

Fig. 1 Typical Elementary Diagram For HKA Relays

# CLOSING RELAYS - HEAVY DUTY TYPE HKA29

## INTRODUCTION

### APPLICATION

The Type HKA relays covered by these instructions are used mainly for closing electrically-operated air or oil circuit breakers when the current required for the operation of the closing mechanism exceeds the rating of the control switch in use. They are used instead of the moderate duty line of Type HKA relays when the currents being interrupted are highly inductive. A typical application diagram of these relays is shown in Fig. 1.

### RATINGS

These relays are available in ratings of 125, 220, and 250 volts d-c.

The coils of the upper units of these relays are intermittently rated for 30 seconds at the voltage indicated on the nameplate. The coil of the lower unit is continuously rated at the voltage indicated on the nameplate.

### CONTACT RATING

Because of the variation in the inductance of the closing solenoids of various circuit breakers, and hence in the stored energy in the solenoid, a contact interrupting rating in terms of current does not represent a true picture of the contact capacity. Therefore, for the relays covered by these instructions the main contact rating is given in terms of an "energy index" which is approximately proportional to  $I^2 N^2 D^2$  where:

- N = number of turns in solenoid.
- I = exciting current - E/R value or cutoff value.
- D = diameter of plunger in inches.

## RECEIVING, HANDLING AND STORAGE

These relays, when not included as a part of a control panel will be shipped in cartons designed to protect them against damage. Immediately upon receipt of a relay, examine it for any damage sustained in transit. If injury or damage resulting from rough handling is evident, file a damage claim at once with the transportation company and promptly notify the nearest General Electric Apparatus Sales Office.

Reasonable care should be exercised in un-

Using the product of  $I^2 N^2 D^2$  as an index of severity of the interrupting duty, these relays can be applied where the energy index does not exceed  $114 \times 10^9$  at the cutoff current value and  $455 \times 10^9$  at the E/R value.

The interlock contacts of the upper unit will close 30 amperes for voltages not exceeding 250 volts and will carry 12 amperes continuously or 30 amperes for one minute. The interrupting ratings of non-inductive circuits for the various voltages are as follows:

Volts Amps.	D-C				A-C	
	24	48	125	250	220	260
	12	6	3	1	15	15

The lower unit contacts will interrupt the upper unit coil current at 110 per cent of its nameplate rated voltage and will carry continuously the coil current of its own operating coil at 110 per cent of its nameplate rated voltage.

### BURDENS

The upper unit coil has a burden of approximately 55 watts at its intermittent d-c rated voltage.

The approximate total circuit burden for lower units with series resistors included is shown below:

Voltage Rating	Burden
125 DC	9 Watts
220 DC	15 Watts
250 DC	16 Watts

packing the relay in order that none of the parts are injured or the adjustments disturbed.

If the relays are not to be installed immediately, they should be stored in their original cartons in a place that is free from moisture, dust and metallic chips. Foreign matter collected on the outside of the case may find its way inside when the cover is removed and cause trouble in the operation of the relay.

*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.*

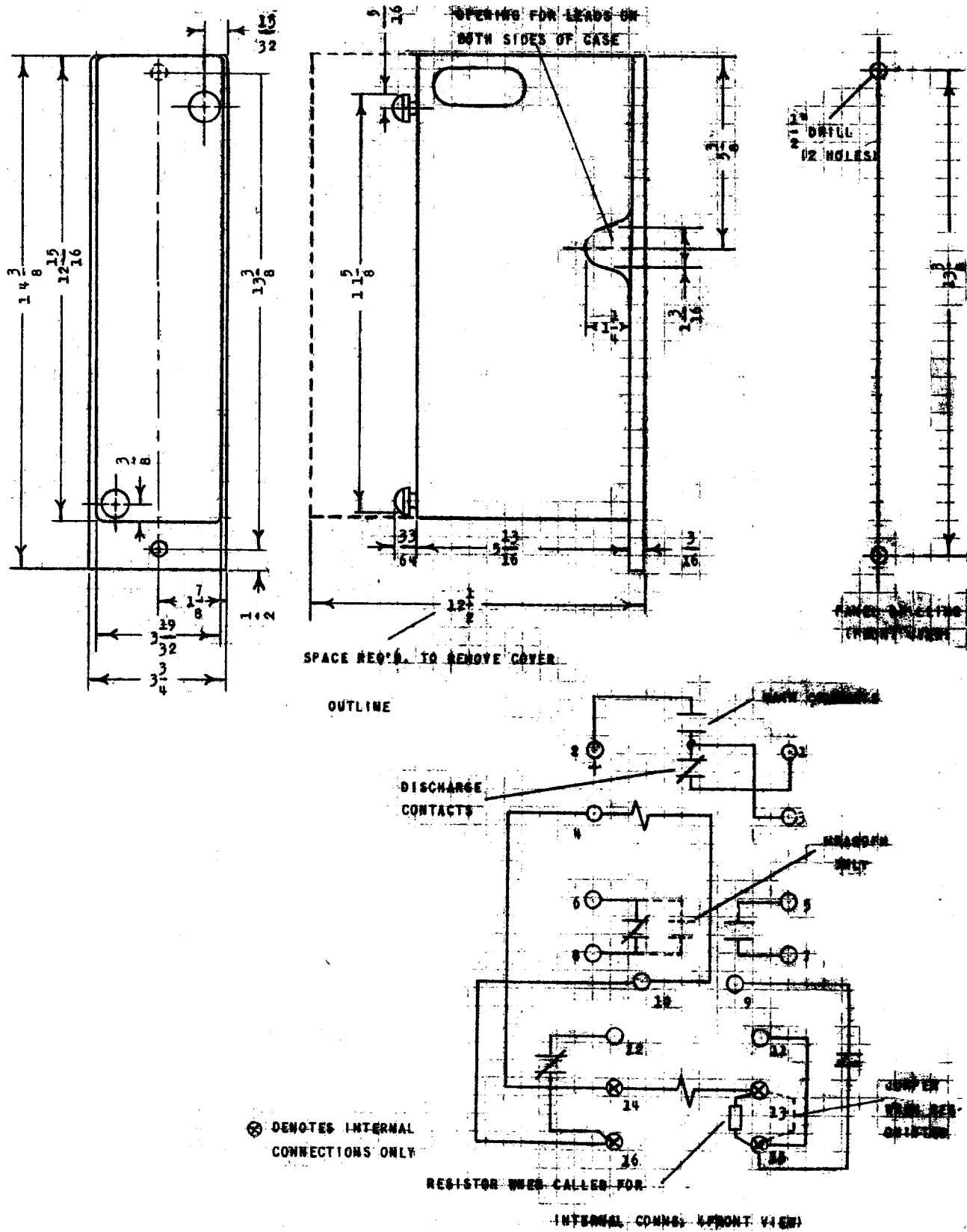


Fig. 2 Outline, Panel Drilling And Internal Connections For Type HKA29EM And HKA29FM Relays

## DESCRIPTION

The relays consist of two hinged armature-type relay units mounted on a steel plate. The upper unit, known as the X unit, is the closing unit whose main contact operates the closing mechanism of the breaker. The unit consists of a main heavy duty contact with magnetic blowout, two electrical interlock contacts and one discharge contact.

The moving contact of the main contact is constructed to serve as the moving contact of the discharge contact also. With the armature in the de-energized position this moving contact makes with a bracket-type stationary contact which is secured to the \*Textolite base and extends directly over the armature assembly.

The lower unit, known as the Y unit, is a simple hinged armature-type relay having one normally-open and one normally-closed contact. This unit, Type HMA relay, has an internally-mounted resistor in series with its operating coil for all d-c relays rated 125 volts and higher.

The cover, when used, has ventilating cutouts provided for escape of gases generated by the arc interruption. This cover is larger than the one used on light and moderate Type HKA relays.

The relays covered by these instructions are front connected.

The Type HKA29EM relay was described in the preceding paragraphs. This relay has one normally-open and one normally-closed interlock.

The Type HKA29FM relay is similar to the Type HKA29EM relay except that it has two normally-open interlocks.

The Type HKA29HM relay is similar to the Type HKA29EM relay except that the cover is omitted and there is a slight change in the mounting of the relay units and resistor.

## INSTALLATION

### LOCATION AND MOUNTING

Relays shipped as supply items should be mounted on vertical surface near the circuit breaker where it will not be subjected to excessive vibration or heat from resistors and other sources. When mounting the relay it may be necessary to consider the direction of the stray field produced by the closing coil of the breaker, if the relay is close to it, or else shield the relay from its effects.

The outline and panel drilling dimensions are shown in Figs. 2 and 3.

### CONNECTIONS

The internal connection diagrams are also shown in Figs. 2 and 3. Because of the permanent magnet blowout feature on the main unit, the polarities given in the internal connection diagram for the type of relay in question should be strictly observed.

## PRINCIPLES OF OPERATION

The X unit of the Type HKA relay picks up instantaneously when energized through the control switch, a normally-closed auxiliary switch of the circuit breaker and the normally-closed contact of the Y unit. The main contact of the X unit energizes the closing solenoid of the circuit breaker. A normally-open interlock on the X unit also closes, setting up the circuit to the Y unit. This circuit is completed by a normally-open auxiliary switch on the breaker (designated as "52 aa") and the Y unit picks up instantaneously sealing itself in. The normally-closed contacts of the Y unit opens the X unit coil circuit causing it to drop out. The X unit main contact opens the solenoid circuit of the circuit breaker closing mechanism, causing an arc to be blown upward between the main contacts. At the

instant the discharge contact makes, the closing solenoid is shorted and the arc goes out. The stored energy in the magnetic field of the closing solenoid is dissipated in the form of  $I^2R$  losses in the solenoid instead of attempting to maintain the arc. Because the resistance of the discharge path is low, the time constant (L/R) can be relatively large depending on the inductance of the solenoid. The closing solenoid plunger does not reset until the circulating current decays to the dropout value which can produce a time delay as much as 8 seconds. The effect is the prevention of immediate successive reclosures of the circuit breaker.

The seal-in feature of the Y unit makes the system "pump free".

\*Reg. Trade- Mark of General Electric Co.

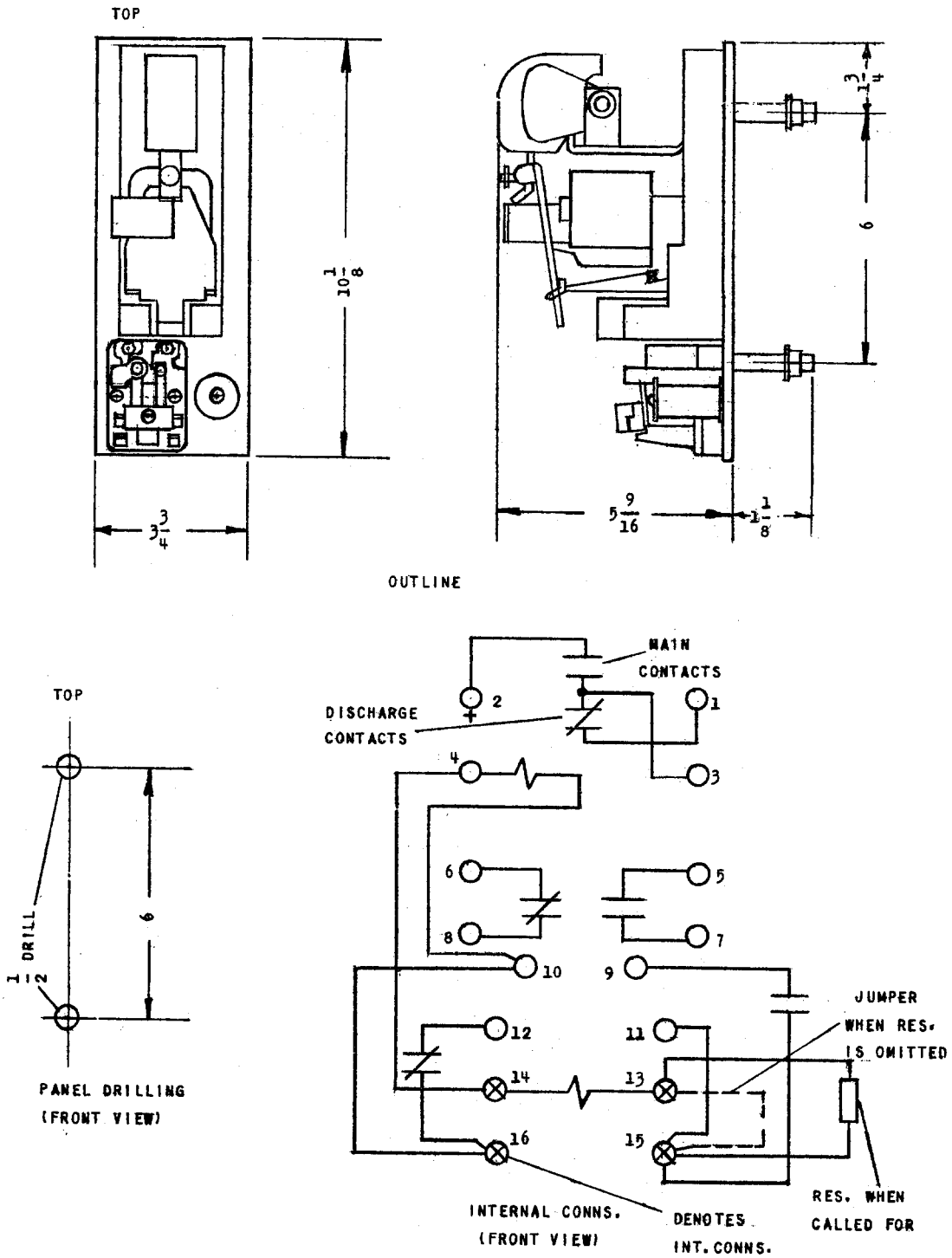


Fig. 3 Outline, Panel Drilling And Internal Connections For Type HKA29HM Relay

## MAINTENANCE

### INSPECTION AND ADJUSTMENTS

The relays have been adjusted at the factory to operate at less than 60 per cent of rating. Normally it should not be necessary to change the settings of the various contact gaps and wipes, however, if readjustment is necessary the following points should be observed.

The control springs of both the upper and lower units should be adjusted for the maximum tension which will still result in pick-up voltages of less than 60 per cent of the d-c rating.

The wipe of the upper unit main contacts should be 1/8-inch measured at the top of the pole piece while that of the interlocks should be 1/8-inch when measured at the end of the interlock contact support. The main contact gap should be at least 23/64-inch and is not adjustable.

The gap of the "b" contact of the lower unit should be 3/64 to 1/16-inch with the armature closed. This can be set by means of the adjustable back contact screw. There should be approximately 1/32-inch wipe on the "a" contacts; being measured between the upper edge of the armature and the pole piece with the "a" contact just making.

The discharge contact of the upper unit should always have enough wipe to increase the main contact gap approximately 1/8-inch. This can be checked by comparing the gap when the discharge contacts just make and after they have fully wiped in. This wipe is not adjustable. However, the following points should be checked: The upper unit control spring tension should be set at the allowable maximum; the interlocks should not have more than the recommended 1/8-inch wipe; the flexible shunt connected to the movable contact should be free to bend with the armature motion and should not be hindered by any connecting leads that might be used for other internal connections; the armature and moving contact should be free of any mechanical interference.

If it is ever necessary to replace the arc chute, care must be taken to replace the permanent magnet so that the left end of the magnet is the North pole when facing the relay. Make sure that the connection polarities are identical with those indicated on the connection diagram, Fig. 1.

Relay Types HKA29EM and HKA29FM will operate satisfactorily only with the cover having ventilating slots in it. Also, it is important to make sure that the discharge contacts are actually shorting out the solenoid of the breaker.

### RENEWAL PARTS

It is recommended that sufficient quantities of renewal parts be carried in stock to enable the prompt replacement of any that are worn, broken, or damaged.

When ordering renewal parts, address the

A periodic check should be made to insure that the relay units are picking up below the limits given under adjustments, and that the various wipes and contact gaps have not been disturbed.

### CONTACT CLEANING

For cleaning fine silver contacts, a flexible burnishing tool should be used. This consists of a flexible strip of metal with an etched roughened surface, resembling in effect a superfine file. The polishing action is so delicate that no scratches are left, yet corroded material will be removed rapidly and thoroughly. The flexibility of the tool insures the cleaning of the actual points of contact. Sometimes an ordinary file cannot reach the actual points of contact because of some obstruction from some other part of the relay.

Fine silver contacts should not be cleaned with knives, files, or abrasive paper or cloth. Knives or files may leave scratches which increase arcing and deterioration of the contacts. Abrasive paper or cloth may leave minute particles of insulating abrasive material in the contacts and thus prevent closing.

The burnishing tool described above can be obtained from the factory.

### REPLACEMENT OF MAIN CONTACTS

If it is necessary to replace the main stationary contact of the upper or X unit it will be necessary to remove the arc chute assembly. All the parts of this assembly are held together between the U-shaped bracket by a long screw extending through a hole in the blowout magnet. If this screw is removed the entire assembly can be lifted out. The main stationary contact can then be easily replaced and the replacement securely tightened.

The reassembly procedure can be simplified by fitting the pole pieces to the sides of the arc chutes, placing the permanent magnet between the pole pieces, and then transferring the entire assembly into position on the U-shaped bracket. If an arc shield is used it should be replaced in its correct position on the sides of the bracket and between the arc chute and coil. The screw should then be inserted through the holes in the bracket, pole pieces, and magnet, and secured with a lockwasher and nut. Care must be taken when reassembling the magnet that the north pole of the magnet, the end which is numbered, is on the left side of the relay when viewed from the front; otherwise the reversed polarity will cause the arc to blow downwards. The movable contact finger should not hit the sides of the arc chute in any position of the armature.

nearest Sales Office of the General Electric Company, specify quantity required, name of part wanted, and give complete nameplate data, including serial number. If possible, give the General Electric Company requisition number on which the relay was furnished.

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