CAPACITOR TRIPPING FOR OIL CIRCUIT BREAKERS

110 to 550 Volts—All Frequencies

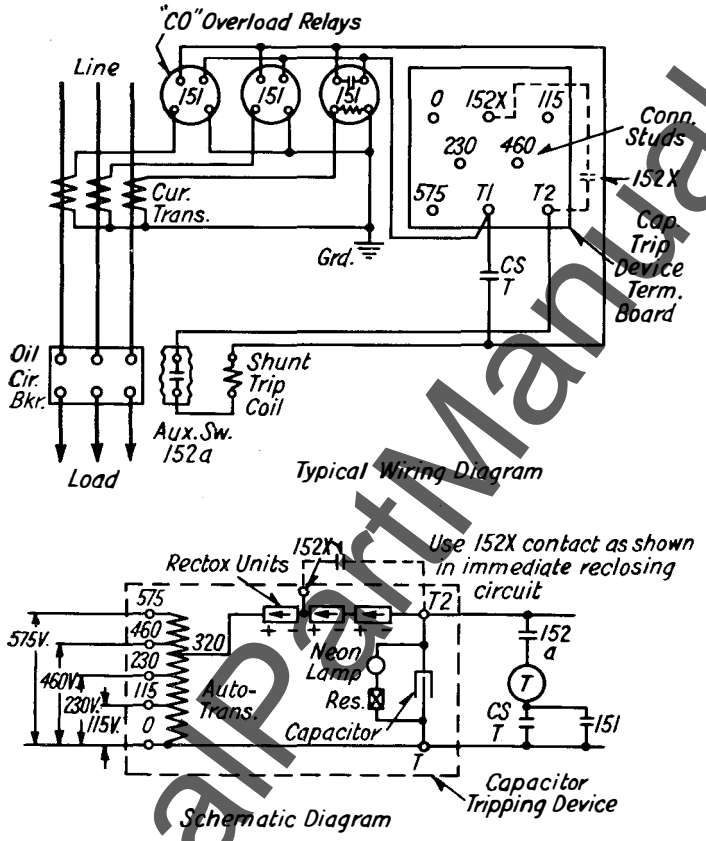

FIG. 1—WIRING AND SCHEMATIC DIAGRAMS

Application

The capacitor tripping device is comparable to the battery—CO relay tripping combination except that it eliminates the necessity of battery upkeep. The principal applications for the capacitor trip device will probably be found in the following:—

1. Small unattended substations or isolated locations to eliminate battery maintenance.
2. Low current feeder circuits to secure the economy of bushing type current transformers over that of the wound type transformers.
3. For use with wound-type current transformers where the higher burdens of overload coils would be detrimental to the power functioning of relays or meters.

Distinctive Features

Instantaneous tripping attachments used in conjunction with current transformers were standard for many years and are still widely used. The disadvantage of this method is the absence of control over the tripping time which is increasingly important as service is extended.

To control the time at which a circuit breaker trips, induction relays may be used, together with a source of energy independent from system disturbances. Storage batteries serve this purpose but require a certain degree of maintenance for reliable and satisfactory service.

To retain the tripping selectivity offered by induction relays and to eliminate the storage batteries, the following are sometimes used:

1. Circuit opening relays with instantaneous trip coils.
2. Circuit closing relays with:
   a. Direct-trip attachments
   b. Tripping reactors
   c. Tripping transformers
   d. Current transfer relays

The above methods are all quite reliable but have one outstanding disadvantage—a rather high volt-ampere burden is required for successful operation. The ideal method would retain all the advantages without having the disadvantage. Such method is "Capacitor Tripping".

CAPACITOR TRIPPING FOR OIL CIRCUIT BREAKERS—Continued

Operation

The tripping energy is obtained from a capacitor of suitable size which is charged by a half-wave, dry-type rectifier, which in turn draws its energy from the secondary of the step down transformer, 110 to 550 volts, connected to the line side of the breaker. (This transformer can also be used for closing the breaker by means of a Rectox solenoid combination).

The steady state volt-ampere burden imposed on the voltage transformer is less than 1 volt-ampere.

The conventional current transformers are used for operating the relays but the size is independent of the tripping means and need be only of sufficient capacity to operate the relays. With low-energy relays it is therefore possible to trip at very low primary currents. When the relay operates, the capacitor discharges through the breaker shunt-trip coil, tripping the breaker.

The capacitor trip device requires a light latch load (not exceeding 3 pounds) and a special trip coil. Some breakers require a light trip attachment, see Table I.

The capacitor will hold sufficient charge to trip the breaker at least six seconds after charging potential is entirely removed, which is ample time for relays to operate under fault conditions. However, on most fault conditions some potential is available, and the device is so designed that 65 per cent of normal potential will give the capacitor sufficient charge to trip the breaker at any time.

A low-energy glow lamp connected in parallel with the capacitor provides visual indication of the charge on the capacitor. When the supply is removed, the condenser will discharge in approximately 60 seconds to 90 volts The glow lamp in series with the discharge resistance glows at any voltage above 90 volts.

The condenser can be recharged in approximately 0.3 second by using the special connection shown in Fig. 1. This time is important, especially for fast-reclosing breakers. It should be connected to the line side of the breaker so that it can be charged when the breaker is open. Refer to Fig. 1 for wiring and schematic diagrams. Capacitor tripping has been developed for the breakers referred to in Table I.

TABLE I

	Style No.
Capacitor-trip device (110 to 550V)‡	1 014 428

TRIP ATTACHMENTS FOR USE WITH CAPACITOR TRIP DEVICE

Manually Operated

F-10	1 043 277
MF, F-122, F-11	1 043 278
F-124	1 043 282
B-20-B, B-22-B—B-7-A, B-8-A, B-10-A. F-100	1 043 283
FO-22-A	1 043 280
*GO-B, GO-1-B, GO-2-B	1 043 279

Solenoid Operated

*MF, F-11, F-122, F-124 (600 and 1200 Amp.)—SAF-2 Mechanism	1 043 281
*F-124—2000 Amp.—F-75, F-100—SA-3 Mechanism	1 043 279
*B-20-B, B-22-B, B-7-A, B-8-A, B-10-A.—SA-3 Mechanism	1 043 279
FO-22-A—Special Mechanism	1 043 280
*GO-B —GO-1-B, GO-2-B—SA-3 Mechanism	1 043 279

*These breakers, either manually or electrically operated, must be equipped with the light (4 coil) trip attachment.
‡Can be used on voltages 20% greater than top rating.

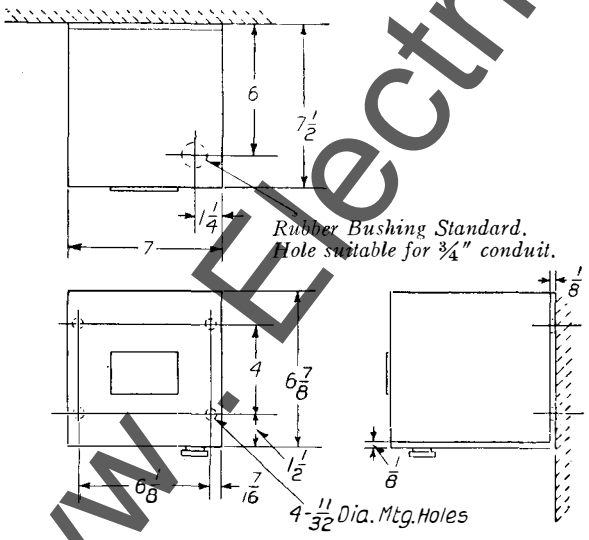

FIG. 2—OUTLINE AND MOUNTING DIMENSIONS

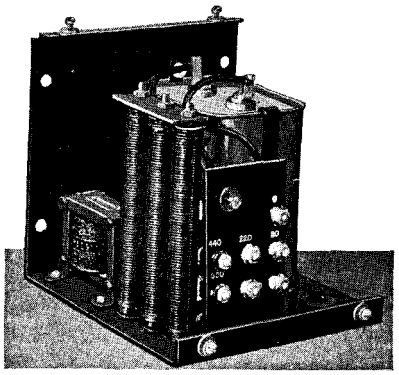

FIG. 3—CAPACITOR TRIP DEVICE WITH COVER REMOVED

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