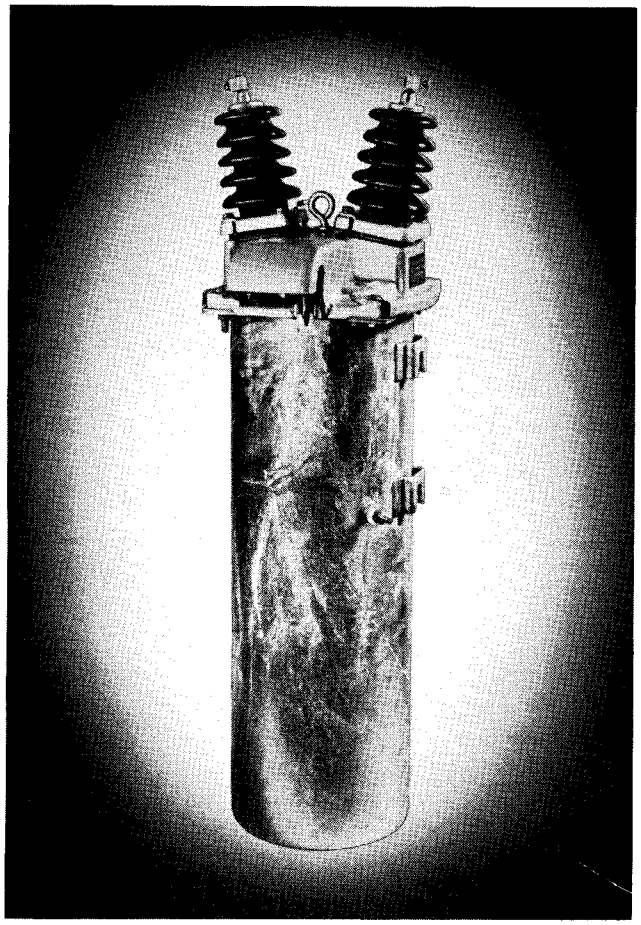
INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

AUTOMATIC RECLOSER, TYPE 100-GR

Single Pole, 25 to 100 Amperes, 2300 to 23,000 Volts
Max. Interrupting Capacity 2500 Amperes



TYPE 100-GR RECLOSER is a single pole, self-contained, automatically reclosing oil circuit breaker. A companion to the line of 50-GR Reclosers, it is designed for circuits having high load currents and high fault currents.

STORING

The recloser is filled before shipping with the correct amount and type of oil. Therefore, it may be stored either indoors or out, but it must be placed in a vertical position. No particular care need be taken of the recloser while in storage because it is designed for use outdoors and may be stored anywhere.

The recloser, like any other piece of oil insulated apparatus, should never be placed in storage unless its tank is filled with proper type and amount of oil.

INSTALLATION

Mounting. The recloser is contained in a seamless drawn steel tank on which two mounting lugs are welded. It can be mounted to the crossarm, or on the pole mounting brackets as shown in Figure 3. In either case, the recloser can be positioned in the tank so that the hood will face in any desired position. This is accomplished by merely loosening the clamping bolts, rotating to the desired position, and retightening the bolts.

To mount the recloser, attach the mounting brackets to the crossarm (or pole). Loosen the two captive carriage bolts and push the heads away from the bracket so that the tank can be slipped down into position, (see Figure 2) then retighten captive bolts.

After it is in place on the mounting brackets and the captive bolts have been retightened, the recloser should be operated manually approximately four times to expel any air that may be trapped in the time-delay dashpot.

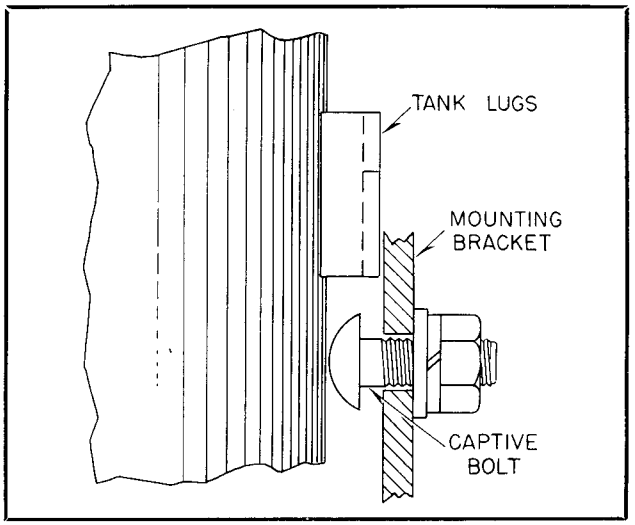


FIG. 2. Mounting Bolt Details

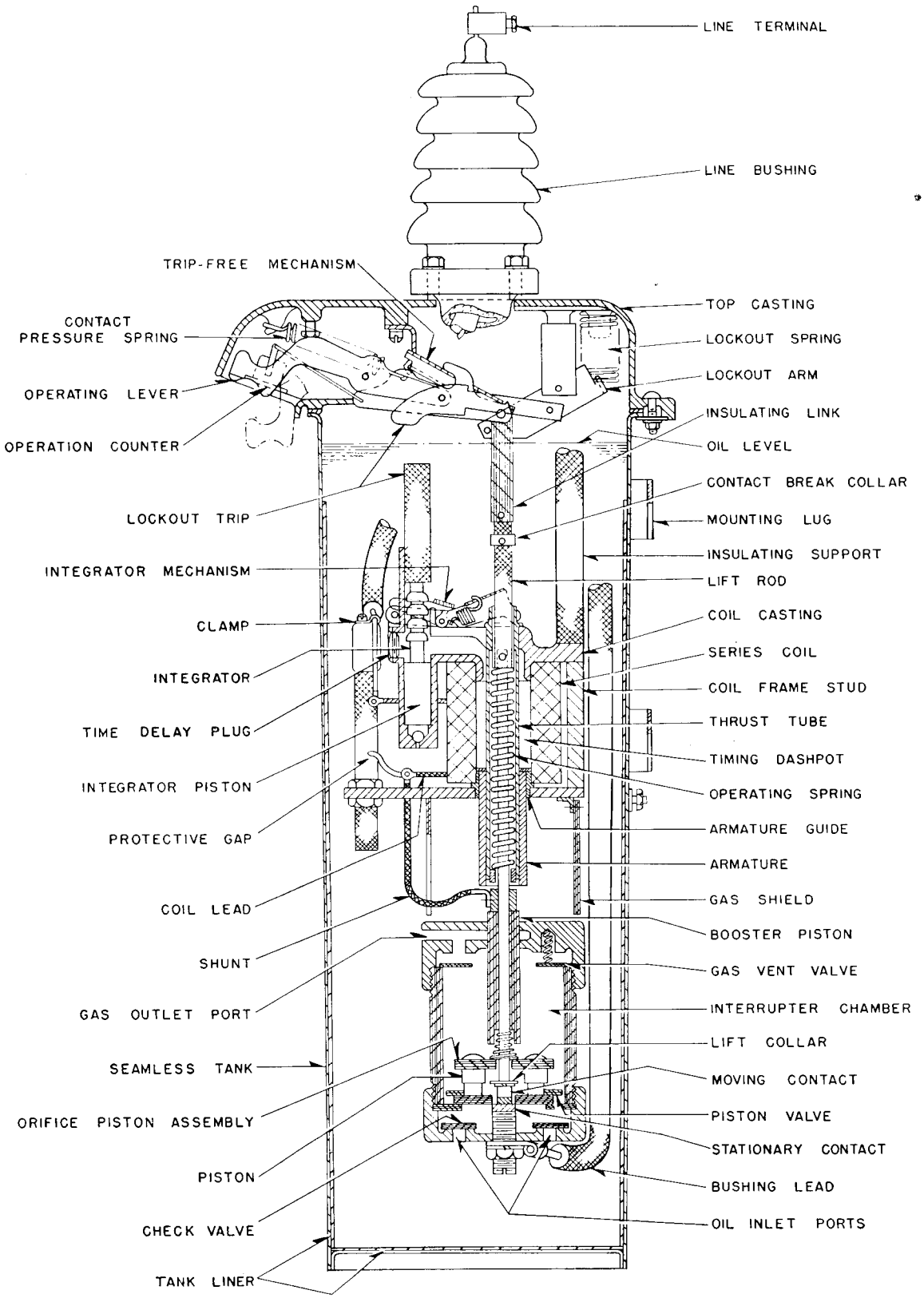


FIG. 3. Sectional View of Type 100-GR Automatic Recloser

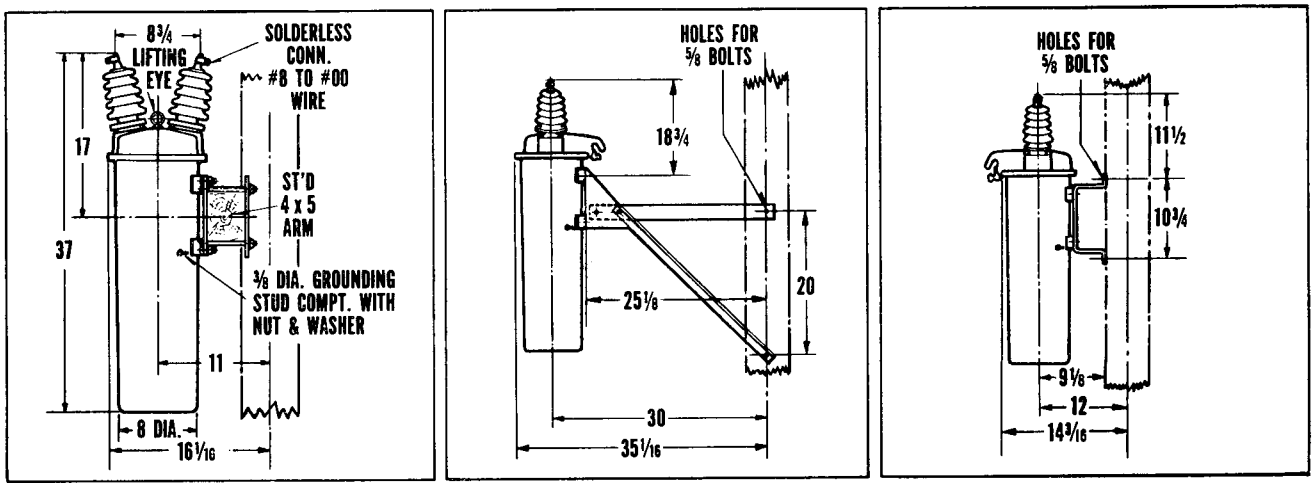


FIG. 4. Crossarm and Pole Mounting Details

Electrical Connections. The recloser is connected in series with the line. Clamp-type terminals are supplied on the bushings. Depending on operating practice, a ground lead may or may not be attached to the stud which is welded to the tank adjacent to the lower tank lug.

OPERATION

Circuit Interruption. When the recloser is tripped by its series coil, it interrupts the circuit and then recloses after a short time interval. If there is a permanent fault condition on the circuit, the recloser will interrupt and reclose three times. It will then lock out on the fourth interruption.

If the fault is of a temporary nature and is cleared up before the fourth interruption, the recloser will reclose and the lockout device will reset to allow the recloser to make four more operations on a subsequent fault condition. When the recloser locks open, a manual operation is required to reclose it.

Caution: Do not operate the recloser electrically unless it is filled with oil.

To Place In Service. The Type GR Recloser is initially closed by an upward push with a hook stick on the combination operating handle and position indicator (see Figure 4). This permits the contacts to close and place the recloser in service.

Operating Principle. If an overcurrent flows through the series coil, the armature moves upward into the timing dashpot from which it forces the trapped oil, at the same time compressing the operating rod spring. The armature speed varies directly as the magnitude of the overcurrent.

After a predetermined free travel, the armature, by means of the thrust tube, drives the moving contact open against the contact pressure spring. The force of the contact pressure spring rapidly decreases to zero and the compressed operating rod spring drives the moving contact to its full open position. The arc is quickly de-ionized in the "orifice-flow, self-driven" interrupter.

The series coil is de-energized as soon as the circuit is cleared, and the armature and contact moving together then drop slowly by reverse dashpot action under the influence of the force of gravity. When the moving contact is a predetermined distance from the stationary contacts, it snaps closed to prevent arcing. The reclosing time is constant, independent of the magnitude of the overcurrent.

Lockout Integrator. Each opening of the recloser advances the 4-step lockout integrator piston one step (see Figure 5). As this piston is inder oil, it draws oil in through the check valve which closes at the end of the upward travel and traps oil below the piston. Thus, on the second operation, the mechanism will engage the piston below the second flange and lift the lockout piston one step farther.

If the recloser opens four times on a permanent fault, the lockout piston is advanced sufficiently to break the lockout toggle. This moves the operating handle to the open position at the same time lifting and holding the contacts in the full open position. Reclosing and resetting of integrator mechanism is thus prevented until the operating handle is reset to the closed position.

The integrating 4-step lockout resets to its original position after a period of time if the recloser remains closed after the first, second, or third opening, thus

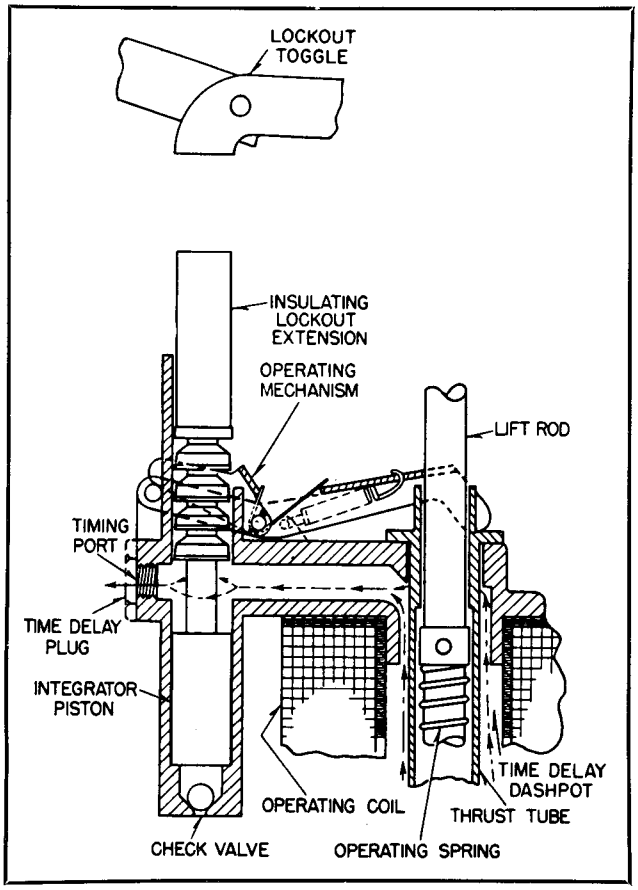


FIG. 5. Integrator Lockout Action in Original Position

providing the same sequence of operation for subsequent short circuits or overloads. The resetting time is approximately one minute per operation, or about three minutes if the breaker operates three times. If the recloser is closed against a fault condition after lockout, it locks out immediately on the first tripping operation.

TIMING CHARACTERISTICS

Standard Setting. As shipped from the factory, the recloser is set for 4 time-delayed operations to lockout. This is the preferred setting when the recloser must co-ordinate with one of smaller rating connected on its load side, for it eliminates any unnecessary operations.

Alternate Setting No. 1. The recloser may be changed in the field to give one instantaneous operation plus three time-delayed operations to lockout. This is easily done by removing the time-delay plug (shown in Fig. 5) and discarding it.

Removal of the plug opens a port which allows oil to flow freely out of the timing dashpot (Fig. 5). After the first operation, however, the integrator piston acting as a slide valve, closes the port. Subsequent operations are then time-delayed, just as though the plug were still in place. Reclosing time remains constant whether or not the plug is in place.

Alternate Setting No. 2. For some applications it may be desirable to use a sequence of three operations to lockout. This may be accomplished by unscrewing the insulating lockout extension (Fig. 5) on the integrator piston $^{11}/_{32}$ inch so it strikes the lockout toggle on the third operation. Correct adjustment may be checked by engaging the pawl in the second step of the integrator piston and operating the recloser mechanism by hand to the full open position; the lockout extension should then clear the lockout toggle by approximately $^{3}/_{16}$ inch.

The first operation of the three operations to lockout may be either instantaneous or time-delayed as desired, by removing or leaving in the time-delay plug.

Coil Protector. The "De-ion" coil protector is of the low voltage type mounted under oil on the coil plate and connected directly across the trip coil. This gives the coil the best possible protection. The gap is of the expulsion type and is so constructed that a $^{1}/_{4}$-inch air gap will be automatically maintained in the gap electrode due to the "diving bell" effect.

Important: It is necessary to have some air in the coil protector before putting the recloser in service. To insure this condition, merely lift the recloser out of the tank until this intake of air is accomplished and then replace. This should be done immediately before mounting the recloser on the pole.

TESTING

No testing of the recloser should be required other than the manual operation of the operaing lever. When this lever is pushed upward the contact should close with an audible snap after a short time interval. The operation counter will indicate the opening of the recloser contacts.

Low Voltage Testing. The 100-GR Recloser is a high voltage (2300-15,000 volts) circuit interrupter and is designed to operate in this voltage range at a lagging power factor. It should not be tested at low voltage (110-440) or at unity power factor at any voltage less than 2300.

If the device is tested on low voltage circuits it will not operate properly but will chatter. This is caused by the rapid interruption of the current through the series coil before the moving contact

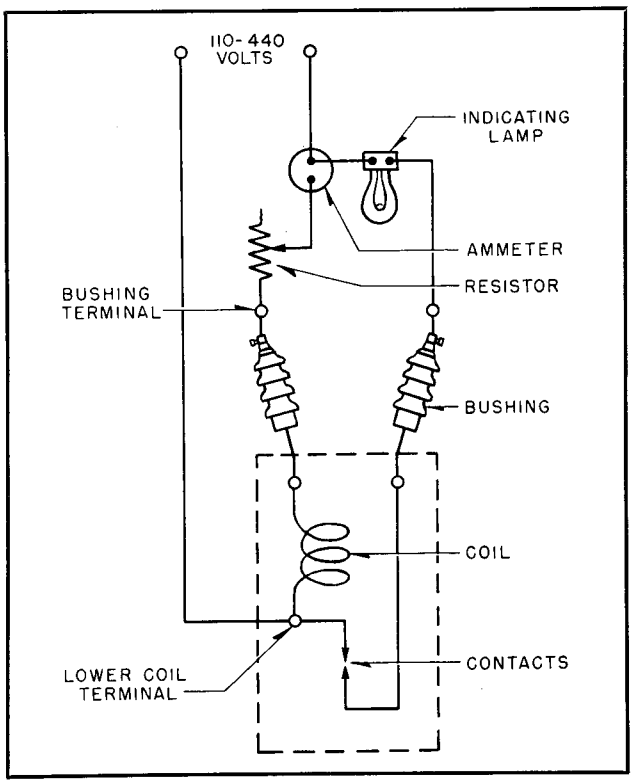


FIG. 6. Low Voltage Test Circuit

has moved sufficiently to push the contact pressure toggle over center. The armature then falls back slightly, the contacts make, and the operation is repeated. This is commonly called "chattering". Such a situation cannot happen on high voltage, for the arc energy in the "self-driven" interrupter is sufficient to drive the contacts to full open position.

If it is desired to determine the minimum trip current of the recloser on a low-voltage circuit, the recloser should be connected with the contacts out of the tripping circuit as in Figure 6.

Important: The recloser should never be operated unless the tank is filled with oil.

Connections. The low voltage leads are connected to the coil terminals by attaching one lead to the bushing on the coil side and the other lead to the lower coil terminal.

A test lamp may be connected across the contacts to indicate the time at which they open.

Increasing the Current. If a resistor is used to control the current in the circuit and an ammeter is used to measure the current, the current may be slowly increased until such time as the ammeter needle indicates a decrease in the current. This decrease is caused by the increase in circuit reactance as the armature is drawn upward into the series coil.

Therefore, the maximum current indicated on the ammeter before the current begins to decrease is the minimum trip current of the recloser.

Because the circuit current will decrease as the armature rises, the recloser may not be able to open the contacts unless the resistance controlling the circuit current is reset to maintain the current constant as the armature moves upwardly. On a typical 110 volt test circuit with a 25-ampere recloser (S# 1534 500), the armature will pick up at a value of 50 amperes, $\pm 10\%$.

As it moves upwards, the current will drop off to a value of approximately 30 amperes. This current is not sufficient to cause the armature to complete its stroke and separate the contacts. Therefore the circuit current must be readjusted to the original value of pick up current (50 amperes). The armature should then force the contacts open. If the circuit current is then turned off by external means, the recloser will reset.

Note: This effect of reduced current, due to increase of reactance in the coil, is no factor on a 2300-volt circuit as the coil reactance is a very small portion of the total reactance of the circuit.

Because this device is primarily intended for high voltage operation the operation counter will not operate on low voltage test. This is due to the fact that the contacts do not travel sufficiently far on low voltage operation to actuate the counter. The operation counter may be checked by moving the operating rod up and down by hand.

INSPECTION AND MAINTENANCE

Yearly Inspection. At least one inspection per year is recommended at which time the recloser should be removed from the tank and the tank drained of oil. The recloser is removed from the tank by loosening the four captive carriage bolts and then moving the four clamps away from the flange of the tank.

Oil should be changed once a year or about every 100 operations, whichever is oftener.

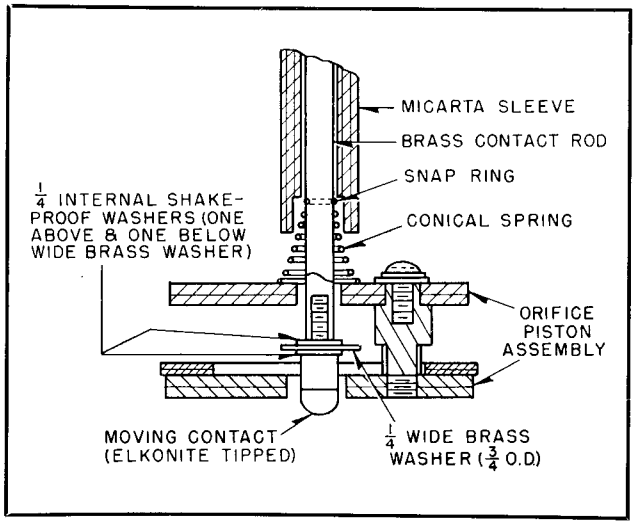


FIG. 7. Moving Contact and Orifice Piston Assembly

Check the condition of the contacts. These contacts should have an average life of 100 to 1000 operations depending on the magnitude of the short circuits interrupted. The contacts, which are faced with $\frac{3}{16}$-inch-thick arc resisting tungsten alloy, are suitable for further operation as long as the remaining portion of this material is $\frac{1}{32}$ inch thick.

Note: It is not necessary to dress the contacts even though they may appear mottled and uneven as they will carry their full rated current within the rated temperature rise as long as this arc resisting alloy is present.

The moving contact may be removed by unscrewing it from the operating rod, being careful to save the accompanying washers. Care should be taken to reassemble as shown in Fig. 7. Both shake-proof washers are essential to prevent loosening under vibration.

The orifice piston assembly is designed to have about the same life as the contacts. Ordinarily, it should be replaced whenever contacts are replaced. A complete maintenance kit, including contacts, orifice piston assembly, and necessary hardware, is available from the factory.

Contact Adjustment. The fixed contact should be moved up or down until the groove on the Micarta operating rod extension is level with the top of the thrust tube cap. (See Fig. 8). This adjusts the recloser for correct position and contact pressure.

Maintenance Procedure. Before remounting the recloser in the tank the following procedure should be followed:

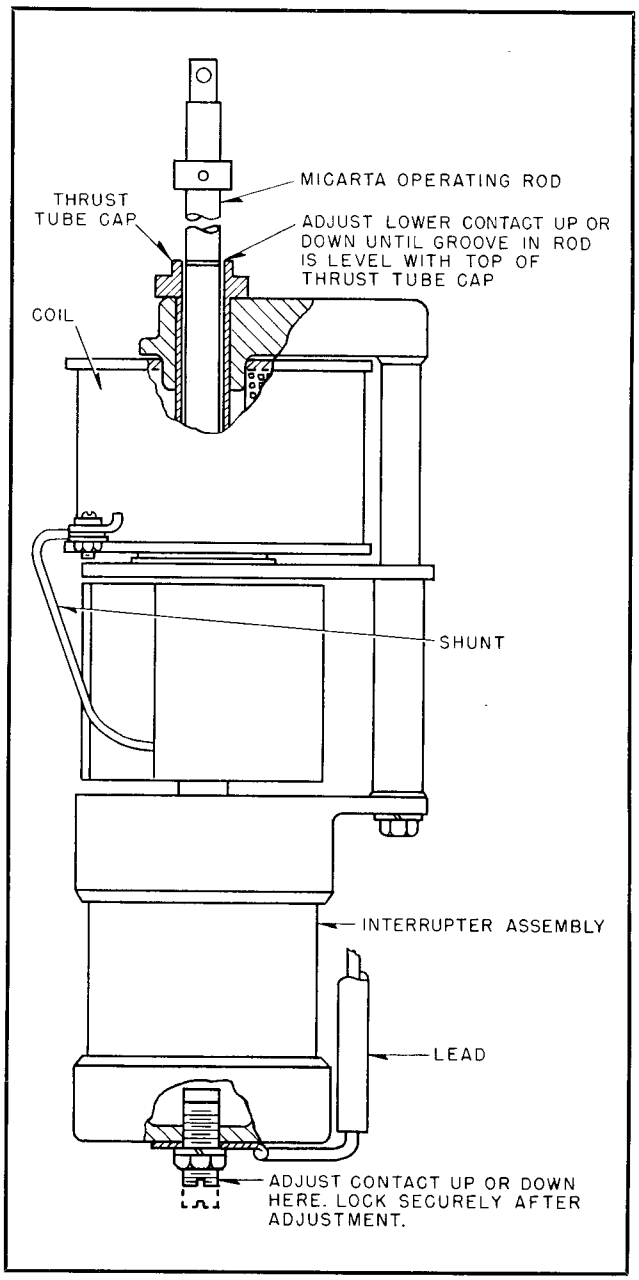


FIG. 8. Adjustment of Fixed Contact

1. Wipe the inside of the tank clean with lint-free cloth. Do not use waste.

2. Wipe the bushings clean.

3. Check the electrical connections for tightness.

4. Check to see that the stationary contact leads are tight.

5. Refill the tank with clean oil.

6. Operate the recloser manually before remounting in the tank to make certain all parts of the mechanism are free.

Both tank and top casting are galvanized and therefore require no maintenance except to check for breaks due to abrasion. These may be retouched with aluminum paint or red lead.

TO CHANGE RATING

In order to change the rating of the recloser, merely replace the trip coil with one having the desired rating. Refer to the Table on page 8 to determine the style number for the particular coil. To remove the trip coil, proceed as follows (See Fig. 9).

1. Disconnect both leads at the coil terminals. Disconnect main lead from fixed contact at bottom of interrupter. Disconnect flexible shunt from operating rod.

2. Remove lower interrupter casting. Disconnect moving contact and orifice piston assembly.

3. Remove interrupter tube and upper casting as one unit by unscrewing the three bolts which enter the Micarta supporting studs.

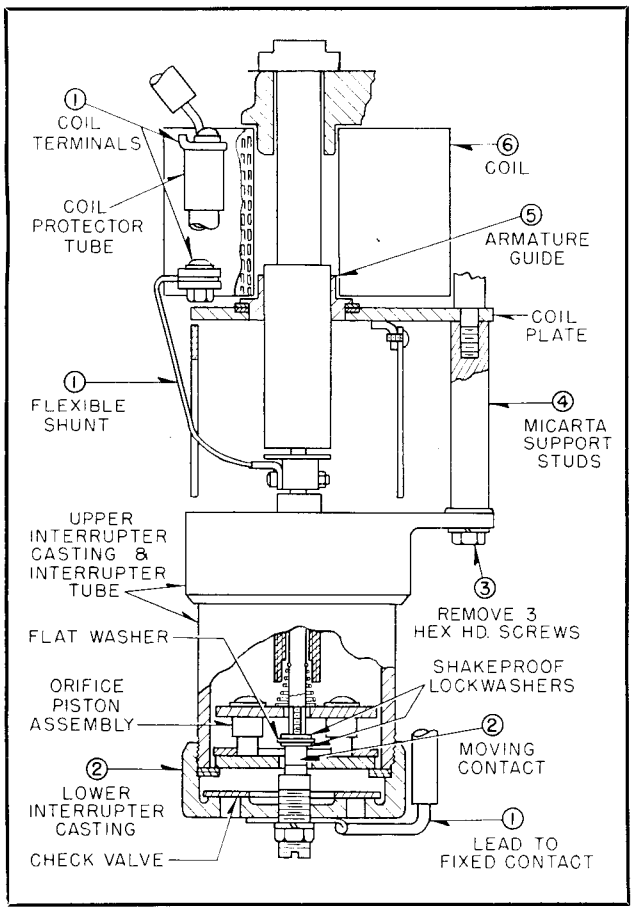


FIG. 9. Changing Rating by Replacing Trip Coil

4. Remove as one unit the coil plate, coil protector tube and gas baffle by unscrewing the three Micarta supporting studs that fasten the coil plate to the coil frame studs.

5. Remove armature guide from coil. Now the coil may be removed and the new one substituted.

6. Position the coil so that the upper coil terminal will be directly above the coil protector tube when reassembled.

7. Replace parts previously removed in the reverse order as described.

8. Important: Micarta check valve in interrupter must be free to move up and down.

9. Reconnect all leads in their original positions. Maintain a minimum clearance of $\frac{3}{8}$ inch between the upper coil lead and the coil casting.

10. Adjust the position of the fixed contact as described in Fig. 8.

11. Operate the mechanism manually to insure that all moving parts are free.

INSULATING OIL

The care of the insulating oil used in this circuit recloser is of the utmost importance to its successful operation. Contamination by dirt, moisture, metallic particles, lint and other types of foreign particles, reduces the dielectric strength of the oil upon which the operation and current interrupting ability of the recloser depends. Consequently, careful attention should be given to keeping the oil clean, not only in filling the tank, but in storage.

Only the highest grade of insulating oil such as Wemco "C" should be used. The oil should be new or at least thoroughly reconditioned by means of filter press or centrifuge.

If the recloser has been allowed to stand with no oil in the tank, the tank should be thoroughly cleaned and flushed out with insulating oil before filling. The same treatment should be given the recloser mechanism itself. Care should be used during inspection and maintenance which should preferably be done only under favorable weather conditions.

TABLE OF RATINGS

LOAD CURRENT AMPERES	MIN. TRIP CURRENT AMPS (±10%)	INTERRUPTING RATING AMPERES			RECLOSER STYLE NO.	COIL ASSY. STYLE NO.
		2.4—7.5 KV	15 KV	23 KV		
25	50	1000	1000	500	1534 500	1534 618
35	70	1500	1500	750	1534 501	1534 619
50	100	2500	2000	1250	1534 502	1534 620
70	140	2500	2000	1250	1534 503	1534 621
100	200	2500	2000	1250	1534 504	1534 622

* Oil capactiy—6 gallons
Net weight with oil, less bracket—115 pounds
Shipping weight with oil and bracket—135 pounds
Crossarm Mounting Bracket—Style No. 1446 066
Direct-to-Pole Mounting Bracket—Style No. 1446 067
Extended Pole Mounting Bracket—Style No. 1446 068

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