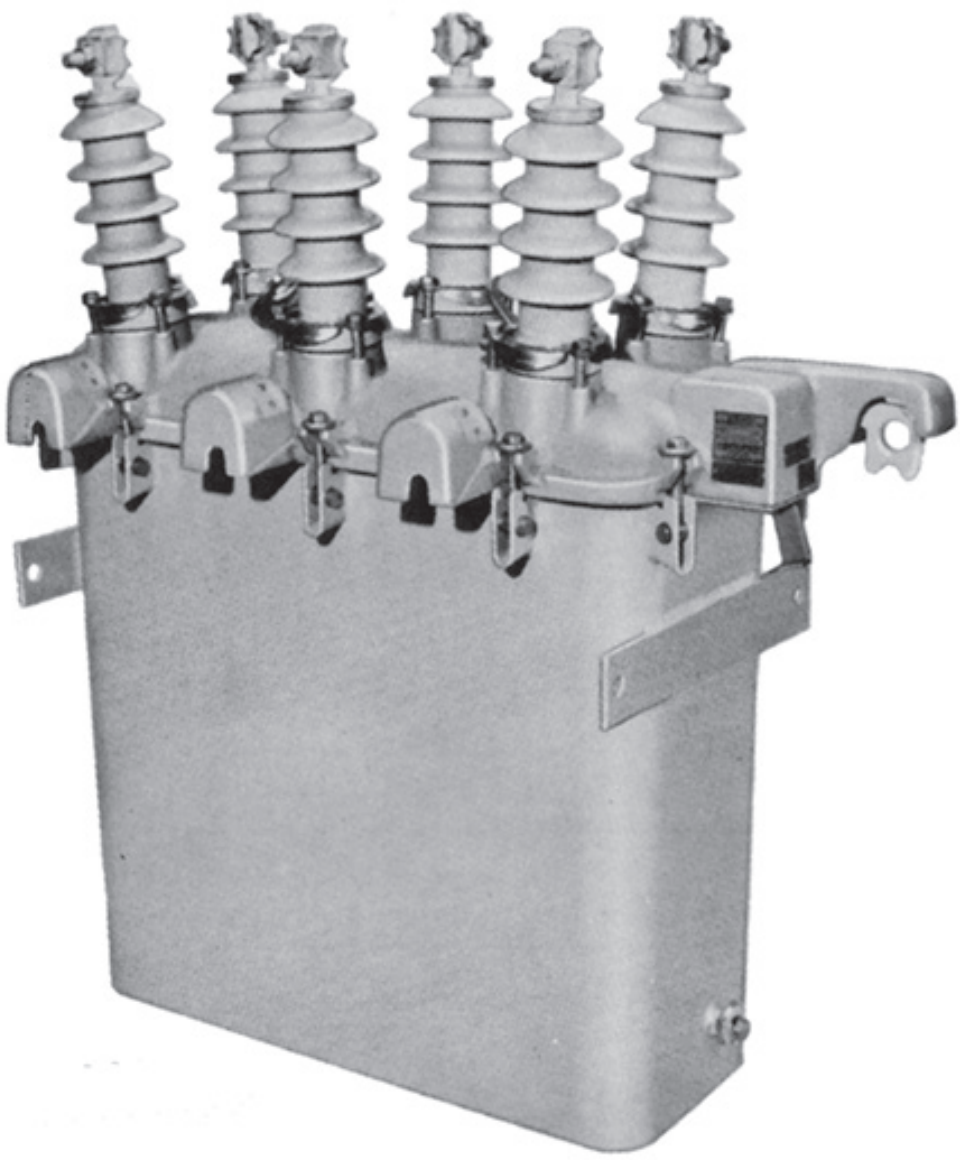
Type 6H and V6H maintenance instructions



Powering Business Worldwide

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Contents

Safety for life

Eaton's Cooper Power series products meet or exceed all applicable industry standards relating to product safety. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Eaton employees involved in product design, manufacture, marketing, and service.

We strongly urge that you always follow all locally approved safety procedures and safety instructions when working around high voltage lines and equipment and support our "Safety For Life" mission.

Safety information

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only competent technicians, who are familiar with this equipment should install, operate, and service it.

A competent technician has these qualifications:

- Is thoroughly familiar with these instructions.
- Is trained in industry-accepted high- and low-voltage safe operating practices and procedures.
- Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.
- Is trained in the care and use of protective equipment such as flash clothing, safety glasses, face shield, hard hat, rubber gloves, hotstick, etc.

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Hazard Statement Definitions

This manual may contain four types of hazard statements:

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in equipment damage only.

Safety instructions

Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

DANGER

Hazardous voltage. Contact with high voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high- and low-voltage lines and equipment. G103.3

WARNING

Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling or maintenance can result in death, severe personal injury, and equipment damage. G101.0

WARNING

This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply may result in death, severe personal injury and equipment damage. G102.1

WARNING

Power distribution and transmission equipment must be properly selected for the intended application. It must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install, or maintain power distribution and transmission equipment can result in death, severe personal injury, and equipment damage. G122.3

Product information

Introduction

Service Information MN280050EN covers the maintenance instructions for the Types 6H and V6H hydraulically controlled three-phase reclosers. This includes their general description, operating principles, and instructions for periodic inspection, testing, trouble shooting, and shop repairs. A service-parts list keyed to an exploded-view drawing of the equipment is included at the back of the manual.

Additional information

These instructions cannot cover all details or variations in the equipment, procedures, or process described, nor provide directions for meeting every possible contin gency during installation, operation, or maintenance. For additional information, contact your Eaton representative.

Quality standards

ISO 9001-Certified Quality Management System.

Description

The Types 6H (oil interrupter) and V6H (vacuum interrupter) reclosers are self-contained devices that sense and interrupt single-phase or three-phase fault on a distribution circuit. Independent operation of the three interrupting mechanisms allows single-phase tripping. If the fault is temporary, the device automatically recloses to restore service and then resets for another series of operations. If the fault is permanent, all three interrupting mechanisms are locked out simultaneously after the flrst, second, third or fourth trip operation depending upon the setting. Once locked out, the recloser must be manually reset to restore service.

Operating sequences of the recloser can be all fast, all retarded, or a combination of fast operations followed by retarded operations. Fast operations (no intentional delay in interrupting the circuit) are used to clear temporary faults before branch-line fuses are damaged. Retarded operations (delay inversely proportional to the magnitude of the fault) are used to allow fault current to flow long enough to be cleared by branch-line fuses. Subsequent reclosure restores service to the unfaulted portion of the circuit and confines outages to shorter sections of the line.

Specification and ratings

Table 1. Voltage ratings

Nominal system voltage, kv rms	14.4
Rated maximum voltage, kv rms	15.5
Rated impulse withstand voltage (BIL), kv crest	110
60-hertz withstand, kv rms	
Dry, one minute	50
Wet, 10 seconds	45
Reclosing time, seconds	
Type 6H recloser	1-1/2
Type V6H recloser	1
Bushing creepage distance, inches	10-7/8

Table 2. Current ratings

Trip coil ratings, continuous (amps)	Minimum trip ratings (amps)	Interrupting ratings (rms symmetrical amps)		
		4.8 kV	8.32 kV	14.4 kV
Type 6H, 100 amps maximum				
5	10	200	200	200
10	20	400	400	400
15	30	600	600	600
25	50	1000	1000	1000
35	70	1400	1400	1400
50	100	2000	2000	2000
70	Q	2800	2500	2000
100	200	3000	2500	2000
Type V6H, 200 amps maximum				
5	10	200	200	200
10	20	400	400	400
15	30	600	600	600
25	50	1000	1000	1000
35	70	1400	1400	1400
50	100	2000	2000	2000
70	140	2800	2500	2000
100	200	3000	2500	2000
140	280	3000	2500	2000
200	400	3000	2500	2000

Table 3. Duty cycle

Type	Percent of interrupting rating	X/R Ratio	Number of unit operations
6H	15-20	2	32
	45-55	5	24
	90-100	10	12 Total 68
V6H	15-20	2	128
	45-55	5	96
	90-100	10	48 Total 272

Recloser operation

Electrical operation of the recloser is initiated by a trip solenoid mechanism in each phase of the recloser. Each mechanism operates independently to open and reclose only its own phase during a fault-clearing operation. However, when any one mechanism reaches lockout, all three mechanisms are tripped simultaneously to effect three-phase lockout.

The trip solenoid coil of each mechanism is connected in series with one phase of the distribution circuit and is protected from transient surges by a bypass gap. When the current through the coil approaches twice the normal current rating of the recloser, the increased magnetic field pulls the solenoid down into the coil. As the plunger moves downward, it trips open its set of contacts to open the phase circuit and interrupt the fault. The trip coil deenergizes, the plunger is released, and the contacts reclose to restore service. Up to a maximum of four trip operations can be performed before the recloser locks out all three phases. Then, it must be reset manually to restore service.

The operating sequence of the Types 6H and V6H reclosers is governed by a hydraulic system which utilizes the surrounding insulating oil in timing and counting operations. For a normal sequence of two fast operations followed by two retarded operations, the hydraulic counting and timing mechanism functions as follows:

First operation

As the plunger is drawn down by the solenoid coil, the lower end trips the contact assembly to open the contacts. At the same time, the plunger displaces the oil in the plunger cylinder. The displaced oil raises the slide valve and escapes through a port above the trip piston (Figure 2).

The pump piston, connected to the plunger by a lever arrangement also moves downward and forces a charge of oil under the trip piston. This charge displaces the trip piston a measured amount. A ball-check valve retains the charge in the trip piston. The quantity of oil in the charge can be regulated by changing the effective length of the pump piston.

Opening the contacts breaks the circuit and de-energizes the solenoid coil. Contact operating springs force the plunger back to its normal position and close the contact assembly. As the plunger moves upward, Figure 3, oil is drawn back into the plunger cylinder, causing the slide valve to move down and block the port to the trip piston cylinder. Thereafter, oil flows slowly through the small port in the slide valve. This slow oil flow retards the return of the plunger to its normal position, causing a delay of approximately one or 1-1/2 seconds before the contacts close.

Second operation

If the fault still exists after the contacts close, the recloser recycles. This second operation is similar to the first, except the second charge of oil from the pump raises the trip piston high enough to block the escape port in the slide-valve cylinder.

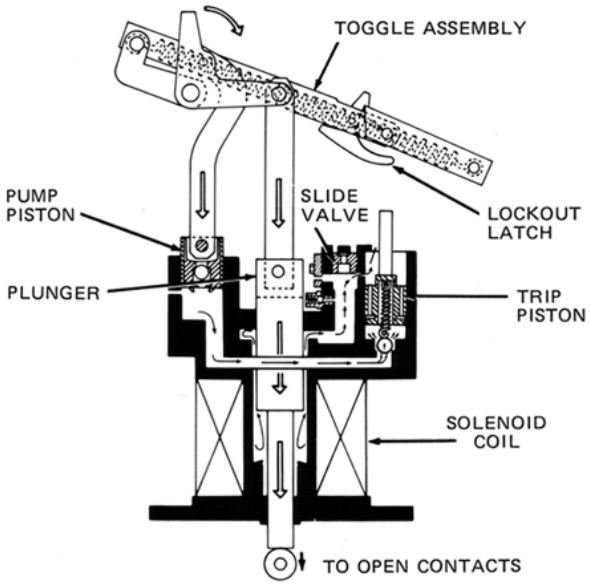

Figure 1. Magnetic force of coils pulls plunger down

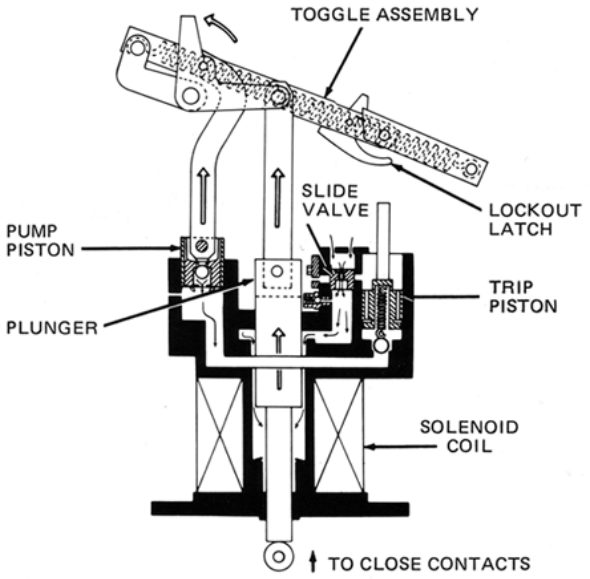

Figure 2. Plunger returns to normal position

Third operation

If the fault still exists after the contacts close the second time, the recloser again recycles. During this third operation, Figure 4, travel of the plunger down into the coil is impeded by the oil. Oil displaced by the plunger raises the slide valve, but it cannot flow out through the blocked escape port. The oil must flow around the plunger and through the orifice in the timing plate. Slowing the downward movement of the plunger causes a delay in opening the contacts to produce the retarded trip operation.

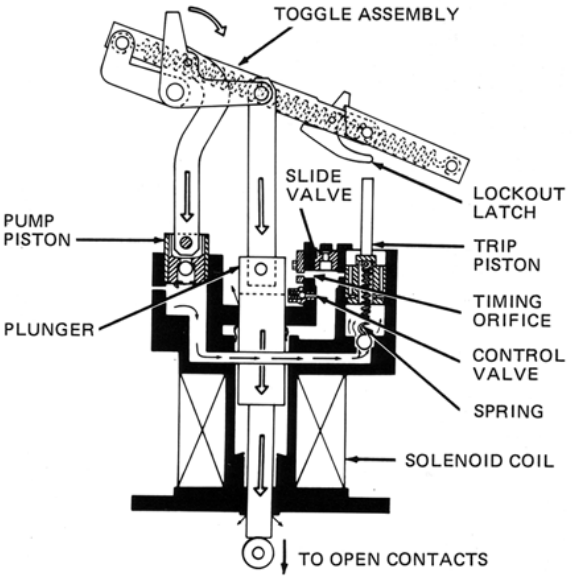

Figure 3. Magnetic force pulls plunger down for third operation which is retarded by blocked escape port

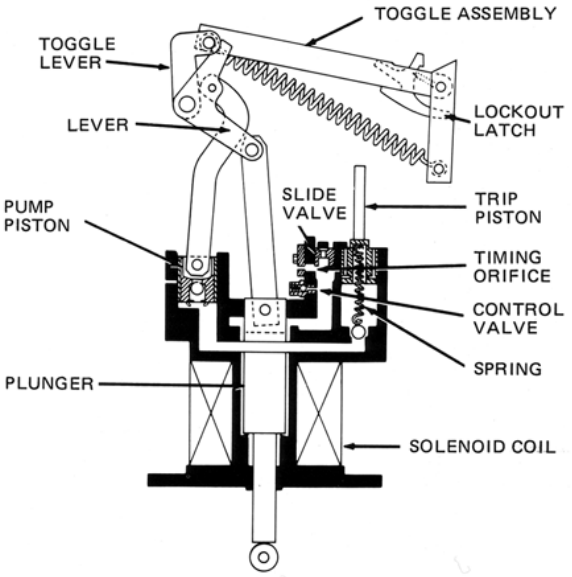

Figure 4. Fourth operation causes lockout as trip piston strikes lockout latch

If the fault current is high, enough pressure will be developed by the plunger to open the spring-loaded control valve in the trip-piston cylinder and provide an additional escape port for the oil. This produces the inverse time current characteristic of the retarded trip operation.

As the plunger moves downward, a third charge of oil is forced under the trip piston, raising it another measured amount in its cylinder.

Fourth operation

If the fault is still present after the third reclosure, the recloser performs a fourth operation. The fourth operation is a retarded trip operation similar to the third. However, the fourth charge of oil produced by the pump raises the trip piston the remaining distance required to trip the lockout latch (Figure 5).

This latch releases the toggle which operates the lockout bar to open all three phases simultaneously. The yellow operating handle of the recloser must be closed manually to reset all three toggle assemblies and close the recloser contacts.

During lockout, the trip piston, aided by its spring, settles to the bottom of its cylinder. The recloser is ready to perform another operating sequence as soon as the contacts are manually closed.

If the fault clears before lockout is reached, all mechanical operations cease after the contacts close on the first successful reclosure. The trip piston settles to the bottom of its cylinder and the recloser is ready to start another operating sequence when a fault occurs again. The settling of the trip piston enables the recloser to "forget" that a temporary fault had occurred. Settling time is approximately one minute per operation at a 70 F ambient.

Periodic inspection and maintenance

⚠ CAUTION

This equipment requires routine inspection and maintenance to ensure proper operation. If it is not maintained, it can fail to operate properly. Improper operation can cause equipment damage and possible personal injury. G105.1

The frequency of maintenance depends upon local climate conditions and the severity of the operating service imposed on the recloser. Eaton recommends that, initially, a maintenance check should be made after one year of service, or the completion of a standard duty cycle, whichever occurs first. A study of maintenance records for similar equipment and the results of the initial inspection can then be used to establish routine maintenance intervals.

American National Standards ANSI C37.61-1973, "Guide for the Application, operation and Maintenance of Automatic Circuit Reclosers," gives a procedure for evaluating the actual operating duty of an oil recloser in terms of its standard duty cycle.

Note: See Recloser Modernization at the end of this section before starting these procedures.

Inspection procedure

Each periodic maintenance check should include at least the following steps:

1. Bypass and remove the recloser from service.
2. Inspect external components.

A. Check for broken or cracked bushings, paint scratches, and other mechanical damage.

B. Note the counter reading and enter into the record log.

C. Close and trip the recloser manually several times to check manual operation. Leave the recloser in the open position.

3. Loosen the bolts that secure the head casting and remove the mechanism from the tank. (The gasket seal can be broken by carefully prying apart the head and tank.) Allow the oil to drain off the mechanism.

4. Clean all internal components.

   A. Remove all traces of carbon by wiping with a clean, lint-free cloth.

   B. Flush mechanism with clean, dry transformer oil.

5. Inspect contacts and interrupting structures.

⚠ CAUTION

Dielectric failure, equipment damage. Never use volatile solutions, detergents, or watersoluble cleaners when cleaning the interior of this equipment. These cleaners will contaminate the insulating oil, reducing its dielectric strength. Operation with contaminated insulating oil can result in internal flashovers that will cause equipment damage and possible personal injury. T201.2

For 6H recloser:

A. Slight pitting and discoloration can be dressed with crocus cloth.

B. Replace moving contacts and interrupting structures if they are severely eroded.

For V6H recloser:

See **Vacuum Interrupter Check** in this section.

6. Inspect tank liners. Soft or spongy areas indicate that water has been absorbed. Replace liners if this condition exists.

7. Check the dielectric strength of the insulating oil.

⚠ CAUTION

This equipment relies on dielectric fluid to provide electrical insulation between components. The dielectric strength of the fluid must be checked on a regular basis, as part of the routine maintenance inspection, to ensure that it is at or above minimum dielectric requirements. Use of this equipment with dielectric fluid that does not meet minimum requirements can result in internal flashovers that will damage the equipment and can cause personal injury. G107.3

A. The dielectric strength should not be less than 22 kv when tested with a 0.1-in. gap in accordance with methods specified in ASTM D-117.

B. Low dielectric strength usually indicates the presence of water or carbon deposits.

8. If oil must be replaced, drain the tank and clean out all sludge or carbon deposits.

9. With the mechanism removed, fill the tank with clean insulating oil to the level marked on the tank liner.

   Capacity is approximately 21 gallons. Use only new or like-new reconditioned transformer oil which conforms to the specifications in Reference Data TD280022EN, "Oil Specifications and Test."

10. Examine head gasket. Replace the o-ring gasket if it has taken a permanent set.

11. Replace the mechanism in the tank.

    A. Replace the head bolts and torque to 11 to 16 ft-lbs.

Clamping forces must be applied gradually and equally, in rotation, to each bolt. This results in evenly distributed gasket sealing pressure.

B. Operate the recloser manually approximately eight times to expel all air from the hydraulic system.

C. See Testing section to check for proper operation before returning recloser to service.

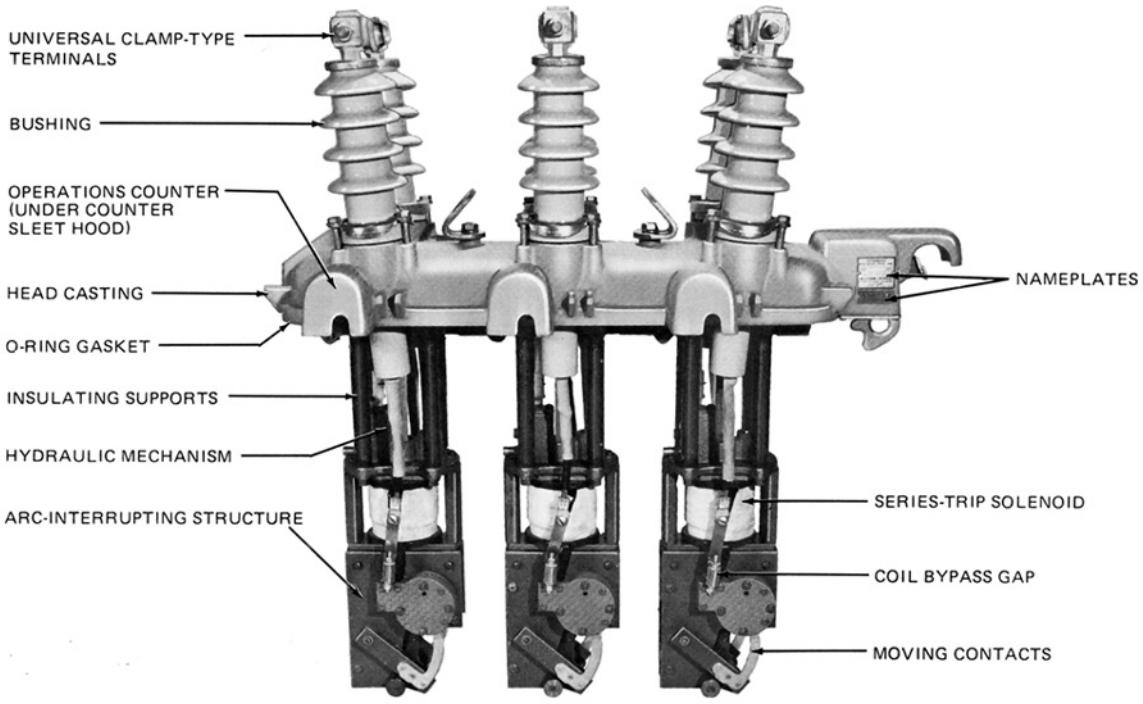

Figure 5. Identification of major assemblies-type 6H recloser

Oil condition

Oil plays an important role in the proper functioning of the recloser. It provides the internal insulation barrier from phase to ground, it acts as the timing and counting medium, and, in the 6H recloser, it acts as an arc quencher. For effective recloser operation, the oil must be replaced before it deteriorates below a safe level. Oil that has been contaminated with carbon sludge or has a dielectric strength of less than 22 kv should be replaced.

New oil should always be filtered before using even though it may be obtained from an approved source. Passing the oil through a blotter press will remove free water and solid contaminants such as rust, dirt, and lint. When filtering the oil, aeration should be kept to a minimum to prevent moisture in the air from condensing in the oil and lowering its dielectric strength.

Used oil must be treated before reusing. Filtering may remove absorbed and free water and other contaminants to raise the dielectric strength to acceptable levels. However, filtering does not always remove water-absorbing contaminants and the dielectric strength of the oil may fall rapidly after being returned to service. Therefore, the recloser should be filled with new oil or oil that has been restored to like-new condition.

Vacuum interrupter check

⚠ CAUTION

Radiation. At voltages up to the specified test voltages, the radiation emitted by the vacuum interrupter is negligible. However, above these voltages, radiation injurious to personnel can be emitted. See Service Information S280-90-1, Vacuum Interrupter Withstand Test Voltage Ratings Information for further information. G109.2

⚠ CAUTION

Equipment damage. Never operate a vacuum recloser with a dc test source. The vacuum interrupters will be severely damaged if a dc arc interruption is attempted. T229.1

Vacuum integrity

The following procedure may be used to check the vacuum integrity of the interrupter.

1. With the unit installed in its oil-filled tank, pull down the yellow operating handle to make sure the recloser is open.
2. Perform a hi-pot test across the bushings of each phase of the open recloser at 37.5 kv ac rms.

3. The interrupter should withstand the specified test voltage for one minute and should not load down the test source.
4. Replace any interrupter failing to meet this test.

Contact erosion

With the mechanism removed from its tank and the recloser closed (yellow operating handle up), check the distance, dimension X in Figure 7, between the interrupter bracket and the larger diameter of the stepped shaft. If dimension X is less than 13/16-inch, the interrupter must be replaced.

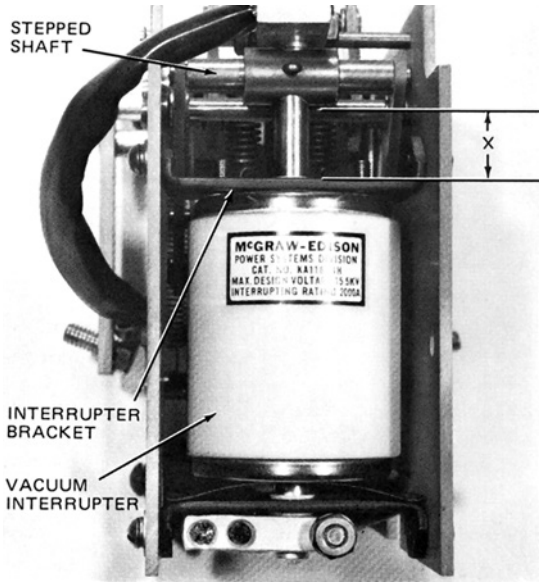

Figure 6. Measurement of contact erosion

Recloser modernization

(Applicable to Type 6H reclosers below serial no. 11084 and Type V6H reclosers below serial no. 872).

During the past years of production, a number of product improvements have been incorporated into the design of Types 6H and V6H reclosers to further improve product reliability. For the Type 6H recloser, these design changes affect the contact box assembly (130, Figure 28), the solenoid frame assembly (103) and the plunger part of the plunger and link assembly (84). For the Type V6H recloser, these design changes affect the plunger only. It is recommended that applicable reclosers be modernized to incorporate these product improvements when they are next removed from service for routine maintenance.

Reclosers, serial numbers 6H/11084 and above and V6H/872 and above, include these design improvements and need not be modernized.

The amount of modernization required for any individual recloser will depend upon how long ago the recloser was manufactured and whether any of these improvements have already been incorporated, either in the field or at the factory.

The following descriptions will help identify the amount of modernization required for each individual recloser.

Contact box (type 6h)

Among the various changes made, the width of the rectangular slots in the stationary contact chambers for entrance of the moving contacts has been enlarged from 1/4 inch to 5/16 inch to allow additional clearance for the moving contacts. Replace all three contact box assemblies (KA4H4) if the slots measure less than 3/4 x 5/16 inch.

Solenoid frame assy. (Type 6h)

The bridge plate (120, Figure 28) has been drilled and pinned to the solenoid frame (103) to improve plunger alignment. To assure proper alignment, return all three solenoid frame and bridge assemblies to the factory for drilling and pinning.

Plunger assembly (types 6h/v6h)

To eliminate the possibility of plunger hang-up, design changes have been made in the plunger and plunger stop to improve alignment and decrease the bearing surfaces. This product improvement can be identified by the amount of lateral play in the guide rod of the plunger assembly. The lateral play has been reduced from about 1-3/4 inch to less than 1/8 inch as measured at the tip of the plunger guide rod.

A plunger and plunger stop field-modification kit (KA7OSH4-1) is available. Three kits—one for each phase - are required for Types 6H and V6H reclosers. Installation instructions are included with the kit.

Testing

Two simple tests can be performed to determine if the recloser is operating properly. These tests should be adequate for most users. For a more detailed explanation of low-voltage a-c testing procedures refer to Reference Data R280-90-2, "Low-Voltage A-C Testing of Hydraulic Reclosers."

Mechanical operation test

To check the number of operations to lockout and the number of fast and retarded operations, the following mechanical-operation test can be performed:

1. Move the yellow manual operating handle to the CLOSED position and wait at least three minutes to be sure the trip piston is fully reset.
2. Move the operating handle to the OPEN position and listen for the opening of the main contacts. Move the handle to the CLOSED position and repeat this cycling until lockout occurs.

3. When lockout occurs, the unlatching of the lockout mechanism can be heard. In addition, for a short time afterwards, the yellow manual operating handle cannot be latched in the CLOSED position.
4. During fast operations the contacts open immediately after the handle is moved to the OPEN position. On delayed openings, a noticeable slowing of the handle movement can be observed until contacts open.

Minimum-trip-current test

To perform the minimum-trip-current test:

1. Connect a low-voltage variable-current source across one set of recloser terminals as shown in Figure 8.
   A. Ratio and kVA size of the transformer (T1) will depend upon the size of the recloser trip coil.
   B. Table 4 shows the test voltage and kva requirements for all ratings of the recloser. This table is based on a 4-times-current-rating test circuit capacity to minimize the effects of an increasing series solenoid inductance as the trip circuit is activated.

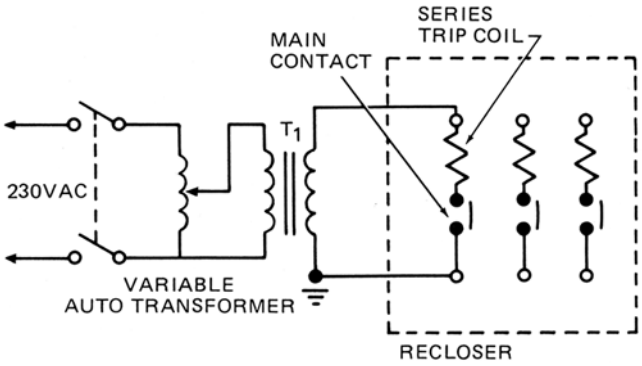

Figure 7. Test-circuit diagram

Table 4. Recloser test circuit power requirements for minimum trip-current test

Coil rating (amps)	Test circuit current (amps) (4 X Coil Rating)	Voltage required	Test KVA (Short-time)
5	20	750	15
10	40	375	15
15	60	245	14.7
25	100	150	15
35	140	110	15.5
50	200	75	15
70	280	55	15.5
100	400	40	16.0
140	560	30	16.8
200	800	20	16.0

2. Close the recloser by moving the yellow operating handle to CLOSE. Wait at least three minutes to make sure the trip piston is completely reset.
3. Slowly raise the variable-autotransformer voltage.from zero and note the maximum ammeter reading needed to trip the recloser.
4. As the trip-solenoid plunger starts to move, the trip coil impedance will start to rise and cause a decrease in current. The maximum reading before the current decrease is the minimum trip current.
5. Repeat the test on the other two phases of the recloser.

Shop maintenance procedures

The operations described in this section should be performed under the cleanest conditions possible. The repair work, except for bushing replacement, will be simplified if the work bench is arranged so the mechanism can be inverted (bushings down). No special tools are required for any of the repair procedures.

Bushings

Bushing maintenance generally consists of cleaning the bushings thoroughly and examining them carefully for cracks while the recloser is untanked for servicing. Cracked or broken bushings must be replaced.

A bushing can be replaced with the recloser either tanked or untanked. The following criteria should be used as a guide.

- If the bushing has been damaged in service or while in storage, the recloser should be untanked. Water or other contaminants may have entered the tank (check the tank liner and test the condition of the oil), the bushing lead could be damaged (either mechanical damage or from flashover), or pieces of porcelain may be in the tank.
- If the bushing porcelain is accidentally chipped during installation or maintenance and it is obvious that no other damage has been done, it is not necessary to untank the recloser to replace the bushing porcelain.

Bushing replacement with the recloser untanked

⚠ CAUTION

Equipment damage. Recloser must be open (yellow operating handle, under sleet hood, down) before untanking. Tripping the mechanism out of oil will cause excessive mechanical shock to the operating mechanism, which will cause accelerated wear and/or damage to the mechanism. T202.0

1. Untank the recloser and disconnect the appropriate bushing lead.
   A. Disconnect the long lead at the arc interrupting chamber.
   B. Disconnect the short lead at the solenoid coil.

2. Remove the three hex-head capscrews and bushing clamps that secure the bushing to the head casting and lift out the entire bushing assembly up through the head.
3. Remove and discard the lower bushing gasket.

⚠ CAUTION

Bushing damage. The split aluminum ring must be replaced if damaged. The clamping ring cushions and distributes the pressure between the bushing flange and the bushing. If bushing clamps are assembled without a new clamping ring, the bushing may be damaged when clamp hardware is tightened T234.1

4. Twist off the aluminum clamping ring from the old bushing. If it is in good condition, install it on the new bushing porcelain. If the ring is damaged, a new clamping ring must be installed.

Note: The clamping ring cushions and distributes the pressure between the porcelain and the clamps and must not be omitted.

5. The complete bushing assembly can be replaced or porcelain only can be installed. If new porcelain only is to be installed, proceed as follows:
   A. Unscrew the bushing terminal assembly and withdraw the lead assembly from the bottom of the porcelain.
   B. Remove and discard the upper bushing gasket. C. Insert the lead assembly all the way into the new porcelain until the locking key on the lead is seated in the porcelain.
   C. Insert the lead assembly all the way into the new porcelain until the locking key on the lead is seated in the porcelain.
   D. Reassemble the bushing terminal assembly to the lead using a new terminal gasket.

Note: Apply a very small amount of petrolatum jelly to the inside face of the terminal before reassembling to the bushing. It is necessary to cover the knurled surface only.

6. Reinstall the bushing assembly (new or reworked) into the head using a new gasket between the bushing and head casting. Position the bushing with the stud end of the terminal pointing outward.
7. Position the aluminum clamping ring with the split in the ring centered between two clamping bolts.

⚠ CAUTION

Dielectric failure, bushing damage. To prevent gasket leaks or bushing damage, clamping force must be applied gradually and equally in rotation to each bolt. If the clamping force is not evenly applied, seal leakage can result, compromising the dielectric capabilities of the recloser and can cause possible personal injury. Unequal clamping force can cause bushing breakage. T235.2

8. Reassemble the bushing clamps and tighten the capscrews evenly, a little at a time, to a torque of 6-10 ftlbs.
9. Reconnect the bushing leads.

Porcelain bushing replacement with the recloser tanked

1. Unscrew the bushing terminal and discard the terminal gasket.
2. Remove the bushing clamps; lift the porcelain out of the head casting; remove and discard the lower bushing gasket.

⚠ CAUTION

Bushing damage. The split aluminum ring must be replaced if damaged. The clamping ring cushions and distributes the pressure between the bushing flange and the bushing. If bushing clamps are assembled without a new clamping ring, the bushing may be damaged when clamp hardware is tightened T234.1

3. Transfer the aluminum clamping ring from the old to the new porcelain. Replace the ring if it is damaged.
4. Install a new lower bushing gasket.
5. Tie a string to the lead, thread it through the porcelain, and pull the lead through the bushing as it is inserted into the head, until the locking key on the lead is seated.
6. Install a new terminal gasket and reassemble the terminal to the bushing.

Note: Apply a very small amount of petroleum jelly to the inside face of the terminal before reassembling to the bushing. It is necessary to cover the knurled surface only.

7. Position the aluminum clamping ring with the split in the ring centered between two clamping bolts.

⚠ CAUTION

Dielectric failure, bushing damage. To prevent gasket leaks or bushing damage, clamping force must be applied gradually and equally in rotation to each bolt. If the clamping force is not evenly applied, seal leakage can result, compromising the dielectric capabilities of the recloser and can cause possible personal injury. Unequal clamping force can cause bushing breakage. T235.2

8. Reassemble the bushing clamps and tighten the capscrews evenly, a little at a time, to a torque of 6-10 ftlbs.

Note: Clamping forces must be applied gradually and equally, in rotation, to each bolt. This results in an evenly distributed gasket sealing pressure.

Contact box assembly (type 6h)

For purposes of this discussion, see Figure 9.

Fault current is interrupted by an oil-quenched arc-interrupting structure consisting of two interrupting chambers connected by a cross-blast tube. Circuit opening is accomplished by a double, spring-loaded, moving contact assembly.

If contacts are badly burned or do not close completely, both interrupting-chamber assemblies, the cross-blast tube, and the moving-contact assembly must be replaced. Proceed as follows:

Removal of contact-box assembly:

⚠ CAUTION

Equipment damage. Recloser must be open (yellow operating handle, under sleet hood, down) before untanking. Tripping the mechanism out of oil will cause excessive mechanical shock to the operating mechanism, which will cause accelerated wear and/or damage to the mechanism. T202.0

1. Lock in the operating mechanism by closing the yellow operating handle.
2. Disconnect the long bushing lead from one side of the interrupter structure.

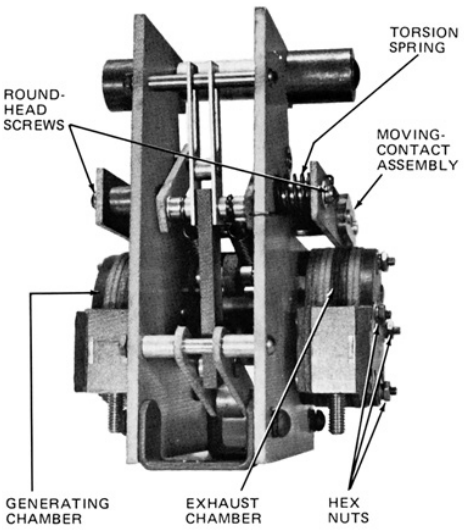

Figure 8. Type 6H contact-box assembly

3. Disconnect the coil lead and bypass gap from the other side of the interrupter structure.
4. Remove the two hex-head bolts that secure the arc interrupting structure to the solenoid frame and remove the structure.

Note: To prevent inadvertent tripping of the operating mechanism, lock out the mechanism. While securely holding the yellow operating handle in the closed position, trip all three lock-out latches (Figure 21) and then slowly release the operating handle.

5. Holding the moving contacts open, loop a light cord to the contact spring at the end farthest from the crossblast structure (Figure 10) and unhook both springs. Do not stretch the springs any further than required for removal.
6. Unhook the torsion spring and remove the two roundhead screws, lockwashers, flat washers, and pivot bearings to free the moving contact arm assembly. Remove the assembly.

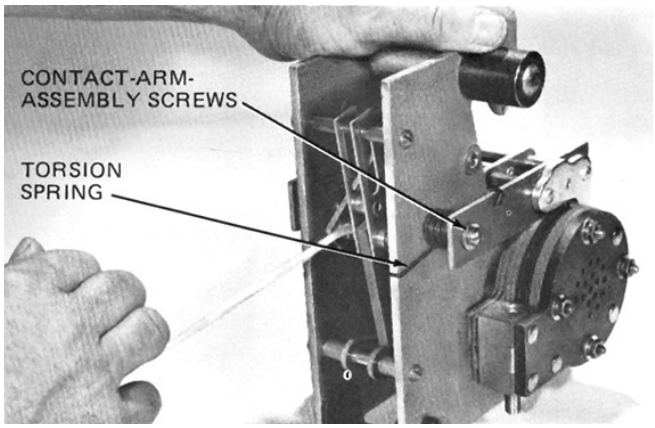

Figure 9. Releasing contact springs

7. Remove the four hex nuts, lockwashers, and flat washers that secure the exhaust and generating chambers to the contact-box assembly and remove both chambers by sliding them off the mounting bolts. Figure 11 shows the exhaust chamber removed from the contact-box assembly. Note the position of the insulating spacers.
8. Remove the cross-blast tube. Remove and save the fibre dowel before discarding the tube.

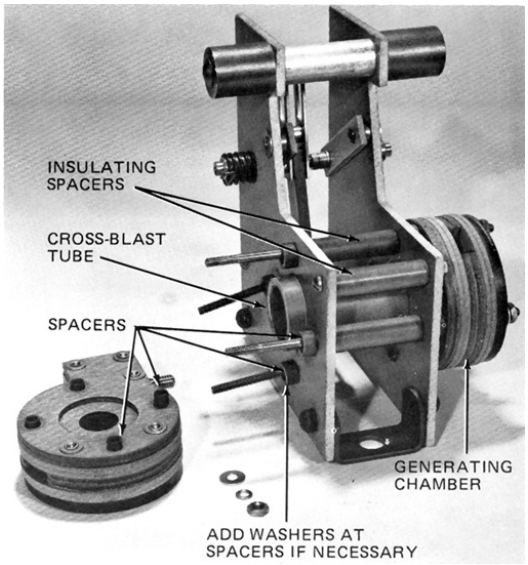

Figure 10. Partially assembled contact box

Reassembly of the contact-box assembly:

1. Assemble the fibre dowel to the new cross-blast tube and install the tube into the contact box. Make sure the dowel is secured in the notch on the side plate.
2. Assemble the interrupting chambers and the moving contact assembly by reversing steps 5, 6 and 7 above.

Note: After reassembling the contact-box assembly, check for completely free entry of the moving contacts into the stationary-contact housing. Use No. 10 plain brass washers to adjust the position of the stationary-contact housing with respect to the moving contact (Figure 11).

Installation of the contact-box assembly:

Note: If further maintenance is to be performed, do not reinstall the arc-interrupting structure.

1. Lock in the operating mechanism by closing the yellow operating handle.
2. Install the contact-box assembly and secure with the two hex-head bolts.
3. Reconnect the coil lead and bypass gap to the generating chamber.
4. Reconnect the long bushing lead to the exhaust chamber.
5. Manually open and close the mechanism several times to check the operation of the arc-interrupter assembly.

Vacuum contact box assembly (Type V6H) replacement

For purposes of this discussion, see Figure 12.

Current is generally interrupted in less than one-half cycle by the vacuum interrupter. Circuit opening is accomplished by a spring-loaded contact assembly operating in a high vacuum chamber.

When the vacuum interrupter is to be replaced because of contact wear (dimension X in Figure 7 is less than 13/16 inch) replace the entire contact-box assembly. If, however, replacement is required because of vacuum interrupter failure (physical damage, loss of vacuum) the vacuum interrupter only can be replaced.

Note: Before attempting to replace the vacuum interrupter, check that the contact-box assembly has a 1/4-inch. diameter hole near the bottom edge of both side plates (Figure 12). Units without the hole are of an earlier design in which the interrupter only cannot be replaced (replace the entire contact-box assembly). Units with the hole are of a later design in which the vacuum interrupter only can be replaced.

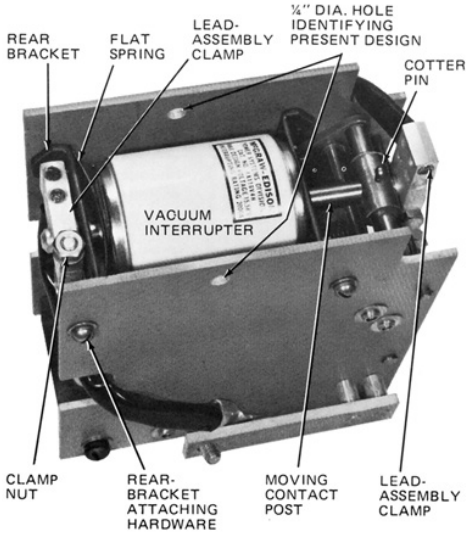

Figure 11. Type V6H vacuum contact-box assembly

Replacement of the entire vacuum contact-box assembly:

⚠ CAUTION

Equipment damage. Recloser must be open (yellow operating handle, under sleet hood, down) before untanking. Tripping the mechanism out of oil will cause excessive mechanical shock to the operating mechanism, which will cause accelerated wear and/or damage to the mechanism. T202.0

1. Lock in the operating mechanism by closing the yellow operating handle.
2. Disconnect the long bushing lead from one side of the interrupter structure.
3. Disconnect the lower coil lead and bypass gap from the other side of the interrupter structure.
4. Remove the two hex-head bolts that secure the vacuum contact-box assembly to the solenoid frame and remove the vacuum contact-box assembly.

Note: To prevent inadvertent tripping of the operating mechanism, lock out the mechanism. While securely holding the yellow operating handle in the closed position, trip all three lock-out latches and then slowly release the operating handle.

Reassembly of the vacuum contact-box assembly:

Note: If further maintenance is to be performed, do not reinstall the arc-interrupter structure.

1. Lock in the operating mechanism by closing the yellow operating handle.
2. Install the contact-box assembly and secure with the two hex-head bolts.

Note: See Figure 13 for proper orientation of the vacuum contact-box assemblies. Note that the contact box nearest the operating handle is mounted opposite to the other two phases.

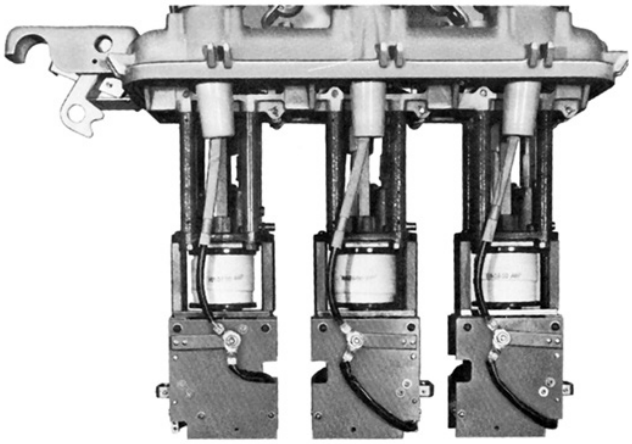

Figure 12. Orientation of contact-box assemblies-type V6H

3. Reconnect the coil lead and bypass gap to one side of the interrupting structure.
4. Reconnect the long bushing lead to the other side of the structure.
5. Manually open and close the mechanism several times to check the operation of the arc-interrupter assembly.

Replacement of vacuum interrupter only, proceed as follows:

CAUTION

Equipment damage. Do not twist or apply radial pressure to the vacuum interrupter movable contact rod. Excessive twisting or pressure on the contact rod will damage the interrupter bellows, which can cause equipment failure. T211.0

1. Remove the lead assemblies from each end of the vacuum interrupter by loosening the clamping nuts and prying open the clamps.
2. Remove the cotter pin which attaches the movable contact rod to the operating linkage.
3. Remove the rear bracket by removing the two attaching screws, lockwashers, and flat washers.
4. Remove the flat spring and withdraw the vacuum interrupter.
5. Install a new interrupter and reassemble the structure in the reverse order of disassembly.

Solenoid coil

Types 6H and V6H reclosers are constructed so that solenoid coils of different ampere ratings are interchangeable. To change a coil proceed as follows:

1. Remove the arc-interrupting structure.
2. Disconnect the short bushing lead and coil-gap assembly from the upper coil lead.
3. Remove the bridge plate, plunger stop, and lower solenoid gasket shown in Figure 14.

Note: On Type 6H reclosers above serial 11084 and Type V6H reclosers above serial 872, the bridge plate and plunger stop are assembled with a press fit. On reclosers with lower serial numbers the bridge plate and plunger stop are assembled with a loose fit.

Also note that the bridge plate is drilled and pinned to the solenoid frame in a factory fixture for optimum plunger fit. To obtain the most reliable operation do not intermix bridge plates, plungers, plunger stops, or other parts between individual mechanisms.

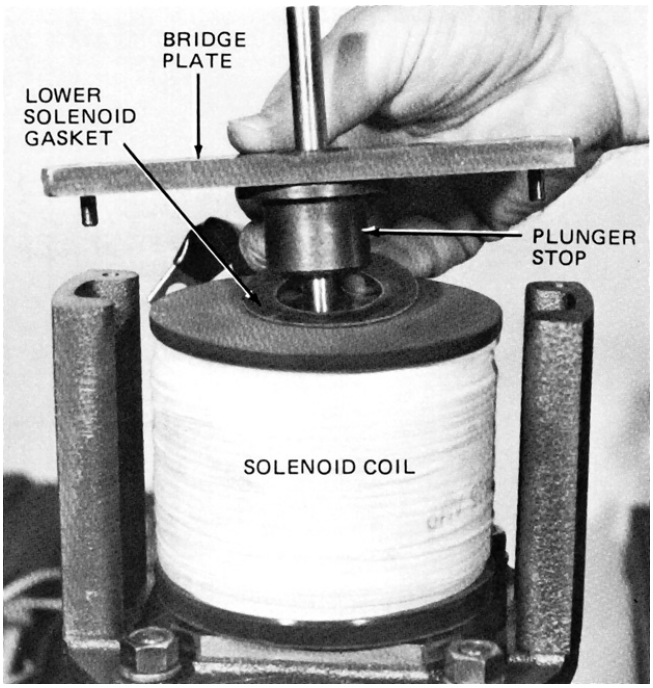

Figure 13. Removing bridge plate

4. Remove solenoid coil, upper solenoid gasket, and impact washer shown in Figure 15.

Note: Whenever the solenoid coil is replaced or reinstalled, the upper and lower solenoid gaskets must be replaced to maintain proper timing characteristics. Gaskets are included in the coil replacement kits.

5. Install solenoid coil of desired rating by reversing the above procedure. Make sure that the coil is installed with its leads on the same side of the recloser as the sleet hood and with the short coil lead connected to the short bushing lead and the long coil lead connected to the contact box.

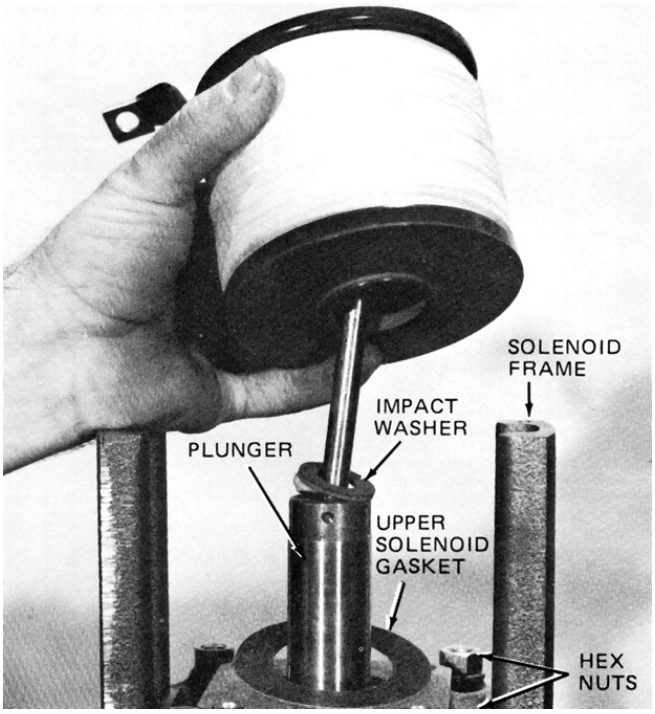

Figure 14. Removing solenoid coil

Solenoid frame and hydraulic mechanism

For purposes of this discussion, see Figures 16 and 17.

Normally, the components of the hydraulic timing and counting mechanism will require little or no maintenance. To disassemble the mechanism for cleaning, inspection, and possible replacement proceed as follows:

1. Remove the four hex nuts and lockwashers which attach the solenoid frame to the support stringers.

⚠ CAUTION

Equipment damage. Carefully support the plunger and piston when removing the piston or installing the solenoid frame assembly. If either the plunger or the pump piston are nicked or damaged, the recloser can misoperate or fail to operate. T209.1

2. Separate the solenoid frame from the support stringers. Cradle and support the plunger and pump piston during this step to prevent any damage to these components.
3. Remove the slide valve and spring by removing the two screws and lockwashers attaching the trip-piston stop and the slide-valve stop and gasket to the solenoid frame.

Note: Before disassembly, scribe a mark across the slidevalve stop and the adjacent solenoid frame to identify proper orientation during assembly.

4. Remove the timing plate, gasket, and the control valve assembly from the solenoid frame.
5. Remove the solenoid plate and gasket by removing the four flat-head screws.

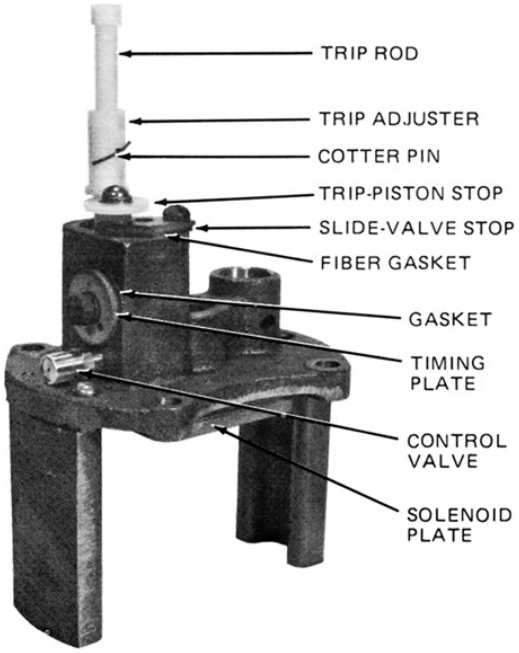

Figure 15. Solenoid frame and hydraulic mechanism assembly

⚠ CAUTION

Equipment damage. Do not over stretch the trip piston return spring when removing the piston assembly. Over stretching the spring can affect the sequence of operation and reset times. T210.0

6. Remove the trip-piston assembly:
   A. Using a wire hook, raise the check-valve ball seat out of the underside of the casting to expose the tension spring which is part of the trip-piston assembly.
   B. Insert a thin metal plate through the spring to release the spring tension on the ball-seat pin, as shown in Figure 18.
   C. Remove the ball-seat pin to disengage the spring and free the ball seat.

      Note: The steel ball inside the seat is free to drop out. Handle carefully to prevent nicking or scratching.

   D. Withdraw the thin plate from the spring and remove the trip-piston assembly.

The disassembled hydraulic-mechanism components are shown in Figure 19.

Thoroughly clean all parts and carefully inspect for nicks, scratches, or other damage. Include pump piston and plunger in the inspection. Replace as necessary.

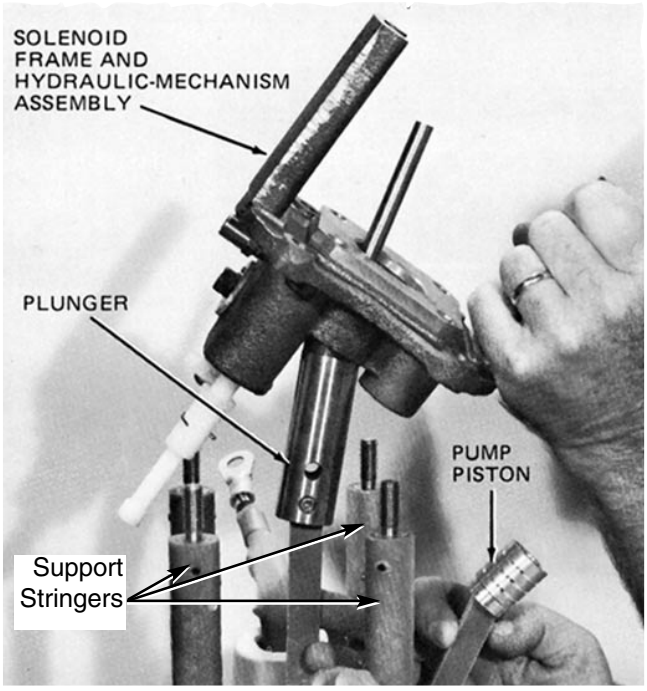

Figure 16. Removing hydraulic mechanism

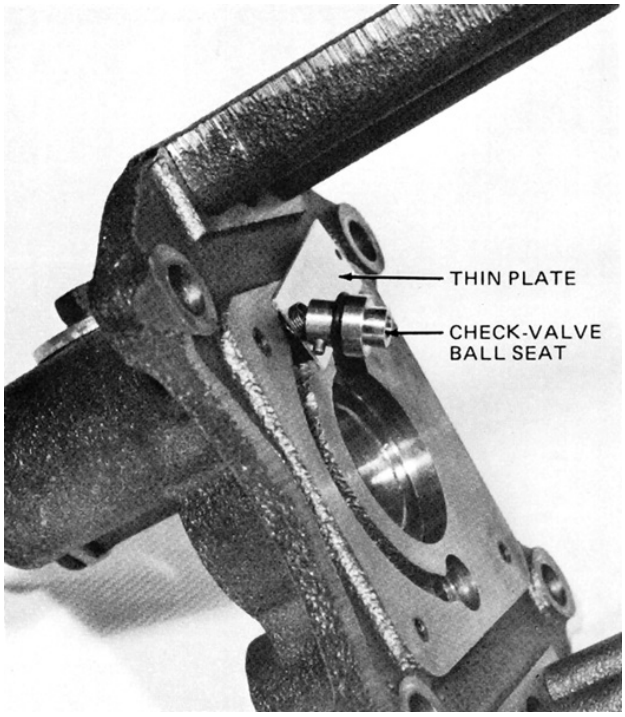

Figure 17. Removing trip piston assembly

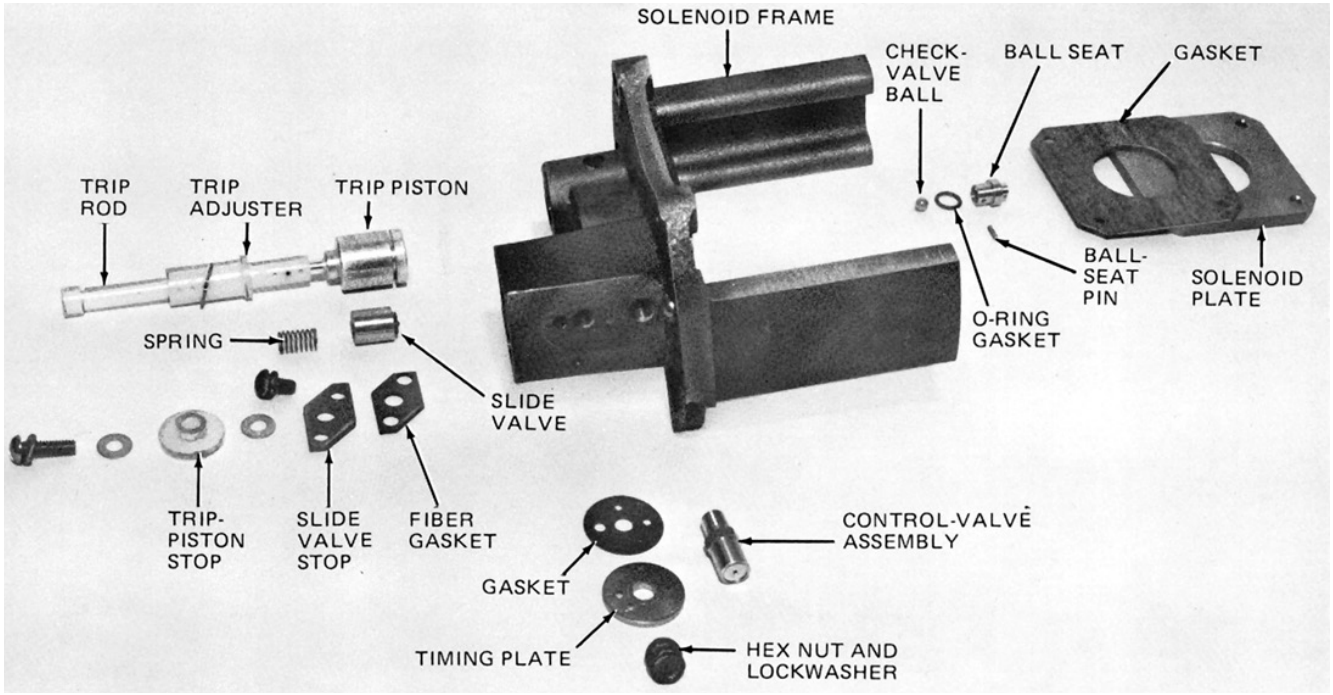

Figure 18. Components of hydraulic mechanism assembly

Reassembly of the hydraulic mechanism:

1. Reinstall the control-valve assembly and the timing plate and gasket. Make sure the small hole in the timing-plate gasket is positioned over the indexing pin and the large hole is positioned over the orifice in the casting. Check that the plate is indexed to the proper timing curve (check data plate on sleet hood for proper timing curves).
2. Replace the trip-piston assembly:

Note: If the operating sequence of the recloser is to be changed, make changes to trip-piston assembly before installing. See Timing Mechanism section.

   A. Install the trip piston into its cylinder.

   B. Using a wire hook, pull out spring through bottom of trip-piston cylinder and hold with a thin metal plate.

   C. Reinstall o-ring gasket on ball seat, replace check valve ball, and pin the assembly to the spring (Figure 18).

   D. Remove thin plate and seat check valve in place.

3. Reassemble solenoid plate and gasket to hold the ball-seat check valve in place. Reverse the solenoid plate gasket when reassembling.
4. Insert slide valve and slide-valve spring into its cylinder and secure the fibre gasket, slide-valve stop and trip-piston stop with the appropriate attaching hardware. Check scribe marks made during disassembly to properly orient the slide-valve stop. Be sure holes in fibre gasket and slide-valve stop are aligned and centered over the slide-valve cylinder.
5. Test the check valve in the base of the pump piston.

   A. Holding the piston upside down, fill it with degreasing fluid or clean transformer oil.

   B. If the check valve does not hold, clean it thoroughly in degreasing fluid and repeat step A.

   C. If the check valve still does not hold, replace the entire pump-piston assembly.

6. To replace the pump-piston assembly:

   A. Note position of pump-piston shell with respect to the pump-link assembly.

   B. Unscrew shell far enough to expose the steel pin (Figure 20).

   C. Push out pin and discard pump piston.

   D. Install new piston and replace the pump-piston shell in its original position.

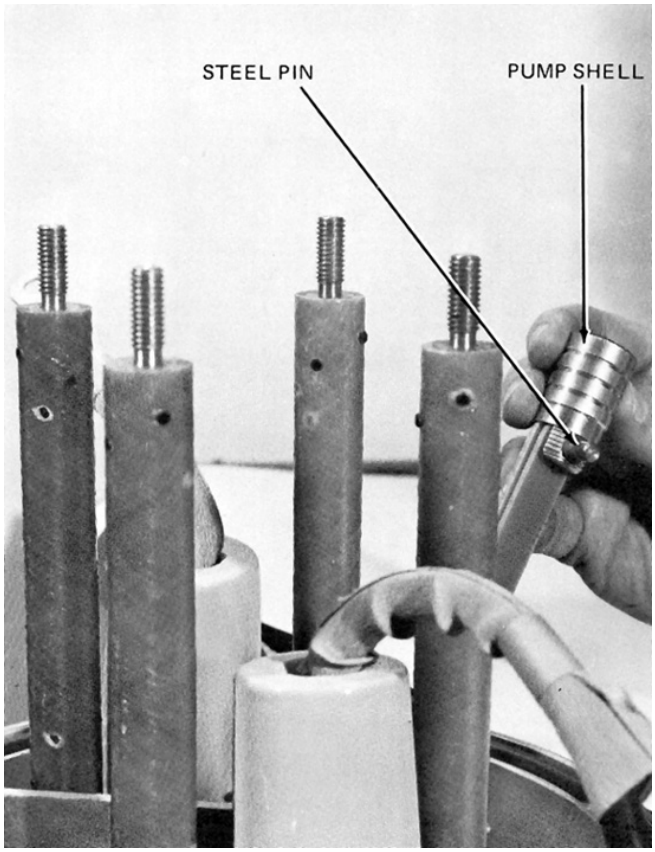

Figure 19. Removing pump piston

Adjusting new pump pistons

After installing a new pump piston, it may be necessary to adjust the pump-piston shell to obtain the correct number of operations to lockout. Turning the pump-piston shell to increase the effective length of the piston will cause the port in the pump cylinder to be covered earlier in the downward stroke of the pump. The quantity of oil escaping through this port is reduced and the amount of oil pumped to the trip-piston cylinder is increased. Turning the shell to decrease the effective length of the piston will cause the port to remain open during a greater part of the stroke. The quantity of oil escaping through the port is increased and less oil is pumped into the trip-piston cylinder. Proper position of shell is determined as follows:

1. Attach solenoid frame to support stringers. Make sure plunger and pump piston are inserted in their respective cylinders.
2. Install solenoid-coil assembly (see Solenoid Coil in this section).
3. Lower the mechanism into the oil until pump and trip pistons are completely covered.

4. Operate recloser manually. Close and trip mechanism, by means of the manual operating handle, a few times to remove the air trapped in the hydraulic system. Return operating handle to CLOSED position and allow trip piston to reset fully.
5. Manually open and close recloser three times if it is set for four operations to lockout. Observe trip rod; end of trip rod should touch lockout latch as shown in Figure 21.
6. To lengthen the travel of the trip rod, increase the effective length of the piston by unscrewing the piston shell a slight amount. The trip-rod travel is shortened by screwing the shell farther onto the piston. Adjust in one-half turn increments and repeat step 5.

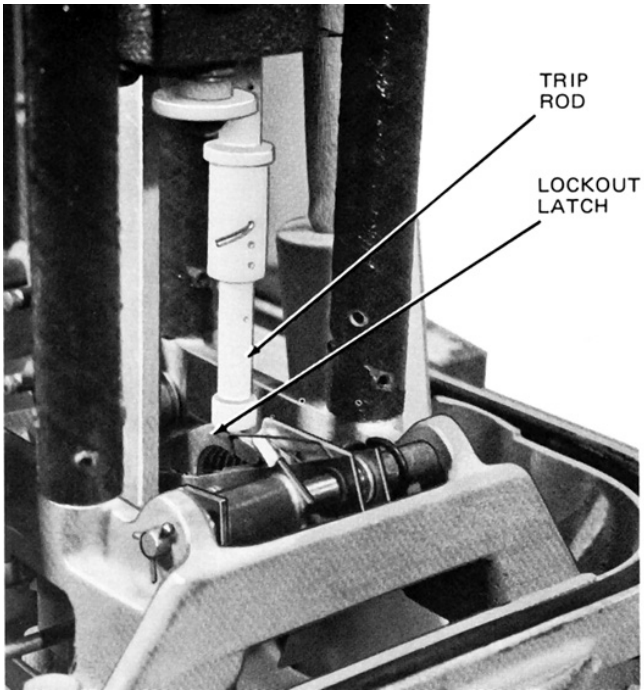

Figure 20. Trip rod should touch lockout latch

Timing mechanism and operating sequence

The operating sequence and timing of Types 6H and V6H reclosers is governed by the hydraulic system. The hydraulic system utilizes the surrounding insulating oil as operating medium. The operating sequence and timing can be changed with the mechanism disassembled, during maintenance, or by untanking the recloser to gain access to the points of adjustment.

Timing

Provision is made for selecting an A characteristic, no intentional time delay, and a retarded B characteristic or an extra-retarded C characteristic. Choice of the B or C characteristic is made by indexing the timing plate to the appropriate hole (Figure 22). Complete removal of the timing plate causes all operations of the recloser to have A characteristics.

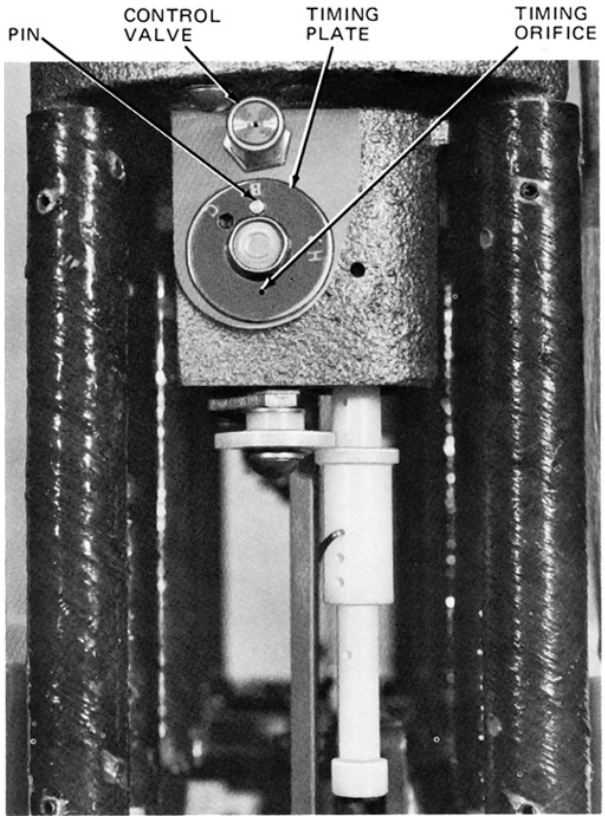

Figure 21. Timing plate

Operating sequence

Two, three, or four operations to lockout are selected by positioning the trip rod to the appropriate hole in the trip adjuster and securing with a cotter pin. Figure 23 shows a recloser set for two fast and two retarded operations. one operation to lockout is selected by pulling down the nonreclosing lever, located under the sleet hood, if provided.

Selection of one, two, or three fast operations is made by positioning the trip adjuster to the appropriate hole in the trip piston and securing with a roll pin (Figure 23).

Note: To gain access to the adjustment for fast operations when the recloser mechanism is assembled, pull out the trip rod until the top of the aluminum trip piston is exposed. Use a small, fiber wedge between the trip-piston assembly and the valve-stop plate to hold the trip piston extended while making changes in the number of fast operations. The trip adjuster should be backed by a solid metal object when the roll pin is being driven in or out.

A retarded characteristic for all four operations requires a special spacer above the slide valve and a special slide valve equipped with a timing orifice.

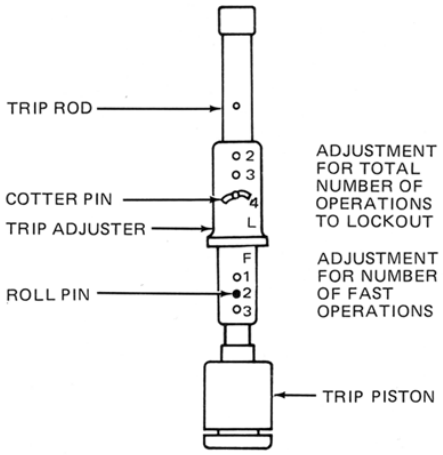

Figure 22. Setting operating sequence

Head and mechanism assembly

Other than the possible replacement of a broken part, normally no maintenance will be required on the head and operating mechanism assembly. Disassemble the mechanism only to the extent required for replacing the part in question and reassemble in the reverse order of disassembly.

The replacement of some parts in the mechanism assembly will be greatly facilitated if the operating mechanism is removed from the head. To remove the operating mechanism from the head, refer to Figures 24 and 25 and proceed as follows:

1. Disconnect the long bushing leads at the interrupter assembly and the short bushing leads at the series trip coil.
2. Drive out all three counter lever pins (Figure 24); remove the counter levers and withdraw the counter operating shaft.
3. Remove the cover plate and gasket adjoining operating handle sleet hood (Figure 25).
4. Disconnect the operating links from the manual operating handle by removing the link pin which is secured by C-type retaining rings.
5. If the unit is equipped with the non-reclosing feature, disconnect the operating link from the toggle assembly of the non-reclosing lever by removing the C-ring, roll spring and operating link from the toggle assembly pin.
6. Remove the eight 3/8" capscrews and lockwashers which secure the operating mechanism frame to the head and lift the mechanism out of the head assembly.
7. Reassemble the operating mechanism to the head assembly in the reverse order of disassembly and make the following checks and adjustments to assure proper operation.

   A. Toggle Latch Adjustment—Manually close the operating mechanism and check that all three phases latch in simultaneously. If one or more assemblies do not latch in at the same time, or fail to latch, adjust the travel of the trip lever in question with the set screw on the lever (Figure 24). Lock all three screws in place when the adjustments have been completed.

   B. Counter Adjustment—Circuit interruptions on each phase are recorded by the operations counters. Remove the counter assembly from the sleet hood of the head casting and adjust the counter arm as necessary to obtain proper counter operation.

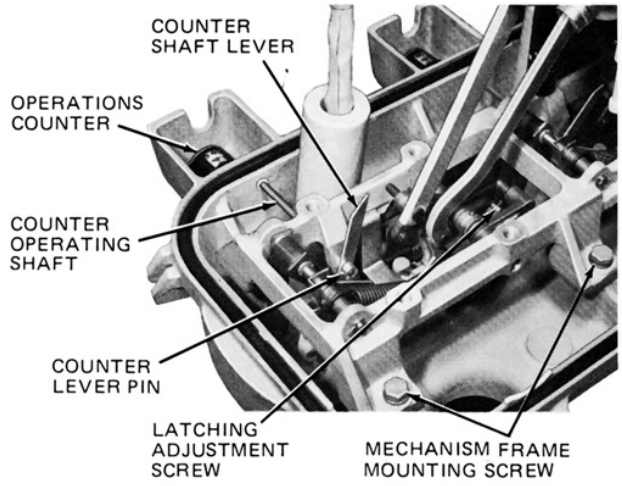

Figure 23. Operating mechanism details

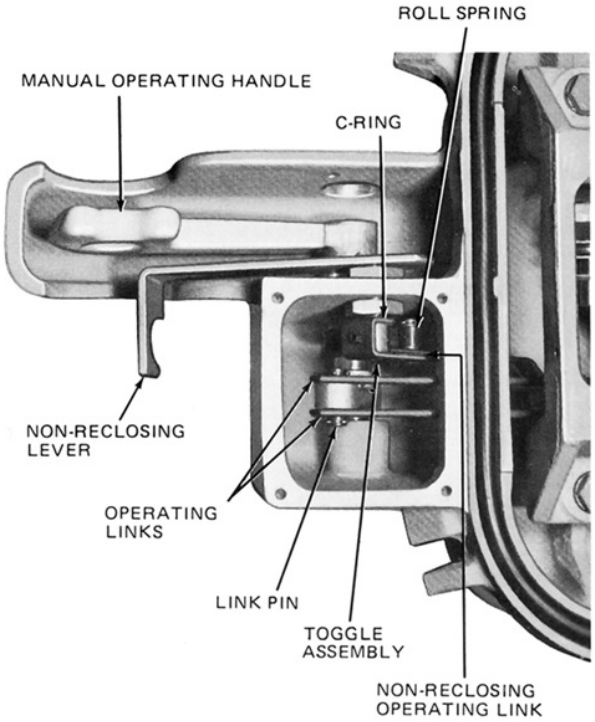

Figure 24. Operating handles mechanisms

Maintenance information

CAUTION

This equipment requires routine inspection and maintenance to ensure proper operation. If it is not maintained, it can fail to operate properly. Improper operation can cause equipment damage and possible personal injury. G105.1

CAUTION

This equipment relies on dielectric fluid to provide electrical insulation between components. The dielectric strength of the fluid must be checked on a regular basis, as part of the routine maintenance inspection, to ensure that it is at or above minimum dielectric requirements. Use of this equipment with dielectric fluid that does not meet minimum requirements can result in internal flashovers that will damage the equipment and can cause personal injury. G107.3

Replacement parts

Replacement parts for Eaton's Cooper Power series reclosers are available through the factory Service Department. Only factory authorized replacement parts are to be used. To order replacement parts, refer to the applicable maintenance manual and the current Replacement Parts price list for catalog numbers and pricing. Contact your Eaton representative for additional information and ordering procedures.

Factory authorized service centers

Factory authorized service centers are located throughout the continental United States to provide maintenance, repair, and testing services for Eaton's Cooper Power series reclosers. For further information, contact your Eaton sales representative.

Factory maintenance classes

The factory Service Department offers recloser maintenance training classes. These classes, taught by experienced service technicians, are held at the factory's inhouse training facility. These courses provide training and factory recommended procedures for the routine maintenance, troubleshooting, repair and testing of Eaton's Cooper Power series reclosers. It is recommended that all personnel who service and maintain Eaton's Cooper Power series switchgear, attend the appropriate classes. For additional information, contact your Eaton representative.

Instructional video programs

Two DVD video maintenance training programs; *KSPV1 General Maintenance and Inspection Procedures for Kyle Reclosers and KSPV5, Mechanical Operation Service and Testing For Kyle Three-Phase Hydraulic Reclosers;* are also available as supplemental training aids for maintenance personnel. These video programs, developed for use in the factory training classes, are to be used in conjunction with existing service literature. For additional information, contact your Eaton representative.

Service parts lists

Service parts listed and illustrated include only those parts usually furnished with a standard unit. Major parts that have been especially ordered for a specific application are available upon request by submitting a full description of the part with the recloser type and serial number.

Because of the ease, faster receipt and greater economy of local acquisition, the wiring, wire-end terminals and connectors have not been included in this parts listing. All hardware parts dimensions have been carefully checked so they may also be obtained locally.

To assure correct receipt of any parts order, always include switchgear type and serial number. Because of Eaton's continuous improvement policy, there will be cases where parts ordered may not be exactly the same as parts furnished; however, they will be completely interchangeable without any rework of the recloser. All parts have the same warranty as any whole item of switchgear; i.e. against defects in material or workmanship within one year from date of shipment.

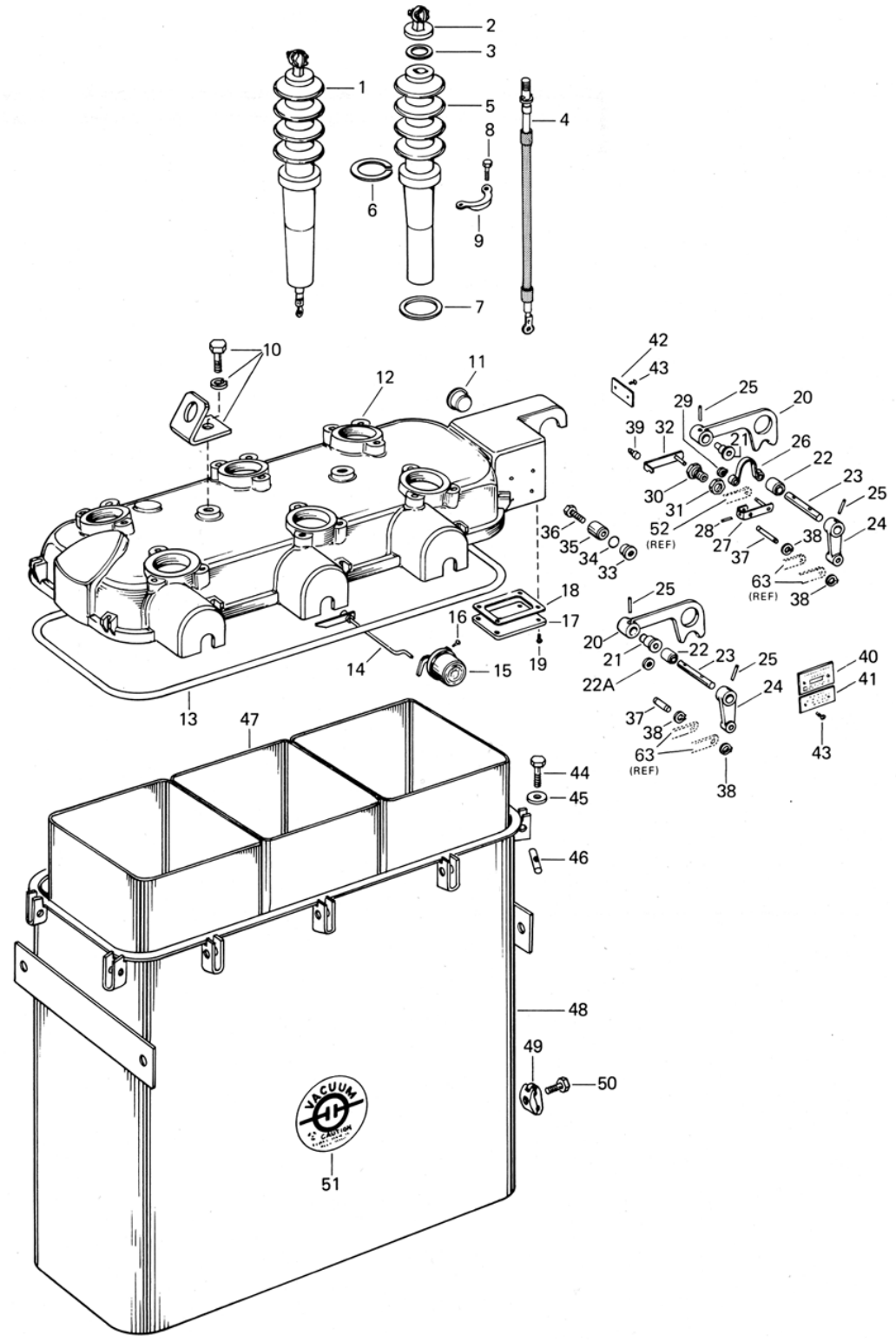

Figure 25. Tank assembly

Tank assembly (Figure 26)

Item no.	Description	Catalog number	No. req'd.
1	Bushing assembly, short lead, standard, Type 6H	KA234H61	3
	Bushing assembly, long lead, standard, Type 6H	KA234H62	3
	Bushing assembly, short lead,15" creepage, Type 6H	KA234H63	3
	Bushing assembly, long lead,15" creepage, Type 6H	KA234H64	3
	Bushing assembly, short lead,17" creepage, Type 6H	KA234H65	3
	Bushing assembly, long lead,17" creepage, Type 6H	KA234H66	3
	Bushing assembly, short lead, standard, Type V6H	KA234H67	3
	Bushing assembly, long lead, standard, Type V6H	KA234H68	3
	Bushing assembly, short lead,17" creepage, Type V6H	KA234H69	3
	Bushing assembly, long lead,17" creepage, Type V6H	KA234H70	3
	(Above include items 2 through 5)		
2	Bushing terminal assembly	KA143L	6
3	Bushing terminal gasket	KP2090A57	6
4	Short lead assembly, standard bushing, Type 6H	KA233H5	3
	Long lead assembly, standard bushing, Type 6H	KA233H43	3
	Short lead assembly, 15" creepage bushing, Type 6H	KA233H45	3
	Long lead assembly, 15" creepage bushing, Type 6H	KA233H64	3
	Short lead assembly, 17" creepage bushing, Type 6H	KA233H42	3
	Long lead assembly, 17" creepage bushing, Type 6H	KA233H66	3
	Short lead assembly, standard bushing, Type V6H	KA233H65	3
	Long lead assembly, standard bushing, Type V6H	KA233H67	3
	Short lead assembly, 17" creepage bushing, Type V6H	KA233H68	3
	Long lead assembly, 17" creepage bushing, Type V6H	KA233H69	3
5	Ceramic bushing, standard	KP130VR	6
	Ceramic bushing 15" creepage	KP196VR	6
	Ceramic bushing, 17" creepage	KP246VR	6
6	Bushing clamping ring	KP121L	6
7	Lower bushing gasket	KP2090A29	6
8	Capscrew, 3/8-16 x 1 5/8, stl	KP1360	18
9	Bushing clamp	KP41L	18
10	Lifting lug kit	KA764H	2
11	Caplug	KP2073A15	1

Item no.	Description	Catalog number	No. req'd.
12	Head casting assembly	KA700H6	1
13	Head gasket	KP2103A6	1
14	Counter shaft assembly	KA73H3	3
15	Counter assembly	KA28C04	3
16	Self-tapping screw, Type F, 6-32 x 1/2, stl	KP1257	6
17	Cover plate	KP31H3	1
18	Cover plate gasket	KP32H3	1
19	Machine screw, rd hd, 10-32 x 7/16, stl	KP1198	4
20	Operating handle	KP6H3	1
21	Bushing	KP3106A14	1
22	Spacer	KP3011A1	1
23	Operating shaft	KP36H3	1
24	Lever	KP5H3	1
25	Groove pin, 5/32 x 7/8 Type 1	KP2001A18	2
26	Roll spring	KP105H3	1
27	Toggle lever assembly	KA52H3	1
28	Roll pin, 5/32 x 7/8	KP507	1
29	Retaining ring, Type C, WAS 14	KP75	1
30	Bearing	KP103H3	1
31	Nut	KP141H3	1
32	Non-reclosing lever assembly	KA53H3	1
20	Operating handle	KP6H3	1
21	Bushing	KP3106A14	1
22	Spacer	KP3011A3	1
22A	Flat washer, 1/2", stl	KP557	2
23	Operating shaft	KP36H3	1
24	Lever	KP5H3	1
25	Groove pin, 5/32 x7/8 Type 1	KP2001A18	2
33	Plug	KP179H3	1
34	O-ring gasket	KP2000A5	1
35	Spacer	KP3013A57	1
36	Capscrew, 1/4-20 x 1/2, stl	K P1367	1
37	Pin	KP3125A15	1
38	Retaining ring, Type C, WAS16	KP1093	2
39	Stop	KP140H3	1
40	Nameplate	KP103H6	1
41	Coil data plate (part of item 124)	KP2119A15	1
42	Operating data plate, (blank)	KP164H11	1
43	Self-tapping screw, No. 2 x 3/16, Type Z	KP69	6
44	Capscrew, 3/8-16 x 3, stl	KP176	10
45	Flat washer	KP2028A33	10
46	Combination nut and pin	KP3061A3	10
47	Tank wall liner kit	KA761H3-2 1	1
48	Tank assembly	KA4H	1
49	Parallel ground clamp	KA227H	1
50	Capscrew, 1/2-13 x 1, stl	KP1282	1
51	Decal, for Type V6H	KP1041V4H	2

THESE PARTS APPLICABLE TO RECLOSERS WITH NON-RECLOSING FEATURE

THESE PARTS APPLICABLE TO RECLOSERS WIT NON-RECLOSING FEATURE

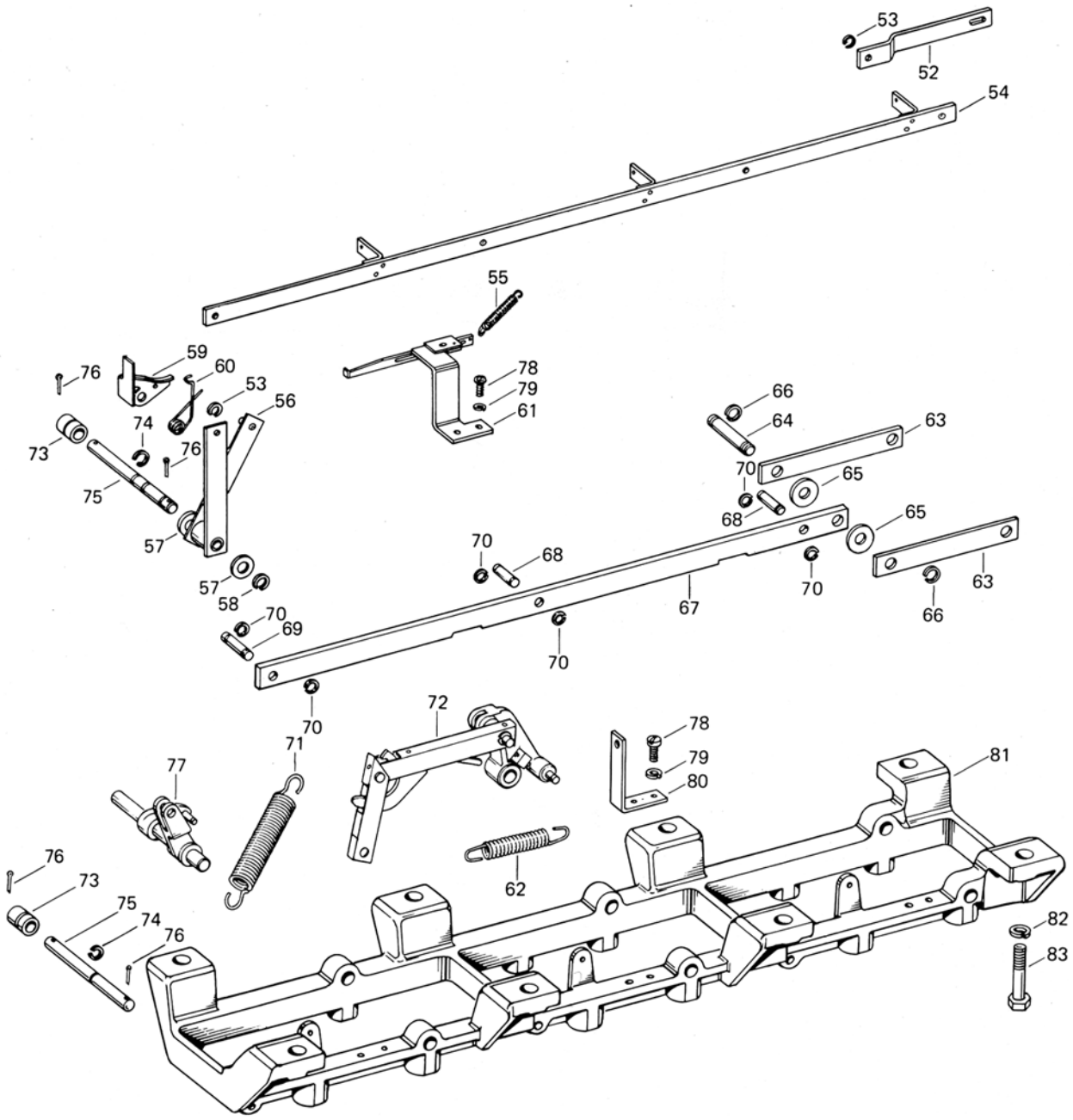

Figure 26. Mechanism assembly

Mechanism assembly (Figure 27)

Item no.	Description	Catalog number	No. req'd.
52	Link	KP122H3	1
53	Retaining ring, Type WA-514	KP75	4
54	Connecting bar assembly	KA44H3	1
55	Spring	KP95L	3
56	Lever assembly	KA83H3	3
57	Washer	KP3008A3	6
58	Retaining ring, Type C WA -516	KP76	6
59	One shot trip lever	KP150H3	3
60	Torsion spring	KP96H3	3
61	Slide and bracket assembly	KA50H3	3
62	Spring	KP155H3	1
63	Operating link	KP121H3	2
64	Grooved pin	KP3125A15	1
65	Flat washer, 20S, brass	KP342	2
66	Retaining ring, Type WA-516	KP76	2
67	Operating connecting	KP253H	1
68	Grooved pin	KP3124A15	2
69	Grooved pin	KP154H3	1
70	Retaining ring, Type C WA-514	KP75	6
71	Lockout spring	KP116H6	3
72	Toggle mechanism and trip lever assembly	KA40H3-1	3
73	Spring spacer	KP18H3	3
74	Retaining ring, Type C WA -516	KP76	3
75	Toggle shaft, (std. recloser)	KP19H3	3
	Toggle shaft, (non-reclosing feature)	KP87H3	3
76	Cotter pin 1/16 x 1/2	KP301	6
77	Main shaft assembly	KA22H3	3
78	Machine screw, fil hd 1/4-20 x 1/2, stl	KP477	2
79	Lockwasher, med,1/4, stl	KP837	2
80	Bracket	KP153H3	1
81	Operating mechanism frame	KP8H3	1
82	Lockwasher, med, 3/8, stl	KP1107	8
83	Capscrew, hex hd, 3/8-16x 11/4, stl	KP1372	8

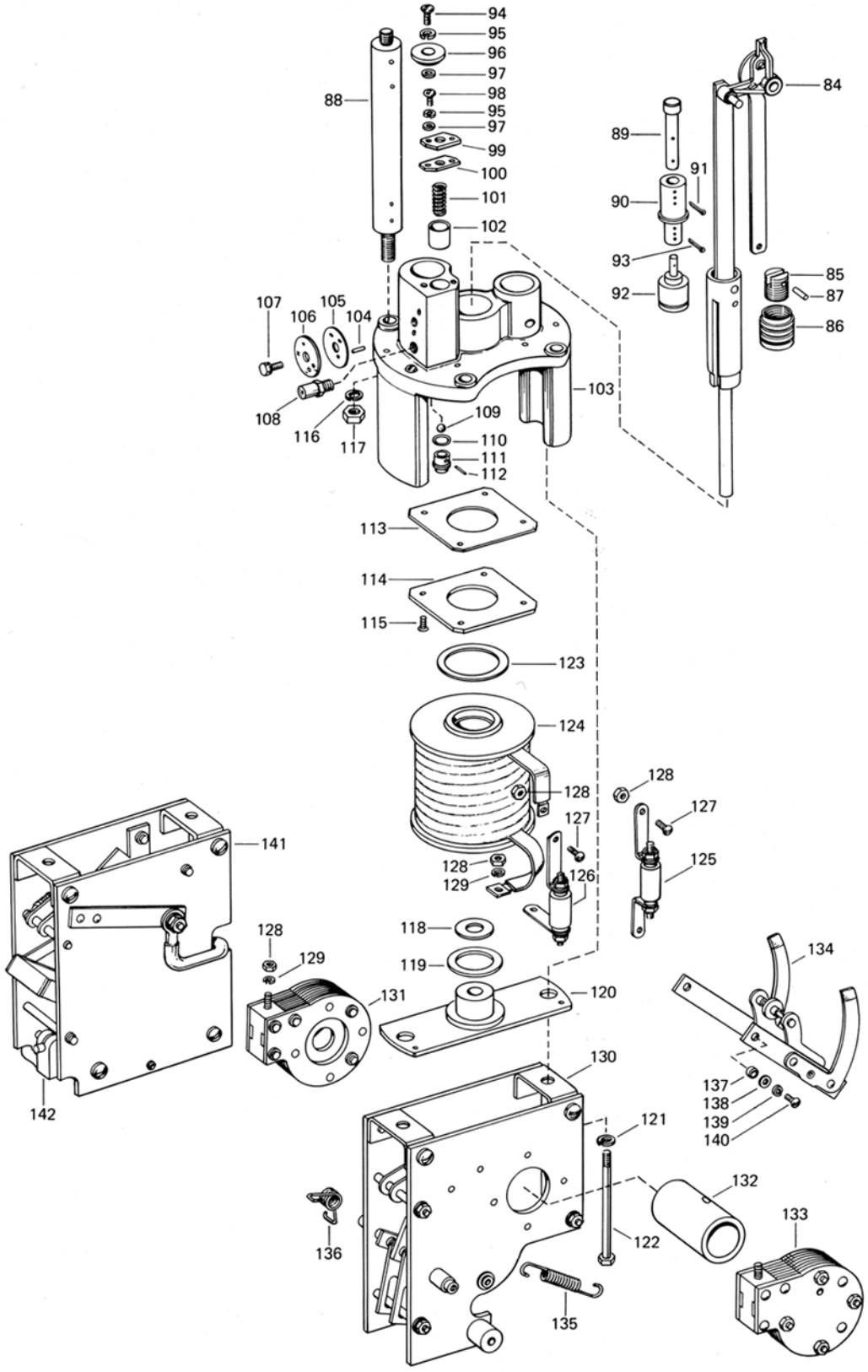

Figure 27. Hydraulic mechanism and solenoid frame assembly

Hydraulic mechanism and solenoid frame assembly (Figure 28)

Item no.	Description	Catalog number	No. req'd.
84	Plunger and link assembly	KA11 H6	3
	Pump piston assembly replacement kit (includes items 85,86)	KA725H	3
85	Pump piston	KA25H	3
86	Pump piston shell	KP151H	3
87	Pin	KP3055A1	3
88	Spacer assembly	KA18H4	12
	Trip rod and adjuster replacement kit (Includes items 89, 90, 91, 93,96)	KA703H4	3
89	Trip rod	KP216H4-1	3
90	Trip adjuster	KP215H4	3
91	Cotter pin, 1/16 x 1, stl	KP310	3
92	Trip piston assembly	KA17H4	3
93	Roll pin 1/16 x 7/16	KP515	3
94	Machine screw, rd hd, 1/4-20 x 7/8, stl	KP452	3
95	Lockwasher, med, 1/4", stl	KP837	6
96	Trip adjuster stop	KP231H4	3
97	Flat washer, 16S, brass	KP605	3
98	Machine screw, rd hd 1/4-20 x 1 /2, stl	KP110H4	3
99	Slide valve stop	KP111 H4	3
100	Gasket	KP177H4	3
101	Spring	KA16H4-1	3
102	Slide valve assembly	KA49H4	3
	Slide valve assembly (for BO4 operation)	KA51 H4	3
	Slide valve assembly (for CO4 operation)	KA3010-8	3
	Slide valve stop (for BO4 and CO4 operation only)	KA5H4	3
103	Solenoid frame subassembly (Includes items 120,121,122)	KP3001A3	3
104	Groove pin,1/8 x 3/8	KP113H4	3
105	Gasket (for KP112H4-2 timing plate) Gasket (for KP201 H4 timing plate)	KP202H4	3
106	Timing plate (for B and C curve operation)	KP112H4-2	3
	Timing plate (for AO4 operation)	KP201 H4	3
107	Preassembled capscrew and lock washer, 5/16-18 x 1/2	KP10	3
108	Control valve assembly	KA3H4	3
	Ball seat and pin assembly kit for 6H-serial number 5382 and above all V6H (Includes items 109,110, 111,112)	KA710H-1	3
	Ball seat and pin assembly kit for 6H—serial number below 5382 (includes items 109,111,112)	KA710H-2	3
109	Ball	KP2025A2	3
110	O-ring gasket (6H—serial number 5382 and above; all V6H)	KP2000-3	3
111	Ball seat (6H—serial number 5382 and above;all V6H)	KP155H2	3
	Ball seat (6H—serial number below 5382)	KP155H1	3
112	Pin	KP3051A3	3
113	Gasket	KP 176H4	3
114	Plate	KP122H4	3
115	Machine screw, fit hd, 10-24 x 3/4, stl	KP606	12
116	Lockwasher, med, 3/8, stl	KP1108	12
117	Hex nut, 3/8-16, stl	KP276	12
118	Impact washer	KP2090A31	3
119	Lower solenoid gasket	KP2090A60	
120	Bridge plate assembly (part of 103, solenoid frame subassembly)		
121	Lockwasher, med,1/2, stl (part of 103, solenoid frame subassembly)		3
122	Capscrew, hex hd,1/2-13 x 5, stl (part of 103, solenoid frame subassembly)	KP2090A55	3
123	Upper solenoid gasket	KA83H	3
124	Replacement coil kit, 50 amperes and below (state coil rating as suffix; example: KA83H50) (includes items 41, 119,123)	KA709H4	3
	Replacement coil kit, 70 & 100 amperes (state coil rating as suffix; example: KA709H4-70) (includes items 41,119,123)	KA701V4H1	3
	Replacement coil kit, 140 amperes (includes items41,119,123)	KA701V4H3	3
	Replacement coil kit, 200 amperes (includes items41,119,123)	KA100H1	3
125	Coil gap assembly (for V6H)	KA100H2	3
126	Coil gap assembly (for 6H)	KP105	3
127	Preassembled screw and lockwasher 5/16-18 x 5/8, brass	KP283	9
128	Hex nut,5/16-18, brass	KP348	9
129	Lockwasher, med, 5/16, bronze Contact box assembly, complete for 6H) (includes items 130 through 140)	KA4H4	3
130	Contact box frame assembly	KA701H4	3
131	Exhaust chamber	KA27H4	3
132	Cross blast tube	KP128H4	3
133	Generating chamber	KA26H4	3
134	Movable contact arm assembly	KA25H4	3
135	Toggle spring	KP169H4	3
136	Torsion spring	KP190H4	3
137	Bushing	KP3008A1	6
138	Flat washer, No.10, stl		6
139	Lockwasher, med, No.10, stl		6
140	Machine screw, 10-24 x 1/2, stl		6
141	Contact box assembly, complete (for V6H) (includes item 142)	KA101V4H	3
142	Vacuum interrupter assembly	KA116V4H	3

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