SWITCHGEAR

INSTRUCTIONS

TYPES MA-75C, MA-250C and MA-350C, 5-KV AIR MAGNETIC CIRCUIT BREAKERS with SOLENOID OR STORED ENERGY OPERATORS

BWX-6731-1

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INTRODUCTION

This instruction manual contains installation, operation and maintenance information for Types MA-75C, MA-250C and MA-350C solenoid or stored energy operated, 5-kv air magnetic circuit breakers.

WARRANTY

The sales contract carries all information on warranty coverage.

RECEIVING

Circuit breakers are shipped from the factory completely assembled. Observe weight markings on crates and ensure that capable handling equipment is used.

Remove crating carefully with the correct tools. Check each item with the shipping manifest. If any shortage or damage is found, immediately call it to the attention of the local freight agent handling the shipment. Proper notation should be made by him on the freight bill. This prevents any controversy when claim is made and facilitates adjustment.

When handling breaker with a crane or hoist, hooks should be attached only to breaker frame. Use a spreader to prevent frame distortion. Do not attach lifting hooks, rope, etc., to bushings, insulating parts, fittings, etc. Do not slide breaker off shipping skid as interlock damage may occur.

STORAGE

Indoor - The circuit breaker should be installed as soon as possible. If storage is necessary, it should be kept in a clean dry place where it will not be exposed to dirt, corrosive atmospheres or mechanical abuse.

Outdoor - Outdoor storage of circuit breakers is not recommended. If breakers must be stored outdoors, they must be completely covered and a heat source provided to prevent condensation and subsequent corrosion.

CIRCUIT BREAKER PREPARATION

Prepare the circuit breaker for insertion into its cubicle as follows:

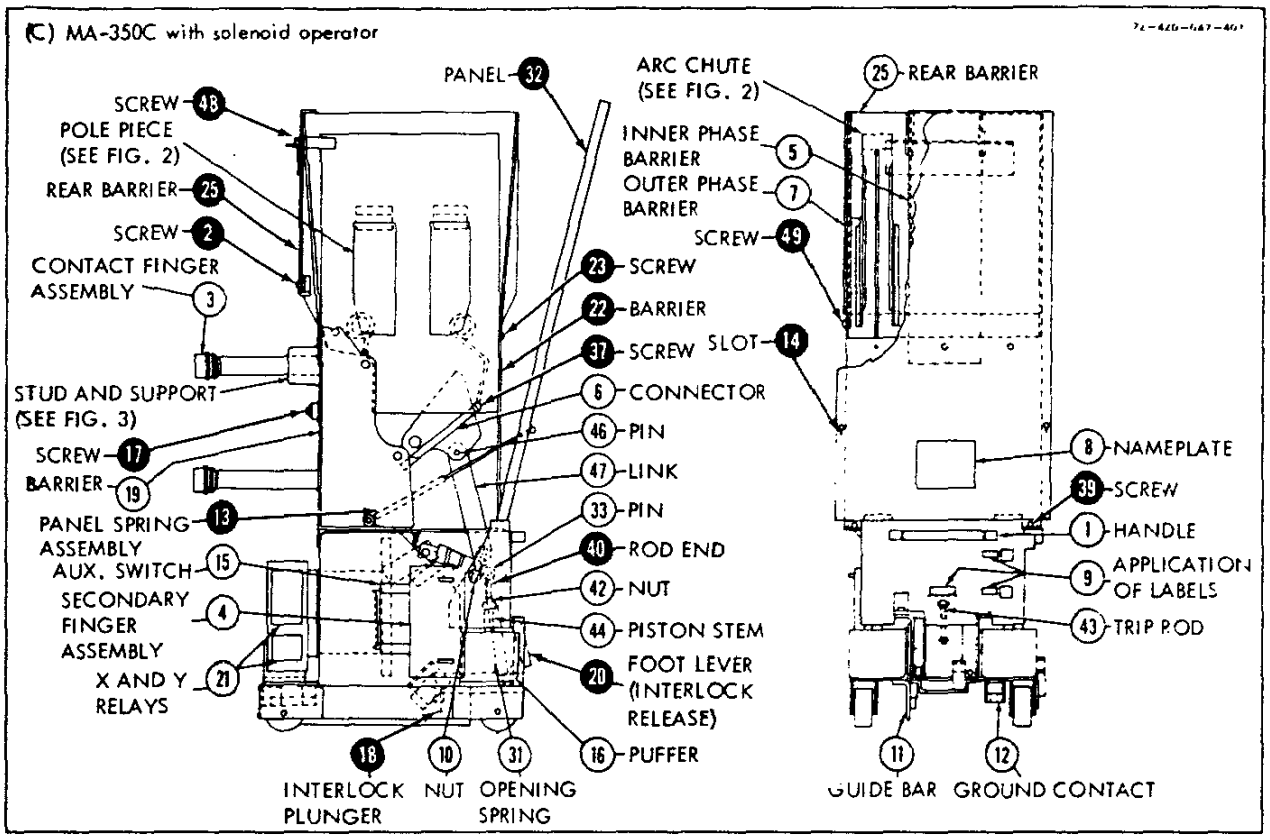
1. Free trip latch. Note: Breakers are shipped in closed position with the trip latch and foot lever blocked or tied to prevent opening during shipment. REMOVE BLOCKING.
2. Push manual trip rod to open breaker.
3. Remove phase barriers and unfasten coil connections. (See "Phase Barrier Assembly," page 14).
4. With arc chute support in place at the rear of the breaker, tilt the arc chutes (refer to page 14) to expose contact area.
5. Remove dust, foreign particles, etc., from breaker.
6. Check for mechanical freedom of disconnect arm movements by slowly closing the breaker.

   Solenoid Operated Breaker - Insert the manual closing device pin into the angle bracket mounted at the rear of the breaker. With the device rolls against the solenoid armature, lever the armature in to close the breaker.

   Stored Energy Breaker - Refer to page 17.

7. Trip out breaker by depressing trip rod.
8. Return arc chutes to upright position, fasten blowout coil connections and replace phase barriers. Be sure screws on all phases are tightened securely.
9. Install plug jumper and energize control. (Springs should charge on stored energy breakers.)
10. Close breaker - with control switch on cubicle panel.
11. Trip breaker - with control switch on cubicle panel.
12. Depress foot lever and close electrically (*).
13. Release foot lever and repeat steps 10 (#) and 11.
14. Lock out Kirk interlock (if provided) and repeat step 10 (*).
15. Open interlock and repeat steps 10 (#) and 11.
16. De-energize control power and remove plug jumper.
17. Coat movable primary disconnects with a light film of lubricant supplied by A-C.
18. Insert breaker into its cubicle between "test" and "disconnect" positions and close manually (*).
19. Complete movement of breaker to "test" position and repeat steps 10 (#) and 11.
20. Check for proper alignment between stationary and movable secondary contacts.
21. With line and bus de-energized, rack breaker into fully connected position. Close and trip breaker from main control panel. If bus or line are energized, get clearance before beginning this step.
22. Breaker is now ready for normal operation.

(*) Breaker is trip free.
(#) Breaker will close.



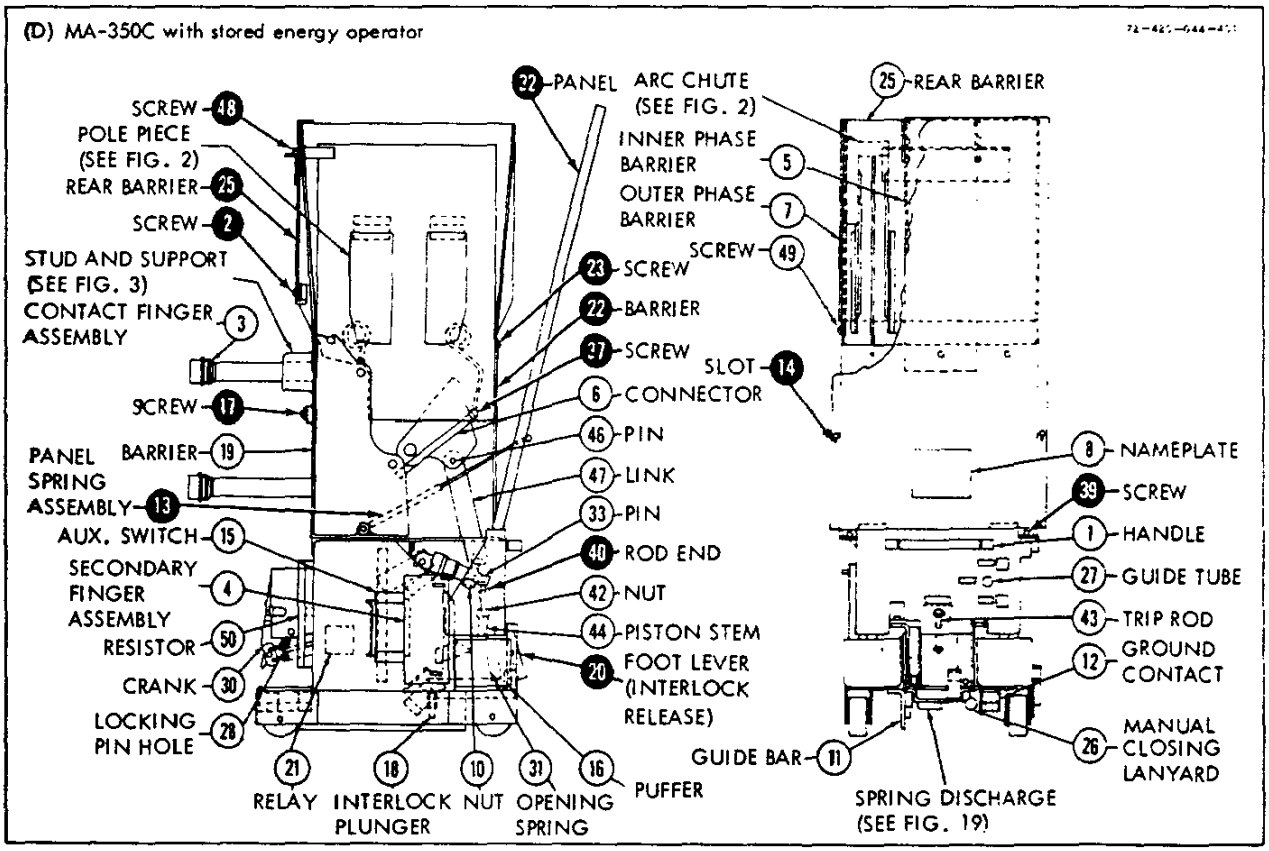


Fig. 1 – Typical circuit breaker assemblies.

Reset Relay

The reset relay is used for instantaneous reclosure service on stored energy operated breakers instead of a latch check switch. The relay is a solid state device that operates an electro-mechanical relay. Closing time is not affected by voltage or current variances well beyond the standard circuit breaker control limits. The voltage regulator and timing circuits are mounted on a printed circuit board and encapsulated in a resilient material for shock resistance.

AUXILIARY EQUIPMENT

Auxiliary Switch

Mounted on the breaker, the auxiliary switch is normally used to open the trip circuit when the circuit breaker is opened. As this multi-stage switch operates from the breaker disconnect blades, circuitry dependent on the position of the breaker, such as indicator lights, etc., is wired through this switch. The individual stages are easily converted to "a" or "b" without disassembling the switch. (See page 16, Figure 14.)

Capacitor Trip Device

A capacitor trip device is commonly used with circuit breakers having an ac control supply installed in remote locations or unattached substations where battery cost and maintenance are undesirable.

In these cases, the capacitor trip device may be charged from the same stepdown transformer that is used to energize the breaker control. This stepdown transformer should be connected to the line side of the breaker.

To apply the capacitor trip device to existing breakers originally shipped with dc trip coils, contact your Allis-Chalmers sales representative.

ARC CHUTE ASSEMBLY

Each arc chute (Fig. 2) consists of a flame retardant envelope which provides phase isolation for interruption and venting of the by-product gases of interruption. The arc chute contains -

1. The stationary end arc runner (4) and moving end arc runner (3) to which the arc terminals transfer from the arcing contacts. The arc runners form paths for the arc terminals to travel up the arc chute.
2. The stationary end blowout coil (15) and moving end blowout coil (13) which connect their respective arc runners to the top and bottom bushings. The current in these coils creates the magnetic flux which passes through cores (18), pole pieces (22) and the space between the pole pieces. The action of this flux on the arc forces the arc up the barrier stack.
3. The barrier stack (23) consisting of a number of refractory plates, with "v-shaped" slots, cemented together. The barrier stack cools, squeezes and stretches the arc to force a quick interruption.
4. The barrier (1) containing coolers (28) through which the by-product gases of interruption pass, completes the cooling and deionizing of the arc products.

Arc chutes are tilted to expose contact area for inspection of barrier stack (23). The arc chutes may also be lifted and removed from the breaker. Unfasten coil connections before tilting or removing arc chutes.

OPERATION

CIRCUIT BREAKERS

Normal -- Normal circuit breaker operation is controlled by cubicle mounted controls or other control devices. The closing springs of stored energy operated breakers will charge as soon as the breaker control bus is energized. Check the motor cutoff adjustment (page 18) if springs do not charge.

Opening Breaker -- Solenoid or stored energy operated breakers can be tripped manually by depressing the trip rod (43), Fig. 1, or electrically by energizing the trip circuit. This rotates the latch that allows the closing linkage to collapse and reset.

Closing Breaker -- When the springs of a stored energy operated breaker are fully charged, it can be closed manually by pulling lanyard (26), Fig. 1, or electrically by energizing the closing circuit. This rotates the latch that allows the springs to close the breaker.

OPERATORS

Solenoid Operator - The primary closing force of this operator (Fig. 3) is supplied by a dc solenoid. The iron circuit housing the solenoid consists of the main operator frame - to which the pole head is welded - a helically wound tube and a back plate held in place by four bolts (68). The armature (4), with plunger (6) and cap (19) attached, slides in a non-magnetic tube (5). When the coil (8) is energized, the armature moves toward the pole head. The non-magnetic washer (21) keeps the armature from actual contact with the pole head so that the armature will release rapidly when the coil is de-energized by reducing the effect of the residual magnetism. The armature is returned by a spring around the plunger.

The operator, through the use of a 4-bar linkage, may be electrically and mechanically trip-free by the release of the trip latch mechanically or by energizing the trip solenoid electrically at any time during the closing stroke or after the breaker is closed.

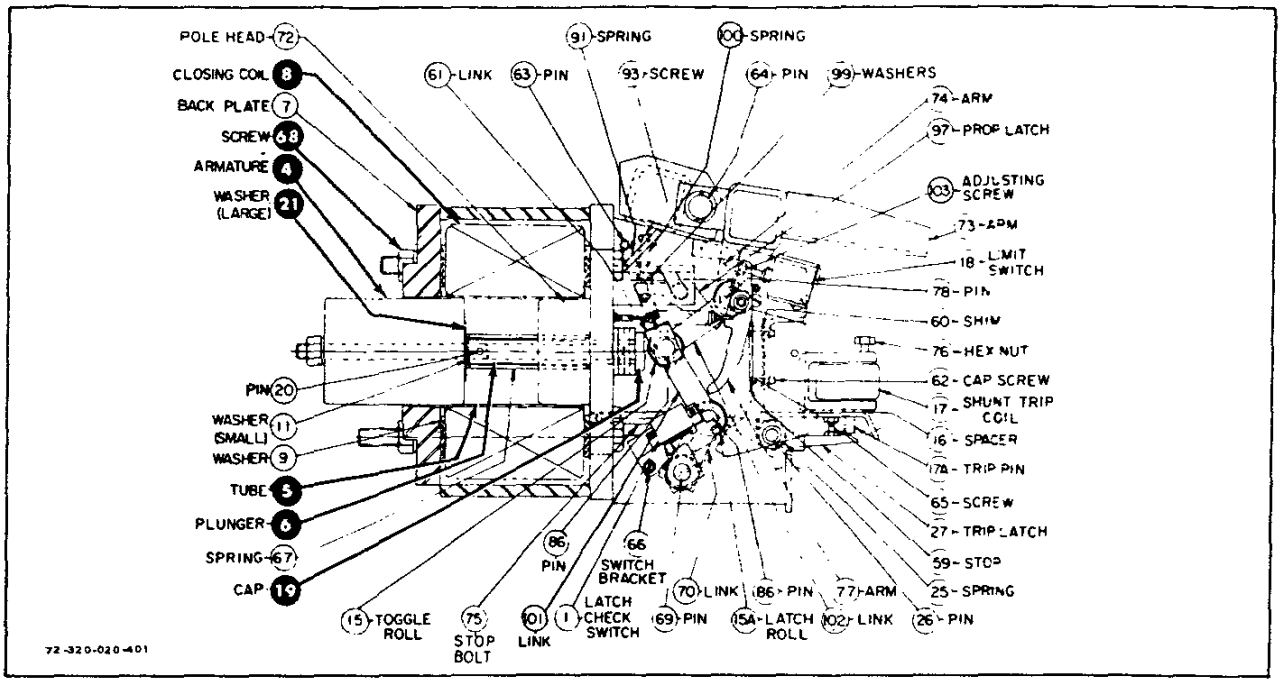


Fig. 3 – Solenoid operator assembly.

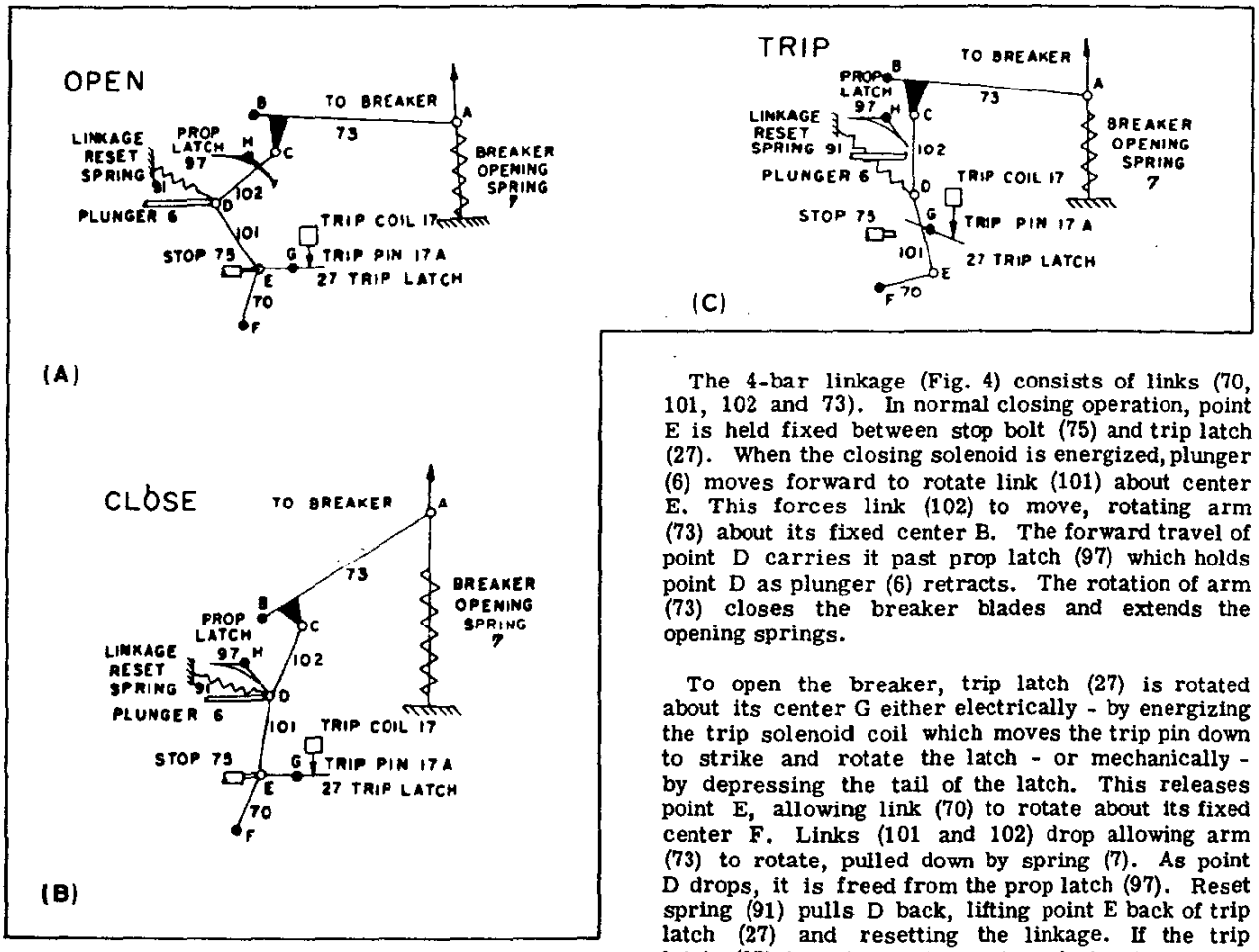


Fig. 4 – Four-bar linkage.

The 4-bar linkage (Fig. 4) consists of links (70, 101, 102 and 73). In normal closing operation, point E is held fixed between stop bolt (75) and trip latch (27). When the closing solenoid is energized, plunger (6) moves forward to rotate link (101) about center E. This forces link (102) to move, rotating arm (73) about its fixed center B. The forward travel of point D carries it past prop latch (97) which holds point D as plunger (6) retracts. The rotation of arm (73) closes the breaker blades and extends the opening springs.

To open the breaker, trip latch (27) is rotated about its center G either electrically - by energizing the trip solenoid coil which moves the trip pin down to strike and rotate the latch - or mechanically - by depressing the tail of the latch. This releases point E, allowing link (70) to rotate about its fixed center F. Links (101 and 102) drop allowing arm (73) to rotate, pulled down by spring (7). As point D drops, it is freed from the prop latch (97). Reset spring (91) pulls D back, lifting point E back of trip latch (27) and resetting the linkage. If the trip latch (27) is rotated at any time during the closing stroke, the linkage will collapse.

Fig. C -- Breaker Open, Springs Charged. As the closing springs become fully extended, cranks (4) push links (9, 10) over toggle and cranks (4) disengage roll (24) and rotate out of the way. The closing springs are fully charged and held by spring release latch (13).

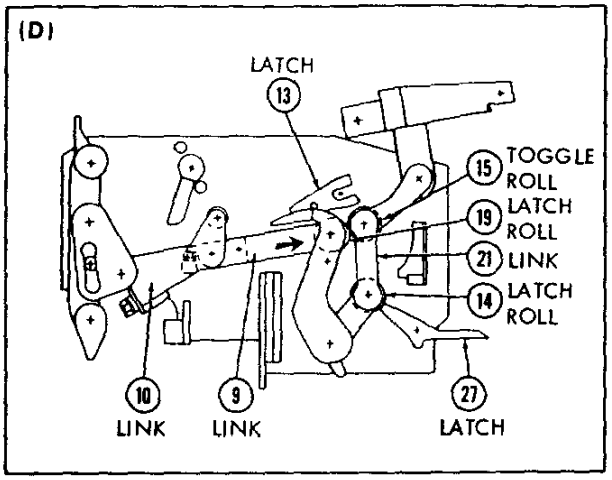


Fig. E -- Breaker Closed, Linkage Starts to Collapse. The rotation of link (21) rotates arm (23), through link (20), closing the disconnect blades. Links (20, 21) go over toggle against stop (59), locking the breaker closed. Screw (32) and crank (12) come in contact and force link (10) to rotate, breaking the over toggle between links (9, 10).

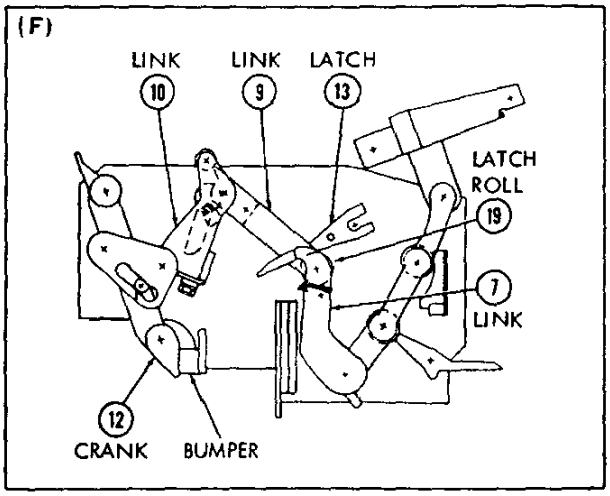


Fig. G -- Breaker Opening, Springs Charged. To open the breaker, trip latch (27) is rotated by depressing latch, releasing latch roll (14). Arm (22) rotates about its center, allowing links (20, 21) to drop. This rotates arm (23) about its center, opening the breaker. Toggle roll (15) is forced back by the curve of stop (59), breaking the over toggle of links (20, 21) and allowing them to reset. This rotates arm (22) back into reset position with latch roll (14) back of latch (27).

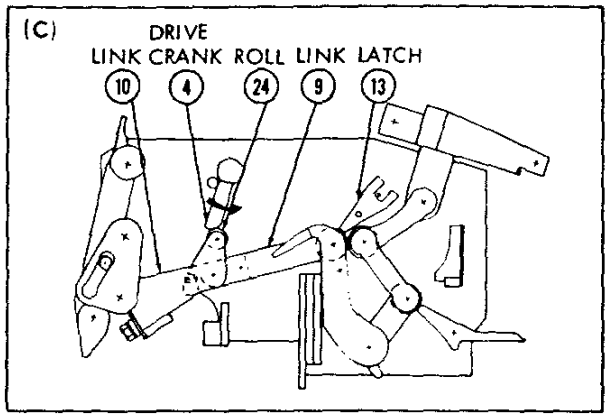


Fig. D -- Start of Closing. To close the breaker, the spring release latch (13) is moved up to release latch roll (19). Links (9, 10) drive forward as a unit. Latch roll (19) forces toggle roll (15) forward. This rotates link (21) about latch roll (14) which is held fixed by latch (27).

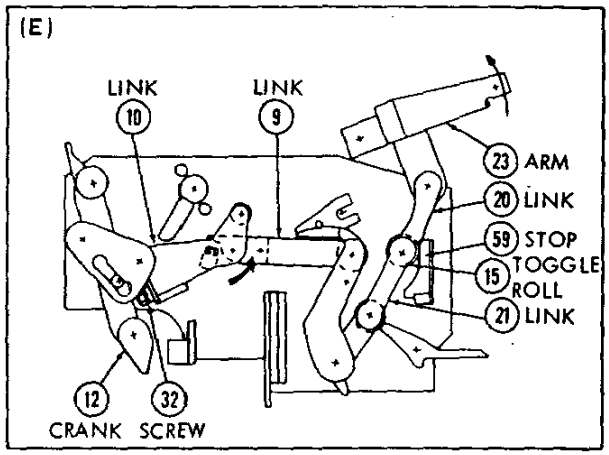
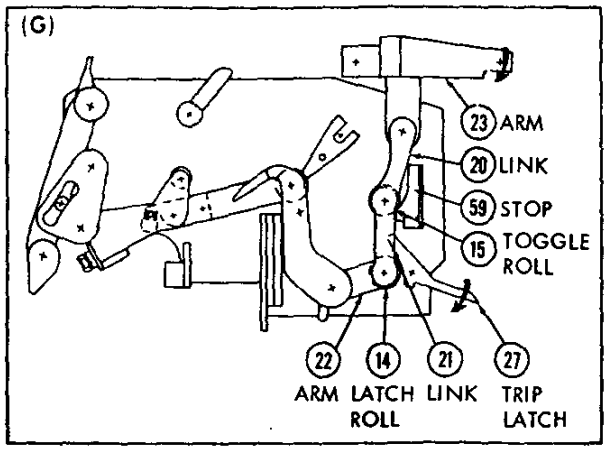


Fig. F -- Breaker Closed, Springs Discharged, Mechanism Practically Reset. Crank (12) is stopped by the bumper. Links (9, 10) collapse upward, allowing link (7) to reset. Latch (13) drops ahead of latch roll (19). Unit is set to recharge springs.



STORED ENERGY OPERATOR

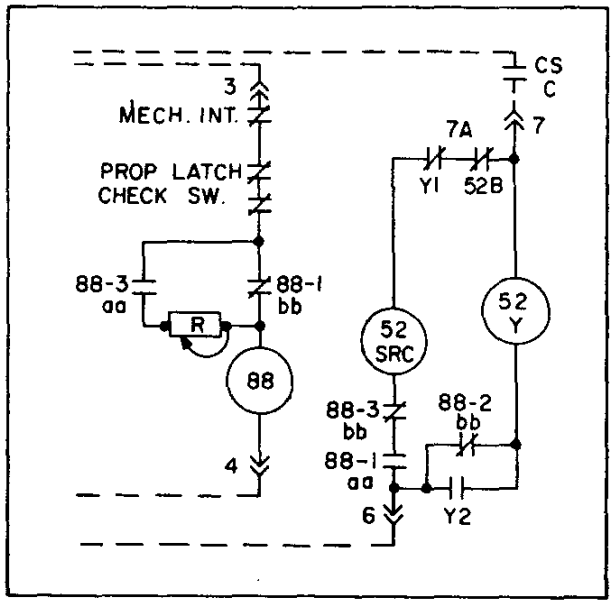
The normal control (Fig. 7) for this operator has been incorporated in one switch assembly located at the rear of the unit. It consists of two heavy-duty toggle switches (6) operated by common linkage (1) from the main closing springs and one heavy-duty toggle switch (6) operated by a cam (2) driven by the main gear (Fig. 11).

The main spring charging motor power is supplied through terminals 3 and 4, Fig. 7. The mechanical interlock is a switch operated by the breaker release lever which opens the motor circuit when the lever is depressed. The prop latch check switch is closed when the spring release latch is in reset position. The 88-1 and 88-2 switches are shown with the main closing springs discharged. When the control is energized, the motor starts to charge the springs. The 88-3 switch is operated by cam (2), Fig. 11, on the main gear. As the charging linkage charges the main closing springs, the motor switch cam rotates with the left-hand large gear. When the control is energized the motor starts to charge the springs. Just before the springs are fully charged, the 88-1 and 88-2 switches are thrown by lever (1) which is operated by pin (5), Fig. 11. The 88-1bb switch opens when the springs are fully charged. However, before this switch opens, the 88-3aa switch closes and connects the dropping resistor into the motor circuit. The motor continues to drive the gears until the free swinging cranks on the main gears are almost to the top of the greas. The motor then shuts off (cutoff by the cam operating the 88-3aa switch) and coasts until the cranks go over center and drop out of the way.

Closing Circuit

The standard control circuit for a stored energy operator is shown in Figure 7. When the close control switch (CS) is closed, the circuit from terminal 7 through 52B and Y1 to 52SRC, through 88-3 and 88-1 to terminal 6 energizes the spring release coil, closing the breaker. As soon as the closing springs are discharged, 88-2 (bb) closes to energize 52Y relay. If the close control switch remains closed, the 52Y relay remains locked in through contact 52T2. Control switch (CS) has to be released to reset control for another closing operation. This forms the anti-pump circuit which prevents the circuit breaker from reclosing immediately after a trip free operation.

Fig. 7 – Control scheme for stored energy operator.



Reset Relay (Reclosing Control)

The reset relay (Fig. 8) designed for use in circuit breaker control is an electronic solid state time delay which operates an electro-mechanical relay (R). The relay, in turn, energizes the spring release coil (SRC) to close the breaker. The relay contacts are rated 15 amperes.

The relay closing time is not affected by board variance of voltage and current well beyond the standard circuit breaker control limits. The time delay error caused by temperature is minor, being less than 3% from -20 to +80 C and not over 5% to -40 C.

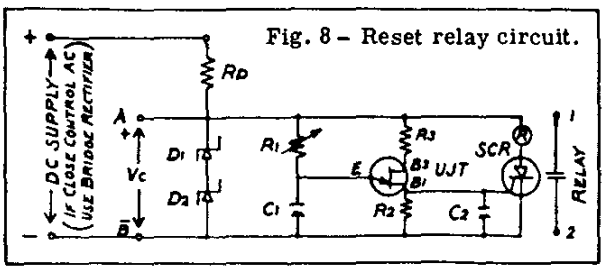
The voltage regulator and timing circuits are mounted on a printed circuit board and encapsulated in a resilient material for shock resistance.

The controlled supply voltage charges the capacitor (C1) through the time rate determining resistor (R_1) to the triggering voltage of the unijunction transistor (UJT) which activates the SCR, energizing the relay coil.

Variable resistor (R) is preset at the factory for a delay of ten cycles and locked in place by the stem locking nut. A 5-degree change in resistor setting would mean a change in delay of approximately 1/2 cycle. The unit is adjustable from an approximately instantaneous to a 60-cycle delay. Any readjustment should be made using a cycle counter or equivalent for timing.

The delay circuit in the reset relay is a closely controlled capacitor relaxation circuit, direct current operated. Figure 9 shows a circuit used on a breaker with dc contr[illegible] When the close control switch is closed, the [illegible]uit from 7 through 52B and Y1 to terminal [illegible] and from terminal T3 to 6 energizes the time delay circuit. After the specified delay, normally ten cycles, the relay coil is energized, closing the relay contact (R_2), tieing terminal T1 to terminal T2, completing the circuit to the spring release coil and closing the breaker.

Fig. 8 – Reset relay circuit.



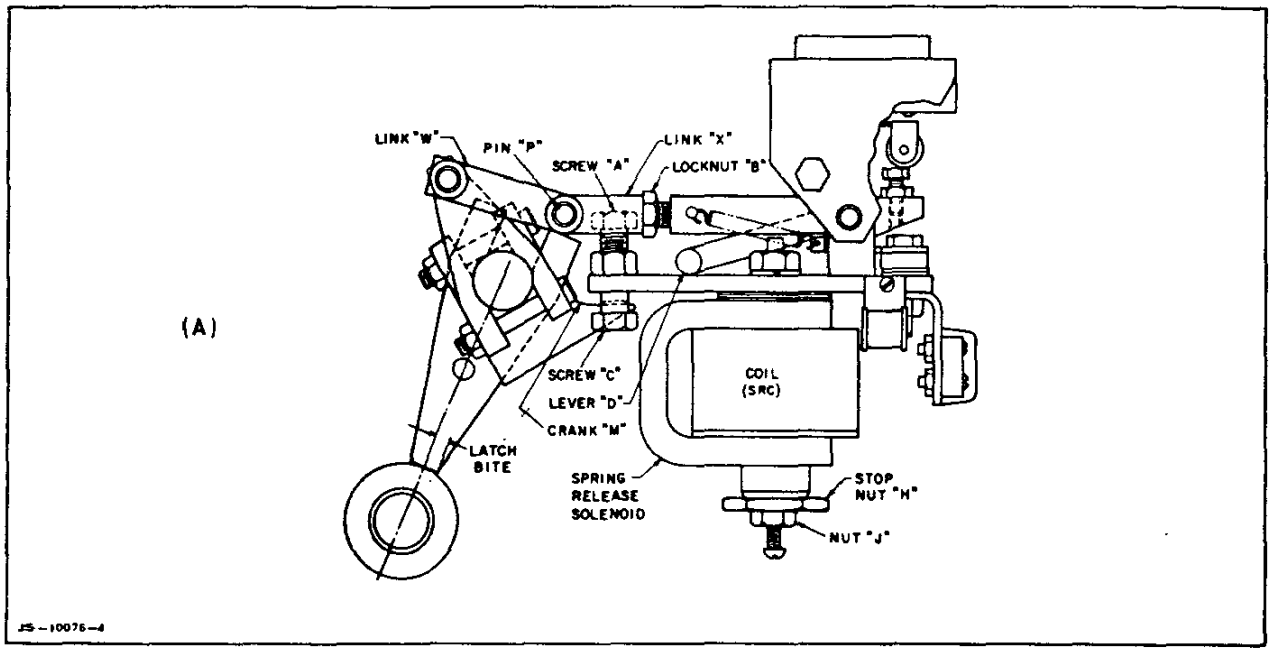
The resistor is adjusted to limit the speed of the unloaded motor. It is factory set to operate the motor at rated and minimum voltage and limit the coast of the motor so that the pin on the gear coasts past top center by not beyond 10 o'clock. With too much resistance the motor will stall. With too little resistance, the motor will coast too far and the cam will reclose the 88-3aa switch and the motor will continue to run.

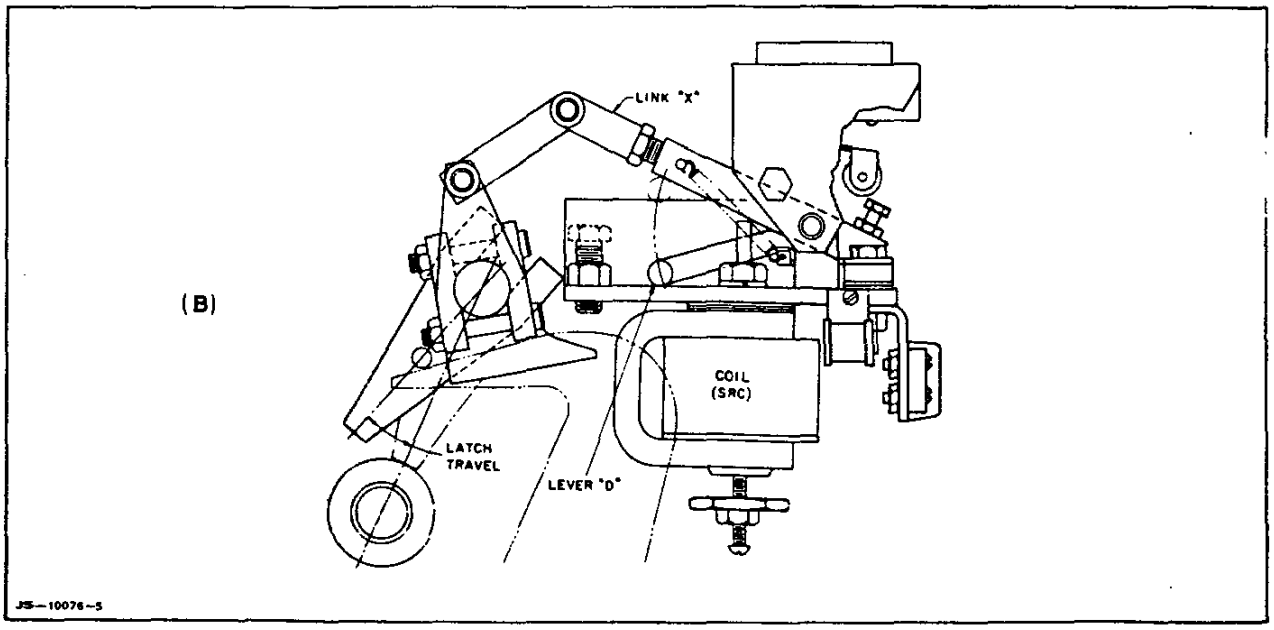
Spring Release Latch

Fig. 12a shows the spring release latch in the hold position and locked in place by links (W and X) which are over toggle against screw (A). To release the latch, link (X) must be moved upward to invert the toggle. The switch is in the drive motor circuit and is closed when link (X) is against screw (A). Vertical movement of link (X) opens the switch.

When the spring release solenoid is energized (Fig. 12b), the armature moves up with the ram, forcing link (X) up, to break the over toggle condition of links (W and X). Link (X) is rotated to the right, removing the latch from the latch roll to release the closing mechanism. The upward movement of link (X) opens the switch in the drive motor circuit, preventing the springs from charging until link (X) resets to lock switch in position.

Fig. 12 – Spring release latch for stored energy operator.





ADJUSTMENTS

Adjustments are factory set and checked before and after numerous mechanical operations on every breaker to insure correctness. No adjustment checking should be necessary on new breakers. If a malfunction occurs, check for hidden shipping damage.

The following will help you get the correct adjustments when replacing a broken or worn part.

CIRCUIT BREAKER TIMING

A comparison of circuit breaker timing at any period of maintenance with that taken when the breaker was new will indicate the operational condition of the breaker mechanism. A time variance of more than 1/2 cycle on opening and 2 cycles on closing indicates a maladjustment or friction buildup. A hole in the movable contact arm is provided for connection of a speed analyzer.

PHASE BARRIER ASSEMBLY

Full size barriers of high dielectric flame retardant material isolate each phase (Fig. 1).

To remove phase barriers, lift panel spring assembly (13) out of slots (14) to release panel (32). Lift and remove panel (32). Remove screws (23, 39) from barrier (22). Remove screws (2, 48, 49). Remove rear barrier (25).

TILTING ARC CHUTES

Remove phase barriers as described under "Phase Barriers," above. Refer to Fig. 1. Remove screw (37) on each phase.

Position arc chute support at the rear of the breaker and tilt back the arc chutes.

After arc chutes are tilted back to their normal position, make sure all screws are tightened securely on all phases before phase barriers are replaced.

BARRIER STACKS

The barrier stacks (Fig. 2) are fragile and must be handled carefully. Inspect the barrier stacks for erosion of the plates in the areas of the slots. The stacks should be replaced when a milky glaze appears on the full length of the edges of most of the slots. They should also be replaced if plates are broken or cracked. When cleaning the breaker and cubicle, inspect for pieces of barrier stack refractory material which would obviously indicate breakage.

To remove the barrier stacks, tilt back the arc chutes, remove screws (30) and barrier (27) from each arc chute. Slide barrier stack (23) through top of arc chute. When replacing barrier stack be sure the v-shaped slots go in first.

SERVICING CONTACTS

The frequency of contact inspection depends on severity of service. Refer to Fig. 13. Remove disconnect arms as a unit by removing screw (24), nut (14) and spring (23). Carefully inspect all contact surface in hinge joint. Silver washer (25) and adjacent surfaces should be clean and free of roughness or galling. Lubricate silver washer and mating surfaces by rubbing in microfine dry graphite sparingly. Reassemble hinge hoint. Tighten screw (24) and nut (14) so that cotter pin can be re-installed. Spring (23) and washer (25) must be assembled in their original position to assure proper adjustment. Replace badly pitted or burned contacts before they are damaged to such an extent to cause improper operation of breaker.

CONTACT PRESSURE OF HINGE JOINT

The hinge joint contact pressure is in proper adjustment when a pull of 5 to 7 pounds is required to move the disconnect toward the open position. This measurement is obtained as follows: (Fig. 13)

Remove pin (12) and detach link (8) from the disconnect arms (18) and (19). Move the disconnect to a position just short of "contact make." Attach a spring scale to the disconnect 8-1/2 inches above screw (24), and in a direction perpendicular to the longest edge of the disconnect arm. Measure the pull to move the disconnect toward the open position.

Adjustment is made by tightening (or loosening) nut (14).

Before attaching link (8) to disconnect arms (18) and (19), check contact alignment and contact lead (Page 15).

ARCING CONTACT HINGE JOINT

The arcing contact hinge joint (Fig. 13) is in proper adjustment when each spring washer (15) is deflected approximately 0.015 inches.

This adjustment is obtained by tightening nut (4) until all parts just touch, then tighten the nut 3/4 to 1 turn more.

CONTACT ALIGNMENT

The main and arcing contacts are an integral part of the bushing assemblies and are carefully alignment with the upper and lower bushings before shipment. Normally, no further adjustment is necessary.

Use these procedures if it becomes necessary to change contacts or reset contact alignment (refer to Fig. 13).

Procedure A. Horizontal Alignment

1. If not already detached, remove pin (12) and detach link (8) from disconnect arms (18, 19).

2. Detach arcing contact (10) from yoke (2) by removing pin (26) and loosening nut (1) until assembly is free. Move main contacts as far back as they will go on stud.

3. Move the disconnect towards the closed position until it touches a main contact finger (view A-A, Main Contacts Engaging). Dimension "c" should be no greater than .020 with one contact touching.

4. Adjustment is made by loosening two nuts (22) and rotating the entire contact assembly. Check alignment (dimension "c") after nuts (22) are tightened.

5. Alignment is checked and adjusted on each phase separately. Be sure there are no binds between contacts (11) that could prevent wiping action with the disconnect arm.

Procedure B. Contact Penetration (Stroke)

1. Contact penetration should be checked and adjusted only when the contacts are properly aligned.

2. Attach link (8) with pin (12).

3. Using electrical closing procedures, close and latch breaker. Teh spread of the contacts (view A-A, Breaker Latched) should be 1/8 to 3/16 inch. This is the total of the two gap dimensions "a" measured on each side of the contact centering tube between the brass tube and the flat stop surface on the contact. Each "a" dimension is normally 1/16 to 3/32 inch.

4. With the breaker open, adjust by increasing or decreasing length of link (8) by turning nut (16). Adjust each phase separately.

Procedure C. Arcing Contact Lead

Arcing contacts are adjusted only after the main contacts have the proper alignment and penetration. The arcing contacts should "make" before the main contacts. To measure and adjust each phase:

1. Attach the arcing contacts to the yoke and spring assembly (reverse of Procedure A, step 2).

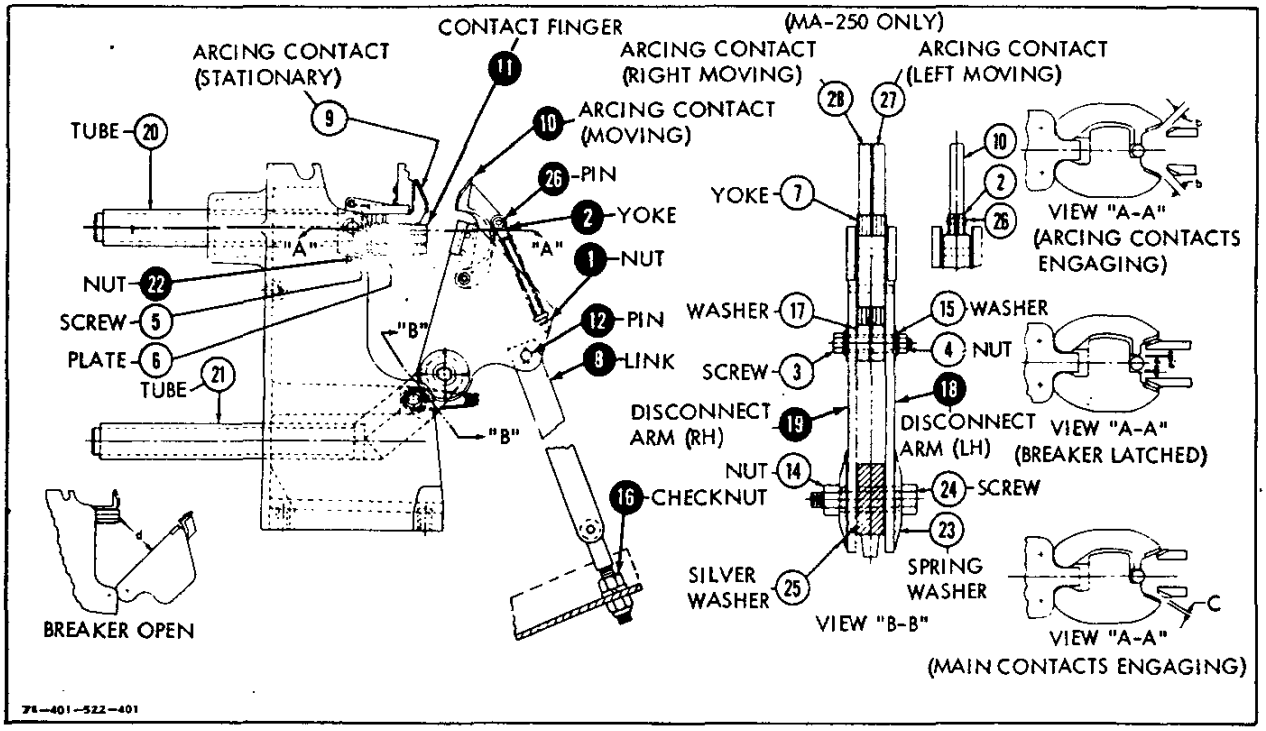
2. Using the maintenance closing procedure, slowly move all three phases toward the closed position until a dimension between 7/32 to 9/32 (dimension "b" view A-A, Arcing Contacts Engaging) can be measured simultaneously between main contacts on all three phases.

3. Set the arcing contacts to touch simultaneously at this point by adjusting nut (1) on the individual phases.

Procedure D. Check Breaker Open Position

Dimension "d" (Breaker Open of Fig. 13) is 4 inches plus or minus 1/8. Following the setting and adjustment of the contacts (Procedures A, B and C) open the breaker and measure dimension "d" between the disconnect arm and the bottom of the second finger in the main contact assembly. Adjustment is made with the breaker in the open position by positioning rod end (40), Fig. 1 at the top of the puffer piston rod.

Fig. 13 – Stud and support assembly.



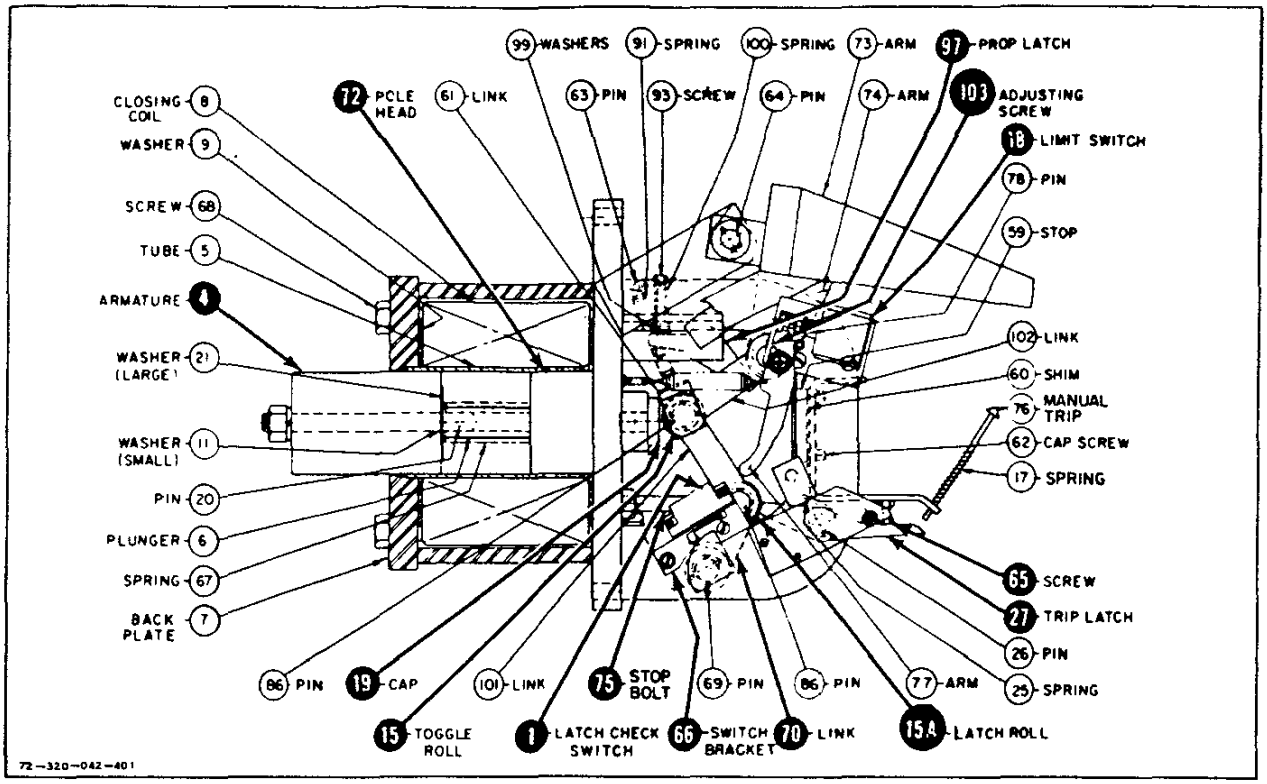


Fig. 15 - Solenoid operator assembly.

Limit Switch - The limit switch (18) is located on the front of the operator frame and is contacted by an extension of the toggle roll (15) pin within the 4-bar toggle linkage.

Adjust by screw (103). Contact action required by circuit breaker should be at 3/4 to 7/8 inch of the stroke of ram cap (19).

Latch Check Switch - The latch check switch (1) is mounted on the bottom of the operator frame. The switch makes contact near the end of the reset travel of the lower link (70) of the 4-bar toggle linkage.

Adjust by moving switch bracket (66). The latch check switch may be jumper wired out or omitted if not used for instantaneous reclose.

STORED ENERGY OPERATOR (Fig. 16)

Main Toggle Roll -- When the breaker is in closed position with roll (15) against block (59), center of main toggle roll (15) should be 3/16 to 5/16 of an inch beyond line of centers of latch roll (14) and pin (30). Adjustment is made by adding or removing shims (60) behind stop (59).

Trip Latch -- The trip latch should engage its roll (14) 1/8 to 3/16 of an inch above the lower edge of the latch face. Adjustment is made with screw (65). This adjustment affects the clearance between the trip pin (17A) and the trip latch (27). With the springs charged and the breaker open, the trip latch (27) should clear its latch roll (14) by 1/64 to 3/64 of an inch. Adjustment is made by stop bolt (75).

Trip Solenoid -- The trip solenoid is adjusted by shims so that when the armature is against the pole head there is 1/32 to 3/32 of an inch of travel after the breaker trips. The trip pin (17A) clears the trip latch (27) when relaxed by 3/32 to 5/32 of an inch. Adjustment is made by hex nut (34).

Manual Charging of Closing Springs -- The springs are manually charged by inserting the charging handle into the guide tube to engage the gear motor (48). Turn the handle in the direction shown until the spring linkage is heard to go over toggle. This audible snap indicates that the springs are fully compressed (changed). Continue turning handle (about 95 more turns) to bring driving cranks (4) to their reset position (just past dead center). This removes the cranks from the danger of being hit by roll (24) as the breaker closes. It also correctly positions the cam controlling the 88-3 switch for electrical operation.

Manually Slow Closing the Breaker -- This breaker can be partially closed slowly and mechanically held in any position of the closing stroke to make or check adjustments. Insert spring charging handle into guide tube and engage with gear motor (48). Turn handle counterclockwise until resistance is felt. Pull closing lanyard and hold out, continue turning handle. Contacts will close to main contact touch position but not fully closed.

CAUTION

As the contacts approach the closed position, check position of cranks (4) on rolls (24). Do not allow cranks to pass by the rolls, causing the contacts to snap open.

3. Hand crank unit until pin (8) rests on crown of cam (2) (before springs begin to charge).

4. Turn adjusting screw (3) on 88-3 switch until there is only 1/32 to 1/64 inch travel left. Lock with locknut (4C).

5. Hand crank unit until springs charge and 88-3 switch snaps over just before springs reach the full charged position.

6. Turn adjusting screws (3) on 88-1 and 88-2 switches until they snap over. Lock with locknuts (4A, 4B).

7. Crank unit until 88-3 switch is reset and drive pawls drop over center.

8. Discharge springs.

9. Recharge springs and readjust 88-1 and 88-2 switches, if necessary, to snap over with--or after--88-3 switch.

Spring Release Latch and Over Toggle Linkage - To change bite of spring release latch (Fig. 18), disconnect links (W and X) by removing pin (P) and turning screw (A) against crank (M). Check visually to see that bite is 3/16-in., or point of contact at about the center of the latch (18). Lock screw (A) with locknut (C). Adjust link (X), if necessary, so that pin (P) can be easily inserted. To adjust link (X), loosen locknut (B) and rotate the link end to increase or decrease its length.

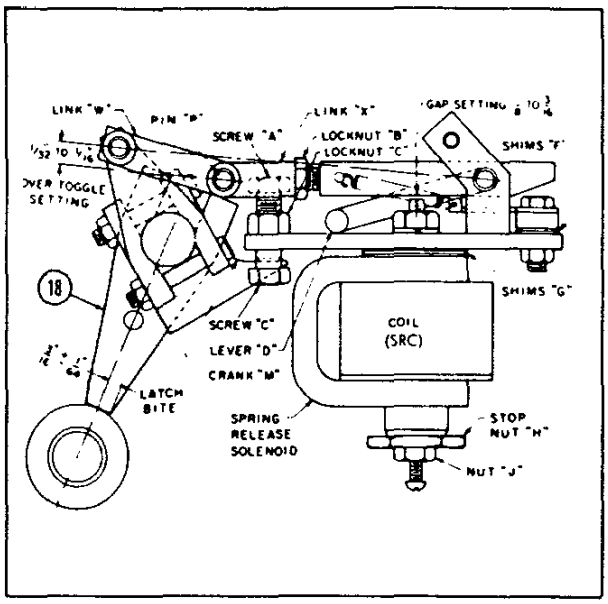


Fig. 18 - Spring release latch.

The over toggle linkage (links W and X) functions to stabilize the position of the spring release latch (18). It is in proper adjustment when the center of pin (P) is 1/32 to 1/16-in. below a line drawn between the pivot points of links W and X. This adjustment is made with screw (C) which acts to position link (X).

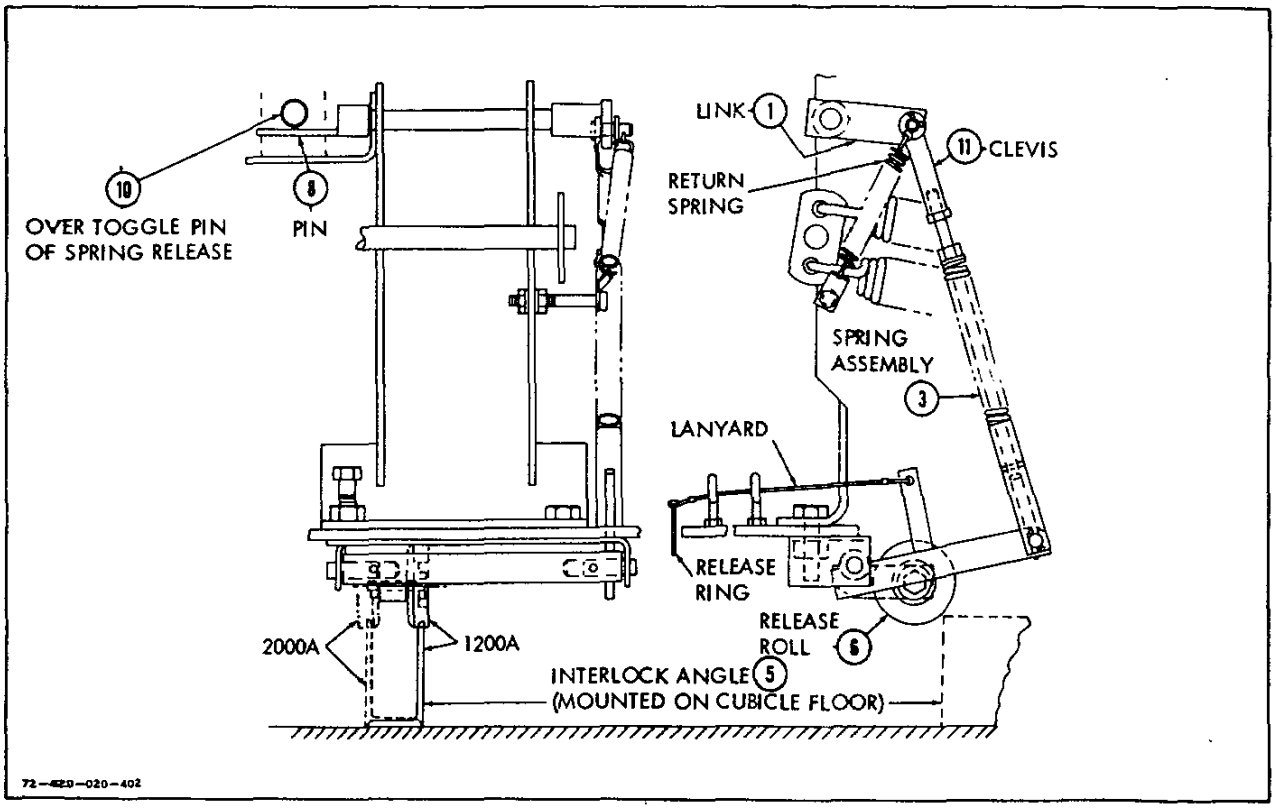


Fig. 19 - Spring release arrangement for stored energy operator.

ATTACH TO:

18X3087-02
December, 1973

CORRECTION SHEET

This sheet(s) notes changes which should be made in the attached instruction booklet:

CIRCUIT BREAKER INSTRUCTIONS 18X3087-02

Types MA-75C, MA-250C, MA-350C Air Magnetic

Breakers

MA-250B (#1RWP)

ON PAGE 1, Circuit Breaker Preparation, #17 should read as follows:

Coat movable primary and secondary disconnects with a light film of lubricant supplied by A-C.

ON PAGE 14, Contact Pressure of Hinge Joint, first paragraph, first sentence should read as follows:

The hinge joint contact pressure is in proper adjustment when a pull of 4 to 6 pounds is required to move the disconnect toward the open position.

ON PAGES 14 and 15, replace ADJUSTMENT PROCEDURES A, B, AND C with the following:

Procedure A. Horizontal Alignment

1. Push stationary contact fingers as far back as they will go on stud.

2. Using maintenance closing procedure, move the disconnect towards the closed position until it touches a main contact finger (view A-A, Main Contacts Engaging). Dimension "c" should be no greater than .020 with one contact touching.

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Procedure A. Horizontal Alignment (Continued)

3. Adjustment is made by loosening two nuts (22) and rotating the entire contact assembly. Check alignment (dimension "c") after nuts (22) are tightened.

4. Alignment is checked and adjusted on each phase separately. Be sure there are no binds between contacts (11) that could prevent wiping action with the disconnect arm.

Procedure B. Contact Penetration (Stroke)

1. Contact penetration should be checked and adjusted only when the contacts are properly aligned.

2. Check that open gap "d" is approximately correct to avoid over penetration (see Procedure D).

3. Using power* closing procedures, close and latch breaker. The spread of the contacts (view A-A, Breaker Latched) should be 1/8 to 3/16 inch. This is the total of the two gap dimensions "a" measured on each side of the contact centering tube between the brass tube and the flat stop surface on the contact. Each "a" dimension is normally 1/16 to 3/32 inch.

4. With the breaker open, adjust by increasing or decreasing length of link (8) by turning nut (16). Adjust each phase separately.

Procedure C. Arcing Contact Lead

Arcing contacts are adjusted only after the main contacts have the proper alignment and penetration. The arcing contacts should "make" before the main contacts. To measure and adjust each phase:

1. Push stationary contacts back on stud.

2. Using the maintenance closing procedure, slowly move all three phases toward the closed position until a dimension between 7/32 to 9/32 (dimension "b" view A-A, Arcing Contacts Engaging) can be measured simultaneously between main contacts on all three phases.

3. Set the arcing contacts to touch simultaneously at this point by adjusting nut (1) on the individual phases.

*Power close S.E. operator, maintenance close solenoid operator.

ON PAGE I8, Substitute the following 88 SWITCH ADJUSTMENT PROCEDURE:

1. Loosen locknuts on switch adjusting screws and back off adjusting screws on all three switches.

2. Hand crank operator (as in manual spring charge) until switch actuating roller of motor cutoff switch 88-3 resets on the crown of the cam. (Before the spring begins to charge).

3. Turn adjusting screw on the 88-3 switch until the switch actuates; then continue turning the screw carefully until full travel of the switch actuating lever is reached. Then back off 1/2 to 5/8 turn on the adjusting screw and lock with locknut.

4. Check to see that a .025 feeler can be inserted between switch roller and cam and that a .045 feeler cannot be inserted. Readjust if required.

   This assures that the 88-3 switch has actuated at the earliest possible time, has maximum overtravel beyond the actuating point, and will not "bottom out" and damage the switch or actuator.

5. Hand crank to fully charge the springs.

6. Adjust the screws on the charge initiating switch 88-1 and the spring position indicating switch 88-2 until the switches actuate. Then turn the screws 1 1/2 more turns and lock with locknut.

7. Crank until 88-3 switch is reset and driving cranks drop over center.

8. Discharge springs.

9. Manually charge the springs noting the sequence of operation of the switches.

   As the springs charge the 88-3 switch must actuate first followed by the 88-1 and 88-2 switches. During a manual charge the 88-1 and 88-2 switches will lag the 88-3 by 2 to 4 revolutions of the hand crank. The 88-1 and 88-2 switches should actuate at approximately the same time.

10. Measure the control voltage prior to operating the breaker electrically and determine whether the value measured is the normal value for that location. The resistor should be set to coincide with the normal value of control voltage existing in the switchgear.

    Operate the breaker electrically at normal control voltage, setting the resistor to limit coasting to the point where the pins that drive the driving cranks will stop between 10 and 11 o'clock.

88 SWITCH ADJUSTMENT PROCEDURE (Continued)

At rated maximum voltage the pins will approach the 10 o'clock position and the flat (trailing) edge of the cam surface will be approximately horizontal. This is the maximum allowed in factory setting. Field setting will probably be nearer the 11 o'clock position.

NOTE: If working in temperatures below 50°F allow for the fact that more coasting will occur as the temperature rises and lubricants become more fluid. Set resistance so that drive pins stop between 12 and 2 o'clock.

ON PAGE 20, Maintenance, 3rd paragraph, last three sentences are condensed into one and should read as follows:

Rub microfine lubricate current carrying joints with A-C contact lubricant and remove any excess which squeezes out following reassembly.