ALLIS CHALMERS CONTROLS

INSTRUCTIONS

AIR CIRCUIT BREAKER
TYPE LA-3000, LA-4000
& LA-4000F (FUSED)

BWX-6670-2

18X4583

INDEX

ILLUSTRATIONS

TABLES

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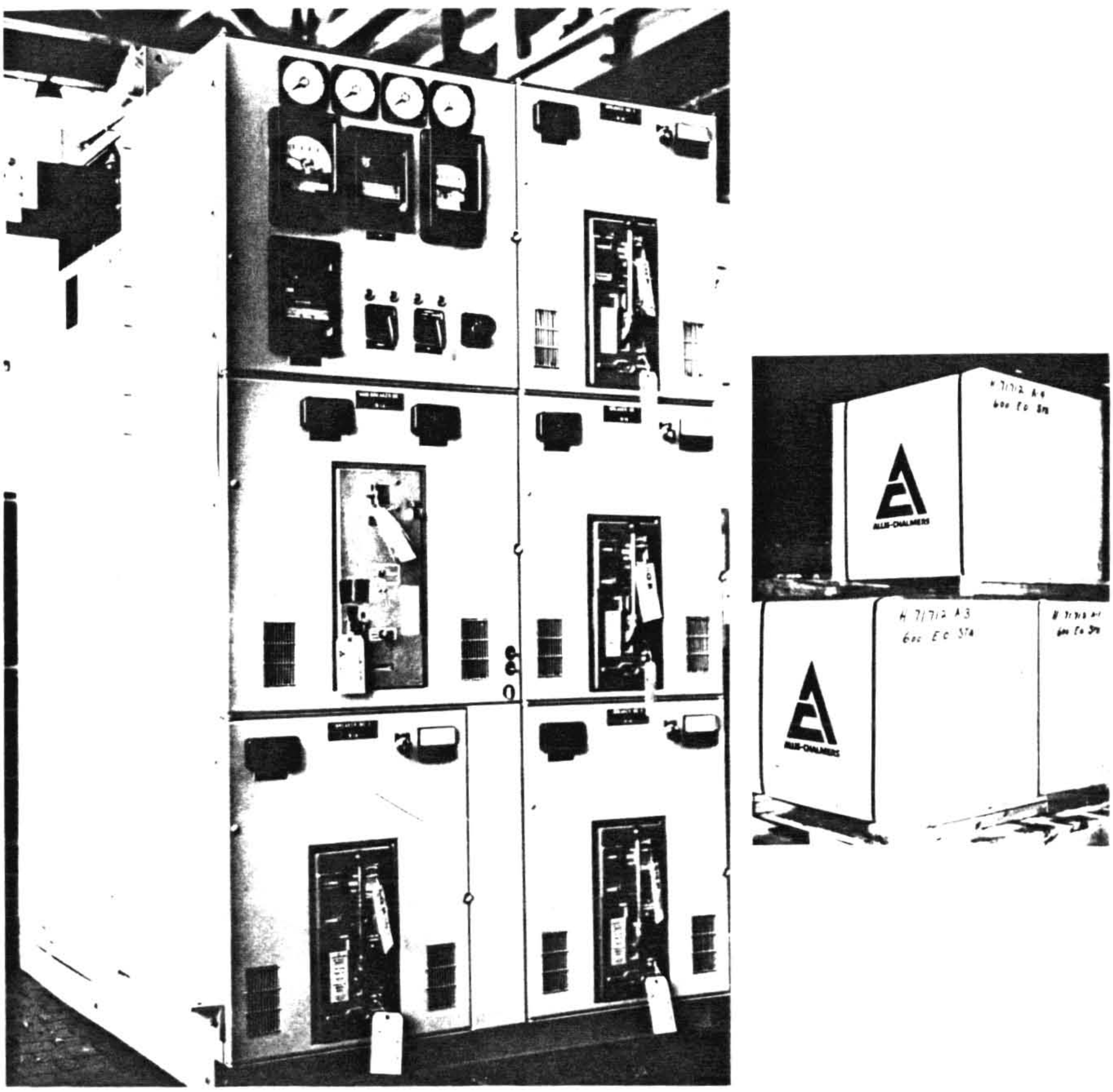
WARRANTY

Allis-Chalmers "LA" air circuit breakers are warranted to be free of defects in material and workmanship for a period of one year after delivery to the original purchaser. This warranty is limited to the furnishing of any part which to our satisfaction has been proven defective. Allis-Chalmers will not in any case assume responsibility for allied equipment of any kind.



Typical Shipping Methods Used With "LA" Breakers

INSTALLATION AND INSPECTION

Introduction

This instruction book contains information on the installation, operation and maintenance of the Type LA-3000 and LA-4000 air circuit breakers. Figure 1 provides outline and dimension data as well as major component location for these similar breakers. Type "LA" air circuit breakers may be furnished for mounting in any one of three ways. They may be used in metal enclosed switchgear of the drawout type, in individual enclosures (pullout type), or for stationary mounting in a user's own enclosing case or switchboard. All "LA" breakers are completely assembled, tested, and calibrated in a vertical position and must be so installed to operate properly. User's primary connections should be adequately braced against the effects of short circuit currents to prevent overstressing the breaker terminals.

Receiving and Inspection for Damage

Immediately upon receipt of this equipment, carefully remove all packing traces and examine parts, checking them against the packing list and noting any damages incurred in transit. If such is disclosed, a damage claim should be filed at once by the customer with the transportation company and Allis-Chalmers notified.

Two shipping methods are used with "LA" breakers:

1. Individually with protective covering.
2. Within a cubicle when part of a switchgear lineup. Breakers shipped in their cubicles are blocked to prevent accidental tripping during shipment. Note all caution tags, remove blocking bolts, and open breaker contacts before installation.

CAUTION

1. *READ INSTRUCTION BOOK before making any changes or adjustments on the breaker.*
2. *Discharge the closing springs before working on the breaker.*
3. *Check current ratings and serial numbers against single line diagram to assure that breakers are properly located in switchgear at installation.*
4. *Check the alignment of the secondary disconnect fingers to ensure against misalignment due to possible distortion of fingers during shipment and handling.*
5. *Once the breaker is energized, it should not be touched except to operate, since most of the component parts are also energized.*

Installation

Circuit breakers should be installed in a clean, dry, well-ventilated place in which the atmosphere is free from destructive acid or alkali fumes. Stationary type breakers should be mounted high enough to prevent injury to personnel either from circuit interruption or from moving parts during automatic opening of the breaker. Allow sufficient space to permit access for cleaning and inspection and adequate clearance to insulating barrier above the breaker to prevent damage from arcing during interruption. Before installing, make certain that the breaker contacts are in the open position.

1. After the breaker is installed in position, close it manually by the maintenance closing method (See OPERATION Section) to check proper functioning of the mechanism and contacts.

WARNING

MAKE SURE CIRCUIT IS NOT ENERGIZED.

During the closing operation, observe that the contacts move freely without interference or rubbing between movable arcing contacts and parts of the arc chutes. Then refer to OPERATION Section of the Instruction Book for a detailed description of the circuit breaker operating characteristics before putting the breaker in service.

2. Trip units and accessory devices should receive a thorough check prior to placing the breaker in service to be certain that adjustments are proper and parts are not damaged.
3. Cubicle-mounted breakers of the drawout type are equipped with a drawout interlock to prevent movement of a closed breaker into or out of the connection position. See the OPERATION Section for a description of the interlock. Its operation should be checked before the breaker is energized.
4. The breaker is ready to be energized after the control wiring is checked and the insulation tested.

Storage

When breakers must be stored, they should be wrapped or covered with a non-absorbent material to provide protection from plaster, concrete dust or other foreign matter. Breakers should not be exposed to the action of corrosive gases or moisture. In areas of high humidity or temperature fluctuations, space heaters or the equivalent should be provided.

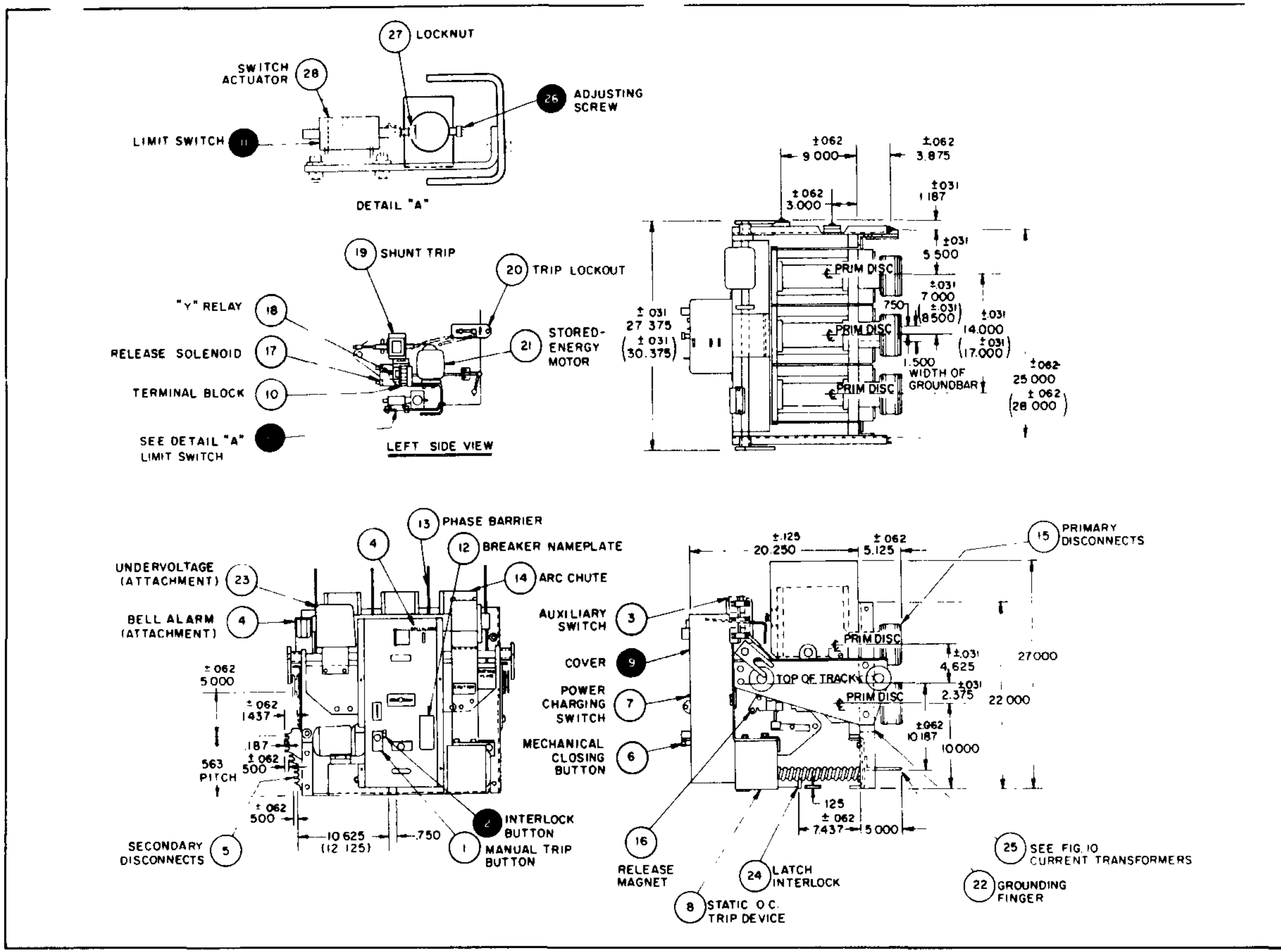


Figure 1. – Typical LA-3000 and (LA-4000) Breaker Outline

Maintenance

Occasional checking and cleaning of the breaker will promote long and trouble-free service. Periodic inspection and servicing at six month intervals should be included in the breaker maintenance routine.

If the circuit breaker is not operated for extended periods, the breaker should not remain in either the closed or open position any longer than six months. Maintenance opening and closing operations should be made to ensure freedom of movement of all parts.

Renewal Parts

When ordering renewal parts, specify the complete nameplate data including breaker serial number.

OPERATION

Description and Function

The operating mechanism is the medium used to transmit power from the stored-energy closing springs to the contact structure to close the breaker. Cubicle mounted breakers of the drawout type are provided with the motivating means to rack the breaker into and out of the cubicle compartment. A maintenance closing link is furnished to manually close the breaker for inspection prior to installation and for maintenance inspection.

A double-toggle, trip-free operating mechanism is used; that is, the breaker contacts are free to open at any time, if required, regardless of the position of the mechanism or the force being applied. For descriptive purposes the operating mechanism can be divided into two groups: the stored-energy mechanism and the closing mechanism.

Stored-Energy Mechanism

Figure 2 shows the operating mechanism in the closed, open, and trip-free positions. In view C of Figure 2, the stored-energy springs are in the discharged position. On electrically operated breakers, energization of the motor by actuation of the power charging switch causes the motor to rotate pinion shaft (9) to drive gear (10). This gear is provided with a driving pin (12) positioned to engage with a corresponding pin (11) on eccentric (13). The eccentric is revolved clockwise about fixed center "A" driving the connecting rod (14) to the right. The motion of the connecting rod to the right compresses the pair of stored-energy springs (16) that function as a unit through links (15) and bar (34). At the instant the springs are fully charged, latch roll (18) affixed to connecting rod (14) engages prop latch (20) thus holding the fully charged springs latched and ready to be discharged to close the breaker.

To guard against accidental overloading of the charging system, gear (10) that is driven by the pinion shaft (9) is shaped to disengage from the pinion shaft at the fully charged position of the stored-energy springs. This disengagement is accomplished by the removal of a segment of the teeth from the periphery of the gear. Flexible teeth are provided at the end of the open segment to facilitate re-engagement. (See Figure 3.)

Closing/Opening Mechanisms

Figure 2D shows the mechanism in the open position with the stored-energy springs charged. The stored energy closing force is released either manually by depressing mechanical closing button or electrically by actuation of the solenoid release plunger. In either case, prop latch (20) is rotated clockwise to release the connecting rod (14). The connecting rod is attached to the closing springs (16) through link (15) and bar (34) and to the bell crank (17) by pin (21). Release of the prop latch permits the closing springs to move the connecting rod clockwise to the left about fixed center "A" and the bell crank clockwise about fixed center "B". Clockwise rotation of the bell crank drives link (22) to rotate closing cam (23) which acts against toggle rolls (24) moving the toggle linkage to the right about releasable center "C" thus closing breaker contacts. When the full closed position is reached, the toggle linkage is propped over center against the toggle stop (25) and is supported through toggle latch (26), trip latch (27) and trip shaft (28) as shown in Figure 2B. The closing cam will remain in the up, or closed position until the closing springs are charged. Charging of the closing springs will rotate bell crank in the counterclockwise direction thereby drawing the closing cam down into position for another closure.

Opening of the breaker contacts is accomplished by the release of trip latch (27). Trip shaft (28) is rotated counterclockwise by action of the various trip devices or the manual trip button. This rotation of the trip shaft permits trip latch (27) to rotate counterclockwise about fixed center "D" thus toggle latch (26) is released and permitted to rotate clockwise about center "E". Releasable center "C" is now free to rotate with the toggle latch permitting the force of the stationary main contact spring as well as the opening springs to move cranks (29), (40) clockwise to collapse the toggle linkage as shown in Figure 2D. The rotation of cranks (29), (40) and movement of link (30) to the left, thereby opens the breaker contacts. The resetting sequence of the trip latch, toggle latch and toggle linkage is entirely dependent on the position of the stored energy springs. With the springs charged, the latches and toggle mechanism will immediately reset as shown in Figure 2D. With the springs discharged, and the breaker open, the

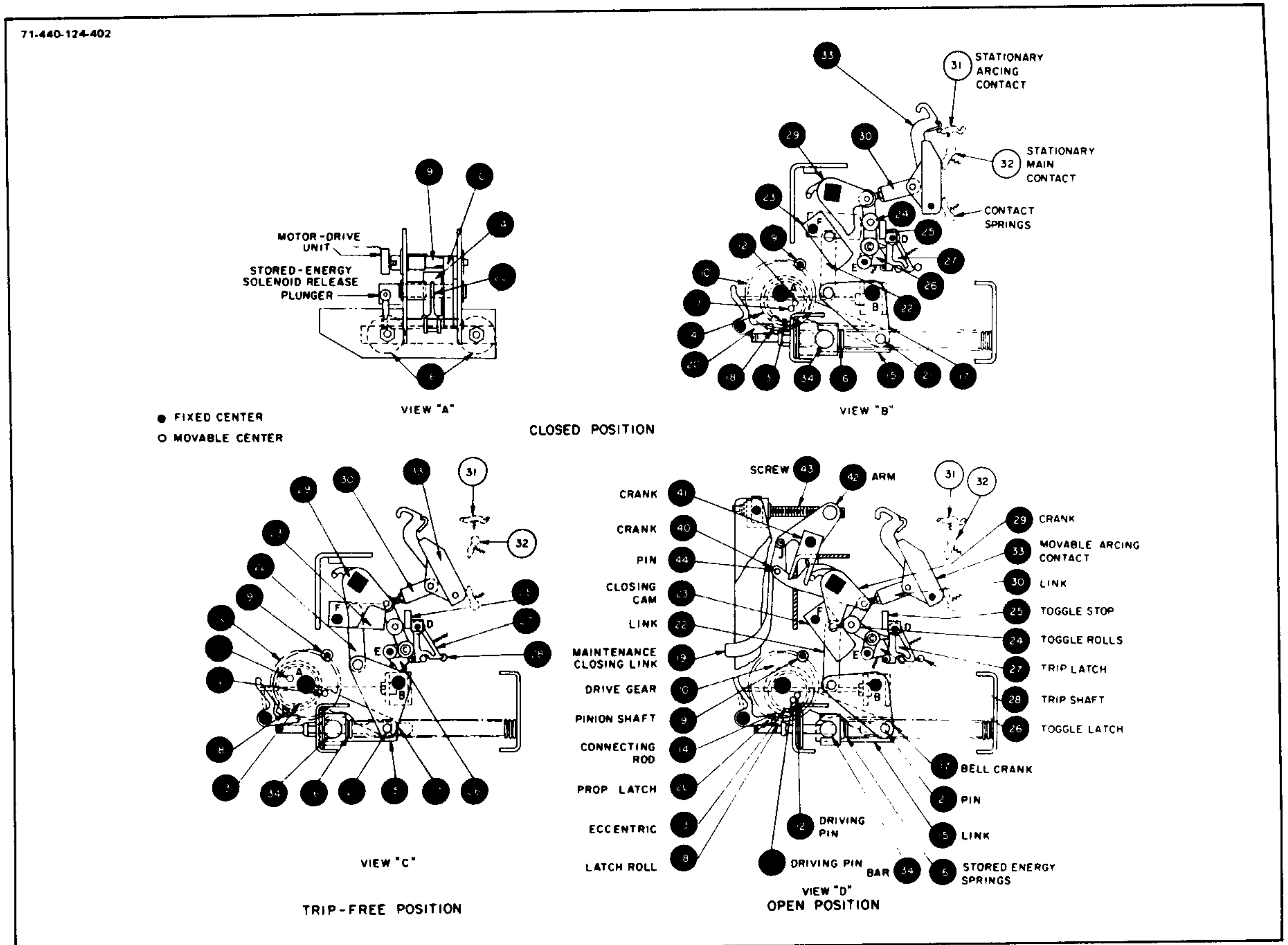


Figure 2. – Type "LA" Operating Mechanism

closing cam will hold the toggle mechanism trip-free as shown in Figure 2C until the charging sequence is started at which time the closing cam will be withdrawn permitting the toggles and latches to reset.

Trip-Free Mechanism

Figure 2C shows the mechanism in the trip-free position. When latches (27) and (26) are released, center "C" is not restrained as in normal closing operation, but now is released to pivot about pin "E" as a center. Thus when closing energy is delivered to the toggle linkage through the closing cam, the toggle latch (26) rotates clockwise about the new center "E" permitting the closing cam to go through its complete cycle without moving link (30), and the breaker contacts, therefore, will not close. This action can take place during any part of the closing stroke, causing movable contacts (33) to immediately return to the open position even though the stored energy springs are acting to close the mechanism.

Maintenance Closing

During inspection prior to installation and for subsequent routine maintenance inspections, the breaker may be closed manually as follows: Refer to Figure 2D.

1. Place the breaker on the floor or other firm base. (Do not use this method of operation while the breaker is in the switchgear cubicle or on the extension rails.)
2. Remove the front sheet-metal cover.
3. With the switchgear operating crank or a 3/8" square-socket speeder wrench, rotate screw (43) to place crank (41) and arm (42) approximately as shown in the OPEN POSITION diagram.
4. Insert manual maintenance closing link (19) with the "U" shaped section over pin (44) in center crank (40). Align the hole in the maintenance closing link with the holes in arm (42) and insert the pin that is attached to the maintenance closing link.
5. As the closing mechanism is now linked to screw (43), clockwise rotation of the operating crank will slowly move the main contacts to the contact touch position.
6. Reversal of operating crank rotation to counterclockwise will slowly return the contacts to the open position.
7. Replace the front sheet-metal cover after removing maintenance closing link.

During maintenance closing operation, observe that the contacts move freely without interference or rubbing between movable arcing contact (33) and surrounding surfaces of the arc chutes.

Racking Mechanism and Drawout Interlock

Cubicle mounted breakers of the drawout type include as integral parts the mechanism to rack the breaker in and out of the cubicle compartment, the drawout position indicator and the drawout trip interlock. Refer to Figure 3, unless otherwise directed.

Manual trip button (29), which is an essential part of the drawout and interlock linkage, performs a dual function:

1. Within the limits of movement in the large slot, actuation of the button trips the breaker by means of engagement of trip rod (43) with angle (45). This rotates trip shaft (44) counterclockwise and releases trip latch (46), thus tripping the breaker.
2. By raising the interlock button, Figure 1, (2), the stop is removed from the large slot in trip button (29), and the button may then be pushed in to the limit of its travel. (Lowering the knob will place the stop in the narrow slot to hold the button in this position.) Through interlock crank(42), link (37) and eye end (38), the interlock latch (39) is raised above the fixed stop on the floor of the cubicle compartment. The breaker is then free to be racked in or out of the cubicle. The necessary actuation of the manual trip button to release the interlock latch prevents possible movement of a closed breaker out of the "CONNECT", "TEST" or "DISCONNECT" position.

With the breaker in position on the rail extensions, the following sequence should be used to rack the breaker into the fully connected position. Again, unless otherwise directed, all index numbers refer to Figure 3.

1. Raise the interlock button, Figure 1, (2), push in the manual trip button (29) to its full travel, and lock the trip button in this position by resetting the interlock button in the last slot in the trip button. With the trip button in this position, interlock latch (39) is raised permitting movement of the interlock and breaker past the fixed stop on the floor of the cubicle compartment.
2. Move slide near the top of the sheet-metal cover to the right to uncover the square end of screw (19).
3. With the switchgear operating crank, rotate screw (19) to position racking cranks (53) approximately as shown in Figure 3. Move the breaker along the rail extensions until the racking cranks engage the fixed pins in the cubicle.

CAUTION

Do not move breaker beyond this point. Follow Step 4, below, for further movement of the breaker.

4. Be certain that power charging switch (24) is in the "OFF" position. Counterclockwise rotation of the operating crank will now rack the breaker successively into the "DISCONNECT", "TEST", OR "CONNECT" positions.

   At each designated position of "DISCONNECT", "TEST", and "CONNECT" the interlock latch (39) can

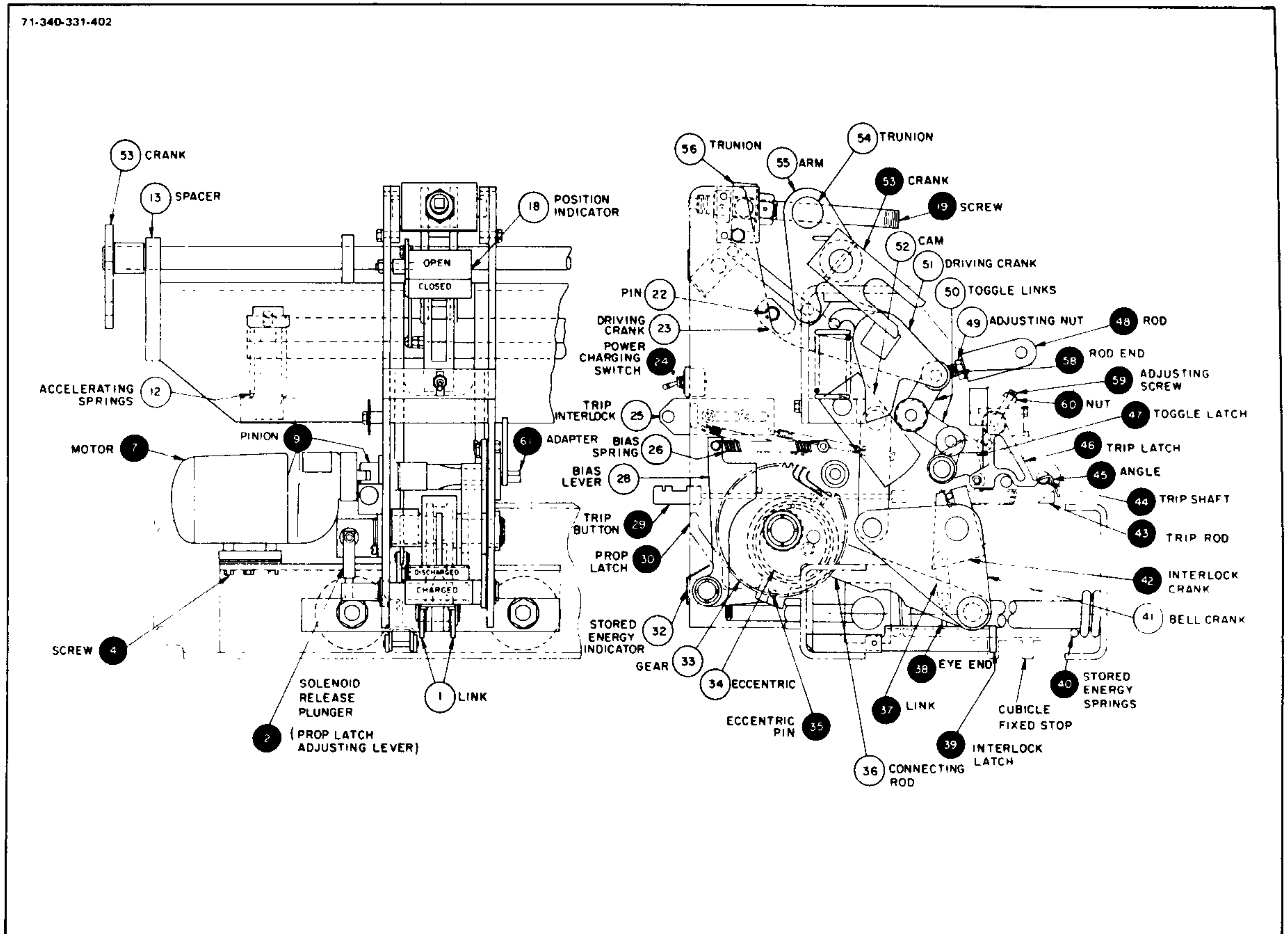


Figure 3. – Typical Operating Mechanism

be lowered into a slot in the fixed stop on the floor of the cubicle compartment by raising interlock button and permitting the manual trip button to return to its normal extended position. The breaker is operable electrically only in the "TEST" and "CONNECT" positions.

NOTE

It may be more convenient to raise the interlock button and permit the manual trip button to return to its normal extended position prior to reaching any of the slots in the fixed stop. The interlock latch will then drop into position as the breaker is moved along the rails.

5. To move out of any position, the previously described release procedure of raising the interlock button and actuating the manual trip button is required.
6. To withdraw the breaker from the "CONNECT" position, the drawout interlock releasing procedure is the same except that the direction of rotation of the operating crank becomes clockwise.

NOTE

When the manual trip button is in the extended position, be sure to return the stop to the slot by lowering button (2), Figure 1.

When the power charging switch (24) is in the "ON" position and the breaker is in "TEST" or "CONNECT" position, the stored energy springs will be automatically charged if the control circuit is energized.

CAUTION

To avoid damage to the racking mechanism, do not rotate operating crank unless the interlock latch is released, and do not operate beyond the limits of "DISCONNECT" or "CONNECT" position.

Control

The electrical control on the breaker is designed to ensure complete operation and prevent repeated attempts to close ("PUMPING"). The following is the operational sequence of a typical wiring diagram, Figure 4, which is shown with the stored-energy springs in the discharged position:

1. With the three contacts – motor limit contact SPS b, normally closed Y1 contact, and power charging switch (N) all closed, motor (M) can be energized.
2. Energizing the motor completely charges the stored-energy springs. As the springs approach the charged position, motor limit contact SPS b opens and cuts off power to the motor. As SPS b opens, SPS a closes and sets up the circuit to the spring release coil (SRC) for a breaker closing operation.
3. Closing the control switch (CSC) energizes the spring release coil discharging the energy in the springs. As the breaker closes, the b and SPS a contacts open to cut off power to the spring release coil. The Y coil is energized simultaneously with the SRC, and causes the Y1 contact to open the circuit to the motor. Since the Y relay will remain energized as long as the control switch is held closed, it eliminates "pumping" or repeated attempts to charge the stored-energy springs.

Although variations may be necessary or other control elements added to suit a specific application, the basic arrangement will be as shown in Figure 4.

Maintenance and Adjustment

A semi-annual inspection and servicing is usually sufficient; however, in cases where unfavorable atmospheric conditions exist, more frequent inspections are recommended. In any case, the total number of breaker operations between servicing should not exceed 250. After a severe overload interruption, the breaker should be inspected.

A suggested procedure to follow during maintenance inspections is:

1. De-energize the primary and control circuits.
2. Rack cubicle-mounted breakers of the drawout type to the disconnected position.
3. Discharge stored-energy springs.
4. Remove arc chutes and examine for burned, cracked, or broken parts.
5. Wipe the contacts with a clean cloth saturated with a non-toxic cleaning fluid.
6. Replace badly burned or pitted contacts.
7. Wipe all insulated parts with a clean cloth saturated with a non-toxic cleaning fluid.
8. Bearing pins and other sliding or rotating surfaces should be cleaned and then coated with a light film of grease (BEACON P290 or similar). (Silver plated current-carrying friction areas are lubricated with graphite.)
9. Operate the breaker manually in maintenance closing position to check latch and linkage movement.
10. Check breaker adjustments.

The following adjustments are listed for convenience in maintaining the operating mechanism in good condition. Refer to Figure 3, unless otherwise directed, throughout each adjustment.

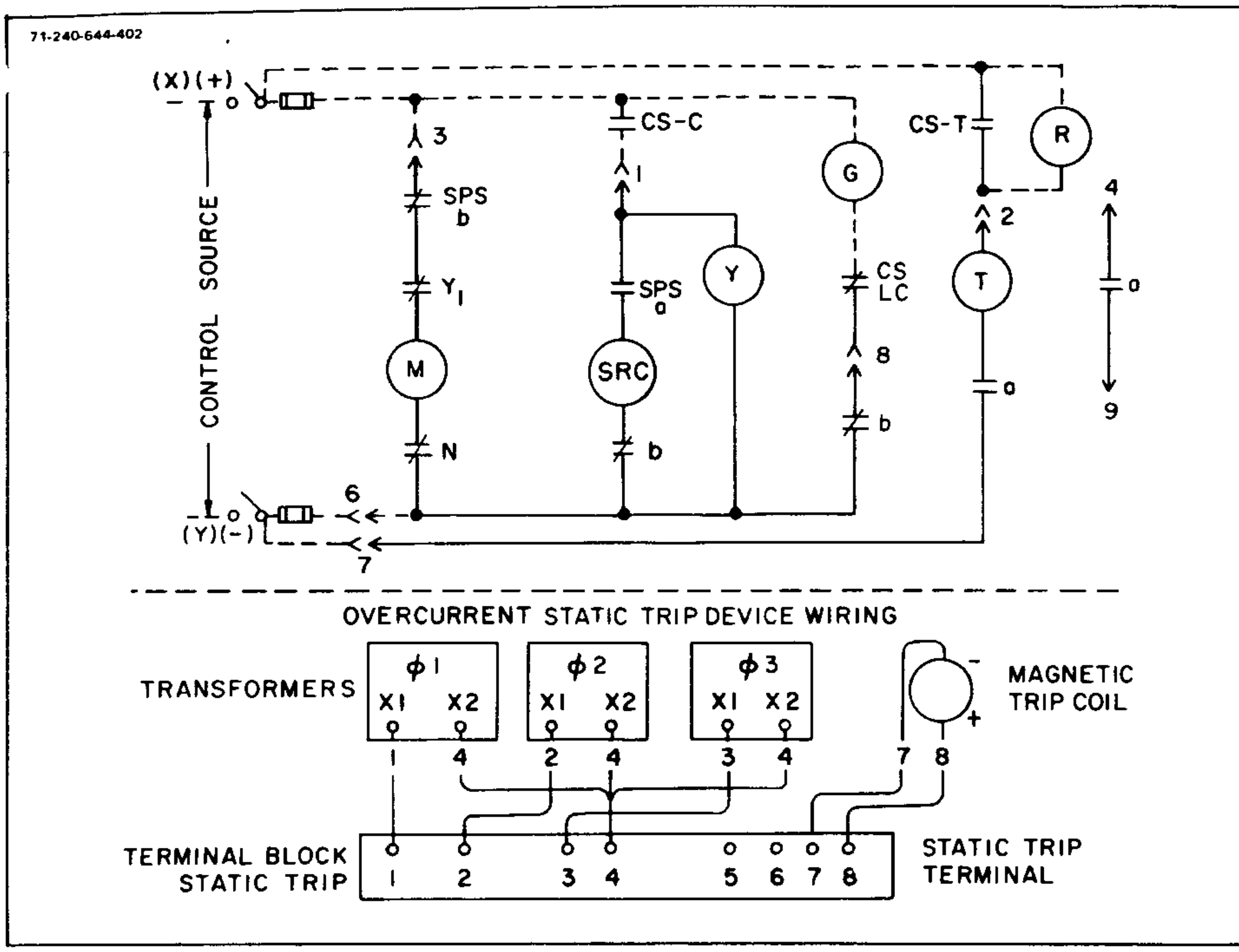


Figure 4. – Typical Wiring Diagram

Trip Latch Adjustment

The trip latch (46) should have an engagement of .047" to .068". The measurement is from the flat face of the trip shaft (44) to the bottom lip of the trip latch. Adjustment is obtained by positioning manual trip button and rod (29) (43) against angle (45) on trip shaft. This measurement may be checked by chalking the face of the latch. With this engagement, the trip shaft must rotate between 10.5° and 15° to release the trip latch.

Toggle Latch (47) Adjustment

Adjust screw (59) by turning clockwise or counterclockwise to get a .010 to .015 clearance between trip latch face (46) and outer surface of trip shaft (44). When adjustments are completed hold screw (59) from turning, then tighten check nut (60). Adjustment should be made with breaker mechanism reset (springs charged, contacts open).

Prop Latch Adjustment

The prop latch engagement should measure 3/16" to 1/4". The measurement is from the top edge of the latch (30) to the mean line of contact of the eccentric pin (35). Adjustment is obtained by positioning spacers on the end of solenoid release plunger (2). Check this adjustment by operating the solenoid release electrically.

Limit Switch

This switch is adjusted by turning the adjusting screw Figure 1, (26) so that the "bb" contacts of the limit switch (11), Figure 1, open just prior to the spring charge latch position.

Motor Drive Unit

The motor drive unit (7) is mounted on the operating mechanism frame and held in position by three mounting screws (4). Should realignment of the unit be necessary, add or remove spacers to provide alignment of the motor shaft with the pinion (9) vertically. The motor shaft should also be positioned as closely as possible to the center of the pinion horizontally.

Lubrication

Lubrication should be a part of the service procedure. Needle bearings are packed with grease and should require no further attention. Old grease should be removed from bearing pins and other rotating or sliding surfaces. and they should be wiped with a thin film of petroleum-oil-base precision-equipment grease similar to BEACON P-290. Greasing should be done with care because excess grease tends to collect foreign matter which in time may make operation sluggish and may affect the dielectric strength of insulating members.

Spring Discharge Mechanism

Unless otherwise directed, all index numbers refer to Figure 5.

Description and Function

When racking the circuit breaker OUT of the cubicle the stored energy closing springs will automatically discharge prior to or when the circuit breaker reaches the DISCONNECT position. This is accomplished by the following sequence:

1. Arm (1) rotates clockwise during rackout allowing roller (2) on lever (3) to rotate lever (4) counterclockwise.

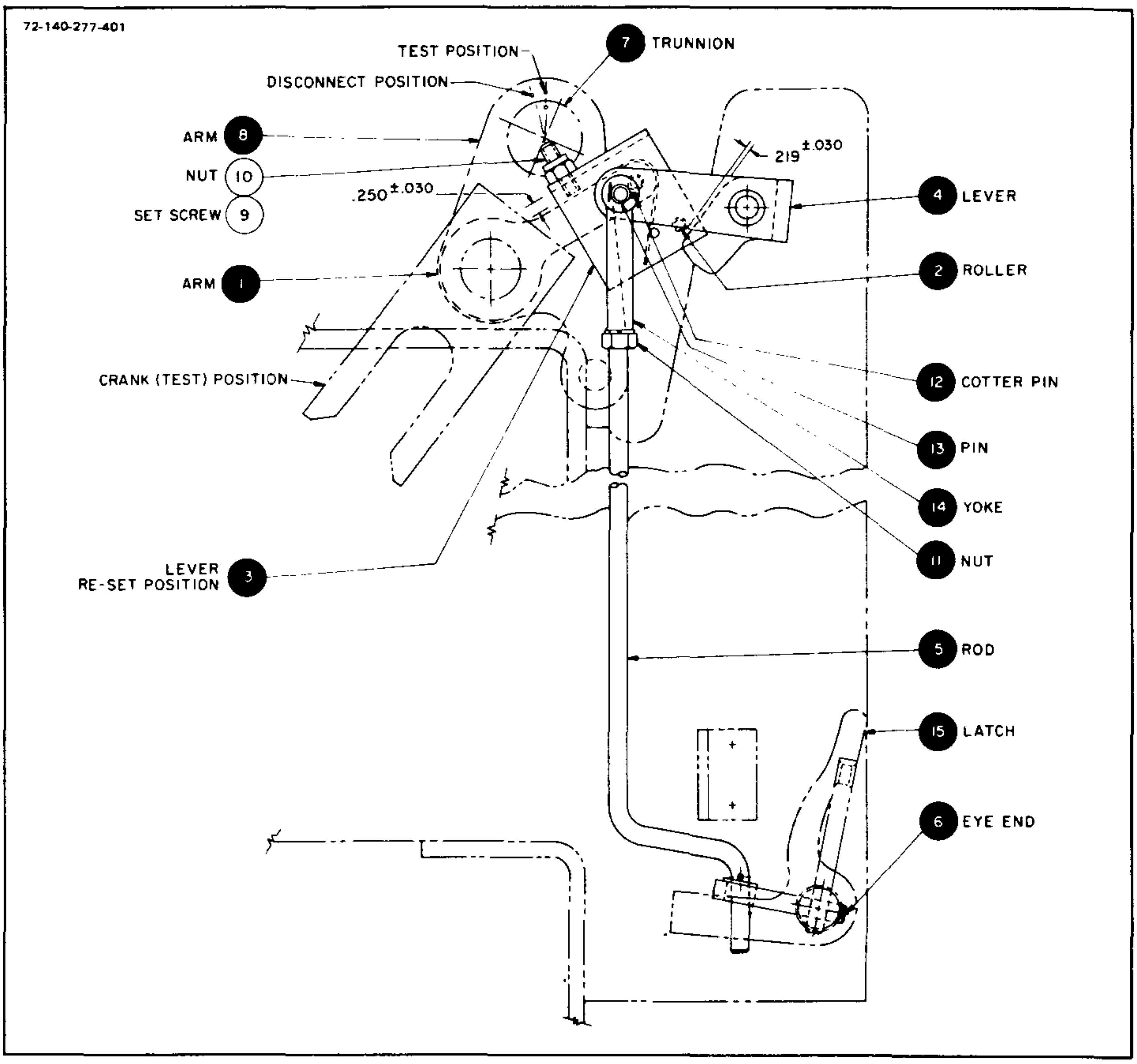


Figure 5. – Spring Discharge Mechanism

2. Lever (4) moves rod (5) downward which in turn rotates eye end (6) counterclockwise.
3. Eye end (6) rotates prop latch (15) counterclockwise allowing the stored energy springs Figure 3, (40) to discharge.
4. When roller (2) strikes lever (4) and stored energy springs discharge, lever (4) must snap back into reset position prior to or when circuit breaker reaches the DISCONNECT position.

Adjustments

If adjustment becomes necessary the following procedure will be required:

> **CAUTION**
>
> *With cover removed and circuit breaker open, the breaker contacts will close when the springs are discharged automatically.*

1. Remove cover, Figure 1, (9).
2. Align the scribed line on the trunion (7) with the center punch mark (test position) on arm (8). Racking crank should be 37° off vertical.
3. Loosen nut (11), remove cotter pin (12), remove pin (13). Adjust rod (5) by adjusting yoke (14) until the nominal .219 dimension is obtained between lever (4) and roller (2). Insert pin (13), insert cotter pin (12) and bend. Tighten nut (11) to lock rod in place.
4. Charge the stored energy springs. Then rotate the racking screw, Figure 3, (19) in the clockwise direction. The springs should automatically discharge prior to or when the circuit breaker reaches the DISCONNECT position, as described in Step 4 of the preceding paragraph. Discharge occurs when racking crank is between 44° and 50° off vertical.
5. If the stored energy closing springs DO NOT automatically discharge, repeat Steps 2, 3, and 4.

Manual Charging of Stored Energy Springs

CAUTION

The stored energy closing springs should not be manually charged with the circuit breaker in the "CONNECT" position.

The manual charging sequence is the same as that described under the heading of the Stored Energy Mechanism. The exception is that an open end wrench is used to charge the springs rather than energization of the motor.

The stored energy closing springs may be manually charged by placing a .750 open end wrench over adapter, Figure 3, (61) and rotating wrench in the counterclockwise direction until the springs are fully charged. Figure 6 illustrates this procedure.

When the springs are fully charged, adapter will rotate freely. Remove wrench.

CONTACT STRUCTURE

Description and Function

(Refer to Figure 7.) The contact structure consists of main current carrying contacts and arcing contacts arranged so that contact make and break is by means of the arcing contacts. The main contacts are not subjected to arcing. Arcing contact surfaces are clad with an arcing alloy which greatly reduces mechanical wear and arc erosion. A positive wiping action of the arcing contacts prevents welding and sticking when interrupting high currents.

Both the stationary and the movable arcing contacts have arc runners which lead the arc away from the contact surfaces. This prolongs contact life as well as aiding arc interruption.

The main current carrying contacts are silver plated and have a positive wiping action. This ensures high conductivity and maintains the current carrying areas clean, smooth, and free from pitting or hammering. When the main contacts make, the first point of contact is at the lower end of contact finger (2). Further motion causes this contact finger to rotate in its socket, causing the contact point to move up toward the "knee" of the contact and separating the initial contact point.

When the breaker is called upon to interrupt a current, the main contacts (22), (20) and (2) separate, transferring the current to the arcing contacts (1) and (4) without arcing. When the arcing contacts part, an arc is drawn between the contact surfaces. Due to the inherent magnetic and thermal effects of the arc, it will rapidly move upwards along the arc runner and into the arc chute where it is extinguished.

Maintenance, Adjustment, and Replacement

A semi-annual inspection and servicing is usually sufficient; however, in cases where unfavorable atmospheric conditions exist, more frequent inspections are recommended. In any case, the total number of breaker operations between servicing should not exceed 250.

The following items are listed for convenience in maintaining the contact structure in good condition:

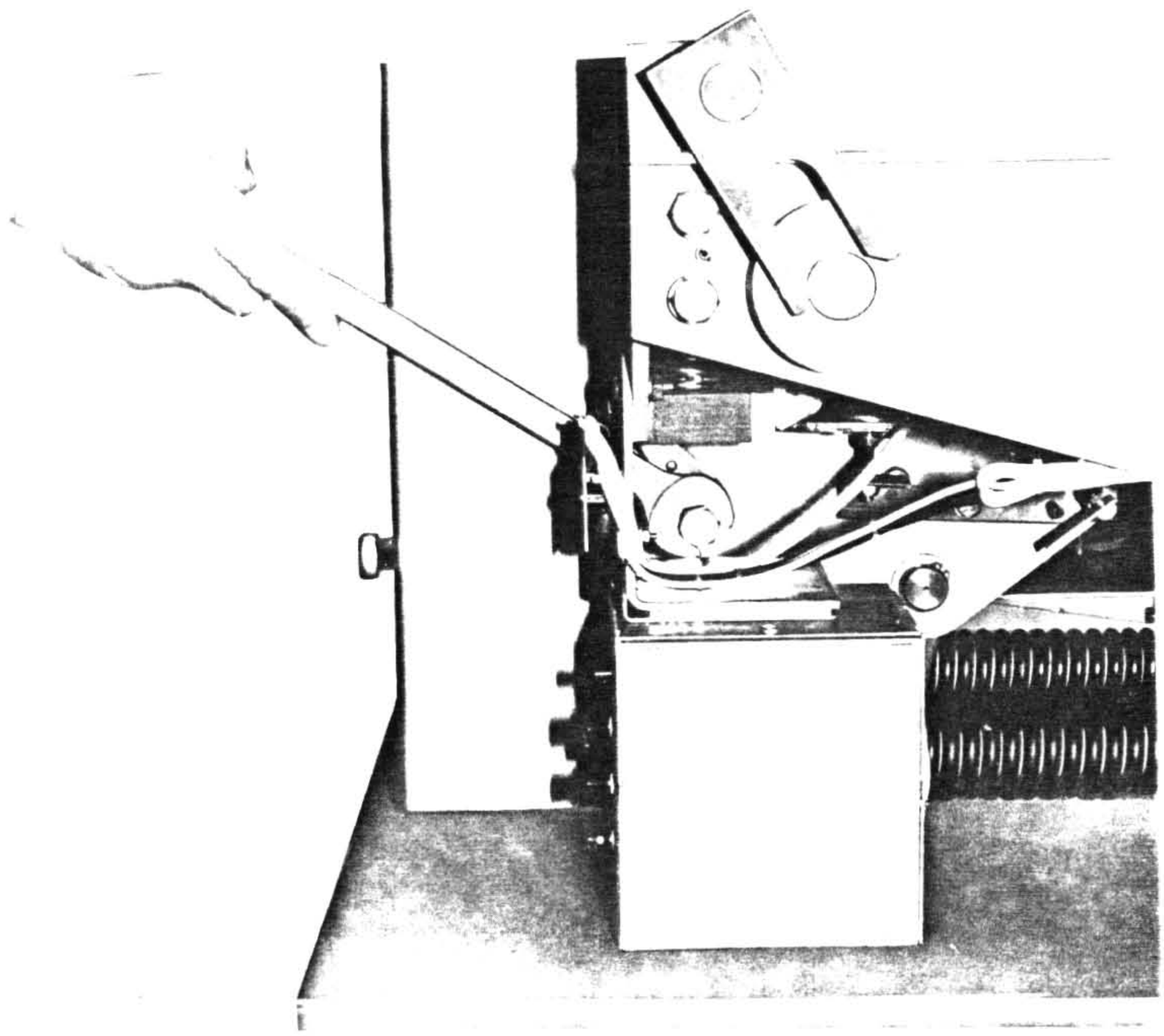


Figure 6. – *Manually Charging Stored Energy Springs*

General

Check main contacts for cleanliness. (They should not be dressed.) Check arcing contacts for wear and arc erosion. Contacts should be replaced if arcing alloy shows indications of wearing-through before the next inspection. With arcing contacts (1) and (4) just touching, if a 1/8" diameter rod cannot be passed between stationary contact fingers (2) and movable main contacts (20) and (22), arcing contacts should be replaced.

Contact Adjustment

(Refer to Figure 7 unless otherwise directed.) The arcing contacts are connected to the main contacts and as such cannot be adjusted independently of the main contacts. The main contacts (20) and (22) are factory adjusted and should not require any field adjustments unless parts have been disassembled. Adjustment is made by positioning connecting rod Figure 3 (48) on rod end Figure 3 (58). The main contacts are in proper adjustment when there is a clearance of 1/32" to 1/16" measured at each side of the contact, between the bottom of the main contact finger (2) and the face of the movable main contacts (20) and (22) with the breaker fully closed and latched. All main contact fingers should be in contact at the "knee" of the contact and open at the bottom.

Movable Arcing Contact Replacement

The movable arcing contacts (1) may be replaced after removing arc chutes by removing screw (23) and pin (21). After removal of these two items the movable arcing contacts can be lifted out and replaced. No adjustment is required.

Stationary Arcing Contact Replacement

The stationary arcing contact (4) may be replaced, after removal of arc chutes, merely by removal of screws holding the retainer. Replacement is obvious and no adjustment is required.

Movable Main Contacts Replacement

The movable main contacts (20), (22) may be replaced, after removal of the arc chutes, as follows:

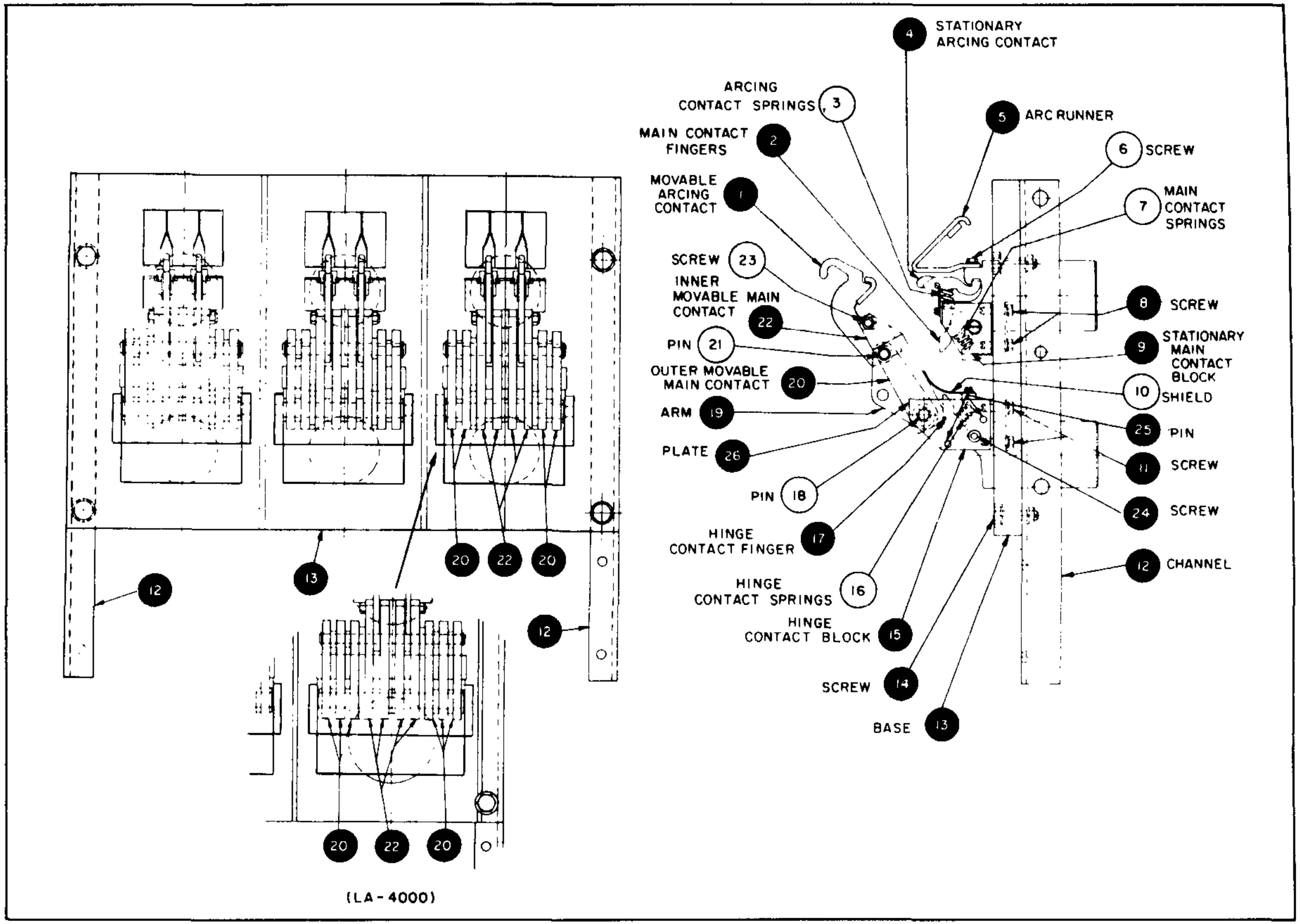


Figure 7. – LA-3000 and (LA-4000) Breaker Panel Assembly

1. Disconnect rods from movable main contact by removing pin from arm (19).

2. Remove the four screws (14) which mount base (13) on channel (12). This will permit removal of the complete three-phase contact structure from the breaker as a complete integral unit.

3. Remove screw (24) and spring back plate (26) over roll pins (25). Rotate the movable main contact past the hinge contact fingers (17). Since the hinge contact fingers and the main contacts are under spring pressure, care must be used so as not to score or damage either contact surfaces.

4. Reassemble by reversing this procedure.

Stationary Main Contacts Replacement

To remove the lower hinge contact block (15), first remove the movable contact assemblies (20) and (22) as outlined above and then remove screws (11). To remove stationary main contact block (9), remove movable contact assembly above, then screws (8). This will permit the removal of the stationary main contact block, stationary arcing contact (4) and arc runner (5) as an integral unit. Once the above members have been removed, the contact fingers (2) and (17) can be removed. Remove the contact fingers under a cloth or other shield to prevent springs from flying free. A screwdriver may be used to work springs and fingers to the ends of the block for removal. Be careful not to raise nicks or burrs or otherwise damage contact fingers. During reassembly of these contact blocks, no adjustments are necessary.

RELEASE MAGNET

When the static trip device senses a circuit condition that requires the circuit breaker to open, it produces an output that is fed to the magnetic latch release device. This device then causes the circuit breaker contacts to open and isolate the circuit.

Mounted on the circuit breaker, the magnetic latch release is held in a charged position by a permanent magnet. It contains a coil that is energized by the output of the static trip device. When energized, the coil causes the magnetic flux to shift to a new path, releasing the stored energy of a spring located inside the magnetic latch release. The spring provides the energy to trip the breaker.

The release magnet is illustrated in Figure 8. During normal operation, trip rod (1) which is attached to a spring loaded armature inside the magnetic release latch cylinder cannot move due to a magnetic field set up by permanent magnet (2) which holds the internal armature against plate (3) on the bottom of the magnetic release latch. When an overload or fault condition exists, coil (4) which is inside on the bottom of the magnetic release latch is energized by the static trip device creating a flux which decreases the magnetic hold force on the spring loaded internal armature allowing the armature to be forced upward due to the spring load, thereby allowing trip rod (1) to move up against trip lever (10), which in turn, trips the circuit breaker. As the breaker opens, coil (4) becomes de-energized due to de-energization of the static trip device, and shaft (6) rotates magnetic release latch reset arm (7) forcing spring loaded armature against plate (3) allowing trip rod (1) to be reset to the non-trip position.

If the spring loaded armature does not reset during trip operation as explained above, spacers (8) may be added to obtain positive reset of the armature.

If adding spacers does not allow armature to be reset, the magnetic release latch should be replaced (if breaker mechanism is not at fault).

CAUTION

Do not attempt to disassemble the magnetic release latch as this will destroy the magnetic field set up by the permanent magnet and will render the release latch inoperative permanently.

When replacing a magnetic release latch, the coil (4) leads must be connected to the terminal block of the static trip in the correct polarity relationship.

The black lead of coil (4) must be connected to terminal 7 (negative) of the static trip device and the red lead connected to terminal 8 (positive) (see Figure 4).

A clearance of .032" to .060" should be maintained between the trip pin (11) and breaker trip arm (5) with the circuit breaker open, springs charged and trip arm reset by the trip shaft (6). Adjustment is made by positioning nut (9) while holding trip rod (1).

When the magnetic release latch has been replaced, the circuit breaker should be given a FUNCTION TEST to ensure proper operation of all components. Refer to Allis-Chalmers Instruction Book 18X4392 for the procedures of the FUNCTION TEST.

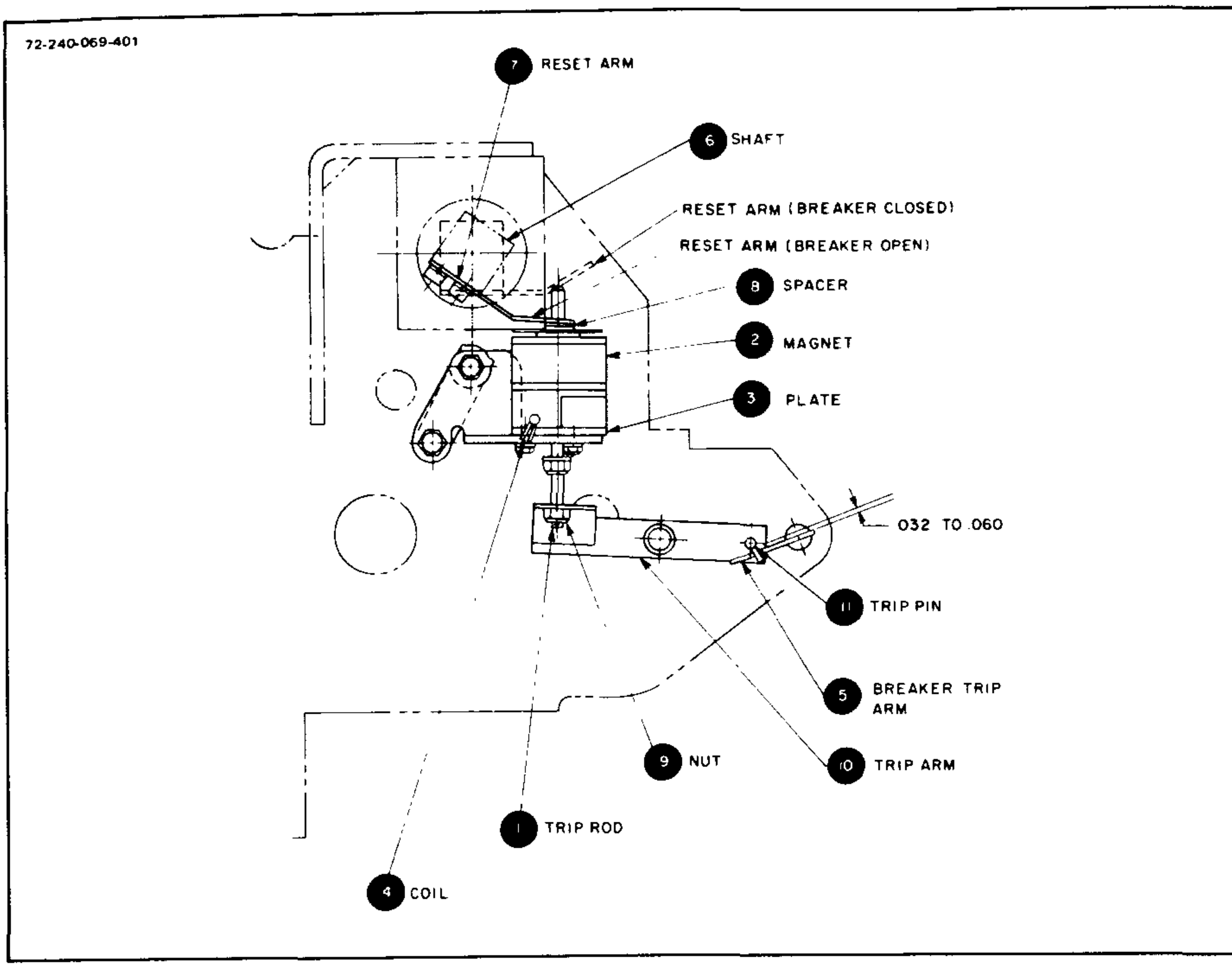


Figure 8. – Typical Release Magnet

FUSE FUNCTIONS

Current Limiting Fuse

See Figure 9. The C.L. fuse (1) NEMA Class "L" has an interrupting rating of 200,000 Amps RMS symmetrical.

When replacement is required due to the C.L. fuse interrupting, replace only with the same fuse rating that was supplied with the circuit breaker.

To remove the C.L. fuse remove bolts (2) and associated hardware. Remove supports (3), bolts (4) and associated hardware. Remove fuse. To replace the C.L. fuse, reverse the above procedure.

Trigger Fuse

See Figure 9. The trigger fuse (5) and associated trip mechanism has a dual function. The first function is to trip the circuit breaker mechanically when the C.L. fuse (1) has interrupted.

The second function is to indicate which phase the C.L. fuse has interrupted.

The plunger (6) on bottom of the trigger fuse indicates visually which phase the C.L. fuse has interrupted.

The trigger fuses are wired in parallel with the C.L. fuse. When the C.L. fuse interrupts, its associated trigger fuse also opens and releases a plunger (6) which is operated by a precompressed spring contained in the trigger fuse housing.

The plunger operates arm (7) which allows spring loaded lever (8) to engage circuit breaker trip arm (9) which trips the circuit breaker and holds the circuit breaker in the mechanical trip free position.

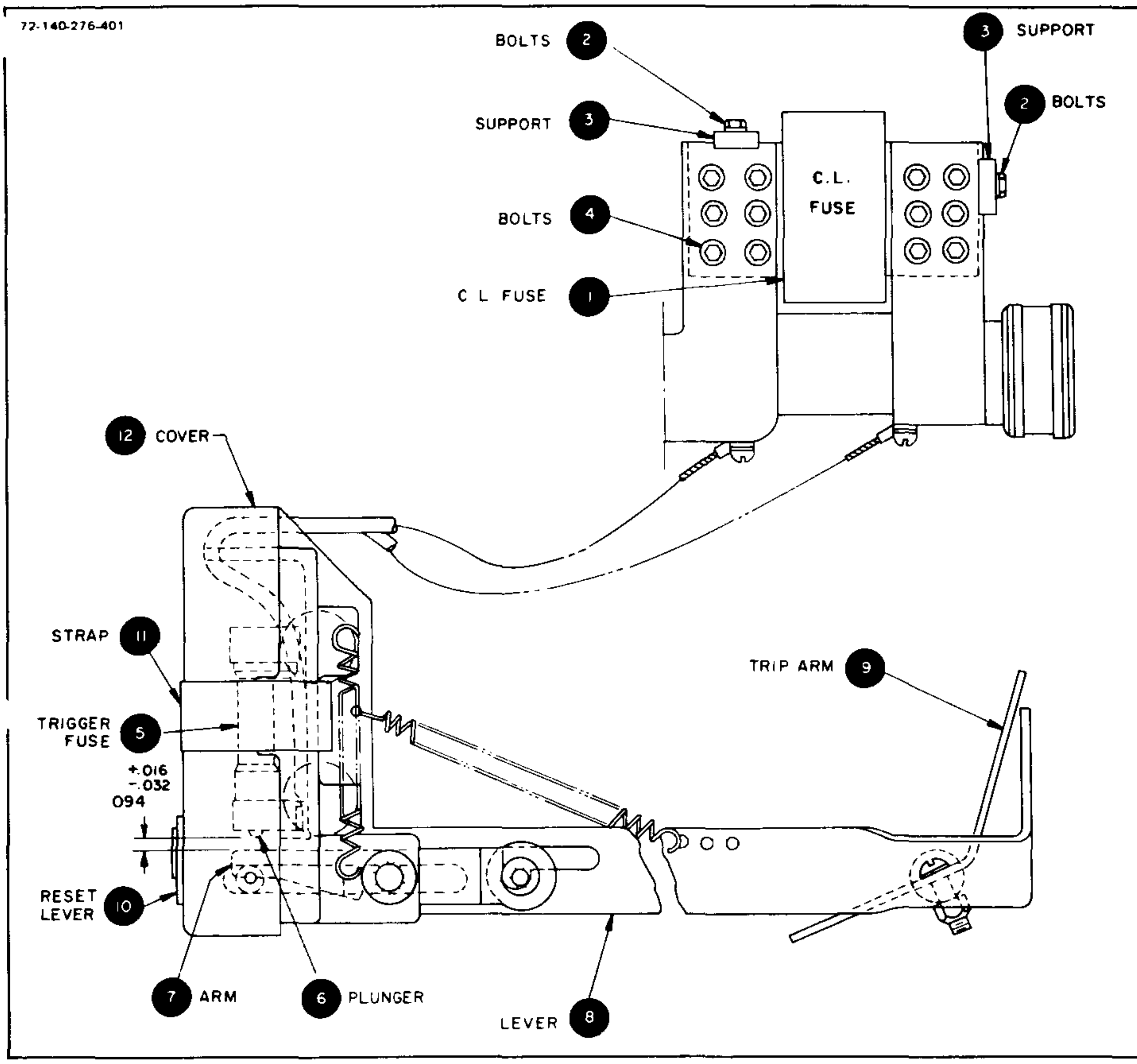


Figure 9. – Current Limiting and Trigger Fuse

The circuit breaker will remain trip free (cannot be closed) until the trigger fuse has been replaced and the associated trip mechanism reset lever (10) has been manually reset (pushed in).

To remove the trigger fuse, remove strap (11) and plastic cover (12). To insert the trigger fuse, reverse the above procedure.

CAUTION

The trigger fuse must be inserted with the plunger (6) facing arm (7). The .094 + .016 - .032 dimension must be maintained.

CURRENT TRANSFORMERS

There are two tripping transformer ratings available for the LA-3000 and one for the LA-4000, each with seven calibrated pickup settings (Table 1). Figure 10 shows a typical breaker rating plate.

The current transformers for the LA-3000 and LA-4000 circuit breakers are mounted with polarity marks facing the breaker panel.

TABLE 1. TRIP RATING TABLE – AMPERES

Breaker Type and Frame Size	Tripping XFMR Rating (Primary)	Long Time Element Calibrated Pick-Up Settings							Max Cont Rating	Ground Element Calibrated Pick-Up Settings			
		A	B	C	D	E	F	G		20%	40%	80%	100%
LA-3000 3000 Amperes	2000 3200	1000 1600	1250 2000	1500 2400	1750 2800	2000 3200	2250 3600	2500 4000	2500 3000	400 640	800 1280	1600 2560	2000 3200
LA-4000 4000 Amperes	4000	2000	2500	3000	3500	4000	4500	5000	4000	800	1600	3200	4000

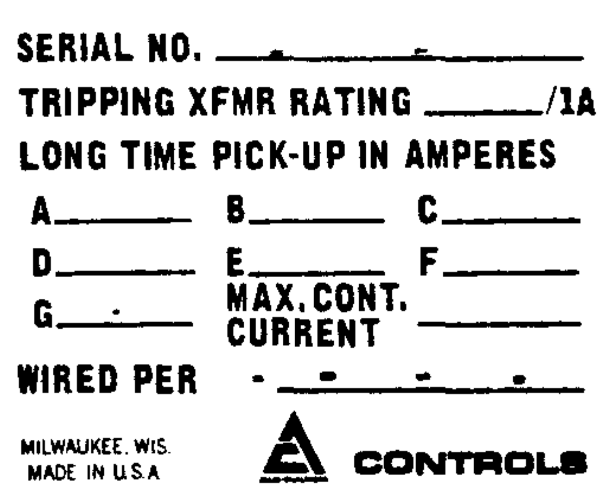


Figure 10. – Typical Breaker Rating Plate

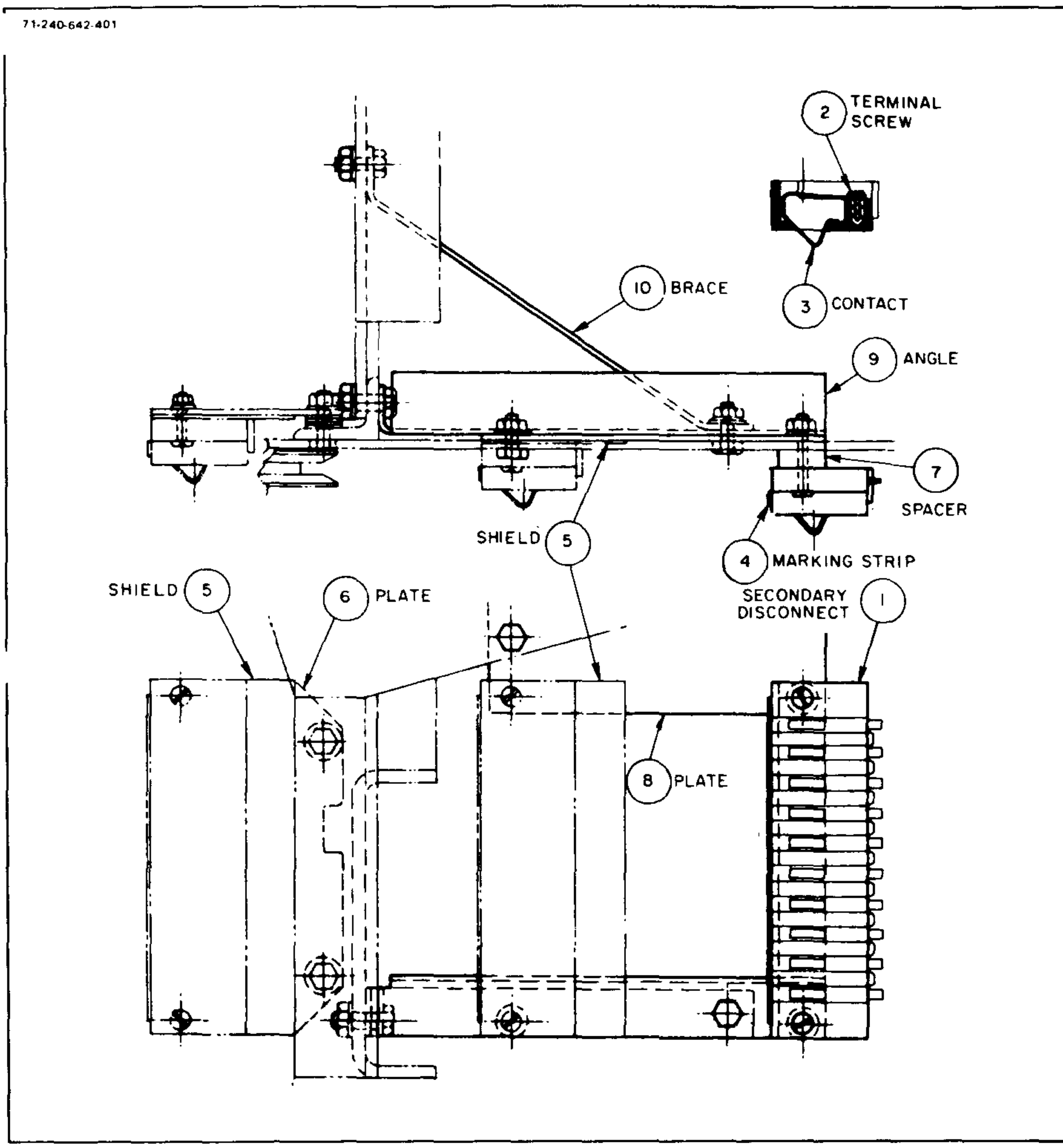


Figure 11. – Typical Secondary Disconnects

The electrical attachments are wired to the terminals of a secondary disconnect assembly which is mounted on the left side of the breaker. Three blocks of ten terminals each can be mounted on the breaker. The secondary disconnect assembly is accessible from the front of the breaker and aligns with a stationary unit in the cubicle.

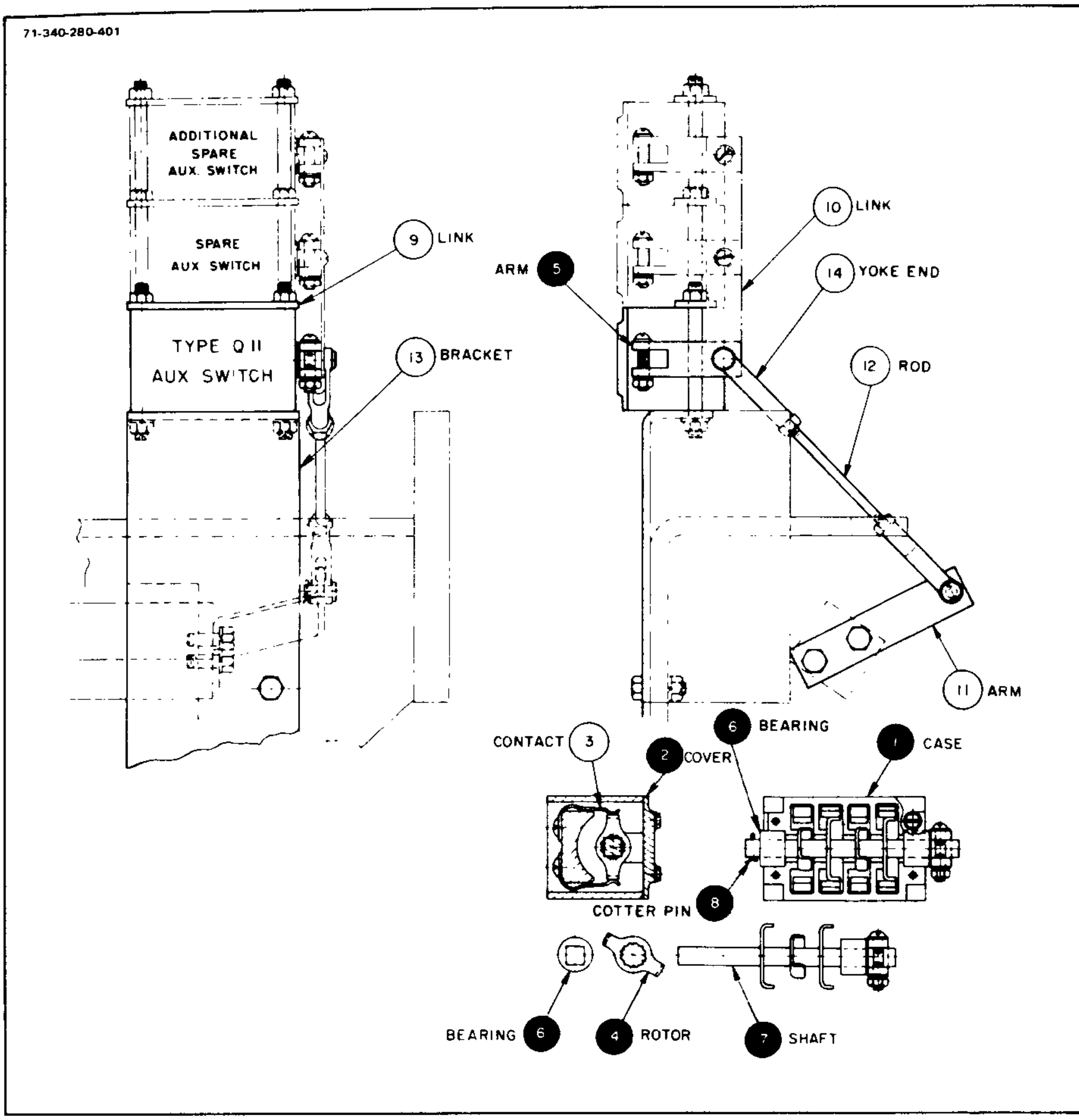


Figure 12. – Typical Auxiliary Switch

The auxiliary switch is of the rotary type and functions by direct connection to the breaker mechanism. The contacts are factory set for "a" (open when breaker is open) and "b" (closed when breaker is open) position, but each rotor (4) may be adjusted individually in steps of 30 degrees. This adjustment is made by removing cover (2) and lifting the entire rotor assembly out of case (1) after disconnecting arm (5) from the linkage. Cotter pin (8) and bearing (6) are removed to permit removal of rotors (4) from shaft (7). To change rotors (4) from "a" to "b" position, the rotor should be rotated 60° in the clockwise direction after removal and replaced on the shaft in this new position.

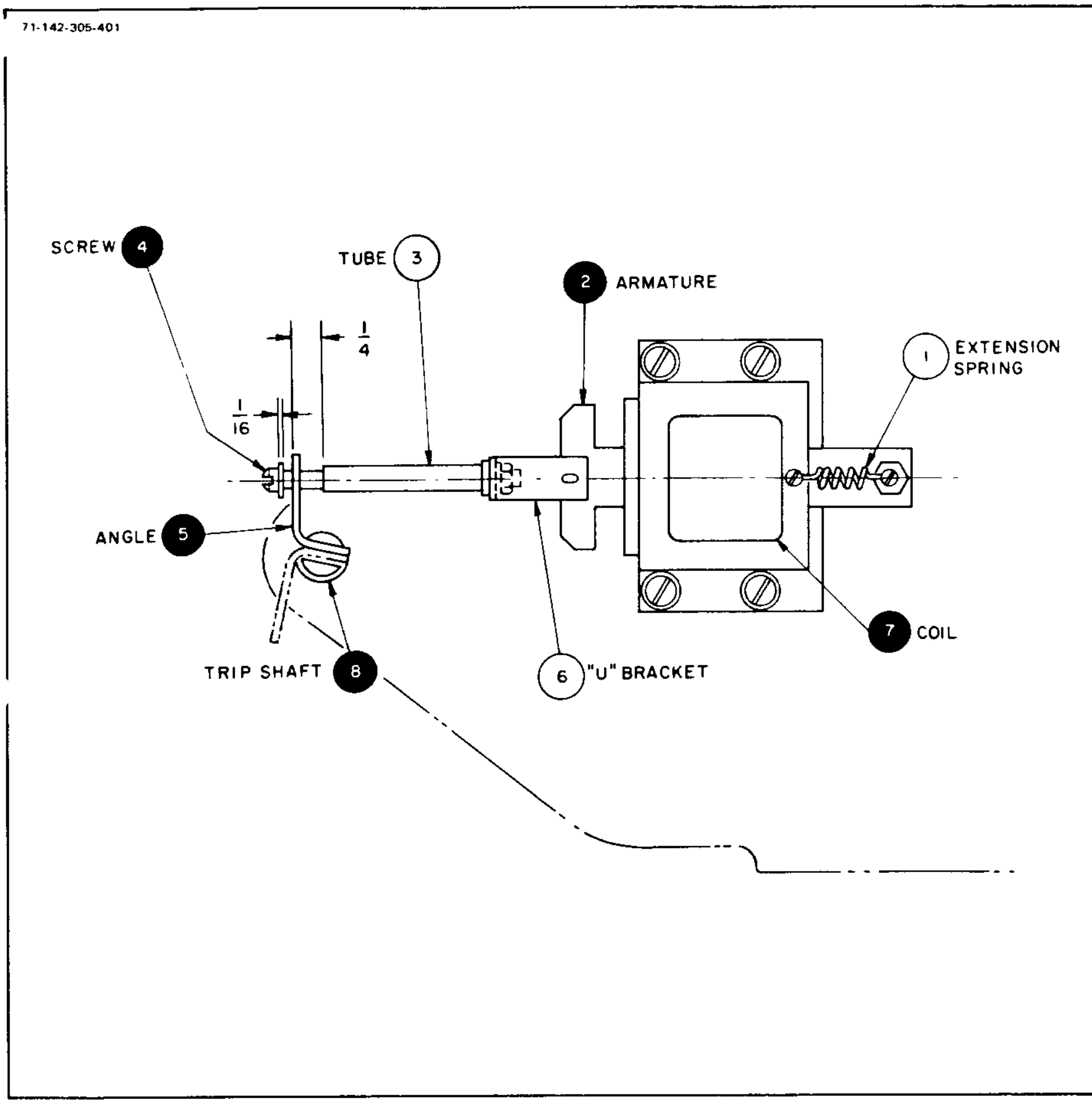


Figure 13. – Typical Shunt Trip Device

Each breaker is equipped with a shunt trip attachment for remote tripping. Since the shunt trip coil is designed for a momentary duty cycle, an "a" auxiliary switch contact is used to interrupt its circuit immediately after the breaker is tripped. Energization of the coil (7) causes armature (2) to pick up and rotate trip shaft (8) thereby tripping the breaker. If adjustment of the shunt trip is necessary, make the following adjustments with the mechanism and trip shaft in the reset position.

Position screw (4) to provide 1/16" ± 1/64" clearance between washer and angle (5), and 1/4" ± 1/64" clearance between tubing and angle (5). When breaker is equipped with undervoltage device, 3/8" ± 1/64" clearance should be provided between tubing and angle (5).

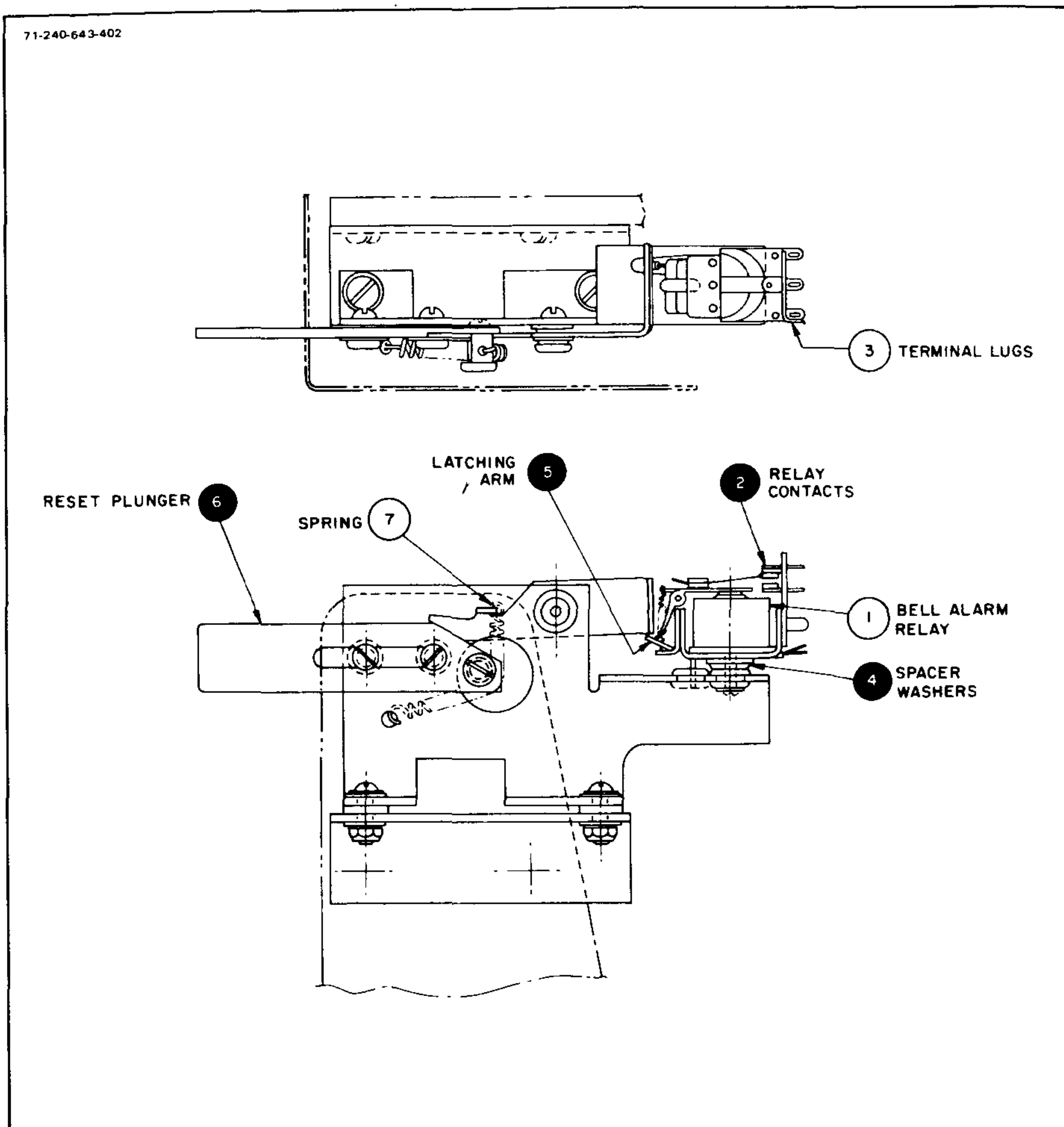


Figure 14. – Typical Bell Alarm (Manual Reset)

The bell alarm attachment functions to close or open an alarm circuit upon automatic overcurrent tripping of the breaker. The relay coil is wired to terminals 7 and 8 of the static trip device. This is a latching-type relay, and relay contacts (2) are reset to the open position shown by actuating reset plunger (6). Spacer washers (4) are used to position the relay to ensure correct engagement of latching arm (5) when resetting the contacts. The relay and its mounting bracket are shock-mounted on rubber grommets to avoid false operation due to shock of the breaker opening or closing. The mounting hardware is tightened to obtain slight compression of the rubber grommets but not so tight as to cause malfunction due to shock. Reset plunger (6) should not touch sides of the slot in the front cover.

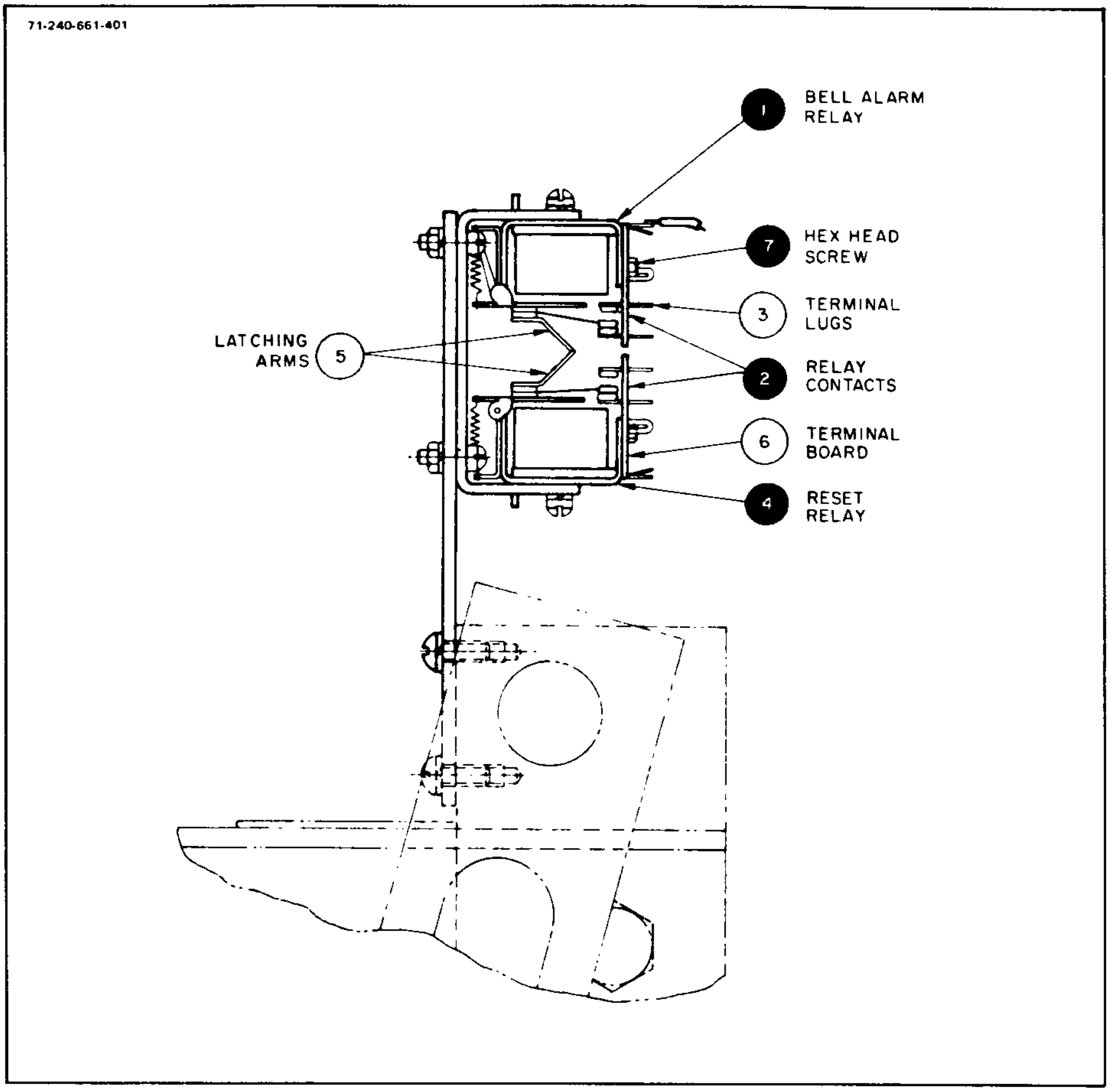


Figure 15. - Typical Bell Alarm (Electrical Reset)

The bell alarm attachment functions to close or open an alarm circuit upon automatic overcurrent tripping of the breaker. It consists of two relays with interlocking armatures. The bell alarm relay (1) coil is wired to terminals 7 and 8 of the static trip device. As this is a latching type relay, the alarm relay contacts (2) are reset electrically to the open position shown by actuating reset relay (4). If the device is not stable during breaker operation or if either armature fails to pick up when actuated, loosen hex head screws (7) to reposition the terminal boards. This changes the engagement between the interlocking latching armatures and the relationship between the stationary and movable contacts.

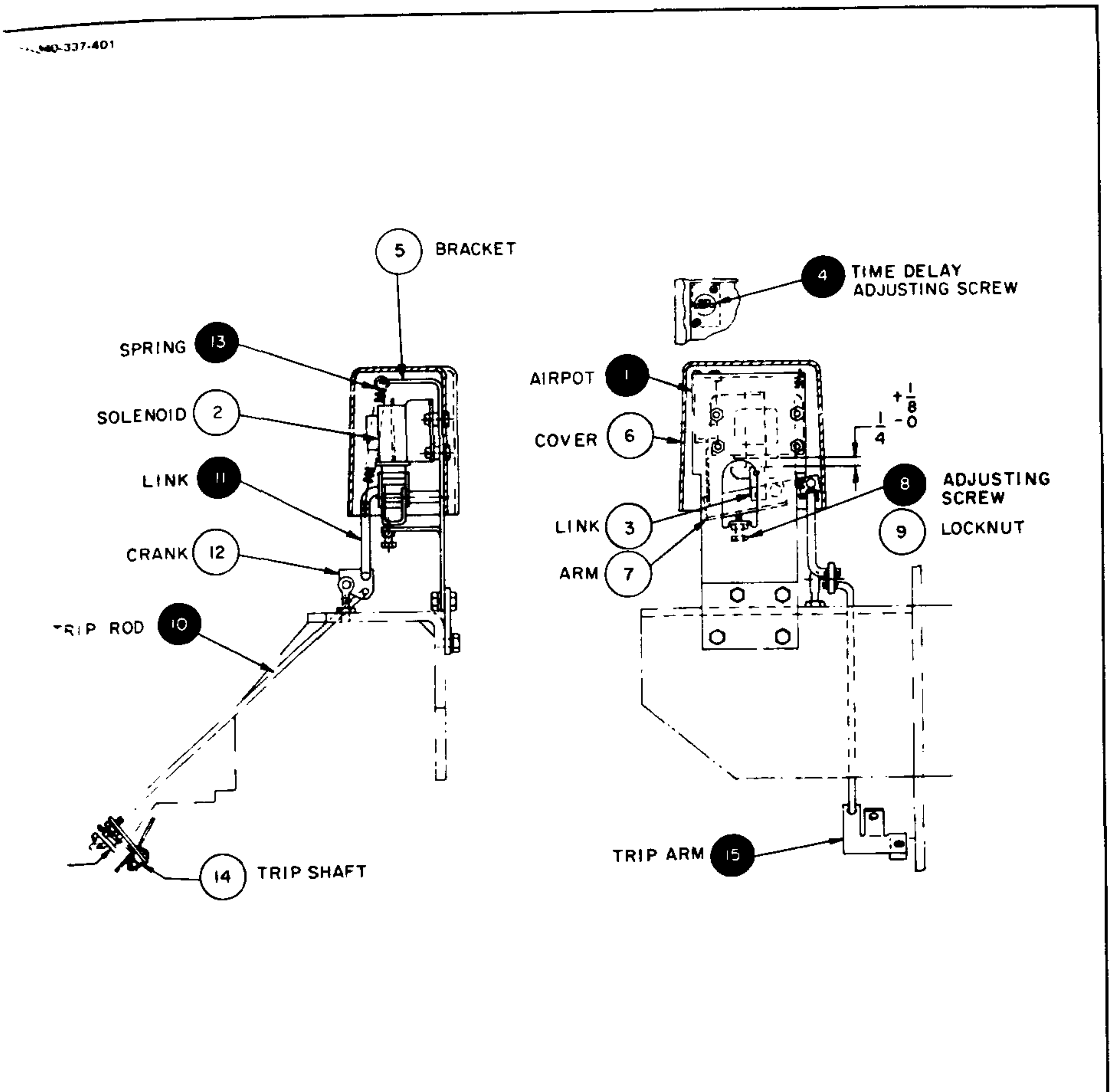


Figure 16. – Typical Undervoltage Device

The undervoltage trip device automatically trips the breaker on loss of voltage. Eithet instantaneous or time-delay operation can be supplied. Adjusting screw (8) should be set to provide an air gap of .25" between the solenoid pole head and armature with the device de-energized as shown in the front view. A .06" gap should be maintained between the arm (15) and trip bar (10) when the device is energized with the breaker closed as shown in Detail "A". Pickup and drop-out adjusting screw (11) should be set so that the device picks up at a voltage of 80% or more of rated value and drops out between 30% and 60% of the rated value.

NOTE

Pickup and dropout are not individually adjustable.

On devices equipped with time delay airpot (1), adjusting screw (4) can be set to provide a range of time delay between 0.5 and 4.5 seconds. Tightening the screw increases time delay.