CONTROLS

INSTRUCTIONS

AIR CIRCUIT BREAKER

TYPE LA-600 & LA-600 F (FUSED)

BWX-6637-6 18X4581

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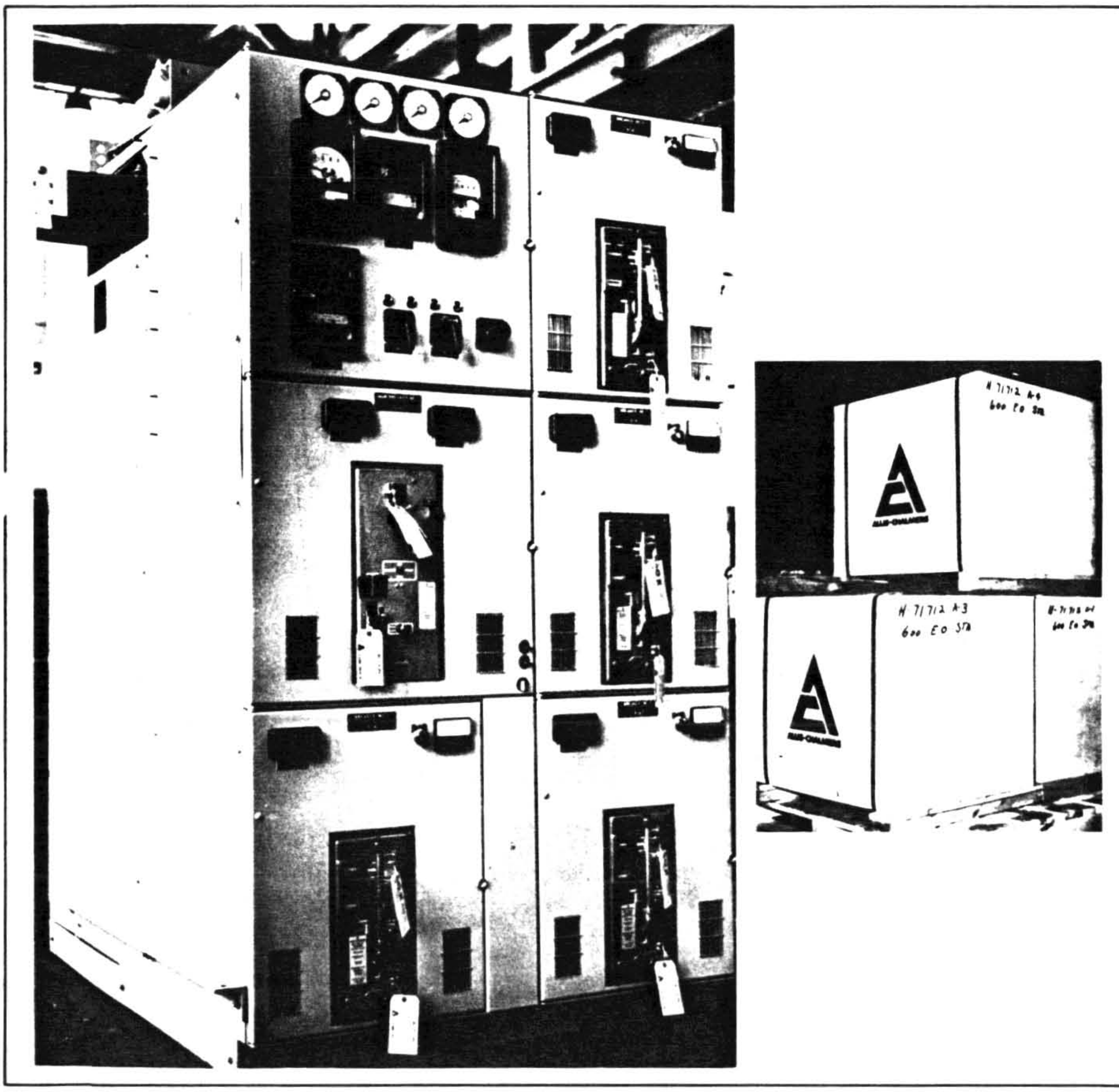
WARRANTY

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

The 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 customer's own enclosing case or switchboard. All "LA" breakers are completely assembled, tested, and calibrated at the factory in a vertical position and must be so installed to operate properly. Customer'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.

Installation

The "LA" air circuit breaker is completely adjusted, tested, and inspected before shipment, but a careful check should be made to be certain that shipment or storage has not resulted in damage or change of adjustment. Circuit breakers should be installed in a clean, dry, well-ventilated area in which the atmosphere is free from destructive acid or alkali fumes (see Figure 1 for dimensional data). 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 MAINTENANCE AND ADJUSTMENTS, page 9) to check proper functioning of the mechanism and contacts.

CAUTION

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, page 3 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. Refer to Static Trip Device Instruction Book (18X4392).
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 connected position. See OPERATION, page 3 for a description of the interlock. Its operation should be checked before the breaker is energized.
4. Upon completion of the installation inspection, the breaker is ready to be energized after the control wiring, if any, is checked and the insulation tested.

Storage

When breakers are not to be put into immediate use, they should be wrapped or covered with a non-absorbent mate-

CAUTIONS TO BE OBSERVED IN THE INSTALLATION AND OPERATION OF "LA" CIRCUIT BREAKERS

1. *Read Instruction Book before installing or making any changes or adjustments on the breaker.*
2. *As the closing springs on stored-energy breakers may be charged in either the breaker open or closed position, extreme care should be taken to discharge the springs before working on the breaker.*
3. *When closing manually-operated breakers, always grasp closing handle firmly until it is returned to the normal vertical position.*
4. *Check current ratings against single line diagram to assure that breakers are properly located in switchgear at installation.*
5. *Check the alignment of the secondary disconnect fingers to ensure against misalignment due to possible distortion of fingers during shipment and handling.*
6. *Once the breaker is energized, it should not be touched, except for operating, since most of the component parts are also energized.*

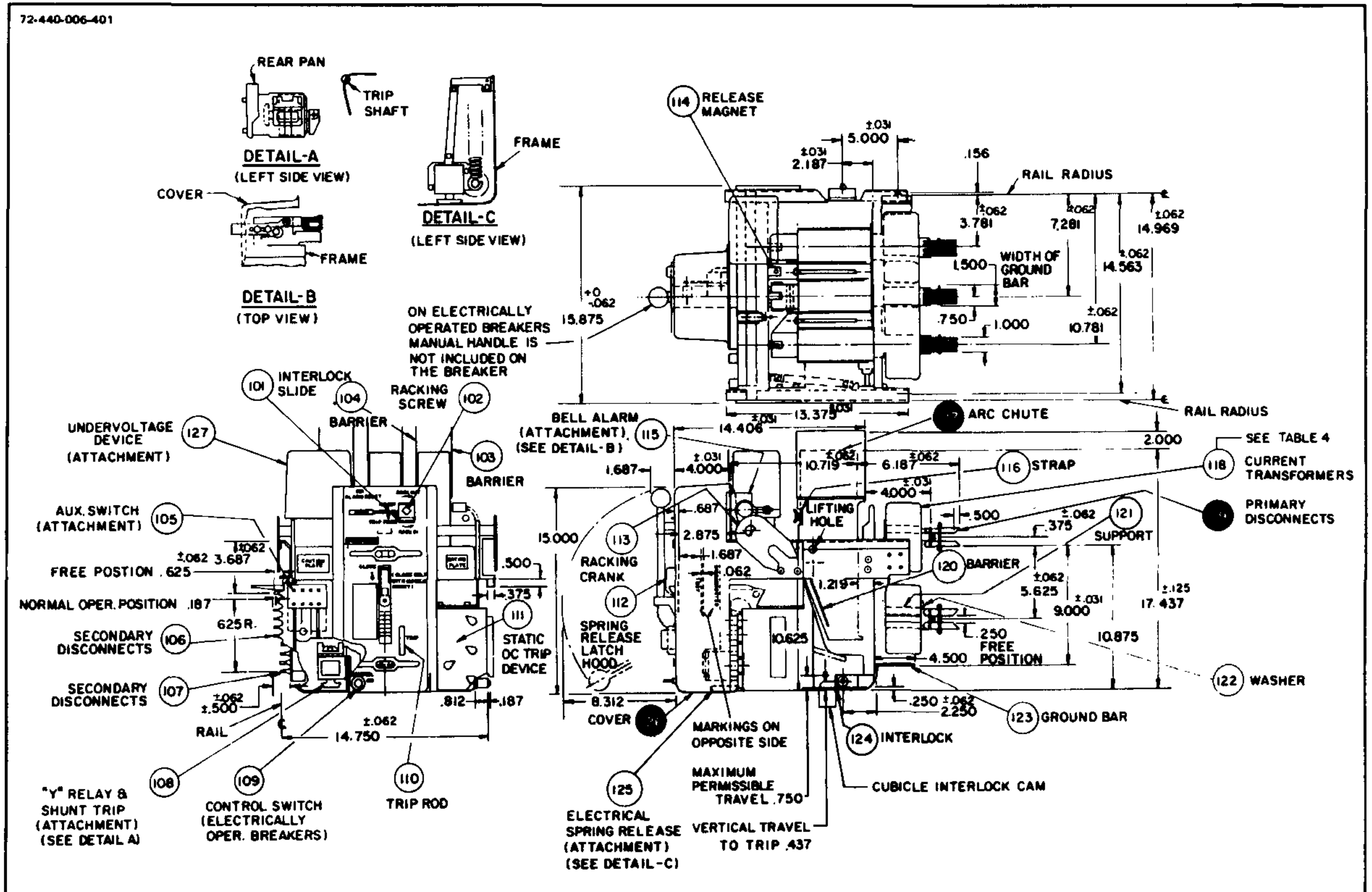


Figure 1. – Typical LA-600 Breaker Outline

rial 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.

Maintenance

Occasional checking and cleaning of the breaker will promote long and trouble-free service. A periodic inspection and servicing at least every six months should be included in the breaker maintenance routine.

If the circuit breaker is not operated during 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.

OPERATION

Description

The LA-600 air circuit breaker has an interrupting capacity of 22,000 amperes and a maximum continuous current rating of 600 amperes at 635 volts, 60 cycles. For information on other voltages or frequencies, the factory should be consulted. It is available as a manually-operated breaker or an electrically-operated breaker. The two breakers are identical with the exception of the medium used to transmit power to charge the stored-energy springs.

A double-toggle, trip-free 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.

Manually-Operated Breaker

As the breaker has a single-frame type construction, most of the latches and linkages are arranged in pairs; however, for descriptive purposes, they will be referred to as single items. Refer to Figure 2 and Table 1. Detail "A" shows the position of trip latch (216) when the breaker contacts are open with the closing spring discharged. Movement of closing handle (201) downward rotates cam (208) against roller (205), thus pivoting closing cam (210) clockwise

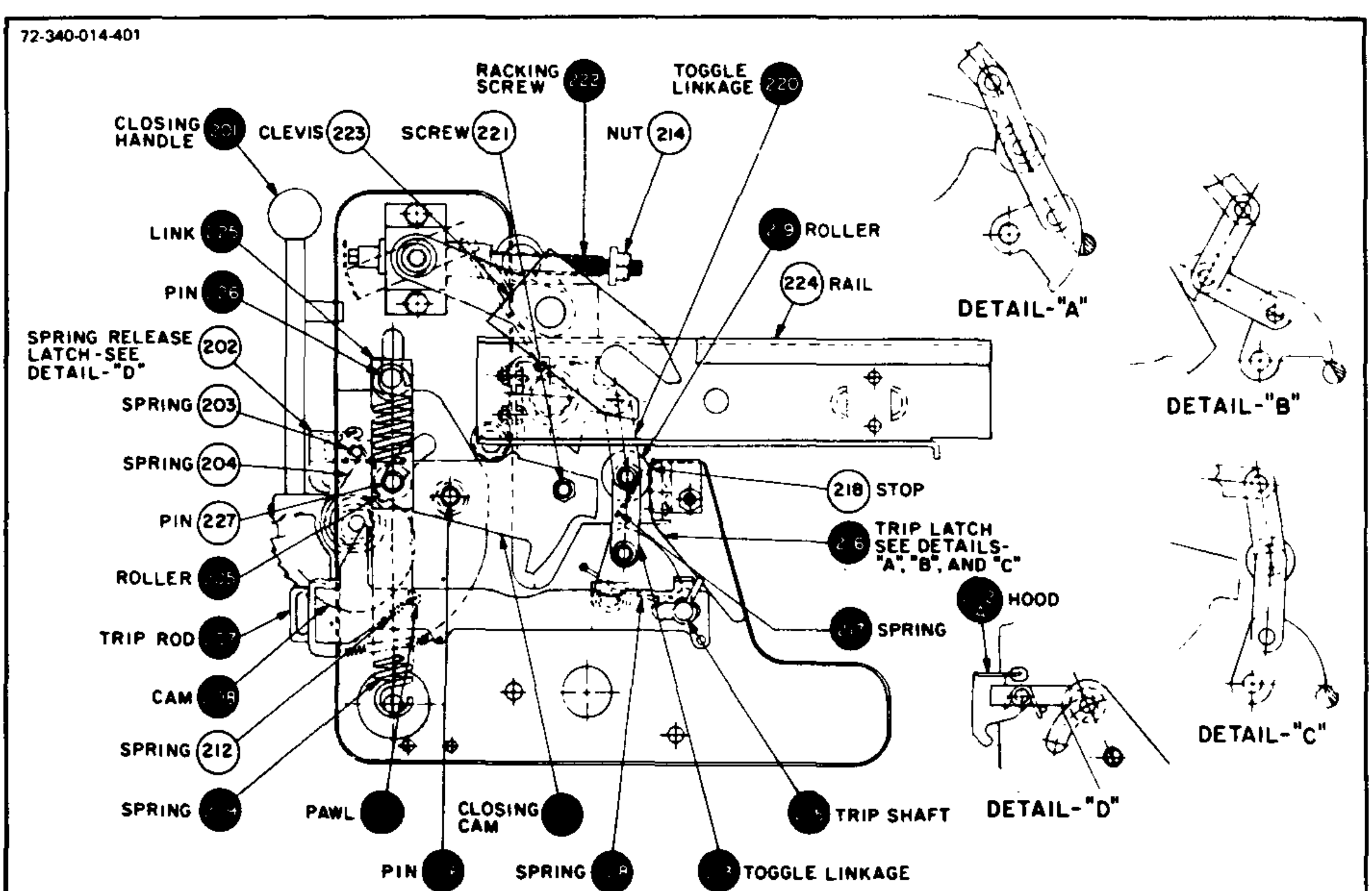


Figure 2. – Typical Operating Mechanism – Manually Operated Breaker

about pin (206) and extending stored-energy springs (209) through link (225) and pin (226). Rotation of cam (210) clockwise permits spring (217) to collapse toggle linkage (213) and (220). At the same time, trip latch (216) is reset by torsion spring (228) as shown in Detail "B". Pushing down spring release latch hood (202A), after the closing handle is returned to the normal vertical position, releases the energy in springs (209). Through link (225), closing cam (210) is rotated counterclockwise against roller (219), which moves toggle linkage as shown in Detail "C", to close the breaker contacts. The closing operation may be interrupted at any point by functioning of the trip device, thus ensuring "trip-free" operation.

TABLE 1. OPERATING PROCEDURE – MANUALLY-OPERATED BREAKERS

Operation	Procedure
Charging Springs	Pull handle (201) down all the way (approximately 120°) and return to normal vertical position. (Engagement of pawl (211) with the ratchet teeth prevents handle reversal until the downward stroke is completed.)
Closing	Push down spring-release latch hood (202A) after handle is returned to normal vertical position.
Tripping	Push in manual trip rod (207). or If shunt trip is provided, operate remote trip control switch (CST) (See Figure 4.)

To open the breaker contacts, trip rod (207) is actuated. This rotates trip shaft (215) clockwise which releases trip latch (216) as shown in Detail "A". On breakers equipped with a shunt trip device, the breaker contacts may be opened by operation of a remote trip control switch. The shunt trip device rotates the trip shaft to release the trip latch.

Electrically-Operated Breaker

The mechanism of the electrically-operated breaker is the same as that of the manually-operated breaker except that the manual closing handle is replaced by an electric motor and the gear system.

Refer to Figures 3 and 4 and Table 2. Movement of the control switch (N) located on the front of the breaker to the "ON" position, when the control circuit is energized, will start the automatic closing cycle. Motor gear box pinion (338) rotates gear (335) counterclockwise, and pins (336) move across the top of flat biasing spring (334). This raises gear (335) to mesh with gear segment (340). Since this gear segment is attached to closing cam (310), the stored-energy springs are charged and latched in the same sequence as described in the previous section. As gear (335) reaches the last tooth on segment it is disengaged by means of spring (348).

Spring-position switch (330) (SPS b) is actuated to the open position by arm (331) attached to link (325) as the stored-energy springs approach the charged position. This switch initiates the spring recharging cycle and is connected in parallel with motor cut-off switch (332) (88 a) which is open initially, closes while the motor charges the springs, and opens when the springs are charged with the gearing disengaged. The motor cutoff switch is actuated by the movement of plunger (333) over pins (336). Approximately twelve seconds are required for completion of the spring charging cycle.

The breaker may now be closed by pushing down spring-release latch hood (302A) as in the manually-operated breaker, or it may be closed electrically through remote close control switch (CSC). This switch energizes spring-release coil (SRC) which moves pin (341) in a counter-clockwise direction to trip spring release latch hood (302A) and spring-release latch (302). The "Y" coil is energized simultaneously with the spring-release coil and causes the "Y" contact to open the circuit to the motor. Since the "Y" relay will remain energized as long as the remote close control switch (CSC) is held closed, "Y1" contact keeps the motor circuit open to prevent "pumping" or repeated attempts to charge the stored-energy springs when the breaker is closing.

After the stored-energy springs are discharged, they are automatically recharged as long as the control circuit is energized, and the motor toggle switch (N) is in the "ON" position. Figure 4 shows the spring-position switch (SPS b) closed to complete the motor control circuit as it would be when the springs are discharged.

TABLE 2. OPERATING PROCEDURE – ELECTRICALLY-OPERATED BREAKERS

Operation	Procedure
Charging Springs	Energize control circuit. Move control switch (N) on front of breaker to "ON" position.
Closing	After springs are charged, actuate remote close control switch (CSC). or Push down spring-release latch hood (302A).
Tripping	Actuate remote trip control switch (CST). or Push in manual trip rod (307).

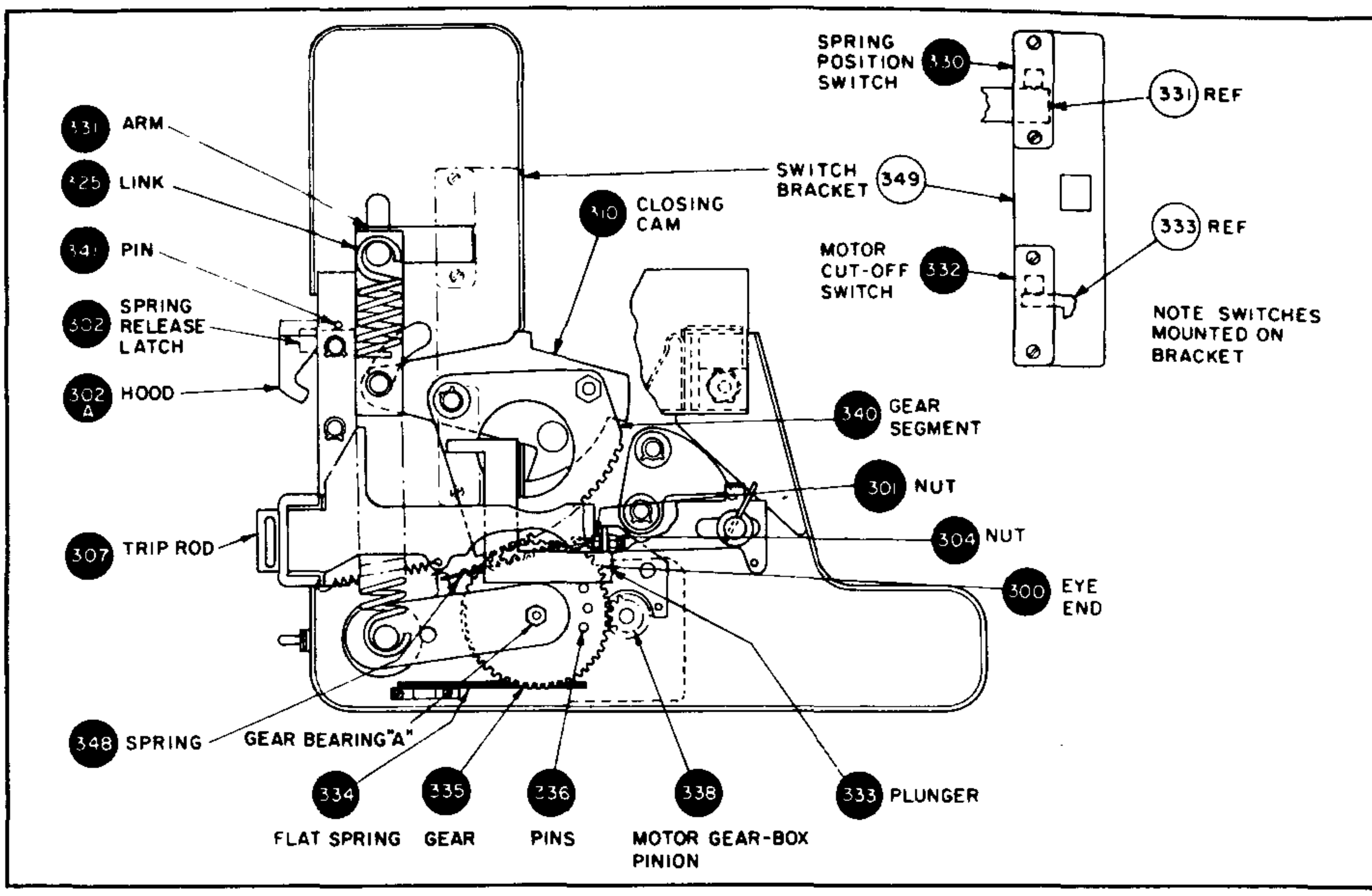


Figure 3. – Typical Operating Mechanism – Electrically Operated Breaker

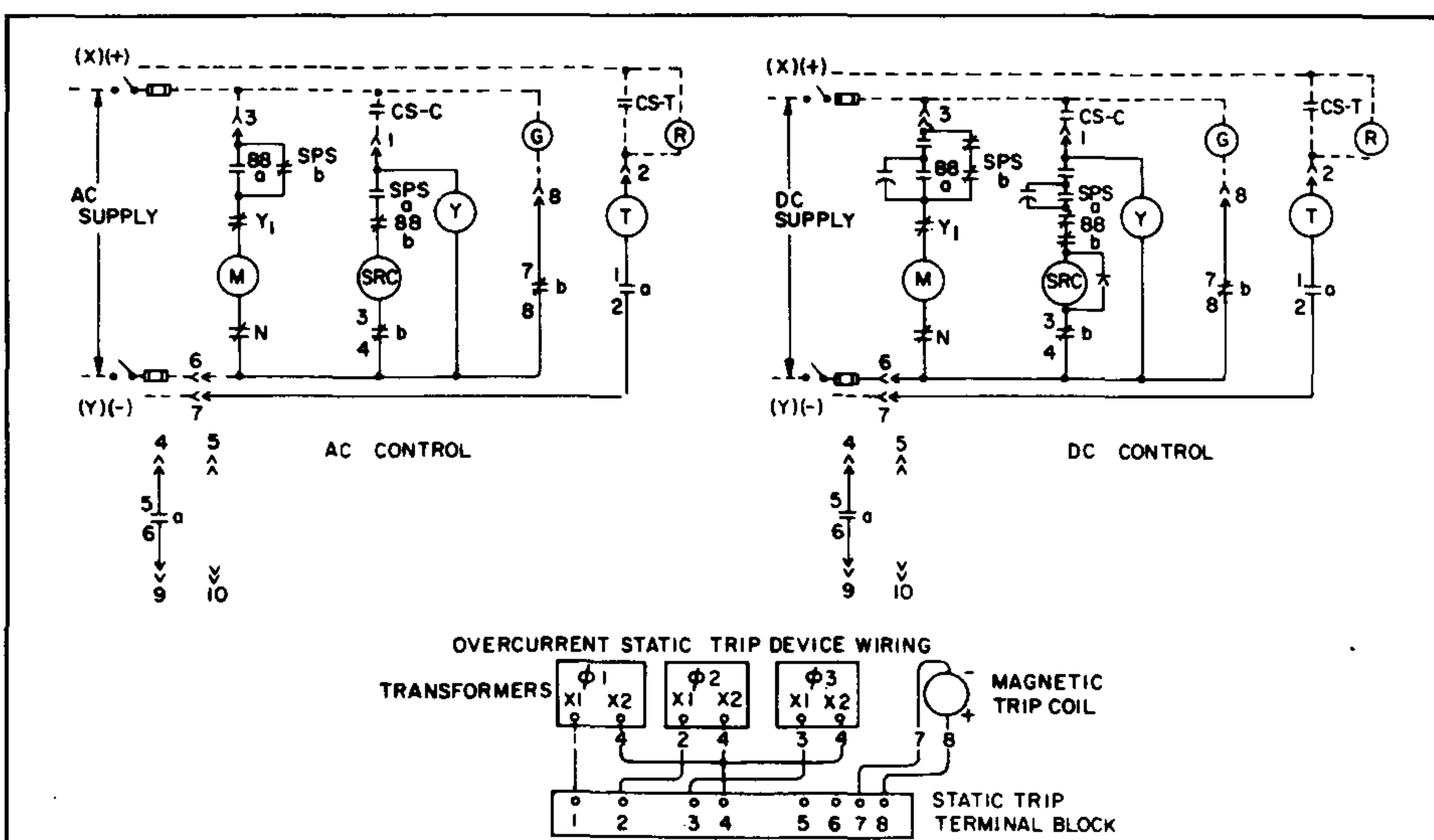


Figure 4. – Typical Wiring Diagram – Electrically Operated Breakers

Racking Mechanism, Drawout Interlock, and Lifting Bar.

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 trip interlock, and the drawout position markings.

Refer to Figure 5. Lifting bar (501) may be used to lift the breaker when it is being inserted in the cubicle.

With the breaker in position on the rails, the following sequence should be used to rack the breaker into the fully connected position.

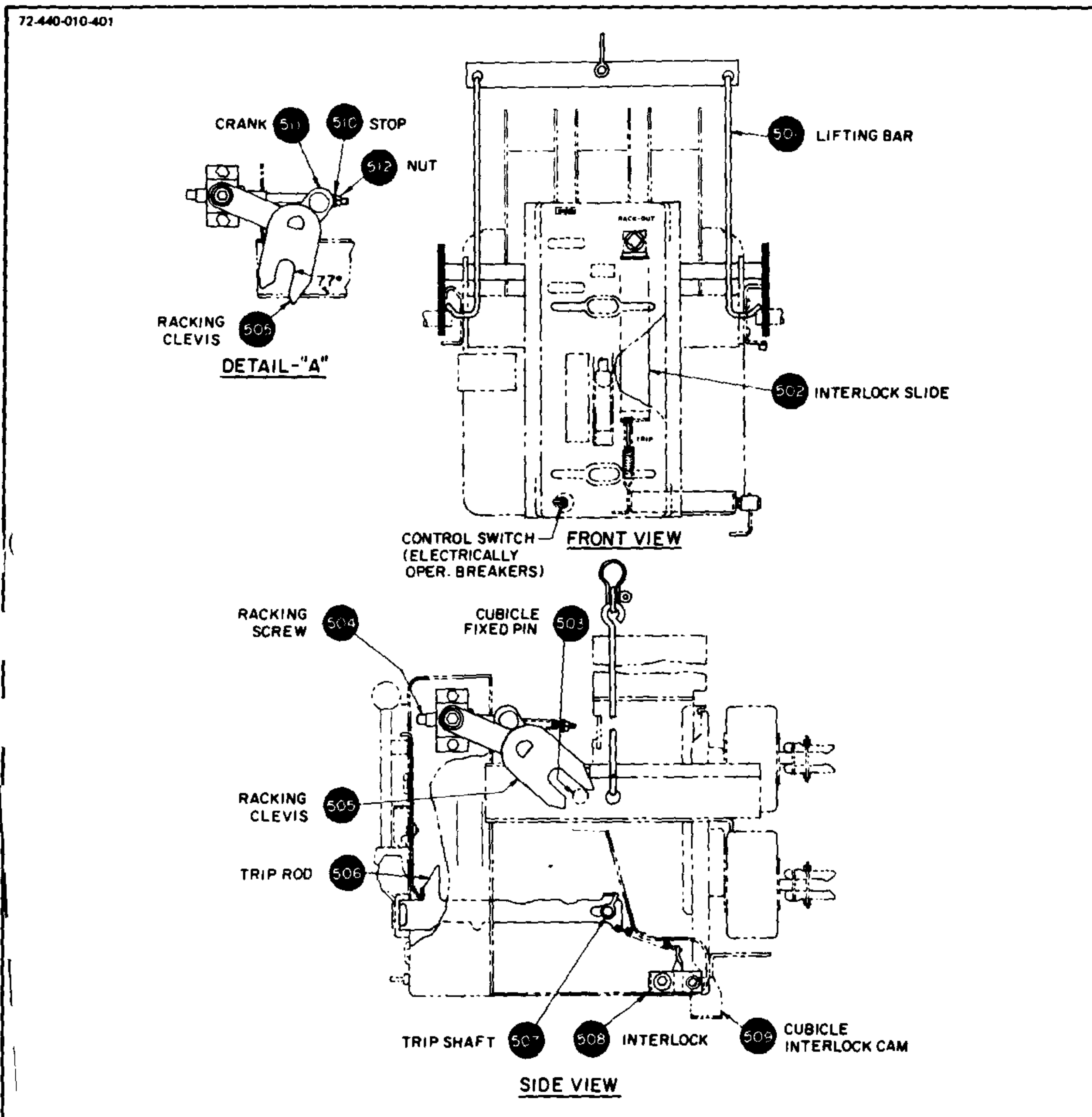


Figure 5. – Typical Racking Mechanism and Drawout Interlock

> **CAUTION**
>
> *On electrically-operated breakers, be certain that the control switch on the front of the breaker is in the "OFF" position.*

1. Push trip bar and lower the interlock slide (502) to expose racking screw (504). (Lowering the interlock slide will also actuate trip rod (506) so that a closed breaker will be tripped.) While the interlock slide is in this position, the breaker is "trip-free" and cannot be closed.
2. With the switchgear operating crank, rotate racking screw (504) to move racking clevises (505) to the position shown where they will engage with fixed pins (503) in the cubicle.
3. The breaker should now be pushed along the rails to the "DISCONNECTED" position. At the same time the racking clevises (505) should be checked to see that they are in correct alignment with cubicle fixed pins (503).

   Counterclockwise rotation of the operating crank will now rack the breaker into the "TEST" and CONNECTED positions. At the "TEST" and CONNECTED positions, interlock (508) is in its normal horizontal position. By removing operating crank and then raising interlock slide (502), trip rod (506) returns to the extended position permitting trip shaft (507) to reset and the breaker may be operated.

   Between "TEST" and CONNECTED positions, the cubicle interlock cam (509) raises interlock (508) to hold trip rod (506) and trip shaft (507) in the "trip-free" position so that the breaker cannot be closed even if interlock slide (502) is raised. This is to prevent movement of a closed breaker into or out of the CONNECTED position.
4. To withdraw the breaker from the CONNECTED position, the procedure is the same except that the direction of rotation of the operating crank is clockwise.
5. If necessary to adjust racking screw stop (510) rotate racking screw (504) until racking clevis (505) reaches the 77° position as shown (Detail "A"). Position stop (510) against crank (511) with nut (512).

> **CAUTION**
>
> *To avoid damage to the racking mechanism, do not rotate the operating crank in the counterclockwise direction after the breaker has reached the fully connected position.*

Spring Discharge Mechanism

Description and Function

(See Figures 2 and 6.) When racking circuit breaker OUT of cubicle (see Racking Mechanism, Drawout Interlock, and Lifting Bar, page 6) the stored energy closing springs (209) will automatically discharge prior to or when circuit breaker reaches the DISCONNECT position.

This is accomplished by the following sequence:

1. Lever (601) rotates clockwise during RACKOUT, allowing roller (602) on lever (601) to rotate cam (603) counterclockwise.
2. Cam (603) moves rod (604) upward which in turn rotates lever (605) clockwise.
3. Lever (605) in turn rotates spring release latch (613) clockwise allowing the stored energy closing springs (209) to discharge.
4. When roller (602) strikes cam (603) and stored energy springs discharge, cam (603) 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 (see Figures 1, 2, and 6):

1. Remove cover (126).

> **CAUTION**
>
> *With cover removed and circuit breaker contacts open, the circuit breaker will CLOSE when the stored energy springs are discharged automatically since the slide interlock is not in place.*

2. Align scribed line on trunion (606) with center punch mark (TEST position) on arm (607).
3. Remove cotter pin (610, remove washers (611), remove rod (604) from cam (603). Adjust rod, (604), by screwing into or out of yoke (612) until the nominal .375 dimension is obtained between the end of rod (604) and inside of yoke (612). Insert rod (604) into cam (603), replace washers (611), insert cotter pin (610) and bend.
4. Charge stored energy springs (209) and rotate racking screw (222) in the clockwise direction (see Racking Mechanism, Drawout Interlock, and Lifting Bar, page 6). The stored energy closing springs should automatically discharge (see caution note, above) prior to or when circuit breaker reaches the DISCONNECT position. Cam (603) must snap back to reset position as shown. (See Step 4 of Description and Function, above.)
5. If the stored energy closing springs DO NOT automatically discharge as described in Step 4:
   a) Repeat Adjustments, Step 2.
   b) Readjust as necessary per Adjustments, Step 3 within the prescribed tolerance limits of .375 $\pm$.062.
6. Repeat Adjustments, Step 4.

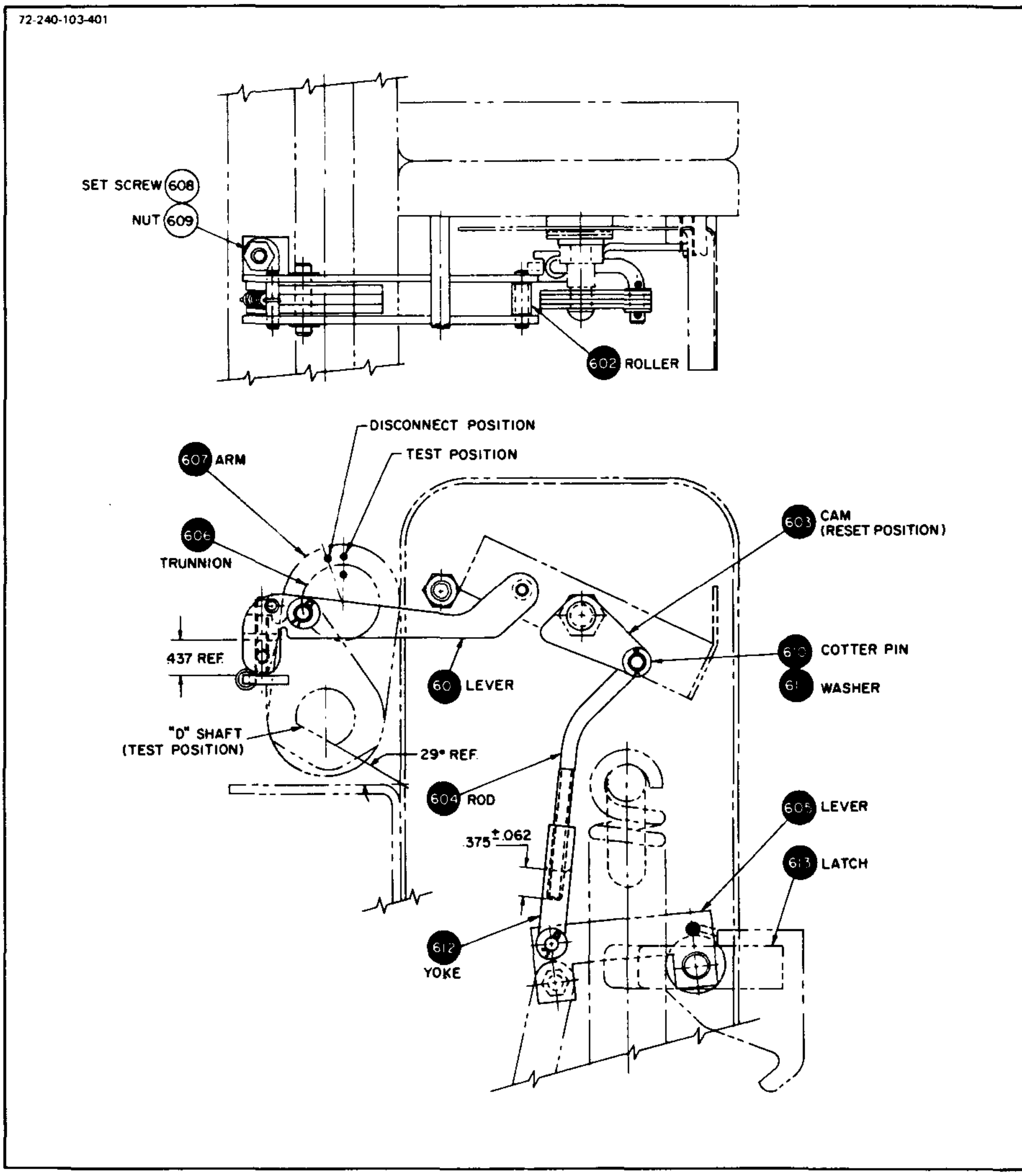


Figure 6. – Spring Discharge Mechanism

MAINTENANCE AND ADJUSTMENTS

Maintenance

Occasional checking and cleaning of the breaker will promote long and trouble-free service. A periodic inspection and servicing at intervals of six months or one year should be included in the maintenance routine. Circuit breakers located in areas subject to acid fumes, cement dust, or other abnormal conditions, require more frequent servicing. After a severe overload interruption, the breaker should be inspected.

If the circuit breaker is not operated during extended periods, it 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.

A suggested procedure to follow during maintenance inspections is given below.

1. De-energize the primary and control circuits.
2. Rack cubicle-mounted breakers of the drawout type to the disconnected position.
4. Remove breaker from cubicle.
5. Remove arc chutes (117, Figure 1) and examine for burned, cracked or broken parts. To remove arc chutes, proceed as follows (see Figure 5):
   a. Move breaker to disconnect position.
   b. Turn racking screw (504) until crank (511) is in vertical position, giving maximum clearance between screw and holding bar.
   c. Remove wing nuts from holding bar.
   d. Tilt top of holding bar toward back of breaker and move bar down.

NOTE

After inspection and before moving breaker to test position, turn racking screw (504) until racking clevis (505) reaches its normal disengaged position.

6. Wipe the contacts with a clean cloth saturated with a non-toxic cleaning fluid.
7. Replace badly burned or pitted contacts (see Contact Replacement, page 11).
8. Wipe all insulated parts with a clean cloth saturated with a non-toxic cleaning fluid.
9. Bearing pins and other sliding or rotating surfaces should be cleaned and then coated with a light film of grease (see Lubrication, next paragraph).
10. Operate the breaker manually in maintenance closing position (see Maintenance Closing, below) to check latch and linkage movement.
11. Check breaker adjustments (see Adjustments, page 11).

Lubrication

Lubrication should be a part of the servicing 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. Faces of main and arcing contacts should not be lubricated. The rubbing surfaces of the main contact fingers and hinge contact fingers are lubricated with micro fine dry graphite. If dust has accumulated, disassembly is necessary to relubricate these points (see Contact Replacement, page 11).

Maintenance Closing

During inspection prior to installation and for routine maintenance inspections, the breaker contacts may be closed slowly to check clearances, contact adjustments, and movement of links and latches. The manual closing handle is used for maintenance closing the breaker.

Electrically-operated breakers do not have a manual closing handle, but a manual closing handle-cam assembly is available as a maintenance item. Figure 7 shows the maintenance closing handle being inserted in an electrically-operated breaker after removal of the front cover from the breaker. When the hole in the maintenance closing handle assembly is aligned with the holes in the operating mechanism frame, the pin which is attached to the chain is inserted. This pin holds the assembly in place and acts as a pivot point for the cam.

After insertion of the maintenance closing handle assembly on the electrically-operated breaker, the actual maintenance closing operation is the same for both the electrically-operated breaker and the manually-operated breaker. Refer to Table 3 and Figure 7.

CAUTION

The procedure in Table 3 should be used for maintenance closing only.

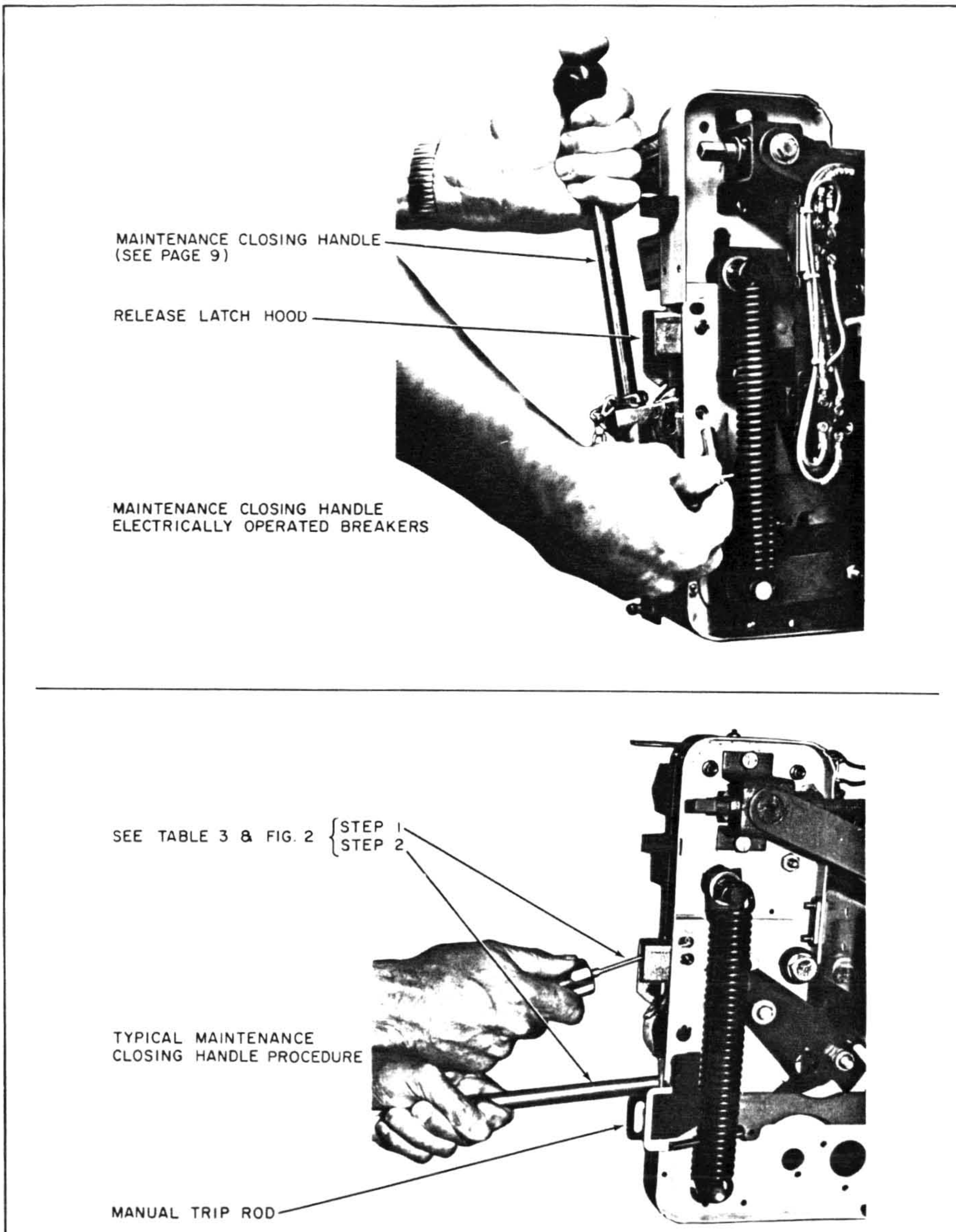


Figure 7. – Maintenance Closing

TABLE 3. MAINTENANCE CLOSING

Operation	Procedure
Closing Contacts	1. Pull closing handle DOWN ALL THE WAY (approximately 120°). 2. Place blade of screwdriver between hood and spring release latch and hold it in this position. 3. Slowly return handle to vertical position. (Contacts will close to arcing contact touch position, but breaker will not close completely.)
Opening Contacts	Push in manual trip rod.

NOTE

Holding the spring release latch down prevents the stored-energy springs from propping in the charged position. Thus, when the handle is slowly returned to the normal vertical position, the energy in the springs is slowly released against the closing handle assembly cam face.

Adjustments

During maintenance inspections, the following items should be checked to ensure that the original settings are maintained:

Trip-Latch Engagement

(Refer to Figure 2.) Trip latch (216) should have an engagement of .062" plus 0 minus .015" on trip shaft (215). Measurement is made with the latch resting on the shaft in the reset position. With this engagement, the trip shaft must rotate between 10.5° and 15° to release the trip latch.

Main Contact Make

(Refer to Figure 8.) Compression of contact fingers (819) should be between .093" and .125". This is the difference in the measurement from the breaker base to the tip of the finger contact surface when the breaker is open and the measurement in the same place when the breaker is closed. This is checked with a normal closing operation – not maintenance closing. Adjustment is provided by positioning screws (808) after loosening nuts (821). Counterclockwise rotation of screws (808) increases compression. Care should be taken to retighten nuts (821) after adjustment. If it is desired to check contact pressure, a push-type spring scale can be used to compress contact fingers (819), with breaker open. Contact pressure should be between 20-30 lbs.

Arcing Contact Make

(Refer to Figure 8.) With movable arcing contact (820) in any one phase touching the mating stationary contact when the breaker is closed by the maintenance closing method (see Table 3), the phase to phase variation should not exceed .062". Adjustment may be made by positioning screws (808) as in the previous paragraph, but it is essential that the main contact compression be maintained within the tolerance listed in the previous paragraph. Arcing contact pressure should be between 30 and 40 pounds when checked with a pull-type spring scale at the base of the arcing contact tip insert with the breaker contacts closed.

Electrically Operated Breakers

(Refer to Figures 3 and 4.)

1. Motor Cut-Off Switch and Spring-Position Switch

   These switches are mounted on a common bracket which is set and roll-pinned in position during production testing. If replacement is required, the bracket must be positioned so that when roll pins (336) in gear (335) are at the top position, they have moved plunger (333) against the roller of motor cut-off switch (332) to shut off the motor. As the springs are charged, arm (331) must engage the roller of spring-position switch (330). Pilot holes are provided in the mounting bracket for drilling and roll-pinning the replacement assembly in the correct position. There should be .010 clearance between gear and slide.

2. Gear Disengagement

   (Refer to Figure 3.) With the breaker closing cams (310) in the horizontal position, adjust the tension of spring (348) by means of eye end (300) and nuts (301, 304) until a dimension of 2 3/8 $\pm$1/32 is measured between spring loops. This dimension is measured when gear (335) touches or meshes with gear segment (340). At this point a force of 5 1/2 to 7 lbs will be required to hold the gears in contact.

Contact Replacement

(Refer to Figure 8.) The contact structure consists of main current carrying contacts and arcing contacts arranged so that initial contact make and final contact break is by means of the arcing contacts. The main contacts are not subject to arcing. The actual contact surfaces are clad with an alloy facing which greatly reduces mechanical wear and arc erosion.

When inspection of the alloy facing indicates that the contacts should be replaced, it should be noted that hinge contact fingers (814), main contact fingers (819) and arcing

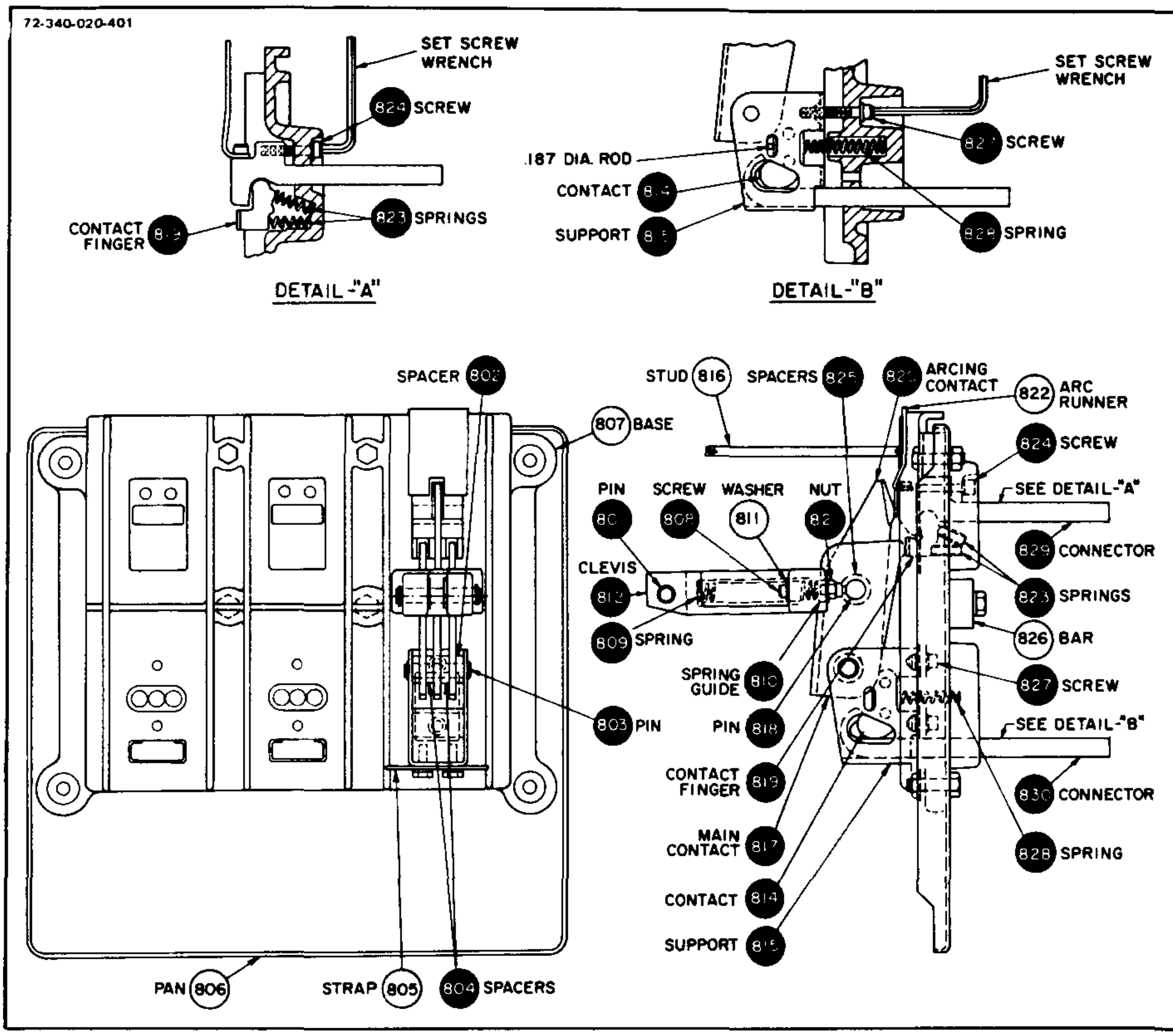


Figure 8. – Typical Panel Assembly

contacts (820) are spring loaded. Therefore, care must be exercised in removal and installation of any of the contacts.

Main Contact Fingers

With the breaker contacts open and the stored-energy springs discharged, main contact fingers (819) may be removed by loosening screws (824) enough to relieve the compression on springs (823) as shown in Detail "A". There are two springs behind each finger and it is important that they be positioned properly upon reinstallation. If difficulty is experienced in correctly positioning these springs, the upper and lower primary disconnects (119 – Figure 1) may be removed from each phase and the breaker inverted to rest on the ends of connectors (829) and (830).

After the contact fingers are replaced, connector (829) should be positioned in the center of the slot in the molded base to assure correct alignment of the primary disconnect fingers.

Stationary Arcing Contact

The stationary arcing contact is a part of connector (829) and may be replaced by proceeding as above. In this case, screws (824) must be removed. However, to provide clearance for removal of connector (829) first insert a 3/16" diameter rod at least 2" long through the opening in support (815) as shown in Detail "B". It may be necessary to compress contact (814) opposite arcing contact (820) in order to insert the rod. This will hold hinge contact fingers (814) in position to permit removal of pin (803). After removal of pin (803), main contact (817) and arcing contact (820) can be positioned so that connector (829) can be removed.

Hinge Contact Fingers

Hinge contact fingers (814) may be removed as follows: Remove top screw (827) from support (815) and replace it with a 1/4-20 screw at least 1-1/2" long. Remove lower screw (827) and then gradually back off the 1-1/2" screw as shown in Detail "B", to relieve the loading from springs (828). The hinge contact fingers can now be removed. To provide easier access to the hinge contact fingers, pin (803) may be removed after the loading is relieved from springs (828).

Moving Arcing and Main Contact

Either moving arcing contact (820) or main contact (817) or both may be removed and replaced as follows: Follow the steps outlined in the above paragraph including removal of pin (803) or if hinge contact fingers are not to be replaced, omit these steps and begin by placing a 3/16" diameter rod at least 2" long through the opening in support (815) as shown in Detail "B". Remove pin (801) and pin (803) if these have not been removed previously.

The complete movable contact assembly may now be brought to a bench. It is suggested that a 1/2" thick piece of wood or phenolic be placed upright in a vise and the open slot in clevis (812) placed against it as a rest. The location of spacers (802), (804) and (825) should be noted. To minimize adjustment upon reassembly, the position of the two screws (808) relative to pin (818) should also be noted. Then the two elastic stop nuts (821) should be loosened and screws (808) backed off far enough to remove them from pin (818).

CAUTION

Extreme care should be taken to hold the assembly firmly to retain spring guide (810) and spring (809) upon removal of the screws.

The moving arcing contact or the main contact may now be easily replaced. The reverse procedure is followed for re-installation. Care should be taken to replace spacers (802), (804) and (825) correctly. Check alignment and adjustment of contacts upon reassembly.

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 9. During normal operation, trip rod (901), 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 (902) which holds the internal armature against plate (903) on the bottom of the magnetic release latch.

When an overload or fault condition exists, coil (904), 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 (901) to move up against trip arm (905), in turn, tripping the circuit breaker. As the breaker opens, coil (904) becomes de-energized due to de-energization of the static trip device, cam (906) rotates arm (907) forcing spring loaded armature against plate (903) allowing trip rod (901) to be reset to the non-trip position.

If the spring loaded armature does not reset during trip operation as explained above, spacers (908) 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).

NOTE

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 (904) leads must be connected to the terminal block of the static trip in the correct polarity relationship.

The black lead of coil (904) must be connected to terminal 7 (negative) and the red lead of coil (904) connected to terminal 8 (positive) of the static trip device.

A clearance of .032" to .060" should be maintained between the trip arm (905) and nut (909) with the circuit breaker open, springs charged and trip arm (905) reset by the trip shaft. Adjustment is made by positioning nut (909) while holding trip rod (901).

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.

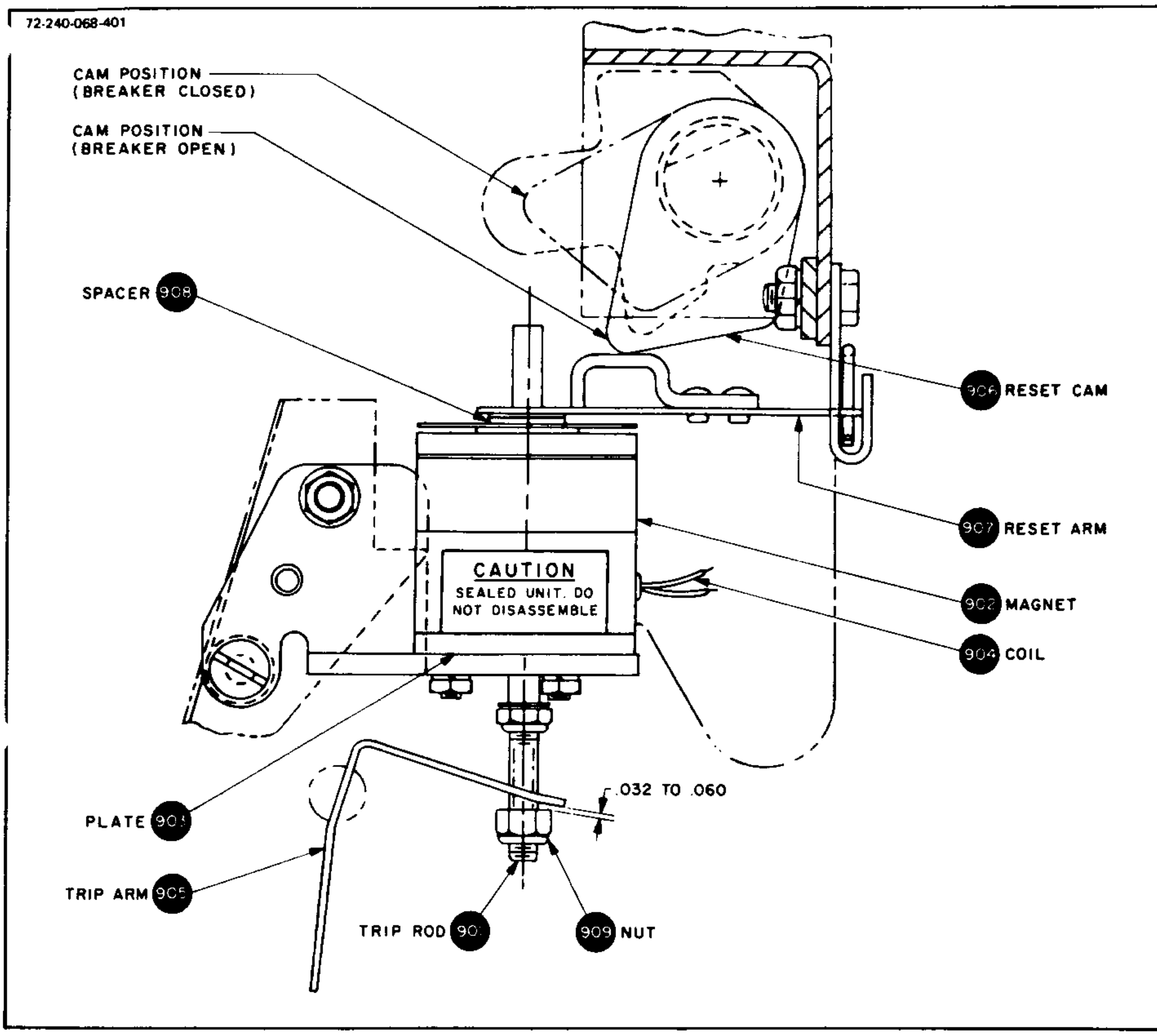


Figure 9. – Typical Release Magnet

FUSE FUNCTIONS

Current Limiting Fuse

(See Figure 10.) The C.L. fuse (1001) NEMA Class "J" and Class "L" have an interrupting rating of 200,000 Amps RMS Symmetrical.

When replacement is required due to the C.L. fuse interrupting, replace only with a fuse of the same manufacturer and rating as supplied with the circuit breaker. Fuses of different manufactures may have considerably different melting time-current characteristics and peak let-thru currents and, consequently, may not be completely interchangeable.

To remove the C.L. fuse, remove bolts (1002) and associated hardware. Remove fuse. To replace the C.L. fuse, reverse the above procedure.

Trigger Fuse

(See Figure 10.) The trigger fuse (1003) and associated trip mechanism has a dual function. The first function is to trip the circuit breaker mechanically when the C.L. fuse has interrupted.

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

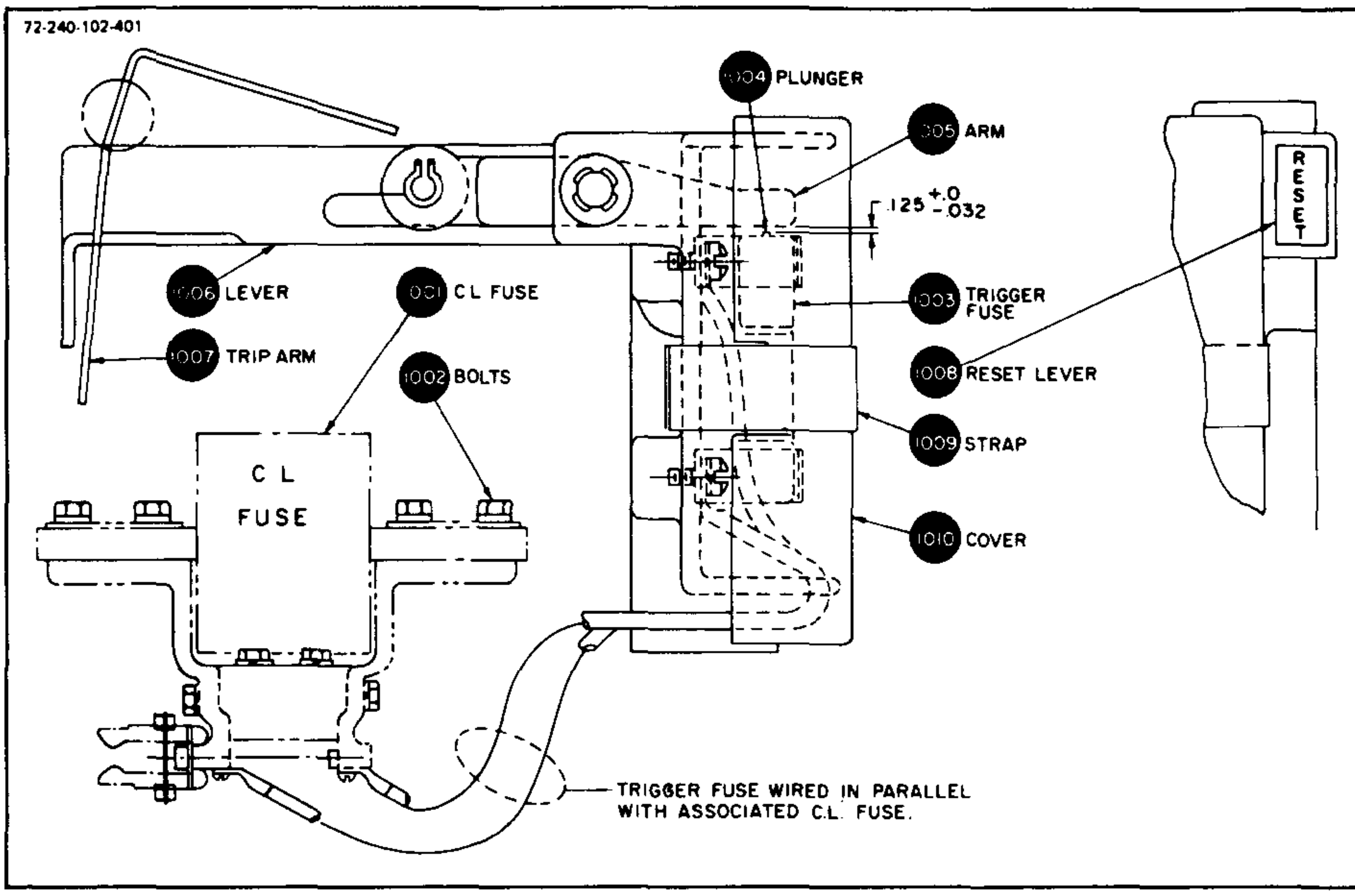


Figure 10. – Current Limiting and Trigger Fuse

The plunger (1004) on top of the trigger fuse indicates visually which phase 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 (1004) which is operated by a precompressed spring contained in the trigger fuse housing.

The plunger operates arm (1005) which allows spring loaded lever (1006) to engage circuit breaker trip arm (1007) which trips the circuit breaker and holds the circuit breaker in the mechanical trip free position.

The circuit breaker will remain trip free (cannot be closed) until the trigger fuse has been replaced and the associated trip mechanism reset lever (1008) has been manually reset (pushed in).

To remove the trigger fuse remove strap (1009), remove plastic cover (1010), then the trigger fuse.

To insert the trigger fuse, reverse the above procedure.

CAUTION

The trigger fuse (1003) must be inserted with the plunger (1004) facing arm (1005). The .125 + 0 – .032 dimension must be maintained.

CURRENT TRANSFORMERS

There are a number of tripping transformer ratings available, each with seven calibrated pickup settings (Table 4). Figure 11 shows a typical breaker rating plate.

The current transformers on the upper connectors for the LA-600 circuit breaker are mounted with the polarity marks facing breaker panel.

The current transformer on the lower connector is mounted with the polarity mark facing away from the breaker panel.

TABLE 4. 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-600	80	40	50	60	70	80	90	100	100	-	32	64	80
	200	100	125	150	175	200	225	250	250	40	80	160	200
600	400	200	250	300	350	400	450	500	500	80	160	320	400
Amperes	600	300	375	450	525	600	675	750	600	120	240	480	600

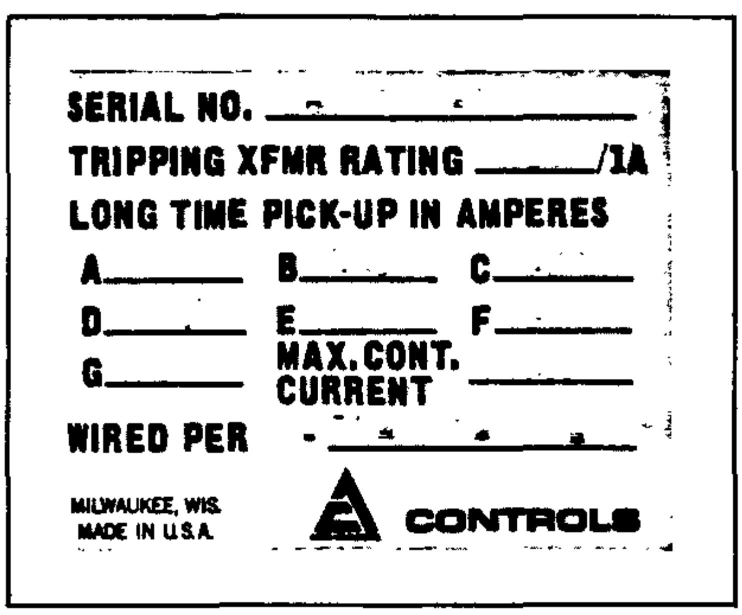


Figure 11. – Typical Breaker Rating Plate

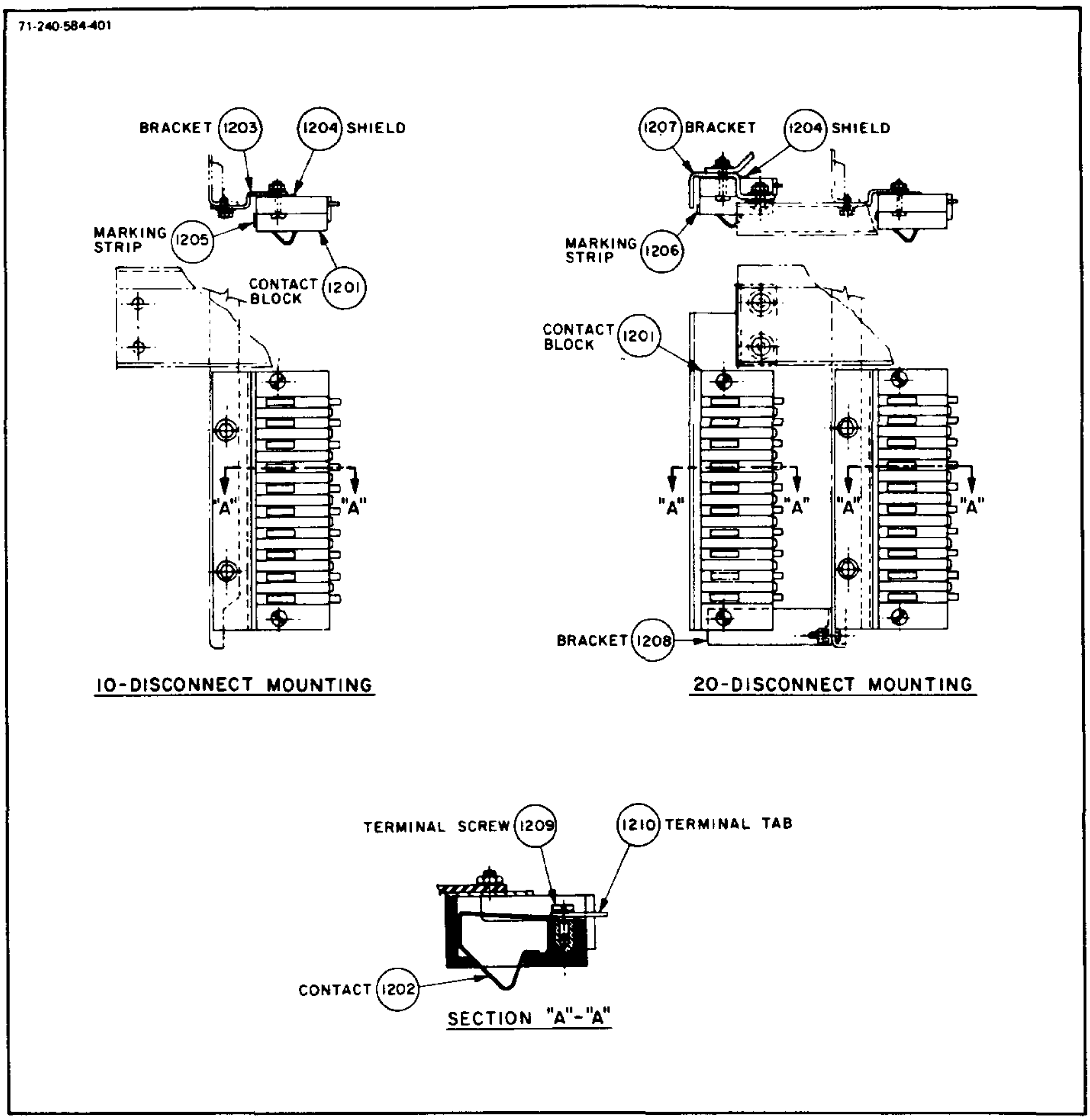


Figure 12. – Typical Secondary Disconnects

The electrical attachments are wired to the terminals of a secondary disconnect assembly which is mounted on the left side of the breaker. Two 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. The stationary contact strips should be lucricated with a light film of AERO LUBRIPLATE which is furnished with the switchgear.

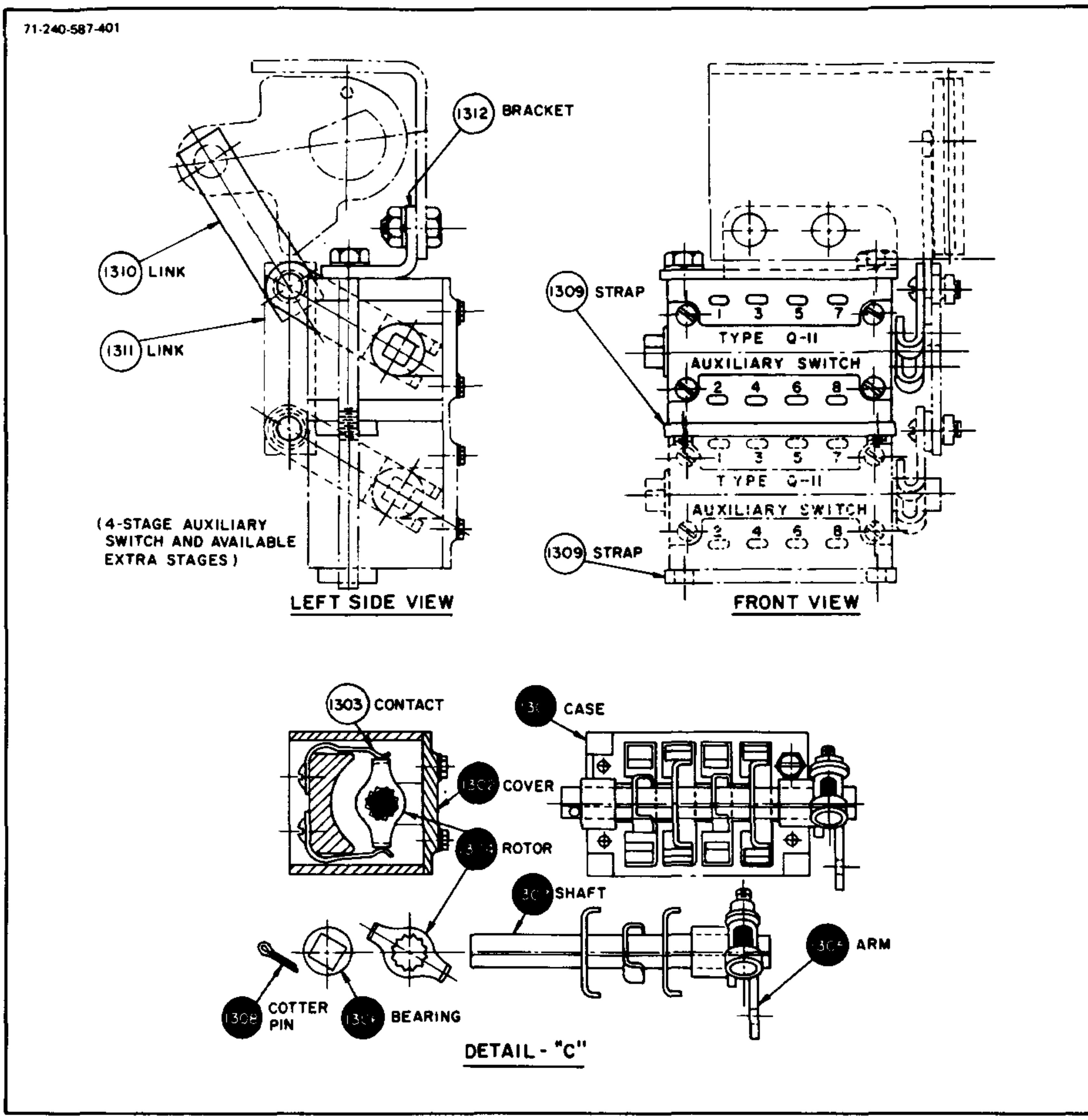


Figure 13. – Typical Auxiliary Switch

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 (1304) may be adjusted individually in steps of 30 degrees. This adjustment is made by removing cover (1302) and lifting the entire rotor assembly out of case (1301) after disconnecting arm (1305) from the linkage. Refer to Detail "C". Cotter pin (1308) and bearing (1306) are removed to permit removal of rotors (1304) from shaft (1307). To change rotors (1304) from "a" to "b" position, the rotor should be rotated 60^{o} in the clockwise direction after removal and replaced on the shaft in this new position.

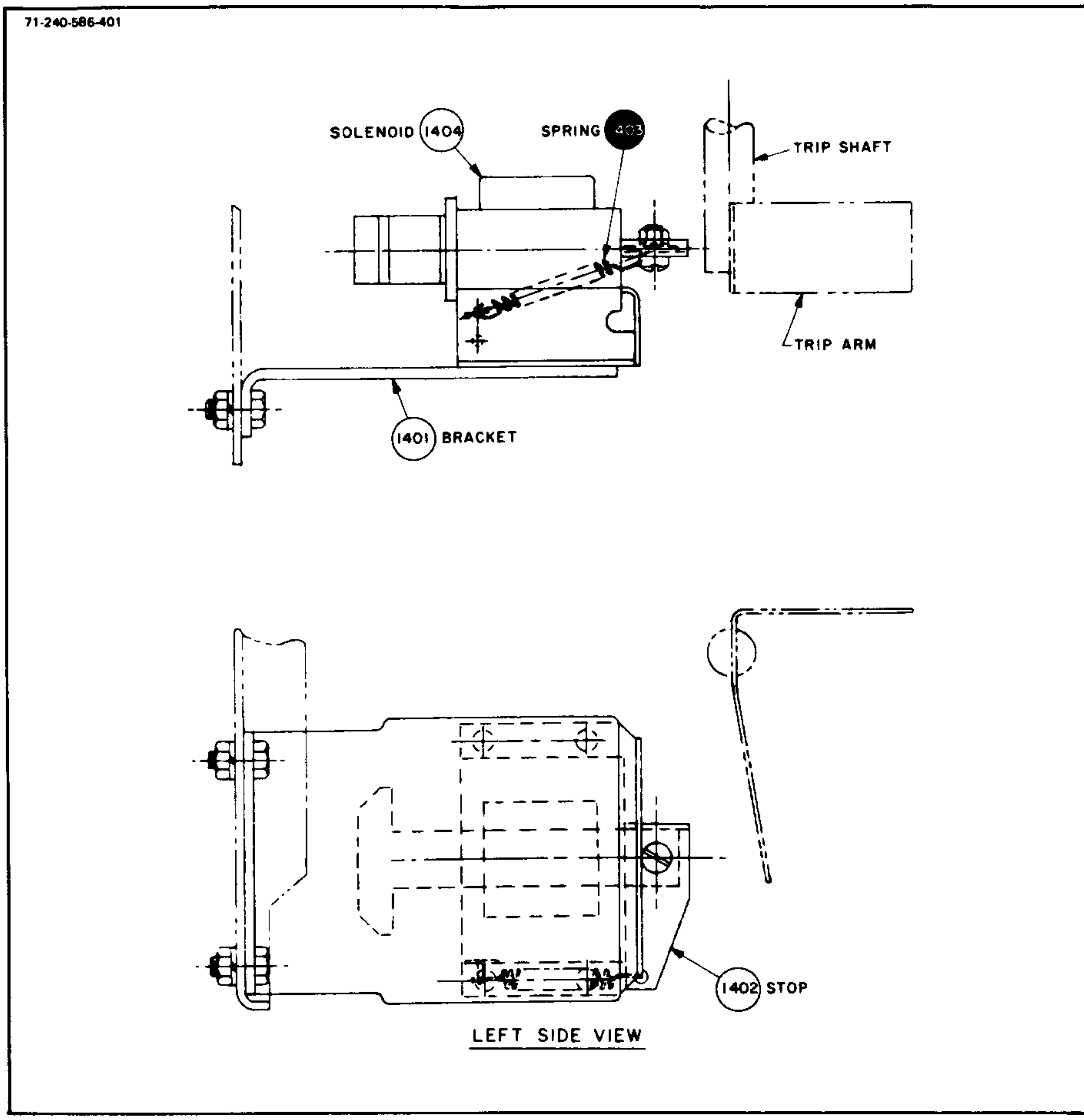


Figure 14. – Typical Shunt Trip

Each electrically-operated breaker is equipped with a shunt trip attachment for tripping from a remote location. Since the shunt trip coil is designed for a momentary duty cycle, an "a" auxiliary contact switch is used to interrupt its circuit immediately after the breaker is tripped. Energization of the coil causes the armature to pick up and rotate the trip arm counterclockwise to trip the breaker. Extension spring (1403) returns the armature to its normal position.

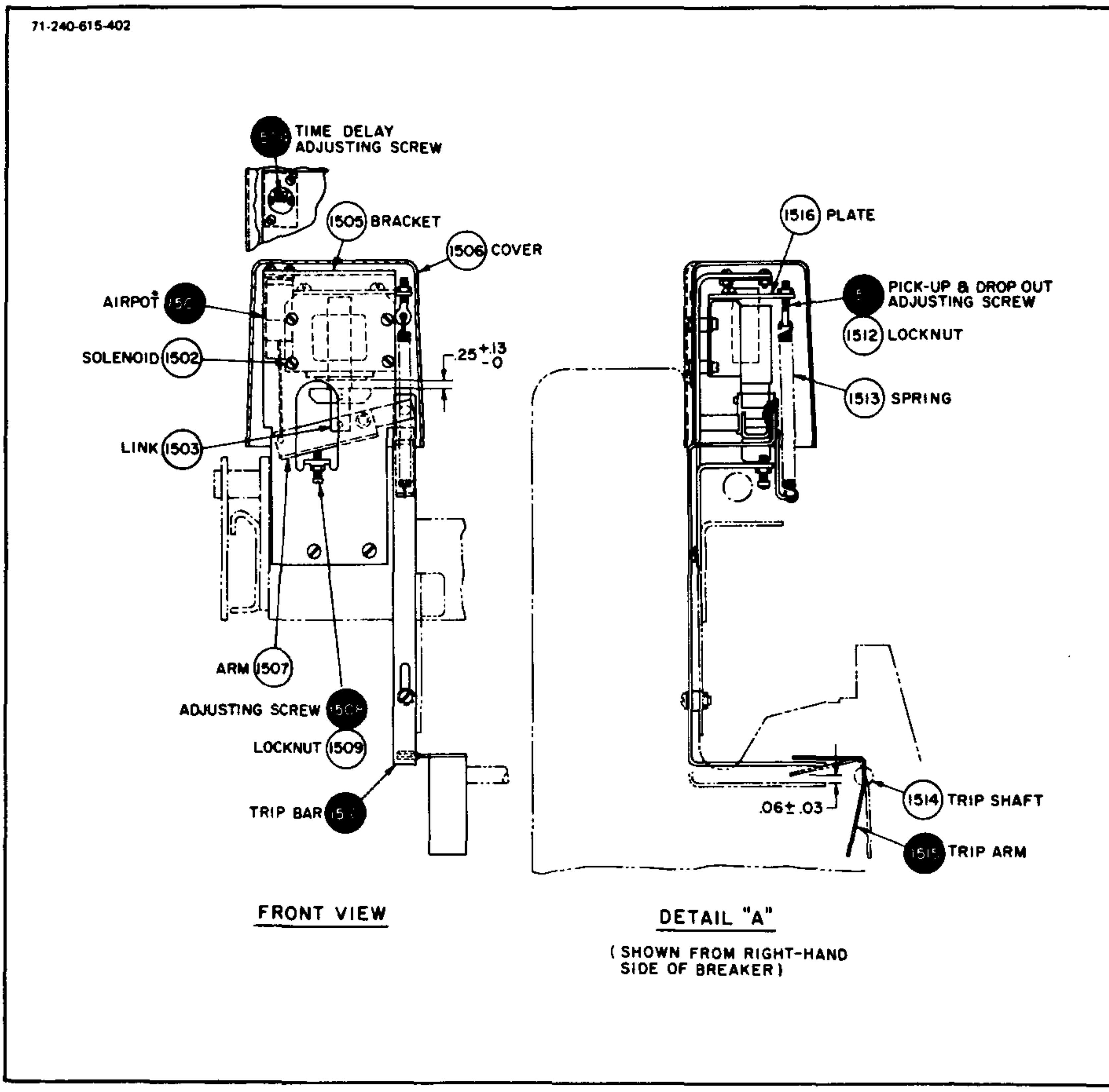


Figure 15. – Typical Undervoltage Device

The undervoltage trip device automatically trips the breaker on loss of voltage. Either instantaneous or time-delay operation can be supplied. Adjusting screw (1508) 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 trip arm (1515) and trip bar (1510) when the device is energized with the breaker closed as shown in Detail "A". Pick-up and drop-out adjusting screw (1511) 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 (1501), adjusting screw (1504) can be set to provide a range of time delay between 0.5 and 4.5 seconds. Tightening the screw increases time delay.

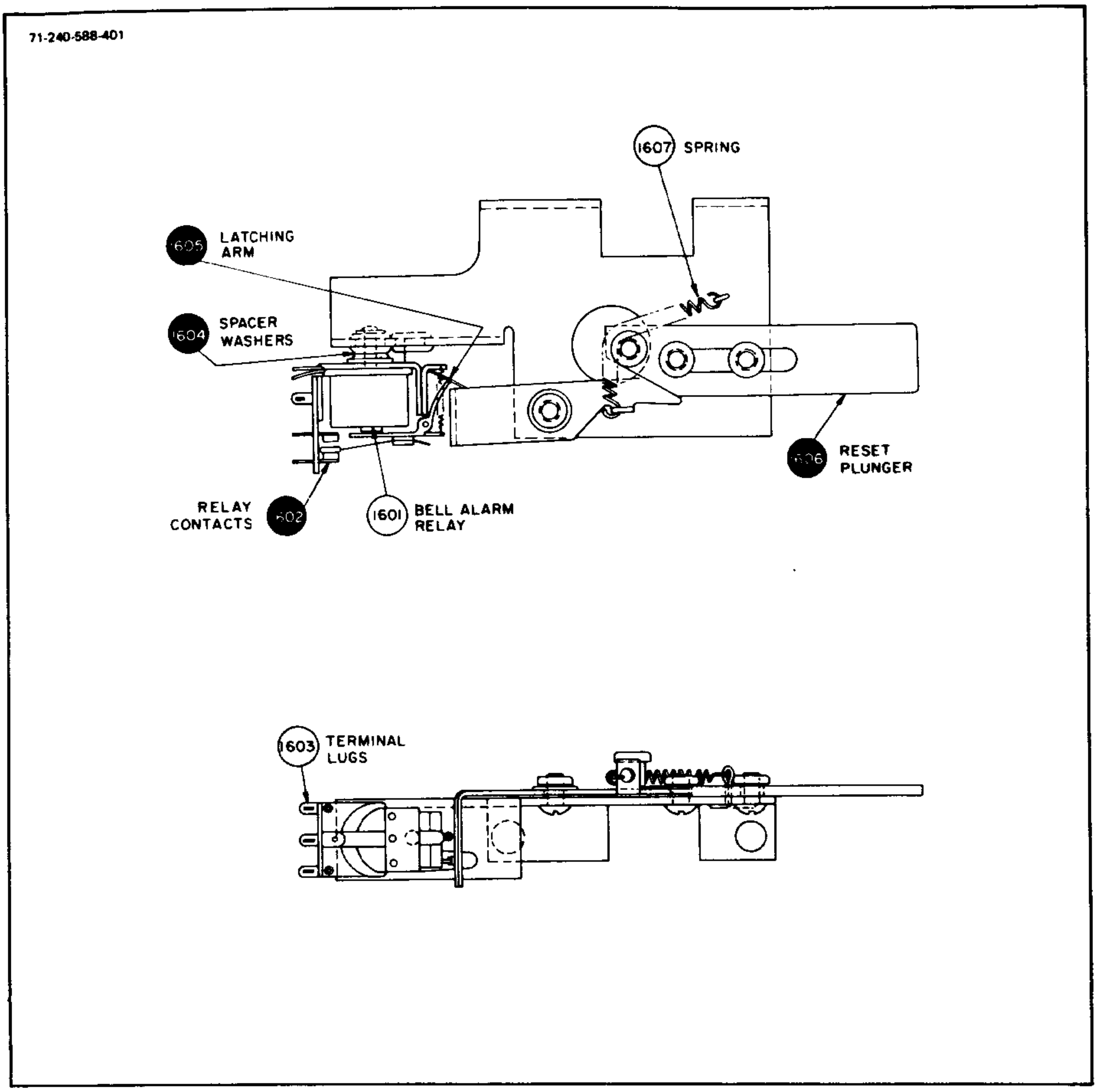


Figure 16. – Typical Bell Alarm (Manual Reset)

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 (1602) are reset to the open position shown by actuating reset plunger (1606). Spacer washers (1604) are used to position the relay to ensure correct engagement of latching arm (1605) 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 (1606) should not touch sides of the slot in the front cover.

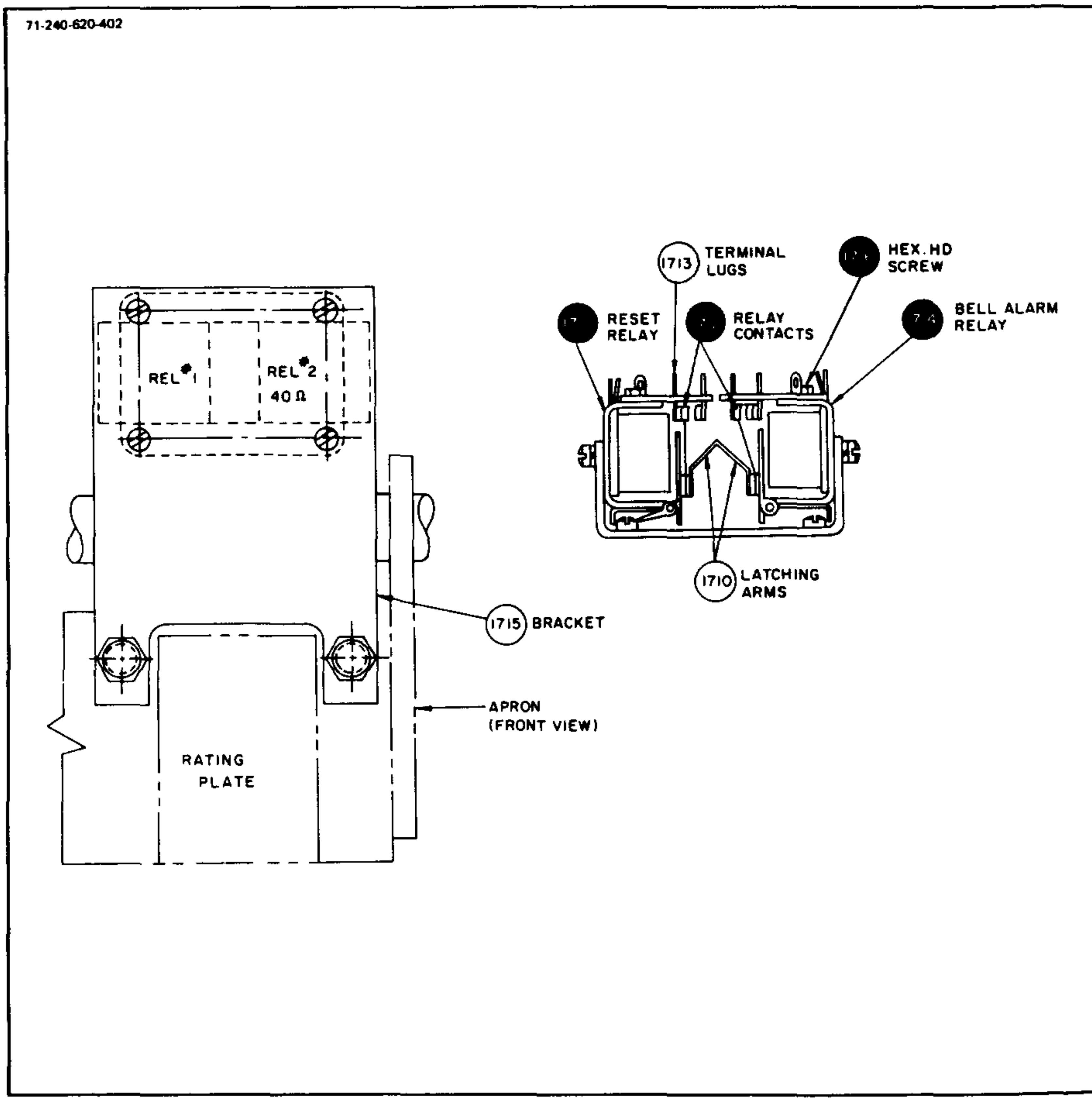


Figure 17. – Typical Bell Alarm (Electrical Reset)

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 (1714) coil (40Ω) is wired to terminals 7 and 8 of the static trip device. As this is a latching type relay, the alarm relay contacts (1712) are reset electrically to the open position shown by actuating reset relay (1711). If the device is not stable during breaker operation or if either armature fails to pick up when actuated, loosen hex head screw (1716) to re-position the terminal board. This changes the engagement between the interlocking latching armatures and the relationship between the stationary and movable contacts.