ALLIS-CHALMERS

INSTRUCTIONS

Operation

TYPE "D" GROUND AND TEST DEVICE Special for Consolidated Edison Company

BWX-6723-S

TABLE OF CONTENTS

PART 1

INTRODUCTION. This manual illustrates and explains the features and use of the Type D Ground and Test Device (G & T) manufactured for Consolidated Edison Company. The operating instructions for each test procedure are located on fold-out page at the end of Part 1. These operating instructions are to be laid out and referred to while following the illustrated steps.

The rack-in mechanism operation is illustrated and and explained in Part 2.

Operating sequence of SE-4 stored-energy operator is explained in Part 3.

LOCATION OF COMPONENTS. Figure 1 is a typical Ground and Test device with the location of all the components mentioned in this manual indicated.

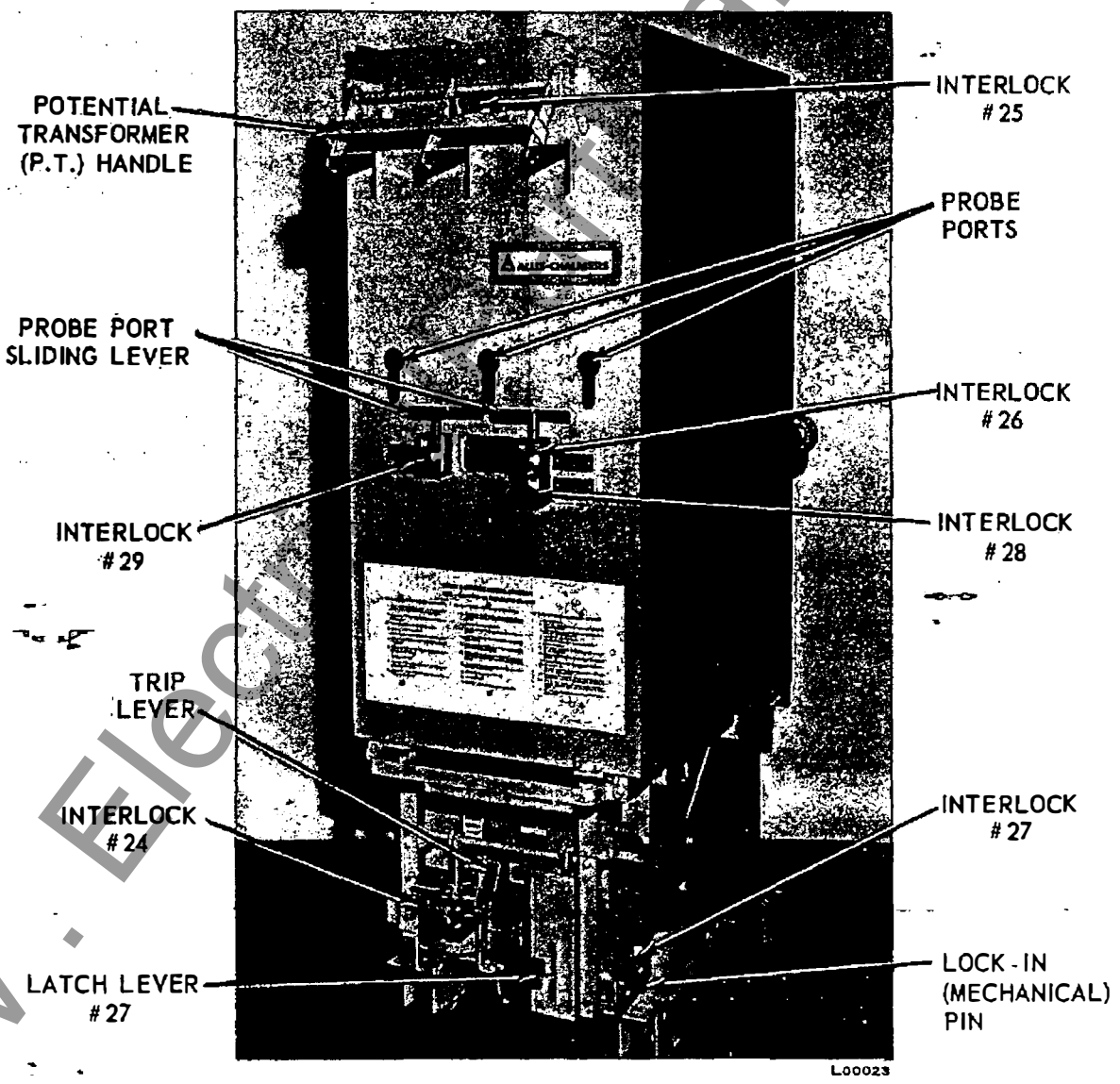


Figure 1 – Typical Ground & Test (G & T) Device

DESCRIPTION OF INTERLOCKS. The following is a description of the key and mechanical interlocks used on the ground and test device.

KEY INTERLOCKS

Interlock 24 – A1 Interchange. Key removable with bolt extended to lock ground and test device in cubicle. Coordinates with interlocks 25 and 26.

Interlock 25 – A1 Interchange. Key removable with bolt extended to lock potential transformer (P.T.) handle in open position. Coordinates with interlocks 24 and 26.

Interlock 26 – A1 Interchange. Part of multiple interlock with interlock 28. Key removable with bolt extended to lock probe port door in closed position. Prohibits exposing probe ports unless P.T. handle is locked open and G & T device is locked in cubicle. Coordinates with interlocks 24 and 25.

Interlock 27 – A2 Interchange. Key removable with bolt extended to lock ground switch in closed position. Coordinates with interlocks 28 and 29. Also contains two contacts (52C-1 and 52T-1) which are open with bolt extended (ground switch closed) to prevent tripping by control switch and to prevent energizing the closing solenoid.

Interlock 28 – A2 Interchange. Key removable with bolt extended to lock probe port door in closed position. Part of multiple interlock with interlock 26. Prohibits exposing probe ports unless grounding contacts are closed. Coordinates with interlocks 27 and 19.

Interlock 29 – A2 Interchange. Key removable with bolt extended to lock test probes in position. Prohibits ungrounding of circuit unless test probes are locked in place. Coordinates with interlocks 27 and 28.

MECHANICAL INTERLOCKS

Test Probe Interlocks. Prohibits moving probe port door to locked position unless all three probes are fully inserted.

Closing Mechanism Interlock. Prohibits release of key in interlock 27 until ground switch has reached the closed position.

Trip Lever. Works with key interlock 24 to lock device in or out of cubicle. In raised position, interlock plunger is extended to lock device, and mechanism trip latch is in normal position. In depressed position, interlock plunger is raised for insertion and removal of device, and latch is held in trip free position to prohibit closing of ground switch.

Latch Lever 27. Works with key interlock 27 to lock ground switch in closed position. In pushed in position it blocks the latch in the non-trip position and closes contact 52C-2 to permit closing the ground switch and locking it. In the extended position it frees the latch to permit opening the ground switch and closes contact 52T-2 to permit electrical tripping. Manual tripping is possible with the latch lock lever extented and is prohibited with it pushed in.

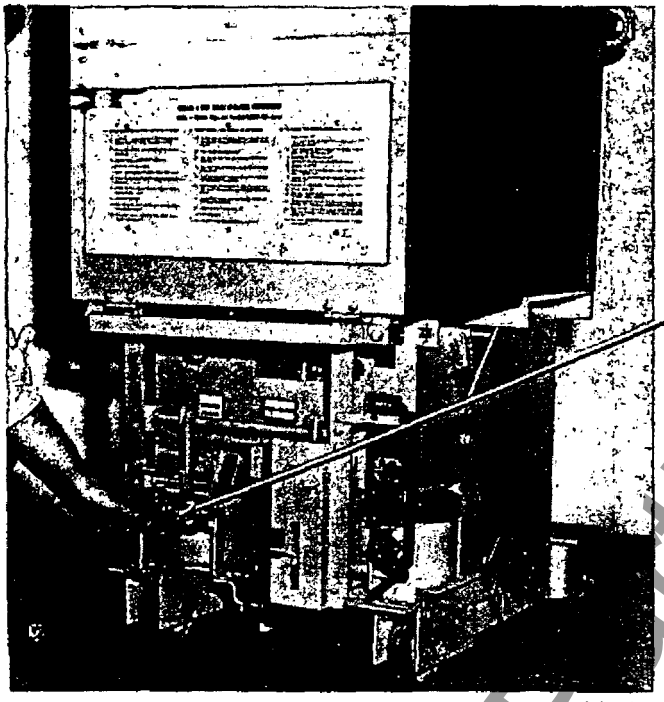
NOTE

Trip lever and the latch lever 27 work in opposition to each other – that is, one holds the latch open to prevent grounding while the other holds the latch closed to permit grounding. Thus a grounding sequence cannot be completed if the device is not locked in or out of the cubicle.

Manual Closing is possible with the latch lever in either position.

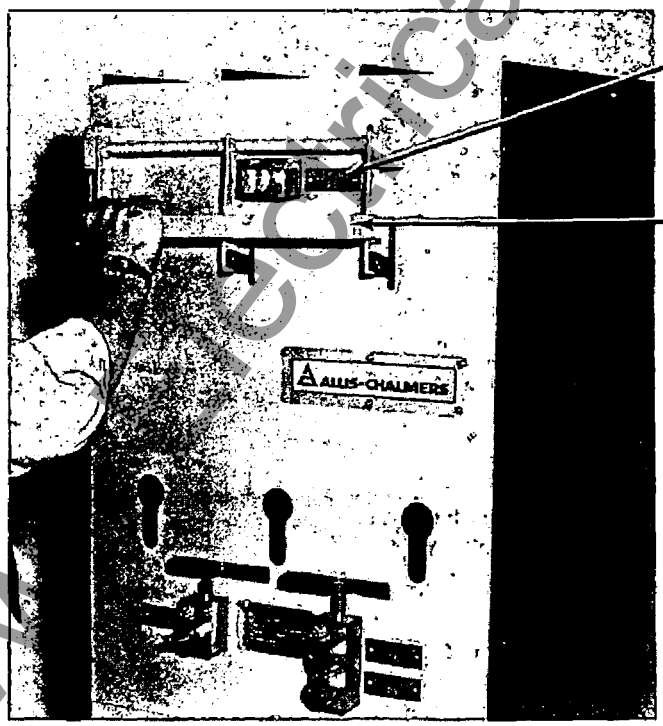
TEST DEVICE OPERATION

(A) Testing for Backfeed; Grounding of Feeder. See operating instructions, steps 1 thru 9.



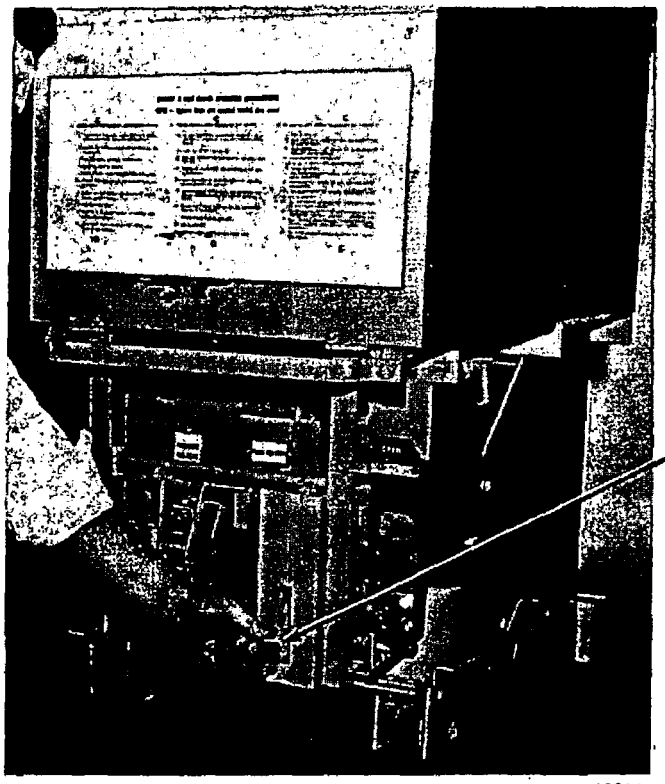
L00024

Step 2 – Remove key #24 from interlock #24 and insert key into interlock #25.



L00025

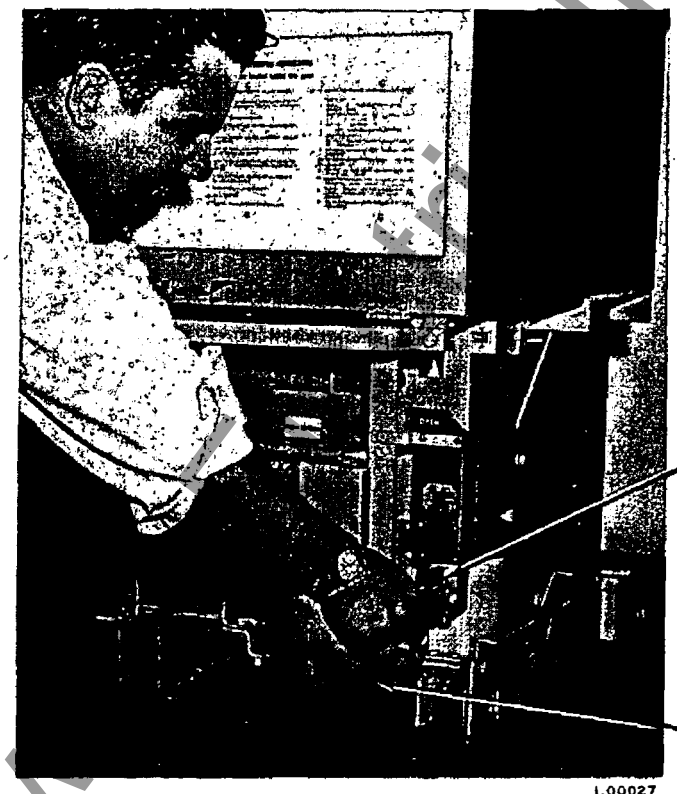
Step 3 – Push P.T. handle, connecting P.T.'s to feeder. Proceed with steps 4, 5 and 6.



L00026

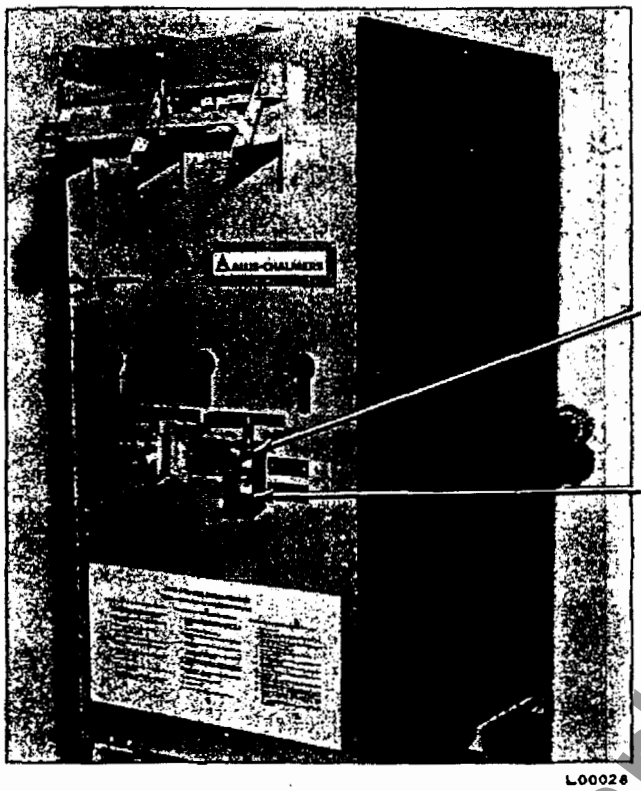
Step 7 – Press latch lever #27. Proceed with steps 8 and 9.

(B) Feeder Testing – High or Low Voltage. See operating instructions, steps 10 thru 19.



L00027

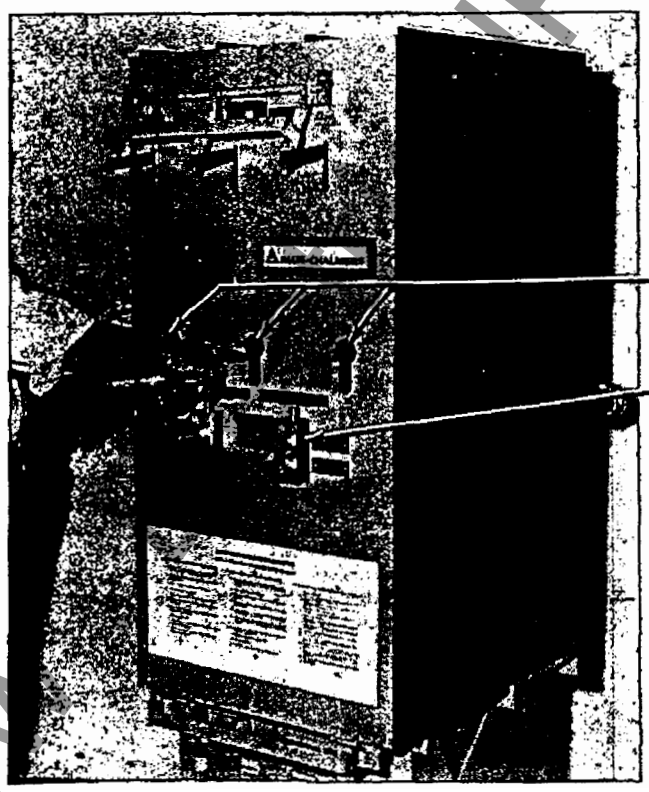
Step 10 – To open ports, insert mechanical pin on interlock #27, locking pin in latch #27, and then remove key #27.



L00028

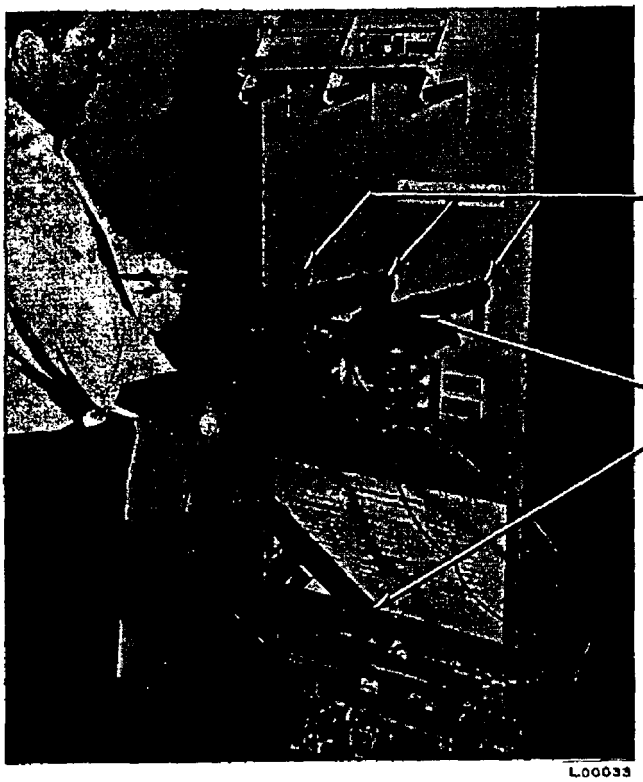
Step 11 – Insert key #27 into interlock #28.

Step 12 – Take key #24 from hook and insert key #24 into interlock #26.



L00029

Step 13 – Turn key in interlock #26, thus permitting all test ports to be opened.

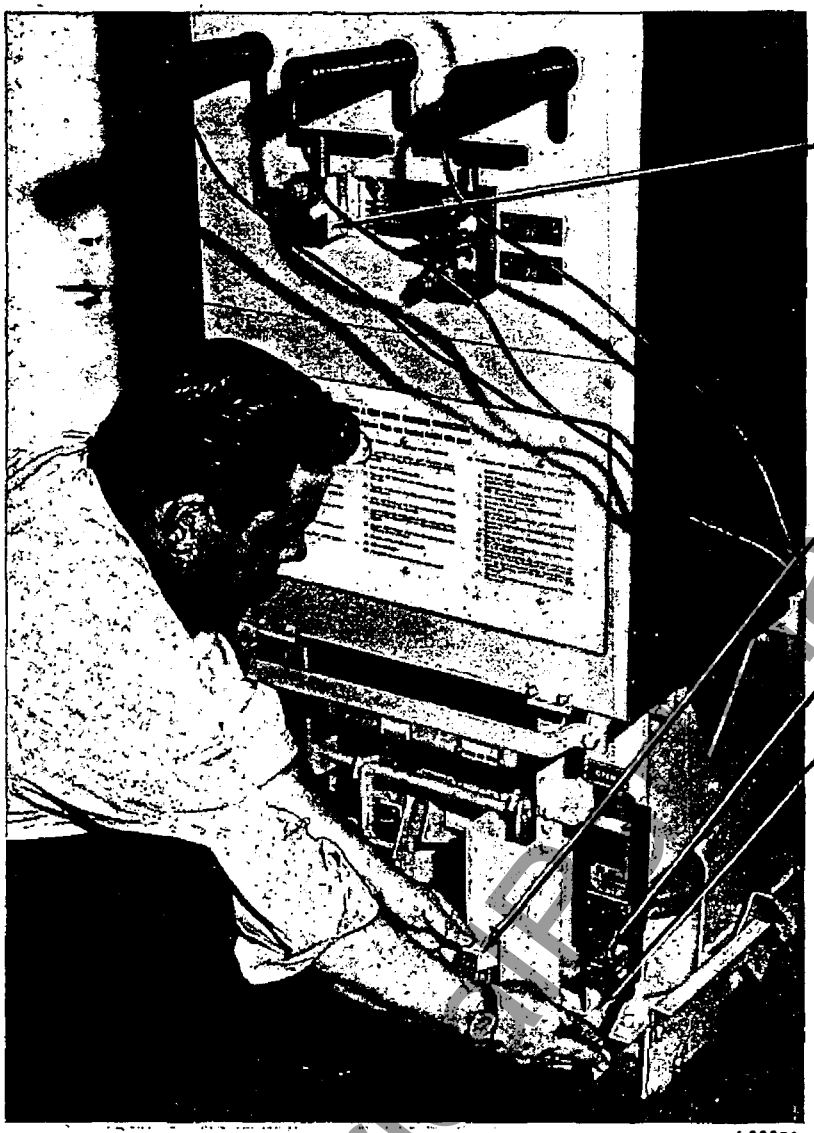


L00033

Step 14 – Insert high tension or low tension test probes (depending on test required) into openings.

L00030

Step 15 – Lock in probes by sliding lever to right and turning interlock key #29. Ascertain test leads are connected to test set.



L00031

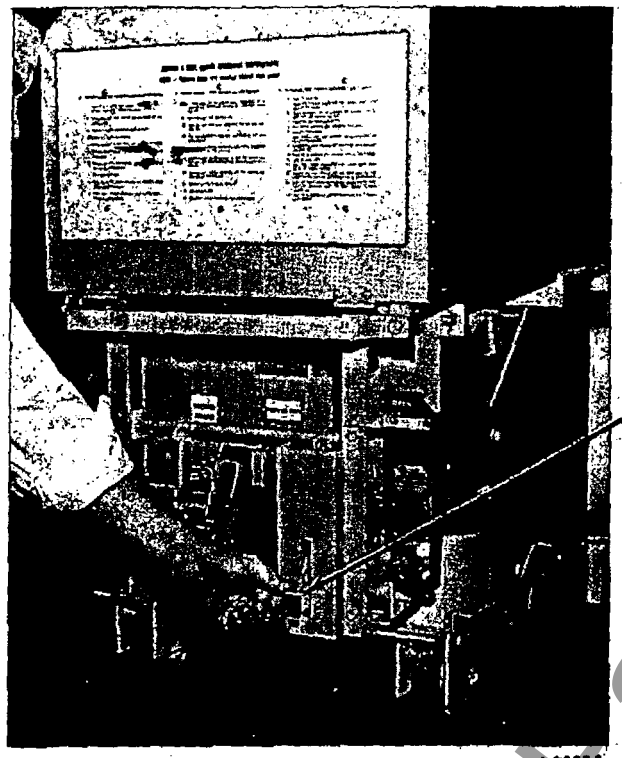
Step 16 – To open G & T device, insert key #29 into interlock #27. Turn key to free interlock.

Step 17 – Release lock-in pin on latch lever # 27.

Step 18 – Lift up latch lever #27.

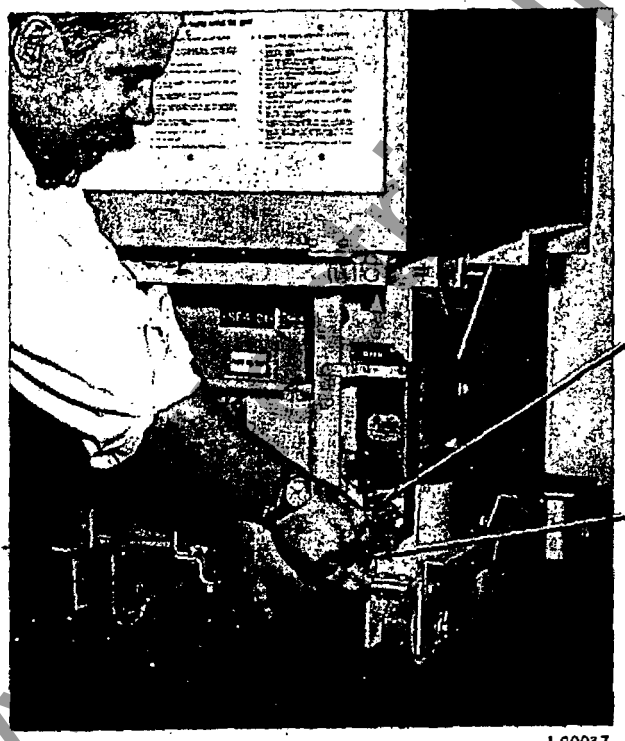
Proceed with step 19.

(C) **Test Probe Removal; Disconnection of G & T Device.** See operating instructions, steps 20 thru 33.



L00026

Step 20 – Push in latch lever #27. Proceed with step 21.



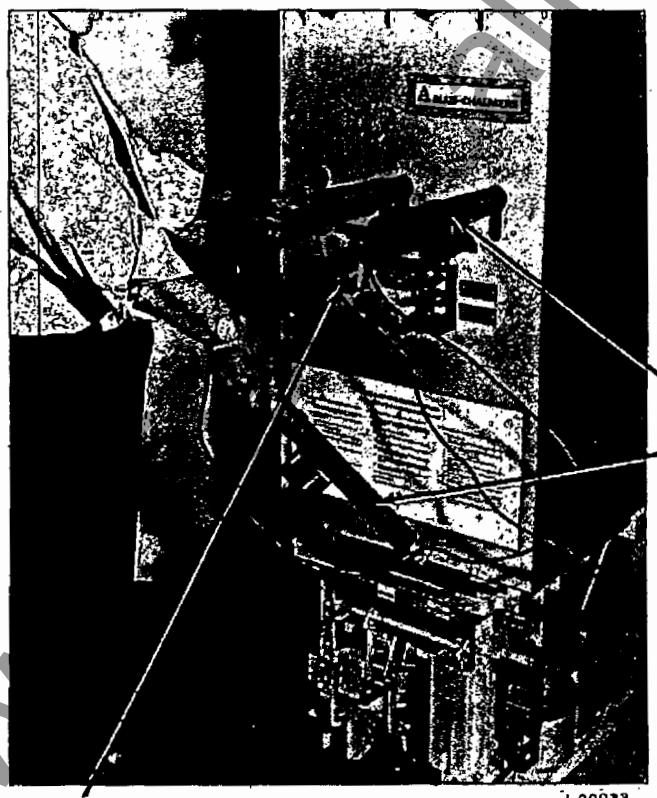
L00027

Step 22 – Insert mechanical pin on interlock #27, locking pin in latch lever #27, and remove key #27.

INTERLOCK
29

L00030

Step 23 – Insert key #27 into interlock #29.



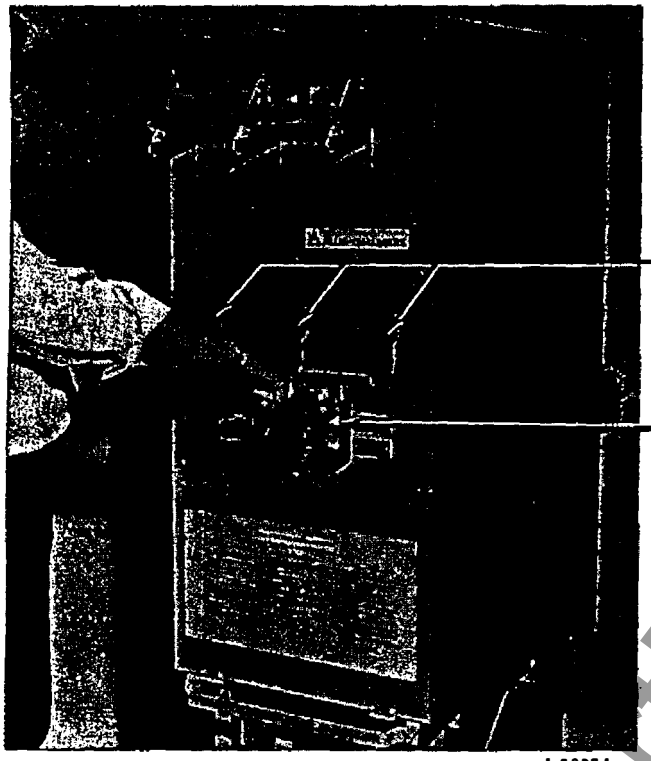
TEST
PROBES

L00033

INTERLOCK
29

Step 24 – Turn key in interlock #29, unlocking test probes.

Step 25 – Remove test probes.



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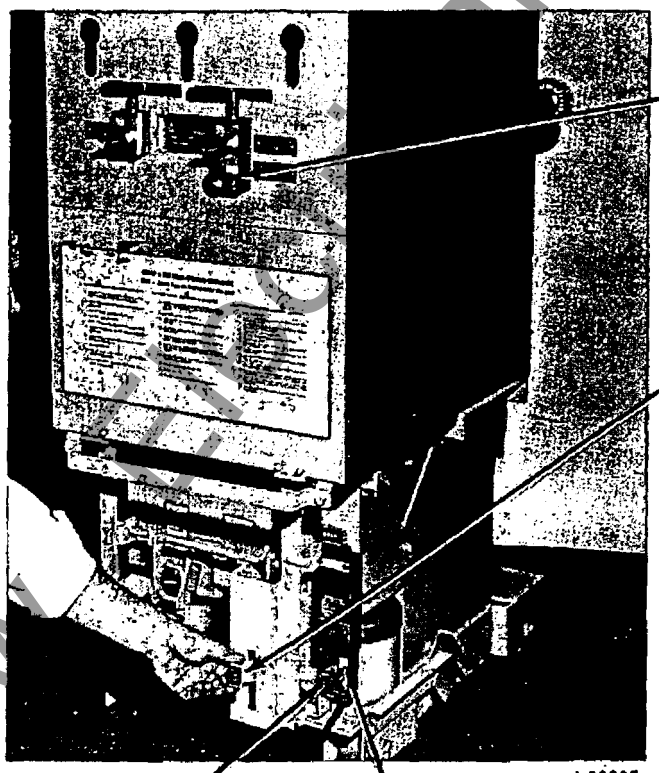
Step 26 – After probes have been removed, close ports and turn key in interlock #26.



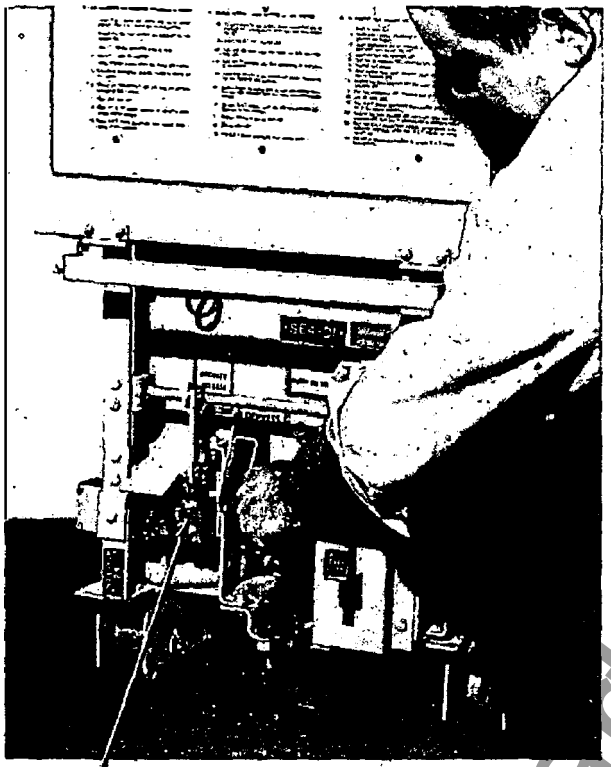
L00035

Step 27 – Remove key from interlock #28 and insert same key into interlock #27.

Step 28 – Turn key in interlock #27, releasing lock-in pin on G & T device.

Step 29 – Lift up latch lever #27.

Proceed with step 30.



L00092

INTERLOCK
#24

Step 31 – Remove key from interlock #26 and insert same key into interlock #24. Turn key in interlock #24 to withdraw bolt.

Proceed with steps 32 and 33.

PART 2

TYPE "D" RACK-IN MECHANISM. Special for Consolidated Edison. The following instructions illustrate and explain the proper use of Type "D" Rack-In Mechanism.

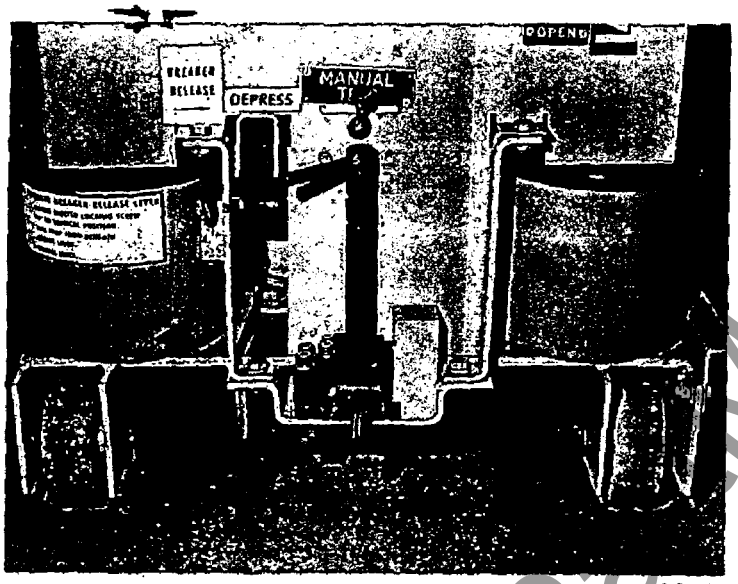


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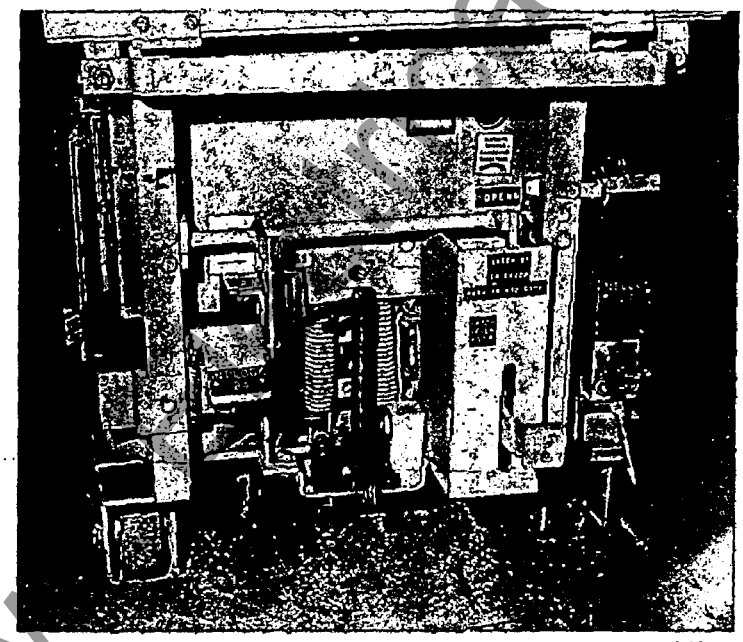
Figure 1 – Typical Air Circuit Breaker.

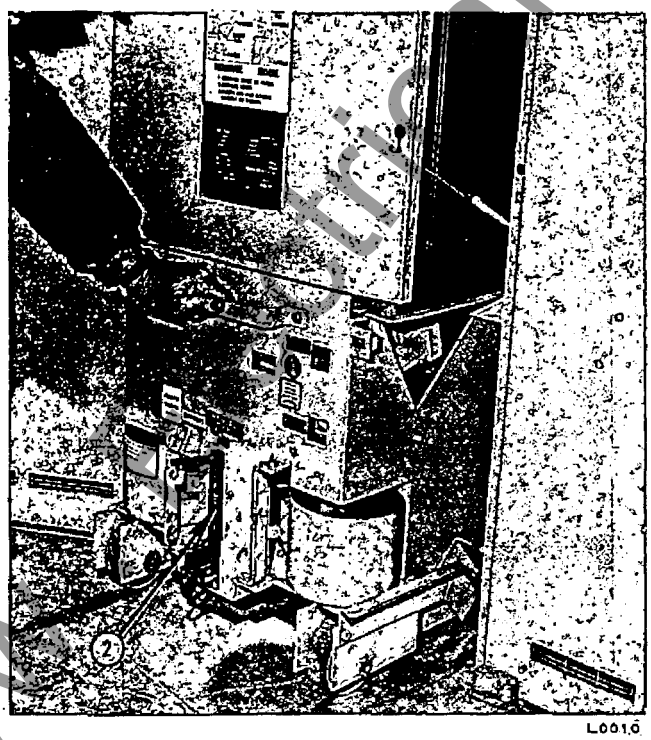


L0007

Figure 2 – Typical Ground and Test Device.

L0009

Figure 3 – CARRIAGE MECHANISM. Shown with hole (1) in movable block into which rack-in mechanism (figure 4, item 2) on ACB engages.

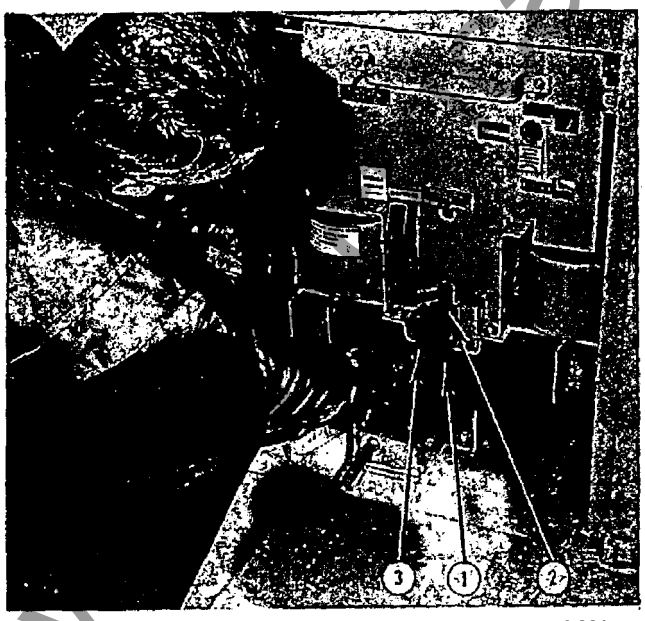


L0010

Figure 4 – RACK-IN MECHANISM ROD (2). Shown in full elevated position. Air Circuit Breaker ready for insertion into cubicle.

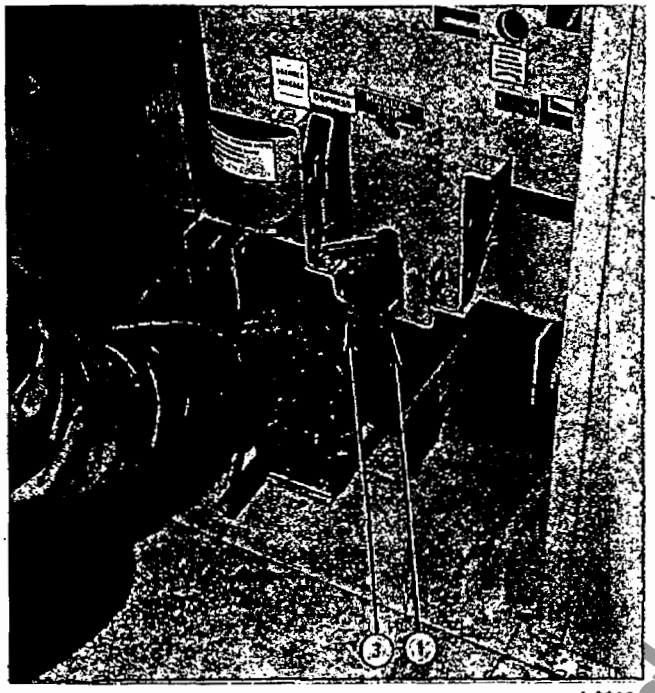
L0011

Figure 5 – READYING ACB FOR RACK-IN Rack-in mechanism rod (2) directly over hole (1) in movable block.



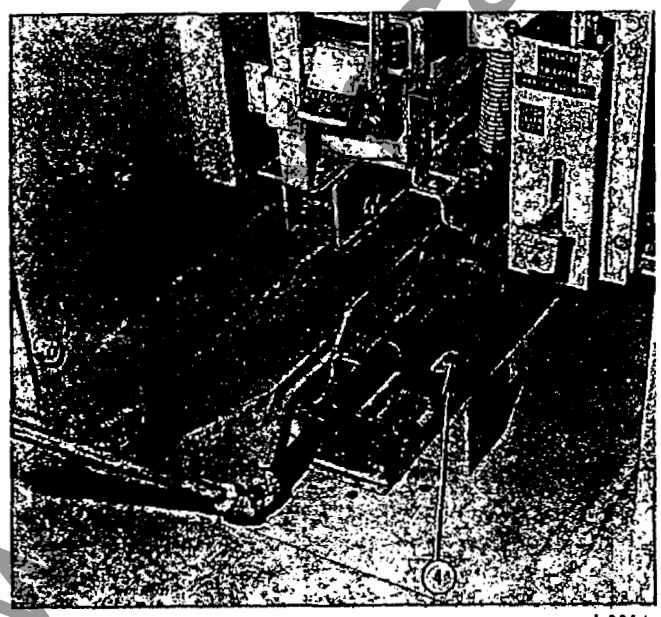
L0012

Figure 6 – ACB READY FOR RACK-IN. Ring (3) which vertically positions rack-in mechanism rod (2) is pulled forward allowing rod (2) to engage in hole (1) on movable carriage block thereby locking ACB to carriage mechanism.



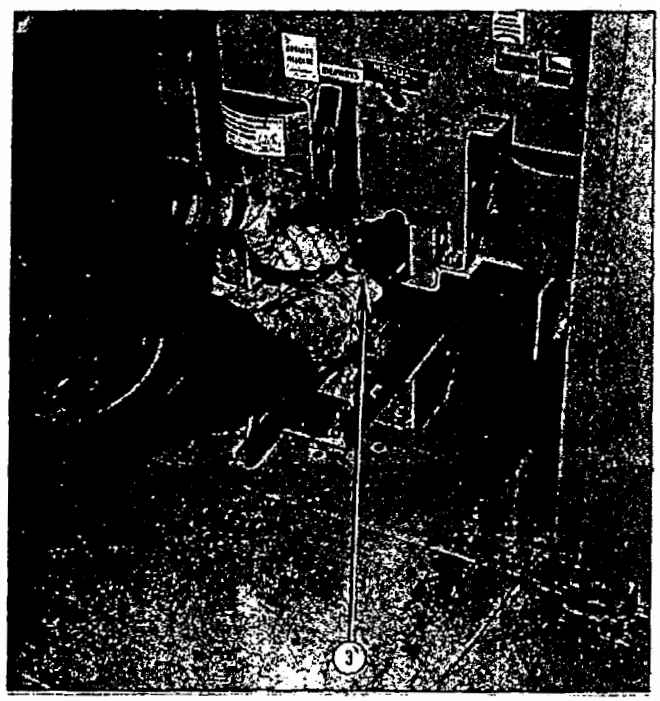
L0013

Figure 7 – ACB RACKED INTO TEST POSITION. Ring (3) is pulled forward allowing rack-in mechanism rod to drop further into hole (1) on movable block and to drop into hole (4) (See figure 8) in cubicle floor locking ACB in test position.



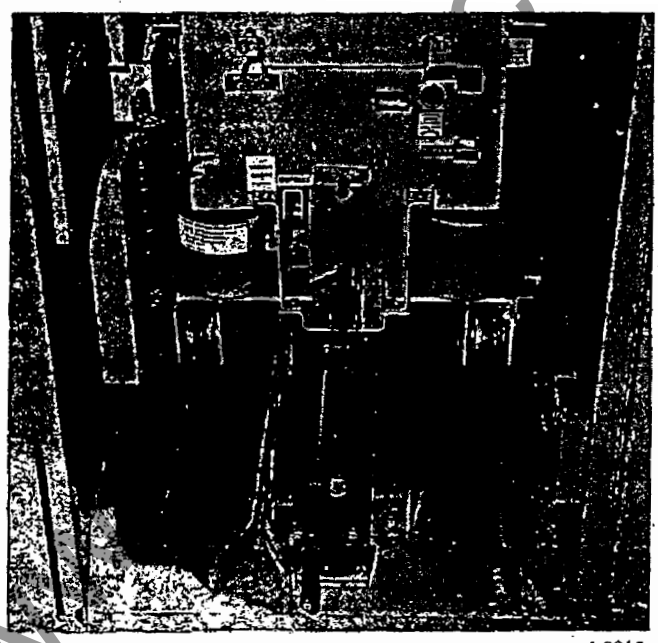
L0014

Figure 8 – TEST POSITION LOCK-IN HOLE Hole (4) which allows ACB to be locked into test position (as shown in figure 7).



L0015

Figure 9 – READYING ACB FOR RELEASE FROM TEST POSITION. Ring (3) is pulled forward allowing rack-in mechanism rod (2) to be raised one notch to rack-in position. (As shown in figure 6).



L0016

Figure 10 – ACB IN FULL CONNECT POSITION. ACB may be racked out and locked in test position per figure 7. ACB may be removed from cubicle by reverse procedure as in figure 6 and rod as shown on figure 4.

PART 3

STORED ENERGY OPERATOR SEQUENCE – SE-4 Operator Description (See figure 1). The stored energy operator consists of three systems: (a) the driving system, (b) the spring linkage, and (c) the 4-bar closing linkage. The systems are disengaged from each other except while performing their specific function; thus, the driving system and spring linkage are completely free of each other except when the spring linkage is reset and ready to be charged. Similarly the spring linkage and closing linkage are free of each other except during a closing operation.

DRIVING SYSTEM. The driving system consists of a gearmotor driving a pinion (2) which, in turn, drives two spur gears (3). A free-swinging crank (4) is mounted on each spur gear shaft; it is driven by a pin (5) fastened to the spur gear; and it drives the spring linkage.

SPRING LINKAGE. This system consists of four closing springs (6), two links (7), two links (9), one link (10), two links (11) and crank (12).

When the linkage is reset, the springs can be charged by cranks (4) driving the rolls (24) fastened to link (10) until links (9) and (10) go over toggle. At the start of this operation, links (9) will be in tension, allowing a gap between latch (13) and its roll (19). However, part way through the charging operation, as the springs are being charged, the action of roll (19) coming against latch (13) will be heard. The action of links (9) and (10) going over toggle will be heard at the end of the charging operation.

Releasing closing latch (13) will free the closing springs to drive the breaker closing linkage (see below). During this operation, the spring charging linkage remains over toggle until near the end of its stroke

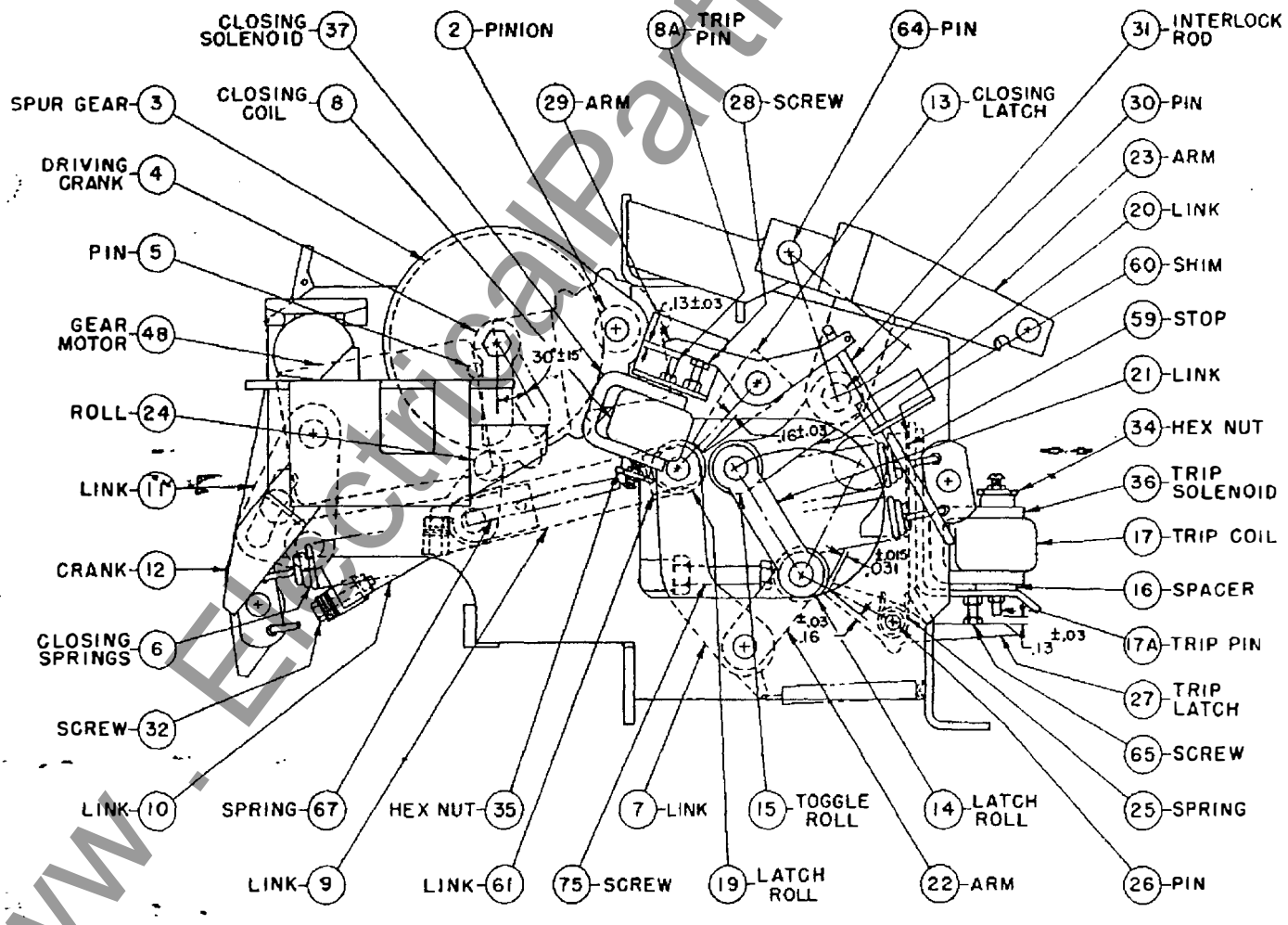


Figure 1 – Typical Stored-Energy Operator - SE-4

when the toggle is broken by crank (12) striking the kick-off screw (32). The spring linkage immediately resets allowing the breaker closing linkage room to reset when tripped.

4-BAR BREAKING CLOSING LINKAGE. This system consists of two links (20), two links (21) and arm (22). It is always free to operate in any of its functions as it is not secured to the spring charging linkage.

In the closing operation the spring charging linkage drives toggle roll (15) over toggle against stop (59), thus closing the breaker through arm (23). Depressing latch (27) during a closing operation prevents the breaker from closing, thereby making it trip free.

CHARGING SPRINGS. The closing springs (6) will charge as soon as the breaker control bus is energized. Should the springs not charge, check the motor cutoff adjustment.

The springs can be manually charged by inserting the charging handle down guide tube to engage the gearmotor. Rotate the handle in the direction shown until the spring linkage is heard to go over toggle.

CAUTION

REMOVE CHARGING HANDLE FROM BREAKER BEFORE ENERGIZING BREAKER CONTROL CIRCUIT.

CLOSING BREAKER. When the springs are fully charged, the breaker can be closed manually by pulling lanyard or electrically by energizing the closing circuit. This rotates latch (13) allowing the springs (6) to close the breaker.

OPENING BREAKER. The breaker can be tripped manually by depressing trip rod or electrically by energizing the trip circuit. This rotates latch (27) allowing the closing linkage to collapse and reset.

The tripping action described above can take place at any time during a closing operation, either manual or electrical, and regardless of whether or not the armature is energized. Thus the mechanism is electrically trip-free in any position.

MANUALLY SLOW CLOSING BREAKER. In order to check and make contact adjustments, the breaker can be closed slowly and mechanically held in any position of the closing stroke. The following procedure should be followed:

a) Remove breaker from cubicle and tilt arc chutes back.

b) Be certain that control circuit is open and closing springs are discharged.

c) Insert mechanism locking pin into hole. It will be necessary to rotate lever to allow pin to pass through hole. The pin should pass behind crank and through hole in opposite side of operator frame.

d) Insert spring charging handle into guide tube and engage with gearmotor. Turn handle in direction opposite to direction indicated on shield until resistance is felt. Pull manual closing lanyard and continue turning handle. The breaker contacts will slowly close.

CAUTION

AS THE CONTACTS APPROACH THE BREAKER CLOSED POSITION, OBSERVE THE POSITION OF CRANKS (4) ON ROLLS (24). CARE SHOULD BE TAKEN THAT THE CRANKS DO NOT PASS BY THE ROLLS, ALLOWING THE CONTACTS TO SNAP OPEN.

Since the motor gears are self locking, the contacts can be cranked to any position and held for adjustment checks.

e) To prepare for normal operation:

Trip breaker open.

Remove spring charging handle.

Remove mechanism locking pin.

SEQUENCE OF OPERATION. The following figures illustrate the sequence of operation of the stored energy operator.

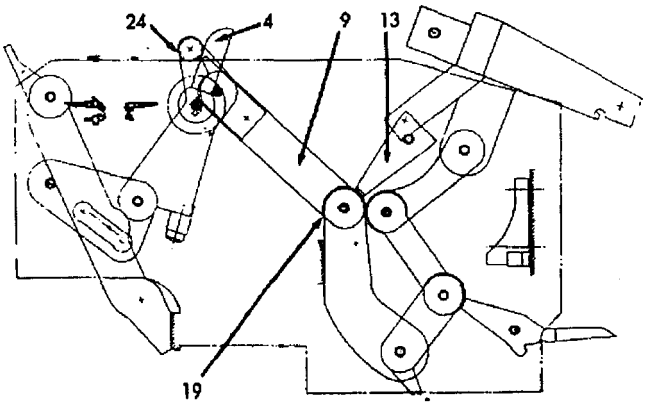


Figure 2 – Shows breaker open - springs discharged. Motor starting springs charge with the driving cranks (4) picking up the rolls (24) throwing links (9) into tension and pulling latch roll (19) back of closing latch (13).

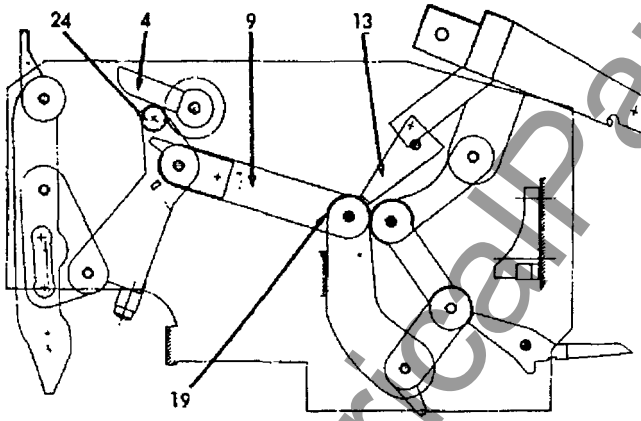


Figure 3 – Driving cranks (4), turning counterclockwise, have gone overcenter throwing links (9) into compression with latch roll (19) against closing latch (13). If latch (13) does not pick up the load, link (9) will move forward allowing roll (24) to go around driving crank (4) to position as shown in figure 2.

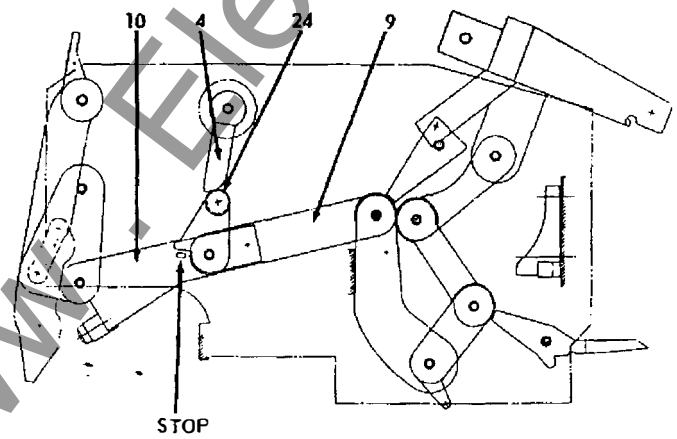


Figure 4 – Driving cranks (4) have forced rolls (24) to the point that links (9) and (10) are slightly overtoggle, springs are fully charged and will snap links (9) and (10) overtoggle against the stop.

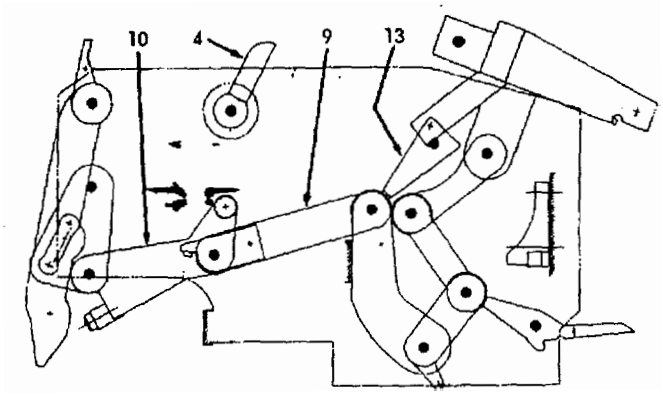


Figure 5 – Driving cranks (4) have rotated free, links (9) and (10) are overtoggle, springs fully extended ready for close when closing latch (13) is released.

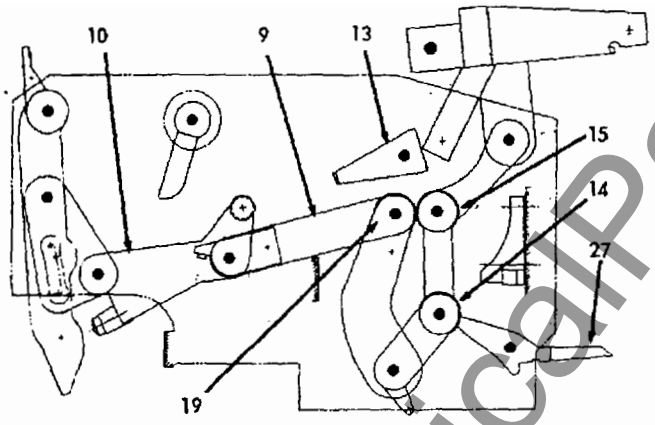


Figure 6 – Closing latch (13) has been released freeing latch roll (19) and allowing springs to drive links (9) and (10) forward as a unit. Latch roll (19) forces toggle roll (15) forward with latch roll (14) held by trip latch (27) the breaker will close.

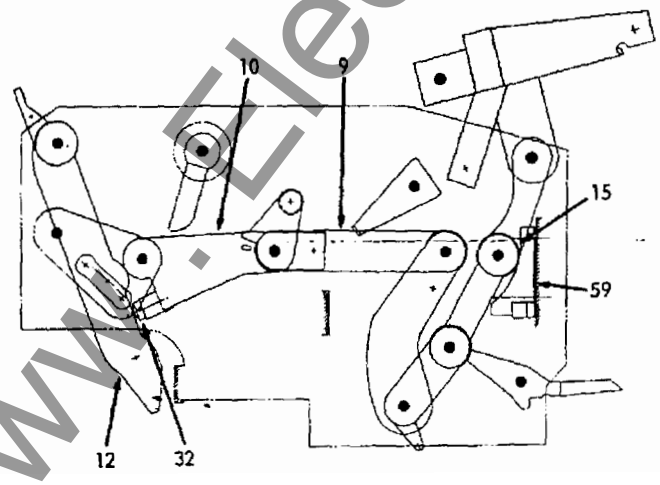


Figure 7 – The toggle roll (15) is overtoggle against stop (59). Screw (32) has come in contact with crank (12) forcing link (10) to rotate breaking the toggle between links (10) and (9).

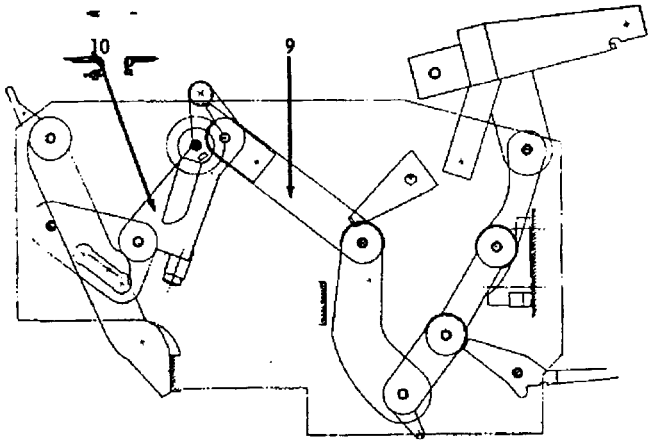


Figure 8 – With the toggle broken between links (9) and (10) they snap back as shown.

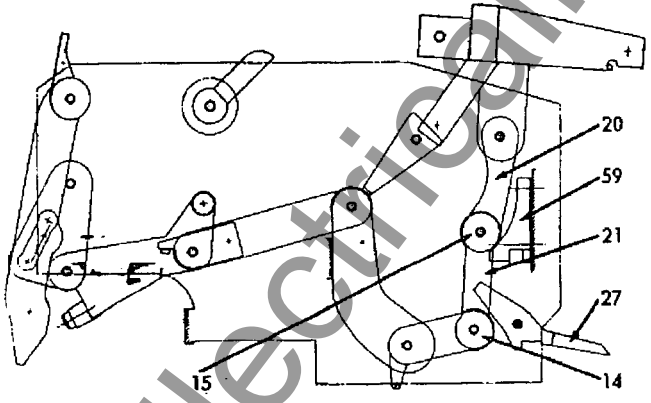


Figure 9 – Springs are recharged ready for next close operation. Breaker has just been tripped. Trip latch (27) has released latch roll (14) allowing it to rotate. Links (20) and (21) drop almost vertically until stop (59) forces toggle roll (15) back to break the link 20-21 toggle and allowing the 4-bar linkage to return to normal position as shown in figure 5.

OPERATING INSTRUCTIONS

(A) TESTING FOR BACKFEED; GROUNDING OF FEEDER

Step 1 Insert G & T device into cubicle. Put rod in connect position. Rack G & T device into connect position.

Step 2 Remove Key #24 from interlock #24 and insert key into interlock #25.

Step 3 Push P.T. handle, connecting P.T.'s to feeder.

Step 4 Check P.T. lights for backfeed.

> **NOTE**
> If feeder is alive inform D.O. Follow D.O.'s orders.

Step 5 If feeder is deenergized, open P.T. switch by pulling out P.T. handle.

Step 6 Remove key from interlock #25 and hang key on hook provided.

Step 7 Press latch lever #27.

Step 8 Close AC & DC supply switches on operating panel; springs become charged.

Step 9 Close G & T device electrically from control panel. Feeder is now grounded.

(B) FEEDER TESTING – HIGH VOLTAGE OR LOW VOLTAGE

Step 10 To open ports for test probes, insert mechanical pin on interlock #27, locking pin in latch #27, and then remove key #27.

Step 11 Insert key #27 into interlock #28.

Step 12 Take key #24 from hook and insert key #24 into interlock #26.

Step 13 Turn key in interlock #26, thus permitting all test ports to be opened.

Step 14 Insert high tension or low tension test probes (depending on test required) into openings.

Step 15 Lock in probes by sliding lever to right and turning interlock key #29. Ascertain test leads are connected to test set.

Step 16 To open G & T device, insert key #29 into interlock #27. Turn key to free interlock.

Step 17 Release locking in pin on latch #27.

Step 18 Lift up latch #27.

Step 19 Trip G & T device electrically from control panel.

(C) REMOVAL OF TEST PROBES; DISCONNECTION OF G & T DEVICE

Step 20 Push in latch lever #27.

Step 21 Close G & T device electrically from control panel. (This grounds the feeder).

Step 22 Insert mechanical pin on interlock #27, locking pin in latch lever #27, and remove key #27.

Step 23 Insert key #27 into interlock #29.

Step 24 Turn key in interlock #29, unlocking test probes.

Step 25 Remove test probes.

Step 26 After probes have been removed, close ports and turn key in interlock #26.

Step 27 Remove key from interlock #28 and insert same key into interlock #27.

Step 28 Turn key in interlock #27, releasing lock on G & T device.

Step 29 Lift up latch lever #27.

Step 30 Trip G & T device electrically from control panel. Open AC & DC supply switches.

Step 31 Remove key from interlock #26 and insert same key into interlock #24. Turn key in interlock #24 to withdraw bolt.

Step 32 Rack out G & T device from cubicle. Spring should automatically discharge while the G & T device is being racked out.

Step 33 Put rod in disconnect position to remove G & T device from cubicle.