TYPE DKN-30 BREAKER

Detailed Mechanical Description

General Description

1. In connection with this description, refer to drawing Nos. 5-D-7438, 4-D-9117, 4-D-8482, and 4-D-8494, which show the assemblies and detail parts of the breaker. The piece numbers referred to in this description appear on the illustrations.

2. Each breaker has an operating mechanism located on the centerline of the breaker. On the three-pole breaker, one pole is located on the same centerline as the operating mechanism, with one pole on either side located symmetrically with respect to the centerline of the breaker. The breaker is closed and tripped through its operating mechanism. The center pole is connected directly to the operating mechanism. A common cross bar is rigidly connected to each pole which insures simultaneous operation of all three poles.

3. The two-pole breaker is assembled identical with the three-pole breaker except that the center pole of the breaker is omitted.

4. The single-pole breaker is assembled similar to the three-pole breaker except it consists of the center pole only, which is located on the centerline of the operating mechanism.

5. The operating mechanism consists of a series of links so arranged that the closed breaker load is transmitted through successive toggles, with a reduction in load at each step, to a final tripping toggle where a low, but consistent tripping load is maintained.

6. The operating mechanism is shown in detail on Drawing No. 5-D-7438. In order to close the breaker, the closing lever (2) is rotated as shown and moves the closing toggle (7) over center to its "closed" position, as indicated by the solid lines. Very high contact pressure is obtained with this type of mechanism with a relatively low closing effort.

7. To trip the breaker, it is necessary to move the tripping toggle (4) off its center position. This is accomplished in several ways, depending upon the type of operation. When the breaker is tripped with the rotary handle, as shown on drawing No. 4-D-8482 the operator rotates the handle in the reverse direction to that for closing and thereby raises the the trip lever (Item 8, Dwg. No. 5-D-7438) and pushes the trip toggle (Item 4, Drawing No. 5-D-7438) off its center position and trips the breaker. When the breaker is tripped by the series overload trip unit or the reverse current trip unit, the tripping force is transmitted to the trip bar (Item 18, Drawing No. 4-D-8482) which is rotated and pushed upward on trip rod (Item 6, Drawing No. 5-D-7438) which moves the trip toggle (4) off its center position and trips the breaker.

8. All necessary adjustments of the mechanism are shown on Drawing No. 5-D-7438.

9. The series overload trip attachments are used to trip the breaker whenever the current through the breaker exceeds a pre-determined value. The overload trip is shown in detail on Drawing No. 4-D-9117, which also gives the proper adjustments to insure correct operation of the unit. Each overload is calibrated at the factory and care should be taken in making adjustments not to disturb this calibration.

10. The unit is calibrated from 100 to 200% of the breaker rating in 25 per cent steps. Time delay on overload is adjustable from 0 to 100%.

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The zero per cent setting gives approximately .2 second time delay when the current is 100% of the calibration setting. The 100% time delay setting gives approximately 15 seconds time delay when the current is 125% of the calibration setting.

11. The shunt trip attachment is used to trip the breaker electrically from a manually operated control switch or from automatic relays. It consists of a small coil and magnetic solenoid which are mounted in the location shown on Drawing No. 4-D-8482, Item 29. When the trip coil is energized, the solenoid is raised and pushes the trip toggle (Item 4, Drawing No. 5-D-7438) off its center position.

12. The reverse current trip attachment is used to trip the breaker when the direction of current flow through the breaker is reversed.

13. The reverse current trip mechanism consists of a stationary magnet energized by a potential coil and a movable iron armature energized by a coil in series with the breaker contacts. When the series coil current is flowing in the normal direction, the armature rotates in one direction against the action of a relatively strong spring. When the series coil current is flowing in the reverse direction, the armature rotates in the reverse direction and trips the breaker.

14. The reverse current trip is calibrated from 10 to 25% of rated current in 5% steps. The calibration is obtained by increasing or decreasing the tension on a spring which opposes the rotation of the armature in the tripping direction.

15. To reset the armature after a tripping operation, it is necessary to open the potential coil circuit. This is usually accomplished by means of the breaker auxiliary switch.

16. The lock-in device is shown on Drawing No. 4-D-8482. In order to prevent tripping of the breaker by the series overloads, shunt trip or manual trip, the operator must pull outward on the lock-in rod (Item 16, Drawing No. 4-D-8482) and hold until need for preventing tripping has ceased. In order to lock the breaker in the "closed" position and prevent the breaker opening under any condition, the operator must rotate the closing handle (Item 28, Drawing No. 4-D-8482) to its maximum position and pull and turn the lock-in rod (Item 16, Drawing No. 4-D-8482) to its locked position.

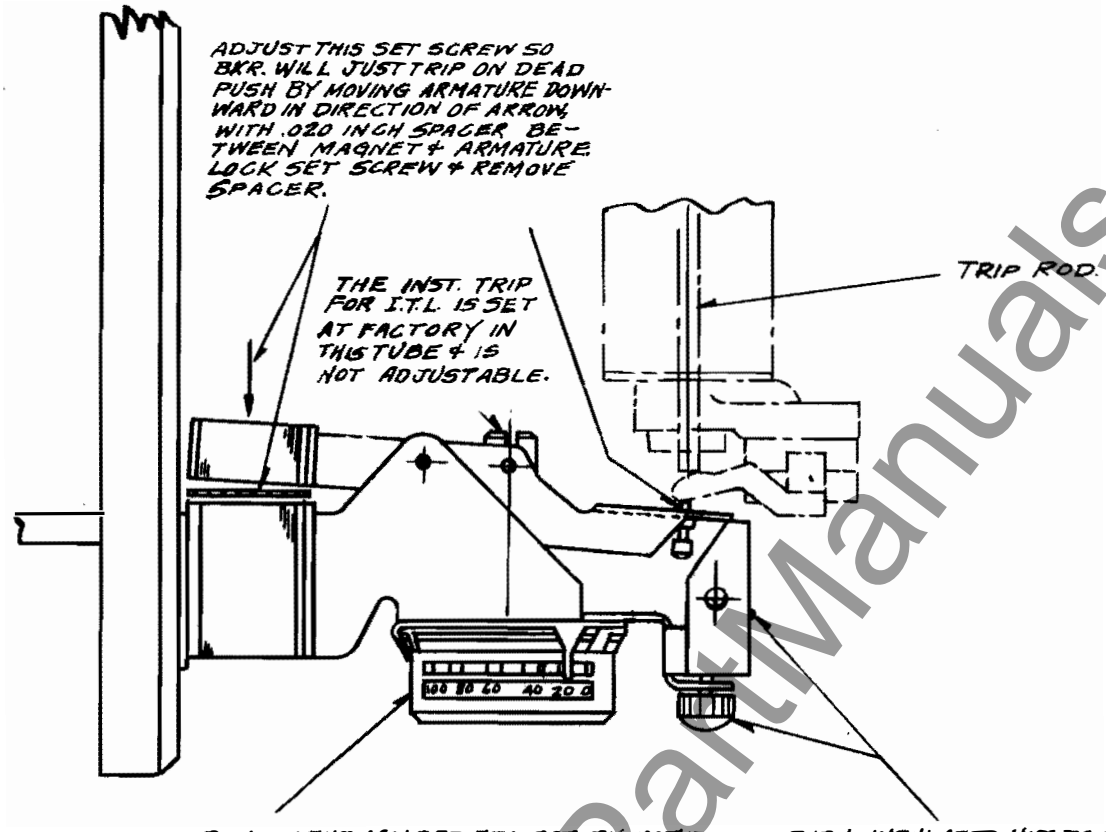
17. When the lock-in rod (Item 16, Drawing No. 4-D-8482) is pulled outward, it opens the shunt trip cut-off switch contacts (Item 25) which are in series with the shunt trip coil (Item 29).

18. The closing motor is shown on Drawing No. 4-D-8494. The motor is a 1/4 horsepower, intermittent rated series motor used for both A.C. and D.C. application. It is geared to the crank and rotor switch assembly (Item 41). When the motor is energized, it rotates and in turn rotates the crank and switch rotor in the direction indicated by the arrow. As the motor crank (Item 41) rotates, the closing roller (Item 40) engages the motor closing cam (Item 51). Additional rotation of the motor crank rotates the closing lever (Item 2, Drawing 5-D-7438) as indicated by arrow and closes the breaker as described previously. The motor crank continues to rotate to its cut-off position which is determined by the control circuit.

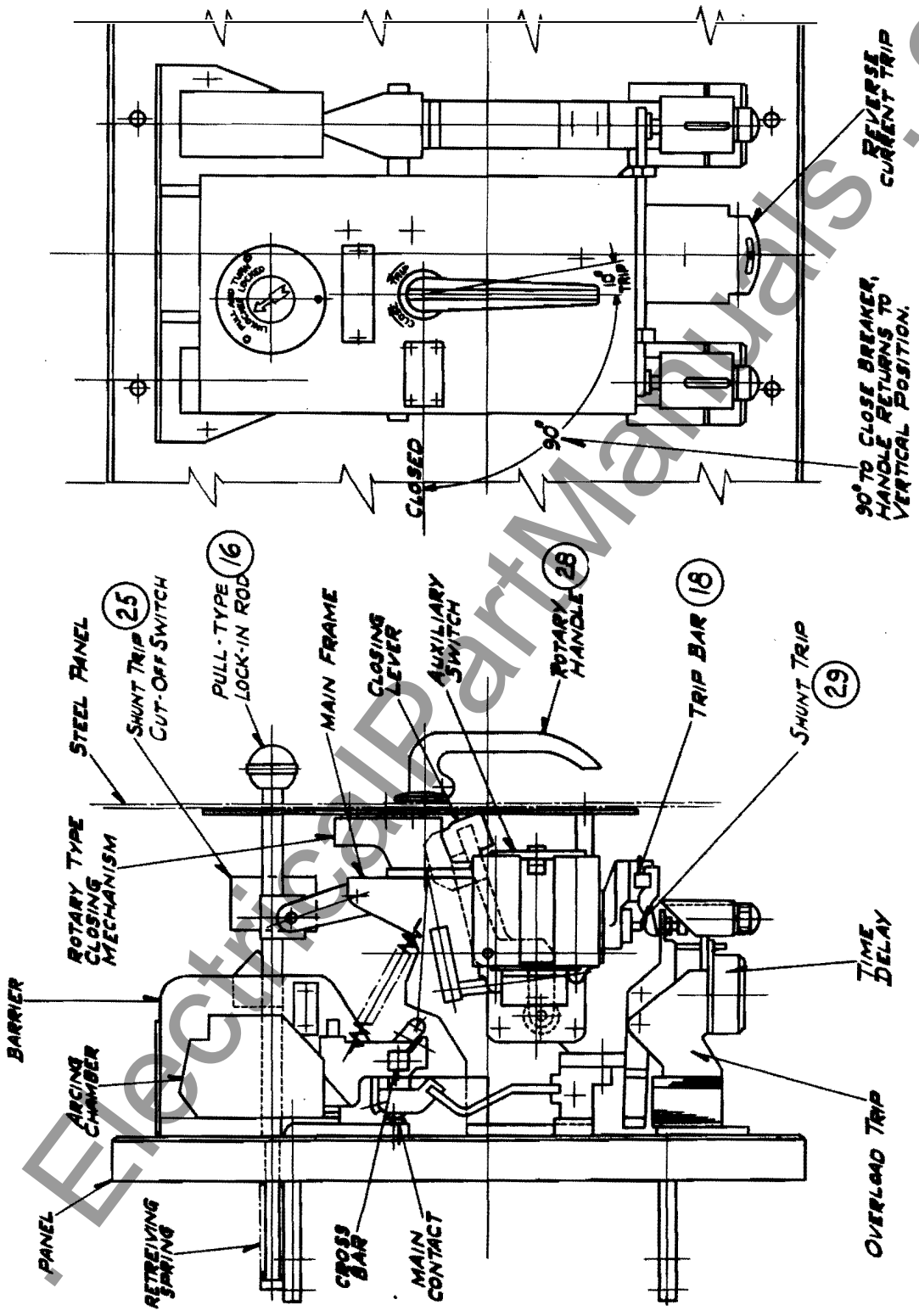
19. The motor relay and motor cut-off switch are shown on Drawing 4-D-8494. A typical control circuit for the operation of the motor, relay, and cut-off switch is shown on Drawing No. 4-D-9361.

When the control switch is closed, the relay coil (Item 47, Drawing No. 4-D-8494) is energized and the motor is energized through the relay contacts (Items 44 and 48). The motor crank (Item 41) starts to rotate and closes the motor cut-off switch (Item 49) which shunts the motor relay contacts (Items 44 and 48) and also the control switch contacts. In this position the motor is connected directly to the control source through the motor cut-off switch (Item 49). Additional rotation of the motor crank (Item 41) rotates the relay latch (Item 43) and releases the relay armature (Item 45). The magnetic attraction of the holding coil (Item 47) rotates the armature (Item 45) and opens the relay contacts (Items 44 and 48). The motor continues to rotate (closing the circuit breaker as described above) until the motor-cut-off switch (Item 49) opens. The relay holding coil remains energized as long as the control switch is in the closed position. Opening the control switch de-energizes the holding coil (Item 47) and allows the relay armature (Item 45) to reset and to close contacts (Items 44 and 48). From this position the complete operating sequence can be repeated.

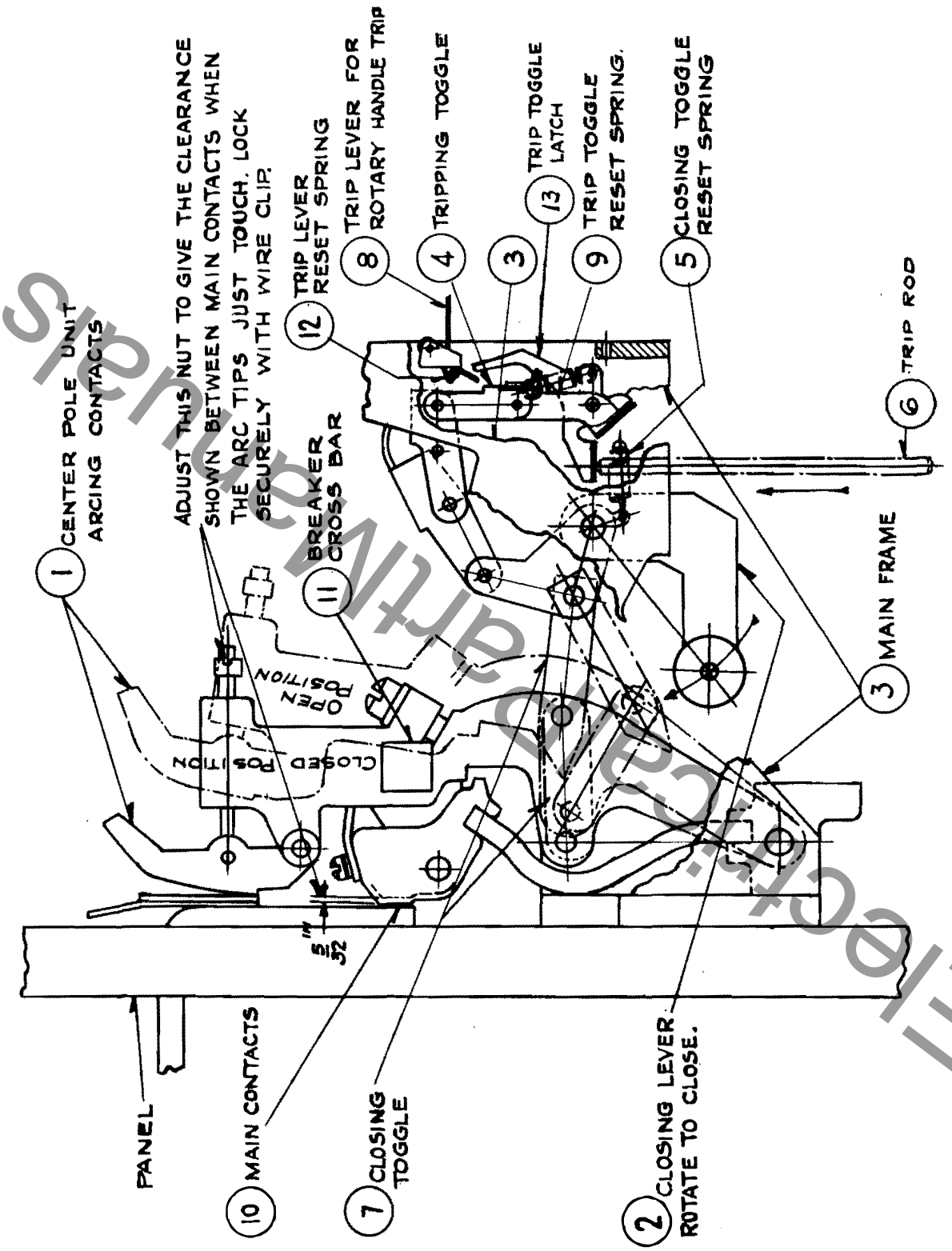
20. Maintenance. The circuit breaker is designed to withstand long wear with a minimum of maintenance. It is not advisable to lubricate any part of the breaker mechanism. The lubrication supplied during factory assembly should be sufficient for years of service. The best insurance for continuous service of the breaker is a periodical inspection of the complete breaker and attachments.



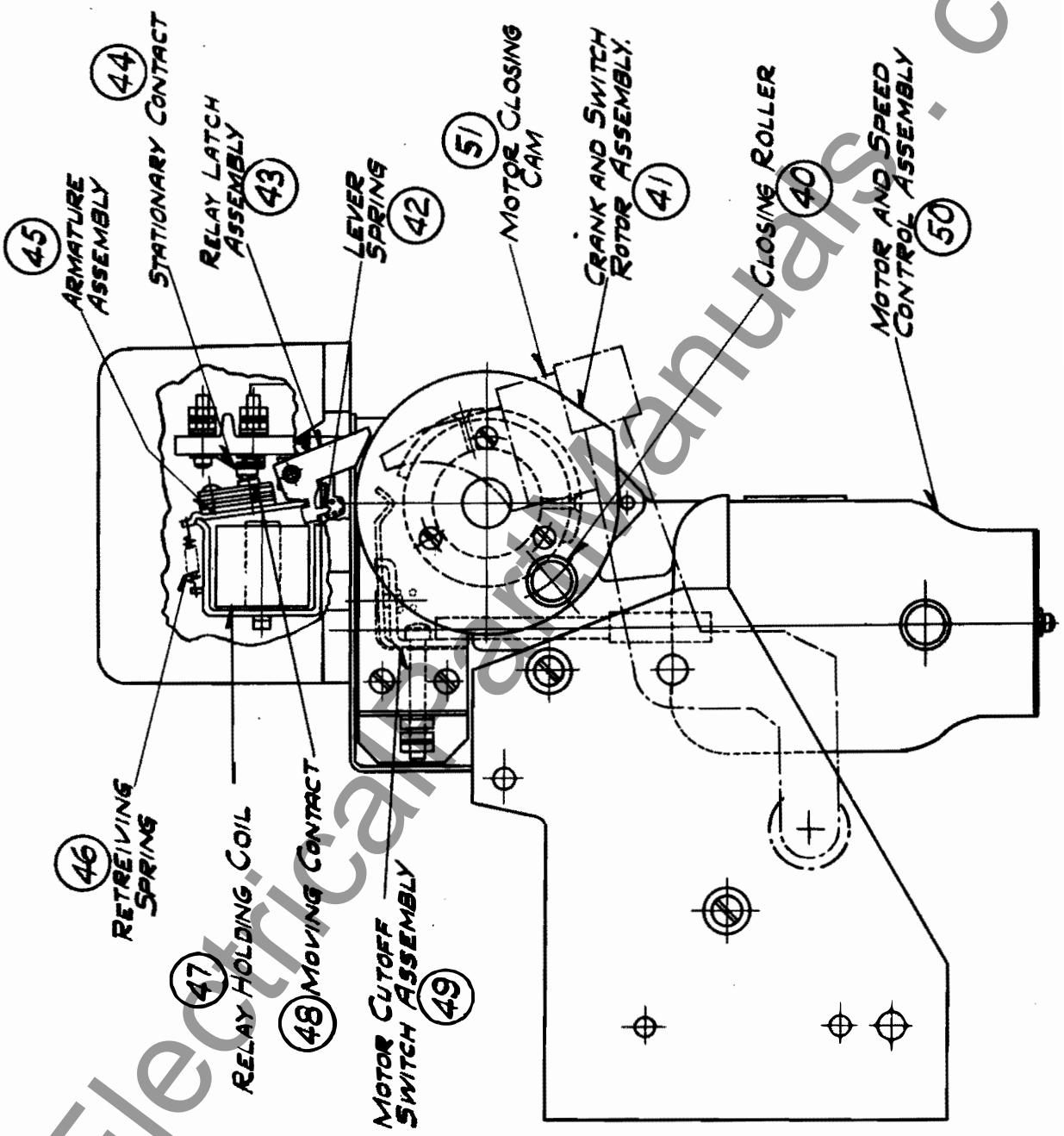
Type "DK" Air Circuit Breaker A.C.-D.C.
Adjustments with Oil Sucker Dual Overload
Drawing 4-D-9117



Type "DK" Air Breaker with Rotary Type Handle
Drawing 4-D-8482

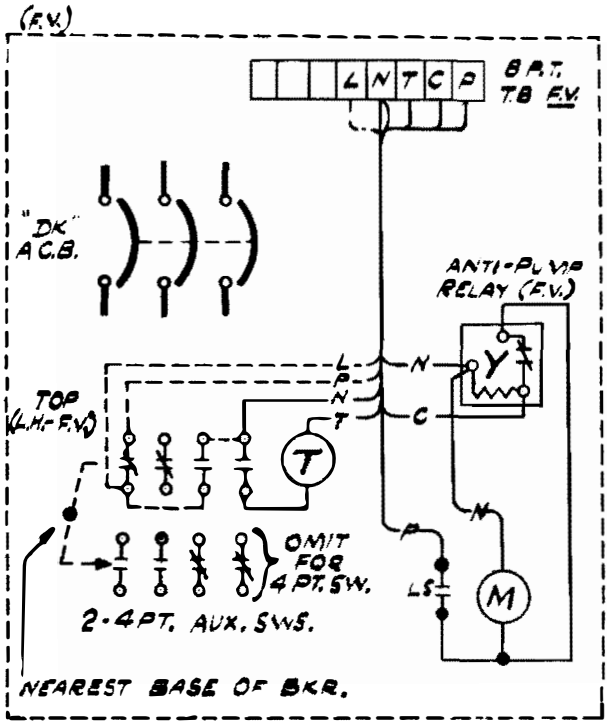


Type "DK" Air Circuit Breaker A.C.-D.C.
Closing and Tripping Mechanism
Drawing 5-D-7438



Type "DKN-30" Motor Mechanism and Anti-Pump Relay Assembly
Drawing 4-D-8494

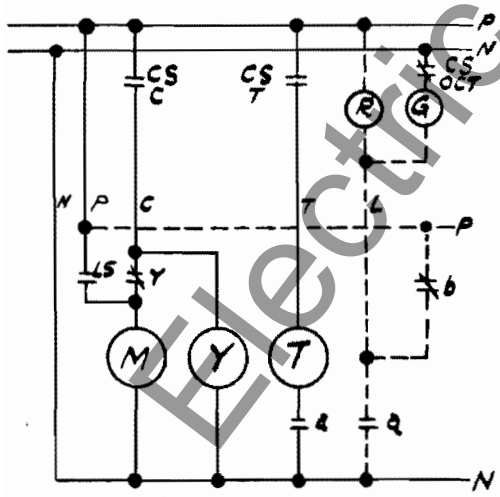
WIRING AND SCHEMATIC DIAGRAM



OPERATION

1 - Control SW CS-C Closes.
2 - Motor Picks Up Through Y Contact
3 - Limit Sw. LS Closes Before Bkr. Starts to Close
4 - Bkr. in Closing Mechanically Operates Y Relay which opens its contact and Seals itself in Through Cont. Sw.
5.- Breaker Closes.
6 - Motor Continues until LS opens cutting off motor
7 - Releasing Control Switch, Y will De-energize and will close its Contact.

Control Voltage:- 115 V., 230 V. A-C.
Control Voltage:- 125 V., 250 V. D-C.
Equipment to be ordered to suit



LEGEND

M = Motor
Y = Anti-Pump Relay
LS = Limit Switch
T = Trip Coil
a = Breaker Aux. Switch Closes when Bkr. is Closed.
b = Breaker Aux. Switch Opens when Bkr. is Closed.
Y = Y Relay Contact, Closed when Relay is De-energized and open when Relay is energized.
CS-C = Control Sw. "Close" Contact.
CS-T = Control Sw. "Trip" Contact.
CS-OCT = Control Switch "Lamp Cutout" Contact.

Note: Dotted Conns. Supplied Only When Ordered

Type "DK" Air Circuit Breaker
Electrically Operated, with Anti-pump Relay
Drawing 4-D-9361