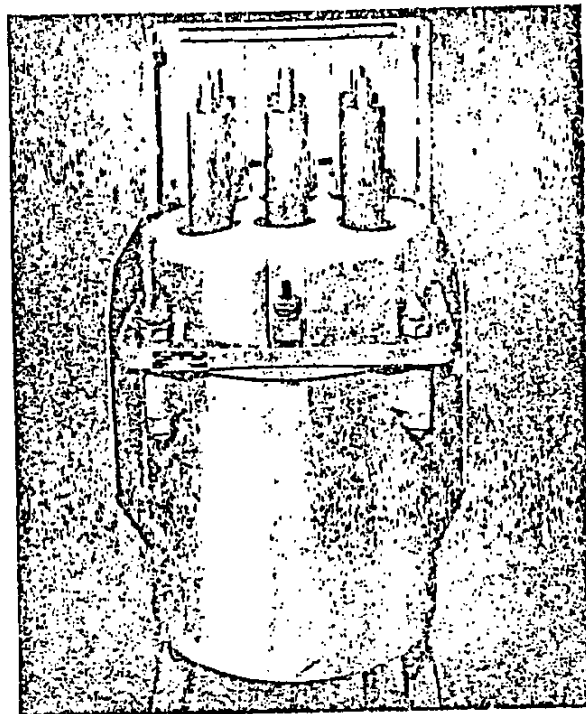


INSTRUCTION BOOKLET
FOR
TYPES C4X, C6X AND C8X
OIL CIRCUIT-BREAKERS



The equipment described in the publication is designed, manufactured and tested with care, and will give satisfactory service if attention is given to these instructions.

As efforts are constantly being made to improve designs and service, the gear supplied may differ in minor details from the data given in this publication.



Appareillage Électrique (1981) Inc.

Electric Switchgear (1981) Inc.



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SUPPLEMENTARY INSTRUCTION BOOKLETS

This publication should be read in conjunction with publications for the following associated equipment:

- (1) SC7, SC10, No. 5 or Solenoid operated mechanism
- (2) Circuit breaker housing and handling truck
- (3) Earthing device if required

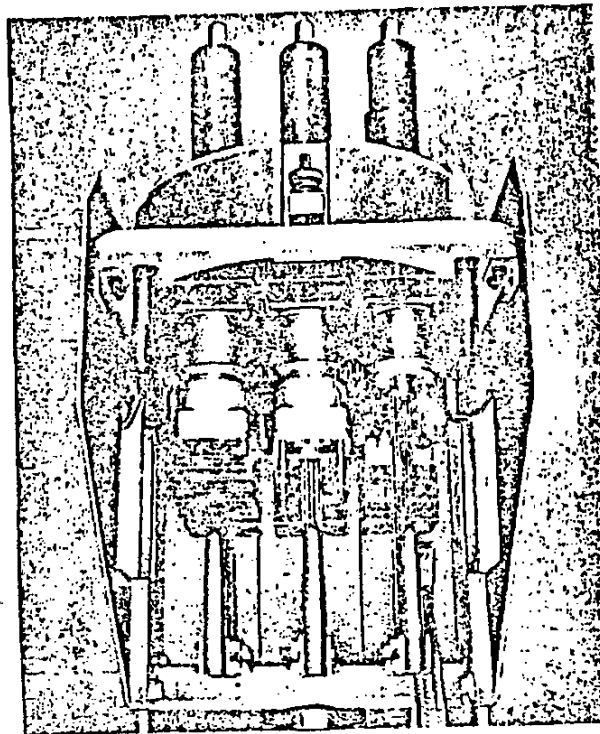


Fig. 1 The internal mechanism of the circuit-breaker top-plate

GENERAL DESCRIPTION

These oil circuit-breakers are of the cross-jet arc control device type, all three phases being contained within a round tank.

The insulators are made up glazed porcelain and are individually clamped to the underside of the top-plate.

At the lower end of the insulators there is fixed contact assembly contained within an arc control device which comprises of an explosion chamber and cross-jet chamber.

The moving contacts are attached to the phase contact bars which are lifted by means of laminated densified wood bars, attached to a horizontal steel cross head which is guided by suitable guide bars fitted to the top-plate. To these guide bars are attached dashpots which are filled with oil from the circuit-breaker tank with the tank in position and are so designed to cushion the moving assembly at the end of the opening stroke. Also fitted to the guide bar assembly are the throw-off springs.

The top-plate contains an internal mechanism which converts the vertical movement of the contact assembly to the horizontal motion of a push bolt operating through the wall of the top-plate, and the separate closing and tripping mechanism is arranged to give a horizontal drive to the push bolt.

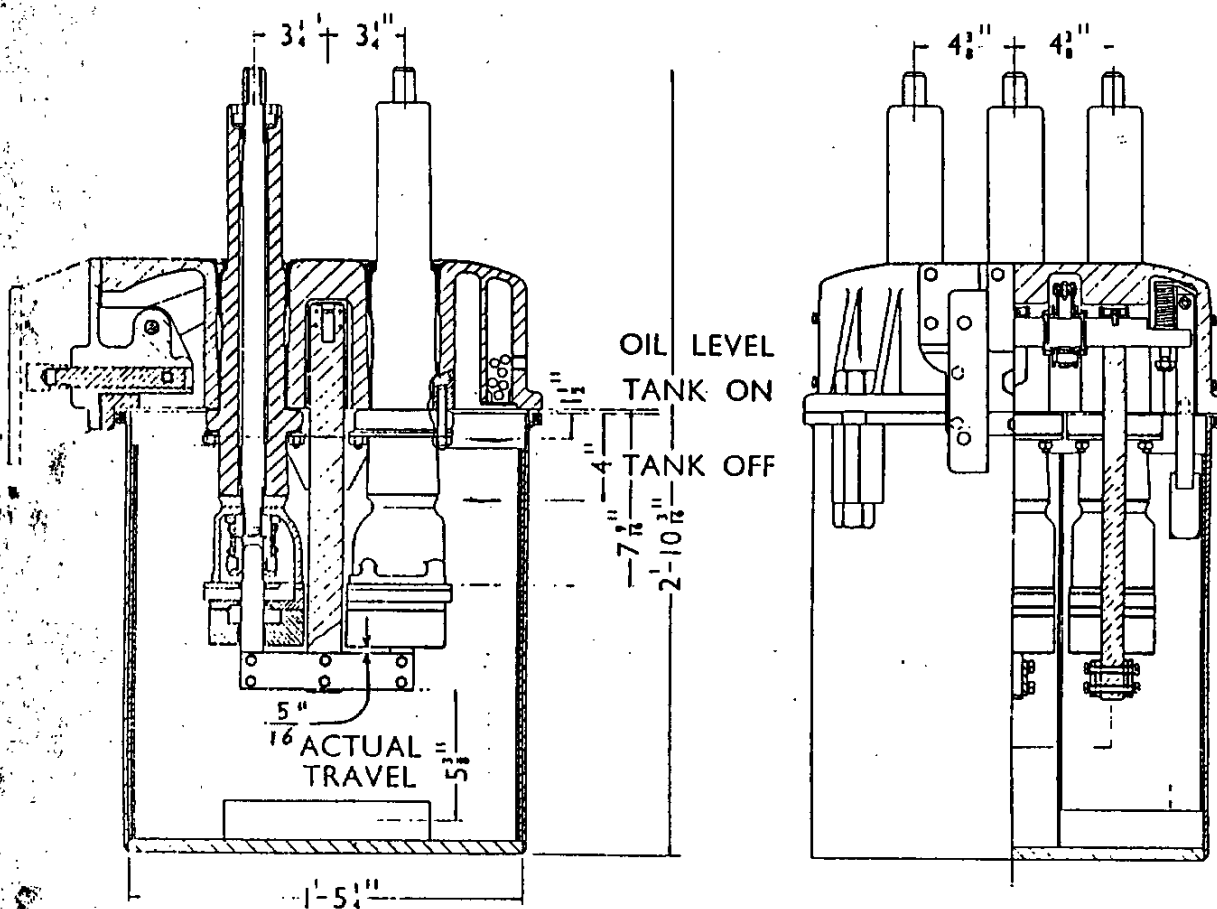


Fig. 2 General arrangement drawing

The top-plate is an aluminium die casting with an integral pebble fitted vent chamber which allows the gases produced during circuit to escape to atmosphere without emission of oil.

The circuit-breaker tank is of a fabricated welded construction embodying a tank gasket contained within the rim of the tank. The tank being secured to the top-plate by four bolts.

The circuit-breaker tank is fitted with a tank lining and phase barrier of treated pressboard assembled as one unit.

The circuit-breaker is normally delivered as a complete unit together with a closing and tripping mechanism and a handling truck to which reference is made in separate instructions covering mechanism and circuit breaker units.

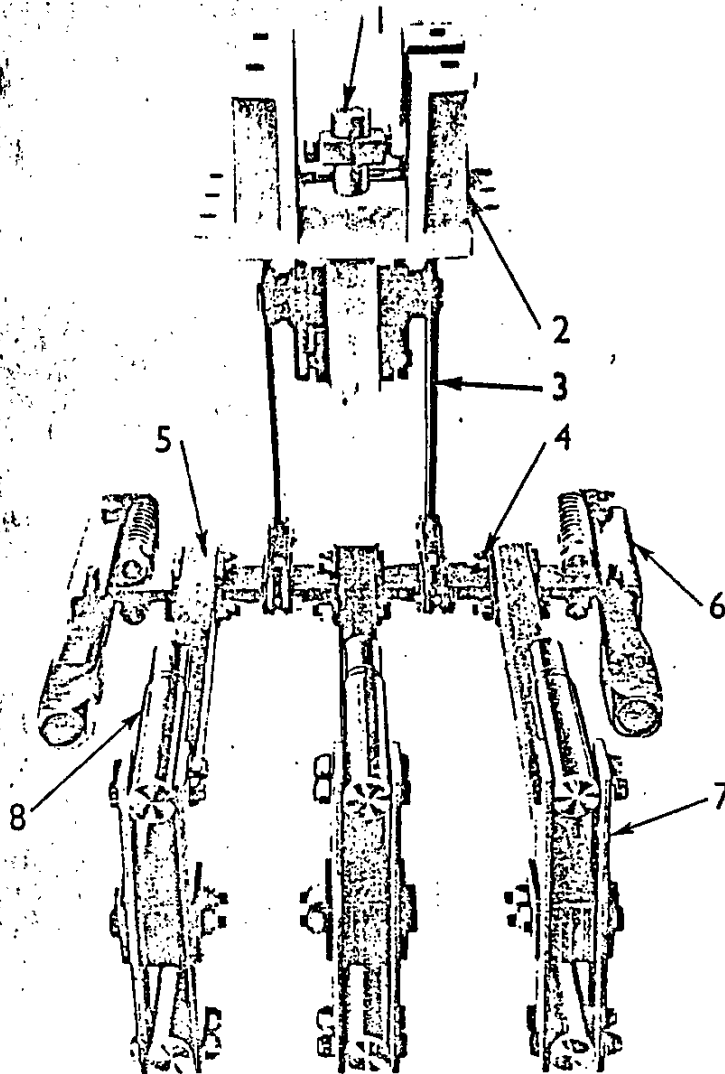


Fig. 3 Details of circuit-breaker
Internal components

1. Push nut and push bolt assemblies
2. Mechanism housing
3. Lifting arm
4. Cross bar
5. Lifting bar
6. Throw-off springs and dashpot assembly
7. Phase bar
8. Poker

PACKAGING AND SHIPMENT

Circuit-breakers are normally shipped from the works, without oil and the insulators are provided with a protective wrapping. If the circuit-breaker is not to be put into service immediately, it should be stored in a dry place, and the covers on the insulators should be left in position.

Oil Filling Procedure

Before putting the oil circuit-breaker into service, carry out a visual inspection of the complete breaker and take care to ensure that the tank is clean and dry before filling with oil. Fill tank with oil, approximate quantity 12 imperial gallons, to the level indicated on the tank lining, thus ensuring that the oil level when the tank is bolted in position is at the correct height.

The oil must be clean and in good condition in accordance with the recommendations

MAINTENANCE

The interval which can be allowed between consecutive overhauls of the circuit-breaker will depend upon the operating conditions of the circuits controlled.

It is recommended that a thorough overhaul should be carried out at least every 12 months, and this period should be reduced where conditions are arduous, e.g. frequent switching or switching of highly inductive circuits, etc.

Circuit-breakers, should be tripped and reclosed at least once every six months both manually and electrically.

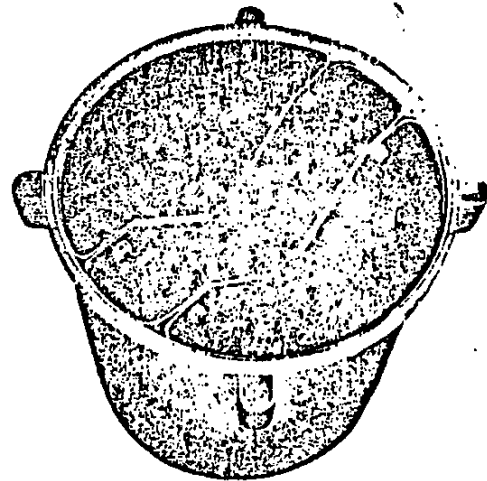


Fig. 4 Circuit-breaker tank showing tank lining and oil level

In general, maintenance should be carried out in accordance with the

Standard Code or Practice

Insulators

The insulators should be carefully examined to make sure that they are undamaged and free from carbon deposit, and they should be carefully cleaned by wiping off the deposits with a cloth, moistened with methylated spirits, followed by a dry one.

Removal and replacement of bushings

Important:—

Precautions must be taken to protect hands from hot compound.

Procedure:—

- (1) Remove the circuit-breaker tank and place a protective sheet or receptacle at base of truck to receive old compound and old bushing.

- (2) Remove the phase bar assembly under the broken bushing.
- (3) Remove cross jet pot, contact and explosion pot
- (4) Remove the porcelain clamping plate which is retained by 4 $\frac{1}{2}$ " U.S.F. nuts.
- (5) Protect the undamaged bushings by forming an asbestos shield to prevent heat being transferred to these bushings while removing compound from around damaged bushing.
- (6) Heat the compound around the outside of the bushing slowly with a blow-lamp by directing flame to top-plate casting adjacent to bushing, ensuring heat is not transferred to the other bushings.
- (7) The compound will eventually become soft, at this point the top end of the bushing conductor should be continually tapped with a hide or wooden mallet. The slow heating of the compound and the tapping of the bushing conductor should be continued until the bushing can finally be lowered out of the top-plate.
- (8) Remove any remaining compound from the area of the top-plate from which the bushing has been removed.
- (9) Assemble new bushing into the circuit-breaker top-plate ensuring that new gaskets are used between the top-plate and bushing, and the bushing and clamp plate and that the bushing is lined up, using the existing bushing as a datum.
- (10) Re-assemble the explosion pot, contact and cross jet pot on to the bushing assembly.
- (11) Ensure that phase bar and plug contacts are assembled to correct alignment as described under the paragraph "Moving Contact Assembly".
- (12) New compound should be poured into the annular space between the bushing and top-plate.

Bushing Conductor

The conductor at the top end of the insulator forms the plug portion of the isolating contacts. In the case of the C6X and C8X circuit breakers, the conductor end is screwed to receive an adaptor plug of appropriate diameter. The plugs are silver plated for the C8X circuit breaker but are normally plain copper in the case of the C4X and C6X circuit breaker. Contact surfaces should be kept in a clear condition but, in the case of the silver plating no abrasive other than good quality plate polish should be used, normally it would suffice to clean the surface with a rag moistened with benzine or other suitable solvent.

Fixed Main Contact and Arc Control Device Assembly

The fixed contacts each consist of a number of separate spring backed self aligning segments arranged in a circle, and are contained within the metal upper portion of the arc control device. The device is in two halves, an aluminium alloy pressure chamber, and a cross-jet chamber. To examine the contacts, the cross-jet chamber retaining nuts must be removed by means of a box spanner and chamber dropped down over the moving contact.

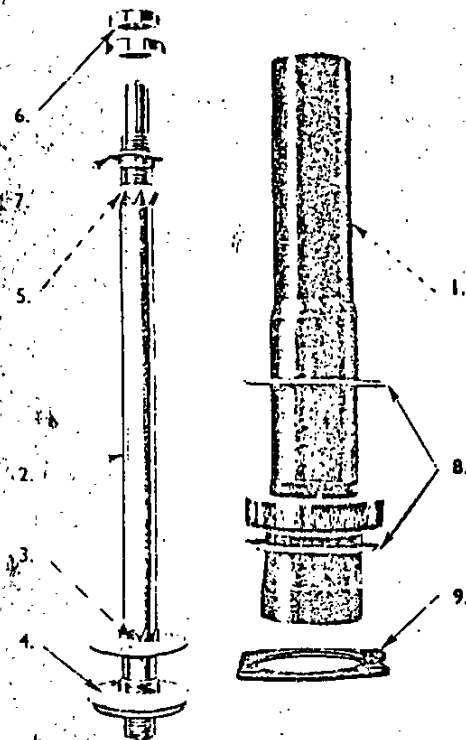


Fig. 5 Bushing Conductor

1. Porcelain insulator
2. Bushing conductor
3. Bottom bushing gasket
4. Collar
5. Top bushing gasket
6. Collar
7. Locknuts
8. Gaskets
9. Clamping Plate

Should it be necessary to remove the contact assembly, first remove the moving contact from the phase bars, then remove the locking disc inside the contact adaptor and unscrew the fixed contact assembly. The pressure chamber may then be removed. If the contacts are badly burned, it is advisable to renew with a complete sub-assembly rather than attempt to replace individual fingers. Examine the arc control chambers and if any carbon deposit is apparent, clean by washing in warm switch oil. Small gas vent holes are drilled in the top of the pressure chamber and these must be kept clear.

NOTE: -The arc control device is so designed that it is not possible to re-assemble it incorrectly.

Moving Contact Assembly

The plug type contacts are readily removable being bolted into the phase contact bars and locked by means of "Nyloc" nuts.

The laminated wood bars should be inspected for any sign of damage, and if a closer examination is found necessary, the complete assembly must be removed from the top-plate. This can be done in the following manner.

- (a) Remove plug contacts.
- (b) Remove cross jet chamber, aluminium alloy pressure chamber and fixed contact assemblies.
- (c) Remove the two pins which connect the swining links to the main lifting arms.

When re-assembling plug contacts, care should be taken to ensure that they are correctly aligned with the cross-jet chamber and fixed contacts.

It is recommended that the circuit-breaker be fully closed, by means of the maintenance closing device which is supplied with the appropriate closing mechanism before the nuts securing the plug contacts are finally tightened. Refer to mechanism publication for details and method of fitting this device.

Setting Dimensions

The circuit-breaker moving assembly setting, which controls contact travel wipe and engagement, is accurately set in the Works before the circuit-breaker is despatched. If, however, it becomes necessary for this to be re-adjusted for any reason on site (e.g. change of mechanism etc.) this can be carried out by a screw adjustment of the circuit-breaker push nut, which is located directly behind the closing mechanism roller, and attached to the push bolt of the circuit-breaker.

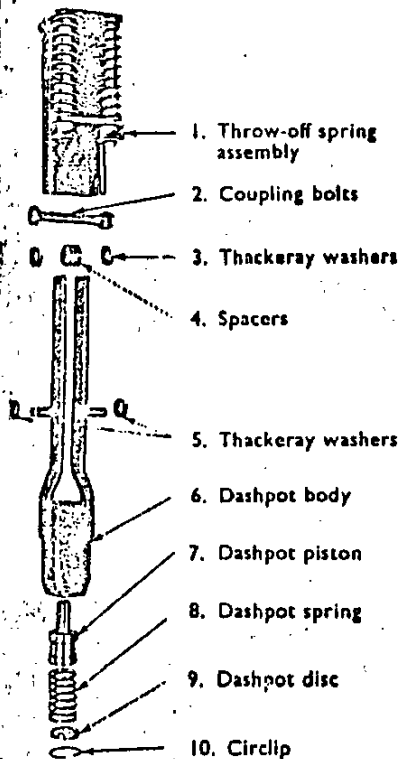


Fig. 6 Expanded view of dashpot and throw-off spring assembly

In order to do this, it will be first necessary to disconnect the auxiliary switch drive rod from its associated drive block by removal of the headed pin; then slacken the drive block clamping bolt. This permits re-adjustment of the push nut so that the circuit-breaker may be set to the correct dimensions shown in Fig. 2.

NOTE:—It may be necessary for the auxiliary switch drive to be slightly adjusted to allow for any re-adjustment of the circuit-breaker push rod.

Oil Dashpots

Check that the dashpots are operating freely by depressing the plunger against its return spring. To do this, it is necessary to lift the moving contact assembly to clear the dashpot plunger.

For cleaning purposes the plunger, return spring and bleeder disc can be removed from the dashpot body by first removing the bottom retaining circlip.

If further maintenance is found necessary, the complete dashpot and throw-off spring assembly should be removed by undoing the four screws which secure the assembly to the top-plate.

Internal Mechanism

During routine maintenance work the internal mechanism linkages should be checked for freedom of

movement during operation of the circuit-breaker by the maintenance closing device. Any wear on the drive couplings pins should be checked and worn pins replaced if necessary.

The push bolt should be sparingly lubricated with a good mineral oil to ensure freedom on its bearing.

Gas Vent

This is situated centrally at the rear of the top-plate and comprises a self-contained baffle chamber filled with fireclay pebbles. The pebbles are retained by means of a baffle plate in which there are vent holes; these should be checked periodically to ensure that they are not obstructed.

Exhausting of gas from the vent chamber is through a spring loaded gas tight joint connecting with a pipe in the fixed portion of the circuit-breaker unit.

Tank

Oil samples should be taken at regular intervals, and if possible, after each fault operation, preferably from the bottom of the tank and tested in accordance with the recommendations. If the oil is found to be contaminated in any way, it should be replaced and the correct oil level as indicated on the tank linings must always be maintained.

The tank linings and interphase barriers should be examined for carbon deposit or scorching and replaced if necessary. The insulated studs and nuts securing the tank linings and inter-phase barriers should be checked for tightness.

The tank gasket is contained within an annular channel at the top of the tank, and should be checked to ensure it is in good condition and seating correctly on the underside of the top-plate when the tank is bolted in position.

When replacing the tank ensure that the tank bolts are fully tightened

SPARES

The stock of spares will depend mainly on the number of units on the switchboard, and recommended spares are listed below:

- (1) Circuit-breaker fixed contact assembly.
- (2) Circuit-breaker plug type moving contact.
- (3) Cross-jet chamber.

When ordering spares or renewals, it is essential to give a complete description of parts required, or alternatively to return samples with order.