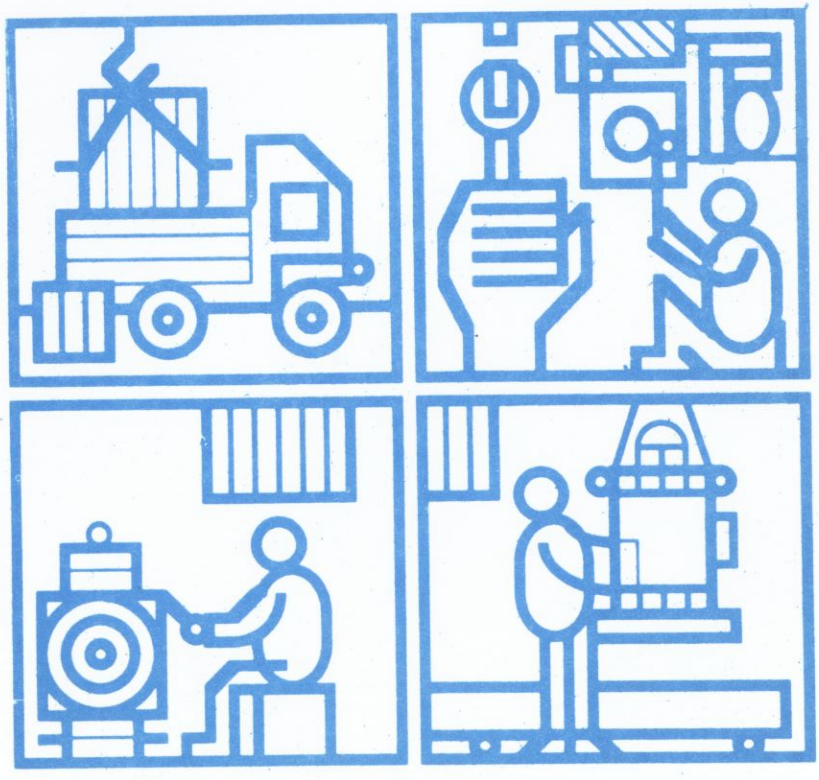
Jyoti Ltd.

'Jyoti'
36 kV Indoor Horizontal Isolation Horizontal Drawout Vacuum Circuit Breaker

(VCB Type 'VY' 30 M 25 & 'VY' 30 P 25)

Installation, Operation and Maintenance Manual



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IMPORTANT INSTRUCTIONS

1. Always keep the packed case with its right side up so as to protect the circuit breaker against damage during transportation and handling.

2. Never use the disconnecting contact arms to lift the VCB.

3. Do not lift or lower the VCB with jerk. This can damage the vacuum interrupter.

4. Do not disturb any setting of latches and linkages, or their positions in the operating mechanism.

5. While charging the VCB manually, "Stop" the handle movement as soon as a distinct "Click' sound is heard and indictor changes over to 'Charged' position.

6. Do not atempt manual closing with interlock lever in raised position.

7. Insertion of VCB into service position is complete only when a 'Click' sound is heard and the driving handle rotates freely.

8. Do not hold the interlock lever while pulling the VCB to test position.

9. Conduct high voltage test on the vacuum interrupters before commissioning.

10. Replacement of vacuum interrupter or any other component on the pole part side of the VCB should be done under the supervision of our expert only.

11. Keep the panel door closed, wether the breaker is in 'Test', 'Service' or 'Withdrawn' condition.

12. Do not discard/override any safety interlock.

13. Access cable compartment only after earthing the circuit side.

CONTENTS

2. GENERAL

2.1 TYPE & RATING

This instruction manuals is applicable to the handling, maintenance and inspection of JYOTI Vacuum Circuit Breaker, Type VY & Panel VD.

1.	Type	VCB PANEL	VY-30M25, VY-30P25, VD36
2.	Rated Voltage		36 kV
3	Rated Current		M:1250A, P:2000A
4.	Insulation level		AC:70kV - Imp. 170 kVp
5.	Frequency		50 Hz
6.	Rated Breaking Current		25 kA
7.	Rated Making Current		63 kAp
8.	Rated Short Time Current		25 kA - 3 Sec.
9.	Opening time (max.)		55 m sec.
10.	Breaking time		Less than 3.5 Cycles
11.	Closing time		25-50 m sec.
12.	Standard Operating Duty		0-3 Min-'CO'-3 Min-'CO'
13.	Closing Operation Voltage		24/30/110/220 V DC
14.	Tripping Operation Voltage		24/30/110/220 V DC
15.	Motor Operation Voltage		110 V DC/220 V DC
16.	Applicable Standard		IEC56, IS3247 IS:13118, IEC:298 IEC:694
17.	Weight		350 Kg/400Kg (Breaker) 1200 Kg / 1500 Kg (Complete panel with breaker)
18.	Busbar Rating		1250 A / 2000 A
19.	Dimension (Panel)	Width (mm) Height (mm) Depth (mm)	1200 2315/2565/2815 2200
20.	Floor Loading (Kg/sq.mt.)		1500

2.2 GENERAL DESCRIPTION OF EQUIPMENT

VD - type switchgear is an indoor metal clad equipment.

The Vacuum Circuit Breaker is horizontally isolated and horizontally withdrawal Vacuum Circuit Breaker.

The Panel is compartmentalized into

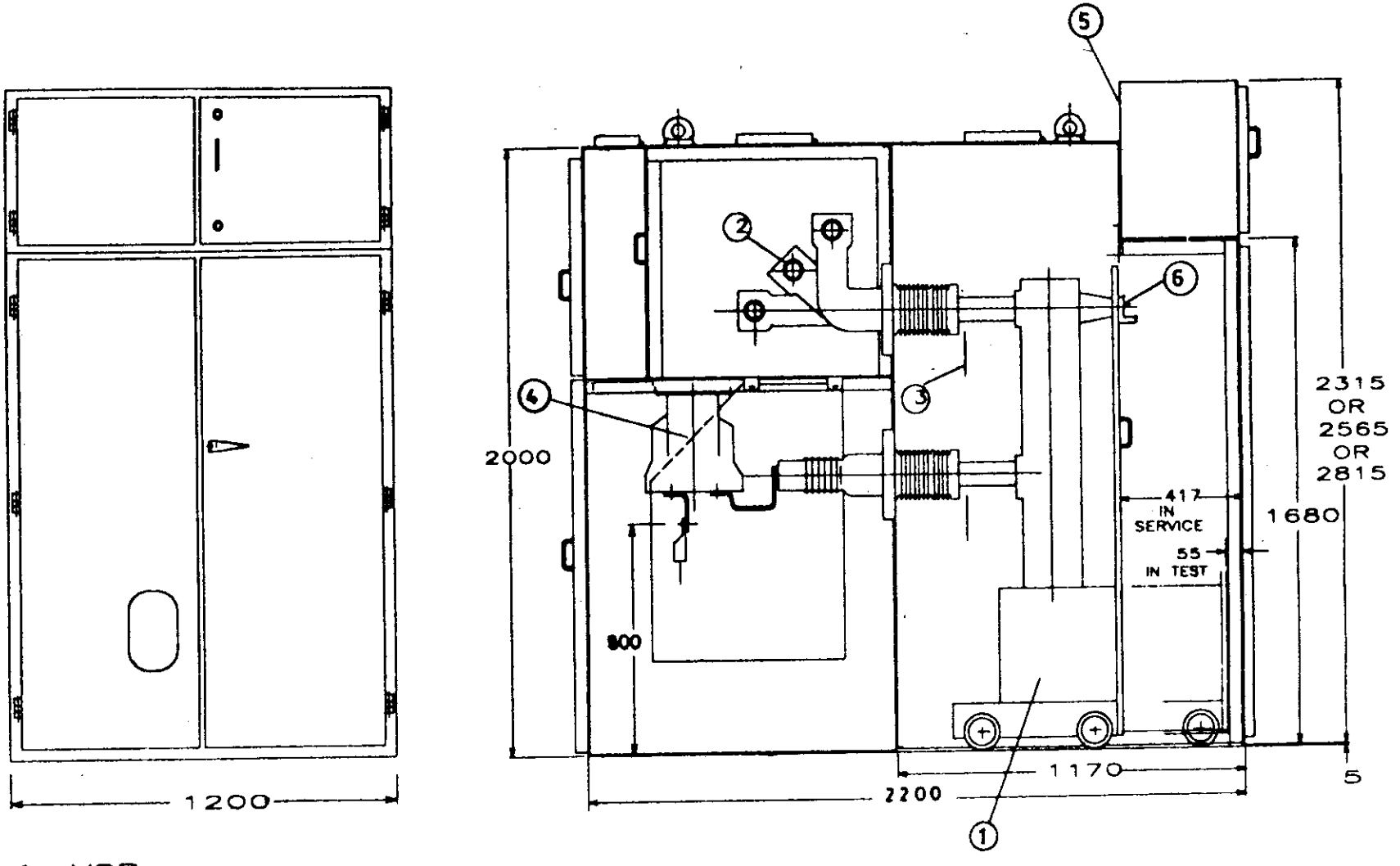
a) Circuit Breaker Compartment

b) Busbar compartment

c) Cable compartment

d) Instrument box.

A typical General Arrangement drawing is shown in Fig. 1.



1. VCB
2. BUSBAR
3. SHUTTER
4. C.T.
5. INST.BOX.
6. TRANSPORT ANGLE

GENERAL ARRANGEMENT FOR 36 kV. VCB PANEL.

FIG : 1

SECTION : A

3.0 TRANSPORTATION

3.1 MODE OF PACKING

Switchgear panels are packed as an individual panel units. This includes Vacuum Circuit Breaker truck. Vacuum Circuit Breaker is dully locked by transport angles, provided at the top.

Each unit is packed by wooden case, dully covered by protective cover.

3.2 UNPACKING

During unpacking, pay attention to the following items.

1. Never allow the circuit breaker / panel to be laid on its side or turned upside down before, during or after unpacking.

2. Ensure that the circuit breaker / panel is free from nails, piece of wood etc.

3. Check for damage or deformations caused in transit or unpacking the crate.

4. Check the accessories / spare and all items as per packing note.

   Circuit breaker truck should be removed from panel for inspection of circuit breaker / panel.

   i) Open the Panel door

   ii) Unscrew 2 Nos. M8 screw, on tranport angle (Ref. Fig. 1)

   iii) Withdraw the breaker from the panel through driving handle following the withdraw / insert instruction as given in breaker.

   Check the circuit breakers, primary disconnect contacts, the resin cast components for visible cracks / damages.

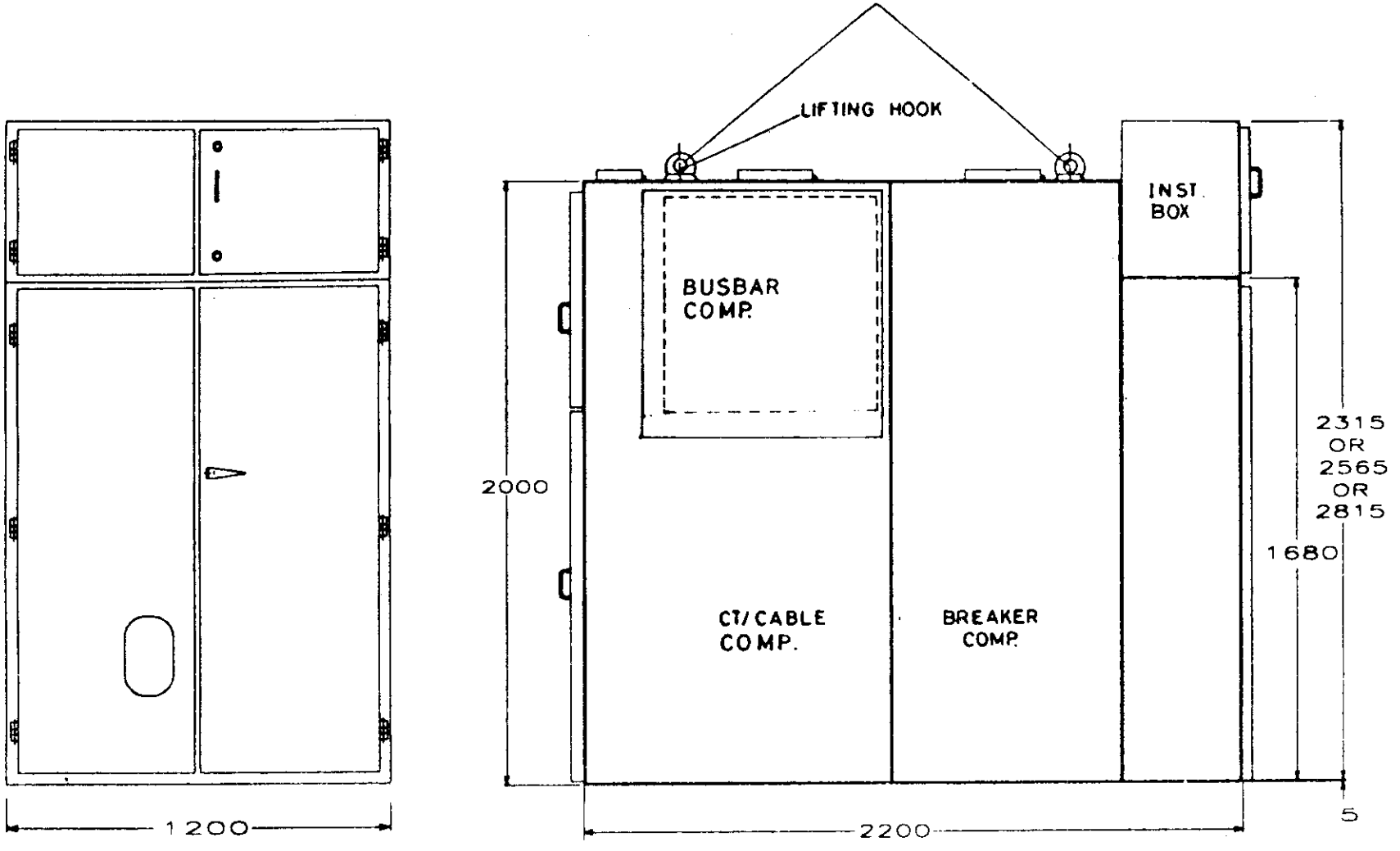
   Similarly check the shutters, CT, epoxy resin cast contact shrouds and loose items such as busbars, shrouds etc.

   If any damages / shortages noticed, report is immediately on receipt of the equipment.

5. For handling during packing, transportation & unpacking a crane with slangs or a fork lift with adequate capacity to be deployed. Ref. Fig. 2 for lifting the cubicle.

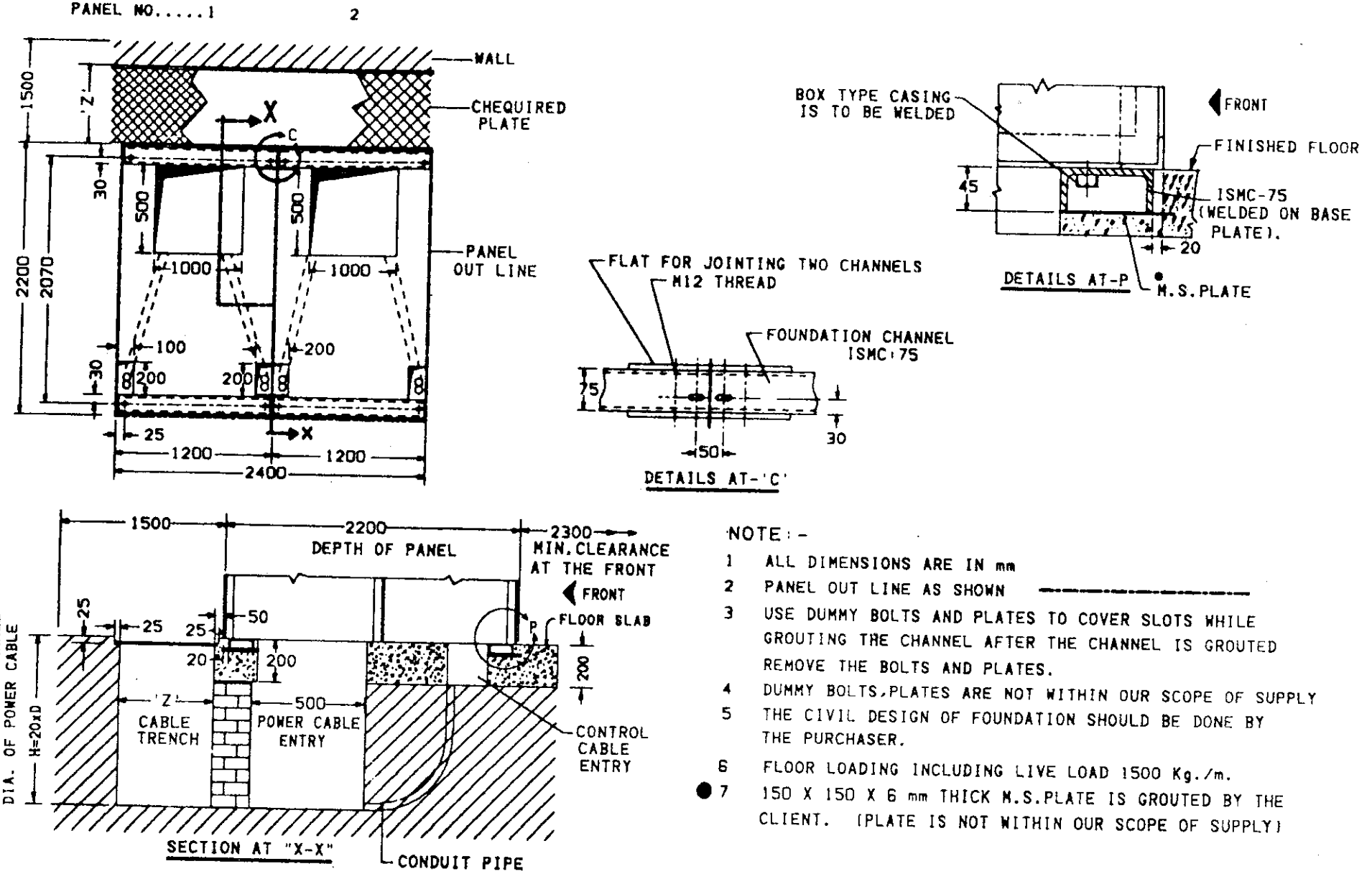
3.3 STORAGE

Once the wooden packing and the polythene sheet cover or corrosion - proof packing used inside are removed, inspect for any damage to instruments, relays, etc. Check and verify the items as per the relevant packing note. Store the switchgear in up right position on leveled platform under permanent cover, free from moisture and dust.



TRANSIT METHOD OF LIFTING

FIG: 2



NOTE:-

1. ALL DIMENSIONS ARE IN mm
2. PANEL OUT LINE AS SHOWN ————————
3. USE DUMMY BOLTS AND PLATES TO COVER SLOTS WHILE GROUTING THE CHANNEL AFTER THE CHANNEL IS GROUTED REMOVE THE BOLTS AND PLATES.
4. DUMMY BOLTS,PLATES ARE NOT WITHIN OUR SCOPE OF SUPPLY
5. THE CIVIL DESIGN OF FOUNDATION SHOULD BE DONE BY THE PURCHASER.
6. FLOOR LOADING INCLUDING LIVE LOAD 1500 Kg./m.
7. 150 X 150 X 6 mm THICK M.S.PLATE IS GROUTED BY THE CLIENT. (PLATE IS NOT WITHIN OUR SCOPE OF SUPPLY)

FOUNDATION DETAIL

FIG:3

FILE :RNP

SECTION : B

4.0 INSTALLATION

4.1 SITE PREPARATION (FOUNDATION)

4.1.1 The switchgear is jig assembled on level surface in the works and is an accurately made product. Satisfactory performance is therefore assured if the area of the substation floor is finished and leveled accurately to an accuracy of 1 mm for 1000 mm. Once this is ensured, the VCB carriage truck would be truly vertical in position at the point of entry into the housing with fixed panel also erected and aligned to be truly vertical. The movements of the VCB contacts with the fix housing contacts will be perfectly matching.

4.1.2 The minimum end working clearance recommended from the wall to the rear and sides of the switchboard shall be more than 1 meter. The working clearance in front of the switchgear panel shall be preferable more than 2 meters to enable easy and comfortable withdrawal of VCB truck to facilitate inspection and testing. The overhead clearance shall be such as to permit maintenance and for access to the mounted equipment on the fixed housing.

4.1.3 The switchboards are of free standing type on the acurately leveled floor.

The leveling is to be checked with a spirit level in perpendicular directions also.

4.1.4 Foundation pockets for bolts shall be marked and made using a templete. (A typical foundation plan is shown in Fig. 3. However for exact foundation plan, please refer GA drawing for the particular Salenote).

4.1.5 After final grouting, sufficient time shall be allowed to elapse to enable curinig.

4.1.6 Correct site preparation as per clause 4.0 above is a precondition for proper erection of switchgear.

4.2 ERECTION OF INDIVIDUAL PANELS

4.2.1 Before erection of the panel over the foundation, please remove the circuit breaker truck from the Fixed Housing.

4.2.2 Position the panel unit on the prepared area using the lifting bolt provided on either side of the panel and align the fixed housing to the foundation bolts. Shims or washers may be used to obtain verticl alignment of the panel.

4.2.3 Locate the holes on the panel over that of the grouted bolts and tighten such that no excessive force is applied.

4.2.4 Ensure that the panel is erected vertical with spirit level as described earlier with shims, washers if necessary.

4.3 ERECTION OF EXTENDED PANELS (BUSBAR CONNECTION)

4.3.1 Assemble together the extension panel as in 4.2.1 above. Bolt the panels together on the sides using M 10 x 25 mm long bolts and nuts. Ref. Fig. 4 coupling panels.

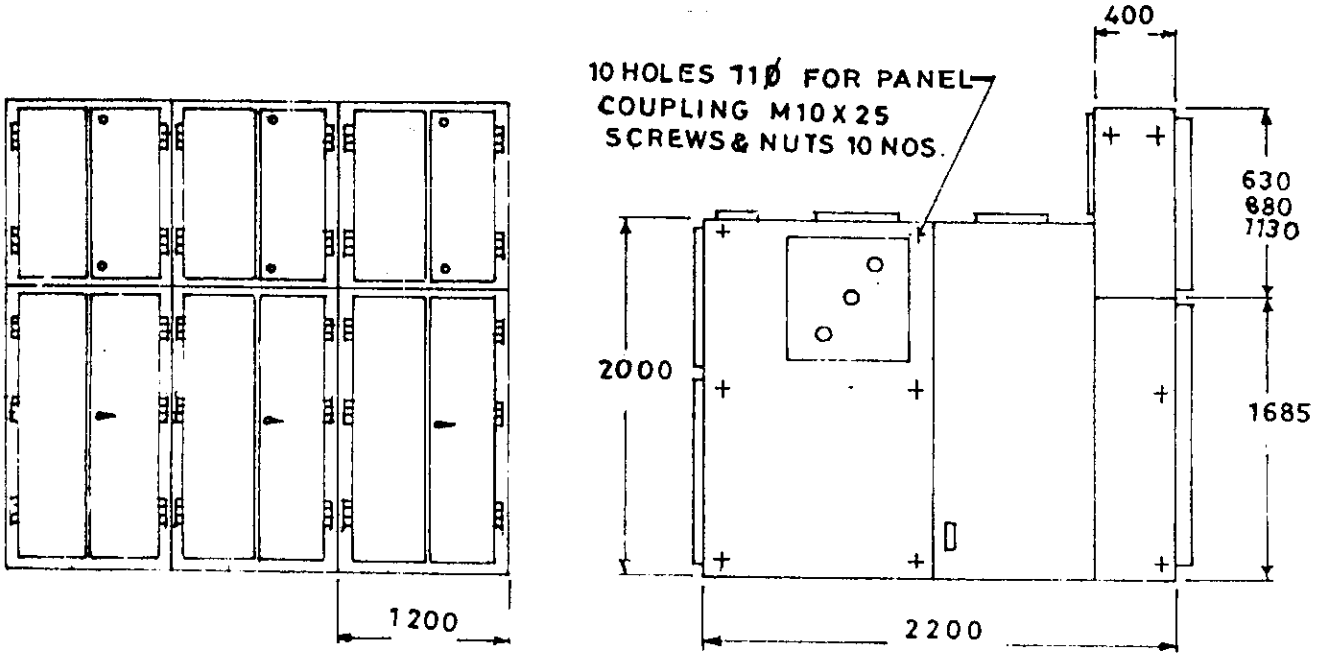


FIG. 4

4.3.2 Clean the busbar chambers and the interior of breaker housing thoroughly to remove dust using a Vacuum cleaner if necessary.

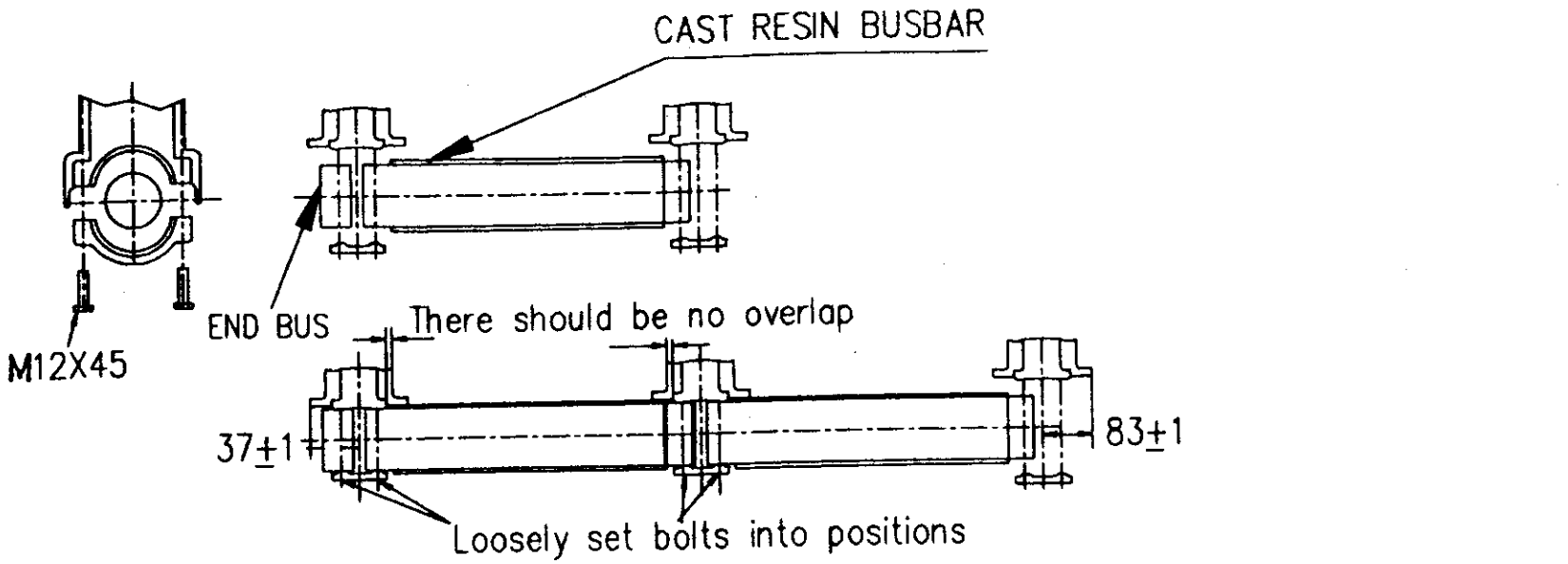
4.3.3 Install the busbars supplied making sure that there are no transit damages. Clean the contact area surfaces with dry lint-free cloth. Apply a thin film of silicone grease (MS4). Care is needed to ensure that when applying the grease, hands are devoid of dirt, dust and moisture. Refer fig. 5 for busbar layout.

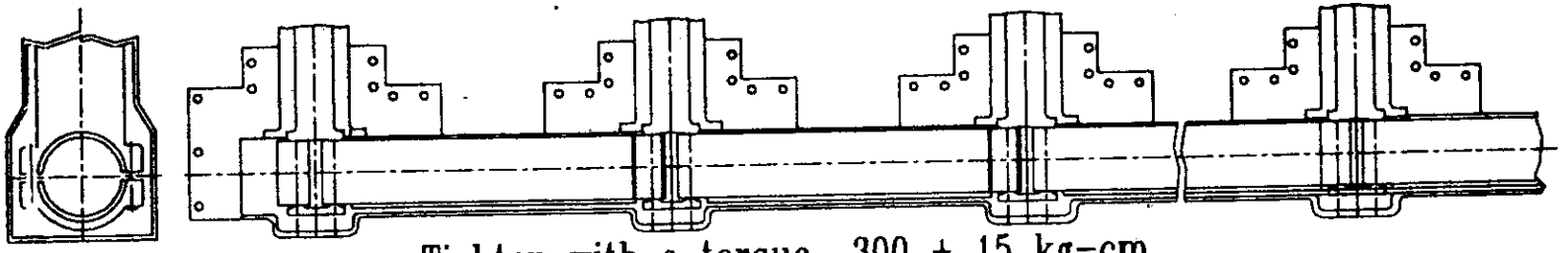
4.3.4 Take care of following points during busbar assembly

a) When the bolts are not matching with its thread of contact shroud, change the position of coupling.

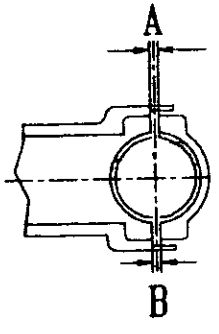
b) Tighten the both ends of busbars before loose your hold of it, otherwise the busbar may fall and damage contact shrouds.

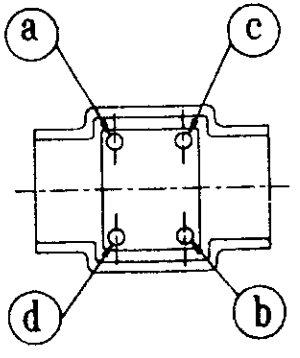
c) Use bolts of specified length.





Tighten with a torque 300 ± 15 kg-cm





Sequence of bolt tightening

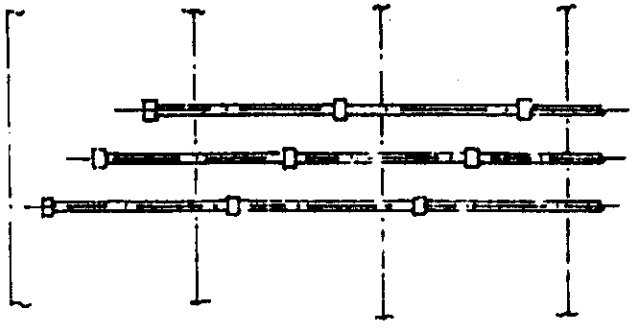
Screw bolts into position with a light torque in the order of (a), (b), (c) and (d) and then in the same order with the specified torque.

NOTE : Bolts should be tightened such that the gaps A and B are equal.

ASSEMBLING OF BUSBARS(FOR INCOMING & FEEDER PANELS) Fig : 5

4.3.5 Busbar Connections

When installation is completed, connect the busbars as shown in Fig 5 & 6 with care described in 4.3.4



BUSBAR ARRANGEMENT FIG: 6

Tightening Screw : M 12 x 45 (Socket headed cap screws)

Tightening torque : 300 ± 15 kg Cm

4.4 METHOD OF MOUNTING INSULATING COVER

After the busbars are connected the insulating coves should be mounted in the following manner.

1. Mount the insulating cover as shown in Fig. 7
2. tighten all the nylon screws

4.4.1 Complete the panel and internal panel wiring in accordance with finally approved schematic.

4.5 EARTH CONNECTION

4.5.1 The earthing busbars are located at the lower middle in each cubicle. Connect the earthing busbars as shown in Fig. 8

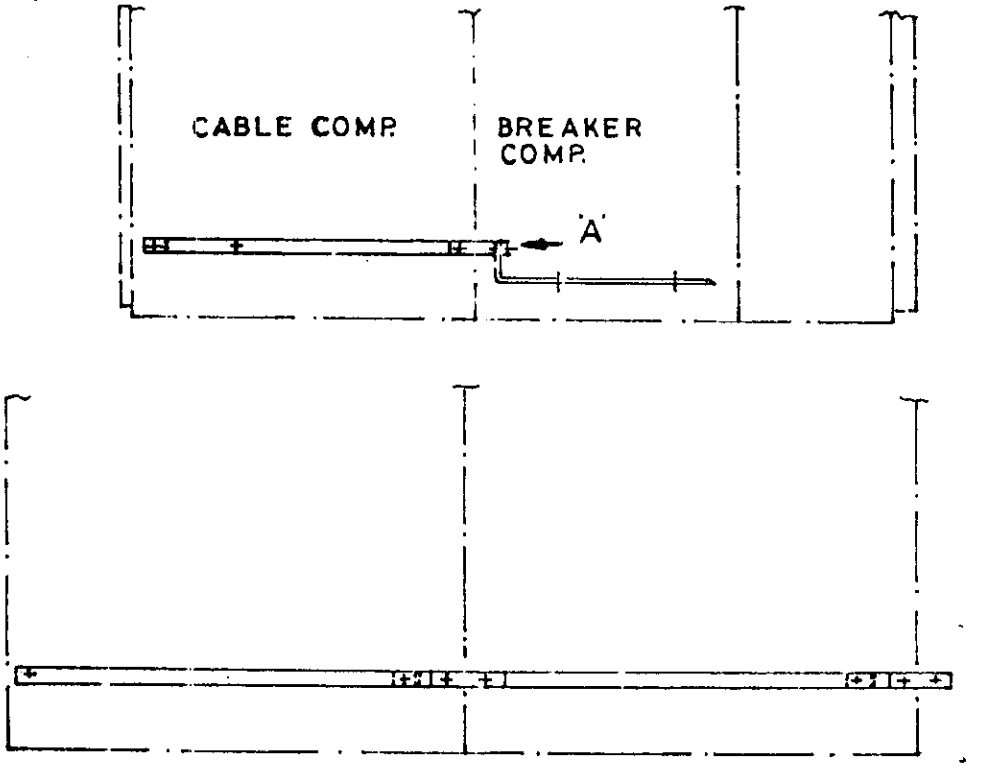
4.6 CLOSING OF COVERS

4.6.1 Clean all the compartments

4.6.2 Ensure that no foreign parts are left.

4.6.3 Plug unnecessary openings / holes

4.6.4 Close all removed covers using appropriate fasteners.



VIEW FROM ARROW 'A'

EARTH CONNECTION

FIG: 8

MOUNTING THE INSULATING COVER

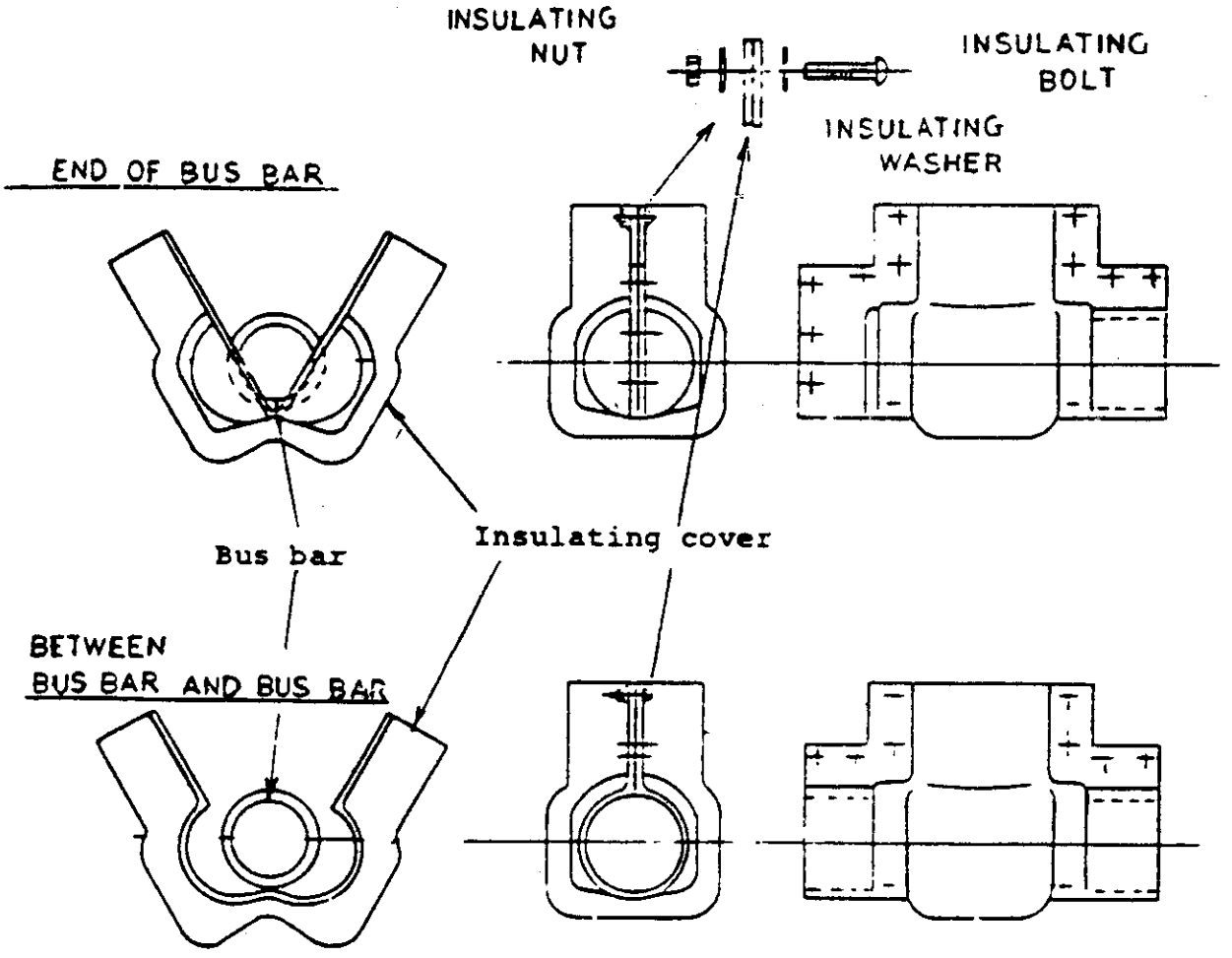
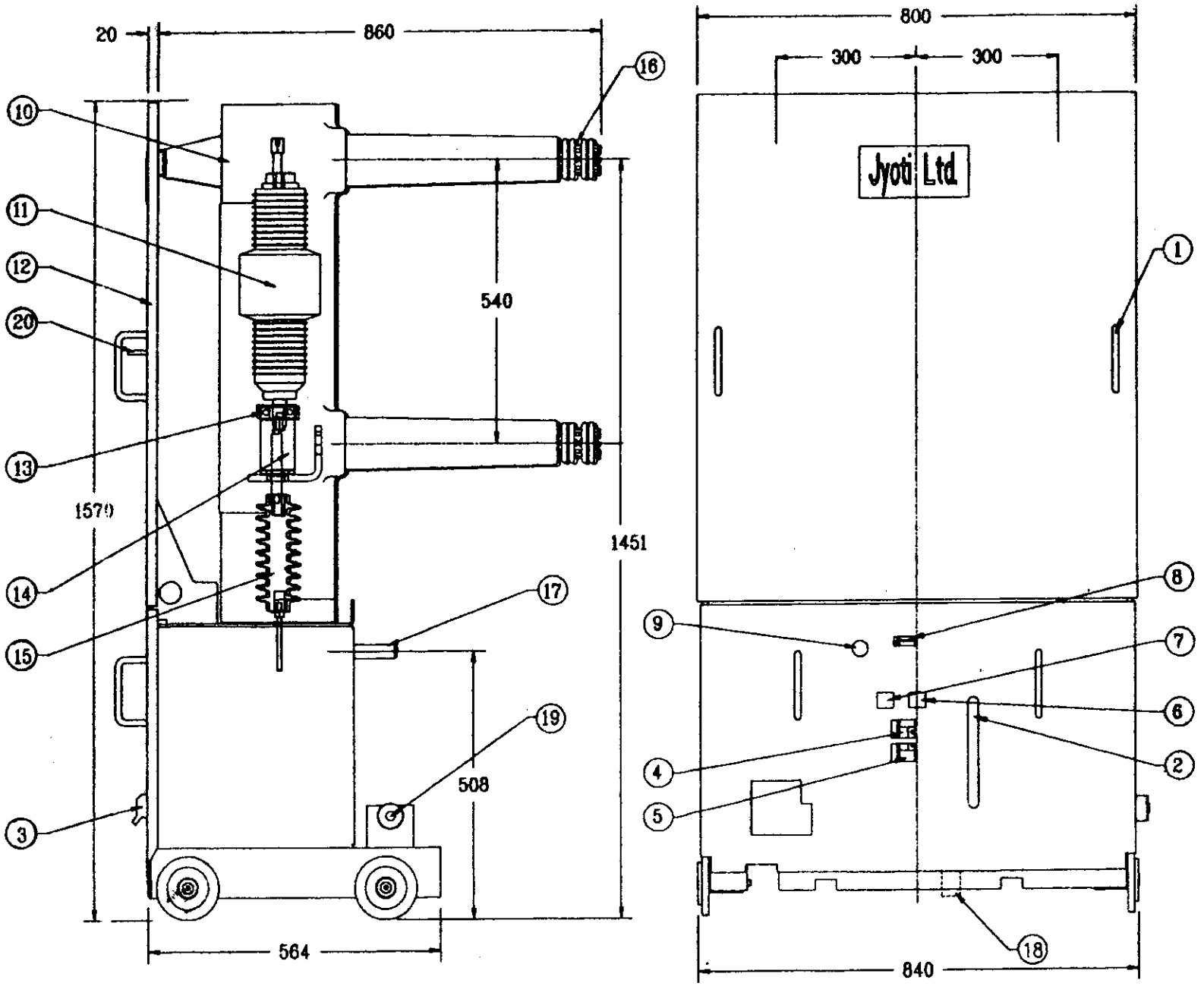


FIG:7



20	INTERLOCK LEVER
19	DRIVING ROLLER FOR SHUTTER
18	EARTHING TERMINAL
17	DRIVING SCREW
16	PRIMARY DISCONNECTS
15	INSULATING STUD ASSY
14	FLEXIBLE CONDUCTOR
13	COUPLING
12	DOOR
11	VACUUM INTERRUPTERS
10	INSULATING BARRIER
9	WITHDRAW INSERT
8	COUNTER
7	SPRING CHARGE INDICATOR
6	OPEN CLOSED INDICATOR
5	TRIP BUTTON
4	CLOSING BUTTON
3	MULTIPIN PLUG
2	CHARGING HANDLE
1	HANDELS

VACUUM CIRCUIT BREAKER

FIG: 9

SECTION : C

5.0 WORKING OF OPERATING MECHANISM

5.1 CONSTRUCTION

VCB incorporates a specially designed and completely sealed vacuum interrupter to perform its basic function of opening as well as closing when called upon to do so, both under normal operating conditions and under fault conditions such as short circuit.

In VCB type VY, the Vacuum Interrupter is housed in unique barrier which ensures stable mounting of the Vacuum Interrupters and also provides adequate inter-phase and phase to earth segregation. The barrier is mounted on the top side of the VCB mechanism cabinet.

A spring operating mechanism mounted inside a sheet steel cabinet is used to provide the energy required for breaker operation. The closing springs, which are charged manually or through a motor, provide the energy for closing the VCB and for applying sufficient contact pressure on the moving contacts of vacuum interrupter through the wipe springs. The wipe springs provide the initial energy during opening of the VCB. The opening springs, which get charged on closing the VCB, provide the energy for opening the VCB.

The mechanism energy is transmitted to the vacuum interrupters via insulating links during closing as well as opening. There is a dash pot in the mechanism which provides sufficient damping during the opening operation of the VCB.

The VCB is provided with OPEN/CLOSED and CHARGED/DISCHARGED indicators on its front side. A green color push button is provided for manual closing and red colour push button for manual opening of the VCB. When VCB is received at site it is in OPEN condition and the springs are DISCHARGED. A charging handle isprovided in the front for manual spring charging. Two handles are provided behind the right side handle. At the bottom center of the VCB cabinet front door, an opening is provided for inserting the driving handle to rack in / rack out the VCB.

The VCB has closing coil, tripping coil and breaker operated auxiliary switch IV.

The VCB is provided with an anti-pumping feature to prevent the re-closing of the breaker after opening in case of continuous electrical closing command. The antipumping relay 'Y' and the auxiliary relay for spring charging motor 'X' are mounted in the mechanism cabinet on the top left hand side.

The moving contact of the vacuum interrupter is connected to the bottom disconnecting arm through flexible jumpers. The fixed contact of the Vacuum Interrupter is assembled with the top disconnecting arm.

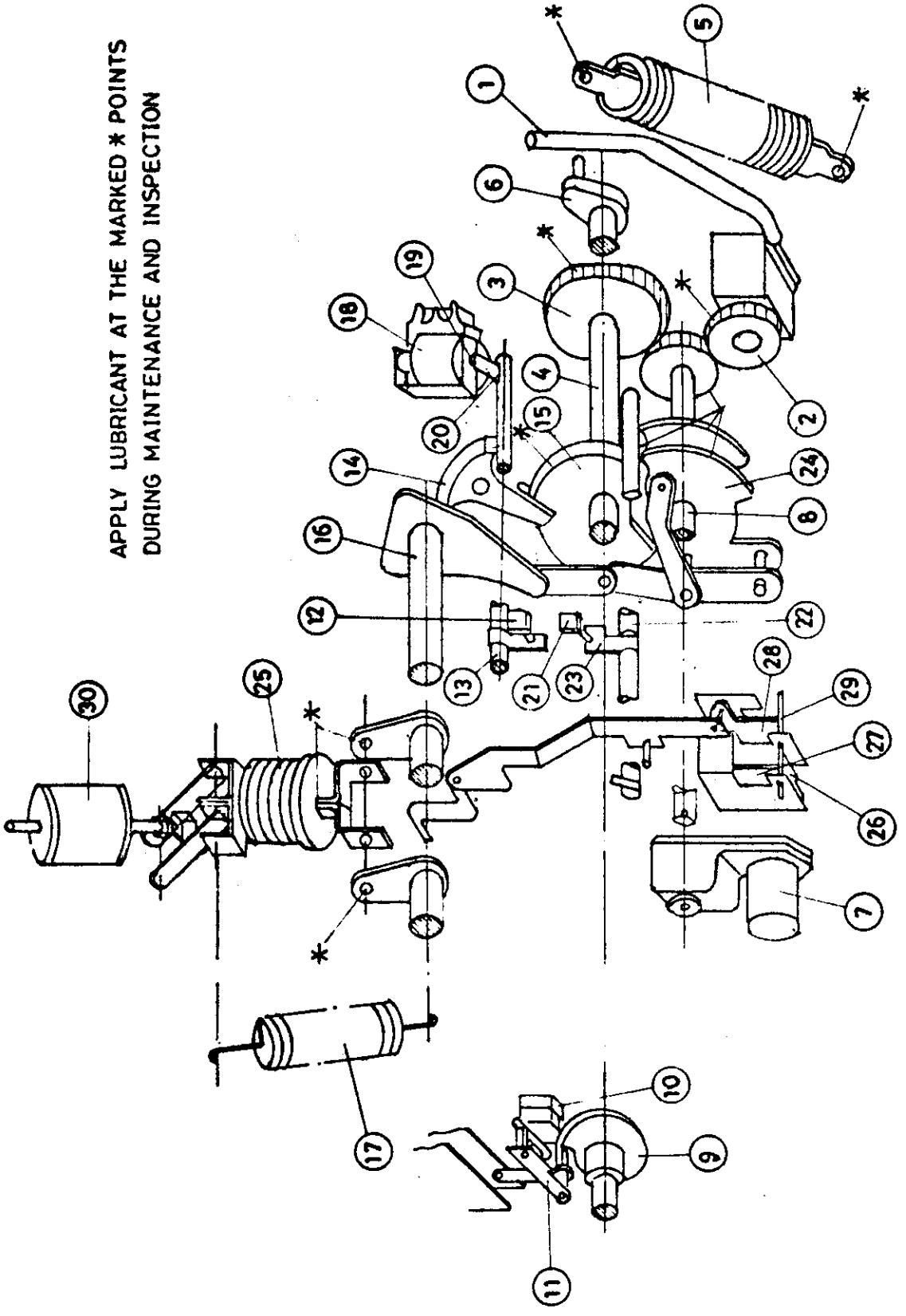
The jaw contacts fixed at the end of the disconnecting arms, are made of specially designed copper flat which are assembled together and are spring loaded. This ensures sufficient contact pressure when the jaw contacts get engaged with the contact blades in the panel while the VCB is in SERVICE.

5.2 OPERATIoNG (FIG. 10 & 11)

5.2.1 CHARGING OPERATION

Initially the VCB is OPEN and closing springs are DISCHARGED. Charging of closing springs is done either manually or electrically

APPLY LUBRICANT AT THE MARKED * POINTS
DURING MAINTENANCE AND INSPECTION



SPRING OPERATING MECHANISM

FIG: 10

LEGEND FOR ITEM NUMBERS IN FIGURE

1. Charging Handle
2. Gear
3. Gear
4. Cam Shaft
5. Closing Spring
6. Crank
7. Motor
8. Shaft
9. Cam
10. Micro-switch
11. Lever
12. Push Button 'ON'
13. Closing Shaft
14. Closing Catch
15. Cam
16. Main Shaft
17. Opening Spring
18. Closing Coil
19. Plunger of Closing Coil
20. Paddle
21. Push Button 'OFF'
22. Opeining Shaft
23. paddle
24. Trip Catch
25. Wipe Spring
26. Paddle
27. Tripping Coil
28. Latch
29. Half Shaft
30. Vaccum Interruoter

through a motor. the CHARGED / DISCHARGED indicator shows the status of the closing springs.

5.2.2 MANUAL CHARGING

Hold the charging handle and move it down by approximately 30 degrees till it stops. This will rotate ger (2) which in turn will rotate gear (3). Gear (3) will rotate cam shaft (4). The closing springs (5) which are hinged at one end, will start getting charged due to rotation of cam shaft as the other end of the spring is connected to crank (6) fitted onthe cam shaft (4).

Now return the charging handle back to its original position and move it down again. Repeat this, till the springs are fully charged. A distinct clicking sound will be heard as soon as springs are fully charged and the CHARGED / DISCHARGED indicator changes over to CHARGED position. The VCB is now ready for closing.

In order to prevent overcharing 'stop' the handle movement as soon as a distinct 'click' sound is heard and indicator changes over to 'CHARGED' position. Overcharging can damage the mechanism. The number of times charging handle is to be moved up and down for full charging of closing springs depends on the angle of handle movement. If the movement of manual spring charging handle is kept to about 30 degrees every time approximately 18 storkes will be required for full charging.

5.2.3 MOROT CHARING OPERATION

As soon as electrical supply is given to the charging motor (7), it will rotate the shaft (8) which in turn will rotate the gear (3). The remaining charging operation is similar to manual charging.

When the springs are about to get charged fully, the cam (9) mounted on cam shaft (4) will operate the micro switch (10) through lever (11) and supply to the motor will be cut off. The motor takes about 10 seconds to charge the springs.

The closing springs will get automatically recharged through the spring charging motor as soon as they get discharged on closing of the breaker.

5.2.4 Closing Operation

When the springs are fully CHARGED, the linkages attain position (A), (Fig. 11). Now the VCB is ready for closing operation.

5.2.5 Manual Closing

Push the closing push botton (12). The closing shaft (13) will turn about its axis, thus relseasing the closing catch (14). Now, energy of the closing springs will close the cam (15) to rotate at fast speed and bring linkages to position (B) (Fig. 11). The rotation of cam will turn the main shaft (16) and the breaker will get CLOSED. The opening spring (17), mounted on main shaft (16) will get charged during closing oepration. The breaker position indicator changes over CLOSED and the charging indicator changes over to DISCHARGED.

It is possible to re-charge the closing springs in this position.

5.2.6 Electrical Closing

When supply is given to the closing coil (18), the plunger (19) of closing coil will push the closing paddle (20). This will cause the closing shaft (13) to turn.

The remaining closing operation is similar to manual closing operation. the supply to the motor is re-connected immediately on closing of the breaker due to rotation of cam (9), Lever (11) and Micro Switch (10) and the closing springs get recharged and linkages attain the position (D) Fig. 11.

The breaker position indicator changes over to CLOSED, and after immediate recharging, the charging indicator will shown CHARGED.

5.2.7 OPENING OPERATION

When the VCB is CLOSED, the linkages attain the position (D) or (B) and the breaker is ready for opening.

5.2.8 Manual Opening

Push the trip push button (21). This will turn the trip shaft (22) through tripping paddle (23), which in turn will relase the tripping catch (24). th energy of opening springs (17) and wipe springs (25) will cause the linkages to attain the position (A) or (C).

This movement of linkage from position (D) or (B) to position (A) or (C), will turn the main shaft (16) and the circuit breaker will OPEN. During opening operation, initially, energy of wipe springs (25) will be released to attain the required initial speed. The same will be further maintained by the release of opening spring energy.

The breaker position indicator changes over to OPEN and the charging indicator remains at the same position as it was when the breaker was in CLOSED condition i.e. CHARGED in case the closing springs where charged after the breaker had CLOSED or DISCHARGED in closing springs were not charged after the breaker was CLOSED.

5.2.9 Electrical Opening

When supply is given to the tripping coil (26), the plunger (27), of tripping coil will push the trippng shaft (22), causing it to turn. The remaining operationis similar to manual opening operation.

5.2.10 Auto re-closing Feature

The VCB is provided with a facility for auto re-closing. This feature is achieved since it is possible to charge springs as soon as they get discharged during closing operation. The mechanism is thus kept ready to re-close the VCB as soon as it is opened.

5.2.11 Auxiliary switches

All switches have their normally open (NO) and normally closed (NC) contacts when the VCB is OPEN and the mechanism is DISCHARGED.

Auxiliary Switch	IV	Cam Switch (Rotary Switch)
Auxiliary Switch	LS	Micro Switch
Auxiliary Switch	IL	Micro Switch

The auxiliary switch IV (Cam switch / Rotary switch) is breaker operated and is driven by a link attached with the main shaft. This switch has 14 contacts (7 NO + 7 NC). Within the VCB two pair of these contacts are used to cut-off the conrol supply to the closing coil (or opening coil) as soon as the breaker is CLOSED (or OPENED).

When the circuit breaker is CLOSED, 'NO' contacts get closed and 'NC' contacts open when the VCB is OPENED the auxiliary contats regain their original status.

Auxiliary switch LS is a micro switch. It is controlled by the rotation of cam shaft (4). When the closing springs are in DISCHARGED condition, the NC contact

energizes the control relay 'X' which in turn connects supply to the spring charging motor. When the springs are fully CHARGED, micro switch LS Charges its position and cuts off the supply to control relay 'X', thus disconnecting the motor supply.

Auxiliary switch IL is a micro switch. The switch is oeprated by movement of interlocking lever. In the lifted position of interlocking lever this switch is in open condition thus disconnecting the closing circuit and preventing the VCB is fully in SERVICE or TEST positions (and, of course when the VCB is completely whtidrawn outside the cubicle), the contact of IL is in closed condition, thus permitting closing operation. This interlock ensures that closing of VCB is prevented in intermediate between TEST and SERVICE.

5.3 INTERLOCK

Interlocking mechanism provided between vacuum circuit breaker and cubicle ensures safe operation, protection to personnel and the correct sequence of operations.

5.3.1 Interlocking Features

1. VCB cannot be inserted from TEST to SERVICE position or withdrawn from SERVICE to TEST position unless it is OPEN.

2. VCB cannot be closed while moving between TEST and SERVICE positions.

5.3.2 Interlocking Mechanism

a) Interlock lever (Fig 9 & 12) cannot be lifted up, when the VCB is CLOSED. Before lifting the lever, ensure that the VCB is OPEN. Do not try to force the interlock lever.

b) When interlock lever is lifted up, electrical closing operation is blocked and mechanical closing button cannot be pushed.

NOTE : When the VCB is fully in the TEST or SERVICE positions, interlock lever drops in the grooves provided in the base channel in the cubicle, thus permitting closing, but preventing the movement of the VCB.

c) The VCB and the cubicle have requisite interlocks to prevent the insertion of circuit breaker into the cubicle unless it is of matching current rating.

5.3.3 Control Circuit multi pin plug interlock (Fig. 13)

VY type VCBs in VD type panels are provided with a multi pin plug for the connection of control supply., An interlock is provided on the breaker and panel such that VCB cannot be inserted from TEST TO SERVICE position unless multi-pin plug is inserted in its receptacle in bottom left corner of the VCB.

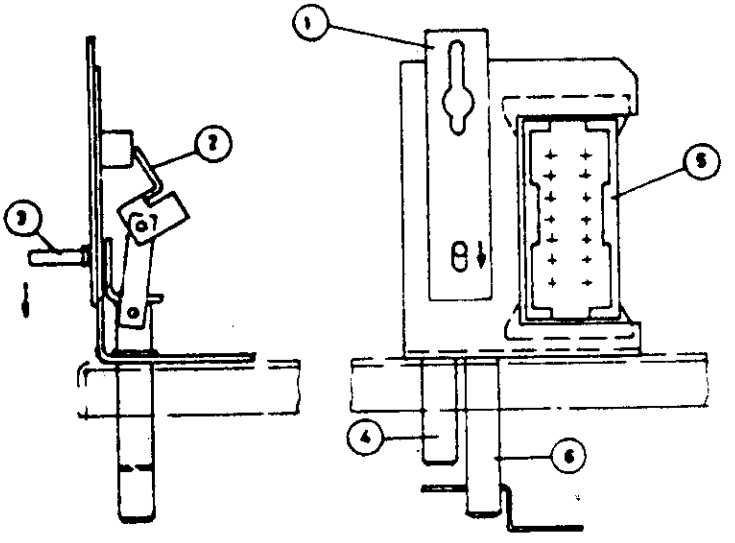
Similarly an interlock is also provided so that multi-pin plug cannot be removed unless the VCB is in TEST position.

Following procedure should be followed for insertation of multi-pin plug into its receptacle provided in the VCB.

a) Keep the VCB in TEST position.

b) Press the lever shown in Fig. 13 down. It will not be possible to press the lever down unless VCB is in TEST position, as movement of lock pin no. 1 is restricted in all other positions except TEST position.

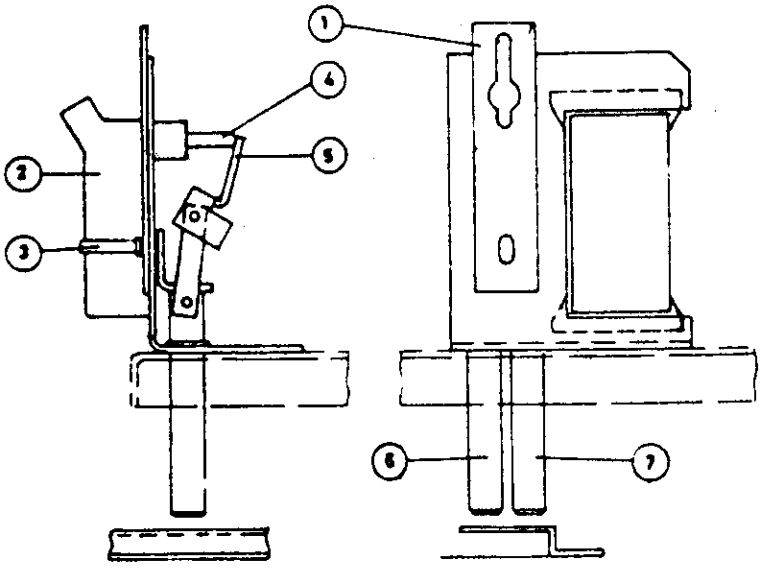
1	PLATE
2	INTERLOCK PLATE
3	LEVER
4	LOCK PIN NO 1
5	SOCKET FOR PLUG
6	LOCK PIN NO 2



MULTI PIN PLUG IS NOT INSERTED BREAKER IN TEST POSITION OR OUTSIDE

FIG-13A

1	PLATE
2	SECONDARY DISCONNECTS PLUG
3	LEVER
4	INTERLOCK PIN
5	INTERLOCK PLATE
6	LOCK PIN NO.1
7	LOCK PIN NO.2



MULTI PIN PLUG INSERTED AND BREAKER IN TEST POSITION.

FIG.13B

c) Insert the multi-pin plug properly. It will lift the lock pin No. 2 due to the pin on the plug of the multi pin plug assembly.

d) Release the lever, lock pin No. 1 will be lifted up and multi-pin plug will be locked. It will not be possible to withdraw the multi-pin plug unless the lever is pressed down, which is possible only in TEST position.

For removing the multi-pin plug, bring the VCB to the TEST position, push the lever down and pull the plug out of its receptacle.

5.3.4 Procedure of Insertion / Withdrawal of VCB

Insertion of VCB from TEST to SERVICE

i) Ensure that VCB is OPEN before inserting.

ii) Hold the handles provided on the VCB front side and raise the interlocking lever provided behind the right side handle. The bottom end of the lever will come out of the groove provided on the base channel of the cubicle.

iii) Push the VCB gently into cubicle with the interlock lever lifted. The VCB will move inside the cubicle about 160 mm and stop.

iv) Keeping the interlock lever lifted, insert the driving handle (provided for final insertion and intial withdrawal of VCB) into the opening provided in the VCB at the middle center, such that it gets engaged with the driving rod.

v) Rotate the handle clockwise to move the VCB further in, for about 100 mm in the cubicle. Stop rotating the handle when a distinct "click" sound is heard and the driving handle rotates freely.

Insertion of VCB into SERVICE position is complete only when a "Click" sound is heard and the driving handle rotates freely.

vi) Remove the handle, check that the right side interlock lever has automatically dropped completely in the gorrve provided in the base channel near the SERVICE position label in the cubicle.

vii) Now the VCB is correctly positioned in SERVICE and ready for operation.

The VCB is held in SERVICE position with the help of the interlocking lever and the driving rod, which gets inserted inthe nut assembly provided in the panel cubicle.

5.4.1 Withdrawal of VCB from SERVICE to TEST

i) The circuit breaker should be OPEN before withdrawal. If it is CLOSED, trip the circuit breaker using the mechanical trip push button with cubicle mounted electrical controls.

ii) Raise the interlock lever. Insert the driving handle in to the opening provided and rotate the handle anti-clockwise untill the handle rotates freely. The VCB will move about 100 mm. Remove the driving handle.

iii) Fro further withdrawal of the circuit breaker, hold both the VCB handles (without holding the interlock lever) and gently pull the VCB till it front reached TEST position lable, and the interlock lever will then drop in the groove of the base channel, thus ensuring correct TEST position.

Do not hold the interlocking lever while pulling the VCB to TEST postion, as this will prevent identification of correct TEST position.

5.5.1 COMMISSIONING INSTRUCTIONS

a) Check mauual spring charging, closing and opening operations.

b) Check operation of all indicators (e.g. CHARGE / DISCHARGED, OPN / CLOSED)

c) Check tightness of the all wire termination's

d) Check electrical operations of the VCB

e) Check all interlocks for satisfactory working

f) Check and ensure that there are no loose connections in the power circuit.

g) Clean the VCB with dry lint-free cloth and or vacuum claner.

h) Check insulation resistance between phase and also pahse to earth with the help of a megger.

i) Conduct High Voltage test on the vacuum Interrupters.

SECTION - D

6.0 MAINTENANCE AND INSPECTION

The stroke of vacuum Circuit Breakers being very samall, the energry required to operate th vacuum interrupter at specified speed is very less as compared to other types of circuit brekers of the same rating.

6.1 CHECK ON VACUUM

Whether the interrupter maintains a high internal vacuum can be checked by applying a voltage of AC 70 kV rms as a voltage withstand test for about 10 seconds. Measurement is taken with the VCB OPEN and the voltage applied between the terminals of the vacuum interrupter.

When the internal peressure (Vacuum level) is not sufficiently low there is almost no delay in the beakdown. So a duration of 10 seconds of voltage application is enough.

If test set up trips, repeat the process thrice. If test up trips all three times, the vacuum interrupters is deemed to the defective and needs to be replaced.

NOTE:

Megger test (I.R. test) is not a method recommended for assessing intergrity of vacuum in the interrupter.

6.2 MEASUREMENT OF CONTANCT EROSION

The wipe springs (25) shown in fig.10 provide sufficient contact pressure to the vacuum interrupter when it is CLOSED. In case of excessive fault trippings, the main contacts may get eroded progressively. when the contacts get eroded, the wipe of the wipe springs get reduced.

Wipe can be observed for each phase by removing the front cover of the VCB. It can be seen by the red mark on the link of the wipe springs (25) with circuit breaker CLOSED as shown in Fig.13 As a routine inspection, the presence of wipe can be seen by the red mark.

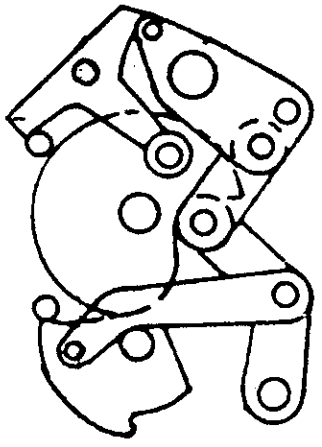
When the red mark is about to disapper with breaker CLOSED, the value of wipe reaches its minimum permissible value. Nominal value of wipe, when circuit breaker is supplied, is 3±0.5 mm. When the value of wipe reaches 1 mm or less, the vacuum interrupter is required to be replaced.

6.3 REPLACEMENT OF PARTS

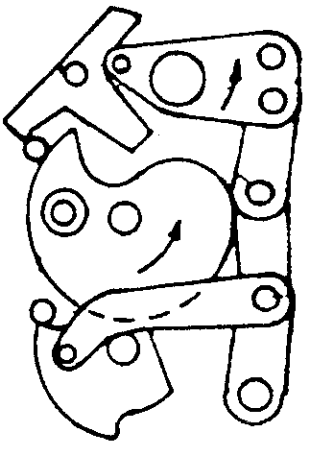
Customers are advised not to replace Vacuum Interrupter or any other components on the pole part side of the VCB.

For such replacement, customers are advised to contact Customer Service Dept., Jyoti Limited, Swichgear Plant, J/44-59, BIDC, Gorwa, Vadodara - 390 016, India or our nearest Branch Office.

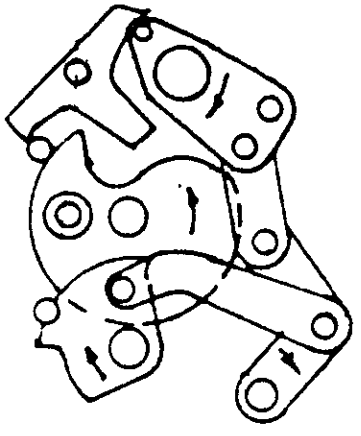
Replacement of other parts like coil, motors, micro switches etc. should also be done only by those personnel who are properly trained at our works which can be arranged on specific request.



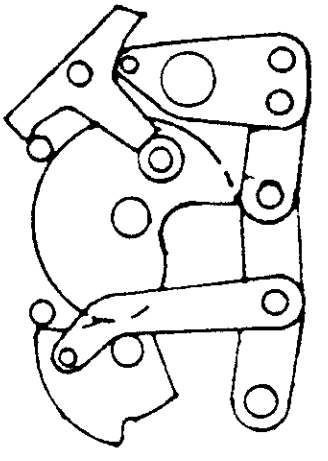
POSITION - A
OPEN AND CHARGED



POSITION - B
CLOSED AND DISCHARGE.



POSITION - C
OPEN AND DISCHARGED



POSITION - D
CLOSED AND CHARGED

FIG: 11

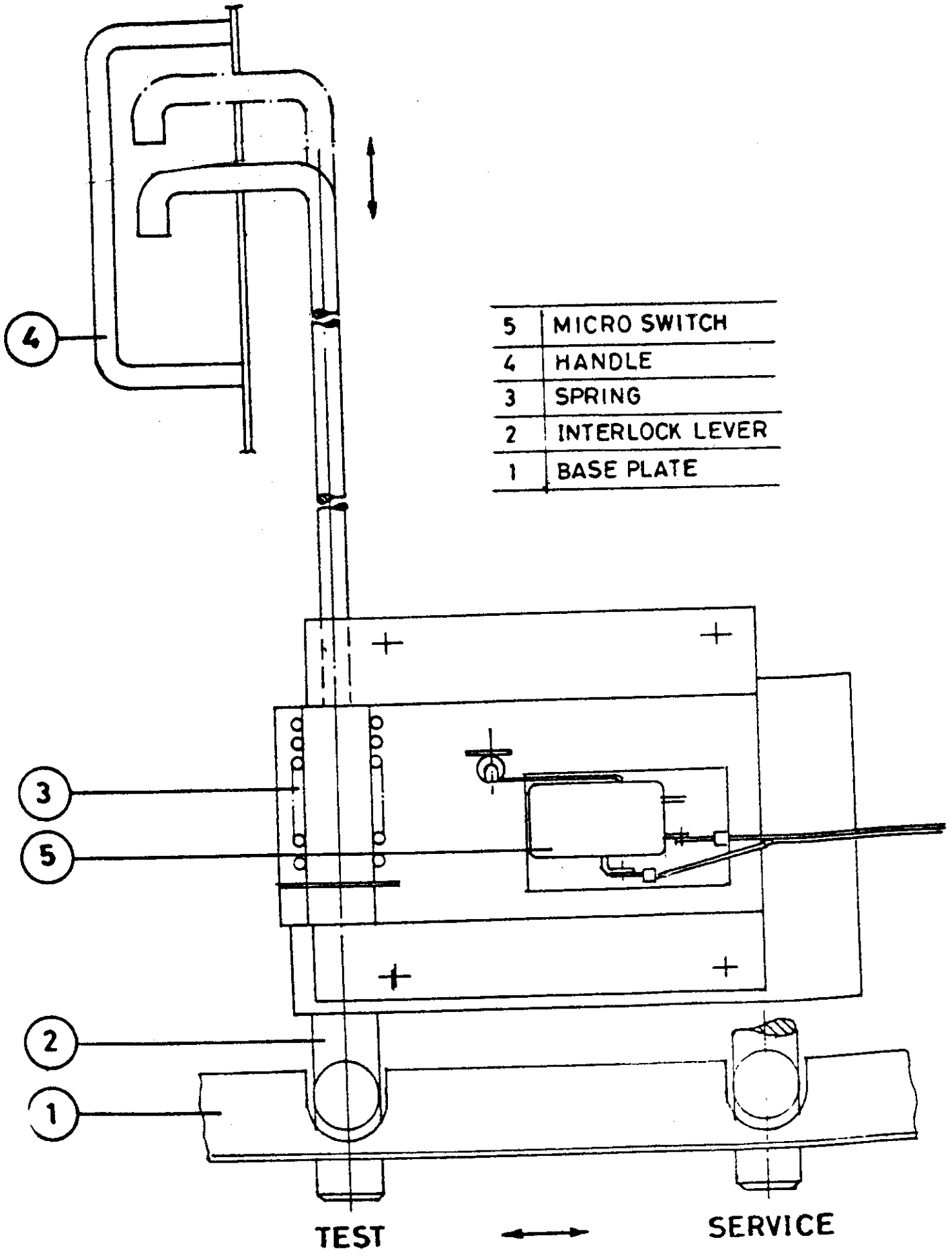
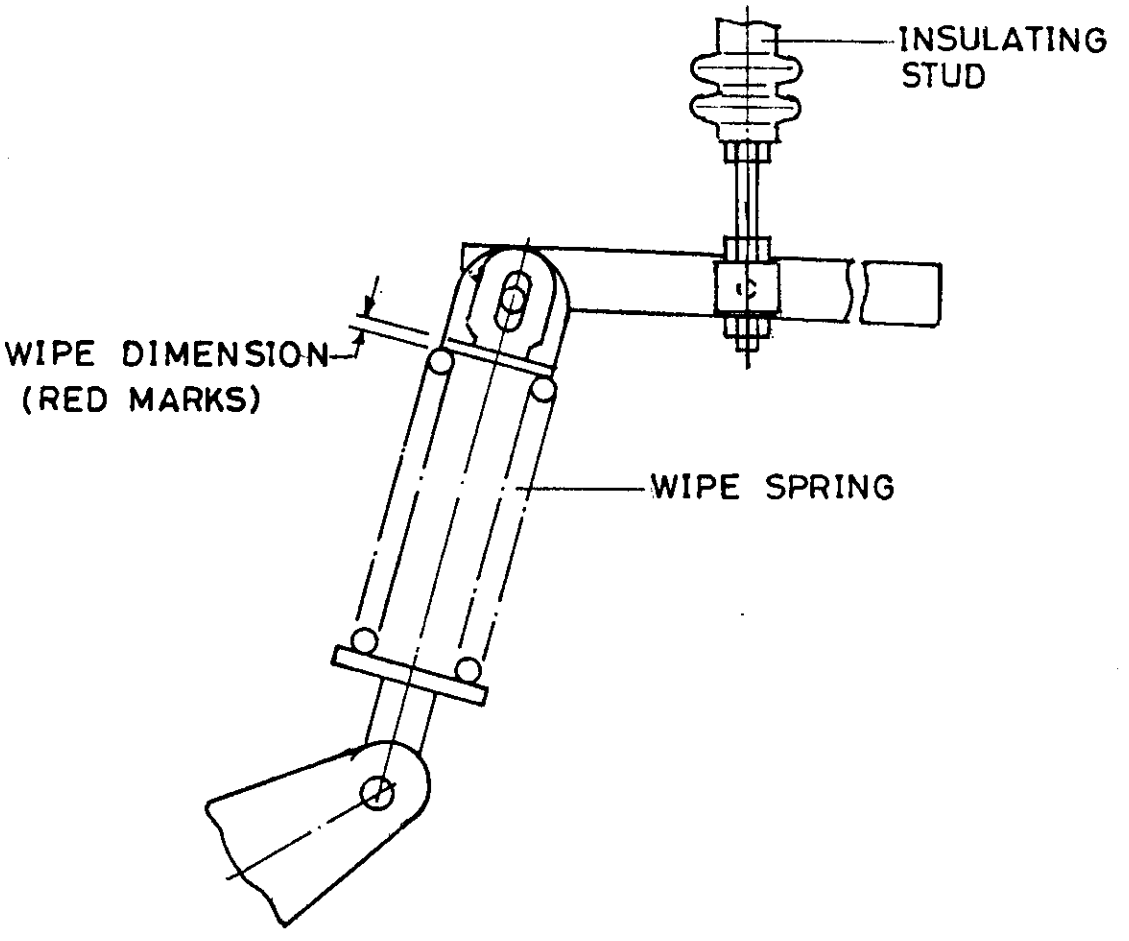


FIG. 12 INTERLOCK ARRANGEMENT



MEASURING THE AMOUNT OF CONTACT WEAR

FIG : 13

6.4 LIST OF RECOMMENDED SPARES

Sr. No.	Item	Rating	Part No.	Qty per Unit
1.	Closing coil	220 V DC 110 V DC 30 V DC 24 V DC	DEG/VS/TP/200/5	1
2.	Tripping coil	220 V DC 110 V DC 30 V DC 24 V DC	DEG/VS/TP/200/6	1
3.	Auxiliary Switch (IV)		DEG/VC/TP/200/4	1
4.	Micro Switch (LS & IL)		DEG/VS/TP/2001	3
5.	Spring Charging Motor	110/200 V DC		1

Other voltages of 110 V AC, 240 V AC are possible using rectifier and power pack units.

Note : While ordering spares please specify the auxiliary voltage.

6.5 LIST OF ACCESSORIES

Following accessories are provided with VCBs for each board.

1. Driving handle for initial withdrawal / final insertion of VCB.

TABLE - I

6.6 CHECK POINTS FOR PERIODICAL INSPECTION

Sr. No.	Check Point	Item	Checking Method	Criteria	Actions required
1.	Complete Circuit breaker	Screws, bolts & Nuts	By screw driver & wrench	There should not be any loose swrew both and nuts	Tighten if found loose
		Dust & foreign matter	Visual check	The breaker shold be clean and should not have any foreign matter on any part	Clean with compressed air and wipe the accessible part by clean and dry lint free cloth
		Deformation, excessive wear	Visual check	There should be no deformation or excessive wear or damage to any part	Remove cause and replace the part
2.	Operating Mechanism	Dust & foreign matter	Visual check	There should be no dust or foreign matter	Clean with compressed Air
		Smooth operation	Manual operation	Operation should be smooth	
		Lubrication of bearings, pins, latches etc.	Visual check	Should be well lubricated	Apply PTFE grease, Beacon Q2 grease or its equivalent as shown in Fig. 10.
		Closing and tripping shaft	Visual check	Must rotate freely	Apply PTFE grease, Beacon Q2 grease or its equivalent as shown in Fig. 10.

Sr. No.	Check Point	Item	Checking Method	Criteria	Actions required
3.	Vacuum Interrupter	Contact Wear	Visual check	Wipe should be 3.0 +/- 0.5 mm when breaker closed position	If it is less than 1 mm, Vacuum Interrupter needs to be replaced.
		Vacuum integirty	See check on vacuum (6.1)	The interrupers should withstand the test.	Vacuum interrupter should be replaced if found defective. The manufacturer should be consulted for replaceing the vacuum interrupter
		Number of operations	Counter	When counter reading reaches 10,000 check vacuum. If OK, continue to use and check again when counter reading reaches 15,000. Check vacuum and if O.K. continue to use. Check again at 20,000 oeprations	Vacuum Interrupter should be replaced, if vacuum is not OK or when counter reaches 20,000 operations.
4.	Ausiliary Switch	Terminal	Tighten by screw driver	There should be no loose connection	Retighten if found loose
		Case & contacts	Visual check	There should not be any damage	Replace if found damaged
5.	Main Power Circuit	Discoloration of contact surface by heat	Visual Check	There should not be aany discoloration	Check contacts and joints. Apply petroleum jelly, if required.

Sr. No.	Check Point	Item	Checking Method	Criteria	Actions required
6.	Control circuit	Operate Breaker	Check at test position	Smooth operation	Check circuit and operation of micro switches & auxiliary switch
7.	Control Circuit disconnect contacts (only for automaatic disconnect contacts)	Insulating part	Visual Check	There should not be any damage	Replace if any dmage is found
		Contact Switch	Visual Check	Petroleum jelly layer	Apply petroleum jelly
8.	Barrier (Vacuum interrupter support)		Visual Check	There shoul be no dust of foreign matter	Clean by compressed air and then wipe with clean and dry cloth.

Sr. No.	Check Point	Item	Checking Method	Criteria	Actions required
9.	Measurement of Insulation resistance	Measuring Location	Insulation resistance	Megger	When insulation resistance between the main circuit terminals is low, clean vacuum interrupter surface by clean and dry lint free cloth and recheck.
		Main conductor to ground	500 M Ohm or more	1000 V	
		Control circuit to ground	2 M Ohm or more	500 V	
		Between main circuit terminals when breaker OPEN	100 M Ohm or more		