Type UR Tap Changer for Tap Changing Under Load

INSTRUCTIONS

GENERAL

The type UR tap changer for changing taps under load consists of a set of transfer switches, a set of reversing switches and a motor driven operating mechanism. Pilot motor and limit switches in conjunction with a magnetic brake insure the tap changer stopping on position. Only periodical inspection of contacts and adjustment of the brake shoes are ordinarily required.

CONSTRUCTION

The stationary transfer switch contacts are mounted on insulating panels and are arranged in three vertical rows, one row for each phase. The moving contacts are mounted on a second insulating panel, rigidly fixed to a moving hub which is operated in a vertical plane by a reversing worm on which the hub rides. The two preventive auto-transformer busses per phase are mounted so that the moving panel slides between the stationary contacts and the busses. As the hub moves on its worm, the moving contacts connect first the two preventive auto-transformer busses to one transformer tap, then one bus to each of two adjacent taps, and then both busses to the second tap, thereby effecting a tap change with the most simple mechanical movement possible.

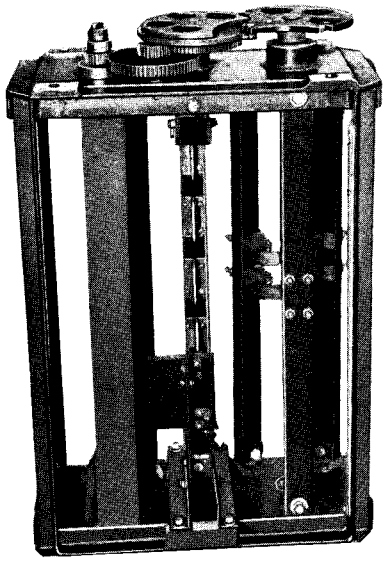

FIG. 2—TOP VIEW OF SINGLE PHASE TAP CHANGER WITH CONTROL MECHANISM REMOVED, SHOWING GENEVA GEAR TRAIN

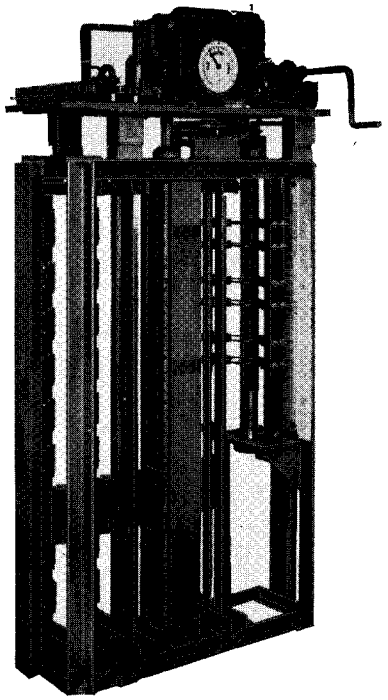

FIG 1—TYPE UR TAP CHANGER MECHANISM ASSEMBLY AS REMOVED FROM TANK

The reversing switch stationary contacts are also arranged in vertical rows and mounted on insulating panels. The moving contacts are mounted on an insulating shaft which rotates about a vertical axis. The reversing switch shaft is rigidly connected to the transfer switch worm shaft by means of a Geneva Gear and pinion. As the tap changer moves through the mid-position, the reversing switch rotates through a small angle, closing the open switch and opening the closed switch, thereby reversing the series winding.

The tap changer is driven directly through a reduction unit by a small motor, thereby giving a solid mechanical drive. The entire mechanism is supported from a base plate which is bolted to four supporting lugs inside the tap changer section of the tank, so that after the cover is removed and leads disconnected, the entire mechanism may be lifted from the tank as a unit.

All main contacts are of the wedge and finger type. With this type of contacts, the mechanical forces in the circuit under heavy overload do not tend to open the contacts since the forces are in quadrature with the contact pressure forces.

All contacts subject to arcing are made of, or are faced with an arc-resisting and high-melting point alloy giving long life to the contacts.

The speed of separation of the arcing contacts is such as to keep arcing to a minimum consistent with good mechanical design.

The operating motor is a single phase reversing capacitor motor with an integrally mounted reduction gear. This motor is coupled directly to the reversing worm shaft and through gears to the pilot and limit switches, the position indicator, and the hand crank.

The principle of operation of the method used for changing taps is shown in the sketch, Fig. 4, which represents a portion of a transformer winding to which a tap changer is connected. The sketch is drawn showing the whole regulating winding in the circuit. To change taps one step, the tap changer transfer switch moves so that one preventive auto-transformer terminal is moved from 3 to 4 and the preventive auto midpoint assumes a voltage which is half way between these two taps. To change another step, the other preventive auto-transformer terminal is moved from 3 to 4 and the midpoint now has the same voltage as tap 4. This sequence is con-

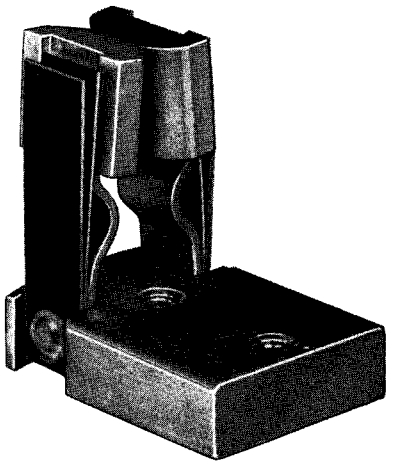

FIG. 3—MAIN MOVING CONTACT

Type UR Tap Changer for Tap Changing Under Load

INSTRUCTIONS—Continued

tinued from tap to tap until both preventive auto-transformer terminals are on tap 7. On all the positions from the beginning of the discussion to this point, the switches A and C have been closed, but not both. On the position with both preventive auto-transformer terminals on 7, A, B, C and D are all closed. As the operation continues, one preventive auto-transformer terminal moves back to 6 due to the reversal of worm on the shaft after A and C opens. In this way, the reversing switches are operated when there is no voltage across them and there is, therefore, no burning of these contacts. The opening of A and C and closing of B and D reverses the connections to the tapped winding and so changes the tap changer from bucking to boosting. The series transformer is used whenever either the voltage between taps or the current in the winding exceeds the rating of the tap changer.

MAINTENANCE

The type "UR" tap changers are designed to operate with a minimum amount of maintenance but should be given a periodical inspection at least once a year.

Oilless bushings and stainless steel shafting are used throughout the mechanism above the oil level, and the worm gear housing is packed with oil at the factory.

The motor brake should be inspected to make sure that the tap changer is stopping on position. If the mechanism is drifting past position, the brake springs should be tightened until the tap changer again stops on position. See instructions on name plate attached to the brake.

Maintenance of the transfer switch contacts will depend upon the load the regulator is called upon to carry. There is no voltage across the reversing-switch contacts or the preventive auto-transformer bus contacts so that these contacts will require no maintenance. The transfer switch contacts are made of special alloys having a high conductivity and also a high melting point so as to resist burning. These contacts should, however, be inspected and replaced if necessary, at the time of the periodical inspection.

The oil in the tap changer compartment should not be allowed to deteriorate to the point where it tests less than 15 Kv. in the standard test cup. The oil level should be checked at the time of the periodic inspection.

RENEWAL PARTS

The customer will find that only a minimum of renewal parts will be required for the type "UR" tap changer. It is recommended that a complete set of stationary and moving arcing contacts for the transfer switches be kept in stock for replacement when necessary. These are the only parts which will be required normally, but if the customer desires a more complete stock, the following is recommended.

1 Motor and Brake Complete
1 Set Cover Plate Gaskets
1 Cover Bushing

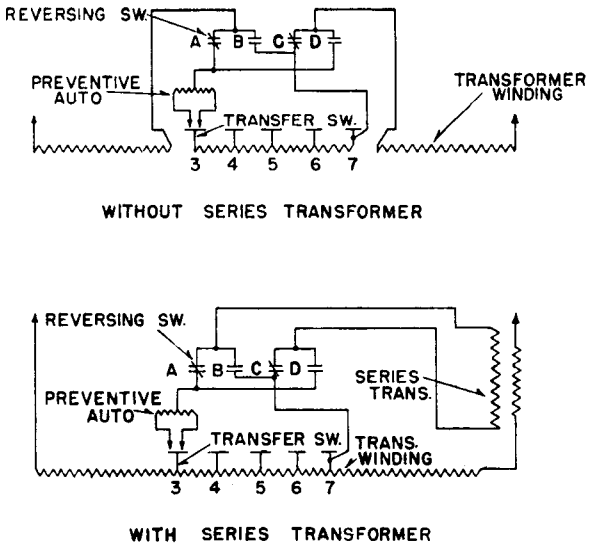

FIG. 4—UR TAP CHANGER CONNECTIONS

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