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TAP CHANGING TRANSFORMER

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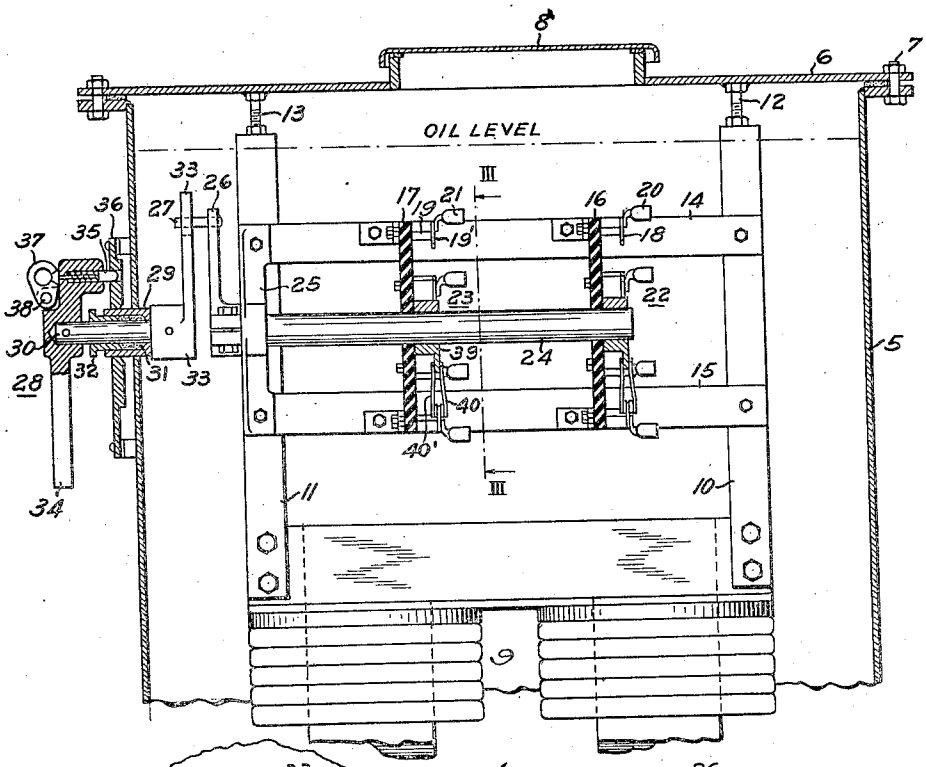


Fig. 1.

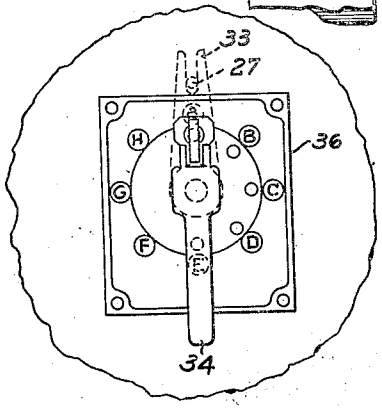


Fig. 2

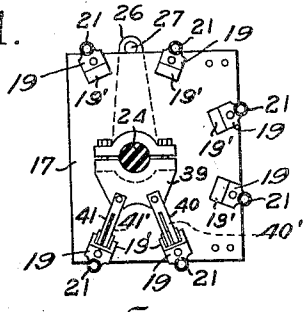


Fig. 3

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TAP CHANGING TRANSFORMER

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4 Claims. (Cl. 171—119)

This invention relates in general to circuit makers and breakers and more particularly to a switch having an operating mechanism extending through a casing for actuating contacts immersed in a liquid within the casing.

The problem which applicant has solved is best understood by reference to the transformer tap-changing art, but it is to be understood that applicant's invention is not limited thereto. In the aforesaid art it is customary to provide a tapped winding mounted within a casing having a cover and to provide a tap-changing switch which is operable by a rod extending upwardly through the cover, the switch operating mechanism being mounted on the cover in order that the transformer may be untanked without disconnecting the connections between the winding and the switch contacts. In such constructions the switch mechanism usually extends vertically a considerable distance below the oil level which makes it difficult to inspect the condition of the contacts through the hand hole in the cover. In such devices, particularly in large transformers, it is inconvenient to operate the tap-changer from the top of the transformer, and actually dangerous because of the proximity to conductors carrying high voltage. It is also practically impossible to determine or check the position of the tap-changer from the ground while the transformer is in service.

An object of this invention is to provide an improved switching mechanism which overcomes the above objections.

Another object of this invention is to provide a switch mechanism in which the contacts are mounted in a tank under an insulating liquid and are actuated by operating means extending through a stuffing box in the side wall of the casing.

Another object of this invention is to provide a switching mechanism having contacts immersed in an insulating liquid in a tank, an operating mechanism outside of the tank and a detachable connection between the contacts and operating mechanism permitting untanking of the switch contacts without lifting out the operating mechanism.

A further object of this invention is to provide a removable tap-changing mechanism for transformers and the like in which the contact assembly is disposed horizontally in a tank above the windings to be controlled.

These and other objects and advantages are obtained by this invention, various novel features of which will be apparent from the description and drawing herein, and will be more particularly pointed out in the claims.

An illustrative example of the application of this invention is shown in the accompanying drawing, in which:

Figure 1 is a side view of a transformer showing the casing in section and embodying this invention;

Figure 2 is a fragmentary end view of the switch operating mechanism shown in Figure 1; and

Figure 3 is an end view of the switch contact assembly taken on line III—III.

Referring now to Figure 1, the numeral 5 shows the side wall of a transformer and 6 is a cover which is attached thereto by means of any suitable clamping means such as 7. A hand hole cover 8 is provided in the tank cover 6 for permitting access to the interior of the tank. A transformer core and winding assembly 9 is mounted within the transformer casing and is provided with four upright supporting members of which two (10 and 11) appear in this view. These upright supporting members are, in some instances, attached to the cover 6 by suitable means such as adjusting bolts 12 and 13. If it is desired to remove cover member 6 without disturbing the core and winding assembly and the tap-changing mechanism, the connection between the upright members and the cover, namely, bolts 12 and 13, may be omitted.

A pair of horizontal insulating cross members 14, 15 are attached to the upright members 10, 11. A pair of insulating panels 16 and 17 are vertically attached to the horizontal members 14, 15 by means of angle brackets. A plurality of stationary contacts 18, 19 are mounted upon the respective panels 16 and 17. A plurality of terminal lugs 20 and 21 are connected to the stationary contacts 18, 19 respectively, and are adapted to receive leads from the taps on the transformer winding, the connections being made in a manner well known in the art. The stationary contacts 18, 19 are each provided with a flat blade portion 18', 19' arranged on the arc of a circle. Two rotary contact assemblies 22, 23 are mounted on the same insulating shaft 24 which extends through holes in panels 16 and 17. One end of the insulating shaft 24 is provided with a bearing 25 which is attached to the upright supporting member 11. A crank 26 is clamped to the insulating rod 24 and is provided with a pin 27.

A switch operating mechanism generally indicated by 28 is mounted outside the side wall 5

of the transformer tank. This mechanism comprises a stuffing box 29 which is attached to the side wall 5. A rod 30 extends through stuffing box 29. Oil from the interior of the tank is prevented from leaking through the stuffing box by means of packing 31 and a packing nut 32. To the inner end of rod 30 is attached a forked crank member 33 having a slot in the end thereof adapted to receive pin 27. To the other end of rod 30 is attached an operating handle 34 which is provided with a locking mechanism which comprises an arm in which spring pressed locking pin 35 is located. Locking pin 35 is adapted to engage holes in indicator plate 36 which is attached to transformer wall 5. The outer end of locking pin 35 is provided with a pull ring 37 and a hole 38 which is so alined with holes in the arm of the operating handle 34 that the hasp of a padlock may be inserted therethrough.

Referring now to Figure 2, it is seen that the indicator plate 36 is provided with a plurality of holes arranged on the arc of a circle and adapted to receive locking pin 35. These holes, which are marked by indicating numerals A to H, inclusive, determine and indicate the position in which respective contracts of the switch mechanism are maintained during operation of the transformer. Obviously a fewer or greater number of contacts than shown may be arranged in the arc of a circle depending upon the number of adjustments desired. It is to be noted that this figure also shows the manner in which pin 27 cooperates with forked crank member 33.

Figure 3 shows more in detail the arrangement of stationary and movable contacts noting that the rotary contact assembly 23 comprises a hub member 39 and two pairs of contacts 40, 40' and 41, 41' attached thereto. Each of these contacts consists of a pair of bifurcated spring biased contact members 40, 40', and 41, 41' adapted to wipe two sides of the flat portions 19' of contact members 19. Contacts 40, 40' and 41, 41' are all electrically connected by hub member 39. It is to be understood that other forms of rotary switches may be used in place of the form shown without departing from the spirit of this invention.

In operating the above described mechanism it is necessary first to deenergize the transformer, then unlock the pull ring 37, disengage locking pin 35 from one of the holes in plate 36 by pulling ring 37, and then move the switch to the desired position noting that the locking pin will snap into the selected hole when the desired position is reached. Although the drawing shows but two sets of panels with contacts thereon, it is to be understood that a greater number of switch units may be operated from the same insulating shaft, noting for example, that in a three-phase transformer three or six switch units will be used, depending upon the manner in which the taps are made.

Should it be desired to untank the transformer it is only necessary to move the operating handle to position A in which the forked lever 33 extends vertically upward. Then the cover clamps may be removed and the transformer untanked by hoisting the cover and the core and coil assembly and the switch mechanism mounted thereon. It is to be understood that if the core and coil assembly is not attached to the cover 6 that the cover may first be removed and then the coil and core assembly together with the tap-changing mechanism attached thereto may be hoisted from the tank. In assembling the device it is only necessary to aline the pin 27 with the slot in lever 33 so that when the transformer core and coil assembly is lowered into the casing an operating connection will be established between the switch operating mechanism and the tap-changing mechanism.

It is to be understood that the disclosure herein described is merely illustrative of the invention and is not to be taken in a limiting sense, changes in details of construction and arrangement of parts being permissible so long as within the spirit of the invention and the scope of the claims which follow.

It is claimed and desired to secure by Letters Patent:

1. In combination, a transformer casing having a removable cover, a core and coil assembly mounted within said casing and attached to said cover, a tap-changing mechanism attached to said core and coil assembly, a body of liquid covering said core and coil assembly and said tap-changing mechanism, a horizontally disposed insulating shaft for operating said mechanism, a metal shaft extending horizontally through said casing below the level of said body of liquid, a stuffing-box for said metal shaft, a disconnectible connection between said metal shaft and said insulating shaft whereby said cover, said core and coil assembly and said tap-changing mechanism may be removed from said casing as a unit, a handle connected to said metal shaft, and means for locking said handle in any one of a plurlity of positions.

2. In combination, a transformer casing, a body of liquid within said casing, a core and winding assembly immersed in said body of liquid, a rotary tap-changing switch attached to said core and winding assembly and immersed in said liquid, a stuffing box attached to said casing, a shaft extending horizontally through said stuffing box for operating said switch, an indicating plate surrounding said stuffing box and having a plurality of holes therein, a handle attached to said operating rod, a spring biased plunger carried by said handle and adapted to pass into said holes so as to retain said handle in any one of a plurality of positions, and a pin and fork connection between said shaft and said tap-changing switch whereby said tap-changer switch and said core and winding assembly may be removed as a unit when said handle is retained in one of said plurality of positions.

3. A transformer comprising a casing having a side wall and a removable cover, a core and winding assembly arranged within said casing and attached to said cover so as to be removable therewith, a tap-changing switch mounted on said core and winding assembly and having a plurality of stationary contacts connected to various turns of said winding, said switch also having a rotary contact actuating member horizontally mounted on said coil and winding assembly, manually operable mechanism mounted on the outside of said side wall and having an operating shaft extending through said side wall coaxial with said contact actuating member, and a pin and fork connection connecting said operating shaft and said actuating member so that said cover, said tap-changing switch and said core and winding assembly may be removed from the side wall of said casing independent of said manually operable mechanism.

4. A transformer comprising a casing hav-

ing a side wall and a removable cover, a core and winding assembly arranged within said casing, a tap-changing switch mounted on said core and winding assembly so as to form a removable unit, said switch also having a plurality of stationary contacts connected to predetermined points of said winding and a rotary contact actuating shaft extending horizontally to a point adjacent said side wall, tap-changer operating mechanism mounted on the outside of the said side wall and including an operating shaft extending through said side wall, and means for drivingly connecting said rotary contact actuating shaft with said operating shaft, said connecting means being so constructed as to cause the automatic disconnection thereof upon the removal of said core and coil assembly and said tap-changing switch as a unit when said tap-changer operating mechanism is in a predetermined position.

LELAND H. HILL.