Sept. 18, 1928. 1,684,650

G. H. TUTTLE

TAP CHANGER

Filed June 2, 1927

Fig. 1.

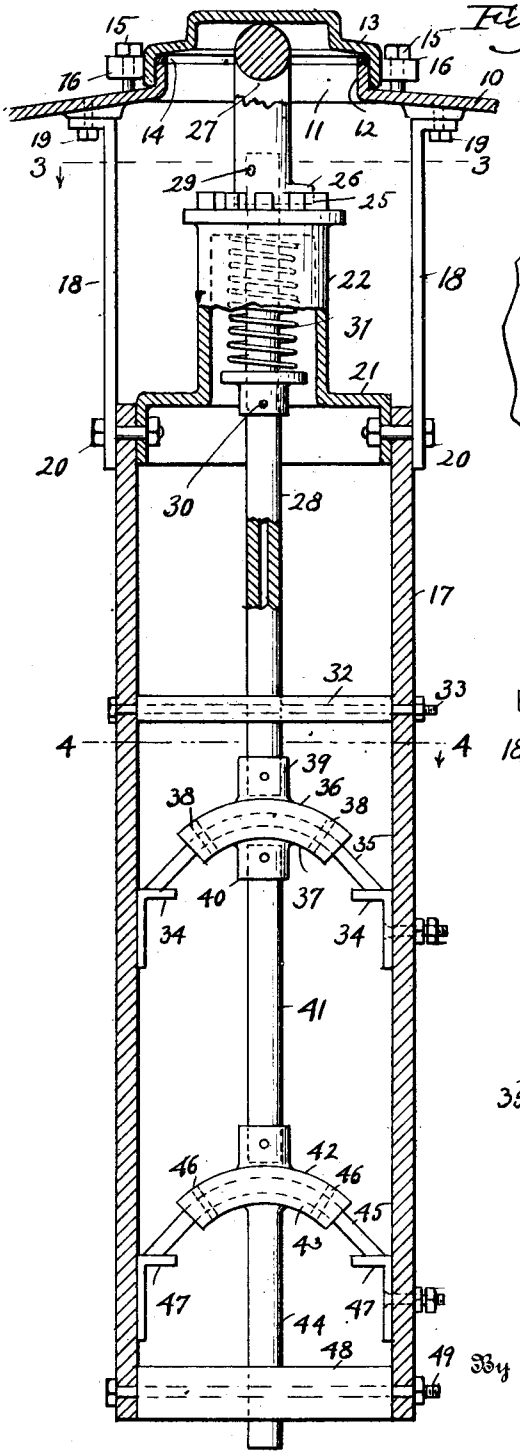


Fig. 2.

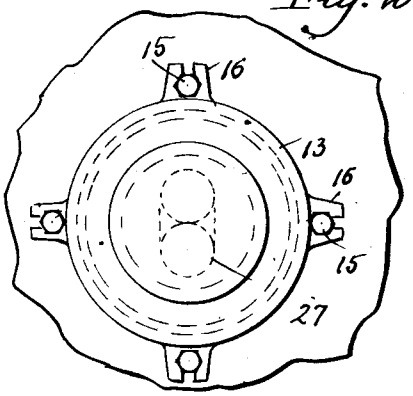


Fig. 3.

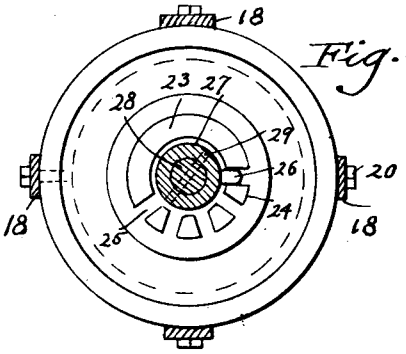
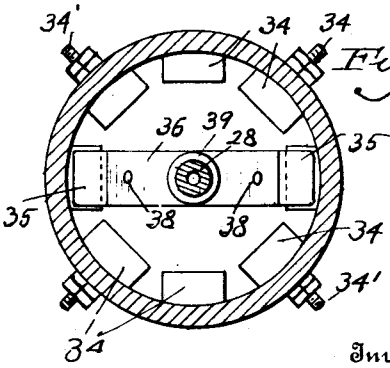


Fig. 4.



Inventor

George H. Tuttle

By Kerr Hudson & Kent

Attorneys

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UNITED STATES PATENT OFFICE.

GEORGE H. TUTTLE, OF WARREN, OHIO, ASSIGNOR TO THE PACKARD ELECTRIC COMPANY, OF WARREN, OHIO, A CORPORATION OF OHIO.

TAP CHANGER.

Application filed June 2, 1927. Serial No. 195,973.

This invention relates to tap changers for transformers, and more particularly to that type of tap changer which is located within the transformer tank. Heretofore it has been common practice to have the operating means for the tap changers extended through the top of the tank so as to be accessible for operation from the outside thereof. While this has advantages from the standpoint of convenience and ease of operation, it has disadvantages from the standpoint of keeping moisture out of the tank, because it is difficult to make a sliding joint so that it will remain moisture-tight for a long period of time, particularly when the joint is exposed to the weather as must be the case in many transformers.

It is, accordingly, one object of the present invention to provide a tap changer that is located entirely within the tank of the transformer and that is nevertheless adapted for convenient operation.

Another object is the utilization of the tank hole cover as a means for holding the tap changer operating rod against accidental movement due to surges of current in the line to which the transformer is connected so that the tap changer will be locked in any position in which it is set by securing the cover in place, and by virtue of which it is impossible to lock the cover down unless the tap changer is in one of its operative positions.

Other objects will appear as I proceed with the description of that embodiment of the invention, which, for the purposes of the present application, I have illustrated in the accompanying drawing, in which:

Fig. 1 is a longitudinal central sectional view through a tap changer and a fragment of a transformer tank in which it is used.

Fig. 2 is a plan view of a fragment of the top of the tank showing the tank cover in place.

Fig. 3 is a horizontal sectional view taken substantially on the line 3—3 of Fig. 1.

Fig. 4 is a horizontal sectional view taken substantially on the line 4—4 of Fig. 1.

Similar reference characters refer to like parts throughout the views.

In the drawing, a fragment of the top of a tranformer tank as indicated at 10. The tank has an opening 11 preferably in its top side, which opening is surrounded by an upwardly extending flange 12. The opening referred to is closed normally by a cover 13, a gasket 14 being interposed between the cover and the flange 12 to seal the joint for the purpose of keeping moisture out of the tank.

The cover 13 is held down and a tight union with the gasket obtained by means of studs 15 extending through slotted projections 16 on the cover and into tapped holes in the tank 10.

A tubular element 17 of insulating material is positioned in the tank in alignment with the opening 11, being supported by hangers 18 which are flanged at their upper ends in order to accommodate stud bolts 19, by means of which the hangers are secured to the tank 10.

The lower ends of the hangers 18 are perforated to receive bolts 20, which also extend through openings in the tubular element 17 and through openings in a cap 21. The number of hangers employed is not material, four being shown herein by way of example. The cap 21 has a central upward extension 22 on the top of which there is an arcuate lug 23 and a series of smaller lugs or teeth 24 by means of which there is formed a series of intervening radial sockets 25.

Cooperating with the sockets 25, there is a lug 26 formed integral with a handle member 27 which is drilled upwardly from the bottom to receive snugly the upward extremity of a rod 28 of insulating material, the rod and handle being secured together by means of a pin 29. The cap 22 is also provided with a central opening through which the rod 28 extends with a sliding fit.

A collar 30 is pinned to the rod 28 somewhat below the top of the cap 22 and forms an abutment for the lower end of a coil spring 31, the upper end of which presses against the under side of the cap. In order to guide and steady the rod 28, I provide a disk 32 of insulating material fitted into the tube 17 and held in position by any suitable means, such, for example, as by a pair of fiber bolts 33 arranged upon opposite sides of the center of the disk, the latter being bored at the center to form a bearing for the rod.

Below the disk 32, I arrange a series of angular contact plates 34 with their upper surfaces in the same horizontal plane held in place by bolts 34′ which serve also as binding posts, to which may be connected electrically the leads or taps of some of the windings for the transformer. Diametrically op-

posite pairs of contacts 34 are arranged to be connected by a brush 35 which I prefer to form of a series of laminated metal strips drawn into arcuate form as shown by means of castings 36 and 37 which are secured to the brush by fastenings 38 or the like. The upper casting 36 has a socket 39 in which is received and pinned the lower end of tubular rod 28, while the lower casting 37 has a similar socket 40 which receives and has pinned thereto the upper end of a second tubular rod 41, also of insulating material.

At the lower end of rod 41 there is a casting 42, identical with casting 39 and secured to the rod in the same way that casting 39 is secured to rod 28. Cooperating with the casting 42 is a casting 43 with an integral stem or rod 44. A brush 45 is formed into arcuate shape like the brush 35 by being compressed between the castings 42 and 43 and held thus by means of fastenings 46. Angular contact plates 47 similar to plates 34 are mounted on the tube 17 in position to be contacted by the brush 45, the plates 47 being adapted to be connected to other taps of the transformer. The lower end of the stem 44 slides in a hole provided in the center of an insulating disk 48 mounted similarly to disk 32 by means of fiber bolts 49.

In Fig. 1 of the drawings, the parts are shown in their normal operative positions. When it becomes desirable to change the taps of the transformer, the operator removes the studs 15, lifts off the cover 13, grasps the handle 27 and lifts it up sufficiently against the action of the spring 31 to enable the lug 26 to clear the lugs 23 and 24, thus raising brushes 35 and 45 away from their contact plates 34 and 47. The operator then turns the handle 27 to the position desired and permits spring 31 to force the movable parts down until the lug 26 is seated in the desired socket 25 and the brushes 35 and 45 are accordingly caused to bridge different pairs of contacts 34 and 47. Now when the cover 13 is replaced and locked down by the studs 15, it meets or substantially meets the top of the handle 27. By this means rods 28, 41 and 44 and the brushes 35 and 45 are held down, so that any surges on the line to which the transformer is connected will not disengage the brushes 35 and 45 from the plates with which they are in contact.

Furthermore, if the operator should fail to properly set the tap changer as, for instance, when the lug 26 rested on the sector 23 or one of the lugs 24, instead of entering one of the sockets 25, then he would be unable to replace the cover 13, and hence the failure to properly set the tap changer would be called to his attention.

Having thus described my invention, what I claim is:

1. In a transformer, a tank having an opening therein, a removable cover adapted to be secured thereto, a tube of insulating material supported within said tank, a plurality of contacts mounted on the inside of said tube, an axially movable and rotatable rod arranged within said tube, a brush carried by said rod and arranged to engage said contacts, a handle secured to said rod, cooperating means carried by said tube and said handle within the tank for locating said brush in its different positions, said cover when in closed position being adapted to hold said rod against axial movement.

2. In a transformer, a tank having an opening therein, a removable cover adapted to be secured to the tank, a tap changer within the tank comprising an axially movable rod, and means associated with the rod and adapted to be engaged by said cover when in closed position for holding said rod against axial movement.

3. In a transformer, a tank having an opening therein, a removable cover adapted to be secured thereto, a tube of insulating material supported within said tank in alignment with said opening, a plurality of contacts mounted on the inside of said tube, an axially movable and rotatable rod arranged within said tube, a brush carried by said rod and arranged to engage said contacts, a cap secured to said tube within the tank, and cooperating means carried by said cap and said rod for locating said brush in its different positions, said cover when in its closed position being adapted to hold said rod against axial movement.

4. In a transformer, a tank having an opening therein, a removable cover adapted to be secured to the tank to close said opening, a tap changer within the tank comprising an axially movable and rotatable rod, and a handle for said rod, said cover when in closed position being adapted to engage with said handle and hold the rod against axial movement.

5. In a transformer, a tank having an opening therein, a removable cover adapted to be secured to the tank to close said opening, a tap changer within the tank comprising an axially movable and rotatable rod, means for holding said rod in adjusted positions against rotative movement, and means associated with the rod and adapted to be engaged by said cover when in closed position for holding said rod against axial movement.

6. In a transformer, a tank having an opening therein, a removable cover adapted to be secured to the tank to close said opening, a tap changer within the tank comprising an axially movable and rotatable rod, means for holding said rod in adjusted positions against rotative movement, and a handle for said rod, said cover when in closed position being adapted to engage said handle to hold the rod against axial movement.

7. In a transformer, a tank, a tap changer located wholly within the tank and compris-

ing an axially movable and rotatable rod, means for releasably holding the said rod in various positions of adjustment, a handle for the rod within said tank, said tank having an opening through which said handle may be reached, and a cover for said opening.

8. In a transformer, a tank having an opening therein, a removable cover adapted to be secured to the tank, a tap changer within the tank comprising a movable rod, and means associated with the rod adapted to be engaged by said cover when in closed position for holding said rod against movement.

9. In a transformer, a tank having an opening therein, a removable cover adapted to be secured to the tank, a tap changer within the tank comprising a rotatable rod accessible for operation through said opening, means for securing the cover in closed position, and means entirely within the tank for holding said rod against rotary movement.

In testimony whereof, I hereunto affix my signature.

GEORGE H. TUTTLE.