Oct. 17, 1944. A. G. STEINMAYER ET AL 2,360,801

SWITCH OPERATING MECHANISM

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Fig. 1

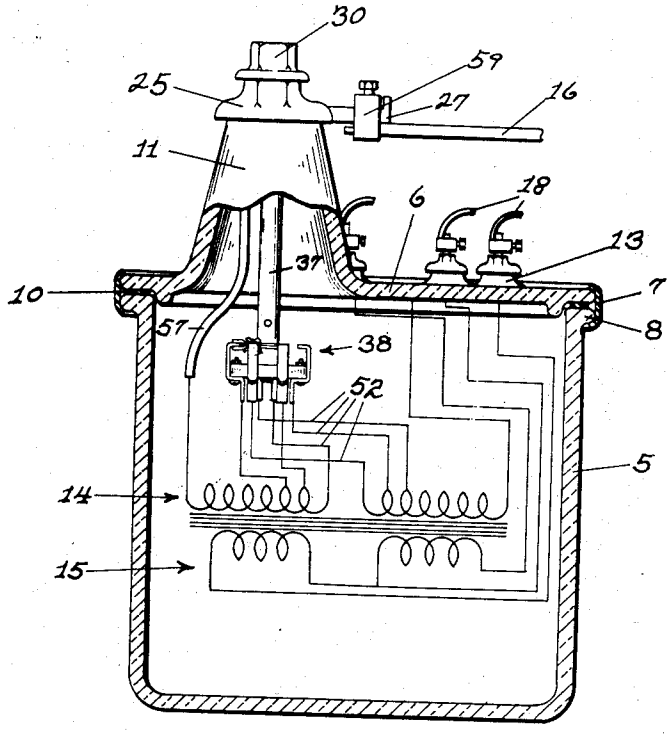
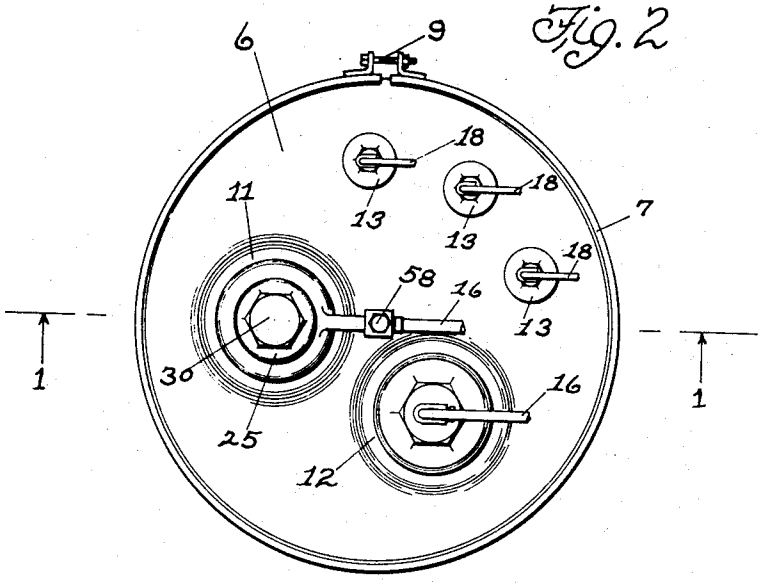


Fig. 2



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Fig. 3

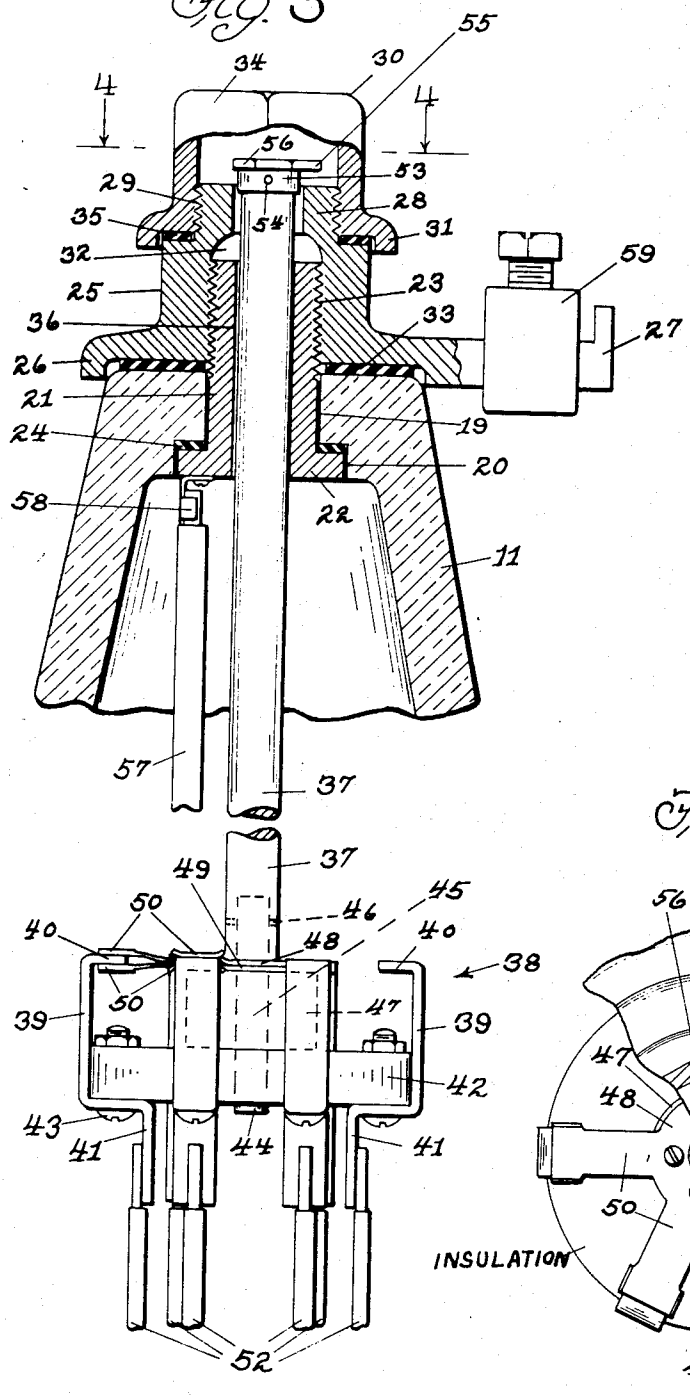
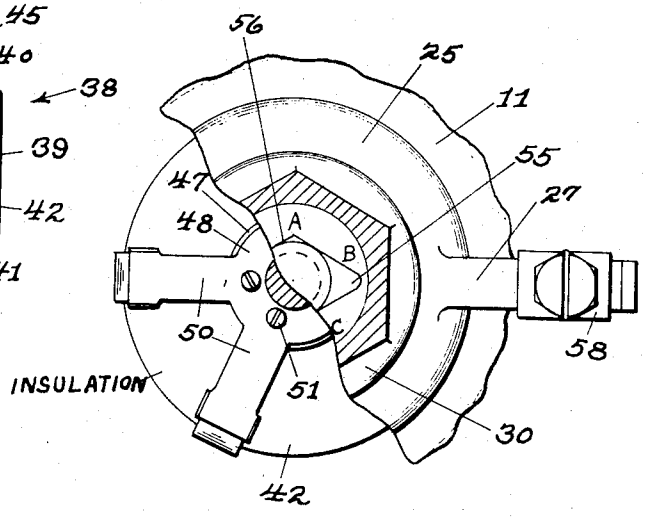


Fig. 4



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UNITED STATES PATENT OFFICE

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SWITCH OPERATING MECHANISM

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Application September 21, 1940, Serial No. 357,680

3 Claims. (Cl. 174—167)

This invention relates to switch operating mechanism for transformers.

With transformer housings including the cover being made of insulating material, as for example glass, it is electrically and economically desirable to provide a minimum of transformer connections through the housing since each connection is a possible source of moisture leakage and each connection requires a positive moisture sealing mechanism.

In providing a transformer with an exteriorly operable switch operating or tap changing mechanism it is desirable to have the operating handle of the tap changer extend through one of the bushings of the transformer, thereby eliminating a separate connection through the housing. In providing this arrangement of parts it is also desirable to provide a simple, positive, and economic sealing mechanism adapted to prevent moisture leakage through the bushing and provide a terminal connection for line conductors.

Therefore, it is an object of this invention to provide for a transformer a tap changer including an operating member extending through a transformer bushing and a sealing mechanism adapted to prevent the entrance of moisture into the transformer and adapted to provide a terminal connection for line conductors.

More specifically, it is an object to provide for a transformer bushing a sealing mechanism including a bearing and a pair of sealing members, which mechanism acts in bearing relationship with the tap-changer operating member to provide a simple, efficient, and economical seal against moisture.

In the drawings:

Fig. 1 is a view in side elevation, partly in section, showing a glass housed transformer embodying the improved tap changer. The primary and secondary coils of the transformer are represented diagrammatically.

Fig. 2 is a top plan view of Fig. 1.

Fig. 3 is an enlarged view in side elevation, partly in section, showing the tap changer and sealing mechanism.

Fig. 4 is a view taken on the line 4—4 of Fig. 3.

In the drawings, numeral 5 designates a transformer tank or housing made of any suitable insulating material such as glass and provided with an insulating cover 6 which is removably held in place by the metal band 7 spun inwardly at its upper and lower sides to engage the cover and rim 8 respectively as shown. The band is held in place by means of the bolt 9 as shown. A gasket is provided at 10 to insure a positive water-tight seal between the cover 6 and the container 5.

The cover 6 is provided with a pair of integral primary bushings 11 and 12 and three integral secondary bushings 13, each of which provides means for electrically connecting the primary and secondary coils 14 and 15 respectively, and corresponding primary and secondary conductors 16 and 18 respectively.

The mounting of the tap changing mechanism with the primary bushing 11 is shown in detail in Fig. 3 in which the upper end of the bushing is shown provided with an aperture 19 and a recessed portion 20.

A metal bearing or sleeve 21 flanged at 22 and threaded at 23 is inserted through the aperture 19 so that the flange 22 is received in the recessed portion 20 where it is held against a gasket 24 by means of a terminal cap 25.

The metal terminal 25 is provided with a depending flange 26 and an integral connector arm 27 extending horizontally outwardly from one side of the terminal as shown.

The upper portion of the terminal 25 is provided with a reduced portion 28 threaded at 29 to receive a sealing cap 30.

The terminal 25 is provided with a bore portion 32 extending throughout the full length of the terminal and threaded as shown to receive the thread end of the bearing 21. A gasket 33 is mounted on the upper end of the bushing 11, forming a cushion and moisture seal between the terminal 25 and the bushing by drawing the terminal tightly upon the sleeve 21.

The sealing cap 30 is provided with a depending flange 31 and a hexagonal portion 34, whereby the cap may be secured in positive sealing contact against the gasket 35 by any convenient means as a wrench (not shown).

It may be noted that the interconnected parts 21, 25, and 30 provide a positive seal against the entrance of moisture through the bushing 11 into the transformer container below and the sleeve 21 provides a bearing surface 36 for the operating member 37.

The operating member or shaft 37, made of any suitable insulating material as "Bakelite," is mounted through the bore portion 32 and journaled in the sleeve 21.

The lower end of the shaft 37 is connected to a stationary finger contact assembly 38 commonly used and comprising six metal contact fingers 39 bent as shown to form the contact portions 40 and 41 at the upper and lower ends respectively, and mounted in spaced relationship to each other

about the periphery of an insulating disk 42 by means of bolts 43.

The lower end of the shaft 37 is pivotally mounted on the disk 42 by means of a rod 44 squared intermediate its ends at 45 and held in position with the shaft 37 by means of a pin 46 as shown.

A metal hub 47 is mounted on the squared portion 45 of the rod 44 and provided at its upper end with an upper and lower resilient contact disk 48 and 49 respectively. Each disk 48 and 49 is provided with a pair of integral contact fingers 50 angularly spaced from each other. Each pair of fingers is held in operative relationship to the other by means of bolts 51 which prevent one disk from turning relative to the hub 47.

The lower end of each finger 39 is electrically connected to one of six different leads 52, each of which is diagrammatically shown in Fig. 1, and represent desired tap connections on the primary coil 14.

The upper end of the shaft 37 is provided with a knob 53 secured thereto by means of a pin 54. The knob is provided with a pointer portion 55 and a hexagonal head 56 adapted to receive any suitable turning means as a wrench (not shown) whereby any adjacent pair of fingers 39 may be electrically connected by rotating the fingers 50 into position so that their outer ends receive the contact portions 40 therebetween, as shown.

Each of the six desired tap connections on the primary coil is indicated on the upper face of the terminal 25, three of which are shown stamped in letters A, B, and C. As the pointer 55 is rotated from letter to letter, the fingers 50 engage with any corresponding pair of adjacent fingers 39, thereby connecting into or out of circuit a greater or lesser number of turns on the primary coil 14.

The primary lead 57 is connected to the flange 22 of the sleeve 21 by means of the clip 58 as shown. It may be noted that the primary conductor 16 which is electrically connected to the arm 27 by means of the connector 59 makes electrical connection with the primary lead 57 through the terminal 25 and the sleeve 21 and that this connection permits an operator to remove the sealing cap 30 and make any desired tap adjustment without removing the primary conductor 16 or disturbing it in any way.

If it is desired to remove the cover 6 for any reason, the operation is made by releasing the bolt 9 and removing the band 7 and turning the pointer 55 to any position intermediate any adjacent pair of letters. This will disengage the fingers 50 from any adjacent pair of fingers 39 and allow an operator to raise the cover a short distance, thereby disengaging the rod 44 from the disk 42. The primary and secondary leads may then be disconnected from the primary and secondary bushings and the cover entirely removed from the tank 5.

It is obvious that the objects of this invention have been accomplished by providing for a transformer bushing a sealing means adapted to provide a moisture seal for the transformer, a bearing means for the tap changer operating member and a terminal connection for line conductors.

We claim:

1. In a device of the character described, a combined sealing and terminal means associated with a transformer bushing of insulating material, a sleeve member terminating in a threaded portion exteriorly of said bushing, a terminal member threadedly mounted on said threaded portion of said sleeve whereby said members are held in sealing relationship with said bushing, a conductor connected to said sleeve interiorly of said bushing, said members being axially aligned relative to the bore portion of said bushing, whereby the operating handle of a switch means may extend therethrough, and a cap threadedly secured to said terminal to close the open end thereof.

2. In a device of the character described, the combination with a transformer bushing of insulating material having an aperture therethrough, a conductive sleeve extending through said aperture, said sleeve being supported by said bushing and having a bore and having a thread situated exteriorly of said bushing, means for securing said sleeve to said bushing, said means including a terminal member situated exteriorly of said bushing and having a thread engaging the aforementioned thread on said sleeve, an operating arm extending through the bore of said sleeve and through said terminal member to an exterior point where it is accessible for manual operation, and a cap threaded on said terminal member and enclosing the end of said shaft exteriorly of said terminal, said bushing, said sleeve, said terminal member, and said cap being in sealed relationship to the aperture of said bushing and bore of said sleeve.

3. In a device of the character described, the combination with a bushing of insulating material having an aperture therethrough provided with an inner annular shoulder, a conductive sleeve extending through said aperture and supported by said bushing, said sleeve having an external flange at one end within said bushing engaging said shoulder, said sleeve serving as a lead-in conductor and having a bore, a conductive member in threaded engagement with the outer end of said sleeve and operative conjointly with said flange for clamping said sleeve to said shoulder, said member including a terminal connector, a sealing gasket between said flange and said bushing, a sealing gasket between said conductive member and said bushing, an operating shaft of insulating material extending through the bore of said sleeve, a cap in threaded engagement with said conductive member and enclosing the exterior end of said shaft, said cap being detachable to afford access to said shaft, and a sealing gasket between said cap and said conductive member.

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