May 11, 1948. E. D. TREANOR 2,441,457

BUSHING CONSTRUCTION

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Fig. 1.

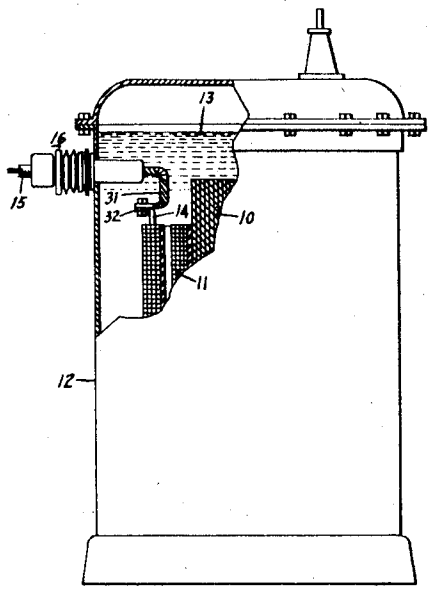
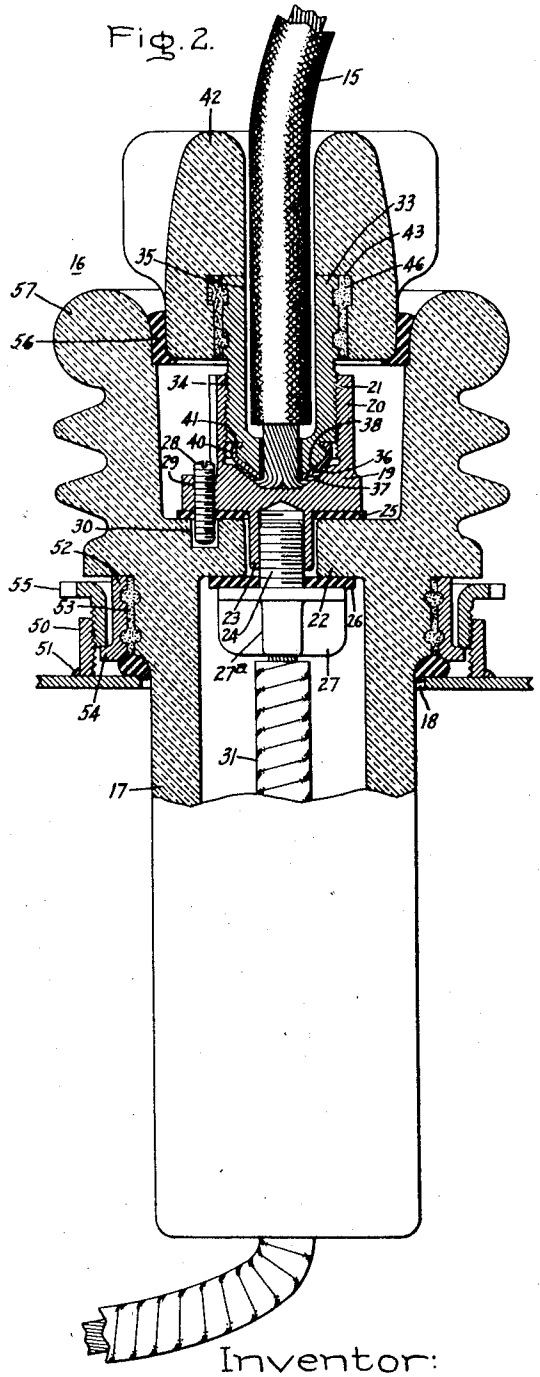


Fig. 2.



Inventor:
Edward D. Treanor,
by Harry E. Dunham
His Attorney.

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BUSHING CONSTRUCTION

Edward D. Treanor, Pittsfield, Mass., assignor to General Electric Company, a corporation of New York

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2 Claims. (Cl. 174—75)

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My invention relates to a bushing construction for accommodating a conductor passing through the tank wall of an electrical apparatus.

Electrical apparatus such as transformers and reactors usually include a tank enclosing the core and coils and a bushing construction within an opening in the tank walls through which electrical connection is made with a conductor inside the tank and electrically connected to the apparatus winding.

It is therefore an object of my invention to provide an improved bushing construction through which connection may be made to a winding lead or terminal inside a casing of an electrical apparatus which is simple in construction and reliable in operation.

Another object of my invention is to provide an improved bushing construction which has no exposed live parts and through which connection or disconnection may be made between an external line lead and a winding lead of an electrical apparatus.

A further object of my invention is to provide an improved bushing construction adapted to pass through an opening in an electrical apparatus casing with an improved structure for tightly securing the bushing to the casing externally of the casing.

Further objects and advantages of my invention will become apparent from the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In the drawing Fig. 1 is a side elevation partly broken away of an electrical apparatus such as a transformer which is provided with an improved bushing construction, and Fig. 2 is a sectional side elevation of the bushing construction employed in Fig. 1.

Referring more particularly to Fig. 1 of the drawing I have illustrated an electrical apparatus including a conventional core structure 10 and winding 11 surrounded by a casing 12. Within the casing is placed any suitable dielectric fluid indicated by the numeral 13. A lead 14 is provided which connects with the transformer winding 11 and a line lead 15 is provided external to the transformer for connecting the transformer in a suitable line or circuit.

In order to connect the winding lead 14 inside the transformer casing with the line lead 15 external thereto I provide my improved bushing construction indicated by the numeral 16 in Fig.

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1. This bushing construction which is illustrated in detail in Fig. 2 includes a tubular insulating member 17 which is adapted to pass through an opening 18 in the tank wall 12. Within the tubular insulating member I provide a first terminal member 19 which has an outwardly extending cup-shaped portion 20 which is internally threaded as indicated at 21. The terminal member may be supported within the insulating tubular member in any suitable manner and as will be seen in Fig. 2 I provide the insulating member with an inwardly extending shoulder indicated by the numeral 22 into which extends a tubular shape portion 23 which is integral with the cup-shaped portion 20 of the first terminal 19. A bolt member 24 has a portion which threads into an internally threaded bore of the tubular member 23 so as to relatively tightly support the cup-shaped member on the shoulder 22 through a suitable gasket 25. A second gasket 26 may also be provided between a head 27 of the bolt 24 so as to prevent injury to the insulating shoulder when the metallic members 19 and 27 are drawn up relatively tightly on the inner and outer surfaces thereof. The cup-shaped member 20 may be prevented from rotating when screwing the bolt 24 by providing a tap screw 28 which extends through a threaded hole 29 in the first terminal member 19 and extends into a hole 30 in the upper surface of the shoulder 22. The head 27 of the bolt is provided with a bore 27*a* at its inner end into which an end of a conductor or pigtail 31 may be attached in any suitable manner such as by welding or swaging. The other end of the pigtail then makes connection with a lug 32 on the end of the conductor lead 14, as is shown in Fig. 1. It is to be understood, of course, that if desired the conductor 14 could be sufficiently long to be connected directly to the bolt 27.

In order to provide an arrangement for connecting an end of the line conductor 15 to the first terminal 19 I provide a second terminal 33 which may be attached to the first terminal 19 in any suitable manner such as by having external threads 34 which cooperate with the internal threads 21 of the first terminal 19. The second terminal is also provided with an internal bore 35 through which the end of the line conductor 15 may extend. The short ends 36 may extend out through the inner end of the bore 35 and are bent over or turned over so as to be compressed between the adjacent surfaces of the first and second terminals so as to make a relatively good electrical connection between the

ends 36 of the line lead 15 and the first terminal 19 which is relatively tightly connected to the winding lead 14.

In order to provide a relatively good connection between the adjacent surfaces of the first terminal 19 and the second terminal 33, the internal surface of the cup-shaped member 20 is provided with a concave surface 37 and the terminal 33 is provided with a conical end or nose 38 which has substantially the same contour as the surface 37. In order to prevent the conical nose 38 from cutting the end strand 36 of the conductor 15 when the second terminal is relatively tighly screwed into the first terminal, I may provide a washer 40 which fits around the conical end 38 of the second terminal and which has an inwardly extending flange 41 which fits into a cooperating slot in the outer surface of the second terminal 33. It will therefore be seen that when the second terminal 33 is relatively tightly screwed into the cup-shaped first terminal, as the end 36 of the line conductor begins to bind on the adjacent surface 37 of the second terminal, the washer will be held stationary and the end of the second terminal will rotate with respect to the washer.

In order to provide a convenient way for gripping the second terminal 33, I provide a hand-grip member 42 which has an opening 43 at its inner end into which a portion of the second terminal 33 may be attached such as by cementing, as is illustrated by the numeral 46. This hand-grip which is made of any suitable material such as porcelain it will be seen also permits the securing of the lead without the operator's hand coming near or in contact with the end 36 of the line lead 15 which may be at high potential above ground.

In order to secure the bushing construction including tubular insulating member 17 to the tank wall, I provide an internally threaded nipple or ring 50 which is welded to the tank wall as is indicated by the numeral 51 around the opening 18. A ring 52 is provided around the outer surface of the bushing 17 which may be attached to the outer surface in any suitable manner such as by cementing as is indicated by the number 53. The ring 52 is provided with an outwardly extending shoulder 54 which is adapted to cooperate with the inner end of a nut 55. The nut is externally threaded which cooperates with the internal threads on the nipple 50 and thus it will be seen that the bushing is relatively tightly secured to the outer surface of the tank wall. It will further be seen that my improved bushing construction may be attached to the casing 12 from the outside of the tank, thus facilitating assembly.

Assembly of my improved bushing construction to an electrical apparatus tank is as follows: The first terminal 19 is attached to the tubular insulating member 17 and the bolt 24, which has been previously connected with the end of the pigtail 31, may then be screwed into the cooperating tubular portion 23 of the first terminal. The bushing may then be thrust through the opening 18 and the nut 55 screwed onto the nipple 50. The line lead 15 may then be placed through the hand-grip 42 and the ends 36 bent around the outer surface of the washer 40. The

second terminal 33 may then be screwed into the first terminal by the hand-grip until the ends 36 are relatively tightly squeezed between the concave inner surface 37 of the first electrode and the conical shape nose of the second electrode. It will be understood that a washer of suitable deformable material 56 may be placed around the inner end of the hand-grip and inside the outer end 57 of the bushing.

Although I have shown and described particular embodiments of my invention, I do not desire to be limited to the particular embodiments described, and I intend in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A bushing construction for making connection through an opening in a tank wall including a tubular shaped insulating member adapted to extend through the wall opening, a first terminal within said insulating member and adapted to be connected with a lead inside the tank, said first terminal having a cup-shaped portion with a concave inner end surface, a second terminal within said insulating member having an internal bore and a conically shaped nose, and a lead extending through said bore and having an end squeezed between said concave inner surface of said first terminal and said conically shaped nose of said second terminal.

2. A bushing construction for making connection through an opening in a tank wall including a tubular shaped insulating member adapted to extend through the wall opening, a first terminal within said insulating member and adapted to be connected with a lead inside the tank, said first terminal having a cup-shaped portion, a second terminal member within said insulating member having an internal bore, a washer on the end of said second terminal member, a lead extending through said bore and an end extending around the end adjacent said washer, and means for relatively tightly securing said second terminal in said cup-shaped portion of said first terminal, said washer being rotatable with respect to said second terminal so as to prevent cutting of said end of said lead during tightening of said second terminal in said first terminal.

EDWARD D. TREANOR.

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