

- [54] BUSHING FOR TRANSFORMERS AND THE
-
- LIKE

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- [51] **Int. Cl.** **H01b 17/26**

- [58] **Field of Search** 174/12 BH, 18, 31 R,
174/142, 143, 152 R, 153 R, 167

[56] **References Cited**

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[57] ABSTRACT

A bushing for a transformer or the like comprising an insulating member having a bore therethrough and an opening adjacent one end thereof intersecting with the bore and including at least one substantially flat side wall portion. The insulating member has a shoulder between said bore and opening. A rigid conductor member extends through the bore and opening and has a pair of threaded ends extending exteriorly of the bore and opening. The conductor member has a flange for abutting engagement with the shoulder and a retainer in threaded engagement between one of the threaded ends thereof and the other end of the bushing urging the flange into engagement with the shoulder. The conductor member carries a pair of spaced seals sealably engaged between the conductor member and the bore and defining therein an isolated chamber.

11 Claims, 5 Drawing Figures

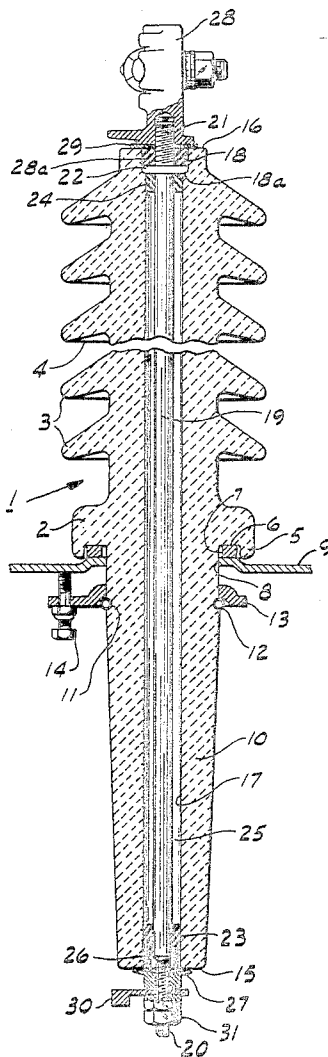


FIG. 1

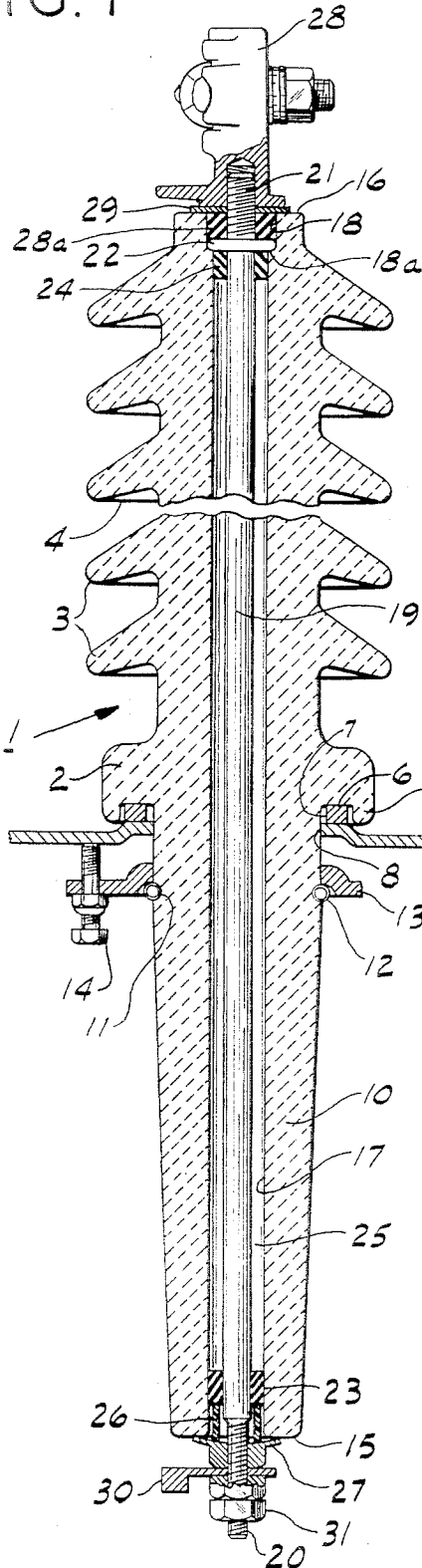


FIG. 2

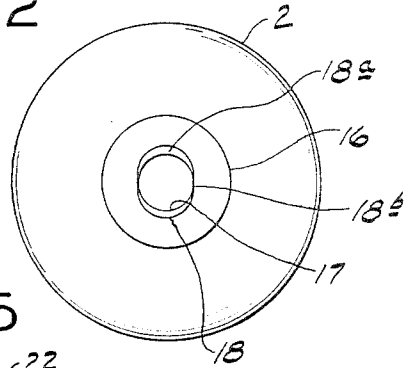


FIG. 5

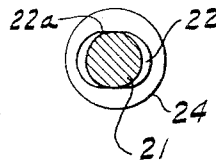


FIG. 4

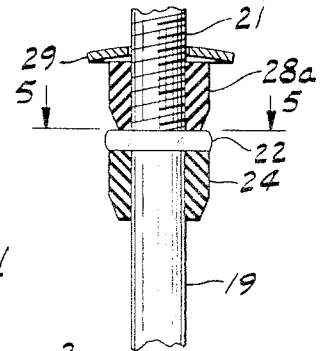
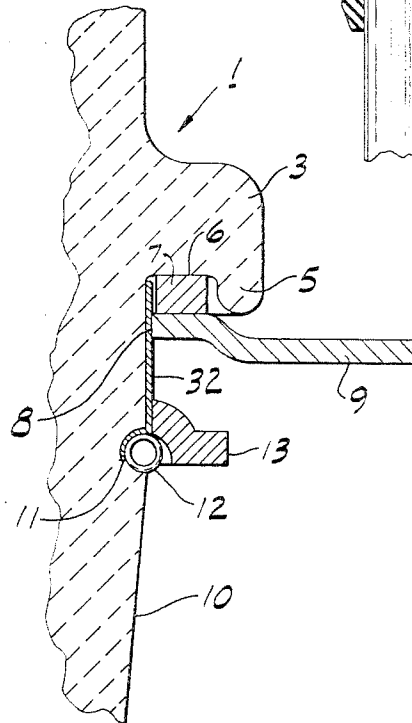


FIG. 3



BUSHING FOR TRANSFORMERS AND THE LIKE**BACKGROUND OF THE INVENTION**

This invention pertains generally to bushings and in particular to high voltage bushing assemblies for distribution transformers and the like.

The many different types of terminals required by different distribution transformer customers such as utilities, etc., pose an increasing storage and inventory problem for transformer manufacturers. Even though there may be a substantial inventory of a particular size and style of distribution transformer, none may have the particular type high voltage bushing terminal required by a particular customer on short notice. Changing just the terminal entails considerable difficulty and expense inasmuch as the seal of the transformer must be broken when a terminal is removed from typical conventional style high voltage bushings. This requires further processing in the plant to reseal the transformer under proper conditions to insure against incursion of moisture, etc., after the new terminals have been installed.

Moreover, in order to obtain and maintain electrical contact between the terminal and the porcelain high voltage bushings and thus avoid a corona-inducing high-stress air gap, a stainless steel spring was generally required between said terminal and porcelain portion. This was undesirable from an economic and assembly viewpoint. Also, different through-conductor structures were required in typical conventional bushing assemblies depending on the high voltage ratings of the particular bushings.

SUMMARY OF THE INVENTION

Among the several objects of the invention are the provision of high voltage bushing assemblies for transformers and the like which permit the convenient changing of the terminals thereto without breaking the seal of the bushing or the need to destroy the integrity of the transformer itself by having to gain access to the interior; and the provision of bushings of the type described which have a simplified construction so as to avoid steel garter springs between the terminal and the porcelain and which are useful for a wide variety of high voltage ratings. Other objects and features will be in part apparent and in part pointed out hereinafter.

Briefly, the bushing of the present invention comprises an insulating member having a bore therethrough and an opening adjacent one end thereof with the bore and including at least one substantially flat wall portion. The insulating member has a shoulder between the bore and the opening. A rigid conductor member extends through the bore and opening and has a pair of threaded ends extending exteriorly of the bore and opening. The conductor member has a flange for abutting engagement with the shoulder, and a retainer in threaded engagement between one of the threaded ends thereof and the other end of the bushing urging the flange into engagement with the shoulder. The conductor member carries spaced seals sealably engaged between the conductor member and the bore and defining therein an isolated chamber.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view illustrating a high voltage bushing adapted for mounting engagement with a transformer housing portion and embodying the present invention;

FIG. 2 is a top plan view of the bushing insulating member of FIG. 1;

FIG. 3 is an enlarged fragmentary view taken from FIG. 1 showing the sealing engagement of the bushing with the transformer housing portion;

FIG. 4 is an enlarged fragmentary view of the upper portion of the bushing conductor showing the upper sealing and locking members disengaged from the bushing; and

FIG. 5 is a sectional view taken along line 5—5 of FIG. 4.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawings and in particular to FIG. 1, a bushing assembly, indicated generally at 1, is provided with an insulating portion or member 2 of porcelain or ceramic, or other insulating material, and a plurality of annular fins or skirts 3 are integrally formed on the upper or exterior portion 4 of said insulating member to increase its insulating capacity. The insulating member includes an abutment or depending flange 5 having an annular groove 6 therein in which is disposed an annular seal or gasket 7 of conductive rubber or synthetic elastomer material or an asbestos-metallic composition such as sold under the trade designation "Flexitallic". The seal 7 is engaged about an opening 8 in a transformer tank or housing portion, such as a housing cover or lid 9, and the lower or interior portion 10 of the insulating member 2 which extends through the cover opening 8 interiorly of the transformer is generally in the form of a truncated cone. A peripheral groove 11 is provided on the interior portion 10 of the insulating member 2 having retaining or abutment means therein, such as a coil spring 12. An adjustable clamping ring 13 having a plurality of adjusting screws 14 therein is received on said insulating member lower portion. Clamping ring 13 is abuttingly engaged with the spring 12, and screws 14 are adjusted into abutment with the interior side of the housing cover 9 urging the seal 7 at the flange 5 into sealing engagement with said housing cover about the opening 8 therein. The insulating member 2 is also provided with interior and exterior end portions 15, 16 and a bore or central opening 17 is provided through said insulating member between the interior and exterior end portions. Referring now also to FIG. 2, a cross-slot, groove or opening 18 is provided in the exterior end 16 of the insulating member 2 intersecting with the bore 17. An abutment or shoulder 18a is defined in the insulating member at the juncture of the slot with the bore between opposed generally parallel flat side wall portions 18b.

A conductive stud or solid rod member 19 extends coaxially through the insulating member bore 17 having opposed threaded connecting ends 20, 21 extending from the bore adjacent to the interior and exterior end portions 15, 16 of the insulating member 2, and a flange 22 having opposed generally parallel abutments

or flat portions 22a thereon is integrally formed with said stud member and received in the insulating member slot 18 with the flats 22a in rotation-preventing engagement with the slot side wall portions 18a. A pair of identical annular resilient sealing members or grommets 23, 24 are sealably engaged between the stud member 19 and the insulating member bore 17 and define therewith an isolated chamber 25, and the seal 24 is carried in abutment with the stud member flange 22 while the seal 23 is spaced from the interior end portion 15 of the insulating member 2 by an annular spacer or sleeve member, such as the seal seating member 26, received on stud member 19. A retainer member, such as a flanged nut 27, is threadedly engaged with the stud member connecting end 20 and is abuttingly engaged with the interior end portion 15 of the insulating member 2 thereby placing the stud member 19 under a tensile force which urges the seal 24 and the stud member flange 22 downwardly into sealing engagement with the bore 17 and displacement-preventing engagement with the slot abutment 18a of the insulating member 2, respectively. It should also be noted that the retainer member 27 also serves as a seat for the spacer 26 obviating the displacement thereof from the insulating member bore 17, and upon the assembly of the retainer 27 on the end 20, as previously mentioned, the retainer also urges the seal 23 into engagement with the bore 17.

A high voltage terminal member 28 of any of the many types well known in the art is threadedly received on the stud member connecting end 21, and another grommet 28a, identical to the grommets 23, 24, is compressed in slot 18 substantially filling it when terminal 28 is mounted. A resilient conical or Belleville type washer or locking member 29 is received on stud member connecting end 21 being biased in locking engagement between terminal member 28 and the exterior end portion of insulating member 2. The resilient force of the washer 29 urges the terminal 28 upwardly compensating for a predetermined amount of expansion in the length of the tensioned stud member 19 at increased temperatures. A transformer coil lead terminal 30 is secured to the stud member connecting end 20 and retained thereon against displacement by a locking member, such as the jam nuts 31. In the assembly of the grommets 23 and 24 on the rod 19, a protective nipple or guide (not shown) is placed over the threaded rod ends 20 to prevent grommet cutting by the threaded end which might impair sealing integrity of the grommets.

As shown in FIG. 3, a conductive strap 32 may be connected between the "Flexitallic" seal 7 and the metal clamping ring 13 and to the coil retaining spring 12 if necessary to obviate the generation of corona between the insulating member depending flange 5 and the housing cover 9.

From the foregoing, it is apparent that the tensile force applied to the stud member 19 by the retainer member 27, which is between said stud member and insulating member interior end 15, urges the stud member flange 22 into displacement preventing engagement with the shoulder or slot abutment 18a of the insulating member 2 thereby capturing or retaining said stud member against displacement from the bore 17 when the terminal 28 is disengaged from the stud member connecting end 21. It is also apparent from the foregoing that the stud member 19 having the seals 23, 24

mounted thereon effects an economical, simplified unitary assembly which is insertable into the bore 17 to define the isolated chamber 25. The sealed chamber 25 preferably contains dry air or an inert transformer gas where bushing 1 is utilized for relatively lower voltage service (e.g., below 9,434 volts) or transformer oil (e.g., for service up to 16,340 volts) or oil and a solid dielectric medium if the bushing is utilized for relatively higher voltage (e.g., above 16,340 volts) service. Thus, the bushing 1 is a multi-purpose unit which serves to simplify manufacturing and reduce the types of bushings for inventory purposes. Moreover, the external terminal may be easily changed without any access to the interior of the transformer tank or breaking of the seal of the bushing or unit. Further, it is apparent that the size of the bore 17 is decreased which results in an increase in the strength of bushing 1. It should also be noted from the foregoing that the high voltage terminal 28 is in direct contact with the insulating member exterior end 16 via the washer 29 thereby obviating any air gap between the terminal and the exterior end which might result in corona.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A bushing for a transformer or the like comprising an insulating member having a bore therethrough, an opening in said insulating member adjacent one end thereof intersecting with said bore and including at least one substantially flat side wall portion, a shoulder on said insulating member between said bore and opening, a rigid conductor member extending through said bore and opening including a pair of threaded ends extending exteriorly of said bore and opening, a flange on said conductor member adjacent to one of the threaded ends thereof for abutting engagement with said shoulder, a retainer in threaded engagement between the other of said threaded ends and the other end of said bushing urging said flange into engagement with said shoulder, and a pair of spaced seals on said conductor member sealably engaged between said conductor member and said bore and defining therein an isolated chamber.

2. A bushing according to claim 1, wherein said seals constitute identical resilient grommets.

3. A bushing according to claim 1, wherein said flange also defines a seat engaged with one of said seals.

4. A bushing according to claim 3, comprising a sleeve about said conductor member in said bore having one end in abutment with said retainer and the other end defining another seat engaged with the other of said seals.

5. A bushing according to claim 1, comprising a sleeve in said bore having one end thereof abuttingly engaged with said retainer and the other end thereof in seating engagement with one of said seals, said conductor member extending through said sleeve.

6. A bushing according to claim 1, comprising at least one flat portion on said flange in abutting engagement

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with said flat side wall portion of said opening to obviate rotation of said conductor member in said bore.

7. A bushing according to claim 1, wherein said opening includes another flat side wall portion substantially parallel with and opposed to said first-named flat side wall portion, and opposed abutments on said flange respectively engaged with said first-named and other side walls to obviate rotation of said conductor member.

8. A bushing according to claim 1, comprising a terminal received on said one threaded end.

9. A bushing according to claim 8, comprising a metallic washer connected in abutting engagement between said terminal and said one end of said insulating member.

10. A bushing according to claim 8, comprising a resilient substantially conical washer biased in abutting engagement between said terminal and said one end of said insulating member, the resiliency of said washer compensating for a predetermined amount of expansion in the length of said conductor member.

11. In a transformer having a housing with an opening therein, a bushing assembly including a porcelain insulating member extending through said opening and having portions extending interiorly and exteriorly of said housing, an annular flange integrally formed on said exterior portion and extending about said opening, an annular seal disposed in said flange means for sealing engagement with said housing about said opening, a mounting ring secured to said interior portion, adjustable means between said mounting ring and said housing about said opening for urging said seal into sealing engagement with said housing about said opening, a bore in said insulating member extending between the ends thereof, an opening in one of said ends intersecting with said bore including opposed substantially parallel

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side wall portions on said insulating member, and a shoulder on said insulating member between said opening and said bore, a solid conducting rod extending substantially coaxially through said bore and opening and having a pair of threaded end portions exteriorly of said bore adjacent to said ends of said insulating member, a flange integrally formed with said rod adjacent to one of said threaded end portions and extending substantially radially thereof for engagement with said shoulder, a pair of opposed flats on said flange respectively engaged with said side wall portions to prevent rotation of said rod, a threaded member threadedly engaged with the other of said threaded end portions and including a second flange in abutting engagement with the other of said ends of said insulating member, said first-named flange being urged into engagement with said shoulder in response to the threaded engagement of said threaded member with said other threaded end portion, a pair of spaced grommets sealably engaged between said rod and bore and defining therewith an isolated chamber in said bore, one of said grommets being seated against said first-named flange, a sleeve received on said rod within said bore and connected in abutting engagement between said second flange and the other of said grommets defining a seat therefor, a terminal for receiving a power lead threadedly connected with said one threaded end portion, a resilient conical washer received on said one threaded end portion and biased into abutting engagement between said terminal and said one end of said insulating member, said other threaded end portion also defining a terminal for receiving a transformer coil lead, and a third grommet engaged between said first-named flange and said washer substantially filling said opening, said third grommet being identical to the other grommets.

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