

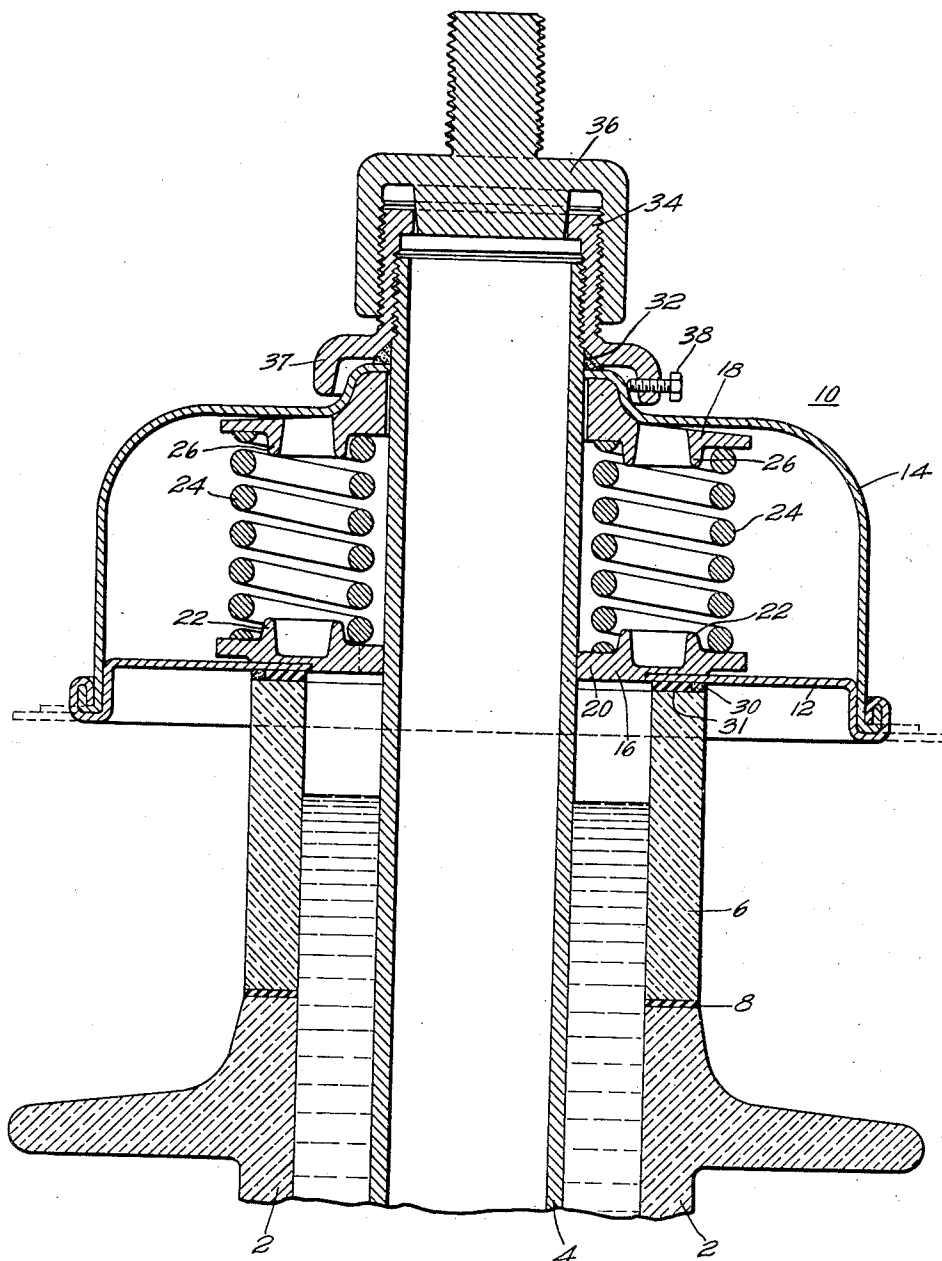
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BUSHING CAP

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WITNESSES:

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BUSHING CAP

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The present invention relates to bushings for insulating the leads to high-tension electrical apparatus, such as circuit breakers and trans-
formers, and is directed more specifically to an improved terminal cap for such bushings.

In bushings of the type contemplated, the conducting lead or stud from the apparatus is surrounded by a cylindrical weather casing of dielectric material such as porcelain. The stud is commonly secured in such casing or shell adjacent the lower part of the shell, and the assembly is supported on a mounting flange for securing around an opening in a circuit-breaker or transformer tank. As is well known, changes in temperature will cause relative movement between the free end of the shell and the conductor as the result of a difference in the coefficient of thermal expansion of the materials. It is desirable to have the interior of the shell hermetically sealed with respect to the outside atmosphere and this differential expansion introduces a problem of effectively closing the outer end of the shell in a fluid and gas tight manner and at the same time maintaining at a minimum the cost of the parts and of the assembly thereof, consistent with acceptable performance in service.

It is an object of the present invention to provide a terminal cap for hermetically sealing the end of a bushing shell, or weather casing, in a simple manner but at the same time insuring that the hermetic sealing is retained intact under varying temperature conditions encountered.

Other objects of the invention will be apparent from the following description and the accompanying drawing, in which:

The single figure of the drawing is a view in vertical section of a bushing cap constructed in accordance with the present invention, the greater portion of the bushing being omitted in the interest of brevity.

Bushings of the type to which my invention is applicable are well known in the art and are of various types. By way of example, and not limitation, the present invention is applied to a bushing comprising a conducting stud surrounded by alternate layers of dielectric and conducting sheets to form a bushing of the condenser type. Adjacent the midpoint of the stud the thickness of the winding is at a maximum and is usually proportioned to tightly fit within a mounting flange upon which the porcelain shell or weather casing is mounted; the latter being filled with an insulating fluid such as oil or gum. The mounting flange is secured in a desired manner around the opening of the tank of encased electrical appa-

ratus. This general construction is disclosed, for example, in U. S. Patent 2,078,219, issued April 27, 1937 to Burr et al. With this type of construction at least a portion of the stud is fixed in relation to the porcelain shell at the mounting flange, and the free ends of the shell and conductor will be subject to relative movement axially of the bushing as the result of changes in temperature. This necessitates a certain amount of flexibility in the enclosure of such free ends. In accordance with some prior art constructions, the free end of the bushing shell is closed by a rigid metallic cap and the conductor extends loosely into the cap with flexible electrical connections between the conductor and the cap so that connection to an external circuit may be made directly to the cap. Usually the cap itself is of cast material which may be subject to leakage, and the electrical connection between the cap and conductor is relatively complicated.

Referring to the drawing, the dielectric shell 2 surrounds a hollow conducting stud 4 and is surmounted by a transparent section 6, suitably gasketed at 8, through which the level of the insulating fluid may be observed. The shell may be of porcelain, the conductor 4 may be either hollow or solid and preferably of copper, and the section 6 may be glass. The upper end of the transparent section 6 is closed by a cap, indicated generally at 10. The cap comprises a bottom wall 12, a combined top and side wall 14 of cup shape, a relatively rigid base plate 16 and top plate 18.

The base plate 16 is of sufficient diameter to overlie the top of the glass section 6 and may be recessed on its underside to receive the inner peripheral edge of the bottom wall 12, preferably of flexible sheet material. Also the plate 16 is provided with inwardly projecting fingers or lugs 20 which engage the conducting stud 4 and space it centrally of the cap. The upper face of the base plate 16 is provided with a plurality of up-standing bosses 22, four in the present instance, over which are disposed the lowermost convolutions of helical springs 24.

The top plate 18 is provided on its under-surface with depending bosses 26 which receive the upper convolutions of the springs 24. The plate 18 is of increased thickness adjacent its inner periphery as indicated, to provide a raised central portion on the top of the cap.

The top and side wall 14 of the cap is initially a flat plate of flexible sheet material which is spun or drawn to the shape shown with the top portion in intimate contact with the upper surface of the top plate 18. As indicated in dotted lines at the

right-hand side of the drawing, the portion 14 is initially provided with an outstanding flange at its outer peripheral edge which overlies a similar flange formed on the bottom wall 12. These two flanges are then tightly rolled together to the shape shown in full lines to form a hermetically tight joint. It has been found that such rolling operation is relatively simple and highly effective to prevent the entrance of air into the cap or the escape of insulating fluid therefrom, and the rolled edge is of rounded contour to decrease the possibility of electrostatic discharge.

Before rolling the flanges of portions 12 and 14 may be tinned and soldered together, as an ultimate degree of precaution, or the flanges may be coated with a polymerizing varnish or cement which, after the rolling operation, and upon the application of heat will set up as a hard insoluble seal impenetrable by oil, water and air.

In assembling the cap construction described, the base and top plates 16 and 18 with the springs 24 are placed in a suitable jig and compressed a desirable amount. The cap portion 14 is then spun to the shape shown, although of course, a drawing or stamping operation may be resorted to to form the desired shape, and the spring and plate assembly then dropped into position. The circular bottom wall 12 is then placed against the base plate 16 and the peripheral edges of walls 12 and 14 are rolled together, as indicated, and the jig for the spring assembly may then be removed. By this arrangement a complete flexible cap assembly is obtained which may be manufactured in quantity and stocked without the necessity of assembling it piece by piece on the bushing when the latter is being manufactured. A pair of gaskets 30 and 31 are disposed upon the top face of the glass section 6 and the cap assembly is placed thereon. The gaskets 30 is initially thicker and softer than the gasket 31 so that the latter will serve as a compression-stop for the former. After the cap assembly has been placed in position, a gasket 32 is placed around the conductor and a clamping member 34 screwed into position to compress the gaskets 32, 30 and 8, as well as the gasket (not shown) usually disposed between the bottom of the shell 2 and the mounting flange. The member 34 is exteriorly threaded to receive the internal threads of a terminal 36 with which connection to the external circuit may be made in a desired manner, and is provided with a depending flange 37 embracing the raised central portion of the cap to protect the gasket 32 from the weather.

Due to the uncertainties in the electrical contact between the lugs or projections 20 on the base plate 16 and the conducting stud 4, as well as the connections between the top plate 18 and other parts of the cap with the conductor, it is desirable to insert a set screw 38 through the flange 37 into contact with the top of the cap. By this means the cap and terminal are maintained at the same electrical potential in service which is desirable.

It will be noted that the rolled outer peripheral edges of the sheet metal members 12 and 14 extend below the bottom wall 12 to afford additional protection against weather effects on the gaskets 30.

In accordance with the invention an unusually simple, rugged and inexpensive cap construction has been produced. Upon changes in temperature, the conducting stud 4 may lengthen or

shorten but the compression on the springs 12 is so selected that there will always be a positive pressure against the gaskets 30 and 8 throughout the range of temperature usually encountered in service. The walls 12 and 14 of the cap, being of flexible sheet metal, will freely deflect sufficiently to follow the movements of the conducting stud 4 without a tendency to rupture the rolled joint between them or the tightness of the gaskets 32 and 8.

Obviously modifications may be made in the specific construction disclosed and it is intended that no limitation shall be placed upon the invention, except as set forth in the appended claims.

I claim as my invention:

1. In a bushing for high-tension electrical service including a shell of dielectric material having a conducting stud extending therethrough, a terminal cap for said bushing comprising a rigid base plate loosely surrounding said conductor and overlying the end of said shell, a circular bottom cap wall of flexible sheet material having a central aperture of less diameter than that of said base plate having the portion adjacent to its inner periphery disposed between the end of the shell and the base plate and its outer peripheral portion disposed remote from said base plate, a rigid top plate having a central aperture loosely surrounding said stud and means for supporting it above said base including means for biasing the base plate against the inner peripheral portion of the bottom cap wall, a top and side wall cap member of flexible sheet material having a central aperture through which the stud extends and an outer peripheral portion disposed adjacent to the outer peripheral portion of said bottom cap wall, means on said stud coacting with said supporting means for the top plate for clamping said top and side wall cap member adjacent to its inner periphery against said top plate, and means for joining said outer peripheral portions in fluid-tight relation.

2. In a bushing for high-tension electrical service including a shell of dielectric material having a conducting stud extending therethrough; a terminal cap for said bushing comprising a rigid base plate loosely surrounding said conductor and overlying the end of said shell, a circular bottom cap wall of flexible sheet material having a central aperture of less diameter than that of said base plate having the portion adjacent to its inner periphery disposed between the end of the shell and the base plate and its outer peripheral portion disposed remote from said base plate, a rigid top plate having a central aperture loosely surrounding said stud and means for supporting it above said base plate including resilient means for biasing the base plate against the inner peripheral portion of the bottom cap wall, a top and side wall cap member of flexible sheet material and having a central aperture through which the stud extends and an outer peripheral portion disposed adjacent to the outer peripheral portion of said bottom cap wall, means on said stud coacting with said supporting means for the top plate for clamping said top and side wall cap member adjacent to its inner periphery against said top plate, and means for joining said outer peripheral portions in fluid-tight relation comprising a rolled joint therebetween.

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