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LOW VOLTAGE OUTLET BUSHING

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Fig. 1.

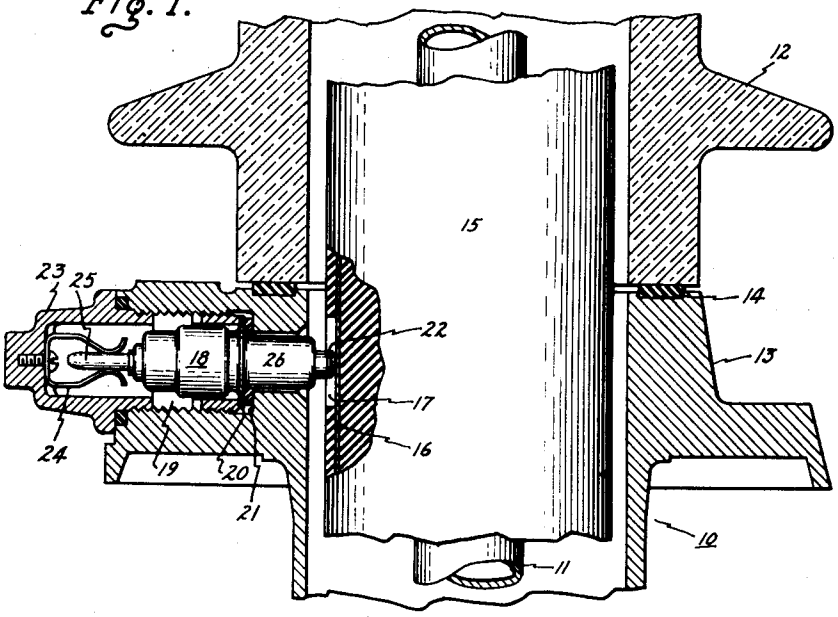
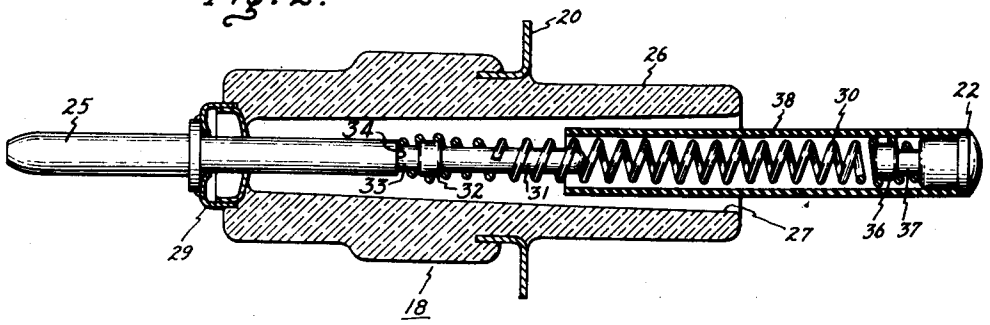


Fig. 2.



Inventor
Edward F. Cronin,
by Gilbert P. Tarleton
His Attorney.

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LOW VOLTAGE OUTLET BUSHING

Edward F. Cronin, Lenox, Mass., assignor to General Electric Company, a corporation of New York

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4 Claims. (Cl. 339—213)

This invention relates to bushings for electrical apparatus, and more in particular to an improved low voltage outlet bushing adapted for application on the low voltage tap of a high voltage condenser bushing.

High voltage condenser bushings are commonly employed on such apparatus as high voltage stationary electrical induction apparatus. Such bushings are generally comprised of a central conductor, which may be hollow, extending through the high voltage bushing from a terminal assembly at one end thereof. A ceramic insulating shell surrounds the portion of the conductor adjacent the terminal assembly, and extends from the terminal assembly to a centrally located metallic mounting flange. Another insulating shell is provided surrounding the other end of the central conductor. Inside of the shells and surrounding a portion of the central conductor is an insulating core member, which may be comprised of a plurality of layers of dielectric fluid impregnated paper. A plurality of conducting equalizers may be interwound with the impregnated paper, and means are frequently provided for making an external connection to the most outwardly of the conducting equalizers for such purposes as determining the quality of the bushing, or for operation of various metering or protective devices. The chamber in the bushing between the core member and the outer shells is generally filled with a dielectric fluid for improved dielectric strength.

In the past, the means for making an external connection to the most outwardly equalizer (or capacitor plate) has generally been comprised of a low voltage bushing extending through the side of the mounting flange of the high voltage bushing. One form of such a low voltage bushing was comprised of an externally threaded insulating member which was screwed into a threaded aperture in the side of the high voltage bushing. A fixed conductor was provided extending from the external side and into the insulator of the low voltage bushing, and an aperture in the internal side of the low voltage bushing was provided with a slidable contact rod mounted therein. A spring was provided in the insulator aperture to provide electrical continuity between the fixed conductor and the slidable contact rod, and also held the contact rod against the outermost capacitor plate of the high voltage bushing.

It has been found that this arrangement has several disadvantages. Due to the difference in dimensions between the mounting flange and the outermost capacitor plate of various size high voltage bushings, the low voltage bushings could not be interchanged on different size high voltage bushings due to the limited travel of the contact rod, unless a plurality of contact rods of varied lengths was provided, or unless a prefit contact rod was provided with each high voltage bushing. Another, and perhaps more serious disadvantage arose in the mounting of the low voltage bushing. Since the contact rod was not captive within the low voltage bushing, the rod had a tendency to fall out or become jammed, especially when the low voltage bushing was mounted on a horizontally disposed high voltage bushing. The connection between the fixed conductor and the contact rod relied upon the pressure of the spring against both members, and therefore a positive connection was not maintained.

It is therefore an object of this invention to provide an improved low voltage outlet bushing.

Another object is to provide a low voltage outlet bushing having a captive contact rod to eliminate the possibilities of the contact rod from jamming or falling out during its assembly.

Still another object of this invention is to provide a low voltage outlet bushing that may be used interchangeably to contact the condenser type core of a plurality of different size high voltage bushings regardless of dimensions between the mounting flange and the outermost capacitor plate of the high voltage bushings.

Briefly stated, in accordance with one aspect of my invention, I provide a low voltage outlet bushing comprised of an insulating member having a central aperture extending longitudinally therethrough. A fixed conductor assembly extends through the aperture and is comprised of a metallic stud and a metallic helical spring having one end affixed to one end of the stud within the aperture. The other ends of the stud and spring extend beyond the inslulating member, and the stud is affixed to the insulating member at one point. The other end of the spring is affixed to a contact button, and an insulating tube is fastened to said contact button and extends over a portion of the spring. The aperture in the insulating member has a sufficient diameter that the insulating tube may extend thereinto upon compression of the spring. Upon compression of the spring the insulating tube may also extend over a portion of the stud.

My invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

In the drawing:

Fig. 1 is a partially cross sectional view of a portion of a typical high voltage condenser bushing and illustrating the low voltage outlet bushing of my invention in position as the capacitance tap of the high voltage bushing, and

Fig. 2 is an enlarged partially cross sectional view of the low voltage outlet bushing of Fig. 1.

Referring now to the drawing and more in particular to Fig. 1, therein is illustrated a portion of a high voltage bushing **10** having a central conductor **11** extending therethrough. A ceramic insulating shell **12** is provided surrounding the upper portion of the conductor **11**, and this shell extends between a top terminal assembly (not shown) and a centrally located metallic mounting flange **13**. Gasket means **14** are provided on the adjacent surfaces of the mounting flange **13** and the shell **12** in order that the chamber surrounding the central conductor **11** may contain a dielectric fluid. Also surrounding the central conductor **11** and internally of the shell **12** and mounting flange **13** is an insulating core member **15** which may be comprised of a plurality of layers of dielectric fluid impregnated paper interwound with a plurality of conducting equalizers. An electrically conducting equalizer **16** is imbedded in the outer portion of the core **15**, and a portion **17** of the insulating core **15** is cut away to expose the equalizer **16**.

A low voltage bushing **18** is provided extending through an aperture **19** in the side of the mounting flange **13**. The portion of the aperture **19** outwardly from the central conductor **11** is internally threaded, and the low voltage bushing **18** is firmly held in place by means of an externally threaded hollow nut screwed in the threads of the aperture **19** and forcing a flange **20** of the low

voltage bushing against a shoulder 21 in the aperture 19. One end of the bushing 18 extends through the internal unthreaded portion of the aperture 19 and a contact button 22 on this end of the low voltage bushing makes electrical contact with the equalizer 16 in the core member 15. A threaded metallic cap 23 is provided over the external end of the aperture 19, and a spring clip 24 fastened to the inside of the cap member 23 makes electrical contact with a metallic stud 25 on the other end of the bushing 18. The removable spring clip and cap assembly connect the equalizer 16 to ground by way of the bushing 18 when the capacitance tap is not being utilized. Suitable gaskets are provided for preventing the escape of dielectric fluid through the aperture 19.

Referring now to Fig. 2, therein is illustrated a low voltage bushing comprised of an insulator 26 with a preassembled mounting flange 20. The insulator 26 is preferably made from glass in order to obtain the advantages of improved electrical characteristics thereof. The bushing has an aperture 27 extending longitudinally therethrough. A conducting stud 25 is permanently affixed to one end of the insulator 26 and has one end extending externally from the insulator 26 and the other end extending through the aperture 27 for a portion of the length of the bushing. The stud 25 may be brazed to a flange 29 molded in the end of the insulator 26. A helical metallic spring 30 is provided extending into the aperture 27. The end of the stud 25 in the aperture 27 is terminated by a portion 31 having a diameter less than the inside of the diameter of the spring 30. The end portion 31 of the stud is adjacent another portion 32 of the stud having a diameter greater than the inside diameter of the spring 30, and the portion 32 of the stud 25 is adjacent still another portion 33 of the stud having a diameter substantially the same as the inside diameter of the spring 30. The remaining portions of the stud 25 within the insulator 26 have a diameter substantially greater than the inside diameter of the spring 30. The spring 30 is an open wound compression spring, and is disposed over the three end portions 31, 32 and 33 of the stud 25. The spring may be readily positioned on the end of stud 25 by virtue of its ability to radially expand when compressed and turned against the portion 32, and thus pass over the length of the portion 32 and with continued turning onto the portion 33 where it assumes a reduced diameter and bottoms against the shoulder 34 between the portion 33 of stud 25 and the remaining portion of the stud within the insulator 26.

The end of the spring 30 extending from the insulator 26 is terminated by the contact button 22. In order to firmly affix the spring to the contact button 22, the button 22 has an end portion 36 having a larger diameter than the inside diameter of the spring 30, and a portion 37 adjacent the portion 36 having a diameter substantially the same as the inside diameter of the spring 30. The spring passes over these two portions of the contact button. Thus the spring is held captive on the stud 25, and the contact button 22 is held captive on the spring 30. A portion of the spring 30 is surrounded by a straight insulating tube 38 which in turn retains the spring conductor by guiding its travel. This insulating tube 38 is attached to and held by the metal contact button 22. The inside diameter of the aperture 27 and the diameter of the stud 25 within the aperture 27 are such that upon compression of the spring 30 by pressure against the contact button 22 the insulating tube 38 may extend into the aperture and over the stud 25, and move longitudinally within said aperture without restraint by the stud or the insulator 26.

From the previous disclosure it is seen that the low voltage bushing of my invention provides for positive connection between the stud 25 and the contact button 22 throughout the range of extension of the spring 30. Since the insulating tube 38 surrounds the spring 30 the only exposed portions of the conductor which passes through the insulator are the portions of stud 25 extending externally from one end of the bushing, and the end of the contact button 22. The bushing is readily assembled, and will not jam or fall apart when being mounted upon a high voltage bushing. It may be employed upon high voltage bushings having a variable distance between the mounting flange and capacitance taps, and therefore it is possible to maintain only one size of low voltage bushing for a number of different applications. Since the same low voltage bushings may be used on different high voltage bushing classes, the conductor variables introduced in the use of the low voltages bushing will not vary in the different high voltage bushing classes.

It will be understood, of course, that, while the form of the invention herein shown and described constitutes a preferred embodiment of my invention, it is not intended herein to illustrate all of the possible equivalent forms or ramifications thereof. It will be understood that the words used are words of description rather than of limitation, and that various changes may be made without departing from the spirit of the scope of the invention herein disclosed, and it is aimed in the appended claims to cover all such changes as fall within the true true spirit and scope of the invention.

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

1. A low voltage bushing comprised of an insulating member having a central aperture extending longitudinally therethrough and a conductor assembly extending through said aperture, said conductor assembly being comprised of a conducting stud affixed to said insulating member and having one end extending into said aperture and the other end extending from one end of said insulating member, an open wound helical spring having one end affixed to said one end of said stud within said aperture and the other end extending through said aperture and beyond the other end of said insulating member, a contact button affixed to the other end of said spring, and a straight insulating tube surrounding said spring and affixed to said contact button, the inside diameter of said aperture being sufficiently large to permit said insulating tube to move freely within said aperture.

2. A low voltage bushing comprised of an insulating member having a central aperture extending longitudinally therethrough and a conductor assembly extending through said aperture, said conductor assembly being comprised of a conducting stud affixed to said insulating member and having one end extending into said aperture, and the other end extending from one end of said insulating member, an open wound helical spring, said one end of said stud having a first portion with a diameter greater than the inside diameter of said spring and a second portion adjacent said first portion toward the other end of said stud having a diameter substantially the same as the inside diameter of said spring, one end of said spring surrounding said two portions of said stud within said aperture and the other end of said spring extending through said aperture and beyond the other end of said insulating member, a contact button, said contact button having a first portion with a diameter greater than the inside diameter of said spring and a second portion having a diameter substantially the same as the inside diameter of said spring, the other end of said spring surrounding said two portions of said contact button, and an insulating tube surrounding said spring and affixed to said contact button, the inside diameter of said aperture being sufficiently large to permit said insulating tube to move freely within said aperture.

3. A low voltage bushing comprised of an insulating member having a central aperture extending longitudinally therethrough and a conductor assembly extending through said aperture, said conductor assembly being

comprised of a conducting stud affixed to said insulating member and having one end extending into said aperture and the other end extending from one end of said insulating member, an open wound helical spring, said one end of said stud having a terminal portion with a diameter less than the inside diameter of said spring, the first portion adjacent said terminal portion with a diameter greater than the inside diameter of said spring, and a second portion adjacent said first portion with a diameter substantially the same as the inside diameter of said spring, one end of said spring surrounding said two portions of said stud within said aperture and the other end of said spring, extending through said aperture and beyond the other end of said insulating member, a contact button, said contact button having a first portion with a diameter greater than the inside diameter of said spring and a second portion with a diameter substantially the same as the inside diameter of said spring, the other end of said spring surrounding said two portions of said contact button with said second portion of said contact button being the nearest to the end of said spring, and an insulating tube surrounding said spring and affixed to said contact button, the inside diameter of said aperture and the diameter of said stud being such that the insulating tube is free to move longitudinally within said aperture.

4. The low voltage bushing of claim 3 wherein said insulating member is glass.

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