March 11, 1941. J. REBHAN 2,234,275

INSULATOR BUSHING

Filed June 21, 1940

Fig. 1.

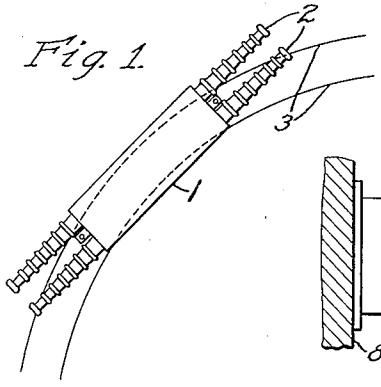


Fig. 2.

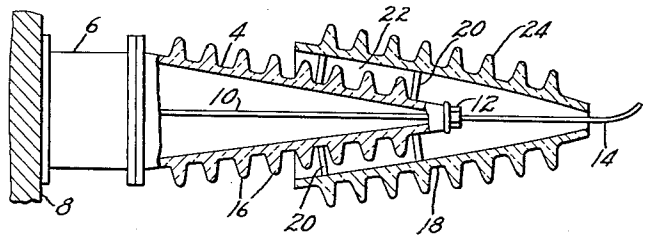


Fig. 3.

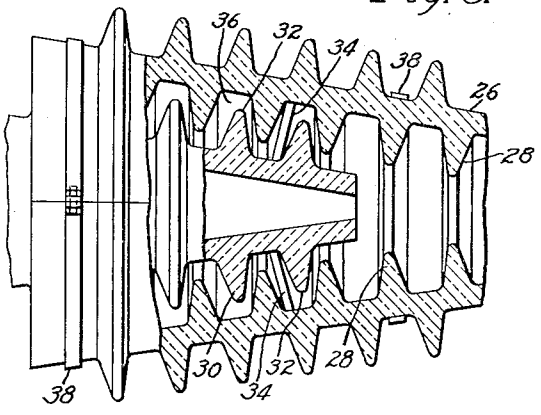


Fig. 4.

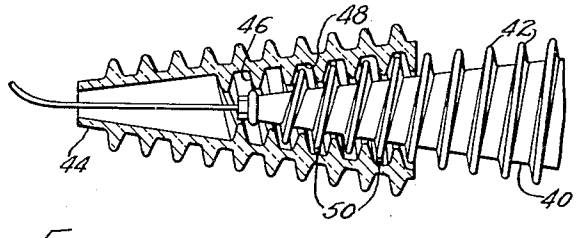
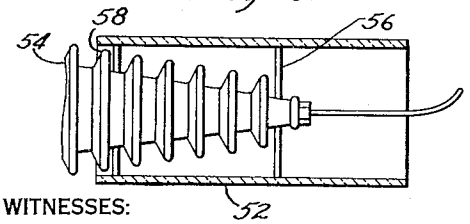


Fig. 5.



WITNESSES:

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Patented Mar. 11, 1941

2,234,275

UNITED STATES PATENT OFFICE

2,234,275

INSULATOR BUSHING

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Application June 21, 1940, Serial No. 341,632
In Germany March 8, 1939

5 Claims. (Cl. 174—152)

My invention relates to insulating bushings and it has particular relationship to an insulating sleeve for use with such bushings.

It is sometimes necessary to employ insulating bushings which are shorter than required by the best practice because of limitations placed on their physical dimensions by the location or use of the apparatus on which they are mounted. As an example, one case in which such bushings may not be of an arbitrary length arises when they are mounted on high output mobile transformers which must frequently be moved from place to place in assembled condition. Because of the clearance limitations imposed by railroads and other carriers, it is often necessary to mount the bushings on the front or rear walls of the transformer casing in a substantially horizontal position. Even when mounted in this manner, the length of the bushings is limited by such factors as the end clearance required by the railroad or other carrier or the size of the openings available for placing them in the carrier. While all insulating bushings are susceptible to reductions in length of the creepage and flashover distance due to deposits of dirt and dust, this effect is particularly dangerous in the case of the shorter bushings, especially when horizontally mounted.

The present invention discloses a method and means for preventing reduction in the creepage and flashover distances due to dirt and dust and for increasing the effective length of shortened bushings. This is done by placing around either part or all of the insulating bushing a sleeve of insulating material separated therefrom by an air gap of appropriate length. The sleeve is preferably of a shape following closely the shape of the bushing and may extend beyond the free end thereof. In some embodiments of the invention, the interior surface of the sleeve is provided with ribs which are located between and spaced from the ribs on the bushing to provide a tortuous or meandering air gap therebetween. By means of the invention, it is thus possible to reduce the length of the insulating bushings to some extent without impairing their insulating qualities.

It is accordingly an object of my invention to provide an insulating sleeve for use with a high voltage bushing to improve its insulating properties.

It is another object of my invention to provide a detachable insulating sleeve for increasing the effective length of an insulating bushing which must meet restricted space requirements under certain circumstances.

A further object of my invention is to provide an insulating bushing with a detachable insulating sleeve for protecting it against impairment of its electrical qualities by deposits of dust and dirt.

Other objects and advantages of my invention will appear from the following description, taken in conjunction with the accompanying drawing, in which:

Figure 1 is a plan view of a mobile transformer mounted on a railroad car which is negotiating a curve.

Fig. 2 is a view partly in vertical section of an insulating sleeve embodying the invention seated upon an insulating bushing; and

Figs. 3, 4 and 5 are views similar to Fig. 2 illustrating modifications of the invention.

In Fig. 1 is shown a mobile transformer 1 with insulating bushings 2 placed on a railroad car which is travelling around a curve on the tracks 3. In order to better illustrate a condition in which the length of the bushings 2 is limited by the end clearance of the railroad car, I have exaggerated the lateral displacement of their ends with respect to the center of the tracks 3 by making the curve of abnormally small radius.

Fig. 2 shows an insulating bushing 4 mounted by means of the metal flange 6 upon an end wall 8 of an electrical apparatus casing. The bushing 4 is of porcelain or other suitable insulating material and may be filled with an insulating compound or liquid, if desired. A conductor 10 passes through this conventional bushing into the apparatus tank and is connected to a bushing terminal 12. A conducting lead 14 is connected to the terminal 12 on the outside of the bushing. Creepage flanges or ribs 16 of a usual type are provided on the outside surface of the bushing 4.

A sleeve 18 which may be of any suitable insulating material, but is preferably of the same material as the bushing 4, is concentrically arranged over an end of the bushing and held in position by spacing members 20. These spacing members may be star shaped so that after being placed on the surface of the bushing they will extend slightly beyond the ribs 16 to leave an air gap 22 free between the sleeve and the bushing. The outside surface of the insulating sleeve 18 is preferably provided with ribs 24. While the sleeve is shown surrounding only a portion of the bushing, it may be designed to enclose the entire bushing, if desired.

The embodiment of Fig. 3 shows an insulating sleeve 26 provided with ribs 28 on the interior surface for use with a bushing 30 having ribs 32 of the usual type. The sleeve 26 is placed over the bushing in such a manner that its ribs 28 are disposed partially within the space between adjacent ribs 32 on the bushing 30. The sleeve may be secured in concentric relationship to the bushing by means of spacing members 34 similar to those employed in the embodiment of Fig. 2. In this manner, a continuous tortuous air gap 36 is left between the bushing and sleeve. In order to permit its assembly upon the bushing, the sleeve 26 is made in two pieces secured together by clamping rings 38.

In Fig. 4, the exterior surface of the bushing 40 is provided with ribs or creepage flanges 42 in the form of an expanded spiral while an insulating sleeve 44 carries similarly arranged internal flanges 46. The sleeve is disposed concentrically about the bushing with its flanges 46 located between the corresponding flanges on the bushing. In this manner an air gap 48 similar to that in the apparatus of Fig. 3 is provided. In this embodiment, the sleeve may be made in one piece and threaded onto the bushing because of the spiral arrangement of the ribs. While any suitable means may be employed to support the sleeve in its proper position, I have shown projections 50 of insulating material disposed on portions of the bushing ribs 42 for this purpose.

A simple and inexpensive embodiment of the invention for use where its purpose is primarily to prevent dirt deposits on the bushing is shown in Fig. 5. A cylindrical sleeve 52 which is preferably of light material as, for example, relatively thin glass, is disposed concentrically about a bushing 54 by means of spacing members 56. An air gap 58 is left between the sleeve and the bushing. In this case, it is preferable to make the insulating sleeve rotatable with respect to the bushing, in which case it is possible to prevent an accumulation of excessive deposits of dirt on a small surface area of the sleeve by occasionally imparting a rotational displacement to it.

From the above, it will be seen that the creepage and flashover distances of an insulating bushing may be considerably increased by providing an insulating sleeve in accordance with the invention. Thus the overall length of a bushing beyond the casing wall may be decreased to a certain extent to alleviate the difficulties described in an earlier part of the specification. In use, the sleeve effectively prevents any inadmissible reduction in length of the creepage or flashover distances because any dirt reaching the insulator will contact the annular ribs on the sleeve and insulator and be retained in the air gap therebetween. When the insulating sleeve is open at both ends, the insulator will be effectively ventilated and air flowing through the annular duct therebetween will bring about a sufficient equalization of temperatures to prevent any harmful condensation of moisture. This air current will cause any ionized air between the sleeve and bushing to be discharged into the outside atmosphere.

While I have shown and described particular forms of my invention, changes may be effected therein without departing from its spirit and scope, as set forth in the appended claims.

I claim as my invention:

1. An insulating structure comprising an insulating bushing including an insulating casing having a ribbed exterior surface, an insulating sleeve having a similarly ribbed interior surface, and means for detachably securing said sleeve concentrically about at least a portion of said casing so as to extend beyond an end of said bushing, said ribbed surface on said sleeve fitting partially within the spaces between the ribbed portions of said casing to define a continuous air gap between said casing and said sleeve.

2. An insulating structure comprising an insulating bushing including an insulating casing having a longitudinally progressing creepage flange on its exterior surface, an insulating sleeve having a similarly progressing flange on its interior surface, and means for detachably securing said sleeve concentrically about at least a portion of said casing so as to extend beyond an end of said bushing, said flange on said sleeve fitting partially within the space between longitudinally adjacent flange portions on said casing to form a tortuous air gap between said casing and said sleeve.

3. An insulating structure comprising an insulating bushing including an insulating casing having spaced creepage flanges on its exterior surface, an insulating sleeve having flanges on its interior and exterior surfaces, said flanges on the interior of said sleeve being spaced similarly to said flanges on said casing, and means for detachably securing said sleeve concentrically with said casing in a position surrounding at least a portion of said bushing and extending beyond the free end thereof to define a continuous air gap between said casing and said sleeve.

4. An insulating structure comprising an insulating bushing including an insulating casing having a longitudinally progressing creepage flange on its exterior surface, an insulating sleeve having on its interior a creepage flange progressing axially at the same rate as that on said casing to permit said sleeve to be screwed over at least a portion of said bushing, creepage flange means on the exterior surface of said sleeve, and means for detachably securing said sleeve to said casing in a position concentrically surrounding at least a portion of said bushing and extending beyond the free end thereof to define a continuous air gap between said casing and said sleeve.

5. The combination with an insulating bushing having creepage flanges on its exterior surface and mounted on an electrical apparatus casing to provide a passage for a high voltage conductor therethrough, a sleeve of ceramic insulating material surrounding a portion of said bushing and extending beyond the free end thereof to increase the insulation about said conductor, and means including a member engaging said bushing between longitudinally adjacent flanges for securing said sleeve to said bushing in spaced relationship thereto with a continuous air gap therebetween.

JOSEPH REBHAN.