Oct. 6, 1942. J. GUZIK 2,298,211

CONDENSER BUSHING

Filed July 13, 1939

Fig. 1.

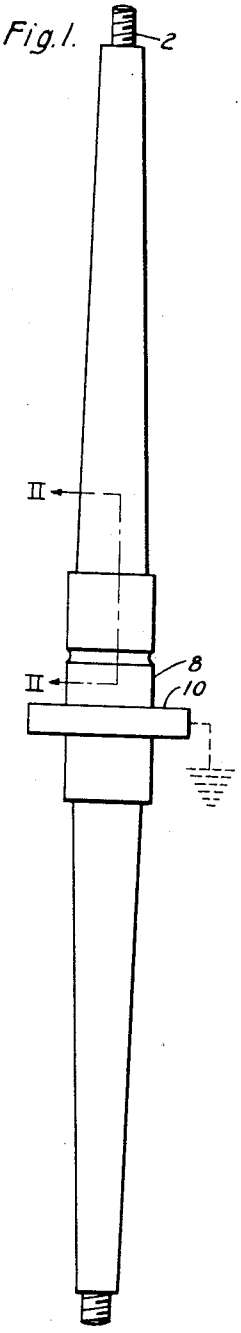


Fig. 2.

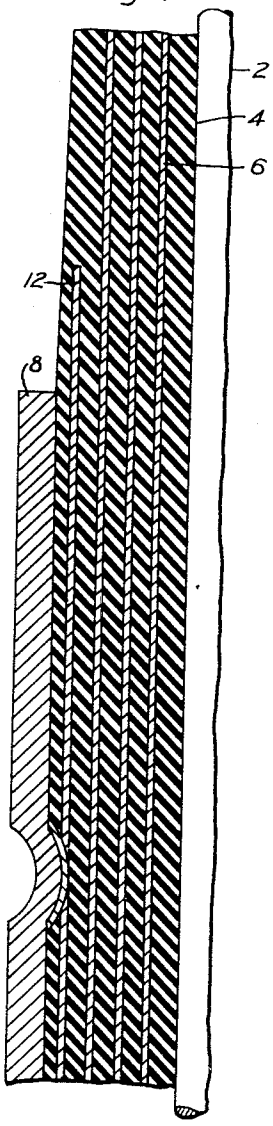
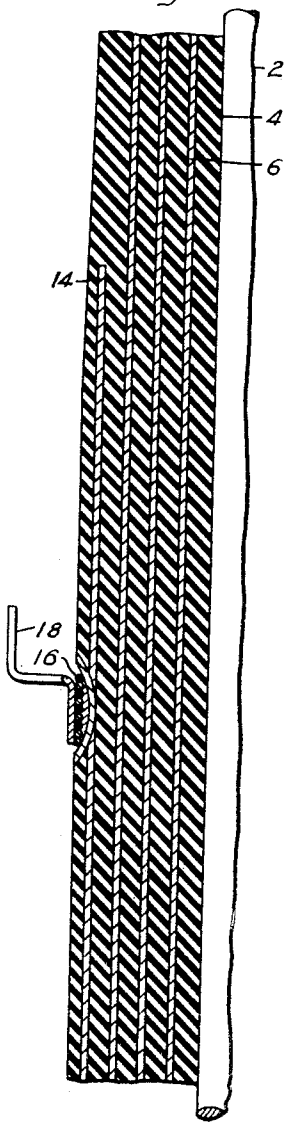


Fig. 3.



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CONDENSER BUSHING

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4 Claims. (Cl. 174—143)

This invention relates to bushings for high tension electrical apparatus, and particularly to bushings in which is provided an embedded insulating material of the type in which it is desired to make electrical contact from the exterior surface of the insulation.

By way of example, a common form of bushing comprises a conducting stud around which are wrapped alternate layers of insulating and conducting material. This is common construction in bushings of the condenser type which are supported in operative position by a metallic flange overlying the opening in the oil-filled tank of a circuit breaker or transformer. The outermost layer of such bushings is of insulating material and it is usually desired to make a ground connection from the mounting flange through this layer to the adjacent layer of conducting material. The grounding of the outermost layer of conducting material is quite common practice, as well as the tapping of an intermediate layer to obtain a potential for measuring or control purposes, but the difficulty in making the connection has confronted the industry for many years and has been a real problem, because of the difficulty in making a proper electrical connection to the very thin and fragile metal layer.

It is an object of the present invention to provide a means for making connection to a conducting member of thin and fragile character through an enclosing body of insulation in efficient manner to ensure proper electrical contact.

Other objects of the invention will be apparent from the following description read in conjunction with the accompanying drawing, in which—

Figure 1 is a view in elevation of a bushing constructed in accordance with the invention;

Fig. 2 is a view in section taken on the line II—II of Fig. 1, on an enlarged scale; and

Fig. 3 is a view corresponding to the portion of the bushing shown in Fig. 2, illustrating a modification of the invention.

The condenser type of bushing is now well known, and comprises a conductor or stud 2 surrounded by alternate layers of dielectric and conducting materials. As indicated in Figs. 2 and 3, the stud is first wrapped with dielectric sheet material, such as a treated paper, to form a layer 4 of desired thickness. A sheet of conducting material 6 is then applied to and bonded with the insulating layer 4 and successive layers of insulation and metal foil are then applied to obtain the desired dielectric properties of the bushing.

When the wrapping is complete, a metallic ground flange 8 is pressed upon the insulating body, and it includes an outstanding flange 10 which is to be bolted about the opening in a circuit breaker or transformer tank into which the lower part of the bushing extends. Such tank is usually grounded and it is desirable to ground the outermost layer 12 of the conducting material to the tank through the ground flange 8.

The ground connection to the conducting foil layer 12 has usually been effected by turning a groove in the outermost layer of insulation before the ground flange 8 is placed in position. Such groove should be cut just deep enough to expose a length of surface of the foil layer 12 sufficient to make a good electrical connection therewith. However, such foil layer is only about one-half mil in thickness and almost invariably it will be torn even to the extent of having only two edges exposed in the groove, the central portion having been cut away in the turning operation. The difficulty of making a proper electrical contact to the foil layer under such conditions may well be appreciated. The manufacturer can not be certain that a good and permanent contact has been made to the foil, or that a contact has been made to both of the exposed edges of the foil.

In accordance with the present invention, after the groove is cut, the entire groove surface is metallized, and this may conveniently be accomplished by spraying. By means of a spray gun, particles of molten metal, such as copper or solder, are driven at high velocity against the surface of the groove and are forced into every crack and crevice thereof. This will insure intimate contact between the applied metal and any portions of the foil layer 12 which are exposed.

After the foregoing operation, the ground flange 8 may be placed in position and the portion overlying the groove in the bushing insulation may be rolled, as indicated in Fig. 2, to intimately contact all of the metallized groove surface. It has been found that this is a very satisfactory and simple means for overcoming the heretofore experienced difficulties in making the ground connection to the foil layer 12.

Fig. 3 illustrates a modification applicable to bushings in which a ground flange, such as 8 in Fig. 1, is not required. Here the surface of the insulation is again cut at least to the depth of the foil layer 14 and the surface metallized as described above. A plurality of turns of conducting wire 16 are then tightly wound in a layer against the metallized surface and suitably secured in position. A terminal strap 18 having a portion extending transversely of the con-

volutions of the wire 16 is then soldered to such wire in electrical contact therewith. This type of construction is resorted to because ordinarily the amount of sprayed metal which may be applied to the grooved surface is of insufficient thickness to permit soldering directly to it. Accordingly, the mechanical contact between the wire 16 and the groove surface is resorted to so that the terminal fitting may be suitably supported in position.

By means of the present invention, an efficient and certain method of making a ground connection to the outer conducting layer of an insulating bushing is provided. Both of the modifications described above have been found entirely satisfactory in service and the method disclosed has effected a substantial saving in manufacturing expense. Quite apparently, variations in the foregoing will present themselves and it is intended that the invention be limited only by the scope of the appended claims.

I claim as my invention:

1. In an insulating bushing, a conductor, a wrapping of alternate layers of dielectric material and thin conductive metal foil surrounding said conductor, the outer layer of said wrapping being of dielectric material and having a peripheral groove cut therein to a depth equal to or greater than the distance of the outermost foil layer from its outer surface, means for making an outside electrical connection to said outermost foil layer from the outer layer of said dielectric material, comprising a sprayed metallic coating over the surface of said groove having at least a portion thereof in electrical contact with said outermost foil layer, and a metallic cylinder closely surrounding said wrapping and having a portion rolled into said groove into intimate contact with the conducting coating therein.

2. In an insulating bushing, a conductor, a wrapping of alternate layers of dielectric material and thin conductive metal foil surrounding said conductor, the outer layer of said wrapping being of dielectric material and having a peripheral groove cut therein to a depth equal to or greater than the distance of the outermost foil layer from its outer surface, means for making an electrical connection to said outermost foil layer from the outer layer of said dielectric material, comprising a sprayed metallic coating over the surface of said groove having at least a portion thereof in electrical contact with said outermost foil layer, a conducting strand tightly wrapped around said groove to intimately contact the metalized surface thereof, and a terminal strap having a portion extending transversely of said groove and soldered to said wrapped strand.

3. In an insulating bushing, a conductor, a wrapping of alternate layers of dielectric material and thin conductive metal foil surrounding said conductor, the outer layer of said wrapping being of dielectric material and having a peripheral groove cut therein to a depth equal to or greater than the distance of said outermost foil layer from its outer surface, means for making an electrical connection to the outermost foil layer from the outer layer of said dielectric material, comprising a sprayed metallic coating over the surface of said groove having at least a portion thereof in electrical contact with said outermost foil layer, and terminal means electrically connected to said metalized groove surface.

4. In combination with a conductor, an insulating bushing therefor comprising a wrapping of alternate layers of dielectric and conducting material, the outer layer being dielectric and the conducting layer adjacent said outer layer being of thin metal foil, said outer layer having a peripheral groove cut therein to at least the depth of the conducting layer adjacent thereto, means for making a ground connection to said adjacent conducting layer, comprising a sprayed conducting coating on the surface of said groove in electrical contact with said adjacent conducting layer, and a metallic cylinder closely surrounding said bushing and having a portion rolled into intimate contact with the conducting coating of said groove.

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