

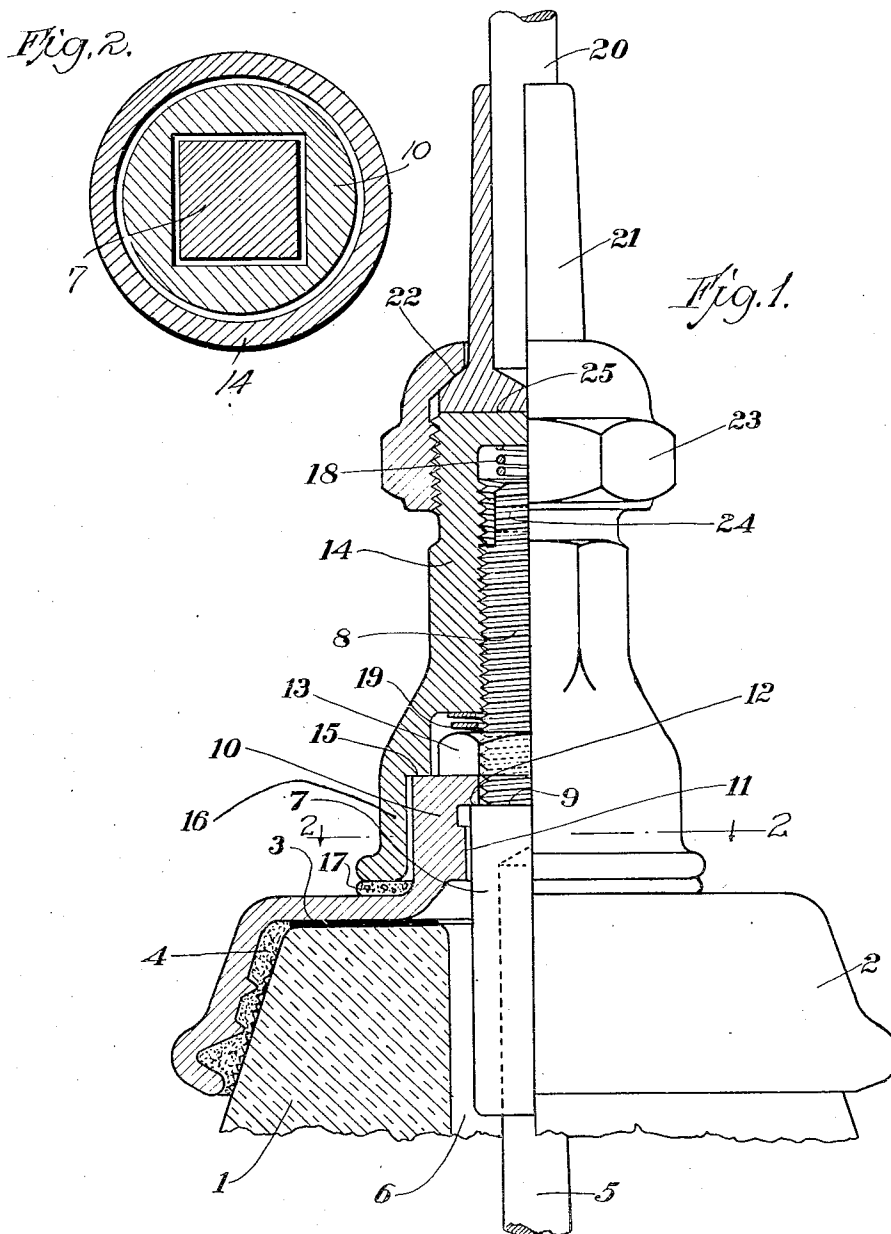
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CONDUCTOR TERMINAL FOR BUSHINGS

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## UNITED STATES PATENT OFFICE

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## CONDUCTOR TERMINAL FOR BUSHINGS

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This invention relates to terminal construction for insulator bushings such as are used in connection with transformer housings and other installations where insulator bushings are used. The invention has for its object the provision of a terminal construction in which a low resistant electrical contact is secured, in which the bushing may be removed or installed without disturbing the connections within the housing, which shall exclude moisture from the interior of the bushing and which shall contain other improved features of construction and operation which shall appear hereafter.

The invention is exemplified in the combination and arrangement of parts shown in the accompanying drawing and described in the following specification, and it is more particularly pointed out in the appended claims.

In the drawing Fig. 1 is a part elevation and part section view showing one embodiment of the present invention.

Fig. 2 is a section on line 2—2 of Fig. 1.

As illustrated in the drawing, the numeral 1 designates a bushing of dielectric material having an end cap 2 assembled therewith and provided with a gasket 3 and cement 4 for forming a tight connection between the end cap and bushing. A conductor 5 extends thru the opening 6 in the bushing and has a square or other angular form of lug 7 secured thereto by brazing, soldering or other approved method of attachment. The lug 7 forms a continuation of the conductor 5 and has its outer end reduced and threaded as shown at 8, thus forming a shoulder 9 at the inner end of the threaded portion. The end cap 2 has an upwardly extending flange 10 provided with an angular opening 11 therethru for receiving the angular portion of the lug 7. Above the opening 11 is a shoulder 12 having an opening for receiving the threaded end 8 of the conductor 5 by providing an abutment for the shoulder 9 to limit the upward movement of the conductor. The nut 13 is threaded on the end 8 of the conductor and is screwed down against the upper surface of the flange 10 to clamp the portion 12 thereof between the shoulder 9

and the nut 13. In this way the lug 7 and the conductor 5 are locked to the cap 2. A terminal cap 14 is threaded on the projecting end 8 of the conductor and is provided with a shoulder 15 which bears against the upper face of the flange 10.

If the surfaces at 15 are ground to fit closely, a tight joint may be made at this joint for excluding moisture from the interior of the bushing. To further insure a tight closure, the cap 14 may be provided with a downwardly extending flange 16 provided with a yielding gasket 17 below the lower edge of the flange and the top surface of the cap 2; this will permit the cap 14 to be screwed down until it is stopped by the bearing 15 and at the same time will compress the gasket 17 to form a tight joint. When the cap is thus tightened it will exert an upward stress on the threads 8 and thus insure close contact between the threaded surfaces on the conductor and terminal cap for the purpose of providing low resistance electrical connection between these parts. To further insure close contact between the threaded surfaces, a helical spring 18 may be interposed between the closed end of the cap 14 and the upper end of the threaded conductor 8. This spring will exert a pressure on the cap and conductor drawing upwardly on the cap and pressing downwardly on the conductor, thus augmenting the action of the abutment surfaces which hold the cap and conductor. The spring 18 will also serve the function of a lock washer for preventing loosening of the cap on the conductor. A second spring 19 may be interposed between the cap and the nut 13 to assist the spring 18 in a similar way. A conductor lead 20 is provided with a lug 21 secured to the end thereof in any approved manner, and having a tapered surface 22 for engagement with a corresponding surface on a screw clamp or coupler 23 for connecting the lead to the terminal cap 14.

A very good bearing or electrical contact can be obtained between the upper end of the conductor 8 and the weather cap 14, as all the stress is taken up between the metal parts. This has the advantage, in that, the

shrinking of the gasket will not affect the electrical contact and, in addition, thermal expansion is not so likely to loosen the joint.

In this form of contact, the conductor is drawn up thru the bushing with a wire attached to an eye 24 in the conductor 8. The nut 13 is then tightened down so as to hold the conductor from dropping back. Rotation is prevented by the squared section 7 which engages in a suitable recess 11 in the cap. When the weather cap 14 is drawn down tightly the squared section 7 bears against the shoulder 12 in the cap 2. This prevents the lead from being drawn thru the bushing, and when the cap 14 is then tightened, pressure is exerted between the cap 2 and the cap 14 at the shoulder 15 and between the cap 2 and the lug 7 at 12. If a ground joint is provided, this will insure a tight fit, or a gasket may also be used.

A preferable method, however, is to install a metal gasket at the point 15 or a soft gasket at the point 17. If a tight joint is not necessary, these gaskets may be left out as the cap 14 provides a water shed so that water cannot drip into the transformer or device upon which the bushing is used.

This form of terminal has the advantage, in that, a flexible conductor 5 may be used. This type of terminal also has the advantage, in that, it may be applied to practically any bushing to which the form of cap shown in 2 may be attached, as no special recesses are required in the bushing. The cap 23 provides means for connecting the external lead 20. Electrical contact is insured by the lug 21 and the upper face of the cap 14 at the surface 25. This may be a flat surface or may be conical to provide increased contact area. To insure a good electrical contact, a thin layer of tin or a springing material such as wire gauze, or corrugated disk is used in the joint. Further electrical contact is provided at the surface 22. This contact surface is increased by making same conical.

As all stress necessary to make good electrical contact or to make a tight joint is confined at the top of the bushing a conductor 5 either rigid or solid may be used with a suitable insulating covering which may extend well up into the bushing and below without being broken. This covering reinforces the bushing and tends to prevent electrical discharge where the conductor leaves the lower end of the bushing, particularly if the oil level is low or the bushing is installed above oil level. The insulating covering may permit the use of a shorter and cheaper bushing, as the covering is very effective in preventing a discharge to ground or other conductors for surges of high magnitude and short duration. If the covering had to be broken at the lower end of the bushing, this covering would be difficult to

make and still insure a sufficient degree of insulation. With the bushing terminal as shown, a fiber tube or varnished cambric coverings may be used which are inexpensive and easily installed.

This type of terminal is generally used where a high degree of tightness is not essential to prevent leakage of oil or air, but where it is highly important to keep out rain. This condition is found in general practice where the oil level in the transformer or conservator is not above the top of the bushing.

I claim:

1. A dielectric bushing having a metallic fitting secured thereto, a conductor in said bushing, means for clamping said conductor to said fitting and a terminal cap for said conductor threaded on the projecting end thereof and bearing against said fitting.

2. A dielectric bushing, a metallic fitting secured to said bushing, a conductor extending through said fitting, a nut for clamping said conductor to said fitting and a terminal member threaded on said conductor and bearing against said fitting so that the force of said conductor and terminal member caused by tightening said terminal member will be transmitted to said fitting.

3. A dielectric bushing having a metallic fitting rigidly fixed to one end thereof, a conductor having an end portion thereof passing through an opening in said fitting and having a shoulder engaging said fitting for limiting outward movement of said conductor through said fitting, the minimum diameter of said opening being greater than the maximum diameter of said end portion to permit passage of said end portion through said opening without relative rotation of said fitting and conductor, a terminal cap threaded on the projecting portion of said conductor and having bearing against said fitting to draw said conductor to the position to which it is limited by said shoulder, and a gasket interposed between said terminal cap and fitting at a position removed from said bearing, and forming a tight joint to close the opening in said bushing.

4. A dielectric bushing having a metallic fitting secured thereto, a conductor extending freely through said bushing and fitting, means on said fitting for limiting movement of said conductor therethrough, a terminal member threaded on said conductor to hold said conductor against said limiting means and a spring interposed between said conductor and terminal member and exerting opposite forces on said conductor and terminal member to provide close contact between their threaded surfaces.

5. A dielectric bushing having a metallic fitting secured thereto, a conductor extending loosely through said bushing and fitting, a shoulder for limiting outward movement of said conductor relative to said fitting, a

terminal member threaded on said conductor and bearing against said fitting to exert outward force on said conductor thus insuring close connection between the threaded surfaces of said terminal member and conductor, and a spring interposed between said terminal member and conductor for augmenting the force tending to hold said threaded surfaces in close connection.

10 6. A dielectric bushing having an opening therethrough, a metallic fitting secured to said dielectric bushing, a conductor having a threaded portion extending through said fitting, a nut for clamping said conductor to  
15 said fitting and a terminal member threaded on said conductor and bearing against said fitting to exert force on said conductor, said terminal member having clearance to permit rotation thereof independently of said nut.

20 7. A dielectric bushing having a metallic fitting secured thereto, a conductor passing through said bushing, means for clamping said conductor to said fitting, a terminal cap threaded on the projecting portion of said  
25 conductor and bearing against said fitting, a spring interposed between said cap and the end of said conductor tending to move said conductor and terminal cap relative to each other to produce close contact between their  
30 threaded surfaces, and a second spring interposed between said terminal cap and clamping means for augmenting the action of said first mentioned spring.

8. A dielectric bushing having a metallic  
35 cap secured to the top thereof, a conductor extending through said bushing and having an angular portion fitting a similarly shaped opening in said cap and an imperforate cover threaded on said conductor and bearing on  
40 said cap to form a seal for said bushing and to provide electric contact with said conductor, the stress produced by said bearing being entirely confined to the cap and parts mounted thereon.

45 In testimony whereof I have signed my name to this specification on this 25th day of July, A. D. 1922.

ARTHUR O. AUSTIN.