June 2, 1942. W. A. SMITH 2,284,926

TERMINAL FOR BUSHING INSULATORS

Filed Dec. 30, 1939 2 Sheets-Sheet 1

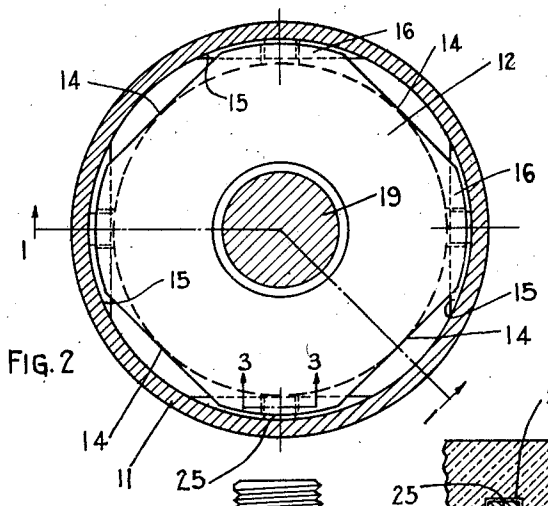


FIG. 2

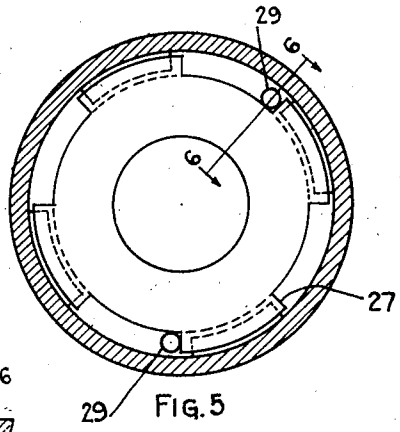


FIG. 5

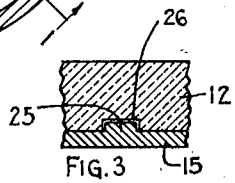


FIG. 3

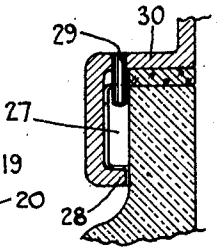


FIG. 6

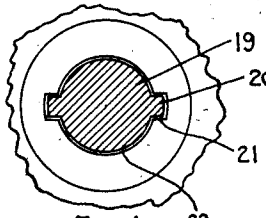


FIG. 4

FIG. 1

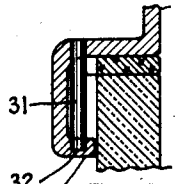


FIG. 7

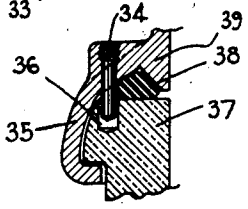


FIG. 8

INVENTOR
William A. Smith
BY Alphens J. Crane
ATTORNEY

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TERMINAL FOR BUSHING INSULATORS

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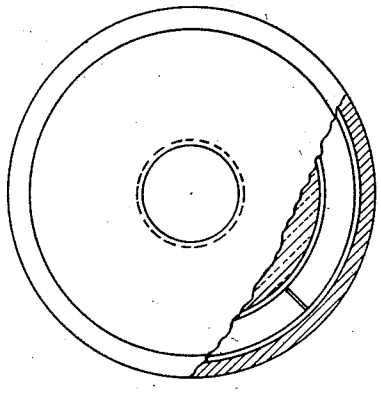


FIG. 10

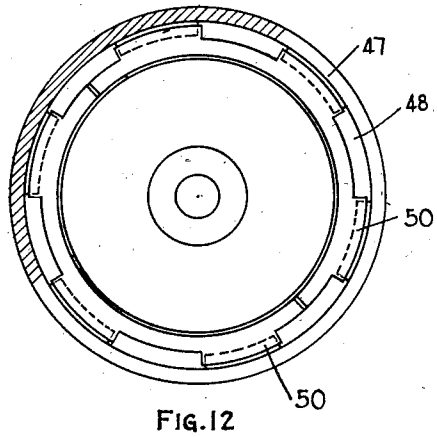


FIG. 12

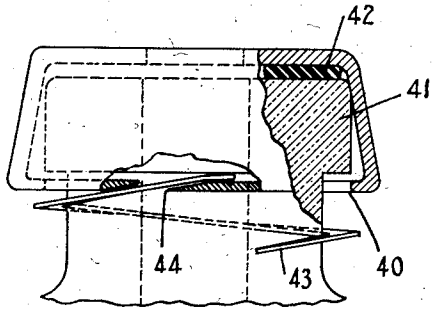


FIG. 9

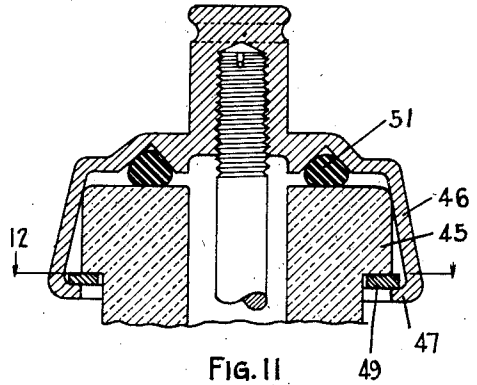


FIG. 11

INVENTOR
William A. Smith
BY Alphonse J. Crane
ATTORNEY

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TERMINAL FOR BUSHING INSULATORS

William A. Smith, Akron, Ohio, assignor to The Ohio Brass Company, Mansfield, Ohio, a corporation of New Jersey

Application December 30, 1939, Serial No. 311,795

8 Claims. (Cl. 174—167)

This invention relates to terminals for bushing insulators and has for one of its objects the provision of a bushing terminal which shall be economical to manufacture, easy to apply and which shall provide a permanent seal for the insulator.

A further object of the invention is to provide a device of the class named which shall be of improved construction and operation.

Other objects and advantages will appear from the following description.

The invention is exemplified by 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 drawings:

Fig. 1 is a fragmentary sectional view on line 1—1 of Fig. 2 of the upper end of a bushing insulator showing one embodiment of the present invention applied thereto.

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

Fig. 3 is a fragmentary section on line 3—3 of Fig. 2.

Fig. 4 is a fragmentary sectional view on line 4—4 of Fig. 1.

Fig. 5 is a horizontal sectional view of a modified form of the invention.

Fig. 6 is a fragmentary sectional view on line 6—6 of Fig. 5.

Figs. 7 and 8 are views similar to Fig. 6 showing other modifications of the invention.

Fig. 9 is a fragmentary elevation with parts broken away of another modification.

Fig. 10 is a top plan with parts in section of the form of invention shown in Fig. 9.

Fig. 11 is a fragmentary section of a further modification.

Fig. 12 is a section on line 12—12 of Fig. 11.

In electrical apparatus where a conductor extends through a grounded member such as the cover for a transformer or circuit breaker housing, it is necessary to provide insulation for the conductor and this is usually in the form of a bushing insulator made of dielectric material, such as porcelain, the insulator comprising a tubular member through which the conductor extends, the member being provided with a fitting at at least one end for connecting the conductor to the insulator, the fitting usually being arranged to seal the end of the tubular dielectric member. It has heretofore been a common practice to secure the terminal member to the dielectric tube by some form of cement, but this has certain disadvantages, such as the time required for assembly and the chance of leakage through the joint. Where both ends of the tube are provided with a fitting, a spring or other resilient means may be employed in connection with the conductor to hold the two terminals in tight resilient connection with the ends of the bushing, but frequently it is not necessary or desirable to close the lower end of the bushing, and in this case, a simpler and more economical closure for the upper end which shall also serve for the bushing terminal, is desirable. The present invention provides such a closure which may be quickly and easily applied and which requires no time after its application for hardening of any sealing material.

In the form of the invention shown in Fig. 1 the numeral 10 designates the upper end of a dielectric bushing having a cap 11 applied thereto. The upper end of the bushing 10 is provided with a terminal head 12 which is undercut to form a groove 13 surrounding the insulator below the head. The overhanging flange thus produced is cut away at various positions around the head 12, as indicated at 14 in Fig. 2 of the drawings. The cap 11 has inwardly projecting segments 15 corresponding in angular displacement to the segments severed from the head 12, but the distance across the cap between opposite segments 15 is slightly greater than the distance across the head of the insulator between opposite surfaces 14 so that, when the segments 15 are located in registration with the faces 14, the cap will move downwardly over the head 12 to bring the segments 15 into registration with the groove 13. A slight rotation of the cap will then bring the segments 15 into registration with the projections 16 on the head 12, as shown in Figs. 1 and 2, so that the cap is restrained from upward movement off the head. A resilient gasket 17 is interposed between the cap 11 and the top of the head 12 and this gasket is of sufficient thickness that it must be strongly compressed to permit rotation of the head to bring the segments 15 into registration with the projections 16. When the cap 11 is pressed down on the gasket 17 and rotated to an angle at which it is locked by the projections 16 from removal, the gasket will be sufficiently compressed to form a tight joint between the cap and the upper end of the bushing. A conductor 18 extends through the bushing 10 and is provided with a threaded terminal 19 having integral keys 20 for engaging notches 21 in the periphery of a central opening 22 in the cap 11. The terminal 21 is drawn upwardly through the opening in the cap and a blind terminal member

23 is screwed tightly on the threaded end of the terminal 19 and bears on a gasket 24 to form a tight closure for the opening through the cap 11. In order to prevent the cap 11 from accidental rotation after it is in place, one or more of the segments 15 may be provided with a raised locking key 25 adapted to enter a slight depression 26 in the lower face of one of the projections 16.

In assembling the bushing the gasket 17 is applied to the upper end of the dielectric member 10 and the cap 11 placed over the head 12 with the segments 15 in registration with the faces 14 and pressed down with sufficient force to bring the segments 15 below the plane of the lower faces of the projections 16. The cap is then rotated until the segments 15 are disposed beneath the projections 16, as shown in the drawing. Pressure on the cap 11 is then released and the resiliency of the gasket 17 draws the locking keys 25 into their locking grooves 26 and the cap is permanently locked in place. The draw lead 18 may then be pulled up into position and the blind terminal 23 threaded onto the end of the draw lead to compress the gasket 24 and complete the assembly.

The cap 11 may be removed from the insulator head 12 by a reverse motion of that just described.

Instead of cooperating segments the head of the insulator and the cover cap may be provided with cooperating radial projections 27 and flanges 28, as shown in Figs. 5 and 6. Locking pins 29 may be inserted through perforations in the cap 30 to hold the cap in place instead of the locking keys 25, shown in Figs. 1 and 2. The pins 29 may be provided with slight enlargements or heads at their upper ends to prevent them from dropping through their perforations, and if desired, a little solder may be applied to the upper ends of the pins to hold them in place.

Instead of headed pins, as shown in Figs. 5 and 6, pins 31 may extend entirely past the projections on the insulator head, as shown in Fig. 7, and be supported in depressions 32 in the inwardly projecting flanges 33.

Another form of lock pin is shown in Fig. 8 which is provided with a threaded head 34 to cooperate with a threaded opening in the cap 35 to hold the pin in place. The pin extends into a recess 36 in the upper end of the bushing head 37. In this figure a gasket 38 is shown which is circular in cross section and fits into a V-shaped groove 39 in the face of the head 35. The gaskets may be made of synthetic rubber or other suitable material.

In the embodiments of the invention thus far described, it is necessary to rotate the cap while in contact with the gasket, in order to move the cap to locking position. Ordinarily, there is no difficulty in this operation, but in cases where it is desirable to employ a gasket on which the cap does not slide readily or where it is inconvenient to press down upon the cap and rotate it at the same time, a different form of the invention may be employed, as shown in Figs. 9, 10, 11 and 12. In Fig. 9 the flange 40 on the lower edge of the cap is in the form of a continuous ring of sufficient diameter to move downwardly over the bushing head 41. In assembling this form of the invention the cap is pressed down on the gasket 42 and a locking ring 43 is fed through a slot 44 formed in the flange 40. The ring 43 is split at one side and may be deformed to permit it to be moved into position over the bushing and fed through the slot 44 by rotation about the neck of the bushing. The ring, of course, will be made of some resilient material, such as spring bronze or steel properly treated to prevent corrosion. After the ring has been fed into place through the slot 44 the outer edge of the ring will rest upon the flange 40 and the inner edge will engage the lower edge of the projection on head 41, thus locking the cap in position.

In the form of invention shown in Figs. 11 and 12, the bushing insulator is provided with a continuous shoulder 45 and the cap 46 is provided with spaced, inwardly extending projections 47 alternating with notches 48. A two-piece, split ring 49 is provided with radially projecting teeth 50 which, in one position of the ring, will register with the notches 48 and permit the ring to be moved into position beneath the shoulder 45 when the cap 46 is sufficiently depressed upon the gasket 51. When the ring is in proper position, it may be rotated a sufficient distance to bring the teeth 50 in registration with the projections 47, thus locking the cap against upward movement. The friction between the ring and the contacting parts will usually be sufficient to prevent displacement of the ring.

The several tops of the several modifications may be removed from the insulator bodies by a reverse motion of the process or assembly described in connection with each modification.

I claim:

1. The combination with a bushing insulator having an opening therethrough, of a separable cap for closing said opening at one end of said insulator, said insulator having a shoulder thereon encircling said opening and registering with a portion of said cap, a resilient gasket interposed between said cap and shoulder and means rotatable relative to said insulator and about the axis thereof to axially move said cap and said insulator such that said gasket is compressed between said cap and shoulder for locking said cap on said insulator and for holding said gasket in compression to provide a tight seal for the opening in said bushing insulator.

2. The combination with a bushing insulator having an opening therethrough, of a separable cap for closing said opening at one end of said insulator, said insulator having a shoulder thereon encircling said opening and registering with a portion of said cap, a resilient gasket interposed between said shoulder and cap and mechanically interlocking means movable into locking position only when said gasket is compressed between said shoulder and cap by relatively axially moving said insulator and cap for locking said cap in position to hold said gasket in a compressed condition for sealing said opening.

3. The combination with a bushing insulator having an opening therethrough, of a separable cap for closing said opening at one end of said insulator, said insulator having a shoulder thereon encircling said opening and registering with a portion of said cap, a resilient gasket interposed between sad shoulder and cap and mechanically interlocking means for holding said gasket in compressed condition between said shoulder and cap, said interlocking means being movable into interlocking relation by a relatively rotary and an axial movement of said cap and insulator about the axis of said insulator to compress said gasket between said cap and shoulder to form a tight seal for said opening.

4. The combination with a bushing insulator

having an opening therethrough, of a separable cap for closing said opening at one end of said insulator, said insulator having a shoulder thereon encircling said opening and registering with a portion of said cap, a resilient gasket interposed between said cap and shoulder, interlocking means for holding said cap in position to compress said gasket against said shoulder, said interlocking means being movable into interlocking position by rotation and relative axial movement of said cap and insulator about the axis of said insulator, only when said gasket is compressed.

5. The combination with a bushing insulator having an opening therethrough, of a separable cap for closing said opening at one end of said insulator, said insulator having a shoulder thereon encircling said opening and registering with a portion of said cap, a resilient gasket interposed between said cap and shoulder, interlocking means for holding said cap on said insulator in position to compress said gasket, said interlocking means being movable into interlocking relation by rotation and relative axial movement of said cap and insulator about the axis of said insulator, only when said gasket is compressed and means for preventing accidental release of said interlocking means.

6. The combination with a bushing insulator having an opening therethrough, of a separable cap for closing said opening at one end of said insulator, said insulator having a shoulder thereon encircling said opening and registering with a portion of said cap, said insulator and cap having projections thereon arranged to pass each other to permit assembly of said cap on said insulator when said cap has one angular position relative to said insulator, a resilient gasket interposed between said shoulder and cap, said cap being rotatable to a different angular and axial position relative to said insulator when said gasket is compressed between said shoulder and cap, said projections being brought into registration by said rotation to retain said cap on said insulator and to maintain pressure on said gasket between said shoulder and cap.

7. The combination with a bushing insulator having an opening therethrough and having a circumferential groove adjacent one end thereof to form a shoulder, a cap for closing said opening at one end of said insulator said cap having projections arranged to extend into said groove when said cap is in position on said insulator, said shoulder and projections being shaped to pass each other when said cap has a certain angular and axial position relative to said insulator, to facilitate movement of said projections over the end of said insulator into registration with said groove and prevent return of said projections past the end of said insulator when said cap has a different angular and axial position relative to said insulator, a resilient gasket encircling said opening and interposed between said cap and the end of said insulator and of a thickness to hold said projections out of registration with said groove except when said gasket is compressed and means for locking said cap from rotation relative to said insulator when said cap is in the angular position in which said projections prevent the return of said cap past the end of said insulator.

8. The combination with a bushing insulator having an opening therethrough and having a circumferential groove adjacent one end thereof forming a head, spaced portions of the side of said head being flat, a cap for closing the opening at one end of said insulator said cap having inwardly projecting segmental portions corresponding in shape and position to the flattened portions of said head so that said cap may be placed over said head when said segmental portions and flattened portions are in registration with each other, a resilient gasket encircling said opening and interposed between said cap and head and of sufficient thickness to prevent registration of said segmental portions with said groove when said gasket is expanded, said gasket being compressible to permit said segmental portions to register with said groove, said cap being rotatable and axially movable relative to said insulator when said gasket is being compressed to bring said segmental portions into the portions of said groove removed from the flattened portions of said head to lock said cap on said head and to hold said gasket in compression.

WILLIAM A. SMITH.