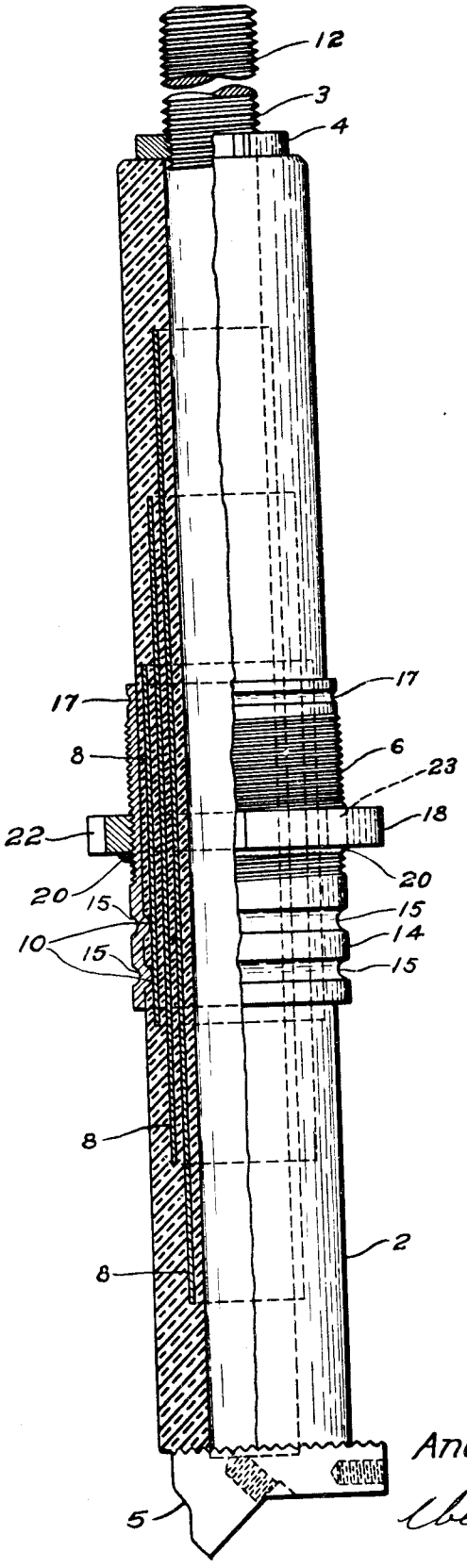
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BUSHING STRUCTURE

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BUSHING STRUCTURE

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My invention relates to high-voltage devices and particularly to bushings of the condenser type.

One object of my invention is to provide a device of the above-indicated character that shall be simple and durable in construction, economical to manufacture and effective in its operation.

Another object of my invention is to provide a high-voltage structure embodying dielectric and metal elements for attachment to each other in a particular relation, wherein cements and other bonding media, having finite life shorter than that of the structure, and other attaching means of usual character, such as screws, bolts and the like, with the attendant disadvantage thereof, shall be replaced by a means for securing the dielectric and metal elements to each other in a simple expeditious manner, free of the faults of features formerly used in the place of such means.

Another object of my invention is to provide a high-voltage structure including means for securing metal and dielectric members to each other that shall conserve more space, comprise fewer parts, have longer life and be more reliable than similar structures heretofore employed.

A further object of my invention is to provide a high-voltage structure, as indicated above, that shall be less dependent upon the quality of the materials employed and the skill of the workmanship required than former similar structures, thereby facilitating the manufacture and assembly of the device and rendering it an improvement in various aspects in the art to which it relates.

In high-voltage electrical apparatus, the quality, structure and relation of parts are usually of great importance where the parts are subject to the influence of oil, air, moisture, corona and other features.

Particularly where dielectric and metal elements are joined to each other and subject to electrical stresses, the joining means are often sources of trouble and expense, and sometimes the weak features result in breakdown, part replacements and other objectionable features.

In high-voltage bushings of the condenser type, it is necessary to support the bushings intermediate the ends thereof, and it is to these intermediate supports and the method of securing them to the bushings to which my invention more particularly relates.

Where a condenser bushing is disposed in an opening in the cover of a circuit-interrupter or transformer tank, it has been usual to place a metal structure around the dielectric material of the bushing, which structure is secured to the bushing by cement or other binding or attaching media, and includes an intermediate flange for attachment to the tank cover.

Under the influence of air, oil and electrical stresses, the binding medium between the bushing and its sleeve support is usually adversely affected, unless a structure of very high-grade materials and workmanship and of relatively expensive and difficult manufacture and assembly is provided.

In practicing my invention, I provide a condenser bushing or other dielectric element and a metal support therefor that are so joined as to avoid the objections to the use of bonding materials and other attaching means heretofore employed, substantially all elements extraneous to the bushing and its support being eliminated and the bushing and its support having mutual holding relation.

The single figure of the accompanying drawing is a view, partially in longitudinal-side elevation and partially in longitudinal section, of a condenser bushing, constructed in accordance with my invention.

The device comprises, in general, a condenser bushing 2, a through conductor 3 therefor, an upper clamping nut 4, a lower contact-member support 5 and a main bushing ground support 6.

The bushing 2 is in the form of an elongated tube of dielectric material, preferably wound of fibrous sheet material, such as paper, impregnated with a binder, and having concentric conducting condenser elements or cylinders 8 embedded therein. The latter are preferably positioned during the winding operation and are successively outwardly of shorter lengths and greater diam-

eter to prevent equal or other voltage-gradient steps between the conductor 3 and the ground support 6.

The outer cylindrical surface of the bushing 2 is provided with annular laterally-extending portions, preferably in the form of groove portions 10 of curved or arcuate cross-sectional contour that are sufficiently deep to expose the outer conducting cylinder 8. These grooves are preferably turned or cut while the bushing is still in the winding machine or lathe-like apparatus for building up its dielectric and conducting layers.

The conductor 3 is preferably of solid metal, such as copper, although it may be of tubular form, and is provided, at its upper end, with exterior screw-threads 12 and, at its lower end, with the member 5 for supporting a stationary contact member (not shown) of a circuit interrupter. The member 5 is preferably welded to the conductor 3 and may be replaced by a member for receiving a transformer lead. Also, if the conductor be tubular, the member 5 may be omitted, and a flexible conducting cable or lead be brought from a transformer or other apparatus to the lower end of the bushing 2 and through the bushing.

While the structures at the ends of the bushing are not germane to this invention and may be variously modified, the member 5, as shown, is corrugated on its upper surface to provide better holding relation to the lower end surface of the bushing, and the nut 4 is provided for cooperation with the screw-threaded portion 12 of the conductor 3 to draw the nut 4 and the member 5 longitudinally together, thereby providing tight assembly of these parts relative to the bushing.

The main bushing support 6 is preferably of metal, such as brass, steel or copper, and includes a one-piece tubular portion or sleeve 14 capable of having annular projections or flanges 15 pressed or rolled into the proove portions 10 of the bushing 2 and into contact with the outer conducting cylinder 8. There are preferably two of the flanges 15 longitudinally offset relatively adjacent to one end of the sleeve 14 and a portion 17 adjacent to the other end of the sleeve that is rolled against the bushing which, however, is preferably not grooved opposite the portion 17 as it is opposite the flanges 15.

The sleeve 6 is preferably exteriorly screw-threaded between the portions 15 and 17 for the reception and adjustment of a laterally-outwardly projecting flange nut or collar 18 which is secured to the sleeve 6, as by a weld or solder joint 20, after adjustment.

Spanner wrench slots 22 may be provided in the supporting flange 18 for adjusting it and openings 23 provided thereon for securing it to the cover of a circuit-interrupter, a transformer or other apparatus tank.

The sleeve 6 is preferably constructed to initially have a close sliding fit over the bushing 2.

With the outer cylindrical surface of the bushing provided with a relatively-thin or superficial film of a binder, such as shellac, the sleeve 6 is slidably moved to its position shown, after which the flanges 15 and the portion 17 are rolled against the bushing to provide radial pressure between the bushing and the sleeve. By the lateral interfitting relation of the flanges 15 in the grooves 10, the support 6 and the bushing 2 are interlocked against longitudinal relative movement.

The extremely thin or superficial film of shellac or other binder between the sleeve and the bushing acts as a further seal against the admission of air, oil and moisture, and by its thinness and protection by the bushing and the sleeve, it is not subject to deterioration, or of causing trouble, if it be slightly affected by electrical stresses, air, oil, moisture, or other factors.

In former practice, it was usual to provide a larger element in the place of the sleeve 6 because of the necessity of utilizing a relatively thick cylinder of cement or other material between the sleeve and bushing, which material has a finite life, under the attendant conditions, of shorter duration than the other elements of the combination, resulting in breakdowns, replacements and other expense and trouble. Also, in former practice, the support corresponding to the main bushing support 6, was materially more complicated and expensive.

The reduction of materials and the saving of space not only render the structure neater, more compact and more effective from mechanical and manufacturing standpoints, but, by reason of the high voltages employed in association with devices of this character, also inure to the betterment of its electrical effectiveness in reducing losses, in preventing interruption of service and in being a general improvement in other ways.

Also, as distinguished from former devices of this character, the assembled structure is more solid mechanically, and free from looseness caused by temperature changes and oil saturation.

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

I claim as my invention:

1. In combination, a bushing comprising alternately-disposed dielectric and conducting condenser elements, and a metal bushing support including a one-piece portion of substantially closed-loop shape having a flange surrounding, and held relative to an outer dielectric element of, a groove in the bushing

under radial pressure in engagement with a conducting condenser element of the bushing.

2. In combination, a condenser bushing having cylindrical outer-surface dielectric portions and an annular outer-surface groove portion between said surface portions, and a bushing support including a cylindrical sleeve surrounding the bushing and having an inwardly bent annular flange engaging a conducting condenser element in said groove.

3. In combination, a condenser bushing having a cylindrical outer-surface dielectric portion and a plurality of longitudinally-spaced annular outer-surface groove portions therein, and a bushing support including a cylindrical metal sleeve surrounding the bushing and having an annular flange in each of said grooves in engagement with one of the conducting condenser elements, and an outwardly-projecting portion longitudinally offset from said flanges.

4. In combination, a condenser bushing comprising telescoped dielectric and conducting cylinders including a cylindrical outer-surface dielectric portion and a plurality of longitudinally-spaced annular groove portions of arcuate transverse contour in said outer-surface portion and a bushing support including a cylindrical sleeve surrounding the bushing and having inner annular flanges in and conforming to, said arcuate grooves, in engagement with one of said conducting cylinders adjacent to one end of the sleeve, and an outwardly-projecting portion at an intermediate portion of said sleeve, the latter having a portion adjacent to its other end under radial pressure relative to the bushing, and a superficial-film binder between the bushing and said sleeve.

5. In combination, a condenser bushing including a dielectric cylinder and a conducting cylinder intermediate the inner and outer surfaces of the dielectric cylinder, the latter having an outer surface annular groove exposing said conducting cylinder, and a bushing support including a metal cylindrical sleeve surrounding the bushing and having an inwardly bent annular flange intermediate its ends in contact with said conducting cylinder in said groove.

6. In combination, a condenser bushing comprising radially-oppositely spaced dielectric and conducting cylinders including longitudinally-spaced outer dielectric cylindrical portions providing a peripheral groove in the bushing with the outer surface of a conducting cylinder at the bottom of said groove, and a metal support surrounding an intermediate portion of the bushing and having an inwardly-bent annular flange engaging said surface in said groove.

7. In combination, a condenser bushing comprising radially-oppositely spaced dielectric and conducting cylinders including longitudinally-spaced outer dielectric cylindrical portions providing a peripheral groove in the bushing with the outer surface of a conducting cylinder at the bottom of said groove, and a metal support including a sleeve surrounding an intermediate portion of the bushing and having an inwardly-bent annular flange intermediate its ends engaging said surface in said groove.

In testimony whereof, I have hereunto subscribed my name this 17th day of June, 1929.

ANDREW H. BAKKEN.