March 17, 1942. G. A. BURR 2,276,923

CONDENSER DEVICE

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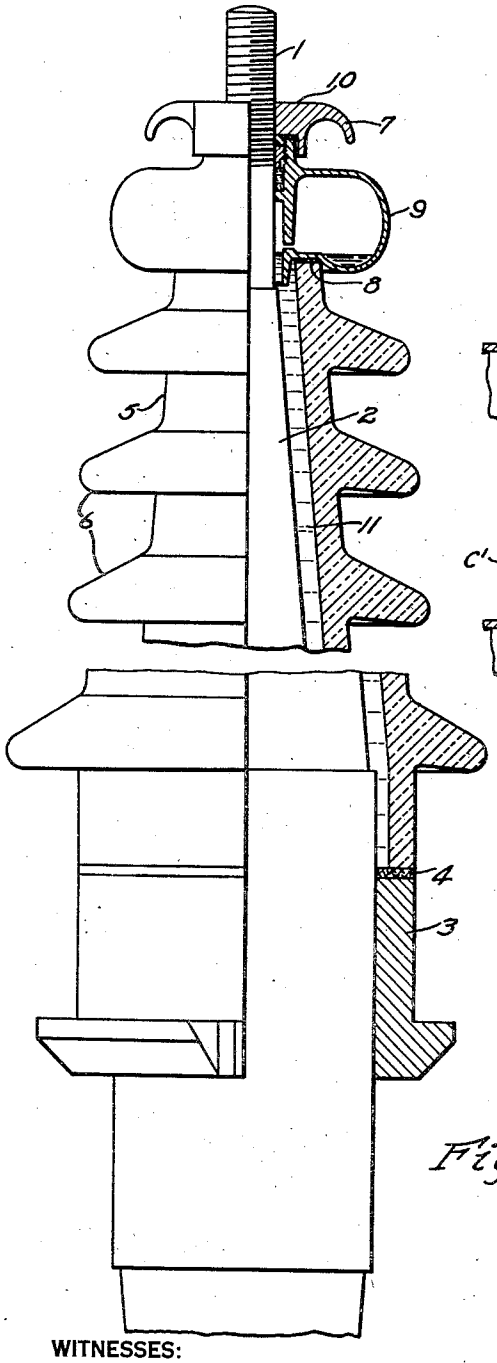



Fig. 1.

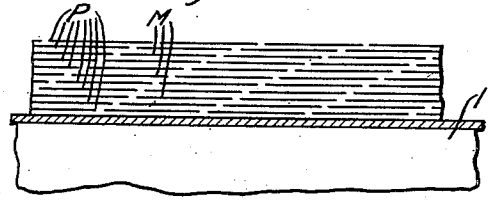



Fig. 2.

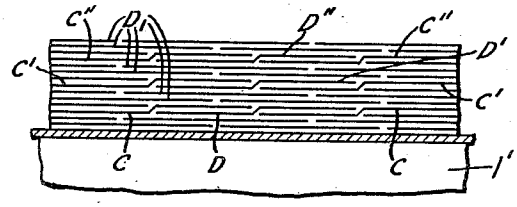



Fig. 3.

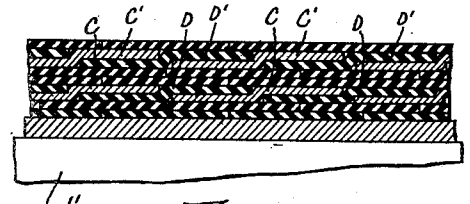



Fig. 4.

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2,276,923

## CONDENSER DEVICE

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4 Claims. (Cl. 174—143)

My invention relates to a condenser device and it has particular relation to condensers of the bushing or wound type which comprise alternative layers of conducting and insulating material. It is especially applicable to condenser type insulating bushings for high voltage circuit breakers and transformers.

A widely and successfully used bushing structure is that constructed of alternate relatively thin conducting layers spaced by dielectric layers or cylinders of successively greater diameters and lesser lengths to provide the desired conditions of capacity between layers and stress on the dielectric.

In what is perhaps the most common form of these bushings the conductor portion is made up in the form of a continuous helical layer, either butted or overlapped, with a dielectric layer of paper strip wound over it in a similar manner. This prior art construction which will be more fully described in connection with the drawing has a serious disadvantage in that its strength and tightness are dependent on the adhesion between the metal foil and paper. It has been found impossible to make such a metal-to-paper bond of a strength comparable to that obtainable between two paper surfaces.

In accordance with my invention such a condenser bushing is wound with a paper strip interleaved with the foil strip. These two strips are wound in similar helical forms which are staggered in relation to each other. In this manner it is possible to form a bushing which is held together principally by means of a dielectric-to-dielectric bond and having, in practical effect, the advantages of a paper-to-paper construction.

It is, accordingly, an object of my invention to provide a novel and improved layer type condenser and a method of construction therefor.

It is another object of my invention to provide a condenser bushing having increased mechanical strength and improved electrical properties.

More specifically, it is an object of my invention to provide a condenser bushing of the wound or tape type in which a dielectric-to-dielectric bond is employed throughout to supply greater mechanical strength and improved sealing properties.

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

Figure 1 is a front elevation, partly in section, of an insulating bushing of the condenser type to which my invention may be applied, with parts broken away;

Fig. 2 is an enlarged view of a portion of a longitudinal section through the condenser structure of Fig. 1, according to the prior art;

Fig. 3 is a view similar to Fig. 2 of a condenser structure built according to my invention, and

Fig. 4 is an enlarged view of a portion of the structure shown in Fig. 3.

Referring to Figure 1 of the drawing, the main conductor or bushing stud 1 is surrounded by a condenser winding 2 of the type to which my invention may be applied. A mounting flange 3 is secured to the condenser structure 2 and has a machined upper surface on which a gasket 4 is placed. A porcelain insulating shell 5 having usual surface creepage flanges at 6 is seated upon the gasket 4. A terminal cap 7 rests upon the upper end of the shell 5 with a gasket 8 therebetween. This cap structure includes the usual expansion chamber 9 and a nut 10 for holding the bushing in assembled condition. In accordance with the usual practice the assembled bushing is filled with an insulating compound indicated at 11. A construction of the type described may be in accordance with that described in greater detail in United States Patent No. 2,078,219, issued April 27, 1937, to Edwin E. Arnold and myself.

In a bushing constructed according to the prior art, as shown in the section of Fig. 2, the strips of metal foil M are wound in a helical form, generally in substantially abutting relationship along the bushing stud 1. A plurality of layers of insulating or paper strips P are wound in similar manner between the various metal strips. This results, in effect, in concentric alternate layers of metal foil and dielectric material.

In accordance with my invention, as indicated in Figs. 3 and 4, a number of turns of dielectric material are first wound around the bushing stud 1'. The conducting strip C, preferably of metal foil, is wound in helical form while dielectric strip D is interleaved therewith and follows the same configuration. Taken along the axis of the bushing stud, it will be seen that portions of the conducting strip C alternately overlap and are overlapped by similar portions of the dielectric strip D. A number of such layers are superimposed with additional dielectric strips $D_1$ in between. For example, in Fig. 3, there is shown two other layers, one of which is made up of conducting strips C' and dielectric D' and another of conductor strip C'' and dielectric strip D''.

The construction of such a condenser in ac-

cordance with my invention will be found particularly simple. It is only necessary to partially overlap edges of a conducting strip and dielectric strip and wind them in helical form together. By selecting the proper amount of lag between the two strips the desired arrangement may be obtained. Adhesive material previously applied to the various strips in the usual manner is softened by heat during the winding operation to permit making a bond between the various strips.

While it appears from Fig. 2 that contacting paper surfaces enclose each turn of conductor strip, the space between adjacent foil edges is exaggerated for purposes of illustration. In practice these edges are substantially in abutting relation, but if there is a space between edges, the exposed areas of paper are too limited to make an effective paper-to-paper joint. In accordance with the invention, the contacting surfaces between the dielectric paper strips around the metal foil strip may amount to nearly half the width of the strip. The superiority of this construction will be evident.

While I have described a particular application of my invention, it will be realized that other applications and modifications may be made without departing from the spirit thereof. I desire, therefore, that the invention be limited only by the scope of the appended claims.

I claim as my invention:

1. In an insulator of the condenser bushing type, a plurality of condenser layers each of which includes a dielectric strip and a conducting strip of substantially equal widths wound into a plurality of corresponding axially progressing turns, said strips in each layer being arranged in such manner that a first edge portion of said conducting strip overlaps a first edge portion of said dielectric strip and a second edge portion of said conducting strip is overlapped by a second edge portion of said dielectric strip, additional dielectric means disposed between said layers, and adhesive material for bonding normally contacting surfaces together.

2. A condenser bushing comprising a plurality of layers each of which includes a dielectric strip and a conducting strip, each of said strips being wound into a plurality of turns progressing axially at substantially the same rate and said strips in each layer being arranged in such manner that a first edge portion of said conducting strip overlaps a first edge portion of said dielectric strip and a second edge portion of said conducting strip is overlapped by a second edge portion of said dielectric strip, additional dielectric means disposed between said layers, and means to cause adhesion between contacting dielectric surfaces.

3. In a wound condenser device, a plurality of superimposed layers each of which comprises a dielectric strip and a conducting strip wound into a plurality of corresponding axially progressing turns, said strips in each layer being arranged in such manner that a first edge portion of said conducting strip overlaps a first edge portion of said dielectric strip and the second edge portion of said conducting strip is overlapped by the second edge portion of said dielectric strip, additional dielectric means disposed between said layers, and adhesive material for bonding normally contacting surfaces together.

4. An insulator of the condenser bushing type comprising axial conducting means, a plurality of superimposed condenser layers each of which includes alternate turns of conducting strip and dielectric strip telescopically disposed about said conducting means in axially advancing relationship thereto, each of said layers being so arranged that a first edge portion of said conducting strip overlaps a first edge portion of said dielectric strip while the opposite edge portion of said conducting strip is overlapped by the opposite edge portion of said dielectric strip, a layer of dielectric material disposed between said superimposed layers, and means for bonding normally contacting dielectric surfaces together.

GORDON A. BURR.