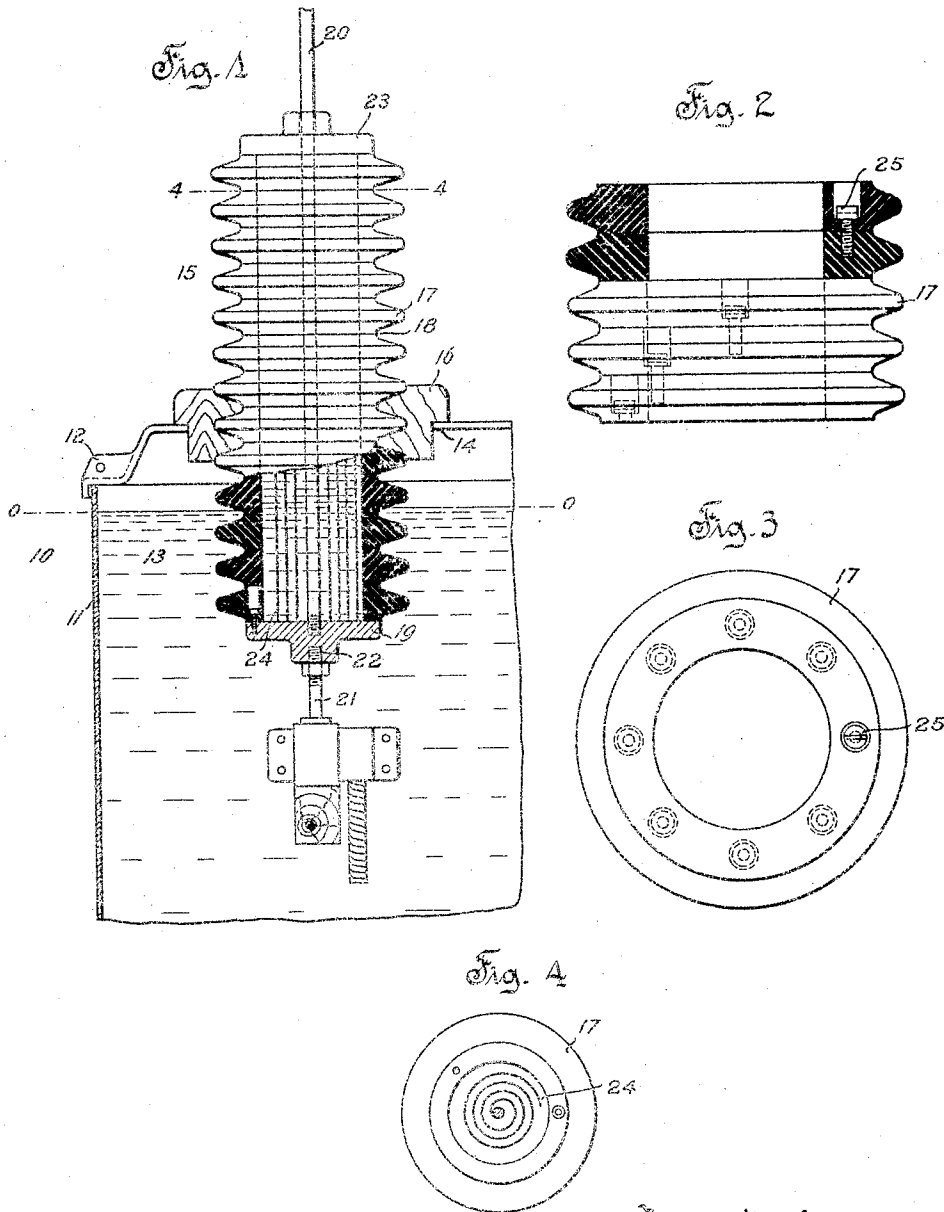


L. G. NICHOLS.
INSULATING BUSHING.
APPLICATION FILED OCT. 25, 1909.

996,878.

Patented July 4, 1911.



Witnesses
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UNITED STATES PATENT OFFICE.

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INSULATING-BUSHING.

996,878.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, LOUIS C. NICHOLS, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Insulating-Bushings, of which the following is a full, clear, and exact specification.

My invention relates to protective means to be used in electric circuits and more specifically to bushings to be used in connection with transformers.

It is a well known fact that static discharges taking place from the surfaces of insulation of high potential apparatus, such for example, as high voltage transformers, frequently operate to reduce the effectiveness of the insulation by affording a conducting path for the formation of an arc between exposed portions of the apparatus between which a high difference of potential may exist, as between an exposed transformer terminal and the transformer casing, the arc traversing a static brush discharge produced on the surface of the insulation surrounding the terminal. This undesirable result may be prevented by interposing members of insulating material in the path which would otherwise be followed by the arc, these members acting to interrupt the continuity of the brush discharge and therefore the continuity of the conducting path afforded by it.

It is the object of my invention to provide an improved bushing to be used in connection with electrical apparatus. This is accomplished by providing a sectionally formed oil-filled bushing comprising a series of annular disks of insulating material held together in a novel manner.

My invention further consists in certain novel details of construction and arrangement of parts to be described in the following specification and particularly pointed out in the appended claims.

In the accompanying sheet of drawings, Figure 1 is an elevation, with parts broken away and in section, showing a portion of a transformer casing through which passes my improved oil-filled bushing; Fig. 2 is an enlarged elevation, partly in section, of a portion of the oil-filled bushing showing the arrangement of means for holding together the insulating members of said bushing; Fig. 3 is a top elevation of that shown in

Fig. 2; and Fig. 4 is a view taken along the line 4-4 of Fig. 1.

A transformer casing 10 comprising a main shell 11 and a cover 12 is provided with oil 13 up to the level as indicated by the line O—O of Fig. 1. The metal cover 12 is provided with an aperture 14 through which passes an oil-filled insulating bushing 15. The bushing is provided with a supporting collar 16 which fits snugly into the aperture in the cover 12. The bushing 15 comprises a plurality or series of similar insulating disks 17 which are placed one on top of another. The engaging surfaces 18 of these annular disks are flat. The contour of the disks is such that when a plurality of them are placed together a corrugated surface is formed and in this way an increased creepage surface is provided. The bushing is made oil retaining by drawing the disks comprising the bushing tightly together by members such as screws 23, which pass entirely through one disk and engage a threaded portion of an adjacent disk. The screws preferably extend axially of the bushing and are staggered in such a manner as to form a spiral. By means of this arrangement a path for a destructive arc is obviated. Each disk with the exception of the top disk of the bushing is provided with two openings. One of these openings passes completely through the disk while the other one passes only half way through the disk for the reception of a screw which passes completely through the disk above.

A metal cap 19, into which a conductor 20 fits, is fastened to the bottom disk of the bushing by screws in the same manner in which the insulating disks are held together. A second conductor 21 makes electrical but not mechanical contact with the first conductor 20 by engaging a tapped portion 22 of the cap 19. The top of the bushing is also provided with a cap 23 through which the axially located conductor 20 passes. Shellac or some other good insulating and adhesive substance is placed between the insulating disks before they are drawn together to fill any crevices which might occur between the disks. By means of this arrangement a practically solid insulating bushing is obtained. Insulating paper or board 24 is wrapped spirally around the conductor 20 thereby increasing the dielectric strength of the completed bushing which is

completely filled with some insulating liquid thus providing a bushing to withstand extremely high voltages.

This compact and practically solid oil-filled insulating bushing is particularly adapted for use in heavy voltage circuits and can be made for use in circuits of any desirable voltage by merely changing the number of disks employed.

There may be many modifications in the precise form and arrangement herein shown and described, and I aim in my claims to cover all such modifications which do not involve a departure from the spirit and scope of my invention.

What I claim as new is:

1. The combination with a conductor forming part of high potential electric apparatus, of insulating material around said conductor, and an oil-retaining insulating bushing inclosing said conductor, said bushing comprising flat disks and separate means for holding together said disks.

2. The combination with a conductor forming part of high potential electric apparatus, of solid insulating material around said conductor, and an oil-filled insulating bushing inclosing said conductor, said bushing comprising flat disks and separate means including a plurality of axially extending members for holding together said disks.

3. An insulating bushing formed of a number of annular disks of insulating material, and means including a plurality of members having different axes and each extending axially of said bushing for holding together said annular disks.

4. In combination, a bushing comprising annular insulating members and retaining means including more than two bodies each extending axially of said bushing, and a conductor axially located in said bushing and separated from the walls thereof by an insulating liquid.

5. In combination, a bushing comprising flat annular insulating members, means separate from said members for retaining them, and a conductor axially located in said bushing and separated from the walls thereof by an insulating liquid and an insulating member.

6. An oil-filled insulating bushing formed

of a plurality of annular members of insulating material, and metal members each extending axially of said bushing for holding together said annular members.

7. An insulating bushing formed of a number of insulating disks, and means separate from said disks for holding together said disks, said means comprising axially extending bodies having parallel axes, each of said bodies being located in two disks.

8. An oil-filled insulating bushing formed of a number of disks of insulating material, and means separate from said members for holding together said disks, said means comprising axially extending bodies each located in adjacent disks.

9. In combination, a bushing comprising annular insulating members held together by means separate from said members, and a conductor axially located in said bushing and separated therefrom by spirally wound insulating material within said bushing.

10. In combination, a bushing comprising flat annular insulating disks held together by threaded members, and a conductor axially located in said bushing and separated therefrom by insulating paper and liquid.

11. An insulating bushing formed of a series of flat similar insulating disks, and means comprising axially extending members for holding together said disks, the axes of said members being parallel.

12. The combination with a conductor forming a part of high potential electric apparatus, of oil and insulating paper wound spirally around said conductor, and an insulating bushing inclosing said conductor, said bushing comprising insulating disks, axially extending members for holding together said disks, and a metal cap engaging said conductor at one end of said bushing completing an electric circuit.

Milwaukee, Wisconsin, October 13, 1909.

In testimony whereof I affix my signature, in the presence of two witnesses.

LOUIS C. NICHOLS.

Witnesses:

CHAS. L. BYRON,

ROB. E. STOLL.