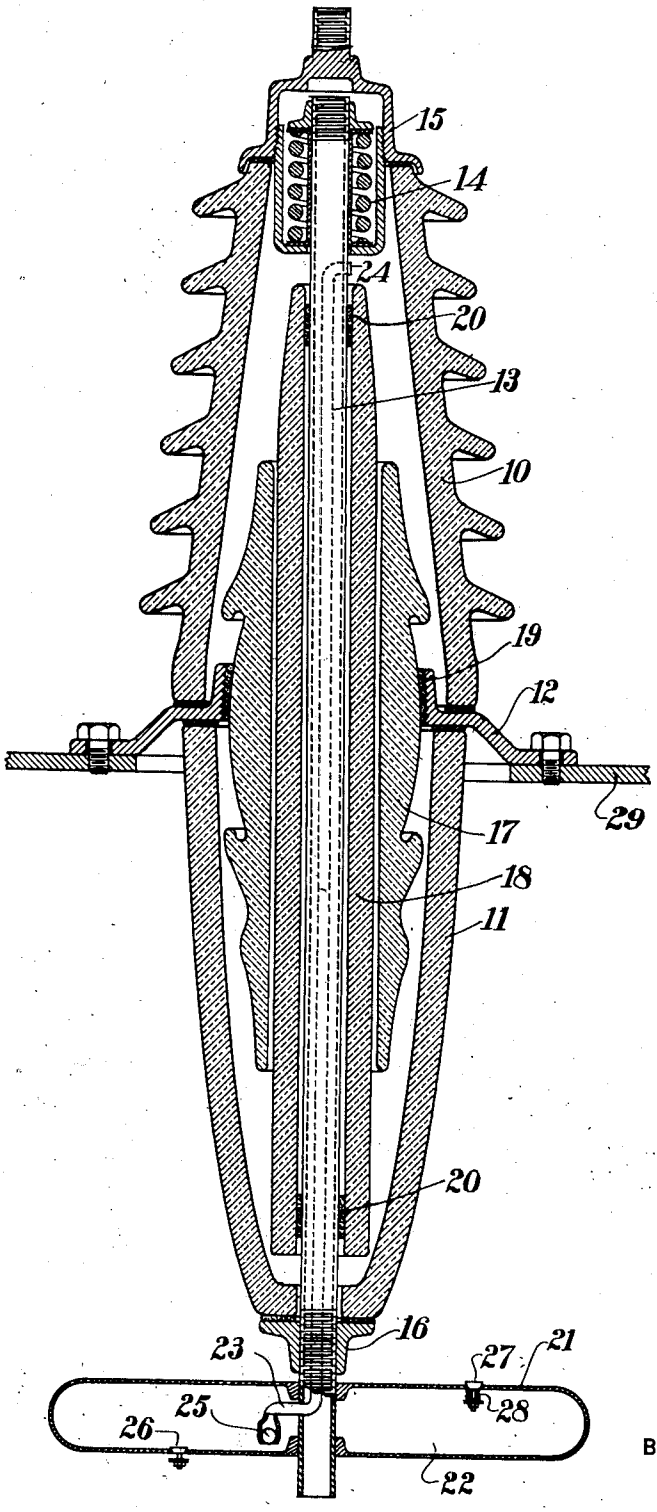
Dec. 4, 1934. W. A. HILLEBRAND 1,983,370

BUSHING INSULATOR

Filed April 18, 1932



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Patented Dec. 4, 1934 1,983,370

UNITED STATES PATENT OFFICE

1,983,370

BUSHING INSULATOR

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Application April 18, 1932, Serial No. 605,887

11 Claims. (Cl. 173—318)

This invention relates to bushing insulators of the oil filled type and is an improvement on the bushing insulator shown and claimed in the application of Arthur O. Austin, Serial Number 583,191, filed December 26, 1931. It has for one of its objects the provision of means for maintaining automatically the surface level of the oil or other insulating liquid in the bushing.

A further object of the invention is to provide an automatic filling means for insulator bushings operated by slight temperature changes.

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 drawing the figure is a vertical sectional view of a bushing insulator having one embodiment of the present invention applied thereto.

In the embodiment shown, the numerals 10 and 11 designate respectively the upper and the lower cones of a bushing clamped against opposite sides of a supporting flange 12 by means of a central conductor 13. A spring 14 transmits the clamping force between the conductor 13 and the cap 15 which bears upon the upper end of the bushing cone 10. The cones 10 and 11 form a container or casing normally filled with oil or other insulating liquid. The tension on the spring 14 may be regulated by the flange nut 16 at the lower end of the bushing. Any suitable arrangement of baffles 17 and 18 may be provided within the bushing and the cement joints 19 and 20 should be provided with passages therethrough to permit proper circulation of the oil within the interior of the bushing. The conductor 13 carries at its lower end a hollow member 21 enclosing a chamber 22. A tube or pipe 23 extends through the interior of the conductor 13 and is provided with a discharge opening 24 at its upper end arranged to discharge into the space within the interior of the bushing. The lower end of the tube 23 extends into the chamber 22 and the tube may be provided with a foot valve 25 which will permit oil to flow from the chamber 22 through the pipe 23 into the interior of the bushing but will prevent reverse flow. The housing 21 is provided with a one-way intake valve 26 and a safety valve 27 which is normally held closed by a spring 28 but which will open against the force of the spring 28 to permit escape of oil from the chamber 22 in case the pressure within the chamber becomes excessive at any time. The bushing extends through the cover plate 29 of an oil filled housing for electrical apparatus or any other housing containing an insulating liquid. The liquid in the oil filled housing covers the hollow member 21 so that the member is completely submerged in the insulating liquid.

The insulator is preferably filled with oil at the time that it is installed but this is not essential as the pumping mechanism connected to the insulator will gradually fill the interior thereof due to expansion and contraction of the oil in the housing 29 caused by temperature changes. The filling liquid commonly employed for electrical apparatus has a comparatively high coefficient of expansion for temperature changes and is usually subject to a considerable range of temperature variations due to different atmospheric conditions and to the variation in the load on the insulator. The variations in load in most cases are such as to augment the variations in atmospheric temperatures, the load usually being least in the latter part of the night when the temperature is the lowest, and greatest in the afternoon when atmospheric temperature is the highest.

When the lower end of the bushing is submerged in oil in the housing, if the bushing has not already been filled, the oil in the chamber 29 will flow through the valve 26 until the surface level of the oil in the tube 23 is the same as that in the housing 29. If, now, the temperature of the oil in the chamber 22 rises, the increased pressure due to expansion will cause the surface level in the tube 23 to rise, and if the change in temperature is sufficient, some oil will be discharged from the opening 24 into the interior of the bushing. The comparatively large volume of the expansion chamber 22 compared to the volume of tube 23 makes it possible to discharge liquid from the upper end 24 for a comparatively slight rise in temperature. If now the temperature falls, the oil in the chamber 22 will contract but the valve 25 will prevent the oil from returning through the tube 23 so that, because of the vacuum produced in the chamber 22, oil will flow from the housing 29 through the valve 26 into the chamber 22 to fill the space left vacant by contraction of the oil in the chamber 22. A subsequent rise in temperature will discharge more oil into the interior of the bushing through the tube 23 and this cycle will be repeated until the bushing is filled. If the bushing is open to atmosphere at its top, the escape valve 27 must be set so that it will open in response to the pressure within the chamber 22 before the height of the liquid in the interior of the bushing is sufficient to cause the bushing to overflow. If the bushing is completely sealed, then the valve 27 should be adjusted so that it will open before pressure within the system becomes sufficient to endanger any of the enclosing parts.

After the bushing is once filled, pressure on the

foot valve 25 will be balanced against the escape valve 27 so that no further pumping action will take place as long as the oil is maintained within the bushing. If the supply of oil in the bushing becomes depleted from any cause, as by leakage or deterioration or evaporation, the shortage will be automatically supplied by the pumping mechanism as soon as the oil is subjected to temperature changes.

I claim:

1. The combination with a container having space therein to be filled with liquid, of a source of liquid supply and an expansion chamber communicating with said source and with the interior of said container and means for controlling the direction of flow of liquid between said expansion chamber and said container and source, respectively, said expansion chamber being located at a lower level than said container and subject to temperature changes for causing transfer of liquid from said source to said container.

2. The combination with an electrical casing having space therein for insulating liquid, of a source of liquid supply, an expansion chamber communicating with said source and with the interior of said casing and adapted to transfer liquid from said source to the interior of said casing when subjected to temperature changes and means for preventing reverse flow of said liquid.

3. The combination with a casing for electrical apparatus having space therein to be filled with liquid, of a source of liquid supply, an expansion chamber communicating with the interior of said casing and with said source and subject to temperature changes, means permitting flow of liquid from said source to said chamber but preventing reverse flow, and means permitting flow from said chamber to the interior of said casing but preventing reverse flow.

4. The combination with a housing for electrical apparatus, of an insulator bushing extending into said housing, an expansion chamber communicating with the interior of said housing and with the interior of said bushing and subject to temperature changes, and means permitting flow of liquid from said housing to said expansion chamber but preventing reverse flow thereof.

5. The combination with a housing for electrical apparatus, of an insulator bushing extending into said housing, an expansion chamber communicating with the interior of said housing and with the interior of said bushing and subject to temperature changes, means providing for flow of liquid from said housing to said expansion chamber but preventing reverse flow thereof, and means providing for flow of liquid from said chamber to the interior of said bushing but preventing reverse flow thereof.

6. The combination with a housing for electrical apparatus, of a bushing extending through the wall of said housing, a closed hollow member disposed within said housing and having a passage for admitting oil from said housing to the interior of said hollow member, a valve for preventing reverse flow of oil through said passage, and means connecting the interior of said hollow member with the interior of said bushing to permit discharge of liquid from said hollow member to the interior of said bushing when the liquid in said hollow member expands due to temperature rise.

7. The combination with a housing for electrical apparatus, of a bushing insulator connected with said housing, an expansion chamber adapted to be submerged in an insulating liquid in said housing, said chamber having a passage for admitting flow of liquid from said housing to said chamber, a valve for preventing reverse flow of liquid through said passage, and a conduit connecting the interior of said chamber to the upper portion of the interior of said bushing the interior volume of said conduit below its overflow point being less than the interior volume of said chamber.

8. The combination with a housing for electrical apparatus, of a bushing connected with said housing, an expansion chamber mounted on the lower end of said bushing in position to be submerged in insulating liquid in said housing, said chamber having a passage for admitting flow of liquid from said housing to the interior of said chamber, a valve for preventing reverse flow of said liquid through said passage, means connecting the interior of said chamber with the interior of said bushing, means for preventing reverse flow of liquid from said bushing to said chamber and a safety valve for preventing excess pressure within the interior of said bushing and chamber.

9. The combination with a housing for electrical apparatus, of a bushing insulator connected with said housing, an expansion chamber adapted to be submerged within an insulating liquid in said housing, said chamber having a passage for admitting flow of liquid from said housing to the interior of said chamber, a valve for preventing reverse flow of liquid through said passage, a tube extending from the interior of said chamber to a point adjacent the top of said bushing, a foot valve for preventing flow of liquid from said tube to said chamber but permitting flow of liquid from said chamber through said tube, and a safety valve for preventing excess pressure of liquid in said bushing and chamber.

10. A bushing insulator having internal space adapted to receive an insulating liquid, a housing into which the lower end of said insulator extends, also adapted to receive insulating liquid, and means for supplying liquid to the interior of said insulator from said housing, said means comprising an expansion chamber arranged to be submerged in the liquid in said housing and having a one-way intake valve to permit entrance of liquid from said housing to said chamber, and a conduit of relatively small bore extending from the interior of said expansion chamber to a position near the upper portion of the interior of said insulator.

11. The combination with a housing for electrical apparatus adapted to contain insulating liquid, of a bushing insulator extending through the wall of said housing and adapted also to contain insulating liquid, of means for supplying insulating liquid from the interior of said housing to the interior of said bushing, said means comprising an expansion chamber arranged to be submerged in the liquid in said housing, a one-way intake valve for admitting liquid from said housing to said chamber, a relief valve for limiting the pressure within said chamber, a conduit of relatively small bore extending from the interior of said chamber to a position near the upper portion of the interior of said bushing, and a one-way valve for admitting liquid to flow from said chamber to said bushing through said conduit but preventing reverse flow of liquid through said conduit.

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