Dec. 1, 1942. J. H. CHILES, JR., ET AL 2,303,435

ELECTRICAL APPARATUS

Filed Jan. 8, 1941

Fig. 1.

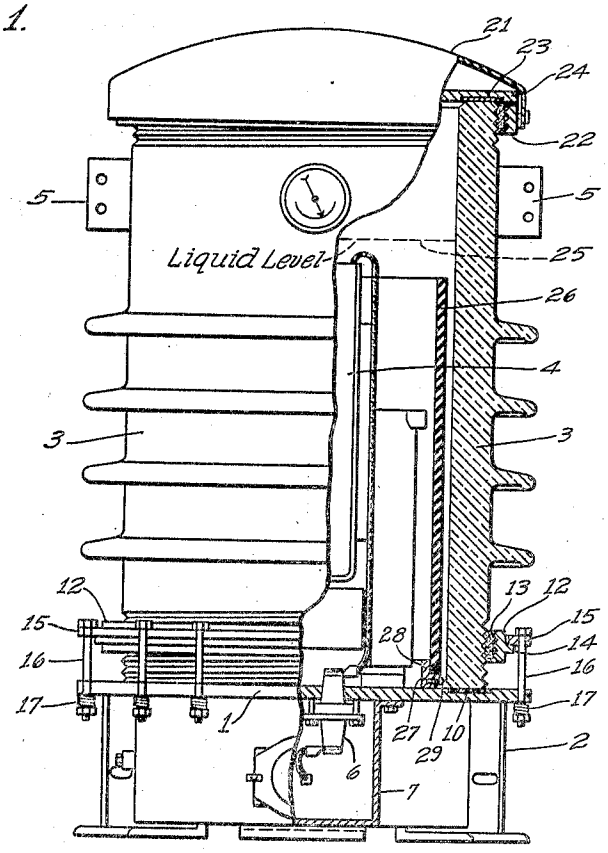


Fig. 2.

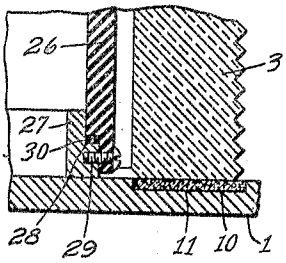


Fig. 3.

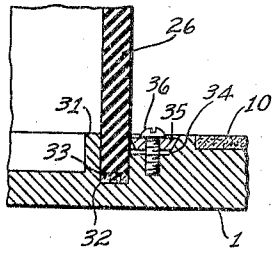
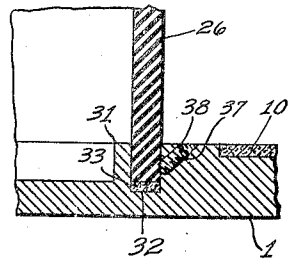


Fig. 4.



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UNITED STATES PATENT OFFICE

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ELECTRICAL APPARATUS

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5 Claims. (Cl. 174—17)

Our invention relates to electrical apparatus of the character employing insulating liquid about an electrical device enclosed in a casing structure.

In many such electrical apparatus, such, for example, as certain types of instrument transformers, it is desirable to provide an outer shell or casing of vitreous insulating material, such as porcelain or glass, for enclosing the electrical device and the insulating liquid in which it is immersed, which shell or casing performs the joint function of a casing structure and an insulating bushing. Because of the fragile character of such vitreous insulating material when subjected to severe shocks or blows, it is desirable to provide means independent of the outer casing itself for maintaining the insulating liquid about the electrical device in case of failure of the outer shell.

It is an object of our invention to provide an electrical apparatus including an electrical device within an outer casing and immersed in an insulating liquid with an auxiliary inner casing or fluid retainer for retaining a major portion of the insulating liquid of the apparatus about the electrical device in case of failure of the outer shell.

It is a further object of the invention to provide means for sealing this fluid retainer to the base of the structure to provide a liquid-tight joint between them.

Other objects and advantages of the invention will be apparent from the following description of preferred embodiments thereof, reference being had to the accompanying drawing, in which:

Figure 1 is an elevational view, partly in section, illustrating one preferred embodiment of the invention;

Fig. 2 is an enlarged cross-section of a portion of Fig. 1; and

Figs. 3 and 4 are cross-sectional views of different detailed structures embodying the invention.

Referring to Fig. 1, a metal base plate 1 is provided supported upon a frame structure 2, and upon which a cylindrical porcelain or glass member 3 is mounted to provide an annular wall or shell forming the side portion of a casing structure enclosing an electrical device, such as a core and coil assembly 4 of a current transformer having line terminals 5 connected to the upper portion of the shell 3 and secondary outlet terminals 6, one of which is shown extending into a junction box 7 below the base plate 1 and within the frame structure 2. A gasket 10 is provided in an annular recess 11 in the base plate 1, against which the lower end of the cylindrical shell 3 rests, and against which it is pressed to make a tight joint by a coupling structure including an annular ring 12 extending about the lower end of the shell and attached thereto by means of cement 13 or other suitable means. The ring 12 is provided with an outwardly extending flange 14, against which a pressure ring 15 engages. A series of bolts 16 are provided extending through openings in the ring 15 and in the outer edge of the base plate 1, and which act through spring members 17 to maintain a downward bias on the ring 15 to force the shell 3 tightly against the gasket 11. A cover 21 is provided over the upper end of the shell 3, the outer margin of which extends downwardly over a ring 22 which may be screw-threadedly attached to the upper end of the shell 3 and tightened to provide a pressure tight seal at 23 between an inner plate member 24 and the upper edge of the shell 3. In normal operation of the device, an insulating liquid is maintained within the shell 3 to a level indicated by the dash line 25.

An inner insulating liquid retaining shell 26 is provided within the outer shell 3 and spaced therefrom and extending upwardly from the base plate 1 to an elevation slightly below that of the liquid level 25. The insulating liquid retaining shell 26 should be formed of an insulating material that is not porous or that will not be easily shattered or broken. A cylindrical tube of "Micarta" has been successfully employed as an inner liquid retaining shell. In order to eliminate the high dielectric stresses over the length of the tube and to prevent creepage paths along the surface of the tube in case of oil leakage from the outer shell, it has been found desirable to provide a considerable space between the top of the tube and the metal parts covering the outer shell 3, and particularly to avoid making contact between these parts by the tube 26.

A liquid tight seal is provided between the "Micarta" tube 26 and the base plate 1 which, in the form of structure shown in Figs. 1 and 2, comprises an upwardly extending metallic flange 27 that is welded to or made integral with the base plate 1. The outer side of the upper edge of the flange 27 is cut back from the outer side of the base, and the inner wall of the tube 26 is likewise cut back adjacent the lower end of the tube 26 to provide a recess 28 for accommodating a gasket to effect a tight joint between the flange

27 and the tube 26. The tube 26 is pressed down against the gasket 30 to make a tight seal. The tube is then maintained in position on the flange by a series of screws 29, one of which is shown in Figs. 1 and 2.

In Fig. 3, a structure is illustrated for forming a liquid tight joint between the liquid retaining tube 26 and the base plate 1 which comprises a flange 31 extending upwardly from the base plate along the inner side of the tube 26 and a recess 32 adjacent the outside of the flange 31, in which a gasket 33 is positioned beneath the lower edge of the tube 26. A recess 34 is likewise provided on the outer side of the tube 26 for accommodating a metal ring 35 surrounding the tube. The tube is forced downwardly into tight engagement with the gasket 33 and locked in place by the ring 35 and a series of screws 36, one of which is shown in Fig. 3.

The structure shown in Fig. 4 differs from that shown in Fig. 3 essentially in the elimination of the binding ring 35 in the groove 34, together with the screws for maintaining the ring in position, and provides instead screw-threaded bores 37 on the outer side of the recess 32 for accommodating screws 38 which may be tightened into place, and the lower ends of which engage the tube 26 to maintain it in tight engagement with the gasket 33 positioned in the lower portion of the slot 32 beneath the tube 26.

It will be apparent from the description of the above embodiments of the invention that should the outer casing wall or shell 3 of the structure become chipped or otherwise damaged in such a manner that the insulating liquid within the apparatus leaks therefrom, the amount of leakage will be limited to only that above the upper edge of the fluid retaining tube 26, and the relatively small portion between the tube 26 and the shell 3, so that a substantial quantity of insulating liquid will be maintained above the electrical device 4 to maintain its operating characteristic and prevent the device from becoming inoperative until such time as the apparatus can be repaired.

Modifications in the structure illustrated and described will be apparent to those skilled in the art, and we do not wish to be limited otherwise than by the scope of the appended claims.

We claim as our invention:

1. In a liquid insulated electrical transformer apparatus, a metal base plate, a shell of vitreous material mounted thereon and having a liquid tight joint therewith forming a casing wall providing a chamber within the shell, a cover for said shell, a core and coil assembly within said shell, and an insulating liquid within the shell, and a liquid retainer open at the top and extending upwardly from said base plate within said shell and about said core and coil assembly to prevent the escape of the liquid from about said core and coil assembly upon failure of said shell, the top of the liquid retainer terminating below the top level of the insulating liquid.

2. In a liquid insulated electrical transformer apparatus, a metal base plate, a shell of vitreous material mounted thereon and having a liquid tight joint therewith forming a casing wall providing a chamber within the shell, a cover for said shell, a core and coil assembly within said shell, and an insulating liquid within the shell, a cylindrical liquid retainer of tough insulating material open at the top and extending upwardly from said base plate within said shell and about said core and coil assembly to prevent the escape of the liquid from about said apparatus upon failure of said shell, the top of the liquid retainer terminating below the top level of the insulating liquid, and means for effecting a fluid tight joint between said liquid retainer and said base.

3. In a liquid insulated electrical transformer apparatus, a base plate, a shell of vitreous material mounted thereon and forming a liquid tight joint therewith to provide a chamber extending upwardly from the plate, a liquid retainer comprising a wall of tough insulating material open at the top and extending upwardly from said base plate within said shell and spaced from said shell, the upper edge of said liquid retainer terminating below the top of said shell, means cooperating with the lower edge of the liquid retainer to form a liquid tight seal between the liquid retainer and said base plate, a core and coil assembly within said shell and liquid retainer, and an insulating liquid within said shell and liquid retainer to an elevation above the top of said liquid retainer.

4. In a liquid insulated electrical transformer apparatus, a base plate, a shell of vitreous material mounted thereon and forming therewith a casing wall providing a chamber therein, an electrical transformer and an insulating liquid within the chamber to an elevation appreciably below the top of the casing wall, a cylindrical liquid retainer of tough insulating material open at the top and extending upwardly from said base plate within said shell and about said electrical transformer to prevent the escape of the liquid from about said transformer upon failure of said shell, and means for effecting a liquid tight joint between said liquid retainer and said base, the upper end of the liquid retainer terminating appreciably below the top level of the insulating liquid.

5. In a liquid insulated electrical transformer apparatus, a base plate, a shell of vitreous material mounted thereon and forming a casing wall outlining a chamber extending upwardly from the plate, means for effecting a liquid tight joint between the shell and the base plate, a liquid retainer comprising a wall of tough insulating material open at the top and extending upwardly from said base plate within said shell and spaced from said shell, the upper edge of said liquid retainer terminating below the top of said shell, means cooperating with the lower edge of the liquid retainer to form a liquid tight seal between the liquid retainer and said base plate, a transformer core and coil assembly within the lower part of the chamber formed by said shell, and insulating liquid within said shell to a level appreciably below the upper edge of the shell and appreciably above the upper edge of the liquid retainer.

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