Aug. 20, 1929. W. J. DICKENSON 1,725,623

ELECTRICAL APPARATUS CASING

Filed July 23 1928

Fig. 1.

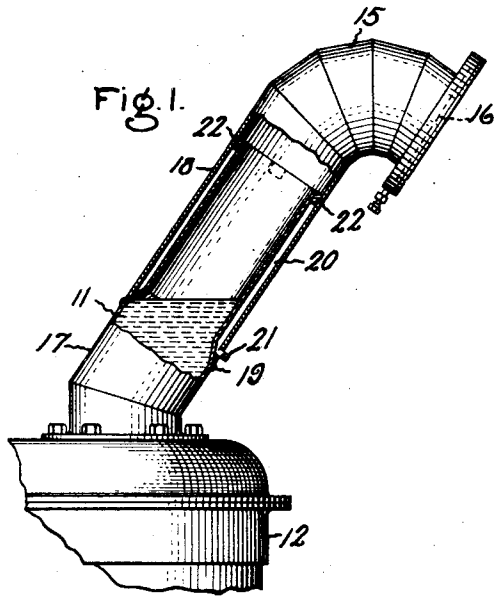
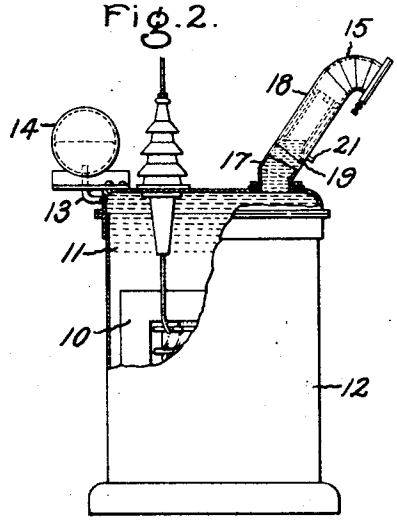


Fig. 2.



Inventor:
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UNITED STATES PATENT OFFICE.

WILLIAM J. DICKENSON, OF PITTSFIELD, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRICAL-APPARATUS CASING.

Application filed July 23, 1928. Serial No. 294,849.

My invention relates to electrical apparatus casings, and more particularly to arrangements for relieving excessive pressures caused by explosions within such casings. Casings containing an insulating liquid are often used for electrical apparatus such as transformers, the electrical apparatus being immersed in the liquid for insulating and cooling purposes. The liquid is heated by the apparatus and will deteriorate rapidly if the oxygen of the outside air reaches it. The casings are generally tightly closed, therefore, except for a small opening to permit expansion and contraction caused by variations in temperature. If there is a defect in the insulation of the apparatus or if the apparatus is subjected to an excessive voltage, the insulation may break down with a resulting arc in the insulating liquid. Such a condition may produce an extremely rapid increase in pressure within the casing.

Pressure relief pipes are often used to relieve excessive internal pressure in electrical apparatus casings. These pipes are of large cross-section to permit rapid escape of gases from the casings and they are normally closed at their outer ends by seals which yield to internal pressure. These pipes extend above the casings so that they contain gas cushions in their upper ends to help absorb the initial shocks of explosions in the casings.

It is practically impossible to keep the insulating liquid absolutely free of moisture. When the liquid is heated, any moisture which it contains may vaporize and ascend into the pressure relief pipe which is cooled by the surrounding air. If the vaporized moisture condenses on the inner surface of the pipe or if any moisture enters the pipe through a leaky joint or past its end seal, such moisture tends to run down into the casing where it may reach the electrical apparatus and result in a weakening and breakdown of the insulation. The general object of the invention is to provide an electrical apparatus casing with a pressure relief pipe having an improved arrangement and construction whereby any moisture reaching the interior of the pipe cannot reach the interior of the casing and the apparatus therein.

The invention will be better understood from the following description taken in connection with the accompanying drawing in which Fig. 1 shows a pressure relief pipe constructed in accordance with the invention, the pipe being shown partly in section, and Fig. 2 shows the same pressure relief pipe mounted on a transformer casing.

Like reference characters indicate similar parts in both figures of the drawing.

The invention will be explained in connection with the casing of an oil immersed transformer. In the particular arrangement shown in the drawing, the transformer 10 is immersed in a body of insulating oil 11 within a casing 12. The casing 12 is tightly closed to exclude outside air except for a small pipe 13 which connects the casing with an expansion chamber 14 to permit expansion and contraction of the oil 11 as its temperature varies.

The pressure relief pipe 15 communicates with the interior of the casing 12, being mounted on the cover of the casing and extending upwardly therefrom. The outside air is normally excluded from the pipe 15 by an end seal 16 which may be a glass diaphragm and which will yield or rupture in response to excessive pressure within the casing 12 and pipe 15 to relieve such pressure and prevent rupture of the casing. The pipe 15 is of large cross-section so that sudden large increases of pressure within the casing may be relieved quickly. The oil 11 may extend a short distance into the lower part of the pipe 15 but it has been found desirable to extend the pipe well above the oil level so that the upper part of the pipe may contain a cushion of air or other gas to help absorb the initial shock of any explosion in the casing 12.

An extremely small proportion of moisture in the oil will so lower its dielectric strength as to make it unfit for use but it is generally impossible to keep the oil absolutely free from all traces of moisture. When the oil is hot, there is a tendency for any traces whatever of moisture in the oil to be vaporized and rise to mix with the gas in the upper part of the pipe 15. There is then a tendency for this moisture to condense on the inner surface of the pipe because the surrounding air keeps the pipe cooler than the gas cushion within it. If the condensed moisture is permitted to run down into the casing, it may settle onto the transformer and cause a failure of the insulation and possibly an explosion.

The pressure relief pipe 15 includes a base section 17 mounted on the casing 12 and an upper section 18 connected at its lower edge

to the outer surface of the base section by a welded joint 19. The base section 17 is reduced in cross-section above the welded joint 19 and extends up into the lower part of the upper section 18 with a cylindrical space 20 between them which is open at its upper end to the interior of the pipe and closed at its lower end by the welded joint 19.

Any condensation of moisture will be on the inner surface of the upper or outer section 18 because the reduced inner part of the base section 17 is protected from the cooling effect of the surrounding air by the air space 20. Condensed moisture collects in the space 20 whence it may be drawn off at intervals by removing the drain plug 21. There is an important advantage in forming the welded joint on the outer surface of the base section 17 because if this joint is not absolutely leak proof any condensed moisture in the space 20 cannot leak into the pipe and find its way into the casing 12 but will appear outside of the pipe where it can do no harm.

The reduced upper part of the base section 17 is shown in the drawing as extending considerably above the oil level where spacing blocks 22 are provided between the two sections. This keeps the space 20 free of oil but this is not of particular importance. If the upper end of the space 20 is below the oil level so that the oil may enter this space, any condensed moisture will still be collected because it is heavier than the oil and will settle through it.

The invention has been explained by describing and illustrating a preferred form thereof but it will be apparent that various changes may be made without departing from the scope of the invention as defined in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A pressure relief pipe for electrical apparatus casings, said pipe including spaced inner and outer portions, the space between said portions being open at its upper end to receive moisture condensed on the inner surface of said outer portion.

2. A pressure relief pipe for electrical apparatus casings, said pipe including spaced inner and outer portions, the space between said portions being open at its upper end to receive moisture condensed on the inner surface of said outer portion, and the lower edge of said outer portion being welded to the outer surface of said inner portion, whereby condensed moisture leaking through said weld cannot enter said pipe.

3. A pressure relief pipe for electrical apparatus casings, said pipe including a base section and an upper section, said base section extending into said upper section and being spaced therefrom, the lower edge of said upper section being welded to the outer surface of said base section, and the space between said sections being open at its upper end to receive moisture condensed on the inner surface of said upper section.

4. A pressure relief pipe for electrical apparatus casings, said pipe including a base section and an upper section, said base section having a reduced portion extending into said upper section and spaced therefrom, the lower edge of said upper section being welded to the outer surface of said base section, and the space between said sections being open at its upper end to receive moisture condensed on the inner surface of said upper section.

In witness whereof, I have hereunto set my hand this 19th day of July, 1928.

WILLIAM J. DICKENSON.