Feb. 5, 1946. R. R. PITTMAN 2,394,329

TRANSFORMER CONSTRUCTION FOR INHIBITING OIL DETERIORATION

Filed Feb. 26, 1943 2 Sheets-Sheet 1

Fig. 1

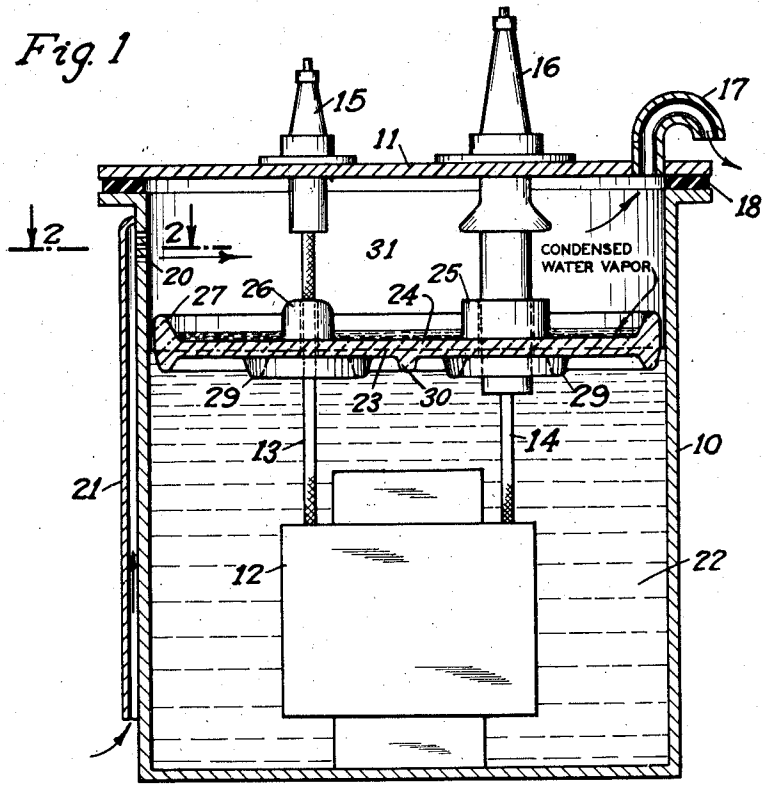
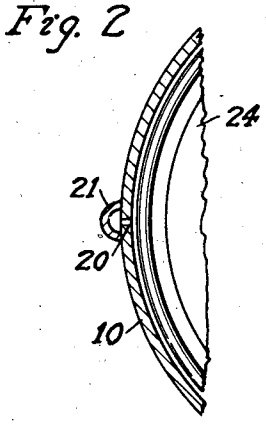


Fig. 2



INVENTOR

Ralph R Pittman

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Filed Feb. 26, 1943 2 Sheets-Sheet 2

Fig. 3

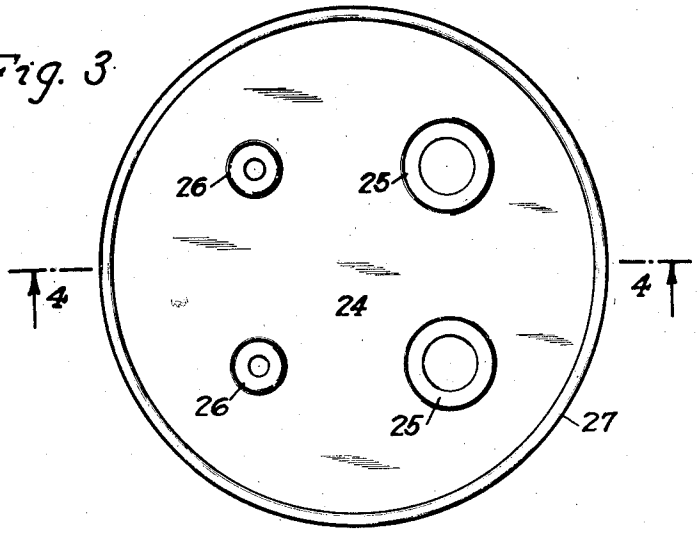


Fig. 4

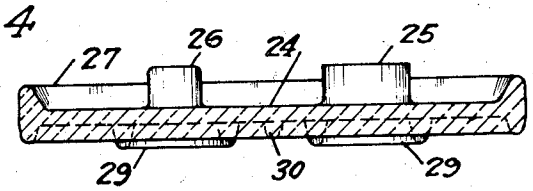
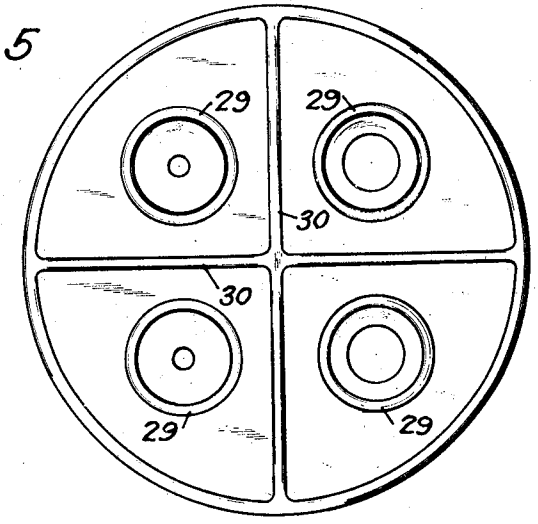


Fig. 5



INVENTOR

Ralph R Pittman

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2,394,329

TRANSFORMER CONSTRUCTION FOR INHIBITING OIL DETERIORATION

Ralph R. Pittman, Pine Bluff, Ark.

Application February 26, 1943, Serial No. 477,294

2 Claims. (Cl. 174—14)

This invention relates generally to electrical apparatus, such as transformers, in which the liquid insulating and cooling medium does not entirely fill the tank in which is contained a winding or other electrical device.

An object of the present invention is the provision of a construction for inhibiting deterioration of the oil used in electrical apparatus as an insulating and cooling medium by preventing contamination of the oil with moisture and at the same time inhibiting oxidation and accompanying sludging of the oil.

More specifically, it is an object of this invention to provide means for collecting at a location removed from the cooling liquid the water vapor which condenses upon the inner surface of the cover of an outdoor transformer in response to the cooling of the cover below the dew point of the vapor, which usually occurs when relatively cold rain impinges on the outside of the cover, and subsequently utilizing the inherent losses of the transformer for subsequently evaporating the collected condensation and expelling it from the tank.

A further important object is to provide a construction in which the moisture-collecting container provides means for excluding oxygen from the oil, to thereby inhibit oxidizing and sludging of the oil.

With these and other objects in view which will appear as the description proceeds, my invention resides in the novel form, arrangement and construction of the transformer, and the scope of the invention is set forth in the appended claims.

In certain patents, such as the United States Patent 2,146,311, a construction is shown which embodies means for circulating air through the unfilled space within the transformer. Such constructions are effective in removing moisture which adheres to the cover of the transformer, but in so doing the circulating air contacts the oil when the latter is above the temperature of the air, and thereby causes oil sludging due to oxidation products. Such constructions are also ineffective in preventing dropping of condensed water vapor into the oil and upon the winding.

In the drawings: Fig. 1 is a side elevational view of an embodiment of the invention, shown in section; Fig. 2 is a fragmentary section along the line 2—2 of Fig. 1; and Figs. 3, 4, and 5 are respectively a top plan view, a sectional view and a bottom plan view of the moisture collector and evaporator.

Referring in detail to Fig. 1, a tank 10, having a vertically extending wall, is provided with a cover 11, a gasket 18 being employed to assure a tight seal between these elements. An electrical device 12, which may be a core-and-coils assembly, is contained by the tank 10, and is electrically connected through the conductors 13 and 14 to the entrance bushings 15 and 16 respectively. A non-aqueous cooling and insulating liquid 22, which may be oil, partially fills the tank 10 to the level 23, the winding 12 being immersed in the liquid 22 in accordance with usual practice.

A container 24, of impervious cellular insulating material, shown in more detail in Figs. 3, 4, and 5, floats freely upon, and substantially covers the upper surface of the oil. Preferably the container 24 is formed of some vitreous inorganic insulating material, such as glass which has been cellulated by some suitable process such that the resulting product has a density, compared to water equal to 1, of about 0.4 to 0.6. An integral upwardly extending wall 27 extends over the entire periphery of the container 24, and the integral walls 25 and 26, which encircle the conductors 14 and 13 respectively, extend upwardly to an elevation above the upper edge of the peripheral wall 27, for the purpose of establishing overflow at the edge of the container at points laterally spaced from the winding 12. The passageway through the wall 25 is slightly larger in diameter than the outside diameter of the lower end of the bushing 16, the arrangement being such as to guide vertical movement of the floating evaporator 24 which occurs when the volume of the oil 22 changes due to change in temperature. Preferably, the bottom of the floating container 24 is provided with the diametrically extending ridges 30, and the conductor-encircling ridges 29, for the purpose of increasing the leakage path between the conductors.

A hollow conduit 21 extends upwardly along the vertical wall of the tank 10 in heat conductive relation with the oil 22, and communicates through the opening 20 in the tank 10 at the upper and closed end of the conduit 21 with the space 31, the latter being the space between the floating container 24 and the cover 11.

Air enters the lower and open end of the conduit 21, thence passes upwardly therethrough and into the tank through the openings 20, and thence laterally across the space 31 and out of the tank to the atmosphere through the vent 17. The water vapor accompanying the air in its passage upwardly through the conduit 21 to the space 31 is heated by the electrical losses inherent in the winding assembly, thereby causing it to reach a condition in which it is much far-

ther removed from the dew-point than if it were not so heated. Obviously the heating of the water vapor per se is of assistance in inhibiting its condensation inasmuch as the extent of cooling in order to reach the dew-point has been increased.

In addition, a pronounced chimney effect results from the passage of the heated air from the inlet at the lower end of the conduit **21** outward through the vent **17**. The arrangement is such that the air in its passage between the points described, and after being heated during its passage through the vertical conduit **21**, is caused to sweep across the space **31**, and carry out of the tank any condensation which may be suspended on the lower surface of the cover **11**, or may have dropped from the cover into the container **24**.

It may be noted that the container **24**, being in contact with the cooling liquid **22**, is thereby heated by the inherent electrical losses to facilitate evaporation of any condensation therein contained, and that the electrical losses are thus utilized to perform the dual function of evaporating water from the container and causing an air current of heated air to flow in such a manner that the water vapor is carried out of the tank.

It may also be noted that the container **24** effectively shields the oil **22** from contact with the hot air passing through the tank. In the absence of such shielding, oxidation products would quickly cause sludging of the oil, and the so-formed sludge collect in layers over the internal surfaces of the transformer, thereby retarding cooling and reducing the capability of the transformer to carry load.

It is intended that the drawings and description of the specific embodiment of the invention herein presented will be interpreted as illustrative rather than limiting.

I claim:

1. In electrical apparatus which includes a tank having a vertically extending wall, a cooling liquid which expands when heated and contracts when cooled partially filling the tank, an electrical device subject to losses expressed as heat positioned in spaced relationship with said wall and intimately associated with said cooling liquid, a conductor extending upwardly from said device to a point above the surface of said cooling liquid, a vertically movable floating container of electrical-insulating material carried by said liquid, said container being formed with a dish-shaped upper surface including an integral upstanding peripheral flange and an integral upstanding wall encircling said conductor and extending above the elevation of said flange.

2. In electrical apparatus which includes a tank having a vertically extending wall, a cooling liquid which expands when heated and contracts when cooled partially filling the tank and the unfilled portion of the tank containing air, an electrical device subject to losses expressed as heat positioned in spaced relationship with said wall and intimately associated with said cooling liquid, a conductor extending upwardly from said device to a point above the surface of said cooling liquid, a vertically movable floating container of impervious cellular insulating material carried by said liquid, said container being formed with a dish-shaped upper surface including an integral upstanding wall encircling said conductor and an integral upstanding peripheral flange, said encircling wall extending above the elevation of said flange whereby liquid condensation products are discharged from said container in the space between said electrical device and said vertically extending tank wall.

RALPH R. PITTMAN.