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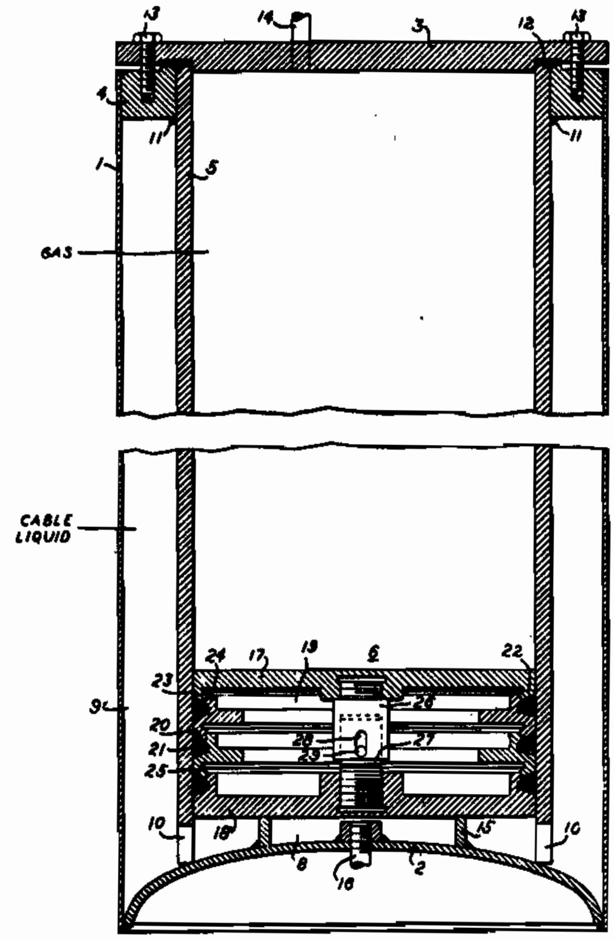

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RESERVOIRS FOR FLUID FILLED CABLE

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In fluid filled electric cable installations, as the cable heats and cools with changes of load thereon, expansion and contraction of the impregnating medium takes place. To avoid undue changes of pressure within the conductor enclosure, means are provided to receive the fluid medium from the cable as it expands and to feed it back to the cable as its temperature and that of the cable decreases. To accomplish this variable capacity, reservoirs are employed in which a gas under pressure is employed as a yieldable means to accommodate any increase in volume of the impregnating material and to feed it back to the conductor enclosure as it contracts. Care must be exercised to prevent the gas from mixing with the impregnating material. As ordinarily constructed, these reservoirs are expensive and require the utmost care in their manufacture, and usually a considerable amount of special manufacturing apparatus.

The object of my invention is the provision of an improved reservoir which is simple in construction, reliable in operation, and of relatively low initial cost.

For a consideration of what I believe to be novel and my invention, attention is directed to the accompanying description and the claims appended thereto.

In the attached drawing, which is illustrative of my invention, is shown a reservoir in vertical section.

The reservoir comprises a tank having a cylindrical wall **1** of relatively thin metal, a bottom wall **2** which is curved inwardly to give it the necessary strength to resist internal pressure which is above that of the atmosphere, and a cover **3**. Inside of the casing so formed is a ring **4** which is brazed or otherwise secured thereto in a manner to provide a fluidtight joint. Inside of the casing is a cylinder **5** of heavier metal which has a carefully smoothed inner surface as it is on that surface that the free piston **6** moves up and down. It is important to make the inner surface smooth for upon it in large measure depends the separation of the gas in the chamber **7** above the piston and the liquid or other fluid from the cable in the chamber **8** below the piston. This chamber is in free communication with the tank chamber **9**, as for example through lateral openings **10**, the effect of which is to greatly enlarge the cubical contents of the retaining or storage space for cable liquid. The upper end of the cylinder is supported by the ring **4** and the two parts are united by a brazed or welded joint **11**. The upper end of the cylinder and the inner part of the top surface of the ring are chamfered to receive a compressible packing **12** which engages the under surface of the cover **3**, the latter being clamped in place by an annular series of clamping bolts **13** which enter the ring. Gas under positive predetermined pressure is admitted to the piston chamber **7** by suitable means, such as the pipe **14**, having any usual form of shutoff means. The bottom wall **2** of the tank has a piston stop **15** of suitable construction, in this case a ring which is brazed or welded to the wall. Liquid or other fluid from the cable is admitted to the chambers **8** and **9** through the pipe **16**. The stop prevents the piston when in its lowermost position from interfering with the admission of fluid to the chamber **8** from the cable.

The free piston **6** comprises top and bottom plates **17** and **18** between which are located a number of floating rings **19**, two being shown in the present illustration. Each ring has a pair of oppositely inclined or beveled peripheral surfaces **20** for engagement with packing rings **21** which are made of material that is somewhat elastic. The top and bottom plates or heads are also provided with beveled faces or surfaces **22** which cooperate with the surfaces **20** to force the packing rings outwardly into contact with the wall of cylinder **5**. The floating rings and the end plates have cooperating engaging shoulders **23** and **24** which prevent undue lateral displacement of one part with respect to another, especially when pressure is applied to the plates. Each floating ring has shoulders on opposite sides thereof, one shoulder such as **24** engages a flange on a head while shoulder **25** engages a shoulder on the adjacent ring. The packing rings are of trapezoidal cross-section, are fitted into substantially conical recesses, and are pressed tightly against the wall of the cylinder by a wedging action due to the beveled or coned surfaces, for example when the upper plate **17** is subjected to gas pressure and the lower plate **18** to cable liquid pressure. The packing rings may be made of rubber where the fluids to which they are exposed do not adversely affect them, or they may be made of any other convenient artificial material which is resistive to the action of fluids or other of them.

The plates are loosely connected which permits of a limited freedom of movement of the floating rings **19**. This has the advantage of equalizing the pressures on the packing rings instead of causing a higher pressure at one region over that of another. To accomplish this, the upper plate 17 has a hub-like socketed center which is screw threaded to receive and retain the threaded part of member 26. The member has a sleeve-like extension in which is located a cylindrical element 27, the two parts having an easy sliding fit. The sleeve has a slot 28 to receive an end of a pin 28, the slot walls and the pin limiting the maximum separation of the end plates and preventing relative angular movement of the parts. The lower plate has a hub-like socketed center portion which has a screw threaded opening to receive the lower end of the cylindrical part 27. The screw threaded arrangement permits of a limited amount of vertical adjustment. As indicated, the arrangement above described permits of limited independent movements of the heads and rings. Because the heads and floating rings are not positively connected, the pressures on the several packing rings are equalized both vertically and laterally with the result of affording a complete separation of the gas and cable liquid. Stated another way, the floating rings have a limited amount of play. The top and bottom plates have smooth edges and make an easy fit within the cylinder so that they will not injure the smooth surface of the cylinder wall as the piston moves up and down.

As will be noted, the end plates are always under pressure when the reservoir is in use, the pressures acting in opposite directions. As the cable liquid or fluid expands, the free piston is pushed upwardly in opposition to the gas pressure in chamber 7. When the cable fluid contracts, the gas pressure forces the piston downward and thus the cable fluid is maintained under the predetermined positive pressure and the formation of voids or gas containing spaces in the cable prevented. I have described the chamber 7 filled with gas and chambers 8 and 8 with cable fluid but this arrangement can be reversed. The free piston being constantly under opposing fluid pressures, the packing will always be under pressure and in contact with the cylinder wall. As a result of this, there will be at all times a complete separation of the fluids and there will be no opportunity for one fluid to leak into the other. There will be very little tendency in this respect for the pressures quickly become equal and opposite.

My invention has been described in connection with a cable but it may be used with other types of electrical apparatus where separation of two fluids, both under pressure, is desirable.

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