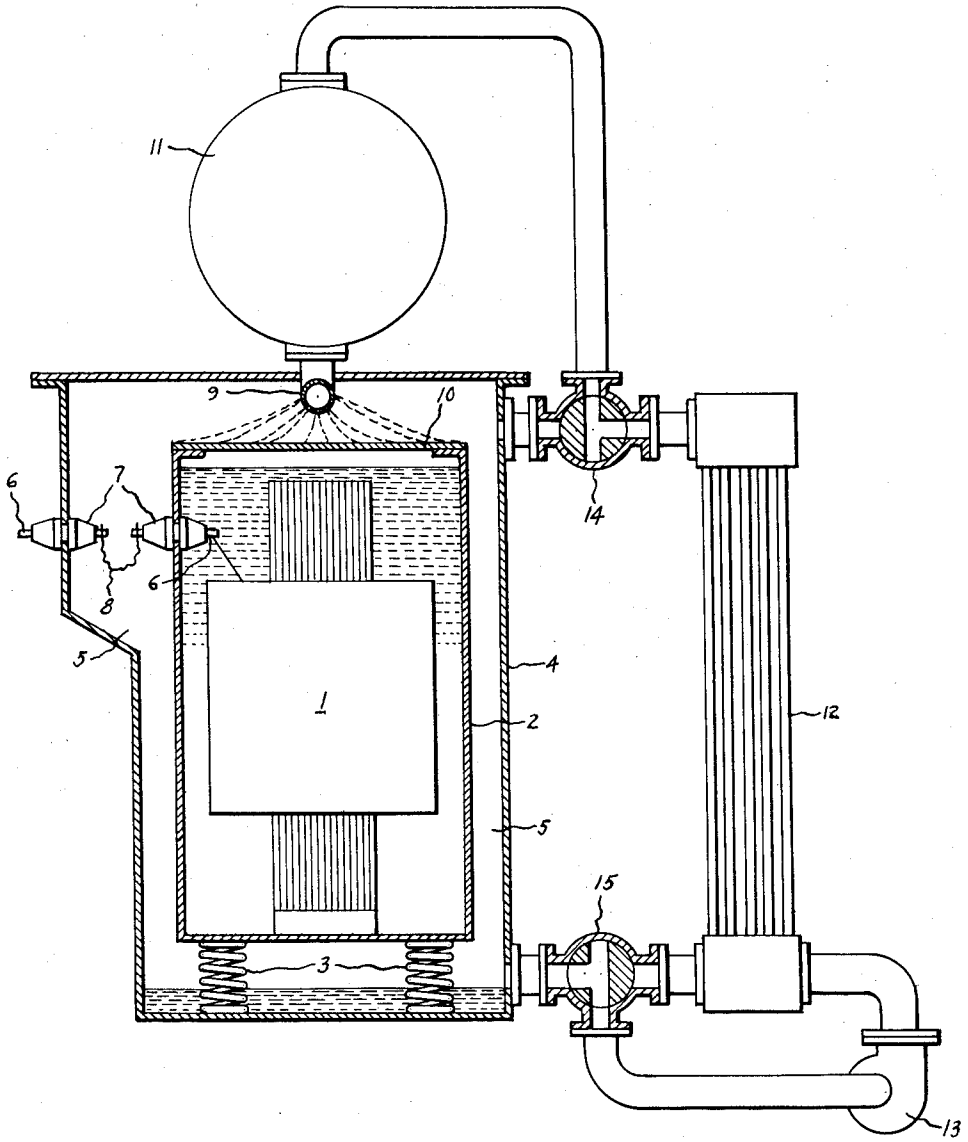
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ELECTRIC TRANSFORMERS AND LIKE APPARATUS

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ELECTRIC TRANSFORMERS AND LIKE APPARATUS

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1 Claim. (Cl. 174—15)

This invention relates to electric transformers and the like and is concerned with the reduction of noise emanating therefrom.

Where an electric transformer is mounted within a liquid filled tank, vibration originating in the core of the transformer and radiated from the tank as noise is transmitted from the core to the tank walls by two main paths, the first through the solid connections, such as the mounting supports between the transformer and the tank and the second through the liquid, generally oil, occupying the space between the transformer and the tank walls. It therefore follows that an arrangement for reducing noise radiated from the transformer tank should aim at attenuating the vibration transmitted by both the paths.

In transformer or like apparatus according to the present invention, an inner tank, in which is mounted the transformer proper for immersion in a liquid, usually oil, is resiliently mounted within an outer tank which encloses an air space surrounding the inner tank, and means are provided for maintaining a flow of cooling liquid over the outer surfaces of the inner tank. The air space between the two tanks will act as a sound barrier between the transformer and the walls of the outer tank whilst the resilient mounting will reduce the vibration which is transmitted through the solid connections between the transformer and the outer tank, with the result that noise radiated from the apparatus will be substantially reduced. It has also been found that the cooling of the transformer may be enhanced in apparatus constructed in accordance with the invention.

It will be appreciated that the mounting of the inner tank must be resilient with respect to the outer tank at all places where there is a solid connection between the transformer and the outer tank; this includes for example, the electric leads passing from the transformer to the exterior of the outer tank, which leads will usually include insulated conductors sealed through the walls of the tanks.

Advantageously in carrying out the invention cooling liquid is sprayed on to the top surface of the inner tank and allowed to flow down the side surfaces, an external pump being provided which withdraws the liquid from the bottom of the outer tank and recirculates it to the spray through a cooler.

In order that the invention may be more clearly understood reference will now be made to the accompanying drawing in which the single figure shows a preferred embodiment of the invention.

In the embodiment shown, a transformer 1 is immersed in oil in an inner tank 2 which is mounted on spring supports 3 in an outer tank 4 enclosing an air space 5 surrounding the inner tank 2. The electrical connections from the transformer pass to the exterior of the outer tank 4 by way of conductors 6 sealed in insulating bushings 7 through the walls of the tanks, these conductors being joined together by a flexible connection 8 to ensure that the inner tank 2 is mounted resiliently in all respects.

A perforated pipe 9 is arranged within the outer tank 4, and above the inner tank 2 on to the top surface 10 of which it continuously sprays a cooling liquid as indicated by the dotted lines. This liquid comes from a reservoir 11 mounted above the outer tank 4 and having a capacity at least equal to the volume of the space between the two tanks plus that of a cooler 12 through which an external pump 13 passes the liquid back to the reservoir 11, the cooler 12 comprising a nest of vertical tubes mounted to the side of the outer tank. The pump 13 is such as will maintain a dry sump to the outer tank 4, while allowing a copious flow of cooling fluid over the top and sides of the inner tank 2 from the reservoir 11 above. In this way, when the pump 13 is operating there will always be an air space 5 between the two tanks which will act as a sound barrier.

The reservoir 11 forms part of a safety arrangement which comes into operation should the pump 13 fail. Normally the cooling liquid for the spray is pumped through the cooler 12 to the reservoir 11, but valves 14, 15, preferably automatic, are arranged so that on stoppage of the pump 13 the cooler 12 is or may be connected directly between top and bottom of the outer tank 4. At the same time, liquid from the reservoir 11 floods the space 5 between the inner and outer tanks so that the unit then operates under a normal thermosyphon cooling system. In such an emergency condition of course, since there is no longer an air barrier between the tanks the only noise reduction will be that effected by the resilient mounting. The rating of the transformer may also be reduced in such a condition due to less efficient cooling.

If necessary the cooling of the inner tank 2 may be enhanced by providing cooling tubes or fins (not shown) on its exterior and in some cases it may even be necessary to employ forced circulation of the oil in the inner tank to increase the cooling still further.

What I claim is:

An electric transformer or like apparatus comprising an inner tank, a transformer proper immersed in a liquid and mounted within said inner tank, an outer tank enclosing an air space which substantially completely surrounds said inner tank, means for resiliently mounting said inner tank within said outer tank, a cooling liquid within said outer tank, means for maintaining a flow of said cooling liquid over the outer surfaces of said inner tank, said flow maintaining means comprising a reservoir mounted above said outer tank, spray means within said outer tank and connected to said reservoir, a cooler, and pump means connected to circulate said cooling liquid from the bottom of said outer tank upwardly through said cooler to said reservoir, and thence onto the top of said inner tank by way of said spray means, said pump means having sufficient capacity to maintain the level of said liquid in said outer tank below the bottom of said inner tank while allowing a copious flow of said cooling liquid over the top and sides of said inner tank from said reservoir, said reservoir having a capacity at least equal to the volume of the space between said tanks plus the volume of said cooler, and valve means arranged such that said cooler may be alternatively connected directly between the top and bottom of said outer tank to cool said transformer by a thermosyphon action or between said reservoir and said pump means, said transformer containing a sufficient quantity of said cooling liquid to flood the space between said inner and outer tanks upon stoppage of said pump means.

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