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G. CAMILLI

2,185,831

TRANSFORMER

Filed March 18, 1938

Fig. 1.

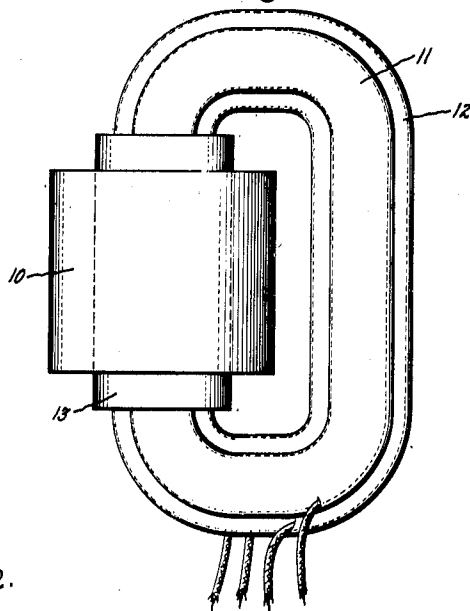


Fig. 2.

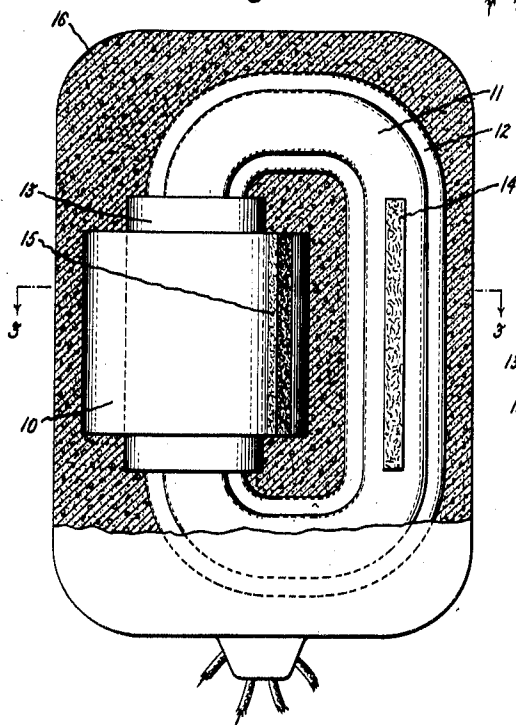
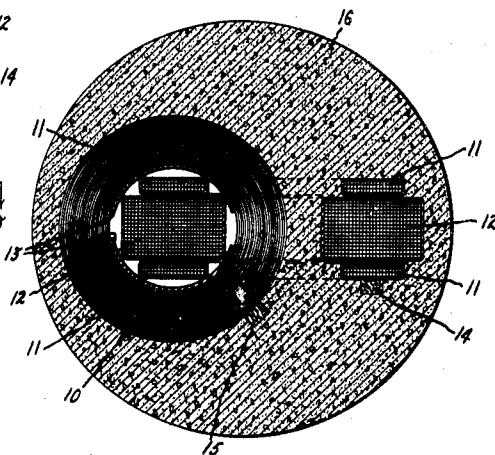


Fig. 3.



Inventor:
Guglielmo Camilli,
by *Harry E. Dunham*
His Attorney.

UNITED STATES PATENT OFFICE

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TRANSFORMER

Guglielmo Camilli, Pittsfield, Mass., assignor to
General Electric Company, a corporation of
New York

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3 Claims. (Cl. 175—361)

My invention relates to transformers and its general object is to provide an improved transformer construction in which the transformer is embedded in concrete. A concrete-encased transformer constructed in accordance with the invention is fireproof and weatherproof. It may be produced very economically and has good load capacity because the heat conductivity of concrete is good.

There is a difference in the thermal expansion of the concrete and of the transformer parts and this tends to cause trouble if the concrete is cast directly onto the transformer and closely fits its surface. The transformer should be impregnated with a suitable insulating compound such as paraffin. Thermal expansion of the insulating compound during operation of the transformer tends to create high pressure which may rupture the concrete casing, and the principal object of the invention is to provide an arrangement which will permit such expansion of the insulating compound without injury to the concrete. The insulating compound may soften and become liquid under temperature conditions prevailing during operation of the transformer but it may be solid under low temperature conditions such as prevail during light load conditions and when operation of the transformer is first started.

Difference in thermal expansion and contraction when the insulating compound is solid may cause empty spaces to appear between the transformer and the concrete so that high voltages in the transformer windings might cause some corona and the invention is therefore particularly applicable in connection with transformers which operate at low or medium voltages.

The invention will be better understood from the following description taken in connection with the accompanying drawing in which Fig. 1 shows a transformer before it has been provided with its concrete casing; Fig. 2 is a view partly in section of the transformer enclosed in concrete in accordance with the invention; and Fig. 3 is a sectional view on the line 3—3 of Fig. 2.

Like reference characters indicate similar parts of the different figures of the drawing.

The invention is particularly applicable in connection with transformers of rather small size so that the weight of the concrete casing may not be objectionable, such a transformer being indicated in Fig. 1 and including a magnetic core 10 provided with windings 11 and 12. In the particular transformer shown in the drawing the winding 11 is formed in two sections disposed at opposite sides of the winding 12. These two sections

of the winding 11 may of course be connected either in series or in parallel. The magnetic core 10 is in the form of a long, flat strip of magnetic material wound into a tight coil or helix around one side of the windings 11 and 12 and insulated from the windings by semi-cylindrical insulating sheets 13.

After the transformer core and windings are assembled, as shown in Fig. 1, the transformer is dried and impregnated with a suitable insulating compound such as paraffin or other insulating wax. A thick strip 14 of some cellular material which is pervious to a liquid but impervious to concrete is laid somewhere along the surface of the transformer, a thick strip of ordinary felt being particularly desirable. Two or more strips of such material may be used and, as shown in Figs. 2 and 3, the strip 14 of cellular material is shown along the surface of one of the windings and an additional strip of cellular material 15 is shown along the surface of the core 10. The transformer surface covered by the felt or other cellular material is so restricted, however, as shown in Figs. 2 and 3, as to prevent any substantial interference to heat dissipation from the transformer.

A sealed casing 16 of concrete is cast in one piece around the transformer and the cellular strips 14 and 15 and closely fitting the surface of the transformer as indicated in Figs. 2 and 3. The insulating compound with which the transformer was impregnated prevents moisture from the concrete from entering and wetting the transformer where it would be apt to cause rusting of the core and lowering of the dielectric strength of the winding insulation. After the concrete has hardened, it is thoroughly dried preferably by heating it in a partial vacuum.

The paraffin or other insulating compound with which the transformer is impregnated will expand under high temperature conditions during operation of the transformer and under these conditions the compound will soften and may even become a liquid. Thus it can flow readily as it expands. The concrete was excluded from the spaces occupied by the felt strips 14 and 15 and the softened or liquid paraffin expands readily into the cellular spaces in the felt so that excessive pressure inside the sealed concrete casing 16 cannot occur.

The concrete casing 16 has good heat conductivity so that the heat generated by the losses in the transformer is rapidly dissipated and the load capacity of the transformer is consequently good. A transformer may be constructed in accordance

with the invention with very little labor and with inexpensive materials.

5 The invention has been explained by describing a particular transformer structure produced in accordance with the invention and it will be apparent that changes may be made without departing from the spirit of the invention and the scope of the appended claims.

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

1. The combination with a transformer treated with an insulating compound which softens when heated, of a sealed one piece concrete casing closely fitting the surface of the transformer, and a cellular member between the transformer surface and the concrete to permit thermal expansion of the insulating compound, the transformer surface covered by the cellular member being restricted to prevent any substantial interference to heat dissipation from the transformer.

2. The combination with a transformer treated

with an insulating compound which softens when heated, of a sealed one piece concrete casing closely fitting the surface of the transformer, and a felt member between the transformer surface and the concrete to permit thermal expansion of the insulating compound, the transformer surface covered by the felt member being restricted to prevent any substantial interference to heat dissipation from the transformer.

3. The combination with a transformer treated with insulating wax which softens when heated, of a sealed one piece concrete casing closely fitting the surface of the transformer, and a felt member between the transformer surface and the concrete to permit thermal expansion of the wax, the transformer surface covered by the felt member being restricted to prevent any substantial interference to heat dissipation from the transformer.

GUGLIELMO CAMILLI. 20