

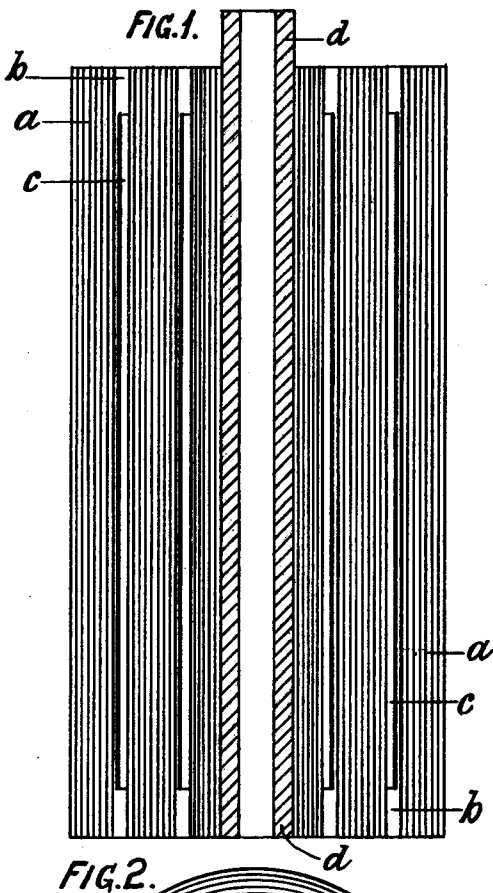
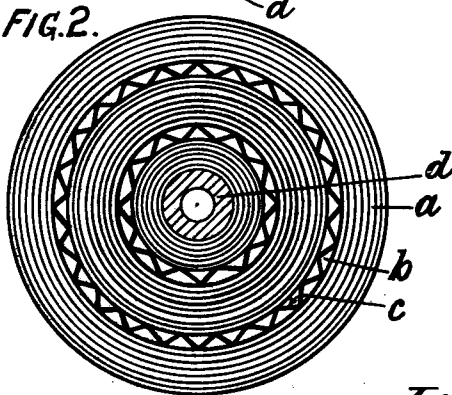
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ELECTRICAL CONDENSER

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by *[Signature]*

UNITED STATES PATENT OFFICE.

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ELECTRICAL CONDENSER.

Application filed July 20, 1921. Serial No. 486,169.

To all whom it may concern:

Be it known that we, ERNEST ARTHUR BAYLES and HAROLD HIGHAM, subjects of the King of England, and residing at Helsby, in the county of Chester, England, have invented new and useful Improvements in Electrical Condensers, of which the following is a specification.

This invention has reference to electrical condensers of the kind in which a liquid impregnating dielectric is used, and the condenser units or bodies are formed of laminæ of papers and metal.

It has been found that, under certain conditions of use of condensers of the kind referred to, the heat generated internally in a condenser body or unit, due to losses which occur therein, however small these losses may be, is not conducted away from the internal laminæ of the condenser unit with sufficient rapidity, and that therefore the temperature of the inner substance of the condenser unit may rise considerably higher than that of the exterior; and the interior temperature may in time rise to such an extent as to deteriorate the dielectric, and eventually cause a break-down.

The primary object and effect of the invention is to reduce a condenser, so that in use, the temperature throughout the substance of each unit, is as uniform as possible, and to obviate thereby the defects referred to, and enable the greatest output in all cases to be given.

In the condenser construction hereinafter described, the object and effects above referred to are accomplished; and for convenience the invention will be described more particularly to the type of condenser bodies or units consisting of rolled strips of paper and metal; and it is to be understood it can be applied with but a little modification equally to condenser units, built up of separate sheets or of folded sheets or strips.

A condenser under this invention, has channels or spaces through the body of the units, adapted to permit of a passage or circulation of the liquid dielectric through them, and so retain the interior at the desired and safe temperature; the number and distance from the axis of the condenser body depending upon the size of the body and other conditions; and these spaces or channels extend between the upper and

lower ends of the body, preferably parallel to the axis of the condenser.

Thus in this condenser the bodies are sub-divided into small thicknesses or number of layers of conductors and dielectric with passages or spaces between or through them for the passage and presence of the liquid in which they are placed in the container.

The drawing hereto annexed illustrates the type of condenser body of the kind just referred to, namely, a cylindrical body consisting of rolled laminæ of paper and metal; and it may be assumed that the diameter of the condenser body shown is about from 1½ to 2 inches. In said drawing, Figure 1 is a vertical section of the condenser body, and Figure 2 is a cross section of the same.

In the case shown, *a* represents the paper dielectric and metal foil rolled together in the wellknown way, and *b* are the channels or spaces between the sub-divided portions of the paper and metal, through which the liquid dielectric in which they are placed in the container is free to pass and circulate; and the channels or spaces *b* are formed and maintained by a layer of corrugated card paper or the like, so that the annular space *b* is divided into a multiplicity of triangular channels or tubes through which the liquid can freely pass, and the different sub-divided portions of the body will be connected up together electrically say on the upper end, in a suitable way.

The corrugated paper card *c* used in the passages *b* will be of sufficient length that two ends of a strip will meet, the card being coated with shellac or the like to make it stiff, and to maintain the corrugations.

In the case shown, the body is wound on a hollow core *d* of suitable paper by which it is adapted to be threaded over wires or rods.

According to one mode or manner of making the internal cooling condenser bodies or units, the units are wound in the usual way, until a predetermined thickness of substance of conductors and dielectric has been attained, and there is then inserted a layer of corrugated material *c* of sufficient length to make a turn round the surface of the condenser unit thus far wound; the direction of the corrugations being longitudinal with the axis of the condenser cylinder *a*. The winding of the condenser is then proceeded

with in the usual manner until the predetermined thickness of substance of conductors and dielectric has been added externally to the corrugated material *c*; and there is then inserted a second layer of the corrugated material *c*, the length being again such as to make a turn round the cylindrical surface of the partly wound condenser unit, and the direction of the corrugations parallel to the axis of the condenser.

In this manner we complete the condenser unit, with as many corrugated layers as may be necessary, and the resulting unit consists of alternate layers of condenser substance *a*, each of a prearranged thickness, open channels, and corrugated material; so that each layer of condenser substance, except the inner and outer layers, has on each side of it a complete layer of open channels, parallel to the axis of the condenser, which channels are due to the corrugations of the stiff material which divides the condenser substance into its layers, and through which the liquid can circulate. A further effect and purpose of the passages or spaces between the sections of the unit is that of the usual operation of drying and impregnating of condensers of the kind referred to, is to assist and accelerate the operations.

The corrugated material may be of stiff paper or thin card, thin metal or any similar materials. It is important, however, that it should possess certain properties which are,—(1) sufficient stiffness to preserve its corrugations without appreciable deformation under the pressure of the winding of the condenser material; (2) capability of preserving its corrugations under the heat required for drying and impregnating the condenser units in manufacture; (3) capability of preserving its corrugations indefinitely under the action of the liquid dielectric at its working temperature; and (4) chemical stability, so that it will not produce or give off acids, alkalies or anything deleterious to the dielectric, either at normal or working temperatures, nor during the heating necessary to dry and impregnate the condensers in manufacture.

It is found that a very suitable material is a good quality insulating paper about 0.010 inch thick, corrugated with corrugations of an angular or approximately semi-circular cross section, about one-tenth of an

inch deep and after corrugating, well varnished with shellac varnish, and baked so as to harden and strengthen the material.

If desired the corrugated material may be perforated, so as to assist the drying and impregnating of the condensers during manufacture, and also to improve the circulation of the liquid dielectric into the substance of the condenser unit during use.

The depth of the corrugated material *c* may be that shown in the drawing, namely, such that the insulating material of the condenser winding overlaps the material at each end, that is to say, the depth should be approximately the same as that of the conducting laminæ of the condenser winding. Or, it may be approximately equal to that of the insulating laminæ of the condenser winding, so that the corrugations keep open channels throughout the full length of the condenser unit.

Other modes of furnishing channels or passages through the condenser bodies, may consist in using on the bodies small tubes, or simple distance pieces, separate, or attached together into bands, and the like.

What we claim is:—

An electrical condenser unit, including a hollow core, a predetermined thickness of a strip composed of a layer of conductor and a layer of dielectric wound on said core, a layer of corrugated material wound around said condenser layer with the corrugations extending lengthwise the layer, a second layer of conductor and dielectric material wound about said corrugated material to the desired thickness, a further layer of corrugated material wound about said second layer of condenser unit, and a further layer of condenser unit material wound about said second corrugated layer, whereby the unit is made up of successive layers of condenser material wound upon strips of corrugated material as and for the purpose described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

ERNEST A. BAYLES.
HAROLD HIGHAM.

Witnesses:

A. M. WATKINS,
E. E. JORDAN.