

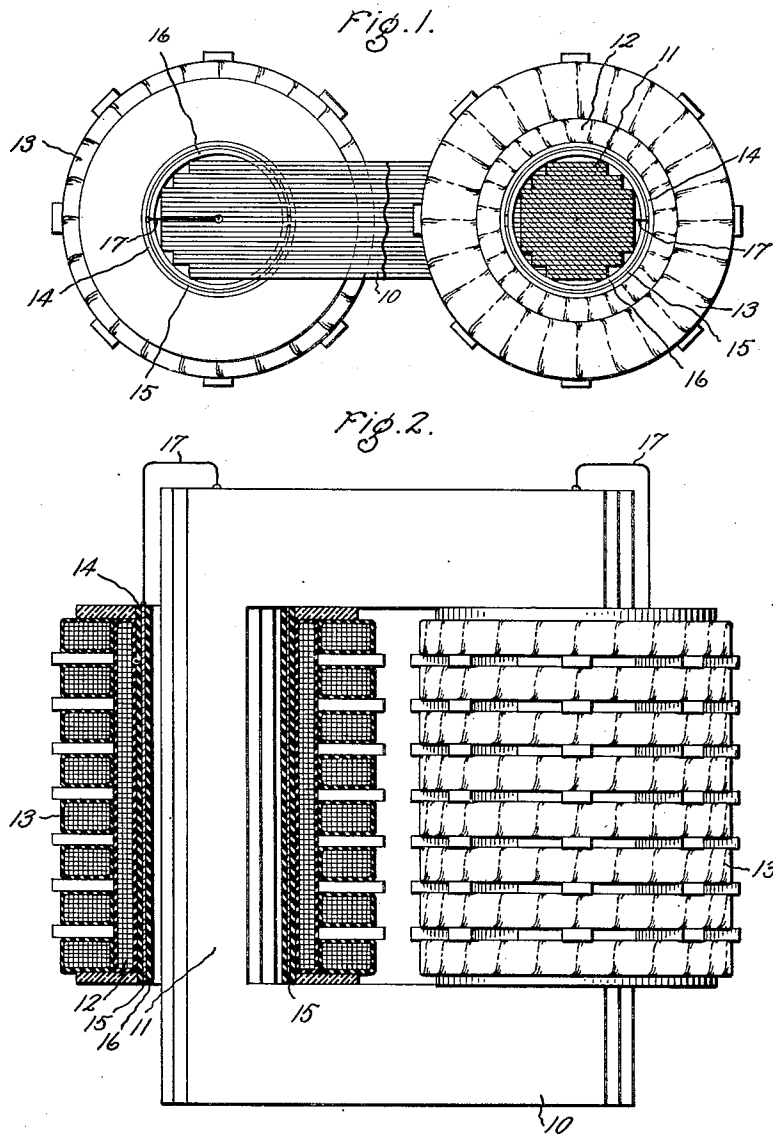
Dec. 29 , 1925.

1,567,797

J. J. FRANK

ELECTRICAL INDUCTION APPARATUS

Filed April 5, 1922



Inventor:
John J. Frank,
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His Attorney.

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UNITED STATES PATENT OFFICE.

JOHN J. FRANK, OF PITTSFIELD, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRICAL INDUCTION APPARATUS.

Application filed April 5, 1922. Serial No. 549,940.

To all whom it may concern:

Be it known that I, JOHN J. FRANK, a citizen of the United States, residing at Pittsfield, in the county of Berkshire, State of Massachusetts, have invented certain new and useful Improvements in Electrical Induction Apparatus, of which the following is a specification.

My invention relates to electrical induction apparatus including a magnetic core surrounded by current carrying windings and has special reference to the provision of an improved arrangement for insulating the windings from the core.

In building up a magnetic core for a transformer or other electrical induction apparatus, it is in general desirable that the cross section of the winding legs be as nearly circular as practicable in order that the winding perimeters and therefore the mean length of the turns of the windings may be as short as practicable. Among the resulting advantages may be mentioned economy in material and cost, compactness and light weight. For well known reasons, such as the reduction of eddy current losses, the winding legs are generally formed of thin laminations of magnetic material, several different widths being used in a manner to provide winding legs having a cross section approaching a circular form but necessarily having a number of angular longitudinal projections or corners along their surfaces. These projecting edges or corners along the core surfaces tend to cause an uneven distribution of the surrounding electrostatic field and consequent concentrations of dielectric stress in the insulation between the core legs and the windings. The general object of the present invention is to provide an improved construction whereby this electrostatic field may be uniformly distributed with consequent uniform dielectric stress in the insulation which is interposed between the core and windings. Further objects and advantages will appear.

One embodiment of the invention is illustrated in the accompanying drawing in which Fig. 1 is a plan view of a transformer, partly in section, and Fig. 2 is a view in elevation of the same transformer, also partly in section.

Like reference characters indicate similar parts in both figures of the drawing.

The drawing shows one embodiment of the invention as applied in the construction of a

transformer which includes a core 10 having two winding legs 11. Each winding leg is surrounded by a primary winding 12 and a secondary winding 13. The windings are insulated from the winding legs 11 of the core by interposed cylinders 14 formed of suitable insulating material. The winding legs are built up of longitudinal laminations of several different widths resulting in a number of longitudinal projecting edges or corners along their surfaces. These projecting edges or corners tend to distort the electrostatic field, each edge or corner tending to produce a concentration of electrostatic flux and consequent high dielectric stress in the adjacent portion of the insulation. It is desirable that the electrostatic field be uniformly distributed so as not to subject any portion of the insulation within the field to more than the average value of electrostatic stress. To attain this result, a cylinder 15 of electrically conductive material is interposed between each winding leg 11 of the core and the corresponding insulating cylinder 14. The conductive cylinders 15 may be formed of any suitable material such as wire gauze, thin sheet metal, tin foil, or even metallic paint applied to the inner surfaces of the insulating cylinders 14, but these conductive cylinders should each have a longitudinal break or interruption, as indicated in Fig. 1 of the drawing, to prevent short circuit currents and consequent heating. Insulating cylinders 16 between the conductive cylinders 15 and the surfaces of the winding legs 11 of the core prevent contact of the conductive cylinders with the projecting corners of the winding legs 11 and consequent heating by short circuiting of portions of the winding legs by the insulating cylinders. Electrical connections 17 between the conductive cylinders 15 and the core maintain these cylinders and core always at the same potential in order to distribute uniformly the dielectric stresses within the insulating cylinders 16.

The provision of the conductive cylinders 15 insulated from the edges of the core and connected electrically thereto assures a uniform distribution of dielectric stresses in the insulation between the core and the windings, and at the same time avoids short circuiting the edges of the core laminations. In accordance with this invention, therefore, short circuit currents and consequent heat-

ing in the conductive cylinders 15 are prevented by separating them from the surface of the core.

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

1. In electrical induction apparatus, a core
formed with projecting portions, windings
surrounding the core, insulation interposed
between the innermost turns of said wind-
10 ings and the core, and a conducting member
between the insulation and the projecting
portions of the core, said conducting mem-
ber being separated from said projecting
corners.

13 2. In electrical induction apparatus, a core
formed with projecting corners, windings
surrounding the core, insulation interposed
between the innermost turns of said wind-
ings and said projecting corners of the core,

and a conducting member between the in- 20
sulation and the projecting corners of the
core, said conducting member being sepa-
rated from said projecting corners of the
core.

3. In electrical induction apparatus, a core 25
formed with projecting portions, windings
surrounding the core, insulation interposed
between the innermost turns of said wind-
ings and said projecting portions of the core,
and a conducting member between the in- 30
sulation and the projecting portions of the
core, said conducting member being sepa-
rated from said projecting portions of the
core and being electrically connected to the
core. 35

In witness whereof, I have hereunto set
my hand this 1st day of April 1922.

JOHN J. FRANK.