

Oct. 12, 1926.

1,603,058

J. BIERMANN'S

TRANSFORMER

Filed March 23, 1926

FIG. 1.

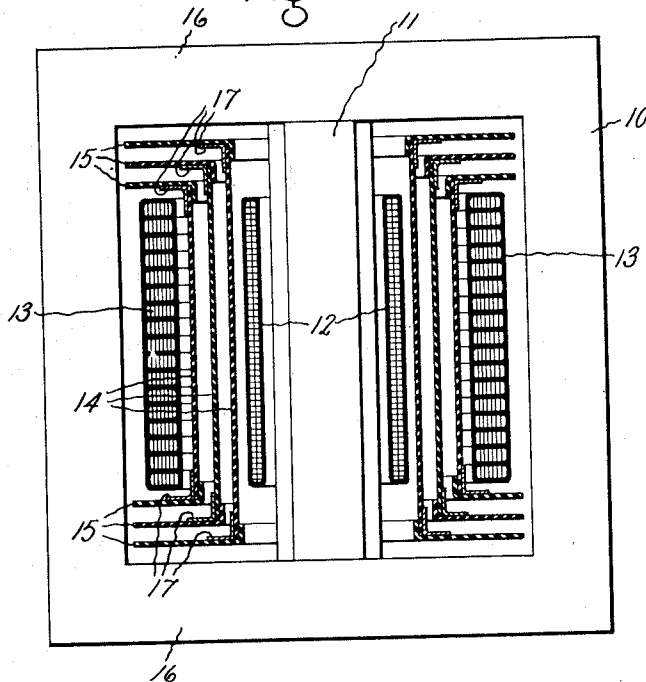
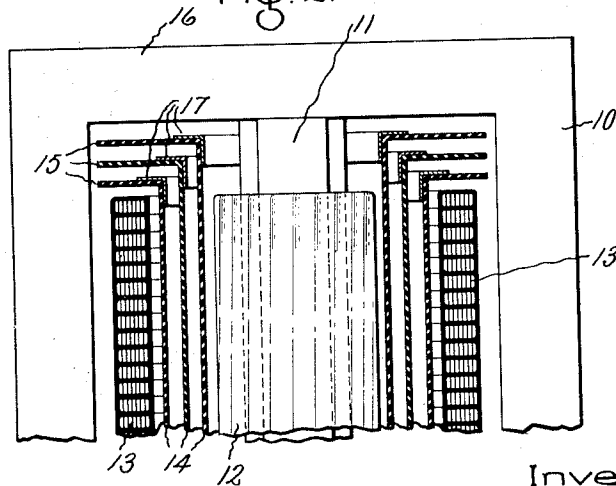


FIG. 2.



Inventor:
Josef Biermanns.
by *Alexander S. Lunt.*
His Attorney.

Patented Oct. 12, 1926.

1,603,058

UNITED STATES PATENT OFFICE.

JOSEF BIERMANN, OF KARLSHORST, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

TRANSFORMER.

Application filed March 23, 1926, Serial No. 96,785, and in Germany April 2, 1925.

My invention relates to transformers and more particularly to the insulation for the high voltage winding of a transformer. In high tension transformers having concentric cylindrical windings, the high tension winding is usually disposed outside of the low tension winding and is insulated from the low tension winding and the winding leg of the core by one or more insulating cylinders interposed between the two windings. These insulating cylinders may have end flanges projecting outwardly from their ends approximately at right angles to the axis of the cylinders and between the ends of the high tension winding and the core yokes. When such end flanges are used, the windings may be closer together and their ends may be closer to the core yokes so that there is a substantial saving in material and the transformer may be smaller and more compact. The lines of force are more concentrated and the electric stress is higher, however, at the junctures of the flanges with their respective cylinders than in other portions of the flanges or cylinders. The insulation is most apt to break down, therefore, at these junctures, particularly if the cylinders and their flanges are not integrally formed but have joints between them. The general object of the invention is to reduce or avoid this danger of breakdown of the insulation by providing suitable electrically conductive layers or coverings to reduce the electric stress along the junctures of the cylinders and their flanges.

Other objects and advantages will appear from the following description taken in connection with the accompanying drawing, in which Fig. 1 shows a transformer, partly in section, the high tension winding being provided with flanged insulating cylinders formed in accordance with the invention, and Fig. 2 is a view similar to Fig. 1 but showing a modified form of flanged cylinders.

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

The invention will be described as applied in connection with a transformer including a shell type core 10 having a winding leg 11 surrounded by a low tension winding 12 and a high tension winding 13. Insulating cylinders 14 are interposed between the high tension winding 13 and the low tension winding 12 and winding leg 11 of the core.

The insulating cylinders 14 have end flanges 15 projecting outwardly at right angles or approximately so over the ends of the high tension winding 13 and between this winding and the yokes 16 of the core. These flanges reduce the distance necessary from the ends of the high tension winding 13 to the core yokes 16 and to the low tension winding 12 and the winding leg 11 of the core and thus make possible a smaller and more compact core and transformer. The flanges 15 as shown in Fig. 1 as being formed separately from their respective cylinders and connected to the cylinders by suitable joints. The flanges are shown in Fig. 2 as being formed integrally with their respective cylinders.

To reduce or avoid a concentration of the electric field and thus to reduce the electric stress and the danger of breakdown of the insulation at the junctures of the flanges 15 with their cylinders 14, a covering or coating 17 of conductive material is provided on the surface of each flange and its cylinder at and adjacent to their juncture. These conductive coverings or coatings 17 which span the junctures of the flanges and cylinders provide equipotential surfaces to which the lines of force of the electric field are necessarily perpendicular. The flanges and cylinders are usually built up of layers of insulating material such as specially treated paper and the parts which are under the conductive coverings 17 are thus under an electric stress which is in the direction of their greatest dielectric strength, that is, perpendicular to the layers.

By suitably extending the conductive coverings 17, they may so control the distribution of potential as to provide a substantially uniform potential gradient and thus a substantially uniform electric stress throughout the flanges and cylinders.

While each flanged cylinder is shown in the drawing as having a conductive covering applied to one surface only, it will be apparent that the application of the conductive covering need not be limited to a single surface to obtain beneficial results.

What I claim as new and desire to secure by Letters Patent of the United States, is:
1. A transformer including a core having a winding leg surrounded by a high tension winding, an insulating cylinder interposed between said high tension winding and said

- winding leg, said cylinder having an insulating end flange extending over an end of said high tension winding, and a conductive covering on the surface of said cylinder and flange and spanning their juncture. 15
- 5 2. A transformer including a core having a winding leg surrounded by a high tension winding, an insulating cylinder interposed between said high tension winding and said winding leg, said cylinder having an insulating end flange extending over an end of said high tension winding, and a conductive covering on the surface of said cylinder and flange and spanning their juncture, the extent of said conductive covering along the surface at both sides of said juncture being such as to provide a substantially uniform potential gradient throughout said flange and cylinder. 15
- 10 In witness whereof, I have hereunto set my hand this 5th day of March, 1926. 20
- JOSEF BIERMANN.