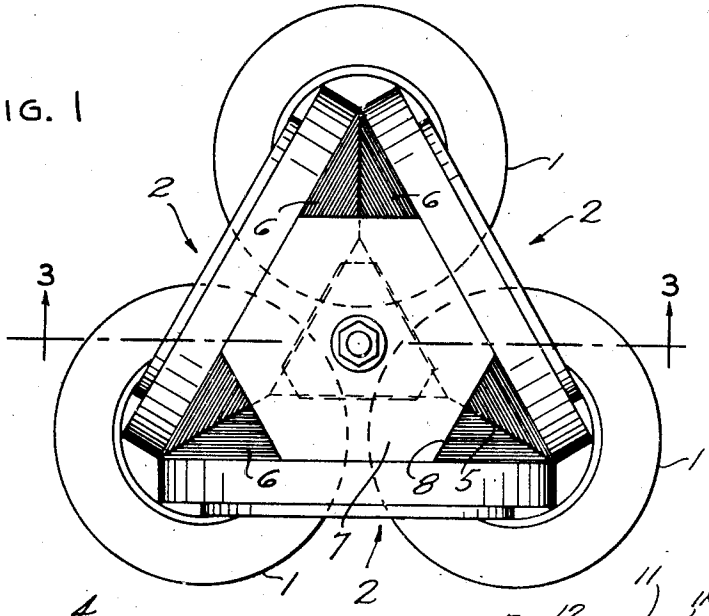
Jan. 4, 1949. A. G. STEINMAYER 2,458,112

THREE-PHASE TRANSFORMER CONSTRUCTION

Filed Jan. 20, 1947

FIG. 1



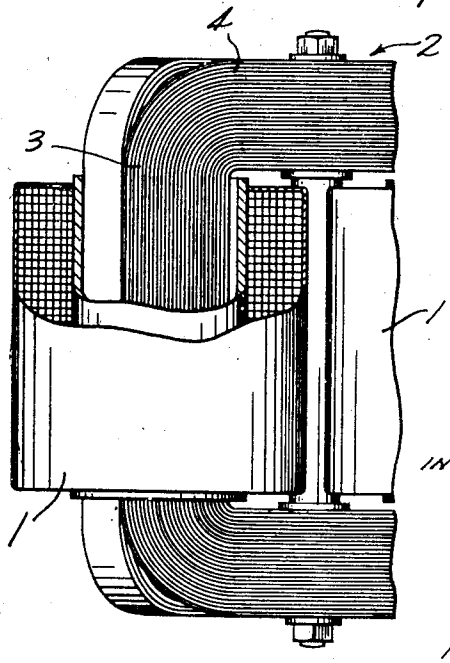


FIG. 2

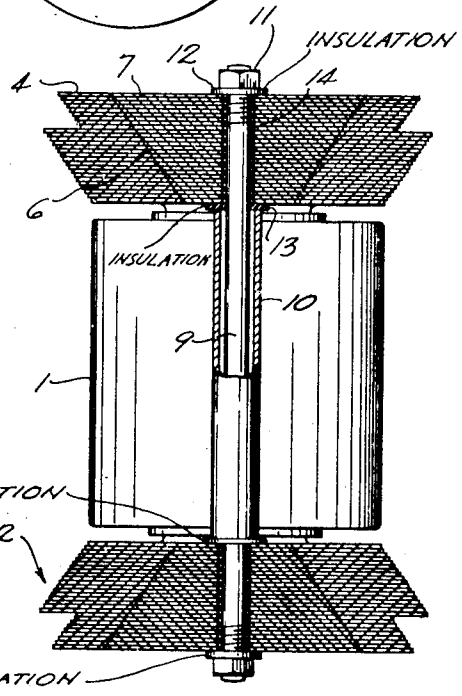


FIG. 3

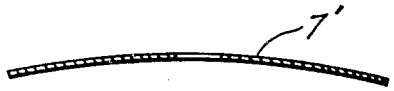


FIG. 4

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THREE-PHASE TRANSFORMER CONSTRUCTION

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4 Claims. (Cl. 175—356)

1

This invention relates to three phase transformers and is particularly directed to the core construction of three phase transformers.

This invention is an improvement over that disclosed in the copending application of David E. Wiegand, Serial No. 556,546 filed September 30, 1944 for Three-phase transformers, assigned to the same assignee as that of the present invention.

In the prior invention disclosed in the copending application, a three phase transformer was provided in which the cores were wound of magnetic ribbon and each core formed a closed core interlinking two of the three conducting windings, the cores having straight leg portions passing through the conducting windings, and yokes connecting the straight leg portions, with the successive ribbons of each core being arranged in a staggered relation with the edges of adjacent cores arranged in edge to edge contact.

The purpose of having the leg portions arranged in the manner described was to provide for the transfer of flux or interchange of flux from core to core during the alternating current cycle.

This invention is designed to provide means for facilitating the transfer of magnetic flux from core to core during the successive portions of the alternating current cycle in addition to that provided by the contacting straight leg portions which pass through the conducting winding assemblies.

In greater detail, objects of this invention are to provide magnetically conducting filler means magnetically interconnecting the yoke portions of the several cores at each end of the three phase transformer so as to provide greater freedom for the free interchange or transfer of flux from one core to another core.

A further object of this invention is to provide a construction in which the magnetic filler means or end bridging means between the yoke portions are so made that they are slightly bowed and are arranged to be straightened out or deflected to increase the certainty and security of contact between the edges of the laminations forming the magnetic filler or bridging members and the adjacent edges of the yoke portions of the several cores.

An embodiment of the invention is shown in the accompanying drawings, in which:

Figure 1 is a plan view of a transformer constructed in accordance with this invention.

Figure 2 is a fragmentary elevation with parts broken away and parts in section.

2

Figure 3 is a sectional view of the line 3–3 of Figure 1.

Figure 4 is an enlarged sectional view through one of the laminations of a magnetic filler member.

Referring to the drawings, it will be seen that the three phase transformer comprises three conducting winding assemblies 1 whose axes are arranged at the apexes of an equilateral triangle. A plurality of wound closed cores formed of magnetic ribbon are provided and are indicated generally by the reference character 2. They are each provided with straight leg portions 3 and yoke portions 4, the straight leg portions passing through the conducting winding assemblies, each core section serving to interlink two of the conducting winding assemblies. The magnetic ribbon forming the several core sections is wound in a staggered manner so as to provide slanting faces 5 for the straight leg portions of adjacent core sections. Incidental to the formation of the slanting faces 5 of the straight leg portions, it is to be noted that the inner faces of the yoke portions are also slanting as indicated at 6. The leg portions 3 are straight where they pass through the conducting windings and the staggered arrangement of the magnetic ribbon allows an edge to edge contact between the legs of adjacent straight leg portions of successive core sections and thus provides means for allowing interchange or transfer of flux from one core section to another core section during the alternating current cycle.

Filler members or magnetic bridging members indicated by the reference character 7 are provided at opposite ends of the transformer. These filler members 7 are formed of a plurality of magnetic laminations which are approximately triangular in contour with their sharp ends cut off as indicated at 8 in Figure 1. They are of successively increasing size as shown in Figure 3 and form an inwardly tapered roughly triangular magnetic filler structure which fits between the slanting faces 6 of the yoke sections. The slanting faces of the yoke sections and the slanting faces of the filler members are produced by the staggered edges of the ribbons and laminations, respectively.

These magnetic filler members 7 are held in place by means of a tie rod or bolt 9 which passes through a spacer sleeve 10. Both the bolt and the spacer sleeve are preferably formed of nonmagnetic material. The bolt or tie rod is provided with nuts 11 at opposite ends which are electrically separated from the magnetic filler mem-

bers 7 by means of insulating washers 12. Similarly, the ends of the spacer sleeve 10 are separated electrically from the filler members 7 by means of insulating washers 13.

Further it is to be noted that insulating sleeves 14 surround the tie rod 9 where it passes through the filler members 7.

In order to secure intimate contact or close engagement between the staggered edges of the successive laminations of the magnetic filler members or bridging members 7 and the adjacent staggered edges of the yoke portions 4 of the core section, it is desirable to slightly dish or bow the laminations 7', see Figure 4, which are stacked together to form the magnetic filler members or bridging members 7. These laminations do not have to have much of a bow imparted to them but only a slight bowing or dishing is needed. It will be seen that when the nuts 11 are drawn up that the laminations forming the filler members 7 are forced to open out and are thus caused to slightly bend or deflect by the pull of the tie bolt and insure close engagement of the adjacent edges of the successive laminations in the filler members 7 and the yoke portions 4. The spacer sleeve 10 limits the amount of deflecting that can be imparted to the filler members by the tie bolt 9.

The core sections indicated generally at 2 are prevented from spreading in any suitable manner; for example, the conducting winding assemblies may prevent separation or spreading of the core sections 2, or any other suitable means could be employed in accordance with the well known practice.

It will be seen that the tie bolt 9 constitutes means which is arranged to force the slanting faces of the filler members outwardly to thereby secure binding engagement between the slanting faces of the yoke portions and the filler members.

It will be seen that this invention provides means for greatly increasing the free transfer or interchange of flux between successive core sections of a three phase transformer having wound magnetic cores.

It will also be seen that the invention may be very simply followed in a cheap and highly practical manner.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. A three phase transformer comprising three conducting winding assemblies, three closed cores formed of wound magnetic ribbon having leg portions passing through the conducting winding assemblies and having yoke portions provided with slanting inner faces, initially bowed laminated magnetic filler members at each end of the transformer located between the yoke portions and having slanting outer faces arranged adjacent the slanting inner faces of the yoke portions, and means arranged to force the slanting faces of the filler members outwardly to secure binding engagement between the slanting faces of the yoke portions and the filler members.

2. A three phase transformer comprising three conducting winding assemblies, three closed cores formed of wound magnetic ribbon having leg portions passing through the conducting winding assemblies and having yoke portions provided with slanting inner faces, initially bowed laminated magnetic filler members at each end of the transformer located between the yoke portions and having slanting outer faces arranged adjacent the slanting inner faces of the yoke portions, and a tie bolt extending through the filler members arranged to force the slanting faces of the filler members outwardly to secure binding engagement between the slanting faces of the yoke portions and the filler members.

3. A three phase transformer comprising three conducting winding assemblies, three closed cores formed of wound magnetic ribbon having leg portions passing through the conducting winding assemblies and having yoke portions provided with slanting inner faces, initially bowed laminated magnetic filler members at each end of the transformer located between the yoke portions and having slanting outer faces arranged adjacent the slanting inner faces of the yoke portions, a tie bolt extending through the filler members arranged to force the slanting faces of the filler members outwardly to secure binding engagement between the slanting faces of the yoke portions and the filler members, and a spacer sleeve surrounding the tie bolt and located between the filler members for limiting the amount of outward motion that can be imparted to the slanting faces of the filler members by the tie bolt.

4. A three phase transformer comprising three conducting winding assemblies, three closed cores formed of wound magnetic ribbon having leg portions passing through the conducting winding assemblies and having yoke portions with the edges of the ribbon in the yoke portions staggered to provide inner slanting faces for the yoke portions, initially bowed laminated magnetic filler members at each end of the transformer located between the yoke portions and formed of stacked laminations of gradually increasing areas with the edges of the laminations staggered to provide slanting outer faces engaging the slanting inner faces of the yoke portions, the laminations of the filler members and the ribbons of the yoke portions having edge-to-edge contact, and means arranged to force the slanting faces of the filler members outwardly to secure binding engagement between the edges of the laminations of the filler members and the edges of the ribbons of the yoke portions.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,401,952	Mayberry	June 11, 1946