Sept. 6, 1927. 1,641,272

S. HORELICK

TRANSFORMER WINDING

Filed Dec. 20, 1923

Fig. 1

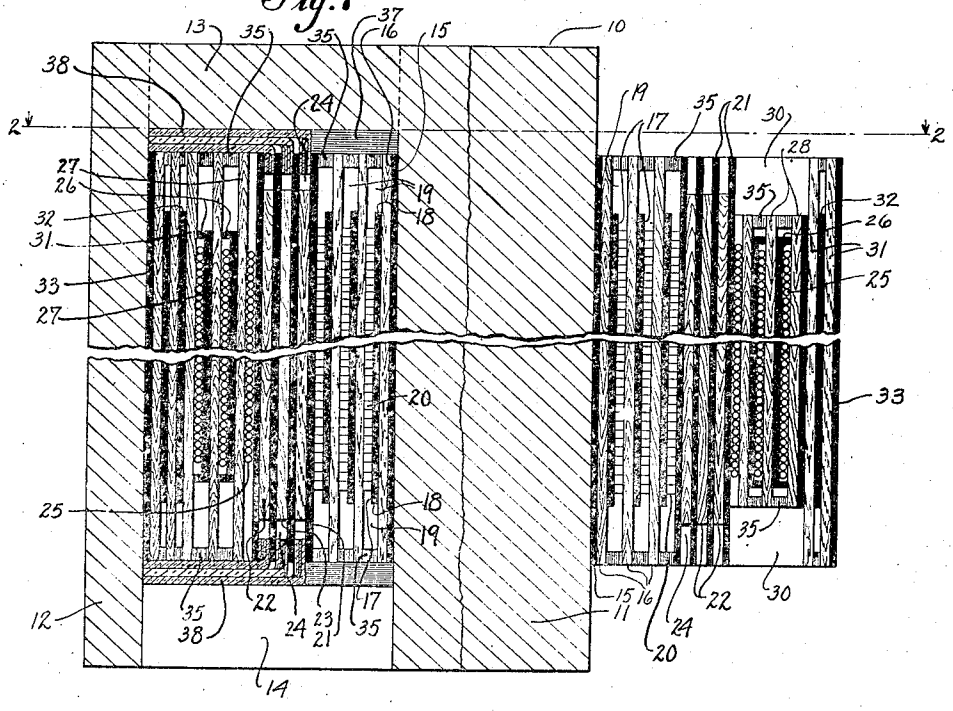


Fig. 2

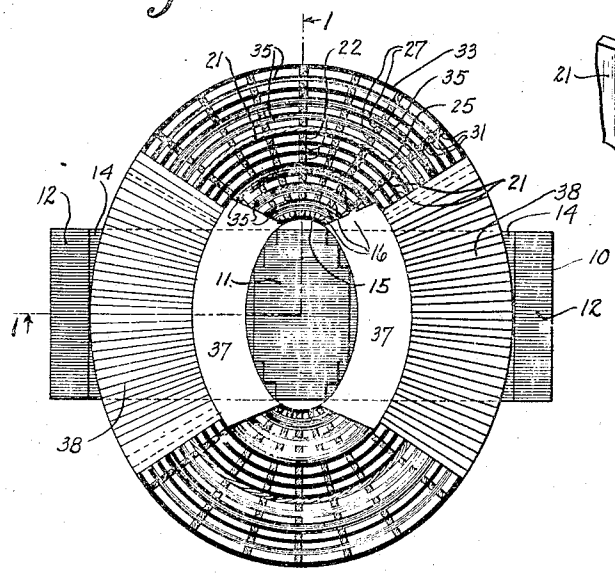
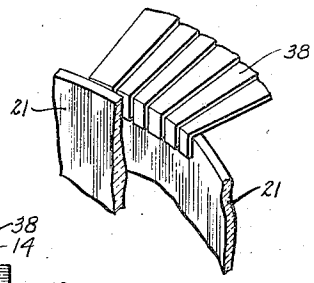


Fig. 3



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UNITED STATES PATENT OFFICE.

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TRANSFORMER WINDING.

Application filed December 20, 1923. Serial No. 681,716.

This invention relates to electrical transformers, auto transformers and the like and particularly to such as have coils that are formed with passages to permit the flow therethrough of a cooling and insulating medium, such as oil.

Among the objects of my invention are to provide a transformer having coils which are securely held and supported by the transformer core, which coils are themselves strong and rigid, cheaply and easily constructed, are formed with passages particularly adapted to facilitate the free passage therethrough of the cooling and insulating means and in which the windings are well insulated from one another and from adjacent metal parts.

Numerous other objects and advantages will appear from the following description taken in connection with the accompanying drawing wherein

Fig. 1 shows the vertical section of a transformer embodying one form of my invention, the said section being taken on the lines 1—1 of Fig. 2.

Fig. 2 shows a horizontal section taken on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary perspective view showing a portion of one end of the coil.

The transformer shown is adapted to be supported in a tank containing oil. Referring to Figs. 1 and 2 of the drawing, 10 represents the core of the transformer formed with an inner leg 11, outer legs 12 and connecting portions 13 and 14. Surrounding the inner leg 11 of the transformer is a sheet of insulating material 15 and about this insulating material are placed a series of suitably treated wooden sticks or rods 16 spaced apart so as to permit the flow of oil between the same. Surrounding these sticks is a second layer of insulating material 17 which terminates at 18 leaving spaces 19 above and below the layer. The first layer of coil 20 of the low potential winding of the transformer is wound around the insulating material 17. Surrounding the coil 20 is a second series of sticks which are likewise spaced as shown in Fig. 2 and terminate flush with the sticks 16. Around this second series of sticks is wound a second layer of insulating material and this structure consisting of successive layers of insulating material, winding and sticks is continued outwardly to the end of the low potential winding. There then follows a series of alternate insulating sheets 21 and sticks 22 which serve as spacing and insulating means between the high and low potential windings. The insulating sheets 21 terminate flush with the sticks 16 while the sticks 22 terminate at 23 leaving spaces 24 above and below these sticks 22. Around the last or outer sheet 21 of this series is wound the first layer or coil 25 of the high potential winding. This coil does not extend up and down as far as the coils of low potential winding and rings 26 of insulating material are placed above and below each layer of the high potential windings in the manner shown. Sticks 27 located between the connecting portions 13 and 14 of the core 10 and which form a portion of the spacing means for the high potential windings have their ends flush with the sticks 16. Sticks 28, however, which space the coils of the high potential winding and are located laterally of the connecting portions 13 and 14 of the core are shorter than the sticks 16 and 22 thus leaving spaces 30 above and below the high potential windings. The high potential windings are insulated and spaced from the outer legs of the core by alternate layers of sticks 31 and insulating layers 32. The last row or rows of the sticks 31 and layers of insulating material 33 extend upwardly and downwardly so as to be flush with the sticks 16 all around the winding. The general arrangement of sticks is shown in Fig. 2 and between adjacent rows of sticks 16, 27 and 31, at the end of the sticks are wedged flexible spacers 35 to brace the stick structure. During the treatment of the coil the sticks and spacers become glued together.

Between the ends of the sticks 16 and the connecting portions 13 and 14 of the core is placed insulating material 37 which may be formed of sheets of fibre. As a means for insulating the high potential windings from the core as well as other metal parts there is placed a series of insulating strips 38, one end of each strip being inserted between adjacent layers of insulating material 21 while the remainder of each strip lies between the ends of the sticks 27 and 31 and the connecting portions 13 and 14 of the transformer core.

The coil shown in Figs. 1 and 2 is wound on a suitable form or mandrel and sticks

are employed which are somewhat longer than the sticks shown in Fig. 1. When the winding has been completed sticks 31 and 16 are sawed or cut off by a single operation to their required length. This method of manufacture insures that these sticks shall all be of the same length and so positioned that their ends may be forced into a firm supporting contact with the insulating material 37 and 38 when the transformer is complete. The core 11 is then formed about the coil. This core is built up of interfitting sheet metal laminations which are forced tightly against the coil or coils so as to support the same firmly in position. When the connecting portions 13 and 14 are forced tightly against the ends of the coil the insulating strips 37 and 38 are tightly compressed and the windings are rigidly held and supported on the stick structure. By extending the sticks beyond the coil insulation the passages between the sticks are open at both ends so as to permit the free circulation of oil through these pasages and out into the space around the transformer.

I claim:

1. In a transformer a core formed with a winding receiving space, a winding comprising coils held in said space, and a supporting structure for said winding comprising a series of separated spacers, there being circulating passages between said spacers terminating in said space, which passages are substantially the length of said space and are open at both ends.

2. In a transformer, a core formed with a winding receiving space, windings comprising coils held in said space, insulating partitions and a series of separated spacers between the coils, said insulating partitions and spacers forming open passages for the circulation of fluid therethrough, said passages terminating in said space and open at both ends permitting circulation of said fluid through said receiving space of said core.

3. In a transformer, windings comprising coils, insulating partitions and separated spacing sticks between said coils, said sticks serving to support said winding and to form circulating passages parallel thereto and passages adjacent their ends perpendicular to the first mentioned passages.

4. In a stationary induction apparatus, a series of concentric coils, insulating sheets and spacing rods between said coils, said rods extending beyond said coils and sheets and terminating flush with substantially parallel planes, and supporting means for said coils positioned in contact with and covering the ends of said rods, said rods and sheets forming passages through said coils, and said rods forming an open columnar structure beyond said coils whereby cooling fluid may freely pass through said coils and into the space outside said apparatus.

5. A transformer having a core formed with an opening and a winding on said core supported in said opening by spaced rods extending through said winding and of substantially the length of said opening there being open passages through said windings between said rods and openings adjacent the ends of said rods extending through the opening of said core.

6. A transformer having a core formed with an opening and a winding on said core and supported in said opening by a structure comprising spaced rods extending through said winding and of substantially the length of said opening and bracing means between said rods adjacent their ends there being open passages through said winding between said rods.

7. A transformer having a core formed with an opening and a winding on said core and supported in said opening by a structure comprising spaced rods extending through said winding and of substantially the length of said opening and bracing means between said rods adjacent their ends being passages in said opening through said winding between said rods, said passages being freely open at their ends.

8. A transformer having a core formed with an opening and a winding on said core and supported in said opening, said winding being formed of successive coils, spacing rods and insulating sheets, certain of said rods being located inside said opening and being extended beyond said coils and sheets forming circulating passages between said rods extending crosswise from the windings of the coils and circulating passages at both ends of said rods extending in the general direction of the windings of the coils and passing through the opening of said core.

SAMUEL HORELICK.

CERTIFICATE OF CORRECTION.

Patent No. 1,641,272. Granted September 6, 1927, to

SAMUEL HORELICK.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, line 92, claim 7, after the word "ends" insert a comma and the word ", there"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of October, A. D. 1927.

Seal.

M. J. Moore,
Acting Commissioner of Patents.