April 12, 1938. A. B. HENDRICKS, JR 2,114,186

TRANSFORMER

Filed March 18, 1936

Fig. 1.

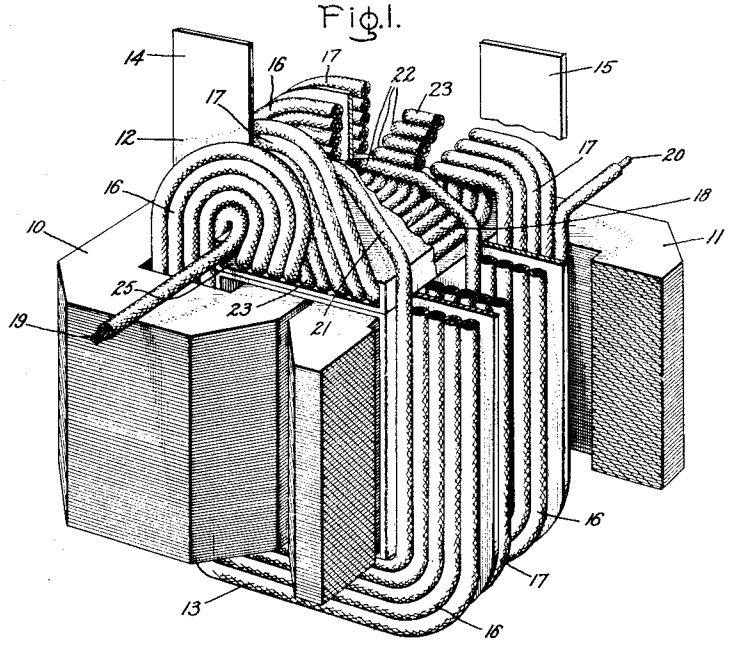
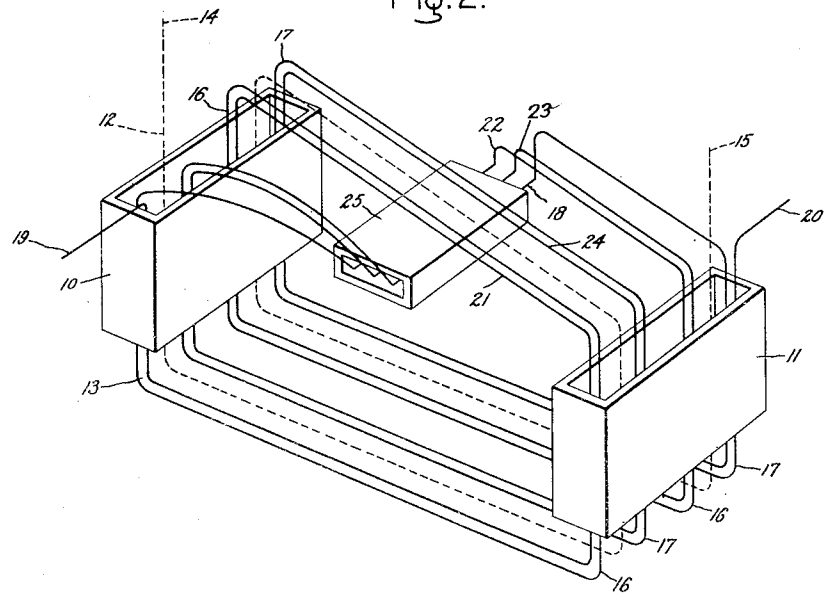


Fig. 2.



Inventor:
Allan B. Hendricks, Jr,
by Harry E. Dunham
His Attorney.

Patented Apr. 12, 1938 2,114,186

UNITED STATES PATENT OFFICE

2,114,186

TRANSFORMER

Allan B. Hendricks, Jr., Pittsfield, Mass., assignor to General Electric Company, a corporation of New York

Application March 18, 1936, Serial No. 69,488

2 Claims. (Cl. 175—356)

My invention relates to transformers and is particularly applicable in connection with a transformer having a low voltage winding of large cross section and rather few turns and a high voltage winding of smaller cross section and a moderate number of turns, although there is no particular maximum limit to the number of turns in either winding. In a low voltage winding which must carry a heavy current, it is convenient to use a wide, flat conductor arranged edgewise in a helix distributed along the winding leg of the transformer core, the turns of the high voltage winding being arranged on both sides of each low voltage turn so that the two windings are well interleaved. This arrangement requires cross connections between high voltage winding turns surrounding opposite ends of the transformer winding leg.

The general object of the present invention is to provide an improved and compact transformer construction of the character referred to and with the cross connections between turns so arranged as to be well protected and to form with the connected turns a continuous, jointless conductor.

The invention will be better understood from the following description taken in connection with the accompanying drawing in which Fig. 1 is a perspective view of a transformer constructed in accordance with the invention, parts being broken away to reveal details of the winding arrangement, and Fig. 2 is a diagrammatic view of the transformer with the parts widely separated to make the arrangement more clear.

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

The transformer shown in Fig. 1 includes a magnetic core formed in two parts 10 and 11 placed side by side so that their adjacent sides form the winding leg of the core which is surrounded by a low voltage winding 12 and a high voltage winding 13. The low voltage winding 12 is formed of a wide, flat conductor arranged edgewise in a helix with its turns spaced apart along the winding leg of the core 10, the two end turns being extended to form the low voltage terminals 14 and 15. The high voltage winding 13 is preferably formed of stranded cable which is more or less flexible and thus may be conveniently curved and bent into place in the winding.

The high voltage winding 13 includes two groups of turns 16 and 17 at opposite sides of each turn of the low voltage winding 12 and a plurality of cross connections 18 for connecting certain turns in series, as will appear later. The entire high voltage winding 13 is formed of a single, continuous conductor extending between its two terminals 19 and 20. This conductor forming the high voltage winding 13 may be followed from the terminal 19 through the inner turn of the first group of turns 16, a cross connection 21, the inner turn of the second group of turns 16 and a cross connection 22 back to the second turn of the first group of turns 16. Thus the conductor continues through successive turns and cross connections through the last turn of the second group of turns 16, whence it continues through the last cross connection 23, the inner turn of the first group of turns 17, a cross connection 24, the inner turn of the second group of turns 17 and one of the cross connections 18 back to the second turn of the first group of turns 17. Thus the high voltage winding conductor continues successively through the turns of the groups of turns 17 to the last turn of the last group of turns 17 and thence to the high voltage winding terminal 20. The transformer is shown in Fig. 1 with five turns in each of the groups of turns 16 and 17 of the high voltage winding, but to avoid complication the groups of turns 16 and 17 in Fig. 2 are shown as including only two turns each. Any reasonable number of turns may of course be used in these groups. The groups of turns 16 may be considered as a single group of turns extending along one face of the low voltage winding 12 and the groups of turns 17 may be considered as a single group extending along the other or opposite face of the low voltage winding 12, the turns of each group being connected in series by the connections 21, 22, 24 and 18, and the two groups being connected in series by the single connection 23.

The cross connections 18 and 22 between winding turns near one end of the winding leg of the core and winding turns near the other end of the winding leg of the core pass through intermediate turns of both the windings, being disposed in the space between the core and these intermediate windings. Thus these cross connections are concealed and protected inside the transformer structure and the arrangement is compact and attractive in appearance. Another advantage of the arrangement which has been described is that the high voltage winding may be formed of a continuous, jointless conductor. It is customary to form the magnetic core of a transformer from sectional laminations which may be assembled after the winding has been

completely formed. This procedure is desirable in producing the transformer of the present invention so that the cross connections 18 and 22 may be easily placed in position before most of the space within those turns already formed has been obstructed by the winding leg of the core. The drawing shows the cross connections 18 and 22 passing through an insulating covering 25 which may of course be applied after the cross connections are in place.

The invention has been explained by describing and illustrating a particular transformer constructed in accordance therewith but it will be apparent that changes may be made without departing from the spirit of the invention and the scope of the appended claims.

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

1. A transformer including a magnetic core having a winding leg, an edge-wise wound low voltage winding arranged in a helix with its turns spaced along said winding leg, a high voltage winding including a group of coils extending along each face of said low voltage winding, connections between the end turns of successive coils to connect the coils of each group in series, said connections passing through the intermediate turns of said groups, and a connection connecting said groups in series.

2. A transformer including a magnetic core having a winding leg, an edge-wise wound low voltage winding arranged in a helix with its turns spaced along said winding leg, a high voltage winding including a group of coils extending along each face of said low voltage winding, connections between the end turns of successive coils to connect the coils of each group in series, and a connection connecting said groups in series, said connections passing through the intermediate turns of said groups.

ALLAN B. HENDRICKS, JR.