Sept. 22, 1925. 1,554,664

H. O. STEPHENS

TRANSFORMER

Filed March 19, 1925

Fig. 1.

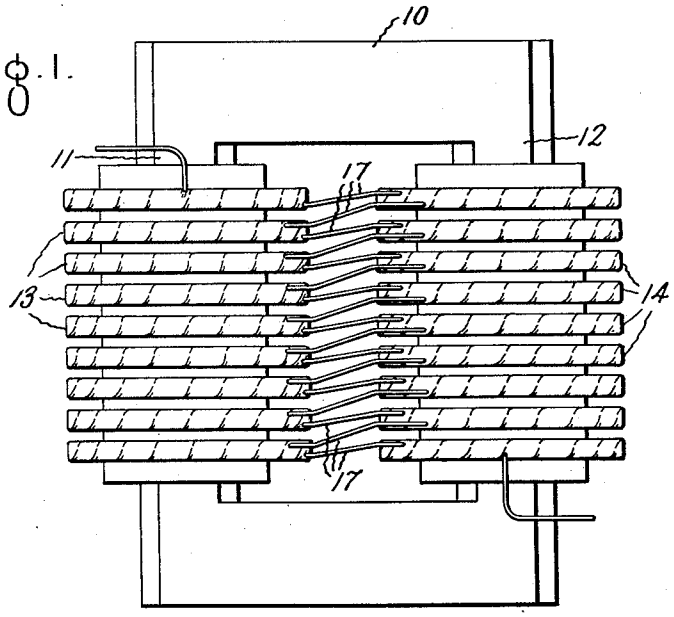


Fig. 2.

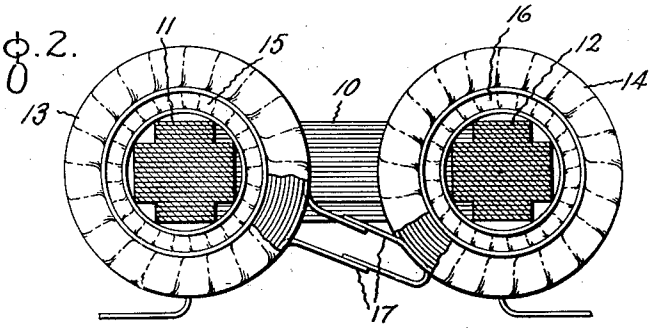
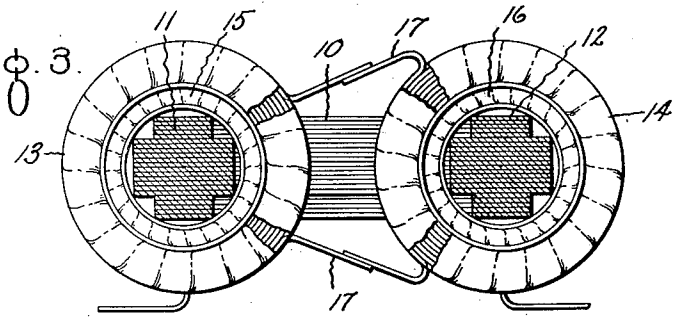


Fig. 3.



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UNITED STATES PATENT OFFICE.

HOWARD O. STEPHENS, OF PITTSFIELD, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

TRANSFORMER.

Application filed March 19, 1925. Serial No. 16,801.

To all whom it may concern:

Be it known that I, HOWARD O. STEPHENS, a citizen of the United States, residing at Pittsfield, in the county of Berkshire, State of Massachuetts, have invented certain new and useful Improvements in Transformers, of which the following is a specification.

My invention relates to transformers and more particularly to the type of transformer which has a winding arranged in the form of two adjacent stacks of disk coils. By connecting the coils of the two stacks alternately in series so that each coil in each stack is connected in series with and between two adjacent coils in the other stack, the voltage across the space between the two stacks is low at all points and the two stacks may be close together. The result is a compact construction and a short path for the magnetic flux in the core. The general object of the present invention is to provide an improved arrangement of the connections between coils arranged in this way so that these connections may be well separated and their insulation correspondingly simplified and made more reliable. The result is attained by bringing out the terminals of the coils differently in the two coil stacks and in such manner that the connections between these terminals are well separated and do not cross each other between the two coil stacks.

The invention will be better understood from the following description taken in connection with the accompanying drawing in which Fig. 1 is a view in elevation of a transformer having two coil stacks with the coils connected in accordance with the invention; Fig. 2 is a plan view of the transformer shown in Fig. 1; and Fig. 3 is a plan view of a transformer similar to that shown in Figs. 1 and 2 but with the coil connections arranged according to a modification of the invention.

Like reference characters refer to similar parts in the different figures of the drawing.

The transformer shown in Figs. 1 and 2 includes a core 10 having two winding legs 11 and 12 which are surrounded by two stacks of coils 13 and 14 respectively. The coils 13 and 14 are of the disk type and together constitute the high voltage winding of the transformer. Inside these high voltage coils 13 and 14 and between them and the winding legs 11 and 12 are two cylindrical low voltage coils 15 and 16. The coils 13 and 14 are all connected in series by connections 17, successive coils of the series being disposed alternately in the two coil stacks so that each coil in each stack, with the exception of the two terminal coils, is connected in series with and between two coils located adjacent to it in the other stack. The potential difference between the two coil stacks is thus low at all points and the stacks may be near together.

All coils and their connections must be arranged, of course, to conduct current in opposite directions around the two winding legs at any instant because while the magnetic flux is flowing up in one winding leg of the core it must be flowing down in the other. This requirement is met and the objects of the invention are attained by the arrangement of coils and connections shown in Figs. 1 and 2 of the drawing. The coils 13 on the winding leg 11 may be termed "open" coils and the coils 14 on the winding leg 12 may be termed "closed" coils. That is the two end turns of each coil 13 are uncrossed between their terminals, being brought out from the coil before they meet so that there is an open space between them, and the two end turns of each coil 14 are closed and pass or cross each other between their terminals and before being brought out from the coil. The connections 17 connect the front and rear terminals of each coil to the front and rear terminals respectively of the proper coils in the other stack so that these connections do not cross each other between the coil stacks and may therefore be well separated. This is of particular advantage because of the joint which must be made and insulated in each of the connections 17. As has been stated, the current must flow in opposite directions in the two coil stacks, and it is therefore necessary that the current path cross itself somewhere. The current path is therefore crossed inside the terminals of each of the closed coils 14 and this avoids the necessity of crossing the connections 17.

The modified form of the invention shown in Fig. 3 is similar to that already described except that the terminals of each coil are more widely separated so that the connections 17 between these terminals may be

more readily accessible from both sides of the transformer. This arrangement may be of advantage in case front connections 17 of Figs. 1 and 2 are so close together as to interfere with the making and insulating of the rear connections 17 shown in these figures.

The current flowing through the connections 17 causes mutual attractions and repulsions between these connections which may result in their rubbing together with resulting injury to the insulation and its possible final breakdown. The separation of the connections in accordance with the present invention eliminates or greatly reduces the possibility of such injury and makes the connections more accessible so that the necessary joints therein may be more easily and conveniently made and insulated.

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

1. A transformer including disk coils arranged in two adjacent coil stacks, the end turns of the coils in the two stacks being respectively crossed and uncrossed between their terminals at the adjacent sides of the two stacks, and connections between the terminals of the crossed turns and the terminals of the uncrossed turns, whereby the two connections from each coil are separated between the two stacks.

2. A transformer including disk coils arranged in two adjacent coil stacks, one of said stacks having coils with their end turns crossed between their terminals at their sides adjacent the other stack, said other stack having coils with their end turns uncrossed between their terminals at their sides adjacent said first stack, and connections between the terminals of the crossed turns in one stack and the terminals of the uncrossed turns in the other stack, whereby the two connections from each coil are separated between the two stacks.

In witness whereof, I have hereunto set my hand this 16th day of March, 1925.

HOWARD O. STEPHENS.