Feb. 23, 1932. R. A. FINNEGAN 1,846,801

COIL ASSEMBLY FOR TRANSFORMERS

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FIG. 1.

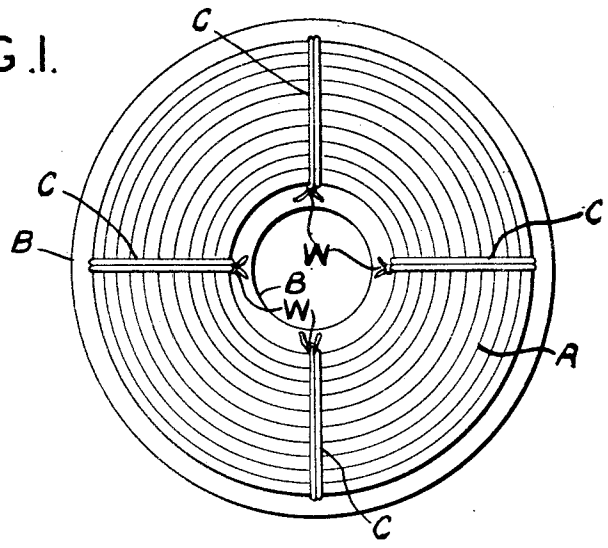


FIG. 2.

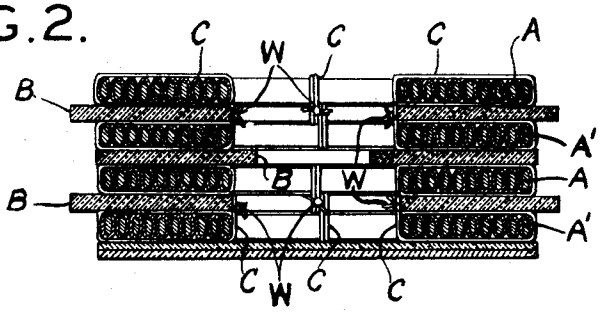
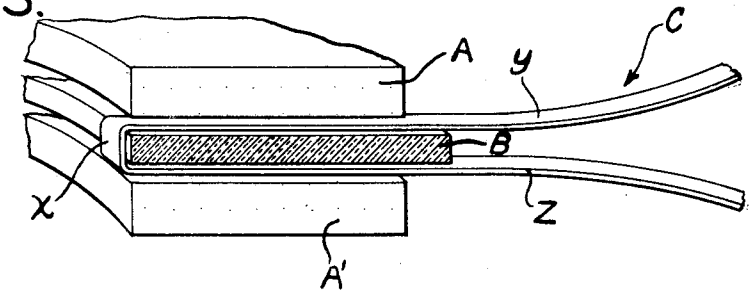


FIG. 3.



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FIG. 4.

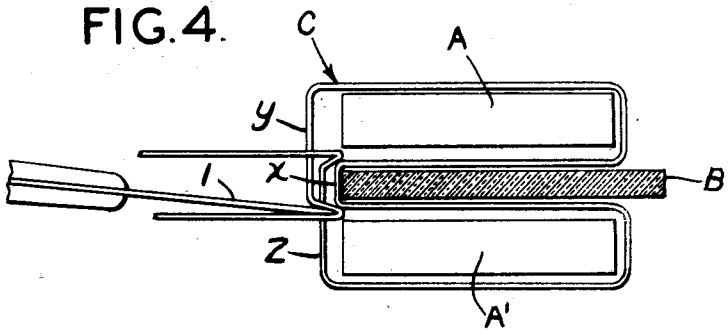


FIG. 5.

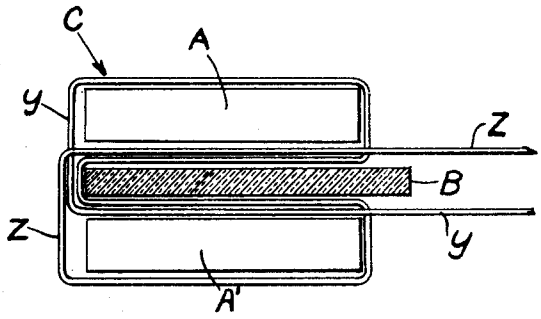
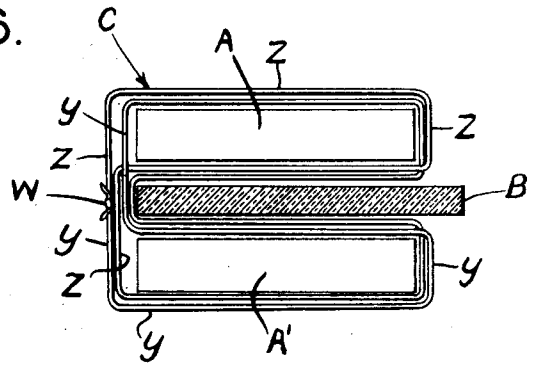


FIG. 6.



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UNITED STATES PATENT OFFICE

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COIL ASSEMBLY FOR TRANSFORMERS

Application filed July 6, 1931. Serial No. 548,756.

This invention relates to transformer coils of the type commonly referred to as twin coils, double section coils or back turn coils, which consist of two coil sections joined together and arranged in superimposed relation or in longitudinal alignment with each other, and an annular-shaped insulating barrier interposed between said coil sections and combined with same in such a way as to form a unit which can be handled easily in the operation of stacking up the coils of a transformer.

In the conventional twin coil or double section coil, the two sections of the coil are clamped to the barrier between the same by tape that is wound spirally around the three elements and which extends over the outer sides of the coil sections and around the inner and outer edges of the barrier. The above described method of binding or clamping the coil sections to the barrier is objectionable for numerous reasons:

(1) It is costly, on account of the time involved in wrapping a tape or strand spirally around the three elements of the structure;

(2) It tends to retard the escape of heat from the coil, due to the fact that the outer sides of the coil sections are practically covered throughout the major portion of their area by tape;

(3) It does not insure the coil sections being maintained in absolutely concentric relationship with the barrier with the inner edges of the coil sections extending flush with the inner edges of the barrier; and

(4) It produces a coil assembly of crude and unworkmanlike appearance, for after a number of coil assemblies have been stacked up or arranged in superimposed relation, and the stack subjected to endwise pressure, the portions of the tape that extend over the outer edges of the barriers become slack, thereby greatly detracting from the appearance of the coil stack and also making it possible for the barriers to shift horizontally to such an extent that they do not project laterally the required distance beyond the outer edges of the coil sections.

The objects of my invention are to reduce the cost of manufacturing or producing transformer coil assemblies of the general type referred to; eliminate the possibility of the barrier of a double section coil or twin coil shifting relatively to the two sections of the coil; improve the heat radiating properties of a double section coil or twin coil by reducing the quantity of tape or other material that is used to combine the sections of the coil with the barrier; and eliminate the possibility of the binding tape becoming slack or bulgy after the coil assembly has been installed or arranged in superimposed relationship with other coil assemblies in the transformer.

To this end I have devised a twin coil, double section coil or back turn coil in which the two sections of the coil are combined with or clamped to an annular-shaped insulating barrier interposed between the coil sections, by means of a few strands of tape or other suitable material disposed so that they clamp or bind the coil sections to the barrier and hold the inner edges of the coil sections flush with the inner edge of the barrier, without crossing the outer edge of the barrier that projects laterally beyond the outer edges of the coil section. The number of strands that are used will depend upon the size of the coil, but usually four or five strands will be sufficient for a small coil and seven or eight strands will be sufficient for a large coil. Said strands can be arranged in various ways without departing from the spirit of my invention, but usually the strands will be so arranged that each strand comprises two legs or portions that lead outwardly from the inner edge of the barrier and then around the coil sections in such a manner that each strand not only draws the two coil sections into intimate engagement with the barrier, but also exerts pressure on said coil sections in a direction that practically eliminates the possibility of the inner edges of the coil sections moving out of alignment with the edge of the center opening of the barrier.

Figure 1 of the drawings is a top plan view of a transformer coil assembly embodying my invention.

Figure 2 is a vertical sectional view, illus-

trating a plurality of my improved coil assemblies, stacked up or arranged in superimposed relation; and

Figures 3, 4, 5 and 6 are diagrammatic views, illustrating the various steps in the operation of assembling or combining the coil sections with the barrier.

In the drawings A and A′ designate the two sections of a twin coil, double section coil or back turn coil, and B designates an annular-shaped insulating barrier interposed between said coil sections and arranged in such relationship with the same that the inner edge of the barrier will extend flush with the inner edges of the coil sections and the outer edge of the barrier will project laterally beyond the outer edges of the coil sections. The coil sections A and A′ are clamped to or bound upon the barrier B by means of a plurality of strands C formed preferably from pieces of linen tape or other non-metallic, pliable material that is looped around the coil sections and arranged in engagement with the barrier in such a way that strands securely clamp said three elements together and hold them in concentric relationship without crossing the outer edge of the barrier, or, in other words, without causing portions of the strands C to extend from the outer edges of the coil sections over the outer edge of the barrier. As previously stated, the number of strands or tapes C that are used with each coil assembly will depend upon the size or diameter of the coil sections A and A′.

In producing my improved coil assembly I prefer to first pass a strand C through the center opening of the barrier B and double or fold said strand in such a way that the strand comprises an anchoring portion or intermediate portion x that engages or bears upon the inner edge of the barrier, and two legs y and z that lead outwardly from said anchoring portion x over the top and bottom sides of the barrier. The two coil sections A and A′ are then applied to the barrier in such a way that the barrier will lie between said coil sections with the inner edge of the barrier in alignment with or extending flush with the inner edges of the coil sections, and with the outer edge portion of the barrier projecting laterally beyond the outer edges of the coil sections, as shown in Figure 3. For convenience I will hereinafter refer to the coil section A as the top section and the coil section A′ as the bottom section. The two legs y and z of the strand C are then drawn over the outer edges of the coil sections and lead inwardly to the inner edges of the said coil sections. One of said legs, for example, the leg y that embraces or surrounds the top coil section A, is then inserted between the underside of the barrier and the top face of the bottom coil section A′ by means of a tool or instrument provided with a flat, blunt blade 1, as shown in Figure 4, the blade 1 being moved outwardly towards the outer edge of the barrier, i. e., to the right, looking at Figure 4, so as to cause the leg y to be positioned between the barrier and the bottom coil section A′, as shown in Figure 5. In the same way the leg z, which surrounds or embraces the bottom coil section A′, is arranged between the top side of the barrier and the top coil section A. When the two legs y and z are drawn tight, the leg y will exert pressure on the top coil section A in a direction tending to clamp said top coil section to the barrier, and the leg z will exert pressure on the bottom coil section A′ in a direction tending to clamp said bottom coil section to the barrier. In addition to drawing the coil sections into intimate engagement with the barrier, the operation of drawing the legs y and z tight causes the two coil sections to be centered with relation to the barrier B, due, of course, to the fact that the strand C is anchored on the inner edge of the barrier, so that when the two legs y and z are pulled tight, said legs will exert an inward lateral thrust or cross-wise thrust on the coil sections, and thus cause the inner edges of said coil sections to line up with the inner edge of the barrier or the point of anchorage of the strand C. The final step in the operation of installing the strand C is to draw the leg y over the outer edge of the bottom coil section A′, and thence inwardly across the underside of the coil section, and draw the leg z over the outer edge of the top coil section A, and thence inwardly over the top face of said coil section A. The same procedure is employed to install the other strands used to bind the two sections A and A′ of the coil to the barrier B. At some point in the assembling operation the free ends of the legs y and z of each strand are secured preferably by tying them together so as to form a knot w, as shown in Figure 6, which knot is arranged on the inside of the structure where it will be hidden from view when the coil assembly is arranged in superimposed relationship with other coil assemblies so as to form a coil stack.

With the coil assembly of the construction above described the operation of exerting endwise pressure on a stack of coils so as to clamp them together, has absolutely no effect on the tapes or strands C used to bind the sections of each coil to its interposed barrier, due, of course, to the fact that the tapes are anchored on the inner edge of the barrier, from which point the tapes are drawn taut around the coils, and thence back to the inner edge of the barrier. The result is that a coil stack, made up of coil assemblies of the kind above described, will present a workmanlike appearance, with no loose or bulgy tapes. One of the main advantages of my coil assembly, however, is that it is impossible for the barrier to shift horizontally relatively to the coil sections and become arranged in such a position

that the barrier does not project laterally sufficiently beyond the outer edges of the coil sections to perform the function for which the barrier is employed. As the outer surfaces of the coil sections are covered by only a relatively few strips of tape, heat can radiate from the coil easily, and still another desirable feature of my coil assembly, is that the coil sections can be bound to the barrier in a fraction of the time required to wrap a tape spirally around two coil sections mounted on a barrier, thereby greatly reducing the cost of manufacturing a twin coil, double section coil or back turn coil.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A coil assembly for transformers, consisting of a double section coil, an annular-shaped barrier interposed between the two sections of the coil, and strands for holding said elements in assembled relation, disposed so that said strands surround the coil sections without crossing the outer edge of the barrier.

2. A coil assembly for transformers, consisting of a double section coil, an annular-shaped barrier interposed between the two sections of the coil, and strands for holding said elements in assembled relation, disposed so that said strands exert pressure on the coil sections in a direction tending to hold the inner edges of the coil sections flush with the inner edge of the barrier.

3. A coil assembly for transformers, consisting of a double section coil, an annular-shaped barrier interposed between the two sections of the coil, and strands for holding said elements in assembled relation, disposed so that each strand draws both coil sections towards the barrier and also exerts pressure on said coil sections in a direction tending to hold the inner edges of same flush with the inner edge of the barrier.

4. A coil assembly for transformers, consisting of a double section coil, an annular-shaped barrier interposed between the two sections of the coil and arranged so that its outer edge projects laterally beyond the outer edges of the coil sections, and strands for maintaining the coil sections in assembled relationship with the barrier, located wholly inside of the outer edge of the barrier.

5. A coil assembly for transformers, consisting of a double section coil, an annular-shaped barrier interposed between the two sections of the coil, and strands for clamping the coil sections to the barrier, each of said strands being arranged in engagement with the inner edge of the barrier and comprising portions that are looped around the coil sections.

6. A coil assembly for transformers, consisting of a double section coil, an annular-shaped barrier interposed between the two sections of the coil, and strands for clamping the coil sections to the barrier, each of said strands being arranged in engagement with the inner edge of the barrier and comprising portions that are looped around the coil sections a plurality of times.

7. A coil assembly for transformers, comprising two coil sections arranged in superimposed relation, an annular-shaped barrier interposed between said coil sections, and a strand stretched across one edge of said barrier and provided with legs that exert pressure on the coil sections in two directions at right angles to each other, whereby the coils are clamped to the barrier and maintained in concentric relationship with the barrier.

8. A coil assembly for transformers, comprising two coil sections arranged in superimposed relation, an annular-shaped barrier interposed between said coil sections, and a strand stretched across one edge of the barrier and provided with legs, each of which is looped around both sections of the coil without crossing the other edge of the barrier.

9. A coil assembly for transformers, comprising two coil sections arranged in longitudinal alignment with each other, an annular-shaped barrier interposed between said coil sections, and a strand disposed crosswise of the inner edge of the barrier and looped around said coil sections, the free ends of said strand being secured together adjacent the center of the structure.

10. A coil assembly for transformers, consisting of a double section coil, an annular-shaped barrier interposed between the two sections of the coil, and strands for binding said coil sections to the barrier, disposed so that each strand comprises an intermediate portion anchored on one edge of the barrier, and two separate legs wrapped around the coil sections without crossing the other edge of the barrier and having their free ends tied together.

11. A coil assembly for transformers, consisting of a double section coil, an annular-shaped barrier interposed between the two sections of the coil, and strands for holding the coil sections in assembled relationship with the barrier, each of said strands comprising an anchoring portion that contacts with the inner edge of the barrier and two leg portions disposed so that each leg portion exerts pressure on both coil sections in a direction tending to clamp the same to the barrier and maintain said sections in concentric relationship with the barrier.

12. A coil assembly for transformers, consisting of an annular-shaped barrier, two coil sections arranged at opposite sides of said barrier in concentric relationship with the same, a strand for holding said elements in assembled relationship, provided with an intermediate portion that engages the inner edge of the barrier, and two leg portions that lead outwardly to the outer edges of the coil

sections, one of said leg portions extending inwardly over the top coil section, thence downwardly through the barrier and around the bottom coil section, and said other leg portion extending inwardly under the bottom coil section, thence upwardly through the barrier, and thereafter around the top coil section.

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