MANUFACTURE OF ELECTRICAL COILS

Frank Martindell, Western Springs, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

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This invention relates to the manufacture of electrical coils, and more particularly to electrical coils of the type in which sheets of insulating material are interposed between successive superposed layers of windings.

Electrical coils of the type above referred to are usually wound in multiple, that is, a plurality of such coils are wound simultaneously, in separated zones, upon a common winding spindle or mandrel. The convolutions of wire of each coil are wound in layers, superposed one upon the other, and sheets of insulating material, common to all of the coils, are inserted between successive layers without interrupting the winding operation. After the required number of layers have been completed, the "stick" of coils is removed from the winding spindle and then separated into individual coils by severing the several interleaving sheets between the spaced coils.

One of the chief difficulties encountered in connection with the winding of electrical coils of the type referred to is in the introduction and application of the interleaving sheets while the coil spindle is rotating at the high speed which is necessary in order to obtain the desired economy in the manufacture of such coils. Heretofore, the insertion of the interleaving sheets at the desired spindle speeds without wrinkling or producing other irregularities therein has been exceedingly difficult, if not impossible, especially when employing interleaving material that is extremely thin, as is desirable in order to reduce the size of the coils and thereby conserve space in the apparatus in which the coils are employed. The principal difficulties arise from the tendency of the forward or leading edge corners of the interleaving sheets to curl or fold back due to such corners being unsupported and free of the approaching on-coming wires until the superposed layer of wires is nearly completed. Such curling or folding back of the leading edge corners of the interleaving sheets results in an undesired bulging, irregularity or unevenness in the end coils on the spindle, which sometimes renders them unsuitable for commercial use.

An object of the present invention is to obviate the abovementioned difficulties by providing an improved method of winding such coils, a method in which an improved form of interleaving sheet is employed.

In accordance with the above object, one embodiment of the invention contemplates the provision of an improved method of winding electrical coils of the type referred to, and more particularly, a method which employs interleaving sheets having their forward or leading edge corners rounded or cut away and thus free of any tendency to curl or fold back upon insertion of the sheets into a "stick" or coils being wound.

A more complete understanding of the invention may be had from the following detailed description when read in conjunction with the accompanying drawing, in which:

Fig. 1 is a plan view of an interleaving sheet embodying the invention and with the use of which the improved method may be practiced;

Fig. 2 is a perspective view of a partially wound "stick" of coils, showing an interleaving sheet in process of being inserted into the several coils, and

Fig. 3 is a perspective view similar to Fig. 2 with the interleaving sheet completely wrapped around the several coils.

Referring to the drawing, there is illustrated in Figs. 2 and 3, a winding spindle or mandrel 10 upon which a plurality of electrical coils 11, 11' are formed simultaneously by winding thereon, in separated zones, a plurality of superposed layers of wires 12, 12' drawn from a plurality of supply spools (not shown). Upon the completion of each layer of wire in the several coils, an interleaving sheet 15 of insulating material is inserted therein to separate the superposed layers of wires. The sheet is wrapped around the several coils by the respective wires 12. When the required number of layers of wire have been wound, the several coils on the spindle are removed as an integral unit or "stick" which is later separated into individual coils by severing the several interleaving sheets between the spaced coils.

Machines for producing "sticks" of electrical coils of the type above referred to are well known in the art and, therefore, further description thereof is unnecessary to a complete understanding of the present invention. In order that such coils may be manufactured economically, it is necessary, as mentioned above, that the interleaving sheets be inserted without introducing the high rotating speed of the winding spindle.

According to a feature of the present invention, the forward or leading edge 16 of each interleaving sheet 15 is provided with rounded or cut away corners 17, 17'. Thus, when the sheets are inserted into a "stick" of coils being wound, with the leading edges of the sheets parallel to the axes of the coils, as shown in Fig. 2, the leading edge corners 17 of the sheets will closely adhere to the preceding layer of wires, since the corner portions which otherwise would tend to curl or fold back are completely cut.
away. The end coils on the spindle are thus formed just as smooth and uniform as the intermediate coils.

The trailing edge 18 of each interleaving sheet is preferably formed with corner portions 18, 19 which are complementary to the inner edge corners 17, so that when the sheet is completely wrapped around the coils, the usual uniform amount of overlap is provided, as shown in Fig. 3. It should be understood that the invention is not limited to the specific embodiments thereof herein illustrated and described, except insofar as is defined by the appended claims.

What is claimed is:

1. A method of winding electrical coils, which comprises the steps of winding simultaneously in separated zones on a common winding spindle, a plurality of convolutions of wires in superposed layers, and inserting between successive layers without interrupting the winding operation, a sheet of interleaving material having rounded corners at its leading edge.

2. A new article of manufacture, comprising an interleaving sheet for insertion between superposed layers of wires of a plurality of coils while being wound simultaneously in separated zones upon a common spindle, said interleaving sheet being of a length sufficient to completely surround said layers, the leading edge of said sheet having rounded corners and the trailing edge corners of said sheet being complementary to said leading edge corners so as to slightly but completely overlap each other.

3. A method of winding a series of coils of alternate layers of wire and insulating strips which comprises cutting away the ends of each insulating strip at the leading edge before they are wound, and feeding the strip so that the leading edge of the strip is contacted first by the intermediate winding wires.

4. A method of winding simultaneously a series of coils of alternate layers of wire and insulating strips which comprises rounding the ends of each insulating strip at the leading edge before they are wound, and feeding the strip so that the leading edge of the strip between the rounded ends is gripped first by the central winding wires.

5. A method of winding a series of coils of alternate layers of wire and insulating strips upon a common spindle which comprises cutting away the ends of each insulating strip before they are wound, and feeding the strip so that the leading edge is parallel to the axis of the spindle and is contacted first by the intermediate winding wires.

6. A method of simultaneously winding a series of coils of alternate layers of wire and insulating strips which comprises cutting away the ends of each insulating strip at the leading edge before they are wound, and cutting the trailing edge of each insulating strip complementary to the leading edge so that the leading and trailing edges completely overlap.

7. A method of winding a series of coils of alternate layers of wire and insulating strips which comprises cutting away the ends of each insulating strip at the leading edge before they are wound, feeding the strip so that the leading edge of the strip is contacted initially by the intermediate winding wires, and cutting the trailing edge of each insulating strip complementary to the leading edge so that the leading and trailing edges completely overlap.

FRANK MARTINDELL.