

R. VARLEY.
COIL FORMER.

APPLICATION FILED OCT. 14, 1911.

1,047,899.

Patented Dec. 17, 1912.

FIG. 1

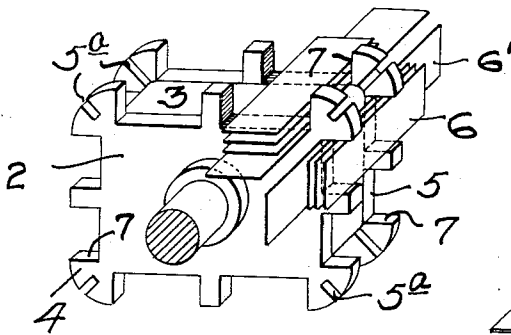


FIG. 2

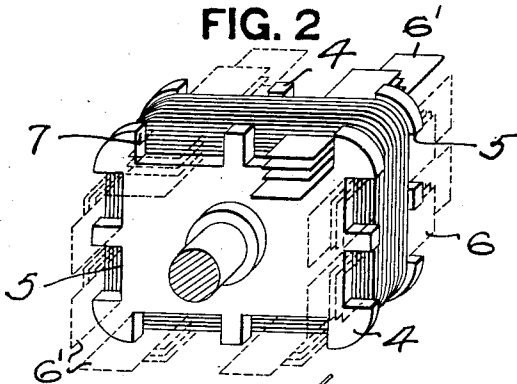


FIG. 3

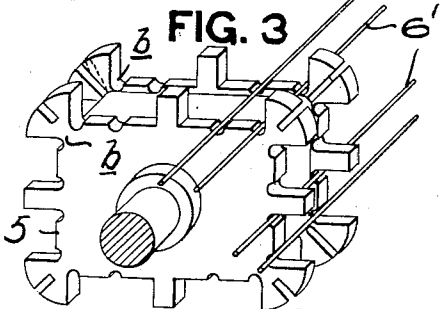


FIG. 7

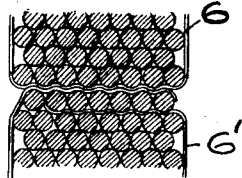


FIG. 4

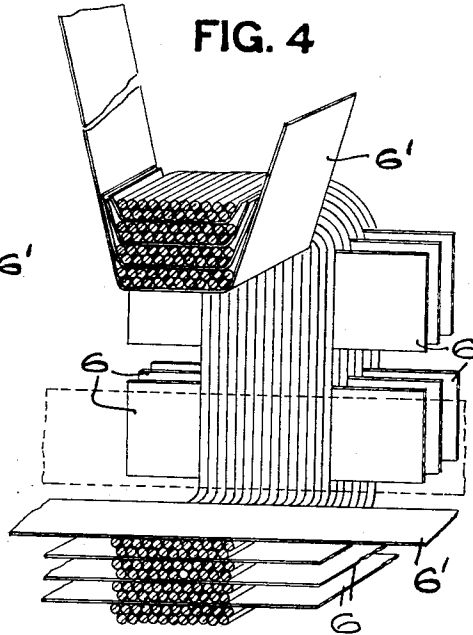


FIG. 5

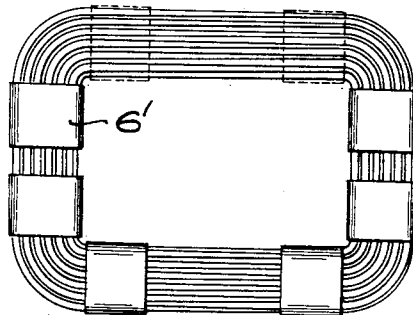
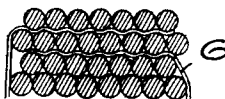


FIG. 6



WITNESSES.

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INVENTOR.

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UNITED STATES PATENT OFFICE.

RICHARD VARLEY, OF ENGLEWOOD, NEW JERSEY, ASSIGNOR TO VARLEY DUPLEX MAGNET COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

COIL-FORMER.

1,047,899.

Specification of Letters Patent.

Patented Dec. 17, 1912.

Application filed October 14, 1911. Serial No. 654,753.

To all whom it may concern:

Be it known that I, RICHARD VARLEY, a citizen of the United States of America, and residing at Englewood, in the county of Bergen, State of New Jersey, have invented a new and useful Coil-Former, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form part of this specification.

This invention relates to formers adapted for use in winding electric coils and its primary object is the provision of simple means whereby coils may be so made that they will retain their cross-sectional shape formed by the symmetrical superposition of one layer of wire on another.

In the making an electric coil is usually wound upon a coil former or mandrel, under tension, and in its removal, reactional strains are thereby set up, which tend to misshape its cross-sectional design or "block." Subsequent handling of the coil and the application or impregnation of insulation also give rise to strains which readily distort, in an ordinary coil, this cross-sectional shape. This distortion or bulging presents not only a difficulty of adaptation of the malformed coil to apparatus in which standard or fixed dimensional coil space obtains, but also one in causing variations in predetermined electric capacity of the coil.

The above-mentioned difficulties, while arising in coils of practically all electric apparatus, are peculiar to, and clearly instanced in, the case of static transformers in which, as is commonly known, the capacity of transformation is dependent upon the size and the relative turns of wire in the coils for determination of the ratio of conversion of the potential or voltage. In transformer coils, the requirement that the coil be symmetrical and compact in cross-sectional shape, arises not only from the desirability of keeping the transformer down to moderate size (by reason of the fact that the coil elements change as to the cube of the linear dimensions while changes in the casing occur as to the square of the linear dimensions), but also from the necessity of non-variation of predetermined capacity or ratio of transformation, for distortion of the coil places the wire of different layers of the winding in such irregular juxtaposition as to vary the potential of the coil.

I aim by my device to provide means whereby thin layers or strips of binding element may be fed to the coil in such manner as to not change the shape or unduly or abnormally increase the size of the coil.

In the accompanying drawings, I show a coil former or mandrel of preferable construction and adapted to the formation of angular coils, that is, coils having angular openings. However, I do not limit my invention to any shape of coil as it is applicable to the formation of different angularly shaped coils as well as coils of circular and other shapes. It will also be premised that changes may be made in the apparatus shown, without departing from my invention.

In the drawings, Figure 1 is a perspective view of a former embodying my apparatus, and indicating diagrammatically the application of different portions of binding tape thereto in the making of the coil; Fig. 2 is a similar view but showing a coil wound thereon and in diagram the application of binding element to the coil; Fig. 3 is a similar view showing the former adapted to the reception of a binding element of different character from that of the flat tape indicated; Fig. 4 is an enlarged sectional perspective view of a coil wound on my improved former and indicating condition prior to removal from the former; Fig. 5 is a plan view of a coil made on my improved former, portions of the binding tape being indicated in dotted lines; and Figs. 6 and 7 are sections through coils made on my former and to be hereinafter more fully referred to.

The former is indicated by the numeral 2 and may be of any suitable construction in so far as concerns its separability for the removal of completed coils, as that feature does not concern my present invention. Coil formers are usually spool-like in construction, that is, they have a body or winding mandrel 3 with which are associated end members 4 which serve to determine the length of the coil to be wound. In these members or disks 4 I form recesses or slots 5 adapted to receive and permit of ready application of strips of binding tape 6 to the coil in the making thereof. The coil may be intermittently wound and the tape fed thereto in the progress of winding or the tape may first be presented to the coil former and the coil subsequently wound after

which the tape may be applied to the coil for binding of the winding. Or tape may be first fed to the coil former and the winding subsequently applied and the same tape or other tape incorporated in the coil in the progress of making.

This method of winding coils is fully disclosed and forms subject-matter of my co-pending application Serial No. 654,752. In binding the coil, tapes of paper, cambric, or thin fiber-board may be employed, and these tapes are preferably so applied to the coil as to bring different portions thereof into superposition, thereby effecting mutual support or coöperation of the tapes in their binding action on the turns of the winding. My coil former enables such application of the tape by reason of the recesses 5 through which the tapes pass and in which they lie in winding the coil. As the slots or recesses 5 lie outside of the winding zone of the coil former, the tapes 6 may extend beyond each end of the coil without cramping or binding thereof between the disks 4 and the respective end faces of the coil. This is an important feature of my invention as it enables incorporation in the coil or application to the turns of wire, of tape or tapes of length sufficient to overcome abortive binding or tying action arising from take-up or "drawing in" of the ends of the tape, due to binding of the turns of winding of one layer on those, in alternate or staggered manner, of another layer. These extensions serve to prevent superficial turns of the winding at the ends of the coil from being displaced and may be fastened to or clamped against the ends of the coil in the manner shown in Fig. 4 by a binding element or tape 6'.

The coil former of my invention is not limited to any particular method or manner of applying the binding element. The tape 6' may, by reason of the recesses 5, be presented to the coil former and winding of the coil proceeded with and portions of the tape 6' firmly incorporated therein, as shown in Fig. 6, or the coil may be wound in sections and such sections bound with separate pieces of binding tape, as shown in Fig. 7.

The coil former shown is also provided with corner slots or recesses 5^a which permit of application of narrow strips of binding element to angular coils at their corner portions where there is, in coils of large size, a tendency to spreading or fanning out of the corners. This binding element may be applied to the corner of the coil in any suitable manner, such as disclosed in my above-mentioned application Serial No. 654,753. The shape of the slot or recess 5^a is preferably such as to provide for strength of corner construction of the disks 4, and in this respect I may form such recesses so as to cause them to approach the body of the coil

former or mandrel 3, at an angle thereto. This provides a thickness of material as at 6 in Fig. 3, at the base of the disks, where strains of winding are delivered.

The coil former shown is particularly adapted to the formation of angular coils, such as shown in Fig. 5. In binding the coils I preferably bind them contiguous to the corners thereof, along straight portions of the coil body. This manner of tying the coil without bringing the binding tapes within the zone of the curved corner portions of the winding enables the formation of angular coils having true shape and compact in size, for it allows the turns of winding to geometrically position or adjust themselves as they draw across or over the corner portion of the coil. With the corners free from binding tape the turns symmetrically contact with one another in staggered or alternating manner at these points, so that layers are evenly and uniformly applied, resulting in ability to wind coils of a predetermined or given number of layers having also a required number of turns. These conditions make it possible to make a coil of any certain predetermined electric capacity. As the turns are held in proper relationship at the corners of the coil, the crossing of the winding (which necessarily takes place in the reciprocal feeding of the wire turns across the former or coil to produce the layers) occurs in the body intermediate the corners, thereby resulting in a long or moderate crossing effect which does not abruptly bend the wire or irregularly pile it up at these crossing points.

Application of binding material to the corners of the coil also results in bulky and unsymmetrical corner formation due to the fact that the radii of the corner turns of the winding are very small in most cases and produce uneven and center-bound condition of the tape at the corner or corners of the coil. By employing a mandrel or former which will permit of binding of the coil at points contiguous to the corner arcs of the turns of wire the binding tape operatively contacts throughout its whole width with the straight, (or moderate curve) or substantially straight, portions of the winding, resulting in efficacious binding action. While tape of different widths may be employed for different size coils, this binding of the coil at points contiguous to the curvilinear portions thereof permits of the preferable employment of tapes of a constant unit of width for coils of various sizes.

In order to adapt the coil former to application of the binding tape to the coil at points contiguous to the corner turns of the winding, as above set forth, I so dispose the recesses 5 as to bring the end face 7 thereof in a position lying substantially in the plane

of a line intersecting the turns of wire at a point just outside the arc or arcs of the corner turns. Of course, it will be understood that the positioning of the recesses 5, as just described may be greatly varied without materially affecting their function, both as acting as guiding means of superposed presentation of the tapes to the mandrel and as that of serving to properly position such tapes with respect to the corner of the coil.

I do not limit my coil former in adaptation to the making of angular or square coils and therefore that portion of the above description which sets forth the advantageous feature of applying the tapes of binding element adjacent the corners of a coil is not to be understood as limiting my invention if such feature is not presented in coil formers of different shapes. The recesses for guiding the tape may be distributed or disposed, although preferably symmetrically, in any desired manner. Other changes may suggest themselves to the skilled mechanic without departing from my invention.

The method disclosed in connection with the herein-described invention forms subject-matter of my co-pending application, above mentioned, Serial No. 654,752 and I do not therefore claim such method in this application.

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

1. An electric coil former comprising a coiling mandrel having its winding face provided with corner portions, and end members having triangular-shaped portions lying opposite the corner portions, said triangular portions having recesses in alinement with the corner portions of the coiling mandrel.

2. An electric coil former comprising a coiling mandrel having its winding face pro-

vided with corner portions, and end members having triangular shaped portions lying opposite the corner portions and an intermediate portion spaced from the triangular portions and extending above the winding face of the coiling mandrel.

3. An electric coil former comprising a coiling mandrel having its winding face provided with corner portions, and end disk members having triangular corner portions in alinement with the corner portions of the coiling mandrel and extending above the winding face of the said mandrel, and having portions spaced from and intermediate the triangular portions and extending above the winding face of the mandrel, said triangular corner portions having recesses registering with the corner portions of the mandrel.

4. An electric coil former comprising a coiling mandrel having its winding face provided with corner portions, and end members having triangular-shaped portions lying opposite the corner portions, the triangular-shaped members having tape guiding recesses lying from the winding face of the mandrel at an angle thereto.

5. An electric coil former comprising a coiling mandrel having its winding face provided with corner portions, and end members having triangular-shaped portions lying opposite the corner portions, said triangular portions having tape guiding recesses passing from the winding face of the mandrel at an angle thereto to the outer face and at a point below the periphery of the triangular corner portions.

In testimony whereof, I have hereunto set my hand.

RICHARD VARLEY.

Witnesses:

M. A. BARTH,
M. A. KELLER.