A. D. SCOTT.

MANDREL FOR WINDING COILS.

APPLICATION FILED DEC. 18, 1915.

1,172,910. Patented Feb. 22, 1916.

Fig. 2.

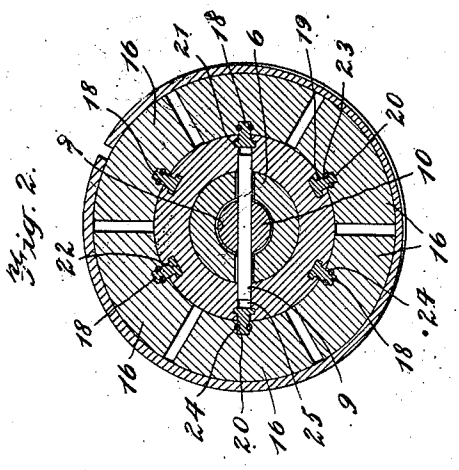


Fig. 1.

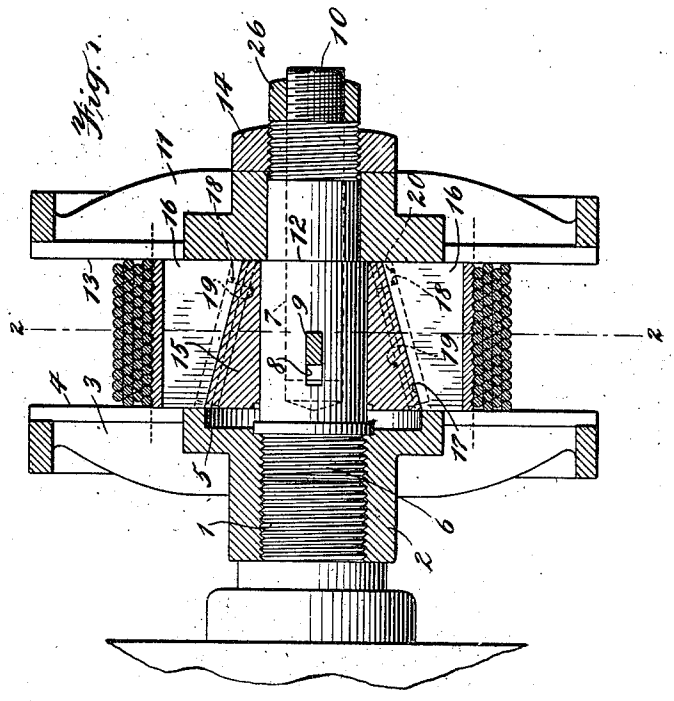
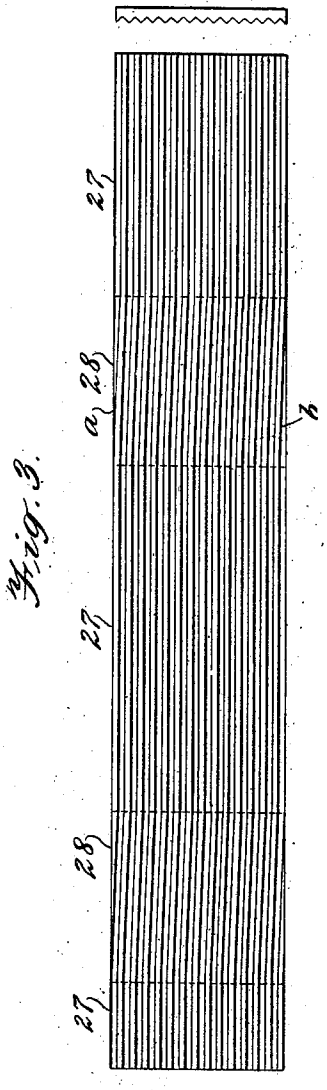


Fig. 3.



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UNITED STATES PATENT OFFICE.

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MANDREL FOR WINDING COILS.

1,172,910. Specification of Letters Patent. Patented Feb. 22, 1916.

Original application filed September 27, 1910, Serial No. 584,040. Divided and this application filed December 18, 1915. Serial No. 67,675.

To all whom it may concern:

Be it known that I, ARCHIBALD D. SCOTT, a citizen of the United States, residing in Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Mandrels for Winding Coils, of which the following is a specification.

My invention relates to new and useful improvements in winding mandrels upon which a strand or strands may be wound or coiled, and contemplates a mandrel which is so constructed that it may be readily collapsed within the winding so that the latter can be detached therefrom.

In the drawings I have shown a mandrel constructed to form round or cylindrical coils, although the mandrel may be shaped to form polysided coils, if desired.

This application is a division of my pending application Serial Number 584,040, filed in the United States Patent Office September 27, 1910.

The invention consists in the novel construction and combination of parts to be fully described hereinafter, and the novelty of which will be particularly pointed out and distinctly claimed.

I have fully and clearly illustrated my invention in the accompanying drawings to be taken as a part of this specification and wherein:

Figure 1 is a transverse section through a collapsible mandrel for holding and forming the winding; Fig. 2 is a section on the line 2—2 of Fig. 1; Fig. 3 is a view of the foundation guide for receiving and guiding the wire on the mandrel.

1 designates a spindle or center-piece upon which the parts of the improved mandrel are assembled and held during the winding operation. This spindle may form part of a machine such as described in my said pending application, or it may be driven by any suitable means, not shown. Threaded onto the end of the driving spindle 1 is a hub member 2 supporting a flange plate 3, the same having a smooth inner plane face as at 4 except at its central portion where it is formed with an annular recess or pocket 5.

6 designates a cylindrical core piece which is threaded into the hub 2 in longitudinal alinement with the shaft 1, said core piece having a longitudinal bore 7 intersected by a transverse slot 8 extending entirely across and through the core piece. Projecting through this core piece 6 is a cross key 9, adapted to be moved back and forth in the slot 8 lengthwise of the core piece, said key being operable by a plunger 10, slidably disposed within the bore of the core-piece. Mounted on the core-piece is a second flange plate 11 spaced from the plate 3 by a shoulder 12 on the core-piece against which it abuts, said second plate having a smooth inner plane face 13, said flange plates defining a space about the core-piece within which the winding is to be formed. The plate 11 is hold in place in engagement with the shoulder 12 by a clamping nut 14 threaded onto the end of the core-piece.

Slidable on the core-piece between the plates 3 and 11 is a collar 15 frusto conical in form and having its larger end toward the plate 3, and its smaller end toward the plate 11. The diameter of the larger end of the collar is such that it may be received by the recess 5 in the plate 3.

Mounted on and supported by the collar is a plurality of filler blocks 16 having their outer faces parallel with the axis of rotation of the spindle 1 and each has an inner inclined face 17, curved to rest on the surface of the collar and said filler blocks being each slidably connected to said collar by a key 18 seated in alining grooves 19 and 20, formed respectively in the collar and filler block. The keys may be formed to connect the collar and filler pieces to prevent lateral or radial separation thereof when the winding is removed. For this purpose the grooves in the collar may be undercut at 21 to receive lateral projections 22 on the keys, the keys being secured in the grooves of the blocks by locking pins 23 set in alining recesses 24 in the sides of the keys and the side walls of the block grooves.

The cross-key 9, heretofore described, projects at its ends beyond the core-piece into recesses 25 in the collar 15, and it will be seen that when the said key is moved lengthwise of the slot 8 the collar will cause the

filler blocks to move radially toward or away from the core-piece accordingly as the collar is moved toward the end plate 3, or the end plate 11. The filler blocks are held against movement lengthwise of the shaft by the end plates. When the winding is being formed the parts are in the position shown in Fig. 1, the collar 15 being moved against the end plate 11, any means being provided for this purpose such, for instance, as the nut 26 threaded onto the end of the plunger and abutting the end of the core-piece 6. After the winding is formed, the nut 26 is turned to release the plunger and the latter is moved in to slide the collar 15 lengthwise of the shaft to permit the filler blocks to collapse, the rear end of the collar moving into the recess in the plate 3, and the nut 14 is then removed to permit the flange plate 11 to be detached, so that the winding may be drawn from the mandrel.

The primary feature of this invention consists in providing the mandrel, whether it is formed to make round windings or polysided windings, with means whereby the turns of the layers constituting a winding, will be arranged in regular form so that alternate layers are counterparts of each other throughout the entire winding, the result being that I provide a completed article which is much more compact for a given weight of wire than any winding which has been produced heretofore, as far as I am aware, and which not only makes a winding which is much more compact, but results in a great saving of wire, which, of course, in copper windings is important. In order to arrive at this result, my invention broadly contemplates the provision of the mandrel with means whereby the first layer of the winding is laid between the flanges of the mandrel with great precision, this winding serving then as a guide for the next layer and so on throughout the article produced.

Before proceeding to a detail description, I believe the invention will be better understood if it is borne in mind that the invention is based on the fact that the distance from the flange plate, of any wire which is the nearest one of its layer must be either zero or one-half the diameter of the strand, in order that the arrangement of strands in layers will be such that it is repeated as layer after layer is wound on the core.

In Fig. 3 I have shown a foundation guide for the wire which consists of a continuous strip embodying four guiding zones, a portion of a zone appearing at each end of the figure. Two zones 27 are provided, each formed with a plurality of parallel grooves which run at right-angles to the axis of rotation of the mandrel or parallel to the flat faces of the plates 3 and 11, the grooves of one of said zones being offset laterally from those of the other the distance of one-half a groove, and said zones being joined at their ends by zones 28 of inclined grooves, each groove of which joins one of the straight grooves of a zone 27 with the next offset groove of the other zone 27. Of course, in making a winding of this character, the strand is laid on the mandrel in the form of a coil and in order that the strand be guided laterally so as to take substantially the direction of a coil, one or more zones are formed with a fractional groove adjacent the starting flange, the said fractional grooves being indicated by the letters *a* and *b* in the middle zone 27, Fig. 3. If now, for instance, the start of the winding is in the fractional groove *a*, Fig. 3, it will follow the groove as the mandrel revolves until it reaches the alining whole groove in the zone 27, which it follows until it reaches the inclined groove in zone 28 which will guide the strand into the second zone 27 and in a groove parallel with but laterally offset from the groove in the first zone 27, etc. The winding continues until the strand reaches an end plate which causes it to move laterally in a reverse direction and above and intermediate two underlying turns of the strand, as illustrated in Fig. 1. Thus, as the coil is wound all of the succeeding turns of the first layer will be correspondingly laid, and the turns of the second layer will be guided by the turns of the first layer with the same accuracy as the first layer was forced to take by the foundation guide. The foundation guide, illustrated in Fig. 3, may be made of a rigid metal, or thick paper, fiber, etc., wrapped around the shell of a core or mandrel and formed to guide the wire, the guide being left in place in the coil when the latter is removed.

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

1. A collapsible winding mandrel having a removable peripheral plate formed with guiding grooves running substantially parallel to the direction of rotation of the mandrel and offset from each other and connected by inclined grooves.

2. A winding mandrel having sets of strand guiding grooves on its receiving face, the grooves of each set running parallel to the direction of rotation, and the grooves of one set being offset from the grooves of another set and connected by inclined grooves.

3. A winding mandrel having a corrugated strand guiding face, the said face comprising spaced zones, the corrugations of alternate zones being parallel and contra-disposed relatively to adjacent zones.

4. A strand guide for winding mandrels consisting of a strip having sets of parallel grooves, the grooves of one set being offset

laterally from the grooves of another set, and sets of oblique parallel grooves connecting the grooves of said first-named sets.

5. A strand guide for winding mandrels consisting of a strip having sets of parallel grooves running lengthwise of the strip, the grooves of one set being offset laterally from the grooves of another set substantially one-half the diameter of a groove, and sets of oblique parallel grooves connecting the grooves of said first-named sets.

ARCHIBALD D. SCOTT.