

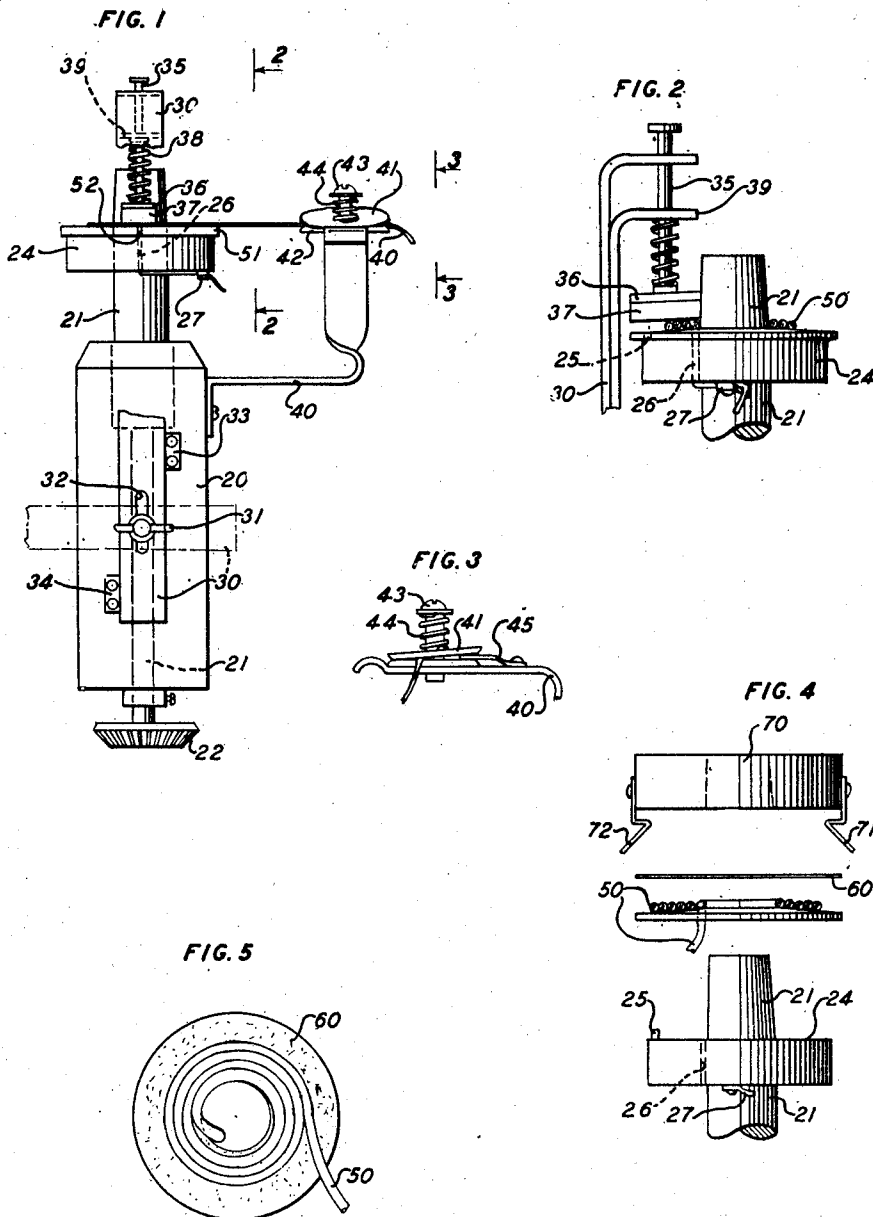
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APPARATUS FOR AND A METHOD OF MAKING COILS

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APPARATUS FOR AND A METHOD OF
MAKING COILS

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12 Claims. (Cl. 242-9)

This invention relates to apparatus for and a method of making coils and more particularly to apparatus for and a method of winding and assembling flat spiral coils of wire.

For some purposes and particularly for use in certain electrical devices used in the communications arts it is desirable to have coils of insulated wire comprising a coplanar plurality of turns arranged in single layered flat spirals. Such coils may be useful, for example, as auxiliary windings to be associated with transformers used in various types of communications apparatus.

An object of the present invention is to produce a simple, convenient and accurately functioning apparatus or device for winding strand into a coil having a plurality of turns arranged coplanarly in a flat spiral.

With the above and other objects in view one embodiment of the invention in an apparatus may comprise a rotatable winding member having means to fasten one end of a strand thereto to be wound thereon, guiding means to force the successive coils as wound to lie in coplanar relation, and means to tension the strand being wound. So also one embodiment of the invention in a method may comprise steps of winding a strand in a flat spiral on a substantially flat supporting member, applying an adhesive coated coil base member to the spiral, compressing the coil base member and the spiral on the supporting member, and allowing the adhesive to set.

Other objects and features of the invention will appear from the following detailed description of one embodiment thereof taken in connection with the accompanying drawing in which the same reference numerals are applied to identical parts in the several figures and in which—

Fig. 1 is a broken view in front elevation of an apparatus construction in accordance with the invention;

Fig. 2 is a broken view, slightly enlarged, in right side elevation of the upper portion of Fig. 1 with the tension device bracket removed;

Fig. 3 is a detail of the tension device in side elevation;

Fig. 4 is an exploded view in elevation of the drying clamp as associated with the apparatus, and

Fig. 5 is a plan view of a coil as completed.

In the embodiment of the invention herein disclosed, a body member 20 is stationarily supported in any suitable manner not shown, and carries a shaft 21 journaled to be rotatable therein. A

bevel gear 22 secured to the lower end of the shaft affords means for driving the shaft by power means not shown. A winding table 24, in the form of a flat axially perforated disk, is rigidly mounted on the shaft above the body 20 to rotate with the shaft. A driving pin 25 is mounted in the upper surface of the table near its periphery and stands up above the table. There is also a vertical perforation through the table or notch in the wall of the axial perforation, numbered 26; and a spring clip 27 is secured against the under face of the table near the perforation 26.

A bracket 30 is pivotably and slidably secured by a thumbscrew 31 to the body 20 to be rotatable on the body 20, from the vertical position shown in Fig. 1, counterclockwise to the left, 90° or more or less as convenient, and to be simultaneously slidably adjustable, longitudinally of itself, on the body. The bracket 30 may conveniently consist of a pair of metal strips, as shown, secured together by welding, riveting or the like and having a common slot 32 for the passage of the thumbscrew 31 which is mounted in the body 20. Stops 33 and 34 are secured to the body to position the bracket accurately in its vertical position. At the upper end of the bracket 30, the two component strips are bent over at a right angle, spaced apart and perforated to slidably support a vertical plunger rod 35 having a pressure pad attached to its bottom end. This pressure pad may conveniently consist of a metal plate 36 secured to the end of the rod 35 and a felt pad 37 cemented or otherwise attached to the under side of the plate 36. The plate 36 and pad 37 are arcuately concave at the side nearest the shaft 21 to press against the shaft when the bracket 30 is vertical and so be prevented from rotation on or with the rod 35. A helical compression spring 38 surrounding the rod 35 between the plate 36 and the underside of the lower rod support 39, urges the pad downwardly toward the table 24.

A second bracket 40 rigidly secured to the body 20 has a flat upper surface coplanar with and spaced conveniently from the top surface of the table 24. A pair of mutually abutted tension disks 41 and 42 is resiliently clamped down on the upper surface of the bracket 40 by a screw 43 passing freely through central perforations in the disks and entering a correspondingly threaded bore in the bracket 40. A helical compression spring 44 surrounding the screw between the under side of the screw head and the top of the upper disk 41 serves to press the discs together with a force adjustable by means of the screw

43. A wedge member 45 mounted on the bracket 40 enters between the disks 41 and 42 at one side and serves to tilt the upper disk 41 on the lower disk 42.

5 In operation a strand 50 to be wound, drawn from a supply thereof not shown is threaded between the disks 41 and 42 on the opposite side of the screw 43 from the wedge 45. The strand thus passes through a more or less triangular space defined by the disks and the screw and thus
10 tends to be constrained to remain between the disks. A winding spool head or platen 51 is placed on the top surface of the table 40. This platen is a flat disk of suitable material, e. g. vulcanized
15 fibre, molded artificial resin or the like, of size appropriate to the diameter of the coil to be wound, having a notch or slot therein to receive the driving pin 25, and also formed with a perforation or radial slot 52 giving access from the
20 top of the platen to the passage 26. The end of the strand 50 is drawn from the tension disks 41 and 42 over the top surface of the platen, down through the slot 52 and the passage 26, and is jammed under the clamp 27 to be held thereby.

25 During all the preceding preparation, the bracket 30 has been down in the dotted line position of Fig. 1. This bracket is now swung up into the vertical full line position of Fig. 1 and is drawn downwardly until the felt pad 37 presses
30 against the upper surface of the platen and the bracket is locked in place by the thumbscrew 31.

The shaft 21 is then driven in rotation. This winds the strand 50 about the shaft 21 as a mandrel; and, since the strand leads between the
35 platen and the pad, the successive coils are forced to lie in a flat spiral on the platen. To assist in assuring this effect, it may be preferable to form the upper surface of the platen as a wide angled convex cone frustum as indicated in Figs. 2 and 4.

40 When the predetermined number of turns has been wound, the rotation of the shaft is stopped. The strand may now be severed between the platen and the tension disks, if desired, and the wound coil removed. However, without further
45 means to maintain the turns in relative position it is not easily practicable to remove the coil without destroying its desired character.

A suitable mode of proceeding further is the following. The desired number of turns having
50 been wound, the shaft is stopped. The bracket 30 is then raised and swung down, thus carrying the pad 37 and its supports out of the way. A laminar annulus 60 of suitable material such as paper, cloth or the like, coated on its under side
55 only with adhesive material, is slipped down over the top of the shaft 21 to lie on the newly wound spiral coil with its adhesive side resting on the coils. The upper end of the shaft 21 is preferably slightly tapered, as shown, to facilitate this and
60 the subsequent step in the process.

An annular block 70, whose central aperture is formed and dimensioned to fit down snugly but not tightly over the upper end of the shaft, is then slipped over the shaft and pressed down to
65 rest on the annulus 60. The block 70 is provided with spring catches 71, 72; and the block 70, its catches 71, 72 and the platen 51 are so proportioned and dimensioned that the platen is wider
70 than the table 24 and wider than the finished coil and its adherent annulus 60, the block 70 is substantially the same in width as the platen, and the catches 71, 72 spring over the edges of the platen and hold it firmly against the block thereby
75 lightly compressing the coil and its superimposed annulus. The entire temporary assembly of

platen 51, wound coil, annulus 60 and block 70 may now be removed upwardly from the apparatus and set aside or treated to dry the adhesive. Another platen may then be placed on the table
5 24 and the entire operation repeated to make another coil.

When the adhesive is dry, the platen is pulled axially away from the block 70, the catches being held back to permit this. The coil, now mounted
10 on the annulus as a base, may then be slipped out laterally under the catches and appears as the finished product shown in Fig. 5.

While the coil as shown and described has only one uniplanar spiral lamina of winding, obviously the strand may be carried back to the shaft and another spiral wound beside the first. This may
15 be repeated if desired to make a coil having as many such spiral windings in laterally abutted relation as may be desired. Obviously also, laminae 60 may be intercalated as desired between successive spirals. The only change re-
20 quired in the apparatus disclosed, is in the length of the catches 71 and 72.

The embodiment of the invention herein disclosed is only illustrative and may be modified
25 and departed from in many ways without departing from the spirit and scope of the invention as pointed out in and limited solely by the appended claims.

What is claimed is:

30 1. A method of making a coil, which method comprises the steps of winding a strand into a plurality of substantially coplanar spiral turns upon a supporting member having a slightly
35 conically dished convex surface which aids to prevent successive turns of winding from overriding previous turns, applying an adhesive coated annular base member to the convex side of the substantially coplanar group of turns, ap-
40 plying a compression member to the base member, compressing the wound coil and the base member between the supporting member and the compression member, and allowing the adhe-
sive to set.

45 2. A method of making a coil, which method comprises the steps of winding upon a supporting member a strand into a group of substantially coplanar spiral turns having a convex side, applying a retaining member over the turns of
50 strand while being wound, removing the retaining member, applying an adhesive coated annular base member to the convex side of the substantially coplanar group of turns, compressing the wound spiral and the base member, and allow-
55 ing the adhesive to set.

60 3. A method of making a coil, which method comprises the steps of winding a strand into a plurality of substantially coplanar spiral turns upon a supporting member having a slightly conically dished convex surface which aids to prevent
65 successive turns of winding from overriding previous turns, applying a retaining member over the turns of strand while being wound, removing the retaining member, applying an adhesive coated annular base member to the convex side of the
70 substantially coplanar group of turns, applying a compression member to the base member, compressing the wound coil and the base member between the supporting member and the compression member, and allowing the adhesive to set.

75 4. A method of making a coil having a substantially flat spiral winding, which method comprises the steps of winding a strand in consecutive spiral turns upon a nearly flat but slightly convexly dished supporting surface, and applying a

base member to the wound turns while still upon the supporting surface.

5 5. An apparatus for winding a coil having a substantially flat spiral winding, which apparatus comprises a rotatable support having a substantially flat but slightly conically convexly
10 10 dished supporting surface transverse to the axis of rotation, means on the support to secure one end of a strand thereto for winding thereon, and means to maintain the strand in contact with the supporting surface while being wound to cause
15 15 successive turns of strand to lie upon the surface in substantially coplanar but slightly dished spiral relation.

15 6. An apparatus for winding a coil having a substantially flat spiral winding, which apparatus comprises a rotatable support having a substantially flat but slightly conically convexly
20 20 dished supporting surface transverse to the axis of rotation, means on the support to secure one end of a strand thereto for winding thereon, means to maintain the strand in contact with the supporting surface while being wound to cause
25 25 successive turns of strand to lie upon the surface in substantially coplanar but slightly dished spiral relation, an adhesive base member for securing the turns against relative movement, and means to compress the wound coil and base member.

30 7. An apparatus for winding a coil having a substantially flat spiral winding, which apparatus comprises a stationary body, a rotatable shaft mounted therein, a winding table on the shaft
35 35 and rotatable therewith, a removable platen on the table and rotatable therewith and having a substantially flat but slightly conically convexly dished strand supporting surface transverse to the axis of rotation, and a strand retaining member mounted on the body to coact with the platen to force a strand being wound thereon to lie in
40 40 substantially coplanar but slightly conically convexly dished consecutive spiral turns upon the supporting surface.

8. In an apparatus for winding a coil, a strand supporting member having a slightly conically convexly dished surface for supporting a strand, and means to form a spiral winding of strand material on the dished surface.

5 9. In an apparatus for winding a coil having a substantially flat spiral winding, a strand supporting member having a slightly conically convexly dished surface for supporting a strand
10 10 being wound in combination with means to retain consecutive substantially coplanar spiral turns of strand in relative position upon the surface.

15 10. In an apparatus for winding a coil having a substantially flat spiral winding, a strand supporting member having a slightly conically convexly dished surface for supporting a strand being wound and causing each successive turn of the strand to lie with its axis beyond the plane of the axis of its previous turn adjacent the member, and means for rotating the member.
20 20

25 11. In an apparatus for winding a coil having a substantially flat spiral winding, a strand supporting member having a slightly conically convexly dished surface for supporting a strand being wound and causing each successive turn of the strand to lie with its axis beyond the plane of the axis of its previous turn adjacent the member, means for rotating the member, and means for securing the turns of the coil against displacement.
30 30

35 12. In an apparatus for winding a coil having a substantially flat spiral winding, a strand supporting member having a slightly conically convexly dished surface for supporting a strand being wound and causing each successive turn of the strand to lie with its axis beyond the plane of the axis of its previous turn adjacent the member, means for applying a predetermined tension to the strand to cause the turns to build one upon the other, and means for rotating the member.
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