

Jan. 16, 1945.

A. J. DOWD

2,367,489

WINDING APPARATUS

Filed Aug. 10, 1943

2 Sheets-Sheet 1

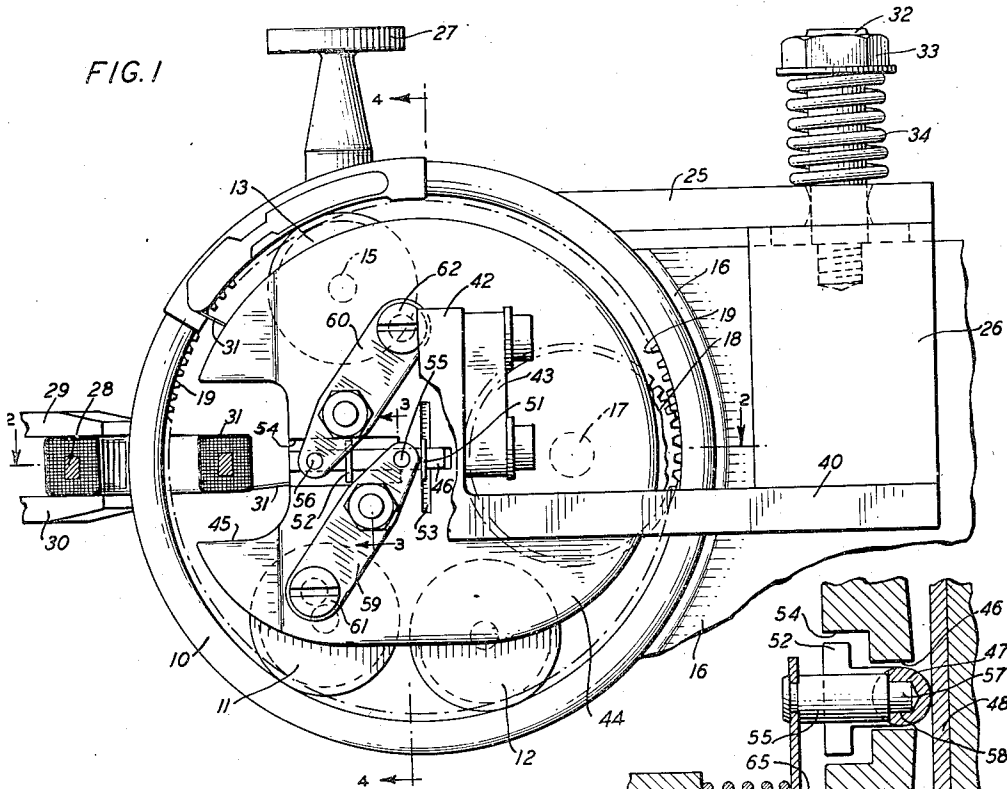


FIG. 3

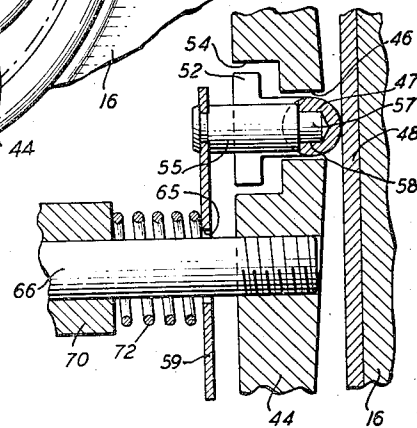
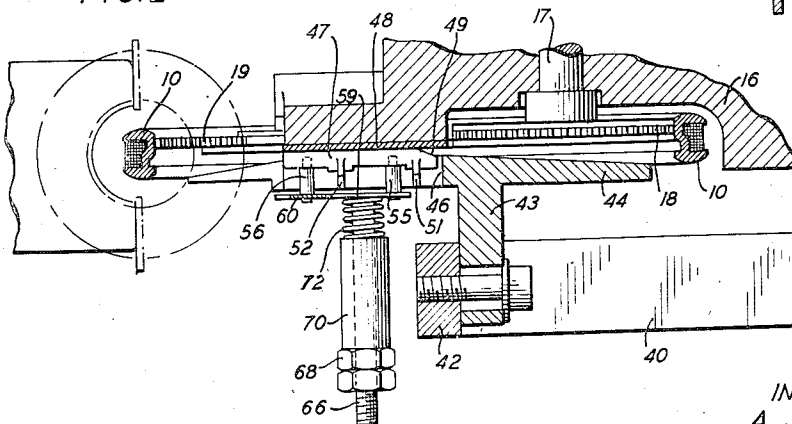


FIG. 2



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FIG. 4

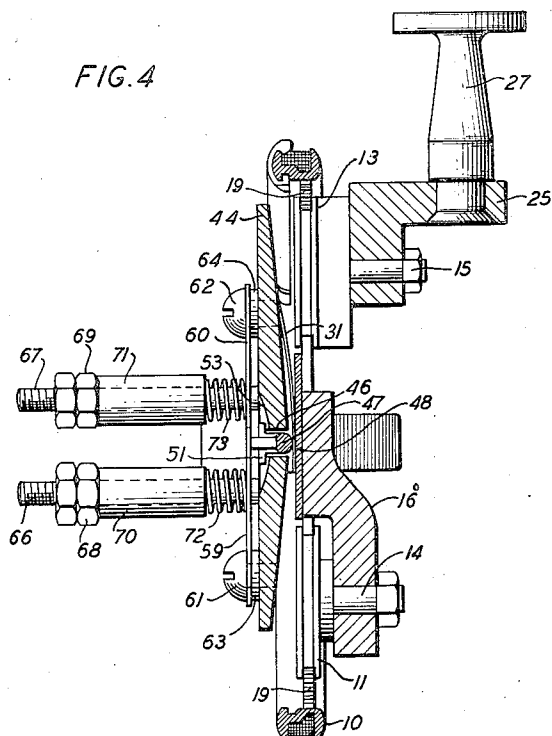


FIG. 5

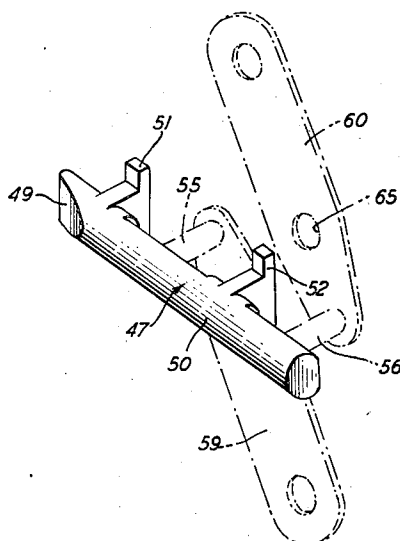
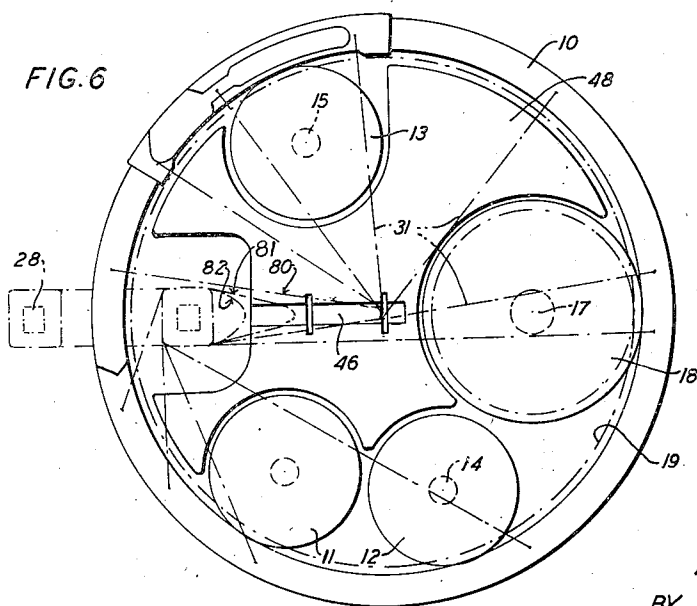


FIG. 6



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WINDING APPARATUS

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Application August 10, 1943, Serial No. 498,072

10 Claims. (Cl. 242-4)

This invention relates to winding apparatus and more particularly to an improvement in apparatus for winding toroidal coils.

It is an object of the present invention to provide an apparatus for more accurately controlling the application of wires to toroidal cores.

In accordance with one embodiment of the invention, a winding machine of the general type disclosed in the co-pending application of A. L. Quinlan, Serial No. 422,195, filed December 9, 1941, which issued on August 17, 1943 as Patent No. 2,326,969, is provided with a wire guiding or tension controlling mechanism which comprises a spring-pressed bar extending from a position adjacent to the point of application of a strand on the core to the center rotation of the winding ring, from which the strand is withdrawn, to press the wire against a back tension plate of the apparatus and during the portion of the winding operation when slack would normally be formed in the wire, the wire from the supply on the ring will pivot about the end of the spring-pressed bar until finally drawn therefrom onto the core, thus eliminating the possibility of a loose or slack loop of wire forming in the apparatus.

A clear understanding of the invention may be had by reference to the following detailed description when considered in conjunction with the accompanying drawings, wherein

Fig. 1 is a fragmentary side elevational view of a winding machine embodying the features of the present invention, portions of the core holding mechanism being broken away and the core being shown in section to more fully illustrate the relative position of the core and winding ring;

Fig. 2 is a fragmentary sectional view taken substantially along the line 2-2 of Fig. 1 in the direction of the arrows showing some details of the tension controlling mechanism and also showing the drive for the winding ring;

Fig. 3 is an enlarged fragmentary detail view taken substantially along the line 3-3 of Fig. 1 in the direction of the arrows showing some details of the support for the wire tension controlling bar;

Fig. 4 is a transverse vertical sectional view taken substantially along the line 4-4 of Fig. 1 in the direction of the arrows;

Fig. 5 is a detail view in perspective of the guide or tensioning bar, the springs upon which the bar is mounted being shown in dot and dash lines in the position they occupy in the apparatus; and

Fig. 6 is a diagrammatic view illustrating the path which the wire follows during the rotation of the winding ring to apply wire on a core, which is shown in dot and dash lines.

In the drawings, a split winding ring 10 of the type disclosed in detail in the co-pending application of Amos L. Quinlan, Serial No. 422,195, filed December 9, 1941, is shown mounted for rotation on a series of grooved guide wheels 11, 12 and 13. The two guide wheels 11 and 12 are mounted to rotate freely on stud shafts 14, one of which is shown in Fig. 4, whereas the guide wheel 13 is mounted on and freely rotatable with respect to a stud shaft 15. Both of the stud shafts 14 are mounted on a fixed base member 16, which also serves as a bearing for a drive shaft 17 (Fig. 2), carrying a driving gear 18 in mesh with gear teeth 19 formed on the inner annular surface of the winding ring 10. The stud shaft 15 is mounted upon an arm 25 of a bracket 26, which arm also has a handle member 27 mounted upon it, whereby, when there is no supply of wire wound on the winding ring, the ring may be separated to permit the insertion or removal of a core 28 between jaws 29 and 30 of a clamping mechanism, which serves to hold a core in position during the application of servings of wire 31 to the core. The bracket 26 is mounted on the fixed base member 16 by means of a pivot stud 32 threaded into the base member 16 and having a retaining nut 33 threaded on its upper end. A spring 34 compressed between the retaining nut 33 and the upper surface of the arm 25 of the bracket 26 will tend to maintain the bracket in any position to which it may be moved by means of the handle 27. Of course, the resiliency of the split winding ring will tend to return the arm 25 to the position shown particularly in Fig. 4, but the pressure of the spring 34 is sufficient to hold it open to permit the removal or insertion of a core 28 between the clamping jaws 29 and 30.

The bracket 26 has a lower arm 40 fixed to it for supporting suitable guide members in position to guide the wire 31 from the ring 10 into position to be wound upon the core 28. An upwardly extending portion 42 of the arm 40 has adjustably mounted thereon a bar 43, which is, in turn, formed integrally with a guide plate 44. The guide plate 44 is of non-uniform thickness, being thinner adjacent its periphery and thicker toward the center thereof, whereby wire withdrawn from the ring 10 during the rotation of the ring will be guided toward the center of the ring. The guide plate 44 has a core-receiving

cutout 45 formed in it adjacent the clamping jaws 29 and 30 and has a slot 46 formed thereon (Figs. 2 and 4) through which a wire guiding bar 47 may be urged to bear against a guide plate 48, as shown most clearly in Fig. 6.

The guide plate 48 is mounted on the base member 16 and is cut out to receive the driving gear 18 and grooved guide wheels 11, 12 and 13. The wire guiding bar 47, as shown in detail in Fig. 5, has a beveled face 49 and a round body portion 50. Extending from the surface of the round body portion 50 of the guiding bar 47 opposite to the surface which has the beveled face 49 formed thereon are a pair of T-shaped extensions 51 and 52. The T-shaped extension 51 is adapted to be received in a notch 53 milled into the left face (Fig. 4) of the guide plate 44 and the T-shaped extension 52 is adapted to be received in a slot 54 (Figs. 1 and 3), which is wider than the slot 46, but which constitutes an enlargement of the slot 46. The heads of the T-shaped extensions 51 and 52 will, during the loading of a core 28 into the machine, engage the surfaces of the guide plate 44 when the guiding bar 47 is urged to the right (Figs. 3 and 4) and even though the bracket 26 is swung to a position where the guiding bar 47 will not strike the guide plate 48, the bar 47 will not drop out of the apparatus. Means for urging the guiding bar 47 in a direction to engage the heads of its T-shaped extensions 51 and 52 against the shoulders of their respective slots comprises a pair of pins 55 and 56 of exactly the same construction and having reduced portions 57—57 extending into suitable sockets 58 formed in the body of the guiding bar 47, as shown most clearly in Fig. 3. The pins 55 and 56 are riveted to leaf springs 59 and 60, respectively, fixed to the lefthand surface (Fig. 4) of the guide plate 44 by means of short rounded head machine screws 61 and 62, and washers 63 and 64 are interposed between the springs 59 and 60 and the face of the plate 44, respectively, to space the springs 59 and 60 slightly from the face of the guide plate 44. Thus, when a new core 28 is being inserted in the machine to have a winding applied to it, the arm 40, carrying the plate 44, may be moved counterclockwise from the position shown in Fig. 2 and although the guiding bar 47 is urged to remain in engagement with the plate 48, as described hereinafter, the bar will not fall out of plate 44.

Intermediate their ends, the leaf springs 59 and 60 have apertures 65—65 formed in them, as shown most clearly in Fig. 3, for receiving posts 66 and 67. The posts 66 and 67 are threaded at both ends, their inner ends being threaded into the plate 44 and their outer ends being adapted to receive lock nut assemblies 68 and 69, respectively. Interposed between the lock nut assemblies 68 and 69 and their respective springs 59 and 60, through which the posts 66 and 67 extend, are sleeves 70 and 71 and coiled springs 72 and 73. In this manner, the leaf springs 59 and 60 may be urged toward the guide plate 44 under a predetermined pressure and will thus, when the bracket 26 is in operating position, urge the wire guiding bar 47 to engage the plate 48 with the desired amount of pressure.

The arrangement of the wire guiding bar 47 with respect to the winding ring 10 is such that the portion of the bevelled face 49 which terminates in the rounded portion 50 of the bar 47 is exactly at the center of rotation of the wind-

ing ring and the pressure with which the wire guiding bar 47 is urged against the guide plate 48 may be adjusted so that during operation of the apparatus, the strand of wire 31 will follow the course indicated diagrammatically in Fig. 6. Thus, the winding ring carrying the outer end of the radially disposed wire will rotate substantially 180° while the inner end pivots at the center of the ring. As the winding ring rotates further and distributes the wire, the wire will be wrapped from the inner surface of the annular core under the bevelled face 49 of the bar 47 to form a loop, as indicated at 80. In this manner, the wire 31 will be maintained taut until the upper edge of the loop 80 is laid onto the upper surface of the core 28 and the pressure exerted by the bar 47 against the back plate 48 will maintain this loop until the point of the winding ring from which the wire is distributed passes below the upper surface of the core, at which time the wire in the loop 80 will be drawn, as indicated progressively at 81 and 82, until the wire is wrapped around the core, the tendency for the wire to remain on the winding ring being just sufficient to overcome the spring pressure exerted on the guiding bar 47. In this manner, no loose loops of wire will be formed in the winding operation and the only time that the wire is not under some tension will be from the time shortly after the loop 82 is formed until the wire is completely wrapped on the core.

What is claimed is:

1. In a toroidal coil winding machine, a winding ring rotatable about a core to apply a strand to it, guide plates spaced apart slightly more than the width of the strand, and tension controlling means extending solely along a radius of the ring from a point adjacent to the core to the center of rotation of the ring for pressing the strand against one of the guide plates.

2. In a toroidal coil winding machine, a winding ring rotatable about a core to apply a strand to it, guide plates spaced apart slightly more than the width of the strand, tension bar guiding surfaces formed on one of said plates, a tension bar guided by said surfaces, and means for urging said bar to bear against the other plate.

3. In a toroidal coil winding machine, a winding ring rotatable about a core to apply a strand to it, guide plates spaced apart slightly more than the width of the strand, tension bar guiding surfaces formed on one of the said plates, a tension bar guided by said surfaces extending from a point adjacent the center of rotation of the winding ring to a point adjacent the core, and means for urging said bar to bear against the other plate.

4. In a toroidal coil winding machine, a winding ring rotatable about a core to apply a strand to it, guide plates spaced apart slightly more than the width of the strand, and means supported by one of said plates and resiliently urged against the other plate to provide a pivot for the strand at the center of the winding ring.

5. In a toroidal coil winding machine, a winding ring rotatable about a core to apply a strand to it, guide plates spaced apart slightly more than the width of the strand, and means supported by one of said plates and resiliently urged against the other plate to provide a pivot for the strand at the center of the winding ring, said last-mentioned means comprising a bar having a beveled face to cooperate with said other plate to form a notch to hold the strand until the strand is forced between the bar and said other plate.

6. In a toroidal coil winding machine, a winding ring rotatable about a core to apply a strand to it, guide plates spaced apart slightly more than the width of the strand, and means supported by one of said plates and resiliently urged against the other plate to provide a pivot for the strand at the center of the winding ring, said last-mentioned means comprising a bar having a beveled face to cooperate with said other plate to form a notch to hold the strand until the strand is forced between the bar and said other plate and having a rounded surface for making a point contact with the strand after the strand slips under the bar.

7. In a toroidal coil winding machine, a winding ring rotatable about a core to apply a strand to it, guide plates spaced apart slightly more than the width of the strand, tension bar guiding surfaces on one of said plates, a tension bar positioned between said surfaces, a pair of leaf springs mounted on and in spaced relation to said one plate, tension bar engaging pins on the free ends of said leaf springs, and means for urging said leaf springs to move the bar into engagement with the other of said plates.

8. In a toroidal coil winding machine, a winding ring rotatable about a core to apply a strand to it, guide plates spaced apart slightly more than the width of the strand and movable relative one to another during loading of the machine, tension bar guiding surfaces on one of said plates, a tension bar positioned between said surfaces, a pair of leaf springs mounted on and in spaced relation to said one plate, tension bar engaging pins on the free ends of said leaf springs, 35

means for urging said leaf springs to move the bar into engagement with the other of said plates, and T-shaped extensions on the tension bar engageable with surfaces on the plate which supports it for preventing displacement of the bar with respect to the plate which supports it when the guide plates are moved relative to each other.

9. In a winding apparatus, a winding ring, means for supporting a core to be wound eccentrically within said ring, means including two strand engaging members, one of which extends along a radius of the ring from the center of said ring to a point adjacent said core for engaging a strand being wound to hold it stationary at said center while said ring rotates a portion of a revolution, said one member being resiliently mounted to yieldingly engage said strand along said radius during further revolution of the ring.

10. In a winding machine, a winding ring for carrying strand to be wound on a core, means for supporting a core eccentrically in said ring, means for delivering strand from a point in the periphery of said ring, means for retardingly gripping said strand extending radially from the center of said ring toward said core, means for rotating said ring to lay a loop of strand from the core to the portion of the gripping means at the center of the ring and then to pull said loop past said gripping means, and resilient means for actuating the gripping means with a force such that the strand will be held substantially stationary at the center of said ring during a portion of a revolution thereof and yieldingly released during another portion of its revolution.

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