Dec. 8, 1959 J. ONISKO, JR 2,916,221

COIL WINDING MACHINE

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fig. 1.

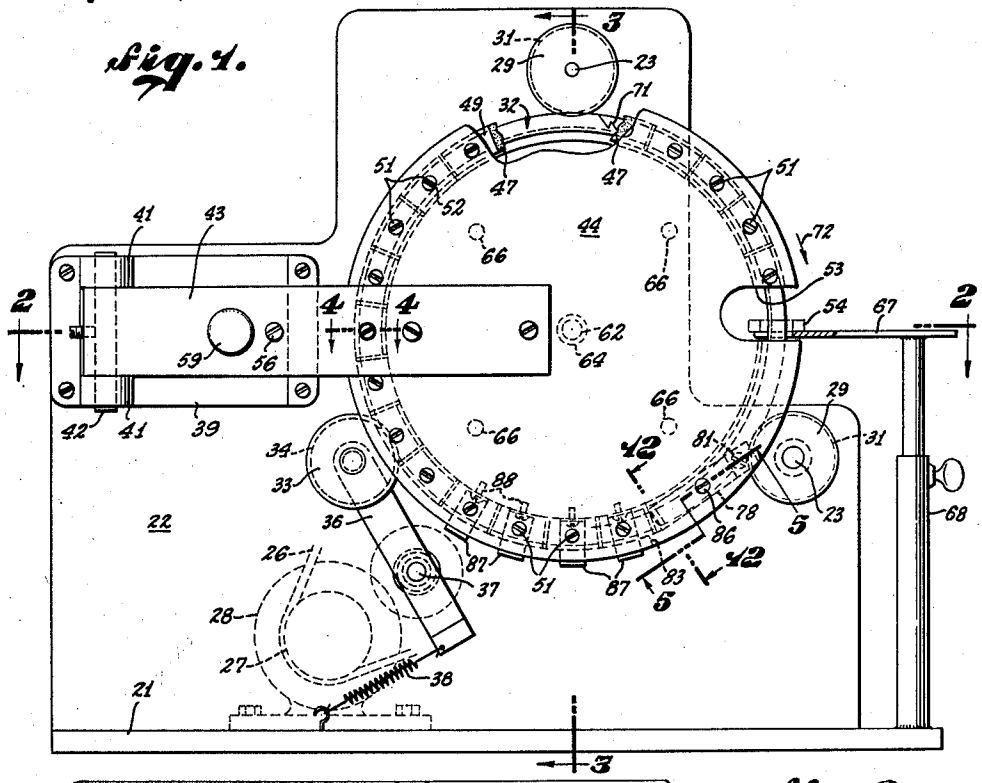
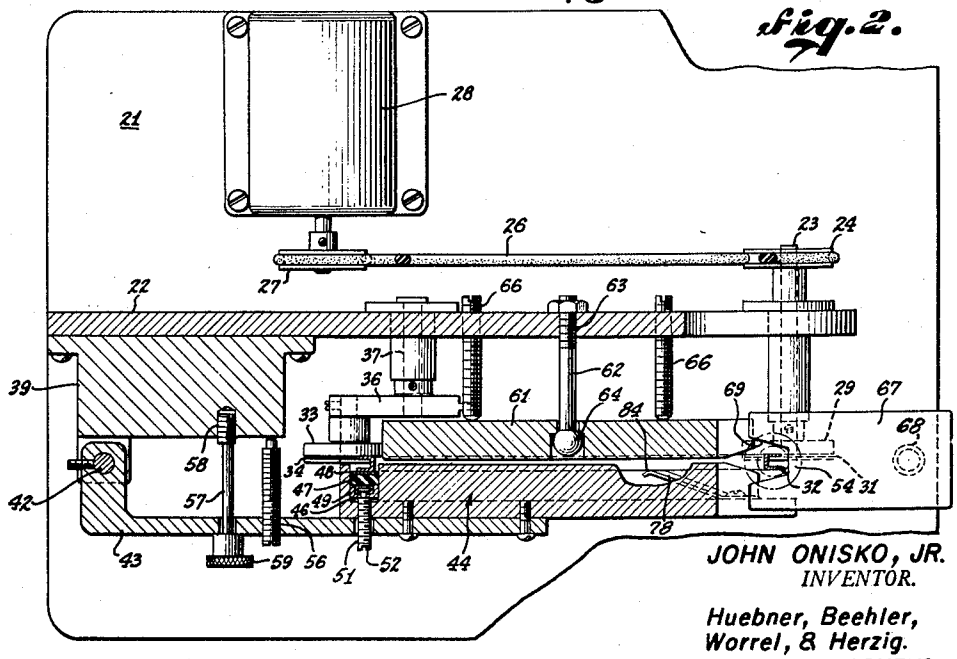


fig. 2.



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Filed April 25, 1955 3 Sheets-Sheet 2

fig. 3.

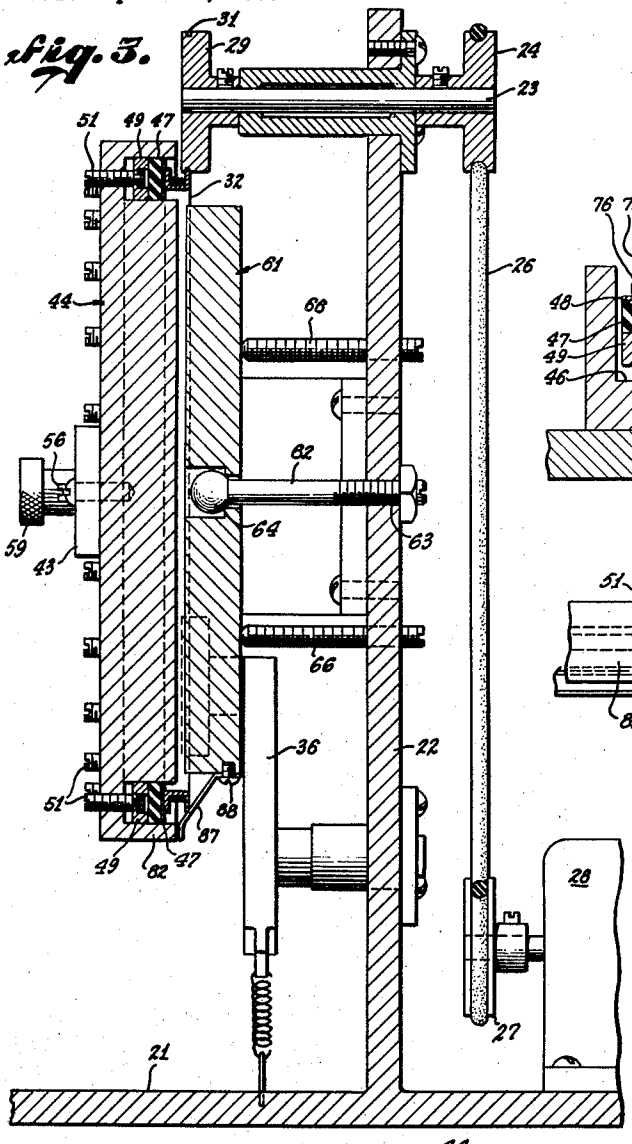


fig. 4.

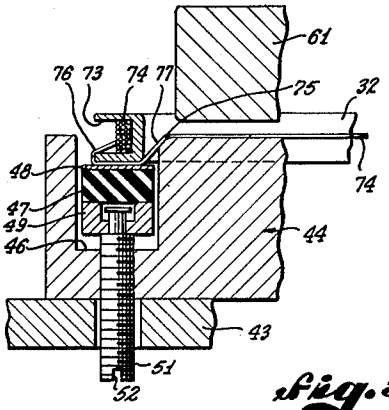


fig. 5.

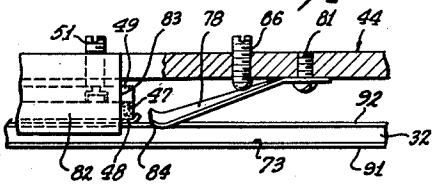


fig. 6.

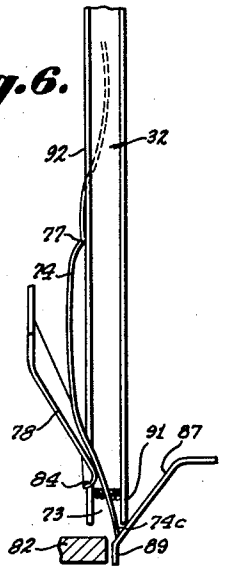


fig. 13.

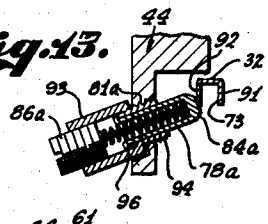


fig. 12.

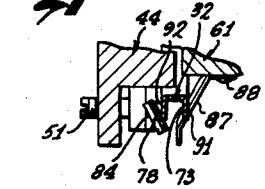
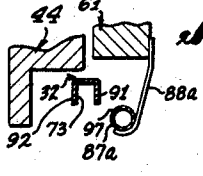


fig. 15.



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COIL WINDING MACHINE

Filed April 25, 1955 3 Sheets-Sheet 3

fig. 7.

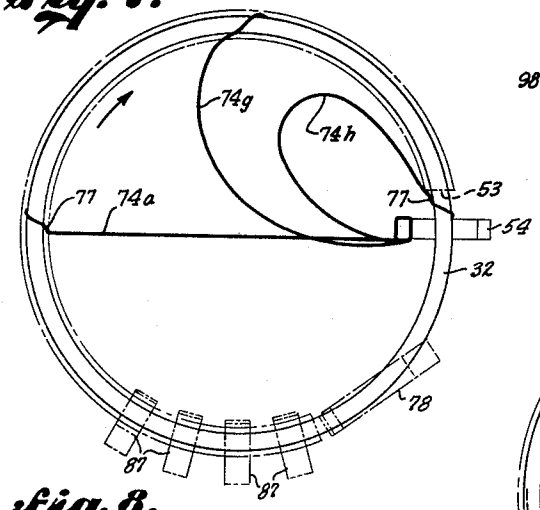


fig. 14.

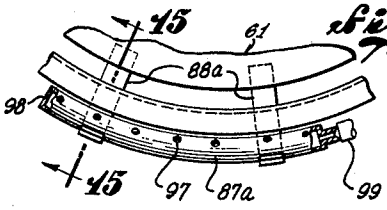


fig. 10.

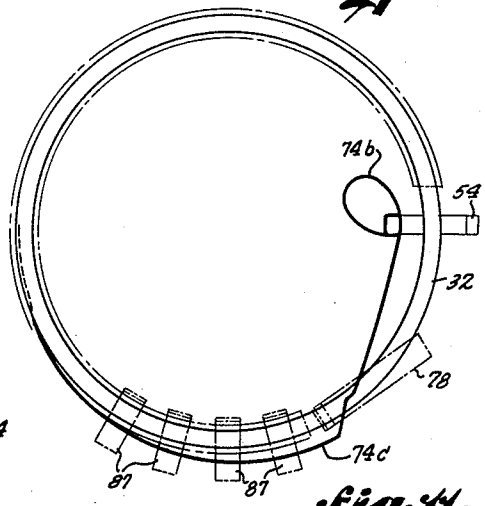


fig. 8.

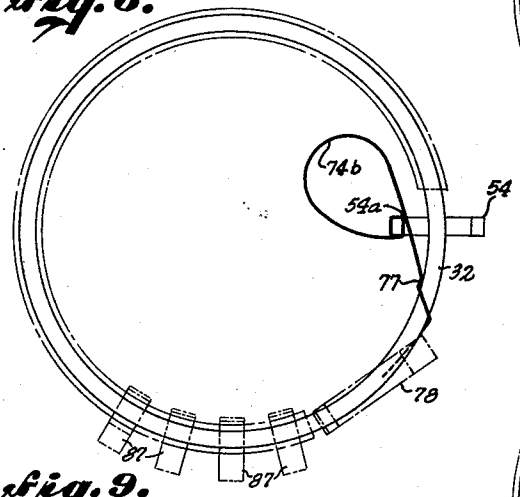


fig. 11.

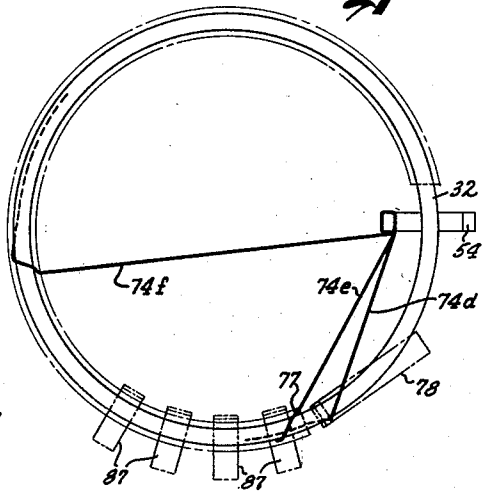
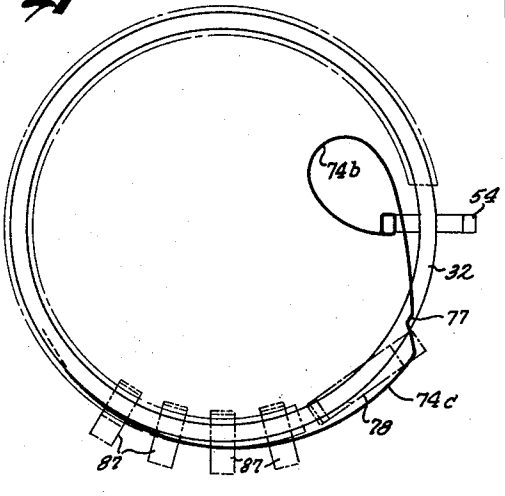


fig. 9.



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COIL WINDING MACHINE

John Onisko, Jr., China Lake, Calif., assignor of one-half to Jesse R. Watson, China Lake, Calif.

Application April 25, 1955, Serial No. 503,633

12 Claims. (Cl. 242—4)

This invention relates to improvements in coil winding machines and more particularly to improvements in the control of that portion of the wire which forms a relatively loose loop between the bobbin on the coil winder and the core on which the wire is being wound.

It is an object of this invention to provide means for assuring that the loose loop of wire existing between the bobbin and the core during a certain portion of the winding cycle will be fed back on to the bobbin without danger of snagging and with minimum wear to the insulation on the wire.

It is another object of this invention to prevent the loose loop of wire occurring between the bobbin and the core during a certain portion of the winding cycle from being thrown axially of said bobbin with consequent danger of snagging over the edge of the bobbin.

It is another object of this invention to prevent such a loop of wire from crossing over to the wrong side of the bobbin during the critical loose portion of the cycle.

The present invention is particularly adaptable to a coil winding machine consisting of a bobbin adapted to be linked to a core on which wire or other filament is to be wound, which bobbin has a peripheral cavity for reception of the filament and is provided with means for rotating the bobbin in a given direction both as the wire is fed on to the bobbin and as it is taken off of the bobbin on to the core over one edge of the bobbin. Such a machine is disclosed in co-pending patent application Serial No. 314,237, filed October 10, 1952, in the name of John Onisko, Jr., and entitled Toroidal Coil Winding Machine, now abandoned and replaced by continuation application Serial No. 566,051, filed February 16, 1956. Features of the present invention, however, are not necessarily limited to a coil winder of the type therein disclosed, but may be advantageously employed in other types of coil winders.

In a coil winding machine, as disclosed in said Serial No. 314,237, there occurs a certain critical portion in the winding cycle when there is a loose loop of wire extending between the bobbin and the core. In order that the wire not snag as the loop is tightened up against the core, it is necessary that some means be provided for assuring that the unused portion of the loop remain in, or return to, the proper relationship with respect to the bobbin. For a certain portion of the wire, this means that wire must be laid back into the peripheral cavity of the bobbin in which it is contained during the winding operation. Said application Serial No. 314,237 discloses a unique and novel means for providing assurance that the wire will stay in proper registry with the bobbin cavity. This means, in said application, consists in the formation of a Z kink which tends to lock the wire to the under or inside of the bobbin, thereby preventing it from loosening, with consequent assurance that the wire will not be thrown radially outward by centrifugal force.

In the continued development of the coil winding machine described in said Serial No. 314,237, it has been found that where a very small cross-section bobbin is

used, particularly at high winding speeds such as are necessary for efficient production of coils, the Z kink at times does not provide sufficient locking to hold the loose loop in proper position. As a result, the wire in the bobbin cavity is loosened and is thrown radially outward by centrifugal force. There is thus danger that when the loop is tightened up at a subsequent point in the winding cycle the wire will slip over the wrong side of the bobbin and become snagged, which will of course instantly break the wire.

A small bobbin is required whenever the center hole in the toroidal coil is small. Such smallness in the coil center hole also limits the offset that may be provided in the Z kink. Thus, where small coils are to be wound, the necessity of limiting the Z kink offset sufficiently to permit passage of the wire through the coil without striking the coil results in such a small Z kink that there is not sufficient locking action to hold the wire in place, and this is particularly true at high winding speeds.

It is, accordingly, an object of this invention to provide means for assuring that such loose wire, if thrown radially outward of the bobbin cavity, is properly fed back to the bobbin at the proper time in the cycle, to assure that the next winding cycle will be properly effected.

It is another object of this invention to provide means for intercepting the wire if it is thrown radially outward of the bobbin cavity, so that there is no danger of wire crossing over to the wrong side of the bobbin and thereby becoming snagged.

In accordance with these and other objects which will become apparent hereinafter, preferred embodiments of the present invention will now be described with reference to the accompanying drawings, wherein:

Figure 1 is an elevational view of a coil winding machine embodying the present invention.

Figure 2 is a plan section taken on line 2—2 of Figure 1.

Figure 3 is a vertical section taken on line 3—3 of Figure 1.

Figure 4 is a fragmentary section taken on line 4—4 in Figure 1.

Figure 5 is a fragmentary section taken on line 5—5 in Figure 1.

Figure 6 is an enlarged elevation showing operation of the anti-crossover means of the present invention and taken generally in the same direction as Figure 3.

Figures 7, 8, 9, 10, and 11 are schematic views illustrating various stages in the winding cycle of the present invention and illustrating the operation of the present invention.

Figure 12 is a fragmentary section taken on line 12—12 of Figure 1.

Figure 13 is a fragmentary section generally similar to Figure 12 and showing an alternative form of feed-back means of the present invention.

Figure 14 is a fragmentary elevation taken generally in the same plane as Figure 1 and illustrating an alternative form of anti-crossover means, and

Figure 15 is a fragmentary section taken on line 15—15 in Figure 14.

Referring to the drawings, the toroidal coil winding machine of the present invention comprises a base 21 to which is secured an upright vertical plate 22. Extending through the plate 22 and journaled therein are a pair of spaced parallel shafts 23. At the rear face of the plate 22, each shaft 23 is provided with a pulley 24. The pulleys 24 are linked with a drive belt 26 rotated by a pulley 27 secured to the shaft of a drive motor 28 mounted on the base 21 at the rear of the plate 22.

At the front face of the plate 22, each shaft 23 is provided with a drive wheel 29 having a peripheral groove 31 therein. The groove 31 of the wheels 29 receives

the rear flange of a bobbin 32, which is held in position against the wheels 29 by an idler wheel 33. For symmetry, the three wheels 33 and 29 are distributed substantially equi-angularly about the ring-like bobbin 32. The idler wheel 33 has a similar groove 34 receiving the rear flange of the bobbin 32 and is mounted on an idler arm 36 secured to a shaft 37 journaled in the upright plate 22. Extending between the lower end of the arm 36 and the base 21 is a tension spring 38 which keeps the idler wheel 33 biased inwardly against the bobbin 32.

It will thus be seen that when the motor 28 is energized it rotates the bobbin 32 by means of the belt 26 and the drive wheels 29. In operation, the bobbin 32 is rotated in a clockwise direction in Figure 1, both when wire or filament is laid onto the bobbin 32 and when it is fed off the bobbin 32 onto a core.

Secured to the upright plate 22 is a pivot arm bracket 39 having a pair of trunnions 41 between which extends a pivot shaft 42. Secured to the vertical pivot shaft 42 is a pivot arm 43 carrying on its end a wire control plate 44. The plate 44 is generally circular and extends slightly beyond the periphery of the bobbin 32 so as to substantially completely overlie the bobbin as shown in Figure 1.

The plate 44 is provided with wire control means comprising an annular groove 46 in which is disposed an arcuate pad 47 made of a springy material such as sponge rubber. The pad 47 has securely attached on one face an arcuate flexible metal facing 48 which bears against the outer face or side of the bobbin 32. Securely attached to the other face of pad 47 are a plurality of arcuately adjusting segments 49 which are positioned by set screws 51 threaded through the plate 44 and engaging the segments 49. Each screw 51 is provided with a kerf 52 by means of which the pressure of the facing 48 against the side of the bobbin 32 may be variably adjusted at different angular portions thereof.

At one side, the plate 44 is provided with a notch 53 by means of which a coil form 54 may be linked with the bobbin 32, as will be described hereinafter. The control pad 47 extends from immediately above the notch 53 counterclockwise all the way around the plate 44 to a point corresponding to about five o'clock on a clock face, as shown in Figure 1.

The position of the control pad plate 44 with respect to the bobbin 32, during operation of the machine, is determined by an adjustable stop screw 56 threaded through the arm 43 and bearing against the bracket 39. The arm 43 and plate 44 are held inward by a pivot arm lock screw 57 threaded into the bracket 39 at 58 and having a knurled head 59 extending through the arm 43 for manual operation.

A stationary but adjustable guide plate 61 is held in opposed relation to the control pad plate 44 by means of a ball stud 62 threadedly mounted, and therefore adjustably mounted, in the plate 22, as shown at 63. The plate 61 has a notch registering with notch 53 in plate 44 and is held on to the stud 62 by the formation of a ball 64 on the stud and is pressed into constant engagement with the ball by four guide plate adjusting screws 66 threaded from the rear through the plate 22 and abutting the rear face of the guide plate 61.

The core or form 54, which is in the form of a torus or ring and on which the wire is to be wound, is supported on a platform 67 held in vertically adjustable position by a telescoping post 68. The platform 67 has a notch 69 to provide clearance for passage of the bobbin 32.

Use of the machine as thus far described is substantially as follows:

The bobbin 32 is provided with a joint 71 by means of which the core 54 may be linked with the bobbin. The joint is then re-formed and the screw 57 is taken out, allowing the plate 44 to be swung out to permit mounting of the bobbin 32 in the wheels 29 and 33.

The bobbin 32 has a peripheral cavity 73 (Figure 4) facing outward and adapted to receive a filament such as insulated wire 74. The wire 74 is supplied from a separate reel, not shown. One end of the wire 74 is secured to the bobbin 32 within the cavity 73, and the bobbin is then rotated clockwise, as shown by the arrow 72, until the desired amount of wire has been wound into the cavity 73, as shown in Figure 4. The wire is then cut off and the loose end is secured to the core 54 by any suitable means. After closing of the plate 44, the winding operation is then ready to begin by rotating the bobbin 32 in the same direction as that in which the filament was wound on, namely, clockwise.

In the winding operation, the wire 74 is paid out from the cavity 73 over the front edge 76 of the bobbin and is then guided inwardly by being passed over the inner edge 75 of the plate 44, as best seen in Figure 4. The fragmentary section view Figure 4 shows the wire 74 substantially in the position 74*a* illustrated in Figure 7. It will be noted that the wire 74, in passing around the front edge 76 of the bobbin 32 and around the inner edge of the plate 44, has a Z kink 77 formed therein, which tends to lock the wire in against the inside face of the bobbin 32. This Z kink is formed while the wire 74 is held in position by the pressure of the metal facing 48 backed by the sponge rubber pad 47. At the notch 53, where the pad 47 terminates, the wire 74 loses the securement of the pad 47; and at this point the Z kink 77 becomes of great importance in holding the wire in the cavity 73 against the appreciable centrifugal force which tends to force it outward. As long as the Z kink 77 remains locked inside the bobbin 32, as shown in Figure 8, the centrifugal force is not able to employ the looseness of the wire loop 74*b* to pull the remainder of the wire out of the cavity 73. It has been found in practice that the Z kink 77 is quite effective to maintain the wire in the bobbin cavity 73 as long as high speeds or small cross-section coils (cores 54) are not involved. However, at high speed and with small cores, it has been found that the Z kink 77 comes unlocked from inside the bobbin and slips around the side, allowing centrifugal force to throw the wire out of the cavity 73. Contributing to this unlocking of the Z kink 77 is the fact that in some of the cycles or turns, as the loop 74 is drawn in about the core 54, as shown in Figure 8, the wire 74 strikes the inside edge of the core 54, as shown at 54*a*. This appears to set up a shock wave which travels down the wire 74 to the Z kink 77 disturbing the locking; and the Z kink 77 is thrown axially out, i.e., in a direction parallel to the bobbin axis, from inside the bobbin 32, as shown in Figure 9. This is true particularly when the core inside diameter is small, i.e., for miniature winding. Release of the Z kink 77 as shown in Figure 9 enables centrifugal force to throw a rather large arc of the wire 74 radially outward from the cavity 73 as shown at 74*c* in Figure 9.

In accordance with the present invention, means are provided for assuring that this radial throw-out of wire 74*c* does not result in malfunctioning of the machine.

To this end, and in accordance with the present invention, there is provided feed-back means for feeding the thrown out portion of wire 74*c* back into the cavity 73 as the wire loop 74*b* is tightened up around the cores 54. This means, in the embodiment now to be described, comprises an elongate, resilient leaf spring member 78 secured to the control pad plate 44 by a suitable securement such as a screw 81. To accommodate the leaf spring 78, a peripheral portion of the plate 44 forming one wall 82 of the groove 46 is eliminated immediately to the right of the pressure pad 47, as shown at 83 and continuing counterclockwise up to the notch 53. As shown in Figure 1, it is not absolutely necessary to cut this wall 82 away, since the leaf spring 78 could be made curved

and spaced within the groove 46. However, the wall 82 serves no purpose at this point, since there is no pad 47 and it can just as well be removed. Furthermore, removal of the wall makes it easier to cause the free end of the spring 78 to be bent or twisted slightly obliquely, as shown in Figures 5 and 12 so as to overlie slightly the bobbin cavity 73 as best seen in Figure 12. The free end of the spring 78 is turned back slightly, as shown at 84, to prevent any danger of the edge rubbing against the bobbin. The resilient spring 78 is kept pressed against the edge of the bobbin 32, as shown in Figures 5 and 12, to any desired pressure by an adjusting screw 86 threaded into the plate 44. The pressure of the spring 78 on the bobbin 32 is adjusted in accordance with the size of wire being wound.

As a second means of preventing deleterious effect on the operation of the machine through the thrown out portion 74*c*, there is provided an anti-crossover means for preventing the loose portion of wire 74*c* from being thrown laterally over the rear edge of the bobbin 32, that is, the edge engaged by the supporting wheel 29. In the preferred embodiment, this anti-crossover means takes the form of a plurality of resilient deflector plates 87, four such plates being shown by way of example in Figure 1. The plates 87 are secured by screws 88 to the under edge of the guide plate 61, as shown in Figure 3. The plates 87 extend obliquely down and past the rear edge of the bobbin 32, as shown in Figures 3 and 6, and bear lightly against this edge by their resilience. The free end of each plate 87 is turned downward parallel and closely adjacent to the rear edge of the wall 82, as shown at 89. The portion 89 is disposed as close as possible to the wall 82 while still permitting sufficient clearance to always assure that there will be a slight resilient engagement between the deflector plate 87 and the edge of the bobbin 32, as shown in Figure 6.

Operation of the feed-back means 78 and the anti-crossover means 87 will now be described with particular reference to Figures 9 through 11.

Referring to Figure 9, it will be recalled that there had heretofore been described a phenomenon prevalent when small cores and/or high winding speeds are used. This phenomenon was the uncoupling or unlocking of the Z kink 77 from the inside of the bobbin 32. As shown in Figure 9, this produces the loose wire portion 74*c* which is thrown radially outward from the cavity 73 by centrifugal force.

At this point, the anti-crossover plates 87 come into play. As shown in Figures 6 and 9, the portion 74*c* may drop well below the confining edges of the cavity 73. At high speed, vibrations of the bobbin 32 in an axial direction, i.e., parallel to the rotative axis of the bobbin, may cause an axial displacement between the portion 74*c* and the bobbin 32, to such an extent that the portion 74*c* crosses axially behind or over the rear flange 91 of the bobbin 32. Such a crossover is prevented by the plates 87 which intercept the portion 74*c*, as shown in Figure 6, and prevent it from being thus displaced axially. The plates 87 thus keep the portion 74*c* generally in alignment with the cavity 73. That is, a pair of planes passing radially outwardly from the two sides of the cavity 73 will bound out an area within which the portion 74*c* is constrained by the anti-crossover plates 87. There is no harm in the portion 74*c* crossing axially beyond the forward flange 92 of the bobbin 32 because such a crossing would be automatically fed back by the feed-back means 78, as will be described hereinafter. The clearance between the ends 89 and the wall 82 is sufficiently small that the portion 74*c* will not be driven down through it.

Thus, as the winding proceeds and the loop 74*b* becomes smaller, as shown in Figure 10, the loose portion 74*c* is kept in alignment with the cavity 73 during the critical portion of the cycle illustrated in Figure 10.

As the cycle continues, a point is reached, which may be during that time in the cycle illustrated in Figure 10, wherein the wire 74 is brought against the feed-back spring 78. The sloping angle and overhang of the spring 78, illustrated in Figures 5 and 6, deflects the wire into the cavity 73. Since the wire 74 and more particularly the portion 74*c* has not yet been drawn tight, there is only a low tension in the wire which might force it between the spring 78 and the front edge 76 of the bobbin 32; and this tension is overcome by the resilient pressure of the spring 78 against the bobbin edge 76. At that point in the cycle where all of the slack in the wire has been taken out and returned to the cavity 73, the loop 74*b* has disappeared and the length of wire 74*d* remaining free of the cavity, as shown in Figure 11, is drawn taut between the core 54 and the point at which the spring 78 engages the bobbin 32. At this point, the tautness of the wire causes it to snap under the spring 78, between the spring 78 and the bobbin 32. Immediately thereafter, the wire comes into engagement with the first portion of the pressure pad 47, which, from that point on, controls the disposition of the wire with respect to the bobbin and in particular controls formation of the Z kink 77 and tension in the wire.

From the moment the wire 74 comes under the control of the pressure pad 47, a Z kink is formed, as shown at 77 in Figure 11. The position of this Z kink 77 in the wire 74 is not stationary, however, because from the position 74*e* to position 74*f* in Figure 11 and slightly beyond, wire is continuously being payed out over the edge of the bobbin under the control of the pressure pad 47. The Z kink 77 is diametrically opposite the core 54, as shown at 74*a* in Figure 7. From this point on, no further wire is payed out. On the contrary, a slack loop begins to be formed, as shown at 74*g* in Figure 7. This loop has no adverse effect on the wire in the bobbin, because the wire is maintained in the bobbin by the pressure pad 47 and continues to be so maintained until the point 74*h* is reached, where the control pad terminates. At this point, the Z kink 77 assumes control by its locking action within the inside of the bobbin 32 as explained hereinbefore.

The pressure pad 47 is backed up by discrete individual segments 49 in order to allow a graduation of pressure around the arc of the bobbin. Starting at the first segment following the feed-back spring member 78, the pressure is adjusted from a light wiping action gradually up to a heavy pressure at a point diametrically opposite the core 54 and substantially as shown at 74*a* in Figure 7. This gradual increase in pressure assures gradual application of tension to the wire without shock and also causes formation of a firm Z kink which locks in firmly within the bobbin. Clockwise from the point 74*a*, the pressure pad 47 is set at only a light wiping action, since there is no longer any continuing formation of the Z kink 77. The light wiping action of the pad 47 combined with the locking action of the Z kink 77 serves to keep the wire in position in the cavity 73, from position 74*a* through 74*h*. A light wiping action is preferred in order to minimize wear on the insulation of the wire as it passes between the bobbin 32 and the pressure pad 47 and more particularly the flexible metal facing 48 thereon.

The anti-crossover plates 87 are made quite resilient so that they may constantly press against the flange 91 of the bobbin 32 and thus follow any inaccuracies due to manufacturing tolerances which might exist in the true circular configuration of the flange 91.

In Figure 13 is shown an alternative form of feed-back means member. This means comprises a cylindrical housing 93 ensmalled and threaded at 81*a* into the plate 44. Reciprocably mounted in the ensmalled portion 81*a* is a plunger 78*a* having a rounded external end 84*a* bearing obliquely against the forward edge 76 of the bobbin 32. The plunger 78*a* is biased resiliently

against the edge 76 by a spring 94, the pressure of which is adjusted by an adjusting screw 86*a* threaded into the cylindrical mounting 93 proper.

The function of the member 84*a* is substantially the same as that of the spring 78. That is, it serves to catch and guide the wire 74 back into the cavity 73 until such time as all slack has been taken up, at which moment the wire is drawn between the bobbin and the plunger, the resiliency of the spring 94 permitting the slight retraction necessary for this passage.

The inner end of the plunger 78*a* is provided with an outward flange 96 which prevents the plunger from being impelled completely out of the holder upon removal of the bobbin 32.

An alternative form of anti-crossover means is shown in Figures 14 and 15. In this form, the several spring members 87 are replaced by an arcuate tube 87*a* positioned adjacent to the edge 91 of the bobbin 32, as shown in Figure 15. The tube 87*a* is provided with a plurality of jet holes 97 directed toward the edge of the flange 91. One end of the tube 87*a* is closed, as shown at 98, and the other end is connected to a flexible tube 99, by means of which fluid under pressure, such as air, may be admitted continuously to the tube 87*a*.

In operation, continuous jets of air are directed through the holes 97 against the edge 91 and serve to deflect the portion of wire 74*c* back into the cavity 73, thereby offsetting any vibration or axial motion of the loop 74*c* which might otherwise cause it to catch over the other edge 91 of the bobbin.

While the instant invention has been shown and described herein in what are conceived to be the most practical and preferred embodiments, it is recognized that departures may be made therefrom within the scope of the invention, which is therefore not to be limited to the details disclosed herein, but is to be accorded the full scope of the claims.

What is claimed is:

1. In a coil winding machine comprising a bobbin adapted to be linked with a core on which filament is to be wound, said bobbin having a peripheral cavity for the reception of said filament, means for rotating said bobbin in a given direction, means for paying off filament from said bobbin to said core, over one edge of said bobbin on one side thereof, as said bobbin is rotated in said direction, the combination of: feed back means for directing any loose loop of filament back into said cavity.

2. In a coil winding machine comprising a bobbin adapted to be linked with a core on which filament is to be wound, said bobbin having a peripheral cavity for the reception of said filament, means for rotating said bobbin in a given direction, means for paying off filament from said bobbin to said core, over one edge of said bobbin on one side thereof, as said bobbin is rotated in said direction, the combination of: feed-back means located on said one side of said bobbin, and bearing against the surface of said bobbin, for directing any loose loop of filament back into said cavity.

3. In a coil winding machine comprising a bobbin adapted to be linked with a core on which filament is to wound, said bobbin having a peripheral cavity for the reception of said filament, means for rotating said bobbin in a given direction, means for paying off filament from said bobbin to said core, over one edge of said bobbin on one side thereof, as said bobbin is rotated in said direction, the combination of: stationary feed-back means located on said one side of said bobbin, and bearing against the surface of said bobbin and slightly across said cavity, for directing any loose loop of filament back into said cavity.

4. In a coil winding machine comprising a bobbin adapted to be linked with a core on which filament is to be wound, said bobbin having a peripheral cavity for the reception of said filament, means for rotating said bobbin in a given direction, means for paying off filament from said bobbin to said core, over one edge of said bobbin on one side thereof, as said bobbin is rotated in said direction, the combination of: feed-back means for directing any loose loop of filament back into said cavity, and anti-cross-over means for preventing any loose filament loop from being thrown out laterally over the edge of said bobbin opposite said one edge.

5. In a coil winding machine comprising a bobbin adapted to be linked with a core on which filament is to be wound, said bobbin having a peripheral cavity for the reception of said filament, means for rotating said bobbin in a given direction, means for paying off filament from said bobbin to said core, over one edge of said bobbin on one side thereof, as said bobbin is rotated in said direction, the combination of: stationary feed-back means located on said one side of said bobbin and bearing against the surface of said bobbin and slightly over said cavity for directing any loose loop of filament back into said cavity, and anti-cross-over means located on the side of said bobbin opposite to said one side and bearing lightly against the edge of said bobbin opposite said one edge for preventing any loose filament loop from being thrown out laterally over said opposite edge.

6. In a coil winding machine comprising a bobbin adapted to be linked with a core on which filament is to be wound, said bobbin having a peripheral cavity for the reception of said filament, means for rotating said bobbin in a given direction, means for paying off filament from said bobbin to said core, over one edge of said bobbin on one side thereof, as said bobbin is rotated in said direction, the combination of a stationary, elongate, resilient, leaf feed-back member disposed on said one side of said bobbin and generally tangential thereof and bearing against the surface of said bobbin and slightly overhanging said cavity for directing any loose loop of filament back into said cavity; and a plurality of stationary, anti-cross-over resilient leaf members disposed, generally radially, on the side of said bobbin opposite to said one side and bearing lightly against the edge of said bobbin opposite said one edge for intercepting any loose filament loop and maintaining the same in alignment with said cavity.

7. In the process of feeding a filament from a bobbin to a core linked with said bobbin, the steps of engaging said filament with a feed-back member bearing against said bobbin, and feeding loose filament back on to said bobbin.

8. In a coil-winding machine comprising a bobbin adapted to be linked with a core on which filament is to be wound, said bobbin having a peripheral cavity for the reception of said filament, means for rotating said bobbin in a given direction, means for paying off filament from said bobbin to said core, over one edge of said bobbin on one side thereof, as said bobbin is rotated in said direction, the combination of: an elongate feed-back means located on said one side of said bobbin, disposed generally tangentially with respect to said bobbin, and bearing resiliently against said bobbin, for directing any loose loop of filament back into said cavity.

9. In a coil-winding machine comprising a bobbin adapted to be linked with a core on which filament is to be wound, said bobbin having a peripheral cavity for the reception of said filament, means for rotating said bobbin in a given direction, means for paying off filament from said bobbin to said core, over one edge of said bobbin on one side thereof, as said bobbin is rotated in said direction, the combination of: an elongate, resilient, leaf, feed-back means located on said one side of said bobbin, disposed generally tangentially with respect to said bobbin, and bearing resiliently against said bobbin, near one end of said member, for

directing any loose loop of filament back into said cavity.

10. In a coil-winding machine comprising a bobbin adapted to be linked with a core on which filament is to be wound, said bobbin having a peripheral cavity for the reception of said filament, means for rotating said bobbin in a given direction, means for paying off filament from said bobbin to said core, over one edge of said bobbin on one side thereof, as said bobbin is rotated in said direction, the combination of: an elongate, resilient, leaf, feed-back means located on said one side of said bobbin, disposed generally tangentially with respect to said bobbin, and bearing resiliently against said bobbin, near one end of said member, and slightly over-hanging said cavity, at the point where it bears against the bobbin, for directing any loose loop of filament back into said cavity.

11. In a coil-winding machine comprising a bobbin adapted to be linked with a core on which filament is to be wound, said bobbin having a peripheral cavity for the reception of said filament, means for rotating said bobbin in a given direction, means for paying off filament from said bobbin to said core, over one edge of said bobbin on one side thereof, as said bobbin is rotated in said direction, the combination of: anti-cross-over deflector plate means extending generally radially outward from said bobbin, located on the side of said bobbin opposite to said one side, and bearing lightly against the edge of said bobbin opposite said one edge, for intercepting any loose filament loop and maintaining the same in

alignment with said cavity, thereby preventing such loop from being thrown out laterally over said opposite edge.

12. In a coil-winding machine comprising a bobbin adapted to be linked with a core on which filament is to be wound, said bobbin having a peripheral cavity for the reception of said filament, means for rotating said bobbin in a given direction, means for paying off filament from said bobbin to said core, over one edge of said bobbin on one side thereof, as said bobbin is rotated in said direction, the combination of: anti-cross-over deflector plate means in the form of a plurality of stationary resilient leaf-members extending generally radially outward from said bobbin into the annular region lying immediately circumjacent said cavity, located on one side of said bobbin opposite to said one side, and bearing lightly against the edge of said bobbin opposite said one edge for intercepting any loose filament loop and maintaining the same in alignment with said cavity, thereby preventing such loop from being thrown laterally over said opposite edge.

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