United States Patent

[11] 3,625,443

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[54] **BOBBIN WINDING MACHINE**
7 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** ..... **242/18 A,** 242/20
[51] **Int. Cl.** **B65h 54/12**
[50] **Field of Search** ..... 242/18, 20, 21, 22, 23, 24, 25 A, 35.5, 7.09, 18 A

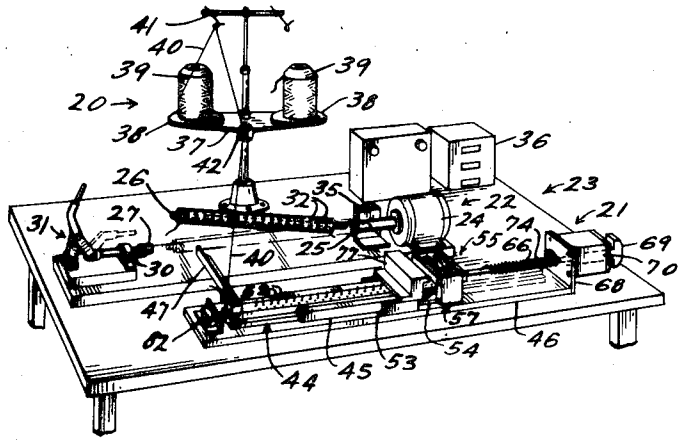
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ABSTRACT: A machine for winding measured lengths of thread onto a series of identical bobbins or the like. The machine has a removably mounted arbor on which the empty bobbins are assembled in adjacency and which is rotated at high speed. A continuous length of thread is fed to the bobbins over a thread guide that slides along ways parallel to the axis of the arbor. When each bobbin is filled, a thread guide indexing mechanism is actuated to advance the thread guide two bobbin widths for flipping the thread off of the bobbin just wound and then immediately to retract the thread guide one bobbin width to guide the thread onto the empty bobbin adjacent that bobbin just wound.



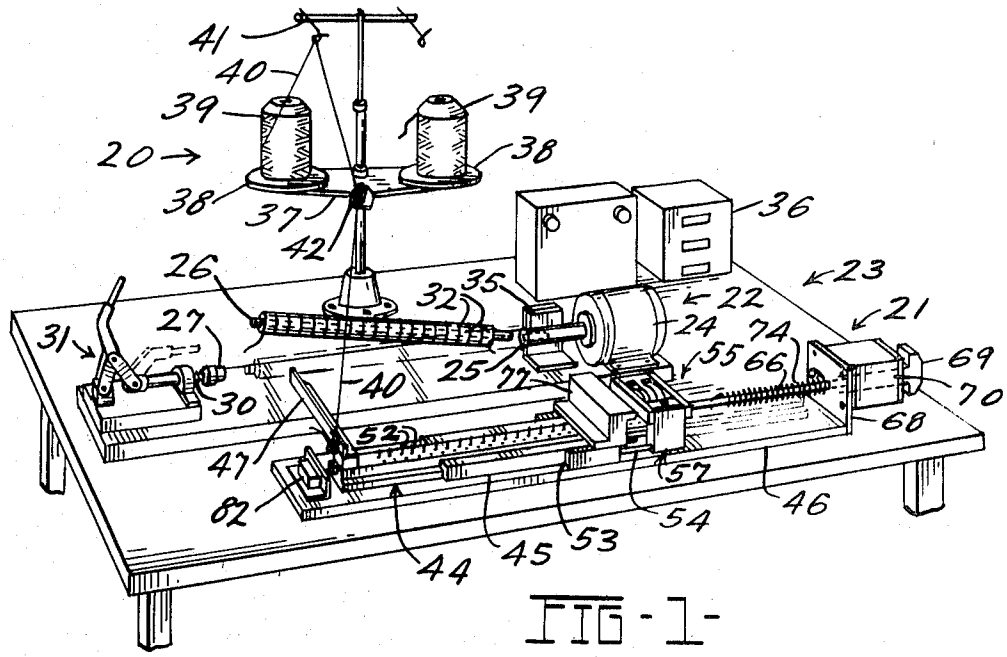


FIG-1-

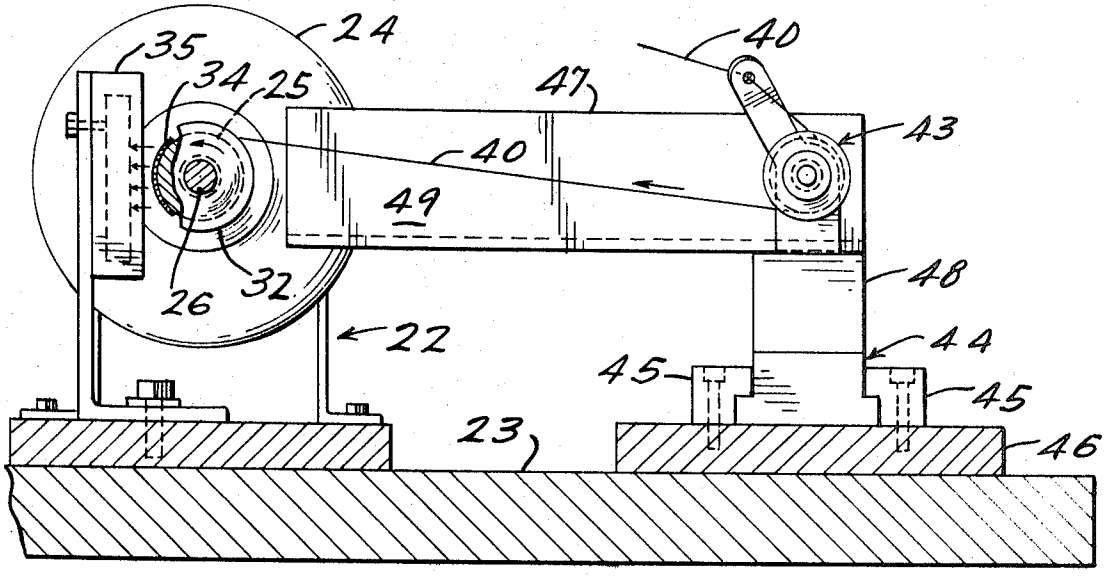


FIG-4-

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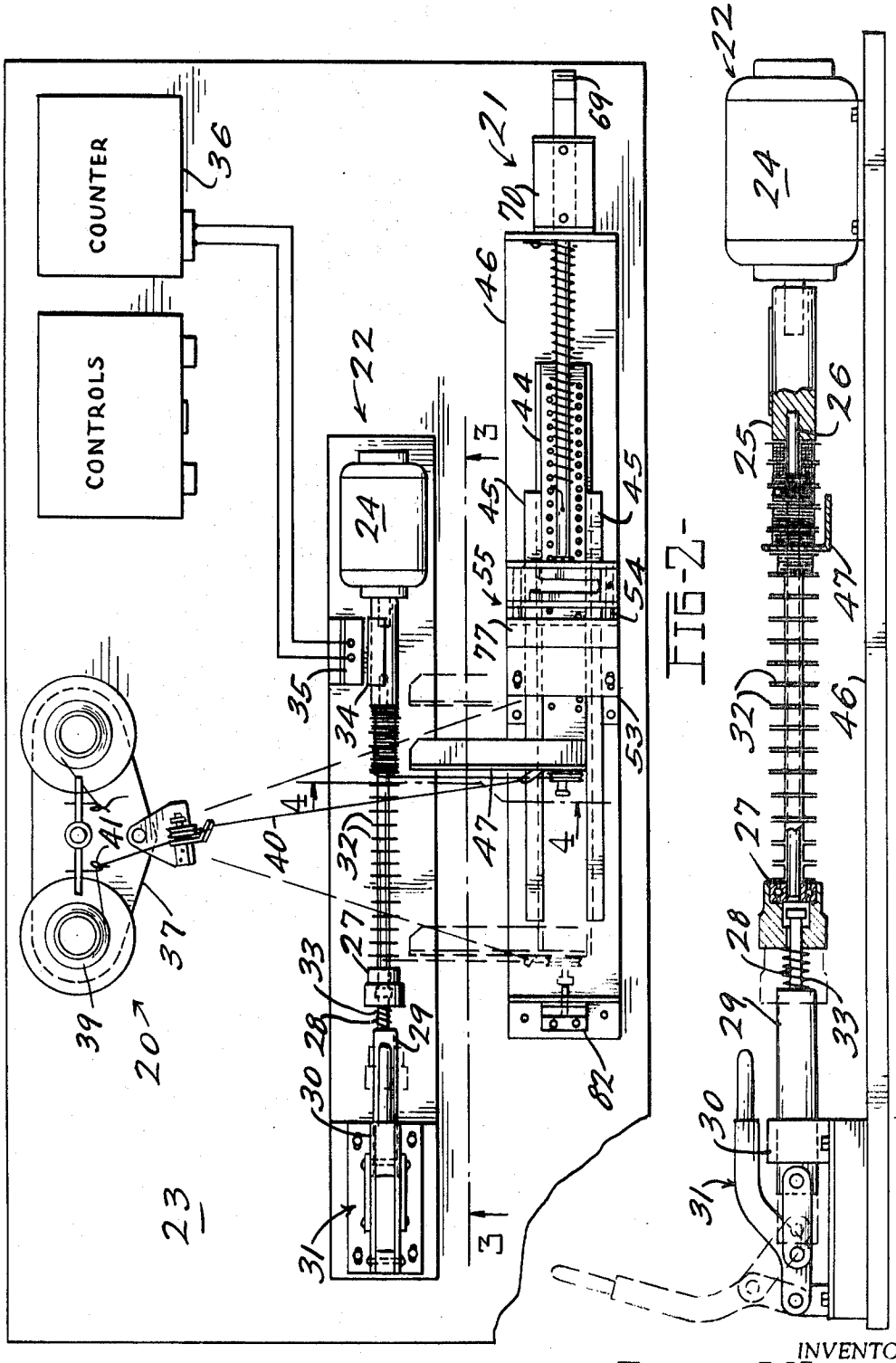


FIG-2-

FIG-3-

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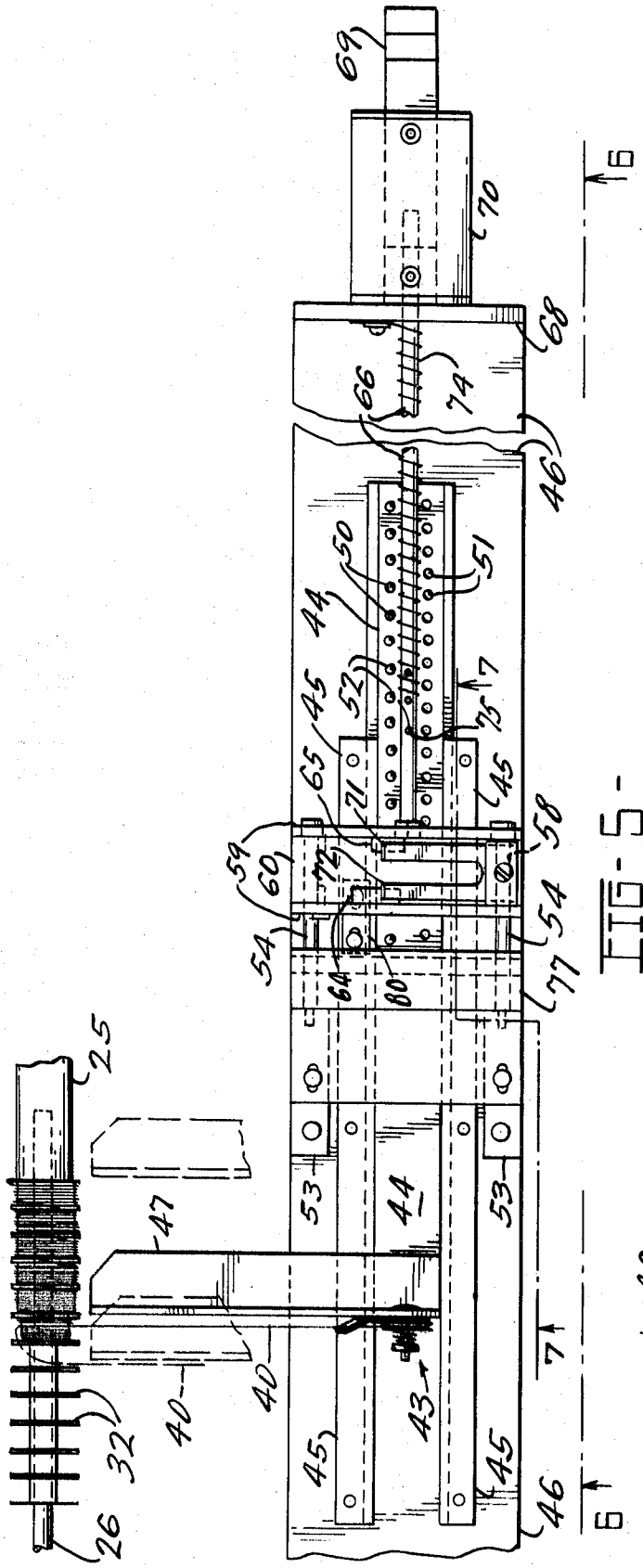


FIG-5-

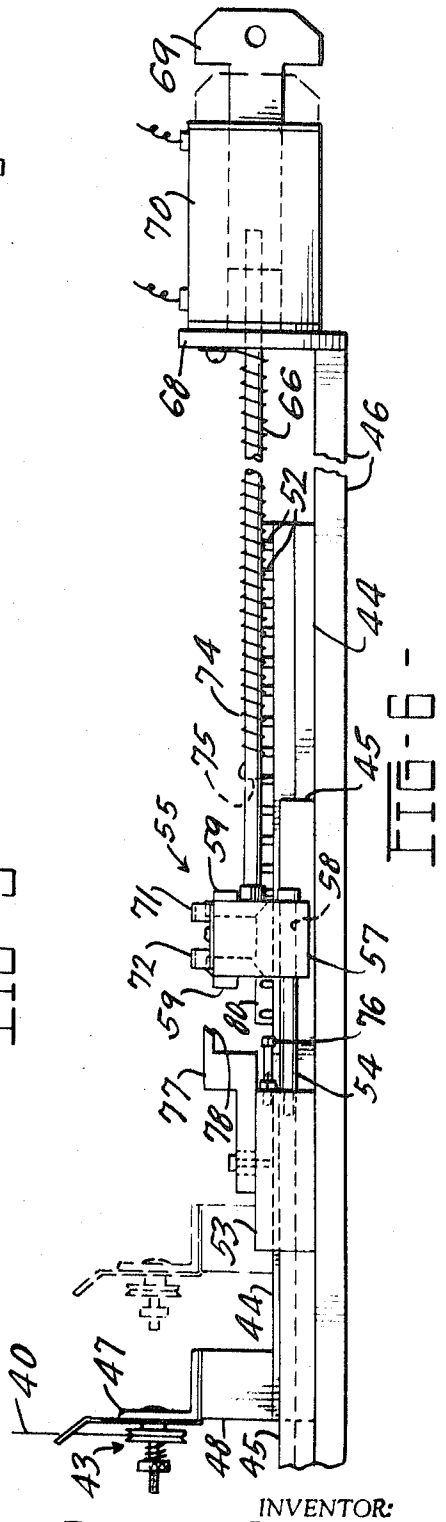


FIG-6-

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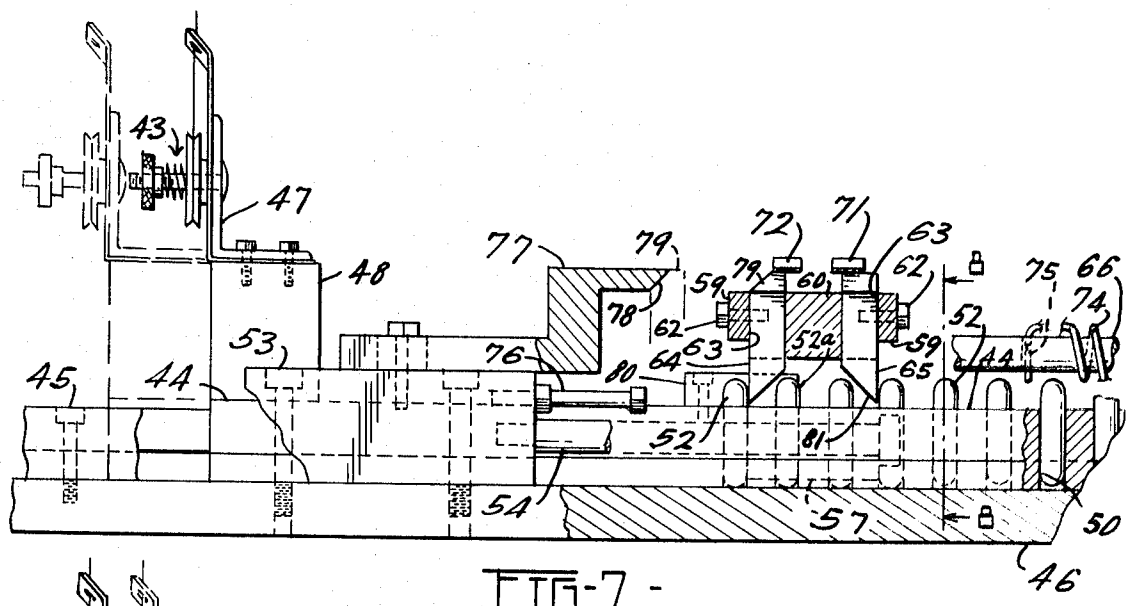


FIG-7-

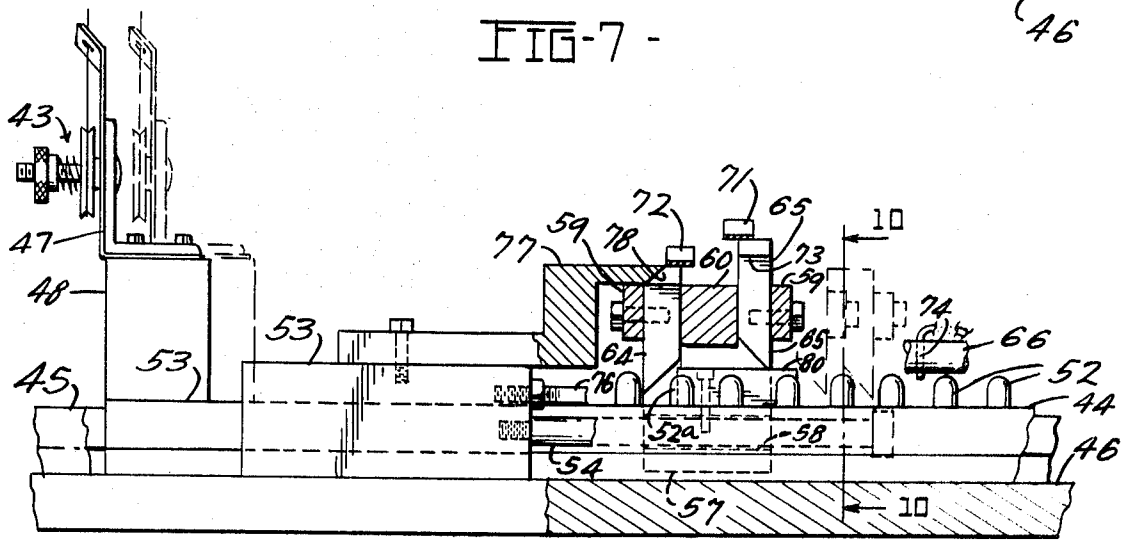


FIG-9-

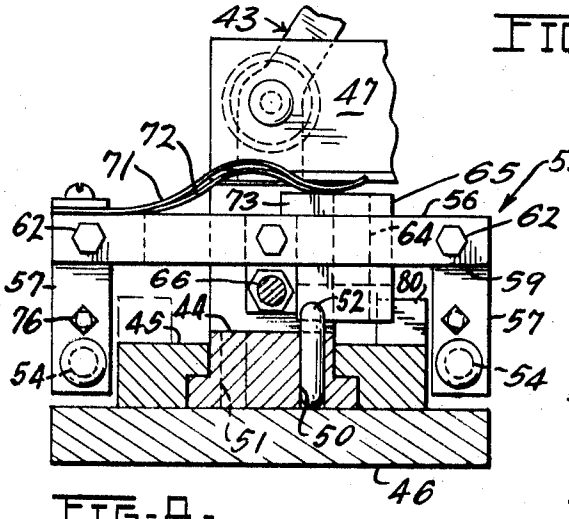


FIG-8-

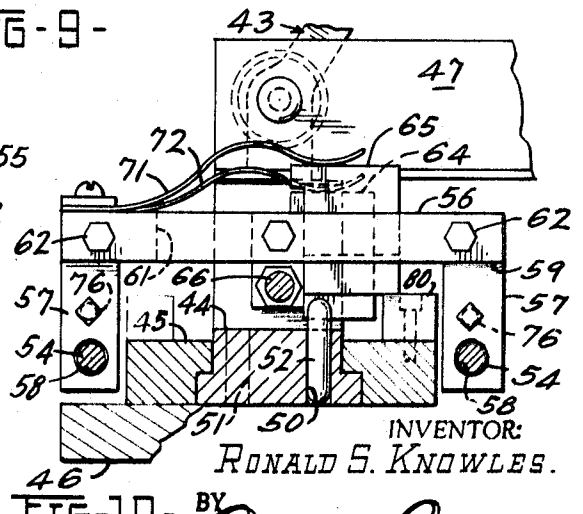


FIG-10-

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BOBBIN WINDING MACHINE

FIELD OF THE INVENTION

One of the continuing problems in industrial sewing plants or shops is the need for a large supply of bobbins wound with appropriate thread which the machine operators can rapidly insert into the industrial sewing machines as necessary. The supplying of prewound bobbins for industrial sewing machines has become a recognized business but, in order for suppliers to sell them at reasonable prices, very large orders for bobbins wound with a particular size thread of a particular color must be placed with the bobbin prewinding company or the cost of the prewound bobbins becomes prohibitive. In industrial sewing plants having the problem of a variety of colors and sizes of thread, or the necessity for identical prewound bobbins in smaller quantities than those economically available from companies who prewind bobbins, the plant operator is faced with the necessity of either over purchasing or having the bobbins wound on the individual sewing machine at a considerable cost.

An apparatus embodying the present invention makes it possible for the operator of an industrial sewing plant of not major production to economically prewind bobbins for a number of industrial sewing machines, in quantities of, say, 20–50 at a time, thus enabling him to supply his machine operators with prewound bobbins but not obligating himself for the purchase of large quantities thereof in order to achieve economical costs.

It is therefore the principal object of the instant invention to provide a machine capable of automatically winding bobbins but which is not so expensive nor so slow in operation as to make prohibitive the prewinding of bobbins in a relatively small sized industrial sewing plant.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in perspective of a bobbin-winding machine embodying the invention;

FIG. 2 is a plan view of the machine illustrated in FIG. 1, but shown on an enlarged scale with a minor portion broken away;

FIG. 3 is a fragmentary vertical view, taken partly in section, from the position indicated by the line 3—3 of FIG. 2;

FIG. 4 is a fragmentary vertical sectional view taken along the line 4—4 of FIG. 2 and shown on a considerably enlarged scale;

FIG. 5 is a fragmentary, detail, plan view of a portion of the mechanism illustrated in FIG. 2 and shown on an enlarged scale;

FIG. 6 is a fragmentary view in elevation taken from the position indicated by the line 6—6 of FIG. 5;

FIG. 7 is a fragmentary view, partly in section and partly in elevation and with parts broken away, taken along the line 7—7 of FIG. 5;

FIG. 8 is a fragmentary, vertical, sectional view taken along the line 8—8 of FIG. 7 and is shown on an enlarged scale;

FIG. 9 is a view similar to FIG. 7 but showing the mechanism in a different position; and

FIG. 10 is a fragmentary vertical sectional view taken along the line 10—10 of FIG. 9 and shown on an enlarged scale.

DESCRIPTION OF A PREFERRED EMBODIMENT

A bobbin-winding machine embodying the invention comprises a thread supply generally indicated in FIG. 1 by the reference number 20, a thread guide and indexing mechanism 21 and a bobbin mounting and rotating mechanism 22 all of which may be mounted upon a table 23. The bobbin mounting and rotating mechanism 22 comprises an electric motor 24 the shaft of which mounts a rotatable collet 25 that is adapted to receive and rotate one end of a bobbin arbor 26. The other end of the bobbin arbor 26 is removably socketed in an axially aligned thrust bearing 27 that is rotatably and slidably supported by a stem 28. The stem 28 is mounted by a strut 29 that is slidably carried by a sleeve bearing 30 and connected to a toggle clamp 31.

The arbor 26 is adapted to mount and rotate a plurality of identical bobbins 32. A coil spring 33 is positioned on the stem 28 between the end of the strut 29 and the thrust bearing 27 in order to urge the thrust bearing 27 toward the motor 24 thus to squeeze the bobbins 32 against each other on the arbor 26 to increase the frictional engagement between the sides of the bobbins 32 so that all the bobbins 32 on the arbor 26 rotate with the arbor 26 when the motor 24 is energized.

The collet 25 is fabricated from a nonmetallic material and mounts a segmental, magnetic lamination 34 (see also FIG. 4) adjacent which there is located a sensing mechanism 35. With each revolution of the collet 25, the lamination 34 passes adjacent the sensing mechanism 35 and, in response thereto, a revolution counter 36 is energized. The revolution counter 36 is presettable for the number of revolutions of any one of the collets 32 which is necessary to wrap on that particular collet 32 a full measure of the particular thread being wound. This is determined for any particular gauge of thread and then for that thread on that bobbin, the counter 36 is preset upon each successive energization of the bobbin-winding machine embodying the invention.

When it is desired to insert an arbor 26 in the mechanism 22, the toggle 31 is opened to the position indicated by dotted lines in FIG. 3, and a suitable number of bobbins 32 of the predetermined size are slid over an arbor 26. The ends of the arbor 26 are inserted into the collet 25 and the thrust bearing 27. The toggle 31 is swung downwardly to move the thrust bearing 27 into engagement with the end one of the bobbins 32 the spring 33 functioning to press the thrust bearing 27 against the last bobbin 32 on the arbor 26 as shown in FIG. 3. After all of the bobbins 32 in the group on the arbor 26 are wound, as will be described below, the operator opens the toggle 31, removes the arbor 26 and wound bobbins from the mechanism (as illustrated in FIG. 1) and delivers them to a sewing machine operator who is performing an operation requiring the particular thread which has been wound upon the particular group of bobbins 32.

The thread supply 20 comprises a vertically adjustable stand 37 having one or more turntables 38 each of which supports a supply spool 39. A length of thread 40 is lead from one of the spools 39 through an overhead eye 41 and a conventional tensioning guide 42 to a traveling tensioning guide 43 that is mounted upon a slide generally indicated by the reference number 44. The slide 44 is mounted in parallel guideways 45 erected on a base 46 that is carried by the table 23, the guideways 45 extending parallel to the bobbin arbor 26. The thread 40 is lead around the traveling tensioning guide 43 and thence to the first one of the bobbins 32 on the arbor 26 at the beginning of a bobbin-winding cycle.

The traveling tensioning guide 43 and a thread guide bar 47 are both carried by a block 48 secured on the end of the slide 44. The guide bar 47 extends horizontally from the block 48 into close adjacency to the perimeters of the bobbins 32 and has a flat vertical face 49 of a height approximately equal to or greater than the outside diameter of the sides of the bobbins 32.

In the embodiment of the invention illustrated in the drawings, the slide 44 has two longitudinally extending series of pinholes 50 and 51 each of which is uniformly spaced on center-to-center distances corresponding to bobbins of different widths. In the slide 44 there are 21 holes 50 and 25 holes 51. Each of the holes 50 and 51 is adapted to receive one of a plurality of positioning pins 52, and 21 pins 52 are shown in place in the pin-receiving holes 50. This series of 21 pins 52 provides for the successive winding of 20 individual bobbins the longitudinal spacing between the bobbins on the arbor 26 equaling the center distance between the pinholes 50. The more closely spaced series of pinholes 51 is intended for use when 24 slightly narrower bobbins are to be wound on the same machine. The holes 50 and 51 are used alternatively depending of course, upon the axial width of the particular bobbins being wound. These two spacings are such that a single slide 44 is useable for winding the two most commonly used types of bobbins.

Stop blocks 53 are erected on the base 46, one on each side of the ways 45 and each of the stop blocks 53 mounts a horizontal guide rod 54. A saddle shaped indexing yoke 55 has a bridge 56 and two depending wings 57. Each of the wings 57 has a horizontal bore 58 through which the respective one of the guide rods 54 extends to guide the yoke 55 for horizontal reciprocation relative to the stop blocks 53.

The bridge 56 comprises a pair of horizontal side members 59 (FIGS. 7 and 8), a center block 60 and end spacers 61. The side members 59, center block 60 and end spacers 61 are assembled to each other by horizontal machine screws 62 and thus form two sets of vertical ways 63 for the reception of vertically movable dogs 64 and 65. The dog 64 functions as a "drive" dog and the dog 65 as a "return" dog. The two dogs 64 and 65 (See FIG. 10) are shown in their respective ways 63 at the side of the slide 44 for engagement with the set of pins 52 fitted into the pinholes 50.

A thrust rod 66 is threaded at one end into a depending ear 67 of one of the side members 59 of the yoke 55 and at its other end the rod 66 extends horizontally through a guide plate 68 erected at the end of the base 46 and is connected to an armature 69 of a solenoid 70 carried by the guide plate 68. Each energization of the solenoid 70 urges its armature 69 forwardly (to the left in FIG. 5) and through the thrust rod 66 moves the yoke 55 a distance corresponding to the width of two of the bobbins 32 being wound i.e., a distance corresponding to the center-to-center spacing of two of the pins 52.

As can best be seen in FIGS. 7–10 inclusive, the drive dog 64 and the return dog 65 are urged downwardly in their ways 63 by leaf springs 71 and 72 which are mounted on the bridge 56 and engaged with the upper surfaces of the dogs 64 or 65. Each of the dogs 64 and 65 has a laterally extending finger 73 to limit its downward movement in its respective way 63. The lower ends of the two dogs 64 and 65 are beveled (FIGS. 7 and 9), with the bevels on the dogs 64 and 65 being inclined in opposite directions thereby allowing the return dog 65 to ratchet over the tops of the pins 52 during a forward stroke and allowing the drive dog 64 to ratchet over the pins 52 during a return stroke. Longitudinally, the two dogs 64 and 65 are aligned with the pins 52 as can best be seen in FIGS. 8 and 10 so that as the traveling yoke 55 is reciprocated by the action of the solenoid 70 during a forward stroke, the drive dog 64 engages behind one of the pins 52 to move the slide 44 forwardly. The thrust rod 66 and traveling yoke 55 are returned by a return spring 74 which extends along and around the thrust rod 66, the rear end of the spring 74 being fixed to the guide plate 68 and the forward end of the spring 74 being engaged in a diametrically extending hole 75 drilled through the thrust rod 66.

Each time the solenoid 70 is energized, upon completion of the predetermined number of revolutions of the bobbin arbor 26, the thrust rod 66 pushes the yoke 55 forwardly two interbobbin steps. At the initiation of this movement (FIG. 7) the drive dog 64 is engaged on the back side of one of the pins 52, being retained in its lower position by its spring 72, so the slide 44 is moved rapidly forwardly two steps from the position shown in solid lines in FIG. 7 to the position shown in broken lines in FIG. 7. During this movement of the yoke 55, the thread guide bar 47 strikes the thread 40, just prior to its engagement with the respective bobbin 32 being wound, so as to "flip" the thread forwardly two-steps (see dotted line indication in FIG. 5) thereby to disengage the winding thread from the bobbin 32 just completed. Precise limitation of the forward two-step stroke is controlled by a pair of adjustable stops 76 that are threaded into the stop blocks 53 and engaged by the leading edges of the yoke wings 57. A retainer 77 which has a beveled nose 78 is engaged by a complementary beveled edge 79 on the front upper corner of the feed dog 64 when the yoke 55 reaches the forward limit of its movement. The engagement of the edge 79 of the dog 64 with the nose 78 ensures that the dog 64 is retained in its lowermost position at the end of a forward stroke. This prevents the dog being cammed upwardly by a following pin 52*a* (see FIGS. 7 and 9) which might occur if inertia causes the slide 44 to travel beyond the two-step distance so that the following pin 52*a* strikes the beveled bottom edge of the dog 64. Otherwise, the dog 64 might be cammed upwardly by the pin 52*a* and the slide 44 could escape and be moved too far.

As the yoke 55 moves forwardly, the return dog 65 engages a lifting block 80 so that its lower beveled edge 81 cams the return dog 65 upwardly (from the position shown in dotted lines to the position shown in solid lines in FIG. 9) lifting the bottom end of the return dog 65 above the level of the tops of the pins 52. After completion of the forward two-step stroke and deenergization of the solenoid 70, the return spring 74 pulls the thrust rod 66 and the yoke 55 backwardly sliding the return dog 65 off of the lifting block 80 and, under the urging of the spring 71, the dog 65 drops down in front of one of the pins 52 so that the entire slide 44 is returned one full step.

During this movement of the yoke 55, the thread guide bar 47 moves from the solid line position shown in FIG. 5 to the broken line position shown therein. Because the thread 40 is closely adjacent the face 49 of the bar 47, when the bar 47 is moved forwardly, the thread 40 is also pushed forwardly by the bar 47 and at a sharp angle relative to its former path. This sharp angle causes the thread 40 to be guided across the adjacent flanges of the finished and empty bobbins 32. When the thread guide bar 47 is moved backwardly to align the thread 40 with the empty bobbin 32, tension on the thread 40 pulls it down and into the space between the flanges of the empty bobbin 32. The thread engages the hub of the new bobbin 32 upon which it then winds as the bobbin arbor continues to rotate.

When it is desired to wind a plurality of bobbins of a narrower width and the spacing pins 52 are inserted into the series of holes 51 in the slide 44, it is necessary also to adjust the positioning of the stops 76 and the retainer 77 in order to determine the end of the two-step stroke of the yoke 55 to correspond to a two-step distance between adjacent ones of these narrower bobbins 32. The dogs 64 and 65 are also lifted from the ways 63 in which they are shown in FIGS. 8 and 10 and moved over to the opposite side of the bridge 56 in order to be longitudinally aligned with the pins 52 in the series of holes 51.

As each bobbin is wound with a length of thread and the magnetic responsive sensing mechanism 35 signals the revolution counter 36 to the predetermined number of turns necessary to fill a bobbin 32, the sequence of two-step forward movement followed by one-step rearward movement proceeds to shift the thread 40 from each completely wound bobbin 32 to the next adjacent bobbin 32. When the last of the group of bobbins 32 on the arbor 26 is being wound, the slide 44 reaches the end of its travel (see FIG. 2) and after the completion of the winding of the last of the bobbins 32 has taken place, the next signal from the revolution counter 36 to the solenoid 70 results in the yoke 55 being urged forwardly by the solenoid 70 into engagement with a limit switch 82 (see FIG. 2) which is connected in the electrical control circuit so as to open the power circuit to the motor 24 to stop the rotation of the bobbin arbor 26. The operator then removes the arbor 26 and the group of wound bobbins 32, manually moves the slide 44 back to starting position, resets the revolution counter and the various controls and commences the winding of a new series of bobbins 32 on an arbor 26 newly inserted into the bobbin mounting and rotating mechanism 22.

I claim:

1. A bobbin winding machine comprising, in combination, a rotatable, elongated arbor adapted to receive and to rotate a plurality of identical bobbins that are assembled thereon, means mounting said arbor for rotation and for rotating said arbor and said bobbins, means for mounting a supply of thread, a thread guide including a tensioning device for guiding the thread from the supply onto said bobbins, a guide way for said guide extending parallel to the axis of rotation of said arbor, indexing means for moving said guide along said way in increments of distance corresponding to the axial width of one of said bobbins, means for counting the revolutions of said arbor and for delivering a signal upon the completion of a

number of revolutions of said arbor predetermined to result in the winding of a certain length of thread on a bobbin and means responsive to such signal for actuating said indexing means to move said guide forwardly along said way two increments of distance and returning said guide one increment of distance for transferring the thread off of a wound bobbin and onto the next adjacent empty bobbin.

2. A machine according to claim 1 in which the thread guide comprises an elongated bar movable along the guideway and said indexing means comprises a plurality of vertical stops positioned on said bar that are spaced from each other even increments of distance along said bar, and a feeder mounted adjacent to and for forward and return reciprocation along said guideway, said feeder having means engageable successively with said stops.

3. A machine according to claim 2 in which the feeder comprises two dogs which are alternately engageable with the stops on the thread guide bar, one of said dogs being engageable during the forward movement of said feeder and the other of said dogs being engageable during the return movement of said feeder, and means for disabling the other one of said dogs during the first increment of distance of movement of said feeder during the return stroke thereof.

4. A machine according to claim 1 in which the means for counting the revolutions of the arbor comprises a magnetized lamination on a segment of the arbor mounting means and a counter responsive to the passage of such lamination mounted adjacent to said arbor mounting means.

5. A machine according to claim 3 and mechanism for moving said feeder comprising a solenoid for moving said feeder forwardly two increments of distance upon each actuation thereof.

6. A bobbin-winding machine comprising, in combination, a rotatable, elongated arbor adapted to receive and to rotate a plurality of identical bobbins that are assembled thereon, means mounting said arbor for rotation and for rotating said arbor and said bobbins, means for mounting a supply of thread, a thread guide including a tensioning device for guiding the thread from the supply onto said bobbins, a guide way for said guide extending parallel to the axis of rotation of said arbor, indexing means for moving said guide along said way in increments of distance corresponding to the axial width of one of said bobbins, means for counting the revolutions of said arbor and for delivering a signal upon the completion of a number of revolutions of said arbor predetermined to result in the winding of a certain length of thread on a bobbin and means responsive to such signal for actuating said indexing means to move said guide forwardly from a winding position along said way a distance in excess of one increment of distance and returning said guide to one increment of distance from such winding position for transferring the thread off of a wound bobbin and onto the next adjacent empty bobbin.

7. A machine according to claim 6 in which said indexing means comprises a solenoid for moving said feeder forwardly along said way a distance at least equal to two increments of distance.

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