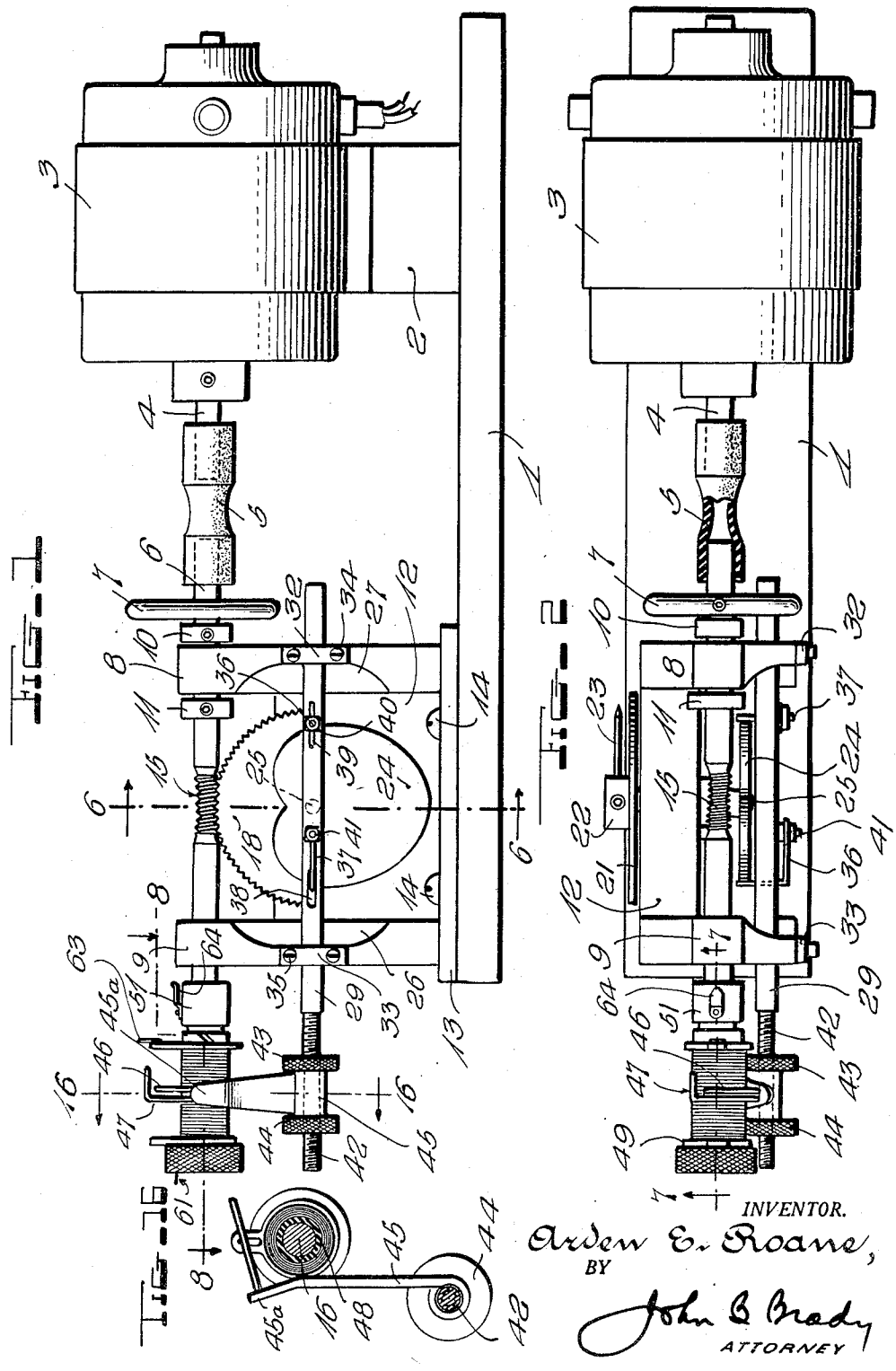
Aug. 5, 1952 A. E. ROANE 2,605,973

DIRECT DRIVEN WINDING MACHINE AND BOBBIN MOUNTING MEANS

Filed Oct. 6, 1948 3 Sheets-Sheet 1



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DIRECT DRIVEN WINDING MACHINE AND BOBBIN MOUNTING MEANS

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FIG. 3

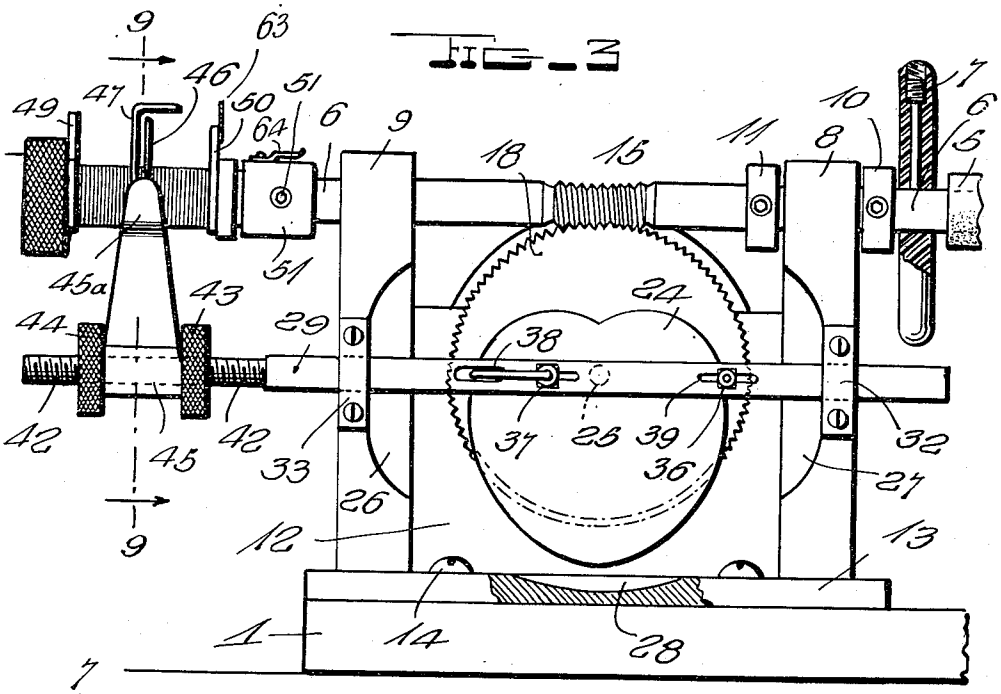


FIG. 4

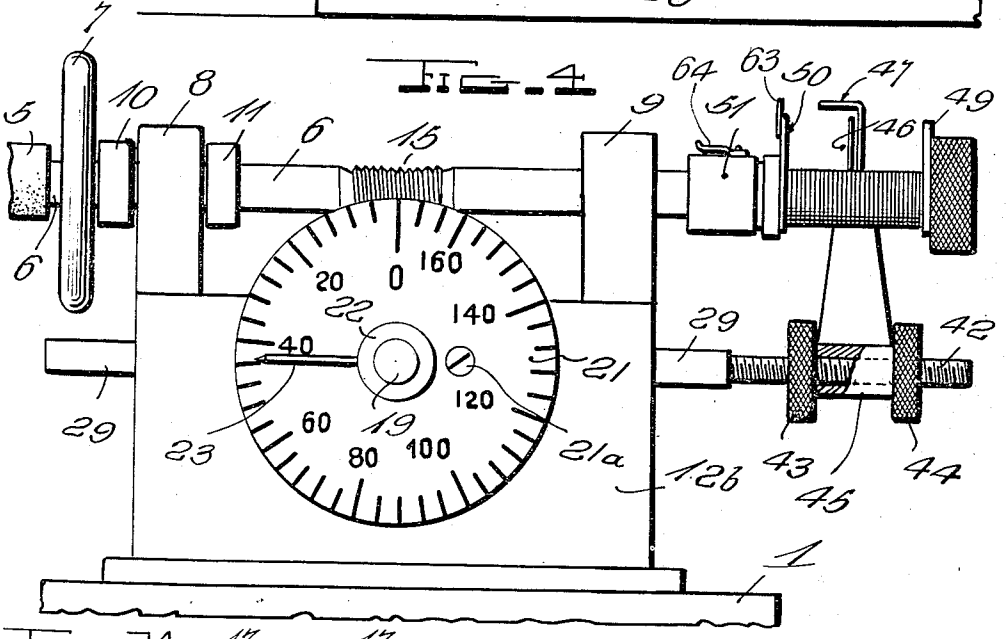


FIG. 14

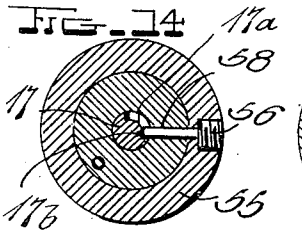
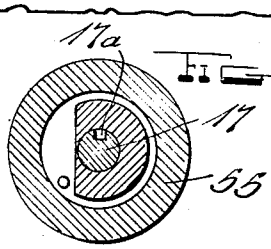


FIG. 15



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FIG. 5

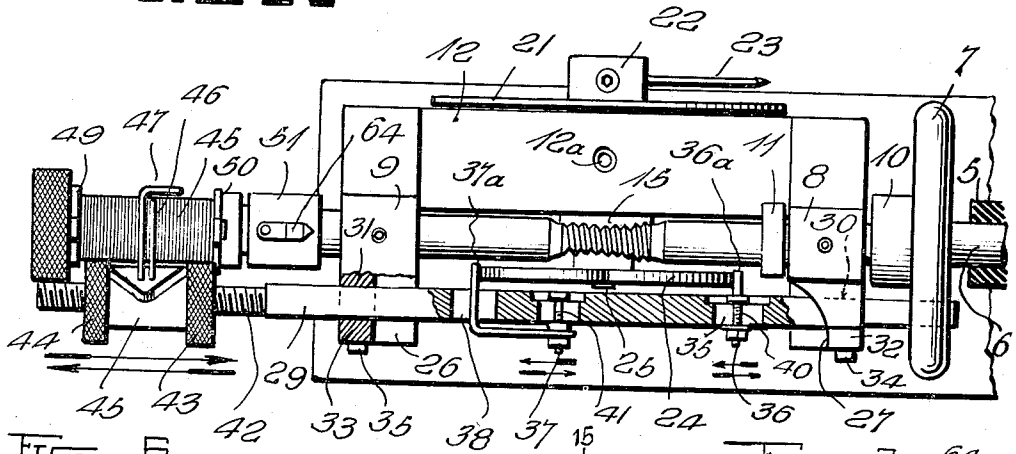


FIG. 6

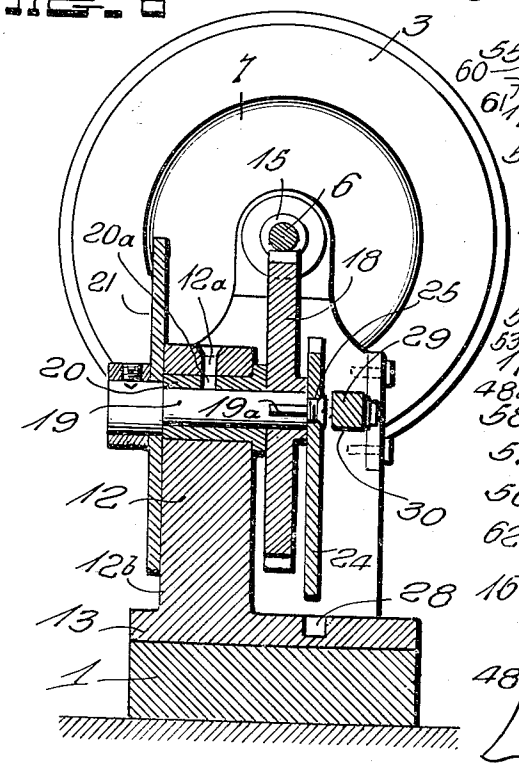


FIG. 7

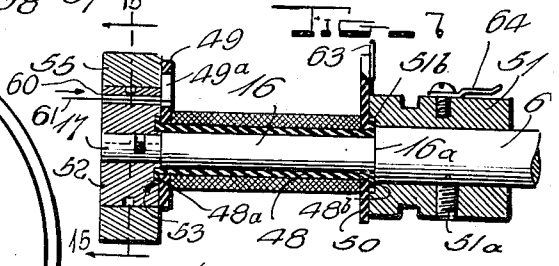


FIG. 8

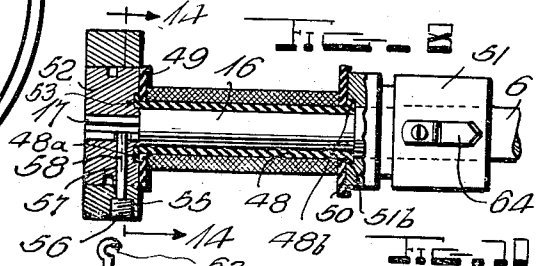
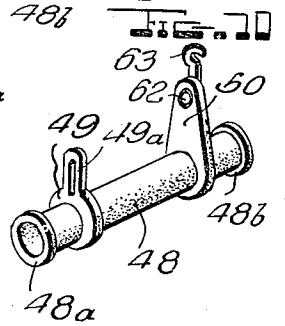


FIG. 10



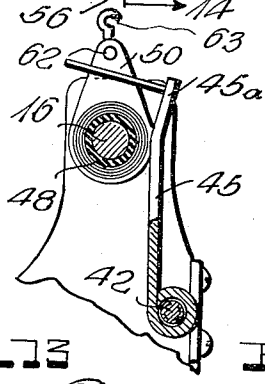


FIG. 11

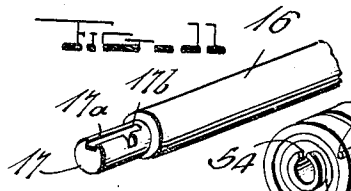


FIG. 12

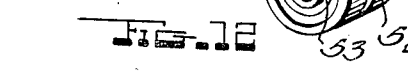


FIG. 13

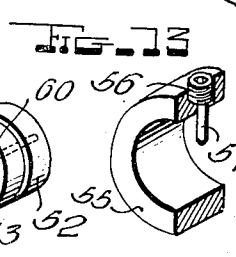


FIG. 9

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UNITED STATES PATENT OFFICE

2,605,973

DIRECT DRIVEN WINDING MACHINE AND BOBBIN MOUNTING MEANS

Arden E. Roane, Hagerstown, Md.

Application October 6, 1948, Serial No. 53,108

3 Claims. (Cl. 242—9)

1

My invention relates broadly to winding machines and more particularly to an efficient construction of winding machine selectively adaptable for uniform winding of bobbins of differing lengths at relatively high speed.

One of the objects of my invention is to provide an adjustable mechanism for winding machines for controlling the distribution of wire, thread, yarn, or other textiles along bobbins of various lengths and individually controllable in very compact manner.

Another object of my invention is to provide a construction of stroke controlling mechanism for winding machines which is readily interchangeable in adapting the machine to the winding of bobbins of various lengths.

Still another object of my invention is to provide an improved construction of wire or textile guide for use in winding of bobbins at relatively high speed.

A further object of my invention is to provide a construction of indicator mechanism for visually indicating the number of turns of wire or thread applied to a bobbin during a winding process.

Still another object of my invention is to provide an improved mounting means for the bobbin of a wire or thread winding machine adaptable to bobbins of differing lengths.

A further object of my invention is to provide a construction of wire or textile winding machine embodying a direct shaft drive through a relatively small motor, eliminating the necessity for overhead belt drive systems prevalent in conventional textile mills.

Other and further objects of my invention reside in a simplified construction of winding machine particularly adaptable to the winding of small electromagnets as set forth more fully in the specifications hereinafter following by reference to the accompanying drawings in which:

Figure 1 is a rear elevational view showing the winding machine of my invention; Fig. 2 is a top plan view of the winding machine illustrated in Fig. 1; Fig. 3 is an enlarged rear elevational view of the stroke control mechanism of my invention with parts of the machine broken away and illustrated in sections; Fig. 4 is a front elevational view of the portion of the machine illustrated in Fig. 3; Fig. 5 is a top plan view of the portion of the winding machine shown in Figs. 3 and 4, with parts of the stroke control mechanism broken away and illustrated in sections; Fig. 6 is an enlarged vertical sectional view taken substantially on line 6—6 of Fig. 1; Fig. 7 is a vertical sectional view taken through the mounting means for the bobbin of the winding machine, the view being taken substantially on line 7—7 of Fig. 2; Fig. 8 is a vertical sectional view taken through the bobbin of the winding machine substantially on line 8—8 of Fig. 1; Fig. 9 is a fragmentary sectional view taken substantially on line 9—9 of Fig. 3; Fig. 10 is a perspective view showing the assembly of the parts of the bobbin preparatory to a winding operation; Fig. 11 is a fragmentary perspective view of the end of the arbor which carries the bobbin to be wound; Fig. 12 is a perspective view of the removable end plate which is detachably connected to the end of the arbor during a winding operation for confining the bobbin on the arbor; Fig. 13 is a fragmentary perspective view of a ring member which co-acts with the removable end plate for securing the end plate in position during a winding operation; Fig. 14 is a transverse vertical sectional view taken substantially on line 14—14 of Fig. 8; Fig. 15 is a transverse vertical sectional view taken substantially on line 15—15 of Fig. 7; Fig. 16 is a vertical sectional view taken substantially on line 16—16 of Fig. 1.

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My invention is directed to an improved construction of winding machine for a variety of purposes such as the winding of bobbins with yarn, thread, cordage, wire, textiles and the like, and particularly for the winding of bobbins of electromagnets of relatively small size. The machine of my invention is a direct drive unit, eliminating the necessity of over-head belt and pulley arrangements prevalent in conventional textile mills. I provide in the driving unit of my invention a mechanism for selectively adapting the unit for the winding of bobbins of varying lengths. The parts of the mechanism may be readily interchanged for controlling the length of the stroke and the movement of the wire or textile guide mechanism. I also provide a novel form of mounting mechanism for the bobbin to be wound with protective means for the opposite ends of the textile, thread, or wire being wound. A counting mechanism is provided for visually indicating the number of turns applied to the bobbin for halting the winding operation at the proper time. Manual means are provided for turning the bobbin independently of the motor drive and facilitating the commencement and termination of the winding operation.

I have found the mechanism of my invention highly practical in manufacture and use, but I desire that the embodiment of my invention

shown herein shall be considered in the illustrative sense rather than in a limited sense.

Referring to the drawings in more detail reference character 1 designates the base of the equipment carrying the motor support 2 providing mounting means for the driving motor 3 which drives live spindle 4. The motor 3 may be of small size of either D. C. or A. C. type operating from conventional 110 volt power sources. The live spindle 4 connects to the shock absorbing flexible coupling 5, the opposite end of which connects to the driven shaft 6. Driven shaft 6 has a hand wheel control 7 secured thereon for revolving the driven shaft 6 under manual control. The driven shaft 6 is journalled in bearings in upwardly extending members 8 and 9 supported on base plate 13 secured by suitable means 14 to the base 1. The upwardly extending members 8 and 9 are interconnected by a plate portion 12. Base plate 13, plate portion 12 and the upwardly extending members 8 and 9 may be formed as a single casting serving as a housing for the adjustable stroke controlling mechanism. The front of the interconnecting plate 12 is represented at 12b representing the front of the casting which includes the base plate 13, intermediate plate 12 and upwardly extending members 8 and 9.

The bearings formed in the upwardly extending members 8 and 9 serve as journals for the driven shaft 6 which is confined in a predetermined position by means of adjustable collars 10 and 11 which may be set in position on driven shaft 6 to limit end-wise movement of driven shaft 6. The driven shaft 6 is provided with a worm 15 intermediate the upwardly extending members 8 and 9 and the driven shaft 6 extends through upwardly extending member 9 and is reduced in section at 16 and again at 17 to form an arbor for receiving the bobbin to be wound.

The worm 15 engages a worm wheel 18 keyed to which is a transverse shaft 19, united by key and key-way indicated at 19a, which is journalled in sleeve bearing 20 mounted in the support 12 which extends between upwardly extending members 8 and 9. The sleeve bearing 20 is provided with a lubricating aperture 20a alignable with the lubricating aperture 12a in the intermediate plate 12 for maintaining the shaft 19 lubricated at all times. The shaft 19 extends beyond the front of the face-plate 12b and through the indicator dial 21 and is secured there to the ferrule 22 to which is attached the radially extending pointer 23. The indicator dial 21 is fastened to the face 12b of intermediate plate 12 in any suitable manner such as screw 21a and carries graduations thereon for indicating the number of turns on the bobbin, properly compensated for the variation in diameter of the bobbin as the size of the bobbin increases during the progressive winding process.

The transverse shaft 19 carries a plate-like cam 24 on the end thereof and secured thereto by a readily removable set-screw 25 shown more clearly in Fig. 6. The screw 25 is readily removable and replaceable to permit the interchange of the plate-like cam for the selective control of strokes of different lengths. The plate-like cam is of cardioid shape which I have employed to secure the reversal in movement of the guide mechanism for the wire or textile being distributed along the bobbin and to ensure reversal of the stroke at the proper instant. To provide for the entire 360° of movement of the plate-like cam 24 of the various increasing sizes which may be applied to the winding mechanism for the winding of bobbins of various lengths I form the upwardly extended member 8 and 9 with inwardly curved recesses shown at 26 and 27. Similarly base plate 13 is recessed at 28 to permit sweep of the plate-like cam 24 or the associated cams of the increasing size of the set of cams employed for the winding machine. In controlling the stroke for bobbins of different lengths plate-like cams of a throw almost sufficient to approach the limiting distance allowed by the recesses 26, 27 and 28 may be applied to the end of shaft 19 so that adequate clearance is provided in the mechanism initially.

The stroke control mechanism includes bar 29 of polygonal section which is controlled by the plate-like cam 24 and is mounted for reciprocative movement in vertical extending members 8 and 9 which are recessed at 30 and 31 in section conforming to the polygonal section of the bar 29. Bar 29 is confined in the recesses 30 and 31 by removable strip members 32 and 33 removably secured in position by screws 34 and 35. When it is necessary to substitute plate-like cams for the cam 24 strips 32 and 33 are readily removable whereupon access is immediately had to the cam mechanism for the interchange of cams and the application of a cam of proper size. However, by virtue of the individual adjustment means 36 and 37 which I provide on bar 29, one plate-like cam may be made to serve over a wide range of stroke adjustments, thereby minimizing the number of cams to be utilized.

The adjustment means 36 and 37 comprise rod members having screw threaded ends extendable through longitudinally disposed slots 38 and 39 in the bar 29 and projecting in the path of the plate-like cam 24 as shown at 36a and 37a. The rod members 36 and 37 are clamped in a selected position by means of bolts with threaded ends shown at 40 and 41. Thus the ends of the rod members at 36a and 37a may be spread apart or moved closer to embrace the peripheral edge of plate-like cam 24 or any one of a series of cams of larger or smaller size which may be installed for controlling the length of the stroke.

The end of the bar 29 is screw-threaded as represented at 42 for the engagement of a pair of knurled adjusting nuts 43 and 44 which may be manually adjusted to move the wire or thread guide member 45 to a select position with respect to the bobbin to be wound. The wire or thread guide 45 comprises a plate member which is wrapped loosely around the screw-threaded portion 42 of bar 29 and terminates in a tapered tongue 45a which carries a pair of yieldably mounted wire or thread guides represented at 46 and 47. The wire or thread guide 47 extends across the path of the wire or thread guide 46 as shown.

In Figs. 7–16 I have shown more clearly the manner of assembling the bobbin on the arbor 16. In Fig. 10 I have illustrated the insulated tubular core 48 for the bobbin having a flanged end 48a which is formed to provide an abutment stop for a coil end 49 of insulation material. The tubular core 48 also has a coil end 50 of insulation material slipped thereon before the end of the tubular core 48 is rolled over to form a flange as represented in 48b. The coil form thus provided is slid upon the end of the arbor 16 and abuts against the shoulder 16a intermediate

drive shaft 6 and arbor 16. A cylindrical sleeve 51 is secured to driven shaft 6 and is set thereon by set-screw 51*a*, in a position in which the annularly recessed face 51*b* forms an abutment for the end of the flange 48*b* of the tubular core of insulation 48 and abutment for the end 50 of insulation material as shown clearly in Figs. 7 and 8. With the support thus afforded for the coil end 50 with respect to the tubular coil form 48 the detachable end flange 52 is moved into position over the terminating end 17 of the arbor 16. The end flange 52 has an annular recess 53 forming the end thereof and slotted as represented at 54. This facilitates the entry of the flange end 48*a* of the tubular insulator 48 and permits insulation member 49 to be seated directly against the end flange as represented in Figs. 7 and 8. I provide an annular ring member 55 which embraces the flange 52 and is provided with a set-screw 56 therein with a radially extended pin 57 thereon adapted to extend through a radial aperture 58 in end flange 52 and project into the groove 17*a* in end section 17 of the arbor and effect an interlock with the bayonet slot 17*b* in the terminus of the arbor 17.

The flange 52 is pierced at 60 by an aperture which facilitates the threading of the wire 61 therethrough at the start of the winding operation. The assembly of a bobbin on the arbor 16 is thus greatly simplified as it is only necessary to slide the tubular coil form 48 on to the arbor 16 with the coil end 49 in abutment with the flange 48*a*, and coil end 50 in abutment with flange 48*b*. The coil end 50 abuts against the cylindrical sleeve 51 with the flange 48*b* projecting into the annular recess 51*b* in the end of the cylindrical sleeve 51. Similarly, the flange 48*a* extends into the annular recess 53 in end flange 52 when end flange 52 within ring member 55 is detachably positioned on the terminating end 17 of arbor 16.

In order to commence a winding operation the end of the wire from the supply reel is threaded through the wire or thread guides 46 and 47 and threaded through the slit 49*a* in the insulation member 49 and through the aperture 60 as represented at 61 in Fig. 7. The motor 3 is then started and the wire is fed automatically to the bobbin. As each layer is completed the path of travel of the wire guides 46 and 47 is reversed and the succeeding layer wound in position. This automatic reversal of the movement of the wire guides 46 and 47 is automatically controlled by the movement of the cardioid shaped cam 24 until the winding of the bobbin is complete. The free end of the wire is then brought out through the eyelet 62 forming the securing means for the hook shaped lug 63 which is fastened to coil end 50 and looped around the securing clip 64 on cylindrical sleeve 51 where the end of the supply reel may be severed. The completely wound solenoid is then readily removed by quick rotation of the ring member 55 and pin 57 with respect to the interlock connection with the bayonet slot 17*b* and the removal of the ring member 55 and the enclosed flange 52. This permits the withdrawal of the solenoid from the arbor 16 and the replacement of a new solenoid form ready to receive a subsequent winding.

The winding process is very readily completed and inasmuch as the motor drive for the winding machine is directly connected with the gear mechanism the entire unit is made very compact and the control thereof very greatly simplified.

Adequate reduction in speed is secured by the

arrangement of worm and worm wheel drive 15—18 to enable proper translatory movement of the wire guide members 46 and 47 to be maintained during the winding operation in proportion to the speed of rotation of the bobbin obtained by the direct motor drive arrangement.

The cardioid shaped cam 24 illustrated is but one of a set of cams which may be readily installed in the mechcanism for securing the desired length of stroke of the winding guide. With each substituted flat cam 24 I provide for adjustment of the rod members 36 and 37 which embrace the edges of the plate-like cam 24.

I have found the winding equipment of my invention highly practical in its construction and efficient in operation, and while I have described my invention in one of its preferred embodiments, I realize that modifications may be made and I desire that it be understood that no limitations upon my invention are intended other than may be imposed by the scope of the appended claims.

What I claims as new and desire to secure by Letters Patent of the United States is as follows:

1. Winding apparatus comprising a support, a driving motor mounted adjacent one end of said support, a bearing structure mounted adjacent the other end of said support, a longitudinally extending shaft journalled in said bearing structure and coupled at one end with said driving motor, a carrier on the other end of said shaft detachably supporting a bobbin to be wound with wire and the like, a countershaft journalled in said bearing structure and extending in a direction substantially normal to said first mentioned shaft, a worm carried by said first mentioned shaft intermediate the ends of said bearing structure, a worm wheel carried by said countershaft and extending in a plane substantially within the limits of said shaft and meshed with the worm on said shaft, a cam on one end of said countershaft disposed in spaced relation to said worm wheel, a calibrated dial adjacent the other end of said countershaft, an indicator arm carried by said countershaft and operative over said calibrated dial, a slidable bar mounted in said bearing structure and movable in a plane substantially parallel with the plane of said cam, a wire guide mounted on the end of said bar adjacent said carrier for directing wire on to a bobbin supported by said carrier, the bar having slots therein adjacent the peripheral edges of said cam and pin members extending through said slots and clamping means for maintaining said pin members in predetermined positions for engaging the peripheral edges of said cam for controlling the length of stroke of said wire guide.

2. A bobbin carrier for winding machines, a rotatable shaft terminating in an arbor having an end terminus of reduced section, a sleeve bushing carried by said shaft and having an annularly recessed portion for receiving one end of a bobbin carrier, the bobbin carrier being slidable into a position over said arbor with the end thereof abutting the annularly recessed portion of said bushing, a detachable end member engageable with the end of the reduced section of said arbor and operative to confine the bobbin carrier in position on said arbor, in which said detachable end member comprises a pair of separable portions with one portion concentrically surrounding the other portion and forming a manual gripping means and with said inner portion pierced for the passage of the end of the wire extending from the end of the bobbin.

3. A bobbin carrier for winding machines comprising a rotatable shaft terminating in an arbor having an end terminus of reduced section, a sleeve bushing carried by said shaft and having an annularly recessed portion for receiving one end of a bobbin carrier, the bobbin carrier being slidable into a position over said arbor with the end thereof abutting the annularly recessed portion of said bushing, a detachable end member engageable with the end of the reduced section of said arbor and operative to confine the bobbin carrier in position on said arbor, said end member comprising a central cylindrical portion and an encircling ring portion, said ring portion being detachable from said cylindrical portion and having a removable pin therein extending radially through said central cylindrical portion and engageable with the end of reduced section on the end of said arbor.

ARDEN E. ROANE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,038,263	Atwood	Sept. 10, 1912
1,494,764	Wishart	May 20, 1924
1,610,280	Franks	Dec. 14, 1926
1,789,358	Grout	Jan. 20, 1931
1,884,184	Pearson	Oct. 25, 1932
2,140,555	Satterlee	Dec. 20, 1938
2,172,770	Martindell	Sept. 12, 1939
2,305,085	Jacob	Dec. 15, 1942

FOREIGN PATENTS

Number	Country	Date
212,984	Germany	of 1909