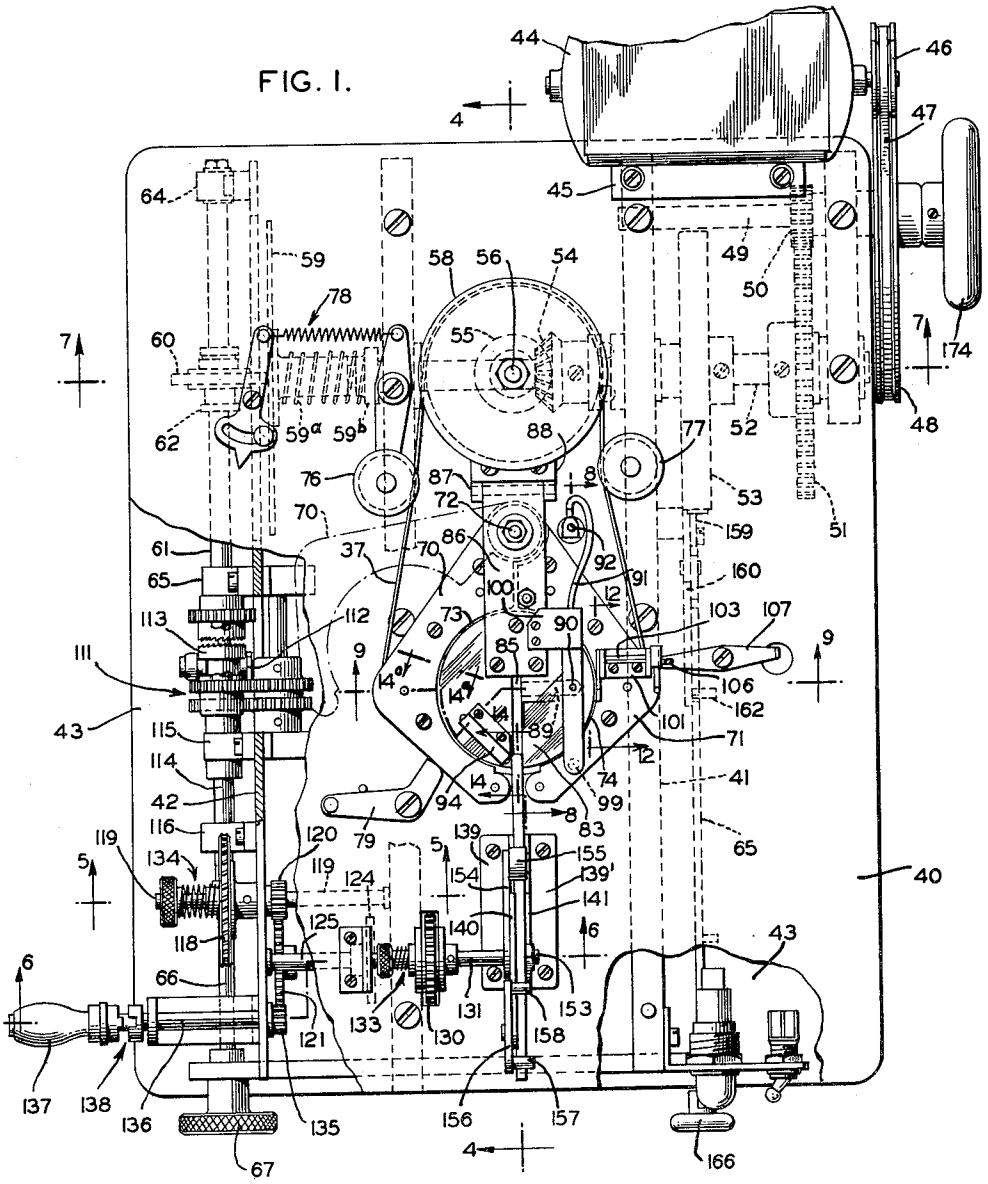
July 21, 1964 A. BERGLUND 3,141,623

COIL WINDING MACHINE

Original Filed Nov. 7, 1956 10 Sheets-Sheet 1

FIG. 1.



INVENTOR
ARTHUR BERGLUND

BY John J. Lynch

ATTORNEY

July 21, 1964 A. BERGLUND 3,141,623

COIL WINDING MACHINE

Original Filed Nov. 7, 1956 10 Sheets-Sheet 2

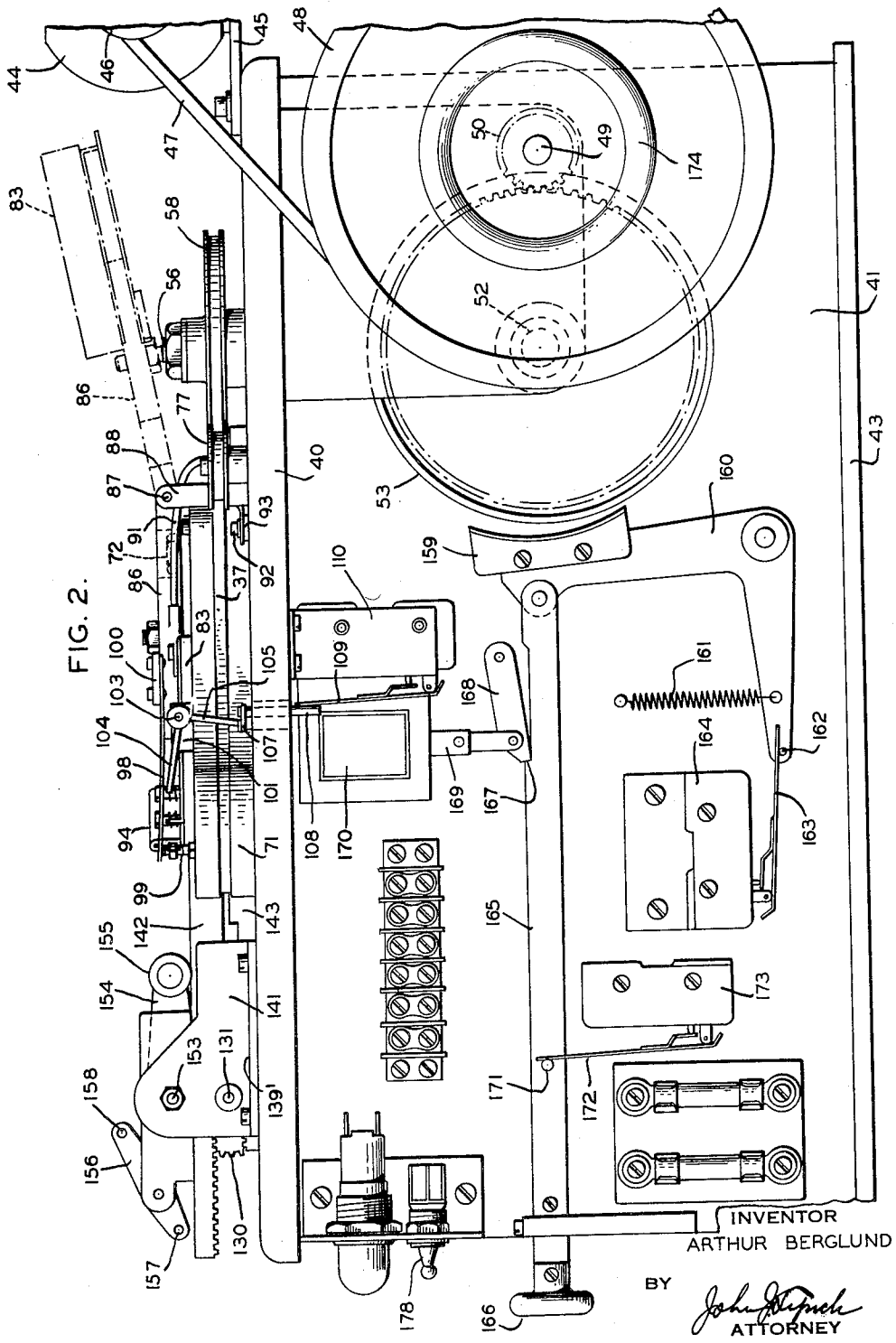


FIG. 2.

July 21, 1964 A. BERGLUND 3,141,623

COIL WINDING MACHINE

Original Filed Nov. 7, 1956 10 Sheets-Sheet 3

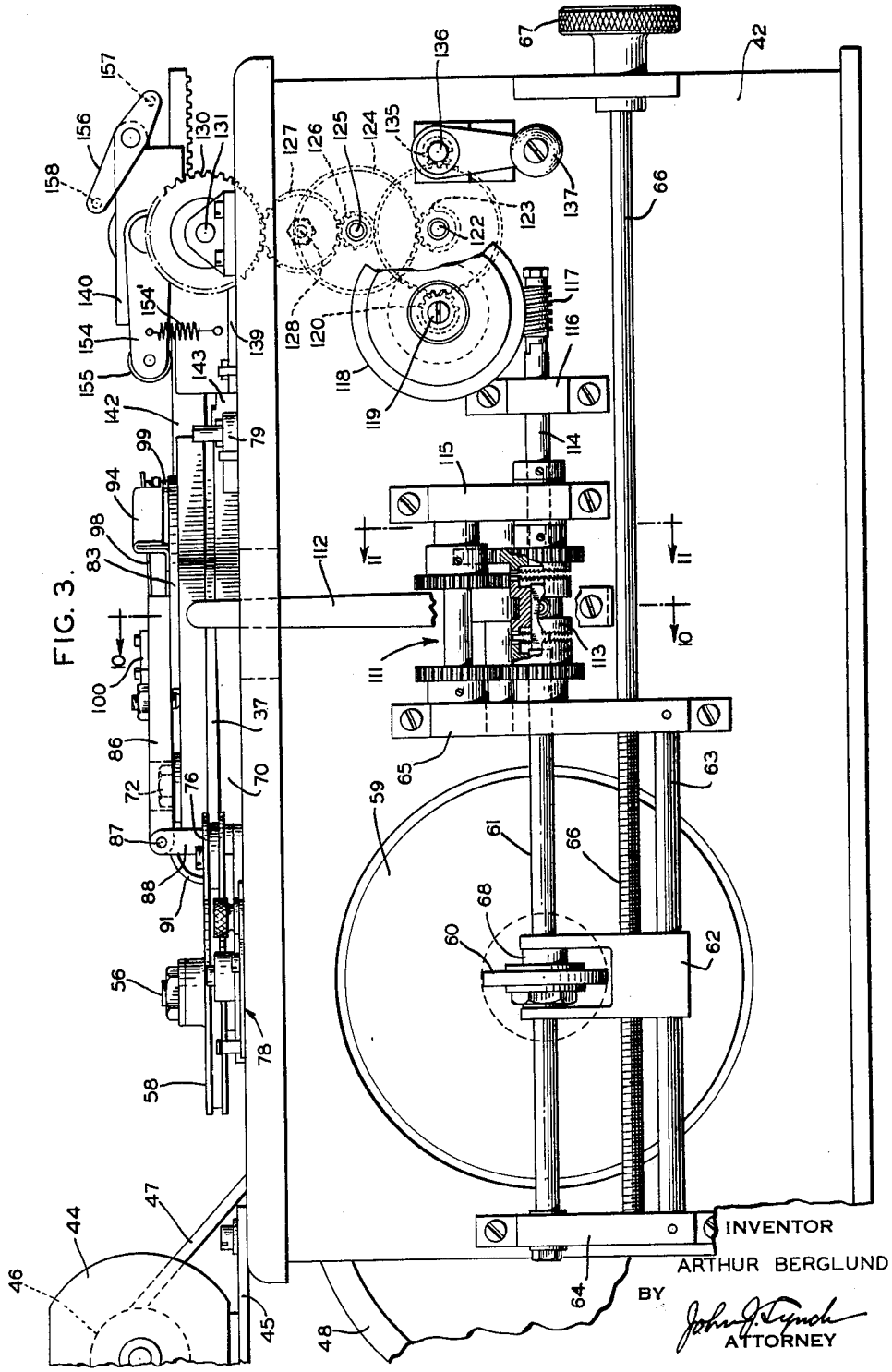
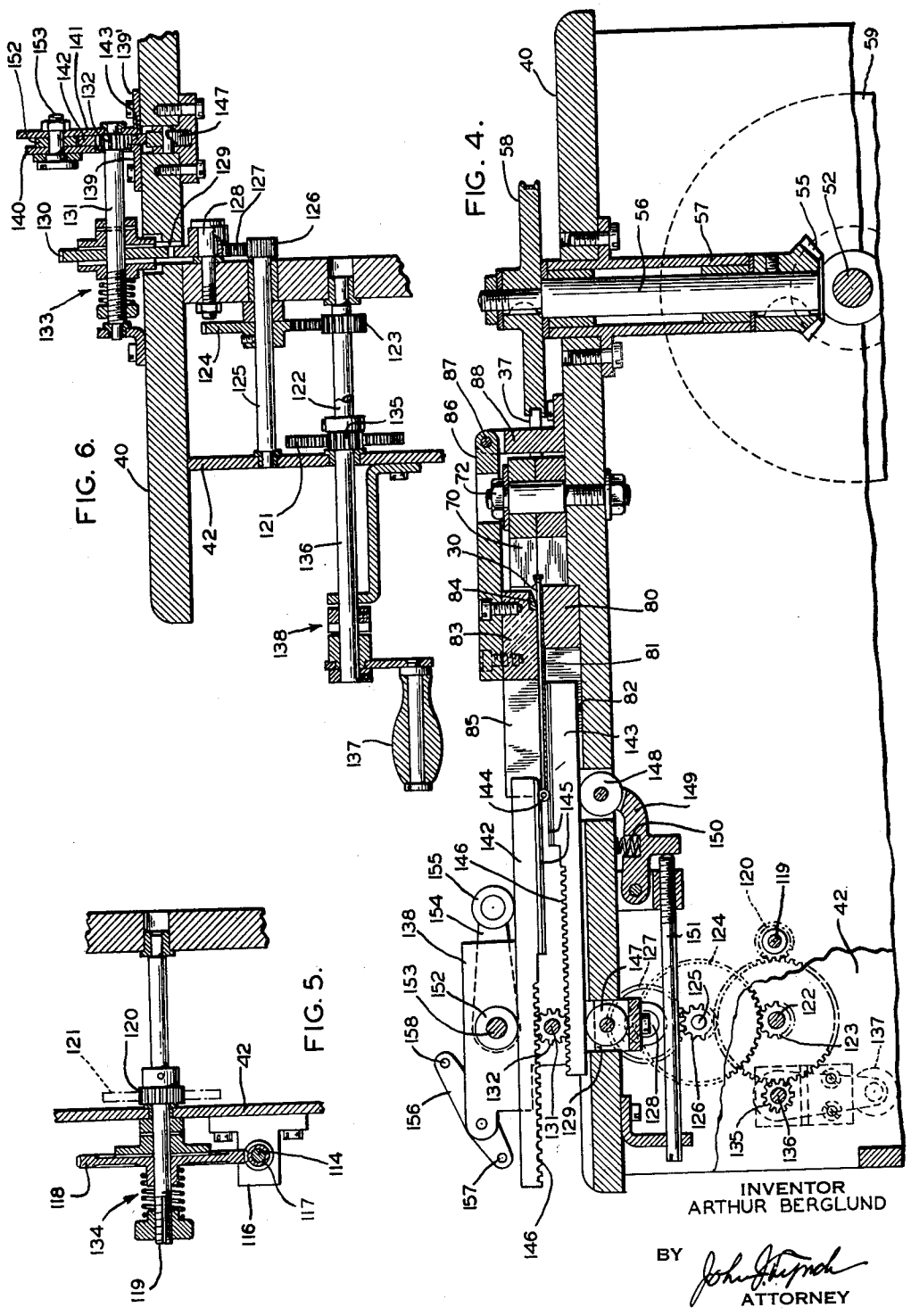


FIG. 3.

July 21, 1964 A. BERGLUND 3,141,623

COIL WINDING MACHINE

Original Filed Nov. 7, 1956 10 Sheets-Sheet 4



July 21, 1964 A. BERGLUND 3,141,623

COIL WINDING MACHINE

Original Filed Nov. 7, 1956 10 Sheets-Sheet 5

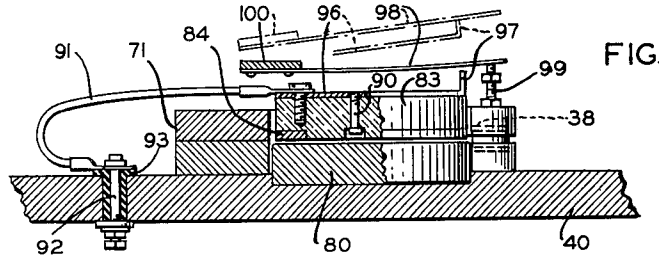


FIG. 8.

FIG. 9.

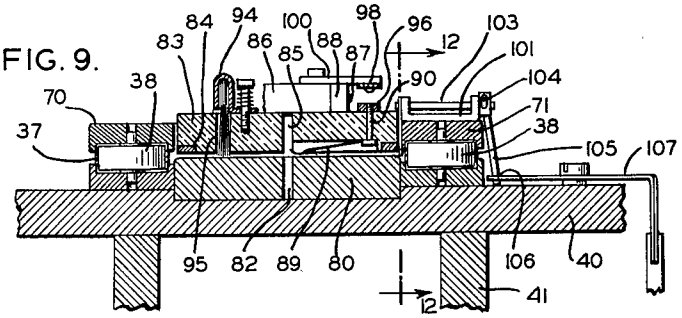
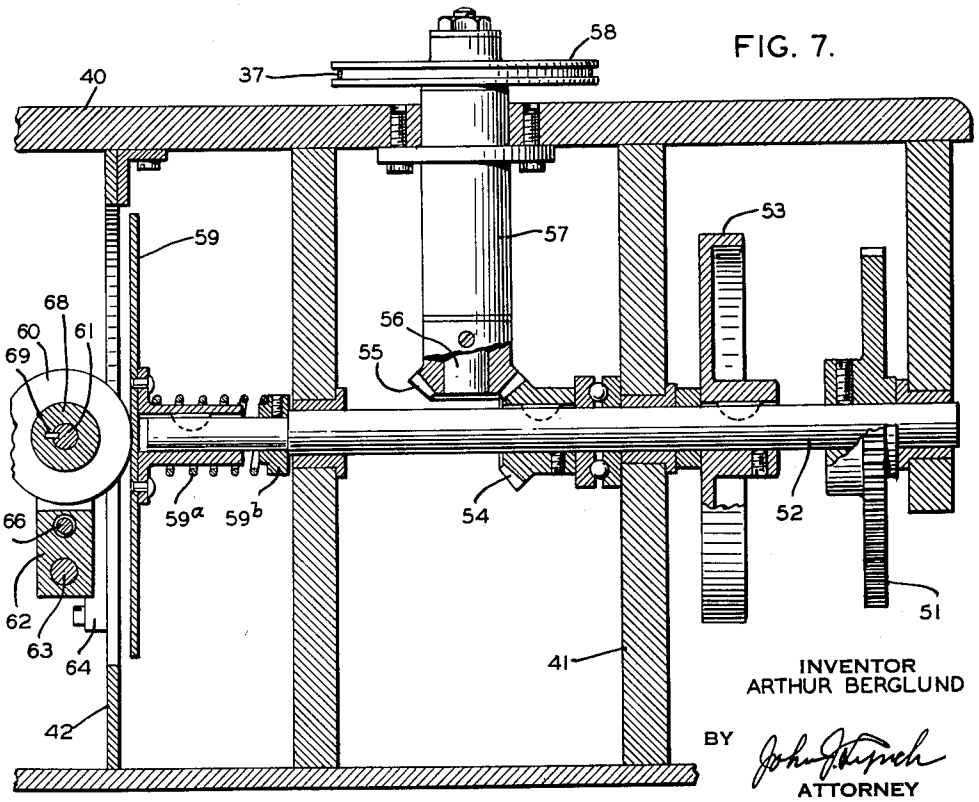


FIG. 7.



INVENTOR
ARTHUR BERGLUND

BY

ATTORNEY

July 21, 1964 A. BERGLUND 3,141,623

COIL WINDING MACHINE

Original Filed Nov. 7, 1956 10 Sheets-Sheet 6

FIG. 10.

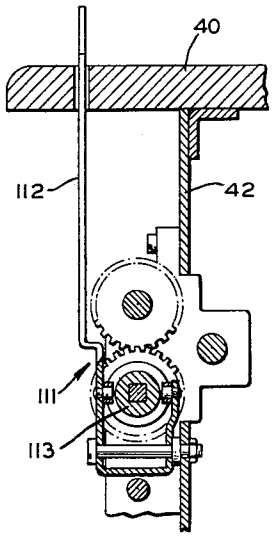


FIG. 11.

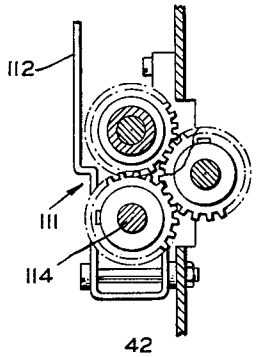


FIG. 12.

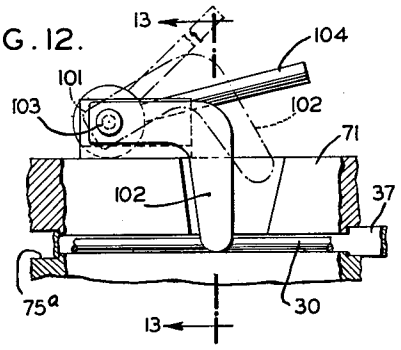


FIG. 13.

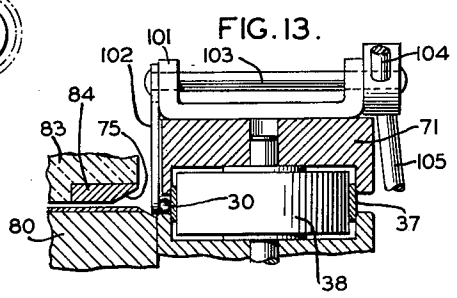
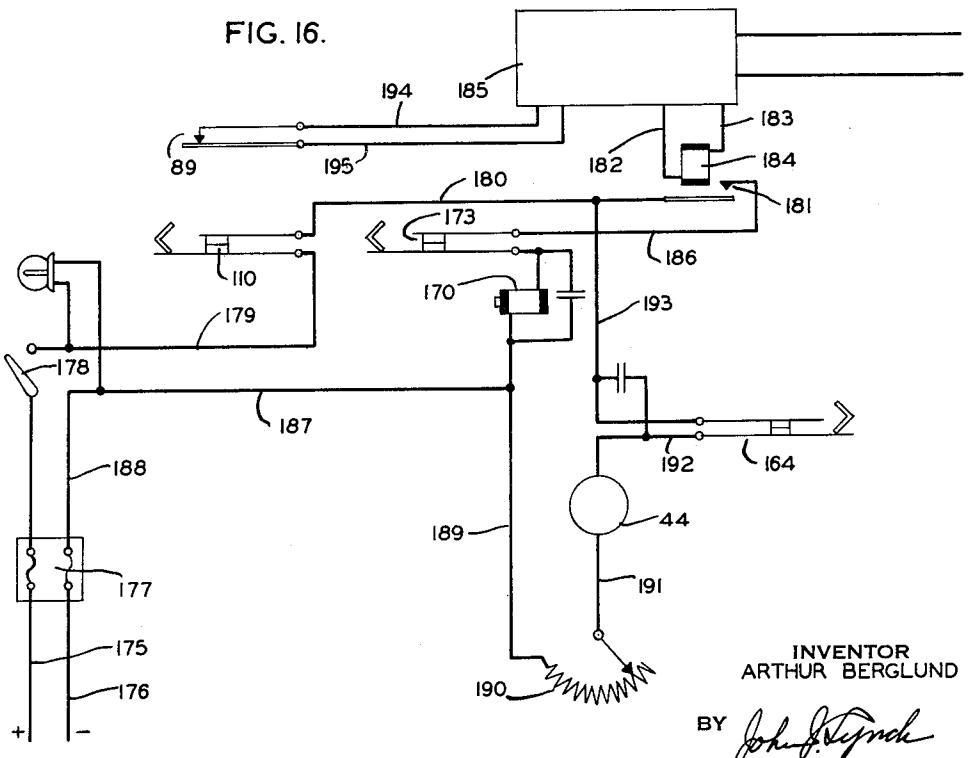


FIG. 16.



INVENTOR
ARTHUR BERGLUND

BY John J. Lynch

ATTORNEY

July 21, 1964 A. BERGLUND 3,141,623

COIL WINDING MACHINE

Original Filed Nov. 7, 1956 10 Sheets-Sheet 7

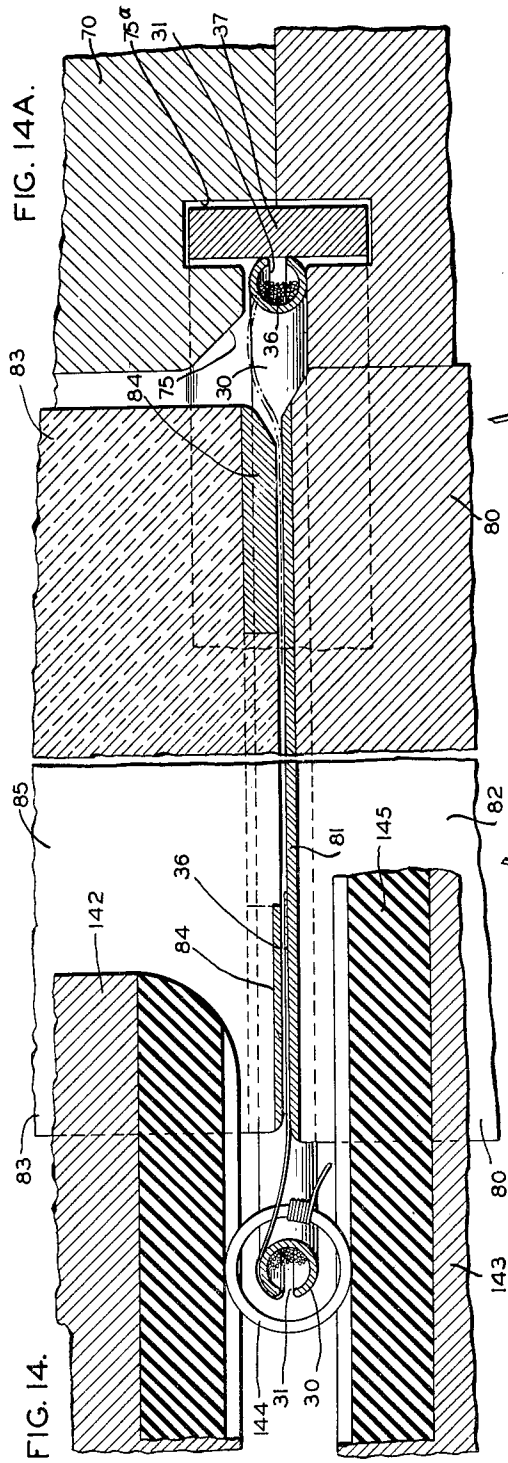


FIG. 14A.

FIG. 14.

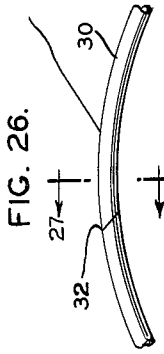


FIG. 26.

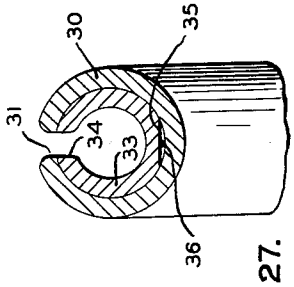


FIG. 27.

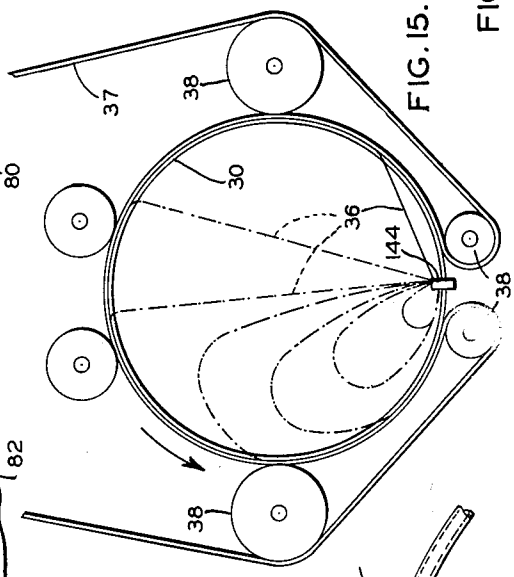


FIG. 15.

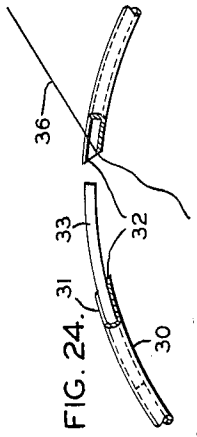


FIG. 24.

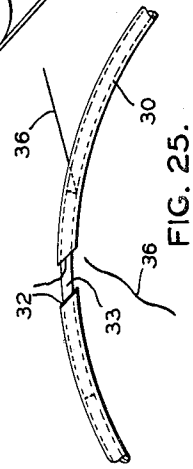


FIG. 25.

INVENTOR
ARTHUR BERGLUND

BY John J. Lynch

ATTORNEY

July 21, 1964 A. BERGLUND 3,141,623

COIL WINDING MACHINE

Original Filed Nov. 7, 1956 10 Sheets-Sheet 8

FIG. 18.

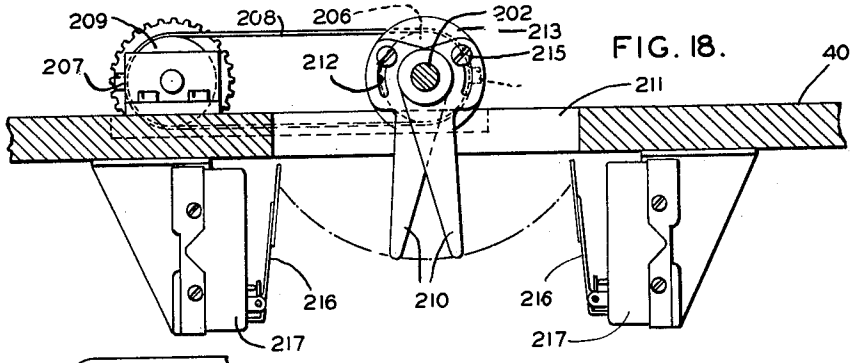
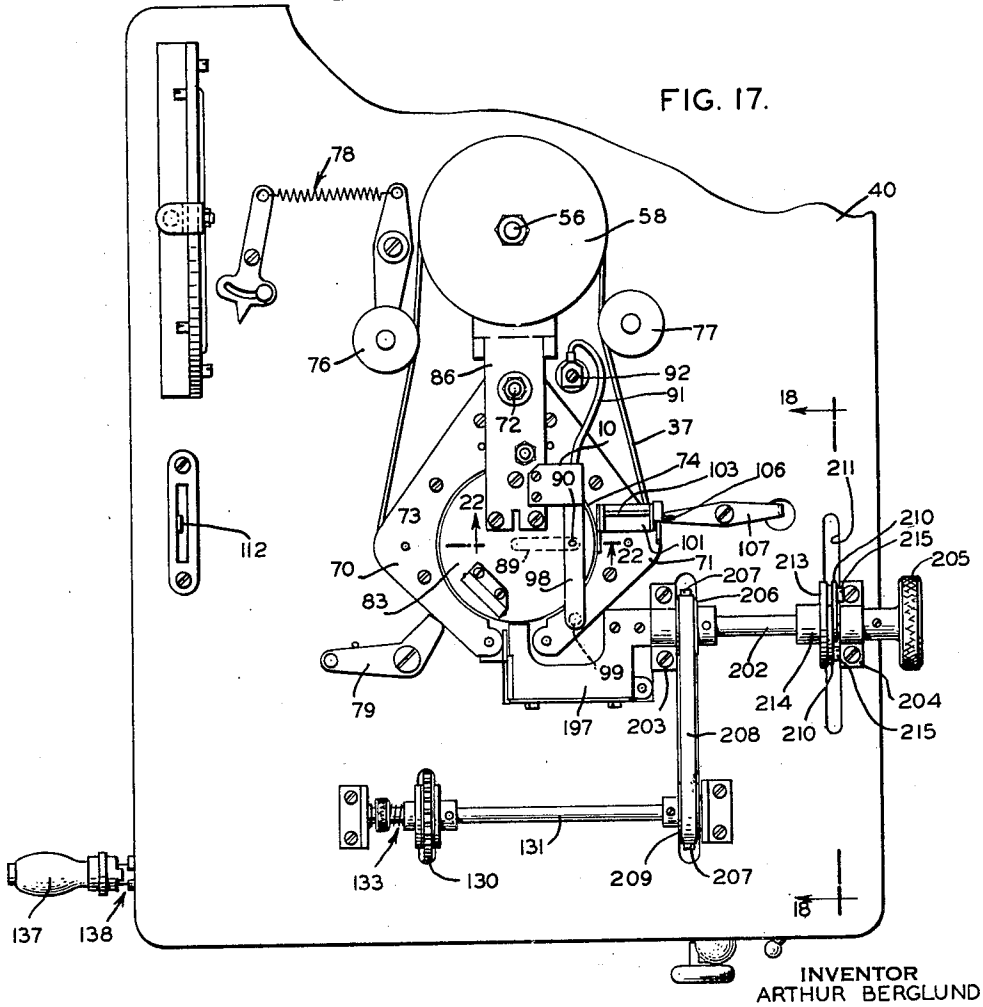


FIG. 17.



INVENTOR
ARTHUR BERGLUND

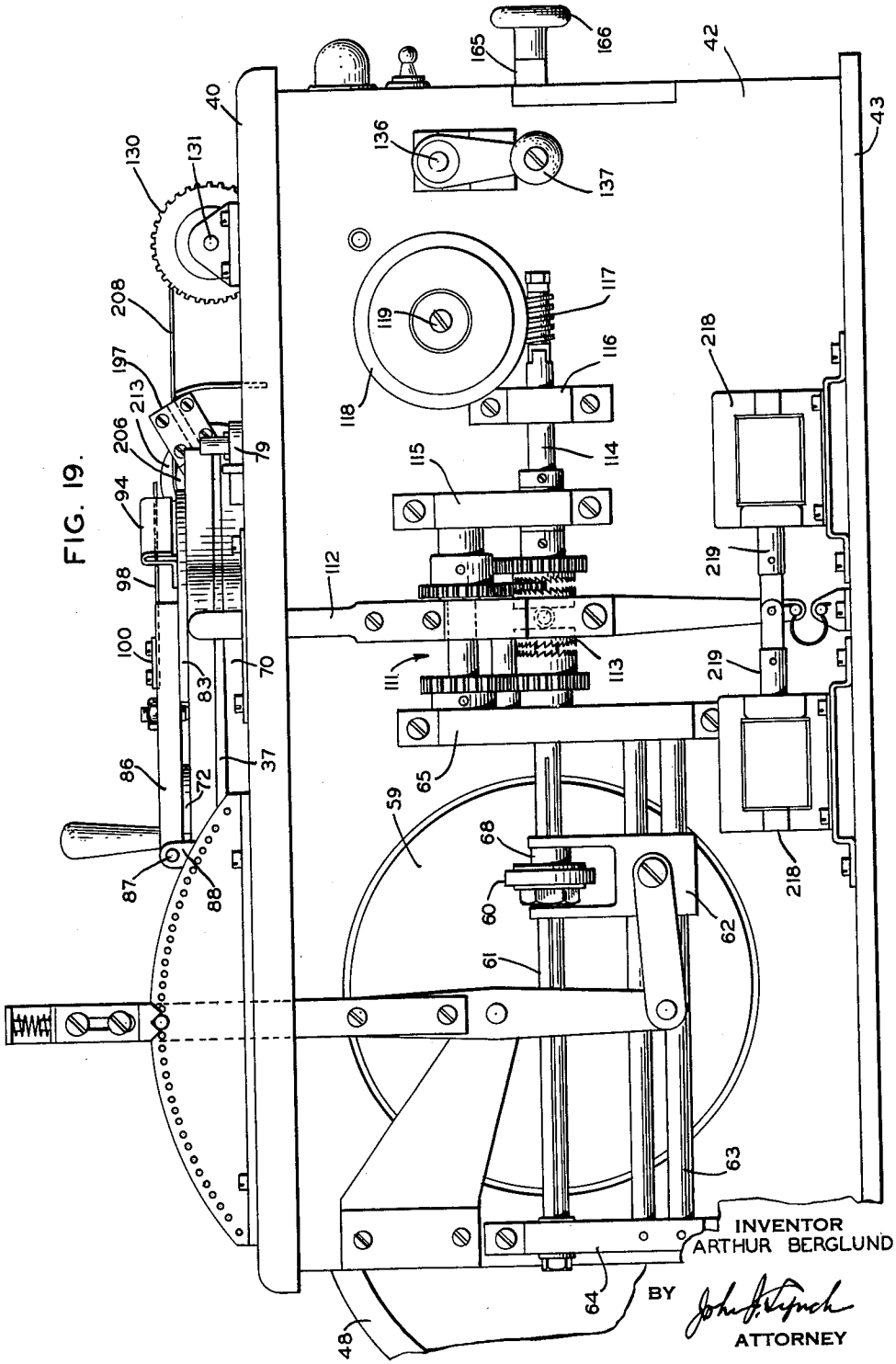
BY John J. Lynch
ATTORNEY

July 21, 1964 A. BERGLUND 3,141,623

COIL WINDING MACHINE

Original Filed Nov. 7, 1956 10 Sheets-Sheet 9

FIG. 19.

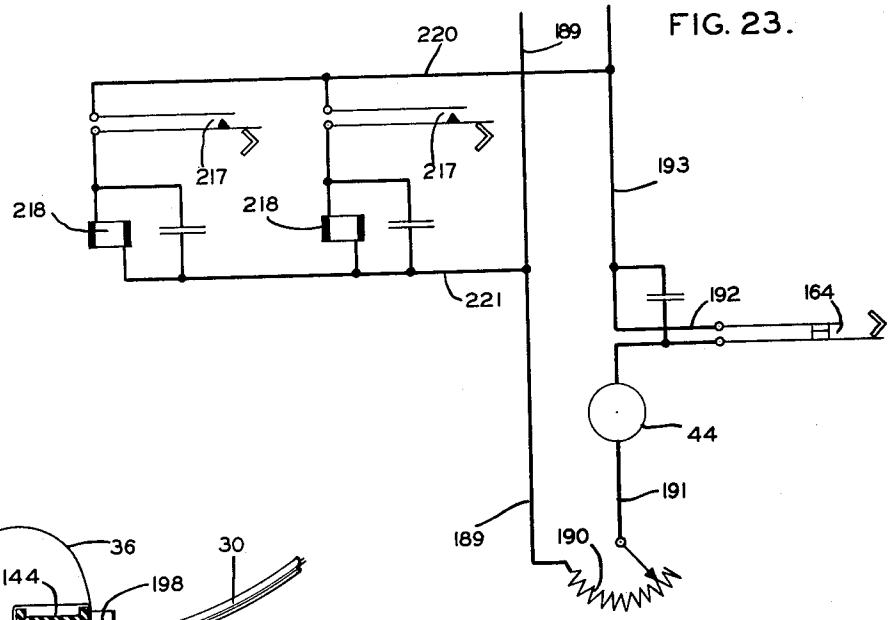


July 21, 1964 A. BERGLUND 3,141,623

COIL WINDING MACHINE

Original Filed Nov. 7, 1956 10 Sheets-Sheet 10

FIG. 23.



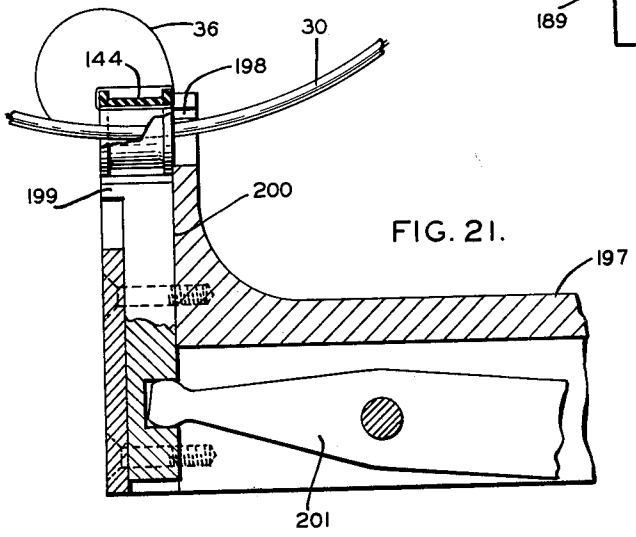
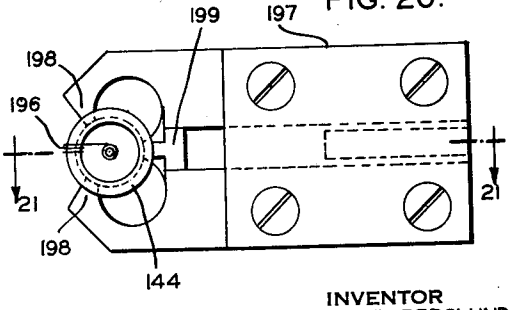


FIG. 21.

FIG. 20.



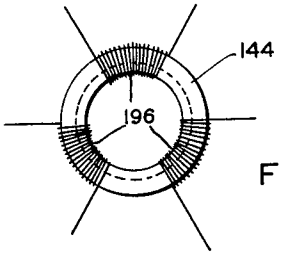


FIG. 22.

INVENTOR
ARTHUR BERGLUND

BY John J. Lipinski
ATTORNEY

United States Patent Office

3,141,623
Patented July 21, 1964

3,141,623

COIL WINDING MACHINE

Arthur Berglund, Boca Raton, Fla., assignor to Sperry Rand Corporation, New York, N.Y., a corporation of Delaware

Continuation of application Ser. No. 620,971, Nov. 7, 1956. This application Feb. 13, 1961, Ser. No. 88,817

12 Claims. (Cl. 242—4)

This application is a continuation of application Serial No. 620,971, filed November 7, 1956, and now abandoned.

This invention relates to new and useful improvements in coil winding machines, and has particular reference to winding cores of sub-miniature type.

In developing a machine to wind coils on these cores a unique problem was posed in that the cores may have inner diameters of from 0.050 to 0.100 inch and this requires a wire supply bobbin which is small enough to pass through these cores and therefore is somewhat fragile.

A main object of the invention is to provide a unique drive mechanism for the circular bobbin wherein the drive means drives the bobbin by peripheral contact while at the same time securely holding the main body of the wire therein and also maintaining a uniform tension on the wire as it is pulled off the bobbin.

Another object is to provide a sectional frame which can be readily and quickly opened and closed to permit the bobbin to be inserted and removed in a matter of seconds.

Yet another object is to provide simple and efficient means to turn the core as the wire is being wound thereon and for automatically reversing the rotation of the core if a plurality of layers are to be wound.

Still another object is to provide simple and efficient means whereby coils of predetermined widths may be wound on the core at spaced intervals thereon, with automatic reversal when desired.

Yet another object is to provide a counter means, preferably of the pre-set electronic type which, through proper circuit connections, will be pulsed for each turn wrapped on the core and which will automatically cause the stoppage of the machine when a predetermined number of turns have thus been placed on the core.

Further and more specific objects, features, and advantages will more clearly appear when taken in connection with the accompanying drawings which form part of the specification and which illustrate preferred embodiments of the invention.

Briefly and in general terms, the invention concerns the winding of coils on sub-miniature cores of inner diameters as small as 0.050 inch. This requires a wire-supply bobbin of even smaller diameter and to that end a circular wire-supply bobbin is made of stock from which hypodermic needles are made. This bobbin is provided with a circular slot which opens at the periphery thereof and in this slot the wire is wound before the bobbin is placed in the machine. In fact several wire-supply bobbins may be prepared in advance to enable production to proceed with as little interruption as necessary. In winding cores of 0.050 inch inner diameter, the outer diameter of the bobbin may be as small as 0.025 inch and the wire being wound on the cores may be as small as 0.0015 inch diameter.

With parts so small and fragile, special means have to be provided to handle them. To this end the bobbin, when loaded with wire, is placed in a sectional frame having an inner circular channel in which is disposed a flexible belt to engage the bobbin along substantially its entire periphery. The frame is preferably in two sections, one of which is pivoted so as to be swung out to permit the ready insertion and removal of the bobbin in a matter

of seconds. With the frame closed, the belt is driven by suitable means and under proper tension to rotate the wire-supply bobbin within the frame. This belt, by contacting the slotted periphery of the bobbin, tends to hold the main body of wire within the bobbin and exerts an even tension on that portion of the wire which is being pulled out of the bobbin.

The core around which wire is to be wound is slipped on to the bobbin before the bobbin is placed in the frame and the core is disposed between suitable jaws which are operated in manners subsequently described to turn the core as desired.

Suitable mechanism is provided to reverse the direction in which the core is turned so that a plurality of layers of wire may be laid on the core. This mechanism may be operated manually or automatically as will subsequently appear.

The invention further includes the use of any well-known type of electronic counter device which is pulsed as each turn of wire is laid on the core and which, when the desired number of turns have been thus laid, will pulse a relay to stop the drive through the intermediary of a suitable brake mechanism.

Still further, the invention contemplates the use of oscillating jaws to hold the core and to turn it back and forth through predetermined angles whereby, through proper manipulations, several windings of predetermined widths and at stated distances apart may be wound on the core.

Present preferred forms of the invention are shown in the accompanying drawings, of which

FIG. 1 is a plan view, partly broken away, of one form of the device;

FIG. 2 is a partial side elevation, as viewed from the right side of FIG. 1;

FIG. 3 is a partial side elevation of the device, as viewed from the left side of FIG. 1;

FIG. 4 is a partial vertical longitudinal section taken on the line 4—4 of FIG. 1;

FIG. 5 is a vertical transverse section on the line 5—5 of FIG. 1;

FIG. 6 is a vertical transverse section on the line 6—6 of FIG. 1;

FIG. 7 is an enlarged vertical transverse section on the line 7—7 of FIG. 1;

FIG. 8 is a vertical longitudinal section on the line 8—8 of FIG. 1;

FIG. 9 is a vertical transverse section on the line 9—9 of FIG. 1;

FIG. 10 is a vertical transverse section on the line 10—10 of FIG. 3;

FIG. 11 is a vertical transverse section on the line 11—11 of FIG. 3;

FIG. 12 is a vertical longitudinal section on the line 12—12 of FIG. 9;

FIG. 13 is a vertical transverse section on the line 13—13 of FIG. 12;

FIG. 14 is an enlarged vertical section on the line 14—14 of FIG. 1;

FIG. 14A is a similar section on the line 14A—14A of FIG. 1;

FIG. 15 is a schematic diagram of the structure whereby the circular quill is driven and guided;

FIG. 16 is a circuit diagram of the device shown in FIG. 1;

FIG. 17 is a partial plan view of a modified form of the device adapted to wind several coils on spaced portions of the core;

FIG. 18 is a longitudinal vertical section on the line 18—18 of FIG. 17;

FIG. 19 is a side elevation of the modified form of the device as viewed from the left in FIG. 17;

FIG. 20 is an end elevation of the core holding oscillating jaws as viewed from the left in FIG. 21;

FIG. 21 is a horizontal section on the line 21—21 of FIG. 20;

FIG. 22 is a plan view of the core wound on the modified form of device shown in FIG. 17;

FIG. 23 is a circuit diagram employed with the modified form of the device shown in FIG. 17;

FIG. 24 is a partial side view of the bobbin with the ends separated and the wire disposed ready to be gripped;

FIG. 25 is a similar view showing the ends of the bobbin drawn closer with the plug projecting therebetween;

FIG. 26 is a similar view of the bobbin in its final operative form; and,

FIG. 27 is a cross sectional view through the bobbin and the plug.

Referring now to the preferred forms of the device shown in the drawings, it is to be noted that because very small cores are to be wound with wire, very small wire-supply bobbins have to be used although the inventive ideas involved cover the use of larger bobbins.

WIRE-SUPPLY BOBBIN

(*FIGS. 14, 14A, 24–27*)

Because the cores used are of the small sizes mentioned above one form of bobbin may be made of hollow hypodermic needle stock. The bobbin 30 made of such stock has a peripheral slot 31 throughout and it is cut across in a sloping transverse manner as shown at 32. The strip of material is bent into a ring-like form and a plug member 33 slotted along its outer edge at 34 is soldered into one end of the bobbin as shown in FIG. 24. The lower forward end of the plug is flattened as at 35. The end of the wire 36 to be loaded into the bobbin is laid across the open end of the ring as shown in FIG. 24 and then the plug is introduced into this open end as shown in FIG. 25 to clamp the wire between the flat end 35 of the plug 33 after which the unclamped free end of the wire is cut off as indicated in FIG. 25. After the end of the wire is cut off, the plug is then pushed into its final position as shown in FIG. 26 and the bobbin is then placed in any suitable loading machine to load the bobbin with the requisite amount of wire. The slope of the transverse cut 32 in the ends of the bobbin is in such direction that when the wire is pulled out of the bobbin in the operation of winding wire on a core, the wire as it passes across the bobbin in the vicinity of the cut will not lie parallel thereto and therefore will not tend to catch therein.

BOBBIN DRIVE

(*General*)

The drive of the bobbin which is an important feature of the invention is somewhat schematically shown in FIG. 15. When the loaded bobbin is placed in the machine it is in contact throughout most of its periphery with a flexible drive member 37 preferably in the form of a belt. A system or series of pulleys 38 are disposed around the bobbin and guide the belt and hold it in contact with the outer periphery thereof. This contact of the drive member with the peripheral slot of the bobbin will tend to hold the wire load in the bobbin and at the same time exert a suitable pressure on the wire as it is pulled out of the bobbin to keep the wire under tension. This type of drive is found to be necessary due to the smallness and flexibility of the bobbin material.

BOBBIN DRIVE

(*Detail*)

The operative elements of the machine are mounted on and within a cabinet having top wall 40, side walls 41 and 42, and bottom wall 43. A drive motor 44, is mounted on the top wall 40 by bracket 45. The motor shaft mounts a pulley 46 over which passes a drive belt 47 which also engages and drives a large pulley 48 fastened to horizontal shaft 49 carrying a pinion 50 meshing with a gear 51 on a shaft 52 which extends across the cabinet and supports a large brake drum 53 (FIGS. 1, 2, and 7). This shaft also has a bevel gear 54 thereon meshing with another bevel gear 55 on a vertical shaft 56 supported in a sleeve housing 57 fastened to the under side of the top wall 40. At the top of shaft 56 above the top wall 40 is fastened a pulley 58 over which runs the previously mentioned flexible member 37 which is guided in the manner generally described above by the pulleys 38 on detailed support of which is to be subsequently described. On the other end of shaft 52 there is a drive disk 59. This disk is keyed to a slot in the shaft and is pressed outwardly by a spring 59*a* bearing between the disk and a hub 59*b* fixed to the shaft. Engaging with the outer surface of this disk is a friction wheel 60 fixed to horizontal shaft 61 (FIG. 3). This wheel is mounted in a bracket plate 62 which is slidable along the shaft 61 and a guide rod 63. The shaft 61 and rod 63 are supported suitably in brackets 64 and 65 fastened to the side wall 42 of the cabinet. In FIG. 1 the wheel 60 is moved across the face of the disk by the threadable engagement of bracket plate 62 with a threaded rod 66 on one end of which is a hand knob 67 which can be turned one way or the other to cause the disposition of the wheel across the face of the disk. As shown in FIG. 7 the wheel 60 is mounted on a hub 68 carrying an elongate key 69 extending into an elongate slot in the shaft 61 which thus permits the wheel to turn the shaft and also slide therealong. The function and operation of this shaft will be later described.

Referring now to the detailed manner in which the bobbin is supported there is to be noted (FIG. 1) that on the top wall 40 there is disposed a bobbin receiving frame formed on two frame members 70 and 71. Frame member 71 is fixed in position on the wall 40 and frame member 70 is pivoted thereon around a pivot point 72. The adjacent walls of these frame members are curved as shown at 73 and 74 (FIG. 1) to form a circular space within which the bobbin will lie. These adjacent walls have a slot 75 into which the bobbin projects as shown in FIG. 14A. The pulleys 38 previously mentioned are disposed within the frame members in the relative positions noted in FIG. 15 and guide the belt 37 around within the frame members and in contact with the periphery of the bobbin 30 as previously mentioned. The belt 37 (FIG. 14A) lies within a chamber 75*a* formed in the frame members 70 and 71 and open to the slot 75 into which the periphery of the bobbins extends. Tensioning rollers 76 and 77 are disposed on top of wall 40 to engage the belt 37 and tension it. The roller 77 is fixed but the roller 76 is adjustable on an arm and positioned by any suitable spring adjusting means generally indicated by the numeral 78. The frame member 70, as stated, is pivoted and can be swung open to permit the removal of the bobbin from the frame members. A latch arm 79 is movable to hold the frame member 70 in closed position.

Referring to FIGS. 4, 8, 9, 13, 14 and 14A there will be seen a circular metal table 80 disposed on the top wall 40 and having a top surface projecting up therefrom to a plane substantially level with the plane of movement of the wire 36 as it is drawn from the bobbin. The area of this table is such as to substantially fill the opening between the curved walls of the frame members 70 and 71. The top surface of this table 80 is plated with a thin layer of wear-resisting material such as chromium as indicated at 81. This table is provided with a radial inwardly extending slot 82 beneath the chromium layer to receive a core turning jaw later described.

WIRE GUIDE PLATE AND COUNTING MECHANISM

A circular guide plate 83 is adapted to be disposed over the table 80 and the wire is drawn off the bobbin and across the table beneath this guide plate. This therefore tends to keep the wire flat and prevent it from becoming snarled, also maintains tension in the wire. The lower surface of this plate is provided with a circumferential ring 84 of wear-resisting material (FIG. 9) and is provided with a slot 85 (FIG. 4) which overlies the slot 82 in the table 80 and is adapted to receive the end of another jaw to be described. This plate 83 is supported on an arm 86 pivoted at 87 on a bracket 88 mounted on the top wall 40. The guide plate 83 is spaced slightly above the table and has dependent therefrom a spring contact element 89 which bears on the upper surface of the table 80. A conducting stem 90 is connected to this spring and extends up through the plate and is connected to an insulated wire 91 which in turn is connected to a stem 92 (FIG. 8) which extends through an insulating bushing 93 and the other end of this stem 92 is connected to a counter circuit in a manner later described. As the wire sweeps across the table, as indicated in dot-and-dash lines in FIG. 15 and since the wire is insulated, it momentarily lifts the spring contact from the table and breaks the counter circuit for each turn of wire wound on the core. Dependent also from the plate 83 is a brush member 94 which is suitably mounted on top of the plate 83 by resilient means and extends downward through an elongate slot 95 in the plate 83. This brush means also aids in keeping a certain amount of tension in the wire. As shown in FIGS. 1 and 8 the stem 90 is connected at its upper end to a metal plate 96 fastened to the top of the plate 83 and to which plate 96 an end of the wire 91 is connected. The end 97 of this plate 96 is upturned to form a contact piece. Normally disposed above the end 97 is a contact spring leaf 98 one end of which normally rests on an adjustable stop pin 99 and the other end of which is connected to a metal plate 100 fastened to the upper face of arm 86. Normally the counter circuit through wire 91 is grounded through the spring 89 except when it is broken by the sweep of the wire 36 across the table. However, when it is desired to remove the bobbin from the frame and the frame member 70 is to be swung to open position, it is necessary to lift the guide plate 83 and this is achieved by pivoting the said plate upwardly around the pivot 87 (FIG. 4). The contact parts are so related that as this plate 83 is lifted the contact is made between the end 97 of the plate 96 and the leaf spring 98 before the spring 89 breaks contact with the table. Thus the counter circuit is kept grounded even though the guide plate is lifted and therefore no undesirable pulse is transmitted to the counter.

BOBBIN SAFETY LOCK AND CIRCUIT SWITCH

Referring particularly to FIGS. 1, 12 and 13, a bracket plate 101 is fastened to the frame member 71 on the top thereof at a mid point and an arm 102 is dependent from a rod 103 mounted in said bracket. This arm can be swung up and down and when down will, at its lower end, lie closely adjacent the inner face of the bobbin 30 as shown to hold the bobbin whenever it is so desired, especially when the frame is opened. At the other end of rod 103 there is fixed a handle 104 and an arm 105 the lower end of which lies in a slot 106 in a pivoted lever 107 (FIG. 1) fixed to the top wall 40. The other end of this lever 107 depends through a hole in the top wall and is adapted to be moved to engage a spring arm 109 of a micro-switch 110 with an arm 108 (FIG. 2). When the handle 104 is moved to move the arm 102 down to lie along the side of the bobbin, the arm 108 moves to open the micro-switch 110. The switch 110 is in circuit with the drive motor 44 so that, until the arm 102 is raised away from the side of the bobbin, the motor can not be started.

MECHANISM FOR TURNING THE CORE ON THE BOBBIN

(See FIGS. 1, 3, 4, and 6)

Previously there has been described the operation of shaft 61 through the intermediary of disk 59 and wheel 60. This shaft extends to the right (FIG. 3) and is connected to a reversing mechanism generally designated by the numeral 111 and is of any suitable type and can be manually reversed in the usual manner by means of a reversing handle 112 connected to the central movable clutch element 113. Associated with this reversing mechanism on its side opposite the shaft 61 is a shaft 114 suitably supported against side wall 42 by bracket plates 115 and 116. On its end, the shaft 114 has a worm 117 meshing with a worm gear 118 on a shaft 119 on which is a pinion 120 meshing with a gear 121 on a shaft 122 which also carries a pinion 123 meshing with a gear 124 on a shaft 125 which also carries a pinion 126 meshing with a gear 127 on a shaft 128. The gear 127 extends up into a slot 129 in the top wall 40 and meshes with gear 130 on a shaft 131 carrying a pinion 132. A spring loaded clutch mechanism generally designated by the numeral 133 is interposed between the gear 130 and the shaft 131 to allow slippage. The worm gear 118 is loose on the shaft 119 and is associated therewith through a spring loaded clutch mechanism of a known type generally designated by the numeral 134.

The gear 121 may also be turned by hand through the intermediary of a pinion 135 meshing therewith and mounted on a shaft 136 (FIG. 6) with a handle 137 adapted to be connected to the shaft 136 by any suitable clutch mechanism generally designated by the numeral 138.

CORE TURNING JAW MECHANISM

On the top wall 40 of the cabinet are disposed bracket plates 139 and 139' the vertical walls 140 and 141 of which are spaced apart a predetermined distance to allow core-engaging jaws to slide therebetween. The shaft 131 passes through these vertical walls and the pinion 132 on the shaft 131 lies between these walls. Core-engaging jaws 142 and 143 are disposed for reciprocatory movement between walls 140 and 141. The adjacent surfaces of these jaws engaging the core 144 are provided with surfaces of friction material 145 such as rubber. The opposite adjacent surfaces of these jaws are formed with rack teeth 146 and are disposed respectively above and below and in engagement with the pinion 132. Therefore it is clear that as the pinion is rotated one way or another, the jaws are reciprocated to turn the core as desired. The core of course has been slid on to the bobbin before the bobbin is loaded. Rollers 147 and 148 (FIG. 4) project up through openings in the top wall 40 to support the lower jaw 143, the roller 147 being in a fixed position and the roller 148 mounted on a pivoted bracket 149 under tension of a spring 150 but adjustable by a threaded adjusting shaft 151 which can be turned to adjust the level of the roller 148 against the pressure of the spring 150. This permits the lower roller 148 to be adjusted so as to bring the center of the core in line level with the upper plane of the table 80 since cores of different diameters may be used.

The upper jaw member 142 has bearing thereon rollers 152 and 155. The roller 152 is loose on a stub shaft 153 supported between the walls 140 and 141. To one end of the stub shaft 153 is connected an arm 154 on the end of which is disposed the roller 155. This arm 154 is connected to a spring 154' (FIG. 3) the other end of which is fastened to the wall 140. At the rear end of the upper portion of the wall 140 an intermediate portion of an arm 156 is pivoted. The rear end of this arm is provided with an offset stud 157 which extends over the top of the rear of the upper jaw member 142. At the other end of this arm 156 there is another offset stud

158 which lies over the top of the wall 140. This stud acts as a stop against clock-wise motion of the arm 156 beyond a certain position. The stud 157, when the arm is moved counter-clockwise (as viewed in FIG. 4) around its pivot presses down on the rear end of the jaw 142 and tends to tilt it counter-clockwise to lift its forward end away from its position of rest on the top of the core 144. In this manner the upper jaw may be lifted whenever it becomes desirable to remove the bobbin from the machine.

COUNTER OPERATED BRAKING MECHANISM

Referring to FIG. 2, there is seen a brake shoe 159 adapted to press against the periphery of the brake drum 53 to stop the drive of the mechanism. The shoe is mounted on one arm of a bell crank 160 the other arm of which is urged clockwise by a spring 161. This latter arm has a lateral stud 162 engaging a spring leaf 163 of a micro-switch 164 connected in circuit as will be explained. The shoe 159 is also connected to a link 165 at the other end of which, outside the cabinet wall, is a hand knob 166 which can be pulled outwardly to pull the shoe away from the brake drum. When this is done, a shoulder 167 on the link is engaged by a latch member 168 operated from the plunger 169 of a solenoid 170 which is in circuit with an electronic counter as will be explained. The link has a lateral stud 171 engaging a leaf spring 172 of another micro-switch 173 for a purpose to be explained. The micro-switches 164 and 173 are opened when the brake is set and closed when the brake shoe is retracted to inoperative position. On the shaft 49 outside the wall 41 is fixed a hand wheel 174 whereby the shaft may be turned manually when the motor is not running.

CIRCUIT DIAGRAM FOR MACHINE OF FIGS. 1 TO 15

(FIG. 16)

Power enters from the source over wires 175, 176. Wire 175 leads through fuse box 177 to main switch 178, thence over wire 179 to micro-switch 110 which is normally closed when the motor is running. Thence the circuit passes over wire 180 to a switch 181, normally open, but closed by a pulse sent over wires 182 and 183 to a relay 184 from an electronic counter 185 of any suitable type and only schematically shown herein. From this switch 181 the circuit passes over wire 186 to the micro-switch 173 and thence to solenoid 170 which releases the brake shoe. Thence the circuit passes back over wires 187 and 188 back to the other side of the line. From wire 180 a circuit passes also over wire 193 to the switch 164, to motor 44, then over wire 191 to rheostat 190, and thence by wire 189 to wire 187 which is connected back to the negative side of the line.

The electronic counter 185 is any suitable type known in the trade which can be set for any desired number of counts and is pulsed each time the input circuit to it over wires 194 and 195 is broken at the spring contact 89 by the sweep of the insulated wire 36 over the table as previously described. When the number of pulses for which the counter is set has been received the counter will emit a pulse over wires 182 and 183 to energize relay 184 as above described, to release the brake mechanism and stop the machine since the motor circuit is opened when the brake is applied as above explained.

The modified form of the machine shown in FIGS. 17 to 23, inclusive, is in many respects the same as the form just described and therefore the following description will specifically refer only to the parts of the mechanism which are different from those previously shown and described.

CORE-HOLDING JIG

When it is desired to wind wire around the core over predetermined angles thereon but at spaced distances it is necessary to employ a form of device shown in the above figures. This form produces a core and windings as shown in FIG. 22 in which on the core 144 are disposed a series of windings 196 of one or more layers of wire and at spaced intervals apart around the circumference of the core. In this instance the core is held in a jig element 197 which, as viewed in FIG. 17 is a U-shaped block having at its left end a series of three spaced jaws two of which 198 (FIG. 20) are fixed and the third 199 is adjustable so as to permit the set of jaws to receive cores of different diameters. The adjustable jaw 199 is slidable in a slot 200 (FIG. 21) in the jig and is suitably manipulated therein by being connected to a manipulable handle member 201. To the jig is connected an operating shaft 202 (FIG. 17) which is supported between spaced brackets 203 and 204 mounted on the top wall 40 of the machine. A hand knob 205 is connected to the outer end of the shaft so that it may be turned manually when desired. This shaft 202 has fixed thereon a pulley 206 to which is fixed by screw 207 an endless band 208. This band also passes around and is similarly fixed to another pulley 209 fixed to shaft 131 previously described (FIG. 18). This shaft has mounted fixedly thereon the gear 130 previously mentioned and this gear is driven in the same manner as before described. As this gear rotates it rotates the pulley 206. A pair of dependent arms 210 pass down through an elongate slot 211 in the top wall 40. These arms have curved slots 212 thereon which permit the arms to be angularly adjusted with respect to each other and with respect to a disk 213 on a hub 214 fixed to the shaft 202. On the disk are set screws 215 extending through the slots 212 and capable of being tightened to hold the arms in any adjusted position. As the shaft 202 is turned the arms 210 are swung and are adapted to engage and operate leaf springs 216 associated with micro-switches 217. These switches are normally open but when an arm engages the spring 216 the micro-switch is closed to energize a solenoid as and for the purposes now to be described. The angular motion of shaft 202, before the solenoids are energized, obviously depends upon the angular relation of the arms 210.

Referring to FIG. 19 there is the usual and before mentioned reversing mechanism generally designated by the numeral 111, with a manual operating handle 112. However in this form of the invention there are provided at opposite sides of the lower end of the handle 112 solenoids 218 the plungers 219 of which are connected in any suitable manner to the lower end of the handle 112. As these solenoids are sequentially operated the reversing mechanism will be operated to reverse the direction of rotation of the shaft 202. This reversal takes place until the desired number of layers of wire have been placed on the core to form one of the windings 196 (FIG. 22). After one winding is thus formed the machine is stopped, the jaws of the jig are opened and the core is turned to present another surface of the core in position to receive another spaced winding 196 and the operation is repeated. It will be noted that as the angle between the arms 210 is increased the shorter will be the time before they operate the microswitches to effect the reversal of the core rotation and consequently the spread of the winding on the core will be smaller. Consequently if the angle between the arms is made smaller, then a wider spread of the winding on the core is achieved.

Referring to FIG. 23 there is shown part of the circuit added for the operation of solenoids 218. The circuits for these solenoids are connected across the wires 193 and 189 by wires 220 and 221. The solenoids are bridged across these wires as shown and respectively in series with the microswitches 217.

While I have described what I consider to be a highly desirable embodiment of my invention, it is obvious that changes in form could be made without departing from the spirit of the invention and I therefore do not limit myself to the exact form shown or described herein nor to anything less than the whole of my invention as hereinbefore set forth and as hereinafter claimed.

What I claim is:

1. In a coil winding machine, a supporting platform, a sectional frame having a circular opening therein with a recess formed in the walls of said opening, a hollow wire-supply bobbin in the form of a split ring peripherally slotted and disposed in said opening with its periphery extending into said recess, drive means including a motor, a motor circuit, a flexible drive member in the form of a flat belt disposed in said recess and contacting the peripheral slot of the bobbin throughout substantially its entire length and means to drive said member to turn the bobbin, a contact table projecting upwardly from the platform part way into said opening in said frame, the top of the table being substantially in the same plane as the wire as it is pulled off the bobbin, and a wire guide plate pivoted to the platform and adapted to lie over the table in said opening but spaced therefrom, safety lock means including manually operable arm means movable into and out of holding relation to said bobbin, a switch in said motor circuit and means on said arm for operating said switch to break said motor circuit when the arm is out of holding engagement with said bobbin.

2. In a coil winding machine, a supporting platform, a frame mounted on said platform and having a circular opening therein with a recess formed in the walls of said opening, a wire-supply bobbin disposed in said opening with its periphery extending into said recess, an arm on said frame movable into a position against the inner side of the bobbin to hold it in position in said recess, circuit means including a motor for driving the bobbin and a switch member connected to and operable by the movement of said arm, said switch being open when the arm is moved against the side of the bobbin and closed when the arm is moved to an inoperative position away from the side of said bobbin to control the operation of said motor.

3. The invention of claim 2 further comprising flexible means driven by said motor to rotate the bobbin, said switch being in the circuit of the motor whereby the motor circuit is opened when the arm is in position against the side of the bobbin.

4. In a coil winding machine, a rotatable wire-supply bobbin, a core thereon around which wire is to be wound, said wire being insulated, an electronic counter settable for a predetermined number of counts, a switch in circuit with said counter and normally closed, means whereby the wire opens the switch as each turn is wrapped around the core whereby the counter is pulsed, a drive motor and connecting mechanism for rotating the bobbin, a circuit for said motor, a solenoid pulsed by the counter when the predetermined number of counts has been reached, a braking mechanism for braking the movement of the drive connections to the bobbin and normally in inoperative position, a latch mechanism for holding the braking mechanism in inoperative position and connected to the solenoid and released when said solenoid is pulsed, and spring means to urge the brake mechanism into operative position when the latch is released.

5. The invention of claim 4 further comprising separate normally closed switches in the circuits of the motor and the solenoid and operatively associated with the braking mechanism and adapted to be opened when the braking mechanism moves to operative position.

6. The invention in claim 1 in which the contact table is grounded, a contact element on the guide plate adapted to engage the table when the guide plate is in position thereover, a counter circuit including the table, the contact element and a counter device, adapted to be pulsed when said circuit is broken, said contact element being adapted to make and break said counter circuit to provide a pulse to said counter and break said counter device, and means for grounding the counter circuit as the guide plate is lifted from the table and before the circuit contact on the guide plate breaks contact with the table whereby a pulse is not transmitted to said counter device.

7. In a coil winding machine as set forth in claim 6 including a core through which said wire supply bobbin passes, reciprocable jaw members engaging opposite sides of said core, and means for driving said jaw members in opposite directions to turn said core.

8. In a coil winding machine as set forth in claim 7 wherein one of said jaw members is pivotally mounted to permit it to be moved away from engagement with the core whereby said core may be removed.

9. In a coil winding machine, a bobbin made in the form of a peripherally slotted hollow split ring, the line of the split being substantially straight and in a non-radial direction across the ring, a hollow slotted plug having one end disposed in one end of the ring, the other end of the plug member being adapted for insertion into the other end of the ring, the lower peripheral surface of said other end of the plug being flattened to permit the end of a wire to be positioned between it and the bottom of the ring, and the ends of the ring being drawn together to clamp the wire and close the ring.

10. The invention of claim 9 wherein said slot is about the outer periphery of said ring and including a flat flexible drive belt contacting the bobbin substantially about the major portion of its outer periphery, the peripheral contact of the drive member closing the slot to hold the wire in the bobbin and exerting a uniform tension on the wire as it is pulled out of the slot.

11. The invention of claim 10 including a frame having a circular opening to receive the bobbin, the walls of said frame around substantially the major portion of the inner periphery of the opening being recessed for the reception of said flexible drive belt and means for driving said belt.

12. In a coil winding machine, a bobbin made in the form of a peripherally slotted hollow split ring, the line of the split ring substantially straight and in a non-radial direction across the ring, the slot being about the outer periphery of said ring; a hollow slotted plug having one end disposed in one end of the ring, the other end of the plug member being adapted for insertion into the other end of the ring, the lower end surface of said other end of the plug being flattened to permit the end of a wire to be positioned between it and the bottom of the ring, the ends of the ring being drawn together to clamp the wire and close the ring; a flat flexible drive belt contacting the bobbin substantially about the major portion of its outer periphery, the peripheral contact of the drive member closing the slot to hold the wire in the bobbin and exerting a uniform tension on the wire as it is pulled out of the slot; a frame having a circular opening to receive the bobbin, the walls of said frame around substantially the major portion of the inner periphery of the opening being recessed for the reception of said flexible drive belt and means for driving said belt; and a platform on which said frame is disposed, said frame comprising a stationary section and a pivoted section and said pivoted section being movable to widen said circular opening to permit disposition of the bobbin within said frame.

References Cited in the file of this patent

UNITED STATES PATENTS

2,367,086	Barry	Jan. 9, 1945
2,467,643	Wirth	Apr. 19, 1949
2,672,297	Harder	Mar. 16, 1954
2,726,817	Barrows	Dec. 13, 1955
2,810,530	Marsters	Oct. 22, 1957
2,812,143	Goodykoontz	Nov. 5, 1957
2,865,573	Tarara et al.	Dec. 23, 1958
2,865,574	Blumentritt	Dec. 23, 1958