

May 15, 1945.

S. M. MARTIN ET AL

2,375,862

APPARATUS FOR SERVING STRANDS UPON ARTICLES

Filed March 18, 1944

9 Sheets-Sheet 1

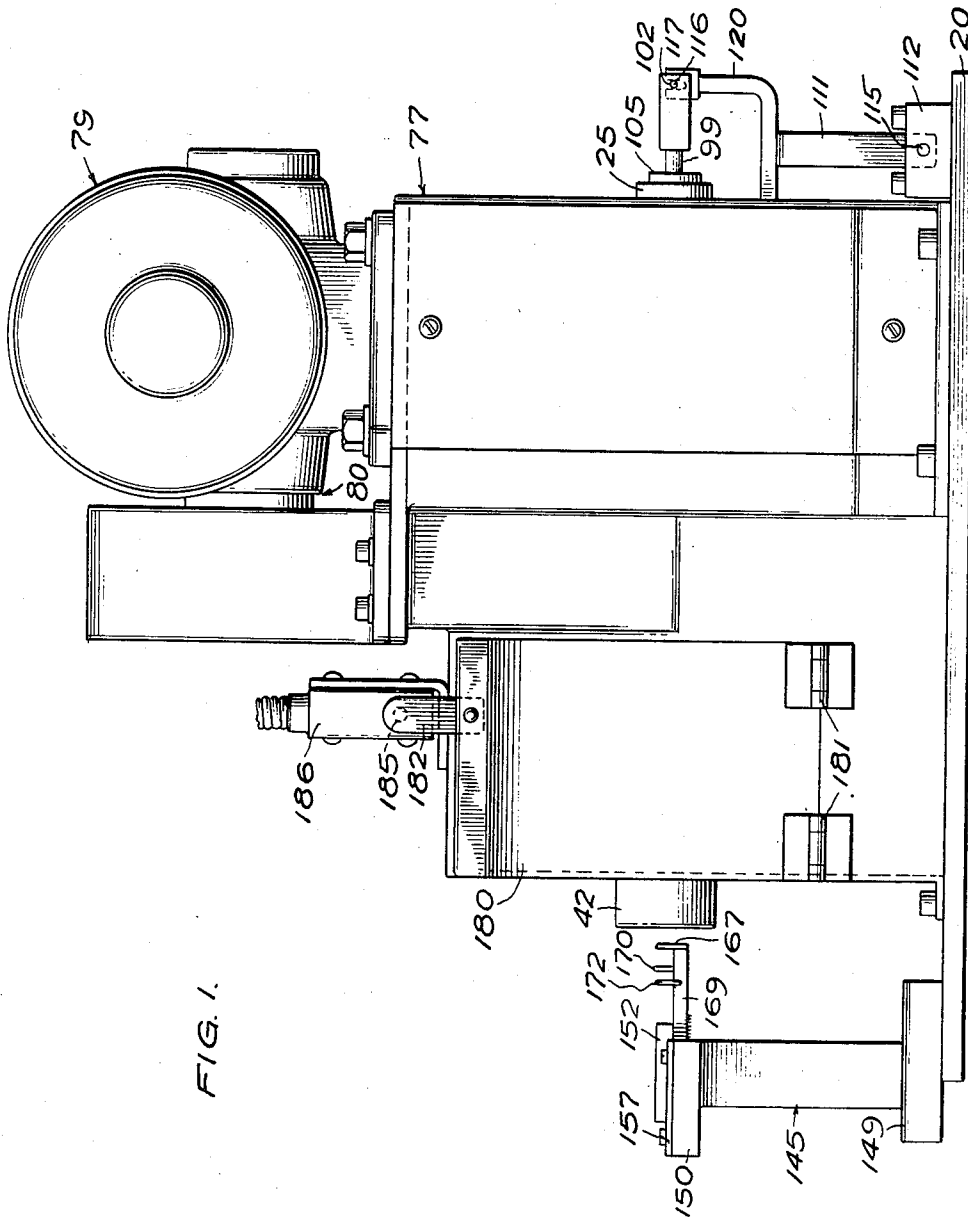


FIG. 1.

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9 Sheets-Sheet 3

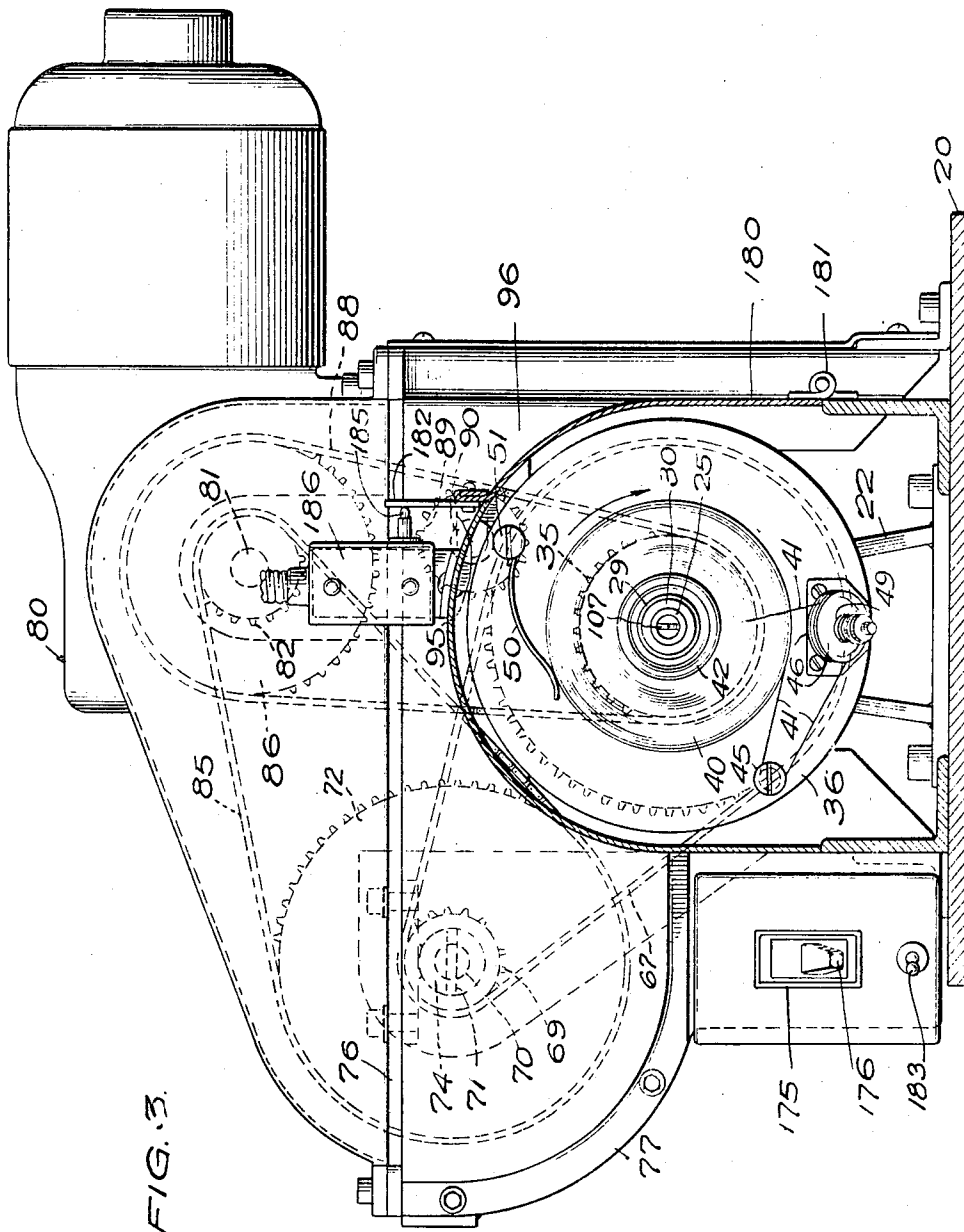


FIG. 3.

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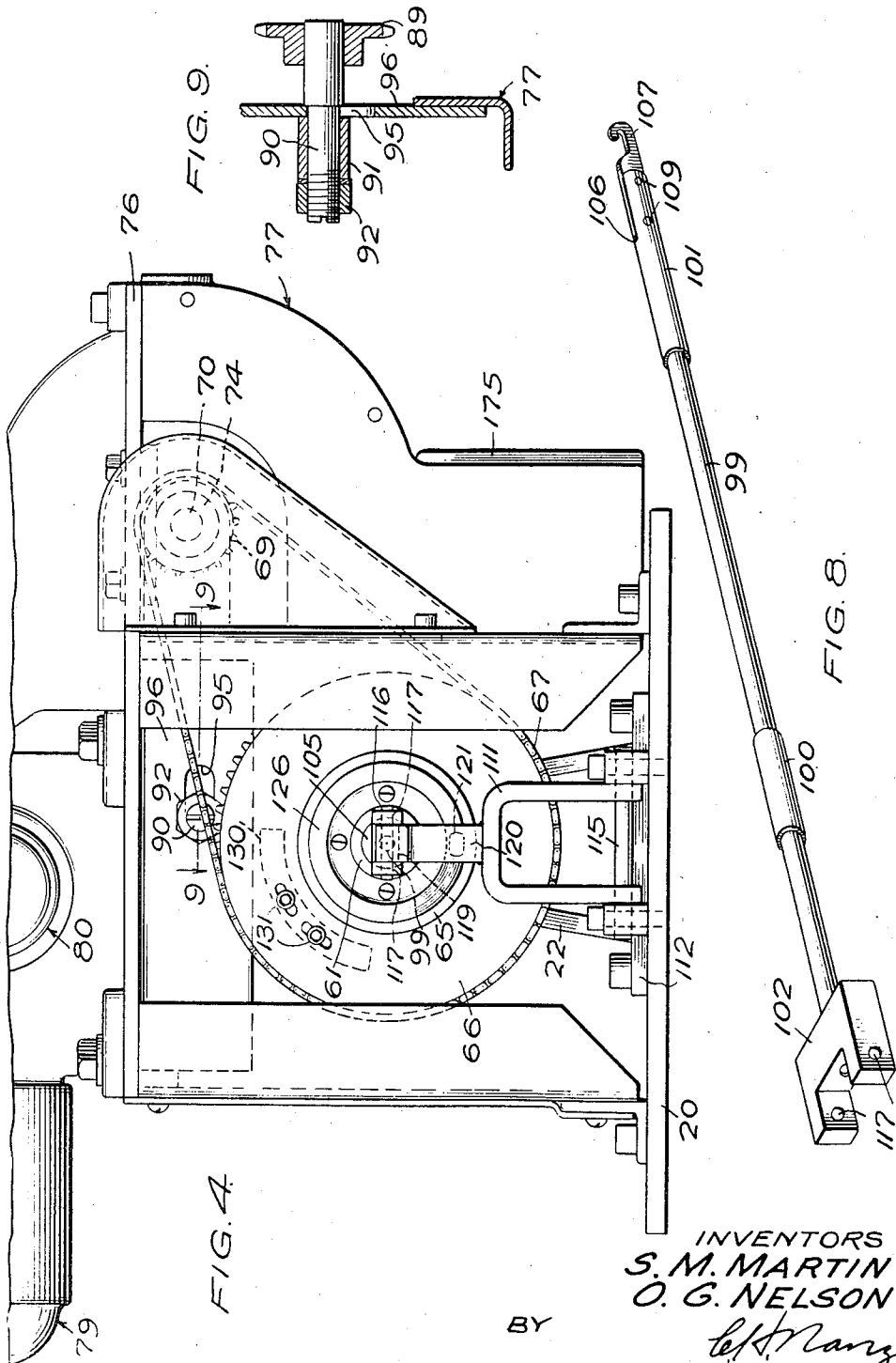
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APPARATUS FOR SERVING STRANDS UPON ARTICLES

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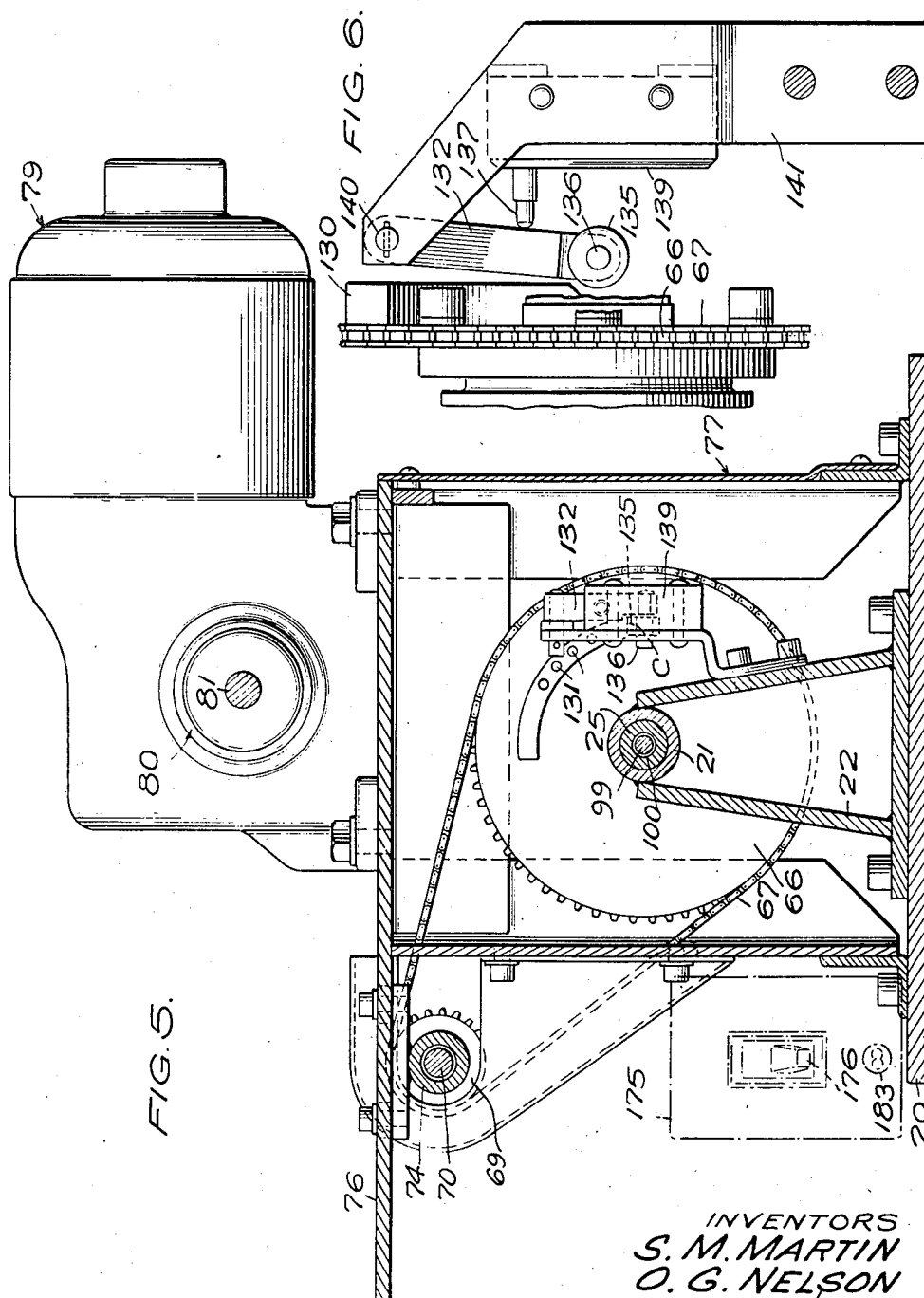
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APPARATUS FOR SERVING STRANDS UPON ARTICLES

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9 Sheets-Sheet 5



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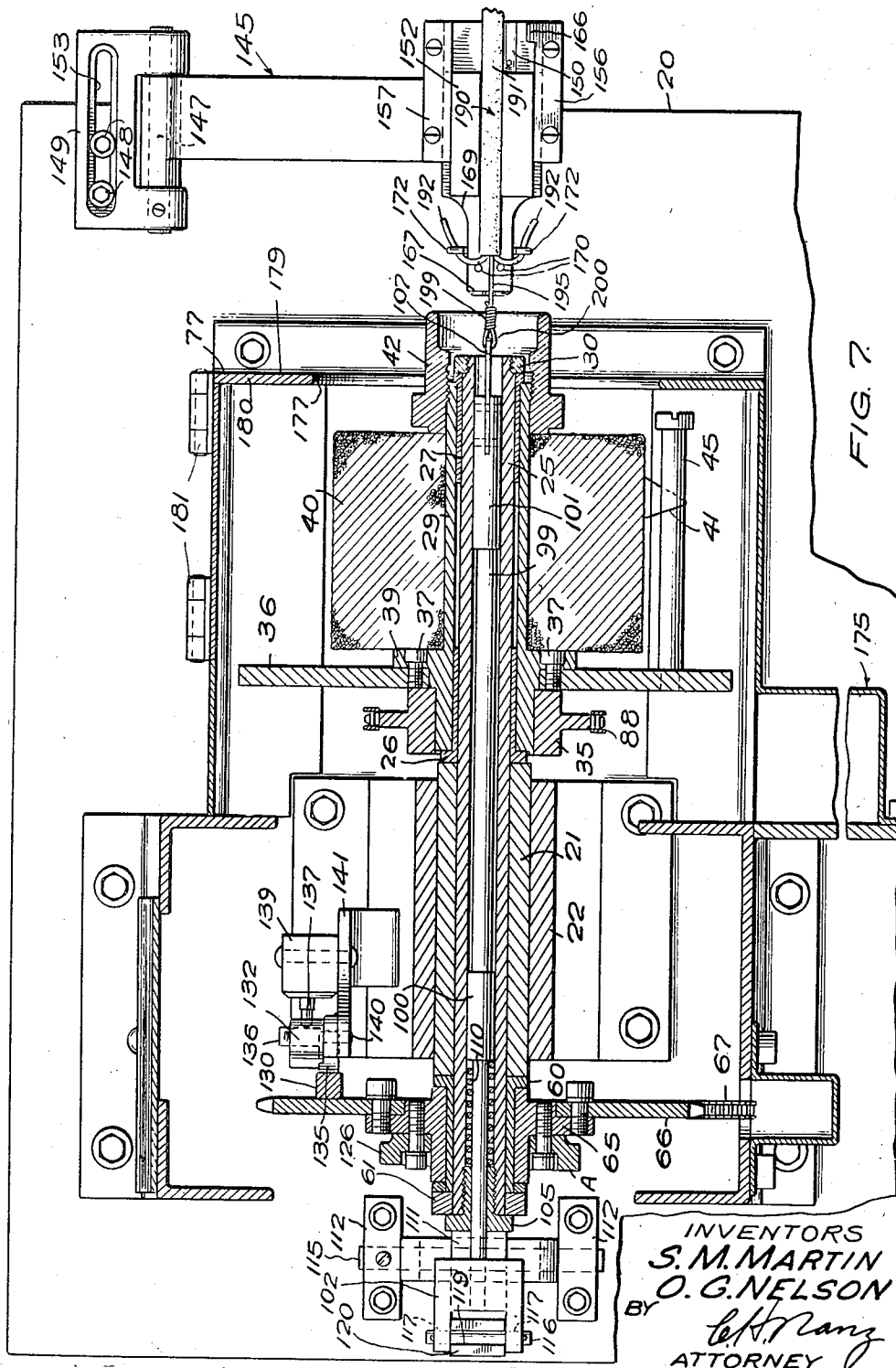
S. M. MARTIN ET AL

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APPARATUS FOR SERVING STRANDS UPON ARTICLES

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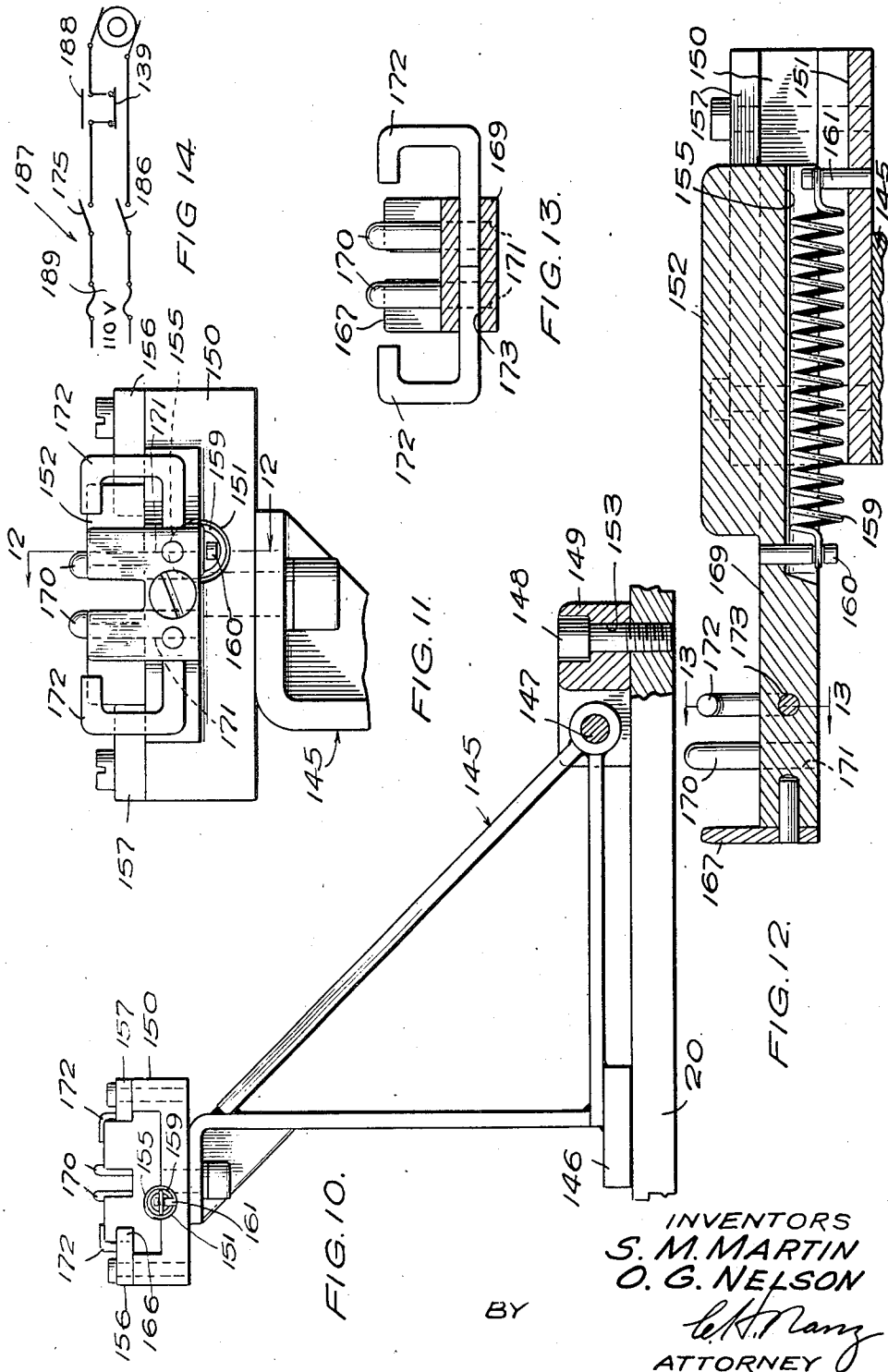
S. M. MARTIN ET AL

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APPARATUS FOR SERVING STRANDS UPON ARTICLES

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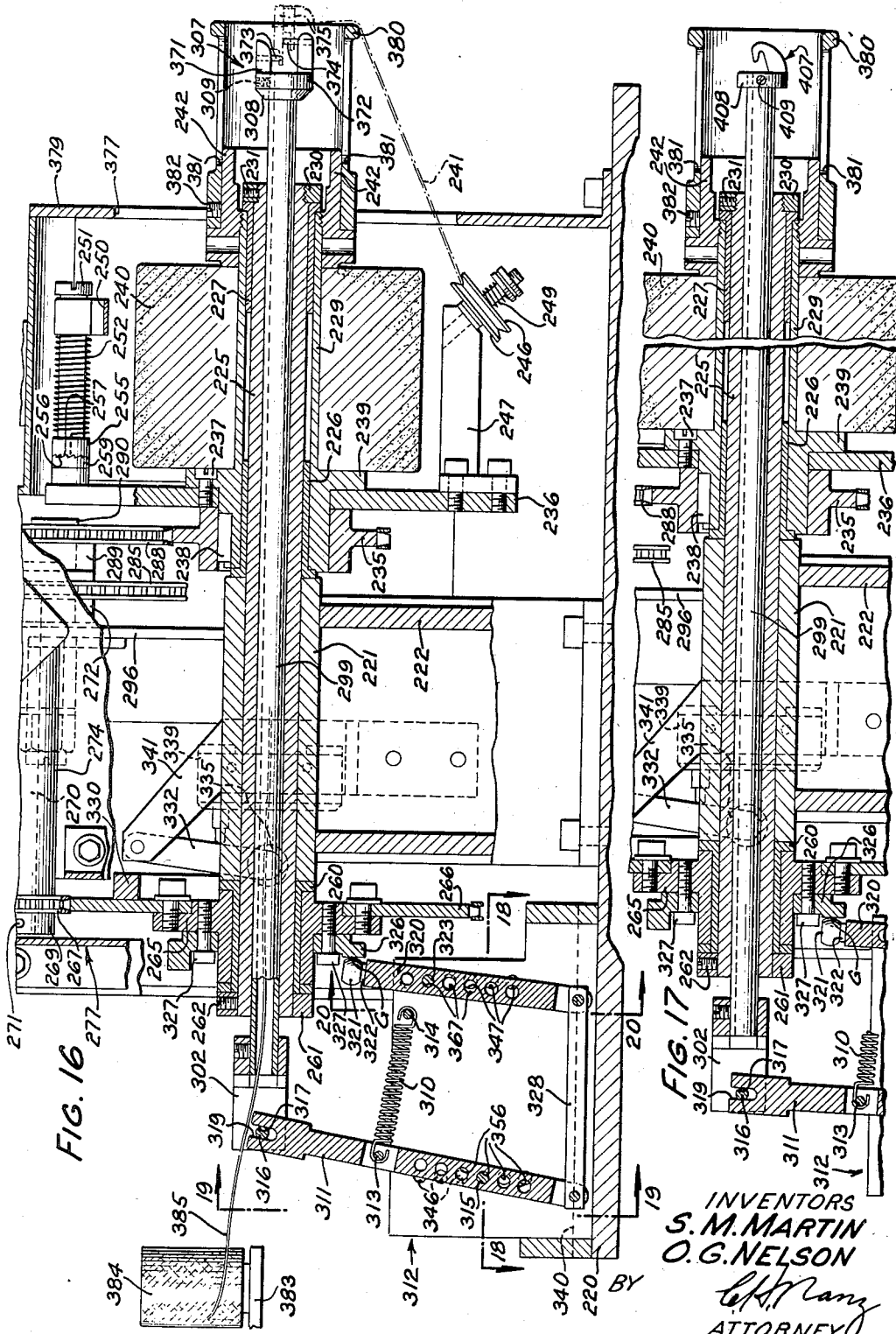
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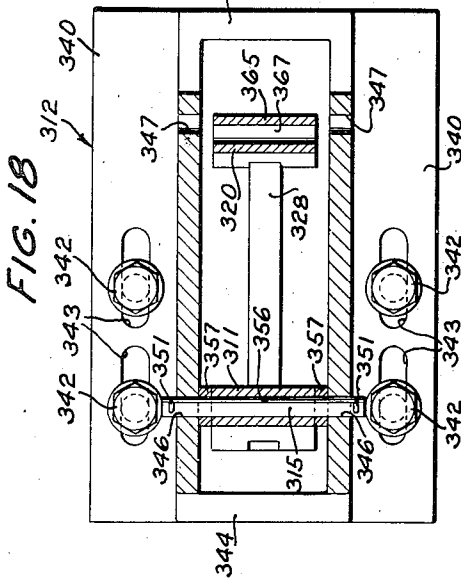
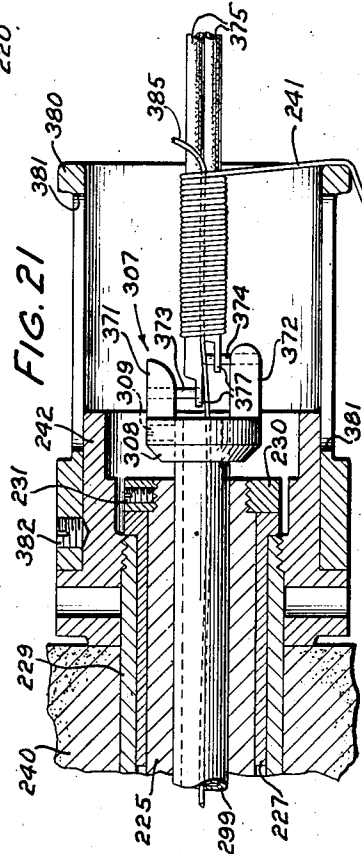
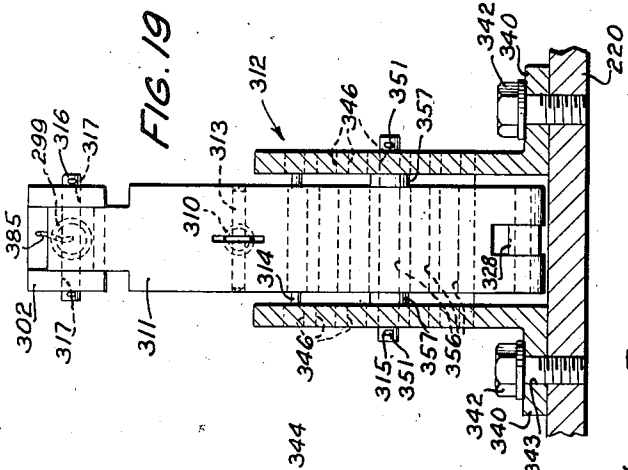
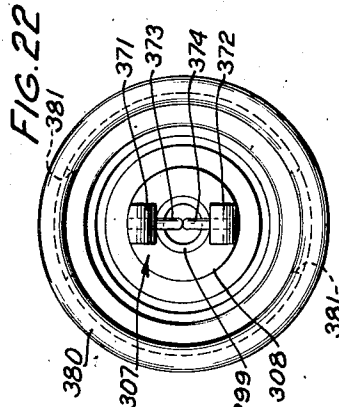
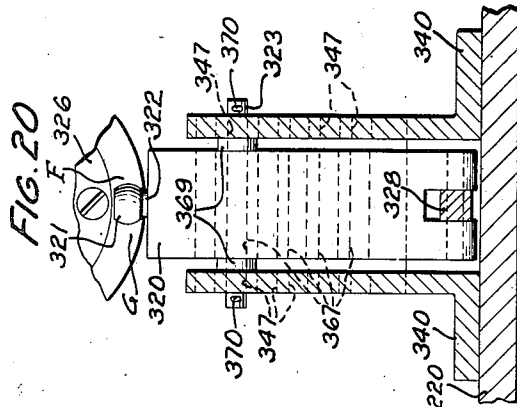
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APPARATUS FOR SERVING STRANDS UPON ARTICLES

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2,375,862

APPARATUS FOR SERVING STRANDS UPON ARTICLES

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Application March 18, 1944, Serial No. 527,092

20 Claims. (Cl. 242-7)

This invention relates to apparatus for serving strands upon articles and more particularly to apparatus for serving strands upon the ends of cords.

This application is a continuation in part of our copending application Serial Number 512,006, filed November 27, 1943, now abandoned, for Apparatus for serving strands upon articles.

In the manufacture of communication cords which have stay cords extending therefrom, the ends of the stay cords frequently are formed into loops. Heretofore, to form and lash the ends of such stay cords into loops has been a slow, tedious and expensive procedure.

It is an object of this invention to provide new and improved apparatus for serving strands upon articles.

One device embodying the invention comprises a serving head, means for rotating the serving head, a rod reciprocable along the axis of the serving head, means for reciprocating the rod, and means on the end of the rod adjacent to the serving head for securing the end of a cord thereon.

A complete understanding of the invention may be obtained from the following detailed description of a specific embodiment thereof, when read in conjunction with the appended drawings, in which:

Fig. 1 is a side elevation of one type of apparatus embodying the invention;

Fig. 2 is an elevation of the opposite side of the apparatus shown in Fig. 1 with some parts shown in vertical section;

Fig. 3 is a vertical sectional view taken along line 3—3 of Fig. 2;

Fig. 4 is a fragmentary rear elevation of the apparatus shown in Fig. 1;

Fig. 5 is a vertical sectional view taken along line 5—5 of Fig. 2;

Fig. 6 is an enlarged view of a portion of the apparatus shown in Fig. 1;

Fig. 7 is a horizontal sectional view taken along line 7—7 of Fig. 2;

Fig. 8 is an enlarged perspective view of a member forming part of the apparatus shown in Fig. 1;

Fig. 9 is an enlarged fragmentary horizontal sectional view taken along line 9—9 of Fig. 4;

Fig. 10 is an enlarged view of a portion of the apparatus shown in Fig. 1;

Fig. 11 is an enlarged fragmentary view of a portion of the apparatus shown in Fig. 10;

Fig. 12 is an enlarged vertical sectional view of a portion of the apparatus taken along line 12—12 of Fig. 11;

Fig. 13 is an enlarged vertical sectional view of a portion of the apparatus taken along line 13—13 of Fig. 12;

Fig. 14 is a diagrammatic view of a circuit for controlling the operation of the apparatus shown in Fig. 1;

Fig. 15 is an enlarged elevational view of a member forming part of the apparatus shown in Fig. 1;

Fig. 16 is a fragmentary vertical sectional view of an alternative embodiment of the invention;

Fig. 17 is a fragmentary vertical sectional view of a modification of the apparatus shown in Fig. 16;

Fig. 18 is an enlarged horizontal sectional view of a portion of the apparatus shown in Fig. 16 taken along line 18—18 of Fig. 16;

Fig. 19 is an enlarged vertical sectional view of a portion of the apparatus shown in Fig. 16 taken along line 19—19 of Fig. 16;

Fig. 20 is an enlarged vertical sectional view of a portion of the apparatus shown in Fig. 16 taken along line 20—20 of Fig. 16;

Fig. 21 is an enlarged vertical sectional view of a portion of the apparatus shown in Fig. 16, and Fig. 22 is an enlarged elevation of a portion of the apparatus shown in Fig. 16.

Referring now to the drawings, one embodiment of the invention, which is illustrated in Figs. 1 to 15, inclusive, comprises a base plate 20 (Fig. 1) mounted upon a work table (not shown). A bearing 21 (Fig. 2) welded to a standard 22 bolted to the base plate 20 serves to support a tube 25. Flanged bushings 26 and 27 fit tightly upon the tube 25 to the right of the bearing 21, as seen in Fig. 2, and an arbor 29 is rotatably secured upon the bushings 26 and 27 by a nut 30 secured upon the threaded end of the tube 25 by a set screw 31.

A sprocket 35 (Fig. 7) is secured to the arbor 29 by a key 38 and a plate 36 is secured by bolts 37—37 to a flange 39 formed on the arbor 29. A ball 40 providing a supply of a continuous strand 41 surrounds the arbor 29 and is secured upon the arbor by a guide cap 42 threaded upon the outer end of the arbor. A flanged guide roller 45 is secured to the plate 36 and guides the strand 41 from the ball 40 to a pair of discs 46—46 (Figs. 2 and 3) slidably mounted upon an arm 47 bolted to the plate 36. The strand 41 passes between the discs 46—46, which are pressed together by a compression spring 49 to exert a braking action upon the strand when the strand is drawn from the ball 40. A brake shoe 50 pivotally mounted upon a bolt 51 secured to the plate 36 is urged against the periphery of the ball 40 by a torsion

spring 52, which is secured to a disc 55 having ratchet teeth 56—56 formed thereon and cooperating with teeth 57—57 formed on an annular shoulder 59 secured on the plate 36.

A flanged bushing 60 secured upon the left end of the tube 25, as seen in Fig. 2, by a collar 61 fastened thereon by a set screw 62, serves to mount a hub 65 rotatably with respect to the tube 25. A sprocket 66 bolted to the hub 65 may be rotated about the longitudinal axis of the tube 25 by a chain 67 driven by a sprocket 69 (Fig. 3) which is secured to one end of a shaft 70 by a pin 71. A sprocket 72 is rigidly secured upon the other end of the shaft 70, which is rotatably mounted in a bearing 74 bolted to a frame member 76 forming part of a housing 77.

A motor 79 of a conventional type actuates a drive 80 of a suitable type terminating in a shaft 81, upon which a sprocket 82 (Figs. 2 and 3) is keyed. The sprocket 82 drives a chain 85, which rotates the sprocket 72, the shaft 70, and the sprocket 69, thereby rotating the sprocket 66 through the chain 67.

A sprocket 86 (Figs. 2 and 3) secured to the shaft 81 by a pin 87 rotates through a chain 88 the sprocket 35, the plate 36, and the arbor 29 upon the bushings 26 and 27. As the arbor 29 is rotated, the brake shoe 50, pressed against the ball 40, holds the ball stationary and causes it to rotate with the arbor. An idler 89 (Fig. 9) secured to a stub shaft 90 adjustably secured by a spacer 91 and a nut 92 in a slot 95 formed in a plate 96 of the housing 77 prevents slack in the chain 88.

A rod 99 (Fig. 8) having bearing surfaces 100 and 101 formed thereon is slidably mounted in the interior of the tube 25 and passes through a bushing 105 (Fig. 2) threaded into the left end of the tube, as viewed in Fig. 2. The right hand end of the rod 99, as seen in Fig. 8, is provided with a slot 106 in which a hook 107 is secured by rivets 109—109. A compression spring 110, bearing against one end of the bearing surface 100 and the end of the bushing 105, urges the rod 99 to the right, as viewed in Fig. 2.

A yoke 102 secured to the left end of the rod 99, as viewed in Fig. 2, is connected to a lever 111 (Fig. 4) by means of a pin 116 passing through apertures 117—117 formed in the yoke and through an open slot 119 formed in one end of an arm 120 secured to the lever. The lever 111 is pivotally mounted upon a pin 115 passing through a bracket 112 secured to the base plate 20. A cam follower 121, rotatably mounted on the arm 120 by a bolt 122 (Fig. 2), a nut 123 and a washer 124, engages a cam 126 secured to the sprocket 66 by bolts 127—127. When the motor 79 is in operation, the cam 126 is rotated with the sprocket 66 in a counterclockwise direction, as viewed in Fig. 4, and causes the cam follower 121 to reciprocate. As the follower 121 is thrust to the left, the lever 111 is pivoted in a counterclockwise direction, as viewed in Fig. 2, to draw the rod 99 to the left against the pressure of the spring 110. When the cam 126 is rotated so the raised portion of the cam (indicated by the letter A in Fig. 15) has passed the follower 121, the follower will be snapped back against the lowermost portion of the cam, which is indicated by the letter B, as the spring 110 urges the rod 99 to the right, as viewed in Fig. 2. Upon the next revolution of the cam 126, the operation just described will be repeated.

An arcuate kicker 130 (Figs. 5 and 6), adjustably secured to the sprocket 66 by screws 131—131

concentrically with the axis of the tube 25, engages a roller 135 rotatably mounted by a bolt 136 upon a lever 132 and forces the lever against a spring-pressed operating button 137 of a micro-switch 139 to open the contacts of the micro-switch. The lever 132 is pivotally mounted by a pin 140 on an arm 141, which is bolted to the standard 22 and supports the microswitch 139. The kicker 130 is so positioned on the sprocket 66 that the foremost portion thereof, indicated by the letter C in Fig. 5, strikes the roller 135 and opens the contacts of the microswitch 139 just as the cam follower 121 engages the designated portion B of the cam 126.

A triangular standard 145 (Fig. 10) resting on a block 146, is pivotally mounted on a pin 147 secured to a bracket 149, which is adjustably secured to the base plate 20 by bolts 148—148 (Fig. 7) passing through a slot 153 formed in the bracket 149. A U-shaped guide 150 bolted to the triangular standard 145 has a semicircular groove 151 formed therein. A slide 152 having a groove 155 complementary to the groove 151 formed therein is slidably secured in the U-shaped guide 150 by plates 156 and 157 bolted to the guide. A tension spring 159 is positioned in the channel formed by the grooves 151 and 155 and is secured to pins 160 and 161 (Fig. 12) carried by the slide 152 and the guide 150, respectively. The spring 159 urges the slide 152 to the right, as viewed in Fig. 12, against a projection 166 (Fig. 10) formed on the end of the plate 156. A U-shaped plate 167 is secured to the end of a tongue 169 projecting from the slide 152. A pair of pins 170—170 are mounted in apertures 171—171 formed in the tongue and a pair of hook-shaped clamps 172—172 (Fig. 13) fit tightly, but slidably, in a bore 173 formed transversely through the tongue 169. When the triangular standard 145 is in the position shown in Fig. 10, the U-shaped plate 167 is aligned with the axis of the rod 99, and the pins 170—170 are positioned equal distances on each side of that axis.

A conventional master switch 175 (Fig. 14) operated by a snap lever 176 (Fig. 3) is mounted upon a portion of the housing 77. The housing 77 extends over the ball 40, and has an opening 177 formed in a side 179 thereof concentric with the rod 99 through which a ball of strand similar to the ball 40 may be inserted when the ball 40 has been exhausted, after the guide cap 42 has been removed from the arbor 29. During such an operation the triangular standard 145 is rotated in a clockwise direction, as viewed in Fig. 10, so that the standard will not obstruct the replacement of the ball 40. A door 180 (Fig. 1) forming part of the housing, is pivotally mounted by hinges 181—181 to the housing 77 and may be opened to facilitate the threading of the strand 41 over the guide roller 45 and between the discs 46—46. When the door 180 is opened, a tab 182 (Fig. 1) secured to the door releases a spring-pressed button 185 of a microswitch 186 to open the contacts thereof. When the door is closed the contacts of the microswitch 186 are closed by the action of the tab 182 pressing against the button 185.

An electrical circuit 187 (Fig. 14) controlling the operation of the motor 79 consists of a conventional source of current 189, the master switch 175, the microswitch 186, and the motor 79, all mounted in series relationship, and the micro-switch 139 mounted in parallel relationship with a switch 188, which may be operated in any suit-

able manner, such as by means of a push button 183 (Fig. 3).

In the operation of the above described apparatus, a cord 190, comprising an insulating jacket 191 enclosing two conductors 192—192 and a stay cord 195, is placed on the tongue 169 with the stay cord 195 thereof positioned between the pins 170—170 and extending through the U-shaped plate 167. The hook-shaped clamps 172—172 are drawn from the bore 173, the two conductors 192—192 are bent back and inserted into the hooked portions of the clamps 172—172, and the clamps are slid inwardly to the positions shown in Fig. 13 to securely clamp the conductors 192—192 to the tongue 169 in positions in which they will not interfere with subsequent operations of the apparatus.

The end of the stay cord 195 is then looped over the hook 107 and is drawn slightly taut. The end of the strand 41, which is drawn from the ball 40, is drawn over the guide cap 42 and coiled once or twice over the looped end of the stay cord 195 and held along the stay cord.

At this stage of the operation, the cam follower 121 is directly opposite the lowermost portion (B) of the cam 126 and the spring 110 is permitted to urge the rod 99 to its extreme position to the right, as viewed in Fig. 2. The arcuate kicker 130 is in a position in which it thrusts the lever 132 in a counterclockwise direction, as viewed in Fig. 6, to operate the button 137 of the microswitch 139 and thereby keep the contacts of that microswitch open. The door 180 is closed and the button 165 of the microswitch 166 is held in a position closing the contacts of the microswitch 166.

The snap lever 176 is then operated to close the contacts of the master switch 175 and the push button 183 is pressed to close the switch 188 to permit current to flow through the circuit 187, thereby starting the motor 79. The arbor 29 and the ball 40 mounted thereon are rotated in a clockwise direction, as viewed in Fig. 3, around the rod 99, and the strand 41 is wound around the looped portion of the stay cord 195. The cam 126 is rotated in a counterclockwise direction, as viewed in Fig. 4, and forces the cam follower 121 slowly to the left, as viewed in Fig. 2, thereby causing the rod 99, the hook 107, the cord 190 and the slide 152 to be drawn slowly to the right, as viewed in Fig. 2, against the action of the springs 110 and 159. As the looped portion of the stay cord 195 is drawn slowly to the left, the strand 41 is guided by the cap 42 directly to the stay cord and is thereby wound upon the looped portion thereof in an even lay. The brake shoe 50 and the discs 46—46 place the strand 41 under a tension as the strand is withdrawn from the ball 40 and wound upon the stay cord 195.

After the arcuate kicker 130 has been rotated out of contact with the roller 135, the lever 132 is moved in a clockwise direction, as viewed in Fig. 2, by the spring-pressed button 137, which thereby closes the contacts of the microswitch 139. At this time, or shortly thereafter, the switch 188 is opened. Since the microswitch 139 and the switch 188 are in parallel and the contacts of the microswitch 139 are closed, the current to the motor is not interrupted by the opening of the switch 188 and the apparatus continues to operate as described hereinabove until the portion C of the kicker 130 causes the lever 132 to open the contacts of the microswitch 139, thereby breaking the circuit and stopping the motor 79.

The kicker 130 is secured to the sprocket 66 in such a position that just as the circuit is thus broken by the microswitch 139, the lowermost portion B of the cam 126 is opposite the cam follower 122 and the action of the springs 110 and 159 draws the rod 99 to the extreme right, as viewed in Fig. 2, just as the motor is cut off and the winding discontinued. Thus, only a single uniform layer 199 of winding will be wound upon the portions of the stay cord 195 adjacent to a loop 200 formed thereby. Throughout the above described operation the spring 159 keeps the stay cord 195 taut to insure uniformity of the application of the strand 41 thereto.

After the foregoing operations are completed, the strand 41 is severed at a point between the cap 42 and the discs 46—46 and the ends of the portion of the strand wound upon the stay cord 195 are tied to prevent unwinding thereof. The hook-shaped clamps 172—172 are then slid outwardly in the bore 173, the conductors 192—192 removed therefrom, and the loop 200 of the stay cord 195 is unhooked from the hook 107 to free the apparatus for operation upon another cord similar to the cord 190.

An alternative embodiment of the invention and a modification thereof are shown in Figs. 16 to 22, inclusive. The apparatus shown in Fig. 16 is designed to apply one or more layers of a strand upon conductors to form built-up portions on the conductors for fitting them into apertures formed in plugs. This alternative embodiment of the invention is, in general, like that illustrated in Figs. 1 to 15, inclusive, except that the rod 99 and the mechanism for reciprocating it have been replaced by other forms of these elements. In the following description of this alternative embodiment of the invention, only that portion thereof which is essential for an understanding of its construction and operation is described, and it is to be understood that in all other respects, the construction and operation thereof are identical with those of the embodiment of the invention described hereinabove.

In the embodiment shown in Fig. 16 of the drawings, a base plate 220 is mounted upon a work table (not shown). A bearing 221 welded to a stand 222 bolted to the base plate 220 serves to support a tube 225. Flanged bushings 226 and 227 fit tightly upon the tube 225 to the right of the bearing 221, as seen in Fig. 16, and an arbor 229 is rotatably secured upon the bushings 226 and 227 by a nut 230 secured upon the threaded end of the tube 225 by a set screw 231.

A sprocket 235 is secured to the arbor 229 by a key 238, and a plate 236 is secured by bolts such as the bolt 237 to a flange 239 formed on the arbor 229. A ball 240 providing a supply of a continuous strand 241 surrounds the arbor 229 and is secured upon the arbor by a guide cap 242 threaded upon the outer end of the arbor. The strand 241 passes from the ball 240 between a pair of discs 246—246 slidably mounted upon an arm 247 bolted to the plate 236. The strand 241 passes between the discs 246—246, which are pressed together by a compression spring 249 to exert a braking action upon the strand when the strand is drawn from the ball 240. A brake shoe 250 pivotally mounted upon a bolt 251 secured to the plate 236 is urged against the periphery of the ball 240 by a torsion spring 252, which is secured to a disc 255 having ratchet teeth 256—256 formed thereon and cooperating with teeth 257—257 formed on an annular shoulder 259 secured on the plate 236.

A flanged bushing 260 secured upon the left end of the tube 225, as seen in Fig. 16, by a collar 261 fastened thereon by a set screw 262 serves to mount a hub 265 rotatably with respect to the tube 225. A sprocket 266 bolted to the hub 265 may be rotated about the longitudinal axis of the tube 225 by a chain 267 driven by a sprocket 269, which is secured to one end of a shaft 270 similar to the shaft 70. A sprocket 272 is rigidly secured upon the other end of the shaft 270, which is rotatably mounted in a bearing 274 bolted to a frame member (not shown) similar to the frame member 76. The frame member forms part of a housing 277.

A motor (not shown) similar to the motor 79 through a series of gears (not shown) drives a chain 285 (Fig. 16), which rotates the sprocket 272, the shaft 270, and the sprocket 269, thereby rotating the sprocket 266 through the chain 267.

The motor through a sprocket (not shown) similar to the sprocket 86 (Figs. 2 and 3) rotates through a chain 288 (Fig. 16) the sprocket 235, the plate 236, and the arbor 229 upon the bushings 226 and 227. As the arbor 229 is rotated, the brake shoe 250, which is pressed against the ball 240, tends to hold the ball stationary and causes it to rotate with the arbor. An idler 289 similar to the idler 89 (Fig. 9) rotatably secured upon a stub shaft 290 prevents slack in the chain 288.

A hollow tube 299 having a yoke 302 secured thereon at the left end, as seen in Fig. 16, replaces the rod 99 and is slidably mounted in the interior of the tube 225. A work holder 307 having a collar 308 is substituted for the hook 107 and is secured upon the right hand end of the hollow tube 299, as seen in Fig. 16, by a set screw 309. The lever 111 shown in Fig. 2 is replaced by a lever 311 (Fig. 16) and the spring 110 is replaced by a tension spring 310. One end of the tension spring 310 is secured by a pin 313 to the lever 311, which is pivotally mounted on a bracket 312 by a pin 315, and the other end of the spring 310 is secured to a pin 314 secured to the bracket 312. A pin 316 passing through apertures such as aperture 317 formed in the yoke 302 passes through an open slot 319 formed in the upper end of the lever 311 to secure the yoke 302 to the lever 311. A lever 320 having a cam follower 321, rotatably mounted on the upper end 322 thereof, is pivotally secured by a pin 323 to the bracket 312. The cam follower 321 engages a cam 326, similar to the cam 126, which is secured to the sprocket 266 by bolts 327-327.

A link 328 is pivotally secured to the levers 311 and 320, and due to the action of the spring 310 upon the lever 311, urges the lever 320 in a clockwise direction, as viewed in Fig. 16. When the motor (not shown) is in operation, the cam 326 is rotated with the sprocket 266 and thrusts the cam follower 321 to the left, as viewed in Fig. 16. As the follower 321 is thrust to the left, the lever 311 is pivoted in a counterclockwise direction, as viewed in Fig. 16, against the force of the spring 310 to draw the tube 299 to the left. When the cam 326 is rotated so the raised portion of the cam 326, which is indicated by the letter F in Fig. 20, has passed the follower 321, the follower will be snapped back against the lowermost portion of the cam, which portion is indicated by the letter G, as the tube 299 is urged to the right, as viewed in Fig. 16, by the lever 311. Upon the next revolution of the cam 326, the operation just described will be repeated.

An arcuate kicker 330 (Fig. 16) similar to the kicker 130 (Fig. 6) is adjustably secured to the sprocket 266 in a manner similar to that in which the kicker 130 is secured to the sprocket 66. A roller 335 rotatably mounted upon a lever 332 and the lever 332 are identical with the roller 135 and the lever 132. The roller 335 and the lever 332, which is pivotally secured to an arm 341, are adapted to be actuated by the kicker 330 in a manner similar to that in which the roller 135 and the lever 132 are actuated by the kicker 130 to operate a microswitch 339 in identical fashion to the operation of the microswitch 139. That is, the kicker 330 engages the roller 335 to open the contacts of the microswitch 339 when the designated portion F of the cam 126 is in the lowermost portion of its circle of rotation, the position shown in Fig. 20.

The bracket 312 (Figs. 18, 19 and 20) consists of a pair of L-shaped plates 340-340, which have elongated slots 343-343 formed in the horizontal portions thereof, adjustably secured to the base plate 220 by bolts 342-342 and a pair of vertical end plates 344-344 welded to the plates 340-340. Each of the vertical portions of the plates 340-340 has a series of holes 346-346 and a series of holes 347-347 formed therethrough. Each of the holes 346-346 in one of the vertical portions of the plates 340-340 is aligned with one of the holes 346-346 in the vertical portion of the other of the plates 340-340 and each of the holes 347-347 in one of the plates is aligned with one of the holes 347-347 in the other plate.

The pin 315 (Fig. 18) extends through two of the aligned holes 346-346 and one of a series of holes 356-356 formed in the lever 311 and is secured therein by cotter pins 351-351. A pair of washers 357-357 (Fig. 18) mounted on the pin 315 space the lever 311 between the plates 340-340. The pin 323 extends through two aligned holes of the series of holes 347-347 and one of a series of holes 367-367 formed in the lever 320. The distance between each adjacent pair of holes 367-367 is equal to the distance between each adjacent pair of holes 347-347. A pair of washers 369-369 (Fig. 20) mounted in the pin 323 space the lever 320 between the plates 340-340, and the pin 323 is secured in its position by a pair of cotter pins 370-370.

The work holder 307 (Fig. 21) has a pair of parallel arms 371 and 372 extending from the collar 308. A pair of spaced pins 373 and 374 are perpendicularly secured to the arms 371 and 372, respectively, and project inwardly from the arms. A pair of conductors 375-375 of different predetermined lengths have eyelet tips 377-377 secured to the ends thereof. The difference in the lengths of the conductors 375-375 corresponds to the distance between the spaced axes of the spaced pins 373 and 374. Each of the tips 377-377 is placed over one of the pins 373 and 374 and thus the conductors 375-375 are attached to the work holder 307.

A guide cap 380 (Fig. 16) having observation slots 381-381 formed therein is secured to the guide cap 242 by a set screw 382. The guide cap 380 extends beyond the guide cap 242 and serves to guide the strand 241 to the conductors 375-375 at a point considerably to the right, as viewed in Fig. 16, of the end of the guide cap 242. The guide cap 380 permits a long, reciprocal movement of the tube 299 and the work holder 307 relative thereto.

A strand supply holder 383 (Fig. 16) serves to rotatably mount a cap 384 containing a supply of a filler cord 385. The end of the cord 385 may be drawn through the tube 299, between the arms 371 and 372, and held along the conductors 375—375 to provide a filler between the ends of the conductors 375—375.

In the operation of the modification just described, the eyelet tips 377—377 of the conductors 375—375 are placed over the pins 373 and 374. The end of the filler cord 385 is then held along the conductors 375—375, and the end of the strand 241 is held flush with the end of the cap 380 and against the conductors and the filler cord 385, which is held along the conductors. The motor (not shown) is then started in a manner similar to the manner in which the motor 79 was started in the operation of the first described embodiment of the invention.

The operation of the apparatus just described is then identical with the operation of the first described apparatus, except that the tube 299 is drawn to the left, as viewed in Fig. 16, by the action of the lever 311, the link 328, the lever 320, the cam follower 321, and the cam 326, and the conductors 375—375 are tensioned by hand rather than by means similar to the standard 145 and its associated means comprising a portion of the first described embodiment of the invention. Also, the movement of the tube 299 is considerably longer than the movement of the rod 99, as described hereinabove, and thus the length of the ends of the conductors 375—375 which are covered by the strand 241 is considerably longer than the length of the end of the stay cord 195 which is covered by the strand 41. During this operation, the strand 241 is guided to the conductors 375—375 by the guide cap 380.

When the portion of the cam 326 (Fig. 20), designated G, is rotated again into contact with the follower 321, the kicker 330 (Fig. 16) opens the contacts of the microswitch 339 and the motor is deenergized. The spring 310 urges the tube 299 again to the right, as viewed in Fig. 16, at this time and the tips 377—377 are disengaged manually from the pins 373 and 374. The end of the filler cord 385 is severed from the remaining portion thereof, after which the operation may be repeated upon another pair of tipped conductors similar to the conductors 375—375. The portions of the conductors 375—375 and filler cord 385 are thus securely bound by the strand 241 in a symmetrical triangular shape forming a built-up section which, with or without a subsequent covering of cotton braid, as may be required, is adapted to fit into an aperture in a plug (not shown) in which the eyelet tips 377—377 are connected.

By employing a multiplicity of arms and pins similar to the arms 371 (Fig. 21) and 372 and the pins 373 and 374 in a work holder similar to the work holder 307, one or more conductors may be added and the filler cord 385 omitted, if not required, thereby permitting a similar build-up of desired proportions to be applied on multi-conductor cords.

The slots 381—381 (Fig. 21) in the guide cap 380 permit observation of the work holder 307 and of the serving of the strand 241 upon the ends of the conductors as the guide cap 380 is rotated during the serving operation. The slots 381—381 also permit observation of the work holder for attaching or disengaging the tips 377—377 from the pins 373 and 374.

The pins 315 (Fig. 16) and 323 may be withdrawn, if desired, from the particular ones of the holes they occupy and may be inserted through others of the holes to vary the angular motion of the upper end of the lever 311 and thereby vary the throw of the rod 299.

For forming loops in stay cords similar to the loop 200, the last described apparatus may be changed by replacing the work holder 307 (Fig. 16) with a hooked work holder 407 having a collar 408 secured by a set screw 409 to the tube 299, as shown in Fig. 17. For this type of operation, the distance of reciprocation of the tube 299 is shortened to the natural throw of the cam 326 by adjusting the positions of the pins 315 and 323, as described above. A standard with a cord holding device thereon similar to the standard 145 and the cord holding device thereon may be used, if desired. The apparatus then operates in substantially the same manner as does the first modification.

If it is desired to vary the starting position of either of the work holders 307 or 407, the bolts 342—342 may be loosened, the bracket 312 slid to the right or left, as viewed in Figs. 16 and 17, as desired, and bolts 342—342 retightened.

What is claimed is:

1. In an apparatus for serving textile strands upon cords, a rod having means formed on one end thereof for attaching a conductor to the rod, means for urging the rod in one direction, means associated with the opposite end of the rod for moving the rod in a direction opposite to the first mentioned direction, a serving head rotatably mounted about the axis of the rod and adjacent to the first mentioned end thereof, and means for rotating the serving head about a cord attached to the end of the rod to wind a strand from the serving head around the cord.
2. In an apparatus for serving strands upon cords, a serving head, means for rotating the serving head, a rod extending through the serving head and mounted reciprocally along the axis of the serving head, means on one end of the rod for attaching a cord thereto, means for urging the rod in one direction along the longitudinal axis of the rod, means for moving the rod in a direction opposite to the first mentioned direction, and means for tensioning a cord attached to the rod during movement of the rod.
3. In an apparatus for serving strands upon cords, a serving head, means for rotating said serving head, a rod extending through the serving head and mounted for reciprocation along the axis of rotation of the serving head, means mounted on one end of the rod for attaching a cord thereto, a rotary cam associated with the rod for moving the rod along the axis of rotation of the serving head, and means for controlling the rotation of said cam.
4. In an apparatus for serving strands upon cords, a serving head, means for rotating the serving head, a movable rod extending through the serving head and mounted along the axis of rotation of the serving head, means for attaching a cord to one end of the rod, a cam, a cam follower associated with the rod and the cam for moving the rod, means for rotating the cam to move the end of the rod and a cord attached thereto through the serving head, and means for stopping the last mentioned means after a predetermined period of rotation of the cam.
5. In an apparatus for serving strands upon cords, a serving head, means for rotating the serving head, a rod extending through the serv-

ing head and mounted movably along the axis of rotation of the serving head, means for attaching a cord to one end of the rod, a cam, means associated with the cam for moving the rod along the axis of rotation of the serving head, means for actuating the cam to move the rod and a cord attached thereto a predetermined distance relative to the serving head, means for adjusting the associated means for varying said predetermined distance, and automatic means for stopping the cam actuating means after the cam has been moved a predetermined amount.

6. In an apparatus for serving strands upon articles, a serving head, means for rotating the serving head, a member having means for positively attaching an article thereto and mounted for reciprocation along the axis of rotation of the serving head, means for moving the member a predetermined distance along the axis of rotation of the head, means for adjusting the moving means to vary said predetermined distance, and automatic means for stopping the last mentioned means after a predetermined movement of the member.

7. In an apparatus for serving strands upon elongated articles, a serving head, means for rotating the serving head, a member extending through the serving head for holding an elongated article along the axis of rotation of the serving head, means for moving the article holding member and an elongated article held thereby along the axis of rotation of the serving head, means for tensioning said article during said movement, and automatic means to stop the means for moving the article holding member after the article has been moved a predetermined amount.

8. In an apparatus for serving strands upon articles, a serving head, means for rotating the serving head, a member having means for positively engaging an article for holding an article coaxially with the serving head, cam means for moving the article engaging portion of the article holding member through the head, means for actuating the cam means and the means for rotating the serving head, and means for automatically cutting off the actuating means after a predetermined movement of the article holding member.

9. In an apparatus for serving strands upon articles, a serving head, means for rotating the serving head, a member extending through the serving head and reciprocally mounted along the axis thereof, means associated with one end of the member for positively holding an article, means associated with the other end of the member for moving the member and an article held by the holding means along the axis of rotation of the serving head, means for actuating the moving means, and means for stopping the actuating means after a predetermined movement of the member.

10. In an apparatus for serving strands upon cords, a hollow arbor, driving means for rotating the hollow arbor, a rod mounted coaxially in the hollow arbor, a hook attached to the end of the rod for securing the end of a cord to the rod, a rotary cam, a cam follower associated with the cam and the rod, a second driving means for rotating the cam to actuate the cam follower thereby moving the rod and a cord attached thereto along the axis of the arbor, an electric motor for actuating the various driving means, a manually operative switch for energizing the

motor, a second switch in parallel with the manually operative switch for maintaining the energization of the motor after the manually operative switch has been opened, means associated with the second driving means for opening the second switch to deenergize the motor after the cam has been rotated through a predetermined arc, a housing partially enclosing the arbor, a door hinged to the housing, a switch associated with the door in series with the aforesaid switches for preventing energization of the motor when the door is open, a cord supporting member, means for slidably mounting the cord supporting member, means for clamping the cord to the cord supporting member, and means for urging the cord supporting member away from the hook to tension the cord supported therebetween.

11. In an apparatus for serving strands upon cords, a serving head, means for rotating the serving head, a member having means for securing a cord thereto, means for mounting the member slidably along the axis of rotation of the serving head, means for moving the member and a cord secured thereto along the axis of rotation of the head, means for actuating the last mentioned means, an electric motor for driving the rotating means and the actuating means, a manually operative switch for energizing the motor, a second switch for maintaining the energization of the motor when the manually operative switch has been opened, and means associated with the actuating means for opening the second mentioned switch after a predetermined movement of the member and the cord held thereby.

12. In an apparatus for serving strands upon cords, an arbor for retaining a strand supply, means for rotating the arbor, a member having means thereon for securing a cord thereto, means for moving the member and a cord attached thereto along the axis of rotation of the arbor, means for actuating the rotating means, a housing including a door for partially enclosing the arbor, and means associated with the door for preventing rotation of the arbor when the door is open.

13. In a device for serving strands upon conductors, a serving head, means for rotating the serving head, a rod reciprocally mounted along the axis of the serving head, means on the end of the rod for securing a cord thereto, means for reciprocating the rod with respect to the serving head, and means for adjusting the reciprocating means to vary the distance of reciprocation of the rod.

14. In a device for serving strands upon conductors, a serving head, means for rotating the serving head, a rod reciprocally mounted along the axis of the serving head and having a passage formed therein, a strand supply from which a strand may be drawn through said passage, means on one end of the rod for securing a cord thereto, adjustable means for reciprocating the rod with respect to the serving head, and a cap associated with the serving head for guiding a strand to a cord secured to said securing means, said cap having apertures formed therein for permitting observation of the cord.

15. In a device for serving strands upon conductors, a serving head, means for rotating the serving head, a tube reciprocally mounted along the axis of the serving head, a strand supply from which a strand may be drawn through the tube, a collar having parallel projections formed thereon secured upon one end of the tube, pins

secured to the projections for securing a cord to the collar, and means for reciprocating the tube with respect to the serving head.

16. In a device for serving strands upon conductors, a serving head, means for rotating the serving head, a rod reciprocably mounted along the axis of the serving head, a collar having parallel projections formed thereon secured upon one end of the rod, pins secured to the projections in offset positions for securing a cord to the collar, and means for reciprocating the rod with respect to the serving head.

17. In a device for serving strands upon conductors, a serving head, means for rotating the serving head, a tube reciprocably mounted along the axis of the serving head, a strand supply from which a strand may be drawn through the tube, a collar having spaced projections extending parallel to the axis thereof secured upon the end of the tube, pins secured perpendicularly to the projections and extending from the opposed faces thereof in offset relationship, a cap having slots formed therein secured to the serving head for guiding a strand from the serving head to a cord secured to the pins, a cam, means for rotating the cam, means for deenergizing the cam rotating means after the cam has been rotated through a predetermined arc, a cam follower associated with the cam, a spring-pressed system of levers associated with the cam follower for reciprocating the tube a predetermined distance along the axis of the serving head, and means for adjusting the system of levers to vary the distance of reciprocation of the tube.

18. In an apparatus for serving strands upon cords, a serving head, means for rotating the

serving head, means for holding a cord to be whipped, means for reciprocating the holding means relative to the serving head, an electric motor for driving the rotating means and the reciprocating means, a switch connected in series with the motor, and means for opening the switch at the end of a reciprocation of the holding means, whereby the motor is deenergized.

19. In an apparatus for serving strands upon cords, a serving head, means for rotating the serving head, means for holding a cord to be whipped, means for reciprocating the holding means relative to the serving head, an electric motor for driving the rotating means and the reciprocating means, a switch connected in series with the motor, means for opening the switch at the end of a reciprocation of the holding means, whereby the motor is deenergized, and a manually operable switch in parallel with the first-mentioned switch for starting the motor.

20. In an apparatus for serving strands upon cords, a serving head, means for holding a cord to be whipped, cam means for reciprocating the holding means relative to the head, an electric motor for driving the rotating means and the cam means, a switch in series with the motor for starting the motor, a second switch in parallel with the first-mentioned switch, and means associated with the cam means serving to close the second switch shortly after the first-mentioned switch is closed and open the second switch after a single reciprocation of the holding means.

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