April 24, 1951 E. WODETZKY 2,550,131

ROD WINDING MACHINE

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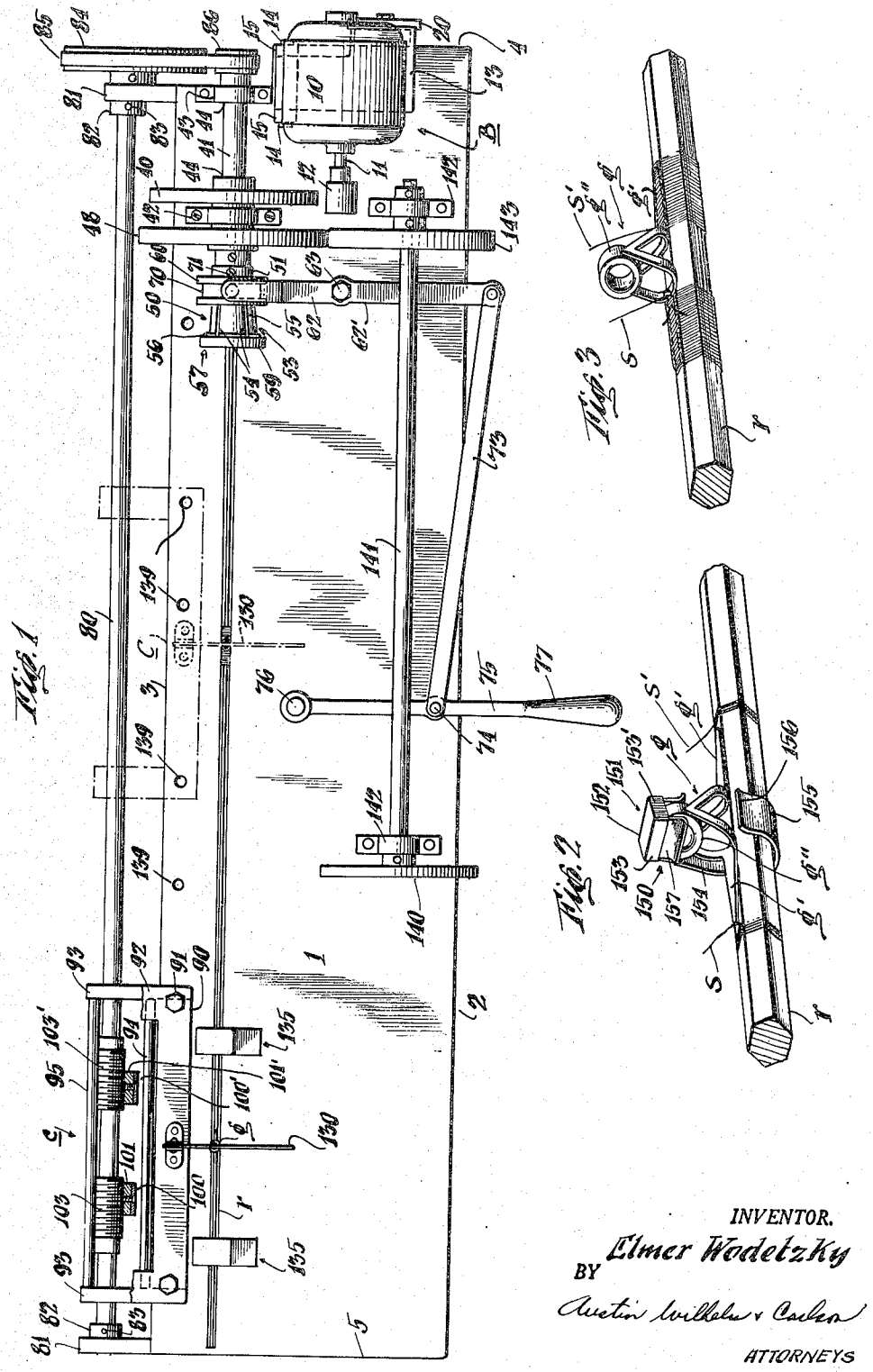


Fig. 1

Fig. 3

Fig. 2

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ROD WINDING MACHINE

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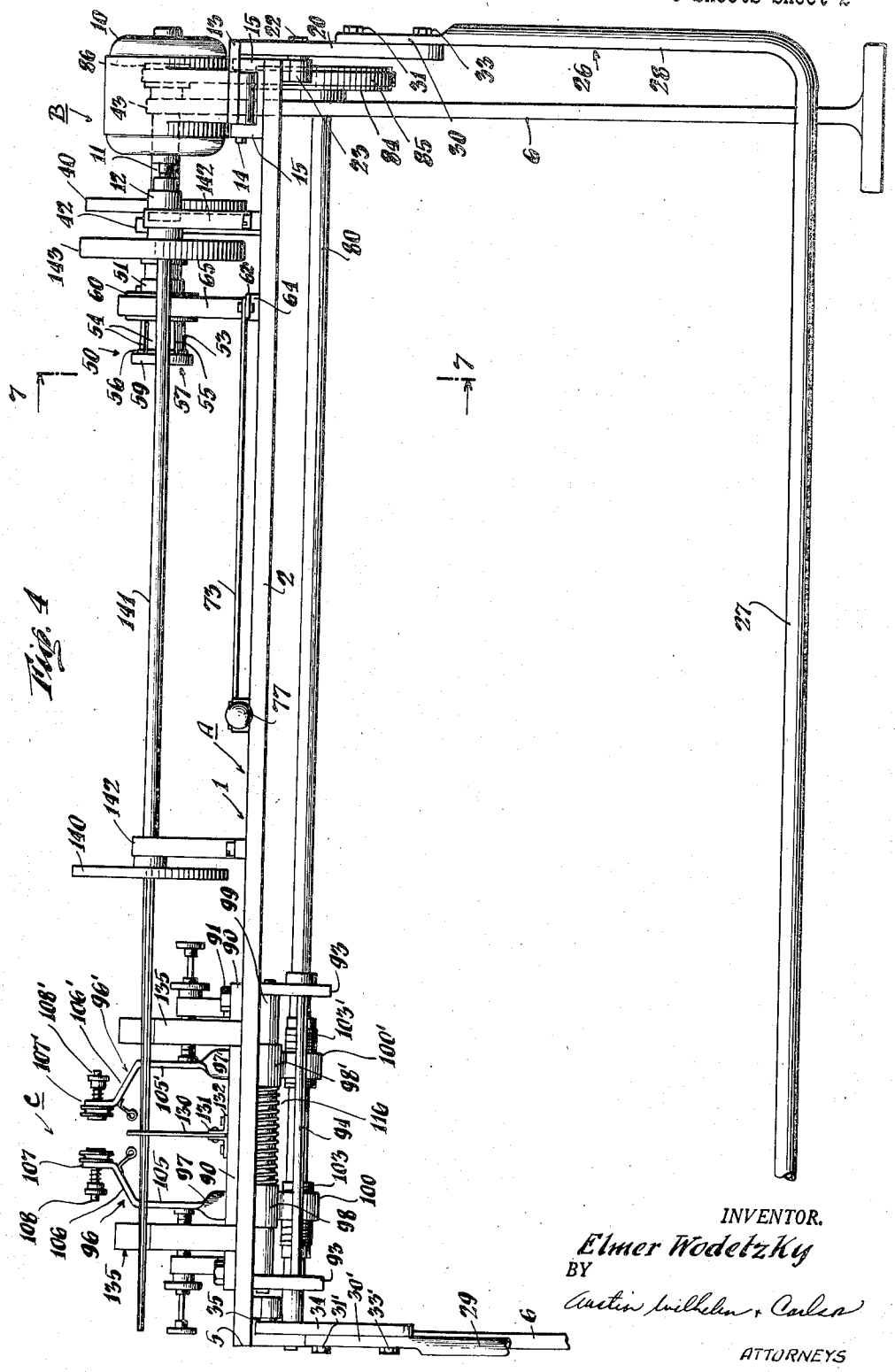


Fig. 4

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ROD WINDING MACHINE

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Fig. 6

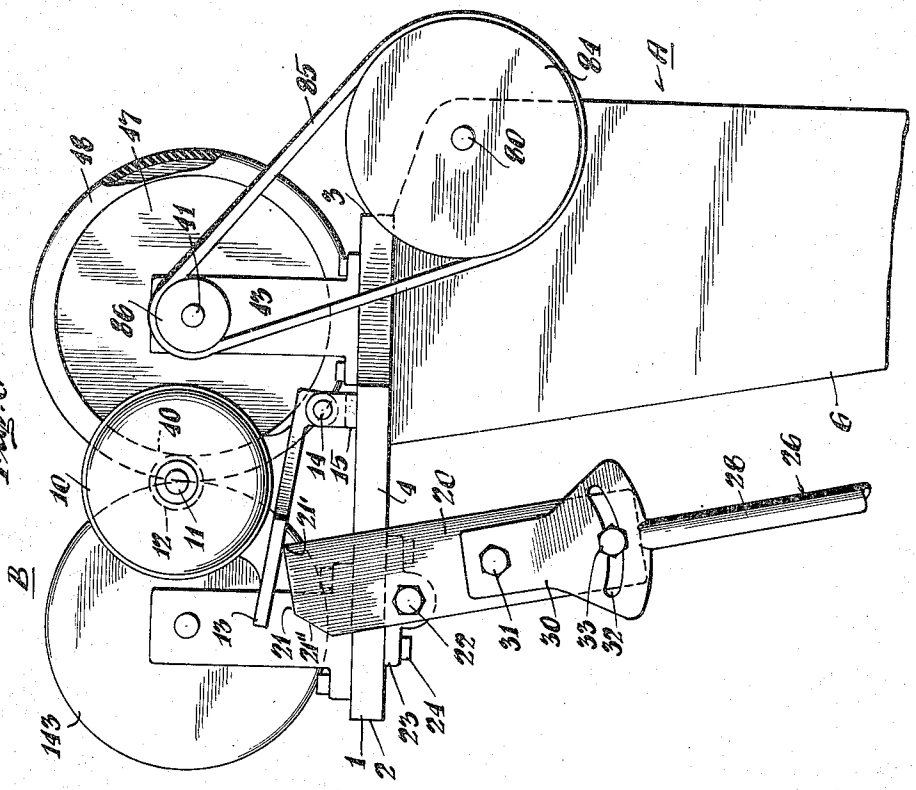
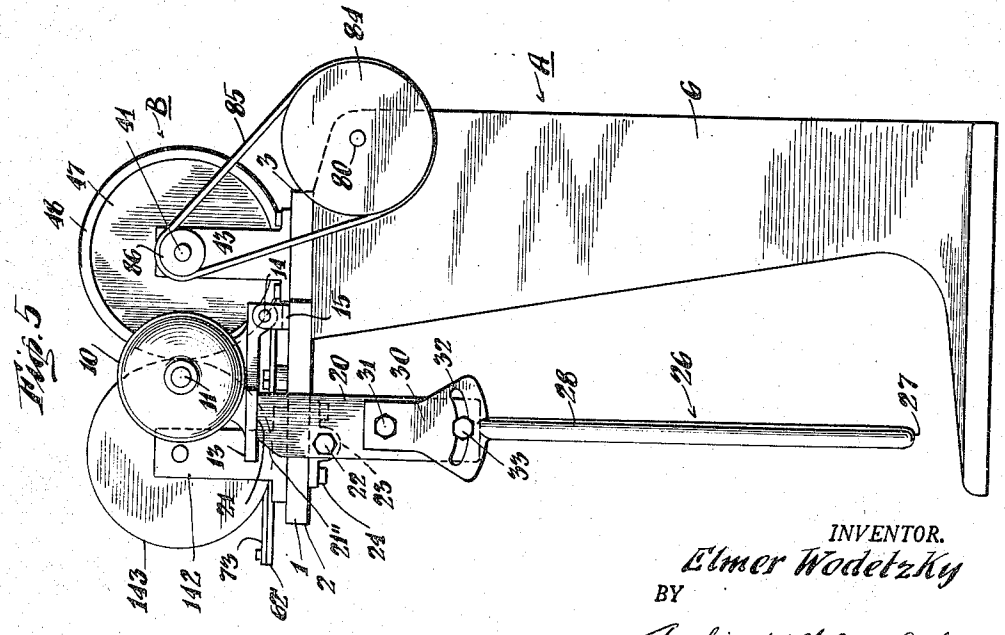


Fig. 5



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ROD WINDING MACHINE

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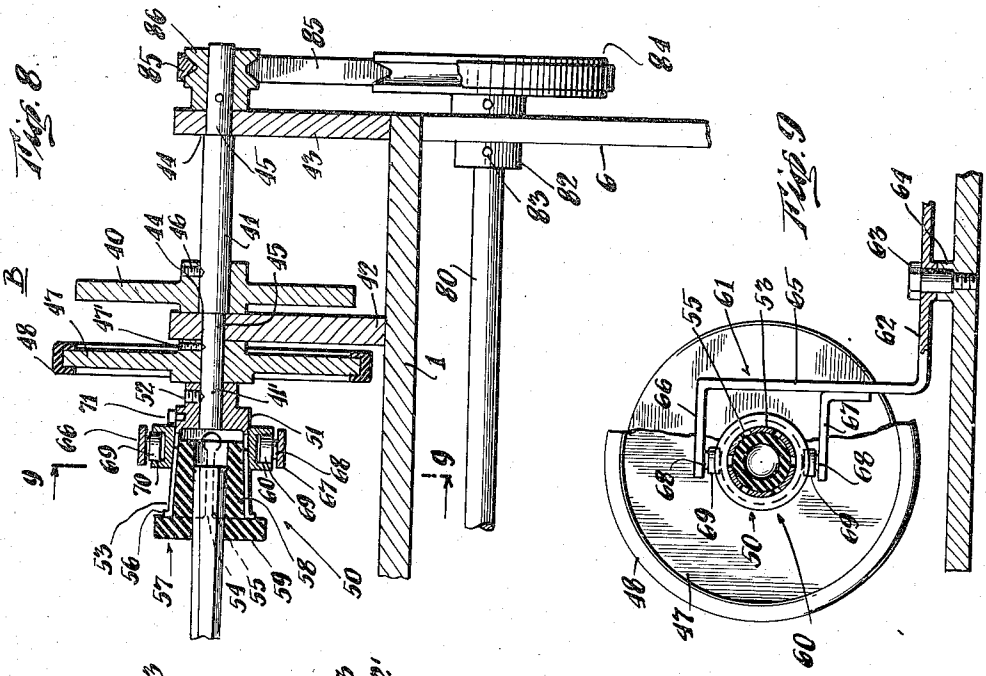


Fig. 8

Fig. 9

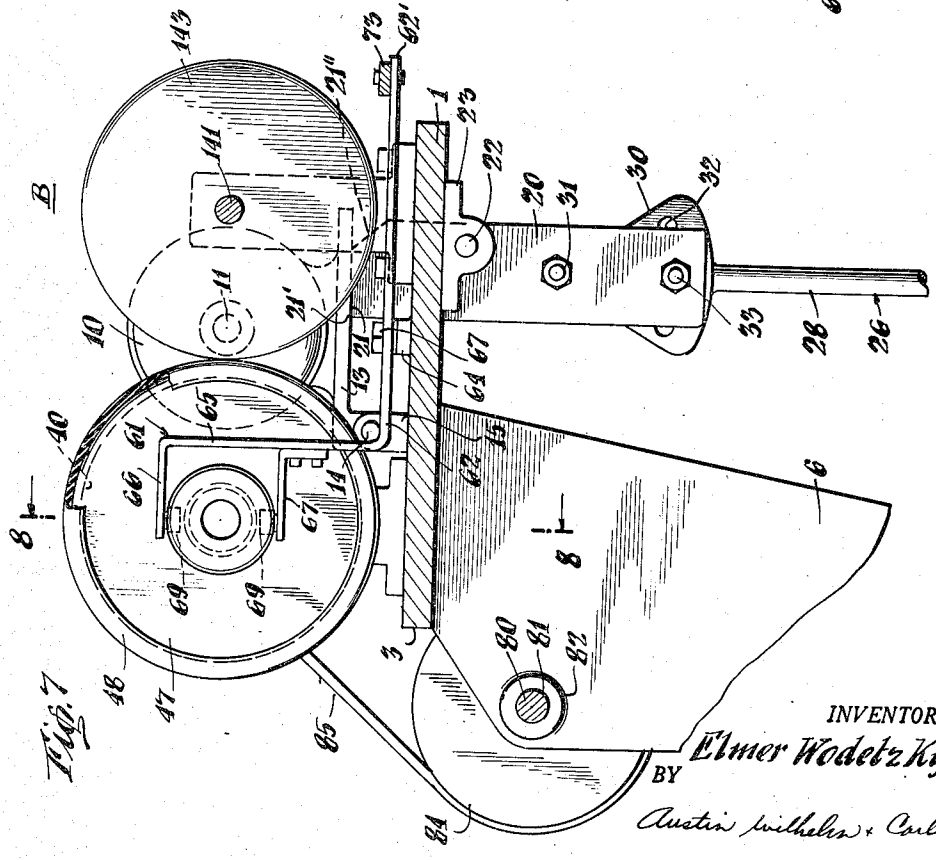


Fig. 7

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Fig. 10

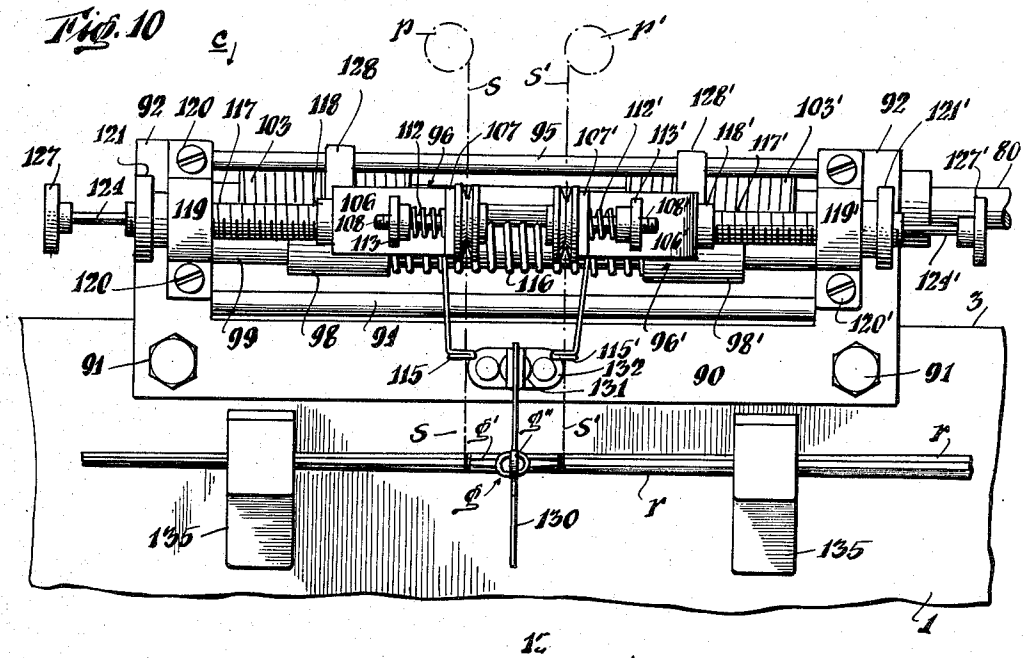
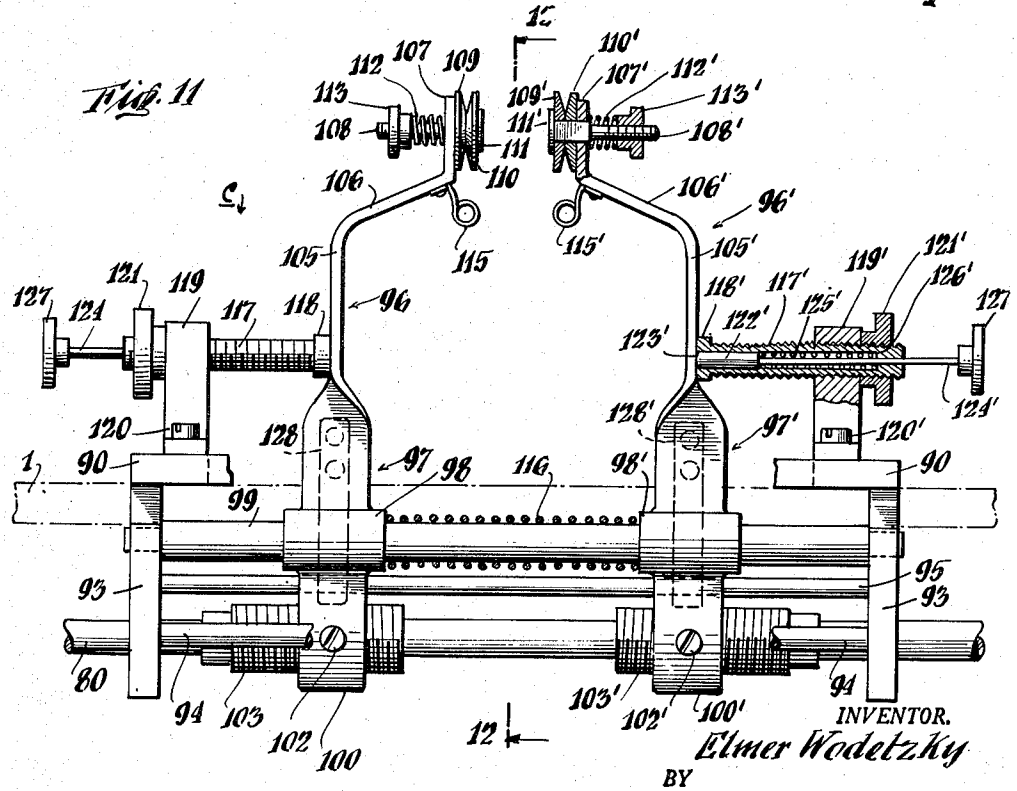


Fig. 11



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Fig. 13

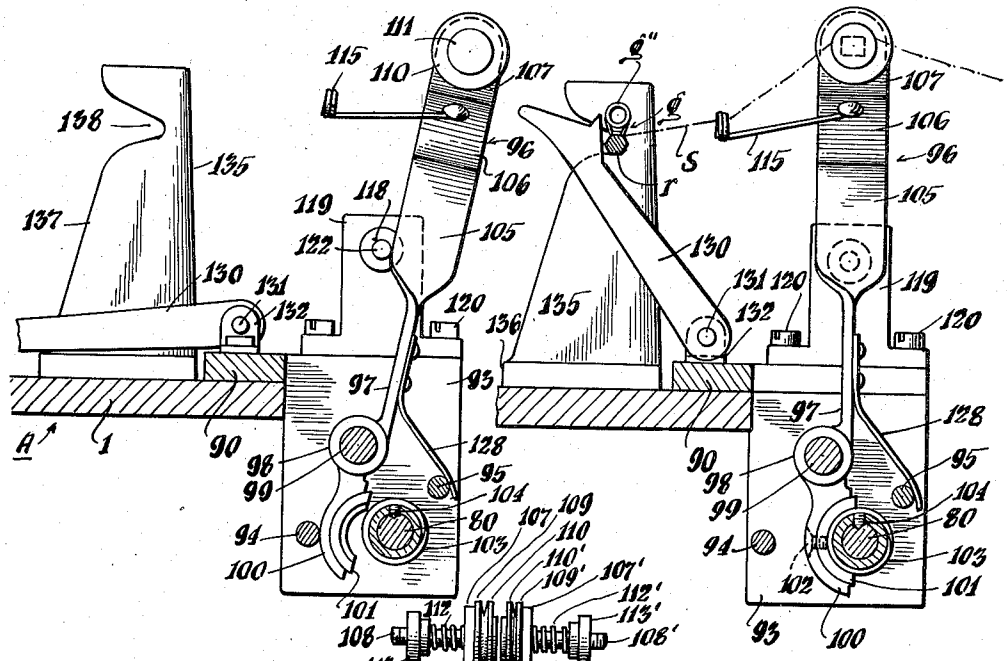
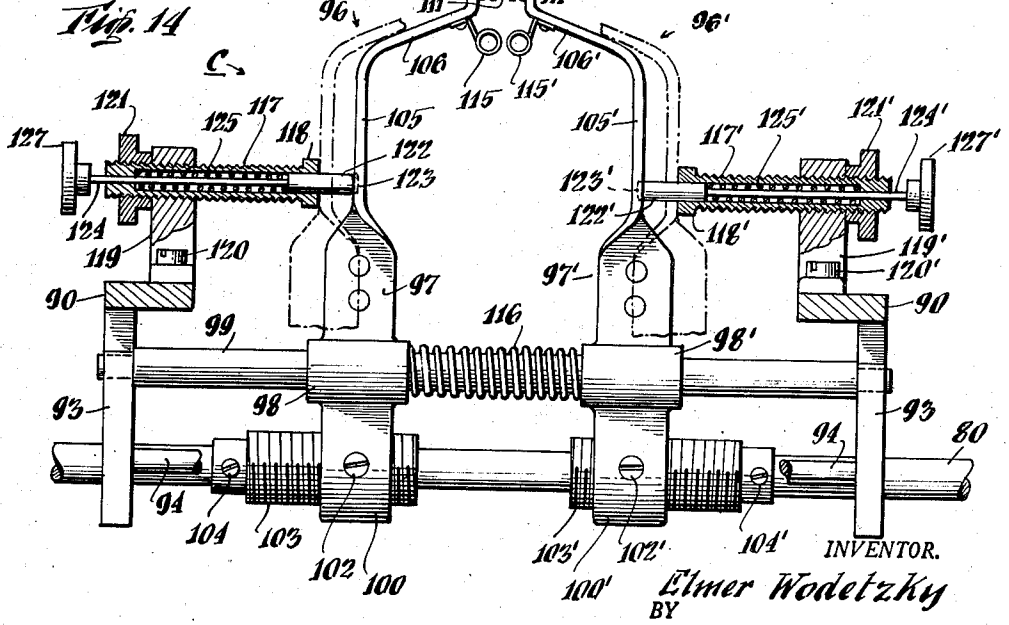


Fig. 12

Fig. 14



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Patented Apr. 24, 1951

2,550,131

UNITED STATES PATENT OFFICE

2,550,131

ROD WINDING MACHINE

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Application May 1, 1947, Serial No. 745,185

15 Claims. (Cl. 242—7)

1

This invention relates to winding machines, and more particularly to an improved mechanism for applying strand windings smoothly and uniformly to various articles.

This improved winding machine has particular application to the automatic winding of thread, cord or wire to fishing rods and the like for strengthening and ornamental purposes, and/or for securing line guides and like attachments and accessories to the rod. To produce a quality product, it is necessary that the windings be tautly wound in a smooth and uniform manner, with the strands of the winding closely and compactly arranged in adjacent relationship, so that a single strand layer only is applied to the article in a manner to fully and completely conceal that section of the article to which the winding is applied. The desired winding uniformity is particularly difficult to attain when irregular objects, such as the legs of line guides, are to be strand-bound to the rod. Uniform winding is rendered further difficult where the rod or article to be wound possesses inherent flexibility and where flexure of the article offers a disturbing influence to the uniformity of the winding.

An object of this invention is to provide an improved winding machine whereby strand windings may be applied to fishing rods and other articles speedily and with precision accuracy by relatively unskilled operators.

Another object of this invention is to provide an improved winding machine whereby a plurality of strand windings may be automatically applied in a single winding operation.

A further object of this invention is to provide an improved winding mechanism whereby duplex wound sections may be automatically applied over irregular surfaces proceeding from the outer extremities towards the adjacent extremities of the windings and whereby the strands are tightly wound in a single layer with the adjacent strands in close abutment.

Another object of this invention is to provide an improved winding mechanism for the strand winding of fishing rods and the like which is substantially automatic in operation and may be operated by a relatively unskilled operator to apply single or plural strand windings uniformly, with precision accuracy, and at high production speeds.

A further object of this invention is to provide an improved winding machine which is substantially foolproof in operation, relatively simple in design and construction, sturdy and lasting in

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use, and whereby precision windings may be automatically accomplished in an economical manner and at high production speeds.

Further objects and advantages of this invention will become apparent as the disclosure proceeds.

In accordance with this invention, an improved winding machine is provided operative to apply various windings to different articles, and has particular adaptability to the automatic application of thread, cord and wire windings to fishing rods. The machine mechanism is mounted upon a base plate supported on suitable legs or brackets so that the operator can assume a comfortable sitting position before the machine. The mechanism incorporates an improved expansible chuck equipped with a resilient socket member to receive the butt end of the rod or article, the chuck incorporating means within convenient access to the operator for manipulating the resilient socket member to releasably grip the article to be operated upon firmly and tenaciously without marring or otherwise defacing the article.

The machine further incorporates an improved winding head which presents duplex winding sections whereby a pair of spaced strands may be simultaneously wound on the article. Each winding section includes a guide arm supporting paired friction discs through which the strand is led to the article being wound. Improved means associated with the friction discs are provided, whereby a nicely controlled predetermined tension may be applied to the strand being wound to insure a tight winding. Each head section also incorporates an eyelet for guiding the strand to the article being wound.

The paired head sections are mounted upon a frame plate adjustably secured to the bed plate of the machine, a driven shaft being provided having a worm drive connection to the guide arms of the winding head. The duplex head sections are driven in synchronism in opposite directions, whereby the legs of a line guide may be strand-bound to the rod body, the winding proceeding simultaneously from the tip ends of the legs towards the ring section thereof. The guide arms of the head section are pivotally mounted so that they may be quickly disconnected from the drive shaft to permit resetting thereof. Means associated with the winding head are provided for accurately setting the guide arms thereof in the desired winding position.

The machine further incorporates an improved driving mechanism whereby a predeter-

mined drive ratio is established between the rotation of the chuck and the traversing movement of the guide arms of the winding head, so that the guide arms will advance in the desired direction a distance equal to the diameter of the strand being wound during each full turn of the rod supporting chuck, thereby insuring the tight winding of a single layer winding over the surface area to be wound.

The drive mechanism is so mounted and arranged that full drive control of the machine may be effected by a simple foot manipulating lever. Means are conveniently provided to permit the operator to manually rotate the chuck and effect transverse movement of the guide arms of the winding head as is desirable when attaching the free ends of the winding strands to the article to be wound. The machine is substantially automatic in operation so that the operator's attention may be confined to attachment and detachment of successive rods being wound in the chuck; initial tying of the head end of the strand to the rod at the beginning of the winding operation; and the loop tying of the tail end of the strand to the rod at the end of the winding operation. In the event only one strand is to be wound on the rod, one of the head sections may be swung into inoperative position, the other selected head section only being employed in the placement of the desired winding on the article.

With this improved machine an operator with relatively little training can apply and fully strand-bind both legs of a line guide to a fishing rod in about one minute. The windings as applied are smooth and compact, and substantially superior in workmanship to windings normally applied by hand. The machine has numerous adjustable features which permit accurate gauging and adjustment of the operating parts thereof to accommodate the various winding conditions that may be encountered. While the machine possesses complete flexibility and responsiveness in operation, it is relatively simple in design and may be inexpensively constructed so as to give long life and service.

Although the characteristic features of the invention will be particularly pointed out in the claims appended hereto, the invention itself, and the manner in which it may be carried out, may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part hereof, in which

Fig. 1 is a top plan view of a machine encompassed by this invention particularly designed for the application of winding strands to such articles as fishing rods, certain parts of the winding head being shown in section.

Fig. 2 is an enlarged perspective view showing a section of a fishing rod and an associated line guide, this view showing a pair of winding strands at the initial stage of application to the legs of the line guide and rod section.

Fig. 3 is an enlarged perspective view of a section of the fishing rod and associated line guide with the paired winding strands substantially fully applied thereto.

Fig. 4 is a front elevational view of the machine shown in Fig. 1.

Fig. 5 is an end view of the machine shown in Figs. 1 and 4 as the same appears at the driving end thereof, the driving mechanism being shown at rest position.

Fig. 6 is an enlarged end elevational view of the driving end of the machine showing the driving mechanism swung into driving position.

Fig. 7 is a transverse cross-sectional view of the machine showing further details thereof as the same would appear when viewed along line 7—7 of Fig. 4.

Fig. 8 is a fragmentary cross-sectional view taken longitudinally of the machine as the same would appear when viewed along line 8—8 of Fig. 7, this view showing details of the rod receiving chuck and its associated driving mechanism.

Fig. 9 is a fragmentary transverse cross-sectional view of the machine as the same would appear when viewed along line 9—9 of Fig. 8, this view showing further details of the rod receiving chuck and associated supporting bracket.

Fig. 10 is an enlarged plan view showing details of the duplex winding head operative to apply a pair of strands simultaneously to a rod shaped article such as a fishing rod, this view showing the winding head in position to commence the winding of a pair of strands to a fishing rod and to the legs of an associated line guide.

Fig. 11 is an elevational view of the duplex winding head shown in Fig. 10, certain parts thereof being shown in section to reveal structural details.

Fig. 12 is a fragmentary transverse cross-sectional view of the winding head as viewed along line 12—12 of Fig. 11 and as the same would appear when in operative position.

Fig. 13 is a transverse cross-sectional view of the winding head as the same would appear when in inoperative position, and

Fig. 14 is a front elevational view of the duplex winding head in the form shown in Fig. 11, this view showing the paired guide arms thereof as they would be positioned at the final stage of the duplex winding operation.

Similar reference characters refer to similar parts throughout the several views of the drawings and specification.

The improved machine encompassed by this invention is particularly designed to apply strand windings in a compact manner and with precision accuracy to various articles such as fishing rods, golf clubs, and the like. The machine as illustrated in the drawings exemplifies its application to the strand winding of fishing rods and the strand binding of line guides to the rod body. The machine as illustrated comprises a supporting table A having a driving assembly B correlated to drive the moving parts of the machine, and a winding head C which may be operated to apply either a single winding or a plurality of windings substantially simultaneously to the article.

The supporting table A comprises a bed plate 1 which may be formed of a heavy steel plate to minimize vibration when the machine is in use, the bed plate 1 presenting a front edge 2, a rear edge 3 and end edges 4 and 5. The bed plate 1 may be supported upon suitable legs or brackets 6 at a height convenient to the operator.

The driving assembly

As shown more particularly in Figs 1, 4, 5, 6 and 7, the driving assembly B comprises a motor 10 whose shaft 11 has a friction gear 12 attached thereto. The motor 10 is mounted upon a supporting plate 13 which is hinged at one end thereof by a hinge pin 14 which is connected to a pair of spaced lugs 15 projecting upwardly from the bed plate 1. The motor supporting plate 13 and the motor 10 may thus be tilted so that the

friction gear 12 may be swung into and out of driving engagement with a friction wheel 40 which forms a part of the driving assembly as more particularly described hereafter.

Means are provided for tilting the motor supporting plate 13, which can conveniently be accomplished by the provision of a cam plate 20 which is swingably mounted at the end edge 4 of the bed plate by means of a pivot bolt 22 extending through the cam plate, the pivot bolt 22 being attached to a bracket 23 fixed as by screws 24 to the underside of the bed plate 1. It will be noted by referring more particularly to Figs. 5 and 6, that the pivot bolt 22 is connected to the cam plate 20 in off-center position so as to improve the camming effect of the relatively flat upper face 21 of the cam plate 20 which seats against the under surface of the hinged motor supporting plate 13. When the cam plate is in a substantially true vertical position as shown in Fig. 5, the motor supporting plate 13 will flatly rest against the upper face 21 of the cam plate, in which position the friction gear 12 of the motor will be in spaced inoperative position with respect to the friction wheel 40. When the cam plate 20 is tilted to position shown in Fig. 6, the motor supporting plate 13 will be supported by the corner portion 21' of the cam plate, in which position the friction gear 12 will be in driving engagement with the friction wheel 40. It will be noted that one of the upper corners of the cam plate has a beveled contour as at 21'' so that an accidental overswing of the cam plate 20 will not raise the motor supporting plate 13 to driving position.

Cam plate 20, which thus serves to throw the driving mechanism of the machine into and out of operation, may be manipulated by hand or in any suitable manner, but preferably is manipulated by the foot of the operator so that the operator's hands can give full attention to the winding mechanism located above the bed plate 1. The foot manipulating lever may comprise a U-shaped frame 26 having a horizontally extending rod portion 27 against which the foot of the operator may rest, and a pair of vertically extending leg portions 28 and 29. Leg portion 28 terminates in a connecting plate 30 which is pivotally connected as by bolt 31 to the cam plate 20. The connecting plate 30 may be provided with an arcuate slot 32 through which bolt 33 extends, the bolt 33 being fastened to the cam plate 20. A similar connecting plate 30' is secured as by bolt 31' to a bracket plate 34 whose upper end is hinged as by a journal 35 supported at the opposite end 5 of the bed plate 1. The connecting plate 30' has an arcuate slot 32' which receives a bolt 33' secured to the bracket plate 34. In this arrangement, the foot manipulating frame 26 may be swung by the operator's foot toward and away from the sitting position of the operator to move the motor driven friction gear 12 into and out of driving engagement with the friction wheel 40. The foot manipulated frame 26 may be adjusted in position for the operator's convenience by adjusting the locked position of the bolts 33 and 33' in the arcuate slots 32 and 32' of the connecting plates 30 and 30' associated with the frame.

The driving assembly encompasses means for supporting and rotating the article or rod which is to receive the winding strand. As shown more particularly in Figs. 1 and 8, the friction wheel 40 is fixed to a horizontally extending shaft 41 which is rotatably journaled in bearings 45

carried by a pair of spaced brackets 42 and 43 fixed to the bed plate 1 of the machine. The shaft 41 is preferably provided with shoulder portions 44 positioned adjacent the supporting brackets 42 and 43 to prevent weaving movement of the shaft, which otherwise freely rotates in bearings 45 associated with the brackets 42 and 43. The friction wheel 40 is suitably secured as by set screw 46 to the shaft 41. The shaft 41 presents a shaft extension 41' to which a hand wheel 47 is secured as by means of a suitable set screw 47'. The rim portion of the hand wheel 47 has a rubber covering 48 shaped to provide a convenient hand grip whereby the shaft 41 and the shaft extension 41' may be manually rotated.

The shaft extension 41' supports an improved chuck assembly 50 providing a receptor for the end of the rod to be wound, and as shown more particularly in Figs. 7, 8 and 9, comprises a collar portion 51 which is fixed to the shaft extension 41' as by set screw 52. An expansible tubular casing 53, defined by a plurality of spring-like fingers 54, extends laterally from the collar portion 51, the fingers 54 flaring outwardly slightly in the direction of their free ends 56. The inner ends of the resilient fingers 54 are integrally attached to the collar portion 51 and are separated by open slits 55, the free ends 56 of the resilient fingers 54 being thickened and reinforced. The expansible tubular casing 53 as defined by the resilient fingers 54 presents an interior cavity or socket which receives a resilient socket member 57 which may be formed of soft rubber or the like and which is shaped to fit within the tubular casing 53, and to maintain contact with the outwardly flaring fingers 54. The resilient socket member 57 has a cavity therein designed and shaped to receive the end of the rod *r* to be wound. The socket member 57 comprises a relatively thick tubular wall 58 which is received and contained by the resilient fingers 54, the socket member 57 also having an outturned rim portion 59 against which the ends 56 of the resilient fingers 54 abut. It will be appreciated that the resilient fingers 54 may be pressed against the tubular body 58 of the socket member 57 to contract the socket cavity therein so that the tubular wall 58 will resiliently grip the butt portion of the rod *r* which is inserted into the cavity thereof.

Means are provided to exert the desired contracting pressure against the resilient fingers 54, which means, as shown in the drawings, may comprise a metal slip ring 60 designed to encircle the resilient fingers 54. The slip ring 60 is supported upon a bracket 61 having a horizontal leg 62 pivotally mounted upon the bed plate 1 as by a screw bolt 63 which extends through a raised boss 64 associated with the bed plate 1. The bracket 61 has a vertical leg 65 from which a pair of spaced branch arms 66 and 67 extend. Each of the branch arms 66 and 67 is provided with an inwardly extending stud 68 having a cylindrical head 69. The cylindrical heads 69 are diametrically arranged and extend into a channel shaped raceway 70 formed in the outer cylindrical face of the slip ring 60.

It will be appreciated that when the supporting bracket 61 is swung upon the pivot bolt 63, the slip ring 60 may be moved axially of the expansible tubular casing 53 to the position shown in Fig. 8 where the slip ring exerts no appreciable pressure upon the resilient socket member 57, to a position adjacent the enlarged

terminus ends 56 of the resilient fingers 54, in which position maximum pressure is exerted against the tubular body wall 58 of the resilient socket member 57. The enlarged ends 56 of the resilient fingers 54 prevent the slip ring 60 from being moved off from the resilient fingers at the terminus end thereof, a set screw 71 or like abutment associated with the collar portion 51 being also provided to limit the axial movement of the slip ring and prevent the slip ring from being moved off from its normally inoperative position adjacent the collar portion 51.

The slip ring supporting bracket 61 may be conveniently manipulated from the working position of the operator by providing the horizontal leg 62 of the bracket with a lever extension 62' which may be manipulated by a connecting rod 73 attached as by hinge pin 74 to a manipulating lever 75. One end of the manipulating lever 75 may be pivotally secured to the bed plate 1 by hinge pin 76, the other end of the lever 75 having a convenient manipulating handle 77 located within easy reach of the operator. By manipulating the lever 75, the operator can manipulate the slip ring 60 as desired to attach or detach the rod *r* to and from the resilient socket member 57. A highly convenient and effective chuck assembly is thus provided whereby the rod operated upon may be firmly gripped and engaged and disengaged therefrom, without marring the finish of that portion of the rod gripped by the chuck. If the rod end to be operated upon is of very small diameter compared with the cavity of the socket member 57, a separate rubber sleeve may first be slipped over the end of the rod to insure a firm grip on the end of the rod by the resilient socket member 57.

A further important feature of this invention is the provision of an improved winding head C whereby one or more winding strands may be wound upon the rod in a compact and even manner with precision accuracy. The winding head C is operated and driven by a shaft 80 which extends longitudinally of the machine adjacent the rear edge 3 of the bed plate 1, and preferably is positioned below the bed plate 1. The drive shaft 80 is rotatably supported in spaced bearing journals 81 which may be fixed to the spaced legs 6 of the machine. Shaft 80 may be provided with spaced collars 82 fixed to the shaft as by set screws 83 to prevent axial weaving movement of the shaft. The driven end of the shaft 80 carries a pulley wheel 84 which receives a drive belt 85 trained around a pulley wheel 86 of reduced diameter which is fixed to the projecting end of the shaft 41. It will be noted that the head driving shaft 80 rotates at substantially slower speed than the motor driven shaft 41 which rotates the rod *r*, a definite speed correlation being established between these shafts for purposes as will presently appear. It will also be noted that rotation of the shaft 41, either by the motor 10 or the hand wheel 48, will also rotate the shaft 80 which operates the winding head.

The winding head

The winding head C may comprise a single winding section designed to direct a strand in compact relation along the article, or a pair of winding sections designed to direct two or more strands simultaneously on adjacent sections of the article or rod being wound. When line guides *g* are to be thread-bound to fishing rods, it is desirable to provide a winding head having a pair of complementary winding sections which

operate to simultaneously direct a pair of strands progressively along the line guides, starting from the tip ends of the guide legs *g'* and moving progressively toward the guide ring *g''* thereof. Figs. 10 to 14 of the drawings illustrate a winding head equipped with paired winding sections particularly adapted for the simultaneous converging strand winding of a line guide to a fishing rod. This is a particularly difficult operation which this machine will perform automatically and with precision accuracy.

As shown more particularly in Figs. 10 to 14 inclusive, the winding head C comprises a frame plate 90 which may be adjustably secured as by bolts 91 to the bed plate 1 adjacent the rear edge 3 thereof. The frame plate 90 presents a pair of spaced rearwardly extending arms 92, each arm having a depending bracket plate 93 which projects downwardly below the bed plate 1. The drive shaft 80 extends through suitably aligned openings in the bracket plates 93. The bracket plates 93 may be connected by a pair of spaced rods 94 and 95 which serve as abutment stops for pivotally mounted guide or winding arms 96 and 96' forming a part of the paired winding sections.

Each of the guide arms 96 and 96' are similar in construction and are driven in unison from the drive shaft 80 so as to have opposite traversing movements. The guide arms 96 and 96' have corresponding lower sections 97 and 97' provided with bearing sleeves 98 and 98' respectively. A supporting shaft 99 extends through the bearing sleeves 98 and 98' and is fixed to and supported by the bracket plates 93. The lower sections 97 and 97' of the guide arms 96 and 96' are respectively provided with extensions 100 and 100' projecting below their associated bearing sleeves 98 and 98'. The guide arm extensions 100 and 100' respectively carry half nut sections 101 and 101' suitably fixed thereto as by rivets 102 and 102'.

The half nut section 101 of guide arm 96 is designed to cooperate with the right hand thread of a drive worm 103 fixed to the drive shaft 80 as by set screw 104, while the half nut section 101' of guide arm 96' is designed to cooperate with the left hand thread of a threaded drive worm 103' also fixed to the drive shaft 80 as by set screw 104'. In this arrangement it is evident that when the drive shaft 80 is rotated in one direction, the paired guide arms 96 and 96' may be advanced towards each other, and when the drive shaft 80 is rotated in the opposite direction the guide arms 96 and 96' will be progressively moved away from each other. By the provision of a winding head having duplex guide arms operably connected to the drive shaft 80 as above described, it is apparent that winding strands may be simultaneously and progressively wound from the tip ends *g'* of the line guide *g* inwardly towards the ring section *g''* thereof.

The guide arms 96 and 96' present upper sections 105 and 105' respectively, which may be formed of metal plate having inturned arm portions 106 and 106' terminating in vertically extending lug portions 107 and 107' respectively. The lug portions 107 and 107' support spindle shafts 108 and 108' respectively. The spindle shafts 108 and 108' rotatably support paired friction discs 109 and 110 and 109' and 110' respectively. One of the winding strands is seated between and gripped by the adjacent surfaces of the paired friction discs 109 and 110, while the other winding strand *s'* is seated between and frictionally gripped by the paired friction discs 109' and 110'.

The spindle shaft 108 has a head portion 111 which presses against the adjacent friction disc 110 so that the paired discs 109 and 110 may be clamped between the head portion 111 of the spindle 108 and the lug portion 107 of the guide arm 96. The spindle shaft 108 carries a coil spring 112 which is compressed between lug portion 107 of the guide arm 96 and a collared nut 113 which is threaded to the end of the spindle shaft 108. The coil spring 112 serves to transmit a resilient grip on the strand *s* drawn between the adjacent surfaces of the cooperating friction discs 109 and 110, the tension on the strand *s* being varied as desired by making suitable adjustment of the collared nut 113.

Similarly, the spindle shaft 108' has a head portion 111' which presses against the adjacent friction disc 110' so that the paired discs 109' and 110' may be clamped between the head portion 111' of the spindle 108' and the lug portion 107' of the guide arm 96'. A coil spring 112' carried by the spindle shaft 108' is compressed between the lug portion 107' of the guide arm 96' and a collared nut 113' which is threaded to the end of the spindle shaft 108'. The coil spring 112' serves to effect a resilient grip on the strand *s'* drawn between adjacent surfaces of the cooperating friction discs 109' and 110', the tension on this strand being varied as desired by making suitable adjustment of the collared nut 113'.

The winding strands *s* and *s'* wound upon spools *p* and *p'* is fed between the paired friction discs 109 and 110 and the paired friction discs 109' and 110' respectively, and then through suitable guide eyelets 115 and 115' supported in a convenient location on the guide arms 96 and 96' respectively. The spools *p* and *p'* may be supported on suitable spindles conveniently located adjacent the winding head, the paired friction discs above described being relied upon to supply the necessary tension to the winding strands *s* and *s'*. Where the winding head comprises a pair of cooperating guide arms 96 and 96' as above described, the winding strands may be conveniently arranged to wind over the oppositely directed legs *g'* of the line guide *g*.

Where the winding head comprises a pair of oppositely travelling guide arms 96 and 96', the guide arms may be resiliently maintained in spaced relation by a coil spring 116, the ends of which abut against the bearing sleeves 98 and 98' of the guide arms 96 and 96' respectively. The guide arms 96 and 96' are nevertheless maintained in predetermined maximum spaced relation by sleeve members 117 and 117' having head portions 118 and 118' designed to abut against the upper sections 105 and 105' of the guide arms 96 and 96' respectively.

The tubular sleeve 117 has a threaded exterior which threads into a bracket 119 fixed as by securing screws 120 to the frame plate 90. The sleeve 117 carries a threaded nut 121 which may be adjusted in accordance with the length of the windings to be made. The tubular sleeve 117 contains a plunger head 122 having a rounded end 123 designed to seat within a corresponding socket in the upper section 105 of the line guide 96. A coil spring 125 embraces a manipulating rod 124 and the ends thereof abut the plunger head 122 and the closed end 126 of the tubular sleeve 117. The coil spring 125 maintains the plunger head 122 resiliently pressed against the upper section 105 of the guide arm 96. The manipulating rod 124 projects beyond the end of the tubular sleeve 117 and is provided with a handle portion 127 whereby the plunger head 122 may be manually manipulated to release the plunger head 122 from engagement with the upper section 105 of the guide arm 96.

The guide arm 96' is likewise equipped with a tubular sleeve 117' having a threaded exterior which threads into a bracket 119' secured as by screws 120' to the frame plate 90. The sleeve 117' also carries a threaded nut 121' which may be adjusted in accordance with the length of the winding to be made by the guide arm 96'. The tubular sleeve 117' contains a plunger head 122' having a rounded end 123' designed to seat within a corresponding socket formed in the upper section 105' of the line guide 96', a manipulating rod 124' being attached to the plunger head 122'. A coil spring 125' which embraces the manipulating rod 124' has the ends thereof abutting the plunger head 122' and the closed end 126' of the tubular sleeve 117'. The coil spring 125' maintains the plunger head 122' resiliently pressed against the upper section 105' of the guide arm 96'. The plunger rod 124' projects beyond the end of the tubular sleeve 117' and is provided with a handle portion 127' whereby the plunger head 122' may be manually manipulated to release the plunger head 122' from engagement with the upper section 105' of the guide arm 96'.

It will thus be appreciated that the coil spring 116 which encircles the rod 99 resiliently retains the cooperating guide arms 96 and 96' in maximum spaced relation as permitted and determined by the threaded settings of the tubular sleeves 117 and 117', which settings may be adjusted by manipulating their associated threaded nuts 121 and 121' respectively. The half nuts 101 and 101' of the guide arms 96 and 96' respectively are normally maintained in threaded operative engagement with the threaded sleeves 103 and 103' respectively by leaf-springs 128 and 128' which are more particularly illustrated in Figs. 12 and 13. The leaf-spring 128 has one end thereof secured to the lower section 97 of the guide arm 96 and the other end of the leaf-spring is positioned to abut the abutment rod 95 which extends between the spaced bracket plates 93. A similar leaf-spring 128' has the upper end thereof secured to the lower section 97' of the guide arm 96' and has its lower end in abutment against the abutment rod 95. By withdrawing the plunger heads 122 and 122' from engagement with the guide arms 96 and 96' respectively, the guide arms may be manually rocked rearwardly away from the operator about the pivot shaft 99 against the tension of the leaf-springs 128 and 128' respectively, which normally serve to maintain the half nuts 101 and 101' in engagement with the threaded sleeves 103 and 103'. Manual release of the plunger heads 122 and 122' will extend the plunger heads so as to abut against the front edge of the upper sections 105 and 105' of the guide arms 96 and 96', so as to prevent a return of the guide arms to operative position until the plunger heads 122 and 122' have been withdrawn out of abutment against the front edge of the guide arms. In this manner the guide arms may be readily engaged and disengaged from driving connection with the drive shaft 80 to permit a resetting of the guide arms for the next succeeding winding operation, after the preceding winding operation has been completed.

Means are provided to asssit the operator to

accurately position the line guide *g* upon the rod *r* and assure accurate centering of the leg windings. The positioning means also assists the operator in accurately locating each individual line guide in the same position on successive rods of the same length or type being operated upon in the production schedule. This improved positioning means, as shown more particularly in Figs. 1, 10, 12 and 13, comprises an indicating arm **130** whose lower end is pivotally mounted on a hinge pin **131** supported upon a suitable bracket **132** fixed to the frame plate **90**. The indicator arm **130** is mounted to be manually swung from an angular position as shown in Figs. 4 and 12, to a substantially horizontal position as shown in Figs. 1, 10 and 13. The indicator arm **130** when swung up into angular position would extend transversely across and would be in contact with the rod *r* to be wound. The ring portion *g''* of the line guide would then be placed by the operator on the rod *r* in true alignment with the indicator arm **130**. If desired, quick drying adhesive may be applied to the legs *g'* of the line guide *g* to temporarily secure the line guide in accuratley aligned position upon the rod to be wound, prior to the application of the winding strands thereto.

A plurality of spaced steady rests **135** are provided to prevent whipping action or movement of the rotated rod during the winding operation. As shown in Figs. 4, 12 and 13, each steady rest **135** comprises an upright member suitably secured to the bed plate **1** and which is preferably made of a block of fairly soft rubber. The bed plate **1** may be provided with a metal socket **136** in which the lower end of the steady rest is firmly fitted. The forward edge **137** of each steady rest is provided with a V-shaped notch **138** into which the adjacent body of the rod *r* is designed to seat. The tension of the strands being wound serves to retain the body of the rod within the V-shaped notch **138** of the steady rest in a manner to prevent whipping or vibration of the rod as it is rotated. When the winding strand is severed from the rod, the rod will be readily released from the supporting notches **138** of the steady rests **135** so that the operator need only confine his attention to removal of the butt end of the rod from the chuck assembly **50**. The V-notch **138** is so shaped and formed as to rotatably support rods of varying diameters and varying surface contours.

It will be appreciated that when rods of the same type and size are being wound in accordance with the production schedule, that the windings as well as the line guides are placed on the rod body at the same locations on successive rods, and accordingly the winding head C may remain fixed in the same location when operating upon rods of the same length and type. Should it be desired to relocate the position of the windings as may be the case in the production of a series of larger or smaller type rods, the winding head C may be conveniently shifted to the desired location by the provision of the spaced threaded holes **139** accurately located to receive the bolts **91** to secure the frame plate **90** of the winding head C to the bed plate **1** in the proper location. The threaded sleeves **103** and **103'** would also be shifted to the proper location along the drive shaft **80** and set in the proper operating position by the set screws **104** and **104'** associated therewith. It will be appreciated that each machine may be equipped with more than one winding head so that plural windings may be applied to the rod simultaneously as desired.

Operation of the machine

In operating the machine, the operator inserts the butt end of the first rod of a production run into the resilient socket **57** and shifts the slip ring **60** laterally so that the resilient fingers **54** will resiliently press the tubular body **58** of the expansible socket member **57** firmly around the butt end of the rod to firmly grip the same. Where a line guide *g* is to be strand bound to the rod, or where an ornamental winding is to be applied to the rod, the winding head C is shifted to the desired location and clamped in position by the clamp bolts **91**. The indicator arm **130** may be conveniently employed to locate the winding with respect to the rod as desired. Where a line guide is to be strand bound to the rod, the duplex guide arms **96** and **96'** are both operated in unison. Where only a decorative winding is to be applied to the rod, only one of the guide arms **96** or **96'** may be employed.

As the initial step in the winding operation, the free ends of the winding strands *s* and *s'* are first manually applied to the rod by making one or two turns of the winding thereon with the end of the thread inserted under the initial winding as shown in Fig. 2. A spot of quick drying adhesive may, if desired, be employed to bond the free end of the strand to the rod body. To facilitate the initial hand winding, the operator may desire to manually rotate the rod *r* fixed to the chuck assembly **50** and the head driving shaft **80**. Since the seating position of the operator may in certain instances place the operator beyond reach of the hand wheel **47**, the machine may be provided with a manipulating extension which comprises a secondary hand wheel **140** located adjacent the seating position of the operator and connected to one end of a shaft **141** rotatably supported in spaced bracket bearings **142** secured to the bed plate **1**. The opposite end of the shaft **141** is provided with a friction wheel **143** which has frictional engagement with the rubber tired periphery of the hand wheel **47**. By manually rotating the secondary hand wheel **140**, it will be appreciated that the chuck assembly **50** and the rod *r* supported thereby, and also the head driving shaft **80**, may be manually rotated in synchronism during the initial application of the ends of the winding strands to the rod.

When the free ends of the strands have been attached to the rod as indicated in Fig. 2, the operator swings the friction gear **12** into driving engagement with the friction wheel **40**, which is effected by foot manipulation of the U-shaped manipulating member **26** which serves to elevate the motor supporting plate **13** and the continuously driven friction gear **12** into driving engagement with the friction wheel **40**. The rod *r* supported in the chuck assembly **50** will then be mechanically rotated by the motor **10**, and the taut winding strands will retain the rod pocketed within the V-shaped grooves **138** of the steady rests **135**. In thread winding a line guide to the rod, the paired guide arms **96** and **96'**, initially held in predetermined maximum space relation by the coil spring **116**, will be advanced along the worm sleeves **103** and **103'** as the strands *s* and *s'* are wound over the legs *g'* of the line guide *g*.

It will be noted that the driven speed of the shaft **80** and the pitch of the threads on the sleeves **103** and **103'** are such that the guide arms

96 and 96' are horizontally advanced the precise thickness of a single strand during a complete revolution of the rod *r*. The threads on the drive worms 103 and 103' are preferably of fine pitch and the driving connection to the shaft 60 is such as to rotate the shaft at a relatively slow speed as compared with the speed of rotation of the chuck assembly 50 and the rod *r* supported thereby. A correlated speed relationship is thus maintained between the transverse travel of the guide arms 96 and 96' and the speed of rotation of the rod *r*, thereby insuring a compact single layer winding of the strands on the rod. Should a strand of different thickness be employed, the speed correlation may be modified by applying either a smaller or a larger pulley wheel 86 to the shaft 41, or by installing a new set of worm sleeves 103 and 103' to the head driving shaft 80.

When the strand windings have been substantially completed, the operator takes a small length of thread and forms a loop therein and continues the winding over the loop section for a considerable number of turns. When the strand winding has been fully completed, the strand is severed and the severed end thereon drown through the loop bonded to the rod windings. The operator exerts a pull on the free ends of the loop, which serves to draw the severed end of the cut strand underneath the previously applied winding to firmly lock the severed end to the wound strand. Any projecting tail ends of the winding or loop thread can be closely clipped adjacent the winding so that the terminal end of the wound strand is substantially invisible.

It will be appreciated that a single decorative winding may be applied to the rod in any location desired by the operative employment of either the guide arm 96 or the guide arm 96'. The tautness of the winding may be set close to the breaking limit of the winding strand by a proper frictional adjustment of the cooperating friction discs 109 and 110 or 109' and 110' as desired. A firm and extremely tight winding can thus be assured. Because of the precise correlation between the speed of transverse travel of the guide arms 96 and 96' and the speed of rotation of the rod *r* which is an inherent characteristic of the machine as designed, extremely compact winding is assured with the adjacent strands of the winding in tight abutment with no overlap of the winding strands.

To maintain the line guide in fixed position on the rod, an improved clamp member may be employed as illustrated more particularly in Fig. 2. The clamp 150 as shown in Fig. 2 is preferably formed of spring steel, presenting a generally box-shaped section 151 having a relatively flat top wall 152 and enclosing rim-shaped side walls 153 and end walls 153'. A spring steel hook section 154 is secured at one end thereof to one of the end walls 153' of the box-shaped section 151 and, if desired, may be made integral therewith. The hook section 154 has a semicircular arm portion 155 designed to snugly embrace the body of the rod *r*, the arm portion 155 having a flared lip 156 to facilitate application of the clamp 150 to the rod body. A pair of flared skirts 157 depend from opposite side walls 153 of the box-shaped member 151 to straddle the ring section *g''* of the line guide.

In applying the clamp 150 to the rod, the line guide *g* is first applied to the rod with the leg portion *g'* thereof snugly seating against the selected exterior face of the rod. The arm portion 155 of the clip is then swung under the rod

and an upwardly lifting pull exerted on the box section 151 thereof so as to swing the box section 151 over the top of the ring section *g''* of the line guide *g*. The box section 151 of the clamp 150 is centered on the ring section *g''* of the line guide *g* so that the clamp 150 exerts pressure against the line guide *g* in a direction towards the axis of the rod, thus retaining the line guide *g* in an immovable position on the rod body during the winding operation. The clamp 150 may be easily slipped off from the line guide *g* and the rod body by exerting a lifting force on the box section 151 of the clamp 150 so as to permit the box section 151 to be readily tilted off from the ring section *g''* of the guide member *g*. The end walls 153' of the box section 151 assist in retaining the box section 151 of the clamp 150 accurately centered on the ring section *g''* of the line guide *g* and the resilient skirts 157 are designed to press against the side face of the ring section *g''* to resiliently retain the clamp 150 properly mounted on the line guide *g* during the winding operation.

While this improved strand winding machine is particularly adapted for the application of guide windings and decorative windings to fishing rods, it will be appreciated that the mechanism above described is equally serviceable in the application of either decorative or reinforcing windings to the shafts of golf clubs and the shafts and handles of instruments, tools and like articles. The machine embraces means whereby the operating parts may be flexibly adjusted and adapted to the particular winding operation to be performed, with the drive and adjustment controls within easy access of the sitting position of the operator. The winding head is preferably equipped with duplex winding sections which may be connected to be driven in accurate synchronism to perform a duplex winding operation, or one of the winding sections may be swung into inoperative position and a single winding section employed, as the operator may elect, to perform the selected winding operation. The mechanical operating parts and the driving assembly are so correlated and synchronized as to insure a taut and tight winding on the article operated upon, with the winding strands in tight and compact abutment. The machine will successfully execute accurate and tight windings on articles of irregular and varying contours, as would be presented in the strand binding of line guides to fishing rods. The machine is substantially automatic in operation and may be operated by relatively unskilled operators to effect precise and smooth windings at high production speeds.

While certain novel features of the invention have been disclosed herein, and are pointed out in the annexed claims, it will be understood that various omissions, substitutions, and changes may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. A machine for applying stranding windings to a rod which includes, a chuck mounted to rotatably support said rod, means to rotate said chuck and the rod supported thereby, and means for traversing a winding strand over a selected area of the rod, said chuck including a receptor having a hub portion fixed to the end of a rotatably mounted shaft, compressible fingers defining a pocket extending from said hub portion, a socket member formed of resilient material contained within said pocket, said socket

member presenting a cavity therein designed to receive a section of the rod body, and means to releasably compress said socket member into firm gripping engagement with the rod body.

2. A machine for applying strand windings to a rod which includes, a chuck mounted to rotatably support said rod, means to rotate said chuck and the rod supported thereby, and means for traversing a winding strand over a selected area of the rod, said chuck including a receptor having a hub portion fixed to the end of a rotatably mounted shaft, said hub portion having compressible fingers extending therefrom and defining a pocket, a socket member formed of resilient material contained with said pocket, said socket member having a cavity therein designed to receive a section of the rod body, a slip ring designed to slide over said compressible fingers to releasably compress said socket member into firm gripping engagement with the rod body, and means for manipulating said slip ring over said compressible fingers.

3. A machine for applying strand windings to selected areas of a rod which includes, a chuck mounted to rotatably support one end of the rod, means to rotate said chuck and the rod supported thereby, and means for traversing a winding strand over a selected area of the rod, said chuck having compressible fingers defining a pocket, a socket member formed of resilient material contained within said pocket, said socket member having a socket cavity therein designed to receive a section of the rod body, a slip ring designed to slide over said compressible fingers to releasably compress aid socket member into firm gripping engagement with the rod body, a pivoted lever for manipulating said slip ring over said compressible fingers, and manually operated means operably connected to said pivoted lever for manipulating the same.

4. A machine for applying strand windings to a rod which includes, a chuck mounted to rotatably support the rod, a winding head including a pivotally mounted arm having means at one end thereof for guiding a winding strand in winding position on to the rod, and driving means for rotating said chuck and for traversing said winding head in correlated speed relationship whereby a smooth and compact winding is effected, said driving means including a rotatably mounted traversing shaft, a drive worm fixed to said shaft, means associated with the other end of said arm providing a traversing drive connection with said worm, a drive shaft rotatably supporting said chuck, and driving means for rotating said shafts in correlated relationship.

5. A machine for applying strand windings to a rod which includes, a chuck mounted to rotatably support the rod, a winding head including a pivotally mounted winding arm having means at one end thereof for guiding a winding strand in winding position on to the rod, and driving means for rotating said chuck and for traversing said winding head, said driving means including a rotatably mounted traversing shaft, a drive worm fixed to said shaft, means associated with the other end of said arm providing a traversing drive connection with said worm, a drive shaft rotatably supporting said chuck, driving means for rotating one of said shafts, a pulley connected to each of said shafts, and a belt operably connecting said pulleys whereby said shafts may be driven in unison, the driving diameter of said pulleys and the pitch of said worm being such as to correlate the speed of rotation of said chuck with the traversing speed of said winding head in a manner to effect a compact single layer winding on the rod body.

6. A machine for applying strand windings to a rod which includes, a chuck mounted to rotatably support the rod, a pivotally mounted winding arm having means at one end thereof for guiding a winding strand in winding position on to the rod, and driving means for rotating said chuck and for traversing said winding arm in correlated speed relationship whereby a smooth and compact winding is effected, said driving means including a rotatably mounted traversing shaft, a drive worm fixed to said shaft, and a half nut carried by the other end of said winding arm adapted to be swung into and out of driving engagement with said worm with the pivoting movement of said winding arm.

7. A machine for applying strand windings to a rod which includes, a chuck mounted to rotatably support the rod, a winding head including an arm having means at one end thereof for guiding a winding strand in winding position on to said rod, and driving means for rotating said chuck and for traversing said winding head, said driving means including a rotatably mounted traversing shaft having, means at the other end of said arm traversing drive engagement with said head, a drive shaft rotatably supporting said chuck, means prividing a driving connection of correlated speed ratio between said shafts, a driving motor, and means for manually shifting said motor into and out of driving engagement with one of said shafts.

8. A machine for applying strand windings to a rod which includes, a chuck mounted to rotatably support the rod, a winding head for guiding a winding strand in winding position onto said rod, and driving means for rotating said chuck and for traversing said winding head, said driving means including a rotatably mounted traversing shaft having traversing drive engagement with said head, a drive shaft rotatably supporting said chuck, means providing a driving connection of correlated speed ratio between said shafts, a driving motor having a driving element, a drive wheel associated with one of said shafts, a pivotally mounted platform supporting said motor and its associated driving element normally out of driving engagement with said drive wheel, and a foot lever connected to said pivotally mounted platform adapted to manipulate said platform and swing the motor driving element into driving engagement with said drive wheel.

9. A machine for applying strand windings to a rod which includes, a chuck mounted to rotatably support the rod, a winding head including an arm having means at one end thereof for guiding a winding strand in winding position onto said rod, and driving means for rotating said chuck and for traversing said winding head, said driving means including a rotatably mounted traversing shaft, means at the other end of said arm having traversing drive engagement with said head, a drive shaft rotatably supporting said chuck, means providing a driving connection of correlated speed ratio between said shafts, and a hand wheel fixed to one of said shafts for manually rotating said shafts.

10. A machine for applying strand windings to a rod which includes, a chuck mounted to rotatably support the rod, a pivotally mounted

winding arm for guiding a winding strand on to the rod, and driving means for rotating said chuck and for traversing said winding arm in correlated speed relationship whereby a smooth and compact winding is effected, said driving means including a rotatably mounted traversing shaft, a drive worm fixed to said shaft, a half nut mounted at one end of said winding arm adapted to be swung into and out of driving engagement with said worm with the pivoting movement of said winding arm, resilient means for normally retaining the half nut in driving engagement with said drive worm, and a strand guide mounted on the opposite end of said winding arm for guiding the winding strand onto said rod.

11. A machine for applying strand windings to a rod which includes, a chuck mounted to rotatably support the rod, a pivotally mounted winding arm for guiding a winding strand on to the rod, and driving means for rotating said chuck and for traversing said winding arm in correlated speed relationship whereby a smooth and compact winding is effected, said driving means including a rotatably mounted traversing shaft, a drive worm fixed to said shaft, a half nut mounted at one end of said winding arm adapted to be swung into and out of driving engagement with said worm with the pivoting movement of said winding arm, resilient means for normally retaining the half nut in driving engagement with said drive worm, a strand guide mounted on the opposite end of said winding arm for guiding the winding strand on to said rod, and adjustable tension means associated with said winding arm for maintaining a predetermined tension on the winding strand during the rod winding operation.

12. A machine for applying strand windings to selected spaced areas on a rod which includes, a chuck mounted to rotatably support the rod, means to rotate said chuck and the rod supported thereby, a pair of strand winding arms, means associated with each of said arms for guiding a winding strand on to the rod, traversing means detachably connected to said winding arms operative to traverse said winding arms in opposite directions, means to correlate the traversing speed of said arms with the rotating speed of the rod whereby a pair of spaced windings on said rod is effected, adjustable means for establishing a predetermined space setting for said windings, and resilient means for automatically moving said winding arms to said space setting when said windng arms are detached from said traversing means.

13. A machine for applying strand windings to selected spaced areas on a rod which includes, a chuck mounted to rotatably support the rod, means to rotate said chuck and the rod supported thereby, a winding head having a pair of pivotally mounted winding arms, means associated with each of said arms for guiding a winding strand on to the rod, traversing means for traversing said winding arms in opposite directions, means for detachably connecting said winding arms to said traversing means, means to correlate the traversing speed of said winding arms with the rotating speed of the rod whereby a pair of spaced windings on said rod is effected, adjustable means for establishing a predetermined space setting of said winding arms, resilient means for automatically moving said winding arms to said space setting when said winding arms are detached from said traversing means, and an indicator associated with said winding head for accurately locating the winding position of the strand windings deposited on said rod.

14. A machine for applying duplex strand windings to a rod which includes, a chuck mounted to rotatably support the rod, a winding head having a pair of pivotally mounted winding arms for guiding the winding strands on to the rod, driving means for rotating said chuck and for traversing said winding arms in correlated speed relationship whereby a pair of smooth and compact windings is effected, said driving means including a rotatably mounted traversing shaft, a pair of oppositely threaded drive worms fixed to said shaft, a half nut mounted at one end of each of said winding arms adapted to be swung into and out of driving engagement with one of said worms with the pivoting movement of the winding arm, a strand guide mounted on the opposite end of each of said winding arms for guiding its winding strand on to said rod, and adjustable means for resiliently maintaining said winding arms in predetermined spaced relationship when said winding arms are out of driven engagement with said drive worms.

15. A machine for applying duplex strand windings to a rod which includes, a chuck mounted to rotatably support the rod, a pair of pivotally mounted winding arms for guiding the winding strands on to the rod, and driving means for rotating said chuck and for traversing said winding arms in correlated speed relationship whereby a pair of smooth and compact windings is effected, said driving means including a rotatably mounted traversing shaft, a pair of oppositely threaded drive worms fixed to said shaft, a half nut mounted at one end of each of said winding arms adapted to be swung into and out of driving engagement with one of said worms with the pivoting movement of the winding arm, resilient means associated with each of said winding arms normally retaining its associated half nut in driving engagement with one of said drive worms, a strand guide mounted on the opposite end of each of said winding arms for guiding its winding strand on to said rod, and adjustable means for resiliently maintaining said winding arms in predetermined spaced relationship when said winding arms are out of driven engagement with said drive worms.

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