June 1, 1937. J. McARTHUR 2,082,562

WINDING MECHANISM

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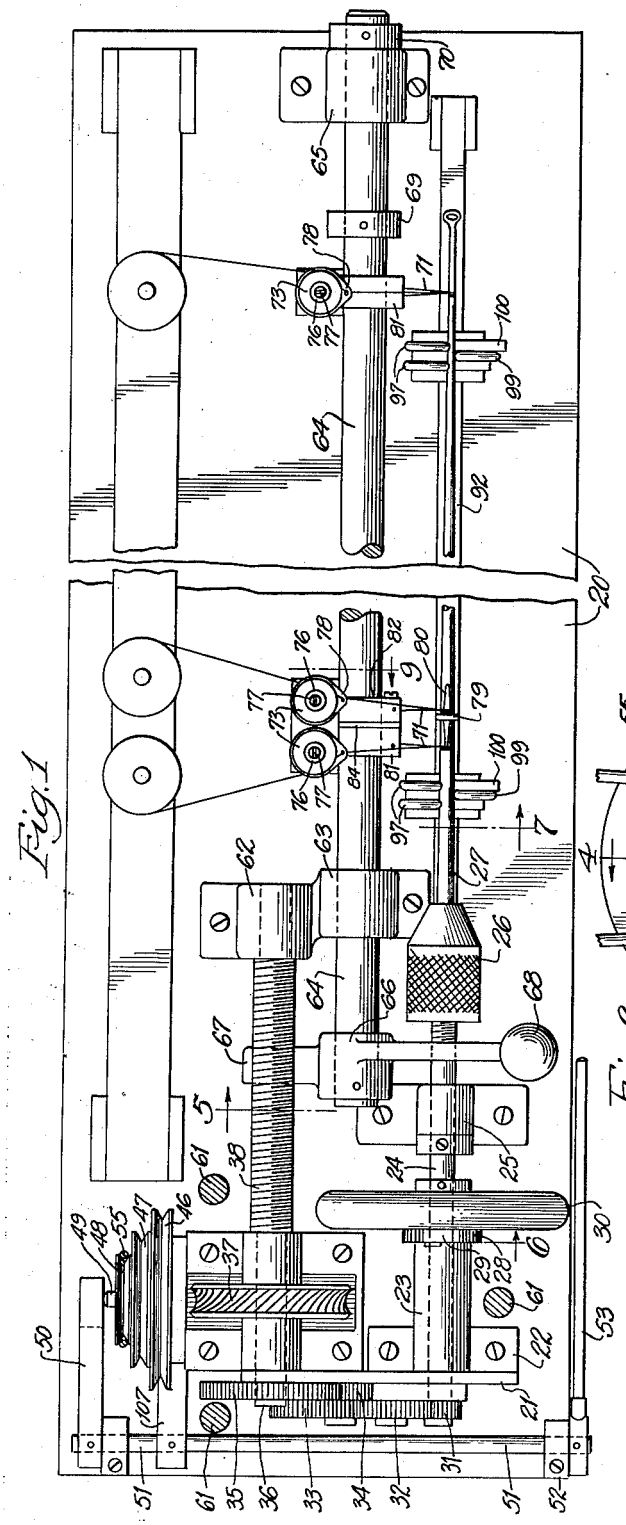

Fig. 1

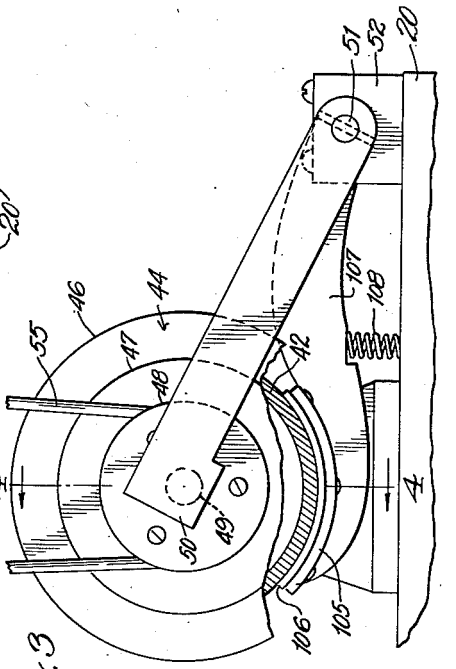

Fig. 3

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Fig. 2

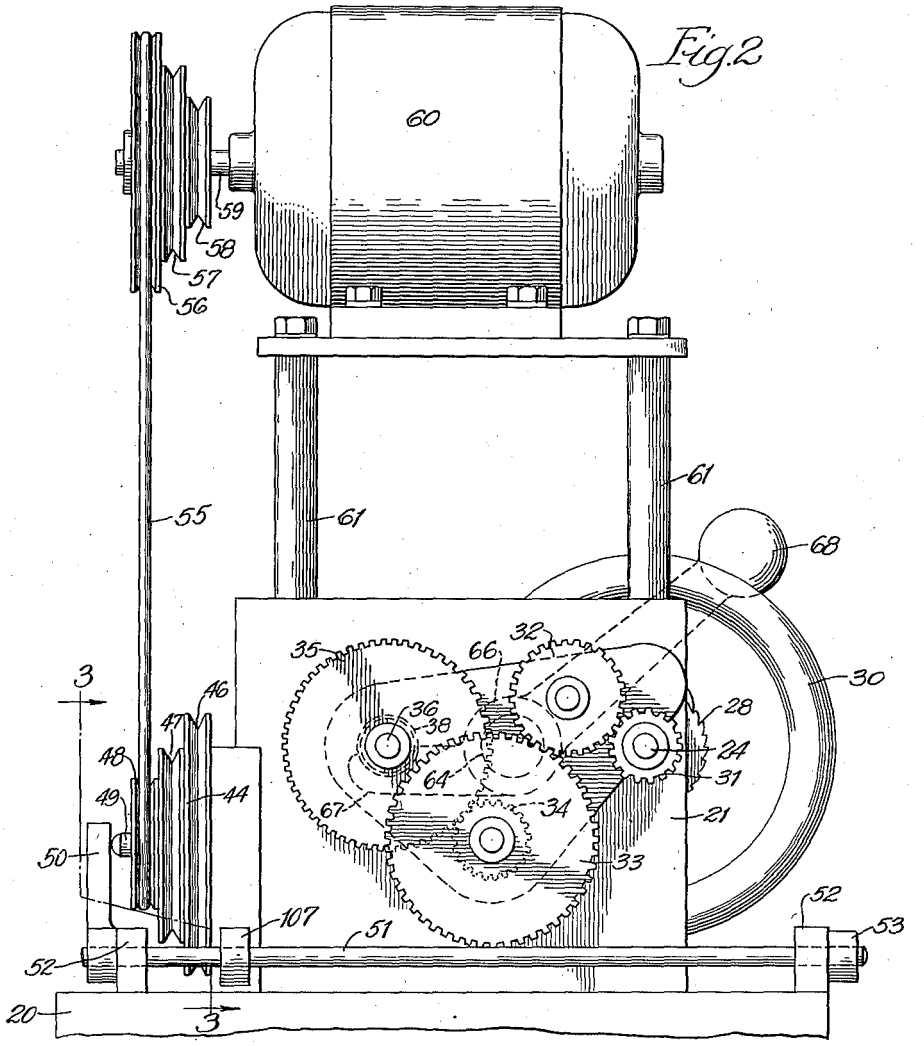

Fig. 4

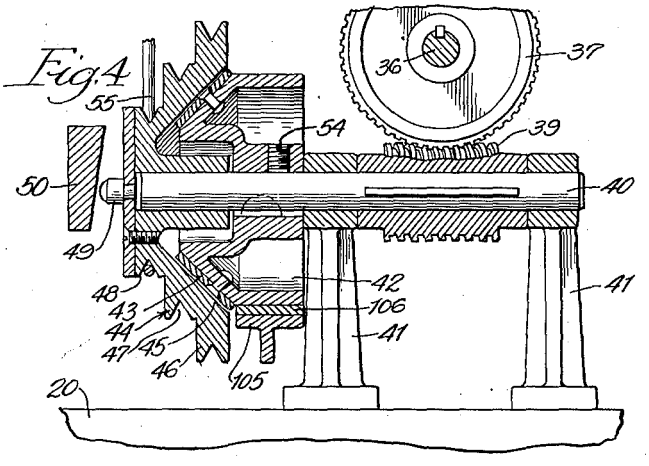

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Fig. 5

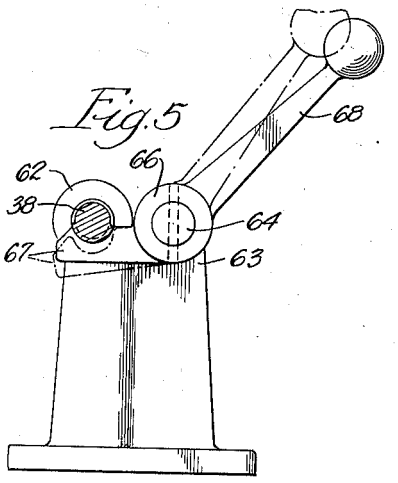

Fig. 6

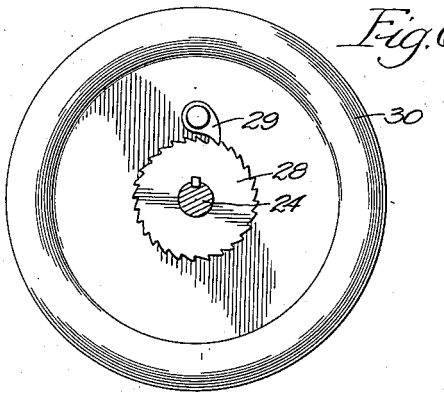

Fig. 7

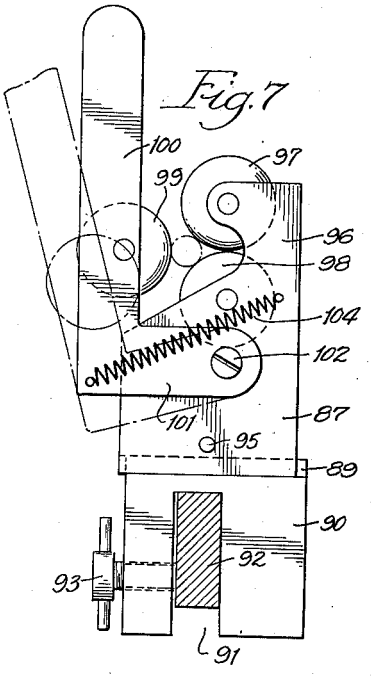

Fig. 8

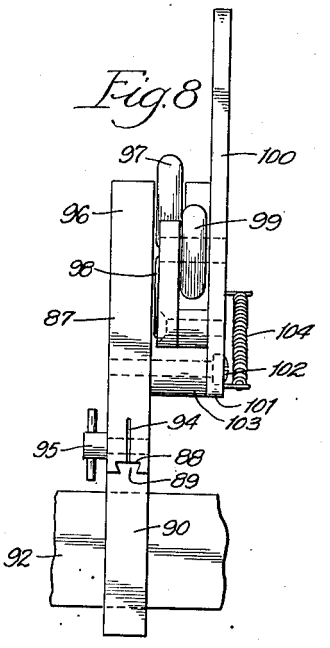

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Fig. 9

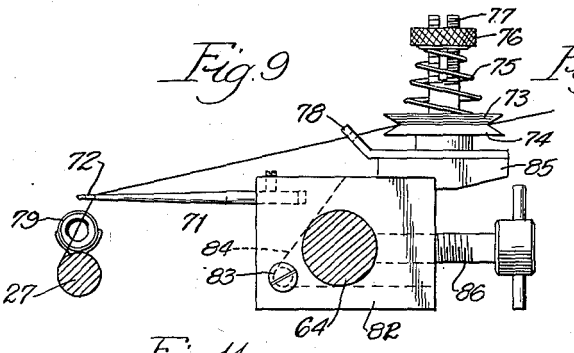


Fig. 10

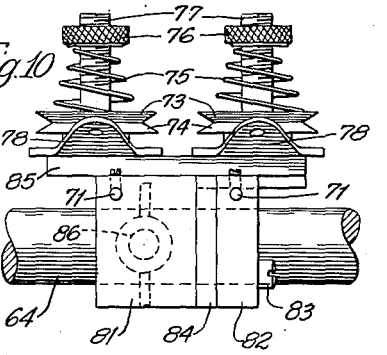


Fig. 11

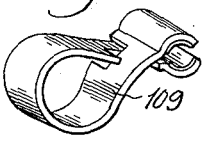


Fig. 12

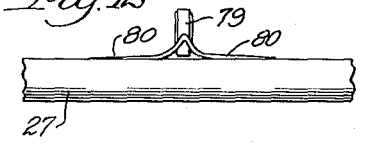


Fig. 13

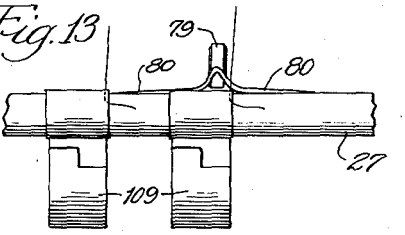


Fig. 14

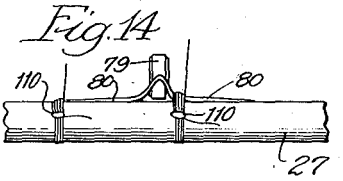


Fig. 15

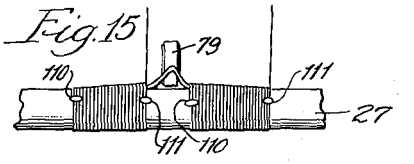
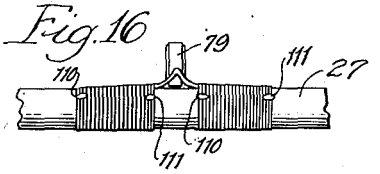


Fig. 16



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Patented June 1, 1937 2,082,562

UNITED STATES PATENT OFFICE

2,082,562

WINDING MECHANISM

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Application March 2, 1935, Serial No. 8,975

5 Claims. (Cl. 242—7)

The winding mechanism of the present invention is designed primarily, though not exclusively, for use in accurately applying winding threads to desired areas of fishing rods under conditions which require the use of fine silk thread and a uniform application of the windings in closely spaced relation to one another. Heretofore this work has been performed by hand, but the work is of a character which requires very close application and skillful performance in order to attain satisfactory results, and even with the exercise of the utmost care by skilled operators it is impossible to secure uniformity in the result, since bodily and mental fatigue and lack of continued attention, as well as the impossibility of maintaining a uniform tension on the winding thread, are factors which affect the character and quality of the resulting product.

The difficulty is also enhanced by the fact that fishing rods are of varying flexibility from the butt end toward the tip, so that the rotating of the flexible rod by hand results in a disturbance of the accuracy of the operation.

The machine of the present invention is designed to provide means for rapidly and uniformly rotating the rod and holding it meanwhile in straight alignment to prevent lateral displacement or whipping due to flexibility, and at the same time to provide means for evenly applying the windings under uniform tension and at the required pitch to produce a compact winding of the desired dimensions and under conditions which permit the operator to perform the work without fatigue and at a much more rapid rate than is possible by hand manipulation.

The invention in particular is directed to the means for supporting the rod during the winding operation; to the means provided for turning the rod either manually or by power; to the means provided for manipulating the feeding of the needles either manually or by power; to the means provided for regulating the tension of the thread, and to the general construction of the machine as a whole.

Further objects and details will appear from the description of the invention in conjunction with the accompanying drawings, wherein,—

Figure 1 is a plan view of the machine partially broken away through the center;

Fig. 2 is an end elevation;

Fig. 3 is a view of the clutch mechanism taken on line 3—3 of Fig. 2;

Fig. 4 is a sectional elevation of the clutch mechanism and associated parts taken on line 4—4 of Fig. 3;

Fig. 5 is a detail of the screw feed and associated mechanism taken on line 5 of Fig. 1;

Fig. 6 is a detail showing the hand wheel and ratchet for manually rotating the rod;

Fig. 7 is a detail showing one of the roller guides for holding the rod in position to permit rotation;

Fig. 8 is a view of the same at right angles to the position illustrated in Fig. 7;

Fig. 9 is a detail of the needle and tension mechanism taken on line 9 of Fig. 1;

Fig. 10 is a view of the same mechanism at right angles to the position illustrated in Fig. 9;

Fig. 11 is a perspective view of the clip employed for temporarily holding the winding upon the rod; and

Figs. 12, 13, 14, 15 and 16 are details showing one of the guides during various stages in the winding operation.

The machine is mounted upon an elongated base plate 20 which near one end has mounted thereon an upright end plate 21 provided at its lower edge with a flange 22 for attachment to the base plate. The end plate has secured to its inner face a journal sleeve 23 which journals the end of a chuck shaft 24 which is also carried through a journal 25 and terminates at its inner end in a chuck 26 adapted to receive the butt end of a fishing rod 27 or other rod to which the winding is to be applied.

The chuck shaft has keyed thereon a ratchet wheel 28 having saw teeth adapted to be engaged by a dog 29 pivoted to the face of a hand wheel 30 freely mounted upon the chuck shaft 24.

The chuck shaft at its outer end is provided with a spur pinion 31 which constitutes a part of a gear train comprising the gears 32, 33, 34 and 35, which latter gear 35 is mounted upon the end of a feed shaft 36 carrying a worm gear 37 and terminating in a screw feed 38. The worm gear 37 meshes with a worm 39 keyed upon a countershaft 40 journalled upon standards 41 and carrying at its outer end a cone clutch element 42 having upon its cone face a friction band 43. The cone clutch element cooperates with a driving clutch element 44 freely mounted upon the shaft and recessed on its inner face to afford a conical clutching surface 45, and provided on its outer face with three grooved pulleys 46, 47 and 48.

The freely mounted clutch element 44 is pro-

vided with an outwardly projecting centrally disposed pin or stud 49 which coacts with a wedge arm 50 mounted upon a rock shaft 51 journalled transversely of the base plate through journal mountings 52, and provided on its opposite end with a hand lever 53 for manual adjustment. The arrangement is such that as the wedge arm 50 is turned it will cam against the pin 49 and force the freely mounted clutch element 44 inwardly into frictional engagement with the friction band 43 on the clutch element 44 which is held rigidly upon the worm shaft 40 by means of a set screw 54.

Power is imparted through a pulley band 55 carried by a selected one of a group of groove pulleys 56, 57 and 58 on a motor shaft 59 driven by a motor 60 mounted upon standards 61. The arrangement shown affords a differential drive depending upon the pulleys selected for transmission of power through the band 55. The driving train shown is one which serves to impart a very slow rotation to the feed shaft 36 through the worm gearing, which slow rotation is speeded up through the gear train shown, so that the chuck shaft which carries the rod will be rapidly rotated concurrently with the slow rotation of the feeding mechanism.

The inner end of the feed shaft 36 is journalled within a journal standard 62 which standard also affords a journal mounting 63 for a slidable rock shaft 64, the opposite end of which is journalled within a standard 65. The slidable rock shaft has pinned thereon a sleeve 66 having a threaded finger 67 which is recessed and threaded to engage the under side of the feed screw 38 into mesh with which it is normally held by a weighted arm 68, which also serves as a handle to permit the threaded finger 67 to be disengaged from the screw feed as occasion may require. The endwise movement of the rock shaft is limited by inner and outer stop collars 69 and 70, which are secured on opposite sides of the journal mounting 65.

The slidable rock shaft 64 serves as a mounting for the desired number of needles 71 which carry the winding thread to the rod. Each of the needles is provided near its end with an eye 72 through which the thread runs after being carried between a tensioning device comprising upper and lower beveled disks 73 and 74 which are held in frictional contact with one another by the medium of a coil spring 75 adapted to be adjusted by a thumb nut 76 carried upon a split screw post 77. The beveled disks in conjunction furnish a groove to permit the easy insertion of the thread which is carried out through a guide finger 78 and through the eye of the needle and around the rod.

Where it is desired to simultaneously apply windings on the opposite sides of a line guide 79 provided with oppositely extending feet or prongs 80, it is necessary to arrange the needles in pairs, as shown near the center of Fig. 1, although where a single winding only is to be applied, a single needle can be used, as shown to the right of Fig. 1.

Where two needles are employed, one of the needles is mounted within a block 81 and the companion needle within a supplementary plate 82, which plate 82 is secured to the block by a screw 83 properly spaced if desired by the use of a shim 84. The block carries a platform 85 for both of the tension devices, as shown in Figs. 9 and 10. Where a single needle is employed, the arrangement is practically identical with that described save for the omission of the supplementary plate 82. The block 81 is provided with a thumb screw 86 which bears against the rock shaft 64, which permits the block to be locked in adjusted position on the shaft.

In order to properly support the fish rod or the like during the winding operation and prevent whipping or lateral movement thereof, the rod is supported by roller mountings, best shown in Figs. 7 and 8. Each of these mountings includes a plate 87 which is provided with a dovetail groove 88 along its lower edge, which groove fits upon a dovetail rib 89 formed on the upper surface of a rider block 90 provided with a groove 91 to straddle a guide rail 92 which extends longitudinally of the base plate 20 and is suitably supported thereon. The rider block is held in longitudinally adjusted position upon the guide rail by a hand screw 93 which permits suitable adjustments to be made.

For the required transverse adjustments, the plate 87 is provided with a split 94 along its under edge, and the divisions of the split plate may be drawn together by a hand screw 95, tightly clamping the plate upon the transversely extending dovetail ridge 89.

The plate 87 near its upper end is cut away to afford an upstanding tongue 96 which mounts a rounded upper roller 97 coacting with a lower roller 98 similarly mounted, and the two rollers in conjunction cooperate with an adjustable roller 99 carried by an L-shaped lever 100, the lower horizontal arm 101 of which is pivoted upon a pin 102 carried by a boss 103 projecting laterally from the plate 87. The L-shaped lever is acted upon by a coil spring 104, the inner end of which is made fast to the plate 87 and the outer end of which is made fast to the L-shaped lever at or near its elbow, the spring being so disposed that when the lever stands upright the spring serves to draw the roller 99 into contacting relation to the fish rod or other work being wound, but when the lever is drawn downwardly it will swing the spring beyond the pivotal mounting for the lever, so that in this adjustment it will serve to hold the rollers 99 away from the rollers 97—98.

In order to instantly stop the rotation of the rod after the power drive has been unclutched, a brake mechanism is provided, which is best illustrated in Fig. 3. This brake mechanism consists of an arcuate brake shoe 105 provided with a brake lining 106 which bears against the drum shaped body of the driven clutch element 42. The brake shoe is carried at the outer end of an arm 107 which is urged upwardly by a spring 108, the arm being mounted upon the clutch operating shaft 51.

Operation

In use, the line guides or other fittings are first secured in position as with cement, and the butt end of the fish rod is then inserted into and clamped within the chuck 26, the adjustable rollers being thrown back to permit the rod to be positioned. After the butt end has been firmly clamped within the chuck, the lever 100 will be swung inwardly to bring the roller 99 into properly adjusted relation to the rollers 97 and 98. In view of the fact that three rollers are employed, a proper contact at three separated points around the periphery of the rod will be made, and in order to exactly center the rod with relation to the axis of the chuck, the necessary cross adjustment can be made by

loosening the hand screw 95 and adjusting the plate 87 to the desired degree.

Similar adjustments can be made to exactly position the various portions of the tapered fish rod and to compensate for variations in the diameter of the rod from the butt end to the tip. After such adjustments are made, the rod may be rotated without any lateral movement or whipping, and the rollers will afford the necessary support required to maintain a flexible rod in properly aligned relation.

With the needles properly spaced to apply the windings to the desired portions of the rod, the winding threads are carried through the eyes of the needles, which are adjusted to the desired positions along the rock shaft 64, and the winding operation is started by first clamping the ends of the winding threads by the use of spring clips 109, which may be of the conventional type shown in Fig. 11 or of any other suitable type, which use of the clips is shown in Fig. 13. Thereafter, the operator may impart a few preliminary turns to the rod to start the winding thread by the use of the hand wheel 30, or by the temporary application of power, after which if desired a drop of adhesive 110 may be applied, as illustrated in Fig. 14, and by overlapping the end of the thread with the preliminary turns of the winding, the operation may proceed without tying the ends of the thread. After the preliminary turns are properly applied, the clips are removed and the winding will proceed upon the operation of the clutch lever 53, which throws the cone clutch elements into clutching relation and thus imparts a relatively rapid motion to the rod concurrently with a relatively slow endwise feeding movement to the rock shaft 64, which carries the needles and tension mechanism.

The winding operation will thus continue throughout the intended extent and until both of the legs or prongs of the line guide have been wound, the winding operation on one side of the line guide proceeding upwardly along the prong and on the other side downwardly along the prong until the prongs have been completely wound, at which point the operator will unclutch the drive and throw the brake, which instantly stops the rotation of the rod, after which the operator severs the thread and applies to the end thereof a drop of adhesive 111, which cements the terminus of the thread and completes the operation. The brake mechanism will instantly stop the rotation of the rod, and the operator also can at any time control the feeding advance of the wrapping by lifting the weighted arm 68, which breaks the screw feeding train and prevents further longitudinal movement to the needles save by hand operation.

The operating levers are conveniently arranged with relation to the operator, so that it is easy at any time to switch from a uniform feeding machine operation to a hand operation, which is desirable not only at the beginning and the end of the winding operations but also under conditions which may require the application of a few special windings which may be taken care of by hand manipulation, after which the regular machine winding can be resumed.

The method of holding and supporting the rod is one which permits easy and accurate adjustment with relation to the needles and also with relation to the axis of the chuck drive, so that provision is made for the winding of rods of varying diameter and taper and for the correct longitudinal adjustment of the needles for spacing of the wrappings around the line guides and elsewhere, as desired, along the rods, all portions of the machine being within easy control of the operator at all times.

By the provision of the thread tensioning devices and the accuracy with which the rotation of the rod may be regulated, it is possible to secure precision and uniformity in the winding in much greater degree than has heretofore been possible in winding operations performed entirely by hand, which invariably resulted in variations in tension and in the spacing of the convolutions even where the utmost skill was employed.

Although the invention has been designed particularly to meet the special requirements involved in the winding of tapered flexible fishing rods, the mechanism is equally adaptable for use under conditions in which rapidity and accuracy in adjustment and in the winding is required, so that in referring to fishing rods it will be understood that no limitation with regard to the possible uses of the machine is intended. Nor is the invention limited to the application of thread as the winding material, since wire or the like may be employed in cases where a metallic winding is required.

I claim:

1. A device for applying binding windings to areas of a tapering fishing rod comprising a chuck mounted to support the butt end of said rod, means movable longitudinally of the rod for traversing a winding strand over a relatively short area of the rod thus supported, means for causing relative rotation between the rod and traversing means, and a radially adjustable steady rest mounted independently of the traversing means for radially supporting the tapering rod beyond the chuck and adjacent the area of winding.

2. A device for applying binding windings to areas of a flexible tapering rod comprising a rotatably mounted chuck adapted to operatively support one end of said rod the opposite end being unsupported, means mounted for movement longitudinally of said rod for traversing a winding strand over a relatively short area of the rod thus supported, and a radially adjustable steady rest mounted independently of said traversing means for adjustment longitudinally of the rod, said steady rest providing the sole supporting means for said tapering rod beyond the chuck and adjacent the area of winding.

3. A device for applying binding windings to areas of a tapered flexible rod comprising a rotatably mounted chuck adapted to operatively support one end of said rod only, means mounted for movement longitudinally of the rod for traversing a winding strand over a relatively short area of the rod thus supported, and a steady rest mounted independently of the traversing means for supporting the rod beyond the chuck and adjacent the area of winding, said rest having relatively adjustable supporting members to accommodate therebetween varying rod diameters adjacent the areas to be wound.

4. A device for applying binding windings to areas of a flexible tapering rod comprising a chuck mounted to rotatably support one end of said rod, means for traversing winding strands over relatively short areas of the rod thus supported, means for rotating said rod and feeding said traversing means relative to the rod,

and steady rest means mounted independently of the traversing means for adjustment longitudinally with respect thereto for supporting the rod adjacent each zone of winding.

5. A device for binding line guide mountings to a tapering fishing rod comprising a chuck mounted to support the butt end of said rod, means movable longitudinally of the rod for traversing a winding strand over a relatively short area of the rod and line guide mounting, means for causing relative rotation between the rod and strand traversing means, and a radially adjustable steady rest mounted for adjustment along said rod independent of said traversing means for radially supporting the tapering rod beyond the chuck and adjacent the line guide mountings.

JOSEPH McARTHUR.