Sept. 4, 1951 D. J. YAKE 2,566,973

ROPE WINDING MACHINE

Filed Nov. 10. 1949 4 Sheets-Sheet 1

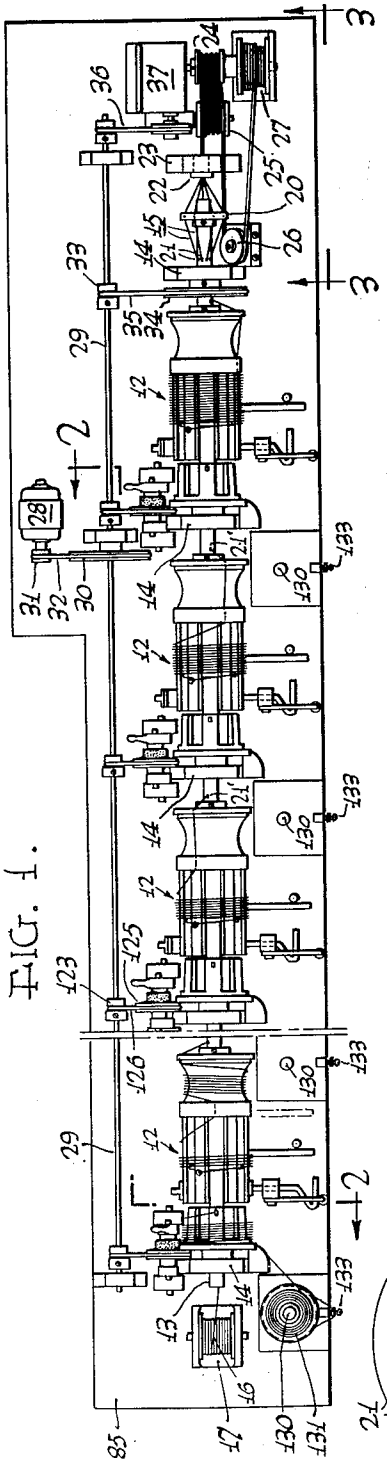


FIG. 1.

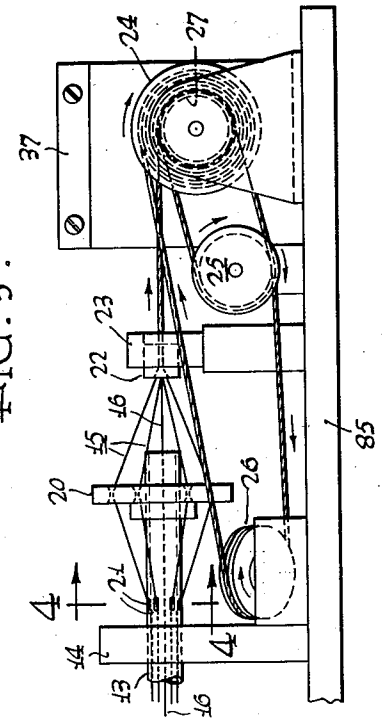


FIG. 3.

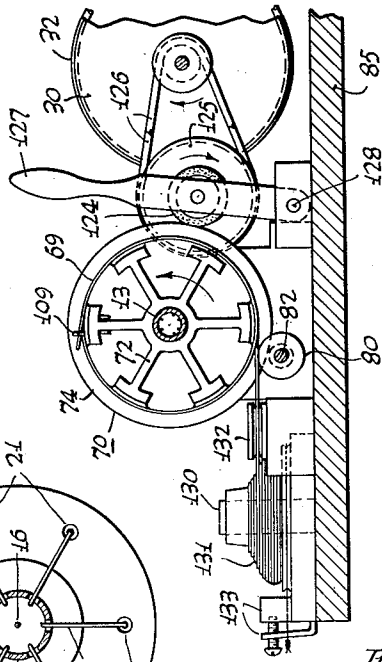


FIG. 2.

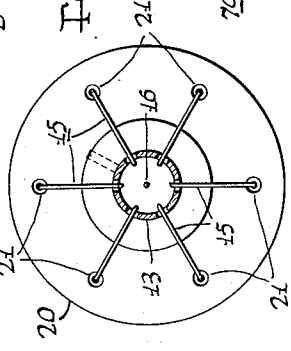


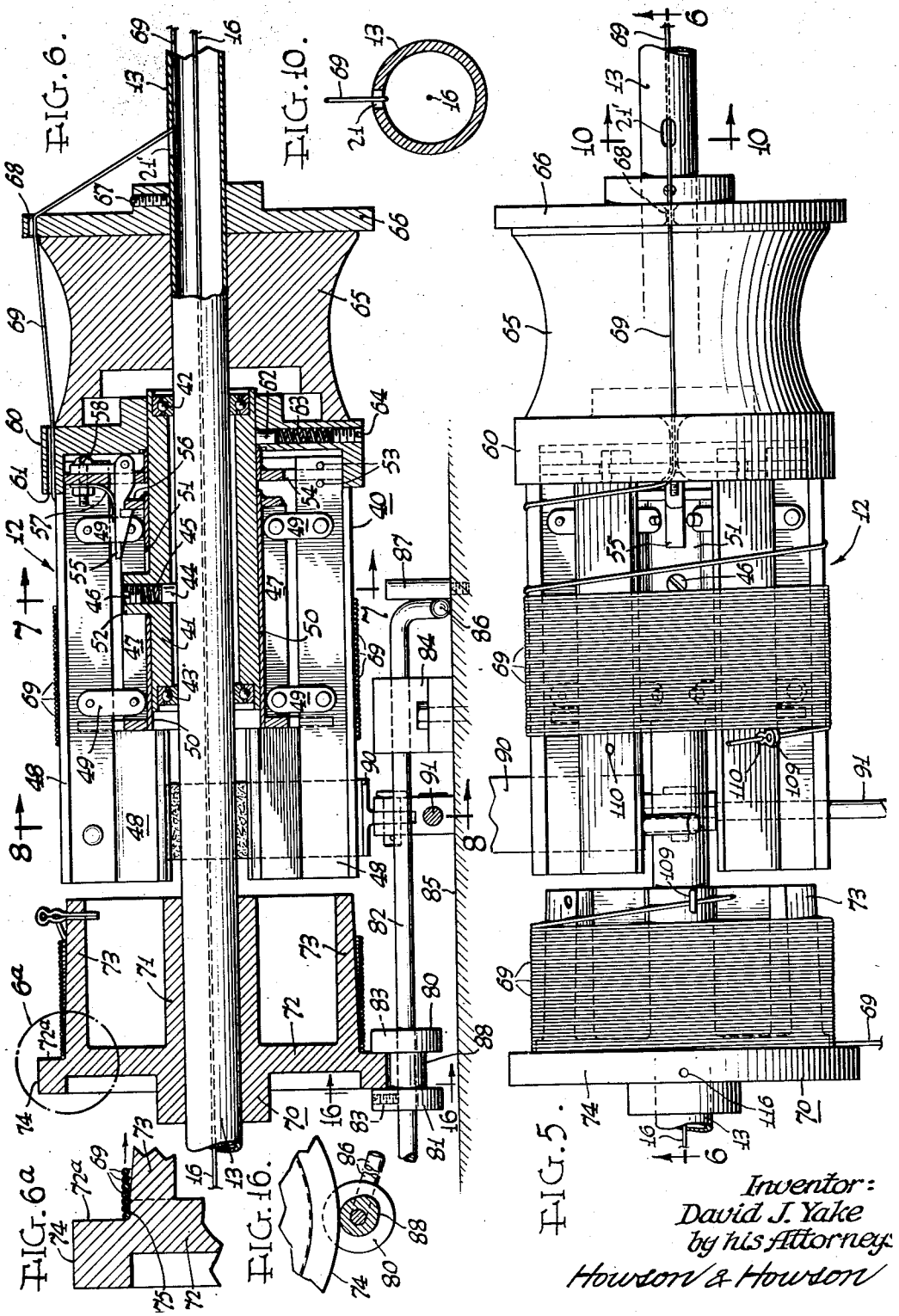
FIG. 4.

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ROPE WINDING MACHINE

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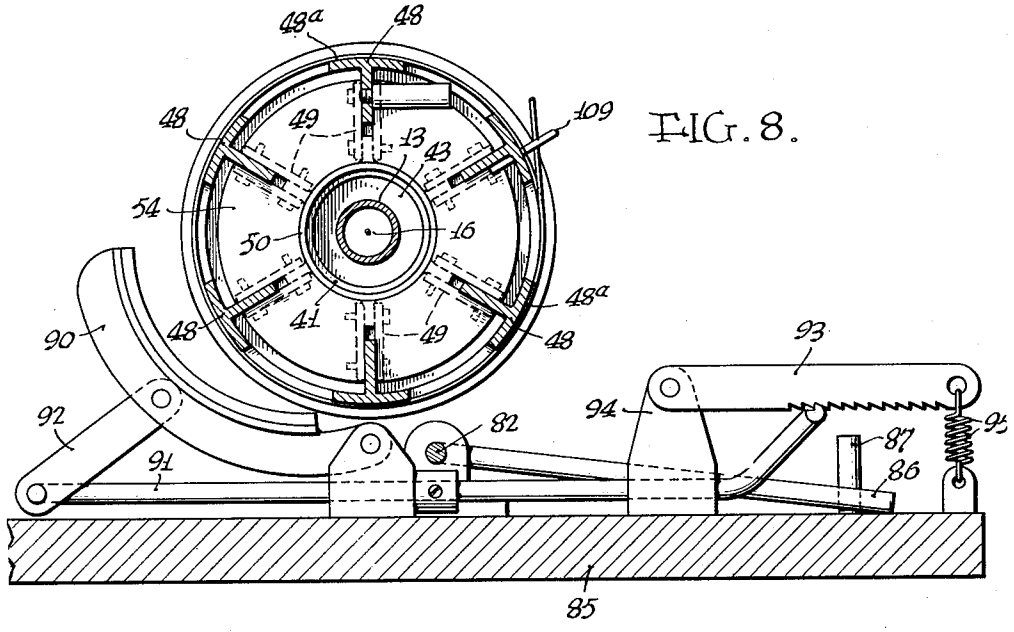


FIG. 8.

FIG. 7.

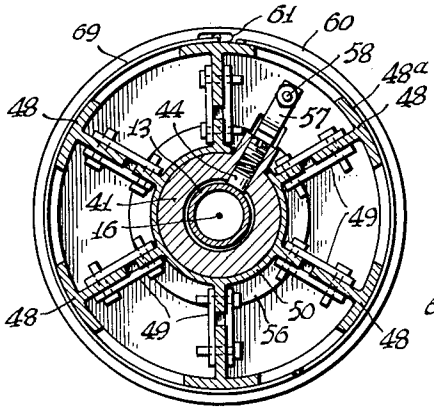
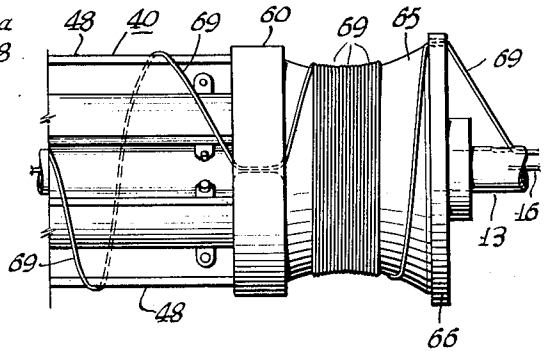


FIG. 9.



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ROPE WINDING MACHINE

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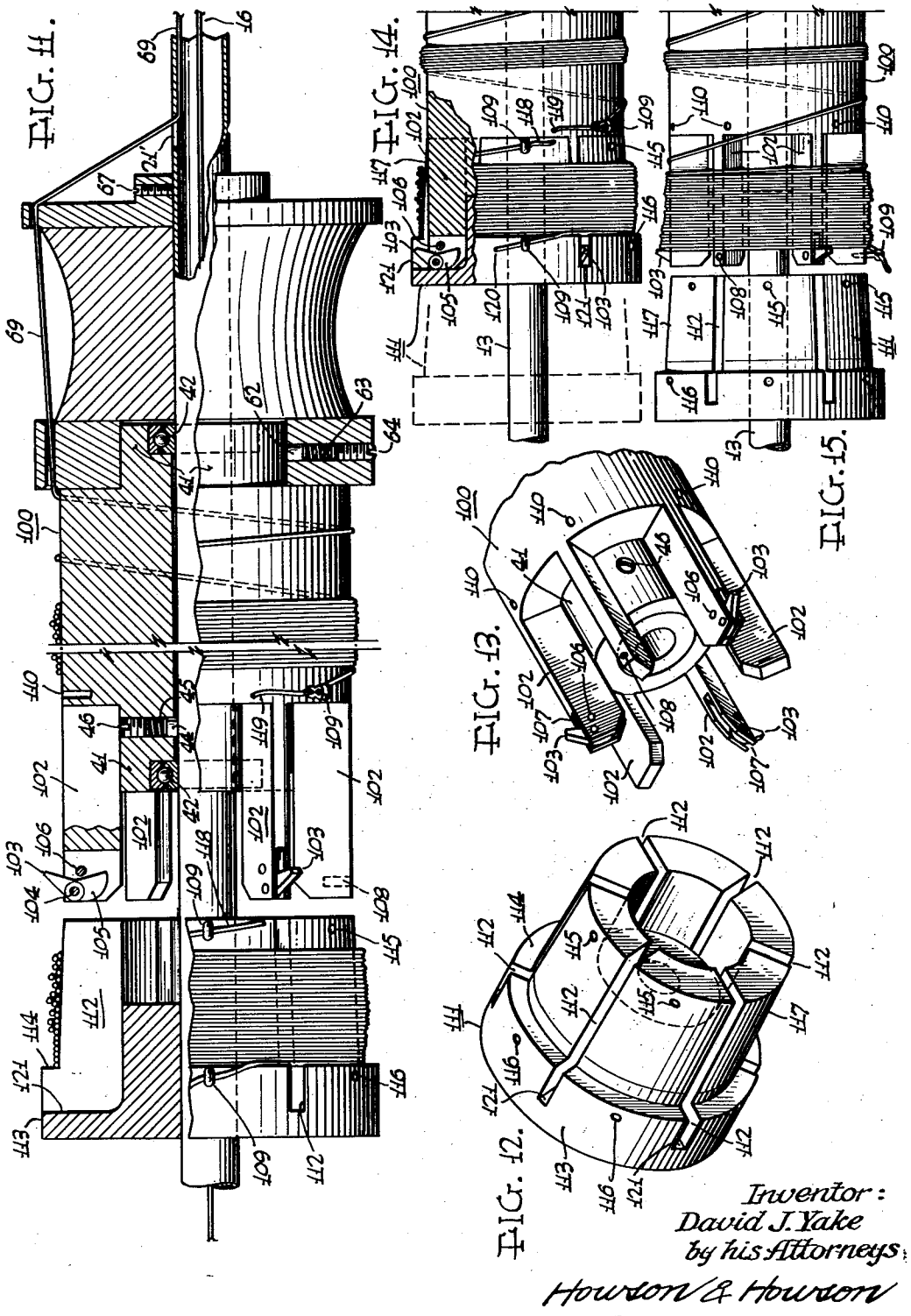


FIG. 41.

FIG. 44.

FIG. 45.

FIG. 43.

FIG. 42.

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UNITED STATES PATENT OFFICE

2,566,973

ROPE WINDING MACHINE

David J. Yake, Lambertville, N. J.

Application November 10, 1949, Serial No. 126,537

24 Claims. (Cl. 57—6)

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This invention relates to the art of rope making and more particularly to a machine for continuously winding a strand or a rope.

Machines employed for winding either metallic wire rope or non-metallic rope are commonly designated as either "vertical stranders" or "horizontal stranders." A vertical strander comprises essentially a turntable which carries a number of spools for the wires or threads which are led through a perforated flange and then wound around a center core to form the rope. Such a vertical strander has two noteworthy disadvantages. First, whenever one of the spools on the turntable becomes empty, it is necessary to stop the machine in order to replenish the wire on the spool or to add a filled spool. Secondly, due to the inherent weight of the moving parts and centrifugal forces developed in a machine of this character, the maximum speed with which rope could be made is definitely limited.

The horizontal srander represents a later development which enables a noticeable increase in speed over the vertical strander. Patent No. 1,581,253 to Connor is illustrative of such a horizontal strander and increased speed is obtained due to the reduction in the diameter of the revolving parts. This reduction was in turn achieved by placing the spools in an end-to-end position with axes parallel to the main shaft so that the length of the machine is increased rather than the diameter of the turntable. Nevertheless, horizontal stranders of all known varieties must be stopped when it becomes necessary to replenish one of the individual spools.

The present invention has for its primary object the provision of a rope winding machine having axially spaced wire spools which may be stopped independently of the main shaft and thus may be replenished without stopping the shaft or interrupting the winding operation.

A further object of the invention is to provide in a horizontal strander a plurality of wire or strand spools, a storage drum axially positioned with respect to each of said spools so that when the spools are held stationary, wire is withdrawn from the spools and stored on the drum, and means for simultaneously replenishing the supply of wire on the spool.

A further object of the invention is to provide means for replenishing the wire on individual spools of a horizontal strander which means is easy to manipulate and which permits the wire to be replenished in a minimum of time.

Further objects will be apparent from the specification and drawings in which:

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Fig. 1 is a top view of a four-strand rope winding machine constructed in accordance with my invention;

Fig. 2 is an enlarged transverse section of the structure of Fig. 1 as seen at line 2—2 of Fig. 1;

Fig. 3 is an enlarged fragmentary detail of the structure as seen at 3—3 of Fig. 1;

Fig. 4 is an enlarged detail as seen at 4—4 of Fig. 3;

Fig. 5 is an enlarged detail of the first or left-hand spool and the replenishing apparatus;

Fig. 6 is a transverse section as seen at 6—6 of Fig. 5;

Fig. 6a is an enlarged detail as seen at 6a of Fig. 6;

Fig. 7 is a transverse section as seen at 7—7 of Fig. 6;

Fig. 8 is a transverse section as seen at 8—8 of Fig. 6;

Fig. 9 shows the structure of Fig. 5 when the spool is held stationary;

Fig. 10 is an enlarged sectional detail as seen at 10—10 of Fig. 5;

Fig. 11 is a partly sectioned view similar to Fig. 6, of a modified form of reel assembly;

Fig. 12 is a perspective of the modified transfer reel shown in Fig. 11;

Fig. 13 is a perspective of the end of the main reel shown in Fig. 11;

Figs. 14 and 15 show steps in transferring a coil of wire from the transfer reel to the main reel with the structure of Fig. 11; and

Fig. 16 is a sectional detail as seen at 16—16 of Fig. 6.

As noted heretofore, the present machine may be employed to wind or fabricate rope from any desired material. However, the present device is intended especially for the winding of wire rope and therefore terms common to this art will be employed but it is not intended that the use of wire rope terms shall in any way limit the invention to that material.

In the wire rope fabricating art, the term "strand" may be defined as an assembly composed of a plurality of individual wires, one of which is usually a center wire and the remainder of which are secondary wires laid or twisted around the center wire to form a helix. The individual strands are wound in much the same way as the individual wires of the strand to form a completed rope which has a core usually of hemp or of a small wire rope and around which the strands are laid so that the strands themselves also form a helix about the rope center.

The present invention comprises essentially a

series of axially positioned reels from which the individual wires making up a strand or the individual strands making up a rope, are fed into the bore of a hollow central shaft and from whence the wires or strands are carried to the rope forming elements of the machine. The storage spools for the wire are frictionally engaged with the main shaft but may be readily held stationary by hand or by a suitable brake. A feed eye for the wire is rigidly secured to the central shaft and is axially spaced on the shaft with respect to the reel. The gap between the feed eye and the reel contains a storage spool which is free to rotate on the shaft or to remain stationary with respect to the shaft. A second feed eye between the storage spool and the reel has a frictional engagement with the reel and in effect floats between the reel and the spool. The function of the second eye is to insure the proper tension in the wire and also to control the manner in which the wire pays off the reel.

When a reel is stopped, the shaft and the other rope forming elements of the machine continue to operate in the usual manner but wire is drawn from the stationary reel and wound onto the storage spool. A replenishing reel is coaxially mounted on the central shaft and is axially slidable with respect thereto. Both the main reel and the replenishing reel have fingers that are inter-engaged when the replenishing reel is axially moved on the shaft. In this position, a coil of wire which has previously been wound on the replenishing reel may be transferred to the main reel, whereupon the replenishing reel is retracted and the main reel is released. As soon as the main reel turns again with the shaft, wire which has been wound on the storage spool during the replenishing operation is gradually fed into the central shaft until wire is drawn directly from the main reel in the manner initially described.

Referring now more particularly to Fig. 1 of the drawings, one form of strand or rope winding machine comprises a plurality of individual wire supply units each designated generally by the numeral 12 on the drawings. For the purposes of the present description, it will be assumed that the machine shown in Fig. 1 is winding a strand from wire, although it will be understood that the same construction and even the identical machine, may be used to wind rope from non-metallic strands or filaments. Likewise, the machine shown in Fig. 1 is one in which six wires are being wound around a center but for the purpose of clarity, only four of the wire supply units 12 are shown. By extending the length of the machine to the left (as seen in Fig. 1) any number of supply units 12 may be added to wind wires or strands of any material about a center. However, since the individual units 12 are identical to each other, it is considered sufficient for the purposes of the present disclosure to describe only one unit in detail, together with the feeding and winding elements of the machine.

A hollow main shaft 13 is journaled in bearings 14, 14 and extends the entire length of the winding machine. Shaft 13 guides and encloses the filaments of wire or other material designated generally at 15 in Figs. 1 and 3, and also the center or core 16 which is fed into the extreme end of shaft 13 from spool 17. The opposite end of shaft 13 carries an axially perforated flange 20 through which the wires 15 are threaded, after they have been withdrawn from the eyes 21, 21 in the shaft (as shown in Fig. 4). The center 16 however, continues through the shaft 13 and is fed directly into a forming die 22 mounted in bracket 23. When the shaft is rotated on bearings 14, the individual wires are wrapped around the core 16 as they are drawn through die 22 by means of a power pulley 24. The completed strand or rope is wound several times around a second drum 25 in order to provide sufficient frictional engagement between the strand and the drum. The strand is then led over a pulley 26 and onto a storage drum 27. Motor 28 drives the shaft 13 through countershaft 29, pulleys 30, 31 and belt 32. Countershaft 29 is drivingly connected to shaft 13 by means of pulleys 33, 34 and belt 35. Drum 24 is likewise driven from shaft 29 through belt 36 and a suitable speed reduction unit 37. It will be understood that in general, the structure described heretofore is well known in the rope manufacturing art but an important departure from previous practice is to feed the individual wires or strands through a hollow central shaft rather than to carry them from the individual spools directly to the flange 20.

Referring now to Figs. 5 and 6, each one of the individual spool units 12 comprises the main or primary reel assembly 40 having a central hub or sleeve 41 journaled on main shaft 13 by means of ball bearings 42 and 43. Hub 41 tends to rotate with shaft 13 due to a friction element 44 which is mounted in hub 41 and is urged against the periphery of shaft 13 by means of a spring 45 having an adjusting screw 46. Hub 41 carries a plurality of radially extending webs 47, 47 to which fingers 48, 48 are pivoted by means of links 49, 49. Webs 47, 47 are formed integrally with a slidable sleeve 50 mounted on hub 41 which is provided with a slot 51 to clear the boss 52 in hub 41 for the friction element 44. Fingers 48, 48 are adapted to expand and contract radially with respect to sleeve 50 and are retained axially by means of pins 53, 53 which engage the sides of a flange 54 rigidly attached to hub 41. Figs. 5 and 6 show the fingers 48 in a fully expanded position in which they are retained by a latch 55 which engages a collar 56 on sleeve 50. Latch 55 is spring-loaded by means of a spring 57 secured to flange 54 by means of bolt 58. When latch 55 is raised, sleeve 50 may be moved axially to the left (as seen in Fig. 6) so that fingers 48 are retracted radially. The fingers are of T-shaped cross-section and the outer faces 48a of the fingers may be curved or convex if desired, as shown in Fig. 7.

A floating eye flange 60 having an axially extending eye 61, is frictionally mounted on hub 41, and rotational driving force is transmitted from hub 41 to the floating eye flange 60 by means of a frictional element 62 which is adjustably spring-loaded in flange 60 by means of spring 63 and screw 64. It will thus be apparent that flange 60 tends to rotate with hub 41 but limited relative rotation between the hub and the flange takes place in accordance with the pressure of the friction element.

A storage spool 65 is freely journaled on the periphery of shaft 13 and is positioned axially adjacent the flange 60. In order to eliminate the necessity for integral flanges on the spool, the periphery of spool 65 is axially concave or curved, as shown clearly in Fig. 6. Immediately adjacent spool 65, a fixed flange 66 is rigidly attached to shaft 13 by means of set screw 67. Flange 66 is provided with an eye 68 through which wire 69 is threaded. The length 69 of

wire 15 stretches between eyes 61 and 68 across spool 65 (as shown in Fig. 6), whereupon it is fed into the bore of shaft 13 through eye 21'.

The replenishing reel 70 is freely rotatable on shaft 13 and is slidably mounted thereon at the opposite end of reel 40. Reel 70 has a hub 71 of relatively small diameter to which a radially extending flange 72 is attached axially opposite from the reel 40. A plurality of axially extending fingers 73, 73 are formed integrally with flange 72 and are so positioned that they may fit between the outer faces 48*a*, 48*a* of fingers 48, 48 when the reel 70 is moved axially on shaft 13. The periphery of fingers 73 is provided with an axial taper so that the minimum diameter of the fingers is substantially less than the maximum expanded diameter of fingers 48, whereas the maximum diameter of fingers 73 is equal to or slightly greater than the maximum diameter of fingers 48. A further feature of the construction of reel 70 is illustrated in Fig. 6*a* which shows the periphery 74 of flange 72 extending somewhat beyond the maximum diameter of fingers 73. It will be noted that a short axial distance at the base of fingers 73 has a cylindrical configuration in which there is no taper. In practice, the width of the cylindrical portion 75 is sufficient to permit at least two or three turns of strand or wire 69 to be wound thereon before the convolutions are forced onto the tapering surface of fingers 73. The purpose of this construction will be described more fully hereinafter.

The periphery 74 of reel 70 also is engaged between collars 80 and 81 which are secured to a shaft 82 by means of set screws 83, 83. Shaft 82 is rotatably and slidably mounted in brackets 84, 84 on base 85, and is provided with a suitable actuating handle 86 engageable against stop 87. A cam 88 is also mounted on shaft 82 between collars 80 and 81 so that when shaft 82 is rotated by means of handle 86, the cam 88 may be used as a brake to slow down or to stop reel 70 and also reel 40 when the two reels are engaged.

Reel 40 may be stopped while the winding machine continues to operate, by means of a brake shoe 90 (Fig. 8) which is actuated by means of lever 91 and connecting link 92. A suitable ratchet lock 93 for the brake is pivoted in bracket 94 and retained in locking position by means of spring 95.

It will be understood that the brakes on either or both of the reels are not essential since in many cases, and especially on smaller machines, the reel 40 may be manually stopped and held during the transfer operation. Where the size of the machine is such that a brake is not needed, it may also be possible to dispense with the expanding and contracting feature for the reel fingers 48 on reel 40. Figs. 11–14 illustrate such a modified reel construction.

In this case, the main reel 100 is formed integrally with hub 41 which is extended at either end to receive bearings 42 so that the reel 100 is substantially solid throughout most of its length. The outer end however, is provided with a plurality of fingers 102, 102 which extend beyond the end of hub 41. Some of the fingers 102 are slotted at their ends and carry dogs 103, 103 which are pivoted on pins 104 and have counterweights 105, 105. A suitable limit stop 106 for each dog is so positioned that the upper surface of the dog is permitted to be enclosed in the slots 107. Other fingers 102 have suitable holes 108 in which split retaining pins 109, 109 may be inserted during the transfer operation. Likewise, the periphery of both reels 40 and 100 may be provided with holes 110, 110 adapted to receive the wire retaining pins 109.

The transfer reel 111 used in conjunction with reel 100 is likewise of slightly modified construction and is provided with relatively narrow axially extending slots 112, 112 in which fingers 102 may be engaged. Slots 112 are cut into the wide flange 113 of the transfer reel at a point beyond the coil forming face 114 of the reel. Reel 112 is likewise provided with suitable holes 115 and 116 on the tapered surface 117 and the periphery of the flange 113 respectively.

The procedure for replenishing the wire on the transfer reel while the machine operates is as follows: when the amount of wire on the main reel 40 or 100 has been substantially withdrawn, this reel is held stationary by brake shoe 90 or by hand. In this position, the floating disc 60 turns on sleeve 51 in accordance with the tension of flexible element 62 and excess wire unwound from the reel is stored on spool 65 as shown in Fig. 9. The first few turns of the wire on the main reel, as well as the friction of floating disc 60, provide the required back tension for this operation. With the main reel held stationary, the transfer reel 70 or 111 carrying a new coil of wire is moved axially to the right on shaft 13 so that the fingers on the main and transfer reels become interengaged. In the case of the construction of Fig. 6, the fingers 48 are radially retracted by releasing latch 55 and sliding sleeve 47 axially to the left. With the reels interengaged, the ends 118 of the new coil and the end 119 of the old coil are secured together by welding or any other suitable means. Fig. 14 illustrates the ends 118 and 119 in position just before the welding operation. As soon as ends 118 and 119 are secured to each other, split pins 109, 109 which hold ends 118 and 119 on the transfer and main reels respectively are withdrawn. Pin 109 which holds the trailing end 120 of the new coil is transferred to one of the holes 103 in the main reel. The transfer reel is then withdrawn to the left, as shown in Fig. 15, to complete the transfer of the new coil to the main reel 100.

In effecting a transfer with the structure of Fig. 6, it will be necessary to release brake shoe 90 before the transfer reel 70 is moved completely into a transfer position. For this purpose, the transfer reel 70 may be moved sufficiently to engage only the outer edge of fingers 48, whereupon brake 90 is released and cam brake 88 is rotated to contact the periphery 74 of flange 72, thus holding both reel 70 and reel 40 from turning. In this position, the reel 40 may be further moved to the right by means of the shaft 82 until the new coil is entirely over the fingers 48. After the ends of the coils have been secured, as described above, reel 40 is retracted and the new coil as well as the remainder of the old coil, are moved axially to the right on fingers 48 to substantially the position shown in Fig. 5. This operation may be done manually or by inserting one or more pins 109 in holes 115, 115 of reel 70 and then moving the reel to the right a second time to slide both coils axially on fingers 48. When the new coil has been located in the proper position on finger 48, the trailing end of the new coil is retained by one of the pins 109 which is inserted in any of the holes 110 in the fingers 48, as shown in Fig. 5. The fingers are then expanded by moving sleeve 47 to the right, whereupon it

may be latched, as shown in Fig. 6. Then either or both brakes 88 or 90 is released and the reel 40 resumes its rotation. It will be understood that brake 90 will not be applied when the coil of wire is being moved over the portion of the fingers 48 that would otherwise be held by the brake. If it is necessary to hold the reel from turning during this operation, brake 88 may be used or the reel may be held manually. During the transfer however, the wire has built up on storage spool 65. This will gradually pay out through eye 68 until it has all been removed, whereupon the wire extends directly across spool 65, as shown in Figs. 5 and 6. Fig. 1 represents schematically the relative amounts of wire on the various spools of a strander and not necessarily the actual number of turns that may be present. The extreme left-hand unit 12 in Fig. 1 shows the filament stored on spool 65 and indicates the stopped position of reel 40 just prior to transfer of a coil. In actual practice, the winding of the new coil on reel 70 would ordinarily be completed before reel 40 is stopped.

When a transfer is made with a reel of the construction shown in Figs. 11–14, dogs 103, 103 pivot in a clockwise direction as reel 111 is moved into engagement with reel 100. This permits the dogs to slide underneath the new coil of wire. When the reel 111 has been moved into nearly complete engagement with reel 100, the counterweights 105 on the dogs strike the walls 121 of slots 112 to pivot the dogs to a vertical position in back of the new coil (Fig. 14) so that the dogs 103 retain the new coil on fingers 102 when reel 111 is withdrawn (Fig. 15). The operator may, if he desires, move the entire new coil to the right on reel 100, either manually or by means of pins inserted in holes 115 of reel 111, or the new coil may be left on fingers 102 until it is substantially depleted. In either event, it is only necessary to move the new coil to the right a sufficient distance so that the pin 109 holding the trailing end of the new coil may be transferred from one of the holes 108 on fingers 102 to one of the holes 110 in the reel, thus avoiding interference when the next new reel is transferred.

In order to make the entire transfer, the operator leaves sufficient wire on the main reel so that he may make the transfer before all the wire has been wound on the storage spool 65.

The procedure for winding the new coil on either reel 70 or reel 111 is substantially the same and will now be described. A pulley 123 is connected to the countershaft 29 and is drivingly connected with a friction drum 124 through pulley 125 and belt 126. Drum 124 and pulley 125 are mounted on lever 127 which is pivoted to the base 85 at 128. Lever 127 may be manually pivoted to engage the periphery 74 of flange 72 with drum 124 to cause rotation of the transfer reel on shaft 13. This rotation will of course, be in a counterclockwise direction as seen in Fig. 2, in order that the new coil may be wound on the transfer reel from the bottom. Each unit is provided with a swift 130 on which a supply 131 of wire is placed.

In the winding of the transfer reel, the leading end of the wire supply 131 is carried over a block 132 which guides the wire onto the cylindrical portion 75 of the transfer reels and against the vertical faces 72a and 114. The leading end of the wire is pinned in one of the holes 115 near the forward end of the reel. Desired tension in the winding operation is provided by means of a suitable tension device 133 which operates in conjunction with swift 130. As the wire is wound onto the transfer reel, successive convolutions thereof push the previously wound convolutions to the right on the transfer reel, as shown in Figs. 6 and 11. Since the cylindrical portion 75 extends axially for approximately only three turns, the initial convolutions of wire become loose on the tapered portion of the transfer reel. When a sufficient supply of wire has been wound on the transfer reel to form a new coil, the reel is stopped by disengaging drum 124 from contact with the reel. Then the trailing end of the wire is secured by a pin 109 inserted in one of the holes 116 in the periphery 74 or 113 of the reel flange. The wire may then be cut and the transfer reel is ready for the replenishing operation as described above.

It will thus be apparent that I have provided a continuous rope or strand winding machine which may be attended by one operator and which never has to be shut down for the purpose of replenishing any of the spools. The machine is relatively simple and easy to operate. An especial advantage in addition to the continuous operation feature, resides in the fact that it can handle a mill coil of wire and does not require that the wire be wound on a spool before it can feed to the machine. In all previous stranding machines, it is necessary that the wire be transferred from a mill coil to a spool before it can be used in the strander. Since the winding of the new coils on the transfer reels conditions the coil properly to be received by the strander, it is possible to place the mill coils directly on the swifts, thereby eliminating one operation in the process of forming wire rope.

Having thus described my invention, I claim:

1. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, and a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel.

2. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel, a plurality of axially extending fingers on said main reel, and a plurality of juxtaposed oppositely extending fingers on said transfer reel, said fingers adapted to

interengage each other when the transfer reel is moved axially on the shaft.

3. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel, a plurality of axially extending fingers on said main reel, a plurality of juxtaposed oppositely extending fingers on said transfer reel, said fingers adapted to interengage each other when the transfer reel is moved axially on the shaft, and means on the outer periphery of the fingers to retain the ends of a wire coil thereon.

4. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel, a plurality of axially extending fingers on said main reel, a plurality of juxtaposed oppositely extending fingers on said transfer reel, said fingers adapted to interengage each other when the transfer reel is moved axially on the shaft, means on the outer periphery of the fingers to retain the ends of a wire coil thereon, and means on the end of at least one of the main reel fingers for engaging a coil of wire and retaining the coil on the main reel fingers when the transfer reel is axially moved away from the main reel.

5. In rope manufacturing apparatus, a strander comprising a hollow central shaft having a plurality of eyes in the periphery thereof, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means and through said eyes in the shaft, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, and a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel.

6. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a fixed eye member rigidly mounted on said shaft in spaced relation to the floating eye member, a storage spool freely rotatable on said shaft adjacent said floating eye member, the periphery of said storage spool having an axially concave surface, and a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel.

7. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a fixed eye member rigidly mounted on said shaft in spaced relation to the floating eye member, a storage spool freely rotatable on said shaft between said eye members, the periphery of said storage spool having an axially concave surface, and a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel.

8. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a first sleeve journaled on said shaft, a second sleeve slidably but non-rotatably mounted on said first sleeve, a plurality of fingers in operative association with said second sleeve, a plurality of links for radially moving said fingers with respect to said sleeve, means for axially retaining said fingers with respect to said sleeve, a floating eye member frictionally mounted on one of said sleeves and adapted to draw a filament from the fingers, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, and a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the sleeves.

9. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a first sleeve journaled on said shaft, a second sleeve slidably but non-rotatably mounted on said first sleeve, a plurality of fingers in operative association with said second sleeve, a plurality of links for radially moving said fingers with respect to said sleeve, means for axially retaining said fingers with respect to said sleeve, a floating eye member frictionally mounted on

said first sleeve, friction means between said eye member and said sleeve for providing limited relative rotation therebetween, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, and a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the sleeves.

10. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel, a plurality of axially extending fingers on said main reel, means for radially expanding and retracting said fingers, and a plurality of juxtaposed oppositely extending fingers on said transfer reel, said fingers adapted to interengage each other when the transfer reel is moved axially on the shaft.

11. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel, a plurality of axially extending fingers of T-shaped cross-section on said main reel, means for radially expanding and retracting said fingers, and a plurality of juxtaposed oppositely extending fingers on said transfer reel, said fingers adapted to interengage each other when the transfer reel is moved axially on the shaft.

12. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a brake for said reel, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, and a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel.

13. In rope manufacturing apparatus, a stander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel, and means for axially sliding said transfer reel on the shaft.

14. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a brake for said reel, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel, and means for axially sliding said transfer reel on the shaft.

15. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel, a flanged periphery on said transfer reel, a cylindrical portion of smaller diameter axially adjacent to said flanged periphery, the side of said periphery and the cylindrical portion forming a wire winding surface, and a tapered storage surface contiguous to said cylindrical surface.

16. Apparatus in accordance with claim 15, in which the minimum diameter of the tapered surface on the transfer reel is substantially less than the diameter of the main reel, and the maximum diameter of the tapered surface is equal to or less than the diameter of the main reel.

17. Apparatus in accordance with claim 15, in which the flange is slotted axially between the fingers.

18. Apparatus in accordance with claim 15, in which the fingers on the reels are provided with radially spaced apertures adapted to receive wire end retaining means.

19. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by

said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a plurality of axially extending fingers rigidly attached to said main reel, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, and a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel.

20. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a plurality of axially extending fingers rigidly attached to said main reel, a plurality of pivoting members at the end of at least one of said fingers, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, and a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel.

21. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel, and means for independently rotating said transfer reel to wind a filament coil thereon.

22. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising a main reel concentric with and frictionally mounted on said shaft, a floating eye member frictionally mounted on said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel, means for independently rotating said transfer reel to wind a filament coil thereon, and filament feeding means including a swift in operative association with the transfer reel.

23. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising an axially slidable sleeve concentric with and frictionally mounted with respect to said shaft, a main reel non-rotatably mounted on said sleeve, a floating eye member mounted adjacent said reel and adapted to draw a filament therefrom, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, and a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel.

24. In rope manufacturing apparatus, a strander comprising a hollow central shaft, means for rotating said shaft, means carried by said shaft for twisting filaments around a central core, means for drawing said filaments and core through said last-named means, a plurality of filament feeding units arranged end-to-end on said shaft, at least one of said units comprising an axially slidable sleeve concentric with and frictionally mounted with respect to said shaft, a main reel non-rotatably mounted on said sleeve, a floating eye member frictionally mounted on said sleeve and adapted to draw a filament from the main reel, a storage spool freely rotatable on said shaft adjacent said floating member, a fixed eye member rigidly mounted on said shaft adjacent the storage spool, and a transfer reel rotatably and slidably mounted on said shaft at the opposite end of the reel.

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