

[54] WINDING APPARATUS

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[51] Int. Cl.B65h 54/14
[58] Field of Search242/27, 32, 18, 43; 184/11

[56] References Cited

UNITED STATES PATENTS

2,763,443 9/1956 Goodhue et al.242/27
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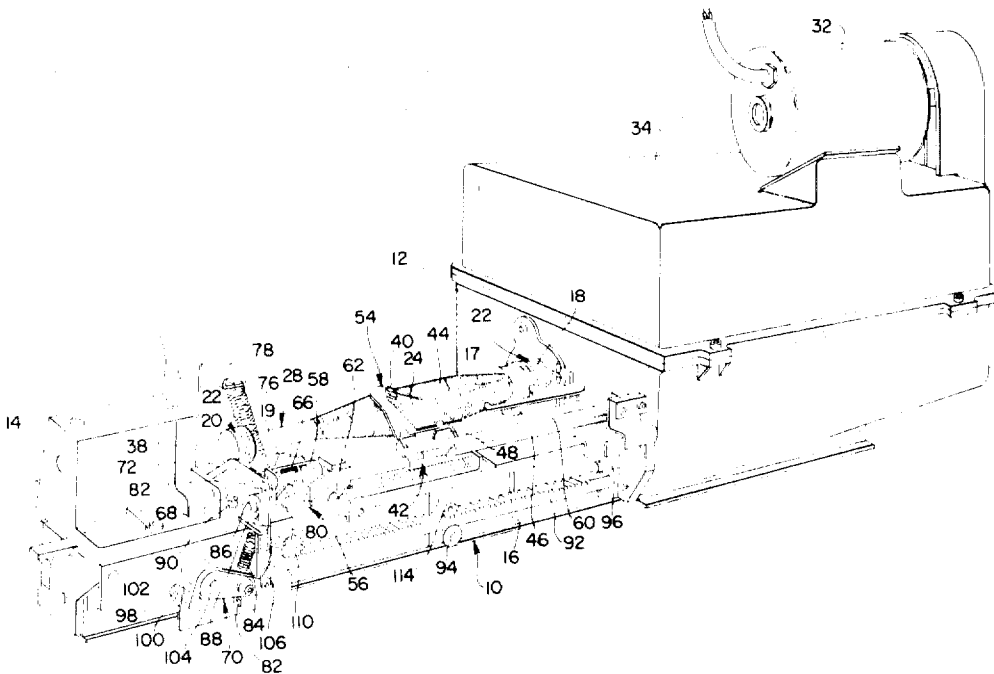
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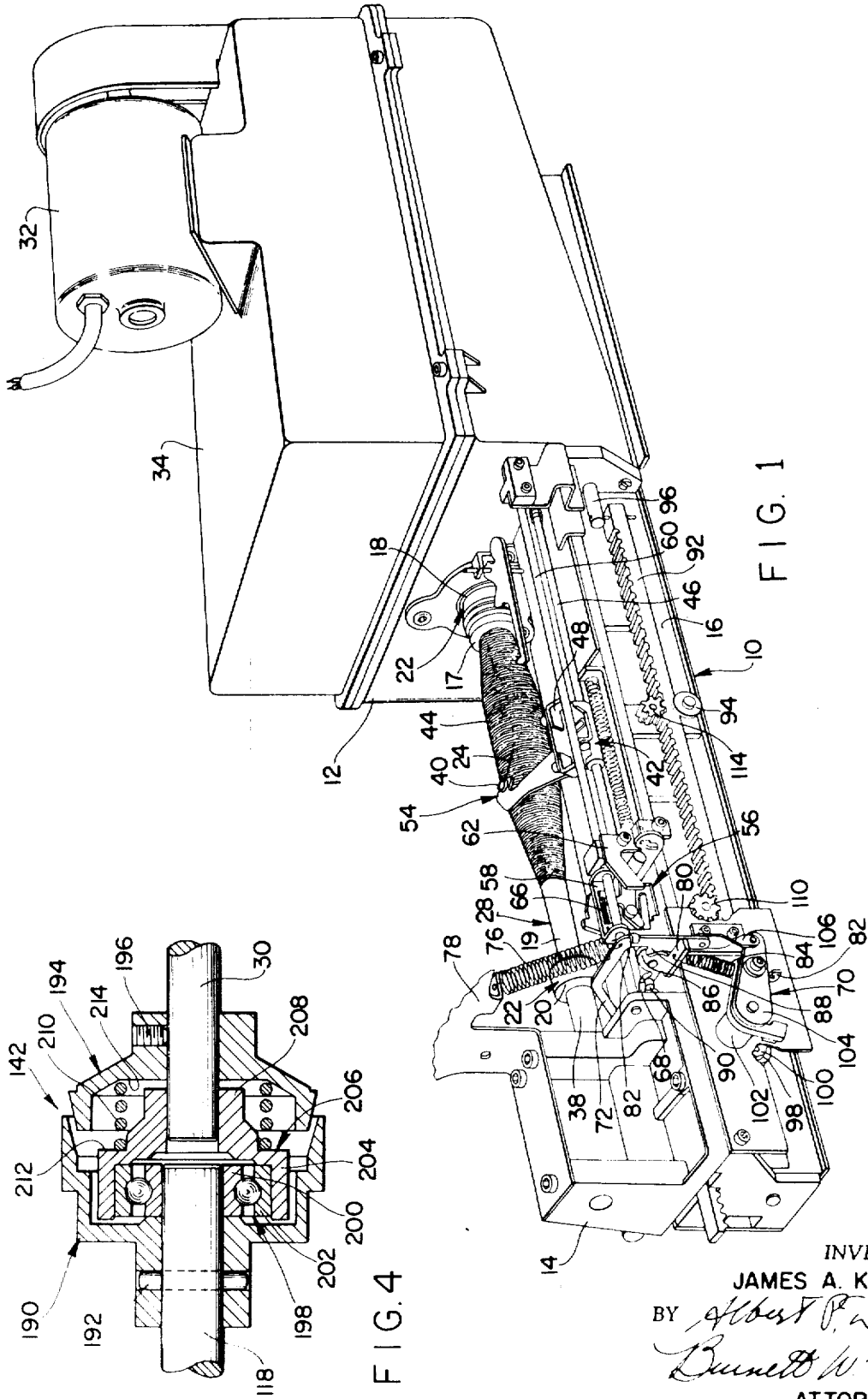
[57] ABSTRACT

A winding machine, such as a UNIFIL loom winder, manufactured by Leesona Corporation, Warwick Rhode Island 02887,

has a spindle assembly for receiving and rotating a bobbin, and a traversing assembly including a traversing member having a pair of jaws releasably threadedly secured to a traverse rod, during winding, for guiding a strand of yarn being wound onto the bobbin. The traversing and spindle assemblies are driven by mechanism within a casing of the winder. This mechanism includes a continuously driven drive shaft connected by a clutch with a spindle shaft which rotates the bobbin and rotatably receives cams for operating the threaded traverse rod to provide the traversing member with builder and reciprocating motions. When the clutch is drivingly engaged it supports an end of the spindle shaft, and when the clutch is disengaged this end of the spindle shaft is supported on a unit which journals the shaft for axial movement. At the end of winding of a bobbin, bobbin doffing and donning operations are initiated, the clutch between the drive shaft and the spindle shaft is released, the jaws are released from the traverse rod and the traversing member is returned to its starting point, the yarn is cut between the traversing member and the doffed, filled bobbin, and the cut yarn is engaged for winding onto an empty bobbin previously donned into the winder. When the traversing member has been returned to its starting position, the clutch again drivingly engages the drive shaft and spindle shaft whereupon the cycle is repeated.

6 Claims, 4 Drawing Figures





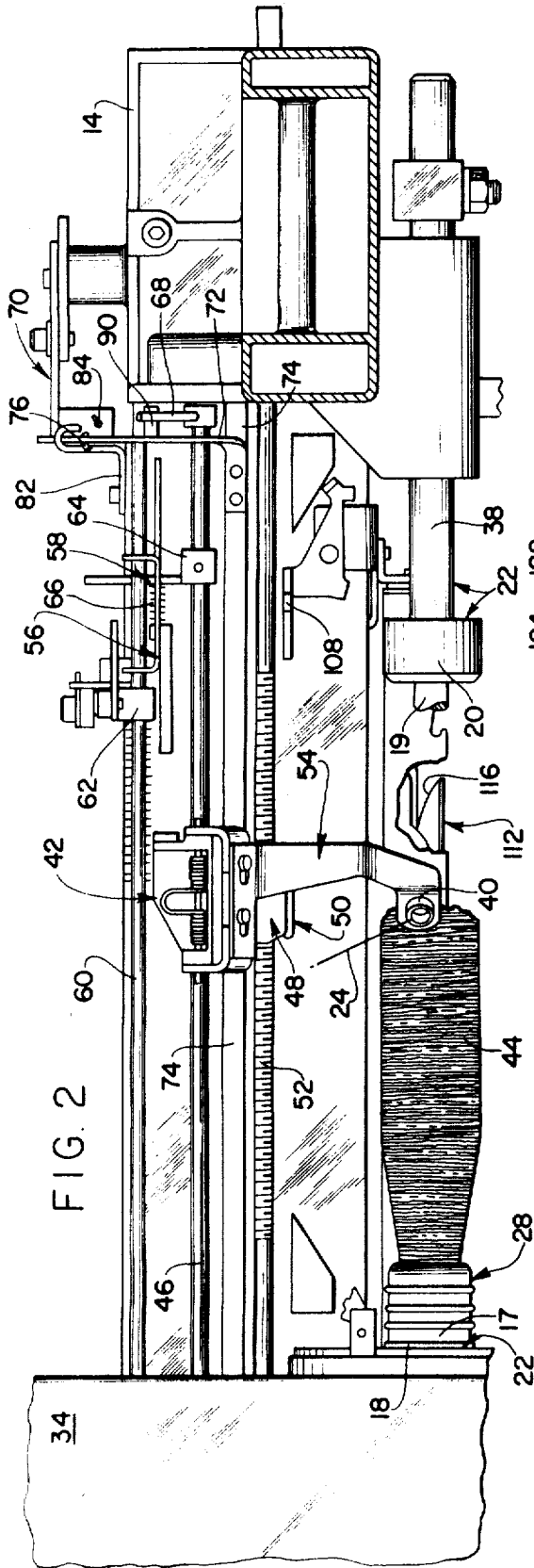


FIG. 2

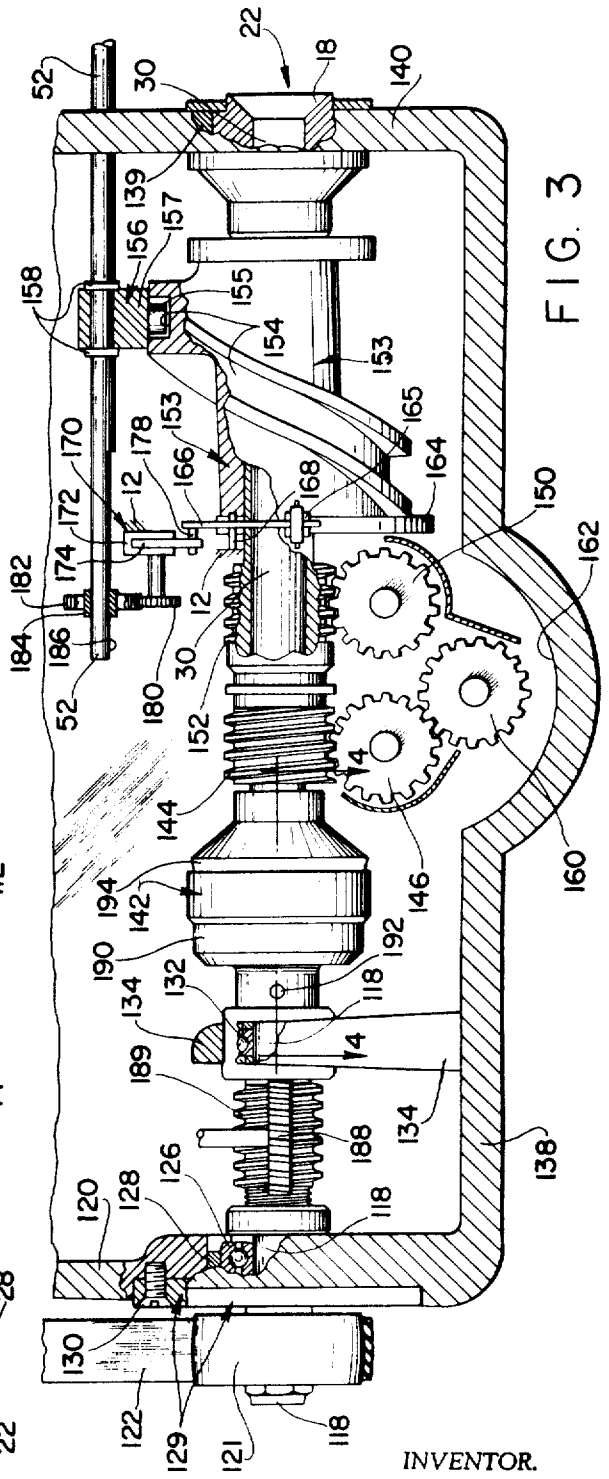


FIG. 3

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WINDING APPARATUS

This invention relates to winding and, more particularly, to a high speed winding machine.

As used herein the term "yarn" means any type of strand material, whether textile or otherwise, and the term "bobbin" means any type of yarn package or cop wound so that it may be readily moved from place to place, or a core on which the yarn is wound.

PRIOR ART AND REFERENCE MATERIAL

The following Leeson Corporation patents and patent application are incorporated by reference: U.S. Pat. No. 2,614,771, dated Oct. 21, 1952; U.S. Pat. No. 2,638,936, dated May 19, 1953; U.S. Pat. No. 2,763,443, dated Sept. 18, 1956; and U.S. Pat. No. 2,785,704, dated Mar. 19, 1957; and U.S. Pat. application Ser. No. 36,126, filed May 11, 1970. These patents and application pertain to the UNIFIL loom winders of which Model 790 and 791 are of particular interest.

The operation of the UNIFIL winder is well understood in the art and is described in the reference patents. The entire operation is automatic. Empty bobbins are fed from a bobbin supply hopper and are automatically donned in opposed rotatable chucks. The end of the yarn passes through a yarn guide of a traversing member and is automatically engaged for winding with the empty bobbin which is rotating during normal winding, as the traversing member is reciprocated back and forth by a threaded traverse rod to which it is releasably secured. At the end of winding, the traversing member is released from the threaded traverse rod, the filled bobbin is doffed, the supply yarn is cut, a new bobbin donned and the traversing member is returned to its starting position to repeat the cycle. Drive and control mechanism within a casing of the winder includes a drive shaft which is continuously driven by a belt drive outside the casing.

A clutch connects the drive shaft with a spindle shaft which carries one of the bobbin receiving chucks. A power take-off from the spindle shaft drives cams rotatably received on the spindle shaft for reciprocating and rotating the threaded traverse rod to provide a to and fro motion, and a builder motion to the traversing member. At the end of winding, mechanism outside of the casing is actuated by the traversing member to rotate a track rod which initiates release of a rectangular rod which rotates to open the jaws of the traversing member. Such rotation of the track rod actuates a cycling mechanism driven by the drive shaft within the casing, and actuates mechanism for releasing the clutch between the drive shaft and the spindle shaft, and initiates bobbin doffing and donning operation. A driver rack is driven by the cycling mechanism and operates a retriever for returning the traversing member to its starting position, and operates a cutter for cutting the supply end of the yarn extending to the doffed bobbin. When the traversing member has been returned to its starting position, the driver rack actuates mechanism to release the jaw operating rod for return to its initial position, permitting the jaws to close on the traverse rod, and the clutch again drivingly engages the drive shaft and spindle shaft whereupon the cycle is repeated.

The patent application is directed to a UNIFIL loom winder which may be operated at relative high winding speeds, for example 12,500 r.p.m., or more. In one embodiment, releasable jaws of the traversing member are held in fixed relationship with each other and are positively threadedly mated with threads of the traverse rod during winding of the bobbin, and a linkage mechanism is actuated by the traversing member, at the termination of winding, to rotate a non-circular bar extending between the jaws and release the jaws from the traverse rod.

The invention is, in brief, directed to apparatus for winding a strand onto a bobbin. The apparatus includes a spindle assembly having a spindle shaft operable for rotating the bobbin during winding thereof. A drive shaft is releasably drivingly connected with the spindle shaft by a clutch having clutch

members, one associated with each of the shafts. The clutch members support the spindle shaft on the drive shaft when the clutch is engaged, and when the clutch is disengaged the spindle shaft is supported by a unit having a journal receiving the spindle shaft for axial movement thereof. A rotary bearing is seated on the unit and on the drive shaft for rotation of the drive shaft relative to the unit, when the clutch is disengaged.

It is a primary object of this invention to provide a new and improved winder.

Another object is provision of a new and improved high speed automatic winder.

Still another object is provision of a new and improved spindle assembly in a high speed winder, the spindle assembly being driven through a clutch operable responsive to donning and doffing of a bobbin from the spindle assembly.

A further object is provision of new and improved apparatus for winding a strand onto a bobbin, the apparatus including a spindle assembly operable for rotating the bobbin during winding thereof and having a spindle shaft, a drive shaft, clutch members releasably drivingly connecting the shafts for operating the spindle assembly to wind the bobbin, and provision for substantially preventing rotation of the bobbin when the clutch members are released from driving connection and including a bearing having an inner race seated on the drive shaft for rotation therewith, and an outer race seated on a unit for rotation therewith, the unit having a portion journaling the spindle shaft for relative axial movement therebetween. Related objects include provision for resiliently urging the clutch members axially apart and including a compression spring having opposite ends, one end seated against the unit and the other end seated against the clutch member on the spindle shaft, and provision for supporting the spindle shaft on the unit when the clutch members are released from their driving connection, and for supporting the spindle shaft on the clutch members when the clutch members are drivingly connected.

These and other objects and advantages of the invention will be apparent from the following description and the accompanying drawings, in which:

FIG. 1 is a fragmentary, perspective view of apparatus illustrating a preferred embodiment of the invention, the apparatus being shown during an intermediate stage while winding a bobbin, with parts omitted, or broken away and removed for clearer illustration;

FIG. 2 is an enlarged, fragmentary, plan view of a portion of the apparatus shown in FIG. 1, with parts omitted, or broken away and removed for clearer illustration;

FIG. 3 is an enlarged, fragmentary, schematic view, generally in elevation, of another portion of the apparatus shown in FIG. 1, with certain parts in other than their normal relative position and other parts omitted, or broken away and removed, for clearer illustration; and

FIG. 4 is an enlarged, fragmentary sectional view taken generally along the line 4—4 in FIG. 3.

Various parts of the winder have been omitted in the drawings and in some instances no mention will be made of such omitted parts because they are well known from the reference material and are not directly concerned with the operation of the portion of the apparatus to be described.

Referring generally to FIGS. 1 and 2 of the drawings, and as is more fully described and shown in the reference material, a winder has a rigid base 10 including a housing or casing 12, which encloses drive and control mechanism (FIG. 3) at a rear or inboard end of the base 10, and a tailstock 14 at a forward or outboard end of the base. The casing 12 and the tailstock 14 are rigidly connected by suitable structural members, as 16. Bobbin donning apparatus (not shown) receives an empty bobbin from a hopper (not shown) and positions the bobbin with its butt end 17 in an inboard or drive chuck 18 and its tip end 19 in an outboard chuck 20 of a spindle assembly 22 which, through the inboard chuck member 18, rotates the bobbin for winding a strand of yarn 24 thereon. The drive chuck 18 is connected with a spindle shaft 30 (FIG. 3) within

the casing 12 and is driven by a suitable motor 32 mounted on a removable cover 34 bolted to the casing 12. The tip end 19 of the bobbin core 28 is freely rotatable with the outboard chuck 20 which is rotatably mounted on a shaft 38 mounted for axial sliding movement in the tailstock 14 and is operated by a rod (not shown) connected with mechanism in the casing 12 for movement between positions holding the core 28 (as shown), and for releasing a filled bobbin preparatory to receiving another empty bobbin core. A spring linkage (not shown) urges the outboard chuck 20 toward the drive chuck 18 to clamp the core 28 in winding position.

As the strand of yarn 24 is wound onto a rotating bobbin, the yarn passes from a suitable source of supply (not shown) and through a yarn guide eye 40 of a traversing member 42 to build a body of yarn 44 on the core.

The traversing member 42 is mounted on a track rod 46 journaled at its opposite ends in the casing 12 and in the tailstock 14. Also, the traversing member 42 is releasably secured, by means of upper and lower threaded jaws 48 and 50 (FIG. 2), respectively, to a threaded traverse rod 52 (FIG. 2) which is generally parallel to the track rod 46, and is telescopically journaled in the casing 12 and in the tailstock 14 for rotation and reciprocation by the mechanisms, to be described, within the casing 12. The guide eye 40 is in an arm 54 carried by the upper jaw 48.

Rotation of the traverse rod 52 during building of the body of yarn 44 on the bobbin core 28 provides a builder motion by progressively threadedly moving the traversing member 42 from its starting point at the butt end 17 of the bobbin to a predetermined point proximate the tip end 19 of the bobbin. Reciprocating motion of the traverse rod 52 provides a back and forth traversing motion.

As is more fully described in the reference patent application, the predetermined position at which building of the body of yarn 44 on the bobbin core 28 is terminated, is determined by an adjustable actuating mechanism 56 for initiating release of the traversing member jaws 48 and 50 from operative threaded engagement with the traverse rod 52, and for initiating operation of a cycling mechanism (not shown) within the casing 12. The actuating mechanism 56 includes an actuating unit 58 received on a fixed rod 60 for sliding movement as limited by a first abutment unit 62 adjustably mounted on the rod 60, and a second abutment unit 64 (FIG. 2) adjustably mounted on the track rod 46. The actuating unit 58 is resiliently urged toward the first abutment unit 62 by a spring 66.

As the traversing member 42 moves to the predetermined position at which winding is to be terminated, it repeatedly engages the actuating unit 58 and causes it to move toward the tail stock 14. During such movement, the actuating mechanism releases the track rod 46 which then rotates to actuate the cycling mechanism (not shown) as a fixed abutment pin 68 on the track rod 46 releases a latch mechanism 70 which in turn causes the traversing member jaws 48 and 50 to be released from the traverse rod 52. Concurrently, the actuating unit 58 ceases driven engagement with the traversing member 42 which continues to move toward the tailstock 14 as the actuating unit is stopped by the block 64.

The latch mechanism 70 includes a latch arm 72, fixed to and extending transversely from the end of a non-circular bar 74 (FIG. 2) and is urged upwardly by a tension spring 76 secured to the arm and to a fixed bracket 78 on the winder base 10. The arm 72 is releasably maintained in a latched position by a detent 80 pivoted on a bracket 82 fixed to the base 10 and urged into a latched position by a tension spring 84 connected to the detent 80 and to the bracket 82. The detent 80 has a nose 86 releasably latched with a cooperating nose 88 on the latch arm 72 during winding of the bobbin. An abutment 90 on the detent 80 is engaged by the abutment pin 68 on the track rod 46 to release the latched engagement of the detent 80 and the latch arm 72 so that the non-circular bar 74 is rotated to cam open the traversing member jaws 48 and 50 and to release them from threaded engagement with the traverse rod 52.

Resetting of the latch mechanism 70 is accomplished as a driver rack 92, mounted on rollers 94 (FIG. 1, only one visible) and driven through a pin and rod 96 by the cycling mechanism (not shown) in the casing 12, moves outwardly in a direction past the tailstock 14 and engages a roller 98 on a crank 100 fixed on a shaft 102 journaled in the tailstock 14. A second crank 104 is also fixed on the shaft 102 and a link 106 is pivoted to the second crank 104 and to the latch arm 72 on the non-circular bar 74. Thus, the latch arm 72 and the non-circular bar 74 are rotated and the detent 80 moves into latched engagement with the latch arm 72.

With reference to FIG. 2, to return the traversing member 42 to its starting position proximate the casing 12, a retriever 108 moves between the opened jaws 48 and 50 of the traversing member 42. The retriever 108 is on a retriever carrier rack (not shown) mounted in suitable guides (not shown) and is driven through a gear train including a pinion 110 (FIG. 1) mated with the driver rack 92 to move the retriever from the tail stock 14 to the casing 12, whereupon the retriever is cammed from between the traversing member jaws 48 and 50 which then threadedly engage the traverse rod 52. Concurrently, the filled bobbin is doffed, and the yarn 24 is severed between the traversing member guide eye 40 and the bobbin by a cutter 112 which is mounted on a suitably mounted rack (not shown) and driven through a gear train including a pinion 114 (FIG. 1) mated with the driver rack 92 to move the cutter 112 from proximate the casing 12 toward the tailstock 14. A scissor 116 on the leading end of the cutter 112 is cammed closed and severs the yarn. An empty bobbin core 28 is automatically donned and rotation of the drive chuck 18 is thereby started as the drive chuck 18 is telescoped inwardly of the casing 12, and the yarn is automatically engaged with the butt end of the bobbin core 28 to start the yarn winding onto the bobbin core.

Outward movement of the driver rack 92 is now reversed and it is moved toward the casing 12 by the cycling mechanism, thus causing the retriever 108 to be moved toward the tailstock 14 and the cutter 112 to be moved toward the casing 12 as the scissor is opened.

With reference to FIG. 3, the operating mechanism within the casing 12 includes a drive shaft 118 which extends through a rear end wall 120 of the casing 12 and carries a belt pulley 121 which is drivingly connected by a belt 122 with a similar pulley (not shown) on the shaft of the motor 32 (FIG. 1). The drive shaft 118 is journaled in rotary ball bearings including a rearward bearing 126 seated in a bearing sleeve 128 of a bearing flange 129 secured to the end wall of the casing by bolts 130, and an inner bearing 132 seated in a pedestal mount 134 fixed to and extending upwardly from a bottom wall 138 of the casing 12. The spindle shaft 30 of the spindle assembly 22 is axially slidably journaled in a bearing 139 in a forward end wall 140 of the casing 12 and is similarly journaled, within a clutch 142, on the drive shaft 118. As the outboard chuck 20 seats the bobbin core 28 against the drive chuck, the spindle shaft is moved axially inwardly to drivingly engage the clutch 142. The clutch 142, to be more fully described later, connects the drive shaft 118 and the spindle shaft 30 and, as previously noted, this clutch is engaged by inward axial movement of the spindle shaft 30 responsive to operation of the cycling mechanism which in turn is operated by the track rod 46, as previously noted, and causes the outboard chuck 20 to move the bobbin and spindle shaft 30 rearwardly.

With the clutch 142 engaged during winding of a bobbin, a worm 144, mounted for rotation with the spindle shaft 30, is mated with a gear 146 to drive a change gear type of variable speed drive (not shown) which in turn drives an intermediate gear 150. The gear 150 drives a spiral gear 152 operatively fixed to a first cam 153 rotatable on the spindle shaft 30 and having a continuous helical slot 154. In FIG. 3 the following structure is displaced from its normal position relative to the spindle shaft 30 and cam 153 for clearer illustration, and is actually, generally behind the spindle shaft and cam. A follower 155 is received in the slot 154 and is on a block 156 suitably mounted for reciprocation generally in the direction of the

axis of the traverse rod 52. The bock 156 has a bore which rotatably receives the traverse rod between fixed shoulders 158 thereon for reciprocating the rod and providing the to and fro motion to the traversing member 42 (FIGS. 1 and 2). An oil slinger 160, which is partially submerged in a sump 162 in the bottom wall 138 of the casing 12, is driven by the gear 146 for lubricating the mechanism. A second cam 164 is operatively fixed to the first cam 153, and receives a roller 165 on a first end of a follower lever 166 which is pivoted, intermediate its ends, to the casing 12 by means of a pin 168, to drive a one way clutch 170 having a housing 172 fixed to the casing 12. The one way clutch has an actuating arm 174 with an elongated slot (not shown) receiving a pin 178, fixed to a second end of the follower lever 166, so that as the clutch is oscillated, a concentric gear 180, suitably connected with the arm 174 is rotated, in only one direction. The gear 180 is mated with a gear 182 having a hub 184 formed with a flat telescopically receiving a complementary flat 186 on the end of the traverse rod 52, to thereby rotate the rod and provide the previously noted builder motion. The cycling mechanism is driven, during doffing and donning operation, by a gear train including a gear 188 meshed with a worm 189 fixed to the drive shaft 118.

As shown in FIG. 4, in order to effectively prevent rotation of the bobbin core 28, and in order to support the end of the spindle shaft 30 adjacent the drive shaft 118 when the clutch is disengaged, the following mechanism is provided. The clutch has a frusto-conical female clutch member 190 fixedly secured to an end of the drive shaft 118 by means of a pin 192. A frusto-conical male clutch member 194, for drivingly engaging the female clutch member 190, is fixedly secured to an end of the spindle shaft 30 by means of a set screw 196. When the clutch 142 is drivingly engaged, the female and male clutch members 190 and 194 concentrically support the spindle shaft 30 on the drive shaft 118 for rotation with the drive shaft.

When the clutch members 190 and 194 are drivingly disengaged (FIG. 4) the end of the spindle shaft 30 is supported generally co-axially with and on the drive shaft 118 by means of a rotary ball bearing 198 having an inner race 200 fixedly seated on the end of the drive shaft 118, and an outer race 202 fixedly seated in a sleeve portion 204 of a unit 206. This unit 206 has a second portion 208 which provides a journal receiving the spindle shaft 30 for axial movement therein. A compression spring 210 is provided between the unit 206 and the male clutch member 194 for resiliently urging the male and female clutch members apart. More particularly, the spring 210 has one end seated against an annular shoulder 212 of the unit 206 and an opposite end seated against an annular surface 214 of the male clutch member 194. When the bobbin core is donned, it causes the spindle shaft 3 to be moved axially toward the drive shaft and against the force of the spring 210, thereby engaging the male and female clutch members.

Thus, since the drive shaft 119 is continuously driven by the motor 32 (FIG. 1), the balls of the bearing 198 are similarly continuously rotated but, in part, because of the resistance to

rotation provided by the spring 210 and the journal 208 between the unit and the end of the spindle shaft 30, the spindle shaft remains effectively stationary when the clutch members are disengaged.

While this invention has been described with reference to a particular embodiment in a particular environment, various changes may be apparent to one skilled in the art and the invention is therefore not to be limited to such embodiment or environment except as set forth in the appended claims.

What is claimed is:

1. Drive means for use with apparatus adapted to wind an advancing strand onto a rotating bobbin comprising, a rotatable spindle for engaging and rotating said bobbin, said spindle having a shaft arranged for rotation, a drive shaft arranged for rotation, motive means for driving said drive shaft, clutch means including first and second mating clutch members, said first clutch member being affixed on said spindle shaft and said second clutch member being affixed on said drive shaft, said first and second clutch members being selectively engageable and disengageable, said spindle shaft rotating cooperatively with said drive shaft when said first and second clutch members are engaged to thereby rotate said spindle and bobbin, bearing means secured on said drive shaft, said bearing means including means substantially precluding transmission of rotational force from said drive shaft to said spindle shaft when said first and second clutch members are disengaged, and engaging means affixed on said spindle shaft and engageable with said bearing means to maintain said spindle shaft generally aligned with said drive shaft when said first and second clutch members are disengaged.

2. Apparatus as set forth in claim 1 including means mounting said spindle shaft for axially movement, said first and second clutch members being selectively engaged and disengaged in response to said axial movement of said spindle shaft.

3. Apparatus as set forth in claim 1 wherein said clutch means includes resilient means urging said first and second clutch members into their disengaged position.

4. Apparatus as set forth in claim 3 wherein said resilient means is seated against a seat on said engaging means and a seat on said first clutch member.

5. Apparatus as set forth in claim 1 including a tailstock spaced apart from said spindle, said bobbin being mounted for rotation between said spindle and said tailstock, said tailstock being movable to a closed position to exert a force on said bobbin to cause said first and second clutch members to engage and rotate said bobbin, said tailstock being movable to an open position to release said bobbin from its mounting position between said spindle and said tailstock, said first and second clutch members moving to said disengaged position as said bobbin is released from said mounting position.

6. Apparatus as set forth in claim 5 including resilient means for urging said first and second clutch members to said disengaged position when said bobbin is released from its mounting position between said spindle and said tailstock.

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