March 25, 1941. E. R. SWANSON 2,236,459

WINDING MACHINE

Filed March 31, 1939 3 Sheets-Sheet 1

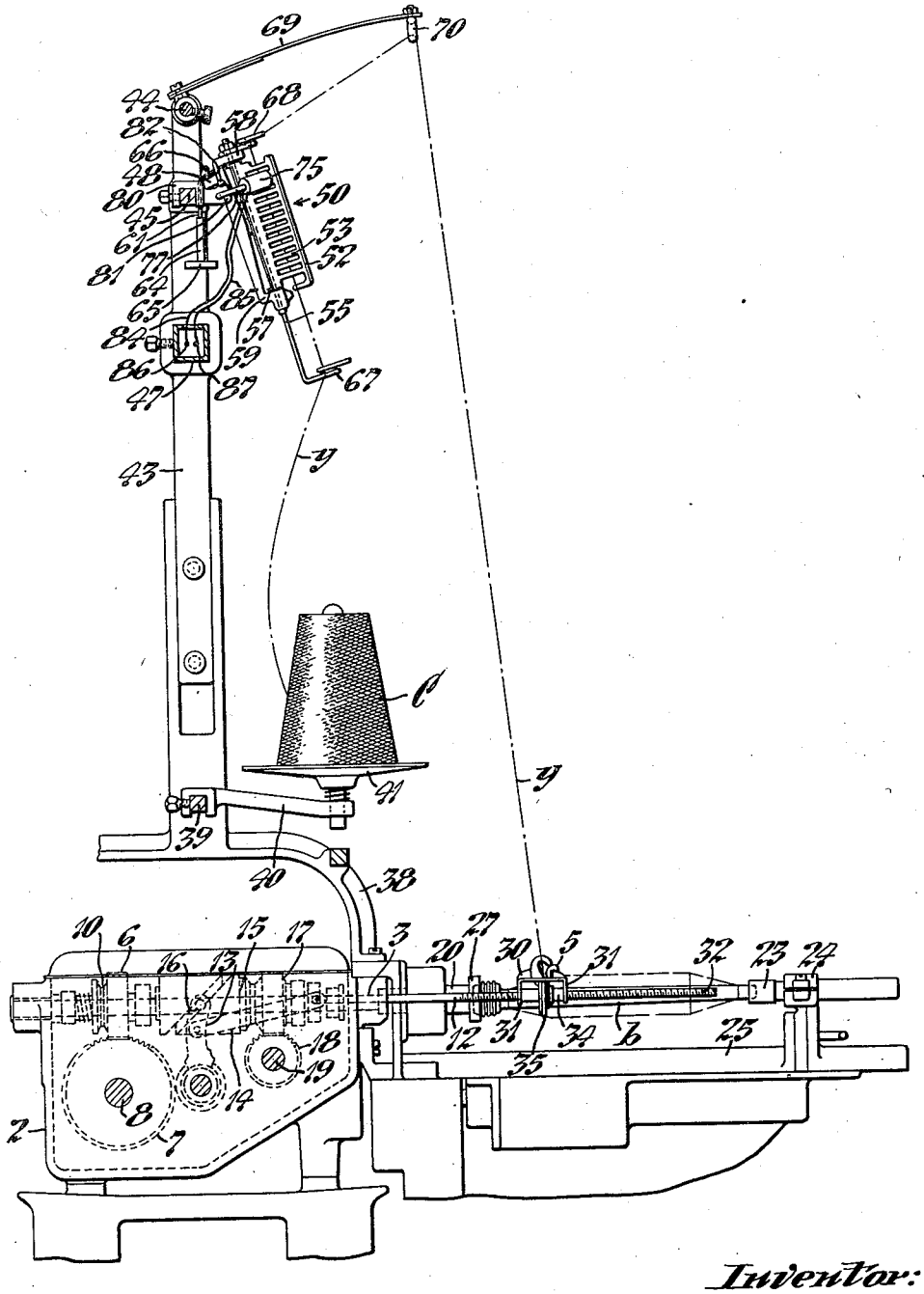


Fig. 1.

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Filed March 31, 1939 3 Sheets-Sheet 2

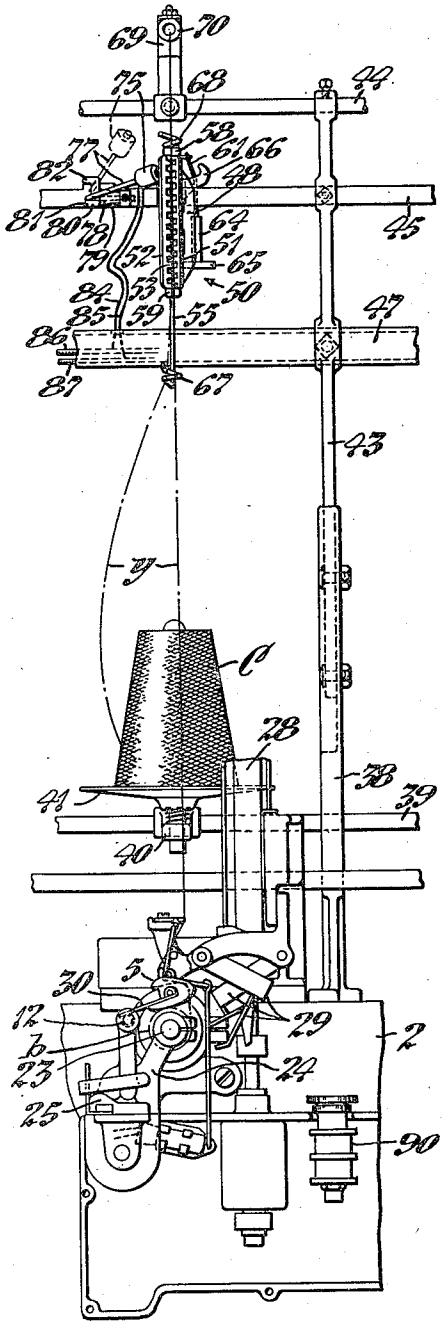


Fig. 2.

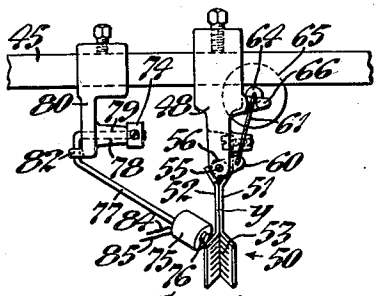


Fig. 3.

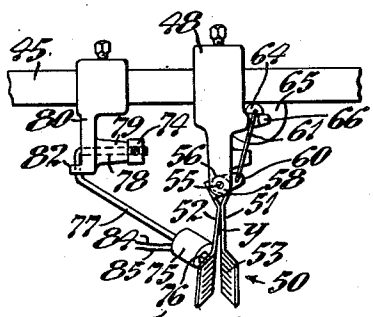


Fig. 4.

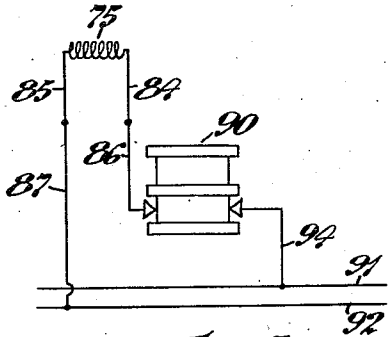


Fig. 5.

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March 25, 1941. E. R. SWANSON 2,236,459

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Filed March 31, 1939 3 Sheets-Sheet 3

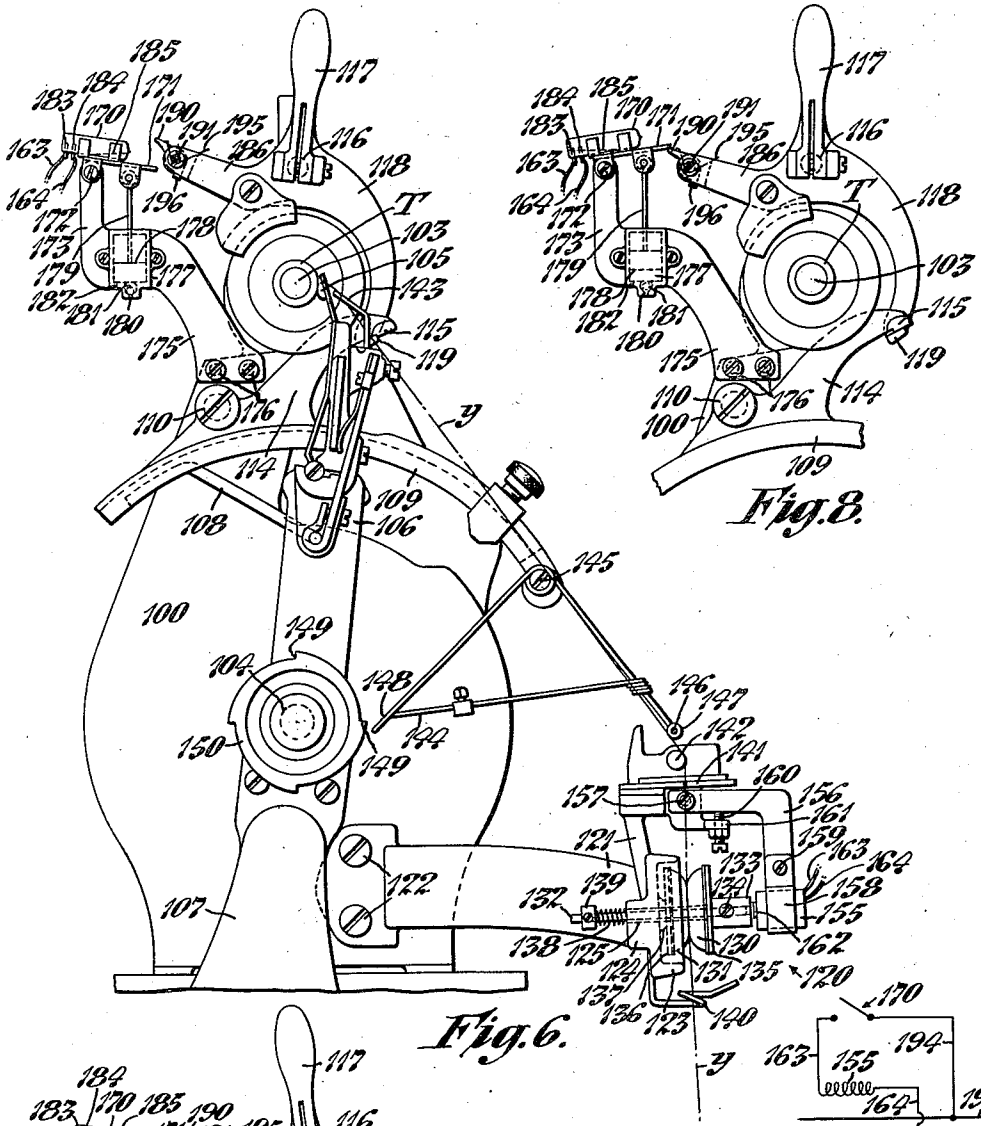


Fig. 6.

Fig. 8.

Fig. 9.

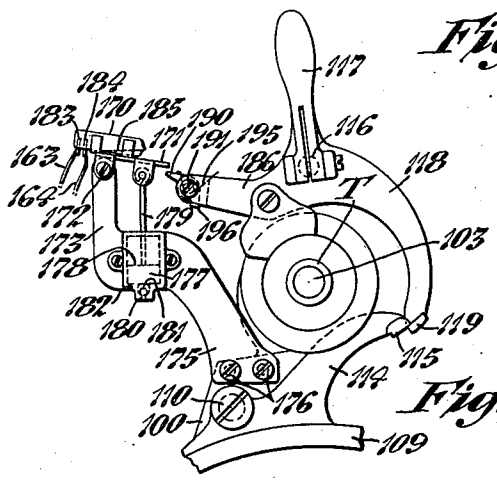


Fig. 7.

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UNITED STATES PATENT OFFICE

2,236,459

WINDING MACHINE

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Application March 31, 1939, Serial No. 265,315

13 Claims. (Cl. 242—45)

The present invention relates to winding machines for winding bobbins, pirns, cops, cones and other forms of packages of thread, yarn and similar strand-materials. In the following specification and claims the term "package" is employed in a general sense to signify any form of wound mass and the term "yarn" is intended to apply to all types of strand-material whether textile or otherwise.

One object of the present invention is to provide means for relieving the tension on the strand delivering to the winding machine at the start of winding a package or when the winding operation is resumed after its arrestment for any cause.

Another object of the invention is to provide means controlled automatically by the winding machine to relieve or entirely remove the applied tension on the strand as it is first taken up by the winding operation.

Another object of the invention is to provide means for opening or otherwise controlling the tension-device to prevent it from applying tension to the strand during the initial stage of the winding.

Another object of the invention is to provide electrically-actuated means for controlling the operation of the tension-device.

Still another object of the invention is to provide electromagnetic means for opening the tension-device.

Further objects of the invention are to provide a device of the type indicated which is simple in construction, dependable in action and proof against derangement or getting out of order.

The following specification describes a preferred form of construction of the invention and a modification thereof as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a side elevational view of a bobbin- or pirn-winding machine showing the present invention applied to use therewith;

Fig. 2 is an end elevational view of the same;

Fig. 3 is a plan view of the tension-device of the machine and the electrical controlling means therefor, showing the tension-members closed together to act on the strand as it feeds therebetween;

Fig. 4 is a similar plan view showing the tension-members in open position under the action of the controlling means to relieve the tension on the yarn;

Fig. 5 is a diagrammatic view of the electromagnet, switch and wiring connections for the tension-controlling means;

Fig. 6 is an elevational view of a winding machine of different type showing automatic tension-controlling means applied thereto;

Fig. 7 is a detailed view of the starting lever of the machine and the cooperating switch-mechanism for the electrical control of the tension-device, showing the parts in position before starting the winding operation;

Fig. 8 is a similar view showing the starting lever as first operated to start the winding operation and close the switch; and

Fig. 9 is a diagrammatic view of the electromagnet, switch and wiring connections for the tension-controlling means of the modified form of winding machine.

In winding machines of various types the strand-material is usually wound on a yarn-carrier such as a bobbin, pirn, cop-tube or other core rotated by a winding spindle, drive-roll or other means and the strand is traversed longitudinally thereof by reciprocatory or rotary guiding means to deposit it in helical coils on the core. Means are usually provided for tensioning the strand as it feeds to the package being wound and when the rotation of the winding spindle is continuous the sudden draft on the strand at the start of the winding is liable to strain or rupture the yarn if tension is applied thereto at this juncture. Likewise, in winding large packages of yarn at high speed, when the winding is started abruptly severe strain is placed on the yarn due to the resistance to its feed applied by the tensioning means; particularly when the package has reached a considerable size and restarting takes place after piecing up the strand following a break therein or after replenishment of the supply. To correct this latter condition a slow-speed starting device is sometimes embodied in the drive of the machine, but this complicates the mechanism and adds to the cost of manufacture.

To overcome the above-noted difficulties and deficiencies in winding apparatus of various types the present invention provides means for relieving the tension applied to the yarn at the start of the winding operation, thus correcting the trouble at its source. For securing this desired result the invention contemplates the employment of means for automatically opening the tension-device during the initial stage of the winding and prior to the starting or restarting of the rotation of the package. As a preferred form of construction the following specification describes electromagnetic means for automatically adjusting or opening the tension-device.

Figs. 1 to 5, inclusive, of the present drawings illustrate the invention as applied to a bobbin or

pirn winding machine such as shown and described in an application for patent Serial No. 231,044, filed September 21, 1938, by C. D. Reynolds and H. A. Moe. In this type of machine the completed bobbins are doffed and replaced by fresh yarn-carriers automatically to provide for continuous operation of the machine. The doffing and donning means and the means for restoring the parts to initial position to start the winding of a new bobbin are operated electrically as fully disclosed in the application referred to above.

Referring to Figs. 1 and 2 of the present drawings, one unit of the multi-spindle winding machine is here shown as comprising a main frame or casing 2 enclosing the driving mechanism for a rotary winding spindle 3 and a traversing thread-guide 5. The winding spindle 3 is rotated by means of a gear 6 connected thereto by a clutch 10 and driven by a gear 7 on the drive-shaft 8. The thread-guide 5 is carried by a traverse-rod 12 extending in parallel relation to the spindle 3 and adapted to be reciprocated by a rocker-arm 13 connected thereto by a link 14. The rocker-arm 13 is arranged to be continuously oscillated by a cam 15 through the means of a bowl or follower 16 on the arm engaging a helical groove in the cam. The cam 15 is rotatably mounted on the winding spindle 3 and connected to a gear 17 driven by a gear 18 on a second drive-shaft 19.

The wooden bobbin or yarn-carrier *b* is held between a slidable spindle-extension 20 at the end of the spindle 3 and a stub-spindle 23 journaled in an outboard bearing 24 supported by a bracket 25 projecting forwardly from the frame or casing 2. The head of the bobbin *b* is held frictionally in a cup 27 at the end of the spindle-extension 20 and the latter is telescopically connected to the main spindle 3 to adapt it to be retracted to release the bobbin upon the completion of the winding. The retraction of the spindle-extension 20 is effected by electromagnetic means, not herein shown but fully described and illustrated in the application previously referred to. When released, the wound bobbins drop down into a box or chute arranged below, but not herein shown, and the fresh bobbin is delivered to the machine from a magazine 28 by instrumentalities indicated generally at 29 in Fig. 2.

The thread-guide 5 is mounted on a holder 30 in the form of a bifurcated arm having legs 31 pivoted on the traverse-rod 12. The traverse-rod 12 is formed with partial screw-threads 32 for engaging the threaded bore of a sleeve-like nut 34 mounted on the rod between the bifurcations or legs 31 of the thread-guide arm 30. A progression wheel or disk 35 fast on the nut 34 is adapted to make contact with the yarn wound on the carrier *b* to feed the thread-guide 5 outwardly along the rod 12 during the winding, whereof to build the bobbin with progressively advancing conical layers in the usual manner known to those versed in the art. After a bobbin has been completed and doffed the thread-guide 5 is returned automatically to initial position to wind a new bobbin by releasing the nut 34 from the threads 32 on the traverse-rod 12 and sliding the arm 30 rearwardly on the rod under the action of electromagnetic means shown and described in the application previously referred to.

Surmounting the casing 2 is a bracket 38 which, with several similar brackets spaced along the gang machine, support a horizontal rod 39. An arm 40 supported from the rod 39 carries a supply-holder 41 for mounting a cone C or other package of yarn for delivery of the strand *y* to the bobbins to be wound on the machine. Projecting upwardly from the bracket 38 is a stanchion 43 which serves as one of a series of similar supports for a pair of horizontal rods 44 and 45. Also supported by the stanchions 43 below the rod 45 is a tubular rod or pipe 47 which forms a conduit for the conductors or wires of the electrical circuit for energizing the electromagnetic means of the machine.

Supported from the rod 45 is a bracket 48 on which is mounted the tension-device 50 for applying tension to the strand *y* as it feeds to the winding bobbin. The tension-device may be of any preferred form and, as herein illustrated, it comprises a pair of tension-members or grid-like plates 51 and 52 arranged in opposed relationship with their bars or fingers 53 alternating and adapted to overlap to form a sinuous course for the strand *y* drawing between the plates. The two members or plates 51 and 52 are supported on a rod 55 projecting through apertures in ears 56 and 57 at the top and bottom of the plates and held in lugs 58 and 59 on the bracket 48. One member 51 is fastened in fixed position on the bracket 48 while the other member 52 is free to pivot on the rod 55 to adapt it to swing toward and away from the fixed member. The member 52 is formed at the top with a laterally-projecting arm 60, see Figs. 3 and 4, to which is attached a cord 61 connected at its opposite end to a pin or weight-holder 64 carrying a weight 65. The cord 61 leads across a hook 66 on the side of the bracket 48 and thus acts to suspend the holder 64 and its weight 65 to urge the movable tension-member 52 toward the fixed member 51, thus causing them to cooperate to apply pressure on the strand *y* to sinuate its course as it draws through the device. The rod 55 is continued downwardly beyond the bracket 48 and bent at right-angles with a pigtail 67 formed at its end. Fastened to the top of the bracket 48 is a second pigtail 68 which cooperates with the pigtail 67 to guide the strand *y* in a medial course through the tension-device. Fastened to the rod 44 at the upper end of the stanchion 43 is a spring-arm 69 carrying a guiding eye 70 at its upper end, through which the strand *y* leads to direct it downwardly to the thread-guide 5; the arm 69 being adapted to flex slightly under fluctuations in the draft on the yarn as it is wound up and down on the conical chase of the bobbin.

The means for adjusting or opening the tension-device 50 to relieve the tension on the strand *y* comprises an electromagnet 75 which is energized from a circuit controlled by the switch that initiates the operation of the automatic donning mechanism prior to starting the winding of a new bobbin. The magnet 75 may be of any suitable type with its coil-windings surrounding a core 76 forming an extension of a wire arm 77. The arm 77 is formed with an angular portion 78 journaled in a bearing 79 which projects laterally from an arm or bracket 80 rigidly fastened to the rod 45 at one side of the tension bracket 48. A collar 74 on the end of the angular portion 78 of the arm 77 holds the arm in place. The arm 77 is thus swiveled to the bracket 80 to adapt it to pivot thereon, being normally maintained in the position illustrated by full lines in Figs. 1 and 2 by gravity, resting upon a lug 81 projecting from the side of the

bracket 80. In this position the magnet 75 is held with the end of its core 76 adjacent but spaced a slight distance away from the flaring forward portion of the movable tension-member 52 at the upper end thereof. Consequently, when the magnet 75 is energized it will attract the outer portion of the pivoted tension-member 52 and swing the latter away from the stationary member 51, as shown in Fig. 4, to relieve the pressure of the members on the strand *y*. The pivotal mounting of the arm 77 permits the magnet 75 to be lifted manually into the position indicated by dash-lines in Fig. 2, whereof to allow the tension-member 52 to be swung wide open for cleaning the device or other purposes. A lug 82 spaced from the lug 81 on the bracket 80 acts to limit the upward movement of the arm 77 to insure that the magnet 75 will return to its lowermost or operative position when released.

The magnet 75 is connected in circuit with the source of electrical current which operates the other parts of the machine by flexible conductors 84 and 85 joined to wires 86 and 87 leading through the conduit 47. The circuit is closed to energize the magnet by means of a switch 90 shown in Figs. 2 and 5. The switch 80 may be of any suitable type and actuated from any moving part of the machine, in the present embodiment of the invention the rotary drum-switch shown in the application hereinbefore referred to being made use of. In the machine of the prior application the rotary drum of the switch is energized by a spring placed under tension by electromagnetic means. The rotary switch serves as the timing device for the various instrumentalities of the doffing and donning mechanism, the spring being released and energized to rotate the drum to close the several circuits in timed sequence. For the present purpose the switch 90 may be in the same circuit with the bobbin-donning means which remain active to hold the fresh bobbin or yarn-receiver in connection with the winding spindle of the machine as it is first rotated to wind several coils of yarn on the bobbin. For the sake of simplicity the switch 90 is shown in the wiring diagram of Fig. 5 as connected directly in circuit with the magnet windings, indicated at 75, and the current line conductors 91 and 92 through the wires 84, 85 and 94.

The construction and arrangement of one preferred embodiment of the invention having been described in detail its method of operation is explained as follows: To prepare the machine for operation the strand *y* of yarn or other material is drawn off from the supply cone C, led up through the pigtail 67, tension-device 50 and pigtail 68; whence it is threaded through the guide-eye 70 on the arm 69, thence drawn down to the thread-guide 5 and threaded therethrough with its end attached to the bobbin *b*. The winding spindle 3 is driven continuously and through its connected cup 27 engaging the bobbin *b* the latter is rotated to wind on the yarn as it is traversed longitudinally thereof by the thread-guide 5, actuated by the continuously-reciprocated traverse-rod 12. As the winding operation proceeds the thread-guide 5 is advanced outwardly along the traverse-rod 12 by the turning of the progression wheel 35 which makes contact intermittently with the yarn on the bobbin at each rearward traverse-stroke of the guide. The bobbin increases in size longitudinally until finally it reaches its full length, at which juncture suitable instrumentalities are actuated to energize the doffing means. The full bobbin is doffed by the retraction of the spindle-cup 27 and thereafter the donning means places a fresh yarn-carrier in alinement with the winding spindle 3 and stub-spindle 23, holding it in this position until it is gripped automatically by the spindle-cup 27 and rotated thereby. In the meantime the thread-guide 5 is restored to first position and the strand *y* drawing therethrough is fastened to the bobbin by gripping it between the latter and the cup 27, this operation also being performed automatically.

As before stated, the donning means remains active during the initial stage of the winding and the tension-relief takes place at this time. That is to say, immediately the donning means starts to act the electrical circuit to the magnet 75 is closed by the switch 90 which controls the donning operation. Energization of the magnet 75 causes its core 76 to attract the pivoted tension-member 52 and swing it away from the fixed member 51, as shown in Fig. 4, to relieve the tension on the strand *y*, this relief taking place just before the start of winding the new bobbin and continuing for a brief period thereafter. The magnet 75 is then de-energized by the continued rotation of the drum-switch 90, thereby releasing the tension-member 52 to permit it to swing back into operative position under the influence of the weight 65 connected thereto. The return of the tension-member 52 will be relatively slow so that tension is applied to the running strand *y* gradually without placing a sudden strain on the yarn. In this way the device operates to relieve the tension on the yarn at the start of the winding when the strand is taken up suddenly so that all chance of rupturing or straining the material is eliminated.

Figs. 6 to 9 of the present drawings illustrate the invention as applied to a winding machine of the type known as a precision winder. This type of machine is employed for producing cross-wound packages of relatively large size, of either cylindrical or conical shape. As herein illustrated the winding machine comprises a main frame 100 providing bearings for a horizontal winding spindle 103 journaled therein and a cam-shaft 104 arranged therebelow in parallel relation thereto. A reciprocable thread-guide 105 is slidably mounted on a traverse-frame 106 which is pivoted on the cam-shaft 104 to permit the guide to move away from the winding spindle as the package is built up thereon. The traverse-frame 106 is balanced by a counterweight 107 tending to maintain the guide 105 bearing against the surface of the package being wound and a dogging device, represented generally at 108, cooperates with an arcuate quadrant 109 to resist the movement of the traverse-frame toward the winding spindle.

The quadrant 109 is pivoted to the main frame 100 by means of a stud or screw 110 to adapt it to serve as a rockable stopping lever for initiating the disconnection of the drive of the machine. For this purpose the quadrant 109 has an upwardly projecting arm 114 formed at its end with a shouldered abutment 115 which serves as a detent to hold the drive operative. The driving means of the machine, not herein shown, may be of any usual construction such as a belt-pulley adapted to be connected to the winding spindle 103 by means of a clutch. The clutching and declutching of the drive is controlled through the means of a rockable shaft or rod 116

carrying a hand-lever 117 and also an arm or lever 118, the lower end of which is formed with a detent abutment 119 adapted to engage the shoulder on the abutment 115 at the end of the arm 114 of the quadrant 109. The rocker-shaft 116 may be operated by a spring or other means upon release of the detents to cause declutching of the drive to arrest the operation of the machine. The operation of the machine is started by rocking the hand-lever 117 manually in a clockwise direction as viewed in Fig. 6 to clutch the drive pulley with the winding spindle, the detent abutments 115 and 119 being engaged at this time to maintain the drive connected.

Any suitable type of tension-device may be used with the machine shown in Fig. 6 and as here illustrated a disk-tension 120 is mounted on a bracket 121 fastened to the side of the machine frame 100 at 122. The bracket 121 is formed with a circular housing 123 projecting from the side of a hub 124 in which is fixedly secured a sleeve 125. Mounted to rotate on the sleeve 125 are a pair of tension-disks 130 and 131 of usual construction having opposed convex faces with rims flaring outwardly therefrom. A spindle 132 is slidably mounted in the sleeve 125 and carries a collar 133 fastened to its outer end by means of a set-screw 134. The collar 133 is arranged to bear against a flexible diaphragm 135 which engages against the rim of the tension-disk 130; while the opposite disk 131 has a similar flexible diaphragm 136 bearing against its rim with its central portion in abutting relation to the face of a boss 137 on the end of the hub 124. The spindle 132 projects beyond the hub 124 to adapt it to receive a helical spring 138 tensioned between the hub and a collar 139 fastened to the end of the spindle. Through this means the outer collar 133 applies pressure at the center of the outer diaphragm 135 to cause the latter to act against the rim of the tension-disk 130 to maintain the latter bearing against the strand *y* drawing between the disks; the inner diaphragm 136 acting with a yielding pressure against the disk 131.

Below the tension-device 120 is a pigtail-guide 140 for directing the strand *y* between the disks and mounted on top of the bracket 121 is a slub-catcher 141 through which the strand feeds to clean the yarn. Above the slub-catcher 141 is a guiding pin 142 across which the strand *y* leads as it draws upwardly to the thread-guide 105 to feed to the package being wound, a thread-rail 143 being mounted on the upper portion of the traverse-frame 106 to serve as a track or guide-way for the yarn during the reciprocation of the guide.

A triangularly-shaped drop-wire or stopping lever 144 is pivoted at 145 on the forward end of the quadrant 109 with one arm reaching downwardly and carrying a cross-pin 146 on which is a sleeve 147 arranged to bear against the strand *y* as it feeds to the winding. The opposite arm or leg 148 of the drop-wire 144 is adapted to be engaged by projections or teeth 149 on a wheel or rotary disk 150 which is mounted on and rotated by the cam-shaft 104. When the strand breaks or its supply is exhausted the drop-wire 144 is released to permit its arm 148 to swing into engagement with one of the teeth 149 on the rotary disk 150, whereby it acts to lift the outer end of the quadrant 109 to disengage the detents 115 and 119 and release the lever 118. Upon release of the lever 118 the rocker-shaft 116 is operated to disconnect the drive to arrest the operation of the machine.

With this last described type of winding machine the tension-device 120 is opened by sliding the spindle 132 to remove the pressure of its collar 133 against the diaphragm 135 so that the pressure of the tension-disks against the strand is relieved. This result is accomplished by means of an electromagnet 155 carried by an elbow-shaped arm 156 pivotally fastened to the tension-bracket 121 by a stud 157. Conveniently, the magnet 155 may be held in a strap-like extension 158 of the arm 156 enclosing the magnet and fastened to the main portion of the arm by a screw 159. A set-screw 160 threaded through an offset lug 161 on the bracket 121 is arranged to bear against the under side of the arm 156 to locate the magnet with its core 162 disposed at a slight distance away from the end of the collar 133. The windings of the magnet 155 are connected in circuit with a source of current by means of wires 163 and 164, an automatically-operated switch being provided for closing the circuit when the winding machine is first started to operate.

As shown in Figs. 6, 7 and 8 the switch 170 may be of the mercury type mounted on a pivoted arm or holder 171. The switch-holder 171 is pivoted on a screw 172 at the upper end of an arm 173 projecting vertically from a bracket 175 attached to the machine frame at 176. Fastened to the bracket 175 is a cylinder 177 which constitutes a part of a dash-pot for delaying the opening of the switch 170. A weighted piston 178 in the cylinder 177 is connected by a rod 179 to the switch-holder 171 and in the bottom of the cylinder is a valve 180 having a ball-closure 181 whereby when the piston is raised in the cylinder the valve will be opened to admit air. When the piston 178 descends in the cylinder the valve is closed by the ball 181 and a small vent-orifice 182 permits the slow escape of the air so that the downward movement of the piston is retarded to retard the tilting action of the member 171 in opening the switch 170.

The glass envelope of the switch 155 is provided with contacts 183 and 184 at one end across which the mercury 185 flows when the opposite end of the switch is tilted upwardly as shown in Fig. 8, thus closing the circuit to the magnet 155. Referring to Fig. 9, one pole of the switch 170 is connected with the magnet 155 by the wire 163 and the wire 194 from the opposite pole is connected to the line conductor 192 with a wire 164 leading from the opposite line conductor 193 to the magnet 155. The line conductors 192 and 193 carry current from any usual source.

The switch-arm 171 is tilted upwardly to close the switch by the movement of the starting lever 117 when the latter is rocked in a clockwise direction to start the operation of the winding machine. The starting handle 117 carries an arm 186 at the end of which is a pivoted latch 190 adapted to engage under and lift the switch-holder 171. The latch 190 is pivoted between the sides of the forked end of the arm 186 on a screw 191, a hairpin-shaped spring 195 coiled about the screw being arranged to normally hold the latch in the position shown in Fig. 6. The latch 190 has a forwardly-extending arm adapted to engage under the end of the switch-holder 171 and a downwardly-extending arm formed with a stop 196 adapted to engage in under one of the sides of the forked end of the arm 186. The spring 195 tends to maintain the latch 190 in the position

shown in Fig. 6 with the stop 196 engaged with the arm 186 while permitting the latch to rock in a clockwise direction on the arm when the latter moves downwardly to position the latch under the end of the switch-holder 171.

The method of operation of the last-described embodiment of the invention is explained as follows: After the strand of yarn *y* has been drawn from its source of supply, not herein shown, threaded through the tension-device 120 and led up to the thread-guide 105 in the manner as explained above its end is attached to a fiber or paper tube T mounted on the winding spindle 103. To initiate the winding operation the starting handle 117 is rocked in a clockwise direction from the position shown in Fig. 7 to that illustrated in Fig. 6, whereby to connect the drive with the winding spindle 103. During the first part of the movement of the handle 117 the latch 190 at the end of the arm 186 will ride up in under the forward end of the switch-holder 171 and tilt the latter upwardly in the manner illustrated in Fig. 8, thus causing the switch 170 to be tilted to flow the mercury 185 across the contacts 183 and 184. This immediately closes the circuit to the magnet 155 and the latter is energized to cause its core 162 to attract the collar 133 on the end of the spindle 132 of the tension-device 120. The attraction of the collar 133 slides the spindle 132 to relieve the pressure of the diaphragms 135 and 136 against the rims of the tension-disks 130 and 131 and the disks are then free to separate so that immediately the strand *y* starts to feed through the tension-device no substantial resistance to its draft is encountered.

It will be understood that the energization of the magnet 155 takes place at the first movement of the starting handle 117 before the clutch is actuated to engage the driving means and start the rotation of the spindle 103. As the movement of the starting handle 117 is continued the abutment 119 on the arm or lever 118 is carried down into engagement with the shoulder on the abutment 115, as illustrated in Fig. 6, to complete the clutching of the drive and immediately thereafter the spindle 103 is rotated to wind on the yarn as it is traversed longitudinally thereof by the reciprocating thread-guide 105. During this last movement of the handle 117 the latch 190 rides off from the end of the switch-holder 171 and under the influence of gravity the piston 178 starts to descend in the cylinder 177. The ball closure 181 remains seated in the valve opening 180 and consequently the air beneath the piston will escape slowly through the vent orifice 182. Consequently, the switch-holder 171 will be retarded in its movement back to its original position shown in Fig. 6 so that the switch will remain closed for a brief interval while the first few coils of yarn are being wound onto the tube T on the winding spindle 103.

Eventually, as the piston 178 reaches the bottom of the cylinder 177 the switch-holder 171 will be tilted back into the position shown in Fig. 6 to flow the mercury 185 away from the contacts 183 and 184 to open the circuit to the magnet 155. The magnet 155 is thus de-energized and as its core 162 releases the collar 133 the spindle 132 is slid to the left as viewed in Fig. 6 under the tension of the spring 138. Pressure is then again applied to the tension-disks 130 and 131 to cause them to bear against the strand *y* to apply resistance to its draft, and thus the yarn is tensioned as it feeds to the package being wound during the remainder of the winding operation.

When the strand breaks or its supply is exhausted the drop-wire 144 is released and actuated by engagement with the teeth 149 on the disk 150 to raise the quadrant 109 and thereby release the detents 115 and 119. Upon release of the detents the starting lever 117 is swung back into the position illustrated in Fig. 7 to declutch the drive and the arm 186 is swung downwardly to carry the pawl 190 beneath the end of the switch-holder 171 in position to raise the latter again when the operation of the machine is restarted. As the arm 186 moves downwardly the latch 190 comes into contact with the end of the switch-holder 171 and is rocked upwardly against the tension of its spring 195 to permit it to pass by the end of the switch-holder.

It will thus be observed that at each starting of the machine the switch-holder 171 is actuated to tilt the switch 170 to close the circuit to the magnet 155, whereby to release the pressure on the tension-disks 130 and 131 to relieve the tension on the yarn. By thus relieving the applied tension on the strand when it is first taken up by the rotation of the winding spindle all strain on the yarn is avoided to prevent its rupture or injury to the material. Consequently, the winding spindle can be started at a high rate of speed so that the use of complicated slow-speed starting devices is unnecessary.

While the invention is herein shown and described as embodied in two preferred forms of construction, it is to be understood that various modifications may be made in the structure and arrangement of the parts of the device without departing from the spirit or scope of the invention. Therefore, without limiting myself in this respect, I claim:

1. In combination, means for winding a strand of yarn or the like to form a package, means movable into engagement with the strand being wound for applying tension thereto, and electrically-operated means for moving the tensioning means laterally of the yarn strand to relieve the tension on the strand at the start of the winding operation.

2. In a winding machine, the combination with the winding mechanism, of means for tensioning the yarn feeding to the winding, electrically-operated means for adjusting the tensioning means to relieve the tension on the yarn, a source of current in circuit with the electrically-operated means, a switch in said circuit, and means operated from the winding mechanism for closing said switch at the start of the winding operation.

3. In a winding machine, the combination with the winding mechanism, of means for tensioning the yarn feeding to the winding, electrical means for adjusting the tensioning means to relieve the tension on the yarn, a source of current in circuit with the electrical means, a switch in said circuit, means for closing the switch at the start of winding, means for opening the switch, and means for delaying the opening of the switch during the initial stage of the winding operation.

4. In a winding machine, the combination with the winding mechanism, of a tension-device for tensioning the yarn as it feeds to the winding, electrical means for adjusting the tension-device to relieve the tension on the yarn, a source of current in circuit with said electrical means, a switch for closing said circuit, and means actuated from the winding mechanism for operating said switch to close the latter for a pre-

determined period during the initial stage of the winding operation.

5. In a winding machine, the combination with the winding mechanism, of a tension-device for applying tension to the strand of yarn or the like feeding to the winding, an electromagnet for adjusting the tension-device to relieve the tension on the strand, a source of current in circuit with the electromagnet, a switch in said circuit, means actuated from the winding mechanism for automatically closing said switch at the start of the winding operation, and means for opening the switch after the start of the winding operation.

6. In a winding machine, means for winding a strand of yarn or the like on a yarn-carrier to form a package, means for tensioning the strand being wound, means for starting and stopping the winding operation, electrically-actuated means for adjusting the tensioning means to relieve the tension on the strand, and means controlled by the starting means for energizing said electrically-operated means during the first stage of the winding operation.

7. In a winding machine, means for winding a strand of yarn or the like on a yarn-carrier to form a package, means for tensioning the strand being wound, electromagnetic means for adjusting the tensioning means to relieve the tension on the strand, a source of current in circuit with said electromagnetic means, a switch in said circuit, and means for closing said switch for a predetermined period during the start of the winding operation.

8. In a winding machine, the combination of mechanism for winding a strand of yarn or the like, starting means for controlling the operation of the winding mechanism, means for tensioning the strand as it feeds to the winding, means for adjusting the tensioning means to relieve the tension on the strand, and means actuated by the starting means to operate the tension-adjusting means at the start of the winding operation.

9. In a winding machine, the combination with the winding mechanism, of starting means therefor, a tension-device for tensioning a strand of yarn or the like feeding to the winding, electrically-operated means for relieving the tension on the strand, a source of current in circuit with said electrically-operated means, a switch in said circuit, and means operated from the starting means to close said switch to energize the electrically-operated means at the start of the winding operation.

10. In a winding machine, means for winding a strand of yarn or the like to form a package, a tension-device comprising relatively movable tension-members adapted to bear against the strand to apply tension thereto as it feeds to the winding, and means actuated from the winding machine to operate said tension-members to relieve the tension on the strand at the start of the winding operation.

11. In a winding machine, means for winding a strand of yarn or the like to form a package, tension means adapted to bear against the strand to apply tension thereto as it feeds to the winding, means to apply pressure to said tension means, and means operated from the winding means to act in opposition to the pressure-applying means to relieve the pressure of the tension means on the strand at the start of the winding operation.

12. In a winding machine, means for winding a strand of yarn or the like to form a package, manually-operable starting means for the winding means, a tension-device comprising a member adapted to bear against the strand to apply tension thereto, and means operated by the starting means for moving said member laterally of the yarn strand to relieve the tension on the strand at the start of the winding operation.

13. In a winding machine, means for winding a strand of yarn or the like to form a package, starting means for the winding machine, a tension-device comprising opposed members adapted to bear against the strand to apply tension thereto as it feeds to the winding, and means operated by the actuation of the starting means to move one of said tension-members with respect to the other member to relieve the tension on the strand at the start of the winding operation.

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