

Oct. 18, 1966

D. T. CARLSON ETAL

3,279,709

TEXTILE FIBER WINDER

Filed Nov. 18, 1963

5 Sheets-Sheet 1

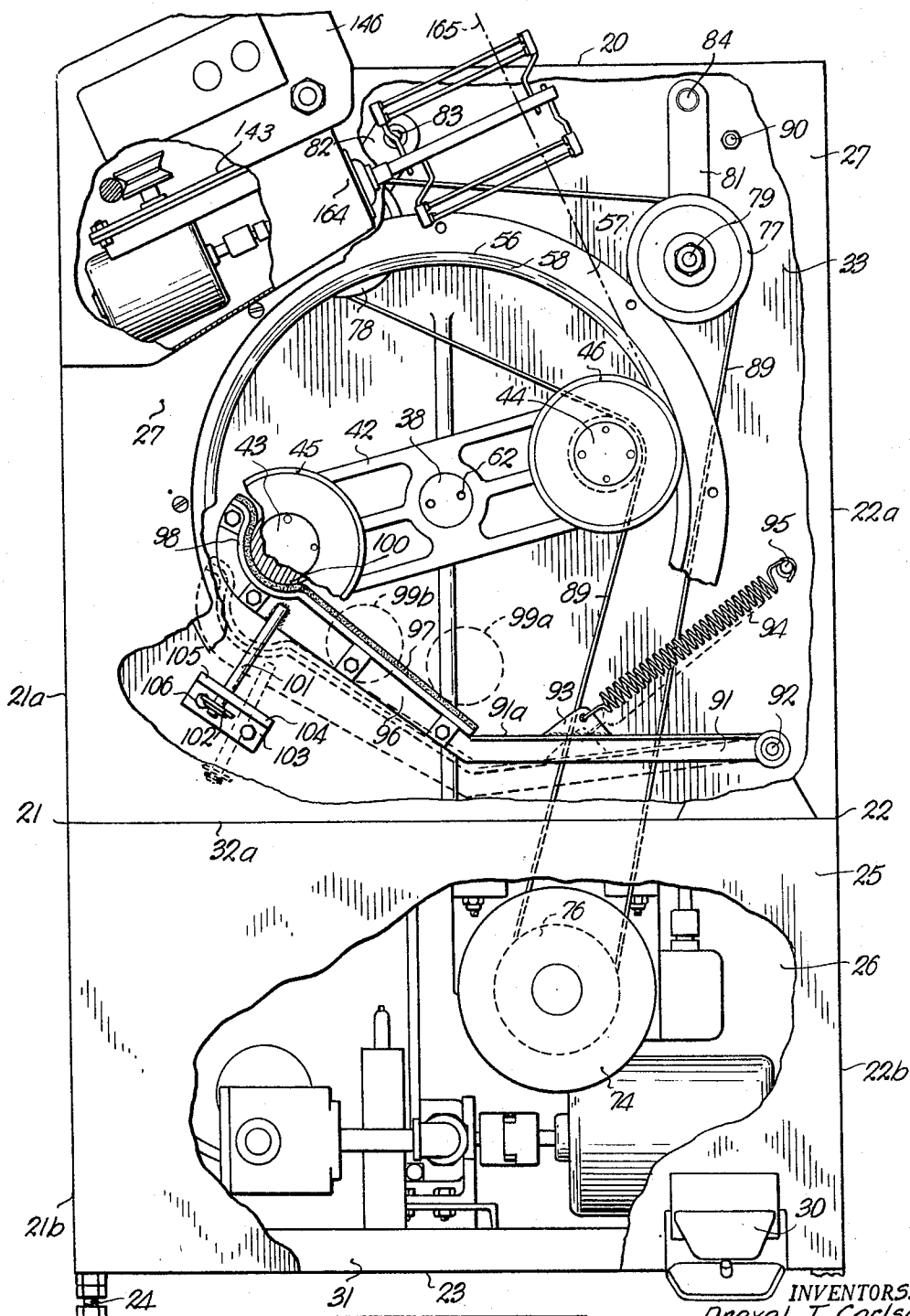


Fig. 1.

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5 Sheets-Sheet 2

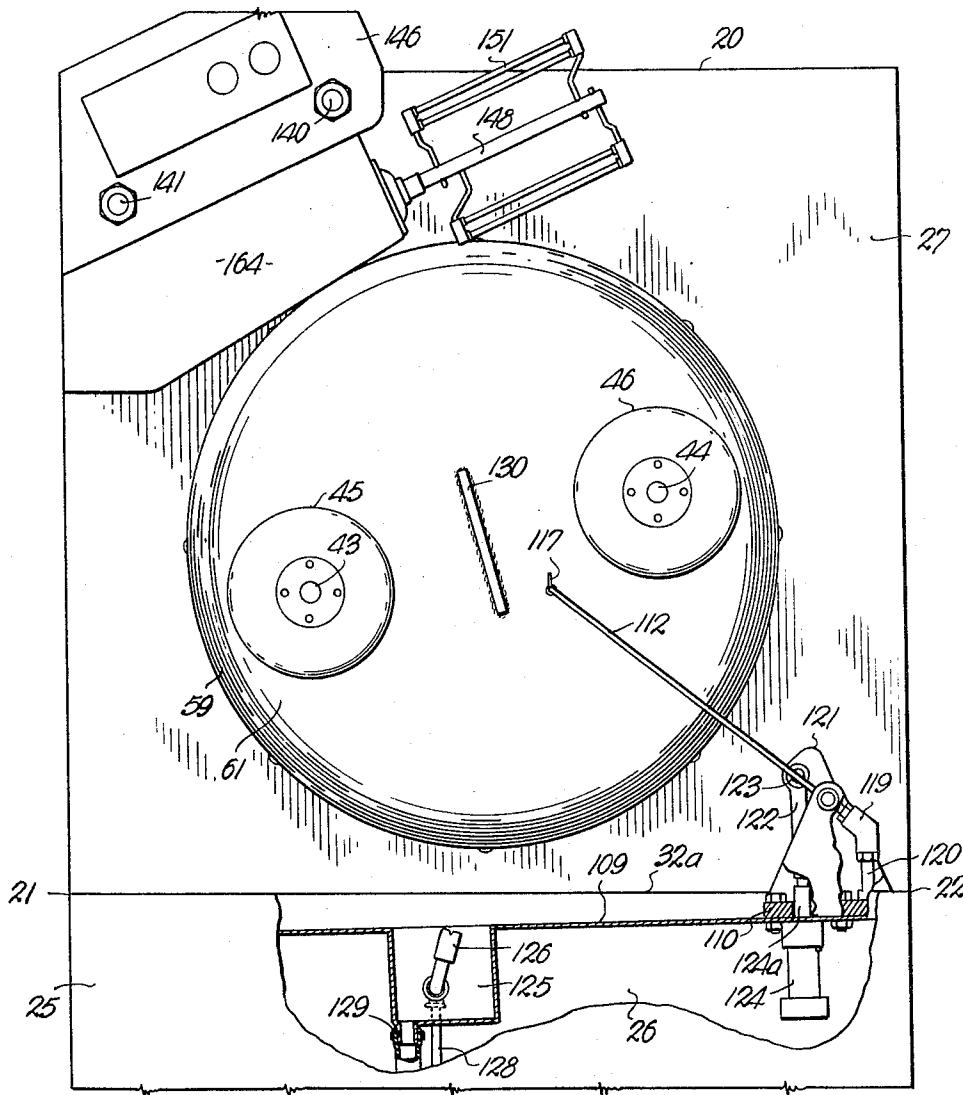


Fig. 2.

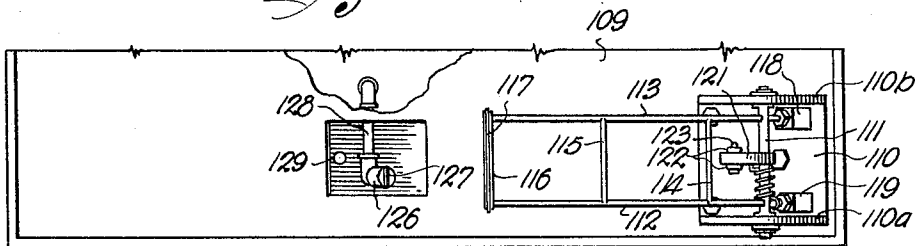


Fig. 3.

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5 Sheets-Sheet 3

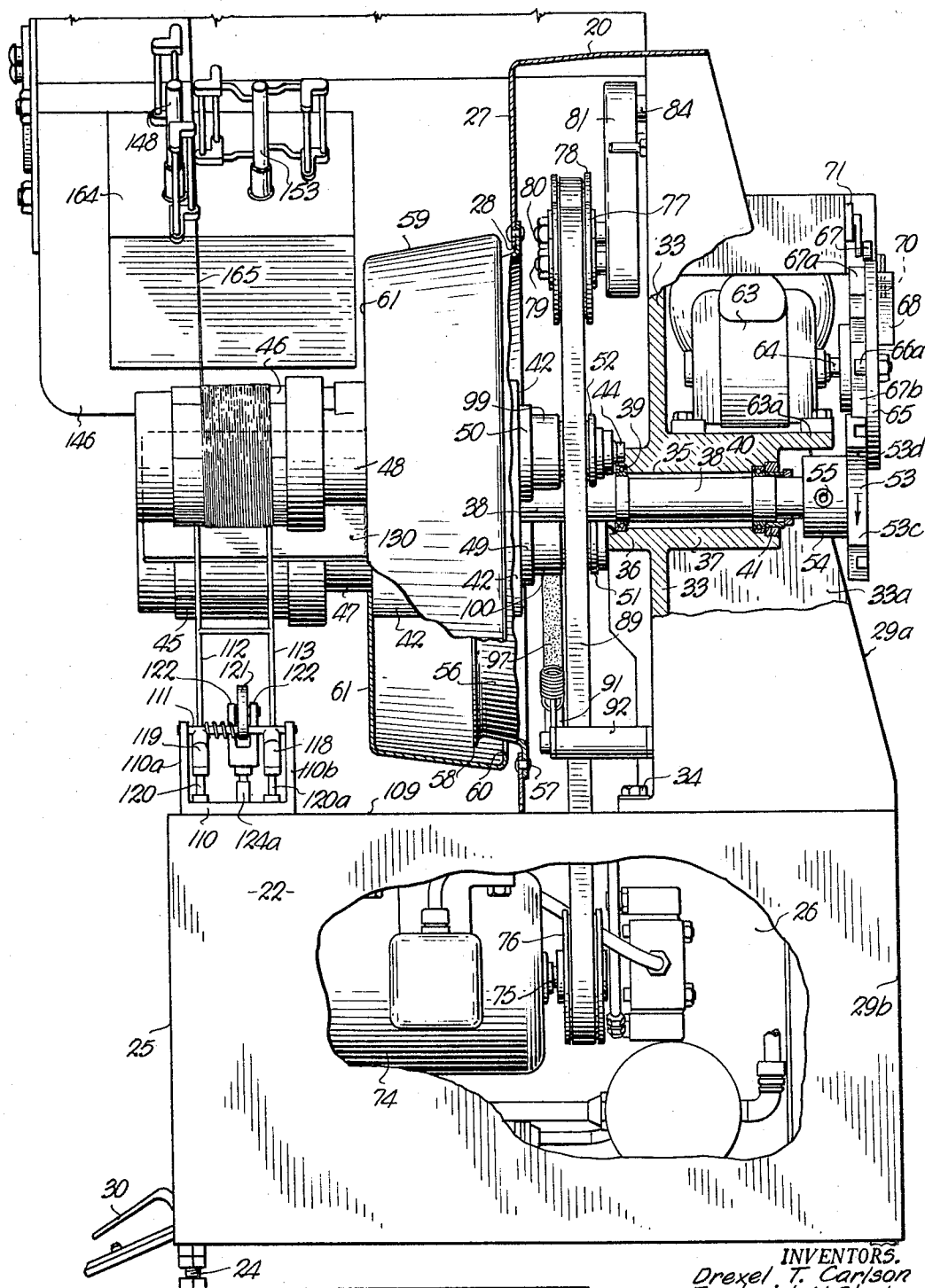


Fig. 4.

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5 Sheets-Sheet 4

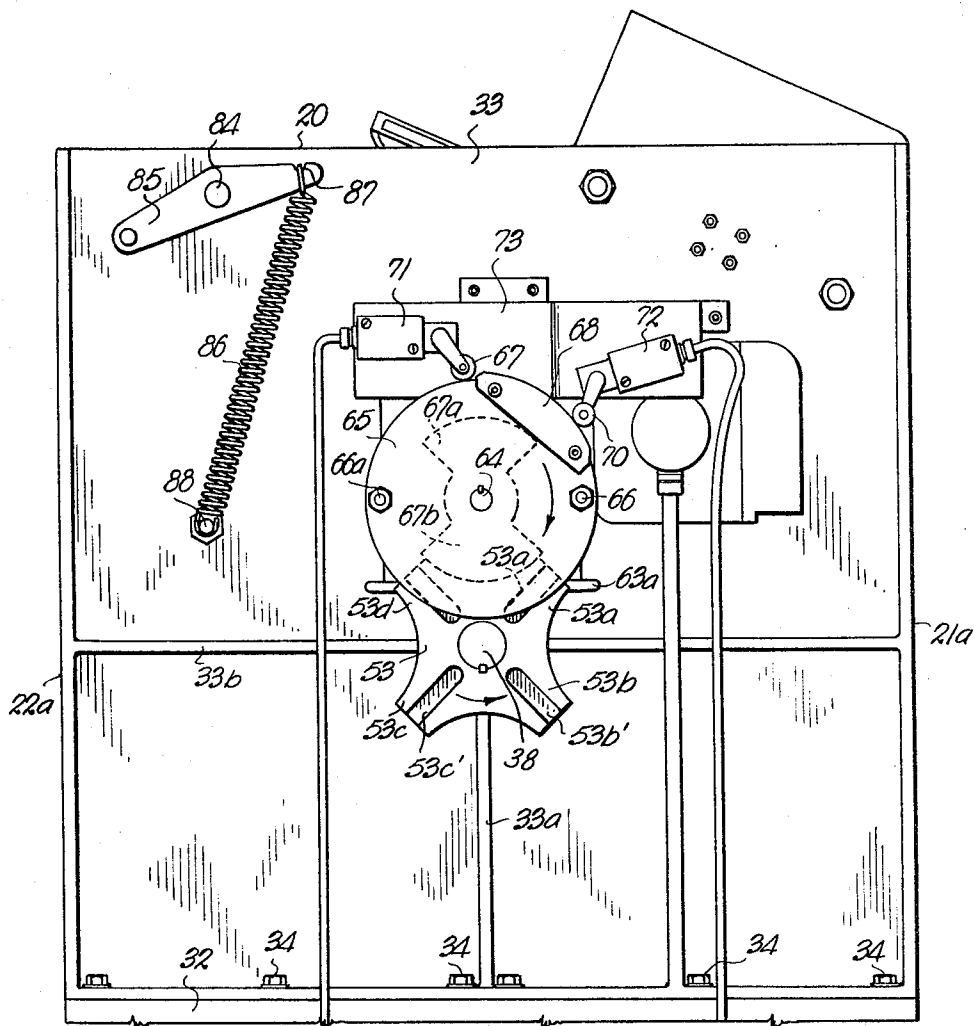


Fig. 5.

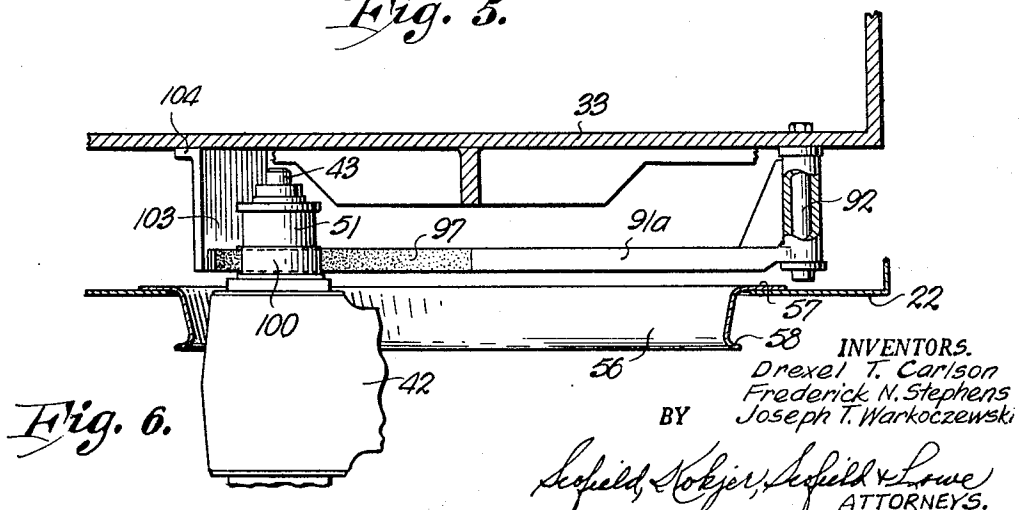


Fig. 6.

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5 Sheets-Sheet 5

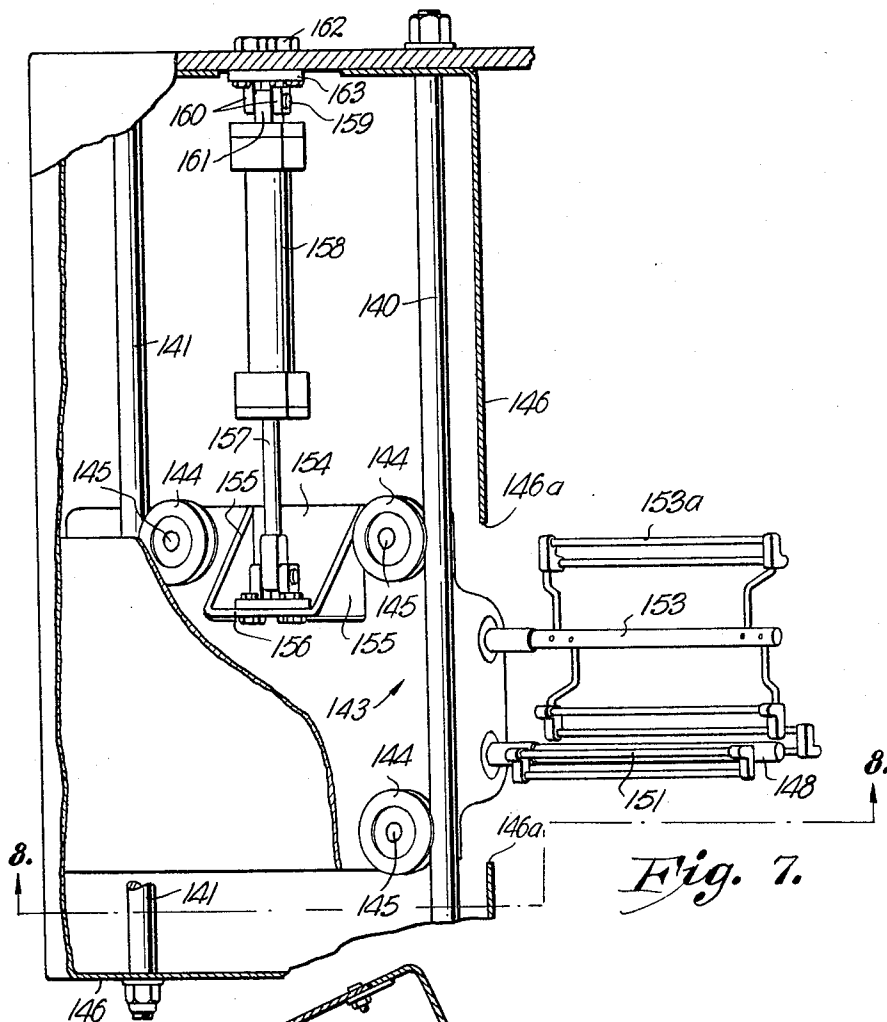


Fig. 7.

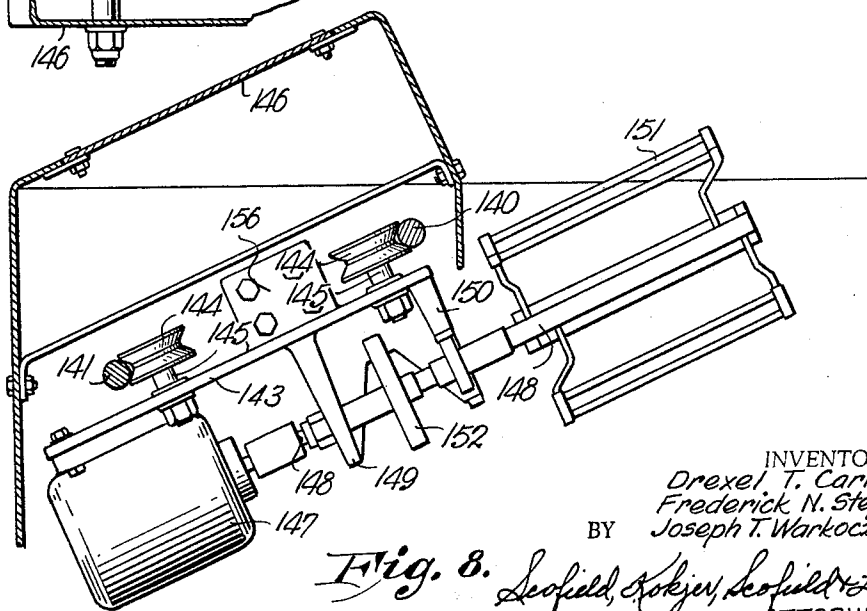


Fig. 8.

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3,279,709

TEXTILE FIBER WINDER

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Filed Nov. 18, 1963, Ser. No. 324,279

7 Claims. (Cl. 242—18)

This invention relates to textile fiber winding devices and refers more particularly to same in which a continuous winding process of the textile fiber is achieved without stopping of same save for correction of filament breakage or the like.

The patents to Higgins, Jr., 3,022,020, February 20, 1962, "Fiber Drawing Apparatus," Case 2,955,772, October 11, 1960, "Textile Fiber Winder," and Stephens et al. 2,846,157, August 5, 1958, "Apparatus for Winding Superfine Glass Fiber," as well as the patents to Fletcher et al. 2,352,781 and Stream 2,433,304 are all directed to textile fiber winding devices and processes related to the instant improvement. However, none of them show methods of and apparatus for continuous fiber winding of the character disclosed here.

In the conventional textile fiber winding devices such as are shown in the United States patents listed above and other patents, the mono-filaments from a multiply orificed bushing are wound on a single drum which is generally traversed to and fro below the bushing. Between the bushing and drum, the filaments are gathered at a sizing applicator and, after the sizing application, the sized fiber is often beaten back and forth by beating devices such as are shown in Case, Stream, etc., to obtain an optimum fiber lay pattern. Water is generally sprayed on the glass filaments as they are drawn from the bushing orifices. Windup is generally on a cardboard tube placed over the drum.

There are many problems and difficulties in the conventional operation above briefly described. Thus, one man in a fiber winding room will usually handle some six bushings or drums. He must remove wound tubes from the drums, place them on a pickup conveyor, and then rewind and restart the drums after replacing the cardboard winding tubes thereon. This operator also must stop drums at bushings with filament breaks, move the "hay chute" into place, ensure that the waste glass in such situation is going into the waste bin through the chute and the like. Thus, there is a very large amount of "down" time in single drum operation.

Additionally, any interruptions in the uniform draw of glass filaments from the bushing, whether due to filament breaks or winding tube replacements, tend to damage the thermal balance of the bushing. This is due to uneven draw of glass from the bushing resulting in uneven arrival of new marbles into the melt furnace of the bushing whereby differentials of temperature are produced between one side of the bushing and the other. It is thus desirable to have as long and continuous a draw from a single bushing as possible. The present necessity of stopping filament draw on a single windup drum machine to remove the wound tube is, per se, a cause of many breaks and if this pause in bushing draw could be avoided, such would be greatly desirable.

It would be additionally desirable that an operator have more leeway in time in replacing a wound tube whereby he could tend more bushings or more adequately tend the ones he has as, if he is in trouble on one bushing, he would not need to remove a wound tube from another at any given specific moment.

A high melting temperature glass tends to emphasize the temperature imbalance in a bushing on a marble feed

type of filament production. Additionally, temperature surges promote undesirable grain growth in the platinum metal comprising the bushings.

Where fiber diameter is unimportant, it is permissible to wind a long time on a single spindle. This results in a decrease in fiber diameter as the package diameter increases due to greater pull on the fiber or filaments per revolution. However, new types of products, such as reinforcements and rovings, must have a more uniform fiber diameter. Therefore, it is becoming more crucial and necessary to limit the fiber draw to a smaller time per spindle or drum. This necessarily results in increased down time if only a single spindle is being employed, because more packages must be removed and more cardboard cylinders reapplied to the serviced drums. Thus, if there is ten minutes of wind per package and no accidental breaks, there are automatically six replacement breaks per hour per machine for an operator.

Therefore, an object of the instant invention is to provide a textile fiber winder which operates continuously save for filament or fiber breaks.

Another object of the invention is to provide a textile fiber winding device wherein the fiber being drawn from the bushing is transferred from one rotating winding drum to another automatically, without requirement of operator intervention.

Another object of the invention is to provide a textile fiber winding device wherein a plurality of winding drums, spindles or collets are provided which are moved into and out of operation in drawing fiber from the bushing thereabove either automatically or at the operator's behest without requirement of stopping of the collet being wound to transfer to the next collet to be wound.

Another object of the invention is to provide a rugged, dependable, relatively simple, multiple collet textile fiber winder which is continuous in winding operation save for fiber or filament breaks.

Another object of the invention is to provide a continuous textile fiber winder (save for fiber or filament breaks) which operates to minimize down time in the winding device, greatly contributes to operator efficiency and convenience, minimizes damage to the thermal balance of the bushing from which filaments are drawn, aids in achieving uniform feed of marbles of glass into the bushing with resultant minimum differentials of temperature between one side of the bushing and the other and gives the operator in a winding room considerable time leeway in replacing wound tubes on any given machine.

Another object of the invention is to provide textile fiber winding devices which may be used with relatively high melting temperature glass by preventing excessive temperature imbalances in the bushings used therewith whereby to promote more uniform fiber diameter and prevent breakouts due to temperature imbalances.

Another object of the invention is to provide textile fiber winding devices wherein the product produced thereon may be made of more uniform diameter while having long continuity of draw from a given bushing by virtue of the fact that draw is automatically transferred from one collet or spindle to another without operator action required, whereby to permit the winding of relatively smaller packages without breaks in the draw from the bushing.

Other and further objects of the invention will appear in the course of the following description thereof.

In the drawings, which form a part of the instant specification and are to be read in conjunction therewith, an embodiment of the invention is shown and, in the various views, like numerals are employed to indicate like parts.

FIG. 1 is a front view of a textile fiber winding device with portions thereof cut away to better illustrate the

operating parts and their relationship to one another with two active positions of the brake portion of the device shown in dotted and full lines.

FIG. 2 is a partial front view of the apparatus of FIG. 1 with the front housing of the machine fully in place, a lower central portion of the machine cut away to illustrate parts of the device not seen in FIG. 1.

FIG. 3 is a view from above of the fiber cutter shown both in the lower right center of FIG. 2 and the left center of FIG. 4 with parts of the machine cut away to better illustrate the construction.

FIG. 4 is a side, partly sectional and partly cut away view of the apparatus of FIG. 1 taken from the right in FIGS. 1 and 2.

FIG. 5 is a partial rear view of the machine of FIG. 1 showing the upper portion of the device with the rear housing removed.

FIG. 6 is a view from above of the brake mechanism seen centrally in FIGS. 1 and 4 comprising a fragmentary partially sectional view of a portion of the machine of FIG. 1 from above.

FIG. 7 is a view from above of the beater mechanism seen in the upper left-hand corners of FIGS. 1 and 4 with the casing cut away whereby to better show the operating parts of this device and its traversing mechanism.

FIG. 8 is a side, partly sectional view through the housing of the beater mechanism of FIG. 7 taken along the line 8-8 of FIG. 7 in the direction of the arrows.

Briefly describing the apparatus of the drawings, there is provided a frame plate on which is rotatably mounted a shaft. This shaft carries a collet carrying arm having rotatably mounted thereon a pair of collets. First means are provided for rotating the shaft with said collet carrying arm 360°, through a number of stages, each stage precisely timed. Second means are further provided for sequentially driving each of said collets as it reaches a certain rotational position with respect to the frame plate, while releasing the other said collet from said drive. Third means are provided for traversing beaters to and fro above the collet arm whereby to traverse a fiber strand being drawn by one of the collets to and fro on the collet to make a uniform windup package. Fourth means comprising a brake mechanism are provided to slow down and stop the collet which is not being driven in the winding operation. Fifth means comprising a fiber cutting device are provided to sever the strand from the collet carrying the wound package in such manner that the strand is picked up by nonwound collet. Thus, the apparatus basic assemblies comprise (1) the collet carrying arm and its shaft mounting, (2) the shaft and collet arm traversing means, (3) the collet power drive, (4) the traversable, rotatable beater system, (5) the brake system, and (6) the fiber cutting system.

The housing, frame plate and collet carrying arm and drive shaft construction will be first described.

Referring to FIGS. 1, 4 and 5, a housing is provided with a top 20, side walls 21 and 22 (upper *a* and lower *b*) and an under side 23, the latter having suitable mounting jacks or legs 24. The front side has a lower forward face or wall 25 (on power and hydraulic housing generally designated 26) with upper recessed face or wall 27 having a central opening 28 (FIG. 4) therethrough. The back side of the housing is designated 29*a* in its upper portion and 29*b* in its lower portion (on the rear of power and hydraulic housing 26). The side walls are designated 21*a* and 22*a* in the upper portions at the sides of face 27 and 21*b* and 22*b* in their lower portions at the sides of power and hydraulic housing 26.

A foot pedal 30 may be provided at the lower right-hand portion of panel 25 for operator control when such is desired. The electrical and hydraulic control and electrical power systems are not shown or described in detail as they do not themselves comprise critical parts of the instant invention.

A base plate 31 (FIG. 1) is provided as the floor of power and hydraulic housing 26 and mounts by suitable structural members (not shown) thereabove beams 32 at level 32*a* which carry rigidly thereon a vertical rigid plate 33. Plate 33 is suitably braced in the rear thereof as by flange brace 33*a* and cross brace 33*b*. Plate 33 is fixed to beams 32 by suitable bolts as seen at 34. An opening 35 is formed substantially centrally of plate 33 and has cylindrical wall extensions 36 and 37 surrounding same frontwardly and rearwardly of plate 33, respectively.

Collet arm mounting shaft 38 is received in opening 35 and is rotatably mounted therein by ball bearing races 39 and 40 and seal bearing 41, said bearings cooperating between shaft 38 and extensions 36 and 37. Collet mounting arm 42 (FIG. 1) is rigidly fixed to the forward end of shaft 38. Collet mounting shafts 43 and 44 are rotatably mounted in bearings mounted on collet arm 42 and have collets, spindles or drums 45 and 46 rigidly fixed to the front ends thereof. Portions of said bearings are mounted in housings 47 and 48 extending forwardly from collet arm 42. Likewise, portions of said bearings are carried in housings 49 and 50 extending rearwardly of arm 42. Pulleys 51 and 52 are fixedly mounted on the rear ends of shafts 43 and 44 whereby to rotate therewith or drive same on being themselves rotated.

The rearward end of shaft 38 has driven wheel 53 of a Geneva drive thereon, the latter having slotted extensions 53*a*-53*d*. Wheel 53 is fixed by collet 54 to the end of shaft 38 by set screw 55.

Referring again to front sheet 27 of the housing, and opening 28 therein (FIG. 4), a frusto-conical channel 56 is removably fixed by screws 57 in said opening, extends outwardly therefrom and has outwardly flanged lip 58 thereon. Channel 56 is itself surrounded by a frusto-conical forwardly extending shield 59 having an inwardly curled rearward edge 60 and an outer front plate 61, the latter bolted to the front end of shaft 38 by means of internally threaded holes 62 therein (FIG. 1). Perforations (not shown) are provided in front panel 61 whereby to pass shafts 43 and 44 therethrough.

Again referring to the portion of the machine rearward of plate 33, motor 63 mounted on plate 63*a* drives shaft 64 upon which is mounted driving wheel 65 of the Geneva drive having the shafts 66 and 66*a* thereof adapted to fit into the slots (53*a*'-53*d*') of slotted portions 53*a*-53*d* of the Geneva drive wheel 53 and, additionally, having arcuate segments 67*a* and 67*b* of the said conventional Geneva drive also fixed to the back thereof. A cam 68 is fixed to the outer surface of driving wheel 65 whereby to contact arms 67 and 70 of switches 71 and 72. The latter switches are mounted on the back of plate 33 by suitably shaped plate 73.

A conventional electric motor 74 (FIGS. 1 and 4) in power and hydraulic housing 26 drives shaft 75 on which is mounted pulley 76. Shaft 75 is below shaft 38. On the front face of plate 33 are positioned two pulleys 77 and 78 which are rotatably mounted on shafts 79 and 80, said shafts carried by arms 81 and 82, respectively. Shaft 80 and arm 82 are rigidly positioned with respect to plate 33, although adjustable to any given fixed position by bolt 83. Shafts 79 and 80 and pulleys 77 and 78 thereon are positioned above shaft 38 and spaced apart from one another a substantial distance. The axes of shafts 75, 38 and 80 are parallel with one another and positioned essentially in a common plane. The rotational axis of shaft 79 and pulley 77 is displaced to one side of said line and positioned between pulleys 78 and 74 whereby the rotational axes of pulleys 77, 74 and 78 make up an essentially triangular array. On the other hand, arm 81 is pivotally mounted on shaft 84 which is rotatably mounted in a bearing (not seen) in plate 33. Shaft 84 has on its rearward end a second arm 85, the latter spring loaded on one side thereof with coil spring 86 clipped at 87 to one end of arm 85 and to bolt 88 at

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the other end thereof. Shaft 81 thus tends to move in a counterclockwise direction in FIG. 1 around shaft 84. Drive belt 89 is threaded over pulleys 77, 78, and 76, as seen in FIGS. 1 and 4, whereby to be driven by motor 74. Belt 89 additionally contacts and drives (in the position shown in full lines in the views) pulley 52 on shaft 44 whereby to drive the latter and collet 46 mounted thereon in rotation. Stop 90 is provided next arm 81 at its maximum permitted counterclockwise movement.

Turning to the wound collet braking mechanism, arm 91 is pivotally mounted at one end on shaft 92 fixed to the lower right-hand quadrant of plate 33. Spring plate 93 is fixed to upper surface 91a of arm 91 and carries one end of coil spring 94, the other connected to extended rod or shaft 95, the latter also fixed to the front face of plate 33. Spring 94 thus tends to rotate arm 91 in a clockwise direction (in the view of FIG. 1) around shaft 92. An upwardly angled extension 96 of arm 91 has a flat upper surface with a covering of brake lining 97 thereon. Hemispherical or hemicylindrical depression 98 is also lined with the said brake lining material 97, the latter so formed as to fit snugly around and against collet braking surfaces 99 and 100 (FIG. 4), the latter next to pulleys 51 and 52 on shafts 43 and 44. Rod 101 is fixed to the under side of arm extension 96 and has washer 102 fixed to the free end thereof. Plate 103, having right angled flange 104 thereof with slot 105 therein, a fixed by bolts 106 to the front face of plate 33. Rod 101 is received in slot 105 with washer 102 on the rod limiting possible clockwise rotation of arm 91 and extension 96 thereon in the view of FIG. 1.

Dotted circles 99a and 99b (in FIG. 1) represent successive positions of a braking surface 99 or 100 at (1) first contact (99a) with brake lining 97 and (2) full brake lining contact (99b) prior to passage of braking surface 99 or 100 into recess 98 in the full line position of the brake in FIG. 1. The dotted line showing of arms 91 and 96 in FIG. 1 illustrate substantially full depression of the brake member at the point of greatest deflection and frictional contacts (99b) with a brake surface 99 or 100.

Referring particularly to FIGS. 2, 3 and 4, therein are shown means for severing the textile fiber or strand after there has been a full 180° cycling of the loaded collet (here considered 46) from the fiber drawing or full belt drive position at the right in FIG. 1 to the stopped left-hand position of other collet 45. Mounting plate 110 is fixed to sloping floor 109 and has shaft carrying flanges 110a and 110b extending normal thereto and rotatably mounting shaft 111 thereon. A pair of blade mounting rods 112 and 113 are fixed at one end thereof to shaft 111 and are braced along their length by transverse rods 114 and 115. At the outer end of rods 112 and 113 is positioned blade mounting 116 carrying saw blade type fiber-cutting blade 117. Adjustable stop members 118 and 119 are mounted on extensions of rods 112 and 113 past shaft 111 and have adjustable screw-in stops 120 and 120a (FIG. 2) operative to control the upward limit of travel of rods 112 and 113. Plate 121 is fixed at one end centrally of shaft 111 and has split rod 122 keyed thereto by pin 123. Split shaft 122 is connected to rod 124a of conventional hydraulic cylinder 124, the latter fastened to the under side of floor 109 and operable to raise and lower split arm 122. This action raises arms 112 to the stop limited positions shown in the figures and then permits arms 112 and 113 to lower the blade end thereof into contact with floor 32 between cutter actuations.

Square recess 125 is provided in floor 109 whereby to receive spray nozzle 126 having slotted discharge opening 127 in the discharge end thereof. Pipe 128 carries water to nozzle 126. Drain tube 129 is provided in the lower end of recess 125 whereby to carry off any water which may collect in the recess. The plane of projection of spray from nozzle 126 passes immediately behind cut-

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ter 117 whereby to project water spray between rods 112 and 113 against the fiber being drawn down around the collet prepared to start to wind (rotating at full speed). This spray plasters the blade cut end of the said fiber against the said rotating collet to continue the fiber draw from the bushing and hold same against the newly winding collet until the winding operation thereby is properly started.

Referring back to plate 61 mounted on the forward end of shaft 38, it will be seen that same carries baffle plate 130 fixed at one edge thereto and extending outwardly therefrom between the two collets 45 and 46. Plate 130 provides a secondary purchase for the cutting action of blade 117 between the collet starting to wind (but rotating at full speed) and the collet stopping winding.

The fiber beater mechanism is operative to lay the drawn fiber at a strong angle across the winding collet. Referring particularly to FIGS. 7 and 8, a pair of elongate rigid mounting rods 140 and 141 are fixedly bolted as at 142 to plate 33 and extend outwardly therefrom and normal thereto. Beater motor mounting plate 143 has four pulley wheels 144 rotatably mounted on shafts 145 fixed thereon in opposed pairs whereby to engage rods 141 and 140 and roll therealong, thus to translate plate 143 to and fro. (Inwardly and outwardly with respect to plate 33 and housing face 27.) Any suitable enclosing housing generally designated 146 may enclose the entire beater translating and drive mechanism and may be conveniently carried by rods 140 and 141 as seen in FIG. 7.

Mounted on the under side of plate 143 is electric motor or other suitable power source 147 driving single shaft 148 rotatably received in bearing mounting plates 149 and 150, the latter plates also fixed to the under side of plate 143. Suitable beating elements 151 are rigidly fixed to the outer free end of shaft 148 to rotate therewith and operate in the manner of one set of the beaters disclosed in the Case patent, supra. Spur gear 152 is fixed on shaft 148 and engages like spur gear (not seen) on shaft 153. Shaft 153 is received in other bearings mounted in plates 149 and 150 and is not directly driven by motor 147, but by means of spur gear 152. Common bearing mounting 150 for the outer bearings carrying shafts 148 and 153 is best seen in FIG. 7.

Fixed to the upper side of plate 143 is flat plate 154 having flanges 155 mounting drive plate 156. The end of piston rod 157 of hydraulic cylinder 158 is connected to plate 156. Cylinder 158 is fixed to plate 33 at one end by suitable means such as pin 159 engaging split arms 160 and lug 161 on cylinder 158. Bolts 162 mount plate 163 carrying split arms 160. Conventional hydraulic feed lines for conventional hydraulic cylinder 158 are not shown but are such as to permit cyclic controlled in and out movement of plate 143 with respect to plate 33.

Beater wires 153a are mounted on shaft 153 and co-operate with beater wires 151 in the manner of the Case patent, supra. The lower part of plate 143 and the apparatus on the under side thereof may be enclosed by a housing 164 fixed to the peripheral edges of plate 143 as seen in FIGS. 2 and 4. Thus housing 164 and plate 143 translate in and out with respect to plate 33 with shafts 148 and 153 rotating the beater wires. Opening 146a in housing 146 permits such movement.

Operation

In operation, it will first be assumed that the device has all parts thereof in the full line showings of the various drawing figures. Thus, belt 89 is driven by motor 74, thereby rotating pulleys 76, 77 and 78 and most particularly pulley 52 connected to collect 46, whereby to drive collet 46 in full speed winding operation. A glass fiber strand 165 is being drawn down between beater arms 151 and 153a on shafts 148 and 153 from a conventional platinum bushing (not seen) producing typically some 204 filaments. As strand 165 is drawn

through the beater arms, they traverse it back and forth with respect to collet 46 while, simultaneously, plate 143 is translated to and fro at a predetermined rate by hydraulic cylinder 158. The two combined actions described cause proper windup of the strand or fiber on collet 46.

Wheel 65 does not rotate continuously. When motor 63 is started, wheel 65 makes one revolution and stops. At the beginning of operation, motor 63 is started by depressing foot switch 30. In continuous operation, motor 63 is started by a timer (not seen) which is set to make the desired size package of fiber. This is commonly about 10 minutes of winding. One revolution of wheel 65 typically requires approximately 5 seconds.

One revolution of wheel 65 produces $\frac{1}{2}$ revolution of member 53. As previously mentioned, the rotation of member 53 is intermittent. When rotation of wheel 65 is started, member 53 does not rotate until wheel 65 has moved about 45° from the position shown in FIG. 5. Member 53 is then rotated 90°. It remains at this position until it is again rotated 90° (180° from its original position) and again stops.

Limit switches 71 and 72 are actuated by cam 68 through rollers 67 and 70. After wheel 65 rotates about 60° from the position shown in FIG. 5, roller 70 drops off cam 68. This stops the traverse mechanism, both the rotation of the beaters 151 and the in and out movement of plate 143. When wheel 65 rotates sufficiently to cause cam 68 to again raise roller 70, the traverse mechanism is again started, after a delay of approximately 2 seconds. This delay is achieved through a time delay relay (not seen). Also, motor 63 is stopped and the package timer is energized. When rotation of wheel 65 causes cam 68 to raise roller 67, water jet 126 is turned on and cutter 117 is raised. Both of these actions are achieved through solenoid valves. When roller 67 drops off cam 68, jet 126 is shut off and the cutter is lowered. The spray continues for approximately 1 second after the cut is made. Inasmuch as the collet rotates about 7200 r.p.m., this will amount to approximately 120 revolutions.

Cutter 117 is raised at the same time that jet 126 is turned on and is lowered when the jet is turned off. The fiber actually breaks and starts on the other collect as soon as the cutter is raised. The cutter is in the raised position for approximately 1 second after the fiber is broken. The spray also operates through this time. After the fiber is cut, approximately 3 seconds elapse before the traverse starts again. As noted above, 1 second of this interval occurs while the cutter is raised and the spray is on. When roller 67 drops off the cam, the spray is shut off and the cutter is dropped. The traverse is started by switch 72 through a time delay relay which causes a 2 second postponement.

The details of operation with respect to collet shifting, strand cut and transfer, braking and package removal from one collet and bringing up to speed of the second collet will now be described in considerably more detail. It is assumed that the device has all parts thereof in the full line showings of the various drawing figures. Proper wind-up of the strand or fiber takes place on collet 46. The predetermined package period is wound, then the timer fires. Motor 63 is thus just started.

At this time, driving wheel 65 of the Geneva drive (FIG. 5) starts moving in the direction shown by the arrows in FIGS. 4 and 5 with arcuate section 67b thereof passing through the arcuate portion of driven wheel 53 between arms 53a and 53d. Peg or shaft 66 on driving wheel 65 is approaching slot 53a' in slotted portion 53 of the said driven wheel. By this time, the non-belt 89 engaged pulley 51 on shaft 43 carrying collet 45 has been braked to a stop from its last winding and, in the full line position of FIG. 1, has braking surface 100 resting motionless in recess 98 of brake lining 97. The operator at any time before the next translation of collect carrying arm 42, to be described, removes the wound fiber package

from collet 45 and replaces same with a clean cardboard cylinder.

As peg 66 on driving wheel 65 engages slot 53a' in driven wheel portion 53a, driven wheel 53 of the Geneva drive moves in the direction of the arrows thereon in FIGS. 4 and 5 whereby to move the collet carrying arm 42 in a clockwise direction in FIG. 1. This action translates the pulley 52 downwardly in a circular arc and the pulley 51 upwardly in a circular arc until the former reaches a position a little short of brake shoe contact at 99a (90°).

There is a pause in the Geneva drive system after the 99a position is reached or slightly therebefore 90° from the full line position of the figures which acts to permit the speed of the winding collet 46 to drop somewhat and the speed of the nonwinding collet 45 to come up. Pulley 51 engages belt 89 before the end of the 90° shift of arm 42, with both pulleys 51 and 52 being driven thereby at the 90° point. There is less contact and tension at the intermediate point and some slippage on both pulleys. At this time, motor 74 continues at the same velocity, driving belt 89. However, at the 90° point, the beater shaft rotation and to and fro translation of plate 143 is stopped. The residual hydraulic pressure in cylinder 158 tends to return plate 143 to center position. Fiber draw and wind continue on collet 46. Spring loaded arm 81 permits belt 89 adjustments as required.

After this delay, pin 66a following on pin 66 which engaged slot 53a' engages the slot 53b' whereby to slowly rotate collet carrying arm 42 another 90° to again reach the full line position of the figures (but with collet 45 and 46 reversed). During this second transfer time, fiber 165 is still being drawn over the rotating surface of nonwinding collet 45 which is coming very closely up to full speed and reaches full speed shortly after collet 45 reaches the full line position of FIG. 1. Correspondingly, the other collet 46 is decelerating sharply by virtue of brake action. Hydraulic cylinder 124 was energized to actuate the cutting member at approximately the 340° position of plate 65 by switch 67 moving off cam 68 and blade 117 moves rapidly up to the full line position of FIGS. 2 and 4 whereby to cut fiber 165. The water jet from nozzle 126 is simultaneously turned on whereby to provide a high speed plane spray of water behind the blade 117 thus to plaster the cut strand against rotating collect 45. After a measured interval of time, say, 1 second, the jet is turned off. Arms 112 and 113 drop to the rest position previously described immediately after cutting of the fiber. Beater arm action and plate 143 traverse are again started after a short delay to consolidate the wind. Once collect 45 is fully stopped, the operator may remove the wound spool.

Turning to the details of the brake, once braking surface 99 is in action, position at 99a brake surface 99 begins to contact brake lining 97, pulley 52 loses contact with belt 89, and pulley 51 is solely contacting belt 89 and being substantially accelerated.

Moving on to the brake surface 100 with brake surface 99 positioned as shown at 99b in FIG. 1, hard braking action between lining 97 and brake surface 99 takes place with hard, full acceleration of pulley 51 by belt 89 rapidly bringing collect 45 up to speed. When speed of collet 45 rises, glass strand 65 being passed thereover is less abraded as they are moving approximately at the same rate. Arm 81 adjusts to take up of tension on belt 89 by pulley 51 with substantial full release of pulley 52 at point 99b.

In case of filament breaks, a hay chute (not seen) is moved into position in conventional manner to deflect the filaments and strand after the operator has stopped the winding device. To start up, with operating parts in the full line position of the figures, belt drive motor 74 is started without beater traverse or shaft rotation and collet 46, for example, is brought up to speed with the fiber 165 being applied therearound at the startup by the operator. Once collet 46 is brought up to speed, and the fiber draw is established in satisfactory fashion, the Geneva

drive is put into operation by the operator with traverse then taking place to the second spool as described. At this point, after cut, transfer and wind establishment, beater action and transverse is begun with respect to collet 45. The first or startup package is discarded. Thereafter, operation takes place as described.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings are to be interpreted as illustrative and not in a limiting sense.

We claim:

1. A textile fiber winding device comprising a frame plate, a first shaft rotatably mounted on said frame plate, an elongate straight collet mounting arm fixed centrally thereof to one end of said first shaft on one side of said plate and rotatable therewith, means connected to said first shaft for periodically rotating same and said collet arm thereon in controlled arcuate amounts, a fiber winding collet rotatably mounted adjacent each end of said collet mounting arm on the side thereof away from said plate equidistant from said first shaft and 180° opposed to one another, said collets each having connected thereto and rotatable therewith on the other side of said arm a drive pulley, said collet drive pulleys comprising first and second pulleys, a power source driving a second shaft and a third pulley thereon, said second shaft and third pulley positioned below said first shaft, fourth and fifth pulleys rotatably mounted on said frame plate adjacent said first shaft and each above same, said fourth and fifth pulleys spaced apart from one another a substantial distance, the rotational axes of the third and fourth pulleys and the first shaft being parallel with one another and lying substantially in a common plane, the rotational axis of the fifth pulley displaced to one side of said plane but between the third and fourth pulleys whereby the rotational axes of the third, fourth and fifth pulleys and first shaft make up an essentially triangular array, the radial length of the collet mounting arms from the center of the first shaft to the rotational axes of said collets less than the distances from the first shaft center to the rotational axes of the third and fourth pulleys, the fifth pulley resiliently mounted relative to said plate whereby same may move under resilient tension toward said common plane, a belt continuously engaging said third, fourth and fifth pulleys and at least one of said first and second pulleys whereby to be driven by said third pulley and continuously drive said fourth and fifth pulleys and at least one of said first and second pulleys, whereby belt engagement of both collet pulleys occurs at a minimum belt tension when the collet pulleys are in line with said plane and belt engagement of only one said collet pulley occurs at a relative

maximum tension when the collet mounting arm is substantially normal to said plane.

2. Apparatus as in claim 1 including first and second braking collars associated respectively with each of said first and second pulleys, brake means mounted relative to said first shaft and positioned on the other side of said plane from the fifth pulley, whereby as one of said first and second pulleys move into increasing belt engagement by moving across said plane toward the fifth pulley, the other of the first and second braking collars move into interaction with said braking means.

3. Apparatus as in claim 1 including fiber shearing and adhering means comprising respectively a cutter and a jet spray device positioned so as to sever fiber being wound on one of said collets and apply jet force thereto when the collet mounting arm crosses said plane at a substantial angle less than a right angle.

4. In a continuous textile fiber winding process, the steps comprising continuously applying an increasing accelerating and driving force from a moving drive belt to a first fiber winding collet whereby to bring it up to winding speed, winding fiber on said first collet while maintaining it at said winding speed by contact with said drive belt at a relatively fixed tension, applying an increasing accelerating and driving force to a second fiber winding collet from said drive belt whereby to bring same up to winding speed while simultaneously relatively decreasing the force applied to said first collet from said belt, simultaneously maintaining said first and second collets in driving contact with said belt and winding only on said first collet while the relative forces applied to said first and second collets approach equality, translating said first collet relatively out of driving contact with said belt while simultaneously moving the second collet into relatively greater driving contact therewith while continuing to wind fiber only on the first collet, and severing the fiber from the first collet and causing same to adhere to the second collet and continue winding on the latter after essential drive decoupling of the first collet with said belt.

5. A process as in claim 4 including applying braking force to the first collet after said essential drive decoupling.

6. A process as in claim 4 wherein severance and transfer of said fiber is effected when the second collet is in substantially maximum belt engagement and said first collet is in substantially minimum belt engagement.

7. A process as in claim 4 including actively traversing the fiber being wound on the first collet to and fro thereon while the first collet is in relatively maximum drive contact with said belt and ceasing said transverse at other times of said first collet-belt contact.

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