March 24, 1942. C. A. RUDISILL 2,277,609

METHOD AND MEANS FOR TREATING YARN

Filed April 30, 1941 3 Sheets-Sheet 1

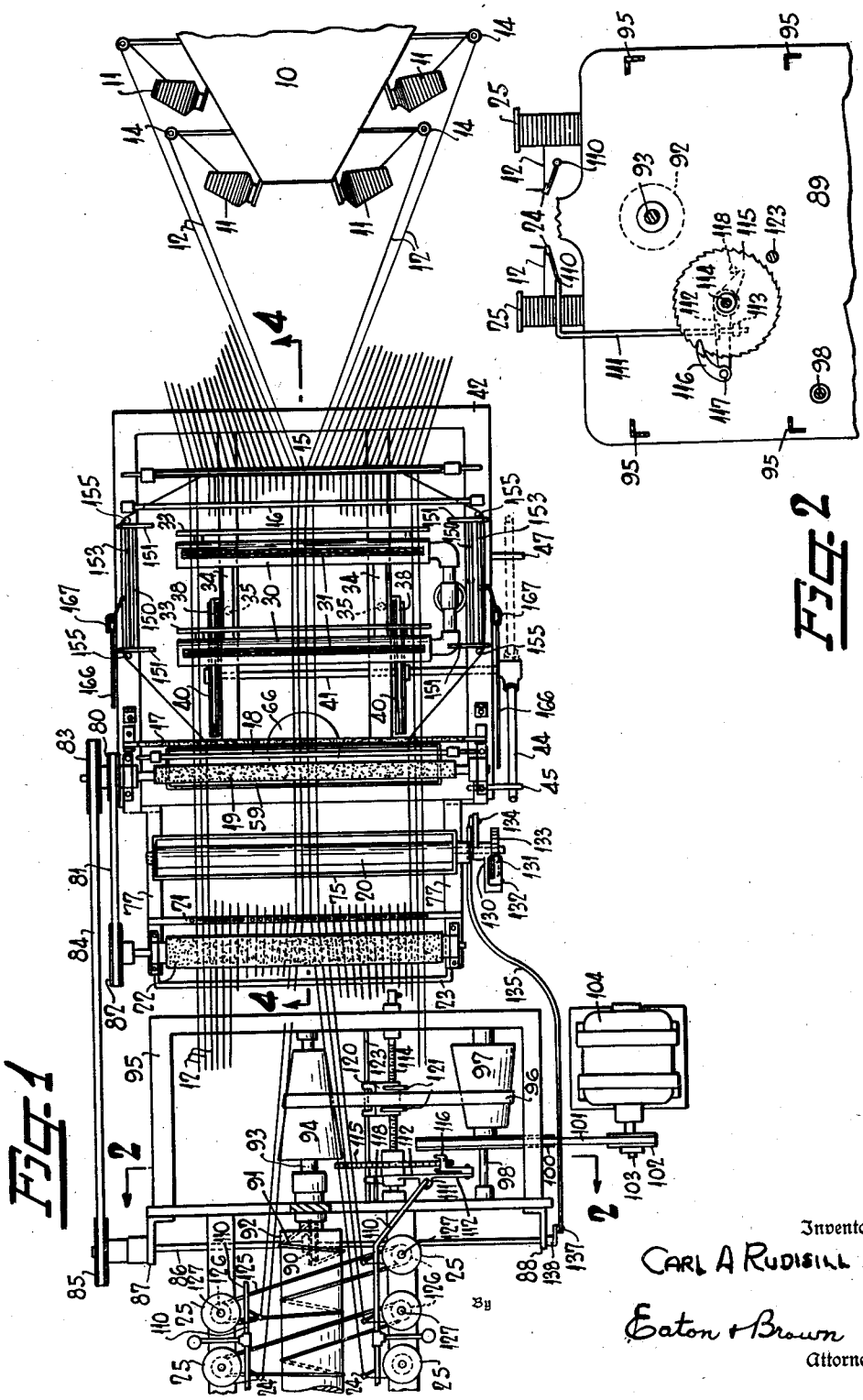


FIG. 1

FIG. 2

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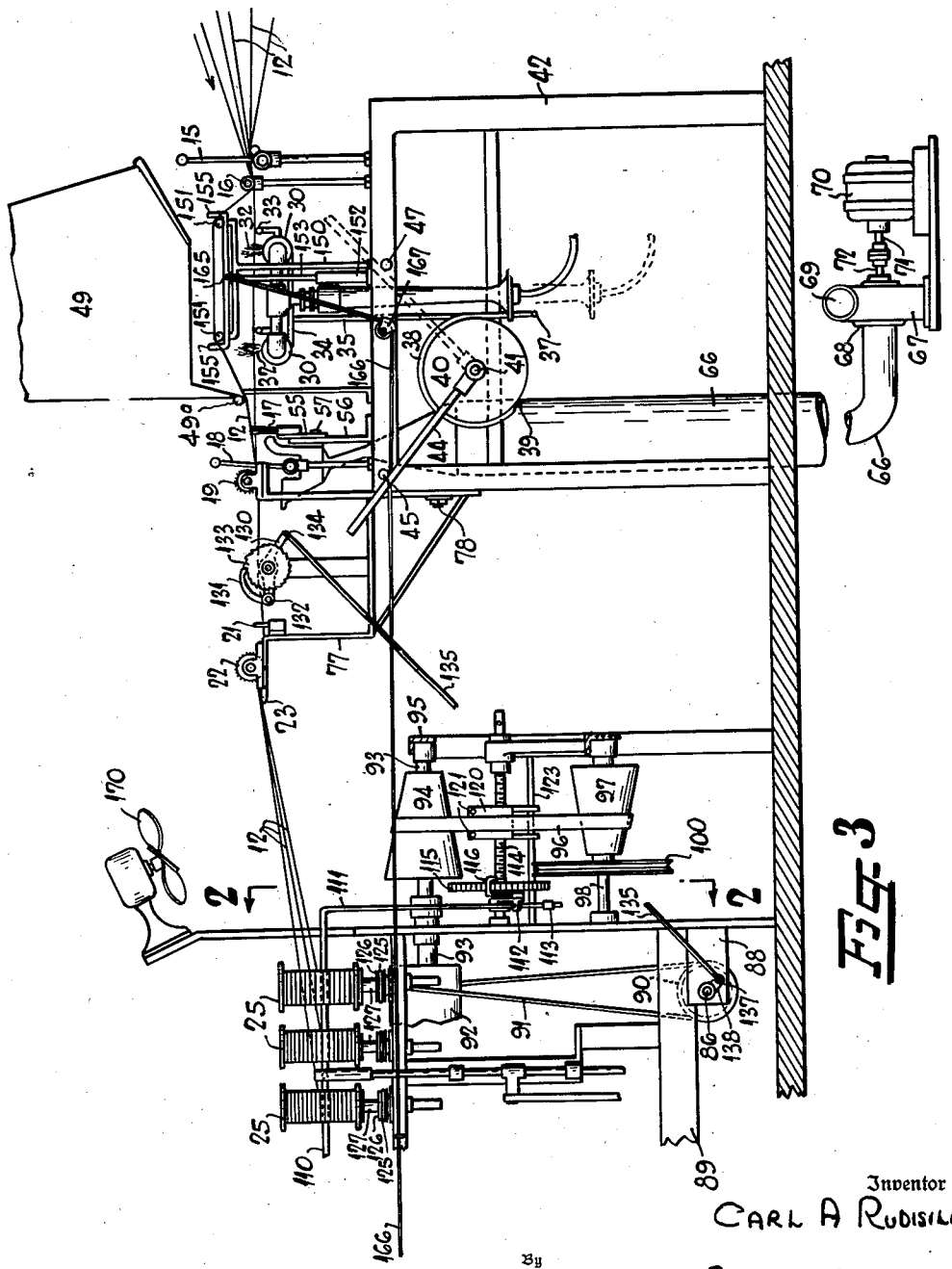


FIG. 3

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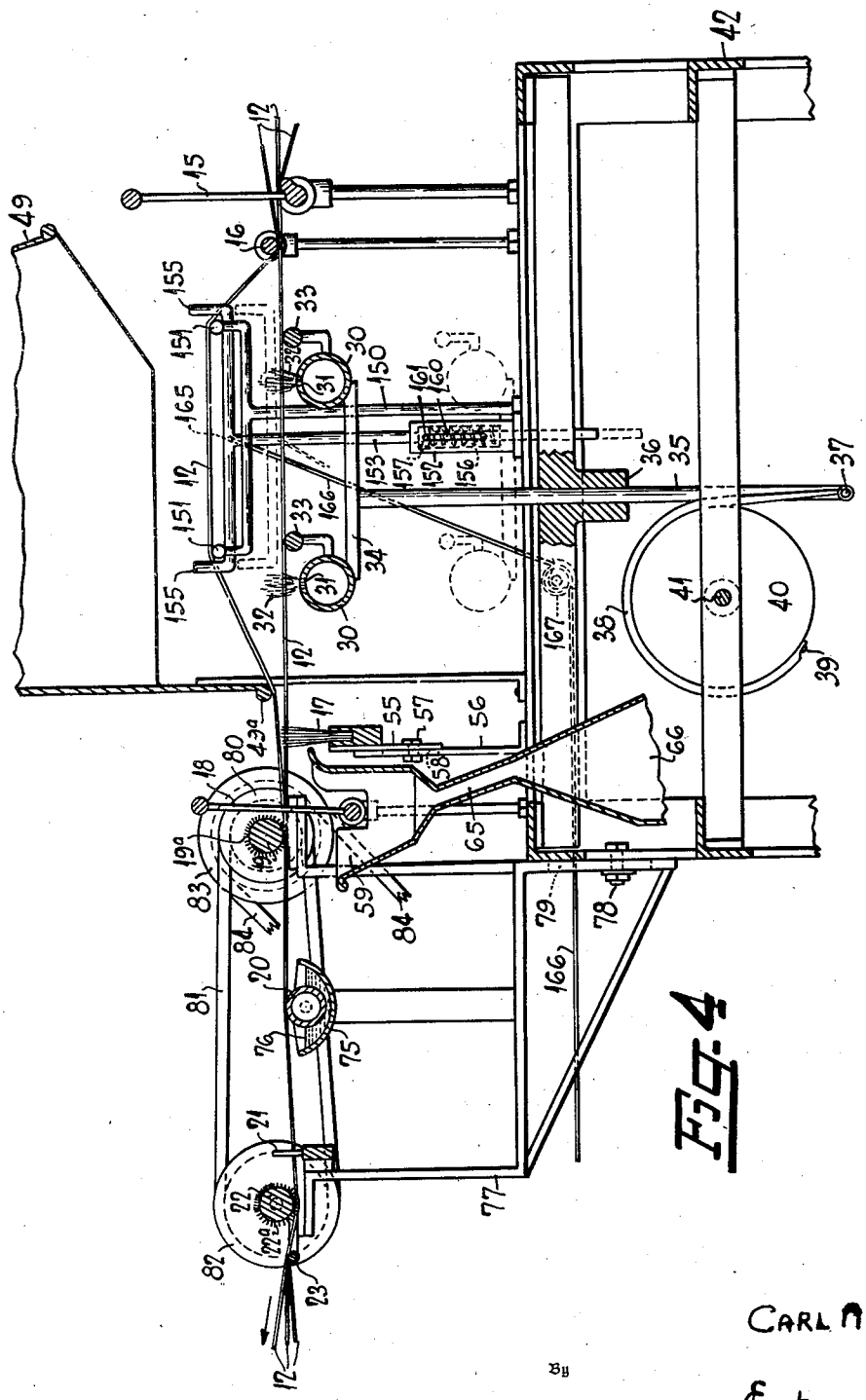


FIG. 4

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METHOD AND MEANS FOR TREATING YARN

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Application April 30, 1941, Serial No. 391,102

4 Claims. (Cl. 28—63)

This invention relates to the art of singeing and more particularly to a method and means for simultaneously singeing a plurality of yarn ends while passing from one set of packages to another set of packages.

Heretofore, it has been the practice to draw the ends from individual creel packages over a singeing flame. After singeing, each of the ends was usually wound upon a reel into a skein form. Since the heat created during the singeing operation caused the yarn to shrink, it was necessary to apply very little tension to the yarn; otherwise the skeins would be wound so tight upon the reels, that it would be impossible to remove them without damage to the yarn. After winding the yarn into skein form, it was then necessary to subject the same to another winding operation in order to place the yarn on spools.

It is an object of this invention to provide an apparatus wherein the ends are simultaneously drawn from individual creel packages, over a singeing flame, and then wound directly onto the individual spools. By employing this method, the yarn ends may be subjected to the desired tension while being singed because the shrinkage on the spool does not matter so much. This method also eliminates one of the above-named operations, namely the winding of the yarn ends from the skeins to the spools.

It is another object of this invention to provide a method of treating yarn which comprises the subjection of the individually tensioned ends to sufficient heat to singe the projecting fibers, then brushing the periphery of the singed ends to remove the charred fibers, and then subjecting the tensioned singed ends to a liquid bath, while hot, to thereby shrink the yarn and set the fibers.

It is a further object of this invention to provide a singeing apparatus of the class described having a novel device for tying in severed yarn ends without lowering the singeing flame or affecting the singeing of the other ends. This tying device comprises means for releasably holding the severed strands out of the path of the flame while the same are being threaded through the machine. After the strand or strands are properly threaded and tied in, they are then released and allowed to resume their proper position for travel through the flame.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

Figure 1 is a plan view of my improved apparatus for singeing yarn;

Figure 2 is a vertical sectional view taken along the line 2—2 in Figures 1 and 3;

Figure 3 is an elevation with certain portions shown in section, looking at the near side of Figure 1;

Figure 4 is an enlarged vertical sectional view taken along the line 4—4 in Figure 1.

Referring more particularly to the drawings, the numeral 10 denotes a suitable creel frame upon which a plurality of cones of yarn 11 are mounted. From each of the cones of yarn 11, a strand 12 is adapted to be drawn, said strand passing through a conventional tension device 14. From the tension device 14, each of the strands pass through a reed 15, beneath a rod 16, between the bristles of a brush 17, through a reed 18, beneath a roller 19, over a rod 23, through an eyelet 24 (Figure 1), and then onto a suitable spool 25.

At a point between the rod 16, and brush 17, a pair of burners 30 are mounted for vertical movement. Each of the burners has an opening 31 in the upper portion thereof, through which gas or other inflammable substance is adapted to pass. Upon passing through this opening, the substance is ignited thereby forming flames 32. When the burners 30 are elevated to the position shown in Figures 3 and 4, the flames are adapted to envelop the strands 12 as they travel therethrough, and singe the projecting fibers from their peripheries. Each of the burners 30 has a cross bar 33, associated therewith, said bars being adapted to support the strands 12 in spaced relation to the top of the burners during a singeing operation.

The burners 30 are connected together by any suitable means such as cross bars 34, and each cross bar has a downwardly extending rod 35, which rod is mounted for vertical slidable movement in bearings 36. The lower end of each of the rods 35 has connected thereto as at 37, a suitable cord or chain 38, the other end of said chain 38 being connected as at 39 to a disk-like member 40. The cord normally contacts the periphery of the disk 40, and therefore when the disk is rotated, the cord winds thereonto or unwinds therefrom to raise or lower the rod and the associated burners 30. Both of the disks 40 are mounted upon a transverse shaft 41, said shaft 41 being rotatably mounted in framework 42.

By observing Figures 1 and 3, it is seen that one end of shaft 41 has a handle 44 fixedly se-

cured thereon. The free end of the handle **44** is adapted to rotate from bold line position (Figures 1 and 3) to dotted line position. When the handle **44** is in bold line position, the burners are in elevated position, as shown, and therefore it is necessary to hold the handle in this position by means of a suitable pin **45**, which is removably inserted in the side of the framework **42**. In order to lower the burners the pin **45** is removed, and then gravity will cause the handle to rotate from bold line position, to dotted line position. When in dotted line position, the handle rests against a stationary pin **47** which likewise projects from the side of framework **42**.

In order to convey the smoke and soot from the flame **32**, a suitable chimney **49** is provided directly above the burners. The chimney **49** has horizontal rim **49***a* which extends across the travelling strands **12** and serves as a guide for these strands when they are lifted at the burners above the normal singeing position.

After the strands have been singed by the flames **32**, it is desirable to remove the charred fibers from the periphery of each strand, therefore, the brush **17** is provided. This brush **17** is supported by plate members **55**, which members overlap angle-shaped plate members **56** and are secured together by any suitable means such as bolts **57**. In order to provide for the necessary vertical adjustment of the brush **17**, the upstanding leg of members **56** have vertically disposed slots **58** cut therein (Figure 4).

The upper ends of the bristles in the brush **17** contact the peripheries of the strands **12** to loosen the charred fibers, after which the removed fibers fall into an opening **59**. The opening **59** is an enlarged bell shaped suction orifice on the end of an elongated nozzle **65**, said nozzle **65** being an integral part of pipe **66**. Pipe **66** is connected to the intake side of a fan **67** as at **68** (Figure 3). This fan has an exhaust outlet **69** and is driven by means of a suitable motor **70** through the medium of motor shaft **71** and fan shaft **72**.

The reed **18**, which is located directly over the opening **59**, serves to keep the strands in their proper position relative to the sides of the framework **42**. Also the roller **19** is employed for resting against the upper side of the strands **12** to thereby bring all of the strands to substantially the same elevation. This roller is preferably covered with a suitable fibrous material such as a pile fabric **19***a* so that the strands can sink into the pile fabric and thereby have the charred portions further loosened therefrom.

When the yarn strands pass through the flame, the heat removes practically all of the moisture supplied by the natural humidity of the mill, thereby reducing the tensile strength. Therefore, the strands **19** after having the charred portions removed from the peripheries are then passed over a suitable moisture applying roller **20**, said roller being preferably made of a hard metallic material. It will be noted by referring to Figure 4, that the strands **12** are raised slightly above their normal line of travel by the upper side of the roller **20**. In other words, a slight downward pressure is exerted by the strands while being drawn over the roller **20**, thereby causing these strands to be moistened and at the same time ironed by this pressure. The moisture for the roller **20** is supplied by a suitable trough member **75**, said member **75** having a solution **76** therein in which the lower portion of the roller **20** is adapted to rotate. Solution **76** is preferably composed of suitable soluble oils or a wetting out or penetrating agent mixed with water. Such a composition readily penetrates the strands, increases breaking strength and adds luster to the yarn. Also by having the ends **12** pass over the roller **20**, while they are still hot, the fibers are consolidated and the yarn is shrunk and cooled properly before being wound upon the spools **25**. The trough **75** is supported by suitable brackets, broadly designated by the reference characters **77**, said brackets being secured to the framework **42** by any suitable means such as bolts **78**. An adjustment is provided for the brackets **77** by cutting slots **79** in the brackets through which the bolts **78** are adapted to be inserted.

Driving means for rollers 19 and 22

The roller **19** has a pulley **80** on the end thereof, said pulley having a belt **81** mounted thereon. This belt is also mounted upon another pulley **82** on the end of roller **22**. The end of roller **19** also has a pulley **83** fixedly secured on this end alongside the roller **80**. Upon this pulley **83** another belt **84** is mounted. Belt **84** is also mounted upon a pulley **85** on one end of a shaft **86**, said shaft being disposed transversely of the travelling strands and being rotatably mounted in brackets **87** and **88** of a winder frame **89**. The intermediate portion of the shaft **86** has a pulley **90** fixedly secured thereon. Upon the pulley **90** a belt **91** is mounted and this belt **91** extends upwardly and around a cylinder **92**. The cylinder **92** has a restricted end portion **93** rotatably mounted in the winder frame **89**.

It is seen by referring to Figures 1 and 3 that the end portion **93** extends a substantial distance beyond the end of winder frame and has a cone pulley **94** mounted thereon. The extreme right hand end of the shaft **93** is rotatably mounted in a framework **95**, said framework **95** being secured to the end of the winder frame **89**. A belt **96** is mounted upon the cone pulley **94**, which belt extends downwardly and is also mounted upon a second cone pulley **97**. This cone pulley **97** is fixedly secured upon a shaft **98**, which shaft **98** has its ends rotatably mounted in framework **95**, and in the end of winder frame **89**. Shaft **98** has a pulley **100** fixed thereon, upon which a belt **101** (Figure 1) is mounted. The belt **101** is also mounted upon a pulley **102**, fixedly secured on shaft **103** of a motor **104**. Therefore, the rollers **19** and **22** are positively driven so that the pile peripheries **19***a* and **22***a* respectively, will contact the individual strands of the yarn. This driving means comprises members designated by the reference characters **80** to **104** inclusive.

The direction of rotation of the rollers **19** and **22** is preferably so that the contacting surfaces will be moving in the opposite direction to the normal movement of the yarn strands **12**. In other words, it is preferable that the rollers **19** and **22** rotate in a counter-clockwise manner in Figure 4, while the yarn strands **12** are moving from right to left in contact with the lower peripheries of these rollers. Since each of the rollers **19** and **22** have a nap or pile periphery, the yarn strands **12** will sink into these rollers and any projecting fibers which extend from the periphery of these ends will be smoothed and consolidated into the main portion of the strand.

Variable speed driving mechanism for spools 25

The eyelets **24** (Figures 1 and 2) are mounted on suitable traverse bars **110**. One of the traverse bars **110** has a downwardly extending link

111, the lower end of which slidably penetrates the intermediate portion of a lever 112. On the lower end of the link 111 and below the point of penetration of the lever 112, a suitable nut 113 is provided. The lever 112 also is mounted for oscillation around a shaft 114 which shaft 114 is substantially parallel to the shafts 93 and 98 previously described. Upon shaft 114 a suitable ratchet wheel 115 is fixedly secured, the teeth in said ratchet wheel being normally engaged by the free end of a suitable dog 116. This dog is pivoted as at 117 to the free end of lever 112. In order to normally limit the amount of counter-clockwise movement of the lever 112 (Figure 2), a suitable pin 118 is provided, said pin 118 extending outwardly from the end of winder frame 89.

During the winding operation, the traverse bars 110 are moved up and down in a well known manner to thereby distribute the yarn evenly upon the spools 25. As the diameter of the spool becomes larger it is necessary to reduce the rate of rotation of the spool so that the surface speed will be maintained substantially the same. Therefore, each time the traverse bar 24 moves upwardly the collar 113 will raise the lever 112 a small amount which, in turn, will rotate the ratchet wheel 115 and the shaft 114. The shaft 114 has a bracket 120 threadably secured thereabout and projecting from the bracket are a pair of guide pins 121 which extend on each side of the belt 96. Also the bracket 120 is adapted to slide along a suitable rod 123 which serves to hold the bracket in the proper position and prevent the same from rotating when the threaded rod 114 rotates. As the ratchet wheel 115 rotates, the belt 96 is shifted from right to left in Figure 3, thereby causing the same to rotate on a smaller circumference of cone 97 and upon a larger circumference on cone 94. This shifting will produce a corresponding reduction of the R. P. M.'s of the cylinder 92. The cylinder 92 is adapted to drive the spools 25 in unison through the medium of suitable belts 125, said belts extending around the cylinder 92 and also extending around suitable whorls 126 in spindles 127. The spools 25 are removably secured upon spindles 127 in a well known manner.

Driving means for moisture applying roll 20

It is necessary to rotate the roll 20 in its bath of fluid 76 in order that portions of the fluid may be applied to strands 12. It is seen by referring to Figures 1 and 3, that the restricted ends of the roll 20 are rotatably mounted in the ends of trough 75. One end of the roll 20 extends beyond the end of the trough and has loosely mounted thereon a lever 130, said lever having a dog 131 pivoted as at 132. Dog 131 has its free end normally engaging a suitable ratchet wheel 133. The ratchet wheel 133 is fixedly secured on the restricted end portion of the roll 20. The other end of the lever 130 has pivotally secured thereto as at 134, a link 135, and this link 135 extends downwardly and is pivoted as at 137 to a bell crank lever 138, which bell crank lever 138 is fixedly secured upon shaft 86, previously described. As the shaft 86 rotates, during the normal operation of the machine, the link 135 is reciprocated back and forth and this reciprocation will oscillate the lever 130, and also cause the dog 131 to advance the ratchet 133 and its associated roll 20 a predetermined amount for each oscillation. The direction of rotation of the roll 20 is such that the contacting surface of this roller with the yarn will be travelling opposite to the normal direction of travel of the yarn strands. In other words, the roll 20 travels in a clockwise manner beneath the strands 12, while these strands are passing from right to left in Figure 4. Such an action will serve to smooth and compress the moistened fibres in the strands after being singed. The roll contact is especially effective, due to the fact that the yarn is still hot when it passes thereover. Since the liquid will more readily penetrate the heated yarn, the pressure applied by the tensioned strands upon this roll will serve to more hastily cause penetration.

Tying in device for broken strands

It frequently occurs that one or more of the strands 12 become broken and severed, and therefore it is necessary to re-thread the same beneath and through the various members so that the strand can again be attached to its respective spool. It is evident that a certain minimum speed must be maintained while the strand is passing over the flame; otherwise all of the strands will be severed by the flame. When a strand becomes severed, it must be held out of contact with the flame while being threaded through the apparatus so as to prevent the flame from burning the same. In order to facilitate production, it is very desirable that means be provided for directing one or more severed strands out of the path of the flame so that the same can be rethreaded through the machine while the remaining strands continue to pass through the flame and be singed.

This means for holding the strand out of contact with the flame while it is being rethreaded is clearly illustrated in Figures 1, 3 and 4 of the drawings. It is here seen that on each side of the framework 42, a suitable Y-shaped bracket 150 is provided, said Y-shaped bracket having horizontally disposed bars 151 integral with the upper forked prongs. Also fixedly secured along each side of the framework 42 at a point in close proximity to the bracket 150 is another bracket 152. Within this bracket 152 a second Y-shaped bracket 153 is mounted for vertical sliding movement. It will be noted that the bracket 153 has prongs 155 integral with its upper end, which prongs normally extend a short distance above the horizontally disposed supporting bars 151. Disposed around the lower portion of bracket 153 and within the bracket 152 is a compression spring 156, which spring abuts a suitable collar 157 on the bracket 153. Spring 156 normally pushes the collar and the bracket upwardly to the position shown in the drawings. In order to prevent rotation of the bracket 152 within bracket 153 and to limit its upward movement, a suitable slot 160 is provided in the bracket 152. This slot is penetrated by pin 161 extending outwardly from the collar 157. In the position shown in Figure 4, the pin 161 is in the upper portion of the slot 160, and consequently the spring 156 has forced the prongs 155 up the maximum amount so that the upper ends thereof are disposed above bars 151. When rethreading a broken strand, through the machine, the strand must pass through reed 18, beneath roller 19, over roller 20, through reed 21 and beneath roller 22. When rethreading, that portion of the strand which is normally above the flames 32, is caused to rest on top of the horizontal bars 151 and on the outside of the projecting prongs 155. In other words, the strand is directed in a path

around the flames 32 to prevent the flame from severing the same prior to its being re-threaded. After the strand has been re-threaded and connected to its respective spool 25, the Y-shaped bracket 153 is lowered to dotted line position as shown in Figure 4 and at this time, the normal tension in the off-set strand will cause the same to move off the supporting bars 151 and back to its proper position relative to the other strands and over the flames 32.

Each of the brackets 153 has connected thereto as at 165, a suitable cord 166, said cord extending downwardly beneath a pulley 167 and then horizontally alongside the winder frame 89. Usually the operator, after having re-threaded a strand through the machine, is positioned adjacent one of the spools 25. In order to enable him to release the strand from the off-set position to allow it to move again over the flame; it is only necessary for him to pull the cord 166 and of course, this will lower the brackets 153 and associated prongs 155 to dotted line position thereby permitting the offset portion of the strand to resume its travel over the flames 32.

In order to provide an additional cooling for the strands 12 before the same are wound upon the spools 25, a suitable electric fan 170 is provided. This fan directs currents of air downwardly upon strands 12 after the same have been subjected to brushing and moistening operations.

In the drawings and specification there has been set forth a preferred embodiment of the invention and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being set forth in the following claims.

I claim:

1. In a singeing apparatus of the class described, the combination of means for singeing a plurality of strands of yarn at a time, and winding the strands into individual packages and means for releasably supporting any of said strands out of contact with said singeing means whereby a broken strand can be tied to its respective package without affecting the singeing operation of the other strands, said means for releasably supporting the strands comprising a pair of horizontally disposed rods disposed at each side of the apparatus and above the plane occupied by the singeing means, a pair of vertically movable rods projecting above the horizontally disposed rods, whereby a parted re-tied strand can be held away from the singeing means, and remotely controlled means for lowering the vertically movable rods below the horizontally disposed rods to allow the re-tied strand to assume its normal position relative to the singeing means.

2. In a singeing apparatus of the class described, the combination of means for supporting a plurality of packages of yarn, a burner, means for drawing said yarn from said packages into close proximity to said burner whereby the projecting fibers will be singed, and means for releasably supporting any of said strands in a remote position from said burner whereby a broken end can be tied to the drawing means without affecting the singeing operation of the other strands, said means for releasably supporting the strands comprising a pair of horizontally disposed rods disposed at each side of the apparatus and above the plane occupied by the singeing means, a pair of vertically movable rods projecting above the horizontally disposed rods, whereby a parted re-tied strand can be held away from the singeing means, and remotely controlled means for lowering the vertically movable rods to allow the re-tied strand to assume its normal position relative to the singeing means.

3. In a singeing apparatus of the class described, the combination of means for singeing a plurality of strands of yarn at a time, means for engaging the periphery of the singed strand to remove the charred fibers therefrom, means for winding the strands into individual packages, and means for releasably supporting any of said strands out of contact with said singeing means whereby a broken strand can be tied to its respective package without affecting the singeing operation of the other strands, said means for releasably supporting the strands comprising a pair of horizontally disposed rods disposed at each side of the apparatus and above the plane occupied by the singeing means, a pair of vertically movable rods projecting above the horizontally disposed rods, whereby a parted re-tied strand can be held away from the singeing means, and remotely controlled means for lowering the vertically movable rods to allow the re-tied strand to assume its normal position relative to the singeing means.

4. In a singeing apparatus of the class described, the combination of means for supporting a plurality of packages of yarn, a burner, means for drawing said strands of yarn from said packages into close proximity with said burner whereby the projecting fibers will be singed, means for engaging the periphery of the singed tensioned strands to remove the charred fibers therefrom, and means fore releasably supporting any of said strands in a remote position from said burner whereby a broken end can be tied to the drawing means without affecting the singeing operation of the other strands, said means for releasably supporting the strands comprising a pair of horizontally disposed rods disposed at each side of the apparatus and above the plane occupied by the singeing means, a pair of vertically movable rods projecting above the horizontally disposed rods, whereby a parted re-tied strand can be held away from the singeing means, and remotely controlled means for lowering the vertically movable rods to allow the re-tied strand to assume its normal position relative to the singeing means.

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