

Dec. 12, 1944.

O. D. GRIMES, SR
CORD STRETCH ELIMINATOR

2,365,069

Filed May 13, 1943

6 Sheets-Sheet 1

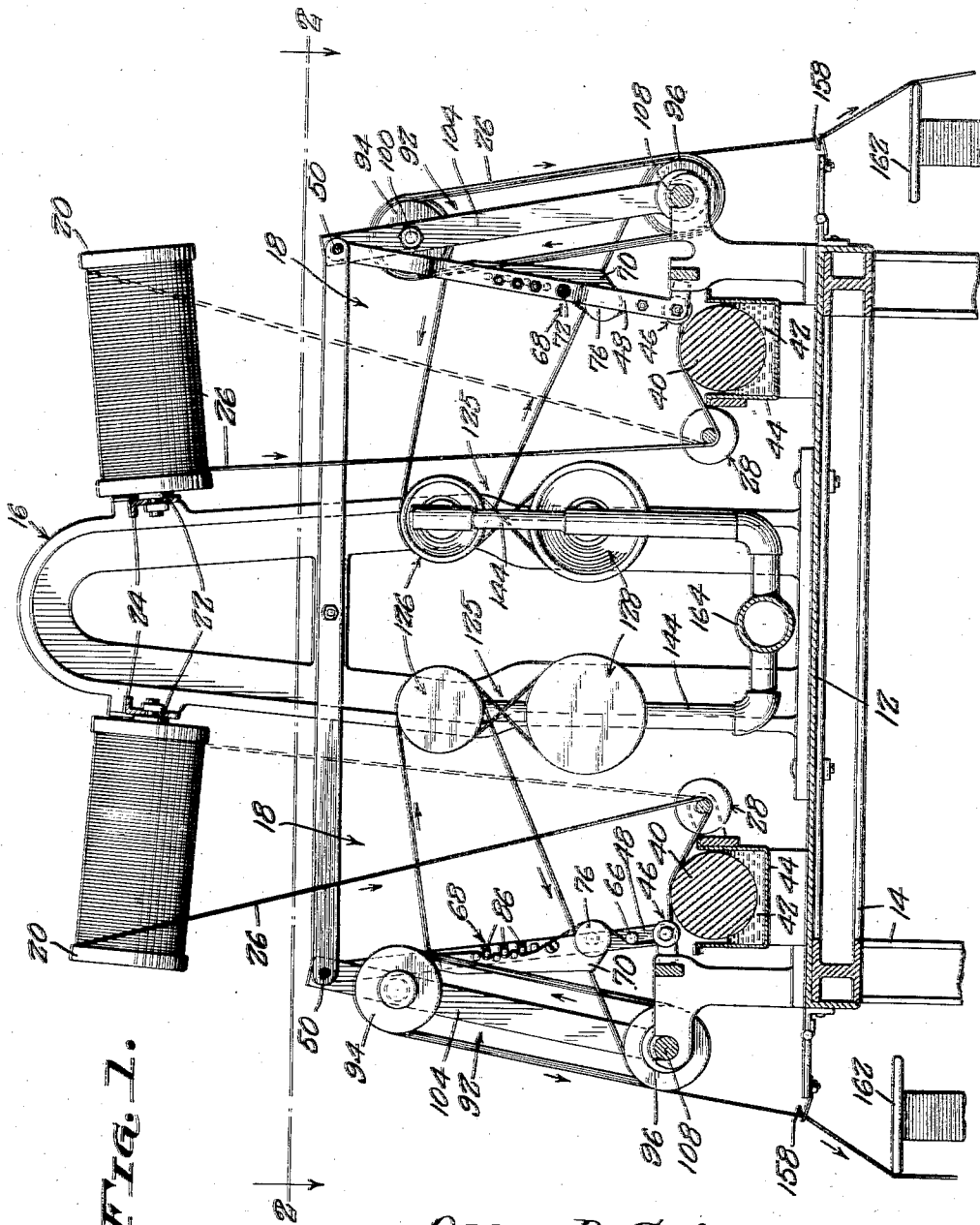


Fig. 1.

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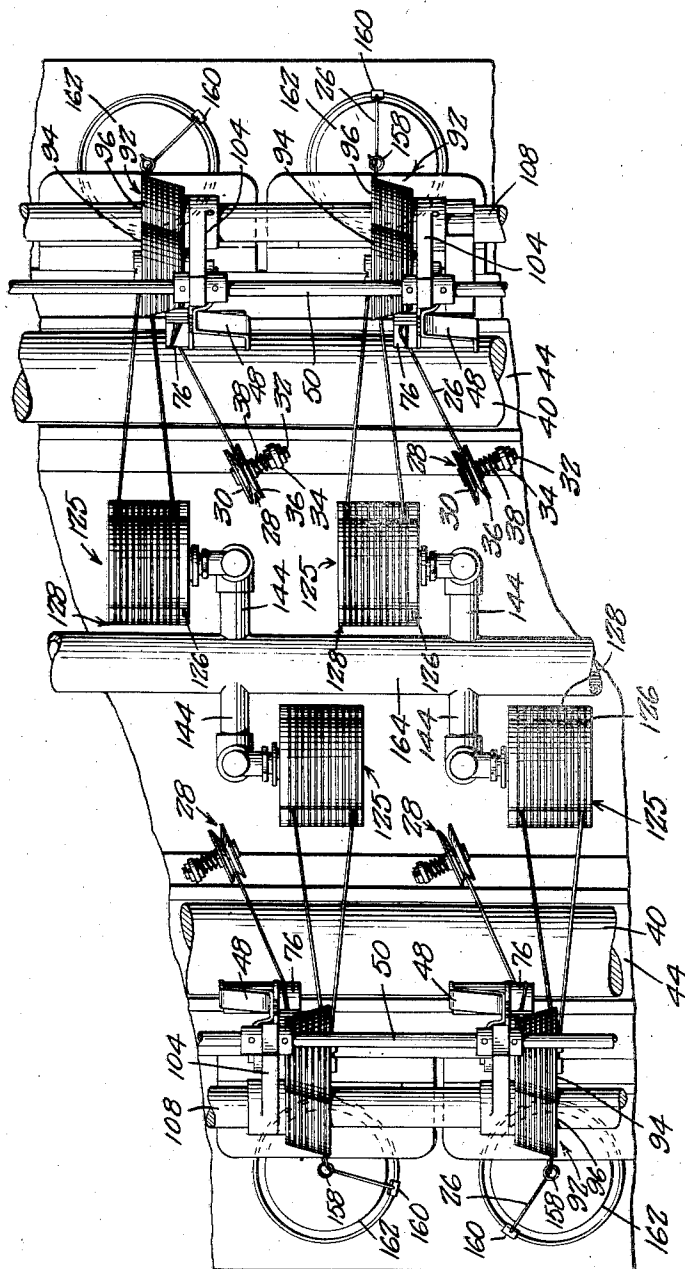
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FIG. 3.

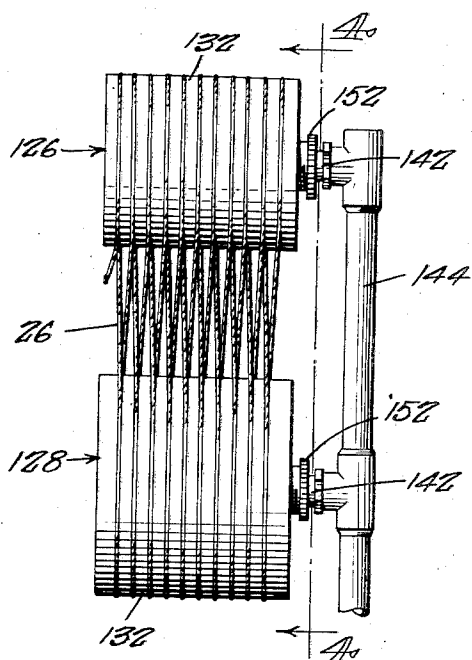


FIG. 4.

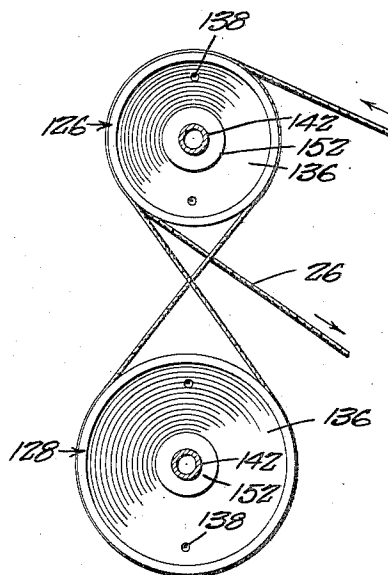
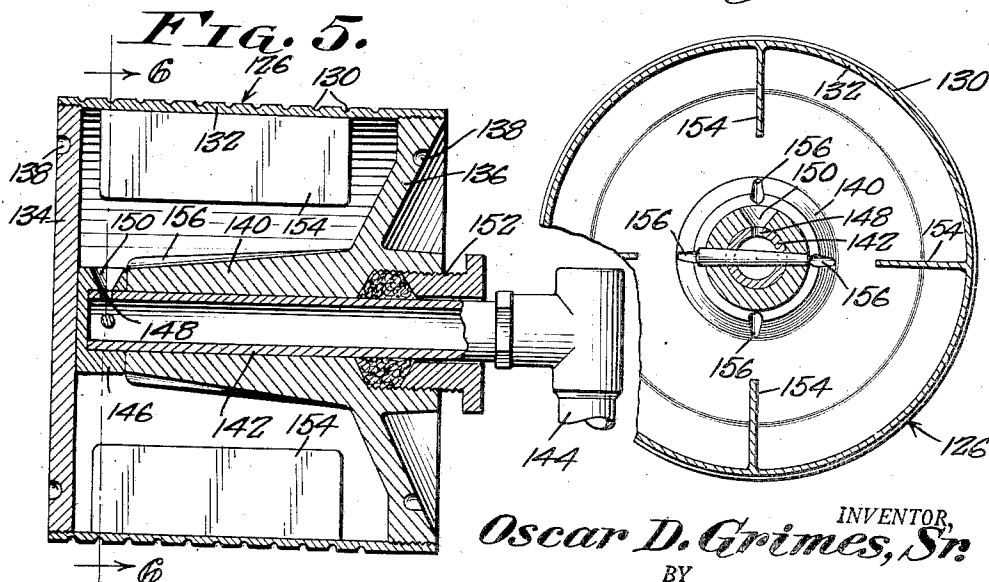


FIG. 6.



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FIG. 7.

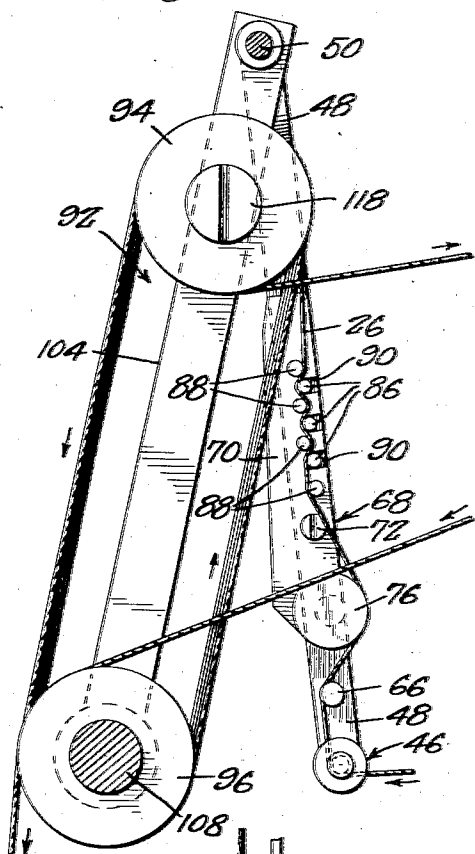


FIG. 8.

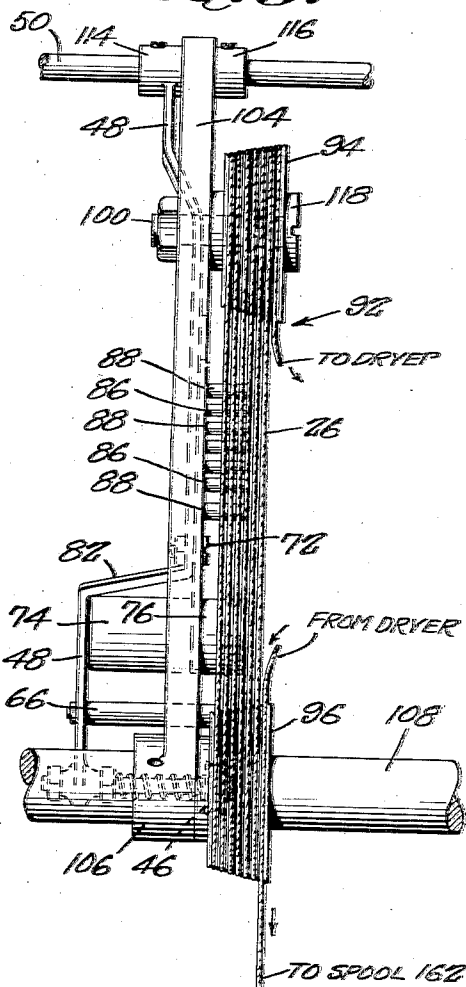
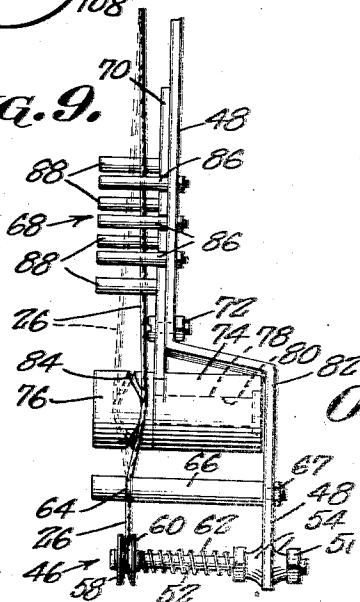


FIG. 9.



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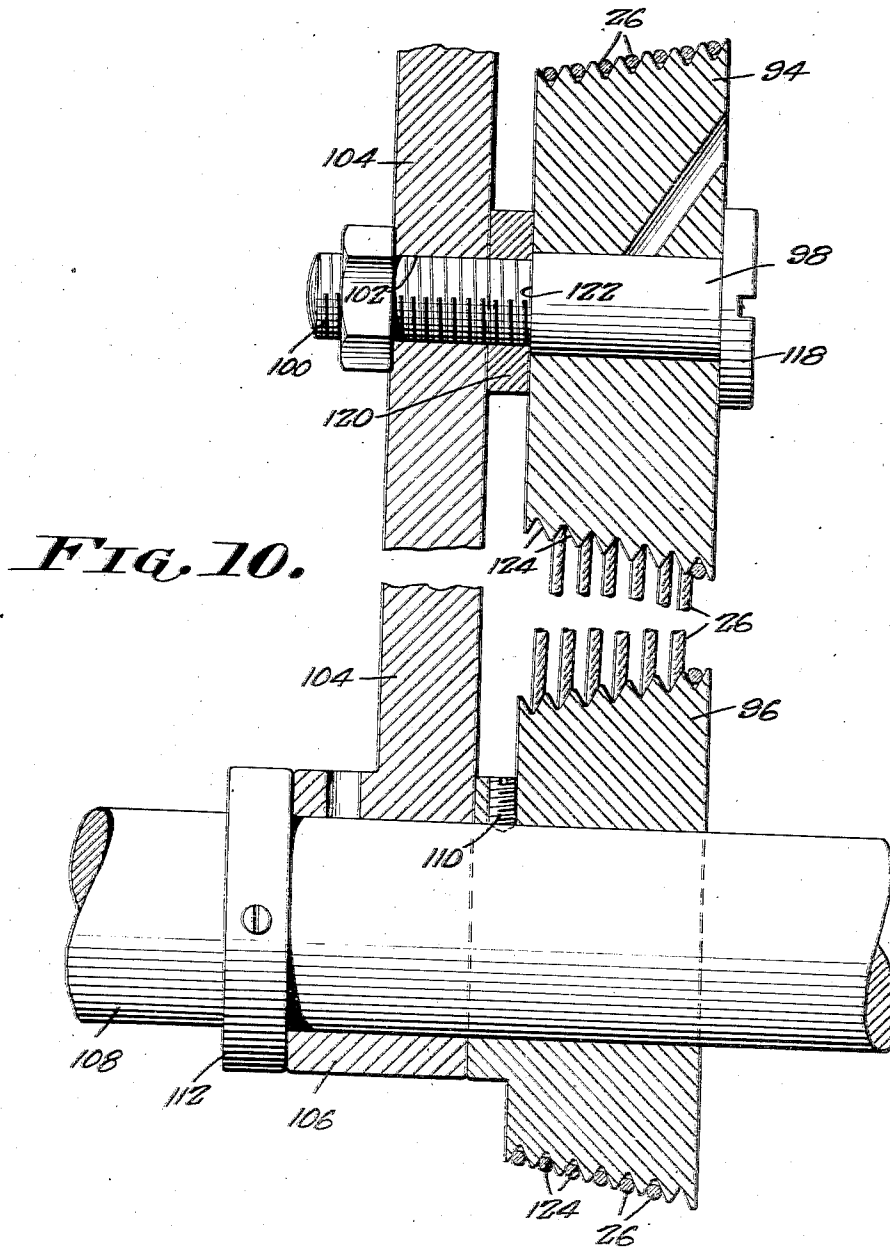
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Fig. 11.

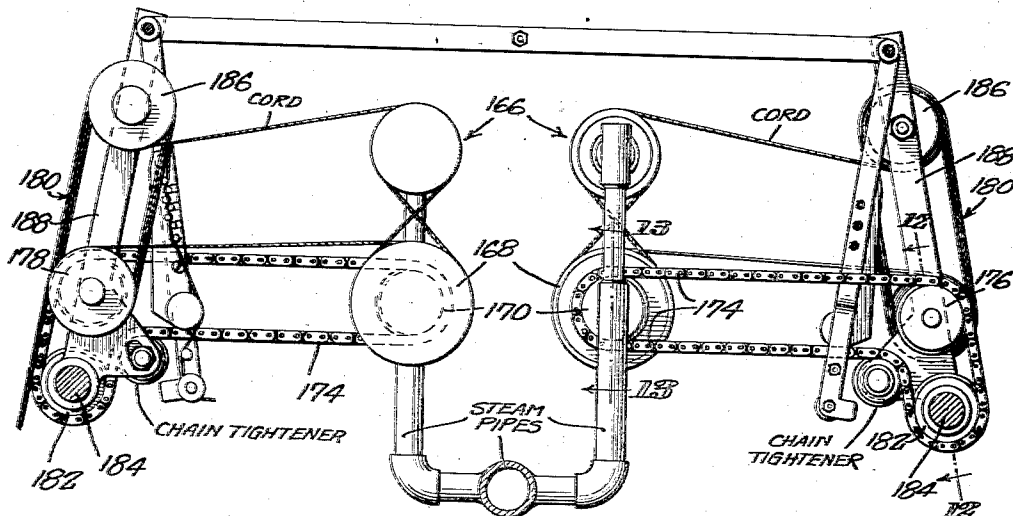


Fig. 12.

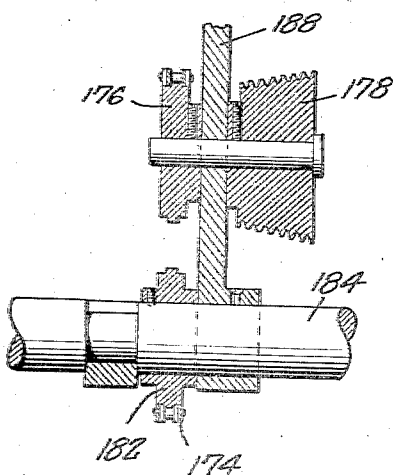
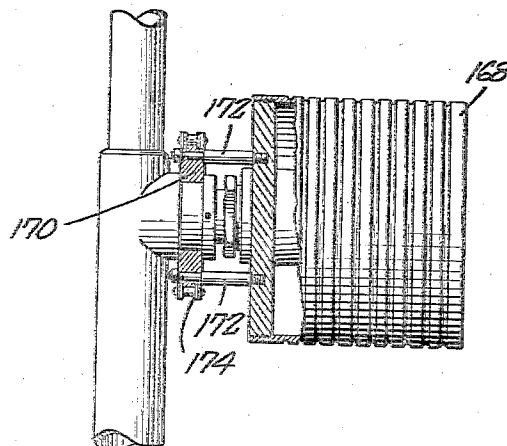


Fig. 13.



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UNITED STATES PATENT OFFICE

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CORD STRETCH ELIMINATOR

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Application May 13, 1943, Serial No. 486,896

4 Claims. (Cl. 28—59.5)

My invention relates to the manufacture of thread material known in the trade as yarn or cord, particularly with respect to such material as is used in the construction of automotive vehicle tires, V-belts and the like, wherein the material is devoid of stretch within predetermined limits, and has among its objects and advantages the provision of an improved method of and means for eliminating stretch within predetermined limits.

In the manufacture of cord of this type, it is common practice to stretch the cord in a wet condition and ship the wet cord to the trade. Prolonged dampness results in mold and deterioration of the cord, in addition to increasing its weight and transportation costs.

Accordingly an object of my invention is to provide a novel machine which is so designed as to wet, stretch and dry the cord in a continuous and single operation.

A further object is to provide a machine of the type described wherein the cord to be stretched is taken from a dry supply, in which novel means are provided for wetting the cord and then stretching the cord in a series of stages to eliminate excess stretch within predetermined limits, and in which means are provided for drying the cord as it comes from the stretching mechanism to be wound on a suitable holder, at which time it is ready for distribution to the trade, or further processing.

In the accompanying drawings:

Figure 1 is an end elevational view partly in section of a machine in accordance with my invention.

Figure 2 is a view taken from the position indicated by line 2—2 of Figure 1.

Figure 3 is a face view of a drying unit.

Figure 4 is a view taken from the position indicated by line 4—4 of Figure 3.

Figure 5 is a longitudinal sectional view of one drum of the drying unit of Figure 3.

Figure 6 is a sectional view taken along the line 6—6 of Figure 5.

Figure 7 is an end view of a stretching unit and tensioning mechanism.

Figure 8 is a face view of the structure of Figure 7.

Figure 9 is a view of the stretching mechanism apart from the stretching unit.

Figure 10 is an enlarged sectional detail view of the stretching unit.

Figure 11 illustrates a chain driven cord drier.

Figure 12 is a sectional view along the line 12—12 of Figure 11, and

Figure 13 is a view taken from the position indicated by line 13—13 of Figure 11.

In the embodiment of the invention selected for illustration, Figure 1 illustrates a table or floor 12 mounted on a frame structure 14. This table may extend the full length or width of the factory. Upon the table 12 is mounted a series of upright supporting frames, one of which is illustrated at 16 in Figure 1. These frames are spaced at suitable intervals longitudinally of the table 12, but each frame assembly and its associated mechanism is independent of the other assemblies, except insofar as the frames may coact for bracing purposes.

In the arrangement of Figure 1, two wetting, stretching and drying devices 18 are associated with the frame 16. These devices are located on opposite sides of the frame 16 and are identical in construction and operation, so that the description of one will apply to both. Similar reference characters are applied to corresponding parts in the two devices. The arrangement shown is one wherein the devices may be closely nested for space saving purposes.

A spool 20 is rotatably mounted on a pin 22 bolted to a horizontal angle 24 attached to the frame 16. This spool contains a dry supply of plied cord 26 to be stretched. The cord taken from a supply such as the spool 20, or a cone (not shown), extends downwardly and passes through a tensioning device 28. In Figure 2, the device 28 may comprise a dished plate 30 fixed to a horizontal shaft 32 mounted on a support 34. A second dished plate 36 is slidably mounted on the shaft 32 and is yieldingly pressed in the direction of a plate 30 by a compression spring 38. The two plates 30 and 36 are bellied in the direction of each other and the cord 26 is frictionally clamped between the two plates, the resistance being predetermined.

The cord 26 passes from the tensioning unit 28 in contact with a driven roller 40 for wetting the cord. This roller lies horizontally and may extend the full length of the table 12. The roller 40 is partially submerged in water or other wetting liquid 42 contained in a trough 44. From the roller 40 the cord 26 passes through a tensioning unit 46 mounted on the lower end of a bar or bracket 48 suspended from a horizontally positioned supporting shaft 50, but is fixedly connected with this shaft.

In Figure 9, the tensioning unit 46 comprises a horizontal shaft 52 threaded into a boss 54 at the lower end of the bracket 48, which shaft is secured against accidental rotation through the

medium of a lock nut 56. Upon the shaft 52 is mounted a dished plate 58 which is restrained from axial movement on the shaft. A second dished plate 60 is mounted on the shaft 52 and may move axially thereon. A compression spring 62 is interposed between the boss 54 and the plate 60 to press the latter in the direction of the plate 58, the cord 26 passing between the two plates, and the plates are belled in the direction of each other.

From the tensioning unit 46 the cord 26 is guided in a groove 64 in a guide pin 66 bolted at 67 to the bracket 48. From the pin 66, the cord 26 passes through a primary tensioning mechanism 68.

The primary tensioning mechanism 68 comprises a bar 70 lying flatwise against the bracket 48 and pivotally connected therewith at 72. A boss 74 is attached to the lower end of the bar 70 for rotatably supporting a cord oscillating roller 76. This roller is provided with a shaft 78 rotatably supported in a bore 80 in the boss 74. While the boss 74 projects laterally from the bar 70 in the direction of the bracket 48, the latter is offset at 82 to provide accommodation for the boss, so that the bar 70 may pivot freely about its axis 72 and relatively to the bracket 48.

The roller 76 is provided with a sinuous groove 84 extending circumferentially of the roller and in which the cord 26 is guided. Thus the cord 26 is caused to oscillate within the full and dotted line limits shown in Figure 9. A series of tensioning pins 86 is attached to the bracket 48 in a straight line, as shown in Figure 7. Similar pins 88 are fixed to the bar 70, this bar being notched at 90 to provide clearance for the pins 86. The greater part of the pins 88 are arranged in a straight line, and the pins 86 and 88 are arranged in alternate relationship, so that the cord 26 is caused to take a sinuous contour as it passes between the two sets of pins.

While the bar 70 pivots freely on the bracket 48, the bar 70 is of considerably greater weight beneath its pivotal axis 72, so that the bar will tend to maintain a vertical position automatically. The roller 76 is of considerable diameter with respect to the pins 86 or 88, and the cord 26 is bowed in a considerable degree as it passes around the roller 76. The pins 86 and 88 are located on opposite sides of the cord 26, so that any clockwise movement of the bar 70 when viewing Figure 7, in response to any straightening tendency of the cord bow passing around the roller 76 is resisted by reason of the opposing relationship of the pins 86 and 88 on the cord. Thus the cord pressure effective on the roller 76 maintains a predetermined pressure on the cord as it passes between the pins 86 and 88 to maintain a predetermined tension on the cord as it leaves the tensioning mechanism 68. The oscillating movement of the cord 26 shifts the cord relatively to the pins 86 and 88 so as to distribute the wear thereon.

The pins 86 and 88 are arranged in parallelism with respect to each other, as well as with respect to the pin 66 and the axis of the roller 76.

The cord 26 enters a stretching unit 92 as it leaves the tensioning mechanism 68. This stretching unit comprises tapered rollers 94 and 96. The roller 94 is rotatably mounted on a shaft 98 having a bolt 100 threaded through an opening 102 in a link 104 having its upper end mounted on the shaft 50 and its lower end provided with a bearing 106 mounted on a drive shaft 108 to which the roller 96 is keyed, as at 110. The

shaft 108 is rotatably supported in bearings mounted on the table 12, as indicated in Figure 1. This shaft is also restrained from longitudinal movement, and the bearing 106 is confined between the roller 96 and a collar 112 fixed to the drive shaft. The upper end of the link 104 is restrained from movement longitudinally of the shaft 50 by reason of its confinement between a collar 114 fixed to the bracket 48 and to the shaft 50 and a collar 116 arranged on the opposite side of the link and fixed to the shaft 50.

The roller 94 rotates freely on the shaft 98, and this shaft is provided with a head 118 which restrains the roller from relative axial movement in one direction, the other end of the roller lying against a washer 120 mounted on the bolt 100 and abutting the annular shoulder 122 on the shaft 98. Thus the shaft 98 may be fixedly related to the link 104 and at the same time permitting free rotation of the roller 94.

Both rollers 94 and 96 are provided with V-grooves 124. The grooves are the same in number, and the grooves in one roller lie in planes common to the respective grooves in the other roller. Both rollers are tapered in the same direction, and the cord 26 passes first around the pulley 94 and in the first groove 124 at the small end of the roller. The cord then passes about the roller 96 in the first groove in its small end, after which the cord is wound about the roller 94 in the second groove. The grooves 124 in the two rollers 94 and 96 are of progressively larger diameters, and the cord 26 is wound in all the grooves in the roller 94 and all but one groove in the roller 96. From the roller 94 the cord passes to a drier 125.

The cord 26 is frictionally gripped by the side walls of the grooves 124 so that the cord runs engaging the pulleys are restrained from slippage. The cord enters the stretching unit in a wet condition, and each straight run of the cord between the rollers 94 and 96 is successively stretched an additional amount as the cord passes through the stretching unit. Thus the cord is stretched in a series of stages and in predetermined amounts, depending upon the degree of roller taper and number of coils of cord wound about the two rollers. Since the cord is restrained from slippage when riding in the grooves 124, the cord is stretched in gentle amounts and in a series of stages which permit effective stretching of the cord to eliminate stretch in a predetermined degree. The cord is maintained under a predetermined amount of tension as it leaves the stretching mechanism 68, so that the cord enters the stretching unit 92 under predetermined tension.

The drier 125 comprises two drums 126 and 128. The cord extends from the roller 94 to the drum 126 and is then successively wound on the drums 126 and 128 in the crossed manner illustrated in Figures 3 and 4. Both drums 126 and 128 are provided with circumferential grooves 130 for guiding the cord. The grooves 130 need not be V-shaped in the manner of the grooves 124, but the two drums 126 and 128 are steam heated to thoroughly dry the cord in its passage about the two drums. The two drums are of identical construction so that the description of one will apply to both.

In Figures 5 and 6, the drum 126 comprises a tubular shell 132 within which are threaded two end plates 134 and 136. These plates are recessed at 138 so that a spanner wrench may be employed. The plate 136 is provided with a

tubular bearing 140 which is arranged coaxially of the shell 132 and is rotatably mounted on a steam branch pipe 142 communicating with a main steam pipe 144.

A collar 146 is secured to the inner end of the pipe 142, and this pipe and the collar are provided with a common opening 148 which is of funnel contour, as at 150. The collar 146 is located between the bearing 140 and the end plate 134 to restrain the drum 126 from relative axial movement on the pipe 142. A stuffing box 152 is provided on the plate 136 for the pipe 142. The drums are effectively heated so as to eliminate all moisture from the cord.

In Figures 5 and 6 radial flanges 154 are attached to the inner face of the shell 132 to function as collectors for condensate. Longitudinal grooves 156 are provided in the bearing 140, this bearing having an external taper in the direction of the collar 146. Liquid is therefore caused to flow into the funnel shaped opening 150 and then to the steam pipes.

The dried cord leaves the drum 126 and passes about the roller 96 and in the groove at the largest end of the roller. The cord then passes through an eye 158 and then to a conventional traveler or guide 160 to be wound on a spool 162, or other suitable package for distribution to the trade.

In Figures 1 and 2, the pipes 144 connect with a large steam supply pipe 164 extending longitudinally of the table 12 for supplying heat to all the driers.

In Figure 11, the drier units 166 are generally identical with the driers 125, with the exception that the lowermost drums 168 have sprockets 170 attached thereto by bolts 172. Chains 174 pass around the respective sprockets 170 and about sprockets 176 keyed to the lowermost rollers 178 of the stretching units 180, the latter corresponding to the stretching units 92. The chains 174 pass around sprockets 182 attached to a shaft 184 corresponding to the shaft 108. In Figures 11 and 12, the lowermost rollers 178, as well as the top rollers 186 are rotatably mounted on the arms 188 corresponding to the arms 104. Thus both the drier units and the stretching units in each gang are positively driven.

In the specification and the claims, the word "cord" means single yarn, plied yarn, or cord.

Without further elaboration, the foregoing will so fully explain my invention, that others may, by applying current knowledge, readily adapt the same for use under various conditions of service.

I claim:

1. A machine for reducing cord stretch within predetermined limits comprising a rotative cord wetter, means for tensioning the cord in advance of said wetter, a stretcher for the wet cord, tensioning means for the wet cord interposed be-

tween the stretcher and the wetter, said stretcher comprising two grooved rollers of tapered contour and arranged for rotation about parallel axes, said cord being wound about the two rollers progressively from their smaller ends to their larger ends, said cord being frictionally engaged by the walls of said grooves to eliminate slippage of the cord relatively to the rollers, steam heated rotary drums for drying the stretched cord, said drums having grooves for the reception of the cord and said cord being cross wound on the two drums and having its convolutions separated one from the other by the grooves in the drums, and means for removing condensate from the drums.

2. A machine for reducing cord stretch within predetermined limits comprising a pair of cord tensioning devices, a cord wetting device located between the two cord tensioning devices and the cord following a path from one tensioning device to the other through the wetting device, a stretching device receiving the cord after it has been tensioned and formed with grooves designed to frictionally engage the cord to prevent slipping and maintain tension, the stretching device comprising tapered rollers with their tapers extending in the same direction and the cord following the grooves from the small to the large end of the rollers, and heated grooved drums to which the cord passes from the stretching rollers, the cord being cross wound on the drums and having its convolution separated by the grooves therein.

3. A machine for reducing cord stretch within predetermined limits comprising a plurality of cord tensioning devices, a rotary cord wetting device located between certain of the cord tensioning devices and the cord following a path through the tensioning devices and the wetting device, certain of the tensioning devices including spring pressed dished plates, and the remaining tensioning device including staggered pens between which the cord passes on a sinuous path, a stretching device receiving the cord after it has been tensioned, said stretching device including similarly formed tapered rollers positioned with their smaller ends in the same direction and having grooves over which the cord is trained to follow the grooves from the small ends to the large ends of the rollers, and heated grooved drums to which the cord passes from the stretching rollers, the cord being cross wound on the drums and having its convolutions separated by the grooves therein.

4. The invention as defined in claim 2 wherein there is a rewind spool, and the cord passes from the heated drums back to the grooved stretching spools before passing to the rewind spool, and wherein a guiding device is provided for the cord from the stretching spools to the rewind spool.

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