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R. E. SOLLIDAY ET AL
CORD PROCESSING APPARATUS

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2 Sheets-Sheet 1

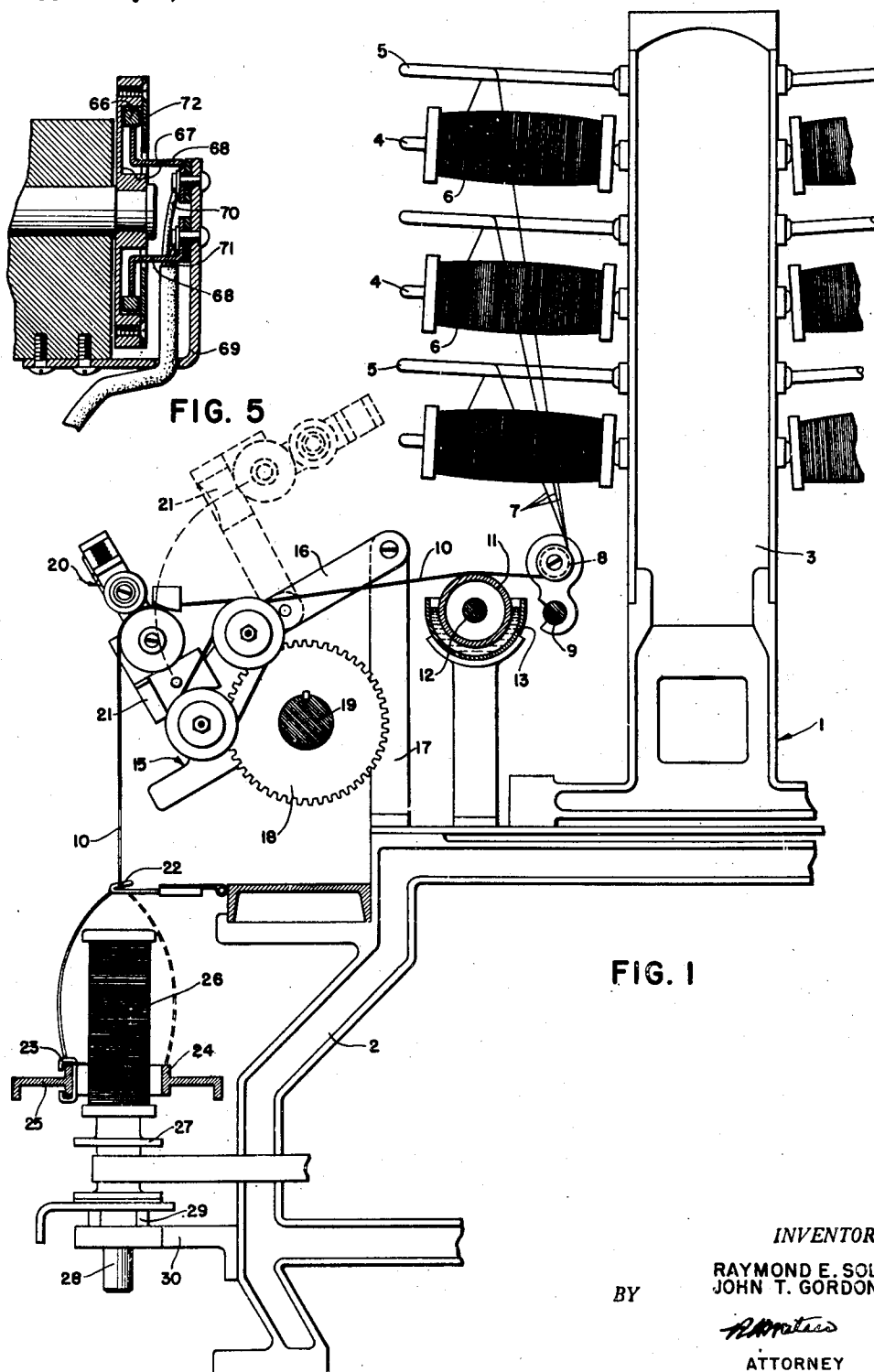


FIG. 1

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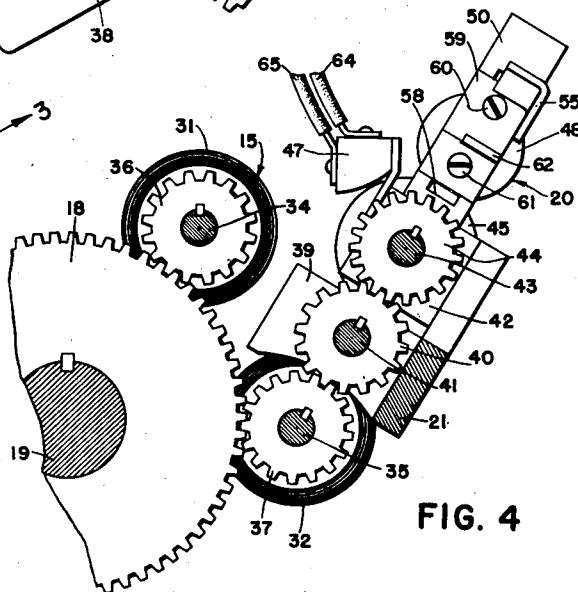
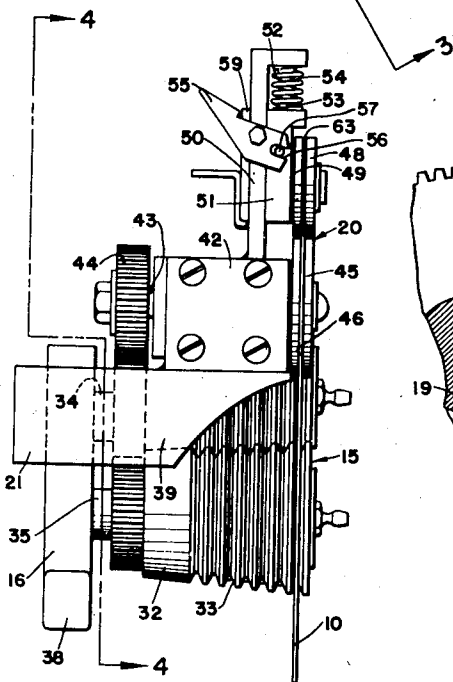
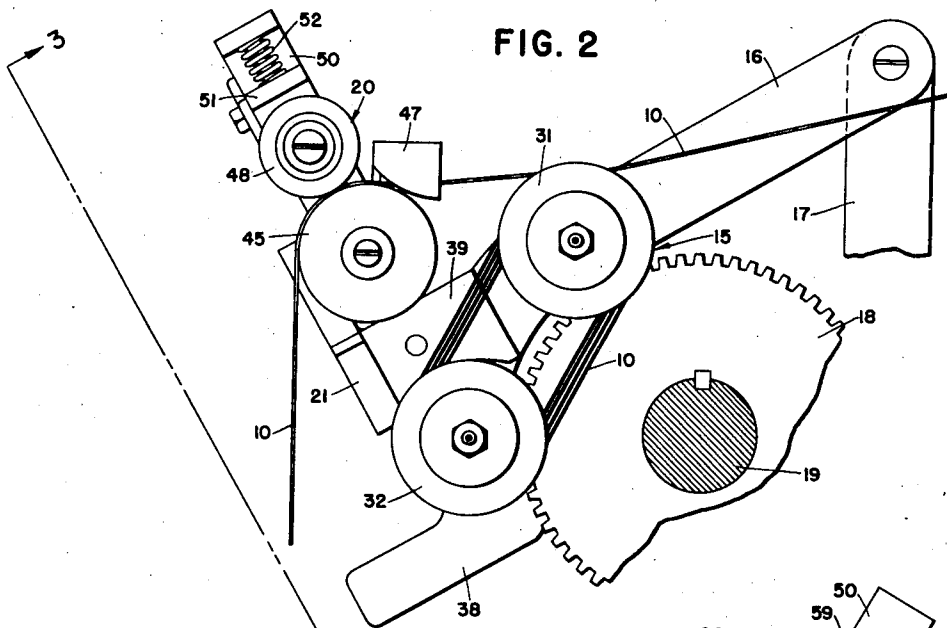
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CORD PROCESSING APPARATUS

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The present invention relates to an improved means for use in the manufacture of doubled and twisted thread, yarn, cord, and the like. More particularly, the invention is concerned with a device which, when employed in combination with conventional forms of stretching devices in thread doubling and twisting apparatus, serves to introduce a twist evening and burnishing effect in the finished twisted thread which insures a product of uniform gauge and tensile strength having a smooth surface free from projecting fibers.

One of the important objects of the present invention is to provide a means for producing a high quality thread characterized by a uniform gauge and tensile strength.

It is another object of the present invention to provide a form of attachment which may be readily applied to conventional forms of stretching apparatus employed in combination with a doubling and twisting machine for manufacturing thread, cord, and the like characterized by a smooth finish.

It is a further object of the present invention to provide a device for producing a smoothing effect upon a doubled thread, after it has been stretched and preferably prior to the twisting operation, so as to facilitate the drawing in of all of the loose fibers present in the component elements of the thread.

A still further object of the present invention is to provide a means for burnishing the outer surface of a thread, cord, and the like either with or without the application of heat so as to produce a smooth product characterized by a high, uniform tensile and embodying all of the desirable features of reinforcing elements for vulcanized rubber products such, for example, as pneumatic tires and the like.

Other objects and advantages of the present invention will become apparent as the following description of one form of the apparatus illustrated in the accompanying drawings proceeds.

In the drawings, Figure 1 represents a partial end elevation of a typical form of doubler-twister apparatus with which the device of the present invention is particularly advantageously adapted to be employed. Figure 2 is an enlarged elevation with parts removed and broken away illustrating a typical device embodying the teachings of the present invention. Figure 3 is a view of the attachment illustrated in Figure 2 as seen from the line 3—3 therein. Figure 4 is a partial sectional elevation of the apparatus of Figure 3 as seen from the line 4—4. Figure 5 is a fragmen-

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tary cross-sectional view illustrating another modification of the present invention.

In Figure 1 of the drawings, the reference numeral 1 identifies a conventional form of doubler-twister apparatus employed in the manufacture of thread, cord, and the like from a plurality of individual threads. In the course of this operation, the individual threads are plied together and twisted into a single thread or cord. The doubler-twister apparatus 1 embodies, among other things, a frame 2 which carries a spindle support 3 thereon. The spindle support 3 is provided with a plurality of spindles 4 and guide bars 5 which are arranged in substantially vertical rows and disposed in spaced mutually parallel relation to each other so as to extend in a substantially horizontal direction from the spindle support 3.

Each of the spindles 4 carries a supply spool 6 which provides an individual thread end for incorporation into a finished, doubled, and twisted cord. The threads 7 from each of the several supply spools 6 are directed to a combining guide 8, one of which is provided for each series of supply spools 6 and adjustably mounted upon a longitudinally extending rod 9, supported in any suitable fashion from the frame 2 of the machine. Each series of threads 7 is combined by the guide 8 into a composite strand or cord 10 which is thereafter subjected to any one of several different processing treatments and finally twisted into a finished cord.

In accordance with conventional procedure in the manufacture of a composite cord, the cord 10 is passed over a freely rotatably mounted roller 11 which is supported by a longitudinally extending shaft 12 in such a way as to enable it to dip into a tank 13 of suitable processing liquor. It will be readily understood that the treating liquor may take the form of certain adhesive materials or lubricating liquids which facilitate the twisting together of the individual threads into the finished cord and secure the protruding fibers in place. Such treatments, when applied to the thread, may serve any of a number of different purposes, but that applied to cord 10 is chiefly intended to aid in promoting a smoothing effect upon the surface of the cord as well as an enhanced tensile strength in the finished cord.

The cord processing apparatus of the present invention is so disposed on the frame 2 that it will receive the cord 10 on the stretching mechanism 15 thereof after it has passed over the roller 11. The stretching mechanism 15 is advantageously mounted upon a swingably mounted arm 16 secured to the frame 2 of the doubler-twister appa-

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ratus 1 as by means of a stationary support 17. The stretching mechanism 15 is adapted to be actuated by a drive gear 18 mounted upon and keyed to a longitudinally extending drive shaft 19 which may be driven by means of a suitable gearing arrangement (not shown) from the same motor which operates the other elements of the doubler-twister apparatus 1.

Associated with the stretching mechanism 15 is a removable attachment which is referred to hereinafter as a cord compressor unit indicated generally by the reference character 20. The cord compressor unit 20 is adapted to be mounted upon an arm 21 which is hingedly mounted upon the swingable arm 16 which, as previously indicated, also supports the stretching mechanism from the stationary support 17. When not in use, the cord compressor unit 20 is adapted to be swung upwardly out of the way as indicated by the dotted lines shown in Figure 1 of the drawings. In this offset position, it is possible to thread up the stretching mechanism 15 after which the operator may introduce the cord 10 to the cord compressor unit 20.

From the cord compressor unit 20, the cord 10 is passed downwardly through a guide eye 22 and thence to a traveler 23 which is mounted for rotation upon a ring 24 mounted upon and forming part of the ring frame 25 of the doubler-twister apparatus 1. A spool or bobbin 26 is rotatably mounted about its longitudinal axis within the ring 24 as by means of a pulley 27 to which it is disengageably attached. The pulley 27 is capable of high speed rotation by means of a suitable tape or belt drive in the manner indicated in Figure 1.

While the spool 26 is rotated by the pulley 27, the ring frame 25 is caused to reciprocate in a vertical direction axially of the spool, thereby enabling the uniform winding of a package of cord upon the outer periphery of the spool 26. The pulley 27 is mounted upon a vertical stub shaft 28 which is carried by the bearing support 29 forming part of a fixture about which the pulley is rotatably mounted. A bracket 30, secured to the frame 2 of the doubler-twister apparatus, serves to support the stationary rail of which the bearing support 29 is a part. Any other suitable form of twisting mechanism such, for example, as a cap twister unit may be employed in lieu of the ring twister mechanism hereinbefore described and illustrated in Figure 1, the purpose of this portion of the apparatus being simply to introduce a relatively high degree of twist into the cord 10 so as to insure intimate cooperation of the several threads 7 comprising the cord.

It will be understood that a like cord processing apparatus, together with its associated driving elements, is provided for each cord forming station along both sides of the doubler-twister apparatus 1.

The stretching mechanism 15 of the cord processing apparatus embodies a pair of grooved stretching cones 31 and 32. The cones 31 and 32 actually take the form of truncated conical segments which have formed in the peripheries thereof a plurality of spaced V-shaped grooves 33. These V-shaped grooves 33 are adapted to receive the cord 10 and advance it from that portion of the cone of smaller cross-sectional diameter toward that of greater cross-sectional diameter, thereby introducing a predetermined stretch into the cord. It will be understood that the cord 10 is advanced from one to another of

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the grooves 33 of the cones 31 and 32 substantially in the form of a helix, thereby insuring a positive advance of the thread from one end to the other of the device once it is threaded up.

The cones 31 and 32 are rotatably mounted upon stub shafts 34 and 35, respectively. The stub shafts 34 and 35 are secured to the swingably mounted arm 16 and are actuated by the gears 36 and 37, respectively. A handle portion 38, at one end of the swingably mounted arm 16 supporting the cones 31 and 32 facilitate the raising and lowering of the stretching mechanism 15 so as to control the driving engagement of the gears 36 and 37 with respect to the drive gear 18 mounted upon the longitudinal shaft 19. Thus, when the several gears are in driving contact, the cones 31 and 32 will be positively driven, thereby causing the cord 10 to advance from one to the other of the cones of the stretching mechanism 15.

The cord compressor unit 20, as previously indicated, is adapted to be operatively associated with the cord stretching mechanism 15. This relationship is accomplished by a mounting 39 forming part of the arm 21 of the cord compressor unit 20, being so arranged as to bring the driving gear 40 secured to stub shaft 41 rotatably mounted in the mounting into driving contact with the drive gear 37 of the stretching mechanism 15. A bearing mounting 42 is provided on the arm 21 for rotatably mounting the shaft 43 which carries a second gear 44 arranged in driving relation to the aforementioned gear 40. The shaft 43 actuated by the gear 44 serves to drive a roller 45 which may be of any desired cross-sectional diameter such as will introduce a slight tension in the cord 10 as it is withdrawn from the last groove 33 of the cone 31 of the stretching mechanism 15 and passed over the periphery of said roller 45.

The roller 45 is advantageously provided with an annular groove 46 in its outer periphery for the reception of the cord 10. A suitable guide 47 is mounted upon the bearing mounting 42 for directing the cord from the cone 31 to the annular groove 46 in the roller 45. The tension introduced into the cord 10, as it leaves the stretching cones 31 and 32 of the stretching mechanism 15, may be predetermined either by arranging the driving gears 40 and 44 so that the latter will insure a positive rotation of the roller 45 at a slightly greater surface speed than the rate of discharge of the cord 10 from the cone 31 or by varying the diameter of the roller 45 itself.

A second roller 48 which may be of somewhat smaller diameter than the roller 45, is so disposed with respect to the latter that it will be in surface contact therewith. Roller 48 is rotatably freely mounted upon a stub shaft 49 in the manner illustrated in Figure 3 of the drawings. A supporting bracket 50 having the shape of an inverted letter L, is secured to the bearing mounting 42 and projects thereabove so as to support the freely rotatably mounted roller 48. In order to facilitate the temporary removal of the roller 48 from contact with the surface of the drive roller 45 during the threading-up operation, a slidable block 51 carrying the shaft 49 is mounted in the supporting bracket 50.

The slidable block 51, carrying the freely rotatably mounted roller 48 is urged downwardly by means of a compression spring 52 which is disposed between the short leg of the supporting bracket 50 and the top of the slidable block itself.

The spring 52 is retained in position between the block 51 and the leg of the bracket 50 by means of a pair of opposed pins 53 and 54, respectively. A lever 55 is pivotally mounted upon one edge of the supporting bracket 50 and has a slot 56 therein for the reception of a pin 57 secured to the sidewall of the slidable block 51.

The slidable block 51 is provided with a portion extending through a generally rectangular slot 58 formed in the long leg of the supporting bracket 50. The block 51 has a plate 59 secured to the portion thereof extending through the slot 58. The plate 59 is held in place by screws 60 and 61 of which the latter also holds in place an angle 62. The angle 62 on the plate 59 co-operates with the lever 55 when the two parts are pressed together by the operator to compress the spring 52, thereby enabling the separation of the rollers 48 and 45 to facilitate the threading-up operation. The roller 48 advantageously carries an annular groove 63 which registers with the groove 46 in the roller 45 to form a substantially circular passage for the cord 10 therebetween.

By virtue of the driving relation between the roller 45 and the stretching cones 31 and 32 of the stretching mechanism 15, the cord 10, after having passed from the cone 31 through the guide 47 to the roller 45, is caused to slip slightly against the positive rotation of the roller. This action has at least two beneficial effects upon the cord, one being to introduce a slight tension into that portion of the cord 10 passing from the cone 31 of the stretching mechanism 15 and the other, a burnishing effect caused by the slippage of the cord with respect to the surface of the roller 45. The cord 10, as it passes from the roller 45 to guide eye 22, is characterized by a smooth outer surface free from projecting fibers and possessing a uniform tensile and gauge.

It will be readily understood that numerous modifications may be made in the apparatus of the present invention without in any way departing from the spirit or scope of the invention. The cord compressor unit may be adapted to any form of stretching device other than that embodying a pair of rotatably mounted cones without affecting its operating or the efficient results which it is capable of producing in the finished cord. In Figure 4 of the drawings, heat may be applied to the running cord 10 as it passes through the guide 47, heat being supplied by an electrical heating element (not shown) to which electrical current is supplied by the connections 64 and 65 to dry the cord and facilitate the burnishing operation.

Figure 5 of the accompanying drawings illustrates modification of the invention in which the action of the cooperating rollers 45 and 48 of the cord compressor unit 20 is enhanced by the introduction of heat. The roller 45 is advantageously heated by a circular heating element 66 supported in stationary relation within a counterbore 67 in one face of the roller 45. The element 66 is advantageously supported from the bottom face of the bearing mounting 42 as by means of clips 68 secured to but insulated from a strap 69. Electrical connections 70 and 71 supply electrical current to the element 66. A cover plate 72 may be applied to the roller 45, if desired.

While in accordance with the Patent Statutes, one best known embodiment of the invention has been illustrated and described in detail, it is to be particularly understood that the invention is not limited thereto or thereby, but that the inventive scope is defined in the appended claims.

We claim:

1. In a thread processing apparatus embodying a snub let-off device and a wind-up means, a rotatable means characterized by a surface of revolution and so constructed and arranged that it receives the thread discharged from the let-off device, drive means actuating the rotatable means at a rate slightly in excess of that at which the thread is discharged from the let-off device, and compressor means contacting the thread and disposed in surface contact with the rotatable means.

2. In a thread processing apparatus embodying a snub let-off device and a wind-up means, a rotatable means characterized by a surface of revolution and so constructed and arranged that it receives the thread discharged from the let-off device, drive means actuating the rotatable means at a rate slightly in excess of that at which the thread is discharged from the let-off device, compressor means for contacting the thread, and means releasably urging the compressor means into surface contact with the rotatable means.

3. In a thread processing apparatus embodying a stretching means, means driving the stretching means, and a twister mechanism, a rotatable means arranged to receive the thread as it is discharged from the stretching means, drive means for actuating the rotatable means to introduce a slight tension in the thread, and means in contact with the thread and in frictional engagement with the rotatable means.

4. In a thread processing apparatus embodying a stretching means, means driving the stretching means and a twisted mechanism, a rotatable means having a generally cylindrical surface arranged to receive the thread as it is discharged from the stretching means, drive means for actuating the rotatable means to introduce a slight tension in the thread, said drive means being arranged in disengageable driving connection with the driving means for the stretching means, compressor means in frictional rolling engagement with the rotatable means, and means releasably urging the compressor means into surface contact with the rotatable means.

5. In a twisting and doubling apparatus having a plurality of spindles each of which carries a thread supply spool and means for twisting the double threads into a finished cord, apparatus for stretching and compressing the doubled threads comprising a positively driven stretching means, compressing means receiving the doubled threads from the stretching means, and means for actuating the compressing means to introduce a slight tension in the doubled threads as they are discharged from the stretching means.

6. In a twisting and doubling apparatus embodying a plurality of thread supply packages, means joining the threads from a number of said supply packages, means for twisting the doubled threads, and stretching means disposed between the supply packages and the twisting means for introducing a uniform stretch in the doubled threads, a device for compressing and burnishing the doubled threads comprising a positively driven roll for receiving the doubled threads discharged from the stretching means, means actuating the driven roll at a rate slightly greater than the rate of discharge of the threads from the stretching means, a guide directing the threads to the positively driven roll, an idler roll disposed in substantial surface contact with the driven roll, and means urging the idler roll into contact with said driven roll.

7. Apparatus for stretching and compressing

thread, cord, and the like comprising stretching means for positively advancing thread substantially in the form of a helix of gradually increasing diameter, compressing means for receiving the thread from the discharge end of the stretching means, and means actuating the compressing means with the thread passing therethrough and in contact therewith, said compressing means being operated at a surface speed in excess of that of the stretching means.

8. Apparatus for stretching and compressing thread, cord, and the like comprising stretching means for positively advancing thread substantially in the form of a helix of gradually increasing diameter, compressing means for receiving the thread from the discharge end of the stretching means, said compressing means embodying a positively driven roll, an idler roll in substantial surface contact therewith, means urging the idler roll into contact with the thread as it passes over the driven roll, guide means for directing the thread from the stretching means to the driven roll of the compressing means, and means actuating the compressing means to introduce a slight tension in the thread discharged from the stretching means.

9. A cord compressing and burnishing attachment for twisting and doubling apparatus and the like, said attachment comprising a positively driven roll, an idler roll, releasable means urging the idler roll into substantial rolling contact with the driven roll, and drive means for actuating the driven roll at a rate greater than that of the normal travel of the thread through the twisting and doubling apparatus to introduce a slight tension therein.

10. A cord compressing and burnishing attachment for twisting and doubling apparatus and the like, said attachment comprising a positively driven roll, means adjustably mounting the idler roll in substantial peripheral contact with the driven roll, manually releasable means urging the idler roll into contact with the driven roll, means heating one of the rolls, and drive means for actuating the driven roll at a rate to introduce a slight tension in the thread as it passes through the twisting and doubling apparatus.

11. A cord compressing and burnishing attachment for twisting and doubling apparatus and the like, said attachment comprising a positively driven roll, means adjustably mounting the idler roll in substantial peripheral contact with the driven roll, manually releasable means urging the idler roll into contact with the driven roll, means heating one of the rolls, and drive gearing which actuates the driven roll at a rate which will introduce a slight tension in the thread as it passes through the twisting and doubling apparatus.

12. Apparatus for stretching and compressing thread, cord, and the like comprising stretching means for positively advancing thread from one end to the other thereof substantially in the form of a helix of gradually increasing diameter, compressing means for receiving the thread from the discharge end of the stretching means, guide

means disposed between the stretching means and the compressing means, means heating said guide means, and means actuating the compressing means at a surface speed in excess of that of the stretching means.

13. In a thread processing apparatus embodying a stretching device and a collecting means, rotatable means characterized by a surface of revolution and so constructed and arranged that it receives the thread from the stretching device, means disposed between the stretching device and the rotatable means for heating the thread, and drive means actuating the rotatable means at a rotational speed slightly in excess of that of the stretching device.

14. In a thread processing apparatus embodying a stretching device and a collecting means, rotatable means characterized by a surface of revolution and so constructed and arranged that it receives the thread from the stretching device, means heating the rotatable means, and drive means actuating the rotatable means at a rotational speed slightly in excess of that of the stretching device.

15. Apparatus for stretching and compressing thread, cord, and the like comprising stretching means embodying a pair of spaced cantilever supported frusto-conically shaped rolls, means actuating the rolls to advance thread therealong substantially in the form of a helix of gradually increasing diameter from one end to the other of said rolls, a rotatably mounted roller to which the thread passes from the stretching means, means actuating the rotatably mounted roller for tensioning the thread as it is discharged from the stretching means, means heating said thread after it leaves the stretching means, an idler roller in surface contact with the driven roller, and means releasably urging the idler roller into contact with the thread as it passes over the driven roller.

16. Apparatus for stretching and compressing thread, cord, and the like comprising means for advancing said thread in a generally helical path characterized by a plurality of turns of regularly increasing circumference, rotatable compressing means disposed adjacent the discharge end of the thread advancing means between which the thread passes as it is discharged from the thread advancing means, and drive means actuating the compressing means at a surface speed in excess of that at which the thread is discharged from the thread advancing means.

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