March 7, 1944. H. B. KLINE 2,343,299

APPARATUS FOR DOUBLING AND TWISTING THREAD

Filed Feb. 14, 1939 2 Sheets-Sheet 1

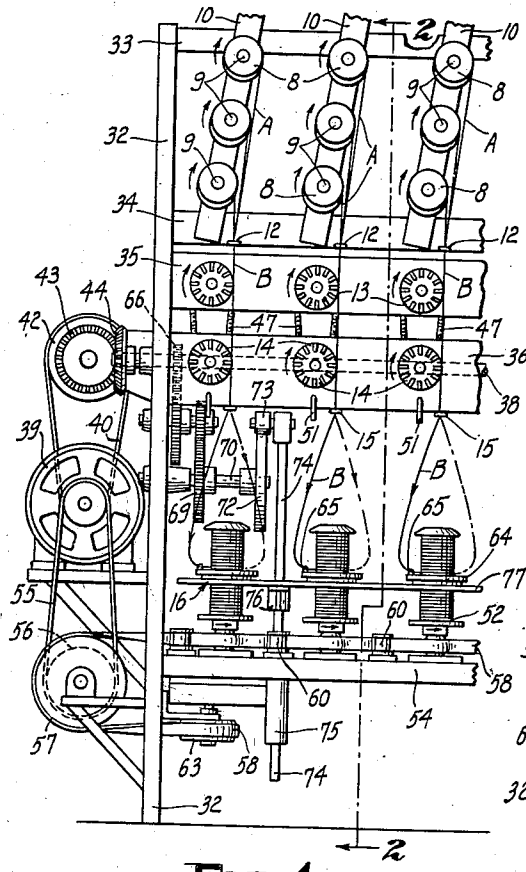

FIG. 1

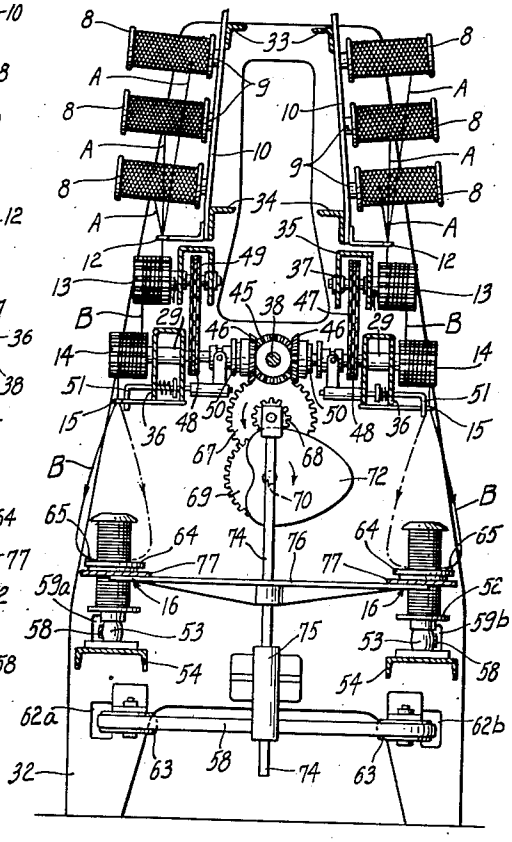

FIG. 2

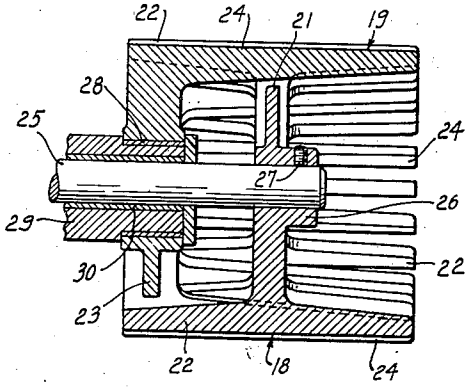

FIG. 6

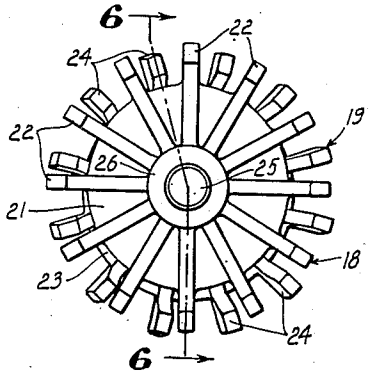

FIG. 5

Inventor

HAYDEN B. KLINE

By Charles E. Hoverstrom

Attorney

March 7, 1944. H. B. KLINE 2,343,299

APPARATUS FOR DOUBLING AND TWISTING THREAD

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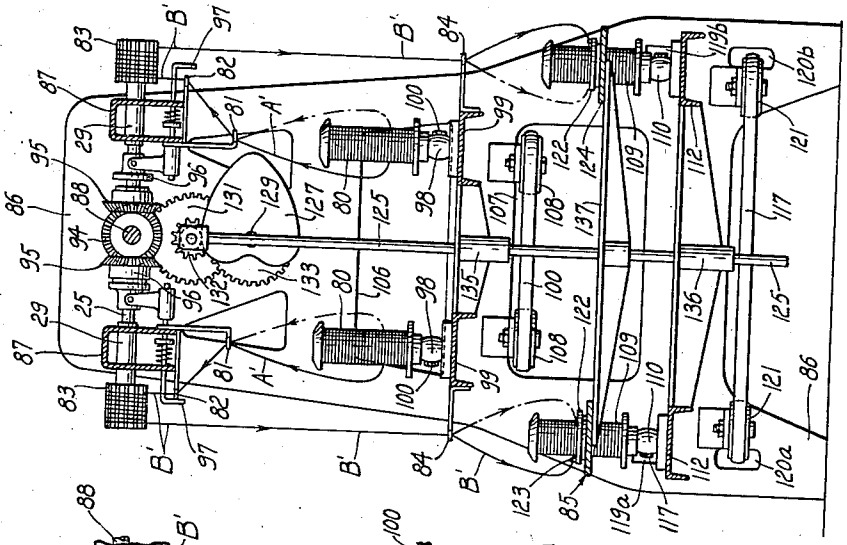

FIG. 4

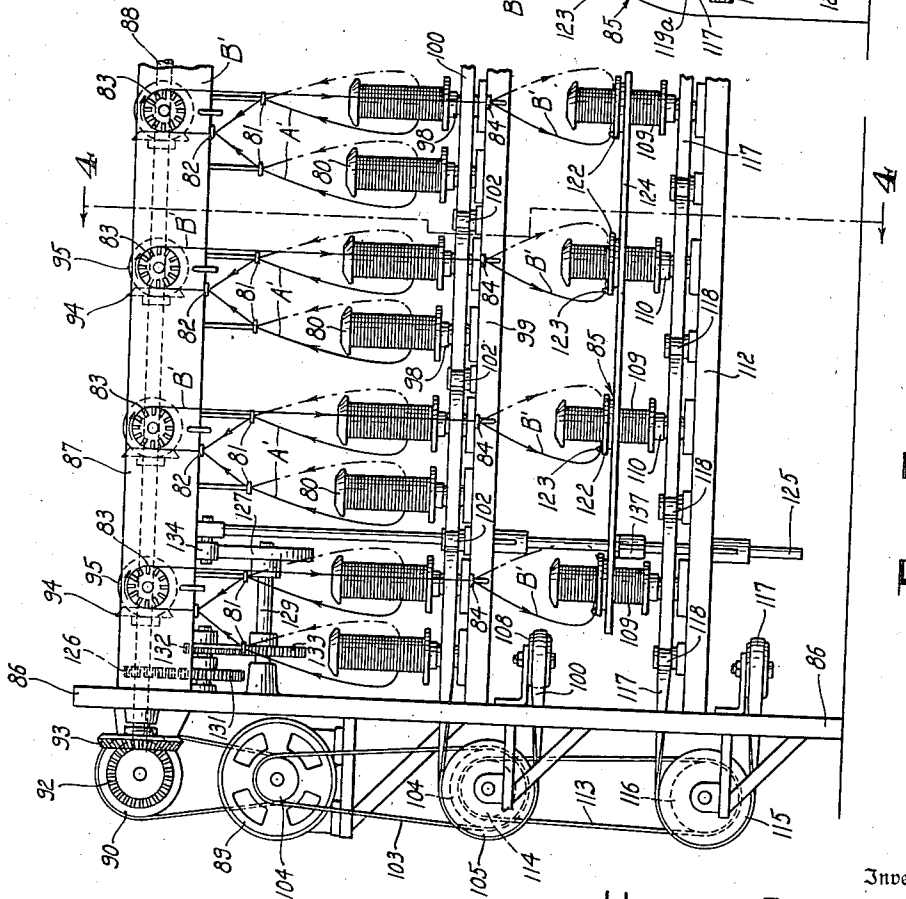

FIG. 3

Inventor

HAYDEN B. KLINE

By Charles O. Herrstrom

Attorney

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APPARATUS FOR DOUBLING AND TWISTING THREAD

Hayden B. Kline, Cleveland, Ohio, assignor to Industrial Rayon Corporation, Cleveland, Ohio, a corporation of Delaware

Application February 14, 1939, Serial No. 256,364

4 Claims. (Cl. 57—55.5)

The instant invention relates to a novel type of apparatus for the doubling and twisting of thread or the like. Although the apparatus of the invention as shown in the drawings and as hereinafter described is particularly concerned with the doubling and twisting of thread, and, in one embodiment of the invention, with the doubling, stretching and twisting of thread, it is obviously equally adaptable to the production of many other threadlike articles. It is therefore intended to include in the generic term "thread" as hereinafter employed not only thread per se, but also such threadlike articles as filaments, cords, bands, tapes and the like.

Apparatus of the type contemplated by the invention is especially advantageous in that it makes possible a high quality product at a low production cost. Significant features of the apparatus are the incorporation therein of one or more unitary helix-forming devices for the handling of thread; its simplicity of construction, which greatly facilitates its operation, inspection and maintenance; and the opportuntiy for treating the thread immediately prior to its collection in package form. These and other advantages of the invention will appear in greater detail as the description of the invention proceeds.

Figure 1 is a front elevation of one form of doubling and twisting machine incorporating the features of the present invention. Figure 2 is a sectional elevation along line 2—2 of Figure 1. Figure 3 is a front elevation of another form of machine illustrating a different arrangement likewise embodying the invention. Figure 4 is a sectional elevation along line 4—4 of Figure 3. Figure 5 is an end elevation of the thread-advancing reel employed in the apparatus of Figures 1 to 4, inclusive, but on a somewhat larger scale. Figure 6 is a sectional elevation along line 6—6 of Figure 5.

Referring first to the embodiment of the invention illustrated in Figure 1, the several threads A are withdrawn simultaneously from the spools 8 mounted on the spindles 9 supported by the upwardly extending spindle arms 10. Upon passing through the combining guide 12, the individual threads A are joined to form a composite thread bundle B which is wound upon a first thread-advancing reel 13. After being advanced therealong in the form of a helix, thread bundle B is discharged therefrom to a second similar thread-advancing reel 14 rotated at a peripheral speed sufficiently higher than that of reel 13 to permit the thread bundle to be stretched between said reels. Thread bundle B is thereafter advanced along reel 14, discharged therefrom at a uniform rate, and passed through guide 15 to the ring twister 16, on which it is twisted and collected in package form.

The thread-advancing reels 13 and 14 may conveniently take the form of the reel illustrated in Figures 5 and 6. The latter is of substantially the same design and operates on the same general principle as the reel shown, described and claimed in Knebusch application Serial No. 652,089, filed January 16, 1933, for "Winding reel" (Patent No. 2,210,914). Such a reel is adapted to accept thread or the like at one end thereof, advance it in the form of a traveling helix made up of a number of generally helical turns, and discharge the same from the opposite end thereof. From the reel of said Knebusch application, the reel of Figures 5 and 6 differs principally in that it is of cantilever construction, but if desired, it may conveniently be flared from its supported to its unsupported end to assist in stretching thread bundle B.

The reel illustrated in Figures 5 and 6 comprises two wholly rigid members 18 and 19. Reel member 18 embodies a spider 21 which supports a plurality of longitudinally extending bar members 22. Reel member 19 has a similar spider member 23 which likewise supports a plurality of longitudinally extending bar members 24. The bar members 22 and 24 interdigitate, being disposed alternately to form the periphery of the reel. Each individual reel member is mounted for rotation about its own axis, with the axes of the two reel members disposed in parallel planes but in inclined relation to each other.

Reel member 18, commonly referred to as the concentric member, is concentrically mounted upon shaft 25 by means of hub portion 26. Set screw 27 serves to fix said member securely to the shaft 25. The second reel member 19, known as the eccentric member, is mounted with its axis slightly offset from and inclined with respect to the axis of shaft 25. The spider member 23 is preferably journalled upon a bearing 28 of generally tubular form carried by the frame member 29 which serves as a means for mounting the reel. Bearing 28 is so formed as to provide the desired eccentricity. Frame member 29 is equipped with sleeve bearing 30 and is bored to provide the required offset between concentric member 18 and eccentric member 19.

When shaft 25 is rotated, concentric member 18 is caused to rotate. Due to the fact that they interdigitate as above described, concentric

member 18 drives eccentric member 19 by bar-to-bar contact. The inclined relationship of reel members 18 and 19 provides for a definite spacing between successive turns of thread or the like, while the offset relation between the axes of the respective reel members permits the bar members of first one of the reel members and then the other to support the thread or the like alternately.

The apparatus illustrated in Figures 1 and 2 of the accompaning drawings is made up of a plurality of similar thread-doubling devices arranged adjacent each other lengthwise of the machine as a whole. Each such series includes a plurality of spools 8, each supplying a single thread; the combining guide 12; reels 13 and 14; the guide 15; and the ring twister 16. As indicated in Figure 2, reels 13 and 14 are preferably arranged in stepped relation in such manner that the supported end of reel 14 is in apposition to the unsupported end of reel 13. With such an arrangement, it is obviously desirable to operate the reels 13 and 14 in such manner that the thread bundle B will be advanced from the supported toward the unsupported ends thereof.

Frame members 32 at either end of the machine and at spaced intervals along the machine carry longitudinal members 33 and 34 which support the spindle arms 10 upon which are mounted the spindles 9 for the winding spools 8. Combining guides 12 are secured to the lower longitudinal member 34 on either side of the machine. In addition to the foregoing, frame members 32 support the longitudinal members 35 and 36 on which are mounted reels 13 and 14, respectively. Reel 13 is indicated as supported in the member 35 in part by frame member 29 and in part by bearing 37, while reel 14 is supported in member 36 entirely from the reel frame member 29.

Longitudinal shaft 38, which serves to operate the reels of the individual series, is driven by motor 39 through a belt 40, pulley 42, and bevel gears 43 and 44. Reel shaft 25 of the lowermost reel 14 is actuated directly by the bevel gears 45 and 46. Through a chain 47 and sprocket 48 mounted on the shaft of reel 14, sprocket 49 drives the shaft of the uppermost reel 13. Sprocket 49 is preferably of larger diameter than sprocket 48 so that a greater angular velocity of reel 14 with respect to reel 13 results. A clutch 50 controlled by hand lever 51 operates to disengage the gear 46 from driving contact with the reel shaft in the event that it is desired to arrest the operation of any individual series without stopping the machine as a whole.

The ring twister designated generally by the reference character 16 comprises a bobbin 52 supported by the whirl 53 rotatably mounted upon the fixed longitudinal frame member 54. By means of belt 55 and pulley 56, motor 39 drives the pulley 57 which serves as the driving means for the endless belt 58. Belt 58 passes through the opening 59*a* in the vertical frame member 32 and extends down one side of the machine, passing alternately in and out between the rotatably mounted idler pulleys 60 and the whirls 53, thereby rotating all of the bobbins 52 on each side of the machine in the same direction with respect to each other. Any conventional form of friction brake may be employed to stop the rotation of the individual whirls 53 in order to replace the bobbins or to thread up the same in the event of thread breakage.

At the end opposite the drive end, the belt 58 crosses to the other side of the machine, where it is employed to drive the opposite bank of bobbins 52 in a manner similar to that previously described. After having rotated each of the bobbins on such side of the machine, the belt returns at the drive end of the machine. It passes through opening 59*b* in the frame member 32, around an idler pulley (not shown) similar to pulley 57, through a second opening 62*b* in the frame member 32, about the idler pulleys 63 mounted upon frame member 32, through opening 62*a*, and around drive pulley 57.

The vertical reciprocation of the ring 64 about which the traveller 65 moves as the thread bundle B is wound upon the bobbins 52 is accomplished by means of a gear train connected to longitudinally extending shaft 38. Gear 66 upon shaft 38, acting through reduction gears 67, 68 and 69, rotates stub shaft 70 upon which is mounted heart-shaped cam 72. By means of follower 73, cam 72 imparts the desired reciprocatory motion to vertical shaft 74 supported from the frame member 32 by the bearing bracket 75. Transverse beam 76, secured both to shaft 74 and to the lifting rails 77 carrying the rings 64 on either side of the machine, causes the latter to move up and down.

The apparatus of Figures 1 and 2 may be modified in various respects to fit the requirements of any particular case: for example, any suitable number of threads A may be employed to form the composite bundle B. In the illustrated embodiment of the invention the two reels 13 and 14, are adapted to operate at different peripheral speeds such that stretching of the composite thread bundle therebetween is effected. In the event it is desired to eliminate the stretching operation, however, with slight alteration the reels may be operated at the same angular velocity or a single reel may be used. Other modifications including the use of conventional types of automatic control devices, to arrest the operation of any unit or units of the machine when thread breakage occurs therein may be effected without departing from the spirit of the invention.

In the embodiment of the invention illustrated in Figures 3 and 4, winding spools 80 are disposed with their axes extending vertically. Threads A' are withdrawn axially as the spools are rotated, thereby introducing a twist into the individual threads A'. After passing through guides 81, threads A' are combined into a composite bundle B' by combining guide 82, from which the composite bundle B' is led to the supported end of a reel 83. Reel 83 is preferably of the type illustrated in Figures 5 and 6. Thread bundle B' is advanced along the periphery of the reel 83 toward the unsupported end thereof, from which it is removed and led to guide 84. After passing through guide 84 it is further twisted and collected in package form upon twister 85.

As before, the machine comprises a plurality of identical thread-doubling series extending longitudinally of the machine, each including two or more winding spools 80, guides 81, combining guide 82, reel 83, guide 84, and ring twister 85.

Frame members 86 are provided at either end of the machine and at spaced intervals therealong to support the longitudinal beams 87, on which reels 83 are mounted by means of members 29. The longitudinal shaft 88 is driven from the motor 89 through pulley 90 and bevel gears 92 and 93. Bevel gears 94 and 95 transmit power

from shaft 88 to reel shafts 25 of the several reels 83. Clutch means 96 controlled by hand lever 97 operates to disengage gear 95 on reel shaft 25 from gear 94 on shaft 86. Longitudinal beams 87 serve to carry the guides 81 and the combining guides 82.

Winding spools 80 are mounted side by side lengthwise of the machine in such manner as to be freely accessible from the working face of the machine. They are rotated by means of whirls 98 rotatably mounted upon longitudinally extending channel members 99 which are supported from frame members 86. The several guides 84 are secured to the channel members 99. Whirls 98 are rotated by means of an endless belt 100 which is interlaced between the idler pulleys 102 and the whirls 98, as indicated in Figure 3. By means of belt 103 and pulleys 104, motor 89 actuates drive pulley 105 for belt 100.

Belt 100 passes through the opening 106 in the frame members 86, down one side of the machine, across, back on the opposite side of said machine, through the frame, over an idler pulley (not shown) similar to drive pulley 105, through frame opening 107, around idler pulleys 108, and back to the drive pulley 105. With the belt arranged in the manner shown in Figure 3, both of the winding spools 80 in each thread-doubling series are rotated in the same direction, thereby imparting to the threads A' the same directional twist. If it is desired to place an opposing twist in each thread A'; for example, a right-hand twist in one and a left-hand twist in the other, the belt 100 driving the whirls 98 may be caused to run at the front of the first whirl; i. e., at the left in Figure 3, at the back of the second whirl, at the front of the third, etc.

The twister referred to generally by the reference character 85 is illustrated as of the ring twister type. It is operated in a manner substantially identical with that employed in the case of the twister of the machine of Figures 1 and 2. The bobbins 109 are supported by whirls 110 rotatably mounted upon the fixed longitudinal frame member 112 secured to frame members 86. Belt 113, driven by pulley 114, rotates the drive pulley 115 by means of pulley 116.

Endless belt 117 passes through the frame opening 119a, is interlaced between the idler pulleys 118 and the whirls 110 along one side of the machine, returns on the other side of the machine, passes through frame opening 119b, over an idler pulley (not shown), through opening 120b, around idler pulleys 121, and through frame opening 120a back to the drive pulley 115. Any conventional type of friction brake mechanism may be employed to stop the whirls 110 of the ring twister mechanism or the rotating winding spools 80 of any given thread-doubling series independently of the other units of the machine for replacing bobbins or re-threading in the event of thread breakage.

The rings 122 about which the travelers 123 move are mounted upon a lifting rail 124 which is reciprocated by means of vertical shaft 125 actuated by longitudinally extending shaft 88 upon which is mounted gear 126. The gear 126 actuates a cam 127 mounted on stub shaft 129 through reduction gears 131, 132 and 133. The cam follower 134 mounted on the upper end of the shaft 125 imparts the alternating upward and downward motion to the shaft, which is mounted in the bearing brackets 135 and 136. The transverse beam 137 secured to the reciprocating shaft 125 is connected to the lifting rails 124 on either side of the machine, causing the same to move up and down in a definite cycle defined by the proportions of cam 127.

In the operation of the apparatus of either embodiment of the invention, the individual threads are withdrawn from the supply spools and passed through the guide means which combines the separate threads into a thread bundle. The thread bundle so formed is wrapped one or two times about the rotating reel, after which the reel proceeds to thread itself up. When the thread bundle reaches the end of the reel, the leading end thereof is threaded through the guide immediately above the twister, passed under the traveler, and started upon the twister bobbin. Conventional mechanical control means, such as trip mechanisms for automatically interrupting operation in the event of thread breakage, may be employed to assist in the operation of the machine.

In apparatus of the sort contemplated by the instant invention it is sometimes desirable to introduce means for humidifying, steaming, sizing or otherwise treating the thread. To that end, a reel of the type shown, described and claimed in Patent No. 2,145,281 for "Processing reel," issued January 31, 1939, to Clarence C. Walters, may be substituted for the reel or reels illustrated in the embodiments of the invention shown in the accompanying drawings. On such reels, the thread may be subjected to a fluid treatment such, for example, as treatment by steam for the purpose of setting the twist introduced into the thread, following which it may, if desired, be dried on a similar reel.

The embodiment of the invention illustrated in Figures 3 and 4 may, if desired, incorporate certain of the features characterizing the embodiment of Figures 1 and 2. Thus the apparatus of Figures 3 and 4 may be readily modified to employ two or more reels in place of the single reel 83. A modification of this sort would permit the application of one or more intermediate processing treatments upon the thread prior to its collection in package form upon the twisting device. Such processing treatment may include such operations as stretching the thread between reels, subjecting the thread to one or more suitable fluid treatments, or any combination of similar operations.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty reside in the invention.

What is claimed is:

1. In apparatus for doubling and twisting thread or the like including a plurality of supply packages each of which serves as a source of thread or the like, means for combining the individual threads or the like into a thread bundle and a twisting device, the improvement in means for feeding said thread bundle to said twisting device which comprises at least two cantilever thread-advancing reels so disposed that each in turn accepts the thread bundle at its supported end and advances it toward the unsupported end thereof.

2. In apparatus for doubling, stretching and twisting thread or the like including a plurality of supply packages each of which serves as a source of thread or the like, means for combining the individual threads or the like into a thread bundle and a twisting device, the improvement in means for feeding said thread

bundle to said twisting device which comprises at least two helix-forming devices of cantilever construction so disposed that each in turn accepts the thread bundle at its supported end and advances it toward the unsupported end thereof and means for rotating each succeeding device at a greater peripheral speed than its predecessor.

3. In apparatus for doubling, stretching and twisting thread or the like including a plurality of supply packages each of which serves as a source of thread or the like, means for combining the individual threads or the like into a thread bundle and a twisting device, the improvement in means for feeding said thread bundle to said twisting device which comprises at least two cantilever thread-advancing reels so disposed that each in turn accepts the thread bundle at its supported end and advances it toward the unsupported end thereof and means for rotating each succeeding reel at a greater peripheral speed than its predecessor.

4. In apparatus for doubling, stretching and twisting thread or the like including a plurality of supply packages each of which serves as a source of thread or the like, means for combining the individual threads or the like into a thread bundle and a twisting device, the improvement in means for feeding said thread bundle to said twisting device which comprises at least two helix-forming devices of cantilever construction so disposed that each in turn accepts the thread bundle at its supported end and advances it toward the unsupported end thereof, means for rotating each succeeding device at a greater peripheral speed than its predecessor and means for subjecting the thread bundle to processing treatment while stored upon at least one of said helix-forming devices.

HAYDEN B. KLINE.