Oct. 4, 1938. C. C. JESSEN 2,131,893

PROCESS AND APPARATUS FOR TWISTING THREADS

Filed Oct. 26, 1935 4 Sheets-Sheet 1

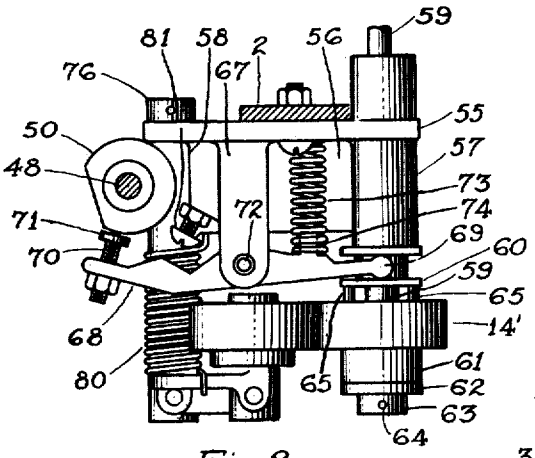


Fig. 2

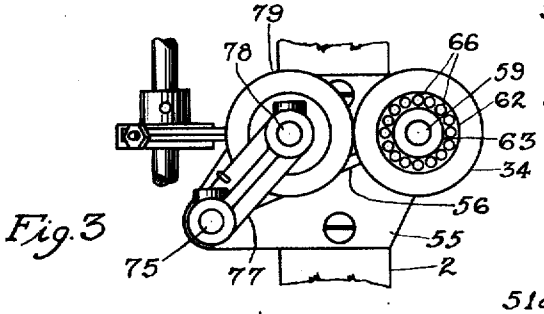


Fig. 3

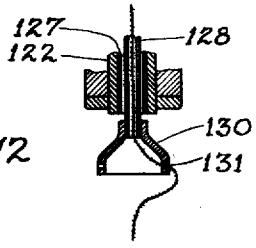
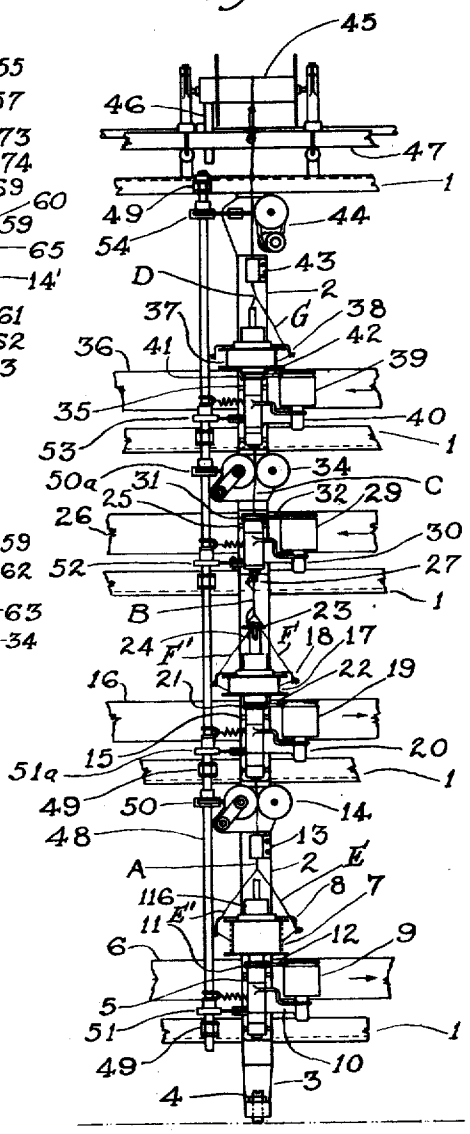


Fig. 12

Fig. 1



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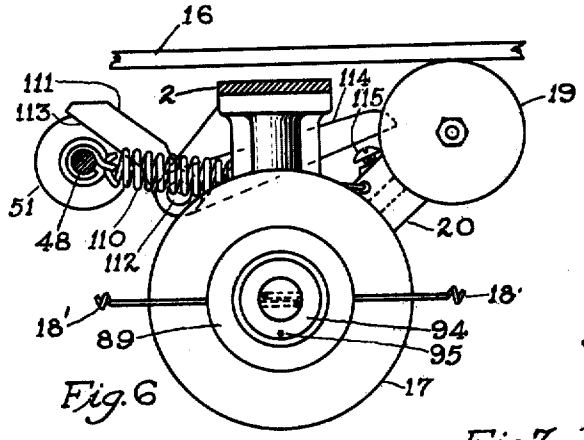


Fig. 6

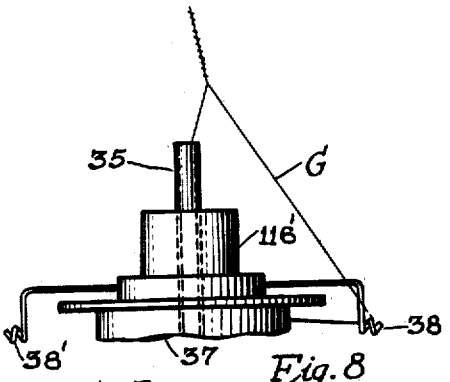


Fig. 8



Fig. 7

Fig. 5

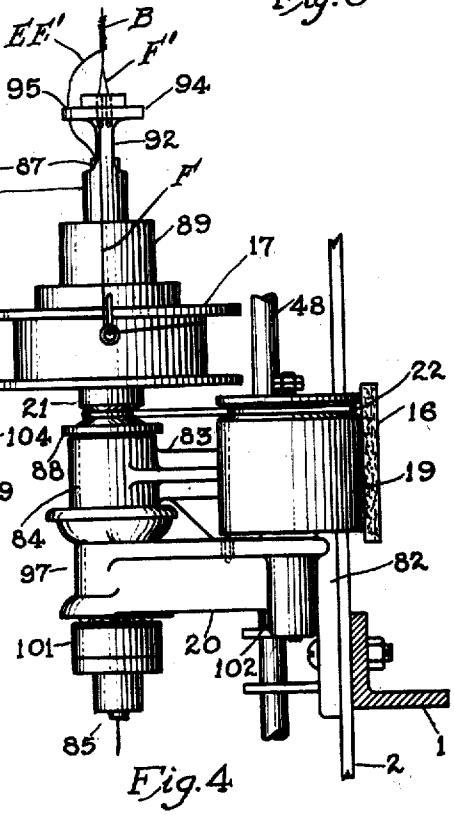


Fig. 4

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Fig. 10

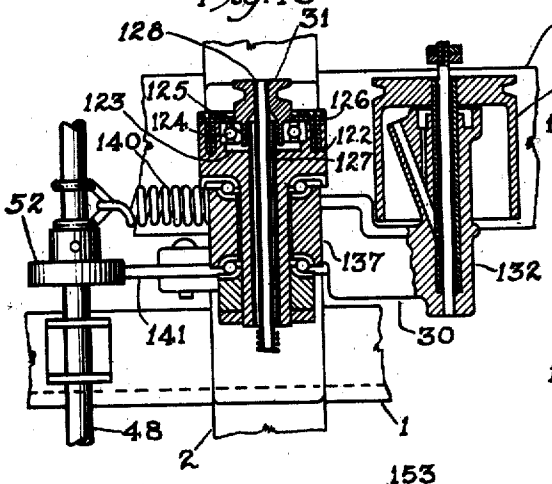


Fig. 9

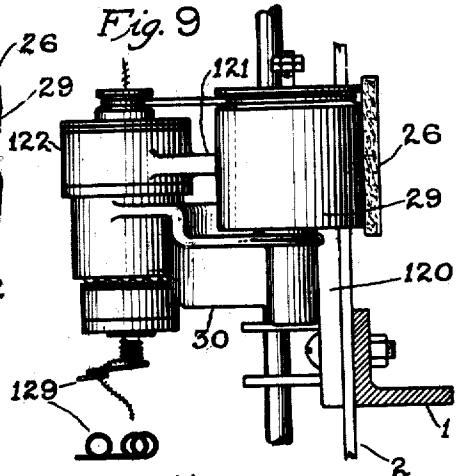


Fig. 11

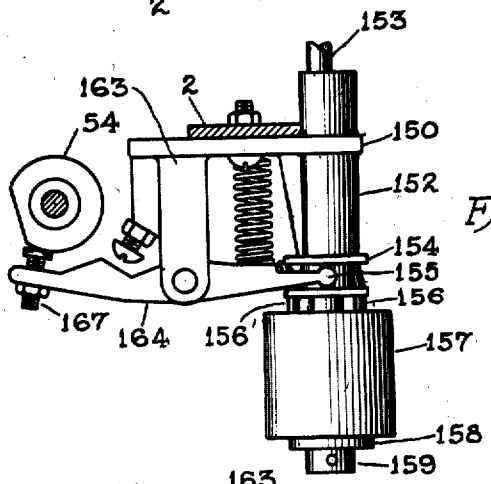


Fig. 15

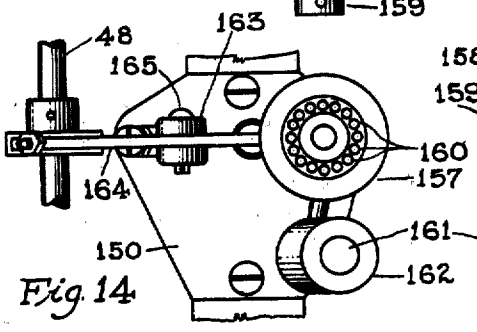
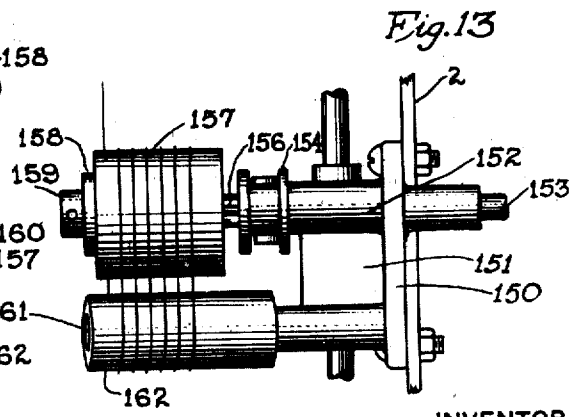


Fig. 14

Fig. 13



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PROCESS AND APPARATUS FOR TWISTING THREADS

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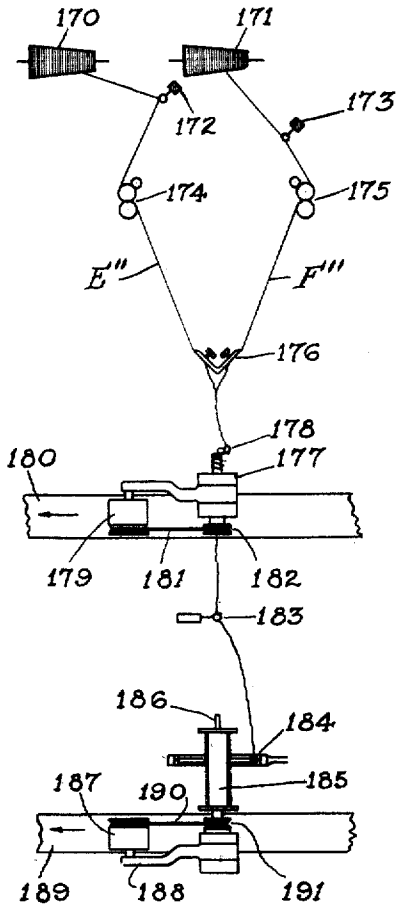


Fig. 16

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Patented Oct. 4, 1938 2,131,893

UNITED STATES PATENT OFFICE

2,131,893

PROCESS AND APPARATUS FOR TWISTING THREADS

Charles C. Jessen, Miami, Fla.

Application October 26, 1935, Serial No. 46,881

36 Claims. (Cl. 117—35)

This invention relates generally to an improved process and apparatus for twisting together a plurality of threads or strands of textile material, the process and apparatus being particularly well adapted for the manufacture of twisted novelty yarns such as spiral, nub, ratiné, loop and bouclé.

In the manufacture of novelty yarns of this type it is customary to loosely twist or wind one or more strands known as the effect thread about one or more strands known as the core thread. It is frequently desired that the effect be so loosely wound on the core as to stand away from the core and give a soft pleasing appearance to the eye. The twisted core and effect may thereafter be twisted with one or more strands known as the binder thread to help bind the effect onto the core. Where binder and core threads are used, they take up tensile strain in the yarn about equally, the effect being merely for purposes of appearance.

Heretofore, difficulty has been encountered in obtaining the desired looseness of the effect thread about the core thread. If the effect thread is merely wound on the core thread in a loose manner, unevenness and irregularity in the winding of the effect about the core is encountered which not only results in a failure of the yarn to meet the standards of appearance, but is conducive of stripping of the effect from the core in subsequent operations. Moreover, the low tension, which is necessary on the supply of effect thread to wind in this manner, is impractical.

It has been customary, therefore, to tightly twist the effect thread about the core thread to a higher number of turns per inch than are desired in the finished yarn. This procedure is usually carried out on a machine of the ring twister type. The package of twisted core and effect is then doffed from the first machine and backwound onto another yarn package to reduce the twist or wind of the effect about the core. This yarn package is then doffed and placed on a third machine where the twisted core and effect are twisted with the binder thread to produce the finished yarn. It is obvious that the numerous doffings required in this process are undesirable, bringing about difficulties in manufacture and increased cost of operation.

Although my invention is not to be limited to the production of novelty yarns, but rather is broadly applicable to the art of twisting threads, it will be seen that my process and apparatus eliminate many of the aforementioned difficulties encountered in the manufacture of novelty yarns.

It is an object of my invention to provide a process and apparatus for twisting threads together wherein frequent doffing of the thread packages is eliminated and a large capacity per doffing is attained.

A further object of my invention is the provision of an improved process and apparatus for winding and backwinding a plurality of threads.

Another object of my invention is the provision of a process and apparatus for twisting threads together whereby the finished twisted yarn moves at relatively slow speed and may be inspected at will.

A still further object of my invention is to improve the process and apparatus for twisting threads together, wherein one or more threads are drawn through a rotating thread package and twisted with a thread drawn from the thread package.

Another object of my invention is the continuous production of a novelty yarn having core, effect and binder threads.

A further object of my invention is to increase the amount of effect wound about the core thread of a novelty yarn.

A still further object of my invention is the continuous production of a novelty yarn having threads of two different directional twists.

Another object of my invention is the elimination of vibration in the rotating parts of my apparatus to thereby prevent unevenness in the finished yarn.

Further objects of the invention will hereinafter more fully appear.

In the accompanying drawings Fig. 1 is a front elevation of my preferred apparatus embodying my invention.

Fig. 2 is a plan view of the yarn feed rolls.

Fig. 3 is a front elevation of the yarn feed rolls.

Fig 4 is a side elevation of one of the rotating spindles and the driving mechanism therefor.

Fig. 5 is a front elevation partly in section of the spindle shown in Fig. 4.

Fig. 6 is a plan view of the spindle shown in Fig 4.

Fig. 7 is a side elevation of the thread guide at the extremity of the hollow spindle, the view being at a 90° angle with respect to Fig. 4.

Fig. 8 is a view showing the flyer of another of the spindles in elevation.

Fig. 9 is a side elevation of the yarn softening or backwinding mechanism.

Fig. 10 is a front elevation partly in section of the yarn softening or backwinding mechanism.

Fig. 11 is a plan view of one form of the yarn

engaging device on the yarn softening or backwinding mechanism.

Fig. 12 is a front elevation in section of a modified form of yarn engaging device for the yarn softening or backwinding mechanism.

Fig. 13 is a side elevation of the metering delivery rolls.

Fig. 14 is a front elevation of the metering delivery rolls.

Fig. 15 is a plan view of the metering delivery rolls.

Fig. 16 is a diagrammatical view of a modified apparatus embodying my invention.

Referring to Fig. 1 of the drawings: 1 indicates the frame of the machine which comprises a plurality of substantially L-shaped members giving proper rigidity to the entire assembly. Suitably spaced along and fastened to the frame are a plurality of vertical standards 2, only one of which is shown in the drawings, it being understood that a plurality of these standards are usually mounted side by side. Standards 2 form intermediate supports for the working parts of each of the yarn units. Beneath each standard 2 is a leg 3 having a leveling bolt 4 which helps support and steady the frame structure.

Standard 2 supports a lower spindle 5 adjacent a drive belt 6 which passes along the full length of the machine and may be used to drive corresponding spindles on the other yarn units. Spindle 5 carries a relatively large thread package 7 supporting a flier 8. Preferably the construction of this spindle is similar to the middle and upper spindles generally indicated at 15 and 35 in Fig. 1. This construction will be hereinafter more fully explained with regard to the middle spindle 15. Briefly, however, the lower spindle is driven by means of a pulley 9 swingably mounted on arm 10, the pulley being driven by frictional engagement with the belt 6. Pulley 9 in turn drives the spindle whirl 11 by means of the local belt 12. The thread or threads E, E' drawn from the spool or thread package 7 pass upwardly therefrom and are twisted together at A before passing through the guide 13. From the guide 13 the threads pass upwardly to the delivery rolls, generally indicated at 14. The rolls 14 are drawing with respect to the spindle 5 but are feeding or delivering with respect to the spindle 15. For convenience the rolls are designated as delivery rolls.

Referring to Figs. 2 and 3: The standard 2 has bolted or otherwise fastened thereto the base 55 having an outstanding flange or web 56 running diagonally across its front face. The web 56 has at each end thereof the bearings 57 and 58. Bearing 57 provides the bearing surface for the drive shaft 59 which is suitably driven by a variable speed mechanism not shown. Shaft 59 passes through bearing 57, the grooved collar 60 slideable on the shaft, and the driven roll 14'. Roll 14' has a hub 61 and against this hub abuts a disc 62 provided with suitable means, such as the smaller hub 63 and the set screw 64, to key the disc 62 to the shaft 59. Two pins 65 secured to one face of grooved collar 60 in diametrically opposite positions, extend outwardly through receiving holes in roll 14' and hub 61. The disc 62 has a series of holes 66 drilled therein, said holes being capable of receiving the ends of the pins 65 which are long enough to pass into a pair of holes in disc 62 when the slideable collar 60 is moved over into a position abutting the roll 14'. When in this position the pins have their ends in a pair of holes in disc 62, are rotated with the shaft, and in turn the pins rotate the feed roll 14', its hub 61 and, of course, the slideable collar 60.

Arm 67 extends outwardly from the base 55 and is bifurcated at its outer end to receive the clutch shift lever 68 which pivots about the pin 72 mounted at the bifurcated portion of arm 67. Clutch shift lever 68 has a shift fork 69 at one end which slideably engages the groove formed in the circumferential surface of the collar 60. The other end of shift lever 68 is threaded to receive an adjustable bolt 70 having a cam follower 71 at one end. A spring 73 is compressed between the base 55 and lug 74 on the shift lever. As a result of the force exerted by spring 73 the cam follower 71 is pressed against the cam 50 on a control rod 48. Fig. 1 shows how the rod 48 is mounted along one side of the unit and has various cams 50, 51 etc., for starting and stopping the rotating parts simultaneously. It will be seen that when cam 50 is in the position shown in Fig. 2 the shift fork 69 has moved the collar 60 away from the roll 14' and the pins 65 are withdrawn from the disc 62. When the slideable collar 60 is in this position, the roll 14', hub 61, slideable collar 60, and pins 65 are stationary. The shaft 59 and disc 62, however, continue to rotate. When the rod 48 is rotated to bring the flat portion of the cam 50 under the follower 71, the spring 73 acting upon lever 68, fork 69 and collar 60, forces the pins into the first pair of holes 66 which pass in their rotation before the pins 65. As soon as this interlocking occurs the rotation of the roll 14' begins.

The bearing 58 supports a shaft 75 to which is set at one end a retaining collar 76. On the outer end of the shaft is set an arm 77 having through its upper end a bore in which is set the stub shaft 78. The cylindrical idler or gripping roll 79 is rotatably mounted on the stub shaft 78. The ends of a spring 80, which is wound around the outer surface of bearing 58, engage the arm 77 and the web 56 to press the idler roll 79 against the drive roll 14' and thereby engage the yarn.

For convenience in adjusting the device, a bolt 81 is mounted in an extension of the web 56. This bolt provides an adjustable stop to limit the movement of the shift lever 68.

Referring again to Figure 1 the yarn from the feed roll 14 passes upwardly through the intermediate hollow spindle generally indicated by 15 in Figure 1. This spindle is exemplary of my preferred spindle and drive construction and is indicated more clearly by Figures 4 to 7 inclusive. Spindle base 82 is bolted on the standard 2, the lower portion of the base being adjacent one of the Ls of the main frame 1. A bracket 83 extends outwardly from the upper portion of the base and is provided at its outer end with an elongated hollow spindle bearing 84. The lower portion of the spindle bearing 84 has secured thereto an inner non-rotating hollow tube 85 which extends upwardly within the bearing and permits the thread from the roll 14 to pass upwardly therethrough. This non-rotating tube 85 also forms an oil seal and prevents oil from the bearing 84 from coming in contact with the yarn.

The rotating spindle comprises a tubular member 87, the outer bearing surface of which fits into the bearing 84. Suitably secured to the rotating spindle is the whirl 21 having a lower flange 88 slightly larger than the upper flange. If desired, the whirl may be positively restrained from upward movement by means of a bolt or

the like having its head spaced from but slightly overlapping the lower flange of the whirl. I have found however, that my spindle mounting eliminates the usual vibrations found in this type of spindle and that when properly adjusted there is no tendency of the spindle to jump upwardly.

Thread package 17 is mounted on the rotating spindle above the whirl. A traveler 88 is mounted on the spindle above the thread package and is provided with one or more fliers 18, 18'. Traveler 89 has at least one surface 90 bearing on the spindle and if desired, the lower face of the traveler may be provided with felt or the like for frictionally engaging the thread package and creating the proper drag on the thread. The weight of the traveler will also determine the drag or tension of the thread or threads F, F' passing from package 17 through the fliers 18, 18'.

The traveler of the intermediate spindle 15 differs from the travelers on spindles 5 and 35 in that it is prolonged into a hollow tubular member 91 having cut out portions at 92 adjacent the upper ends of the tubes 85 and 87. Two slightly eccentric holes 93, 93', forming guideways for the thread or threads drawn from the fliers 18, 18', are drilled through the upper end of member 91. A flange or disc 94 on the upper end of member 91 may be provided with a hole 95 adjacent its periphery to guide and restrain the thread drawn from the hollow spindle.

The driving and control mechanism for spindle 15 is typical of my preferred drive and control for spindles 5 and 35. The upper end of the bearing 84 has a circular groove surrounded by the circumferential wall 840. The groove forms a pocket for lubricant which is drawn up between the stationary tube 85 and the rotating spindle 87 and centrifugally extruded through one or more holes 841 in the hollow spindle 87. The oil overflowing from the groove lubricates the bearing surface. If so desired, a reservoir for the oil may be drilled into the bracket 83.

The outer surface of bearing 84 is provided with a shoulder upon the underside of which is mounted the upper track and dirt shield 95' of a ball race. The lower track 96 of this race is suitably mounted adjacent one edge of annular member 97 encircling the bearing 84 and forming one end of an arm 20. The lower edge of member 97 has mounted thereon the upper track 99 of a ball race which cooperates with a lower track 100 mounted on the ball bearing adjustment member 101. It can be seen that the arm 20 is swingable about the axis of rotation of the spindle tube 87. At its outer end arm 20 is formed into bearing 102 for the rotating hollow shaft 103 of the pulley 19. The upper end of the bearing 102 is extended outwardly and upwardly to form a circumferential pocket for lubricant. Oil centrifugally extruded from the hole 105 in hollow shaft 103, supplies the pocket and drains through opening 106 to the oil retainer 107. Retaining rod 108 fitted in the lower end of bearing 102, extends through the hollow shaft 103 and is provided at its outer end with lock nuts 109 to prevent the pulley from running out of the bearing. The lubrication of the hollow pulley shaft 103 is similar to the lubrication of the rotating spindle 87 in that oil from the hollow shaft is centrifuged outwardly through the holes 105 into the pocket formed by wall 104 where the lubricant is applied to the bearing surface.

Pulley 19 is provided at its upper edge with a groove for the reception of the stretchless, local band 22 which drives the spindle whirl 21. Normally, pulley 19 is held against the driving belt 16 by means of a spring 110 acting to yieldingly pull the arm 20 counterclockwise as shown in Figure 6. Since the pulley is swingable with the arm 20 about the axis of the spindle 87 it will be seen that vibrations caused by the action of the drive belt 16 will be taken up by the swinging of the pulley 19 against the action of spring 110 and will not be directly transmitted to the rotating spindle. The bell crank lever 111 is pivoted at 112, one arm 113 extending into the path of cam 51 on shaft 48, the other arm 114 being adapted to engage ball 115 on arm 20. Upon rotation of shaft 48 the flat portion of the cam 51 will move out from under arm 113 of the bell crank lever and the higher circular face of cam 51 will operate on the lever 111 to move the arm 20 and pulley 19 away from the drive belt 16 thereby stopping the rotation of the spindle.

In operation, one or more strands or threads F, F' may be drawn from the thread package 17 and as shown in Figures 4 and 5 they pass over the fliers 18, 18', through guideways 93, 93' to a point above the spindle where they are twisted together. The thread or threads E, E' drawn from the hollow spindle pass outwardly through the opening 92 and wrap or encircle the twisted threads from the thread package. Since the spindle is rotating at high speed the thread or threads from the hollow spindle tend to balloon out and rotate with the hollow spindle. To prevent this ballooning action from becoming too great the threads from the hollow spindle may be restrained by passing them through guide hole 95 in flange 94 as shown in Figure 4.

Now that I have completely described the construction of intermediate spindle 15, I will point out the differences between this spindle and the lower spindle 5. In my preferred embodiment, no thread is passed through the hollow spindle 5, but I prefer the hollow spindle construction to standardize the parts. The lower spindle 5 has a larger thread package than the intermediate spindle 15 because the lower spindle 5 supplies the larger quantity of thread E, E' which wraps around the core thread drawn from the intermediate thread package 17. The traveler of the lower spindle is not provided with a guide tube, such as tube 89 of the traveler on spindle 15. In Figure 1 this simple type of traveler is indicated by reference character 116 and has attached thereto the fliers 8. This type of traveler is more clearly illustrated in Figure 8 which is an enlarged view of the upper portion of spindle 35 which will hereinafter be more fully explained.

It may be said here that my process and apparatus for wrapping one thread about another has many advantages over prior practices. Where hollow spindles have been used previously, it has been customary to wrap the thread from the package on the hollow spindle about the thread coming up through the hollow spindle. This procedure required a large package on the hollow spindle since the quantity of thread used as the effect or wrapping thread is in excess of the core thread. Large packages or spools are in themselves disadvantageous, since the angle at which the thread leaves the spool varies greatly causing breakage. My process permits the use of a narrow spool 17 as illustrated in Figure 1. Moreover, since the package of effect

thread does not have a core thread passing through its center, it can be replaced at will without the use of a split spool.

My preferred spindle drive also has many advantages. Only the lower portion of the base 82 is rigidly fixed to the main frame L, and since the arm or bracket 83 extends outwardly from the upper portion of the base, it can be seen that the mounting is slightly resilient with respect to the frame and can absorb vibration. Moreover, as previously pointed out, the swingable pulley arm 20, prevents the vibration of belt 16 from being directly communicated to the spindle. In addition, I have provided automatic lubrication for the bearings while effectively preventing the leakage of oil to parts adjacent the yarn.

It is to be understood, therefore, that my process and apparatus in its broad aspect is not to be considered as limited to the particular details of my novel spindle and spindle drive. On the other hand, my novel spindle is capable of use in other types of spinning apparatus and I am not to be limited to use in the particular machine disclosed. For example in this application I disclose six spindles falling within the scope of my invention. In each instance, however, the spindle is used to produce an action on the yarn somewhat different from that of the other spindles.

From spindle 15 the twisted threads pass upwardly to the yarn softener or backwinding device generally indicated as 25 in Fig. 1. The yarn softener is driven by a belt 26 which passes along the full length of the machine and drives the yarn softeners on the other yarn units not shown. It will be noted that belt 26 travels in the opposite direction to the belts 6 and 16 which drive the lower spindles. Consequently, drive pulley 29 and band 32 operate to drive the yarn softener in the opposite direction from the direction of rotation of the spindles 5 and 15. The yarn softener is provided with a crank, generally indicated as 27 in Figure 1, the crank having thread engaging means for carrying or rotating the threads around the axis of rotation of the yarn softener.

Referring to Figs. 9, 10 and 11, the base 120 of the yarn softener is bolted or otherwise suitably fastened to the standard 2, the lower portion of the base 120 being mounted adjacent one of the L's of the main frame 1. The bracket 121 extends outwardly from the base 120 and has an elongated, tubular bearing support 122 at its outer end. The upper portion of the bearing support is recessed as indicated at 123, the wall of the recess being shouldered to support the outer track of a ball race 124. The inner track of the ball race is secured to an annular extension 125 of the whirl 31. A felt ring 126 is bolted or otherwise suitably fastened on the upper edge of the bearing support and overlaps the recess sufficiently to prevent entrance of dirt to the ball race. A hollow, non-rotating tube 127 is secured to the inner surface of the bearing support and extends upwardly into the recess to prevent the lubricant from the ball race from passing downwardly through the bearing support.

Whirl 31 supports a hollow spindle 128 which extends downwardly through and beyond the non-rotating tube 127. At the lower end of the rotating spindle 128 is fastened a crank having a yarn engaging loop 129. This crank, as shown in Figs. 9 and 11, may comprise a wire fastened to the hollow spindle and given several wraps around the lower end of the spindle to resiliently support the outer end of the wire which is spun off into a complete loop in one direction, and then over to form a complete loop diametrically opposite to the first loop. Since the spindle and crank are rotated at high speed, this construction balances the wire loops. As can be seen in Fig. 9, when threads are drawn through loop 129, the rotation of the spindle and the wire affixed thereto will exert a cranking action upon the threads with respect to the axis of rotation of the hollow spindle 128.

The lower portion of the bearing support is reduced in diameter to receive the annular end 137 of the swingable arm 30. The arm 30 is provided at its outer end with a bearing 132 supporting the rotating hollow shaft of the pulley 29. The construction of the ball bearings supporting the annular member 137 on bearing support 122, the swingable arm 30, and the bearing for pulley 29 is substantially the same as the construction of annular member 97, arm 20 and the bearing for pulley 19, all of which has been previously described. Pulley 29 is normally held in frictional engagement with belt 26 by means of the spring 140. However, upon rotation of control rod 48, the cam 52 will operate on bell crank lever 141 to move the swingable arm 30 and the pulley 29 away from belt 26. The construction of the control means is also similar to the construction of the control for spindle 15 previously described.

It is to be understood that any yarn engaging device which will rotate or crank the yarn with respect to the axis of the rotating member will perform my operation successfully. For example, in Fig. 12 I have shown a modified crank. An inverted cup-shaped member 130 is swaged on to the lower end of rotating spindle 128. Member 130 is provided with a hole 131 through which the yarn may be led. It can be seen that the rotation of the spindle will exert a cranking action on the yarn at this point. Nor am I to be considered as limited to the particular spindle construction shown for rotating the crank. Any means which will crank the threads and at the same time permit the threads to pass through the supporting structure may be used with other twisting devices to continuously backwind.

After passing over the crank 129 of the yarn softener and through hollow spindle 128 thereof, the threads pass upwardly to the rolls generally indicated by 34 in Fig. 1. These rolls are duplicates of the rolls 14 but are generally operated at a much slower speed than rolls 14. The relation of the speed of these rolls 34 to the speed of the spindle 15 determines the number of twists per inch in the thread drawn from thread package 17 and also the number of wraps per inch of the thread drawn from rolls 14 about the thread drawn from thread package 17. Rolls 34 are controlled by a cam 50a on control rod 48 in the same manner as has been previously described with reference to rolls 14 and cam 50.

The thread leaving rolls 34 is drawn upwardly through the hollow spindle 35. Belt 36, which I preferably drive in a direction opposite to the direction of belts 6 and 16, and in the same direction as belt 26, drives the pulley 39 on the swingable arm 40. Pulley 39 in turn drives whirl 41 by means of the local endless band 42.

The construction of hollow spindle 35 is substantially the same as the construction of the lower spindles 5 and 15. The traveler of spindle 35 does not have a tube guide, however, as does the traveler on spindle 15. As shown in Fig. 8,

the traveler 116' is without guide means for the thread or threads G other than the fliers 38, 38'. It is to be understood that by changing the weight of the traveler, the tension on the threads drawn from thread package 37 may be varied.

The threads G from the package 37 are twisted with the thread drawn from the hollow spindle at a point above the spindle as shown in Fig. 8. As I prefer to twist these threads at about the same tension, the jointure of the threads is spaced slightly from the axis of the spindle. The twisted threads pass upwardly through guide eye 43 to the yarn metering rolls generally indicated by 44 in Fig. 1.

The yarn metering rolls are shown in greater detail in Figs. 13 to 15. Base 150 is bolted or otherwise secured to the standard 2. Extending outwardly from the base is a flange or web 151 provided at one end with a bearing 152 for drive shaft 153 suitably driven by a variable speed mechanism not shown. Shaft 153 carries a slideable collar 154 having a circumferential groove on its outer surface to receive a shift fork 155. Collar 154 carries two pins 156, 156' diametrically opposed, and which pass through corresponding holes in the roll 157, rotatably mounted on shaft 153. Disc 158 having a hub 159 fixed to the shaft 153 prevents the roll 157 from moving off the end of the shaft 153 which may be provided with a shoulder adjacent the inner end of roll 157 to prevent movement of the roll toward collar 154. Disc 158 is provided with a plurality of holes 160 capable of receiving the ends of the pins 156. Pins 156 are long enough to enter a pair of the holes 160 when the collar 154 is abutting roll 157, but are withdrawn from the holes 160 when the collar 154 is in the position shown in Figs. 12 and 14.

The lower end of web 151 supports a stub shaft 161 at an acute angle with respect to the axis of shaft 153 and roll 157. An idler roll 162 is rotatably mounted on the stub shaft.

Arm 163 extends outwardly from base 150 and is bifurcated at its outer end to receive clutch shift lever 164 which pivots about pin 165 mounted in the bifurcated portion of arm 163. The shift fork 155 at one end of lever 164 slideably engages the groove formed in the circumference of collar 154. The other end of the shift lever is threaded to receive a cam follower bolt 167. Cam 54 on control rod 48 operates the shift lever 164 to start and stop the roll 157 in the same manner as the cam 50 of the feed rolls 14, previously described.

By passing the yarn from spindle 35 a number of times about the rolls 157, 162, the turns of the thread will be automatically separated due to the angular relation of the roll 162 with respect to the roll 157. The thread from the metering rolls is led upwardly through a guide on a conventional reciprocating mechanism 47 and is thereafter wound upon the spool 45 driven by the friction roll 46.

In operation assume that it is desired to produce a novelty yarn having a core thread or threads twisted lefthand 23 turns per inch, an effect thread or threads loosely wound about the core thread 23 turns per inch, and the core and effect bound together by a binder thread or threads wound therewith at about 10 turns righthand per inch.

A package of effect thread is placed on the lower spindle 5 and the effect thread E, E' is drawn through fliers 8, guide 13, rolls 14 and hollow spindle 15. A package of core thread is placed on spindle 15 and the core thread F, F' is drawn through fliers 18, the traveling guideways, and upwardly with the effect thread from the hollow spindle, through the yarn engaging means on the yarn softener or backwinding device 25, and rolls 34. The number of turns per inch of effect thread about the core thread in the finished yarn is determined by the relation of the speed of the rolls 34 to the speed of spindle 15. Assume that a speed of 26 R. P. M. of rolls 34, and 4500 R. P. M. of spindle 15 will produce a twist of 23 turns per inch in the core thread leaving spool 17. Then by rotating the rolls 14 at some speed in excess of 26 R. P. M. while maintaining tension on the thread F, F' drawn from thread package 17, the core thread F, F' will wrap itself in the effect thread E, E' as the two threads are intertwisted at the point B.

If spindle 5 is rotated in the same direction and at the same speed as spindle 15 the effect thread from package 7 will lie flat on the core thread, the only twist in the effect thread residing in its wraps about the core. This is apparent, as spindle 5 creates lefthand twist in the effect thread the amount of which is determined by the relation of the speed of spindle 5 and the speed of rolls 14. Since spindle 15 rotates at the same speed as spindle 5, and since it is drawing with respect to rollers 14 instead of feeding thereto, the twist imparted to the effect thread between 5 and 14 is removed between 14 and the loop of effect thread coming out of the hollow spindle 15. The effect thread then wraps in flat condition about the core thread. By varying the speed relation of spindles 5 and 15 the twist in the effect thread itself may be varied.

The yarn softener 25 rotates in the opposite direction to the direction of rotation of spindle 15. Between the yarn softener and spindle 15, therefore, the intertwist or wrap of the effect E, E' about the core F, F' is temporarily markedly increased. For example, by rotating the yarn softener at about 5000 R. P. M. righthand, the twist of effect thread about the core thread at B is temporarily increased from 23 to about 42 turns per inch. As is hereinafter more fully explained, this temporary increase in the intertwist or wrap of the effect about the core at B is merely a false twist and is removed as the yarn leaves the yarn softener 25. However, the false twist so imparted to the yarn at B enables me to tightly wind a large quantity of effect about the core thread in uniform condition at point B. For example, I have found that with the yarn softener operating at 5000 R. P. M. righthand, the ratio of effect thread to core thread (speed of feed roll 14 to speed of feed roll 34) may be varied over a range of from 1⅛ to 1, to 5 to 1. By increasing the speed of the yarn softener to 15,000 R. P. M. even further take ups of effect yarn may be obtained. The effect thread may be temporarily wrapped about the core thread so tightly and in such large quantities that the wraps of effect thread per inch are in excess of the number of diameters of the effect thread per inch and consequently the wraps of effect thread cover and overlap each other before the backwinding takes place. After backwinding such yarn in accordance with my invention the effect forms very loose loops and gives a soft pleasing appearance. The rotational speeds indicated above are given only by way of example and I am not to be limited thereby. In all cases, however, the yarn softener must have a rotational speed with respect to the twisting device, i. e., the yarn softener will

not produce the result desired when rotating in the same direction and at the same speed as the twisting device.

The crank 27, however, merely induces a false twist in the thread, for whatever twist it imparts to the approaching yarn is removed from the yarn leaving the crank and passing upwardly to the rolls 34. This, of course, results from the well known fact that it is impossible to place a permanent twist in the middle of a yarn without twisting one of the ends. Hence, the effect yarn is untwisted or back wound from the core thread between the crank 27 of the yarn softener and the rolls 34 an amount equivalent to whatever temporary twist was imparted to the yarn at B by the yarn softener. In the particular figures used herein by way of example, the backwinding leaves 23 turns per inch of the effect E, E' about the core F, F' at the rolls 34. This softens the yarn and the effect E, E' is in the form of loose loops about the core F, F'.

The core and effect leave the rolls 34 and pass upwardly through the hollow spindle 35 holding a spool or package 37 of binder thread. I have found that by rotating this spindle righthand at a speed which will produce a twist of about 10 turns per inch of binder righthand I am able to intertwine the binder G with a core and effect having 23 turns left hand so that the binder will lock the core and effect and the finished yarn will not tend to kink when released. Although the core thread and the binder are to take up strain in the finished yarn about equally, I find that it is preferable to create a slightly greater tension on the binder G at the spindle 35. At D, therefore, the core and effect, and the binder are twined together into a finished yarn having a core thread F, F' twisted 23 turns lefthand, an effect thread F, F' wrapped loosely 23 turns per inch about the core thread lefthand, and the binder thread G, which has in itself 10 turns per inch right hand, twined 10 turns per inch right hand with the combined core and effect.

The yarn so twisted at D passes upwardly through stationary guide 43 to the yarn metering rolls 44. Here the yarn moves comparatively slowly and may be observed by the operator at will. One advantage of my process and machine is that the finished yarn is not wound by means of a ring type traveler on to a rotating spindle when observation of the yarn is impossible due to high speed. Hence, if irregularity in the finished product exists, the operator may quickly shut down the unit by means of the control rod 48 and discover the reason for the defect.

It is to be understood that the illustration of the operation is only given by way of example and is not to be taken as limiting. My machine is capable of making an infinite variety of yarns. I have found that by varying the speed of the feed rolls 14 I can produce yarns having the standard variations of take up or ratio of effect thread to core thread. For exceptional looseness of effect, the speed of the yarn softener 25 can be increased and ratios of effect to core greater than 5 to 1 can be obtained.

If it is desired to produce a yarn wherein the effect is itself twisted, the lower spindle 5 can be operated at a lower speed than spindle 15 or held stationary. I have found that this tends to lock the fibers of the effect and produce a somewhat glossy yarn. By varying the speed of the lower spindle this glossy effect can be varied.

If so desired, the yarn may be drawn or fed through the machine at recurring irregular speeds so that the effect will build up in nubs at intervals along the core. Moreover, my machine is easily adapted for the production of simple covered yarns. For example, a thread or threads from either or both of the lower spindles can be led directly through the upper spindle and covered with the thread or threads drawn from the top spindle.

It is obvious that many varieties of yarns may be produced by varying the type and number of threads on the thread packages. For example, one or a plurality of threads E, E' can be drawn from the lower package 7. The core thread F, F' can be a single strand or several strands. If desired, the binder thread G may comprise a combined core and effect which when twisted with a core and effect coming from the lower spindles produces a very soft finished yarn. Other possible combinations are obvious.

In Fig. 16 I have shown diagrammatically a modified apparatus using my backwinding mechanism. Two thread packages are shown at 170 and 171, the thread from each package being drawn through suitable guides 172, 173 to feed rolls 174 and 175 driven by any variable speed mechanism. The two threads pass downwardly over the guides 176 and are twisted together on their passage to the yarn softener generally indicated by 177. This yarn softener is provided with a crank 178 and is of the same general construction as the yarn softener 25 previously described in detail. In this instance, however, the yarn softener is mounted with its crank at the top and the threads from the guide 176 are passed through the crank and downwardly through the hollow spindle of the yarn softener. Pulley 179 driven by belt 180 drives the local band 181 which in turn drives the whirl of the spindle on the yarn softener. The threads from the yarn softener pass downwardly through guide 183 to a ring type traveler 184 and are wrapped on the thread package 185 as shown. The thread package 185 is mounted on a spindle generally indicated as 186. The spindle is of the same general construction as the spindles described in my preferred mechanism, a pulley 187 on swingable arm 188 being driven by the belt 189 and having a local band 190 which drives the whirl 191 of the spindle.

It will be noted, however, that in this instance the spindle is driven in the same direction as the direction of rotation of the yarn softener. In operation the yarn softener is driven at about twice the speed of the spindle 186. Either one of the feed rolls 174, 175 is operated at a greater speed than the other pair of feed rolls. Assume that feed rolls 174 supply the effect thread E'' at a faster rate than feed rolls 175 supply a core thread F''. Below the guide 176 the effect thread will be wrapped around the core thread very tightly and at a high number of turns per inch due to the high speed and crank action of the yarn softener. Below the crank 178 of the yarn softener all of the twist imparted to the threads between the guide 176 and the crank 178 would be removed due to the reverse crank action as the threads leave the crank 178, but for the fact that the lower end of the threads is rotated in the same direction between ring type traveler 184 and spindle 186. Due to this rotation of the end of the thread at a lower speed than the speed of the yarn softener, only a part of the twist imparted between the guide 176 and the crank 178 is removed. The effect E'' is therefore loosely

wound on the core F'' when the yarn is wound on the yarn package 185.

By this process and apparatus I am able to take up a large amount of effect thread on the core thread in a continuous operation, whereas, previously it has been customary to wind the effect thread tightly on the core thread by means of a ring type, then doff the yarn package, and thereafter backwind the effect from the core thread the desired amount in a separate operation.

Having fully described my invention, what I claim is as follows:

1. The method of intertwisting a plurality of threads which comprises drawing a core thread into an intertwisting zone under a first tension, drawing an effect thread into said zone under a second tension sufficiently lower than said first tension to permit ballooning of said effect thread as it is drawn toward said zone, intertwisting the effect thread tightly about the core thread as the two threads are drawn through said zone, and thereafter continuously backwinding a portion of the intertwist of the effect thread about the core thread to loosen the effect thread on the core thread before winding the yarn on a spool.

2. The method of intertwisting a plurality of threads which comprises feeding a core thread to an intertwisting zone at a first rate, feeding an effect thread to said zone at a second rate higher than said first rate, tightly intertwisting the effect thread about the core thread in said zone to thereby take up the excess effect thread and prevent its accumulation as it is fed toward said zone and continuously removing the intertwisted yarn from said zone while backwinding a portion of the intertwist of the effect thread about the core thread.

3. The method as set forth in claim 2 wherein the second rate is from 1⅛ to 5 times the first rate.

4. The method of intertwisting a plurality of threads which comprises feeding a core thread to an intertwisting zone at a first rate, feeding an effect thread to said zone at a second rate higher than said first rate, intertwisting the threads together in said zone to obtain an intertwist of effect threads about the core thread in excess of the number of diameters of effect thread per inch, and continuously removing the intertwisted yarn from said zone while backwinding a portion of the intertwist of the effect thread about the core thread to an intertwist not in excess of the number of diameters of effect thread per inch.

5. The method of intertwisting core and effect threads which comprises leading the threads away from a first rotating member into a common path while rotating at least one of the threads on said member to intertwist the threads, maintaining the tension of the effect thread sufficiently lower than the tension of the core thread to permit ballooning of said effect thread as it is led toward said path, leading the intertwisted threads to a second member rotating in a direction opposite to the direction of rotation of said first member, rotating the twisted threads on said second member to increase the twist of the threads between the first and second members to thereby prevent excessive ballooning of the effect thread, and thereafter leading the threads away from said second member into a non-rotating path to remove the increase in the intertwist imparted by said second member.

6. The method of intertwisting a plurality of threads to form yarn which comprises drawing a first thread from a rotating thread package into a common path with a second thread drawn from a path comprising the axis of rotation of the thread package, creating a tension on the first thread to allow the second thread to wind itself about the first thread in said common path, leading the threads from said common path to a member rotating in a direction opposite to the direction of rotation of said package, rotating the threads on said member to increase temporarily the winding of the second thread about the first thread between said package and said member, and thereafter leading the threads away from said member into a non-rotating path to loosen the winding of the second thread about the first thread.

7. The method of intertwisting a plurality of threads to form yarn which comprises feeding a core thread to a first intertwisting zone at a first rate, feeding an effect thread to said intertwisting zone at a second rate higher than the first rate, intertwisting the effect thread about the core thread in said zone, continuously removing the intertwisted threads from said zone while backwinding a portion of the intertwist of the effect thread about the core thread, feeding the intertwisted threads to a second intertwisting zone, feeding a binder thread to the second intertwisting zone, and twining the binder thread and the intertwisted core and effect threads together in said second intertwisting zone.

8. The method as set forth in claim 7 wherein the twining of the binder thread and the intertwisted core and effect threads in the second intertwisting zone is carried out in a direction opposite to the intertwisting in the first intertwisting zone.

9. The method of intertwisting a plurality of threads which comprises drawing a core thread from a rotating package to a point above the rotating package, leading a further thread from a supply outside of said package through the package substantially along the axis thereof, and thereafter causing the core thread to wrap itself in and to intertwist itself with the further thread at said point.

10. The method as set forth in claim 9 wherein the further thread is drawn from a second rotating package.

11. The method of intertwisting a plurality of threads which comprises drawing a thread from a rotating package to a first point above and substantially in alignment with the axis of the rotating package, leading a further thread from a supply outside of said package through the rotating package along the axis thereof to a second point beneath said first point, causing the further thread to pass in a balloon-shaped path from said second point to said first point, and intertwisting the threads at said point, the core thread wrapping itself in the further thread as the two threads are intertwisted.

12. The method of intertwisting a plurality of threads to form yarn which comprises drawing a core thread from a rotating package to a point above the rotating package, leading an effect thread from a supply outside of said package through the package substantially along the axis thereof, intertwisting the effect thread about the core thread at said point, leading the intertwisted core and effect through a second rotating package substantially along the axis thereof, drawing a binder thread from said second package to a point above said second package, and twining

the intertwisted core and effect, and the binder thread together at the point above said second package.

13. The method as set forth in claim 12 wherein the effect thread is intertwisted about the core thread in one direction and the intertwisted core and effect, and the binder thread are twined together in the opposite direction.

14. The method of intertwisting a plurality of threads to form yarn which comprises drawing a core thread from a rotating package to a point above the rotating package, leading an effect thread from a second rotating package through the first mentioned package substantially along the axis thereof, intertwisting the effect thread about the core thread at said point, leading the intertwisted core and effect through a third rotating package substantially along the axis thereof, drawing a binder thread from said third package to a point above said third package, and twining the intertwisted core and effect, and the binder thread together at the point above said third package.

15. The method as set forth in claim 14 wherein the effect thread is intertwisted about the core thread in one direction, and the intertwisted core and effect, and the binder thread are twined together in the opposite direction.

16. The method of intertwisting a plurality of threads to form yarn which comprises leading a core thread from a first rotating thread package to a point above the rotating package, leading an effect thread from a second rotating thread package through said first package substantially along the axis thereof, intertwisting the effect thread about the core thread at said point, leading the intertwisted core and effect threads to a member rotating in a direction opposite to the direction of rotation of said first package, rotating the threads on said member to increase the intertwist of the effect thread about the core thread between said member and said point, leading the intertwisted core and effect threads away from said member into a non-rotating path to decrease the intertwist of the effect thread about the core thread, leading the intertwisted core and effect thread through a third rotating thread package substantially along the axis thereof, drawing a binder thread from said third package to a point above said third package, and turning the intertwisted core and effect threads and the binder thread together at the point above said third package.

17. The method of twisting a plurality of threads together which comprises drawing a plurality of threads together along a first portion of a path forming the axis of rotation of a further portion of the threads, twisting the threads together while withdrawing the threads from said path and carrying the threads comprising the further portion about said axis at a first angular speed, passing the threads to a second portion of said path, and withdrawing the threads from the second portion of said path and rotating them in the same direction but at a lower angular speed than the first angular speed.

18. The method of twisting yarn which comprises supplying a core thread at a first rate, supplying an effect thread at a second rate higher than the first rate, drawing the threads together along a first portion of a path forming the axis of rotation of a further portion of the threads, winding the effect thread about the core thread while withdrawing the threads from said path and carrying the threads comprising the further portion about said axis at a first angular speed, passing the threads to a second portion of said path, and withdrawing the threads from the second portion of the path and rotating them in the same direction but at a lower angular speed than the first angular speed.

19. The method of twisting a plurality of threads together which comprises feeding the threads to a first zone, twisting the threads together in said zone while carrying a section of the threads around an axis of rotation at a first angular speed, and continuously removing the threads from said first zone and leading the threads to a second twisting zone while backwinding a portion of the twist of the threads about each other and permanently fixing the remaining portion of the twist of the threads about each other by rotating the threads in said second zone in the same direction as the direction of rotation in said first zone, but at a lower angular speed than the first angular speed.

20. The method of twisting yarn which comprises feeding a core thread to a first zone at a first rate, feeding an effect thread to said zone at a second rate higher than the first rate, winding the effect thread about the core thread in said zone while carrying a section of the threads around an axis of rotation at a first angular speed, and continuously removing the threads from said first zone and leading the threads to a second zone while backwinding a portion of the winding of the effect thread about the core thread and permanently fixing the remaining portion of the winding of the effect thread about the core thread by rotating the threads in said second zone in the same direction as the direction of rotation in said first zone, but at a lower angular speed than the first angular speed.

21. Twisting apparatus comprising a spindle for carrying a package of core thread, means for rotating the spindle, a feeding mechanism for positively delivering effect thread at a first rate, means for guiding the effect thread into intertwisting engagement with the core thread, a rotatable member mounted on a hollow support and having thread engaging means, means for rotating said member in a direction opposite to the direction of rotation of the spindle, and means for drawing the intertwisted core and effect threads through the engaging means on said member at a lower rate than said first rate.

22. Twisting apparatus comprising a hollow spindle for carrying a package of core thread, means for rotating the hollow spindle, a feeding mechanism for positively delivering effect thread at a first rate, a rotatable member mounted on a hollow support and having thread engaging means, means for rotating said member in a direction opposite to the direction of rotation of the spindle, and means for drawing the effect thread from the feeding mechanism through the hollow spindle into intertwisting engagement with core thread from said package and for drawing the intertwisted core and effect threads through the engaging means on said member at a lower rate than said first rate.

23. Twisting apparatus comprising a hollow spindle for carrying a package of core thread, means for rotating the hollow spindle, a traveling flier adapted to engage thread drawn from the package, said flier being rotatably mounted on the spindle and creating a first tension on the core thread as it is drawn through the flier, means for supplying effect thread to the hollow spindle, a rotatable member mounted on a hollow support

and having thread engaging means, means for rotating said member in a direction opposite to the direction of rotation of the spindle, and means for drawing core thread from said package through the traveling flier into intertwisting engagement with effect thread drawn from the hollow spindle under a second tension lower than said first tension, and for drawing the intertwisted threads through the engaging means on said member.

24. Twisting apparatus comprising a hollow spindle for carrying a package of core thread, means for rotating the hollow spindle, a traveler rotatable with said spindle above said package and having a guideway portion beyond an open end of the hollow spindle, said portion including a first guideway adjacent the axis of rotation of the spindle and a second guideway spaced from the axis of rotation of the spindle, means for supplying effect thread to the hollow spindle, a rotatable member mounted on a hollow support and having thread engaging means, means for rotating said member in a direction opposite to the direction of rotation of the spindle, and means for drawing core thread from said package through said first guideway and effect thread from said hollow spindle through said second guideway into intertwisting engagement, and for drawing the intertwisted threads through the engaging means on said member.

25. Twisting apparatus comprising a first thread package, a first hollow spindle for carrying a second thread package, said first spindle being mounted above said first package, a rotatable member mounted upon a hollow support above said first spindle, said rotatable member including yarn engaging means, and a second hollow spindle for carrying a third thread package, said second spindle being mounted above said member.

26. Yarn twisting apparatus as in claim 25 wherein the first thread package is rotatable.

27. Twisting apparatus comprising a hollow spindle for carrying a thread package, a traveling guideway adjacent an open end of the hollow spindle, means for drawing thread from said package at a first rate and for drawing said thread through the guideway into intertwisting engagement with a second thread drawn from the hollow spindle, and means for delivering the second thread to the hollow spindle at a rate higher than said first rate.

28. Twisting apparatus comprising a first spindle for carrying a first thread package, a second spindle for carrying a second thread package, said second spindle being hollow and mounted above said first spindle, rolls for drawing thread from said first thread package and delivering the thread to the second spindle at a first rate, rolls for drawing thread from said second package at a rate lower than said first rate, said last-mentioned rolls being located above the hollow spindle and adapted to draw the thread from the first-mentioned rolls through the hollow spindle into intertwisting engagement with the thread from the second package.

29. In combination a first rotatable member having an element adapted to engage thread to rotate the thread about the axis of said member, means for rotating said member in a first direction at a first speed, means for positively delivering effect thread to said member at a first rate, means for delivering core thread into intertwisting engagement with the effect thread as it passes toward said member, a second rotatable member for drawing the intertwisted core and effect threads away from said first rotatable member substantially along the axis thereof and at a second rate lower than said first rate, and means for rotating said second member in said first direction but at a speed lower than said first speed.

30. Yarn twisting apparatus comprising a pair of rolls for positively delivering an effect thread at a first rate, another pair of rolls for positively delivering a core thread at a second rate lower than said first rate, a stationary guide for directing the two threads into intertwisting engagement, a rotatable member mounted on a hollow support and having means for engaging and rotating the threads directed thereto by said guide, means for rotating said member in a first direction at a first speed, means for drawing the threads through the thread engaging means on said member at substantially said second rate, said last-mentioned means comprising a rotatable spindle for carrying a thread package and a ring traveler, and means for rotating the spindle in said first direction but at a speed lqwer than said first speed.

31. Twisting apparatus comprising a first rotating member having an element for engaging and rotating a plurality of threads as they approach said member, means for feeding a core thread at a first rate to a path approaching said member substantially along the axis thereof, feeding mechanism for positively delivering effect thread toward said path at a second rate higher than said first rate, means for drawing the core and effect threads away from the rotating member substantially along the axis thereof, one of said means including a second rotating member having an angular speed and a direction of rotation to maintain a differential between the intertwist of the threads approaching said first rotating member and the intertwist of the threads drawn away from said first rotating member.

32. Twisting apparatus comprising a first rotating member having an element for engaging and rotating a plurality of threads about the axis of rotation of said member to intertwist the threads as they approach said member, means for feeding a core thread at a first rate to a path approaching said member substantially along the axis thereof, feeding mechanism for positively delivering effect thread toward said path at a second rate higher than said first rate, means for drawing the core and effect threads away from the rotating member substantially along the axis thereof, one of said means including a rotatable thread package carrying an end of at least one of said threads and a drive for rotating said thread package to create a permanent intertwist of the core and effect threads.

33. Twisting apparatus comprising a core thread package, an effect thread package, a rotatable spindle having an element for engaging and rotating core and effect threads from said packages to create permanent intertwisting of the threads, means for positively delivering effect thread toward said spindle, means for rotating said spindle at a speed to create a permanent intertwisting insufficient to take up the effect thread delivery by the effect thread delivering means, a rotatable member having an element for engaging and rotating the core and effect threads about the axis of rotation of the member after the two threads come into intertwisting engagement with each other, and means for rotating said member in a direction and at a

speed which will temporarily impart sufficient intertwist to the core and effect threads as they approach said member to take up the effect thread from the effect thread delivering means.

34. Twisting apparatus comprising a rotatable spindle, a package of core thread mounted on said spindle, means for drawing core thread from said package, means for positively delivering effect thread into intertwisting engagement with core thread drawn from said package, means for rotating said spindle at a lower rate than that necessary to produce the intertwisting required to take up the effect thread delivered by the effect thread delivering means, a rotatable member having an element for engaging and rotating the intertwisted core and effect threads about the axis of rotation of said member and means for rotating said member in a direction opposite to the direction of rotation of said spindle and at a speed which will temporarily increase the intertwist of the core and effect as they approach said member to take up the effect thread as it is supplied by the effect thread delivering means.

35. Yarn twisting apparatus comprising means for delivering core thread at a first rate, means for positively delivering effect thread at a rate higher than said first rate, a rotatable spindle carrying an end of both of said threads, means for rotating said spindle to create permanent intertwisting of the two threads at a lower rate than that necessary to take up the effect thread delivered by the effect thread delivering means, a rotatable member located between the delivering means and the spindle and having an element for engaging and rotating the core and effect threads about the axis of rotation of the member, and means for rotating said member at a higher speed than the speed of the spindle to temporarily impart sufficient intertwist to the core and effect threads as they approach said member to take up the effect thread as it is supplied by the effect thread delivering means.

36. Twisting apparatus comprising a first spindle for carrying a first thread package, means for rotating said first spindle, a second spindle for carrying a second thread package, said second spindle being hollow and mounted in alignment with said first spindle, means for rotating said second spindle, a rotatable member mounted on a hollow support in alignment with said second spindle, said member including yarn-engaging means, means for rotating said member in a direction opposite to the direction of rotation of the second spindle, means for drawing thread at a first rate from said first package and for delivering said thread into said second hollow spindle, means for drawing said thread from the hollow spindle into intertwisting engagement with thread drawn from said second package, and for drawing the intertwisted threads through the yarn-engaging means on said member at a second rate lower than said first rate.

CHARLES C. JESSEN.

CERTIFICATE OF CORRECTION.

Patent No. 2,131,893. October 4, 1938.

CHARLES C. JESSEN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 50, for "spinde" read spindle; page 6, first column, line 39, for "F, F'" read E, E'; page 7, first column, line 8, after "type" and before the comma insert the word traveler; line 68, claim 5, for "twist" read intertwist; page 8, first column, line 50, claim 16, for "turning" read twining; page 9, second column, line 69, claim 33, for "delivery" read delivered; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 22nd day of November, A. D. 1938.

Henry Van Arsdale

(Seal) Acting Commissioner of Patents.

speed which will temporarily impart sufficient intertwist to the core and effect threads as they approach said member to take up the effect thread from the effect thread delivering means.

34. Twisting apparatus comprising a rotatable spindle, a package of core thread mounted on said spindle, means for drawing core thread from said package, means for positively delivering effect thread into intertwisting engagement with core thread drawn from said package, means for rotating said spindle at a lower rate than that necessary to produce the intertwisting required to take up the effect thread delivered by the effect thread delivering means, a rotatable member having an element for engaging and rotating the intertwisted core and effect threads about the axis of rotation of said member and means for rotating said member in a direction opposite to the direction of rotation of said spindle and at a speed which will temporarily increase the intertwist of the core and effect as they approach said member to take up the effect thread as it is supplied by the effect thread delivering means.

35. Yarn twisting apparatus comprising means for delivering core thread at a first rate, means for positively delivering effect thread at a rate higher than said first rate, a rotatable spindle carrying an end of both of said threads, means for rotating said spindle to create permanent intertwisting of the two threads at a lower rate than that necessary to take up the effect thread delivered by the effect thread delivering means, a rotatable member located between the delivering means and the spindle and having an element for engaging and rotating the core and effect threads about the axis of rotation of the member, and means for rotating said member at a higher speed than the speed of the spindle to temporarily impart sufficient intertwist to the core and effect threads as they approach said member to take up the effect thread as it is supplied by the effect thread delivering means.

36. Twisting apparatus comprising a first spindle for carrying a first thread package, means for rotating said first spindle, a second spindle for carrying a second thread package, said second spindle being hollow and mounted in alignment with said first spindle, means for rotating said second spindle, a rotatable member mounted on a hollow support in alignment with said second spindle, said member including yarn-engaging means, means for rotating said member in a direction opposite to the direction of rotation of the second spindle, means for drawing thread at a first rate from said first package and for delivering said thread into said second hollow spindle, means for drawing said thread from the hollow spindle into intertwisting engagement with thread drawn from said second package, and for drawing the intertwisted threads through the yarn-engaging means on said member at a second rate lower than said first rate.

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