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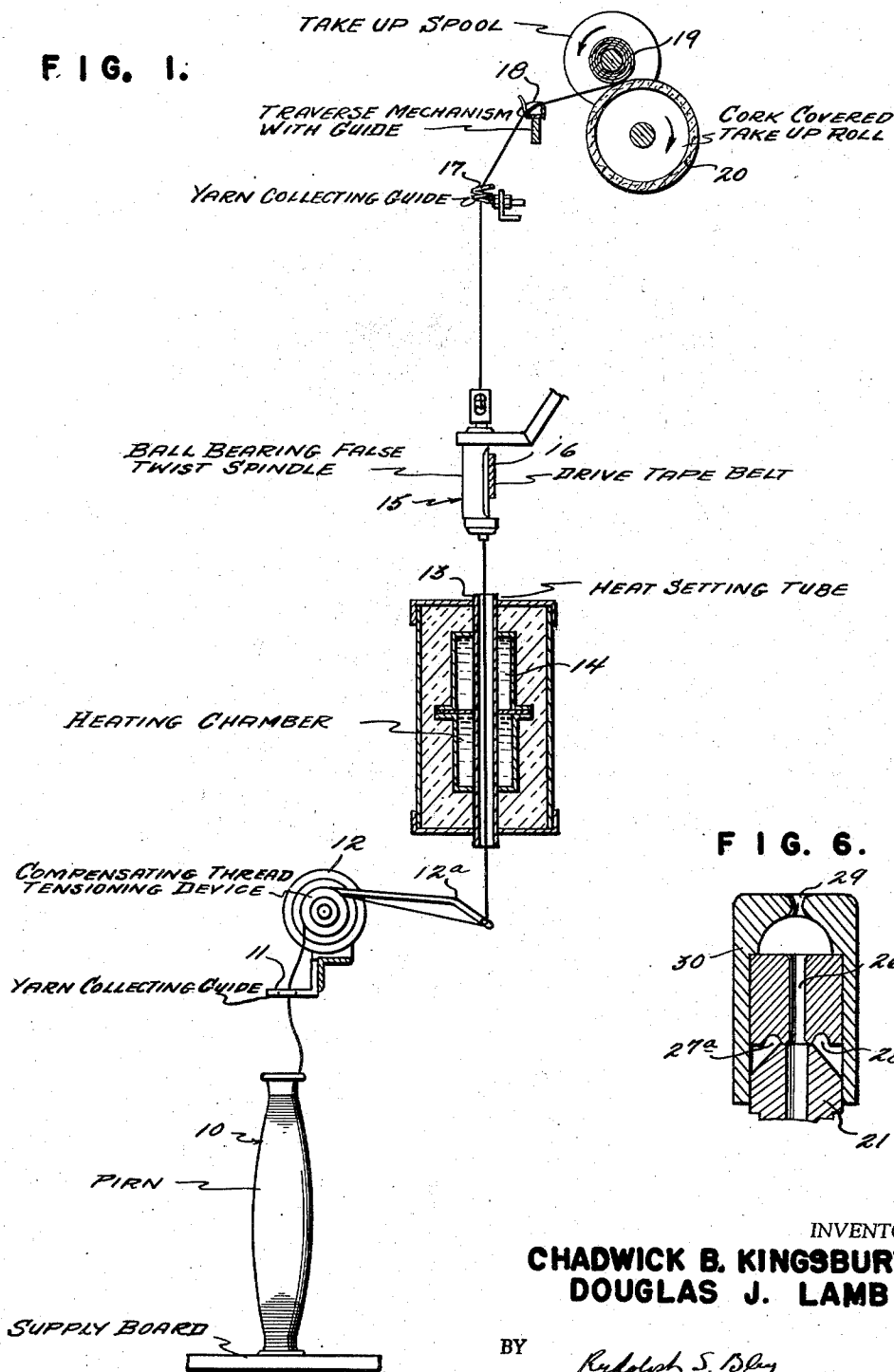
2,813,393

FALSE TWIST SPINDLE

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2 Sheets-Sheet 1

FIG. 1.



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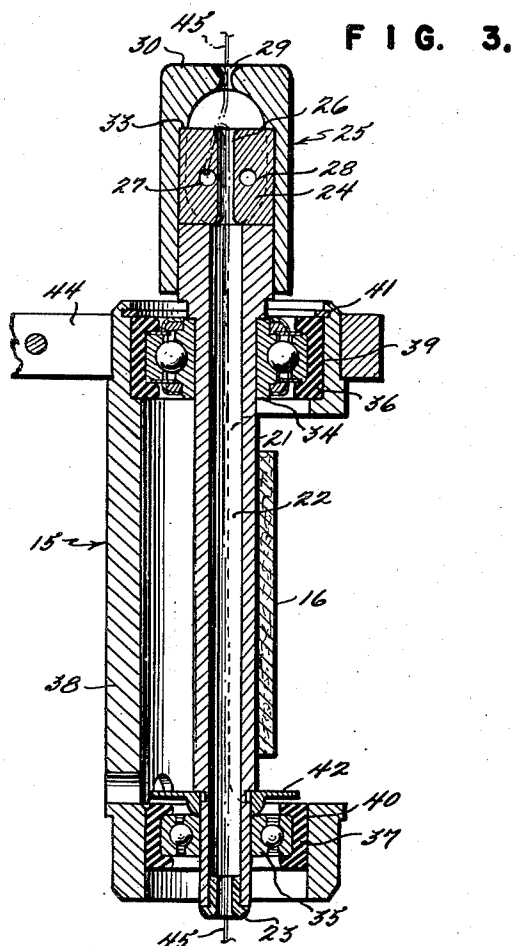
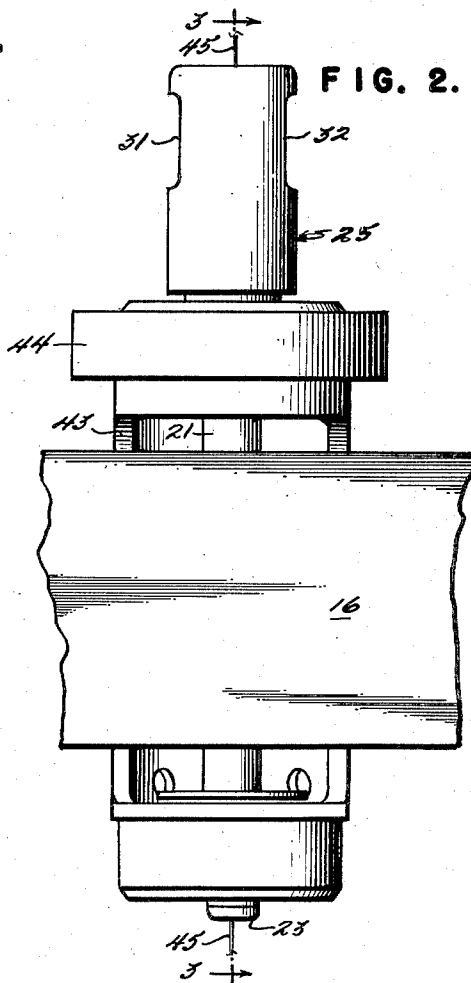
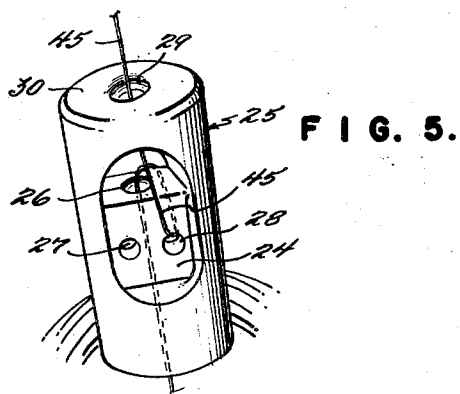
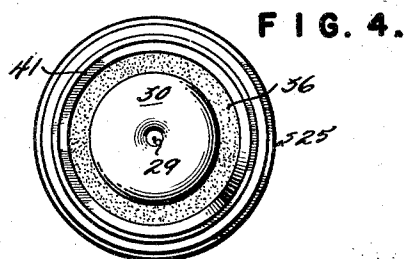
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FALSE TWIST SPINDLE

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2 Sheets-Sheet 2



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1

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FALSE TWIST SPINDLE

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Application October 28, 1955, Serial No. 543,362

6 Claims. (Cl. 57—77.3)

This invention relates to false twist spindles for use on textile machines. More particularly this invention relates to spindles for applying a high and uniform false twist to running yarn in a crimping process.

An object of this invention is to provide an improved false twist spindle for applying a high uniform false twist to yarn.

Another object of this invention is to provide an improved false twist spindle in which the yarn is so coupled with the spindle that one rotation of the spindle must insert one turn of twist in the yarn.

Still another object of this invention is to provide an improved false twist spindle in which the yarn does not contact parts which may rotate erratically and so add tension erratically to the yarn.

Still another object of this invention is to provide an improved false twist spindle having a rotatable twist tube and a yarn coupling block secured to the end of the twist tube, the yarn coupling block having a bore coaxial with that of the twist tube and one or more lateral bores spaced apart from the axial bore.

Another object of this invention is to provide an improved false twist spindle having a rotatable twist tube and a yarn coupling block secured to the end of the twist tube by a retainer in the form of an inverted cup-like member, said retainer having a top thread guide opening and side ports adjacent the coupling block to facilitate threading up.

Still another object of this invention is to provide an improved false twist spindle having a twist tube which is rotatably supported by ball bearings in a housing having an opening so that a drive belt can contact the twist tube.

Other and further objects of this invention will be apparent to those skilled in the art to which it relates from the following specifications and claims.

In accordance with this invention there is provided an improved false twist spindle for applying a high and uniform false twist to running yarn in a continuous crimping process. This is made possible by the novel construction and assembly of the spindle and, in particular, by the novel construction of the yarn coupling block of the spindle which so couples the running yarn to the spindle that each rotation of the spindle must apply one turn of twist to the yarn.

The moving part of the spindle comprises a rotatable twist tube, a yarn coupling block rigidly attached to the tube and a coupling block retainer which secures the coupling block to the twist tube. An axial bore extends through the entire length of the twist tube, through the yarn coupling block and out through the aforesaid retainer. The yarn coupling block is also provided with at least one lateral bore spaced apart from the axial bore. The yarn passes through the axial bores of the twist tube and the coupling block, thence across the top of the coupling block, down one side, through one of the lateral bores, up the opposite side and exits through the axial opening in the coupling block retainer. The yarn is coupled perfectly with the spindle yet it is not in contact with any

2

member which may rotate erratically and so add tension erratically. Furthermore, the construction of the spindle is such that it is not difficult to thread it up correctly.

Further details of this invention are set forth in the following specification, claims and drawing.

Referring to the drawing briefly:

Fig. 1 is a schematic view of a yarn crimping machine embodying the false twist spindle of this invention;

Fig. 2 is an elevational view of the false twist spindle;

Fig. 3 is a vertical sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a plan view of the false twist spindle shown in Fig. 2;

Fig. 5 is a fragmentary perspective view of the spindle head showing the path of the thread through the coupling block; and

Fig. 6 is a sectional view of a modified form of yarn coupling block.

Referring to the drawings in detail, there is shown in Fig. 1 an embodiment of a yarn crimping apparatus of the type disclosed in Application Serial No. 543,361, filed concurrently herewith in which the false twist spindle of this invention is adapted to be used.

In the continuous yarn crimping apparatus shown schematically in Fig. 1 the nylon or other thermoplastic yarn is taken from the pirn 10 and is passed upward through the yarn collecting guide 11 that is disposed directly above the pirn. From the guide 11 the yarn passes between a pair of discs of the yarn tension device 12 which is of the type disclosed in U. S. Patent No. 2,554,493. This tension device is provided with an arm 12a which guides the yarn to the inlet of the yarn heating tube 13 which passes through a suitably insulated heating chamber 14 through which oil or other heating fluid is circulated.

The false twist spindle 15 of this invention, driven by belt 16, is disposed above the yarn heating tube 13 and is coaxial therewith. A yarn collecting guide 17 is disposed directly above the false twist spindle. A traverse guide 18 and a yarn take-up device 19 driven by take-up roll 20 complete one position of the apparatus which is described in greater detail in the above mentioned co-pending application.

The moving parts of the false twist spindle 15 include a rotatable twist tube 21 having an axial bore 22; a yarn guide bushing 23 secured in the lower end of the axial bore and a yarn coupling block 24 secured to the upper end of the twist spindle tube 21 by means coupling block retainer 25.

Yarn coupling block 24 is provided with a vertical bore 26 coaxial with bore 22 of the twist spindle tube 21, and a pair of horizontal bores 27 and 28 disposed on either side and adjacent to the axial bore 26. The yarn coupling block 24 is preferably an insert that is made of materials such as stainless steel, ceramic, or the like, which have suitable wear resisting and frictional properties. Furthermore, each end of each vertical and horizontal bore thereof is chamfered to prevent chafing of the running thread. This yarn coupling block 24 is secured in the retainer 25 by a press fit or by set screws, pins, or the like, and retainer 25 is secured in a similar manner to the upper end of twist tube 21.

Yarn coupling block retainer 25 is an inverted cup-like member having an axially located thread guide opening 29 in the upper portion 30 thereof and oppositely disposed side openings 31 and 32 of this retainer provide access to the yarn coupling block when the device is threaded up. Shoulders 33 in the upper portion of the retainer 25 bear against the upper end of the coupling block when it is positioned on the upper end of the twist spindle tube.

Twist spindle tube 21 is rotatably supported by the upper ball bearing 34 and the lower ball bearing 35. An

3

annular rubber boot 36 of U-shaped cross-section is disposed about the outer race of upper ball bearing 34 and in like manner an annular rubber boot 37 of similar U-shaped cross-section is disposed about the outer race of lower ball bearing 35. These rubber boots serve to absorb vibrations produced in the spindle assembly and thus prolong the life of the bearings.

Twist spindle tube 21 is rotatably supported in a housing 38 which is provided with an annular surface 39 adapted to engage the outer surface of the rubber boot 36. This rubber boot is held in place in the housing by the snap ring 41 that is lodged in a suitable groove in the housing. A cylindrical bore 40 in the lower end of the housing 38 receives the lower ball bearing 35 and rubber boot 37 assembly. Washer 42, secured to the twist spindle tube 21 immediately above the lower ball bearing 35 is provided for the purpose of protecting the lower ball bearing from the accumulation of foreign material resulting chiefly from wear on the belt 16. Housing 38 is provided with a cut-out portion 43 so that the drive belt 16 can contact the twister spindle tube 21 to rotate this spindle tube.

The entire false twist spindle assembly 15 is pivotally attached to the machine by an arm 44 only a portion of which is shown. The spindle is thus pivoted so that it can be raised out of engagement with the drive belt 16. Furthermore, it is held in engagement with said belt during operation, by the force of gravity acting thereon.

A modified form of yarn coupling block is shown in Fig. 6 wherein the horizontal bores 27 and 28 are eliminated and a pair of grooves 27a and 28a are provided at the bottom of the block 25. The yarn is passed up through the axial bore 26 and down on one side of the block to one of the grooves 27a and 28a from which it is drawn up along the other side of the block and out through the hole 29 of the retainer member 30.

In the operation of this device, yarn 45 leaving the heat tube enters the spindle tube 21 through yarn guide bushing 23 and passes upwardly therethrough in a straight line. From the tube 21 the yarn enters the bore 26 of coupling block 24 and then crosses the top thereof and passes down one side and through either horizontal hole 27 or 28; it then is drawn up the opposite side of the coupling block and out through axial thread guide opening 29.

It will readily be seen that yarn 45 is coupled to the spindle by the tortuous passage of the yarn through the axial hole 26 and either horizontal hole 27 or 28 of the coupling block 24 so that one turn of false twist is always inserted in the running yarn below the coupling block 24 for each revolution of the spindle. Tests have shown that the calculated amount of false twist is actually inserted in the yarn by this spindle.

The false twist applied to the yarn by the spindle extends back on the yarn uniformly to a point of radial contact, which in the crimping apparatus shown in Fig. 1 is the arm of the tension device 12. Because the twist runs back on the yarn uniformly through the heating zone where the yarn is softened and because the twist is undisturbed in this zone, a very uniform crimp is produced.

In conventional false twist spindles the yarn is coupled to the spindle by means of a pivoted roller. It has been found by experience that such rollers tend to freeze and remain stationary with respect to the spindle during high speed operation. This tendency to freeze produces erratic tensions in the yarn leaving the spindle. Furthermore, yarn wrapped 360° or more around a roller tends to roll over on itself at the point of overlap on the roller. This damages the yarn and causes tension variations and often a yarn break. Also in filament wraps which are very difficult to remove, tend to form on a rotating roller.

These disadvantages are eliminated in the false twist spindle of the present invention by the construction of

4

the coupling block. In the first place the coupling block has no moving parts to freeze, therefore it always adds a uniform amount of tension to the yarn. Furthermore, the yarn passes through and about the coupling block in such a manner that it cannot roll over on itself. Also, due to the nature of the coupling block, filament wraps cannot form.

The spindle may be threaded up with the assistance of the well-known thread-up wires, hooks, etc. Due to the construction of the device it is not difficult to thread it up correctly.

While we have described this invention in detail with respect to certain preferred embodiment thereof, it is, of course, not desired to limit the invention to the exact details described and illustrated except in so far as these details are defined by the claims.

What we claim is as follows:

1. A false twist spindle adapted for use with thermoplastic yarns for the purpose of inserting a crimp therein, comprising a housing, an elongated hollow rotatable member positioned in said housing, said housing being cut away to expose a portion of said rotatable member, means passing through said cut away portion to rotate said member at relatively high speed, a yarn coupling block positioned on the top of said rotatable member, said block having a vertical bore therethrough in alignment with a longitudinal bore extending through said rotatable member whereby yarn may pass through said bores out of the top of said block, said block also having a horizontal bore passing therethrough on one side of said vertical bore, said yarn being adapted to be threaded through said horizontal bore after emerging from said vertical bore so that one turn of twist is inserted into the yarn for each turn of rotation of said member.

2. A false twist spindle as set forth in claim 1 further comprising ball bearing means engaging the upper and lower end portions of said rotatable member for supporting said rotatable member in said housing.

3. A false twist spindle as set forth in claim 2 further comprising rubber vibration absorbing means positioned between said ball bearing means and said housing for absorbing vibration of said rotatable member.

4. A false twist spindle as set forth in claim 3 further comprising a disc shaped member supported on said rotatable member above the ball bearing means that is positioned at the lower end of said rotatable member, said disc shaped member being adapted to prevent lint and other foreign material from dropping into said last mentioned bearing means.

5. A false twist spindle as set forth in claim 4 further comprising an inverted cup shaped member for receiving said yarn coupling block, said inverted cup shaped member being fixedly attached to the top of said rotatable member for rigidly holding said yarn coupling block in position against the top of said rotatable member, said inverted cup shaped member also having a hole formed therein which is aligned with the longitudinal bore of said rotatable member.

6. A false twist spindle as set forth in claim 5 further characterized in that said inverted cup shaped member is provided with side openings to facilitate threading up of said yarn coupling block, said side openings being in horizontal alignment with the horizontal bore passing through said yarn coupling block.

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