Dec. 20, 1966 H. H. RICHTER 3,292,357

FALSE TWIST SPINDLE

Filed June 2, 1966

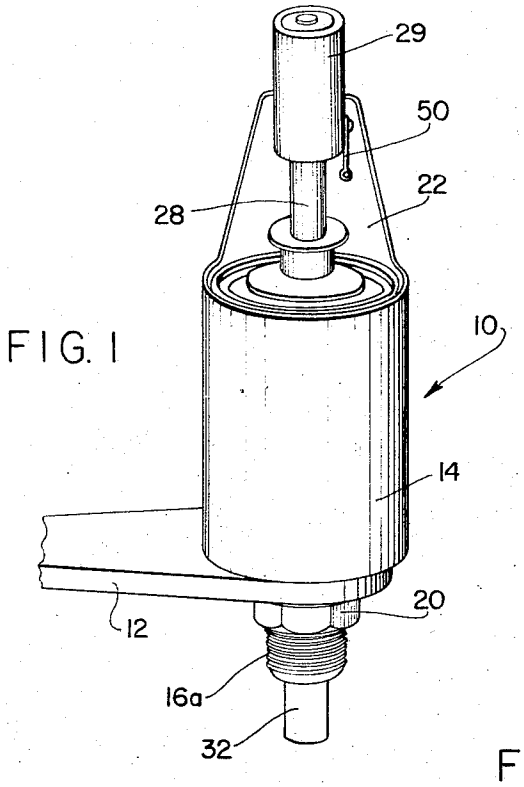


FIG. 1

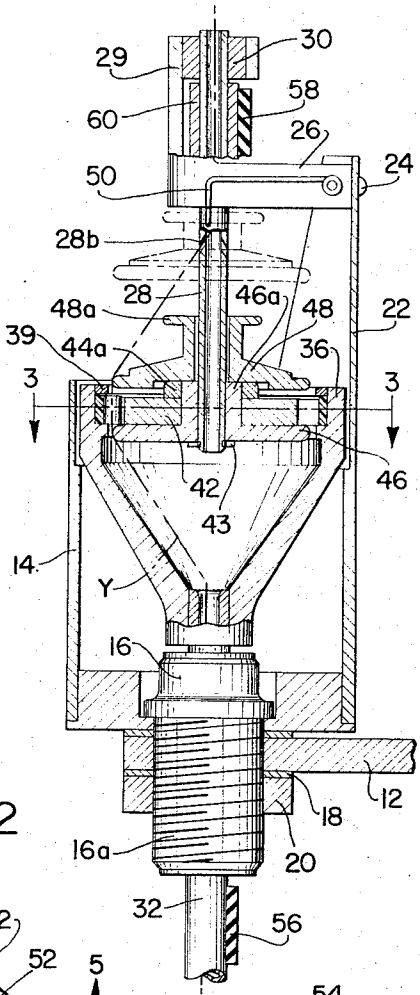


FIG. 2

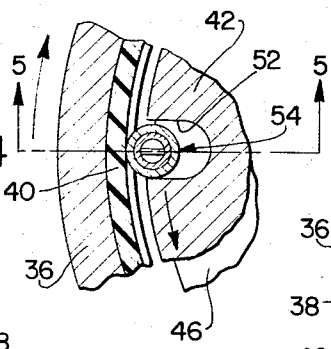


FIG. 4

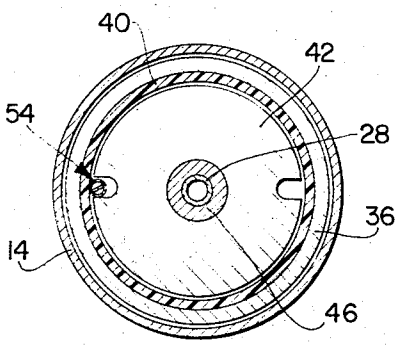


FIG. 3

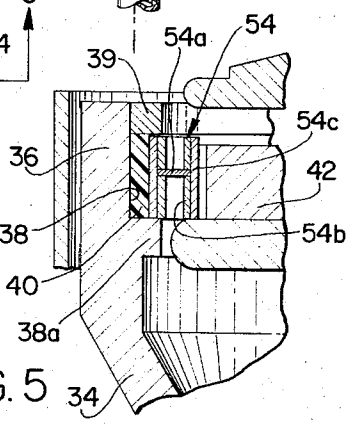


FIG. 5

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FALSE TWIST SPINDLE

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This invention relates generally to apparatus for imparting false twist to a strand of yarn, and more particularly is directed to a novel high speed spindle of the false twist type for use with such apparatus.

A number of processes for imparting a crimped structure to yarns have been employed or suggested from time to time, but, of all these, the false twist process has been most widely accepted. This procedure involves twisting the yarn, setting the twist as by heating, and untwisting the set yarn in a continuous operation. This is accomplished by passing the yarn through a rotating spindle having some means for engaging the yarn to impart twist to the yarn as it approaches the spindle. The twist thus inserted is temporary inasmuch as it is removed as the yarn leaves the engaging means. Spindles adapted for this operation are known as "false twist" spindles.

The spindle disclosed herein employs the principles of planetary mechanics. More specifically, the yarn rotating body itself is of small diameter, and is frictionally engaged by a much larger annular member which rotates at a moderate speed. A retainer member cooperating with the annular member substantially encompasses the rotating body and prevents lateral movement thereof but is itself rotatable relative to the annular member. Rotation of the annular member at a moderate speed serves to rotate the yarn rotating body at a very high speed. Furthermore, rotation of the retainer member in a direction opposite that of the annular member operates to increase still further the rotational speed of the rotating body while rotation in the same direction operates to decrease such speed.

The invention is so constructed that those elements which are of greater mass, namely the annular and retainer members, rotate at relatively slow to moderate speeds, while only the very small yarn rotating body is subjected to high rotational speeds.

Accordingly, one object of the invention is to provide a false twist spindle which is operable at high speeds of rotation without excessive wear.

Another object of the invention is the provision of a false twist spindle which is of simplified construction and which permits an increased economy of operation.

A further object of the invention is to provide a false twist spindle which operates in a planetary manner whereby the mass of the high speed yarn rotating element is small as compared with the mass of the complete structure.

Other objects and advantages of the invention will be obvious or will appear hereinafter in the specification taken together with the drawings.

In the drawings, wherein like numerals refer to like parts throughout;

FIGURE 1 is a perspective view of the invention;

FIGURE 2 is a side elevation view, partially in section taken along the vertical center line of the spindle;

FIGURE 3 is a section view taken along line 3—3 of FIGURE 2;

FIGURE 4 is a detail view of elements generally illustrated in FIGURE 3; and

FIGURE 5 is a detail view in section taken along the line 5—5 of FIG. 4.

With reference now to the drawings, numeral **10** generally indicates the false twist apparatus which embodies the principles of the invention. The apparatus **10** is

illustrated as being mounted on an arm **12** which may be swingable in a conventional manner between an active and an inactive position.

A cup shaped cover **14** is secured to the arm **12** by means of flanged bearing housing **16** which is received through appropriate apertures in said cover and said arm. A washer **18** and a suitable fastener **20** are applied to the threaded portion **16***a* of the housing **16** to hold that element and cover **14** fast to arm **12**. A support bracket **22**, actually an upward extension of cover **14**, has upper bearing housing **26** mounted thereon by screws **24**. Housing **26** extends forwardly in cantilevered fashion and is provided with an upward extending bearing housing at its forwardmost end. A hollow shaft **28** is rotatably journaled in housing **26** by means of a suitable bearing **30**. A pair of diametrically opposed, downwardly inclined openings **28***b* are provided in shaft **28** beneath housing **26**.

A second hollow shaft **32**, axially aligned with shaft **28** is supported for rotation in housing **16** by means of suitable bearings. A funnel-shaped member **34** is fixed to the topmost portion of shaft **32** and terminates at its upper end in an annulus **36**. As best seen in FIGURE 5, a track **38** defined by rim **38***a* and retainer ring **39** is formed in said annulus **36**. A ring **40** formed of a material having the characteristics of resilience and a high coefficient of friction is located in track **38**. The retainer ring **39** is held in place by means of a force fit and itself serves hold ring **40** in place.

Circular yarn guide **46** is held in place on the lower end of shaft **28** by means of a C-ring **43**. Disc-like retainer member **42** rests upon the upper surface of guide **46** and is fixed to the hub **46***a* on said guide by retaining ring **44***a* so that said guide and retainer turn as a unit when shaft **28** is rotated. Guide **46** and retainer **42** are concentric with ring **40** and are positioned vertically so that retainer **42** is in the same plane as said ring. The diameter of retainer **42** is slightly smaller than the inner diameter of said ring **40** and it is slightly greater than the diameter of guide **46**. A second circular yarn guide **48**, having the same diameter as guide **46**, is mounted on shaft **28** above retainer **42**. Guide **48** is free to rotate relative to shaft **28** and is also free to move axially on shaft **28**. In order to selectively hold guide **48** in a raised position adjacent housing **26** for a reason which will be subsequently understood, a spring **50** is fixed to said housing and is engageable with the lip **48***a* on guide **48**. Guide **48** is seen in its raised or inoperative position in phantom in FIGURE 2.

A pair of recesses **52** are provided at diametrically opposed locations in the periphery of retainer disc **42**. One recess serves to receive a false twist head **54**. The other recess serves to maintain the balance of retainer disc **42**. The depth of recess **52** is greater than the diameter of false twist head **54** to permit said head to be slid from beneath ring **39** for removal thereof.

The false twist head **54** is generally cylindrical in shape and has an axial bore formed therethrough. Twist head **54** is formed from an outer sleeve **54***c* and a concentric inner sleeve **54***b* which are pressed together with wear resistant pin **54***a* extending across the bore in sleeve **54***b*. False twist head **54** is adapted to ride on insert **40** in the track **38**, its vertical movement (see FIGURE 5) being limited by rim **38***a* and retainer ring **39**.

Shaft **28** and guide **46** and retainer **42** are adapted to be rotated by belt **58** which contacts whorl **60**, fixed to shaft **28**, when arm **12** is in active position. Shaft **32** and member **34** are rotated by belt **56** when arm **12** is in active position.

To thread the spindle of the present invention a strand of yarn Y is drawn upwardly through shaft **32**. Yarn guide **48** is manually lifted to engage lip **48***a* with spring

50 to make false twist head 54 accessible. Head 54 is then removed from retainer disc 42 and the yarn passed through its bore being wrapped around pin 54*a* as it is passed therethrough. Head 54 is then replaced in recess 52 and guide 48 is lowered to its operating position. The yarn from the twist head 54 is then drawn upwardly through one of the openings 28*b* into the bore of shaft 28, from whence it is eventually wound into a package in a known manner. It will be appreciated that the peripheries of yarn guides 46 and 48 are substantially aligned with the rotational axis of twist head 54 so that the yarn, when properly threaded, will tend to pass through twist head 54 along the axis thereof.

The false twist spindle of the present invention operates in the following manner. Rotation of retainer 42 causes false twist head 54 to be pressed by centrifugal action against ring 40 and to be rotated thereby. Inasmuch as the circumference of ring 40 is much greater than the circumference of head 54 one revolution of retainer 42 will cause head 54 to rotate several times. If ring 40 is rotated in the opposite direction to the rotation of retainer 42 its rotation will also add to the rotation of head 54.

It will be apparent to those skilled in the art that the present invention can be operated in several different manners. For example, ring 40 can be held stationary and retainer 42 rotated. In such an operation the speed of twist head 54 can be computed by the formula:

$$N_{54}=\frac{ID_{40}}{OD_{54}}\times N_{42}+N_{42}$$

Secondly retainer 42 and ring 40 can be rotated in opposite directions. In such an operation the speed of twist head 54 can be computed by the formula:

$$N_{54}=\frac{ID_{40}}{OD_{54}}\times N_{40}+\frac{ID_{40}}{OD_{54}}\times N_{42}-N_{42}$$

Thirdly retainer 42 and ring 40 can be rotated in the same direction. In such an operation the speed of twist head 54 can be computed by the formula:

$$N_{54}=\frac{ID_{40}}{OD_{54}}\times N_{40}-\frac{ID_{40}}{OD_{54}}\times N_{42}+N_{42}$$

In each of the above equations, N denotes rotational speed, ID denotes inner diameter, and OD denotes outer diameter of the respective parts.

From the above it will be seen that if the ratio of the inner diameter of ring 40 to the outer diameter of twist head 54 is 10:1 and shaft 32 is rotated at a speed of 50,000 r.p.m. and shaft 32 is rotated contrariwise at a speed of 10,000 r.p.m. the rotational speed of false twist head 54 is 590,000 r.p.m.

Since certain changes can be made in the above apparatus without departing from the scope of the invention herein involved, it is intended that all matters contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative only and not in a limiting sense.

What is claimed is:

1. A false twist device comprising an annular member, yarn twisting means having a peripheral surface of revolution, means for rotatably supporting said yarn twisting means, and means for driving said yarn twisting means relative to said annular member, said driving means being operable to bias said yarn twisting means into rolling engagement with the inside surface of said annular member.

2. The false twist device set forth in claim 1 wherein said annular member is rotatable and further comprising means for rotating said annular member.

3. A false twist device comprising an annular member, yarn twisting means having a peripheral surface of revolution, a rotatable retainer disc coaxial and coplanar with said annular member and having a recess disposed therein open to said annular member, said yarn twisting means being confined within said recess and engageable with said annular member, and means for rotating said retainer means to bias said yarn twisting means into rolling engagement with said annular member.

4. The false twist device set forth in claim 3 wherein said annular member is rotatable and further comprising means for rotating said annular member.

5. A false twist device comprising rotatable spindle means having an axial bore therethrough for passage of a moving strand of yarn, an annular member formed on said spindle means, first drive means for rotating said spindle means, a rotatable retainer disc coaxial and coplanar with said annular member and having a radial recess disposed therein open to said annular member, yarn twisting means having a peripheral surface of revolution, said yarn twisting means being confined within said recess and engageable with said annular member and second drive means for rotating said disc to bias said yarn twisting means into engagement with said annular member.

6. The false twist device set forth in claim 5 further comprising yarn guide means arranged to direct yarn through said yarn twisting means.

7. The false twist device set forth in claim 6 wherein said yarn guide means comprises at least two elements, one of said elements being movable between operative and inoperative positions, and resilient means for selectively holding said one element in the inoperative position.

8. The false twist device set forth in claim 5 wherein said first drive means comprises a whorl formed on said spindle means and a translatable belt in engagement with said spindle whorl, and wherein said second drive means comprises a rotatable shaft having an axial bore therethrough for passage of a moving strand of yarn, a whorl on said shaft, and a translatable belt in engagement with said shaft whorl.

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