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Richter

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[54] **APPARATUS FOR WINDING YARN**

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[73] Assignee: **Leesona Corporation,** Warwick, R.I.

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[52] **U.S. Cl.** **242/18.1,** 242/43

[51] **Int. Cl.** **B65h 54/38**

[58] **Field of Search** 242/18.1, 43, 158

[56] **References Cited**

UNITED STATES PATENTS

2,264,424 12/1941 Winslow 242/18.1

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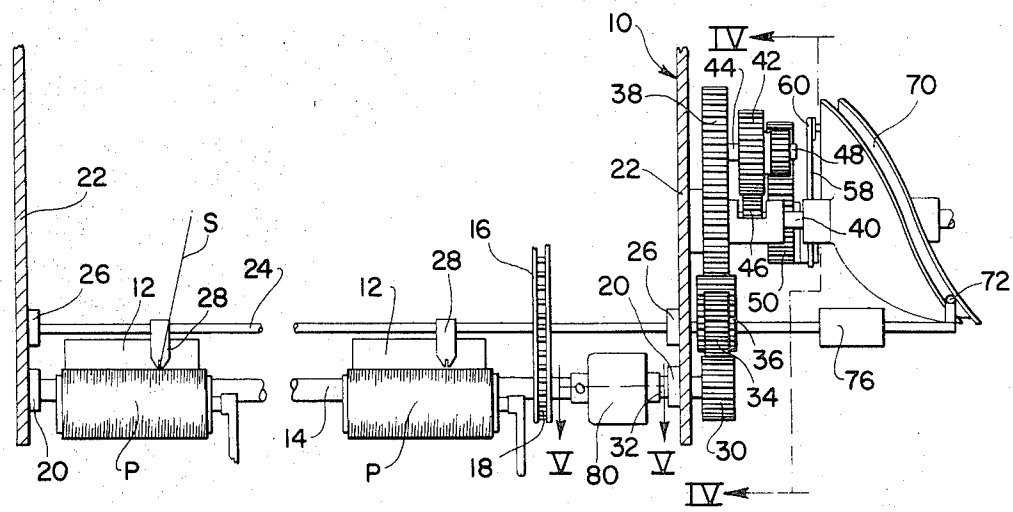
Attorney—Albert P. Davis and Burnett W. Norton

[57] **ABSTRACT**

Apparatus for winding an advancing strand of yarn into a package is disclosed. The apparatus includes means for rotatably supporting and driving a package at a substantially constant rate of speed and means for traversing a strand onto the package as the package is rotated. Drive means for operating the traversing means is provided and regulating means for periodically increasing and decreasing the speed of the drive means as the strand is traversed onto the package is included. The control means is operable in response to the regulating means to disrupt the synchronism between the rotation of the package and the traversing of the strand onto the package to thereby prevent the formation of bands or "ribbons" wherein the strand coils in the package are crowded together or "piled."

6 Claims, 6 Drawing Figures



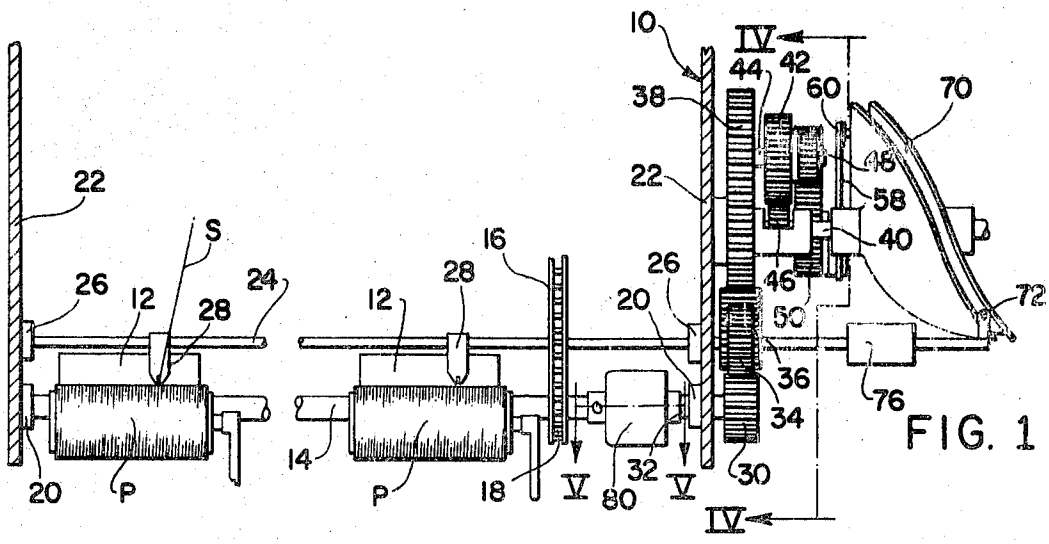


FIG. 1

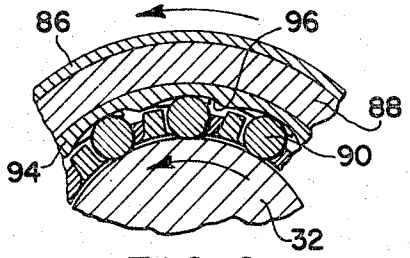


FIG. 2

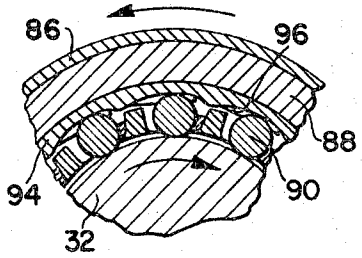


FIG. 3

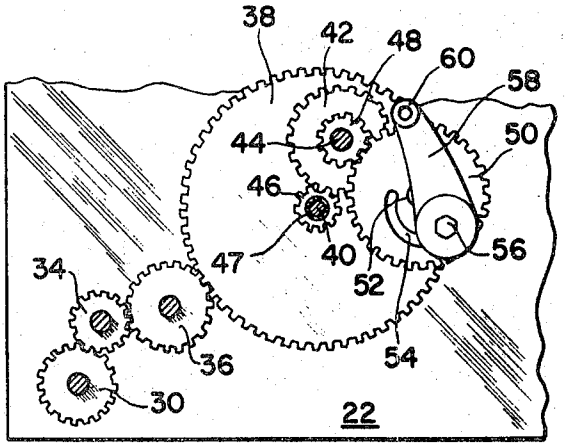


FIG. 4

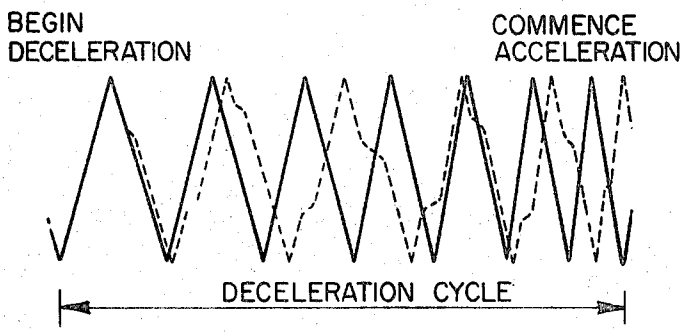


FIG. 6

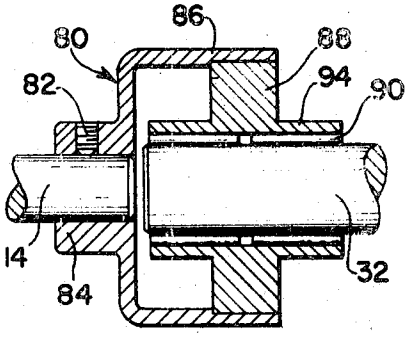


FIG. 5

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APPARATUS FOR WINDING YARN

BACKGROUND OF THE INVENTION

The present invention relates to machines for winding up an advancing strand of yarn, thread, cord or similar material into a package and relates, more particularly, to such winding machines incorporating ribbon breaking mechanism, so-called, which operates to control the disposition of the turns of winding on the surface of the package to prevent the formation of bands or "ribbons" in which the yarn coils are crowded together or "piled" on the package.

In the winding of strand material it has been recognized as desirable to provide some means for controlling the disposition of the turns of winding on the surface of the package to prevent the formation of bands or ribbons in which the yarn coils on the package are crowded together or piled in contiguous relation. A rather effective means for thus preventing ribboning consists in relatively accelerating and decelerating the rotational speed of the drive for the strand traversing mechanism in a manner to interrupt the normal pattern in which the strand is coiled onto the package. In most instances this is effective to disrupt the synchronism between the rotation of the package and the traverse of the strand during winding. Such mechanisms are known in the art and such a device has been employed, for example, on the Model No. 555 False Twist Texturing Machine manufactured by Leesona Corporation, Warwick, R.I., for a number of years. While the problem of preventing ribboning has thus been successfully resolved in numerous instances with the aforementioned prior art ribbon breaking mechanisms it has been found that there are certain critical areas in package winding, particularly when winding low denier yarns, where ribboning may still occur to the detriment of the resultant package.

SUMMARY OF THE INVENTION

The present invention, in contemplation of the foregoing considerations, advantageously provides apparatus for winding an advancing strand of yarn into a package which includes means for supporting a package for rotation, power means for rotating the package at a substantially constant speed and means for traversing the strand onto the package as the package is rotated. Drive means for operating the traverse means are provided, and regulating means for periodically increasing and decreasing the speed of the drive means as the strand is traversed onto the package are included. Said regulating means operates the apparatus in a first mode to cause speed variations of the traverse means relative to the rotational speed of the package according to a cyclical program. The invention further includes control means which are operable in response to the cyclical program of the regulating means to place the apparatus in a second mode to further disrupt syncrhonism between the rotation of the package and the strand being traversed thereon. By this unique arrangement ribboning is prevented throughout the package.

Accordingly, one object of the invention is to provide mechanism incorporated in the drive means of a winding machine for disrupting the synchronism between the rotation of the package and the traverse of a strand thereon during winding.

Another object of the present invention is to provide mechanism of the type for periodically varying the speed ratio between the rotation of the package and the traverse mechanism at recurring cycles throughout package winding.

Still another object of the invention is to provide control means which operates cooperatively with regulating means for periodically increasing and decreasing the speed of the drive means for the traverse means, said control means superimposing on the first disruption between the rotation of the package and the traversing of the strand thereon, caused by the speed increases and decreases, still a further component of disruption between such synchronism to thereby preclude ribbons being formed at any locus in the winding package.

Yet another object of the invention is to provide apparatus of the type indicated which is completely automatic in ts operation.

Further objects of the invention are set forth in the following specification and will become obvious hereinafter.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a top plan view of a portion of a conventional false twist texturing machine, with parts broken away for clarity, incorporating the present invention;

FIG. 2 is a fragmentary sectional view of the control means of the present invention illustrating the position of the parts when engaged for driving the traverse mechanism;

FIG. 3 is a view similar to FIG. 2 showing the control means with the parts therein in an over-running condition to permit slippage between the motive means and the traverse means;

FIG. 4 is an elevational view taken along lines IV—IV of FIG. 1 illustrating the gearing for imparting periodic increases and decreases in the speed of the traverse drive means;

FIG. 5 is a cross-sectional view taken along lines V—V of FIG. 1 illustrating the details of the control means of the invention; and

FIG. 6 is a graphical representation of the coil winding pattern on the package and illustrating the variations to the winding pattern introduced in practice with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With attention initially to FIG. 1 of the drawing the present invention is illustrated, for convenience, in association with a textile machine of the type manufactured and sold by Leesona Corporation, Warwick, R.I., under its designated Model No. 555 False Twist Texturing Machine, said machine being adapted to impart false twist to strandular material S feeding from a supply (not shown) and being wound up in a package P. It will be appreciated that the machine includes a plurality of strand processing stations arranged at spaced locations along the elongated frame 10, and, indeed, the frame may have parallel rows of stations along opposite sides thereof. For purposes of the present disclosure it will suffice to illustrate a pair of these processing stations along one side of the machine, it being understood that the remaining stations insofar as the present invention is concerned, are the same as those described herein. At each station the respective package P is driven by surface contact with a driving roll 12. All of

the driving rolls along a side of the frame are affixed to a common drive shaft **14** which is driven from a prime mover, such as an electric motor (not shown), which operates through a chain **16** and a sprocket **18** to rotate shaft **14** at a constant speed. Sprocket **18** is secured fast on shaft **14** by means of a key or the like not herein illustrated. Shaft **14** is supported in suitable bearings **20** in spaced frame members **22** of the machine **10.**

A traverse rod **24** extends along each frame side substantially the full length thereof and parallel to shaft **14.** Traverse rod **24** is supported for reciprocating movement in suitable bearings **26** affixed in the members **22** of frame **10.** Traverse rod **24** carries a strand guide **28** affixedly thereon for each of the strand processing stations, one of the guides being set to receive a strand S at each station and traverse it from end to end of package P. Thus, it will be apparent that as strand S is moved to and fro from one end of package P to the other and as the package is rotated by virtue of its frictional engagement with rotating roll **12,** the package will increase in diameter as the strand is coiled thereon. Traverse rod **24** is driven via means of a gear train and a cam arrangement which will next be described.

The gear train for reciprocating traverse rod **24** includes a spur gear **30** which is keyed to an extension shaft **32** coaxial drive shaft **14.** Gear **30** is meshed in driving engagement with an idler **34** which, in turn, is meshed with a further idler gear **36.** Said idler gear **36** acts to drive a bull gear **38** which is journaled on a shaft **40** supported from the frame **22.** An epicyclic gear arrangement is carried on gear **38** and includes a gear **42,** which is carried on a stub shaft **44** fastened in the face of gear **38** and which mates with a small non-rotating gear **46** fixed on a shaft **47** which is, in fact, a non-rotatable sleeve surrounding shaft **40.** Thus, upon rotation of bull gear **38** gear **42** is similarly rotated about its axis through engagement with the fixed gear **46.** A cluster gear **48** is fixed on the same shaft **44** as said gear **42.** Consequently, upon rotation of gear **42** the cluster gear **48** is rotated. This latter gear **48** is drivingly meshed with a further driven gear **50** suitably mounted on a stub shaft **52** which is eccentrically fixed in the face of bull gear **38.** Accordingly, gear **50** is rotated in response to rotation of gear **38.** Gear **50** has a quadrant slot **54** therein, this slot acting to receive a bolt **56** which fastens a cam driving link **58** therewith. The end of driving link **58** remote from bolt **56** is provided with a stud **60** which connects the driving link with traverse cam **70.** Cam **70** has a continuous generally helical groove therein for receiving a cam follower **72.** Traverse cam **70** is fixed on shaft **40** for rotation at periodically increasing and decreasing speeds as the gear train is driven from the prime mover through chain **16.** In response thereto traverse cam **70** is operable to impart its motion to traverse rod **24** to cause the yarn guides **28** to periodically increase and decrease speed as they operate to traverse the strand on packages P. A scattering device **76** may be provided for operation with the traverse rod **24,** this scattering device being the same as that fully disclosed in commonly assigned U. S. Pat. No. 3,408,014 issued Oct. 29, 1968 to D. J. Fisher, Jr.

It has already been stated that superimposed on the distruptive action to the strand winding pattern as introduced by the periodic increasing and decreasing of the speed of operation of traverse rod **24** by means of the traverse rod drive mechanism just described, the present invention provides further means for interrupting the winding pattern and thus avoiding ribbons. In this connection the present invention provides a one-way slip clutch **80** which is suitably fastened to drive shaft **14** by means of a set screw **82** which passes through a hub **84** of the clutch, see FIG. **5.** The hub **84** is part of a housing **86** which encloses the interior of the clutch. Within housing **86** there is provided a bearing cage **88** containing a plurality of needle bearings **90** which, as best seen in FIGS. **2** and **3,** engage with extension shaft **32.** The bearing cage includes an outer race **94** which is of sleeve-like configuration and which is provided with a series of cam surfaces **96,** one for each needle bearing **90.** By virtue of this construction and as shaft **32** is rotated in the same direction as drive shaft **14** during the acceleration phase of the traverse rod drive the needle bearings **90** are caused to be cammed or wedged into a locked position between their respective cam surfaces **96** and the surface of extension shaft **32** as shown in FIG. **2.** In this way a positive drive between drive shaft **14** and extension shaft **32** is provided and slippage is precluded. Consequently, traverse rod **24** follows precisely the accelerating speeds provided thereto by the afore-described gear train. However, when the gear train which drives traverse rod **24** is decelerating the housing **86** of clutch **80** is caused to overrun the rotation of shaft extension **32** by virtue of the difference in speed of drive shaft **14** and traverse rod **24** and thus afford slippage between drive shaft **14** and traverse rod **24.** That is to say, drive shaft **14** is continually rotated at a constant speed by means of its direct, positive drive from the prime mover via chain **16** and sprocket **18** while the traverse rod is subjected to cyclically varying accelerations and decelerations induced by the epicyclic gear train which drives traverse cam **70.** During the intervals of deceleration needle bearings **90** will tend to assume a position generally as indicated in FIG. **3** where they are relieved from engagement with their respective cam surfaces **96** to thereby permit low friction overrunning as drive shaft **14** and housing **86** connected thereto rotate faster than extension shaft **32.** Bearing in mind that the inertial force of traverse rod **24,** the parts connected therewith, traverse cam **70** and the gear train driving the traverse cam is substantially, the total effect of the elements just recited will be to attempt to resist the decelerating action induced by the epicyclic gear train. Accordingly, clutch **80** will be caused to shift between a position where the needle bearings **90** are in driving contact with the cam surface **96** of race **94** as shown in FIG. **2** and in a disengaged position where bearings **90** are substantially free of contact with race **94** as shown in FIG. **3.** This condition will be abruptly changed and variable throughout the decelerating phase of the traverse drive mechanism as diagrammatically illustrated in FIG. **6.** In this view the solid lines indicate the traversing pattern assumed by strand S as it would be formed on the package if the traverse mechanism were under the strict control of the afore-described gear train which operates positively to cause the traverse rod **24** and its guides **28** to accelerate and decelerate. In this view the dotted lines depict the pattern of the strand as it is formed in practice with the one way clutch of the present invention. It will be noticed in FIG. **6** that the continual engagement and disengagement of the clutch during the decelerating phase of the traversing mechanism operates to randomize the wind of the coils of the strand onto the package

and thereby preclude the formation of undesirable ribboning in the package.

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

What is claimed is:

1. Apparatus for winding an advancing strand into a package comprising, means for rotatably supporting a package, motive means for rotating the package at a substantially constant speed, means for traversing the strand onto the package as said package is rotated, drive means for operating said traversing means, regulating means for periodically increasing and decreasing the speed of said drive means as the strand is traversed onto said package, and direction-selective means connecting said drive means and said motive means, said direction-selective means including engaging means operable when moved in a first direction to transmit to said drive means the motion of said motive means and operable when moved in a second direction to afford slippage between said motive means and said drive means to thereby disrupt synchronism between the rotatiOn of said package and traversing of said strand.

2. Apparatus as set forth in claim 1 wherein said direction-selective means is a clutch movable in said second direction in response to a force imparted during a decrease in the speed of said drive means to afford slippage between said motive means and said drive means.

3. Apparatus as set forth in claim 1 wherein said apparatus includes a plurality of means for supporting respective packages, said motive means being adapted to rotate all of said packages at a constant speed, and said traverse means includes a separate traverse element for each package.

4. Apparatus as set forth in claim 3 wherein said drive means is driven from said motive means, and said direction-selective means is disposed intermediate the drive means and motive means for simultaneously disrupting synchronism between rotation of each said package and the related strand being traversed thereon.

5. Apparatus as set forth in claim 4 wherein said direction-selective means is a clutch movable in said second direction in response to a force imparted during a decrease in the speed of said drive means to afford slippage between said motive means and said drive means.

6. Apparatus as set forth in claim 5 wherein said traverse means includes an elongated rod adapted to support each said traverse element at a location thereon proximate to its associated package, means mounting said rod for reciprocation to cause each traverse element to reciprocate relative to its associated package to distribute a strand thereon, the rate of reciprocation of each said traverse element being varied in response to periodic increases and decreases in the speed of said drive means and slippage imparted as said clutch moves in said second direction.

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