March 12, 1968 W. E. MACDONALD ETAL 3,372,848

FEED ROLL ASSEMBLY SEPARABLE IN RESPONSE TO THREAD DEPLETION

Filed Oct. 24, 1965 2 Sheets-Sheet 1

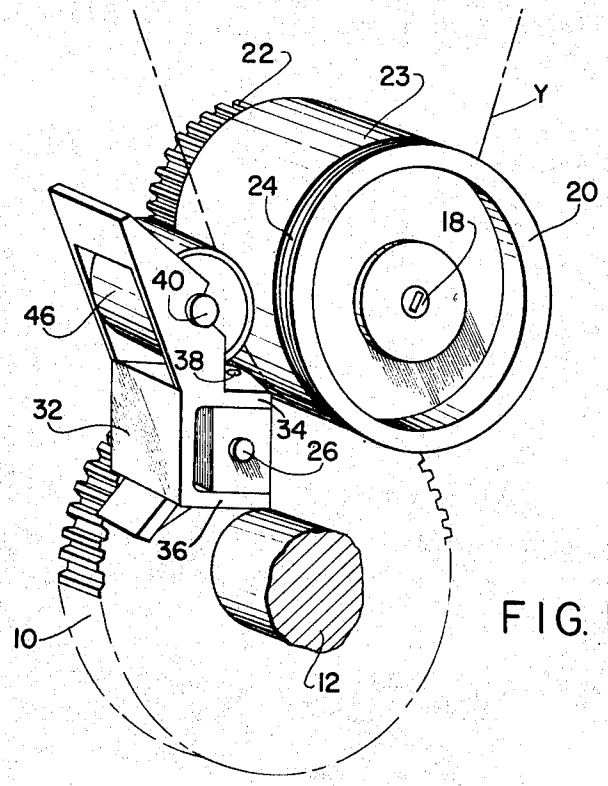

FIG. 1

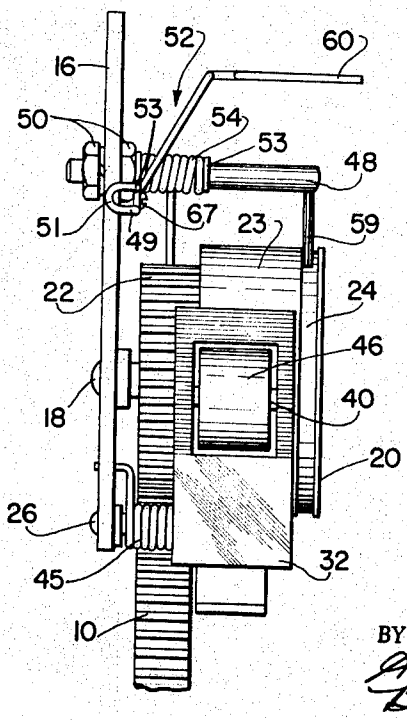

FIG. 2

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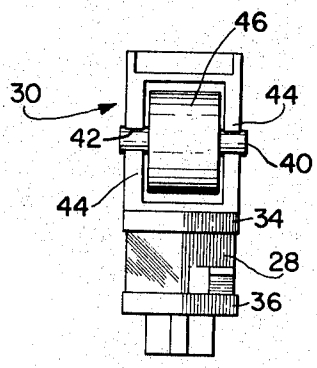

FIG. 3

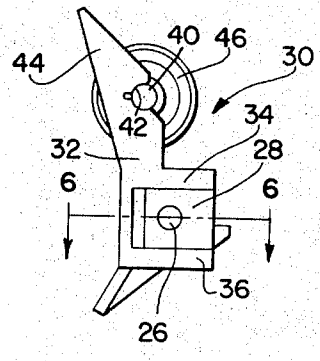

FIG. 4

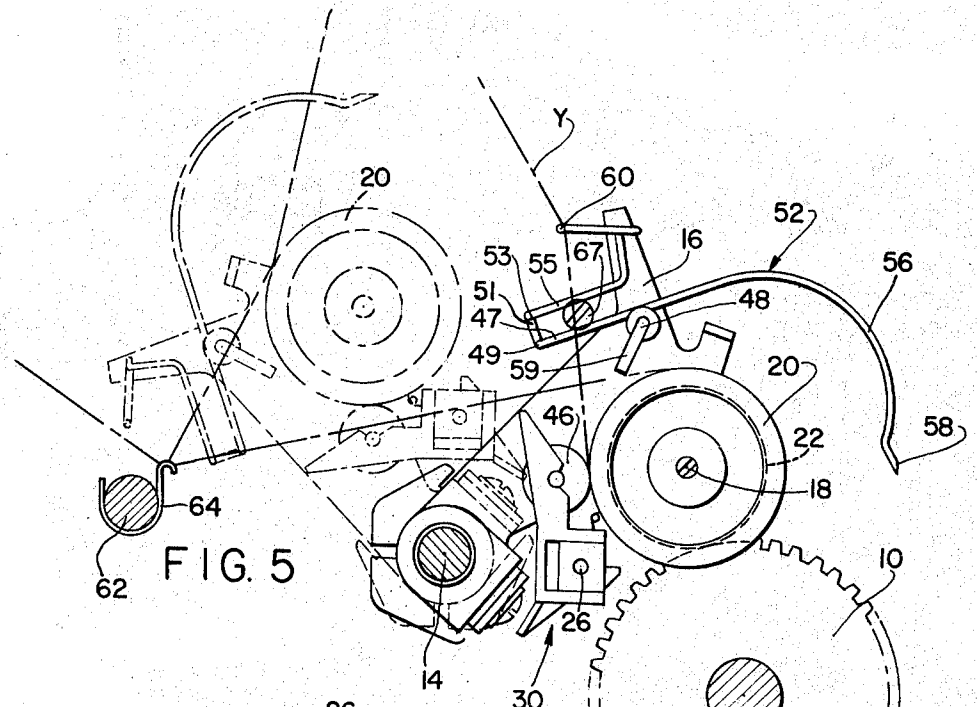

FIG. 5

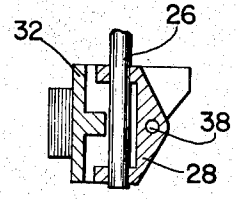

FIG. 6

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FEED ROLL ASSEMBLY SEPARABLE IN RESPONSE TO THREAD DEPLETION

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16 Claims. (Cl. 226—11)

ABSTRACT OF THE DISCLOSURE

Yarn feeding apparatus in which a pinch roll engages a feed roll to define a nip zone for engaging and advancing a strand of yarn. The pinch roll mount is pivoted about a pair of axes, one parallel to the rotational axes of the rolls and the other normal thereto and passing through the nip zone, so that the tension and pressure applied to the strand of yarn remain essentially constant.

The present invention relates generally to textile machinery and, more particularly, relates to an improved feed roll unit for advancing a strand of yarn in a textile machine.

In the following specification and claims the term "yarn" is employed in a general sense to apply to all kinds of strand materials, either textile or otherwise, and the designation "package" is intended to mean the product of the winding machine, whatever its form.

In known apparatuses for treating yarns to impart stretch characteristics thereto, such as so-called "false twist" type machines, for example, it is necessary to withdraw yarn from a supply thereof and advance it through the processing apparatus under constant, uniform tension and speed. In order to achieve this, one or more positively driven feed rolls are employed to engage and advance the strand at a uniform rate. It is known to provide a conventional feed roll for advancing a strand of yarn at constant speed and under uniform tension which includes associated mechanism for automatically arresting the feeding action thereof upon parting of the strand being wound or upon exhaustion of the source of supply. When the yarn supply is replenished or a break in the strand is repaired, the apparatus may again be manually shifted into its operative winding position.

The instant invention is directed to improved feed roll unit for textile machines such as those just mentioned, and includes a rotatable pinch roll pivotably mounted on a yoke. The yoke is spring biased such that the pinch roll is normally held against the yarn feed roll and adaptable for rolling contact thereon. As the threading process commences and the yarn feeding mechanism is in inoperative position, the strand of yarn is prevented from passing into engagement between the feed roll and the pinch roll by a limb which extends outwardly from the same arm member supporting the feed roll and the pinch roll. However, when the yarn feeding mechanism is shifted into operative position, the yarn is permitted to pass under the limb and into engagement on the feed roll. A traverse mechanism moves the yarn slowly across the roll in a reciprocating manner. In order to maintain a constant pressure on the yarn throughout its traversing movement, a unique universal type of mount is provided for the pinch roll which serves as an effective twist trap and as a device for maintaining a uniform tension on all of the filaments of the yarn being processed. Moreover, the yarn emerging from the nip point defined between the feed roll and pinch roll flows therefrom in a path substantially tangential to said feed roll. Thus, the yarn is not caused to engage the surface of either the feed roll or pinch roll for any significant distance. This feature

has been found to be of considerable value since when the yarn engages said feed roll surface without being nipped the texture of the yarn is adversely affected. This is considered to be due largely to the scuffing or rubbing action of the twisting yarn on the feed roll surface which influences the uniformity of twist in the yarn.

In the operation of a prior art false twisting machine by means of which crimp or false twist is applied to yarn as it passes through heating elements, it is desirable that the filaments of the yarn be of substantially even length and evenly mixed and evenly twisted, prior to entering the heating elements thereby allowing for uniform heating throughout the yarn being treated. This results in a superior crimp being imparted to the yarn. Although the prior art machines alluded to herein have as their principal purpose the treatment of synthetic yarns, the instant disclosure need not be so limited. Therefore, the term "filament" herein will not only denote continuous strands as found in rayon, nylon, or silk, but also staple fibers such as found in spun yarns like cotton and wool.

Accordingly, it is an object of the present invention to provide an improved feed roll mechanism for advancing a strand of yarn in a textile machine.

It is another object of the invention to provide a feeding mechanism which will maintain a uniform tension on all filaments of the yarn passing therethrough.

A further object is the provision of a novel feeding mechanism wherein the pinch roll engaging the feed roll is mounted so as to have a compound movement to impart uniform pressure on the yarn as it traverses across the face of the feed roll.

Other and further objects and advantages will become apparent upon a reading of the description which follows taken together with the drawings in which like numbers refer to like elements throughout.

In the drawings:

FIG. 1 is a perspective view, partly broken away, of the novel pinch roll comprising the instant invention in rolling engagement with the roll of a yarn feeding mechanism;

FIG. 2 is a front elevation view of the yarn feed mechanism including the novel pinch roll;

FIG. 3 is a front elevation view of the novel pinch roll;

FIG. 4 is a side elevation view of the pinch roll;

FIG. 5 is a side elevation view of the mechanism of FIG. 2 showing it in operative position in solid lines and in inoperative position in phantom; and

FIG. 6 is a cross-section view taken along lines **6—6** of FIG. 4.

With more particular reference to the drawings, FIG. 1 provides a showing of feed mechanism of a type which serves to withdraw yarn from a source of supply and to direct said yarn into heating elements, thence to a false twist spindle, for the purpose of imparting crimp or bulkiness thereto. In that figure, spur gear **10** is shown mounted for rotation on horizontal drive shaft **12** which is suitably driven by an electric motor (not shown) or other source of motive power. Extending parallel to drive shaft **12** and forwardly thereof is shaft **14** (FIG. 5) mounted to the frame of the winding machine and held fixed from rotation. Shaft **12** supports arm **16** for pivotal movement thereon. A stub shaft **18** is fixed to arm **16** and extends generally parallel to fixed shaft **14** and drive shaft **12**. Suitably mounted for rotation on stud shaft **18** is a yarn feed roll **20** which is integral with gear **22** such that the two are rotatable together.

In FIG. 5, it is apparent that the feed roll **20** can be moved, as desired, from a driven position wherein gears **10** and **22** are in meshing engagement (solid lines) to an idle position wherein gears **10** and **22** are held away from meshing engagement (in phantom). When the gears are

in engaging position, roll 20 acts to deliver a strand of yarn Y from a suitable source of supply into the heating elements of a stretch yarn winding machine. The feed roll is preferably provided with a surface 23 (FIGS. 1 and 2) of high friction and resilience such as rubber or synthetic material to aid in gripping the yarn thereon. An annular groove 24 aids in the procedure of initially setting up the machine for winding by holding the yarn in position on the roll and preventing it from sliding off the end thereof. As the roll 20 approaches normal operating speed, the strand of yarn Y moves out of groove 24 toward the central portions of the roll and into contact beneath the pinch roll.

A second stub shaft 26 is fixed to arm 16 and extends therefrom in a direction generally parallel to shaft 18 supporting roll 20. Base member 28 supports pinch roll mount 30 for pivotal movement about shaft 26. Also an element of pinch roll mount 30 is yoke 32 which has a pair of flanges 34 and 36 encompassing the base member 28 and pivotally mounted thereto by pin 38. Shaft 40 is held at the ends thereof by a press fit within slots 42 formed in ears 44 of yoke 32. Ball bearings (not shown) are interposed between shaft 40 and pinch roll 46 to permit rotation of said roll relative to said shaft.

A torsion spring 45 is received about shaft 26 and operates to urge pinch roll 46 into rolling engagement with feed roll 20 to thereby form a nip therebetween. Thus it will be appreciated that the pinch roll is mounted so as to have two degrees of freedom with respect to the feed roll. Specifically, pivoted movement is permitted about shaft 26 and about pin 38. The former allows movement of the pinch roll generally perpendicular to the axis of roll 20 into and away from rolling engagement with same; the latter allows a rocking or yawing motion of the pinch roll with respect to a line drawn perpendicular to the axis of roll 20. Moreover, the axis of said pin 38 passes through the line of contact or nip between rollers 20 and 46.

A stud 48, disposed generally horizontally and parallel to shafts 18 and 26, is fixed to arm 16 by means of nuts 50 threadedly engaged thereon. The stud provides a support for the yarn roll arresting element generally indicated by numeral 52. Element 52 is preferably constructed of a single length of resilient, round wire or rod bent to the desired form. A support section 54, comprised of loops of wire coiled about stud 48, is positioned between one of the nuts 50 and retaining ring 53 for rotatable movement on said stud.

An arcuate leg 56 conforming substantially to the circumference of gear 22 extends rearwardly from support section 54 and is normally spaced upwardly of said gear 22 in vertical alignment with gear 10. Leg 56 terminates in a short rearward bend 58 adapted to engage with gear 10. In FIG. 5, the yarn Y is seen to pass over the forward portion of the yarn roller arresting element 52 which is bent to form a bail 60. The yarn passing over the bail prevents the clockwise rotation of element 52 about stud 48 (see FIG. 5) thereby preventing rearward bend 58 from engaging gear 10. However, upon breakage of the strand of yarn Y or upon exhaustion thereof, the weight of element 52 on the portion with the rearward bend 58 being greater than that of the tail portion 60, element 52 is seen to rotate in a clockwise manner such that bend 58 engages teeth of gear 10. Rotating in a counterclockwise direction, gear 10 rocks arm 16 to a position distant therefrom and to an idle or inactive position as seen in phantom in FIG. 5.

Also extending forward from support 54 is a length of wire 47 having a right angle 49 formed therein to direct a U-shaped portion 51 (FIG. 2) toward and over arm 16. Portion 51 terminates at right angle 53 which leads to run 55 parallel to and above run 47, thence eventually to bail portion 60, previously described. A screw 67 and interengaging nut (not shown) are positioned for adjustable movement along runs 47 and 55 to provide a counterweight for element 52 when bail 60 is in its operative position contacting a running strand of yarn.

Stud 48 is seen to terminate with a generally vertically disposed pin 59 (FIGS. 2 and 5) formed thereon. The purpose of the pin 59 is to prevent passage of yarn Y emanating from a suitable source into engagement between rolls 20 and 46 when arm 16 is in the idle position shown in phantom in FIG. 5. However, when arm 16 assumes the position shown in solid lines, it is permitted to pass beneath pin 59 and onto roll 20.

A traverse rod 62 is disposed generally parallel to drive shaft 12 and is caused to slowly reciprocate by means of a motor (not shown). The yarn Y passes through guide 64 fixed to rod 62 and reciprocable therewith. Thus, throughout the winding process, the yarn Y traverses slowly on the surfaces of and between rolls 20 and 46. The purpose for the unique construction of pinch roll mount 30 will now become apparent.

As the yarn Y traverses across the surface of feed roll 20 and beneath pinch roll 46, in order to maintain the quality of the yarn, it is necessary that the tension and the pressure of the pinch roll upon said yarn be maintained at uniform values during the winding process. It is also highly desirable that each of the filaments throughout a given length of yarn be of even length prior to insertion into the processing heaters so that the finished yarn will be of a more uniform strength, and therefore of more uniform texture and quality. The universally mounted roll 46 continually adjusts its position by rocking or yawing as yarn passing thereunder advances from one end thereof to the other. By constantly adjusting its position, the roll 46 assures that the tension and the pressure applied to the strand of yarn remain essentially constant. By virtue of the manner in which the pressure is applied at the pinch point between rollers 20 and 46 all the filaments are controlled between the rolls such that all filaments passing out of engagement with the feed roll and into the heating elements are of uniform length and consequently of essentially uniform strength. Further, the roll is pivotable about shaft 26 to allow for purposes of cleaning the roll 46 and yoke 32.

The pinch roll performs as a lower twist arresting device of a so-called stretch yarn machine, the upper twist trap being the false twist spindle itself. As it passes through the rolls 20 and 46, the yarn is "pinched" or held securely at the point of tangency of said rolls such that twist migration does not take place from the downstream side to the upstream side of the feed roll mechanism. Similarly, twist migration is held to a minimum at the false twist spindle so that, at any one instant, a multi-filament strand of yarn is held captive between the feed roll mechanism and the spindle.

For any given length of yarn, the filaments may be of different lengths, each of the longer filaments following a convoluted or spiral course from one side of the yarn strand to the other and each of the shorter filaments following a relatively linear path through the central regions of the strand. Because they follow a longer course or path, and because they lie physically closer to the heating elements of the stretch yarn machine, the longer filaments, upon treatment, become more highly tensioned and therefore more taut than the initially shorter fialments. As a result, the initially longer filaments seek a shorter course or path, viz., a relatively linear route through the central regions of the yarn strand, while the initially shorter, but now comparatively relaxed filaments, tend to move outwardly of said strand into a longer or more convoluted path. Hence, the novel feed roll herein disclosed, by "pinching" as it feeds the yarn, traps the twist imparted by the false twist spindle in a uniform and substantially unhindered manner. As explained earlier, the yarn emerges from the nip zone established between the feed roll and nip roll in a path substantially tangential to the feed roll. Thus, the yarn is not subjected to rubbing or scuffing action during its twisting as would occur if the yarn did, in

fact, run over the surface of the feed roll upstream of the nip zone. This permits the yarn to be evenly twisted. These procedures, then, result in an improved stretch yarn product.

An improved yarn feed roll apparatus has therefore been described which withdraws yarn from a source of supply, directing it into heating elements and thereafter into a false twist spindle. By means of the unique pinch roll, desired yarn tension values are maintained regardless of the location of the yarn as it traverses across the surface of the feed roll.

While particular embodiments of the present invention have been set forth herein, it is not intended to limit the invention to such disclosure, but changes and modifications may be made therein and thereto within the scope of the following claims.

What is claimed is:

1. Apparatus for advancing a strand of yarn comprising, a rotatable feed roll, a rotatable pinch roll, the peripheries of said feed roll and pinch roll being in engagement with each other, a nip zone being defined at the place of engagement of said feed roll and pinch roll peripheries to engage said yarn therein with said yarn emerging therefrom in a path substantially tangential to said feed roll and being advanced therethrough in response to rotation of said feed roll, and means mounting said pinch roll for movement relative to said feed roll about pivots having axes generally normal to each other to maintain said nip zone substantially constant as the yarn advances therethrough, one of said axes passing through said nip zone.

2. Apparatus as set forth in claim 1 wherein the axes of said feed roll and said pinch roll are substantially parallel.

3. Apparatus as set forth in claim 1 including means for traversing the yarn across said feed roll during advancement of the yarn.

4. Apparatus as set forth in claim 1 wherein one of said pinch roll axes is horizontal and the other is vertical.

5. Apparatus as set forth in claim 4 including resilient means for biasing said pinch roll about said horizontal pivot, said pinch roll being freely rotatable about the vertical pivot.

6. Apparatus as set forth in claim 4 wherein the vertical axis is aligned in the vertical plane of said nip zone.

7. Apparatus for advancing a strand of yarn comprising, a rotatable feed roll, means for rotating said feed roll, a yoke, a shaft journaled in said yoke, a pinch roll carried on said shaft for rotation, resilient means biasing said pinch roll into engagement with said feed roll to advance said yarn, said feed roll and said pinch roll defining a nip zone at the place where their respective peripheries engage, and mounting means supporting said yoke for movement about a first pivot and a second pivot whereby to afford two degrees of movement to said pinch roll relative to said feed roll, the axis of said second pivot passing through said nip zone.

8. Apparatus as set forth in claim 7 wherein the axes of said feed roll and said pinch roll are substantially parallel.

9. Apparatus as set forth in claim 7 including means for traversing said yarn across said feed roll during advancement of the yarn.

10. Apparatus as set forth in claim 7 wherein the axis of said first pivot is parallel to the axis of said feed roll, and the axis of said second pivot is perpendicular to the axis of said feed roll.

11. Apparatus as set forth in claim 10 wherein said pinch roll is freely rotatable about said second pivot.

12. Apparatus for advancing a strand of yarn comprising, a feed roll, means for positively rotating said feed roll, a yoke, a shaft journaled in said yoke, a pinch roll carried on said shaft for rotation, mounting means supporting said yoke for movement about a first pivot and a second pivot to afford two degrees of movement to said pinch roll relative to said feed roll, said feed roll and said pinch roll defining a nip zone at the place where their respective peripheries engage, the axis of said second pivot passing through said nip zone, resilient means engageable with said mounting means to bias said pinch roll into engagement with said feed roll to rotate said pinch roll cooperatively with said feed roll and advance a strand of yarn engaged therebetween, and detecting means operable in response to interruption of said yarn to disconnect said feed roll from said positively rotating means, whereby to cease rotation of said feed roll and drive roll.

13. Apparatus as set forth in claim 12 wherein the axes of said feed roll and said pinch roll are substantially parallel.

14. Apparatus as set forth in claim 12 including means for traversing said yarn across said feed rolls during advancement of the yarn.

15. Apparatus as set forth in claim 12 wherein the axis of said first pivot is parallel to the axis of said feed roll, and the axis of said second pivot is perpendicular to the axis of said feed roll.

16. Apparatus as set forth in claim 12 wherein said pinch roll is freely rotatable about said second pivot.

References Cited

UNITED STATES PATENTS

2,022,834	12/1935	Welch et al.	57—90 X
2,721,650	10/1955	Cummings et al.	226—180 X
3,014,629	12/1961	Cunningham et al.	226—190

FOREIGN PATENTS

867,483	11/1941	France.

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