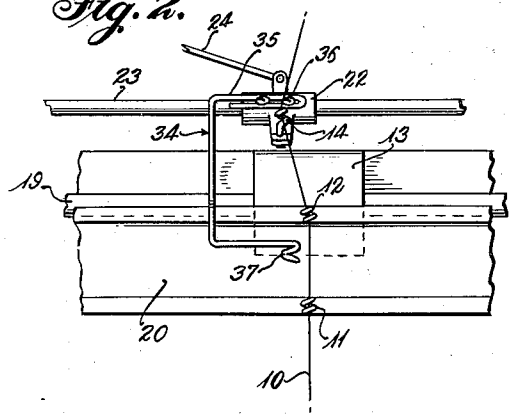
Dec. 1, 1942. D. I. GROSS 2,303,354

METHOD AND APPARATUS FOR WINDING RAYON

Filed Feb. 3, 1942

Fig. 2.



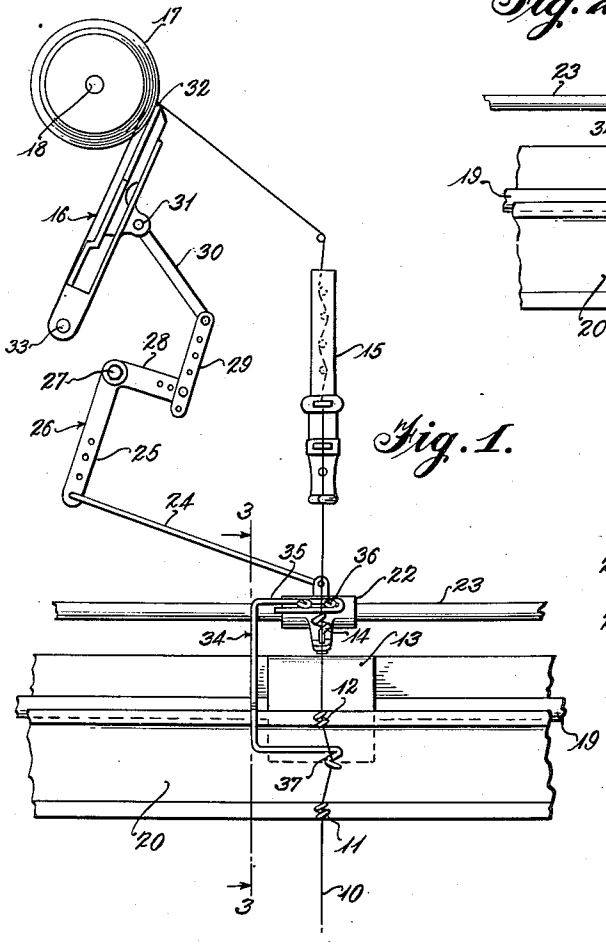


Fig. 1.

Fig. 3.

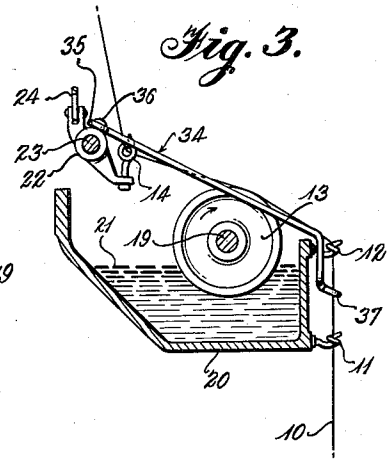


Fig. 4.

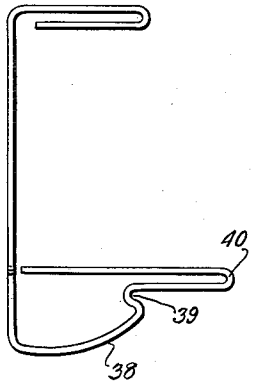
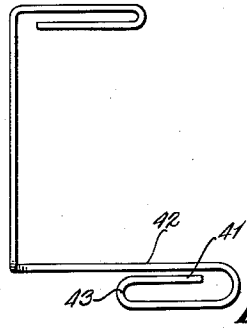


Fig. 5.



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UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR WINDING RAYON

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Application February 3, 1942, Serial No. 429,422

7 Claims. (Cl. 117—7)

This application is a continuation-in-part of my application Serial Number 318,353, filed February 10, 1940, and relates to the treatment of yarn, thread or the like in its passage between a thread storage device and a collecting device, and more particularly to treatments wherein succeeding portions of a yarn, thread or the like are passed in contact with a surface which will modify its characteristics.

While the yarn or the like may be subjected to the modifying influence of many varying types of materials, liquid or solid, involving such operations as abrading, waxing, lubricating, etc., by passage across a suitably prepared surface, it will be recognized that regardless of the type of treatment to be effected it is highly desirable that the yarn or the like be modified substantially uniformly throughout its length.

An appreciation of typical difficulties which have been encountered in the treatment of yarns by passing the same across a prepared surface may be had by a consideration of the problems encountered in the preparation of wound cones for use in the manufacture of knitted fabrics such as underwear, tubing and hosiery. Since such cones are customarily used by the manufacturers of knitted goods in the form in which they are received from the yarn producers, it is encumbent upon the latter to furnish the cones in a condition suitable for insertion directly into knitting machinery without further alteration. It has been found that yarns for use in such machinery must be suitably lubricated in order to render them sufficiently flexible and pliable to be fed through knitting needles without danger of breakage. Furthermore, the good appearance of the knitted fabric is to a large extent dependent upon the amount of lubricant accepted by the yarn and the evenness of its distribution over succeeding portions thereof. In furnishing yarns to be used in knitting operations, it is necessary therefore that the entire length of yarn be uniformly lubricated to an extent within critical limits so that the knitting operation may progress efficiently while the finished product will have a commercially desirable appearance and feel.

In lubricating yarns for use in knitting machinery and the like, it is now the common practice to apply the lubricant during that winding operation in which cones are prepared for shipment. Usually the yarn is passed from a supply package tangentially across a cylindrical metal roller which rotates partially submerged in a suitable lubricant bath, to a driven collecting bobbin or the like. The roller is so arranged with respect to the lubricant bath as to pick up a film of lubricant of sufficient thickness to permit the imparting of a definite amount thereof to the yarn passing thereover, the amount in any instance, of course, being dependent upon the size or denier of the yarn being wound, as well as the use to which the yarn is to be put. The roller is driven at a constant speed and turns counter-current to the direction of yarn travel, thus continuously presenting a uniformly coated surface to the yarn.

As has been pointed out above, it is highly desirable not only that a suitable amount of lubricant be imparted to a given length of yarn but also that such amount be applied uniformly for the entire length of the yarn. This is difficult of accomplishment by the employment of conventional machinery because of the fact that the yarn take-up steadily increases as the driven cone increases in diameter while the roller is driven at a constant speed so that the time of contact of the yarn with the roller proportionally decreases as the winding operation progresses. An attempt has been made to obviate this difficulty by the use of a device for progressively guiding the yarn across the roller at an increasing angle as the cone diameter increases, thus compensating for loss of contact time by the provision of a longer path of contact.

While the use of the guiding device outlined above has resulted in some improvement as regards the maintenance of uniformity of application of lubricant to succeeding portions of yarn, it has been noted that the amount of lubricant accepted by the yarn during that period when the cone is being started, and consequently its take-up is near the minimum, is generally higher than the desired amount and that at this stage the application of lubricant to succeeding portions of yarn lacks uniformity. By experiment it has been determined that the initial non-uniformity and over-coating results from the fact that, due to the relatively low peripheral speed of the collecting device at the beginning of winding, the yarn is under very low tension as it passes from the source of supply to the treating roller, resulting in undesirable vibration of the thread. This vibration causes the surface contact between the yarn and roller to vary considerably with the result that the amount of lubricant accepted by the yarn under these conditions is higher than desired and less uniform.

It has been found that the extent and duration of the vibration is subject to considerable

variation when yarns of different deniers or other physical characteristics are being wound. On the other hand, at some time during the winding operation it has been found that the peripheral speed of the collecting device, and consequently its take-up will increase to a point where the vibration is stopped and satisfactory lubrication can be effected. This time, of course, will depend upon the characteristics of the yarn, winding speed and other variables.

It is an object of this invention to overcome all of the difficulties heretofore encountered in the treatment of yarn by the passage of the same across a surface which will modify the characteristics thereof and to produce a surface treated yarn which is modified uniformly throughout its length.

By the employment of this invention it is contemplated that yarn treated by contact with a modifying surface during a winding operation will be automatically maintained in proper relation to such surface regardless of the speed of travel of the yarn, the condition of the surface, the physical and/or chemical characteristics of the yarn itself or the type of treatment effected by contact, thereby rendering available a modified yarn of great uniformity throughout its entire length.

It is further contemplated by the use of this invention to damp the vibrations of yarn or the like being drawn between a storage device and a treating surface at such times as the normal tension of the yarn, inherent in high speed winding, is insufficient for this purpose, to thereby permit uniform treatment of succeeding portions of yarn contacting a treating surface, and at the same time avoiding drag between the yarn and the treating surface.

Further objects and advantages of the present invention will be apparent from a consideration of the following detailed description when taken in conjunction with the accompanying drawing wherein:

Figure 1 is a view in front elevation of a portion of a winding machine showing a preferred form of vibration damping device of the present invention in damping position;

Figure 2 is a detail view of the damping device in released position;

Figure 3 is a view in section taken along the line 3—3 of Figure 1;

Figure 4 is a plan view of a modified form of damping device, having a self-threading feature; and

Figure 5 is a plan view of another modified form of damping device according to the present invention.

Referring to the drawing in detail, the invention is shown in a machine adapted to receive yarns or the like 10 from a suitable source, not shown, which may be a spool, cake or the like, which yarns are to be treated with a liquid dressing such as a lubricant, and are to be wound into the form of cones or the like. Inasmuch as the machine is adapted to simultaneously treat and wind a plurality of yarns by identical mechanism, the description will be confined for convenience to the mechanism acting upon a single yarn. It is understood, however, that any number of such mechanisms may be included in the machine and may be operated simultaneously.

Yarn 10 taken from its source is passed through stationary pigtail guides 11 and 12, tangentially across a roller 13, through an additional pigtail guide 14 and a tensioning device 15, of well known form, to a traverse mechanism 16 through which it is drawn by a cone or other collecting device 17, mounted for rotation with a shaft 18 driven at constant speed from a source of power, not shown.

Roller 13, across which the thread 10 passes in its travel between the source and collecting device 17, is mounted for rotation with shaft 19, which is driven from a source of power not shown. Shaft 19 is so journaled that roller 13 will rotate partially below the edge of longitudinally extending tank or trough 20, which is partially filled with a suitable lubricant 21. Conveniently a wall of trough 20 constitutes a support for guides 11 and 12.

Guide 14 is attached to a sleeve 22 which is axially movable along a shaft 23, this movement controlling the path of yarn 10 across roller 13. The movement of sleeve 22 is effected automatically so that the length of the path of the yarn in contact with the roller is increased as the speed of take-up increases due to increase in effective diameter of cone 17. Mechanisms for effecting this automatic adjustment of sleeve 22 are well known in the winding art. In Figure 1, sleeve 22 is shown connected by a link 24 to an arm 25 of a bell crank 26, fulcrumed at 27. The other arm 28 of the bell crank is fixedly connected to an arm 29, which in turn is connected to an arm 30, pivotally attached at 31 to traverse mechanism 16. Arms 25 and 25 of the bell crank and arm 29 are provided with a plurality of holes for effecting an adjustment of the effective lengths thereof.

Traverse mechanism 16 is of conventional form and includes a guide member for causing the yarn to be wound on the cone in a series of helices. The guide member is mounted on a cone surface contacting member 32 which, in turn, is arranged for pivotal movement about shaft 33 in response to variations in the effective diameter of the cone. Any known means for maintaining member 32 in contact with the body of wound yarn may be employed.

In the path of yarn 10 between guides 11 and 12, there is interposed a vibration damping mechanism indicated generally at 34 consisting of an elongated piece of metal or other suitable material bent into the general form of U, one arm of which is bent to form a loop 35 which is adjustably attached to sleeve 22 by means of screws 36. The other arm of the damper is bent at its end to form a U-shaped thread contacting guide 37.

When the device is to be placed in operation, traverse mechanism 16 is swung about pivot point 33 away from shaft 18 to permit the placing of a cone or other collecting device thereon. This movement of traverse mechanism 16 causes bell crank 26 to move about its point of pivot 27, which, through the intermediary of link 24, causes sleeve 22 to move along shaft 23, carrying with it damping mechanism 34 to the position shown in Figure 2.

Thereafter, the device is threaded up by passing the yarn 10 from the storage device through guides 11 and 12, across roller 13, through guide 14, tensioning device 15 and traverse mechanism 16, to the collecting device 17, to which the thread end is attached. Traverse mechanism 16 is now moved into contact with cone 17, thus moving bell crank 26 about its point of pivot and causing link 24 to urge sleeve 22 and vibration damper 34 to the position shown in Figure 1.

When cone 17 is drawing yarn 10 from its

source through the various guides, shaft 19 and consequently roller 13 is caused to rotate in a direction counter-current to the path of travel of the yarn. Thus the lubricant 21 is picked up by the roller and imparted to the yarn at the point of contact. During the initial stages of the winding, yarn 10 is deflected from its normal path by damper 34. As the winding progresses, however, traverse mechanism 16 will be moved away from shaft 18 by the increasing yarn body on cone 17, thus pivoting about point 33, and through the intermediary of arms 30 and 29, bell crank 26 and link 24, causing sleeve 22 to move along shaft 23. Damper 34 is attached to sleeve 22 and moves with it, so that as winding progresses the yarn is deflected less and less by the damper until it is moved entirely out of contact with the yarn, whereupon the yarn assumes a straight path between guides 11 and 12.

Since the vibration which causes uneven coating of the yarn exists only in the initial stages of winding when the speed of take-up is too low to maintain the yarn under normal winding tension between the source and the treating roller 13, it will be seen that damping mechanism 34 will operate when needed, while an automatic release thereof is effected by the very factor which overcomes the vibration, i. e., the increased take-up speed caused by the increase in diameter of the yarn body on the cone.

It will be apparent that the stage in the winding at which the release of damping mechanism 34 is effected and the angle of deflection of the yarn caused thereby becomes zero, will vary considerably dependent upon the size of the cone, the denier of the yarn, and other variables. However, by adjustment of the position of the damper 34 and of the effective lengths of arms 25, 28 and 29, a uniform treatment of a wide range of yarns may be permitted.

It will be noted that the mechanism which moves the damper 34 is the same mechanism which causes the angle of contact of the yarn with the treating roller 13 to change as the take-up speed of the yarn increases. That is, damper 34 is attached to sleeve 72, which carries thread guide 14, and as the sleeve moves along shaft 23 the angle of contact of the yarn with roller 13 changes, so that the extent of contact of the yarn with the lubricant increases. However, if desired, separate mechanism may be provided for supporting and moving damper 34.

The modifications of vibration dampers shown in Figures 4 and 5 differ from that previously described in connection with Figures 1, 2 and 3 only in the shape of the thread contacting member proper. The damper shown in Figure 4 is provided with an inclined convex face 38, a recess 39 constituting a yarn guiding surface, and an abutment 40. In initiating a winding operation this damper functions in the same way as that shown in Figures 1 and 2. However, if thread breakage occurs while the damper is in operative position the operator may tie the two ends, restart the machine and simply release the yarn without the necessity of placing it in position on the damper, since the yarn will engage the face 38, slide therealong, and become seated in the recess 39.

In the modification shown in Figure 5 the free arm of the damper is bent to form an elongated, enclosed slot within which the thread rides. In this instance the yarn must be threaded into the guide at the beginning of a winding operation between the arms 41 and 42, and when in operative position the yarn is contacted by the U-shaped portion 43.

It is to be understood that the present invention is not to be restricted to the foregoing description as the underlying principle involves broadly, the inhibition of yarn vibration during that portion of a winding operation wherein vibrations would normally occur. The invention is only to be limited to the extent of the appended claims.

What is claimed is:

1. In a method of conditioning yarn, the steps which comprise unwinding the yarn from a yarn source, passing the same through a treating zone and subsequently collecting the yarn under a predetermined tension and inhibiting the vibrations of the yarn in the treating zone by effecting a slight pre-tension thereon, which pre-tension, throughout the major portion of the winding period, is caused to continuously and gradually decrease until, at the point where the vibrations have substantially ceased, the pre-tension is entirely removed.

2. In a method of conditioning yarn, the steps which comprise unwinding the yarn from a source of supply, collecting the yarn under a predetermined tension, passing the yarn through a treating zone prior to the application of substantial tension thereto and inhibiting the vibrations of the yarn in the treating zone in the initial stages of winding by slightly deflecting the yarn from its normal path between the said source and the said treating zone throughout a predetermined initial winding period and gradually decreasing the angle of deflection of said yarn as winding progresses until the angle of deflection becomes zero.

3. In a method of conditioning yarn, the steps which comprise unwinding the yarn from a source of supply at a gradually increasing speed due to the build-up of the yarn body at the point of collection, collecting the yarn under a predetermined tension, passing the yarn through a treating zone prior to the application of substantial tension, inhibiting the vibrations of the yarn during the initial stages of winding and while the take-up speed is at its minimum, by slightly deflecting the yarn from its normal path between the said source and said treating zone throughout a predetermined initial winding period, gradually decreasing the angle of deflection of said yarn as the speed of take-up increases until the angle of deflection becomes zero and controlling the said decreasing angle of deflection from the build-up of the yarn body.

4. In a winding machine, a source of yarn, thread, or the like, a driven collecting device, means intermediate said source and said device for contacting the yarn with a treating surface, means movable longitudinally of the contacting means for increasing the extent of contact of the yarn with the treating surface thereof during the winding period, a damper mounted on said movable means, said damper including a yarn contacting portion, fixed yarn guiding means positioned intermediate the means for contacting the yarn with a treating surface and the yarn contacting portion of said damper, the latter being initially in contact with and normally operable on said yarn in its path between said source and said contacting means, and means responsive to a change in thickness of the yarn body on the collecting device for effecting longitudinal movement of said movable means and

for gradually withdrawing the damper from contact with said yarn during the winding period.

5. A winding machine as defined in claim 4 wherein the yarn contacting portion of said damper is formed with a U-shaped yarn contacting surface.

6. A winding machine as defined in claim 4 wherein the yarn contacting portion of said damper is formed with an inclined convex face having a recess therein to accommodate and retain the yarn, the inclined face being adapted to cause the yarn to automatically feed into the recess.

7. A winding machine as defined in claim 4 wherein the yarn contacting portion of said damper is formed in the shape of an elongated, enclosed slot within which the yarn is caused to ride and contact one U-shaped end of the slot.

DONALD I. GROSS.