June 4, 1963 B. E. HILL, JR., ETAL 3,092,339

YARN WINDUP

Filed Nov. 30, 1960

FIG. 1

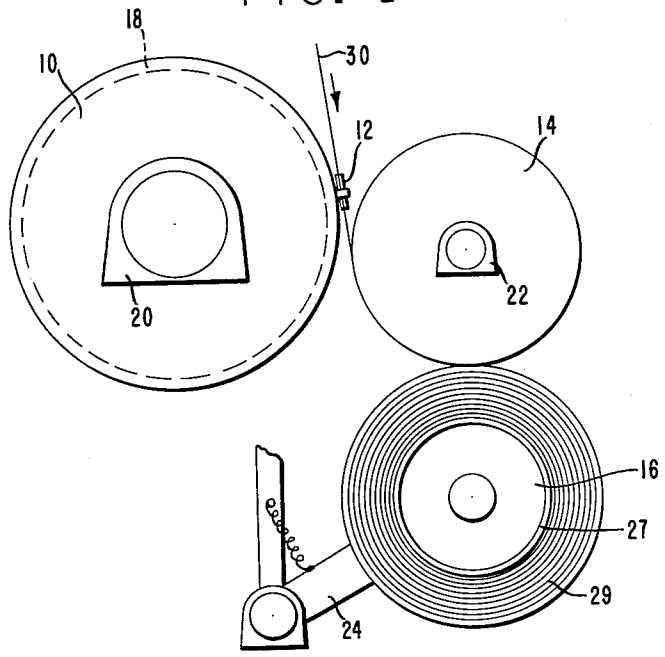
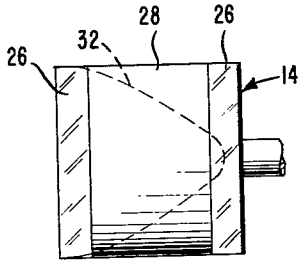


FIG. 2



United States Patent Office

3,092,339

Patented June 4, 1963

3,092,339

YARN WINDUP

Broadus Edward Hill, Jr., Kinston, and Leigh O'Neill Vanneman, Sr., Grifton, N.C., assignors to E. I. du Pont de Nemours and Company, Wilmington, Del., a corporation of Delaware

Filed Nov. 30, 1960, Ser. No. 72,768
5 Claims. (Cl. 242—18)

This invention relates generally to the production of yarn and, more particularly, to improvements in the apparatus employed in packaging yarn.

In the textile field, it is well know that substantially cylindrical packages of yarn, thread or the like may be built on a bobbin in a traverse winding apparatus. One suitable form of the apparatus which has been developed in recent years is known as a print roll windup and includes a cam-actuated traverse guide through which yarn passes to the surface of a driven print roll. The print roll is in driving contact with a bobbin or package situated on a roll which is rotatably mounted on a spring biased swing arm. Thus, the traverse pattern is laid down on the surface of the print roll, carried on this roll for a short distance and then deposited or printed on the package or cake. In this manner, the print roll functions not only to drive the package roll but also to maintain constant the uncontrolled yarn length between the guide and the package. Where the uncontrolled yarn length is excessive, overthrown ends result. For this reason the traverse guide is located as closely as possible to the print roll. The resulting package has substantially flat ends as well as a generally symmetrical appearance and is further characterized by firmness, the absence of appreciable or pronounced shoulders on the peripheral surface, the absence of over-thrown ends and by an equality of mechanical treatment of different incremental lengths of yarn. These results may be achieved on conventional equipment as long as a maximum windup speed is not exceeded. Beyond that speed, the number of print roll wraps is excessive and when high tensions are employed to reduce the number of wraps excessive sloughing and overthrown ends result.

The most important objective of the present invention is to provide improvements in a print roll windup which promote its effective and efficient employment at high winding speeds.

A corollary objective is to provide a print roll which retains the traverse pattern despite a substantial increase in winding speeds.

With these and other objects in view, the print roll windup of the present invention is comprised of a traverse guide, a package roll and a driven print roll over which yarn travels from the guide to the package roll. The print roll has a relatively high friction surface, with respect to the yarn, in bands or zones located opposite the guide reversal points and a relatively low friction surface in a central zone or band.

These and other objectives will be apparent from the following specification wherein reference is made to the accompanying drawing in which:

FIG. 1 is a side view of a print roll windup into which the improvements of the present invention have been incorporated; and

FIG. 2 is a plan view of the print or drive roll shown in FIG. 1.

The yarn-winding apparatus chosen for purposes of illustration includes generally a barrel cam **10**, a traverse guide **12**, a driven print roll **14**, and a package roll **16**. Driven cam **10** has a sinuous groove **18** in its surface and is mounted for rotation in spaced trunnions **20**. Guide **12** rides in groove **18** and is limited to a reciprocating linear path of travel by rails which have been omitted from the drawing for purposes of clarity. It should be noted that guide **12** is located as closely as possible to the surface of drive roll **14**, which is rotatable in a pair of trunnions **22**. Package roll **16** is mounted for rotation on a spring biased swing arm **24** and is adapted to receive a bobbin or tube **27** on which a package **29** is wound.

As shown in FIG. 2, the cylindrical surface of drive roll **14** is divided into two outer zones or bands **26** and a central band **28**. The outer zones have a surface finish which has a relatively high coefficient of friction with respect to the yarn whereas the central zone **28** is provided with a surface finish having a relatively low coefficient of friction. The high friction finishes are usually prepared by grinding, chrome-plating and then buffing the roll.

Ordinarily, the central zone **28** has a matte finish which is prepared by roughening the surface uniformly either before or after it has been chrome plated. The roll surface is roughened by sand or vapor blasting.

Where mentioned herein, actual friction coefficients were obtained on a General Purpose Yarn Friction Tester (Shirley Development, Ltd.) in accordance with the test procedures described by Buckle and Pollit in the Journal of Textile Institute, 1948, 39, T–199. In these tests, a sample of 150 denier, 34 filament, Rotoset, Type 56 polyester, continuous filament yarn, as manufactured by the assignee hereof, was passed in a 180° wrap on the test roll and run at 220 yards/minute with a pretension of 15 grams. The coefficient is read directly from a scale which has 1.0 as the upper limit and which is very compressed adjacent that limit.

In one instance, a drive roll prepared in this manner was tested and found to have friction coefficients of about 0.95 in the end zones and about 0.22 in the central zone. Using the well-known belt-friction formula, other rolls have been tested and found to have coefficients varying from 0.8–1.0 in the end zones and from 0.2–0.4 in the central zone. As an alternative to the metallic surface finishes, the roll may be coated with a suitable, wear resistant, ceramic coating of aluminum oxide, chromium sesquioxide or the like. Here again, the high friction zones may be prepared by buffing and the low friction zone by sand or vapor blasting. Although metallic or ceramic surfaces are particularly useful when lower denier, textile yarns are being wound, it is practicable and sometimes preferred that the end zones be strips of urethane rubber or the like, e.g., when higher deniers such as tire yarn are being wound.

In operation, a yarn end **30** passes through and is reciprocated rapidly by guide **12**. The path followed by the yarn as it is deposited on the drive roll surface is as indicated by the numeral **32** in FIG. 2. As shown, those portions of the path **32** which lie in zones **26** correspond to the reversal points of guide **12**. The high friction finish on these end zones acts to stabilize the yarn in its passage over drive roll **14** and to prevent slips or sloughs toward the center of package **29**. The use of a relatively low friction finish on the larger central band **28** insures against the development of any appreciable number of drive roll wraps. As a direct result of the banded print roll surface described herein, windups of the type which has been illustrated can be operated both effectively and efficiently at speeds in excess of 2000 yards per minute.

The illustrated print roll has only the three zones and is thus adapted only for use in the winding of a single package. If desired, the swing arm **24** can be adapted to receive a plurality of tubes **27**. In this event, it would also be necessary to provide additional print roll facilities for each tube, either by arranging separate rolls in tandem or by providing alternate high and low friction finishes on an elongated roll. The integral roll could be grooved

and the tandem rolls spaced to facilitate installation of transfer tail mechanisms. It is apparent that these and other changes and modifications may be made in the disclosed yarn-winding apparatus without departing from the spirit of the present invention which is, therefore, intended to be limited only by the scope of the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A yarn-winding apparatus comprising a package roll, a print roll driving the package roll and a reciprocating traverse guide through which yarn travels to the print roll, the latter having a low friction surface in a central zone bounded by zones having high friction surfaces, said high friction zones being located opposite the guide reversal points and having surface friction coefficients of at least 0.8, said central zone having a surface friction coefficient of 0.2–0.4.

2. In a yarn-winding apparatus including a reciprocating traverse guide through which yarn travels to a package roll, a drive roll in rolling engagement with said package roll, said drive roll having at least three separate but adjacent surface zones in the length thereof engaging said package roll, the roll surface in the central zone having a relatively low coefficient of friction with respect to said yarn, the roll surface of the outer zones being located opposite the guide reversal points and having a coefficient of friction with respect to said yarn of at least 0.8, said central zone having a surface friction coefficient of 0.2–0.4.

3. The apparatus of claim 2 wherein said drive roll has a metallic surface, said central zone has a matte finish and said outer zones have a highly polished finish.

4. The apparatus of claim 2 wherein said central zone has a matte finished metallic surface and said outer zones have a rubber surface.

5. The apparatus of claim 2 wherein said drive roll has a ceramic coating, said central zone has a matte finish and said outer zones have a highly polished finish.

References Cited in the file of this patent

UNITED STATES PATENTS

2,664,249 Wright ---------- Dec. 29, 1953