Oct. 1, 1940. C. MAGNOLFI 2,216,123

MANUFACTURE OF HAIRY YARN

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Fig. 1,

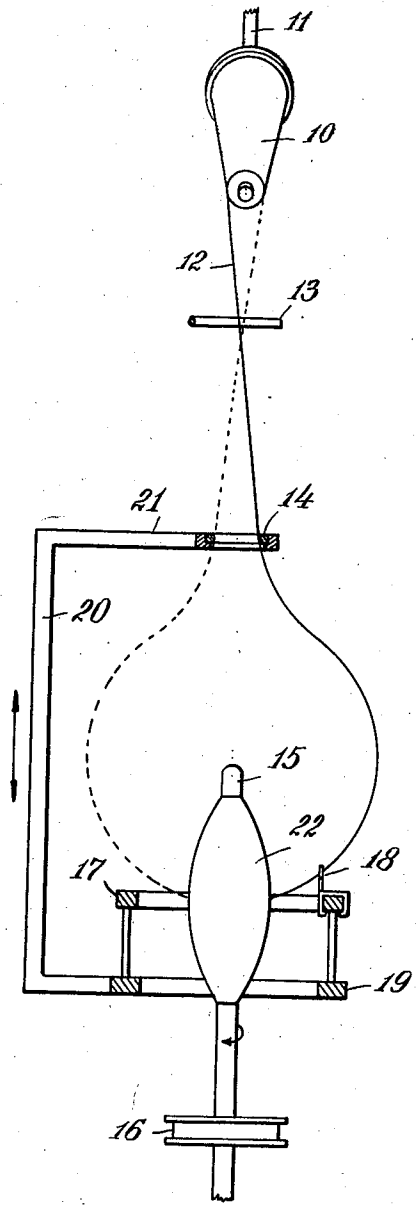
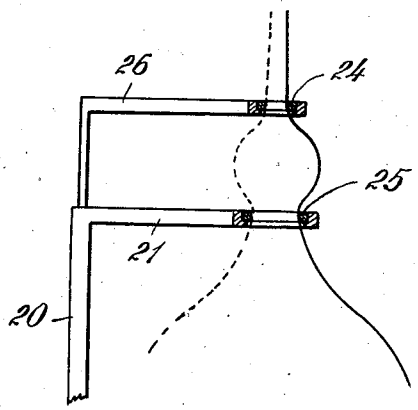


Fig. 2,



INVENTOR
Corrado Magnolfi
BY
Pennie, Davis, Marvin & Edmonds
ATTORNEYS

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MANUFACTURE OF HAIRY YARN

Corrado Magnolfi, Milan, Italy, assignor, by mesne assignments, to Celanese Corporation of America, a corporation of Delaware

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10 Claims. (Cl. 57—2)

This invention is concerned with imparting pubescence to yarn, particularly continuous filament yarn such as rayon during a twisting operation conducted on a ring twister or the like and aims to produce yarn of uniform hairy character.

When rayon yarn is made from a spinning solution it comprises an untwisted bundle of substantially continuous filaments. In order to increase the compactness and durability of the yarn it is twisted. Twisting may be accomplished upon a variety of devices, one of which is known as a ring twister. In the ring twisting operation, as it is usually conducted, a cake (usually of frusto-conical shape) of the yarn to be twisted is held on an immovable spindle, and the yarn to be twisted is pulled off the cake at one end (the smaller end, if the cake is of frusto-conical shape) and passed through guides of various kinds to a second spindle upon which it is wound. The second spindle usually is disposed vertically and is rotated at high speed by a belt driven whorl upon which it is mounted. Around the spindle and concentric therewith, there is an annular track around which a guide is slidable. The track remains horizontal and concentrically disposed around the spindle but is moved slowly up and down. The yarn stripped from the first spindle passes through the slidable guide and is wound uniformly along the length of the rotating second spindle, while the slidable guide is impelled to run rapidly around the track and thus imparts a twist to the yarn. Centrifugal force causes the yarn passing to the guide to describe a balloon as it whirls about the second spindle, and it has been proposed heretofore to develop pubescence in the yarn by causing it to impinge upon an abrasive while it is ballooning. It has also been appreciated that impingement of the yarn upon the abrasive is irregular and the resulting pubescence non-uniform if the size and shape of the balloon changes substantially as the yarn is wound. My invention, however, offers a simple and effective means for maintaining the shape and size of the balloon substantially constant and thus assures uniform pubescence in the abraded yarn.

In the practice of my invention, an abrasive ring or other means for effecting partial rupture of the yarn (i. e., the rupture of some filaments) is attached to the track of the ring twister and moves in fixed spaced relationship with it. The yarn passes through the ring and then through the guide sliding on the track, but because the ring is rigidly attached to the track the distance between the ring and the slidable guide is maintained constant, and consequently the shape of the balloon is also substantially constant. My invention, therefore, contemplates the combination in apparatus for twisting and abrading yarn which comprises a yarn collecting member (for example a spindle), means for rotating the member on an axis, an annular track disposed around the member (and preferably perpendicular to the axis), a yarn guide mounted on the track and slidable around it, means (such for example as an abrasive ring) mounted along the axis for partially rupturing the yarn, and means for holding the rupturing means and the track in fixed spaced relationship with each. The combination may and usually will include means for moving the rupturing means and the guide backwards and forwards along the axis while, as indicated above, their spaced relationship with each other remains unchanged. In other words, the position of the rupturing means and the guide with respect to the collecting means is changed while their position relative to each other remains unchanged, and the result may be brought about either by moving the collecting means along its axis of rotation, or by moving the rupturing means and the guide along this axis. Ordinarily the latter course is preferable, as will be apparent from the following detailed description taken in conjunction with the accompanying drawing in which

Fig. 1 represents schematically a ring twister equipped for the practice of my invention and

Fig. 2 is a fragmentary view of a modified form of the apparatus of Fig. 1.

Referring now to Fig. 1, a cake of yarn 10, of frusto-conical shape and comprising a series of overlapping spirals of yarn to be twisted is held on an immovable spindle 11. The yarn 12 is pulled off the cake at the latter's small end, is bent over a guide bar 13 and passes through an abrasive ring 14 of relatively small internal diameter to a vertical spindle 15 which is rotated at high speed by means of a belt driven whorl 16 upon which it is mounted. Around the spindle is a concentrically disposed annular horizontal track 17 upon which is mounted and around which is slidable a ring twister guide 18. The track is mounted on a base 19 from which extends upwardly a post 20 which bears an arm 21 fastened at right angles to its upper portion. The outer end of the arm is rigidly attached to the abrasive ring, which is thus held in a horizontal position with its axis substantially coinciding with that of the vertical spindle 14.

The base 19 to which both the track of the ring

twister and the abrasive ring are attached is movable up and down the length of the movable spindle through a fixed stroke while maintaining a concentric relationship therewith. Conventional means such as a rack and pinion (not shown) are provided for moving the base up and down with reference to the vertical spindle so that the twisted yarn is wound as a cake 22 along the spindle and forms a series of overlapping spirals. The same relative movement, of course, can be obtained by moving the spindle up and down while holding the base and attached guide and abrasive ring stationary, but this course is less preferable from a mechanical standpoint.

In the operation of the apparatus of Fig. 1, rayon yarn is removed from its cake on the first spindle, passes over the guide bar and then describes a balloon-shaped surface of rotation as it passes through the abrasive ring to the guide sliding around the track. Finally, it is wound on the rapidly rotating spindle as a series of overlapping spirals, due to the fact that the base, and consequently the attached abrasive ring track and rotating guide are moving upward and downward with respect to the spindle. As the yarn passes through the ring, it impinges on the inner abrasive surface of the ring, which may be made of carborundum or like, and some or all of the outer filaments of the yarn are periodically frayed or ruptured. The surface of rotation or "balloon" of the yarn from the abrasive ring to the sliding guide remains of substantially constant size and shape because of the fixed spaced relationship of these two members. Consequently, the yarn tends to impinge on the abrasive surface at a constant angle and with a constant force so that the pubescence developed on the yarn is uniform. (If the abrasive ring did not move with the track, as provided for herein, the vertical dimension of the balloon between the ring and the travelling guide on the track would be periodically lengthened and shortened so that both the shape and size of the balloon would vary and impingement of the yarn with the abrasive would be variable.) Following abrasion, the yarn is twisted as it is wound on the spindle and is thus converted into so-called "artificial staple fibre" yarn of uniform hairiness.

It will be noted that the distance between the guide bar 13 and the abrasive ring is constantly and periodically changing in the operation of the above-described apparatus so that the shape and size of the surface of rotation described by the yarn between these two points is subjected to change. This change, however, is not very serious as long as the inner diameter of the ring is relatively small, and does not bring about a great difference in the angle and force with which the yarn strikes the abrasive. With a view toward promoting absolute uniformity of abrasion and pubescence, however, the apparatus may be provided with a pair of rings 24, 25, both mounted on the vertical axis of the lower spindle as shown in Fig. 2. In this modification, the lower of the two rings 25 is made of abrasive material and the upper ring is smooth. The upper ring is fastened to an extension 26 from the post and both rings are substantially perpendicular to the direction of yarn passage. A small secondary balloon of substantially constant size and shape is described between the two rings. The effect of this is that the surface of rotation both above and below the abrasive means are maintained substantially constant in size and shape and the pubescence of the yarn rendered more uniform.

I claim:

1. In apparatus for producing hairy yarn, the combination which comprises a yarn collecting member, means for rotating said member on an axis, an annular track disposed around said member, a yarn guide disposed along the axis remote from the yarn collecting member, a yarn guide mounted on the track and slidable around it, means mounted along the axis for partially rupturing the yarn, said means being mounted between the yarn collecting member and the yarn guide disposed along the axis and being further mounted remote from the yarn collecting member and means for holding the rupturing means and the track in fixed spaced relationship with each other.

2. In apparatus for producing hairy yarn, the combination which comprises a yarn collecting member, means for rotating said member on an axis, an annular track disposed around said member substantially perpendicular to the axis, a yarn guide disposed along the axis remote from the yarn collecting member, a yarn guide mounted on the track and slidable around it, means mounted along the axis between the first-named guide and the collecting member but remote from the collecting member for partially rupturing the yarn as it passes through the guide to the collecting member, means for holding the rupturing means and the track is fixed spaced relationship with each other, and means for moving the rupturing means and guide relative to the yarn collecting means along the axis thereof.

3. In apparatus for producing hairy yarn, the combination which comprises a yarn collecting member, means for rotating said member on an axis, a circular track disposed around said member substantially perpendicular to the axis and concentric with the member, a yarn guide disposed along the axis remote from the yarn collecting member, a yarn guide mounted on the track and slidable around it, means mounted along the axis for partially rupturing the yarn, said means being mounted between the first-named guide and the collecting member and remote from the collecting member, means for holding the rupturing means and the track in fixed spaced relationship with each other, and means for moving the rupturing means and the track so held back and forth along said axis.

4. In yarn winding apparatus, the combination which comprises a yarn collecting member, means for rotating said member on an axis, an annular track disposed around said member substantially perpendicular to the axis, a yarn guide disposed along the axis remote from the yarn collecting member, a yarn guide mounted on the track and slidable around it, an abrasive ring mounted between the first-named guide and the collecting member and remote from the yarn collecting member on said axis, means for holding the abrasive ring and the track in fixed spaced relationship with each other, and means for moving the abrasive ring and the track so held back and forth along said axis.

5. In apparatus for producing hairy yarn, the combination which comprises a yarn collecting member, means for rotating said member on an axis, an annular track disposed around said member substantially perpendicular to the axis, a yarn guide mounted on the track and slidable around it, a pair of rings of relatively small diameter disposed perpendicular to the axis and remote

from the collecting member so that the yarn passes through said rings to the guide and thence to the yarn collecting means, an abrasive disposed on the inner periphery of at least one of the rings, means for holding the rings and the track in fixed spaced relationship with each other, and means for moving the rings and the track so held back and forth along said axis.

6. Apparatus according to claim 5 in which the abrasive is on the inner periphery of the ring disposed nearer to the collecting member.

7. In apparatus for producing hairy yarn, the combination which comprises a yarn collecting member, means for rotating said member on an axis, an annular track disposed around said member substantially perpendicular to the axis, a yarn guide mounted on the track and slidable around it, a pair of rings of relatively small diameter disposed substantially perpendicular to the axis and remote from the collecting member so that the yarn passes through said rings to the guide and thence to the yarn collecting member, an abrasive disposed on the inner periphery of at least one of the rings, and means for holding the rings and the track in fixed spaced relationship with each other.

8. In apparatus for producing hairy yarn, the combination which comprises a yarn collecting member, means for rotating said member on an axis, an annular track disposed around said member substantially perpendicular to the axis, a yarn guide mounted on the track and slidable around it, a yarn guide disposed along the axis remote from the yarn collecting member, means mounted along the axis between the remotely disposed guide and the collecting member but remote from the collecting member for partially rupturing the yarn as it passes through the guide to the collecting member, means for holding the rupturing means and the track in fixed spaced relationship with each other, and means for providing relative motion between the rupturing means and the yarn collecting means along the axis thereof.

9. In apparatus for producing hairy yarn, the combination which comprises a yarn collecting member, means for rotating said member on an axis, an annular track disposed around said member substantially perpendicular to the axis, a yarn guide mounted on the track and slidable around it, a yarn guide disposed along the axis remote from the yarn collecting member, means mounted along the axis between the remotely disposed guide and the collecting member but remote from the collecting member for partially rupturing the yarn as it passes through the guide to the collecting member, means for holding the rupturing means and the track in fixed spaced relationship with each other, and means for moving the collecting member along the axis thereof relative to the rupturing means and the track.

10. In a twisting apparatus for twisting and collecting yarn comprising a yarn collecting member rotatable on an axis and a yarn guide adapted to cause the yarn to move in an orbit around said member, the improvement which comprises means mounted along the axis in fixed spaced relationship with and above said yarn guide but remote from the collecting member for partially rupturing the yarn as it passes to said collecting member.

CORRADO MAGNOLFI.