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Tsukuma et al.

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[54] **YARN TRAVERSING DRUM USED FOR YARN WINDERS**

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[52] **U.S. Cl.** **242/43.2**, 242/18.1

[51] **Int. Cl.** **B65h 54/48**, B65h 54/38

[58] **Field of Search** ..... 242/43.2, 18 DD, 18.1

[56] **References Cited**

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[57] **ABSTRACT**

On each terminal end of the yarn traversing drum periphery, the reversing part of the yarn traversing groove is followed by an unrecessed region of a very short length and an intermediate groove having a specially dimensioned deep bottom so that a momentary increase in the yarn tension caused by the presence of the unrecessed region will minimize the possibility of ribbon formation on terminal end parts of the package under building.

3 Claims, 7 Drawing Figures

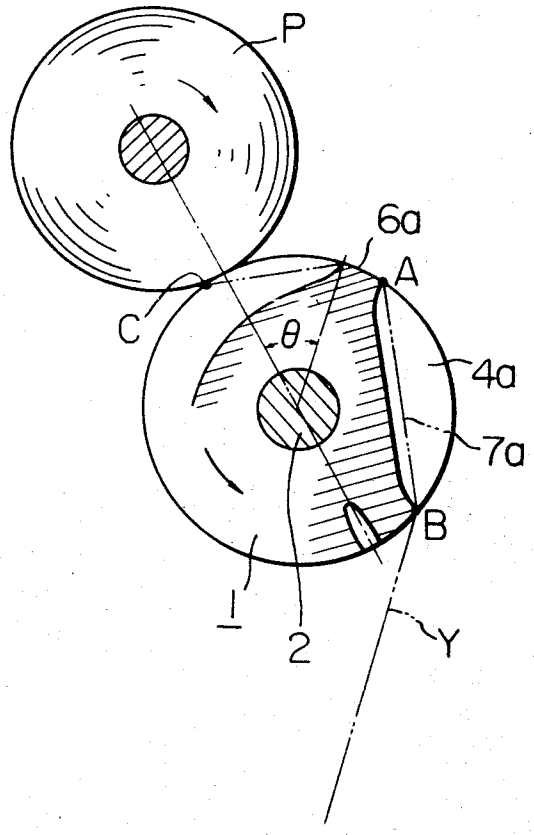


Fig. 1

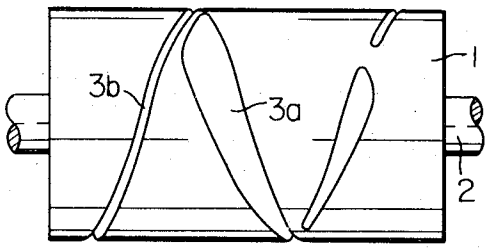


Fig. 2

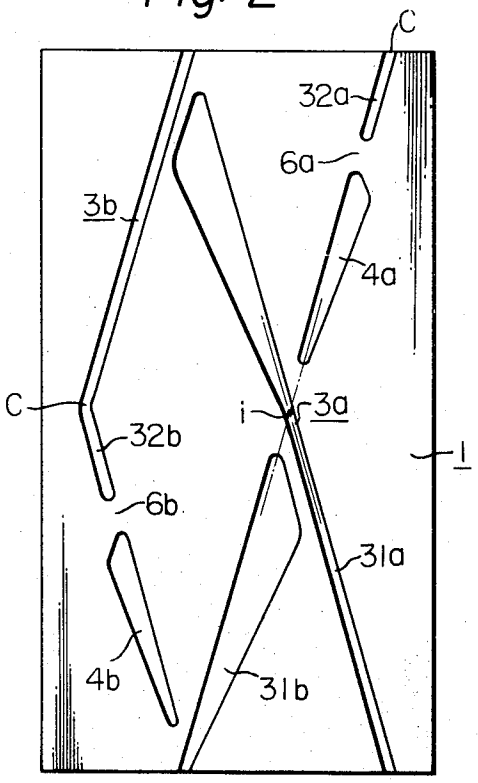


Fig. 3

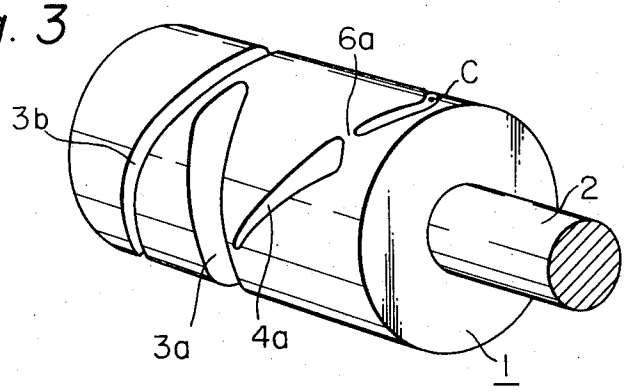


Fig. 4A

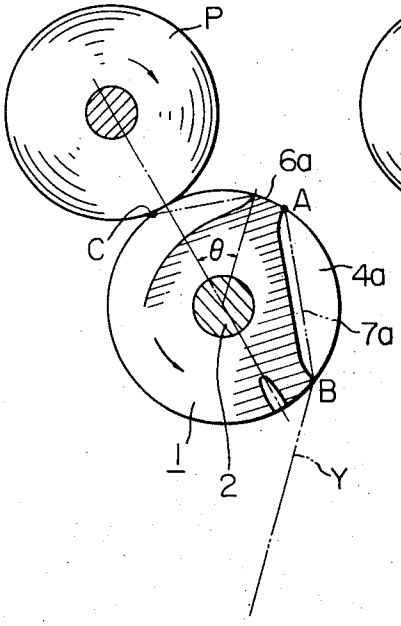


Fig. 4B

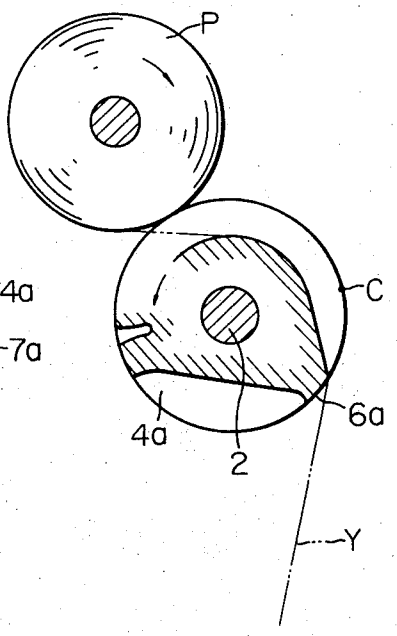


Fig. 5A

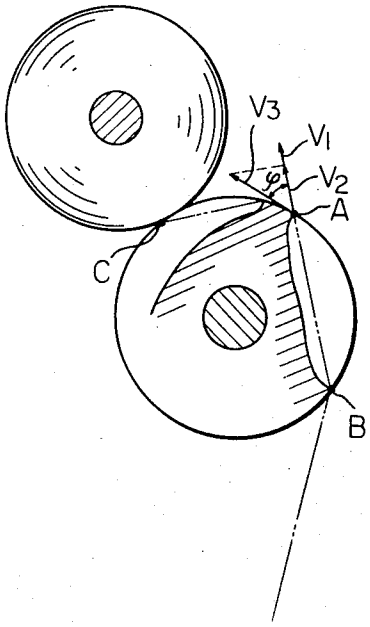
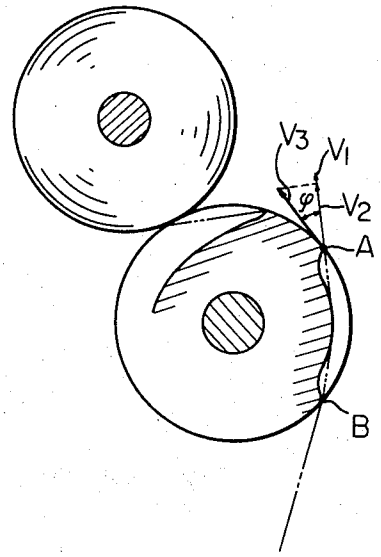


Fig. 5B



YARN TRAVERSING DRUM USED FOR YARN WINDERS

The present invention relates to improved yarn traversing drum used for yarn winding, more particularly relates to an improved yarn traversing drum advantageously usable for yarn take-up winding of constant yarn speed, with reduced possibility of the so-called ribbon formation.

Regarding the process of winding-up a yarn on a package using a yarn traversing drum, it is conventionally known that the so-called ribbon formation tends to develop when the ratio of the package diameter with respect to the drum diameter becomes a certain value. Development of such ribbon formation tends to grow when the yarn tension is reduced at the terminals of the traverse motion, i.e., at the moment when the traversing direction of the yarn is reversed. Due to this reduction in the yarn tension, the yarn just under processing is influenced by the preceding winds of the yarn on the package periphery and a stripe of the winds patterned after the yarn traversing groove on the drum is formed on the package periphery. The stripe so formed is further developed into the so-called ribbon formation through its fitting engagement with the groove on the drum periphery as the winding operation proceeds. The ribbon formation so developed tends to loose its shape particularly on the terminal end parts of the package, resulting in undesirable fluctuation of the yarn tension and/or frequent breakage of the yarn during the subsequent rewinding operation.

Various measures have been conventionally proposed in order to mitigate or eliminate the development of such ribbon wind during the yarn winding-up operation. Such conventional measures can be roughly classified into two major groups. In the case of the first group, the rotating speed of the yarn traversing drum is always varied in order to disturb the relative phase of revolutions between the package and the drum. Whereas in the case of the second group, the yarn traversing groove of the drum has an unrecessed region.

In both of the above cases, the mechanism for minimizing the ribbon formation is based on the concept of changing the yarn wind-up speed over a prescribed length of time. When the yarn winding speed is dependent upon the rotation of the yarn traversing drum only, such change in the yarn winding speed does not disturb the smooth prosecution of the yarn wind-up operation at all. Consequently such conventional measures as described above can advantageously be employed in order to successfully restrain the undesirable development of the ribbon formation.

However, the conventional measures of the above-described type cannot be employed in the yarn wind-up system wherein the yarn is supplied positively at a constant feeding speed, e.g., where the yarn winding system is combined with the so-called open-end-spinning system. This is because the balanced relationship between the yarn feeding and take-up speeds is broken by the above-described change in the yarn wind-up speed.

The object of the present invention is to provide an improved yarn traversing drum capable of minimizing the development of ribbon formation on the package even in the cases where the yarn is supplied to the yarn winder at a constant feeding speed.

In order to attain this object, the yarn traversing drum of the present invention is provided with an unrecessed region of very short length, and an intermediate groove is provided with a bottom positioned below a straight imaginary line including both terminals thereof.

In a preferred embodiment of the present invention, the starting point of the unrecessed region is located following the apex by a center angle from 20° to 70°, in the sense of the rotating direction of the drum.

Further features and advantages of the present invention will be clarified in the ensuing description, reference being made to the accompanying drawings, in which:

FIG. 1 is a front plane view of the yarn traversing drum of the present invention;

FIG. 2 is a explanatory spread view of the yarn traversing drum shown in FIG. 1, and;

FIG. 3 is a perspective plane view of the drum shown in FIG. 1,

FIGS. 4A and 4B are partly sectional explanatory side plane views of the yarn traversing drum shown in FIG. 1, in combination with a package resting thereon;

FIGS. 5A and 5B are partly sectional explanatory side plane view of the traversing drum, showing the unrecessed region and the intermediate groove.

Referring to FIGS. 1 to 3, a typical embodiment of the yarn traversing drum of the present invention is shown. In common with the ordinary yarn traversing drums, the main body 1 of the drum, which is mounted on a rotary drive shaft 2, is provided with two helical grooves 3*a* and 3*b* formed on its peripheral surface and running opposite to each other. It will be well understood that the grooves 3*a* and 3*b* serve to traverse the yarn reciprocally in the axial direction of the drum 1 during the yarn wind-up process.

As shown schematically in FIG. 2, each of the grooves 3*a* and 3*b* is composed of a forwarding part and a reversing part. Using the groove 3*a* as an example, it is composed of a forwarding part 31*a* running rightwards in the drawing, and a reversing part 32*a* running leftwards in the drawing. Both parts 31*a* and 32*a* are connected to each other at the base apex C. The reversing part 32*a* is followed by an intermediate groove 4*a* via an unrecessed region 6*a* of a very short length. This unrecessed region 6*a* extends over a distance corresponding to a center angle from 5 to 10°. The intermediate groove 4*a* runs substantially in the same direction as the reversing part 32*a*, i.e., leftwards in the drawing. As shown in FIG. 4A, the starting point of the unrecessed region 6*a* is located following the apex C by a center angle θ in the sense of the rotating direction of the drum. The value of this center angle θ is desirably in a range from 20° to 70°, more desirably from 30° to 60°. In the case of the illustrated embodiment, a center angle of about 45° is employed.

The depth of the intermediate groove 4*a* is so designed that, as shown in FIG. 4A the bottom of the groove is positioned below a straight line 7*a* including both terminals A and B of the groove.

In FIG. 2, the point i indicates the first crossover.

Needless to say, the arrangements of the other yarn traversing groove 3*b* and its related parts are quite the same as those of the above-described 3*a*, except for the fact that the directions of the arrangements are reversed. During the wind-up process, a yarn package P

is kept in rotating peripheral contact with the main body 1 of the drum.

The operation and the effect resulting therefrom, of the yarn traversing drum of the above-explained structure, are as hereinafter explained in detail.

In the disposition shown in FIG. 4A, the apex C arrives at the point of contact of the drum 1 with the package P and the yarn Y guided by the yarn traversing groove is just going to shift its traversing direction. In contrast to this, a disposition is shown in FIG. 4B wherein the apex C is a position somewhat upstream of the point of the contact.

Because of the presence of the unrecessed region *6a*, the yarn path in FIG. 4A is deformed from that in FIG. 4B and the yarn Y assumes the longest path in the disposition shown in FIG. 4A, i.e., at the moment whereupon the yarn is leaving the terminal end of the traverse. Consequently, in the case of the constant yarn feeding system such as the open–end spinning system, this increase in the yarn path length must be compensated by the corresponding elongation of the yarn, causing the increase in the yarn tension. In the case of the ordinary textile winders, the yarn speed is momentarily increased at this very stage also calling forth the increased yarn tension.

In addition to the above-explained phenomenal mechanism, the shortness of the length of the unrecessed region *6a* contributes to the meritorious effect of the present invention. As is clear from the illustration shown in FIGS. 5A and 5B, the shorter is the length of the unrecessed region *6a*, the greater is the angular difference (ϕ) between the input direction (B-A) of the yarn running and the tangent of the drum periphery at the point A. In other words, when the yarn running speed V_1 equals the periphery speed V_3, the short length of the unrecessed region 6a results in the great difference at the point A between the yarn running speed V_1 and a component V_2 of the periphery speed V_3 projected on the direction of the yarn running. This difference of speed ($V_1 - v_2$) causes an increased frictional resistance at the point A and produces a braking action, resulting in the increase in the yarn tension. It is also clear that, by comparing FIG. 5A with FIG. 5B, the increased depth of the bottom of the intermediate groove 4a assists this increase in the yarn tension because of the increase of the angle (ϕ).

The above-explained momentary increase in the yarn tension effectively operates in the minimization of the ribbon formation. At the time to shift the traversing direction, the yarn is placed under the influence of the force component directed towards the center of the traverse. In the case of the present invention, the increased yarn tension at this very moment naturally produces accordingly an enlarged force component of this nature and, consequently, the yarn is strongly pulled inwardly of the traversing width. By this pulling action, development of the ribbon formation is effectively barred.

In addition to the above-described effect, the momentary tensioning of the yarn must be appreciated from the following point of view. A small and short braking action is applied to the rotation of the package P by the momentary increase in the yarn tension caused by the presence of the unrecessed region *6a*. This braking action slightly disturbs the relative phase of revolution between the drum and the package. This disturbance of the relative phase of revolution is effective in reducing the possibility of ribbon formation on the terminal parts of the package also.

What is claimed is:

1. Improved yarn traversing drum used for winding of yarns and having a pair of peripherally formed helical yarn traversing grooves running opposite to each other wherein, on each terminal end part of the drum length, a reversing part of said yarn traversing groove is followed by an intermediate groove via an unrecessed region of a very short length and the bottom of said intermediate groove is positioned below a straight line extending from the starting point to the ending point of said intermediate groove, the starting and ending points of said intermediate groove being located on the periphery of said drum.

2. Improved yarn traversing drum as claimed inclaim 1 wherein said unrecessed region lies within a center angle in the range from 5° to 10°.

3. Improved yarn traversing drum as claimed in claim 1 wherein the starting point of said unrecessed portion is located following the apex of the yarn traversing groove by a center angle from 20° to 70° in the sense of the rotating direction of said drum.

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