(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 078 690 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
15.07.2009 Bulletin 2009/29

(51) Int Cl.:
B65H 54/38 *(2006.01)* ***B65H 54/48*** *(2006.01)*

(21) Application number: **08020439.9**

(22) Date of filing: **25.11.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(30) Priority: **10.01.2008 JP 2008003662**

(71) Applicant: **Murata Machinery, Ltd.**
Kyoto 601 (JP)

(72) Inventor: **Kubota, Norio**
Kyoto-shi
Kyoto 612-8686 (JP)

(74) Representative: **Liedl, Christine et al**
c/o Hansmann & Vogeser,
Albert-Rosshaupter-Strasse 65
81369 München (DE)

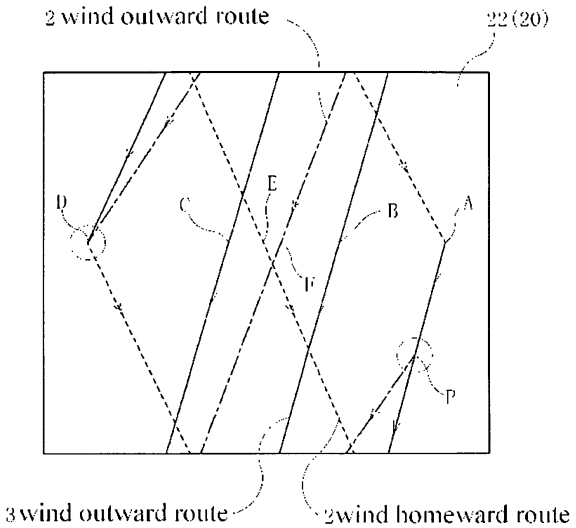
(54) Traverse drum and yarn winding device using the same

(57) A traverse drum and a yarn winding device using the same capable of making it difficult to generate stages on both end surfaces of a package and manufacturing the package presenting a smart appearance even if a traverse groove is switched over to another traverse groove providing a different number of wind so as to prevent ribbon winding.

MEANS FOR SETTLEMENT

Traverse grooves (21) are formed to provide different numbers of wind from a start point A that is a first end to a turn-around point (D) that is a second end. The traverse grooves (21) formed to provide the different numbers of wind are a 3-wind outward route and a 2-wind outward route, respectively. The different numbers of wind are switched by switching the traverse grooves (21) guiding the yarn (11) at a branching point (P). If a direction indicated by an arrow in a drawing is assumed as a traveling direction, the branching point (P) is set at a position forward of the start position (A) substantially by a half round. A merging point (Q) is set at a position backward of the turn-around point (D) substantially by a three-fourths round.

Fig. 2



EP 2 078 690 A2

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a traverse drum and a yarn winding device using the same. The present invention particularly relates to a traverse drum allowing a yarn to be wound on a package while traversing the yarn and a yarn winding device using the traverse drum.

BACKGROUND ART

[0002] There is disclosed a yarn winding device for manufacturing a package by rewinding a yarn from a yarn supplying bobbin using a traverse drum on which traverse grooves traversing the yarn are formed on a peripheral surface thereof (see, for example, Patent Document 1). In this yarn winding device, the traverse drum rotates while a peripheral surface thereof contacts with the package and the package rotates to follow up rotation of the traverse drum. Further, the traverse grooves are formed on the traverse drum so as to provide a predetermined number of wind. If the package is manufactured using the traverse drum providing one number of wind, so-called ribbon winding occurs when a predetermined relationship is held between the number of rotations of the traverse drum and that of the package. The ribbon winding is a phenomenon that a cycle of traversing a yarn by the traverse drum tunes to a cycle of winding the yarn by the package, the yarn wound by the package passes through a same yarn route, the yarn concentrates on a same place, overlap, and is wound into the form of a ribbon. The ribbon winding causes yarn break resulting from sloughing or latching at the time of unwinding the yarn from the package as a later step and eventually causes an unwinding defect. The sloughing is the phenomenon that the yarn is entangled and unreeled at a breath and the latching is the phenomenon that the unreeled yarn is turned upside down.

[0003] There has been proposed a yarn winding device for manufacturing a package using a traverse drum on which traverse grooves providing two different numbers of wind, respectively are formed so as to prevent occurrence of the ribbon winding. In this yarn winding device, a yarn is normally wound on the basis of the traverse groove providing one of the numbers of wind, and the traverse groove is switched over to another traverse groove providing the other number of wind only when the number of wind of the yarn wound around the package relative to the number of wind of this basic traverse groove falls in a predetermined range in which the ribbon winding occurs, thereby preventing an occurrence of the ribbon winding. A conventional traverse drum on which traverse grooves providing different numbers of wind, respectively are formed will now be described.

[0004] Fig. 4 is an exploded view of a peripheral surface of the conventional traverse drum, typically showing the traverse grooves.

[0005] Referring to Fig. 4, a line indicated by a two-dot chain line is an axial direction of the traverse drum. A 3-wind outward route is a traverse groove starting at a start point A, passing through passing points B and C, and reaching a turn-around point D and is indicated by a solid line. A 2-wind outward route is a traverse groove starting at the start point A, branching at a branching point P that is a branching part, passing through a passing point F, and reaching the turn-round point D. An interval from the starting point A to the branching point P of the 2-wind outward route is the traverse groove common to the 3-wind outward route and indicated by the solid line, and an interval from the branching point P to the turn-around point D thereof is indicated by a one-dot chain line. A 2-wind homeward route is a traverse groove starting at the turn-around point D, passing through a passing point E, and returning to the start point A and indicated by a broken line. The turn-around point D is a merging part in which the 3-wind outward route merges with the 2-wind outward route. The number of wind corresponds to the number of rotations of the traverse drum when the yarn is traversed from the start point A to the turn-around point D on the outward route or when the yarn is traversed from the turn-around point D to the start point A on the homeward route. Rewinding of the yarn using the traverse grooves of the 3-wind outward route and the 2-wind homeward route is referred to as "winding of the yarn by 2.5 winds". Rewinding of the yarn using the traverse grooves of the 2-wind outward route and the 2-wind homeward route is referred to as "winding of the yarn by 2 winds". If the yarn is wound back from the yarn supplying bobbin using the traverse drum on which such traverse grooves are formed to manufacture a package and the yarn is, for example, a thin yarn, the yarn is normally wound by 2.5 winds. Only when the number of wind of the yarn wound around the package falls in a predetermined range in which the ribbon winding occurs, the yarn is wound by 2 winds.

[Patent Document 1] Patent No. 3696778

DISCLOSURE OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0006] The above-stated yarn winding device has a problem that stripe stages are generated on both end surfaces of the manufactured package by switchover of the traverse groove to another traverse groove with the different number of wind. A stripe stage is generated whenever one traverse groove is switched over to another traverse groove with the different number of wind. Due to this, if the package has a larger amount of yarn winding, more stripe stages are generated.

[0007] Fig. 5 is a perspective view of a package manufactured using the traverse drum shown in Fig. 4. Fig. 5 (1) is a perspective view viewed from a small-diameter side of the package and Fig. 5 (2) is a perspective view

viewed from a large-diameter side of the package.

[0008] Referring to Fig. 5, a package 60 is formed into a truncated cone shape having a yarn wound around a truncated cone winding bobbin 61 and including a small-diameter side end surface 62 and a large-diameter side end surface 63. Stripe stags 64 each circular in a side view and slightly protruding outward are generated on the small-diameter side end surface 62. Likewise, stripe stages 65 are generated on the large-diameter side end surface 63. It is to be noted that these stripe stages 64 and 65 do not cause an unwinding defect or the like at the time of unwinding the yarn from the package 60 as a later step and do not degrade the package 60. However, an appearance of the package 60 is slightly marred, which possibly casts doubt on the quality of the package 60.

[0009] The present invention has been achieved to solve the above-stated problems. It is an object of the present invention to provide a traverse drum capable of making it difficult to generate stages on both end surfaces of a package and ensuring smart appearance of the package even if one traverse groove is switched over to another traverse groove providing a different number of wind so as to prevent ribbon winding, and a yarn winding device using the same.

MEANS ADAPTED TO SOLVE THE PROBLEMS

[0010] To attain the above-stated object, according to a first aspect of the present invention, there is provided a traverse drum for allowing a yarn to be wound on a package while traversing the yarn, including: a peripheral surface in contact with the package; and traverse grooves formed on a peripheral surface so as to provide different numbers of wind when the yarn is traversed from a first end of the traverse to a second end of the traverse, wherein the traverse grooves include a branching part in which the different numbers of wind are switched and a merging part in which the yarn branches from the branching part and branching parts of the yarn merge together while the yarn is traversed from the first end to the second end, the branching part is set at a position forward of the first end, and the merging part is set at a position backward of the second end.

[0011] By so constituting, portions of the yarn wound in the branching part and the merging part are arranged inward of both ends of the package in a traverse direction, respectively. Further, even if the number of wind is switched over to another number of wind on the traverse drum, a traverse angle between the both ends of the package is constant.

[0012] According to a second aspect of the present invention based on a constitution of the first aspect of the present invention, the branching part is set at a position forward of the first end substantially by a half round or more in the traverse grooves, and the merging part is set at a position backward of the second end substantially by the half round or more in the traverse grooves.

[0013] By so constituting, the portions of the yarn wound in the branching part and the merging part are arranged inward of the both ends of the package in the traverse direction each by a length equal to or larger than a predetermined length, respectively.

[0014] According to a third aspect of the present invention based on the constitution of the first aspect of the present invention, the different numbers of wind are set to three and two, respectively, the number of wind when the yarn is traversed from the second end to the first end is set to two, the branching part is set at a position forward of the first end substantially by a half round in the traverse grooves, and the merging part is set at a position backward of the second end substantially by a three-fourths round in the traverse grooves.

[0015] By so constituting, on the traverse drum capable of switching over between the winding of the yarn by 2.5 winds and the winding of the yarn by 2 winds, the traverse groove on the 2-wind side connecting the branching part to the merging part is inclined with respect to a traverse direction at an angle equal to or greater than a predetermined angle.

[0016] According to a fourth aspect of the present invention, there is provided a yarn winding device using the traverse drum according to any one of aspects 1 to 3, including: the package; the traverse drum rotating while contacting with the package and allowing the package to rotate; and switching means, arranged on an upstream side of the traverse drum in a traveling direction of the yarn, for switching the traverse grooves guiding the yarn in the branching part when the number of wind on the package falls in a predetermined range.

[0017] By so constituting, the branching part and the merging part are arranged at predetermined positions, respectively, and the numbers of wind are switched in the branching part arranged at a predetermined position.

EFFECT OF THE INVENTION

[0018] As stated so far, according to the first aspect of the present invention, portions of the yarn in which portions the yarn is wound at the branching part and the merging part are arranged inward of the both ends of the package in the traverse direction, respectively. Furthermore, even if the numbers of wind on a traverse drum are switched, the traverse angle of the yarn between the both ends of the package is constant. Due to this, even if the numbers of wind are switched to prevent the ribbon winding when the number of wind on the package falls in the predetermined range, it is difficult to generate stages on the both end surfaces of the package and it is possible to manufacture the package presenting a smart appearance.

[0019] According to the second aspect of the present invention, besides the advantage of the first aspect of the present invention, the portions of the yarn in which portions the yarn is wound at the branching part and the merging part are arranged inward of the both ends of the

package each by the length equal to or larger than the predetermined length in the traverse direction, respectively. It is, therefore, possible to further make it difficult to generate the stages on the both end surfaces of the package.

[0020] According to the third aspect of the present invention, besides the advantage of the first aspect of the present invention, on the traverse drum capable of switching over between the winding of the yarn by 2.5 winds and the winding of the yarn by 2 winds, the traverse groove that is on the 2-wind side connecting the branching part to the merging part is inclined with respect to the traverse direction at an angle equal to or greater than a predetermined angle. It is, therefore, possible to prevent an occurrence of such a traverse failure as sticking of the yarn onto the traverse grooves.

[0021] According to the fourth aspect of the present invention, besides the advantage of any one of the first to third aspects of the present inventions, the branching part and the merging part are arranged at the predetermined positions, respectively and the number of wind is switched over to another number of wind at the branching point arranged at a predetermined position.

Due to this, the number of wind on the traverse drum can be switched over to another number of wind at the position that can make it difficult to generate stages on the both end surfaces of the package.

BEST MODES FOR CARRYING OUT THE INVENTION

[0022] Embodiments of the present invention will next be described referring to the drawings.

[0023] Fig. 1 is a schematic diagram showing a schematic configuration of a yarn winding device according to a first embodiment of the present invention.

[0024] Referring to Fig. 1, a yarn winding device 10 is a device for manufacturing a package 24 by rewinding a yarn 11 from a yarn supplying bobbin 12 produced by a ring spinning machine or the like. The yarn winding device 10 includes an unwinding assisting device 13, a tension device 14, a device 15, a yarn clearer 16, a pin cylinder 19 serving as switching means, and a traverse drum 20 in order from an upstream side along a traveling direction of the yarn from the yarn supplying bobbin 12 to the package 24.

[0025] The unwinding assisting device 13 is a device controlling an unreeled balloon generated when the yarn 11 is unreeled from the yarn supplying bobbin 12. By appropriately controlling the balloon, contact between portions of the yarn 11 when the yarn 11 is separated from winding layers of the yarn supplying bobbin 12 can be minimized. This can reduce sloughing, generation of fluff and the like.

[0026] The tension device 14 is a device applying a variable tension to the yarn 11 from the yarn supplying bobbin 12 and controlling a winding tension. By appropriately controlling the winding tension, the winding tension is kept constant since start of winding until end of winding, thus enabling quick winding. Moreover, even during a transit period due to yarn break, the winding tension can be promptly returned to an original tension.

[0027] The splicing device 15 is a device splicing a lower yarn on a yarn supplying bobbin 12 side to an upper yarn on a package 24 side. If the yarn 11 is separated into the lower yarn and the upper yarn during cutting of the yarn 11 by the yarn clearer 16 or the like, then the lower yarn is guided to the splicing device 15 by a suction mouth 17, and the upper yarn is guided to the splicing device 15 by a suction pipe 18. The splicing device 15 joins the guided lower and upper yarns together and winding of the yarn 11 around the package 24 restarts. The yarn clearer 16 is a device detecting a yarn defect of the traveling yarn 11 such as a slub and cutting the yarn 11.

[0028] The traverse drum 20 is a device allowing the yarn 11 to be wound on the package 24 while traversing the yarn 11 in an axial direction of the traverse drum 20 as indicated by a two-dot chain line shown in Fig. 1. The traverse drum 20 is formed into a cylindrical shape having a circular cross section at a diameter L, and includes a peripheral surface 22 in contact with the package 24 and traverse grooves 21 formed on the peripheral surface 22. The traverse drum 20 is driven to rotate around an axis thereof and the package 20 in contact with the traverse drum 20 rotates to follow up rotation of the traverse drum 20. The traverse grooves 21 are formed along a peripheral direction of the traverse drum 20 and formed to be displaced in the axial direction of the traverse drum 20. The traverse drum 20 rotates with the yarn 11 guided by the traverse grooves 21, thereby traversing the yarn 11 in the axial direction of the traverse drum 20. The traverse grooves 21 will be described later in detail.

[0029] The pin cylinder 19 is switching means, disposed on an upstream side of the traverse drum 20 in a traveling direction of the yarn 11, for switching one traverse groove 21 guiding the yarn 11 over to another traverse groove 21 in a branching portion and for controlling the number of wind on the traverse drum 20. The pin cylinder 19 is controlled to be turned on or off. When the pin cylinder 19 is turned on, the pin cylinder 19 protrudes to a position shown in Fig. 1, bends the yarn 11, and switches the traverse grooves guiding the yarn 11. When the pin cylinder 19 is controlled to be turned off, the pin cylinder 19 is withdrawn and the yarn 11 is guided to the traverse groove 21 before switchover. By controlling the pin cylinder 19 to be turned on or off, the number of wind on the traverse drum 20 is switched over to another number of wind. It is to be noted that a sensor, not shown, detects the number of rotations of the traverse drum 20 and that of the package 24. The number of wind of the yarn on the package 24 is calculated from the respective numbers of rotations.

[0030] The package 24 includes a hollow truncated winding bobbin 23 around which the yarn 11 is wound and is formed into a truncated shape.

The winding bobbin 23 is supported by a cradle arm, not

shown, while urging a peripheral surface of the package 24 to always contact with the peripheral surface 22 of the traverse drum 20. A traverse drum 20-side edge of the winding bobbin 23 is set to be parallel to the axial direction of the traverse drum 20 in a side view, whereby a traverse drum 20-side edge of the package 24 contacts with the peripheral surface 22 of the traverse drum 20 in the side view.

[0031] The traverse grooves 21 formed on the peripheral surface 22 of the traverse drum 20 will next be described in detail.

[0032] Fig. 2 is an exploded view of the peripheral surface of the traverse drum shown in Fig. 1, typically showing the traverse grooves.

[0033] Referring to Fig. 2, a line indicated by a two-dot chain line is the axial direction of the traverse drum 20. A length of the peripheral surface 22 orthogonal to the axial direction is $\pi \times L$. A width by which the yarn 11 is traversed by the traverse drum 20 has two ends, that is, a start point A that is a first end and a turn-around point D that is a second end. A 3-wind outward route is the traverse groove 21 starting at a start point A, passing through passing points B and C, and reaching a turn-around point D and indicated by a solid line. A 2-wind outward route is a traverse groove starting at the start point A, branching at a branching point P that is a branching part, passing through a passing point F, merging at a merging point Q that is a merging part, and reaching the turn-around point D. An interval from the start point A to the branching point P and that from the merging point Q to the turn-around point D of the 2-wind outward route correspond to the traverse groove 21 common to the 3-wind outward route, and are indicated each by the solid line. An interval from the branching point P to the merging point Q thereof is indicated by a one-dot chain line.

A 2-wind homeward route is the traverse groove 21 starting at the turn-around point D, passing through the passing point E, and reaching the start point A and indicated by a broken line.

[0034] The number of wind corresponds to the number of rotations of the traverse drum when the yarn is traversed from the start point A to the turn-around point D on the outward route or when the yarn is traversed from the turn-around point D to the start point A on the homeward route.

On the 3-wind outward route, for example, the traverse drum 20 rotates three times to traverse the yarn 11 from right to left on a sheet of the paper. The traverse grooves 21 are formed to provide different number of wind when the yarn 11 is traversed from the start point A to the turn-around point D. Further, the traverse grooves 21 include the branching point P at which the number of wind is switched over to another number of wind and the merging point Q at which the yarn 11 branches into two parts and the two parts merges together between the start point A and the turn-around point D. The traverse grooves 21 formed to provide different numbers of wind are the 3-wind outward route and the 2-wind outward route. One number of wind is switched over to another number of wind by switching the traverse grooves 21 guiding the yarn 11 at the branching point P. A direction indicated by an arrow in Fig. 2 is a traveling direction and the branching point P is set at a position forward of the start point A substantially by a half round. In other words, the branching point P is set at the position forward of the start point A substantially by the half round or more and the merging point Q is set at a position backward of the turn-around point D substantially by the three-fourth round. That is, the merging point Q is set at a position backward of the turn-around point D substantially by the half round or more.

[0035] Rewinding of the yarn 11 using the traverse grooves 21 constituted by the 3-wind outward route and the 2-wind homeward route, respectively is referred to as "winding of the yarn 11 by 2.5 winds". Rewinding of the yarn 11 using the traverse grooves 21 constituted by the 2-wind outward route and the 2-wind homeward route, respectively is referred to as "winding of the yarn 11 by 2 winds". To wind the yarn 11 by 2.5 winds and to wind the yarn 11 by 2 winds, the traverse groove 21 from the branching point P to the merging point Q indicated by the one-dot chain line in Fig. 1 and the traverse groove 21 from the branching point P to the merging point Q indicated by the solid line in Fig. 1, which are independent of each other, are used, respectively and a common traverse groove is used in remaining portions.

[0036] If the yarn 11 passing through the start point A and the yarn 11 passing through the turn-around point D substantially form both ends of the package 24, respectively, a traverse angle formed by the yarn 11 passing through the start point A and that passing through the turn-around point D is a constant predetermined angle on the traverse drum 20 on which the traverse grooves 21 are formed as stated above. This is constant even if the number of wind of the yarn 11 on the traverse drum 20 is switched from, for example, 2.5 to 2.

[0037] If the package 24 is to be manufactured by rewinding the yarn 11 from the yarn supplying bobbin 12 using the traverse drum 20 on which such traverse grooves 21 are formed and the yarn is, for example, a thin yarn, the yarn 11 is normally wound by 2.5 winds. The yarn 11 is wound by 2 winds only when the number of wind of the yarn 11 on the package 24 falls in a predetermined range in which ribbon winding occurs.

[0038] Switchover of the number of wind of the yarn 11 on the traverse drum 20 will next be described.

[0039] Fig. 3 is a chart showing the relationship between the number of wind of the yarn on the package and a large-diameter side diameter of the package if the package is manufactured by the yarn winding device shown in Fig. 1.

[0040] Referring to Fig. 3, a vertical axis indicates the number of wind on the package 24 and a horizontal axis indicates the diameter of the large-diameter side package 24. The yarn 11 is normally and basically wound by

2.5 winds and the number of wind is switched to two only when the number of wind of on the package 24 falls in the predetermined range in which the ribbon winding occurs. Each of a range in which the number of wind on the package 24 is near two and a range in which the number of wind on the package 24 is near 1.5 corresponds to the predetermined range in which the ribbon winding occurs. When the number of wind on the package 24 is near two, the large-diameter side package 24 has a size of about 125 mm to 130 mm. When the number of wind on the package 24 is near 2.5, the large-diameter side package 24 has a size of about 165 mm to 170 mm.

A control unit, not shown, calculates that the number of wind on the package 24 falls in the predetermined range from the number of rotations of the traverse drum 20 and that of the package 24. While the number of wind on the package 24 falls in the predetermined range, the control unit controls the pin cylinder 19 to be turned on, switches the traverse grooves 21 guiding the yarn 11 at the branching point P, and controls the yarn 11 to pass through the 2-wind outward route. If the number of wind on the package 24 is out of the predetermined range, the control unit, not shown, controls the pin cylinder 19 to be turned off and the traverse groove 21 guiding the yarn 11 to pass through the 3-wind outward route. In this way, the package 24 without the ribbon winding is manufactured using the traverse drum 20 on which the traverse grooves 21 with the two different numbers of wind, respectively are formed. It is to be noted that the numbers of wind on the traverse drum 20 may be switched by detecting the diameter of the package 24 and thereby calculating the predetermined range in which the ribbon winding occurs.

[0041] Judging from the foregoing, in the yarn winding device 10 using the traverse drum 20 configured as stated above, portions of the yarn 11 in which portions the yarn 11 is wound at the branching point P and the merging point Q are arranged inward of the both ends of the package by a length equal to or larger than a predetermined length in a traverse direction, respectively. Furthermore, even if the numbers of wind on the traverse drum 20 are switched, the traverse angle of the yarn 11 between the both ends of the package is constant. Due to this, even if the numbers of wind are switched to prevent the ribbon winding when the number of wind on the package 24 falls in the predetermined range, it is difficult to generate stages on the both end surfaces of the package 24 and it is possible to manufacture the package presenting a smart appearance.

[0042] Moreover, on the traverse drum 20 capable of switching over between the winding of the yarn 11 by 2.5 winds and the winding of the yarn 11 by 2 winds, the traverse groove 21 that is the 2-wind outward route connecting the branching point P to the merging point Q and indicated by the one-dot chain line in Fig. 2 is inclined with respect to the traverse direction at an angle equal to or greater than a predetermined angle. It is, therefore, possible to prevent an occurrence of such a traverse failure as sticking of the yarn 11 onto the traverse grooves 21.

[0043] Further, the branching point P and the merging point Q are arranged at the predetermined positions, respectively and the number of wind is switched over to another number of wind at the branching point P arranged at the predetermined position. Due to this, the number of wind on the traverse drum 20 can be switched over to another number of wind at the position that can make it difficult to generate stages on the both end surfaces of the package 24.

[0044] In the above-stated embodiment, the yarn winding device 10 is configured so that the yarn 11 can be wound around one traverse drum by 2.5 winds and 2 winds. However, the numbers of wind of the yarn 11 may be, for example, 1.5 and two as long as the traverse grooves providing different numbers of wind are formed on the traverse drum so as to prevent an occurrence of the ribbon winding.

[0045] Moreover, in the above-stated embodiment, the traverse grooves providing different numbers of wind are formed on an outward side. Alternatively, the traverse grooves providing different numbers of wind may be formed on a homeward side or the outward route may be replaced by the homeward route.

[0046] Additionally, in the above-stated embodiment, the branching point P is set at the position forward of the start point A substantially by the half round and the merging point Q is set at the position backward of the turn-around point D substantially by the three-fourths round. However, the branching point P and the merging point Q may be set at other positions as long as the branching point P is at the position forward of the start point A and the merging point Q is at the position backward of the turn-around point D.

BRIEF DESCRIPTION OF THE DRAWINGS

[0047]

[Fig. 1] Fig. 1 is a schematic diagram showing a schematic configuration of a yarn winding device according to a first embodiment of the present invention.

[Fig. 2] Fig. 2 is an exploded view of a peripheral surface of a traverse drum shown in Fig. 1, typically showing traverse grooves.

[Fig. 3] Fig. 3 is a chart showing the relationship between the number of wind on a package and a diameter of a large-diameter side of the package when the package is manufactured by the yarn winding device shown in Fig. 1.

[Fig. 4] Fig. 4 is an exploded view of a peripheral surface of a conventional traverse drum, typically showing traverse grooves.

[Fig. 5] Fig. 5 is a perspective view of a package manufactured using the traverse drum shown in Fig. 4, wherein Fig. 5 (1) is a perspective view viewed from a small-diameter side of the package and Fig. 5 (2) is a perspective view viewed from the large-

diameter side thereof.

DESCRIPTION OF REFERENCE NUMERALS

[0048]

10	YARN WINDING DEVICE
11	YARN
19	PIN CYLINDER
20	TRAVERSE DRUM
21	TRAVERSE GROOVE
22	PERIPHERAL SURFACE
24	PACKAGE
P	BRANCHING POINT
Q	MERGING POINT

Claims

1. A traverse drum for allowing a yarn to be wound on a package while traversing the yarn, comprising:

a peripheral surface in contact with the package; and
traverse grooves formed on the peripheral surface so as to provide different numbers of wind when the yarn is traversed from a first end of the traverse to a second end of the traverse,

wherein the traverse grooves include a branching part in which the different numbers of wind are switched and a merging part in which the yarn branches from the branching part and branching parts of the yarn merge together while the yarn is traversed from the first end to the second end,
the branching part is set at a position forward of the first end, and the merging part is set at a position backward of the second end.

2. The traverse drum according to claim 1,
wherein the branching part is set at the position forward of the first end substantially by a half round or more in the traverse grooves, and
the merging part is set at the position backward of the second end substantially by the half round or more in the traverse grooves.

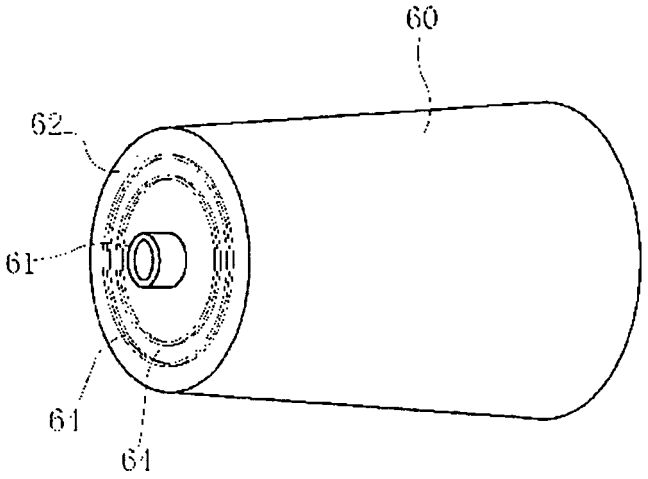
3. The traverse drum according to claim 1,
wherein the different numbers of wind are set to 3 and 2, respectively,
the number of wind when the yarn is traversed from the second end to the first end is set to 2,
the branching part is set at the position forward of the first end substantially by a half round in the traverse grooves, and
the merging part is set at a position backward of the second end substantially by a three-fourths round in the traverse grooves.

4. A yarn winding device using the traverse drum according to any one of claims 1 to 3, comprising:

the package;
the traverse drum rotating while contacting with the package and allowing the package to rotate; and
switching means, arranged on an upstream side of the traverse drum in a traveling direction of the yarn, for switching the traverse grooves guiding the yarn in the branching part when the number of wind on the package falls in a predetermined range.

Fig.1

(1)



(2)

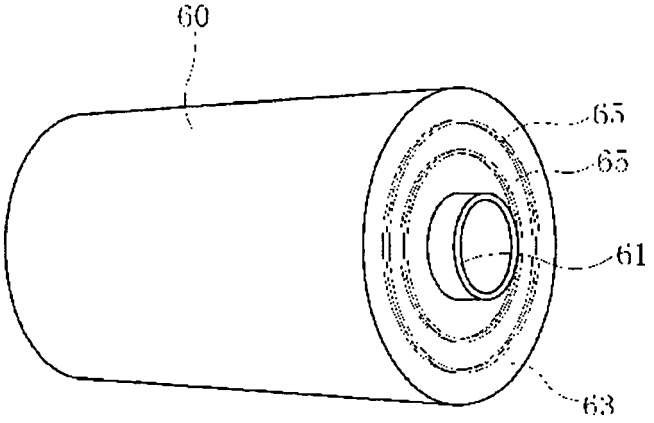


Fig. 2

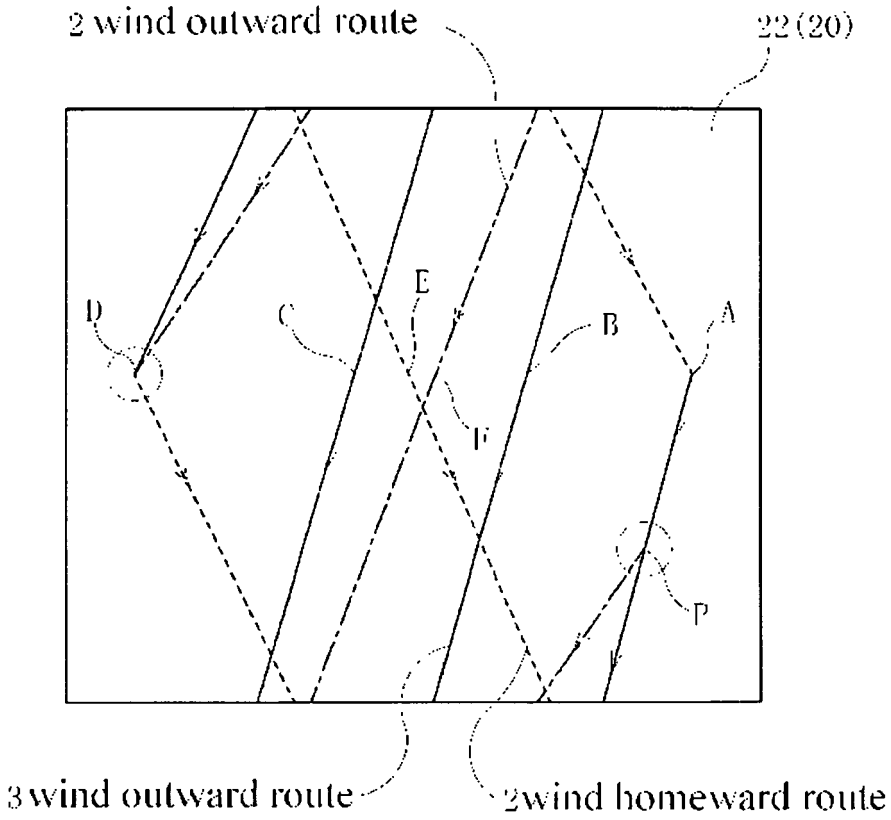

2 wind outward route
22 (20)
D
C
E
B
A
F
P
3 wind outward route
2 wind homeward route

Fig. 3

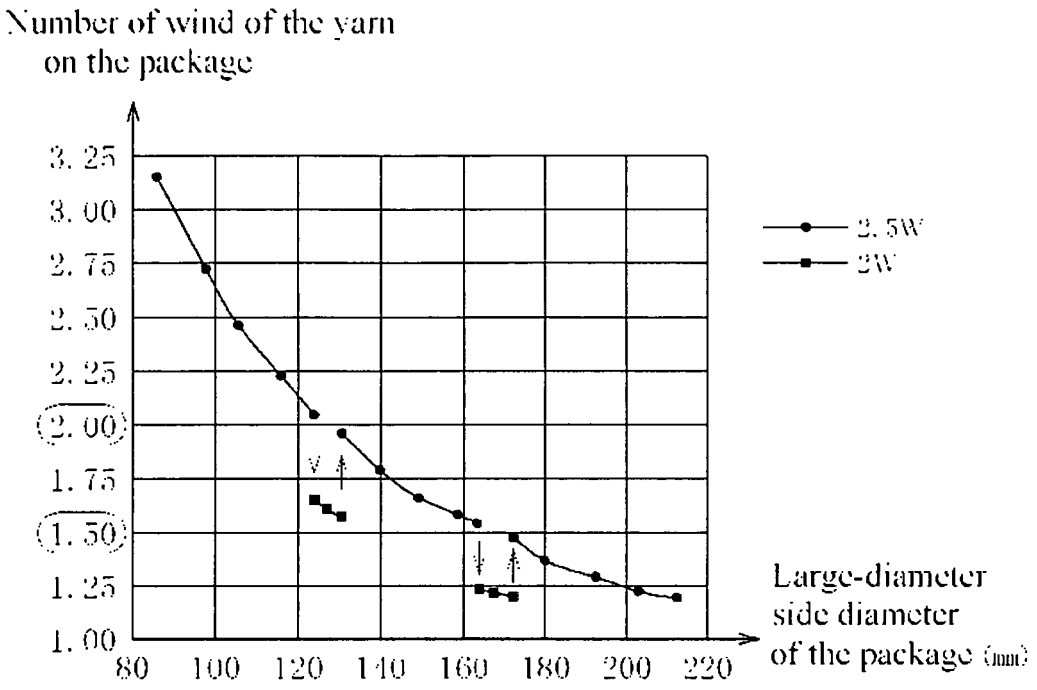

Number of wind of the yarn on the package
3. 25
3. 00
2. 75
2. 50
2. 25
2. 00
1. 75
1. 50
1. 25
1. 00
80
100
120
140
160
180
200
220
2. 5W
2W
Large-diameter side diameter of the package (mm)

Fig. 4

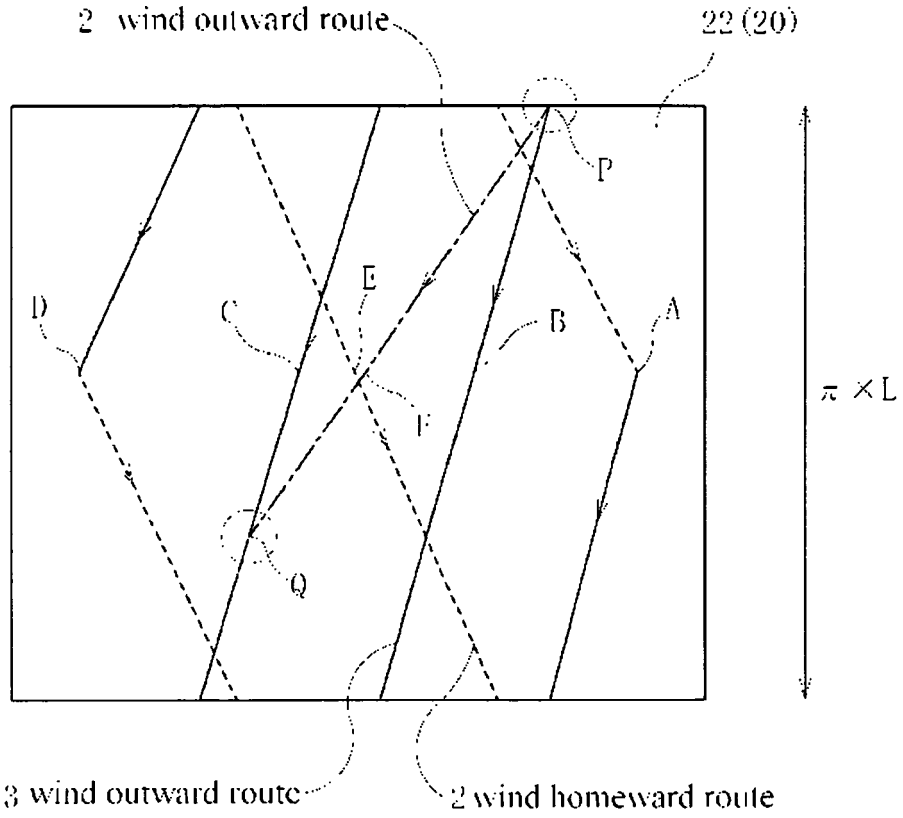

2 wind outward route
22 (20)
P
D
C
E
B
A
F
Q
π × L
3 wind outward route
2 wind homeward route

Fig. 5