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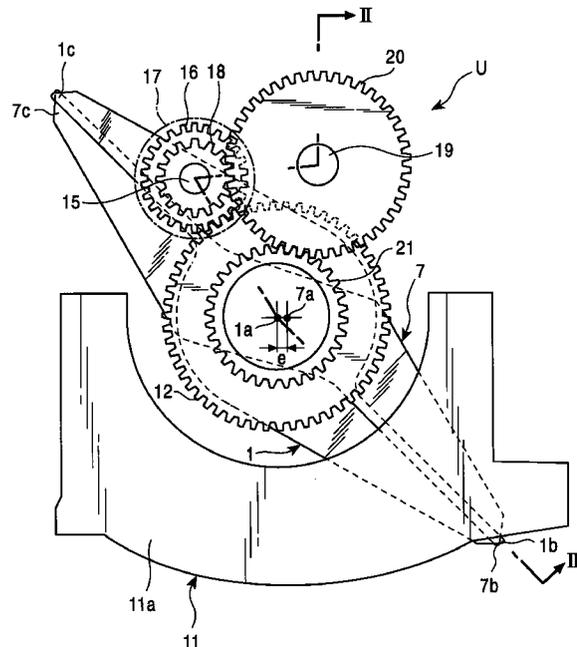
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(54) **Yarn traverse device and take-up winder having the same**

(57) The present invention relates to a yarn traverse device wherein the rotation planes of an upper rotating wing 1 and a lower rotating wing 7 of each yarn traverse unit U are all arranged in parallel with the rotation axis t1 of a touch roller T, and wherein the rotation planes of the upper rotating wing 1 and the lower rotating wing 7 of all yarn traverse units are arranged in four planes. Each yarn traverse unit U can be independently operated without consideration for the driving timings between adjacent yarn traverse units U.

FIG. 1



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Description

Field of the Invention

[0001] The present invention relates to a yarn traverse device having a plurality of yarn traverse units provided in a line which transfer a yarn between an upper rotating wing and a lower rotating wing rotating in opposite directions to traverse a yarn, and to a take-up winder comprising the yarn traverse device, a touch roller, and bobbin holders on which a plurality of bobbins are installed, each of the bobbins contacting said touch roller to rotate, the bobbin holders being supported in a cantilever manner.

Background of the Invention

[0002] In the conventional prior art (for example, Japanese Publications of examined patent application (Tokukohei) No. 3-72544 and (Tokukohei) No. 4-27151), a take-up winder comprises a yarn traverse device having a plurality of yarn traverse units provided in a line each of which has upper and lower rotating wings rotating in opposite directions, and the yarn traverse units are arranged so that upper rotating wings and lower rotating wings of adjacent traverse units are respectively arranged on the same rotation plane and so that the circular paths drawn by the tips of adjacent rotating wings on the same rotation plane partly overlap each other, thereby reducing the interval between the yarn traverse units and the length of the take-up winder with the yarn device.

[0003] In the yarn traverse device in the conventional take-up winder, the upper rotating wings and lower rotating wings of adjacent traverse units are respectively arranged on the same rotation plane and the circular paths drawn by the tips of adjacent rotating wings on the same rotation plane partly overlap each other, as described above. Thus, if one of the yarn traverse units becomes defective, stopping the rotation of the rotating wings, or if the rotation speed of the rotating wings of any yarn traverse units becomes different from that of the rotating wings of the other yarn traverse units, adjacent rotating wings arranged on the same rotation plane may mutually interfere or collide with each other, and thereby be damaged.

[0004] In addition, in the take-up winder wherein bobbin holders are supported in a cantilever manner, the tip of each of the holders tends to deflect downward, hindering packages and touch rollers from contacting each other.

[0005] It is a first object of the present invention to solve the problem of the conventional yarn traverse device by providing a compact yarn traverse device that ensures that yarn is transferred between the rotating wings and that includes a simplified driving mechanism for the rotating wings.

[0006] A second object of the present invention is to

provide a take-up winder that solves the problem of the conventional take-up winder.

Summary of the Invention

[0007] To achieve the first object, the present invention firstly provides a yarn traverse device comprising a plurality of yarn traverse units for traversing a yarn by transferring it between an upper rotating wing and a lower rotating wing that rotate in opposite directions, the plurality of yarn traverse units being driven by a common driving belt, and the yarn traverse device is characterized in that the rotation planes of the upper rotating wing and the lower rotating wing of each yarn traverse unit are all arranged in parallel with the rotation axis of a touch roller, and in that the rotation planes of the upper rotating wing and the lower rotating wing of adjacent yarn traverse units are arranged in four planes. Secondly, between the adjacent yarn traverse units, the rotation plane of the upper rotating wing or the lower rotating wing of one of the yarn traverse units is located between the rotation planes of the upper rotating wing and the lower rotating wing of the other yarn traverse unit. Thirdly, the pulley in each yarn traverse unit is wider than its corresponding driving belt by a value larger than or equal to the difference in height between the rotation plane of the upper rotating wing of the adjacent yarn traverse units. Fourthly, a single driving belt drives all yarn traverse units.

[0008] To attain the second object, the present invention firstly provides a take-up winder comprising a touch roller; a yarn traverse device comprising a plurality of yarn traverse units for traversing a yarn by transferring it between an upper rotating wing and a lower rotating wing that rotate in opposite directions; and a bobbin holder on which a plurality of bobbins are installed, each of the bobbins contacting the touch roller to rotate, the bobbin holder being supported in a cantilever manner, and the take-up winder is characterized in that the rotation planes of the upper rotating wing and the lower rotating wing of each yarn traverse unit are all arranged in parallel with the rotation axis of the touch roller, in that the rotation planes of the upper rotating wing and the lower rotating wing of adjacent yarn traverse units are arranged in four planes, and in that the yarn traverse unit located at the tip of the bobbin holder is placed further from the touch roller than the yarn traverse unit located at the root of the bobbin holder. Secondly, between the adjacent yarn traverse units, the rotation plane of the upper rotating wing or the lower rotating wing of one of the yarn traverse units is arranged between the rotation planes of the upper rotating wing and the lower rotating wing of the other yarn traverse unit. Thirdly, the interval between the upper rotating wing and the lower rotating wing in each traverse unit is approximately equal to the thickness of the rotating wing.

Brief Description of the Drawing

[0009]

Figure 1 is a top view of a yarn traverse unit constituting a yarn traverse device for a take-up winder according to the present invention.

Figure 2 is a partly cutout vertical sectional view along the line II-II of Figure 1 of the yarn traverse unit constituting the yarn traverse device for a take-up winder according to the present invention.

Figure 3 is a schematic front view of the yarn traverse device for a take-up winder according to the present invention.

Figure 4 is a schematic top view of the yarn traverse device for a take-up winder according to the present invention.

Figure 5 is a schematic front view of the yarn traverse unit constituting the yarn traverse device for a take-up winder according to the present invention.

Figure 6 is a front view of the integral part of another embodiment of the yarn traverse device for a take-up winder.

Detailed Description of the Preferred Embodiments

[0010] An embodiment of the present invention will be described below. Note, however, that the present invention is not limited to this embodiment, as other embodiments may be envisaged that adhere to the same principles and general characteristics of the present invention.

[0011] First, a yarn traverse unit U comprising a yarn traverse device provided in a yarn winder will be described with reference to Figures 1 and 2.

[0012] 1 is a propeller-shaped upper rotating wing extending symmetrically with respect to the rotational center point 1a, and an appropriate fixing means such as a screw 6 is used to mount the upper rotating wing 1 on a rotating cylinder 5 disposed via a bearing 4 on the outer circumference of a cylindrical frame 3 attached to a plate-like frame 2. 7 is a propeller-shaped lower rotating wing having the same length as the upper rotating wing 1, extending symmetrically with respect to the rotational center point 7a spaced from, the rotational center point 1a of the upper rotating wing 1 by a predetermined eccentricity e. The lower rotating wing 7 is mounted by an appropriate fixing means such as a screw 10 on the lower end of a rotating shaft 9 disposed in the cylindrical frame 3 via a bearing 8.

[0013] 11 is a guide member for forming the traversing locus of the yarn y provided above the upper rotating

wing 1. The guide member 11 is configured in such a way that the tips of the upper rotating wing 1 and the lower rotating wing 7 protrude from the circular yarn guiding section 11a of the guide member 11. In addition, an eccentricity e on a line joining the rotational center 1a of the upper rotating wing 1 and the rotational center 7a of the lower rotating wing 7 is located nearly along the yarn guiding surface 11a of the guide member 11. The guide member 11 may be located below the lower rotating wing 7 or between the upper rotating wing 1 and the lower rotating wing 7.

[0014] A spur gear 12 is mounted on the outer circumference of the rotating cylinder 5 disposed via the bearing 4 on the outer circumference of the cylindrical frame 3, and meshes with a spur gear 16 mounted at the lower end of a rotating shaft 15 disposed via a bearing 14 inside a cylindrical frame 13 attached to the plate-like frame 2. 17 is a pulley mounted on the upper end of the rotating shaft 15. A spur gear 18 is mounted on the rotating shaft 15 located between the pulley 17 and the spur gear 16, and meshes with a spur gear 20 mounted on a rotating shaft 19 disposed via a bearing inside a cylindrical frame (not shown in the drawings) attached to the plate-like frame 2 as the cylindrical frame 13. Furthermore, the spur gear 20 meshes with a spur gear 21 mounted on the upper end of the rotating shaft 9 on which the lower rotating wing 7 is mounted.

[0015] Next, the traversing operation of the yarn y and driving of the yarn traverse unit U configured as described above will be described.

[0016] When a driving belt, to be described below, rotates the pulley 17, the spur gear 12 rotates due to the gear 16 that engages the gear 12 and mounted at the lower end of the rotating shaft 15 with the pulley 17 mounted thereon. As the gear 12 rotates, the rotating cylinder 5 with the gear 12 mounted thereon rotates to rotate the upper rotating wing 1 mounted on the cylinder 5.

[0017] In addition, as described above, as the driving belt described below rotates the pulley 17, the spur gear 20 rotates due to the spur gear 18 that engages the gear 20 and is mounted on the middle of the rotating shaft 15 with the pulley 17 mounted thereon. As the gear 20 rotates, the spur gear 21 that engages the gear 20 rotates to rotate the rotating shaft 9 with the gear 21 mounted thereon, thereby rotating the lower rotating wing 7 mounted on the shaft 9.

[0018] As described above, the rotation of the pulley 17 is transmitted to the upper rotating wing 1 via the two spur gears 16 and 12, and the rotation of the pulley 17 is transmitted to the lower rotating wing 7 via the three spur gears 18, 20 and 21. Thus, the upper rotating wing 1 and the lower rotating wing 7 rotate in opposite directions.

[0019] For convenience, Figure 1 shows a case in which the upper rotating wing 1 rotates counterclockwise while the lower rotating wing 7 rotates clockwise. Figure 1 also shows the moment the yarn y is trans-

ferred from one 1b of the tips of the upper rotating wing 1, which has moved the yarn y along the yarn guiding surface 11a of the guide member 11 from the left end to the right end of the guide member 11, to one 7b of the tips of the lower rotating wing 7, which is located at the right end of the guide member 11 and which rotates clockwise.

[0020] The yarn y transferred to the tip 7b of the lower rotating wing 7 is moved along the yarn guiding surface 11a of the guide member 11 from the right end to the left end of the guide member 11. Then, the yarn y, which has been moved by the tip 7b from the right end to the left end of the guide member 11, is transferred to the other tip 1c of the upper rotating wing 1, which rotates counterclockwise and which has moved to the left end of the guide member 11. The yarn y is then moved rightward along the yarn guiding surface 11a of the guide member 11.

[0021] Then, the yarn y, which has been moved by the tip 1c from the left end to the right end of the guide member 11, is transferred to the other tip 7c of the lower rotating wing 7, which rotates clockwise and which has moved to the right end of the guide member 11. The yarn y is then moved leftward along the yarn guiding surface 11a of the guide member 11. In this manner, the yarn y is transferred from the upper rotating wing 1 to the lower rotating wing 7 or vice versa at the respective ends of the guide member 11 so as to be traversed along the yarn guiding surface 11a of the guide member 11.

[0022] In Figure 2, T is a touch or friction roller (hereafter referred to as a "touch roller") disposed in the lower part of the yarn traverse unit U and the touch roller T may be disposed independently for each of the plurality of yarn traverse units U constituting the yarn traverse device, but a single common touch roller T may be disposed for the plurality of yarn traverse units U. P is a package formed by winding the yarn y around a bobbin installed on a bobbin holder, which will be described below. The yarn traverse unit U traverses the yarn y, which then contacts part of the circumferential surface of the touch roller T. The yarn y is guided by the circumferential surface of the touch roller T and wound around the package P contacting the touch roller T.

[0023] Next, a take-up winder comprising a yarn traverse device that includes a plurality of yarn traverse units U will be described with reference to Figures 3 and 4.

[0024] 22 is a turret plate on which a pair of bobbin holders 23 are disposed symmetrically around the rotational center of the turret plate 22 in the horizontal direction. The bobbin holders 23 are each configured to be driven by a motor 24 disposed on the turret plate 22. B is a bobbin that has a slit to grasp the starting end of the yarn y to be wound, and a plurality of bobbins B are installed on the bobbin holder 23 in such a manner that the ends of the adjacent bobbins B are close to or contact each other. While the motor 24 is rotating one of the bobbin holders 23 to wind the yarn y around the bobbins

B installed on the rotationally driven bobbin holder 23, the motor 24 for the other bobbin holder 23 is stopped. If the package P that is formed on a bobbin B installed on the rotationally driven bobbin holder 23 becomes full, an appropriate driving apparatus (not shown in the drawings) rotates the turret plate 22 to separate the holder 23 that supports the full package P from the touch roller T, while the motor 24 rotates the bobbin holder 23 with an empty bobbin B installed thereon to contact the empty bobbin B with the touch roller T for winding. The yarn y extending from the full package P to the empty bobbin B is cut when wound around the empty bobbin B.

[0025] 25 is an appropriate bearing member that supports and allows the touch roller T to rotate, and the bearings 25, 25 are disposed in an elevating frame F that ascends as the winding diameter of the package P increases. The yarn traverse units U are also disposed in the elevating frame F.

[0026] Next, the arrangement of the plurality of yarn traverse units U installed in the elevating frame F will be described. Since an even number of yarn traverse units U are normally disposed, this embodiment shows a case in which eight yarn traverse units U1 to U8 are disposed in the elevating frame F. For convenience, the eight yarn traverse units U are designated as U1 to U8 from the turret plate 22 side toward the tip of the bobbin holder 23.

[0027] The rotation planes of the upper rotating wing 1 and the lower rotating wing 7 of each of the yarn traverse units U1 to U8 are all arranged in parallel with the rotation axis t1 of the touch roller T and in such a manner that the rotation planes of the alternatively arranged yarn traverse units U1, U3, U5 and U7 or yarn traverse units U2, U4, U6 and U8 are mutually flush. In addition, the upper rotating wing 1 or the lower rotating wing 7 of each of the yarn traverse units U1 to U8 are partly inserted between the upper rotating wing 1 and the lower rotating wing 7 of the adjacent yarn traverse unit U in such a way as to partially overlap one another. For example, the upper rotating wing 1 of the yarn traverse unit U1 located closest to the turret plate 22 is partly inserted between the upper rotating wing 1 and the lower rotating wing 7 of the adjacent yarn traverse unit U2, and the lower rotating wing 7 of the yarn traverse unit U2 is partly inserted between the upper rotating wing 1 and the lower rotating wing 7 of the adjacent yarn traverse units U1 and U3. Likewise, the lower rotating wing 7 of the yarn traverse unit U8 located furthest from the turret plate 22 is partly inserted between the upper rotating wing 1 and the lower rotating wing 7 of the adjacent yarn traverse unit U7. The interval between the upper rotating wing 1 and the lower rotating wing 7 in one traverse unit is configured to be almost the same as the thickness of the upper rotating wing 1 or the lower rotating wing 7.

[0028] As shown in Figure 3, the yarn traverse units U1 to U8 are composed of a group of yarn traverse units

U1, U3, U5 and U7 located closer to the touch roller T and a group of the yarn traverse units U2, U4, U6 and U8 located further from the touch roller T than the first group. In addition, the yarn traverse unit U1 located closest to the turret plate 22 is closer to the touch roller T, while the yarn traverse unit U8 located furthest from the turret plate 22 is further from the touch roller T than the yarn traverse unit U1.

[0029] As shown in Figure 3, according to this embodiment, the rotation planes of the upper rotating wing 1 and the lower rotating wing 7 of each of the yarn traverse units U1 to U8 are all arranged in parallel with the rotation axis t1 of the touch roller T. Between the adjacent yarn traverse units U, the rotation plane of the upper rotating wing 1 or the lower rotating wing 7 of one of the yarn traverse units U is located between the rotation planes of the upper rotating wing 1 and the lower rotating wing 7 of the other yarn traverse unit U. The rotation planes of the upper rotating wing 1 and the lower rotating wing 7 of the yarn traverse units U1 to U8 are all arranged in the four planes.

[0030] The rotating shafts 15 of the group of yarn traverse units U1, U3, U5 and U7 located closer to the touch roller T all have the same length, and the rotating shafts 15 of the group of the yarn traverse units U2, U4, U6 and U8 located further from the touch roller T also have the same length. In addition, each rotating shaft 15 of the yarn traverse units U1, U3, U5 and U7 of the first group is longer than that of the yarn traverse units U2, U4, U6 and U8 of the second group. This difference in length is equal to the difference in height between the first and second groups (for example, there is also a difference in distance from the lower rotating wing 7 to the rotation axis t1 of the touch roller T between the group of yarn traverse units U1, U3, U5 and U7 located closer to the touch roller T and the group of the yarn traverse units U2, U4, U6 and U8 located further from the touch roller T). In this manner, the pulleys 17 mounted on the upper ends of the rotating shafts 15 of the yarn traverse units U1 to U8 are all located at the same height.

[0031] 26 is a motor disposed in the elevating frame F and having a pulley 27 mounted on its output shaft 26a. 28 is an endless belt as a driving belt extending from the pulley 27 mounted on the output shaft 26a of the motor 26 to the pulleys 17 mounted at the upper end of the rotating shafts 15 of the yarn traverse units U1 to U8. 29 is an idler disposed opposite to each of the pulleys 17 of the yarn traverse units U1 to U8 across the endless belt 28 so as to press the belt 28 against the pulley 17. 30 is a guiding pulley disposed so as to convert the travelling direction of the endless belt 28. Since the pulleys 17 mounted at the upper ends of the rotating shafts 15 of the yarn traverse units U1 to U8 are arranged at the same height as described above, the yarn traverse units U1 to U8 can be concurrently driven by simply extending the single belt 28 among them.

[0032] In addition, since each of the yarn traverse units U1 to U8 has the single pulley 17 driven by the

endless belt 28 to rotate the upper rotating wing 1 and the lower rotating wing 7 of the yarn traverse units U1 to U8, thereby simplifying the structure compared to a structure in which the upper rotating wing and the lower rotating wing are individually rotated by two pulleys rotationally driven by an endless belt, as disclosed in the Published Japanese Translation of PCT International Publication for patent application (Tokuyohei) No. 9-507824 (PCT/EP95/02674).

[0033] Furthermore, in the conventional structure in which the upper rotating wing and the lower rotating wing are individually rotated by two pulleys rotationally driven by an endless belt, the rotation speeds of the pulleys that respectively drive the upper rotating wing and the lower rotating wing may differ due to the occurrence of slip between the pulley and the driving belt that drives the pulley, thereby hindering the yarn y from being normally transferred between the upper rotating wing and the lower rotating wing. Since, however, the single pulley 17 is driven by the endless belt 28 to rotate the upper rotating wing 1 and the lower rotating wing 7, the present invention prevents errors in the yarn y transfer caused by a difference in rotation speed between the two pulleys rotating the upper rotating wing and the lower rotating wing, respectively.

[0034] In addition, in the yarn traverse device disclosed in Tokuyohei No. 9-507824 (PCT/EP95/02674) in which the rotating wings of each yarn traverse unit are inclined relative to the rotating shaft of the touch roller, the rotation plane of the driving belt is located high in the direction in which the rotating wings are tilted upward and the height of the driving box (the elevating frame) that houses the driving belt become large. Furthermore, the length of the rotating shafts of the yarn traverse units' pulleys gradually increases in the direction in which the rotating wing is tilted upward, and the rotating shaft of the pulley of the yarn traverse unit at the terminal is too long, resulting in a large load on the bearing for the rotating shaft. The present invention, however, precludes the height of the driving box from being large, and prevents the rotating shaft 15 of the pulley 17 from being too long.

[0035] Next, the effect of free length on the traversing step will be described with reference to Figures 2 and 5.

[0036] As described above, passing through a traversing support guide 31 disposed above the yarn traverse unit U, the yarn y engages the upper rotating wing 1 or the lower rotating wing 7 and is then traversed. Subsequently, the yarn y contacts approximately one-fourth of the touch roller T located below the upper rotating wing 1 and the lower rotating wing 7, and is then wound around the package P contacting the touch roller T. The length of the yarn y from the point at which it engages the upper rotating wing 1 or the lower rotating wing 7 to a contact point Ta on the touch roller T is called the "free length" Lf.

[0037] By way of example, the yarn y, is being transferred leftward while engaging with the lower rotating

wing 7 as shown by the solid line in Figure 5, is transferred leftward in such a way as to follow the movement of the lower rotating wing 7 in a delayed manner, the yarn y is inclined between the engaging point 7d on the lower rotating wing 7 and the contact point Ta on the touch roller T. Subsequently, the yarn y contacts the touch roller T perpendicularly to the rotation axis $t1$ of the touch roller T and is then wound onto the package P. Thus, at the left transfer point shown by the chain line in Figure 5, a transfer point 7e on the lower rotating wing 7 is located to the left of the left end p1 of the package P, where the lower rotating wing 7 transfers the yarn y to the upper rotating wing 1.

[0038] A case is assumed in which the upper rotating wing 1 and the lower rotating wing 7 are located above their positions shown by the continuous line described above, as shown by the dashed line in Figure 5, in other words, in this case the free length L_f has increased. Then, the transfer point 7e at which the lower rotating wing 7 located at the left side transfers the yarn y to the upper rotating wing 1 remains unchanged, so if the free length L_f has increased as shown by the chain double dashed line in Figure 5, then compared to the smaller free length L_f shown by the chain line, a contact points Ta' on the touch roller T, that is, the left end p1 of the package P moves a distance h toward the center of the package P along the rotation axis $t1$ of the touch roller T, thereby reducing the winding width W of the package P. This also occurs when the upper rotating wing 1 located at the right side transfers the yarn y to the lower rotating wing 7, so the winding width W of the package P formed by a traversing operation by the upper rotating wing 1 and the lower rotating wing 7 located at the position shown by the dashed line and having the larger free length L_f becomes distance $2h$ smaller than that of the package P formed by a traversing operation by the upper rotating wing 1 and the lower rotating wing 7 located at the position shown by the continuous line. Because the same amount of the yarn y is wound around the package P, however, the winding diameter D of the package P formed by the traversing operation by the upper rotating wing 1 and the lower rotating wing 7 located at the position shown by the dashed line tends to be larger than that of the package P formed by the traversing operation by the upper rotating wing 1 and the lower rotating wing 7 located at the position shown by the continuous line.

[0039] As described above, as the free length L_f increases, the winding width W of the package P tends to decrease, and its winding diameter D tends to increase. Thus, in the example shown in Figure 3, the free length L_f of each of the yarn traverse units U2, U4, U6 and U8 in the group arranged further from the touch roller T is longer than the free length L_f of each of the yarn traverse units U1, U3, U5 and U7 in the group arranged closer to the touch roller T. Consequently, the winding width W of the package P formed by the group of yarn traverse units U2, U4, U6 and U8 arranged fur-

ther from the touch roller T tends to be smaller than that of the package P formed by the group of yarn traverse units U1, U3, U5 and U7 arranged closer to the touch roller T, and the winding diameter D of the package P formed by the group of yarn traverse units U2, U4, U6 and U8 arranged further from the touch roller T tends to be larger than that of the package P formed by the group of yarn traverse units U1, U3, U5 and U7 arranged close to the touch roller T.

[0040] If the bobbin holder 23 is disposed on the turret plate 22 in a cantilever manner as shown in Figure 3, the tip of the bobbin holder 23 tends to deflect downward and leave the touch roller T. Thus, according to the embodiment, the yarn traverse unit U8 located furthest from the turret plate 22, that is, the yarn traverse unit U8 located at the tip of the bobbin holder 23, belongs to the group located further from the touch roller T and having a larger free length L_f than the group located closer to the touch roller T, thereby increasing the winding diameter D of the package P formed by the yarn traverse unit U8. This configuration ensures that this package P formed by the yarn traverse unit U8 will contact the touch roller T.

[0041] By contrast, if the yarn traverse unit U1 located closest to the turret plate 22, that is, the yarn traverse unit U1 located at the root of the bobbin holder 23, belongs to the group located further from the touch roller T and having a longer free length L_f than the group located closer to the touch roller T, then the winding diameter D of the package P formed by the yarn traverse unit U1 increases. This arrangement causes a force to press down the root of the bobbin holder 23, thereby further separating the tip of the bobbin holder 23 from the touch roller T. To solve this problem, the yarn traverse unit U1 located closest to the turret plate 22, that is, arranged at the root of the bobbin holder 23, belongs to the group located closer to the touch roller T and having a smaller free length L_f . This arrangement reduces the winding diameter D of the package P formed by the yarn traverse unit U1 located closest to the turret plate 22 and thus restrains the generation of a force that would press the bobbin holder 23 downward.

[0042] Next, another embodiment of the yarn traverse unit U disposed in the elevating frame F will be described with reference to Figure 6.

[0043] As described above, if the length of each of the rotating shafts 15 of the yarn traverse units U1, U3, U5 and U7 in the group located closer to the touch roller T differs from the length of each of the rotating shafts 15 of the yarn traverse units U2, U4, U6 and U8 in the group located further from the touch roller T, two types of yarn traverse units U including rotating shafts 15 of different lengths must be manufactured, thereby increasing the costs of the yarn traverse units U and thus the cost of the yarn traverse device. According to this embodiment, to solve this problem, all yarn traverse units U have the same structure, including that the rotating shafts 15 are all of the same length.

[0044] All yarn traverse units U are configured in the same structure, and in the yarn traverse units U2, U4, U6 and U8 in the group located further from the touch roller T, spacers S for height adjustments are inserted between a frame f1 of the elevating frame F and a driving box u1 in which transmission mechanisms such as the spur gears 12, 16, 18 and 20 of the yarn traverse unit U are accommodated. As a result, these yarn traverse units U2, U4, U6 and U8 are located further from the touch roller T than the group of yarn traverse units U1, U3, U5 and U7 located closer to it.

[0045] In addition, because all yarn traverse units U have the same structure and the spacers S are inserted between the driving box u1 and the frame f1 of the elevating frame F of the group of the yarn traverse units U2, U4, U6 and U8 located further from the touch roller T as described above, the pulleys 17 of the adjacent yarn traverse units U are located at different heights. If the pulleys 17 are located at different heights, the driving belt (endless belt) 28 cannot be passed across all pulleys 17 when part of the width 17a of the pulley 17 that is contacted by the driving belt 28 is almost the same as the width 28a of the driving belt 28. Thus, according to this embodiment, the width 17a of the pulley 17 is larger than the width 28a of the driving belt 28 by a value larger than or equal to the difference in height between the rotation planes of the upper rotating wing 1 of the adjacent yarn traverse units U, thereby allowing the driving belt 28 to be passed across both yarn traverse units U with the spacers S inserted therein and those without spacers S.

[0046] Because the endless belt 28 as a driving belt comprises a timing belt with teeth formed thereon and the pulley 17 mounted at the upper end of the rotating shaft 15 and rotationally driven by the belt also has teeth, slip can be prevented from occurring between the endless belt 28 and the toothed pulley 17, thereby ensuring the transfer of the yarn y to provide a yarn traverse device capable of stable traversing. In addition, because the endless belt 28 comprises a timing belt with teeth formed on both sides and because not only the pulley 17 mounted at the upper end of the shaft 15 but also the other pulleys 27, 29 and 30 have teeth, the transfer of the yarn y is further ensured, thereby ensuring that the yarn traverse device is capable of stable traversing.

[0047] Due to the above configuration, the present invention has the following effects.

[0048] The rotation planes of the upper rotating wing and the lower rotating wing of each yarn traverse unit are all arranged in parallel with the rotation axis of the touch roller, and the rotation planes of the upper rotating wing and the lower rotating wing of adjacent yarn traverse units are arranged in four planes. Thus, each yarn traverse unit can be independently operated without consideration for the driving timings of adjacent yarn traverse units. In addition, the yarn traverse units are arranged horizontally and are not inclined, thereby elim-

inating the need to increase the height of the driving boxes for the yarn traverse units and the length of the rotating shafts with the pulleys mounted thereon. This configuration reduces the load on the shaft bearings and thus increases the lifetime expectancy of the bearings. Furthermore, the yarn traverse device can be made more compact.

[0049] Between the adjacent yarn traverse units, the rotation plane of the upper rotating wing or the lower rotating wing of one of the yarn traverse units is located between the rotation planes of the upper rotating wing and the lower rotating wing of the other yarn traverse unit, thereby helping to make the yarn traverse device even more compact.

[0050] The pulley in each yarn traverse unit is wider than the driving belt (endless belt) by a value larger than or equal to the difference in height between the rotation planes of the upper rotating wing of the adjacent yarn traverse units. As a result, the yarn traverse units constituting the yarn traverse device have the same configuration, thus reducing the cost of the yarn traverse units U and thus the yarn traverse device.

[0051] The single driving belt drives all yarn traverse units, thereby ensuring the transfer of the yarn and providing a compact yarn traverse device having a simplified driving mechanism.

[0052] In addition, a cut in the belt can be easily detected by simply detecting the torque (load) on the motor driving the driving belt.

[0053] The yarn traverse device is adapted so that the rotation planes of the upper rotating wing and the lower rotating wing of each yarn traverse unit are all arranged in parallel with the rotation axis of the touch roller, and so that the rotation planes of the upper rotating wing and the lower rotating wing of adjacent yarn traverse units are arranged in four planes. Thus, each yarn traverse unit can be independently operated without consideration for the driving timings of the adjacent yarn traverse units. In addition, the yarn traverse unit located at the tip of the bobbin holder is placed further from the touch roller than the yarn traverse unit located at the root of the bobbin holder, thereby preventing the package formed by the yarn traverse unit located at the tip of the bobbin holder from leaving the touch roller.

[0054] Between the adjacent yarn traverse units, the rotation plane of the upper rotating wing or the lower rotating wing of one of the yarn traverse units is located between the rotation planes of the upper rotating wing and the lower rotating wing of the other yarn traverse unit, thereby reducing the difference in the free length between the adjacent yarn traverse units.

[0055] The interval between the upper rotating wing and the lower rotating wing is approximately equal to the thickness of the rotating wing, thereby reducing the difference in the free length between the adjacent yarn traverse units to the degree that substantially no problem occurs.

Claims

1. A yarn traverse device comprising a plurality of yarn traverse units for traversing a yarn by transferring it between an upper rotating wing and a lower rotating wing, that rotate in opposite directions, and the plurality of yarn traverse units being driven by a common driving belt, characterized in that rotation planes of the upper rotating wing and the lower rotating wing of each yarn traverse unit are all arranged in parallel with the rotation axis of a touch roller, and the rotation planes of the upper rotating wing and the lower rotating wing of adjacent yarn traverse units are arranged in four planes. 5 10
2. A yarn traverse device according to Claim 1 characterized in that between the adjacent yarn traverse units, the rotation plane of the upper rotating wing or the lower rotating wing of one of the yarn traverse units is located between the rotation planes of the upper rotating wing and the lower rotating wing of the other yarn traverse unit. 15 20
3. A yarn traverse device according to Claim 1 or Claim 2 characterized in that a pulley in each yarn traverse unit is wider than the driving belt by a value larger than or equal to the difference in height between the rotation planes of the upper rotating wing of the adjacent yarn traverse units. 25 30
4. A yarn traverse device according to any one of Claims 1 to 3 characterized in that a single driving belt drives all the yarn traverse units. 35
5. A take-up winder comprising a touch roller; a yarn traverse device comprising a plurality of yarn traverse units for traversing a yarn by transferring it between an upper rotating wing and a lower rotating wing that rotate in opposite directions; and bobbin holder which has a plurality of bobbins installed thereon, wherein the bobbins contact said touch roller to rotate, the bobbin holder being supported in a cantilever manner, characterized in that the rotation planes of the upper rotating wing and the lower rotating wing of each yarn traverse unit are all arranged in parallel with the rotation axis of the touch roller, in that the rotation planes of the upper rotating wing and the lower rotating wing of adjacent yarn traverse units are arranged in four planes, and in that the yarn traverse unit located at the tip of said bobbin holder is placed further from the touch roller than the yarn traverse unit located at the root of said bobbin holder. 40 45 50
6. A take-up winder according to Claim 5 characterized in that between the adjacent yarn traverse units, the rotation plane of the upper rotating wing or the lower rotating wing of one of the yarn traverse units is arranged between the rotation planes of the upper rotating wing and the lower rotating wing of the other yarn traverse unit. 55
7. A take-up winder according to Claim 6 characterized in that the interval between the upper rotating wing and the lower rotating wing is approximately equal to the thickness of the rotating wing. 60

FIG. 2

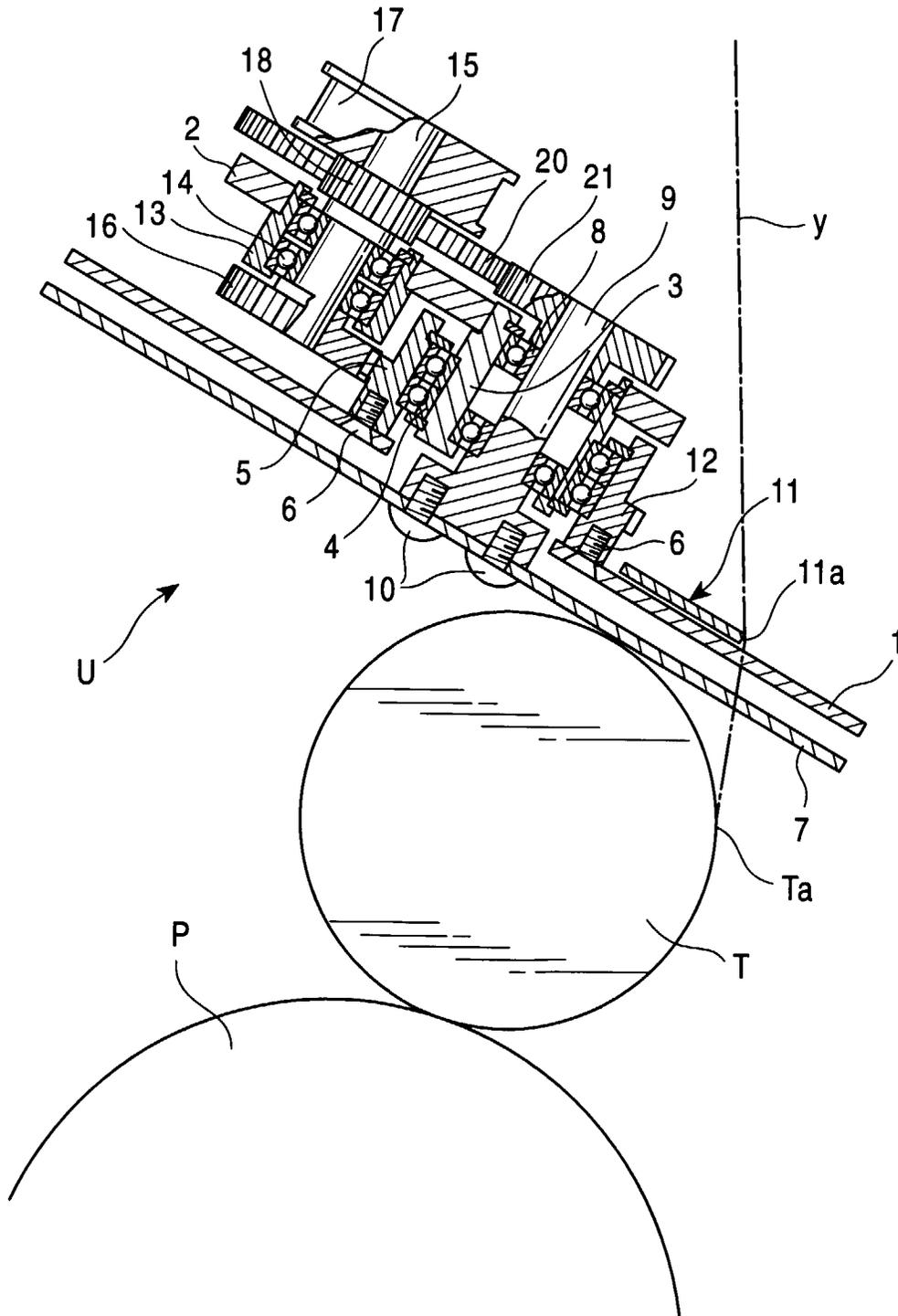


FIG. 4

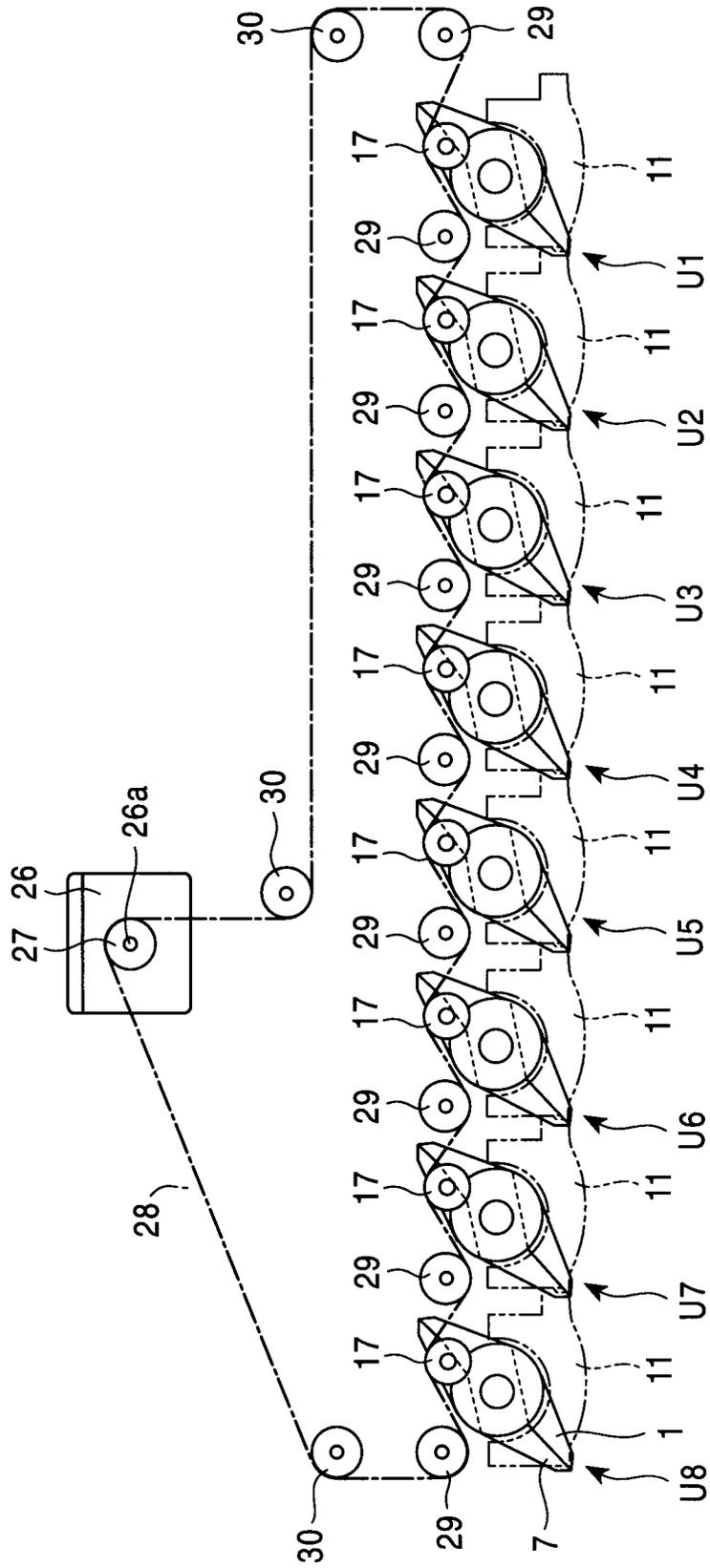


FIG. 5

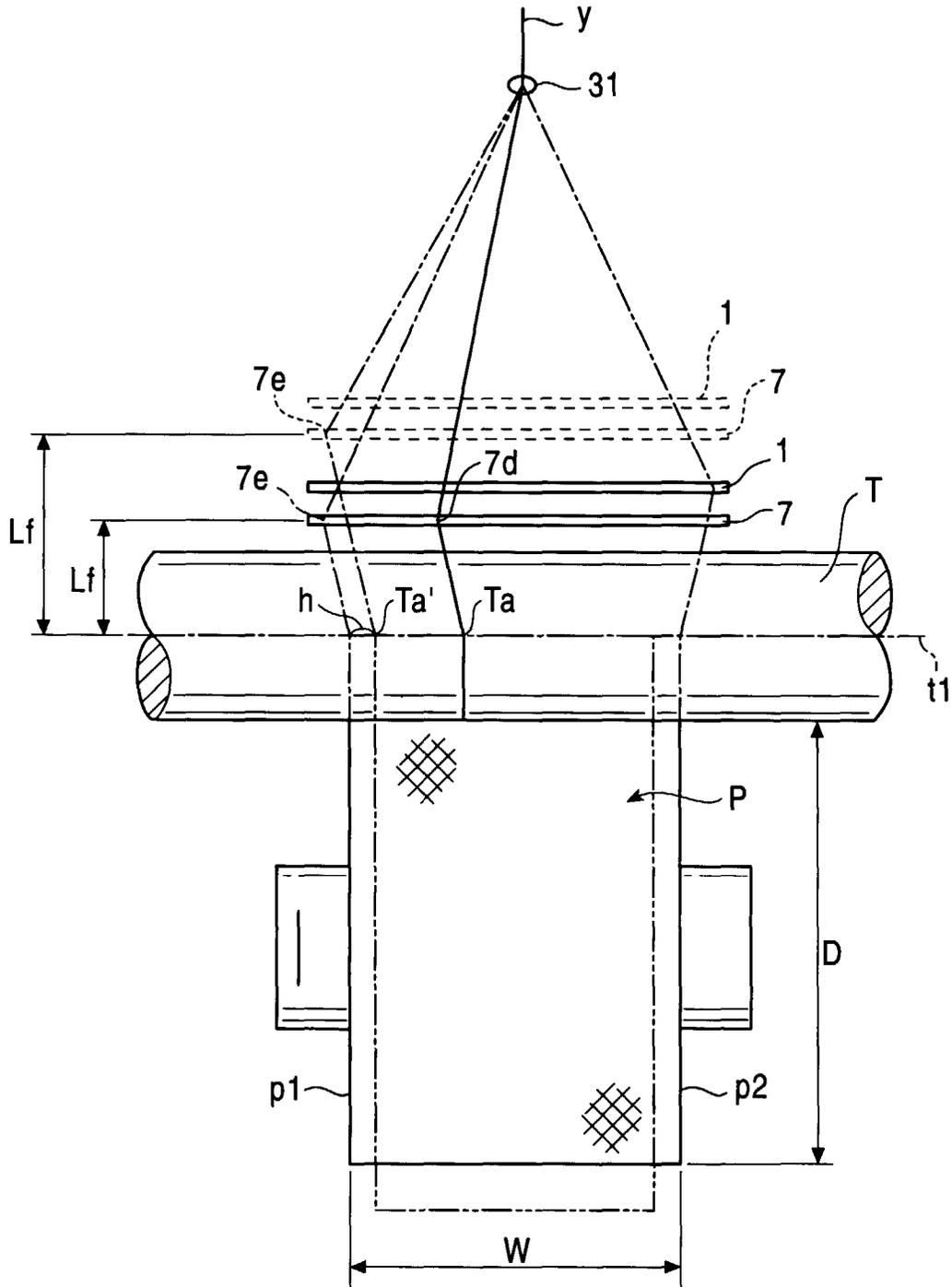


FIG. 6

