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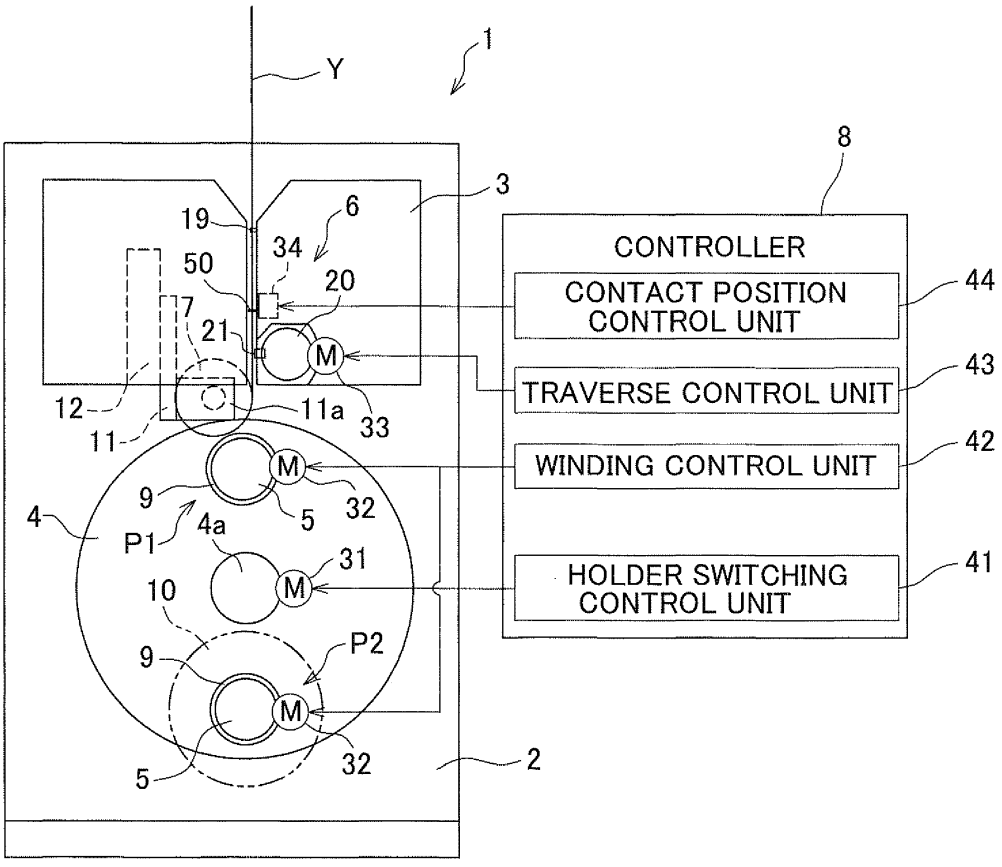
(54) Yarn winding device

(57) A yarn winding device forms a wound package 10 by winding a running yarn Y onto a bobbin 9 attached to a bobbin holder, while traversing the yarn Y in traversing directions by the traverse unit 6. This traverse unit 6 has traverse guides 21 which sandwich the running yarn Y and reciprocate in the axial directions of the bobbin holder 5. Between a fulcrum guide 19 of the traverse unit 6 and a traverse guide 21, a yarn stitching restraining guide 50 is provided to contact the yarn Y traversed by the traverse guide 21, when the traverse guide 21 is reversed.

FIG.2



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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a yarn winding device which traverses yarns by a traverse unit and wind them onto a bobbin so as to form a package.

[0002] A known yarn winding device has a traverse unit traversing yarns in the axial directions of bobbins and forms a package by winding yarns onto a bobbin while traversing the yarns. In this regard, various methods of traversing yarns by the traverse unit of the yarn winding device have been known. For example, Patent Document 1 (Japanese Unexamined Patent Publication No. 238645/1993 (Tokukaihei 5-238645)) recites a cam drum traverse unit which is arranged to include a cam drum which is provided to be in parallel to the shaft of a bobbin and has a helical cam groove on the circumference and a traverse guide which reciprocates in the axial directions of the bobbin along the cam groove in response to the rotation of the cam drum. The traverse guide of this cam drum traverse unit moves so as to traverse yarns in the axial directions of the bobbin while sandwiching and binding the running yarns in the axial directions.

[0003] On the other hand, Patent Document 2 (Japanese Examined Patent Publication No. 3985/1979 (Tokukosho 54-3985) (Fig. 4)) recites a rotating-blade-type traverse unit which has two blade-shaped traverse guides which are superposed onto each other and rotate in reverse directions. In this traverse unit, after a yarn is moved on one side in the axial directions of the bobbin by one traverse guide, the yarn is passed to the other traverse guide at the end point (i.e. an edge of the winding target range on the bobbin), and the yarn is moved to the other side in the axial directions of the bobbin by the other traverse guide.

[0004] This Patent Document 2 aims at reducing the yarn accumulation (so-called saddle bag) at the end portions of the package. To achieve this object, the technology recited in the document utilizes the yarn returning effect at the respective traversal ends, in a traverse unit which winds yarns such that a yarn guided by a traverse guide to a traversal end comes off from the traverse guide and is then engaged with another traverse guide and guided in a reverse direction. More specifically, position regulation guides are provided at the traversal ends to arrange the speed of the yarn returning from a traversal end to be higher than the speed of the movement of the traverse guide, with the result that the yarn accumulation at the traversal ends is alleviated.

[0005] Both of the traversing methods of Patent Documents 1 and 2, however, cannot solve a problem of detachment of yarns at the end portions of the package, which is so-called yarn stitching. Irrespective of the traversing methods, a major cause of this yarn stitching seems to be the existence of an interval between the traverse guide and the bobbin, where yarns run without any guide (so-called free length).

[0006] This cause of the problem will be described below with reference to Fig. 6. As shown in Fig. 6, a yarn Y is traversed while changing its form in the order of (3) → (2) → (1) → (2) → (3). When a traverse guide 80 goes beyond the winding target range of a bobbin 81 and is reversed, the linear distance between the contact point Al of the running yarn Y with the traverse guide 80 and the contact point A2 of the running yarn Y with the bobbin 81 is short. On the other hand, normally the speed of winding onto the bobbin 81 (i.e. the speed of supplying the yarn) is always constant even when the traverse guide 80 is reversed. For this reason, even when the distance is short as above, the length of the yarn Y running between the traverse guide 80 and the bobbin 81 remains the same. As a result, when the traverse guide 80 is reversed, the yarn Y running between the traverse guide 80 and the bobbin 81 is slackened for a moment, as indicated by (2) in Fig. 6. The inventor assumes that the yarn stitching at an edge portion tends to occur when such a slackened yarn is wound onto the bobbin 81.

SUMMARY OF THE INVENTION

[0007] An object of the present invention is therefore to restrain the occurrence of yarn stitching by eliminating the slack in a yarn, which occurs between a bobbin and a traverse guide when the traverse guide is reversed.

[0008] A yarn winding device of the present invention includes: a winding unit which winds a yarn onto a bobbin; a traverse unit which reciprocally moves the running yarn in axial directions of the bobbin; and a slack removal unit which removes the slack in the yarn running between the traverse guide and the bobbin, when the traverse guide is reversed.

[0009] According to the yarn winding device of the present invention, since the slack in a yarn running between the traverse guide and the bobbin is removed when the traverse guide is reversed, a yarn having a stable yarn form is wound at an edge of the winding target range of the bobbin, with the result that the occurrence of the yarn stitching is restrained.

[0010] In addition to the above, the yarn winding device is preferably arranged so that the slack removal unit is provided on a side upstream of the traverse guide in a direction in which the yarn runs, and is a resistance imparting unit which contacts the running yarn to impart, to the yarn, running resistance against the direction in which the yarn runs, when the traverse guide is reversed.

[0011] According to this arrangement, the slack in the yarn is easily removed only by imparting running resistance against the running direction of the yarn when the traverse guide is reversed, as the tension on the yarn is increased on the side downstream of the resistance imparting unit.

[0012] In addition to the above, the yarn winding device preferably further includes: a fulcrum guide which is fixedly provided on the side upstream of the traverse guide in the direction in which the yarn runs; and a contact guide

which is provided between the fulcrum guide and the traverse guide and functions as the resistance imparting unit, the contact guide externally contacting, in the axial directions of the bobbin, the yarn between the fulcrum guide and the traverse guide, on a line connecting the fulcrum guide with the traverse guide when the traverse guide reaches an edge of a winding target range of the bobbin.

[0013] When no contact guide is provided, the yarn running between the traverse guide and the bobbin is maximally slackened when the direct distance between the contact point of the running yarn with the traverse guide and the contact point of the running yarn with the bobbin becomes the shortest, i.e., when the traverse guide reaches the edge of the winding target range of the bobbin. In the present invention, the contact guide contacts the yarn running between the fulcrum guide and the bobbin, on the line L2 (see Fig. 3) connecting the fulcrum guide with the traverse guide at the aforesaid position. For example, as the contact guide gets closer to the traversal center and away from the line L2, the angle of the yarn contacting and bended by the contact guide increases, and hence the damage onto the running yarn between the traverse guide and the bobbin becomes serious in comparison with the effect of removing the slack in the yarn. In this regard, as the contact guide contacts the yarn running between the fulcrum guide and the bobbin on the line L2, it is possible to effectively remove the slack in the yarn running between the traverse guide and the bobbin.

[0014] In addition to the above, the yarn winding device preferably further includes: a position change unit which changes a position of the contact guide in the axial directions of the bobbin; and a position control unit which controls the position change unit.

[0015] In addition to the above, The yarn winding device is preferably arranged so that the traverse unit is able to change a reversal position where the traverse guide is reversed, and the position control unit controls the position change unit so as to move the contact guide in accordance with a direction in which the reversal position of the traverse guide is changed, while the yarn is being wound onto the bobbin.

[0016] For example, when a tapered-end package is formed, the end faces of the package may be arranged to tilt axially outward. In such a case, the reversal position of the traverse guide moves inward as the amount of wound yarns increases. In accordance with this movement, the contact guide is moved inward. With this, the contact guide surely contacts the running yarn when the traverse guide is reversed, with the result that the yarn stitching is more effectively restrained.

[0017] In addition to the above, the yarn winding device preferably further includes: a winding control unit which controls a rotation speed of the bobbin rotated by the winding unit, the winding control unit controlling the winding unit so as to function as the slack removal unit which removes the slack in the yarn running between the traverse guide and the bobbin, by temporarily increasing the rotation speed of the bobbin when the traverse guide is reversed.

[0018] According to this arrangement, by temporarily increasing the rotation speed of the bobbin when the traverse guide is reversed, the slack in the yarn running between the traverse guide and the bobbin is removed with less decrease in the quality of the yarn, as compared to the arrangement in which the slack is removed by imparting running resistance to the yarn.

[0019] By removing the slack in the yarn between the traverse guide and the bobbin when the traverse guide is reversed, the yarn having the desired shape is wound at the edge of the winding target range on the bobbin, the occurrence of the yarn stitching is restrained.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

Fig. 1 is a profile of a yarn winding device according to First Embodiment of the present invention.

Fig. 2 is a front elevation of the yarn winding device according to First Embodiment of the present invention.

Fig. 3 illustrates a position of a yarn stitching restraining guide.

Fig. 4 illustrates the form of the yarn when the traverse guide is reversed.

Fig. 5A illustrates a position of the yarn stitching restraining guide in relation to the winding target range of the bobbin, when the winding starts.

Fig. 5B illustrates a position of the yarn stitching restraining guide in relation to the winding target range of the bobbin, when the winding ends.

Fig. 6 illustrates the forms of a yarn when the traverse guide is reversed in a known case.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

<First Embodiment>

[0021] Now, First Embodiment of the present invention will be described. Fig. 1 is a profile of a yarn winding device according to First Embodiment of the present invention. Fig. 2 is a front elevation of the yarn winding device. As shown in Fig. 1, a yarn winding device 1 successively receives a plurality of yarns Y from an unillustrated spinning machine provided above. The yarn winding device 1 is arranged to form a plurality of packages 10 by winding the yarns Y supplied from the spinning machine onto a plurality of bobbins 9.

[0022] As shown in Fig. 1 and Fig. 2, the yarn winding device 1 includes components such as a main body frame 2, an elevation frame 3 provided to the main body frame 2 to be vertically movable, a disc-shaped turret 4 rotatably provided to the main body frame 2, two bobbin holders 5 (winding units) each of which is supported by the turret

4 at one end and to which a plurality of bobbins 9 are attached, a traverse unit 6 which traverses the yarn Y which is to be wound onto the bobbin 9, a contact roller 7 which is able to contact the bobbins 9 attached to the bobbin holders 5, and a controller 8 which controls the overall operation by controlling the components.

[0023] The turret 4 is disc-shaped and is rotatably attached to the main body frame 2. At two positions which are symmetrical with respect to a shaft 4a which is the rotation center of the turret 4, ends of the two bobbin holders 5 are connected, respectively. The two bobbin holders 5 are rotatably protrude from the turret 4. The two bobbin holders 5 are arranged to rotate together with the turret 4. To each of the two bobbin holders 5, a plurality of bobbins 9 are attached in series in the axial directions of the bobbin holder 5.

[0024] The turret 4 is rotated about the shaft 4a by a rotation motor 31. As the turret 4 is rotated, each of the two bobbin holders 5 moves between a winding position P1 at which the bobbin holder 5 contacts the contact roller 7 and yarns Y are wound onto the bobbins 9 and a standby position P2 which is below the winding position P1 and is point-symmetrical with the winding position P1 with respect to the shaft 4a of the turret 4. After the yarns are wound onto the bobbins 9 attached to the bobbin holder 5 at the winding position P1 and packages 10 are formed, this bobbin holder 5 at the winding position P1 is switched to the standby position P2 whereas the bobbin holder 5 at the winding position P2 is switched to the winding position P1.

[0025] Each of the two bobbin holders 5 supported by the turret 4 is rotated by the rotation motor 32. As the bobbin holder 5 at the winding position P1 is rotated, the yarns Y are wound onto the bobbins 9 attached to this bobbin holder 5.

[0026] The elevation frame 3 is a long frame extending in the axial directions of the bobbin holder 5, and supported by the main body frame 2 at its base end in the longitudinal direction. The elevation frame 3 is connected to a rod of an unillustrated cylinder fixed to the main body frame 2, and is vertically moved (i.e. moved in the direction away from the bobbin holder 5) with respect to the main body frame 2, as the cylinder is driven.

[0027] The traverse unit 6 is provided on the elevation frame 3 and includes components such as fulcrum guides 19, a traverse cam 20, traverse guides 21, and a traverse motor 33.

[0028] The fulcrum guides 19 are provided around the upper end of the elevation frame 3. The yarns Y supplied from the spinning machine are placed onto these fulcrum guides 19, and they function as the traversal fulcrums of the yarns Y. The traverse cam 20 is provided to be in parallel to the bobbin holder 5 and is rotatably supported by the elevation frame 3. The traverse cam 20 has a helical cam groove on its circumference, and is rotated by the traverse motor 33.

[0029] The traverse guides 21 move along the cam groove as the traverse cam 20 is rotated, and reciprocate in the axial directions of the traverse cam 20 (bobbin holder 5). Each traverse guide 21 is arranged to sandwich a running yarn Y by two guide portions 21a in the axial directions of the bobbin holder 5. The traverse guide 21 guides the yarn Y running through the fulcrum guide 19 to the contact roller 7 while traversing, by using the fulcrum guide 19 as a fulcrum, the yarn Y in the axial directions (traversing directions) of the bobbin holder 5.

[0030] Between the fulcrum guides 19 and the traverse guides 21 of the traverse unit 6 of the elevation frame 3, yarn stitching restraining guides 50 are provided to be able to contact the yarns Y traversed by the traverse guide 21. Each yarn stitching restraining guide 50 is connected to the rod of the cylinder 34 fixed to the elevation frame 3. As the cylinder 34 is driven, the yarn stitching restraining guide 50 moves in the traversing directions with respect to the elevation frame 3. This yarn stitching restraining guide 50 will be detailed later. It is noted that, in First Embodiment, the yarn stitching restraining guides 50 may be fixed and immovable. On the other hand, the yarn stitching restraining guide 50 must be arranged to be movable in later-described Second Embodiment.

[0031] The elevation frame 3 is connected to a supporting frame 11, and two supporting portions 11a rotatably supporting the contact roller 7 are provided at the respective longitudinal end portions of the supporting frame 11. The supporting frame 11 is long along the length of the elevation frame 3. Further, the supporting frame 11 is connected to the guide plate 12 at the longitudinal end portions of the supporting frame 11, and is arranged to be vertically movable with respect to the guide plate 12 (elevation frame 3) .

[0032] The contact roller 7 is supported by the two supporting portions 11a of the supporting frame 11 to be in parallel to the bobbin holder 5. This contact roller 7 is arranged to be able to contact the outer circumferences of the bobbins 9 attached to the bobbin holder 5 at the winding position P1 or the packages 10 formed by winding the yarns Y onto the bobbins 9. When the yarns are wound onto the bobbins 9, the contact roller 7 is rotated by the rotation of the bobbin holder 5 while applying a predetermined contact pressure onto the packages 10, so as to adjust the shape of each package 10. The supporting frame 11 and the contact roller 7 are guided by the guide plate 12 to change their relative positions with respect to the elevation frame 3 in the direction to approach the bobbins 9 at the winding position P1 (i.e. downward direction) or in the direction away from these bobbins 9 (i.e. upward direction).

[0033] Now, the controller 8 performing the overall control of the yarn winding device 1 will be described. As shown in Fig. 2, the controller 8 may include components such as a CPU (Central Processing Unit), a ROM (Read Only Memory) storing various programs and data for performing the overall control of the yarn winding device 1, and a RAM (Random Access Memory) temporarily storing data processed by the CPU, and perform below-described various controls as a program stored in the ROM

is executed by the CPU. Alternatively, the controller 8 may be hardware composed by various circuits including an arithmetic circuit.

[0034] The controller 8 includes a holder switching control unit 41, a winding control unit 42, a traverse control unit 43, and a contact position control unit 44.

[0035] The holder switching control unit 41 drives the rotation motor 31 to rotate the turret 4, so as to switch the position of each of the two bobbin holders 5 between the winding position P1 and the standby position P2. The winding control unit 42 drives the rotation motor 32 to rotate the bobbin holder 5 at the winding position P1, so as to wind the yarns Y onto the bobbins 9 attached to the bobbin holder 5.

[0036] The traverse control unit 43 drives the traverse motor 33 to rotate the traverse cam 20, so as to traverse the yarn Y sandwiched between the traverse guides 21 in the traversing directions by reciprocally moving the traverse guides 21 in the traversing directions. The contact position control unit 44 moves the cylinder 34 so as to change the positions of the yarn stitching restraining guides 50 in the traversing directions. In First Embodiment, the yarn stitching restraining guides 50 may be fixed as described above and the contact position control unit 44 may be unnecessary. On the other hand, in later-described Second Embodiment, the yarn stitching restraining guides 50 must be movable and the contact position control unit 44 is necessary. The controller 8 includes the contact position control unit 44 for this reason.

[0037] Now, after describing the layout positions of the yarn stitching restraining guides 50, the traversing movement of the traverse unit 6 will be described with reference to Fig. 3 and Fig. 4. Fig. 3 is used for illustrating the layout positions of the yarn stitching restraining guides. It is noted that the contact roller 7 is not illustrated in Fig. 3. Furthermore, in reality, the yarn Y guided from the traverse guide 21 contacts the contact roller 7 first and then moves along its circumference and then contacts the bobbin 9. In this regard, for the sake of simplicity, the yarn Y guided from the traverse guide 21 is supposed to directly contact the bobbin 9 rather than the contact roller 7. Fig. 4 is used for illustrating the yarn forms of the yarn when the traverse guide is reversed. In Fig. 4, the contact point between the yarn Y and the bobbin 9 gradually moves in a traversing direction when the traverse guide 21 is traversed. This movement, however, is ignored because it is very short in distance.

[0038] As shown in Fig. 3, two yarn stitching restraining guides 50 are provided for a single traverse unit 6 (i.e., a single yarn Y). An end face 50a of each of the two yarn stitching restraining guides 50 is positioned to be on the traversal center side of the line L1 connecting the traverse guide 21 at the reversal position with the fulcrum guide 19 and to be on the line L2 connecting the fulcrum guide 19 with the traverse guide 21 having reached the edge of the winding target range on the bobbin 9.

[0039] Between the traverse guide 21 and the bobbin 9, there is a free length interval where the yarn Y runs in the air without any binding, i.e., an interval FL which is a free length of the yarn Y after the yarn Y on the traverse guide 21 is released from the traverse guide 21 and before the yarn Y contacts the bobbin 9. When the yarn Y is tensioned, usually the yarn Y in the free length interval FL straightly connects the traverse guide 21 with the bobbin 9. The tilt of the yarn Y in the free length interval FL is a synthetic vector of the rotation speed of the bobbin holder 5 (i.e., the speed of winding of the yarn Y onto the bobbin 9) and the traversing speed of the traverse guide 21.

[0040] When the yarn Y tilting with respect to the axial directions of the bobbin 9 as above is wound, the traverse guide 21 traverses the yarn beyond the edge X1 of the winding target range of the wound yarns Y on the bobbin 9. In this connection, when the traverse guide 21 goes beyond the winding target range and reverses, the direct distance between the contact point where the running yarn Y contacts the traverse guide 21 and the contact point where the running yarn Y contacts the bobbin 9 becomes short for a moment. In particular, the distance becomes the shortest when the traverse guide 21 is at the same position as the edge X1 of the yarn Y wound onto the winding target range on the bobbin 9 in the axial directions of the bobbin 9 (i.e., (2) in Fig. 4). If the yarn stitching restraining guide 50 is not provided in the case above, the form of the yarn Y is changed from the straight shape because the length of the yarn Y running in the free length interval between the traverse guide 21 and the bobbin 9 is unchanged, with the result that the yarn Y having an unpredictable shape is wound at the edge X1 of the winding target range on the bobbin 9 and hence the yarn stitching occurs.

[0041] In the present invention, the yarn Y is traversed while changing its form in the order of (3) → (2) → (1) → (2) → (3) as shown in Fig. 4. When the traverse guide 21 is reversed, the running yarn Y contacts the yarn stitching restraining guide 50 and hence running resistance is imparted to the yarn Y. As a result, the tension on the yarn Y is increased on the downstream side (bobbin 9 side) of the part where the running resistance is imparted to the yarn Y, and consequently the slack in the yarn Y is easily removed. As the form of the yarn Y in the free length interval FL immediately before being wound onto the bobbin 9 at the reversal of the traverse guide 21 is stabilized and the yarn Y having the desired shape is wound at the edge X1 of the winding target range on the bobbin 9, the occurrence of the yarn stitching is restrained.

[0042] As such, the yarn stitching restraining guide 50 can remove the slack in the yarn running between the traverse guide and the bobbin and restrain the occurrence of the yarn stitching as described above, when the yarn stitching restraining guide 50 is at least on the traversal center side of the line L1 connecting the traverse guide 21 at the reversal position (traversal end) with the fulcrum guide 19, i.e., on the traversal center side of the

position where the yarn running at the traversal end starts to be slackened. Furthermore, the slack in the yarn running between the traverse guide and the bobbin is more effectively removed when the end face 50a of the yarn stitching restraining guide 50 is on the traversal center side of the line L1 and on the line L2 which connects the fulcrum guide 19 with the traverse guide 21 having reached the edge of the winding target range on the bobbin 9. This is because, for example, as the end face 50a of the yarn stitching restraining guide 50 gets closer to the traversal center and away from the line L2, the angle of the yarn Y contacting and bended by the yarn stitching restraining guide 50 increases, and hence the damage onto the running yarn Y between the traverse guide 21 and the bobbin 9 becomes serious in comparison with the effect of removing the slack in the yarn Y.

[0043] The running resistance imparted to the yarn Y by the yarn stitching restraining guide 50 may be changed by changing the material of the guide and the surface roughness of the surface contacting the yarn Y, in addition to the layout position of the yarn stitching restraining guide 50.

<Second Embodiment>

[0044] Now, Second Embodiment of the present invention will be described. In Second Embodiment, the yarn winding device 1 is arranged so that the yarn stitching restraining guides 50 which have been described in First Embodiment are movable. The positions of the yarn stitching restraining guides 50 are moved by the contact position control unit 44. In other words, the above-described cylinder 34 and contact position control unit 44 for moving the yarn stitching restraining guides 50 are prerequisite.

[0045] Now, the following will describe cases where the technology is used in three different winding methods.

(1) When a belt-type traverse unit recited in Japanese Unexamined Patent Publication No. 2010-163275 (hereinafter, Publication 1) is used in place of the cam drum traverse unit 6 of First Embodiment, the traversal width is changeable. The belt-type traverse unit reciprocates an endless belt having guides, in traversing directions by a drive motor. The traversal width of the yarn guide 4 of Publication 1, i.e., the reversal positions of the yarn guide 4 are changeable. With this arrangement, the winding target range of the yarns Y wound onto the bobbin 9 is changed, for example, to form a tapered shape, so that a tapered-end package 10 whose end face is tilted radially outward is formed.

[0046] In such a case, as shown in Fig. 5A and Fig. 5B, the reversal position of the traverse guide 21 moves inward as the amount of wound yarns Y increases (L4<L3). In accordance with this movement, the cylinder 34 is controlled by the contact position control unit 44 so that the yarn stitching restraining guide 50 is moved inward (i.e., toward the center of the traversal width). With this, the yarn stitching restraining guide 50 surely contacts the running yarn Y when the traverse guide 21 is reversed, with the result that the yarn stitching is more effectively restrained.

[0047] In addition to the above, since the yarn stitching is restrained by arranging the yarn stitching restraining guide 50 to be movable in accordance with the winding target range on the bobbin 9, it is possible to narrow the tapering angle to increase the total amount of the yarns wound in a single package 10, without increasing the diameter.

[0048]

(2) As shown in Japanese Unexamined Patent Publication No. 2010-189127, when the traversal speed is arranged to be high at the start of the winding of a package so as to increase the yarn layer angle (angle θ in Fig. 6) to restrain the package end face from bulging, i.e., when the yarn layer angle is increased by increasing the traveling speed of the traverse guide 21 by the traverse control unit 43 shown in Fig. 2 in the case of Second Embodiment, the yarn stitching restraining guide 50 is moved inward (toward the center of the traversal width) by the contact position control unit 44 in sync with the timing to increase the yarn layer angle.

[0049]

(3) When creeping (saddle bag prevention) is carried out by increasing or decreasing the free length interval FL, the traversal width is changed by changing the distance between the traverse guide 21 and the package 10 by moving the elevation frame 3 shown in Fig. 2 upward or downward. In so doing, the reversal position of the yarns Y gradually moves inward. In sync with this movement, the cylinder 34 is controlled by the contact position control unit 44 so that the yarn stitching restraining guide 50 is moved inward (toward the center of the traversal width). An effect equal to the effect of (1) is achieved by this arrangement.

[0050] Now, various modifications of the embodiments above will be described. It is noted that the same components as in the embodiments above are denoted by the same reference numerals as in the embodiments, respectively, and the description thereof will be omitted.

[0051] In the embodiments above, the occurrence of the yarn stitching is restrained by the yarn stitching restraining guides 50. In this regard, any arrangements may be adopted in place of the yarn stitching restraining guides 50 on condition that the slack in the yarn Y in the free length interval is removed. For example, when the traverse guide 21 is reversed, the rotation speed of the bobbin holder 5 is temporarily increased by controlling

the winding control unit 42 by the rotation motor 32. According to this arrangement, as compared to the arrangement of removing the slack in the yarn Y by tensioning the yarn Y by applying a running resistance to the yarn Y by the yarn stitching restraining guide 50, adverse effects on the yarn quality are alleviated when removing the slack in the yarn Y running between the traverse guide 21 and the bobbin 9.

[0052] In addition to the above, the yarn stitching restraining guide 50 may be movably fixed to the elevation frame 3 by an unillustrated screw or the like, when it is unnecessary to move the yarn stitching restraining guide 50 during the winding of the yarns Y and the yarn stitching restraining guide 50 is moved only when, for example, the yarn type or the winding target range on the bobbin 9 is changed while the winding of the yarns Y is stopped. In this case, an operator loosens the screw, moves the yarn stitching restraining guide 50, and tightens the screw.

[0053] While the embodiments are arranged so that the position of the yarn stitching restraining guide 50 is changed by controlling the cylinder 34 by the contact position control unit 44 in accordance with the traversal width of the traverse guide 21 controlled by the traverse control unit 43, the yarn stitching restraining guide 50 may be arranged to mechanically or electrically move in sync with a change in the traversal width of the traverse guide 21.

[0054] In addition to the above, while the embodiments above deal with the cam drum traverse unit and the belt-type traverse unit, the present invention may be used in other types of traverse units, e.g. an arm-type traverse unit, on condition that a guide is reciprocally moved in the traversing directions. An arm-type traverse unit is a device which reciprocally moves, in traversing directions, an arm member having a guide at its leading end by a drive motor.

Claims

1. A yarn winding device comprising:

   a winding unit which winds a yarn onto a bobbin;
   a traverse unit which reciprocally moves the running yarn in axial directions of the bobbin; and
   a slack removal unit which removes the slack in the yarn running between the traverse guide and the bobbin, when the traverse guide is reversed.

2. The yarn winding device according to claim 1 wherein,
   the slack removal unit is provided on a side upstream of the traverse guide in a direction in which the yarn runs, and is a resistance imparting unit which contacts the running yarn to impart, to the yarn, running resistance against the direction in which the yarn runs, when the traverse guide is reversed.

3. The yarn winding device according to claim 1 or 2, further comprising:

   a fulcrum guide which is fixedly provided on the side upstream of the traverse guide in the direction in which the yarn runs; and a contact guide which is provided between the fulcrum guide and the traverse guide and functions as the resistance imparting unit,
   the contact guide externally contacting, in the axial directions of the bobbin, the yarn between the fulcrum guide and the traverse guide, on a line connecting the fulcrum guide with the traverse guide when the traverse guide reaches an edge of a winding target range of the bobbin.

4. The yarn winding device according to one of claims 1 to 3, further comprising:

   a position change unit which changes a position of the contact guide in the axial directions of the bobbin; and a position control unit which controls the position change unit.

5. The yarn winding device according to one of claims 1 to 4, wherein,
   the traverse unit is able to change a reversal position where the traverse guide is reversed, and the position control unit controls the position change unit so as to move the contact guide in accordance with a direction in which the reversal position of the traverse guide is changed, while the yarn is being wound onto the bobbin.

6. The yarn winding device according to one of claims 1 to 5, further comprising:

   a winding control unit which controls a rotation speed of the bobbin rotated by the winding unit,
   the winding control unit controlling the winding unit so as to function as the slack removal unit which removes the slack in the yarn running between the traverse guide and the bobbin by temporarily increasing the rotation speed of the bobbin when the traverse guide is reversed.

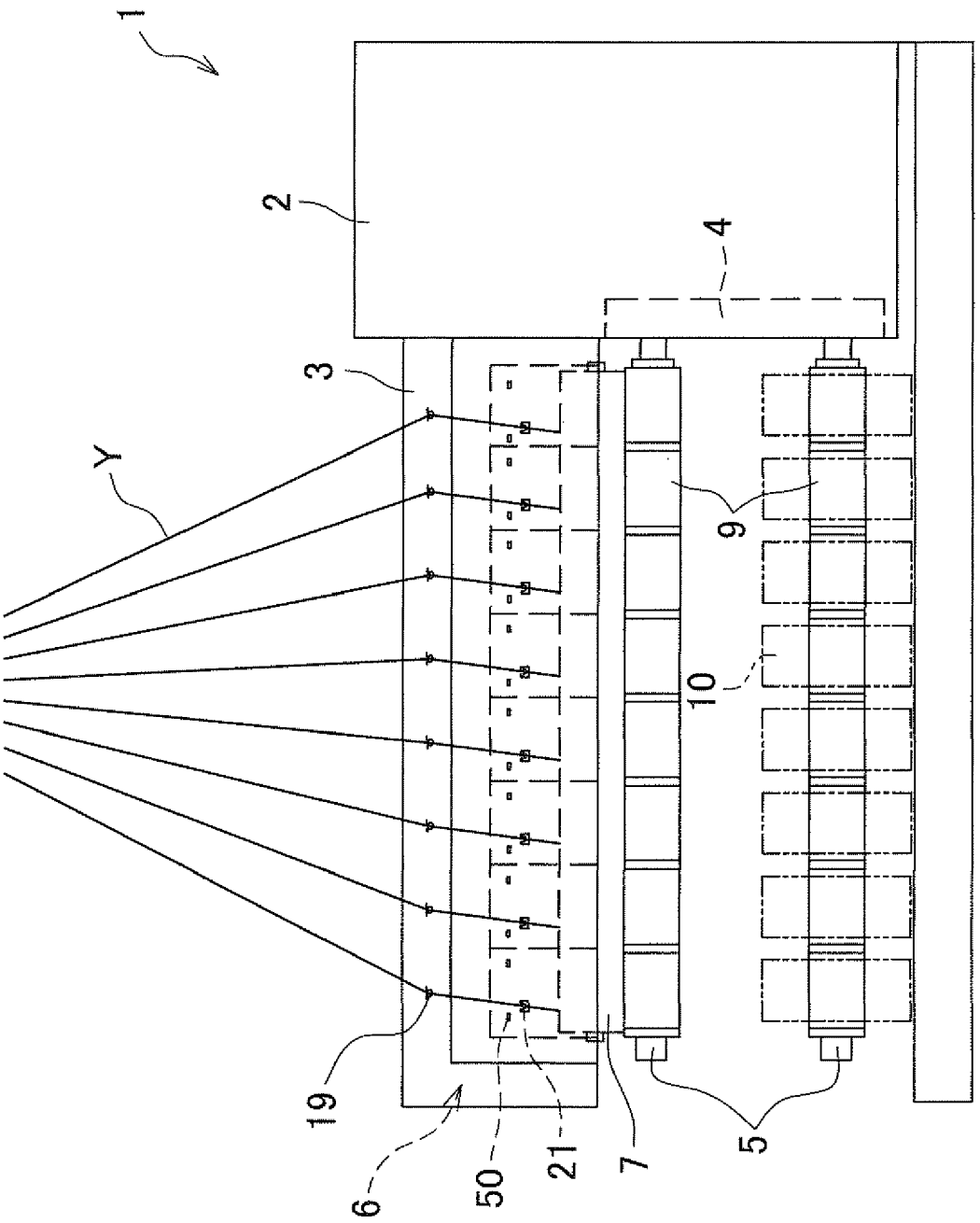


FIG.1

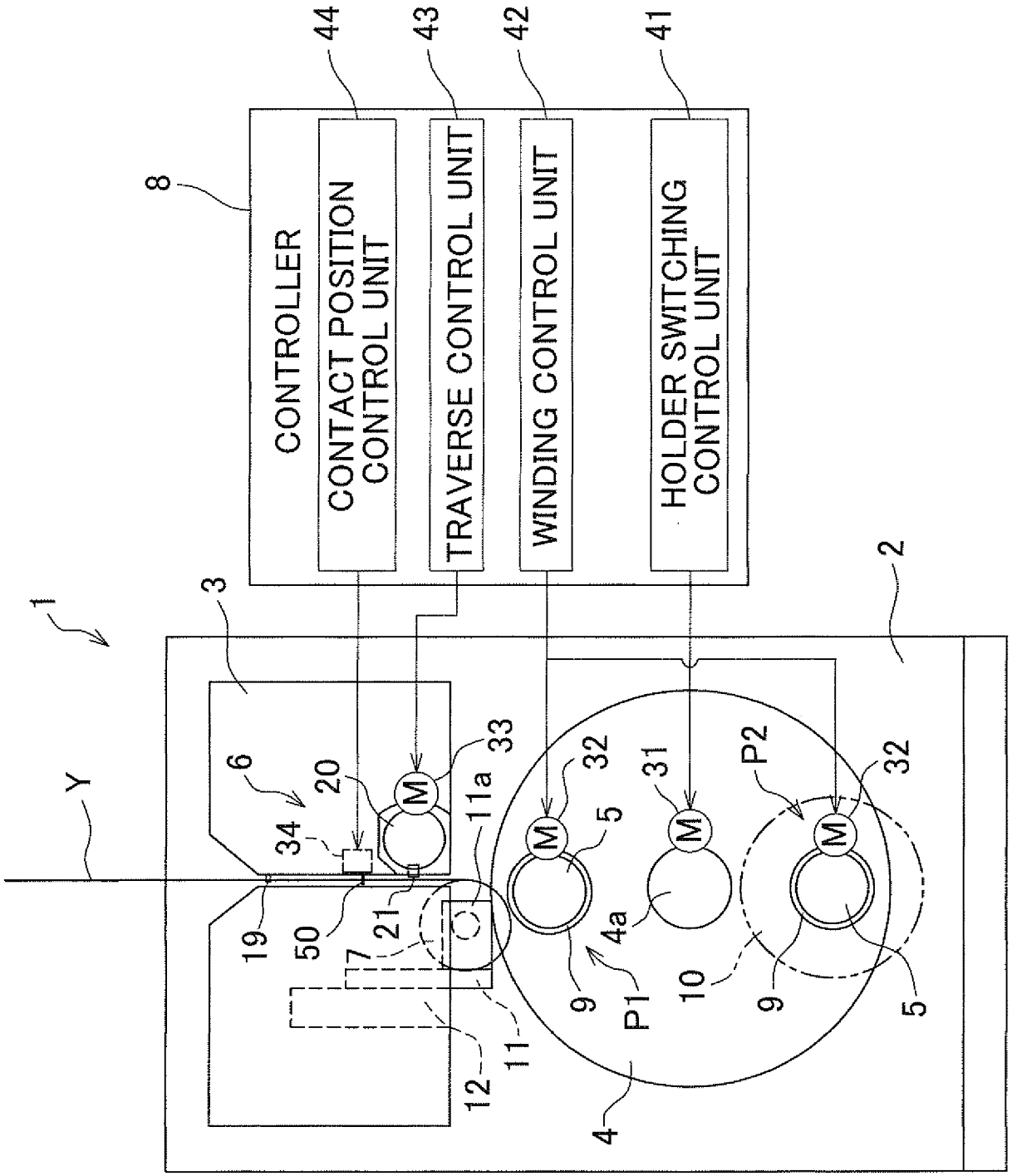

CONTROLLER
CONTACT POSITION CONTROL UNIT
TRAVERSE CONTROL UNIT
WINDING CONTROL UNIT
HOLDER SWITCHING CONTROL UNIT
8
44
43
42
41
1
2
3
4
5
6
7
9
10
11
11a
12
19
20
21
31
32
33
34
50
4a
P1
P2
Y
M

FIG.2

FIG.3

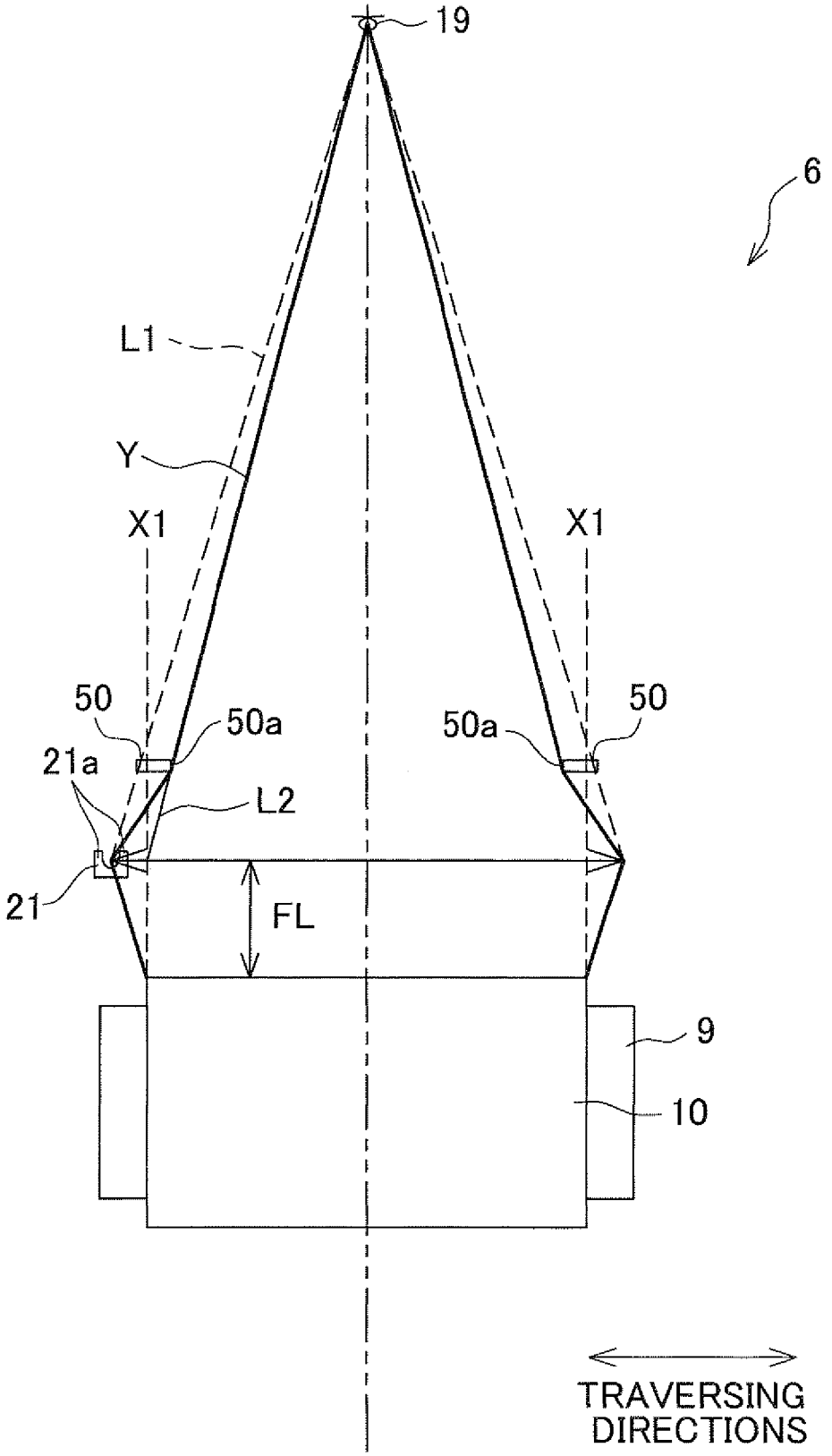

19
6
L1
Y
X1
X1
50
50a
50a
50
21a
L2
21
FL
9
10
TRAVERSING
DIRECTIONS

FIG.4

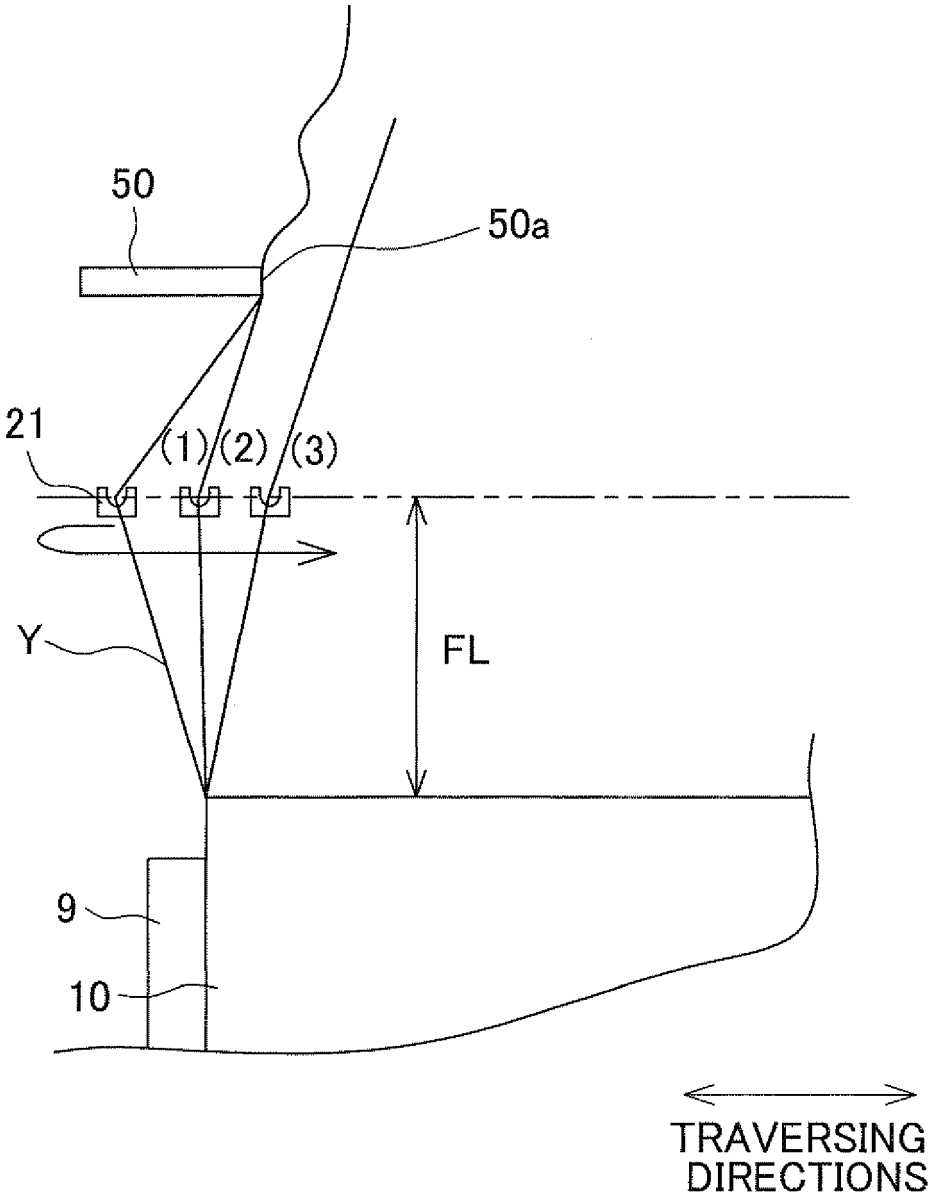


FIG.5B

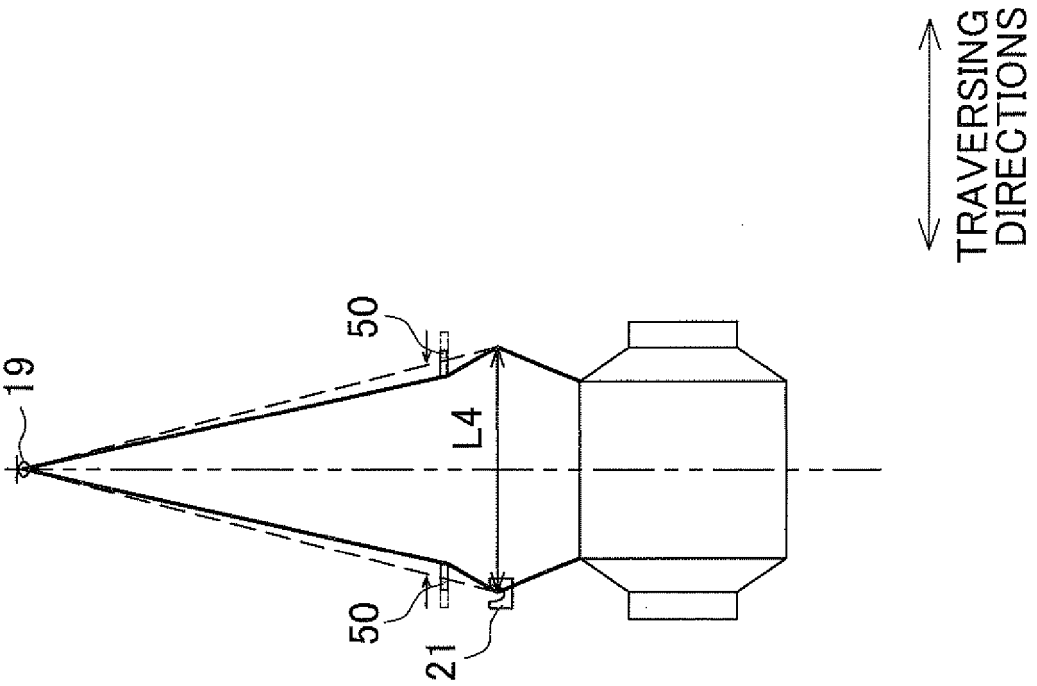


FIG.5A

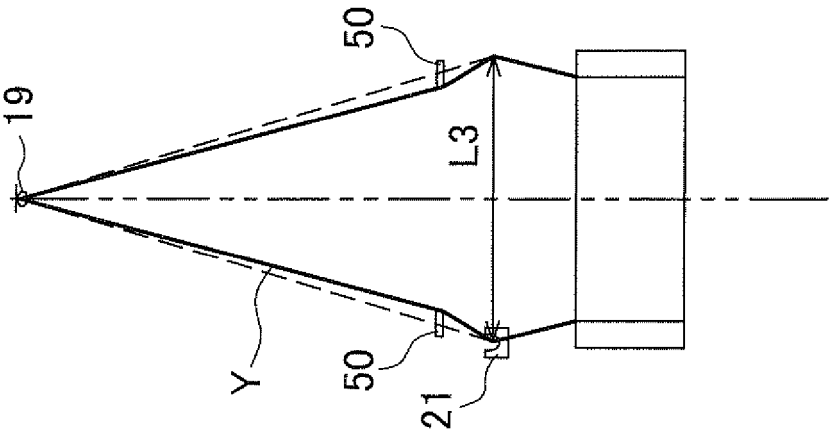
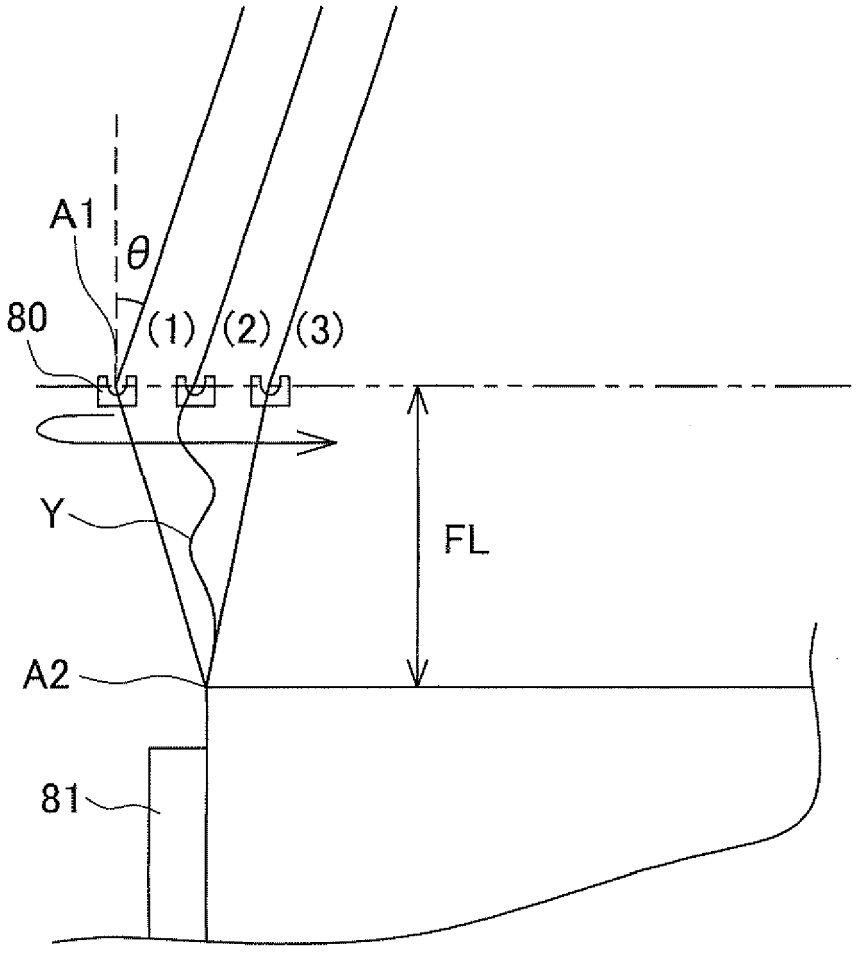


FIG.6



REFERENCES CITED IN THE DESCRIPTION

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