



EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.09.2023 Bulletin 2023/37

(51) International Patent Classification (IPC):
B65H 65/00 (2006.01) **B65H 57/00** (2006.01)
B65H 67/048 (2006.01)

(21) Application number: **23157575.4**

(52) Cooperative Patent Classification (CPC):
B65H 65/00; B65H 57/003; B65H 67/048;
B65H 2701/3132

(22) Date of filing: **20.02.2023**

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

(72) Inventors:
• **YOSHINO, Kyohei**
Kyoto 612-8686 (JP)
• **OKADA, Keisuke**
Kyoto 612-8686 (JP)
• **KAWAI, Masashi**
Kyoto 612-8686 (JP)

(30) Priority: **10.03.2022 JP 2022037056**

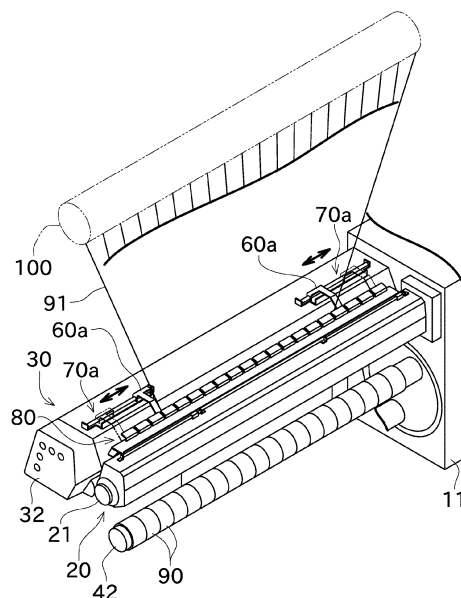
(74) Representative: **Ter Meer Steinmeister & Partner**
Patentanwälte mbB
Nymphenburger Straße 4
80335 München (DE)

(71) Applicant: **TMT Machinery, Inc.**
Osaka-shi, Osaka 541-0041 (JP)

(54) **YARN WINDING MACHINE**

(57) A yarn winding machine includes restriction guides 60a and a movement mechanism 70a. The restriction guides 60a are respectively arranged so as to correspond to both sides of a range in an axial direction of a plurality of bobbins 90, and restrict the plurality of yarns 91 when being held by a yarn disengagement guide so that positions of the yarns 91 in the axial direction of a bobbin holder 42 are within the range in the axial direction of the plurality of bobbins 90 held by the bobbin holder 42. The movement mechanism 70a allow for movement of the restriction guide 60a between a restriction position where the restriction guide acts on the yarns 91 to restrict the yarns 91 and a retracted position where the restriction guide is retracted from the restriction position. An action part is positioned closer to the yarn path than an attachment part in the direction perpendicular to the axis, both when the restriction guide is at the restriction position and when the restriction guide is at the retracted position.

Fig 9



Description

Technical field

[0001] The present invention mainly relates to a yarn winding machine that manufactures a package by winding a plurality of yarns fed from a yarn feed roller, onto a plurality of respective bobbins.

Background Art

[0002] Patent Literature 1 is Japanese Patent Application Publication No. 2003-226469.

[0003] The yarn winding machine disclosed in Patent Literature 1 includes a traverse device and first and second bobbin holders. The traverse device traverses each of a plurality of yarns supplied from a godet roller (yarn feed roller). A plurality of bobbins are attached to each of the first and second bobbin holders. The yarn winding machine manufactures a package by winding yarns on each of a plurality of bobbins of the first bobbin holder. When the manufacture of the package is complete (a full winding package is ready), the yarn winding machine switches a yarn winding target to the plurality of bobbins of the second bobbin holder.

[0004] An axial length of the godet roller disclosed in Patent Literature 1 is shorter than an axial length of the bobbin holder. Therefore, a distance between the plurality of yarns fed from the godet roller to the bobbin holder becomes wider toward the downstream. As a result, when the plurality of yarns are disengaged from the traverse device during switching of the bobbin, the distance between the yarns becomes narrower, and the yarns come closer to the center. To solve this problem, the yarn winding machine of Patent Literature 1 includes a yarn path changing member. The yarn path changing member restricts the movement of each yarn so that the distance between the yarns does not narrow down when the plurality of yarns are disengaged from the traverse device.

Summary of Invention

[0005] The yarn winding machine of Patent Literature 1 suppresses narrowing of the distance between a plurality of yarns when the yarns are disengaged from the traverse device. However, depending on device conditions or winding conditions, a situation may occur where the distance between a plurality of yarns increases when the yarns are disengaged from the traverse device. For example, in a case where the length of the yarn feed roller in the axial direction is greater than that of the bobbin holder, this situation can occur when a plurality of yarns are first threaded onto a plurality of bobbins on the bobbin holder. As a result, the plurality of yarns spread over a wider range than a range in which the plurality of bobbins attached to the bobbin holder. This makes it difficult to thread the plurality of yarns onto the plurality of

bobbins on the bobbin holder. In addition, because of the spread of the plurality of yarns, the yarns may fall on an outer side in the axial direction of the bobbins during winding, possibly resulting in yarn breakage.

[0006] The present invention has been made in view of the above circumstances, and a main object of the present invention is to provide a yarn winding machine that can facilitate the operation of threading yarns onto a bobbin holder and that can suppress breakage of yarns due to yarn-falling by suppressing a plurality of yarns from spreading over a range wider than a range in an axial direction of a plurality of bobbins held by the bobbin holder when the yarns are disengaged from a traverse device.

[0007] Problems to be solved by the present invention are as described above, and next, means for solving the problems and effects thereof will be described.

[0008] According to an aspect of the present invention, a yarn winding machine with the following configuration is provided. As described above, the yarn winding machine manufactures a package by winding a plurality of yarns fed from a yarn feed roller, onto a plurality of respective bobbins. The yarn winding machine includes a bobbin holder, a plurality of traverse guides, a yarn disengagement guide, restriction guides, and a movement mechanism. The bobbin holder holds the plurality of bobbins. Each of the plurality of traverse guides contacts a corresponding one of the plurality of yarns and traverses the yarn in an axial direction of a bobbin holder. The yarn disengagement guide holds the yarns in a state where the plurality of yarns are disengaged from the plurality of traverse guides. The restriction guides are respectively arranged so as to correspond to both sides of a range in an axial direction of the plurality of bobbins, and restrict the plurality of yarns when being held by the yarn disengagement guide so that positions of the yarns in the axial direction of the bobbin holder are within the range in the axial direction of the plurality of bobbins held by the bobbin holder. The movement mechanism allows for movement of the restriction guide between a restriction position where the restriction guide acts on the yarns to restrict the yarns and a retracted position where the restriction guide is retracted from the restriction position. The yarn disengagement guide is movable between a holding position where the yarn disengagement guide holds the plurality of yarns and a retracted position where the yarn disengagement guide is retracted from the holding position. Each of the restriction guides includes an attachment part attached to the movement mechanism and an action part that acts on the yarns. When a direction in which the yarn feed roller is positioned with respect to the yarn winding machine is a height direction, and a direction perpendicular to both the height direction and the axial direction of the bobbin holder is a direction perpendicular to the axis, the action part is positioned closer to the yarn path than the attachment part in the direction perpendicular to the axis, both when the restriction guide is at the restriction position and when the restriction guide

is at the retracted position.

[0009] As a result, the restriction guides restrict the yarns so that yarns are within a range in the axial direction of the plurality of bobbins, and thus, the yarns can be suppressed from spreading when the yarns are disengaged from the traverse device. Therefore, the yarn threading operation of threading the yarns on the bobbin holder can be facilitated. The restriction guide can be moved to the retracted position when restriction of the yarns is not required. Therefore, the handling is easy as compared to a configuration in which attachment and removal is required. Furthermore, the restriction guide can be moved between the restriction position and the retracted position without significantly changing the posture of the restriction guide. As a result, a small movement trajectory of the restriction guide can be achieved, and thus a space for arranging other members can be increased. In addition, it is possible to suppress occurrence of yarn-falling, because the yarns can be suppressed from spreading when the yarns are disengaged from the traverse device. Thus, it is possible to suppress occurrence of yarn breakage due to yarn-falling.

[0010] In the yarn winding machine, it is preferable that the movement mechanism includes a mechanism for sliding the restriction guide in the axial direction of the bobbin holder, at least within the range in the axial direction of the plurality of bobbins.

[0011] During the yarn threading operation, the restriction guide at the restriction position can be slid to disperse winding positions of the yarns restricted by the restriction guide.

[0012] In the yarn winding machine, it is preferable that sliding of the restriction guide in the axial direction of the bobbin holder causes switching between the restriction position and the retracted position of the restriction guide.

[0013] In this configuration, switching between the restriction position and the retracted position can be performed by a simple operation with a small movement trajectory.

[0014] The yarn winding machine preferably includes an operation part arranged on an end side in the axial direction of the bobbin holder with respect to the restriction guide and connected to the restriction guide, and the operation part can be used to perform an operation of sliding the restriction guide.

[0015] In this configuration, the restriction guide can be more easily slid as compared to a case where the restriction guide is operated directly by hand.

[0016] In the yarn winding machine, it is preferable that movement of the action part in a direction away from the yarn feed roller in the height direction causes switching from the restriction position to the retracted position of the restriction guide.

[0017] In this configuration, the restriction guide is suppressed from interfering with the operation of other devices.

[0018] The yarn winding machine preferably has the following configuration. That is, the movement mechanism

includes a support rail that is provided along the axial direction of the bobbin holder and supports the restriction guide so that the restriction guide is retained at the restriction position. The restriction guide is slidable in the axial direction of the bobbin holder along the support rail. Sliding of the restriction guide beyond the position where the support rail is arranged causes switching from the restriction position to the retracted position of the restriction guide.

[0019] In this configuration, a member for assisting with sliding and a member for retaining the restriction guide at the restriction position can be made common. In addition, switching from the restriction position to the retracted position can be easily performed.

[0020] The yarn winding machine preferably has the following configuration. That is, the movement mechanism includes a support shaft member and a connecting member connecting the support shaft member and the restriction guide. When the restriction guide is at the restriction position, the connecting member extends from the support shaft member toward the yarn path in the direction perpendicular to the axis. When the restriction guide is at the retracted position, the connecting member extends from the support shaft member toward the side opposite the yarn path in the direction perpendicular to the axis.

[0021] In this configuration, the movement trajectory of the restriction guide can be made smaller as compared to a configuration in which the restriction guide itself is reversed.

[0022] The yarn winding machine preferably has the following configuration. That is, the yarn winding machine includes a first housing and a second housing. The traverse guide is arranged in the first housing. The second housing is arranged to face the first housing across the yarn path. The yarn disengagement guide is arranged on the first housing. The restriction guides are arranged on the second housing.

[0023] In this configuration, the yarn disengagement guide and the restriction guides can be arranged in a suitable manner.

[0024] The yarn winding machine preferably has the following configuration. That is, the yarn winding machine includes a yarn separating guide that separates the plurality of yarns individually and holds each of the yarns in a traverse range of a corresponding one of the plurality of traverse guides. The yarn separating guide is movable between a yarn separating position where the yarn separating guide separates and holds the plurality of yarns, and a retracted position where the yarn separating guide is retracted from the yarn separating position.

[0025] In this configuration, while restricting the plurality of yarns by the restriction guides, each of the plurality of yarns can be guided into the traverse range of the corresponding traverse guide and brought into contact (engagement) with the traverse guide. Thus, the yarn threading operation is facilitated.

[0026] In the yarn winding machine, it is preferable that

the pitch between the plurality of yarns on the bobbin holder is smaller than the pitch between the plurality of yarns on the yarn feed roller.

[0027] When the pitch between the plurality of yarns on the bobbin holder is smaller than the pitch between the plurality of yarns on the yarn feed roller, the plurality of yarns tend to spread over a wider range than the range in the axial direction of the plurality of bobbins held by the bobbin holder. Therefore, the effect of providing the restriction guides can be effectively exhibited.

Brief Description of Drawings

[0028]

FIG. 1 is a front view of a yarn winding machine according to a first embodiment;

FIG. 2 is a block diagram of the yarn winding machine;

FIG. 3 is a perspective view illustrating a part of the yarn winding machine;

FIG. 4 is a diagram illustrating local thickening of wound yarns at ends of a bobbin holder during a yarn threading operation;

FIG. 5 is a perspective view of a restriction guide and a movement mechanism;

FIG. 6 is a side view of the restriction guide and the movement mechanism;

FIG. 7 is a perspective view of an opening/closing guide;

FIG. 8 is a perspective view illustrating a state in which yarns from a yarn feed roller are threaded onto a yarn separating guide, for performing the yarn threading operation;

FIG. 9 is a perspective view illustrating a state in which the restriction guides restrict the yarns in a range in the axial direction of bobbins, during the yarn threading operation;

FIG. 10 is a perspective view illustrating a state in which the yarns are wound for manufacturing a package, after the yarn threading operation;

FIG. 11 is a perspective view of a variation of the opening/closing guide;

FIG. 12 is a perspective view of restriction guides and a movement mechanism according to a second embodiment;

FIG. 13 is a side view of the restriction guide and the movement mechanism according to the second embodiment;

FIG. 14 is a perspective view of a restriction guide and a movement mechanism according to a

third embodiment; and

[0029] FIG. 15 is a side view of the restriction guide and the movement mechanism according to the third embodiment.

Description of Embodiments

[0030] Next, an embodiment of the present invention will be described with reference to drawings. FIG. 1 is a front view of a yarn winding machine 1 according to the first embodiment. FIG. 2 is a block diagram of the yarn winding machine 1. In the following description, upstream or downstream in a yarn running direction may simply be referred to as "upstream" or "downstream".

[0031] An unillustrated spinning machine is arranged upstream of the yarn winding machine 1 illustrated in FIG. 1. A yarn 91 manufactured by a spinning machine is supplied to the yarn winding machine 1 via a yarn feed roller 100. The yarn winding machine 1 winds the yarn 91 on a bobbin 90 and forms a yarn layer on the bobbin 90 to manufacture a package 92. The yarn 91 is an elastic yarn such as spandex. However, the type of the yarn 91 is not limited to such a yarn, and a synthetic yarn such as nylon or polyester may be used.

[0032] As illustrated in FIG. 1, the yarn winding machine 1 includes two winding units 10 arranged vertically. The yarn 91 is individually supplied to each of the winding units 10, and the package 92 is individually manufactured in each of the winding units 10. A plurality of the yarns 91 arranged in an axial direction of the packages 92 are supplied to the winding units 10. The winding units 10 wind each of the plurality of yarns 91 to manufacture the plurality of the packages 92.

[0033] The two winding units 10 each include the same device, and thus, the upper and lower winding units 10 will be collectively described below. As illustrated in FIG. 1, each of the winding units 10 includes a frame 11, a first housing 20, a second housing 30, and a turret plate 40.

[0034] The frame 11 is a member that holds each component provided in the winding unit 10. The first housing 20 is attached with a traverse device 21. As a result of the traverse device 21 reciprocating in a winding width direction (axial direction of the package 92) with a traverse guide 23 described later being engaged with the yarn 91, each of the yarns 91 fed downstream is traversed. As illustrated in FIG. 2, the traverse device 21 includes a traverse cam 22, a traverse guide 23, and a traverse motor 24. FIG. 2 illustrates a block diagram of one of the winding units 10.

[0035] The traverse cam 22 is a roller-shaped member arranged parallel to the bobbin 90. A spiral cam groove is formed on an outer peripheral surface of the traverse cam 22. The traverse cam 22 is rotationally driven by the traverse motor 24.

[0036] The traverse guide 23 is a portion that is engaged with the yarn 91. A distal end of the traverse guide 23 includes, for example, a substantially U-shaped guide part that engages with the yarn 91 while sandwiching the yarn 91 in the winding width direction. A proximal end of the traverse guide 23 is positioned in a cam groove of the traverse cam 22. When the traverse cam 22 is rotationally driven, it is possible to reciprocate the traverse

guide 23 in the winding width direction.

[0037] The traverse motor 24 is controlled by a control device 50. The control device 50 includes CPU, ROM, and RAM. The CPU executes various controls related to the winding units 10 by reading a program stored in the ROM into the RAM and executing such a program.

[0038] The second housing 30 is rotatably attached with a contact roller 31. When the yarn 91 is wound, the contact roller 31 is driven to rotate with a contact with the yarn layer of the package 92 with a predetermined pressure to arrange a yarn layer shape of the package 92.

[0039] An operation panel 32 is provided on the second housing 30. The operation panel 32 is a device operated by an operator. The operator applies an instruction to the winding unit 10 by operating the operation panel 32. Examples of the instruction applied by the operator include starting winding, stopping winding, and changing a winding condition.

[0040] The turret plate 40 is a disk-shaped member. The turret plate 40 is rotatably attached to the frame 11. The position of the rotation axis of the turret plate 40 coincides with the center position of the turret plate 40. The turret plate 40 is rotationally driven by a turret motor 41 illustrated in FIG. 2. The turret motor 41 is controlled by the control device 50.

[0041] On the turret plate 40, a bobbin holder 42 is provided at each of two locations facing each other across the center position. A plurality of the bobbins 90 can be attached on the bobbin holder 42 by being arranged in the axial direction. When the turret plate 40 is rotated, it is possible to change the positions of the two bobbin holders 42. Each of the bobbin holders 42 is supported by the turret plate 40 in a cantilevered state.

[0042] The bobbin holders 42 are rotatable with respect to the turret plate 40 with the axial position of the bobbin holders 42 being the center of rotation. Each of the two bobbin holders 42 is rotationally driven individually by a bobbin holder motor 43 illustrated in FIG. 2. The bobbin holder motor 43 is controlled by the control device 50.

[0043] With the two bobbin holders 42 arranged vertically, the yarn 91 is wound on the upper one of the two bobbin holders 42. Specifically, the yarn is threaded onto the bobbins 90 of one of the bobbin holders 42, and then the other of the bobbin holders 42 contacts the contact roller 31, and the other bobbin holder 42 is rotated in such a state, resulting in winding of the yarns 91 on the bobbins 90 of the other bobbin holder 42 to manufacture the package 92. It is noted that a distal end support member 45 (FIG. 1) is provided for supporting an end at a free end side of one of the bobbin holders 42 positioned to contact the contact roller 31.

[0044] Once a predetermined amount of yarn 91 has been wound and full winding of the package 92 has been achieved, the turret plate 40 rotates to switch the positions of the two bobbin holders 42. Thereafter, while the package 92 in which the full winding is achieved is collected, the yarn 91 is wound on the bobbins 90 attached

to one of the bobbin holders 42.

[0045] In a stage prior to the manufacture of the package 92, the operator performs a yarn threading operation in which the yarn 91 is wound onto the bobbins 90 of one of the two bobbin holders 42, and then performs dead turns. Next, the yarn threading operation and dead turns will be explained. In the present embodiment, the winding width direction, the axial direction of the package 92, and the axial direction of the bobbin holders 42 (the bobbin holder axial direction) are all parallel. In the description below, these directions are collectively referred to simply as the "axial direction". The direction in which the yarn feed roller 100 is positioned with respect to the yarn winding machine 1 is referred to as the "height direction". In particular, the side closer to the yarn feed roller 100 in the height direction is called the upper side, and the opposite side is called the lower side. A direction perpendicular to both the axial direction and the height direction is referred to as a "direction perpendicular to the axis".

[0046] In the stage of yarn threading by the operator, the yarn 91 is wound in a state in which the yarn 91 is not engaged with the traverse guide 23. Also, the traverse guide 23 is driven at a lower speed than usual. Therefore, even after the yarn 91 is engaged with the traverse guide 23 after the yarn threading, the quality of the yarn 91 cannot be ensured until the traverse guide 23 returns to the normal speed. Therefore, it is necessary to wind the yarn 91 of low quality and discard the wound yarn 91 by performing dead turns.

[0047] Here, in the present embodiment, the length of the bobbin holder 42 in the axial direction (the length indicated by symbol L2 in FIG. 3) is shorter than the length of the yarn feed roller 100 in the axial direction (the length indicated by L1 in FIG. 3). Therefore, the pitch between the yarns on the bobbin holder 42 is smaller than the pitch between the yarns on the yarn feed roller 100. When dead turns are performed under such conditions, the following situation may occur. That is, when the yarns 91 from the yarn feed roller 100 are threaded onto the bobbins 90, yarn-falling, which means that the yarn 91 located at an end in the axial direction of the yarn feed roller 100 falls to the outside in the axial direction of the bobbin 90 arranged at the end in the axial direction, may occur. In such a case, as a result of the yarn-falling, yarn breakage may occur. Moreover, even if yarn-falling does not occur, there is a possibility that a plurality of yarns 91 will be concentrated at the ends of the bobbins 90 in the axial direction as illustrated in FIG. 4. As a result, there is a possibility that the yarn layer will collapse and yarn breakage will occur because the winding will be locally thickened at the ends in the axial direction during dead turns.

[0048] To suppress yarn breakage due to yarn-falling and local thickening of the winding, the yarn winding machine 1 according to the present embodiment includes restriction guides 60a and movement mechanisms 70a. A range in which the restriction guides 60a restrict the position of the yarn 91 is called a restriction range (a length indicated by L3 in FIG. 3). The restriction range is

on an inner side of the range in the axial direction of the plurality of bobbins 90 (the range where the plurality of bobbins 90 are attached to the bobbin holder 42). The restriction guides 60a and the movement mechanisms 70a according to the present embodiment are arranged on an upper surface of the second housing 30. However, the restriction guides 60a and the movement mechanisms 70a may be arranged at other positions where the yarn 91 can be restricted.

[0049] Hereinafter, a configuration of the restriction guides 60a and the movement mechanisms 70a will be described with reference to FIGS. 3 and 5.

[0050] The restriction guides 60a are provided so as to correspond to both sides of the range in the axial direction of the plurality of bobbins 90, respectively (in other words, to correspond to both sides of the bobbin holder 42 in the axial direction, respectively). Both sides mean one side and the other side with respect to the center in the axial direction. More specifically, the restriction guides 60a are provided so as to correspond to both ends of the range in the axial direction of the plurality of bobbins 90, respectively. The "end" as used herein is a term indicating not only an end point of such an end but also an area in the vicinity of such an end. One of the restriction guides 60a restricts one or a plurality of yarns 91 on one side in the axial direction, and the other of the restriction guides 60a restricts one or a plurality of yarns 91 on the other side in the axial direction. The two restriction guides 60a have a symmetric shape with respect to a plane which is perpendicular to the axial direction and between the two restriction guides 60a. Therefore, the two restriction guides 60a will be collectively described below.

[0051] The restriction guide 60a is a member that directly acts on the yarn 91 (contact the yarn 91) thus restricting the yarn 91. The restriction guide 60a is a member manufactured by punching, bending, and the like of a plate material. However, the restriction guide 60a may be manufactured by attaching a plurality of members.

[0052] As illustrated in FIGS. 3 and 5, the restriction guide 60a includes an attachment part 61, an intermediate part 62, and an action part 63. The attachment part 61 is a portion attached to the movement mechanism 70a. Specifically, the attachment part 61 is a portion in which a through hole is formed. The intermediate part 62 is a portion formed between the attachment part 61 and the action part 63. The action part 63 has a shape that is inclined with respect to the intermediate part 62 and is a portion that contacts the yarn 91.

[0053] The movement mechanisms 70a are provided on both sides in the axial direction, respectively. The two movement mechanisms 70a have a symmetric shape with respect to a plane which is perpendicular to the axial direction and between the two movement mechanisms 70a. Therefore, the two movement mechanisms 70a will be collectively described below. As illustrated in FIGS. 3 and 5, the movement mechanism 70a includes a slide rail (support shaft member) 71 and a support rail 72.

[0054] The slide rail 71 is a cylindrical member provid-

ed along the axial direction. The slide rail 71 is inserted through the through hole of the attachment part 61. Thus, the restriction guide 60a can slide along the slide rail 71. Furthermore, since the cross section of the slide rail 71 is circular, the restriction guide 60a can rotate around the slide rail 71 as the center of rotation. In the yarn winding machine 1 according to the present embodiment, the operator manually slides or rotates the restriction guide 60a. Alternatively, an actuator for driving the restriction guide 60a may be provided. In the present embodiment, the slide rail 71 is a member that functions as both a rail along which the restriction guide 60a slides and a rotation shaft (support shaft member) that supports the restriction guide 60a and around which the restriction guide 60a rotates. Alternatively, the member functioning as the rail and the member functioning as the rotation shaft may be separate members.

[0055] The support rail 72 is located closer to the first housing 20 than the slide rail 71. Similar to the slide rail 71, the support rail 72 is provided along the axial direction. The support rail 72 supports the intermediate part 62 to restricts downward rotation of the restriction guide 60a (in other words, downward movement of the action part 63), as illustrated in an upper diagram in FIG. 5. As a result, the restriction guide 60a can be retained at the restriction position. The restriction position is a position where the restriction guide 60a restricts the yarns 91. By sliding the restriction guide 60a in the axial direction while the intermediate part 62 is supported by the support rail 72, the restriction position can be changed in the axial direction.

[0056] Further, the support rail 72 is not formed at or near the ends in the axial direction. In other words, in the movement mechanism 70a, there is a range in which the slide rail 71 is formed and the support rail 72 is not formed. When the restriction guide 60a slides beyond the position where the support rail 72 is arranged and reaches a range where the support rail 72 is not formed, the intermediate part 62 is no longer supported by the support rail 72, and thus the restriction guide 60a rotates downward (the action part 63 moves downward). As a result, the restriction guide 60a moves to the retracted position. The retracted position is a position where the restriction guide 60a is retracted from the restriction position, and does not restrict the yarn 91 (not interfere with the yarn path).

[0057] The restriction guide 60a according to the present embodiment retracts axially outward from the yarn path by sliding to the end in the axial direction, and also retracts from the yarn path by rotating downward. In the restriction guide 60a according to the present embodiment, the action part 63 is positioned closer to the yarn path than the attachment part 61 in the direction perpendicular to the axis both when the restriction guide 60a is at the restriction position and when restriction guide 60a is at the retracted position.

[0058] With this configuration, the movement trajectory of the restriction guide 60a can be made smaller. Specifically, if the restriction guide 60a is retracted by being

rotated upward by 180 degrees or more (that is, if the attachment part 61 is positioned closer to the yarn path than the action part 63), the movement trajectory of the restriction guide 60a becomes larger. As a result, it is necessary to provide a large space above the restriction guides 60a.

[0059] In contrast, in the present embodiment, the movement trajectory of the restriction guide 60a does not include the space above the restriction guide 60a. Therefore, this space can be effectively utilized. As illustrated in FIG. 6, in the present embodiment, an oil droplet tray 12 is arranged in this space. The oil droplet tray 12 is a member for protecting the first housing 20, the second housing 30, and the yarn path between the first housing 20 and the second housing 30 from being splashed with oil. A member other than the oil droplet tray 12 may be arranged in this space.

[0060] Even if an axial force is applied to the restriction guide 60a due to vibrations or the like, the intermediate part 62 interferes with an end surface of the support rail 72, and thus the restriction guide 60a does not return to the restriction position. Thus, the support rail 72 has both the functions of retaining the restriction guide 60a at the restriction position and retaining the restriction guide 60a at the retracted position. In the present embodiment, the mechanism for retracting the restriction guide 60a by rotating the restriction guide 60a downward is not essential and can be omitted because the restriction guide 60a can be retracted from the yarn path only by being slid in the axial direction. Although the restriction guide 60a according to the present embodiment is a member for use during dead turns, the restriction guide 60a can also be used in other situations where yarn-falling can occur (for example, during the operation of threading the yarn 91 onto the bobbin 90).

[0061] Next, with reference to FIGS. 6 and 7, the opening/closing guide 80 used for dead turns together with the restriction guides 60a and the movement mechanisms 70a will be described.

[0062] The opening/closing guide 80 is arranged on the upper surface of the first housing 20. In other words, when viewed in the direction perpendicular to the axis, the opening/closing guide 80 and the restriction guide 60a are arranged to face each other across the yarn path. As illustrated in FIG. 7, the opening/closing guide 80 includes an opening/closing plate 81, a tubular member 82, a rail 83, a yarn disengagement guide 84, a yarn separating guide 85, and a grip part 86.

[0063] The opening/closing plate 81 is an elongated flat plate, and is arranged so that the longitudinal direction of the opening/closing plate 81 coincides with the axial direction. The tubular member 82 is immovably fixed to an end of the opening/closing plate 81 in the short direction. A through hole is formed in the tubular member 82.

[0064] The rail 83 is a cylindrical member provided along the axial direction. The rail 83 is inserted through the through hole of the tubular member 82. This allows the tubular member 82 to slide along the rail 83. The

tubular member 82 is fixed to the opening/closing plate 81, which allows the opening/closing plate 81 to slide along the rail 83 in the axial direction. Furthermore, since the cross section of the rail 83 is circular, the opening/closing plate 81 can rotate around the rail 83 as the center of rotation. In the yarn winding machine 1 according to the present embodiment, the operator manually operates the opening/closing guide 80. Alternatively, an actuator for driving the opening/closing guide 80 may be provided.

[0065] In addition, the yarn disengagement guide 84 and the yarn separating guide 85 are provided on the opening/closing plate 81. As a result, the yarn disengagement guide 84 and the yarn separating guide 85 can be brought closer to the yarn path or separated from the yarn path.

[0066] The yarn disengagement guide 84 is provided at an end of the opening/closing plate 81 in the short direction. In the present embodiment, the opening/closing plate 81 and the yarn disengagement guide 84 are integrally provided, but may be separate as described later. The yarn disengagement guide 84 is movable between a yarn disengagement position corresponding to the opening/closing plate 81 that has been rotated to the restriction guides 60a side (represented by chain lines in an upper diagram in FIG. 7) and a retracted position corresponding to the opening/closing plate 81 that has been rotated to the opposite side (a retracted position where the yarn disengagement guide 84 is retracted from the yarn disengagement position). The yarn disengagement guide 84 when being at the yarn disengagement position interferes with the yarn path when the traverse guide 23 holds the yarn 91, and thus can disengage the yarn 91 from the traverse guide 23. Furthermore, the yarn disengagement guide 84 when being at the yarn disengagement position can hold the yarn 91 that has been disengaged from the traverse guide 23 to prevent the yarn 91 from returning to the traverse guide 23 side.

[0067] The yarn separating guide 85 is arranged at an end of the opening/closing plate 81 in the short direction. The yarn separating guide 85 has a configuration in which a plurality of plate-like members are arranged side by side. The yarn 91 is held by being placed between two plate-like members. The yarn separating guide 85 is a member that assists in holding the yarn 91 on the traverse guide 23. Therefore, the interval at which the yarn separating guide 85 holds the yarns 91 is the same as the interval at which the traverse guides 23 are arranged. Furthermore, a position where each of the yarns 91 is held by the yarn separating guide 85 is within the traverse range of a corresponding one of the traverse guides 23.

[0068] The yarn separating guide 85 is movable between a yarn separating position corresponding to the opening/closing plate 81 that has been rotated to the restriction guides 60a side (represented by the chain lines in the upper diagram in FIG. 7) and a retracted position corresponding to the opening/closing plate 81 that has been rotated to the opposite side (a retracted position

where the yarn separating guide 85 is retracted from the yarn separating position). The yarn separating guide 85 when being at the yarn separating position receives the yarns 91 between plate-like members to hold the plurality of yarns 91 individually in a separated state. Note that the configuration of the yarn separating guide 85 is an example, and for example, a configuration in which grooves are formed at regular intervals in one plate may be used.

[0069] The grip part 86 is formed at one end in the longitudinal direction of the opening/closing plate 81 (the end on the front side). The grip part 86 is a portion that the operator holds by hand when rotating the opening/closing plate 81.

[0070] Next, with reference to FIGS. 8 to 10, a description will be provided for a process from the yarn threading operation, which uses the restriction guides 60a, the movement mechanisms 70a, the opening/closing guide 80, and the like, to the start of package manufacture.

[0071] Firstly, the operator operates the operation panel 32 to rotationally drive the bobbin holder 42 and drive the traverse device 21. At this time, the traverse guides 23 of the traverse device 21 are reciprocatingly driven at a speed lower than the normal speed during package manufacture. As illustrated in FIG. 8, the operator rotates the opening/closing guide 80 to the restriction guides 60a side and then slides the opening/closing guide 80 toward a free end of the bobbin holder 42. The operator holds the plurality of yarns 91 threaded onto the yarn feed roller 100 with a suction gun or the like. In the present embodiment, the yarn 91 is supplied from the yarn feed roller 100 to the upper winding unit 10 and the lower winding unit 10. Therefore, the operator first threads all of the yarns 91 from the yarn feed roller 100 onto the upper winding unit 10, then picks out only the yarns 91 to be fed to the lower winding unit 10 and holds the picked-out yarns 91 using a suction gun or the like, and performs threading of the held yarns 91 onto the lower winding unit 10. However, in this explanation, the yarns 91 supplied from the yarn feed roller 100 are separately threaded onto the upper winding unit 10 and the lower winding unit 10, for the purpose of simplifying the explanation. Thus, the operator holds the plurality of yarns 91 threaded onto the yarn feed roller 100 and to be fed to the upper winding unit 10, with a suction gun or the like. Next, the operator threads the held yarns 91 onto the yarn separating guide 85. At this point, the operator need not separately thread the plurality of yarns 91 onto the yarn separating guide 85. At this point, the restriction guides 60a are at the retracted positions.

[0072] Next, as illustrated in FIG. 9, the operator slides the opening/closing guide 80 back to its original position. At this time, since the restriction guides 60a are at the retracted positions, the yarns 91 do not interfere with the restriction guides 60a. The operator winds the yarn 91 threaded onto the yarn separating guide 85 around the bobbins 90 of one of the bobbin holders 42. Thus, the yarns 91 are wound around the bobbins 90. Next, after

setting the restriction guides 60a to the restriction positions, the operator rotates the opening/closing plate 81 a little up and down. By rotating the opening/closing plate 81 upward, for example, the yarns 91 are disengaged from the yarn separating guide 85 by the yarn disengagement guide 84 and spreads in the axial direction. At this time, since the restriction guides 60a are at the restriction positions, the yarns 91 are restricted so that the positions of the yarns 91 are on the inner side of the restriction positions of the restriction guides 60a, that is, within the range in the axial direction of the plurality of bobbins 90 held by the bobbin holder 42 (the range in the axial direction in which the plurality of bobbins 90 are arranged). At the same time, the restriction guides 60a are slid in the axial direction. As a result, the restriction positions by the restriction guides 60a are dispersed in the axial direction, and thus the plurality of yarns 91 wound on the bobbins 90 on both end sides of the bobbin holder 42 are dispersed in the axial direction. As a result, the local thickening of the winding can be suppressed, making it possible to suppress yarn breakage due to local thickening. After that, the operator rotates the opening/closing plate 81 downward to hold the yarn 91 in another yarn separating guide 85. By repeating the operation, the position of the plurality of yarns 91 can be spread out (separated) in the axial direction. Finally, the operator causes the yarn separating guide 85 to individually hold the plurality of yarns 91 so that each one of the yarns 91 is arranged in an axial range of a corresponding one of the bobbins 90. Since the restriction guides 60a are at the restriction positions, the yarn 91 does not move outside the axial ranges of the respective bobbins 90. Therefore, yarn-falling of the yarns 91 which are spread in the axial direction, from the bobbins 90 is suppressed.

[0073] When the above operation is completed, the yarn threading operation onto one of the bobbin holders 42 of the lower winding unit 10 is performed in the same manner as for the upper winding unit 10.

[0074] When the above-described operations are completed in both the upper winding unit 10 and the lower winding unit 10, the operator operates the operation panel 32 in each of the upper winding unit 10 and the lower winding unit 10 to rotationally drive the turret plate 40, and the operation of switching the position of the bobbin holder 42 starts. At the same time, the traverse guide 23 of the traverse device 21 switches to the normal high speed drive. Almost at the same time, the operator rotates the opening/closing guide 80 in each of the upper winding unit 10 and the lower winding unit 10 to return the opening/closing guide 80 to the original position, as illustrated in FIG. 10. In other words, the yarn disengagement guide 84 and the yarn separating guide 85 are returned to the retracted position. Since each one of the yarns 91 is arranged in an axial range of a corresponding one of the bobbins 90, after the yarn disengagement guide 84 and the yarn separating guide 85 are retracted to the retracted position, each of the yarns 91 are held by a corresponding one of the plurality of traverse guides

23. Once the yarns 91 are held by the traverse guides 23, the restriction of the yarns 91 by the restriction guides 60a is no longer needed. The operator moves the restriction guides 60a to the retracted positions. In the present embodiment, the movement trajectory during the movement of the restriction guide 60a from the restriction position to the retracted position does not interfere with the yarn separating guide 85 when being at the yarn separating position. Therefore, the restriction guides 60a can be moved to the retracted positions without interference with the yarn separating guide 85. As a result of switching the position of the bobbin holder 42 through the rotation of the turret plate 40, the bobbins 90 of the other bobbin holder 42 contact the contact roller 31, and the yarns 91 are wound around the bobbins 90 to manufacture the package 92. The yarns 91 wound around the bobbins 90 of one of the bobbin holders 42 for the yarn threading operation described above are pulled out from the bobbin holder 42 together with the bobbins 90 and removed. New bobbins 90 are attached to the one of bobbin holders 42.

[0075] In the present embodiment, the upper opening/closing guide 80 and the lower opening/closing guide 80 have the same configuration. Alternatively, the upper opening/closing guide 80 and the lower opening/closing guide 80 may have different configurations. For example, the upper opening/closing guide 80 may have the configuration illustrated in FIG. 11. As illustrated in FIG. 1, the yarn path from the yarn feed roller 100 to the lower winding unit 10 is parallel or substantially parallel to the vertical direction, whereas the yarn path from the yarn feed roller 100 to the upper winding unit 10 has a relatively large inclination with respect to the vertical direction. Therefore, there may be a case where rotating up and down the opening/closing plate 81 after the yarns 91 are threaded onto the yarn separating guide 85 does not cause sufficient retraction of the yarn separating guide 85 with respect to the yarns 91 to disengage the yarns 91 from the yarn separating guide 85 and spread the yarns 91 in the axial direction.

[0076] In this regard, the opening/closing guide 80 illustrated in FIG. 11 allows the yarn disengagement guide 84 and the yarn separating guide 85 to operate individually. Specifically, the opening/closing guide 80 includes a first opening/closing plate 81a and a second opening/closing plate 81b. The first opening/closing plate 81a and the second opening/closing plate 81b are rotatably attached to the rail 83 individually. The sliding function of the first opening/closing plate 81a and the second opening/closing plate 81b may be omitted. The yarn disengagement guide 84 is attached to the first opening/closing plate 81a. The yarn separating guide 85 is attached to the second opening/closing plate 81b.

[0077] As illustrated in an upper diagram in FIG. 11, when the yarn disengagement guide 84 is at the yarn disengagement position and the yarn separating guide 85 is at the yarn separating position, the yarn disengagement guide 84 contacts the yarn 91, but the yarn separating guide 85 does not contact the yarn 91. Therefore,

by rotating the first opening/closing plate 81a up and down in this state, the yarn 91 can be spread in the axial direction. As illustrated in the upper diagram in FIG. 11, even if the yarn disengagement guide 84 is at the yarn disengagement position, the restriction guides 60a when being at the restriction position interfere with the yarn path and can restrict the yarn 91.

[0078] During the yarn threading operation, the first opening/closing plate 81a is at a rotated position on the first housing 20 side, and the yarn disengagement guide 84 is at the retracted position. As illustrated in a lower diagram in FIG. 11, even if the yarn disengagement guide 84 is at the retracted position, the restriction guides 60a when being at the restriction position overlap the yarn path. Therefore, the restriction guides 60a can restrict the yarn 91 even during the yarn threading operation.

[0079] Next, restriction guides 60b and a movement mechanism 70b of a second embodiment will be described with reference to FIGS. 12 and 13. In the following description, members identical or similar to those of the above-described embodiment will be denoted by the same corresponding reference signs on the drawings, and a description thereof may be omitted. In addition, the matters described in the above embodiment are also applied to the second embodiment as long as there is no contradiction.

[0080] The second embodiment differs from the first embodiment mainly in the following two points. The first point is that the restriction guides 60b are moved from the restriction position to the retracted position only by sliding and not rotating the restriction guides 60b. The second point is that the operator slides the restriction guides 60b by operating operation parts 75.

[0081] The restriction guides 60b and the movement mechanism 70b of the second embodiment will be described below. The restriction guides 60b are arranged on both sides of the second housing 30 in the axial direction, respectively. The two restriction guides 60b have a symmetric shape with respect to a plane which is perpendicular to the axial direction and between the two restriction guides 60b. Therefore, the two restriction guides 60b will be collectively described below.

[0082] The restriction guide 60b includes the attachment part 61, the intermediate part 62, and the action part 63. The attachment part 61 has substantially the same configuration as that of the first embodiment. The intermediate part 62 is a portion provided between the attachment part 61 and the action part 63. The intermediate part 62 has a shape extending along the surface of the second housing 30. The action part 63 is provided in a direction to rise up from the surface of the second housing 30. As a result, the action part 63 extends toward the first housing 20, and thus the action part 63 can interfere with the yarn path.

[0083] The movement mechanism 70b according to the second embodiment include two operation rods 73, a plurality of slide guides 74, and two operation parts 75.

The operation rod 73 is a cylindrical member provided along the axial direction. Each of the two operation rods 73 is fixed to a corresponding one of the two attachment parts 61 so as not to move relative to each other. That is, the operation rod 73 can move integrally with the restriction guide 60b.

[0084] A plurality of slide guides 74 are provided along the axial direction. Through holes are formed in the slide guides 74. The operation rods 73 are inserted through the through holes of the slide guides 74. Thereby, the restriction guides 60b and the operation rods 73 can slide along the axial direction.

[0085] The operation parts 75 are provided at an end of the slide guides 74. The operation parts 75 have a diameter larger than that of the slide guides 74 to enable easy gripping by the operator. By moving the operation parts 75 along the axial direction, the operator can slide the restriction guides 60b along the axial direction. To enable easy operation by the operator, the two operation parts 75 are provided at an end on the same side in the axial direction. The end on the side where the operation parts 75 are provided is the end on the front side of the yarn winding machine 1, in other words, the end on the side where the operation panel 32 is provided.

[0086] When the operation parts 75 are at the positions represented by solid lines in FIG. 12, the two restriction guides 60b are at the retracted positions. At this time, the positions of the two operation parts 75 in the axial direction is the same. To move the two restriction guides 60b from this state to the restriction positions represented by chain lines, it is necessary to move the two operation parts 75 in different axial directions. Also in the second embodiment, the action part 63 is positioned closer to the yarn path than the attachment part 61 in the direction perpendicular to the axis, both when the restriction guide 60b is at the restriction position and when restriction guide 60b is at the retracted position.

[0087] The process of performing the yarn threading operation using the restriction guides 60b and the movement mechanism 70b is substantially the same as that of the above-described embodiment, so only the following supplementary description will be given, and the description of the entire yarn threading operation will be omitted. In the second embodiment, when the operator slides the opening/closing guide 80 back to its original position, the yarn 91 moves from the outside of the action part 63 of the restriction guide 60b over the action part 63 to the inside of the action part 63. Therefore, the outer shape of the action part 63 is formed into a smoothly curved shape so that the yarn 91 can be easily guided to the inner side of the action part 63.

[0088] Next, restriction guides 60c and movement mechanisms 70c of a third embodiment will be described with reference to FIGS. 14 and 15. In addition, the matters described in the above embodiment are also applied to the third embodiment as long as there is no contradiction.

[0089] The third embodiment differs from the first embodiment in the configuration for moving the restriction

guides 60c from the restriction positions to the retracted positions. The restriction guides 60c and the movement mechanisms 70c are arranged on both sides of the second housing 30 in the axial direction, respectively. The two pairs of the restriction guide 60c and the movement mechanism 70c have a symmetric shape with respect to a plane which is perpendicular to the axial direction and between the two pairs. Therefore, the two pairs of the restriction guide 60c and the movement mechanism 70c will be collectively described below.

[0090] As illustrated in FIGS. 14 and 15, the movement mechanism 70c includes the slide rail 71 and a connecting member 76. The slide rail 71 is a cylindrical member provided along the axial direction. The connecting member 76 is a member having a through hole. The slide rail 71 is inserted through the through hole of the connecting member 76 and serves as a support shaft member for the connecting member. As a result, the connecting member 76 can slide along the slide rail 71. Furthermore, since the cross section of the slide rail 71 is circular, the connecting member 76 can rotate around the slide rail 71 as the center of rotation.

[0091] The restriction guide 60c includes the attachment part 61, the action part 63, and a weight part 65. The attachment part 61 is rotatably attached to the connecting member 76. The rotational direction of the attachment part 61 with respect to the connecting member 76 is parallel to the rotational direction of the connecting member 76 with respect to the slide rail 71. The action part 63 is a portion that acts on the yarn 91 to restrict the yarn 91, similar to the above-described embodiment. The weight part 65 is provided on the opposite side of the action part 63 with the attachment part 61 interposed therebetween. The weight part 65 prevents the action part 63 from rotating downward.

[0092] With this configuration, by rotating the connecting member 76 with respect to the slide rail 71, the restriction guide 60c can be moved closer to or away from the yarn path. Specifically, when the connecting member 76 extends from the slide rail 71 to the yarn path side in the direction perpendicular to the axis, the restriction guide 60c can be positioned at the restriction position. On the other hand, when the connecting member 76 extends from the slide rail 71 to the opposite side of the yarn path in the direction perpendicular to the axis, the restriction guide 60c can be positioned at the retracted position.

[0093] When the restriction guide 60c is at the restriction position, the movement mechanism 70c supports the weight part 65 so that the action part 63 is substantially horizontal. On the other hand, when the restriction guide 60c is at the retracted position, the second housing 30 supports the weight part 65 so that the action part 63 can be oriented upward. Thus, in addition to advancement and retraction of the restriction guide 60c in the direction perpendicular to the axis, the orientation of the action part 63 can also contribute to the retraction of the restriction guide 60c from the yarn path.

[0094] Also in the third embodiment, the action part 63 is positioned closer to the yarn path than the attachment part 61 in the direction perpendicular to the axis both when the restriction guide 60c is at the restriction position and when restriction guide 60c is at the retracted position. The process of performing the yarn threading operation using the restriction guides 60c and the movement mechanisms 70c is the same as in the above-described embodiment, so the description is omitted.

[0095] As described above, the yarn winding machine 1 manufactures the package 92 by winding the plurality of yarns 91 fed from the yarn feed roller 100, onto the plurality of respective bobbins 90. The yarn winding machine 1 according to the present embodiment includes the bobbin holder 42, the plurality of traverse guides 23, the yarn disengagement guide 84, the restriction guides 60a, 60b, 60c, and the movement mechanism 70a, 70b, 70c. The bobbin holder 42 holds the plurality of bobbins 90. Each of the plurality of traverse guides 23 contacts a corresponding one of the plurality of yarns 91 and traverses the yarn 91 in the axial direction of the bobbin holder. The yarn disengagement guide 84 holds the yarns 91 in a state where the plurality of yarns 91 are disengaged from the plurality of traverse guides 23. The restriction guides 60a, 60b, 60c are respectively arranged so as to correspond to both sides of a range in the axial direction of the plurality of bobbins 90, and restrict the plurality of yarns 91 when being held by the yarn disengagement guide 84 so that positions of the yarns 91 in the axial direction of the bobbin holder are within the range in the axial direction of the plurality of bobbins 90 held by the bobbin holder 42. The movement mechanism 70a, 70b, 70c allows for movement of the restriction guide 60a, 60b, 60c between a restriction position where the restriction guide 60a, 60b, 60c acts on the plurality of yarns 91 to restrict the plurality of yarns 91 and a retracted position where the restriction guide 60a, 60b, 60c is retracted from the restriction position. The yarn disengagement guide 84 is movable between a holding position where the yarn disengagement guide 84 holds the plurality of yarns 91 and a retracted position where the yarn disengagement guide 84 is retracted from the holding position. Each of the restriction guides 60a, 60b, 60c includes the attachment part 61 attached to the movement mechanism 70a, 70b, 70c and the action part 63 that acts on the yarns 91. When a direction in which the yarn feed roller 100 is positioned with respect to the yarn winding machine 1 is a height direction, and a direction perpendicular to both the height direction and the axial direction of the bobbin holder is a direction perpendicular to the axis, the action part 63 is positioned closer to the yarn path than the attachment part 61 in the direction perpendicular to the axis, both when the restriction guide is at the restriction position and when the restriction guide is at the retracted position.

[0096] As a result, the restriction guides 60a, 60b, 60c restrict the yarns 91 so that yarns 91 are within a range in the axial direction of the bobbins 90, and thus, the

yarns 91 can be suppressed from spreading when the yarns 91 are disengaged from the traverse guides 23. Therefore, the yarn threading operation of threading the yarns 91 on the bobbin holder 42 can be facilitated. The restriction guide 60a, 60b, 60c can be moved to the retracted position when restriction of the yarns 91 is not required. Therefore, the handling is easy as compared to a configuration in which attachment and removal is required. Furthermore, the restriction guide 60a, 60b, 60c can be moved between the restriction position and the retracted position without significantly changing the posture of the restriction guide 60a, 60b, 60c. As a result, a small movement trajectory of the restriction guide 60a, 60b, 60c can be achieved, and thus a space for arranging other members can be increased. In addition, it is possible to suppress occurrence of yarn-falling, because the yarns 91 can be suppressed from spreading when the yarns 91 are disengaged from the traverse device 21. Thus, it is possible to suppress occurrence of yarn breakage due to yarn-falling.

[0097] In the yarn winding machine 1 according to the present embodiment, the movement mechanism 70a, 70b, 70c includes a mechanism for sliding the restriction guide 60a, 60b, 60c in the axial direction of the bobbin holder, at least within the range in the axial direction of the plurality of bobbins 90.

[0098] During the yarn threading operation, the restriction guide 60a, 60b, 60c at the restriction position can be slid to disperse winding positions of the yarns 91 restricted by the restriction guide 60a, 60b, 60c.

[0099] In the yarn winding machine 1 according to the present embodiment, sliding of the restriction guide 60a, 60b in the axial direction of the bobbin holder causes switching between the restriction position and the retracted position of the restriction guide 60a, 60b.

[0100] In this configuration, switching between the restriction position and the retracted position can be performed by a simple operation with a small movement trajectory.

[0101] The yarn winding machine 1 according to the present embodiment includes the operation part 75 arranged on an end side in the axial direction of the bobbin holder with respect to the restriction guide 60b and connected to the restriction guide 60b, and the operation part 75 can be used to perform an operation of sliding the restriction guide 60b.

[0102] In this configuration, the restriction guide can be more easily slid as compared to a case where the restriction guide 60b is operated directly by hand.

[0103] In the yarn winding machine 1 according to the present embodiment, movement of the action part 63 in a direction away from the yarn feed roller 100 in the height direction causes switching from the restriction position to the retracted position of the restriction guide 60a.

[0104] In this configuration, the restriction guide 60a is suppressed from interfering with the operation of other devices.

[0105] In the yarn winding machine 1 according to the

present embodiment, the movement mechanism 70a includes the support rail 72 that is provided along the axial direction of the bobbin holder and supports the restriction guide 60a so that the restriction guide 60a is retained at the restriction position. The restriction guide 60a is slidable in the axial direction of the bobbin holder along the support rail 72. Sliding of the restriction guide 60a beyond the position where the support rail 72 is arranged causes switching from the restriction position to the retracted position of the restriction guide 60a.

[0106] In this configuration, a member for assisting with sliding and a member for retaining the restriction guide 60a at the restriction position can be made common. In addition, switching from the restriction position to the retracted position can be easily performed.

[0107] In the yarn winding machine 1 according to the present embodiment, the movement mechanism 70c includes the slide rail 71 and the connecting member 76 connecting the slide rail 71 and the restriction guide 60c. When the restriction guide 60c is at the restriction position, the connecting member 76 extends from the slide rail 71 toward the yarn path in the direction perpendicular to the axis. When the restriction guide 60c is at the retracted position, the connecting member 76 extends from the slide rail 71 toward the side opposite the yarn path in the direction perpendicular to the axis.

[0108] In this configuration, the movement trajectory of the restriction guide 60c can be made smaller as compared to a configuration in which the restriction guide 60c itself is reversed.

[0109] The yarn winding machine 1 according to the present embodiment includes the first housing 20 and the second housing 30. The traverse device 21 is arranged in the first housing 20. The second housing 30 is arranged to face the first housing 20 across the yarn path. The yarn disengagement guide is arranged on the first housing 20. The restriction guides 60a, 60b, 60c are arranged on the second housing 30.

[0110] In this configuration, the yarn disengagement guide 84 and the restriction guides 60a, 60b, 60c can be arranged in a suitable manner.

[0111] The yarn winding machine 1 according to the present embodiment includes the yarn separating guide 85 that separates the yarns 91 individually and holds each of the yarns 91 in a traverse range of a corresponding one of the plurality of traverse guides 23. The yarn separating guide 85 is movable between a yarn separating position where the yarn separating guide 85 separates and holds the plurality of yarns 91, and a retracted position where the yarn separating guide 85 is retracted from the yarn separating position.

[0112] In this configuration, while restricting the plurality of yarns 91 by the restriction guides 60a, 60b, 60c, each of the plurality of yarns 91 can be guided into the traverse range of the corresponding traverse guide 23 and brought into contact (engagement) with the traverse guide 23. Thus, the yarn threading operation is facilitated.

[0113] In the yarn winding machine 1 according to the

present embodiment, the pitch between the plurality of yarns on the bobbin holder 42 is smaller than the pitch between the plurality of yarns on the yarn feed roller 100.

[0114] When the pitch between the plurality of yarns on the bobbin holder 42 is smaller than the pitch between the plurality of yarns on the yarn feed roller 100, the plurality of yarns 91 tend to spread over a wider range than the range in the axial direction of the plurality of bobbins 90 held by the bobbin holder 42. Therefore, the effect of providing the restriction guides 60a, 60b, 60c can be effectively exhibited.

[0115] Although a preferred embodiment of the present invention has been described above, the above-described configuration can be modified, for example, as follows.

[0116] In the yarn winding machine 1 according to the above embodiment, the winding units 10 are arranged vertically. Alternatively, the winding units 10 may be arranged horizontally, or the yarn winding machine 1 may have only one winding unit 10.

[0117] Although the traverse device 21 of the above embodiment is of cam drum type, the traverse device 21 may have a different configuration as long as it is possible to reciprocate the traverse guide 23 in the winding width direction. For example, instead of the traverse device 21, a belt-type traverse device may be used.

Claims

1. A yarn winding machine (1) that manufactures a package (92) by winding a plurality of yarns (91) fed from a yarn feed roller (100), onto a plurality of respective bobbins (90), the yarn winding machine (1) comprising:

a bobbin holder (42) configured to hold the plurality of bobbins (90);

a plurality of traverse guides (23) each configured to contact a corresponding one of the plurality of yarns (91) and traverse the yarn (91) in an axial direction of the bobbin holder;

a yarn disengagement guide (84) configured to hold the plurality of yarns (91) in a state where the plurality of yarns (91) are disengaged from the plurality of traverse guides (23);

restriction guides (60a, 60b, 60c) that are respectively arranged so as to correspond to both sides of a range in an axial direction of the plurality of bobbins (90), and configured to restrict the plurality of yarns (91) when being held by the yarn disengagement guide (84) so that positions of the plurality of yarns (91) in the axial direction of the bobbin holder are within the range in the axial direction of the plurality of bobbins (90) held by the bobbin holder (42); and a movement mechanism (70a, 70b, 70c) allowing for movement of the restriction guide be-

- tween a restriction position where the restriction guide acts on the plurality of yarns (91) to restrict the plurality of yarns (91) and a retracted position where the restriction guide is retracted from the restriction position, wherein the yarn disengagement guide (84) is movable between a holding position where the yarn disengagement guide (84) holds the plurality of yarns (91) and a retracted position where the yarn disengagement guide (84) is retracted from the holding position, each of the restriction guides includes an attachment part (61) attached to the movement mechanism and an action part (63) configured to act on the plurality of yarns (91), and when a direction in which the yarn feed roller (100) is positioned with respect to the yarn winding machine (1) is a height direction, and a direction perpendicular to both the height direction and the axial direction of the bobbin holder is a direction perpendicular to the axis, the action part (63) is positioned closer to the yarn path than the attachment part (61) in the direction perpendicular to the axis, both when the restriction guide is at the restriction position and when the restriction guide is at the retracted position.
2. The yarn winding machine (1) according to claim 1, wherein the movement mechanism includes a mechanism for sliding the restriction guide in the axial direction of the bobbin holder, at least within the range in the axial direction of the plurality of bobbins (90).
 3. The yarn winding machine (1) according to claim 1 or 2, wherein sliding of the restriction guide in the axial direction of the bobbin holder causes switching between the restriction position and the retracted position of the restriction guide.
 4. The yarn winding machine (1) according to claim 3, further comprising an operation part (75) arranged on an end side in the axial direction of the bobbin holder with respect to the restriction guide and connected to the restriction guide, the operation part (75) being configured to be used to perform an operation of sliding the restriction guide.
 5. The yarn winding machine (1) according to claim 1 or 2, wherein movement of the action part (63) in a direction away from the yarn feed roller (100) in the height direction causes switching from the restriction position to the retracted position of the restriction guide.
 6. The yarn winding machine (1) according to claim 5,
- wherein the movement mechanism includes a support rail (72) provided along the axial direction of the bobbin holder and configured to support the restriction guide so that the restriction guide is retained at the restriction position, the restriction guide is slidable in the axial direction of the bobbin holder along the support rail (72), and sliding of the restriction guide beyond the position where the support rail (72) is arranged causes switching from the restriction position to the retracted position of the restriction guide.
7. The yarn winding machine (1) according to claim 1 or 2, wherein the movement mechanism includes a support shaft member and a connecting member connecting the support shaft member and the restriction guide, when the restriction guide is at the restriction position, the connecting member extends from the support shaft member toward the yarn path in the direction perpendicular to the axis, and when the restriction guide is at the retracted position, the connecting member extends from the support shaft member toward the side opposite the yarn path in the direction perpendicular to the axis.
 8. The yarn winding machine (1) according to any one of claims 1 to 7, further comprising: a first housing (20) in which the plurality of traverse guides (23) are arranged; and a second housing (30) arranged to face the first housing (20) across the yarn path, wherein the yarn disengagement guide (84) is arranged on the first housing (20), and the restriction guides are arranged on the second housing (30).
 9. The yarn winding machine (1) according to any one of claims 1 to 8, further comprising a yarn separating guide (85) configured to separate the plurality of yarns (91) individually and hold each of the plurality of yarns (91) in a traverse range of a corresponding one of the plurality of traverse guides (23), wherein the yarn separating guide (85) is movable between a yarn separating position where the yarn separating guide (85) separates and holds the plurality of yarns (91), and a retracted position where the yarn separating guide (85) is retracted from the yarn separating position.
 10. The yarn winding machine (1) according to any one

of claims 1 to 9, wherein
the pitch between the plurality of yarns on the bobbin
holder (42) is smaller than the pitch between the plu-
rality of yarns on the yarn feed roller (100).

5

10

15

20

25

30

35

40

45

50

55

Fig. 1

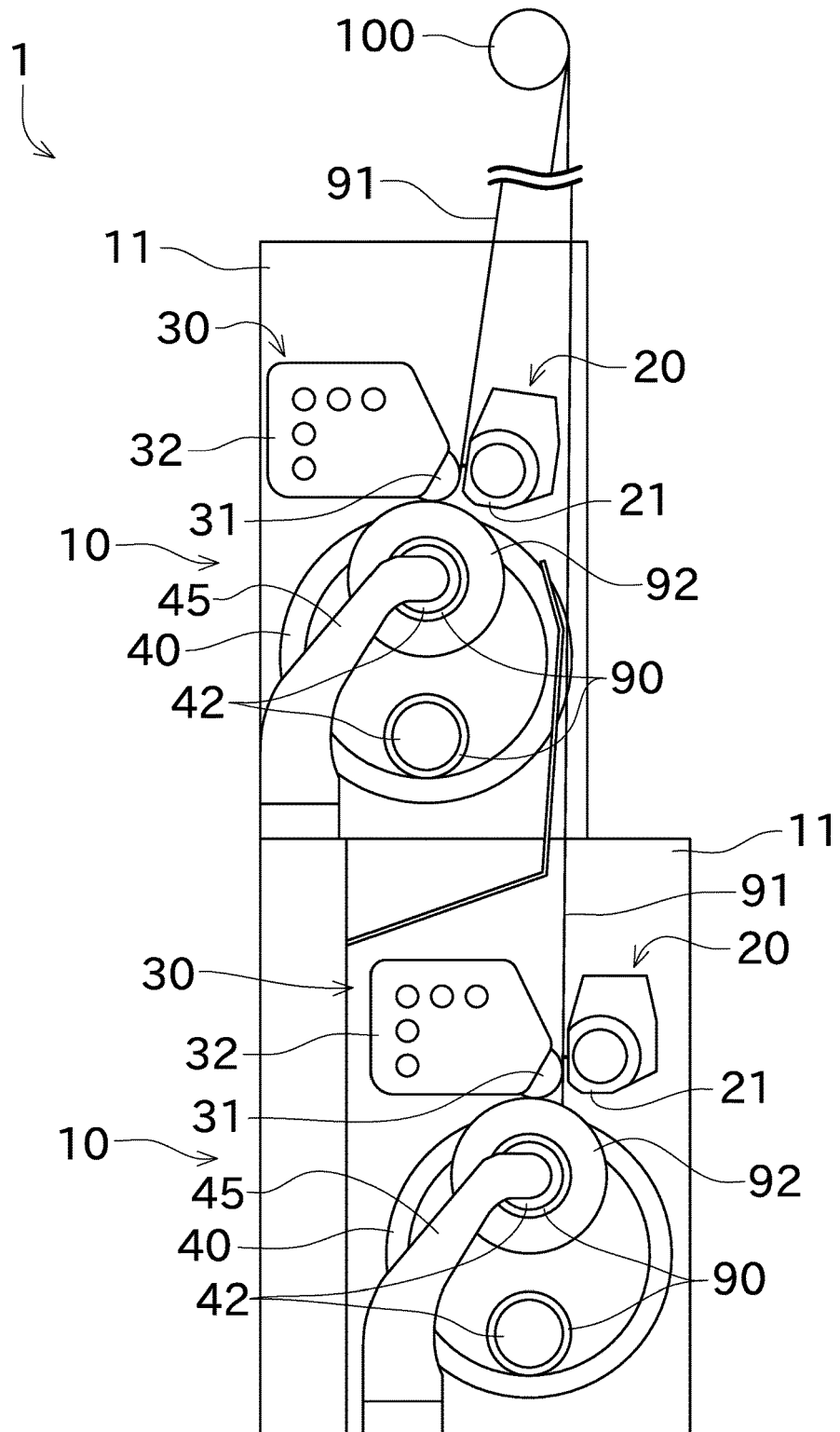


Fig.2

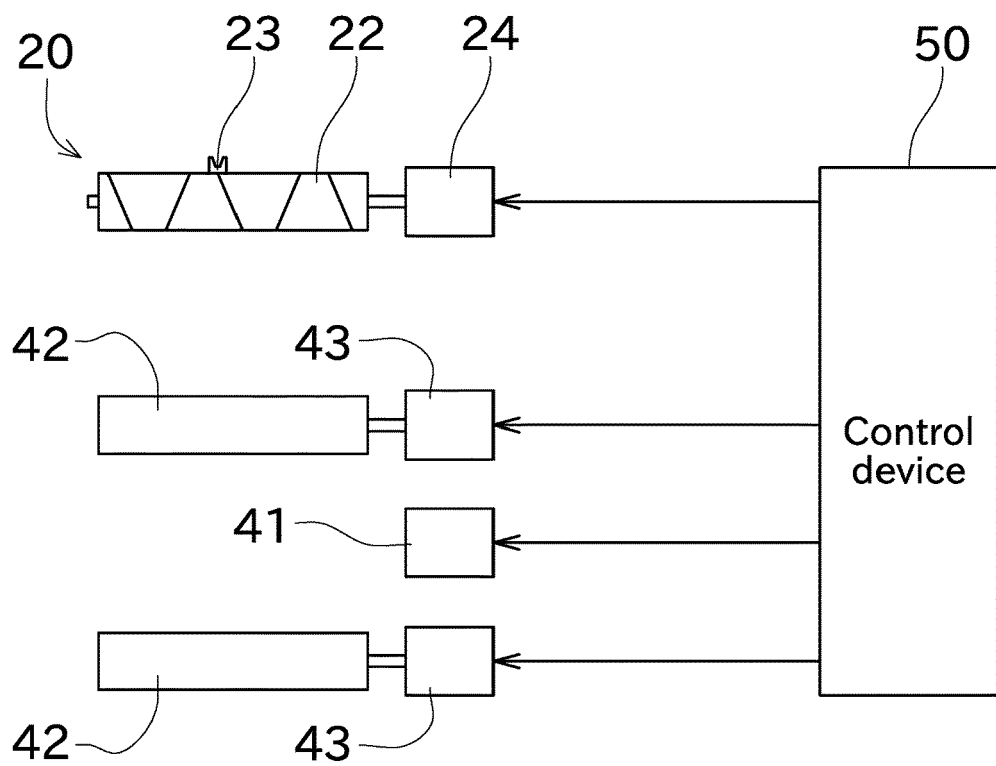


Fig.3

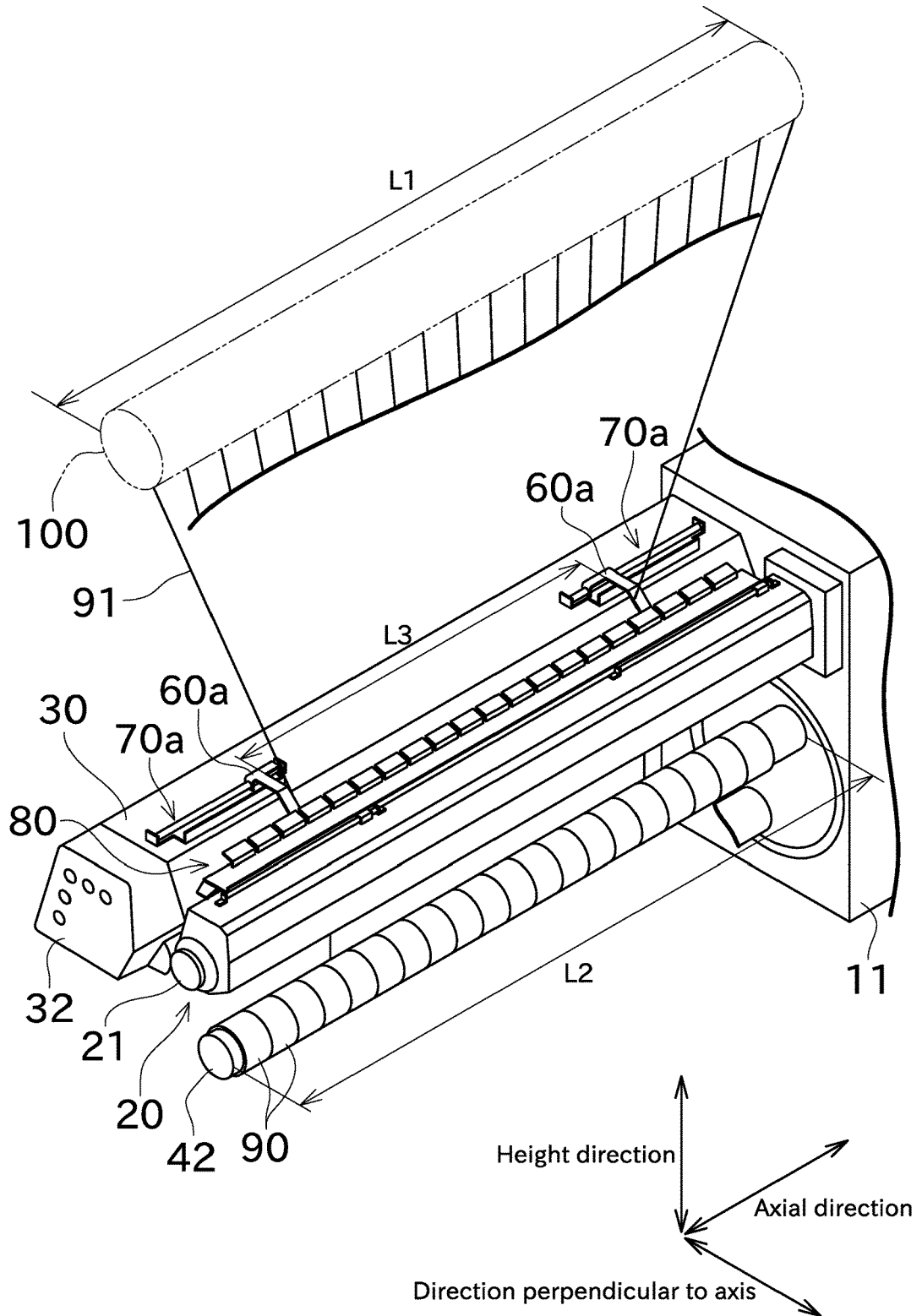


Fig. 4

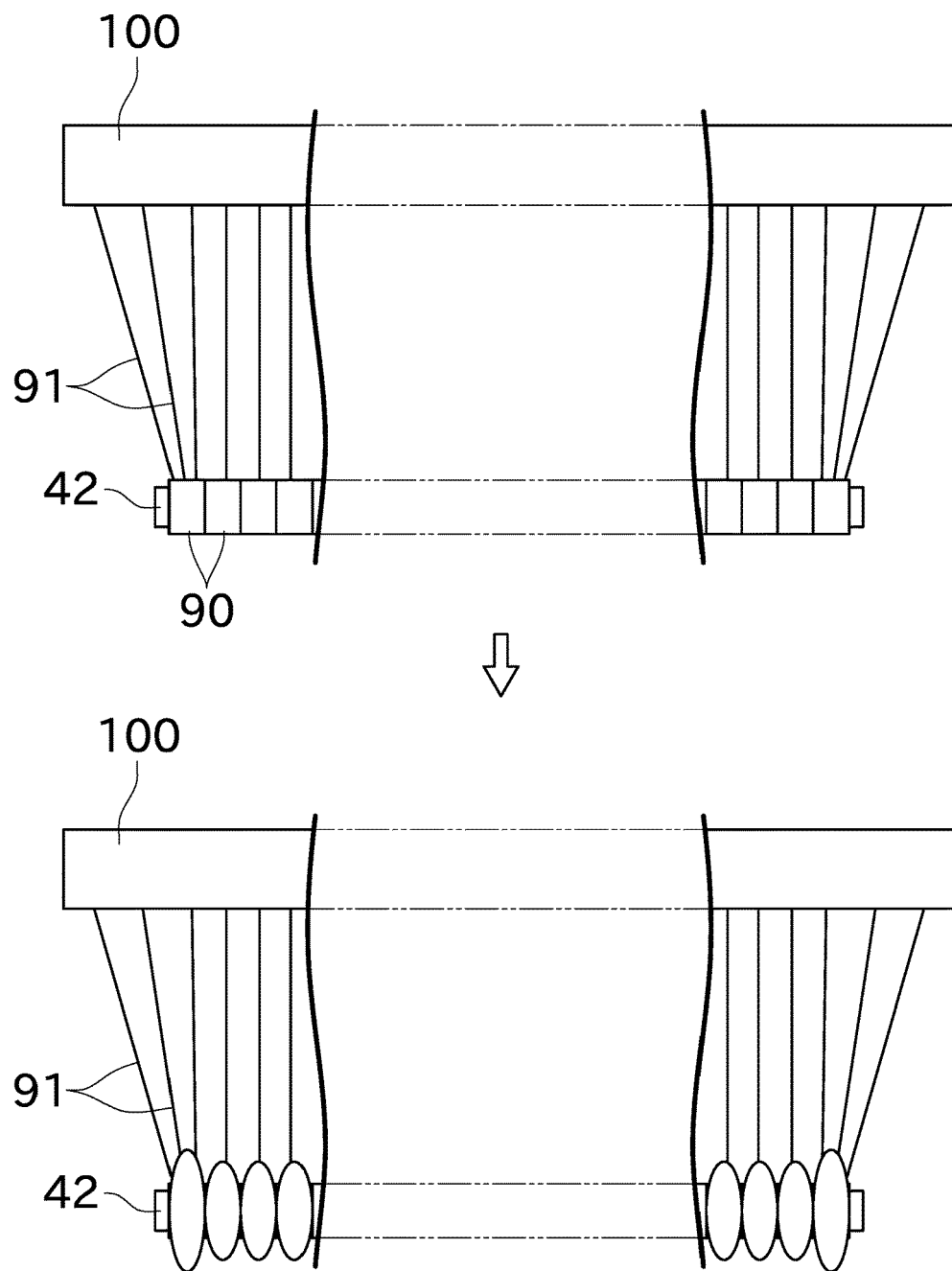


Fig.5

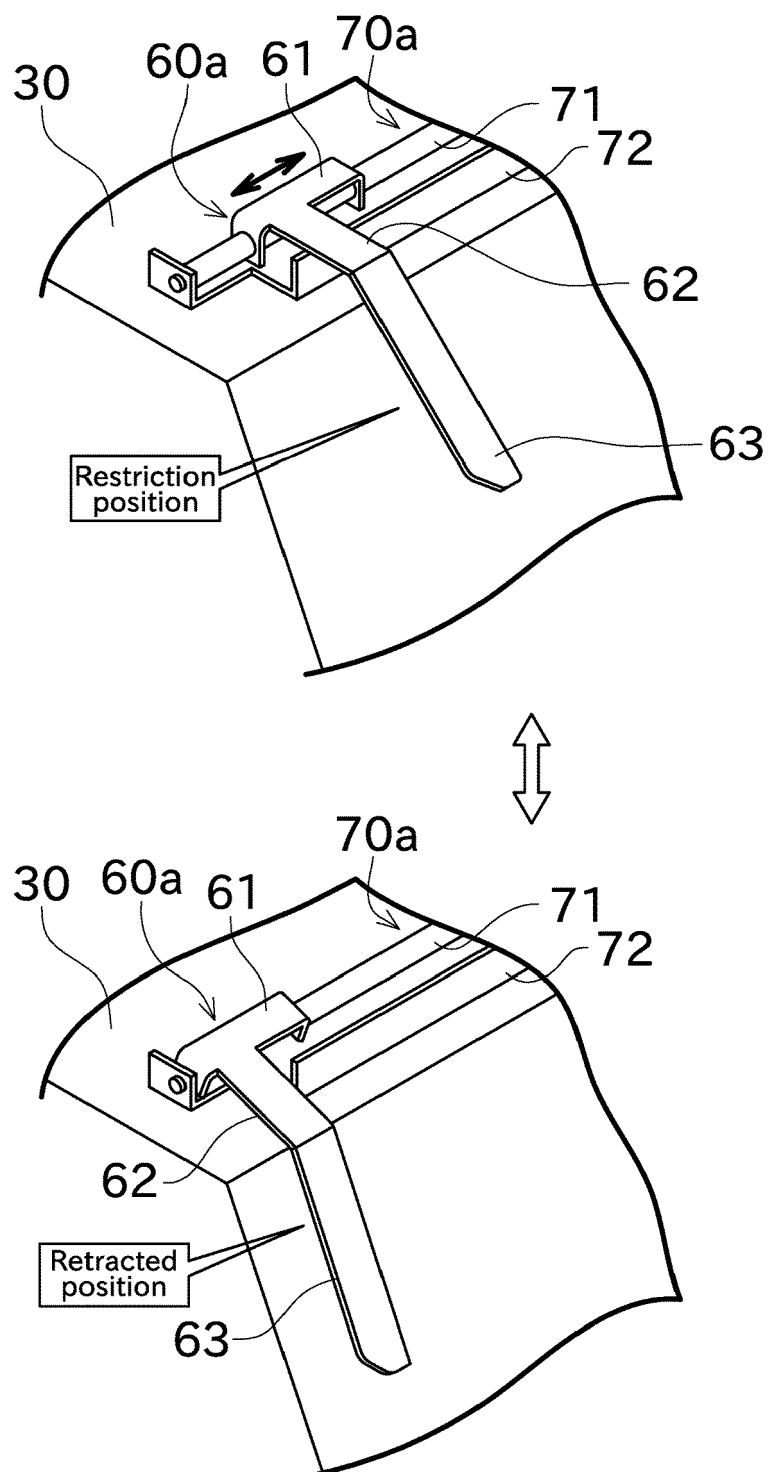


Fig.6

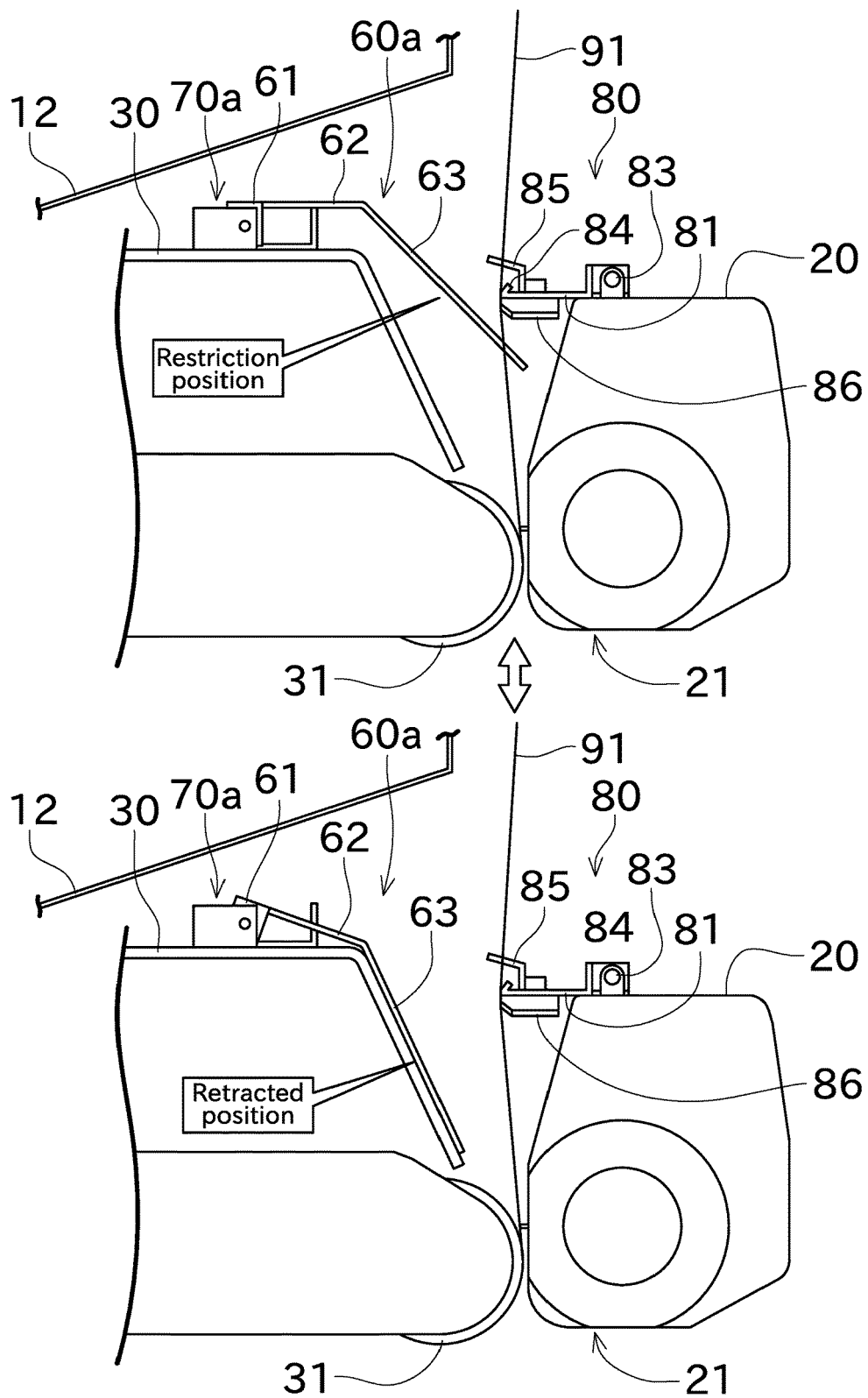


Fig.7

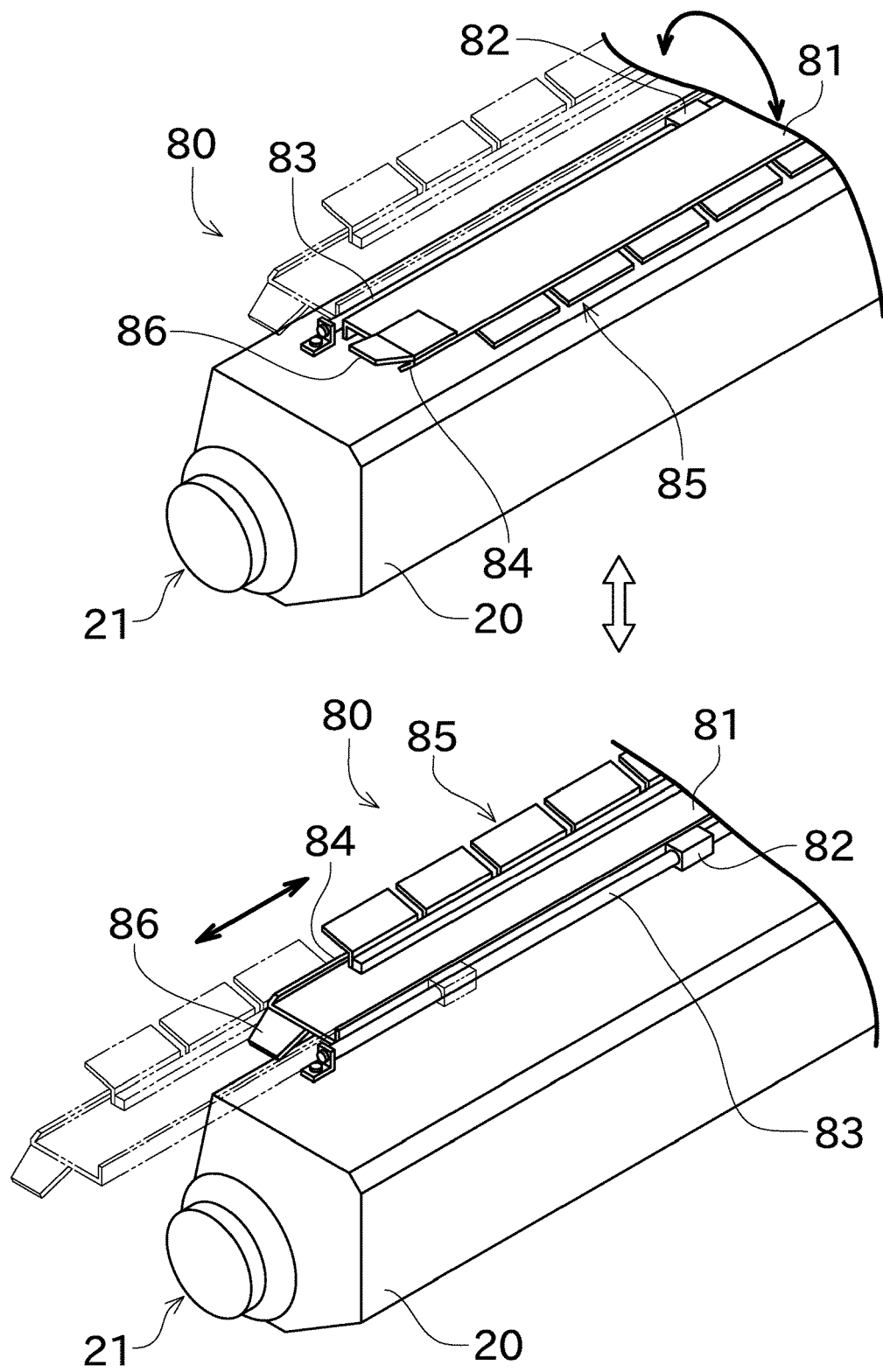


Fig.8

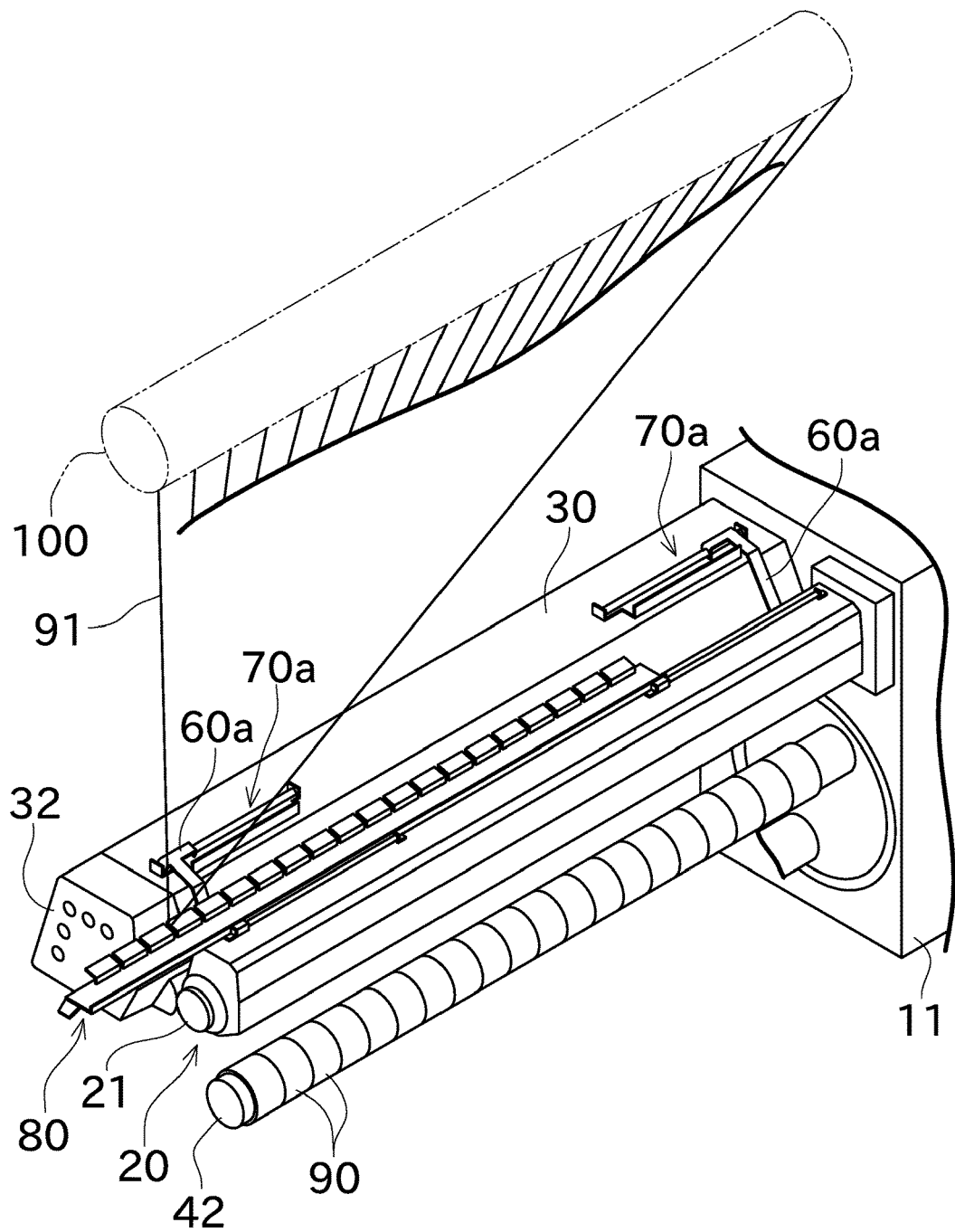


Fig.9

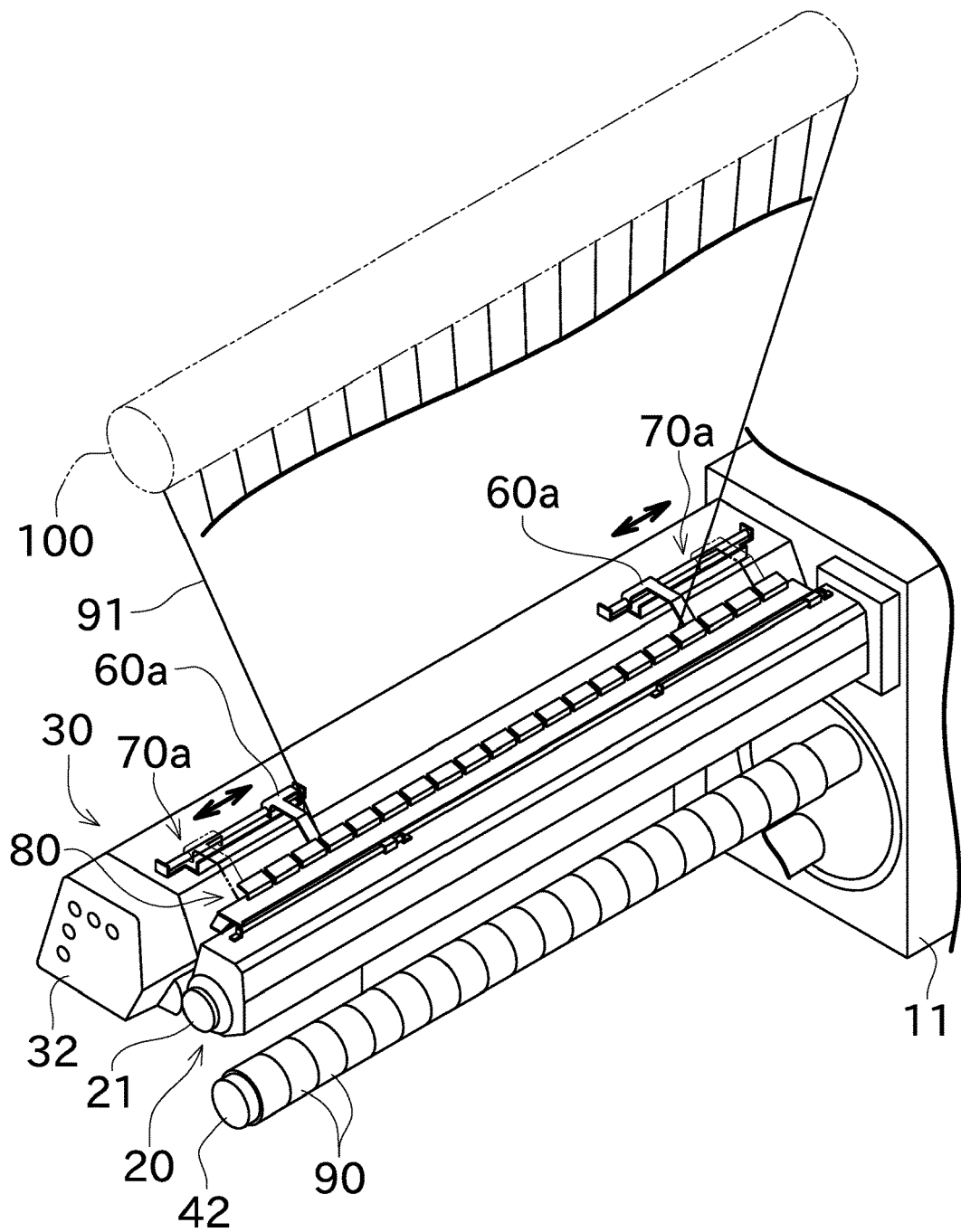


Fig.10

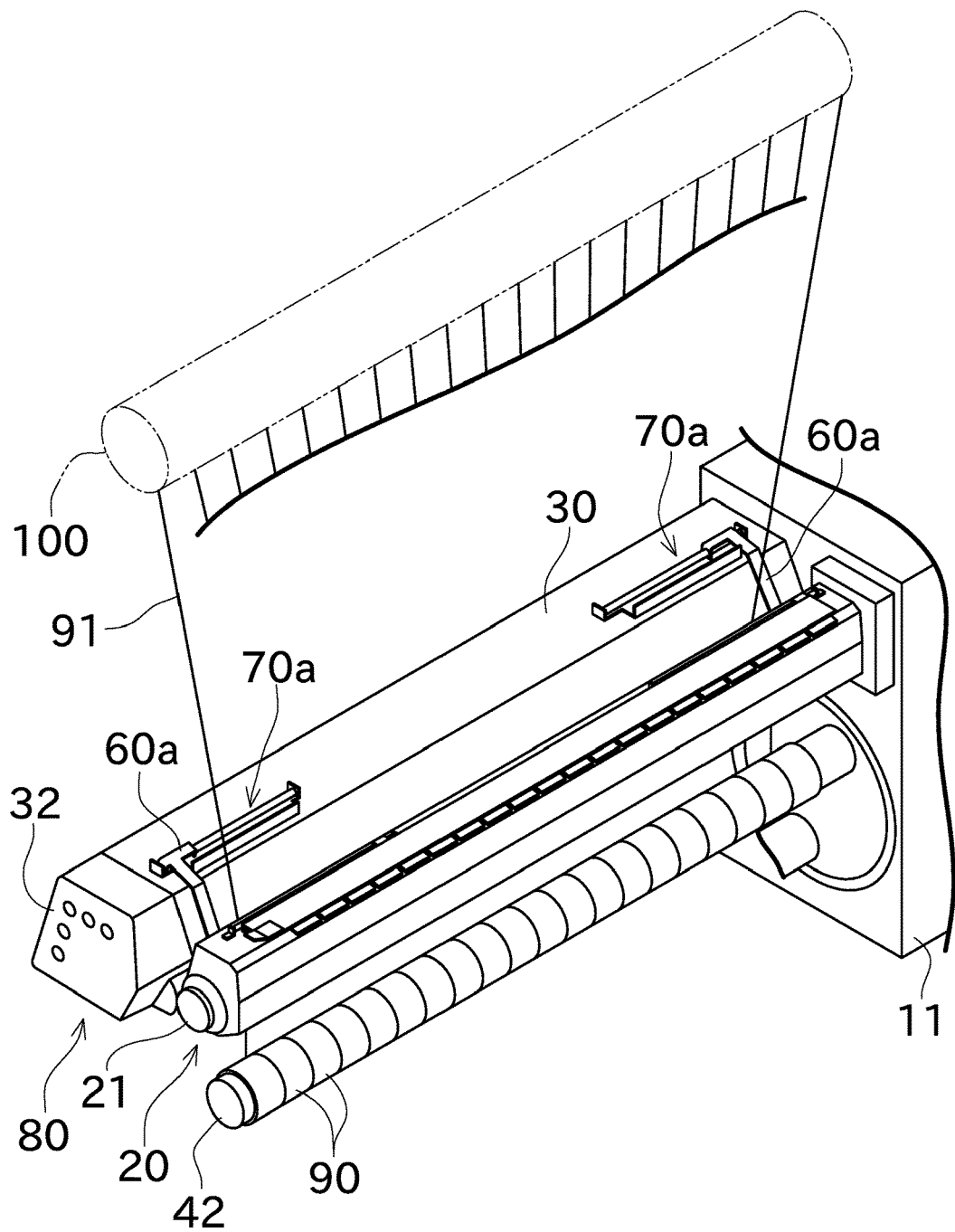


Fig.11

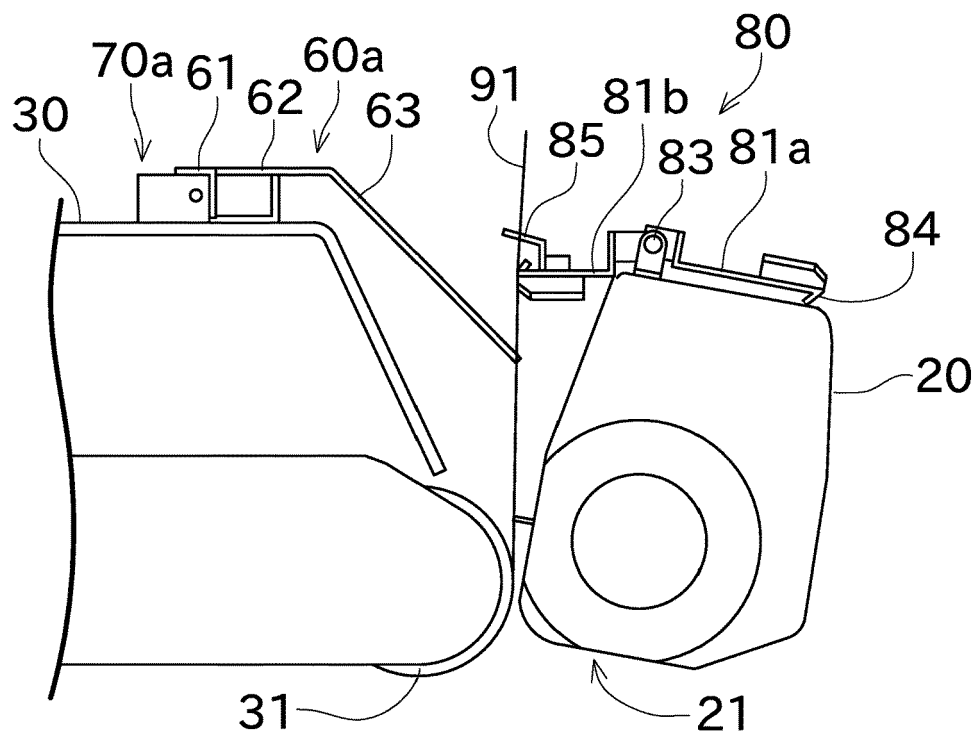
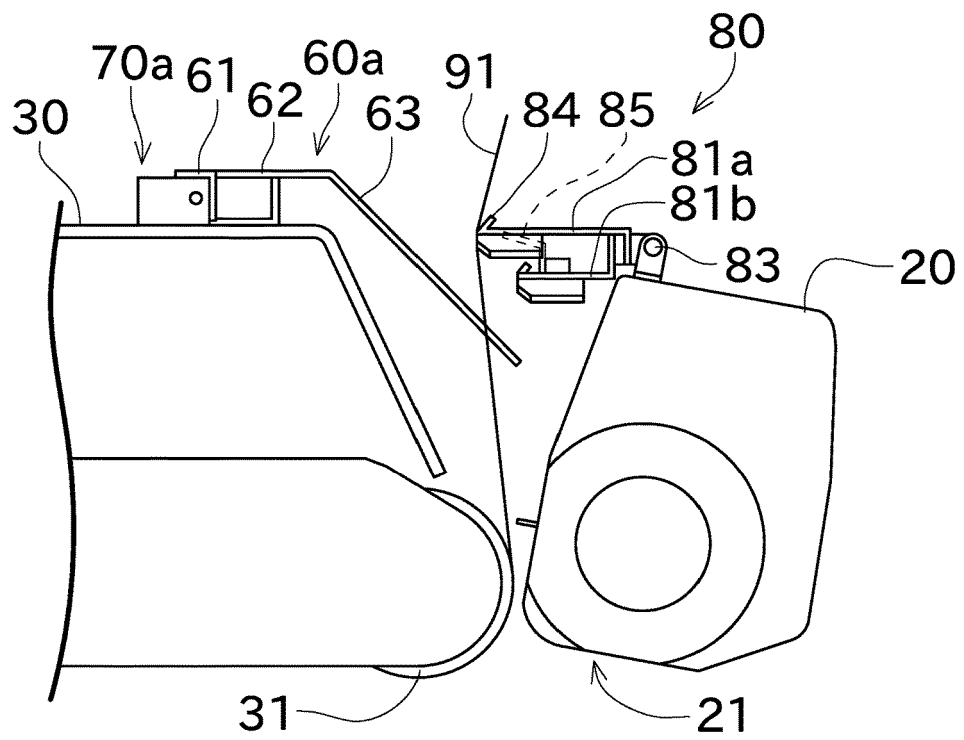


Fig.12

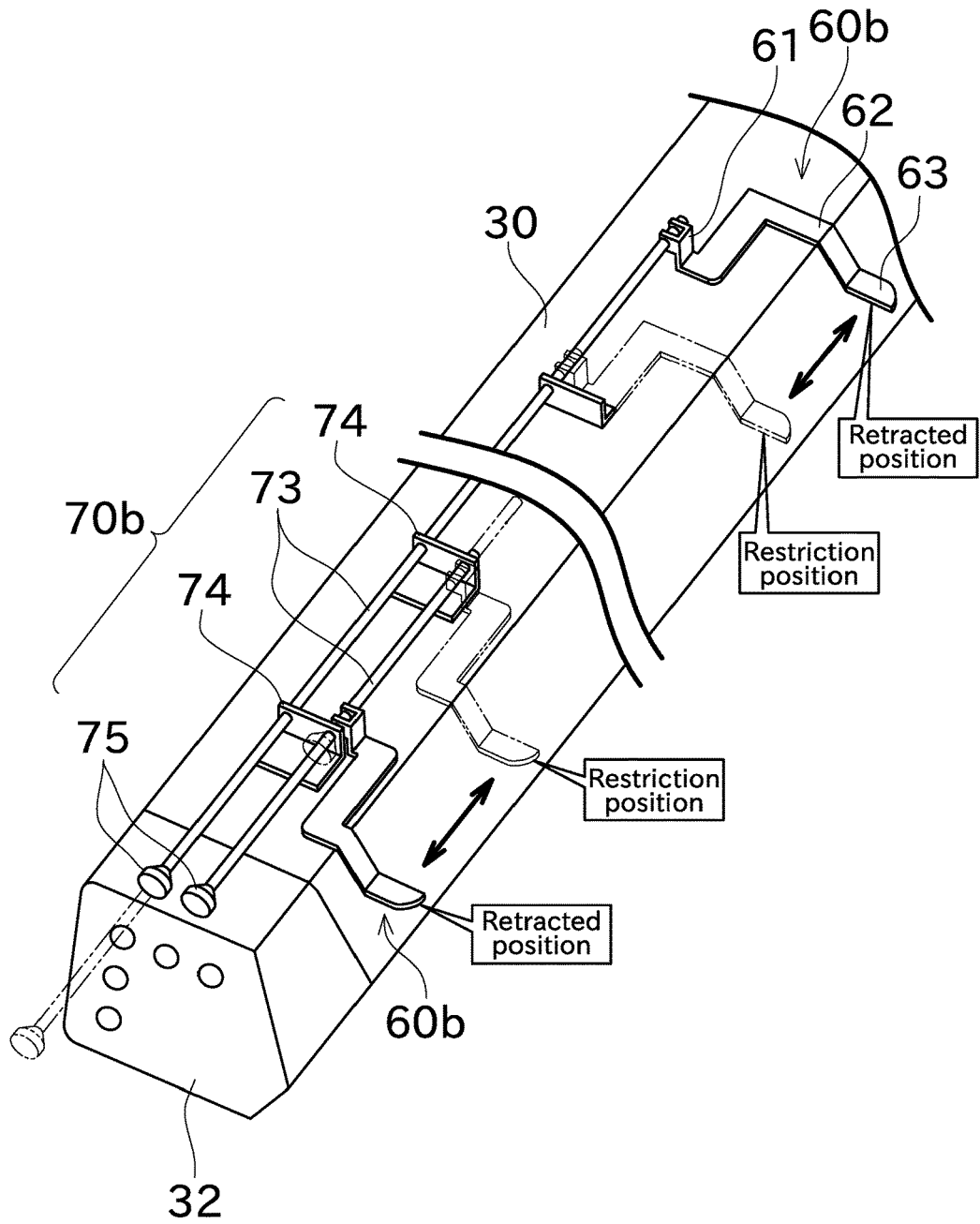


Fig.13

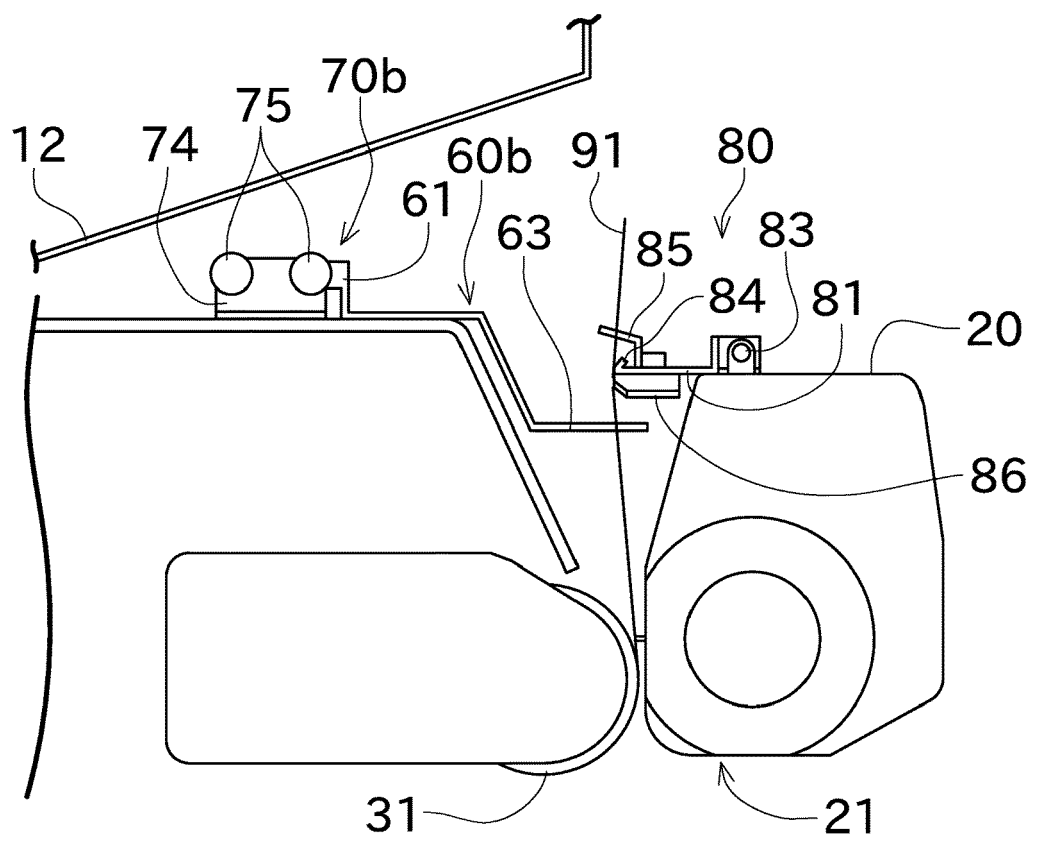


Fig.14

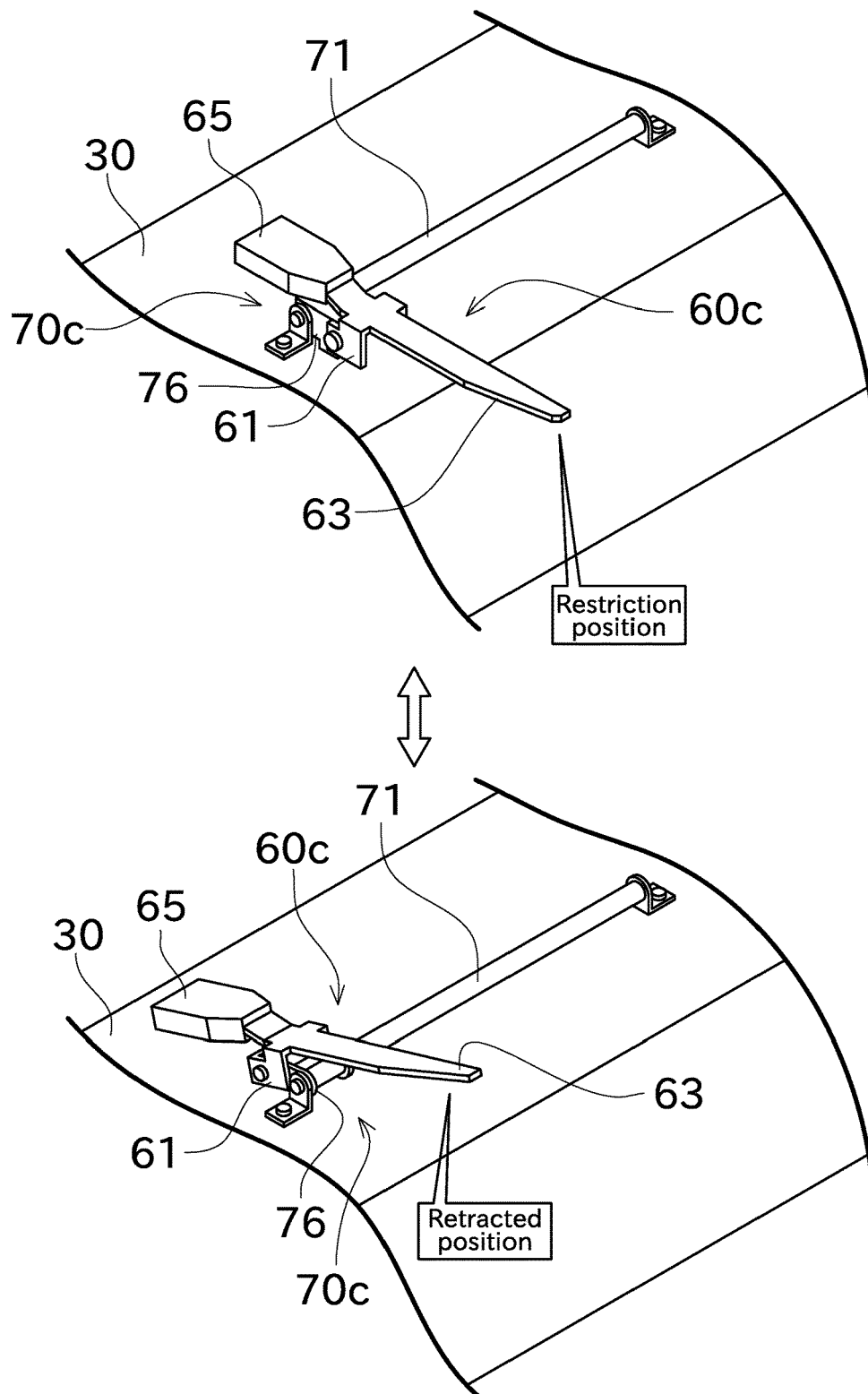
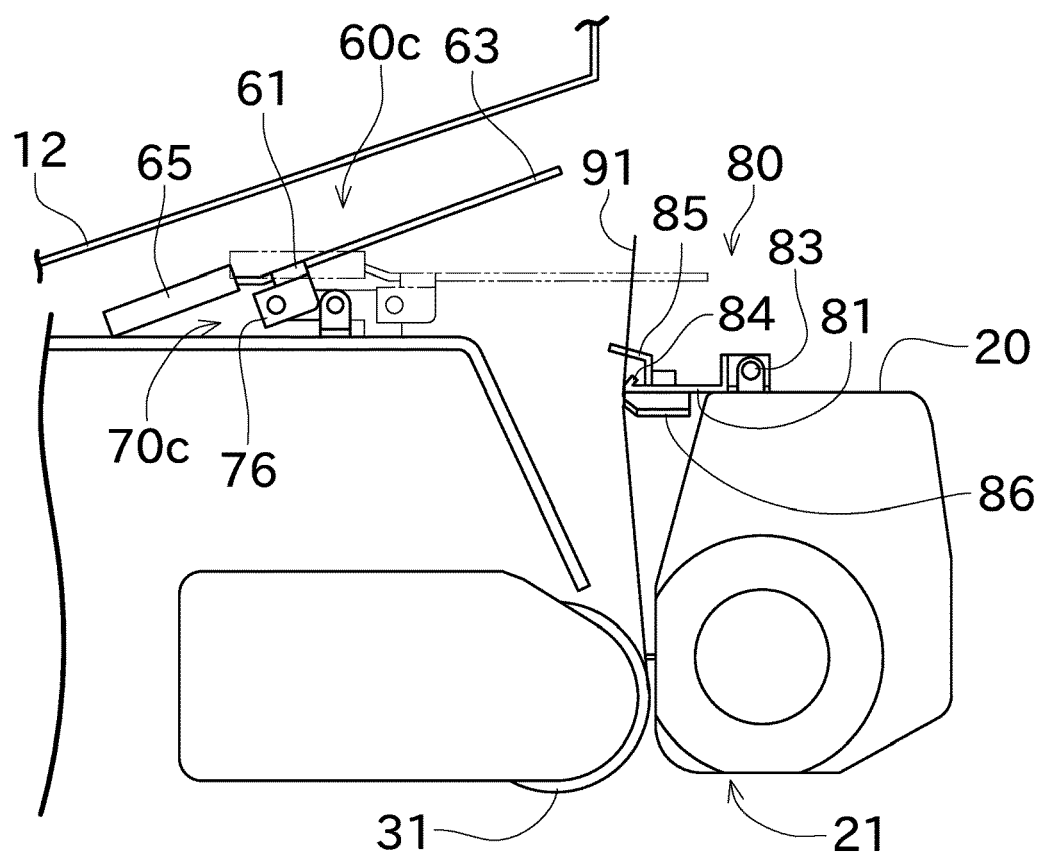


Fig.15





EUROPEAN SEARCH REPORT

Application Number

EP 23 15 7575

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP S62 275977 A (TORAY ENG CO LTD) 30 November 1987 (1987-11-30)	1	INV. B65H65/00
Y	* the whole document *	8-10	B65H57/00
A	----- -----	2-7	B65H67/048
Y	US 5 102 060 A (BUSENHART PETER [CH]) 7 April 1992 (1992-04-07) * column 5, line 63 - column 6, line 16; figure 8 *	9	
Y,D	JP 2003 226469 A (MURATA MACHINERY LTD) 12 August 2003 (2003-08-12) * paragraphs [0006], [0016], [0017]; figures *	10	
X	JP S60 248573 A (MURATA MACHINERY LTD) 9 December 1985 (1985-12-09)	1, 5, 9, 10	
Y	* figures 1, 3 *	8	
A	----- -----	2-4, 6, 7	
X	JP H08 81134 A (RIETER AG MASCHF) 26 March 1996 (1996-03-26) * figures 1-4, 16, 18, 21 *	1	TECHNICAL FIELDS SEARCHED (IPC)
X	WO 94/26645 A1 (TORAY ENG CO LTD [JP]; IWADE TAKASHI [JP] ET AL.) 24 November 1994 (1994-11-24) * figures 1, 4, 21, 22 *	1-4	B65H D01D
A	JP 2008 290819 A (TMT MACHINERY INC) 4 December 2008 (2008-12-04) * the whole document *	1-10	
The present search report has been drawn up for all claims			

2

EPO FORM 1503 03:82 (P04C01)

Place of search

The Hague

Date of completion of the search

17 July 2023

Examiner

Lemmen, René

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 23 15 7575

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-07-2023

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP S62275977 A	30-11-1987	NONE	
US 5102060 A	07-04-1992	EP 0410926 A1	30-01-1991
		JP H0379564 A	04-04-1991
		US 5102060 A	07-04-1992
JP 2003226469 A	12-08-2003	NONE	
JP S60248573 A	09-12-1985	NONE	
JP H0881134 A	26-03-1996	CN 1133812 A	23-10-1996
		EP 0703179 A2	27-03-1996
		JP H0881134 A	26-03-1996
WO 9426645 A1	24-11-1994	DE 69415632 T2	20-05-1999
		EP 0650914 A1	03-05-1995
		US 5653395 A	05-08-1997
		WO 9426645 A1	24-11-1994
JP 2008290819 A	04-12-2008	NONE	

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2003226469 A [0002]