



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
26.12.2018 Bulletin 2018/52

(51) Int Cl.:
B65H 54/52 (2006.01) **B65H 54/72** (2006.01)
B65H 67/048 (2006.01)

(21) Application number: **18176945.6**

(22) Date of filing: **11.06.2018**

(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 MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(72) Inventors:
• **Sugiyama, Kenji**
Kyoto, 612-8686 (JP)
• **Hashimoto, Kinzo**
Kyoto, 612-8686 (JP)

(74) Representative: **Hoffmann Eitle**
Patent- und Rechtsanwälte PartmbB
Arabellastraße 30
81925 München (DE)

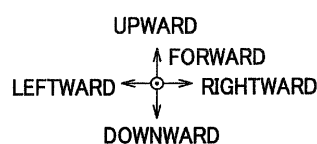
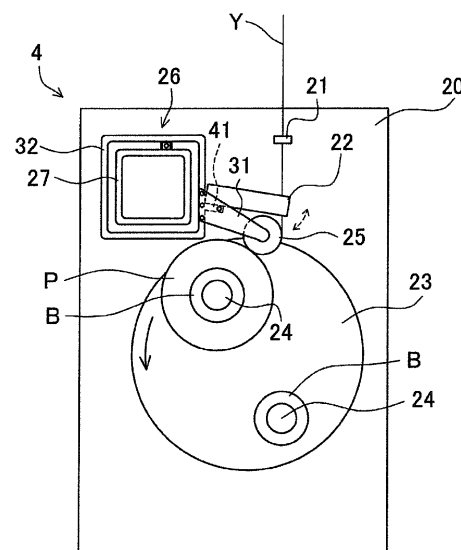
(30) Priority: **21.06.2017 JP 2017121462**

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

(54) **YARN WINDER**

(57) The rigidity of a roller supporting member is improved while an apparatus is prevented from being increased in size. A yarn winder 4 includes a bobbin holder 24, a traverse unit 22, a contact roller 25 which is configured to apply a contact pressure to packages P which are formed by winding yarns Y onto bobbins B, and a roller supporting member 26 which rotatably supports the contact roller 25. The roller supporting member 26 includes: arm members 31 which rotatably support at least end portions in the front-rear direction of the contact roller 25 and extend at least radially outward from a radial central portion of the contact roller 25; and a rigidity improving member 32 to which the arm members 31 are fixed at the end portions, the rigidity improving member being provided so as not to overlap the bobbin holder 24 and the traverse unit 22 when viewed in the front-rear direction. When viewed in the front-rear direction, the rigidity improving member 32 has a part which is longer than the arm member 31 in the direction orthogonal to the direction in which the arm member 31 extends.

FIG.2



Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a yarn winder including a contact roller applying a contact pressure to a package.

[0002] Patent Literature 1 (DE102006001041A1) recites a yarn winder which is configured to wind yarns. To be more specific, the winder includes a bobbin holder which extends in the front-rear direction and to which bobbins are attached to be lined up, a traverse unit provided above the bobbin holder to traverse yarns, and a contact roller which extends in the axial direction of the bobbin holder and is configured to apply a contact pressure to each of packages formed by winding yarns onto the bobbins. The contact roller extends along the front-rear direction and is rotatably supported by a roller supporting member. The roller supporting member includes two arm portions (hereinafter, supporting portions) which rotatably support end portions in the front-rear direction of the contact roller and extend radially outward from the radial center of the contact roller. The two supporting portions are connected to each other by a plate-shaped portion (hereinafter, plate member) which extends along the front-rear direction. When viewed in the front-rear direction, the plate member overlaps the supporting portions and is sandwiched between the bobbin holder and the traverse unit.

SUMMARY OF THE INVENTION

[0003] When the bobbin holder is elongated in the front-rear direction to increase the number of bobbins attachable to the bobbin holder, the contact roller and the roller supporting member are also elongated in the front-rear direction accordingly. As a result of this, the bending rigidity of the roller supporting member is decreased in the front-rear direction, and this may cause problems such as vibrations generated by the driving of the yarn winder. To increase the rigidity of the roller supporting member, the cross-sectional area of the plate member in the direction orthogonal to the front-rear direction may be increased. However, as described above, the plate member is sandwiched between the bobbin holder and the traverse unit. On this account, it is necessary to relocate the bobbin holder and the traverse unit to create a space, when the cross-sectional area of the plate member is increased. This causes increase in the size of the yarn winder.

[0004] An object of the present invention is to improve the rigidity of a roller supporting member while restraining an apparatus from being increased in size.

[0005] According to the first aspect of the invention, a yarn winder includes: a bobbin holder which extends in a predetermined longitudinal direction, bobbins on which yarns are wound, respectively, being attached to the bobbin holder to be lined up in the longitudinal direction; a

traverse unit which is configured to traverse the yarns; a contact roller which extends in the longitudinal direction and is configured to apply a contact pressure to packages which are formed by winding, onto the bobbins, the yarns having been traversed by the traverse unit; and a roller supporting member which supports the contact roller to be rotatable, the roller supporting member including: supporting portions which rotatably support at least end portions in the longitudinal direction of the contact roller and extend at least radially outward from a radial central portion of the contact roller; and a rigidity improving member which extends in the longitudinal direction and to which the supporting portions are fixed, the rigidity improving member being provided so as not to overlap the bobbin holder and the traverse unit when viewed in the longitudinal direction, and when viewed in the longitudinal direction, the rigidity improving member having a part which is longer than each of the supporting portions in a direction orthogonal to the direction in which the supporting portions extend.

[0006] The contact roller is configured to apply the contact pressure to the packages formed by winding the traversed yarns onto the bobbins and is provided in the vicinity of the bobbin holder and the traverse unit. The supporting portions supporting the end portions in the longitudinal direction of the contact roller are therefore provided in the vicinity of the bobbin holder and the traverse unit, too. According to the present invention, the supporting portions are fixed, and the rigidity improving member is provided so as not to overlap the bobbin holder and the traverse unit when viewed in the longitudinal direction. Furthermore, when viewed in the longitudinal direction, the rigidity improving member has a part which is longer than the supporting portions in the direction orthogonal to the direction in which the supporting portions extend. With this rigidity improving member, the bending rigidity of the roller supporting member is improved in the longitudinal direction. It is therefore possible to improve the bending rigidity or the like of the roller supporting member while avoiding interference with the bobbin holder and the traverse unit. In this way, the rigidity of the roller supporting member is improved while restraining increase in size of the apparatus.

[0007] According to the second aspect of the invention, the yarn winder of the first aspect is arranged such that, when viewed in the longitudinal direction, at least a part of the rigidity improving member is provided so as not to overlap the supporting portions.

[0008] When viewed in the longitudinal direction, in case where the rigidity improving member is provided to overlap the supporting portions, the overlapped part is located between the contact roller and the traverse unit. It is therefore difficult to increase the cross-sectional area taken along the direction orthogonal to the longitudinal direction. According to the present invention, the cross-sectional area is increased at the part where the rigidity improving member does not overlap the supporting portions when viewed in the longitudinal direction, with the

result that the rigidity of the roller supporting member is further improved.

[0009] According to the third aspect of the invention, the yarn winder of the first or second aspect is arranged such that each of the supporting portions is a rod-shaped or plate-shaped and is long in the radial direction.

[0010] According to the present invention, a space is formed in the region surrounded by the contact roller, the supporting portions, and the rigidity improving member. Because the rigidity of the roller supporting member is improved by the rigidity improving member even when the supporting portions are rod-shaped or plate-shaped and extend in the radial direction, the other members or the like can be provided in the above-described space while the rigidity of the roller supporting member is improved, with the result that the apparatus is downsized.

[0011] According to the fourth aspect of the invention, the yarn winder of any one of the first to third aspects further includes: a frame which extends in the longitudinal direction and supports the roller supporting member, wherein, a cross section of at least a part in the longitudinal direction of the rigidity improving member, which is taken along a direction orthogonal to the longitudinal direction, at least partially surrounds a cross section of the frame taken along the direction orthogonal to the longitudinal direction.

[0012] The longer the cross-sectional area of the rigidity improving member in the direction orthogonal to the longitudinal direction is, the more the rigidity of the roller supporting member is improved. However, when the cross-sectional area is simply enlarged, the rigidity improving member may interfere with another member or the like, and upsizing of the apparatus may be unavoidable. According to the present invention, a cross section in the direction orthogonal to the longitudinal direction of at least a part of the rigidity improving member is shaped to at least partially surround the frame. To put it differently, the rigidity improving member and the frame share a part of the space where the frame is provided. As a result, the cross-sectional area is enlarged while increase in size of the apparatus is restrained.

[0013] According to the fifth aspect of the invention, the yarn winder of the fourth aspect is arranged such that a cross section of at least a part in the longitudinal direction of the rigidity improving member, which is taken along the direction orthogonal to the longitudinal direction, entirely surrounds the cross section of the frame in the direction orthogonal to the longitudinal direction.

[0014] According to the present invention, when the cross section of at least a part of the rigidity improving member in the direction orthogonal to the longitudinal direction is shaped to entirely surround the frame, the rigidity of the rigidity improving member is significantly improved. The rigidity of the roller supporting member is therefore significantly improved while increase in size of the apparatus is restrained.

[0015] According to the sixth aspect of the invention, the yarn winder of the fifth aspect is arranged such that

the rigidity improving member is cylindrical in shape and extends in the longitudinal direction.

[0016] According to the present invention, the rigidity improving member is cylindrical in shape and extends in the longitudinal direction, and the rigidity improving member on the whole entirely surrounds the frame in cross section taken in the direction orthogonal to the longitudinal direction. The rigidity of the roller supporting member is therefore further improved.

[0017] According to the seventh aspect of the invention, the yarn winder of any one of the fourth to sixth aspects is arranged such that the roller supporting member is supported by the frame to be swingable about a swing shaft extending in the longitudinal direction.

[0018] According to the present invention, the roller supporting member is supported to be swingable. This indicates that the entirety of the roller supporting member and the entirety of the contact roller do not move. Because it is unnecessary to provide a space for allowing the roller supporting member, etc. to move and a guide member or the like for guiding the roller supporting member, it is possible to restrain increase in size of the apparatus.

[0019] According to the eighth aspect of the invention, the yarn winder of the seventh aspect is arranged such that the frame is polygonal in shape when viewed in the longitudinal direction, and the swing shaft is provided at a fixed portion which is fixed to one of outer circumferential surfaces of the frame, the one of the surfaces not being a surface closest to the contact roller when viewed in the longitudinal direction.

[0020] When at least a part of the rigidity improving member at least partially surrounds the frame and the roller supporting member is swingably supported by the frame, the rigidity improving member and the frame tends to interfere with each other if the swing angle of the roller supporting member is large. In the present invention, the swing shaft is provided in the fixed portions which are fixed to a surface which is not the surface closest to the contact roller among the surfaces of the frame. Because the swing shaft is positioned so that the distance between the swing shaft and the rotation shaft of the contact roller is long, the swing range of the contact roller is arranged to be wide even though the swing angle of the roller supporting member is small. Furthermore, because the swing angle of the roller supporting member when the contact roller swings is small, interference between the rigidity improving member and the frame is avoidable.

[0021] According to the ninth aspect of the invention, the yarn winder of the seventh aspect is arranged such that the frame has a top surface, and the swing shaft is provided at the fixed portion fixed to the top surface.

[0022] In the present invention, the swing shaft is provided at the fixed portions fixed to the top surface of the frame. Because the downward force acting on the frame due to the weight of the roller supporting member is stably received by the top surface, a stable structure is realized.

[0023] According to the tenth aspect of the invention,

the yarn winder of any one of the seventh to ninth aspects is arranged such that the frame is rectangular in shape when viewed in the longitudinal direction.

[0024] In the present invention, because the frame is a quadrangular prism in shape, processing is easily done in the manufacture.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

FIG. 1 is a profile of a take-up apparatus including a yarn winder of an embodiment.

FIG. 2 is a front elevation of the yarn winder.

FIG. 3 is a perspective view of a front portion of a roller supporting member and its surroundings.

FIG. 4 is a plan view of the roller supporting member and its surroundings.

FIG. 5(a) is a cross section taken along a line V(a)-V(a) in FIG. 4, whereas FIG. 5(b) is a cross section taken along a line V(b)-V(b) in FIG. 4.

FIGs. 6(a) and 6(b) show the swing of a contact roller.

FIG. 7 is a perspective view of a front portion of a roller supporting member and its surroundings according to a modification.

FIG. 8 is a perspective view of a front portion of a roller supporting member and its surroundings according to another modification.

FIG. 9 is a cross section of a roller supporting member and its surroundings according to a further modification.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0026] The following will describe an embodiment of the present invention with reference to FIG. 1 to FIG. 6.

(Outline of Take-Up Apparatus)

[0027] FIG. 1 is a profile of a take-up apparatus 1 including a yarn winder 4 (detailed later) of the present embodiment. Hereinafter, the left-right direction in the sheet of FIG. 1 will be referred to as a front-rear direction (longitudinal direction in the present invention). Furthermore, the direction in which gravity acts will be referred to as an up-down direction, whereas a direction orthogonal to the front-rear direction and the up-down direction (i.e., a direction perpendicular to the sheet of the figure) will be referred to as a left-right direction.

[0028] The take-up apparatus 1 includes a first godet roller 11, a second godet roller 12, and a yarn regulating guide 16 for taking up yarns Y spun out from a spinning apparatus 3, and a yarn winder 4 configured to form packages P by winding the taken-up yarns Y onto bobbins B.

[0029] The first godet roller 11 is a roller having an axis substantially in parallel to the left-right direction and is provided above a front end portion of the yarn winder 4. The first godet roller 11 is rotationally driven by a motor

which is not illustrated. The second godet roller 12 is a roller having an axis substantially in parallel to the left-right direction and is provided above and rearward of the first godet roller 11. The second godet roller 12 is rotationally driven by a motor which is not illustrated.

[0030] The second godet roller 12 is movably supported by a guide rail 14. The guide rail 14 extends obliquely upward and rearward. The second godet roller 12 is arranged to be movable along the guide rail 14 by members such as a pulley pair, a belt, and a drive motor which are not illustrated. With this, the second godet roller 12 is movable between a position where winding of the yarns Y is performed and a position which is close to the first godet roller 11 and where yarn threading is performed. In FIG. 1, the position of the second godet roller 12 when the yarns Y are wound is indicated by full lines, whereas the position of the second godet roller 12 when the yarn threading operation is performed is indicated by one-dot chain lines.

[0031] The yarn regulating guide 16 is provided above the first godet roller 11. The yarn regulating guide 16 is, for example, a known yarn guide with a comb teeth shape. When the yarns Y are threaded thereon, the yarn regulating guide 16 regulates the interval between neighboring yarns Y to a predetermined value.

(Yarn Winder)

[0032] The following will describe the yarn winder 4 with reference to FIG. 1 and FIG. 2. FIG. 2 is a front elevation of the yarn winder 4. The yarn winder 4 includes members such as: a base 20; fulcrum guides 21; a traverse unit 22; a turret 23; two bobbin holders 24; a contact roller 25; a roller supporting member 26; and a frame 27.

[0033] The base 20 is provided to vertically extend at a rear portion of the yarn winder 4. The base 20 supports members such as the turret 23 and the frame 27.

[0034] The fulcrum guides 21 are provided for the yarns Y, respectively, and are lined up in the front-rear direction. As the yarns Y are threaded onto the respective fulcrum guides 21, the fulcrum guides 21 function as fulcrums of the traversal of the respective yarns Y.

[0035] The traverse unit 22 is provided to traverse the yarns Y. The traverse unit 22 is attached to a later-described rib 41, and is provided above the contact roller 25. The traverse unit 22 includes traverse guides 28. The traverse guides 28 are respectively provided for the yarns Y, and are lined up in the front-rear direction. Each traverse guide 28 is driven by a traverse motor (not illustrated) and reciprocates in the front-rear direction. The yarns Y are traversed by the respective traverse guides 28 about the respective fulcrum guides 21.

[0036] The turret 23 is a disc-shaped member having an axis substantially in parallel to the front-rear direction, and is rotatably supported by the base 20. The turret 23 is rotationally driven by a turret motor which is not illustrated. The turret 23 cantilevers two bobbin holders 24,

and moves the two bobbin holders 24 by rotating about a rotation axis substantially in parallel to the front-rear direction. With this arrangement, it is possible in the yarn winder 4 to swap the positions of the two bobbin holders 24, and hence replacement of the bobbins B is possible at one bobbin holder 24 while yarns Y are wound onto the bobbins B attached to the other bobbin holder 24. Furthermore, the turret 23 is arranged to be rotatable in accordance with an increase in amount of the wound yarn Y when the yarn is wound onto the bobbin B (see the solid arrow in FIG. 2).

[0037] To each of the two bobbin holders 24, bobbins B are attached. The two bobbin holders 24 are rotatably supported at an upper end portion and a lower end portion of the turret 23 supported by the base 20, respectively, and protrude forward from the turret 23. To put it differently, the two bobbin holders 24 are cantilevered by the base 20 which is provided on the rear side. The axes of the two bobbin holders 24 are substantially in parallel to the front-rear direction.

[0038] Bobbins B are attached to each bobbin holder 24. The bobbins B are respectively provided for the yarns Y and lined up in the front-rear direction. The number of the bobbins B attached to one bobbin holder 24 is, for example, 16. The two bobbin holders 24 are rotationally driven by their respective winding motors (not illustrated).

[0039] The contact roller 25 is a roller having an axis substantially in parallel to the front-rear direction and is provided at a position which is above the upper bobbin holder 24 and below the traverse unit 22. The contact roller 25 is configured to make contact with the surfaces of the packages P supported by the upper bobbin holder 24. With this, the contact roller 25 applies a contact pressure to the surfaces of the unfinished packages P, to adjust the shape of each package P. In the present embodiment, as described below, the contact roller 25 is a so-called swing arm contact roller which is swingably supported by the frame 27 via the roller supporting member 26.

[0040] The roller supporting member 26 is a member for rotatably supporting the contact roller 25. The roller supporting member 26 extends in the front-rear direction. The details of the roller supporting member 26 will be given later.

[0041] The frame 27 is a column-shaped member extending in the front-rear direction, and is fixed to an upper part of the base 20. The frame 27 supports the roller supporting member 26 to be swingable. The details of the frame 27 will be given later.

[0042] In the yarn winder 4 structured as described above, when the upper bobbin holder 24 is rotationally driven, the yarns Y traversed by the traverse guides 28 are wound onto the bobbins B, with the result that the packages P are formed. The shape of each package P is adjusted in such a way that the contact roller 25 makes contact with the surface of the package P and applies a contact pressure while the package P is being formed. The turret 23 rotates in the direction indicated by the solid

arrow in FIG. 2 as the diameter of the package P increases (i.e., the package P grows fat) due to the winding of the yarn Y onto the bobbin B. As a result, the distance between the bobbin holder 24 to which the bobbins B onto which the yarns Y are wound and the contact roller 25 is increased. Because the contact roller 25 is swingably supported by the frame 27, the contact roller 25 swings in accordance with the movement of the bobbin holder 24 and the packages P (see the dotted arrow in FIG. 2). With this, the contact between the contact roller 25 and the packages P is maintained.

[0043] In consideration of the production efficiency, the bobbin holder 24 has recently been further elongated in the front-rear direction to increase the number of bobbins B attachable to the bobbin holder 24 at once. In accordance with this, the contact roller 25 and the roller supporting member 26 are also elongated in the front-rear direction. As a result of this, the bending rigidity of the roller supporting member 26 is decreased, and this may cause problems such as vibrations of the roller supporting member 26 generated by the driving of the yarn winder 4. To increase the bending rigidity, etc. of the roller supporting member 26, the cross-sectional area of the roller supporting member 26 in the direction orthogonal to the front-rear direction may be increased. However, when the cross-sectional area is increased, it is necessary to relocate the bobbin holder 24 and the traverse unit 22 to create a space. This causes increase in the size of the yarn winder 4. In this circumstance, in the present embodiment, the roller supporting member 26 and the frame 27 are arranged as described below.

(Details of Roller Supporting Member and Frame)

[0044] The roller supporting member 26 and the frame 27 will be detailed with reference to FIG. 3 to FIG. 6. FIG. 3 is a perspective view of a front portion of the roller supporting member 26 and its surroundings. FIG. 4 is a plan view of the roller supporting member 26 and its surroundings. FIG. 5(a) is a cross section taken along a line V(a)-V(a) in FIG. 4. FIG. 5(b) is a cross section taken along a line V(b)-V(b) in FIG. 4. FIGs. 6(a) and 6(b) show the swing of the contact roller 25.

[0045] The frame 27 will be described first. The frame 27 is substantially rectangular in shape when viewed in the front-rear direction, and is a hollow quadrangular prism extending in the front-rear direction. When viewed in the front-rear direction, each side of the frame 27 is, for example, about 150mm long. The frame 27 has a top surface 43 (see FIG. 5), and fixed portions 44 where a later-described swing shaft 45 is provided are fixed in the vicinity of the end portions in the front-rear direction of the top surface 43.

[0046] Now, the roller supporting member 26 will be described. As described above, the roller supporting member 26 rotatably supports the contact roller 25. As shown in FIG. 3 to FIG. 5, the roller supporting member 26 includes arm members 31 (supporting members of

the present invention) and a rigidity improving member 32.

[0047] The arm members 31 (arm members 31F and 31R) support the respective end portions in the front-rear direction of the contact roller 25. Each of the arm members 31F and 31R is a plate member which extends leftward and upward (i.e., radially outward) from a radial central portion of the contact roller 25. The arm member 31F rotatably supports the front end portion of the contact roller 25 whereas the arm member 31R rotatably supports the rear end portion of the contact roller 25. With this arrangement, the contact roller 25 is rotatable about a rotation shaft 46 (see FIG. 5). When viewed in the front-rear direction, the width of each of the arm members 31F and 31R increases radially outward from the radial central portion of the contact roller 25 (see FIG. 5). As described below, the arm members 31F and 31R are fixed to the rigidity improving member 32.

[0048] The rigidity improving member 32 is provided to improve the bending rigidity of the roller supporting member 26. The rigidity improving member 32 is substantially cylindrical in shape and extends in the front-rear direction (see FIG. 3). In the present embodiment, the rigidity improving member 32 is formed of a member which is different from the two arm members 31. As shown in FIG. 5, when viewed in the front-rear direction, the rigidity improving member 32 is hollow and substantially rectangular in shape, and each side of the rigidity improving member 32 is, for example, about 230mm long. The circumferential part of the rigidity improving member 32 is, for example, about 20mm in thickness. In other words, each side of the hollow area of the rigidity improving member 32 is about 190mm long, and is longer than the side of the frame 27 (about 150mm long) described above. In this way, the rigidity improving member 32 on the whole is shaped in such a way that the cross section of the rigidity improving member 32 taken in the direction orthogonal to the front-rear direction entirely surrounds the cross section of the frame 27 taken in the direction orthogonal to the front-rear direction.

[0049] At a lower part of a right side wall of the rigidity improving member 32, the rib 41 is formed across the entire length in the front-rear direction of the rigidity improving member 32 so as to protrude rightward and downward. The rib 41 is provided to allow the traverse unit 22 to be placed thereon.

[0050] To a front end portion of the right side wall of the rigidity improving member 32, a radially outer part of the arm member 31F is fixed by fixing tools 42 (see FIG. 3 and FIG. 5(a)). Similarly, to a rear end portion of the right side wall of the rigidity improving member 32, a radially outer part of the arm member 31R is fixed. In this way, the two arm members 31F and 31R are fixed to the respective end portions in the front-rear direction of the rigidity improving member 32.

[0051] When viewed in the front-rear direction, the rigidity improving member 32 is provided to surround the frame 27. To put it differently, the frame 27 is provided

inside the rigidity improving member 32 when viewed in the front-rear direction. The gap between the rigidity improving member 32 and the frame 27 is about 20mm long. The rigidity improving member 32 is provided at a position which is leftward and above the bobbin holder 24 and to the left of the traverse unit 22 (see FIG. 5 (a)). In this way, the rigidity improving member 32 is provided so as not to overlap the bobbin holder 24 and the traverse unit 22 when viewed in the front-rear direction. To put it differently, the rigidity improving member 32 is provided outside a region sandwiched between the bobbin holder 24 and the traverse unit 22. When viewed in the front-rear direction, the rigidity improving member 32 is longer than the arm member 31 in a direction (orthogonal direction in FIG. 5(b)) orthogonal to the direction (extending direction in FIG. 5(b)) in which the arm member 31 extends. When viewed in the front-rear direction, the rigidity improving member 32, the arm member 31F, and the arm member 31R do not overlap one another except at parts where they are fixed to one another. To put it differently, when viewed in the front-rear direction, at least a part of the rigidity improving member 32 do not overlap the arm members 31F and 31R.

[0052] As shown in FIG. 3 to FIG. 5, the rigidity improving member 32 is supported by the frame 27 to be swingable. The fixed portions 44 of the frame 27 are provided with the swing shaft 45 which extends along the front-rear direction. About this swing shaft 45, the rigidity improving member 32 (i.e., the entire roller supporting member 26) is swingably supported by the frame 27. As a result, the contact roller 25 is swingably supported via the roller supporting member 26. The swing shaft 45 may be arranged such that two shafts support the front end portion and the rear end portion of the rigidity improving member 32, respectively, or such that a single shaft extends across the entire length in the front-rear direction of the rigidity improving member 32.

[0053] In the roller supporting member 26 structured as above, the rigidity improving member 32 is provided so as not to overlap the bobbin holder 24 and the traverse unit 22 when viewed in the front-rear direction. On this account, the bending rigidity or the like of the roller supporting member 26 is improved by the rigidity improving member 32 while avoiding interference with the bobbin holder 24 and the traverse unit 22. Furthermore, because the rigidity improving member 32 is shaped to entirely surround the frame 27 in cross section as described above, the rigidity improving member 32 and the frame 27 share a part of the space where the frame 27 is provided, and the rigidity improving member 32 has high rigidity.

[0054] In addition to the above, because the arm members 31F and 31R are fixed to the front end portion and the rear end portion of the rigidity improving member 32, respectively, a space is formed in the region surrounded by the contact roller 25, the arm members 31F and 31R, and the rigidity improving member 32. By using a part of this space, the traverse unit 22 is attached to the rib 41

from above (see FIG. 3 and FIG. 5(a)).

[0055] The fixed portions 44 in which the swing shaft 45 is provided are fixed to the top surface 43. With this arrangement, the downward force acting on the frame 27 due to the weight of the roller supporting member 26 is stably received by the top surface 43. Furthermore, the swing range of the contact roller 25 is widened and interference between the roller supporting member 26 and the frame 27 is suppressed, as described below. If, as shown in FIG. 6(a), the fixed portions 44 are fixed to a right side surface of the frame 27 which is the closest to the contact roller 25 among the outer circumferential surfaces of the frame 27, the distance between the swing shaft 45 and the rotational shaft 46 of the contact roller 25 is short when viewed in the front-rear direction. The swing angle of the roller supporting member 26 when the contact roller 25 swings is large, with the result that the frame 27 and the rigidity improving member 32 surrounding the frame 27 tend to interfere with each other (see two-dot chain lines in FIG. 6(a)). In this regard, in the present embodiment, because the fixed portions 44 are fixed to a surface other than the right side surface, i.e., fixed to the top surface 43 as shown in FIG. 6(b), the above-described distance is relatively long. The swing range of the contact roller 25 relative to the swing angle of the roller supporting member 26 is therefore wide (see two-dot chain lines in FIG. 6(b)). Furthermore, because the swing angle of the roller supporting member 26 when the contact roller 25 swings is small, interference between the rigidity improving member 32 and the frame 27 is less likely to occur.

[0056] As described above, the rigidity improving member 32 is fixed to the radially outer parts of the arm members 31 and is provided so as not to overlap the bobbin holder 24 and the traverse unit 22 when viewed in the front-rear direction. Furthermore, when viewed in the front-rear direction, the rigidity improving member 32 has a part which is longer than the arm member 31 in the direction orthogonal to the direction in which the arm member 31 extends. With this rigidity improving member 32, the bending rigidity of the roller supporting member 26 is improved in the front-rear direction. It is therefore possible to improve the bending rigidity or the like of the roller supporting member 26 while avoiding interference with the bobbin holder 24 and the traverse unit 22. In this way, the rigidity of the roller supporting member 26 is improved while restraining increase in size of the yarn winder 4.

[0057] When viewed in the front-rear direction, at least a part of the rigidity improving member 32 is provided so as not to overlap the arm members 31F and 31R. The cross-sectional area of the rigidity improving member 32 in the direction orthogonal to the front-rear direction is increase at this part, and hence the rigidity of the roller supporting member 26 is further improved.

[0058] In addition to the above, a space is formed in the region surrounded by the contact roller 25, the arm members 31F and 31R, and the rigidity improving mem-

ber 32. Because the rigidity of the roller supporting member 26 is improved by the rigidity improving member 32 even when the arm members 31F and 31R are plate-shaped and extend in the radial direction as described above, members such as the traverse unit 22 can be provided in the above-described space while the rigidity of the roller supporting member 26 is improved, with the result that the yarn winder 4 is downsized.

[0059] In addition to the above, the rigidity improving member 32 is cylindrical in shape and extends in the front-rear direction, and the rigidity improving member 32 on the whole entirely surrounds the frame in cross section taken in the direction orthogonal to the front-rear direction. In this way, the rigidity improving member 32 and the frame 27 share a part of the space where the frame 27 is provided, and rigidity improving member 32 has high rigidity. The rigidity of the roller supporting member 26 is therefore significantly improved while increase in size of the apparatus is restrained.

[0060] The roller supporting member 26 is supported to be swingable. This indicates that the entirety of the roller supporting member 26 and the entirety of the contact roller 25 do not move. Because it is unnecessary to provide a space for allowing the roller supporting member 26, etc. to move and a guide member or the like for guiding the roller supporting member 26, it is possible to restrain increase in size of the apparatus.

[0061] In addition to the above, the swing shaft 45 is provided in the fixed portions 44 which are fixed to a surface (the top surface 43 in the present embodiment) which is not the surface closest to the contact roller 25 among the surfaces of the frame 27. Because the swing shaft 45 is positioned so that the distance between the swing shaft 45 and the rotation shaft 46 of the contact roller 25 is long, the swing range of the contact roller 25 is arranged to be wide even though the swing angle of the roller supporting member 26 is small. Furthermore, because the swing angle of the roller supporting member 26 when the contact roller 25 swings is small, interference between the rigidity improving member 32 and the frame 27 is avoidable.

[0062] The swing shaft 45 is provided at the fixed portions 44 fixed to the top surface 43 of the frame 27. Because the downward force acting on the frame 27 due to the weight of the roller supporting member 26 is stably received by the top surface 43, a stable structure is realized.

[0063] In addition to the above, because the frame 27 is a quadrangular prism in shape, processing is easily done in the manufacture.

[0064] The following will describe modifications of the above-described embodiment. The members identical with those in the embodiment above will be denoted by the same reference numerals and the explanations thereof are not repeated.

(1) While in the embodiment above the rigidity improving member 32 on the whole is arranged so that

the cross section thereof taken in the direction orthogonal to the front-rear direction entirely surrounds the frame 27, the disclosure is not limited to this arrangement. For example, because an opening 47 is formed in an upper surface portion of a rigidity improving member 32a of a roller supporting member 26a as shown in FIG. 7, the cross section entirely surrounds the frame 27 only at a part of the rigidity improving member 32a. As such, when the cross section of at least a part of the rigidity improving member 32a (e.g., the front end portion in FIG. 6) is shaped to entirely surround the frame 27, the rigidity of the rigidity improving member 32a is significantly improved. The rigidity of the roller supporting member 26a is therefore significantly improved.

In addition to the above, when the opening 47 is suitably formed, weight reduction is achieved while the rigidity of the roller supporting member 26a is maintained to be high, with the result that the resonance frequency of the roller supporting member 26a is increased and the vibrations of the roller supporting member 26a are suppressed.

(2) For example, as shown in FIG. 8, the frame 27 may be only partially surrounded, as a rigidity improving member 32b of a roller supporting member 26b does not have a lower surface portion (i.e., the cross section is reverse U-shaped). In addition to the above, only a part of the rigidity improving member 32b in the front-rear direction may be shaped to partially surround the frame 27. To put it differently, the cross section of at least a part of the rigidity improving member 32 in the front-rear direction may be shaped to at least partially surround the frame 27. Even in such a case, the cross-sectional area is increased while increase in size of the apparatus is restrained, because the rigidity improving member 32b and the frame 27 share a part of the space where the frame 27 is provided. While in this modification the rigidity improving member 32b does not have a lower surface portion, the rigidity improving member may not have, for example, a left side wall.

(3) The shape of the rigidity improving member may be different from the above. For example, as shown in FIG. 9(a), the cross section of a rigidity improving member 32c of a roller supporting member 26c is ring-shaped. Alternatively, for example, as shown in FIG. 9(b), the cross section of a rigidity improving member 32d of a roller supporting member 26d is a solid rectangle and does not surround the frame 27. As such, the rigidity improving member may be variously shaped on condition that the rigidity improving member is provided so as not to overlap the bobbin holder 24 and the traverse unit 22 when viewed in the front-rear direction. In this case, as shown in FIG. 9(b), the fixed portions 44 may be fixed to the right side surface of the frame 27, i.e., the surface closest to the contact roller 25 when viewed in the front-rear direction. The rigidity improving member 32c, 32d

may not have the rib 41.

(4) The position of the fixed portions 44 is not limited to the above. The fixed portions 44 may be fixed to a bottom surface or a left side surface of the frame 27.

(5) While in the embodiment above the two arm members 31 which are plate-shaped and extend in the radial direction of the contact roller 25 are supporting portions supporting the contact roller 25 to be rotatable, the disclosure is not limited to this arrangement. The two arm members may, for example, be rod-shaped and extend in the radial direction. Alternatively, for example, the two arm members 31 may be connected to each other by a plate member (not illustrated) which extends along the front-rear direction. In this case, the two arm members 31 and the plate member constitute the supporting portion of the present invention. In other words, the supporting portion may extend in a direction different from the radial direction of the contact roller 25. The two arm members 31 may be independent from the plate member, or these members may be integrally formed.

While in the embodiment above the end portions in the front-rear direction of the contact roller 25 are rotatably supported by the arm members 31, the disclosure is not limited to this arrangement. An arm member supporting a central portion of the contact roller may be provided in addition to those supporting the end portions.

(6) While in the embodiment above the rigidity improving member 32 and the arm members 31 are independent members, these members may be integrally formed.

(7) The frame 27 may not be a substantially hollow rectangular in shape but be a hollow polygonal in shape, when viewed in the front-rear direction. Alternatively, the frame may be a solid circle in shape. In other words, the frame may not have a top surface.

(8) While in the embodiment above the contact roller 25 is provided above the bobbin holder 24 and below the traverse unit 22, the contact roller 25 may be differently positioned. For example, the contact roller 25 and the bobbin holder 24 may be provided side by side.

(9) While in the embodiment above the rigidity improving member 32 is provided leftward and above the bobbin holder 24 and to the left of the traverse unit 22, the disclosure is not limited to this arrangement. For example, the present invention may be employed in a yarn winder which is left-right symmetrical as compared to the above-described yarn winder 4. The rigidity improving member 32 may be provided rightward of and above the bobbin holder 24 and to the right of the traverse unit 22.

(10) In relation to the modification (9), the present invention may be employed in two yarn winders which are left-right symmetrical with each other and are provided to be side by side in the left-right direc-

tion. Alternatively, for example, the present invention may be employed in an integrated yarn winder including members such as two turrets which are left-right symmetrical with each other, two bobbin holders, and two contact rollers, which is shown in, for example, Japanese Unexamined Patent Publication No. 2003-238031.

(11) While in the embodiment above the contact roller 25 is swingably supported by the frame 27, the disclosure is not limited to this arrangement. For example, the present invention may be applied to a yarn winder including a so-called linear-motion-type moving mechanism with which a supporting member supporting a contact roller 25 moves up and down while keeping its posture (see e.g., Japanese Unexamined Patent Publication No. 2012-158436). Alternatively, the roller supporting member 26 may not be supported by the frame 27 but be directly attached to the base 20.

Claims

1. A yarn winder comprising:

a bobbin holder which extends in a predetermined longitudinal direction, bobbins on which yarns are wound, respectively, being attached to the bobbin holder to be lined up in the longitudinal direction;
a traverse unit which is configured to traverse the yarns;
a contact roller which extends in the longitudinal direction and is configured to apply a contact pressure to packages which are formed by winding, onto the bobbins, the yarns having been traversed by the traverse unit; and
a roller supporting member which supports the contact roller to be rotatable,
the roller supporting member including:

supporting portions which rotatably support at least end portions in the longitudinal direction of the contact roller and extend at least radially outward from a radial central portion of the contact roller; and
a rigidity improving member which extends in the longitudinal direction and to which the supporting portions are fixed, the rigidity improving member being provided so as not to overlap the bobbin holder and the traverse unit when viewed in the longitudinal direction, and

when viewed in the longitudinal direction, the rigidity improving member having a part which is longer than each of the supporting portions in a direction orthogonal to the direction in which

the supporting portions extend.

2. The yarn winder according to claim 1, wherein, when viewed in the longitudinal direction, at least a part of the rigidity improving member is provided so as not to overlap the supporting portions.

3. The yarn winder according to claim 1 or 2, wherein, each of the supporting portions is a rod-shaped or plate-shaped and is long in the radial direction.

4. The yarn winder according to any one of claims 1 to 3, further comprising:

a frame which extends in the longitudinal direction and supports the roller supporting member, wherein, a cross section of at least a part in the longitudinal direction of the rigidity improving member, which is taken along a direction orthogonal to the longitudinal direction, at least partially surrounds a cross section of the frame taken along the direction orthogonal to the longitudinal direction.

5. The yarn winder according to claim 4, wherein, a cross section of at least a part in the longitudinal direction of the rigidity improving member, which is taken along the direction orthogonal to the longitudinal direction, entirely surrounds the cross section of the frame in the direction orthogonal to the longitudinal direction.

6. The yarn winder according to claim 5, wherein, the rigidity improving member is cylindrical in shape and extends in the longitudinal direction.

7. The yarn winder according to any one of claims 4 to 6, wherein, the roller supporting member is supported by the frame to be swingable about a swing shaft extending in the longitudinal direction.

8. The yarn winder according to claim 7, wherein, the frame is polygonal in shape when viewed in the longitudinal direction, and the swing shaft is provided at a fixed portion which is fixed to one of outer circumferential surfaces of the frame, the one of the surfaces not being a surface closest to the contact roller when viewed in the longitudinal direction.

9. The yarn winder according to claim 7, wherein, the frame has a top surface, and the swing shaft is provided at the fixed portion fixed to the top surface.

10. The yarn winder according to any one of claims 7 to 9, wherein, the frame is rectangular in shape when

viewed in the longitudinal direction.

5

10

15

20

25

30

35

40

45

50

55

FIG.1

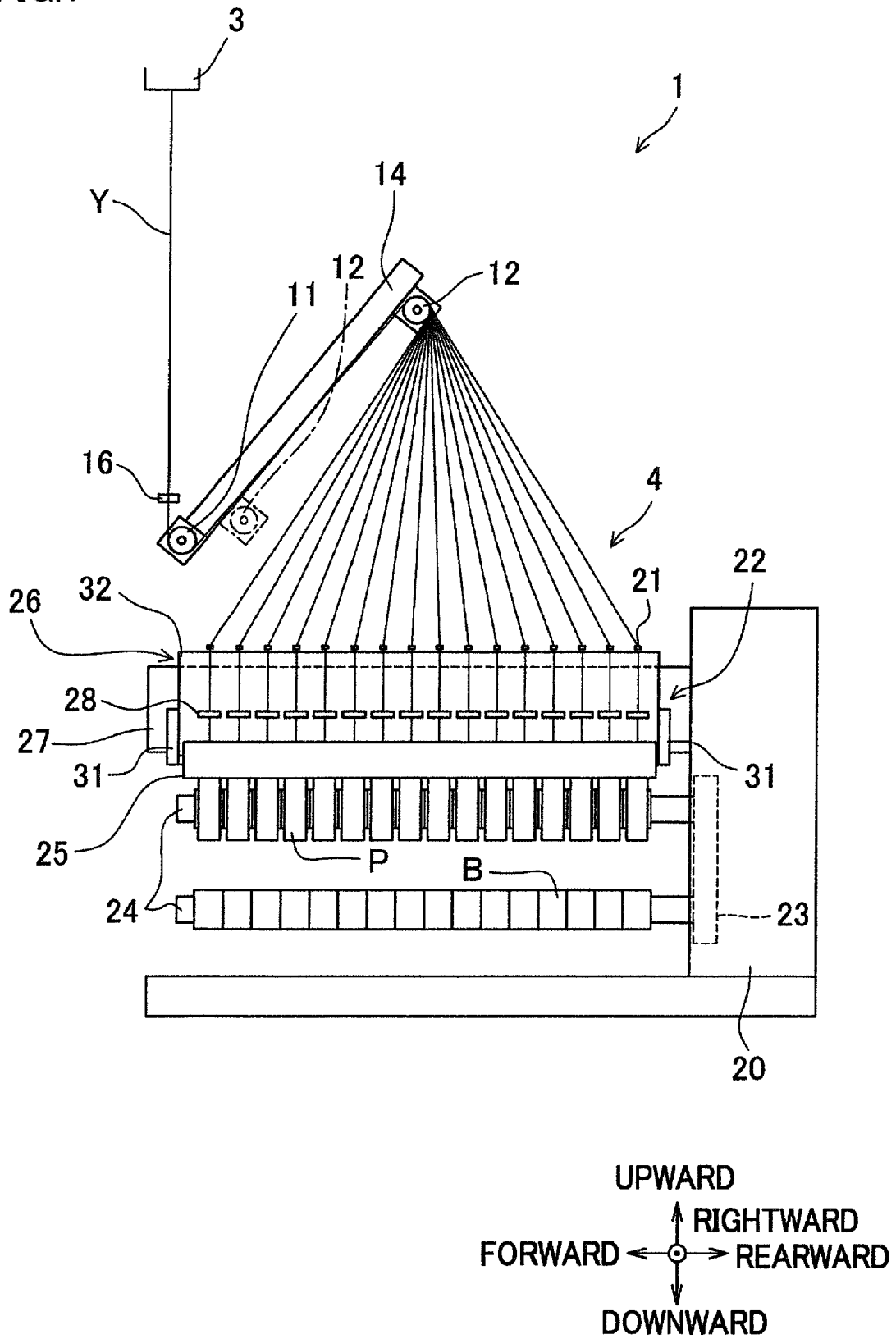


FIG.2

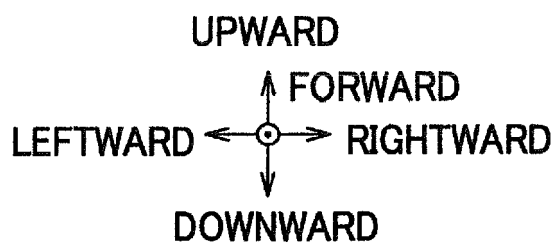
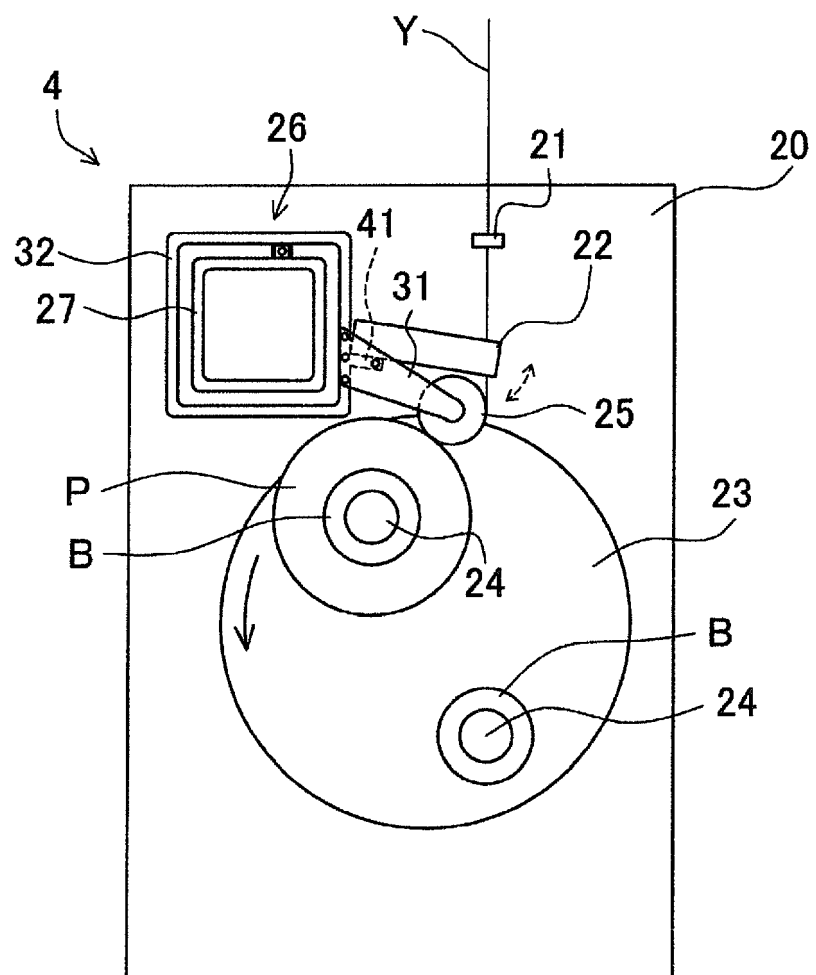


FIG.3

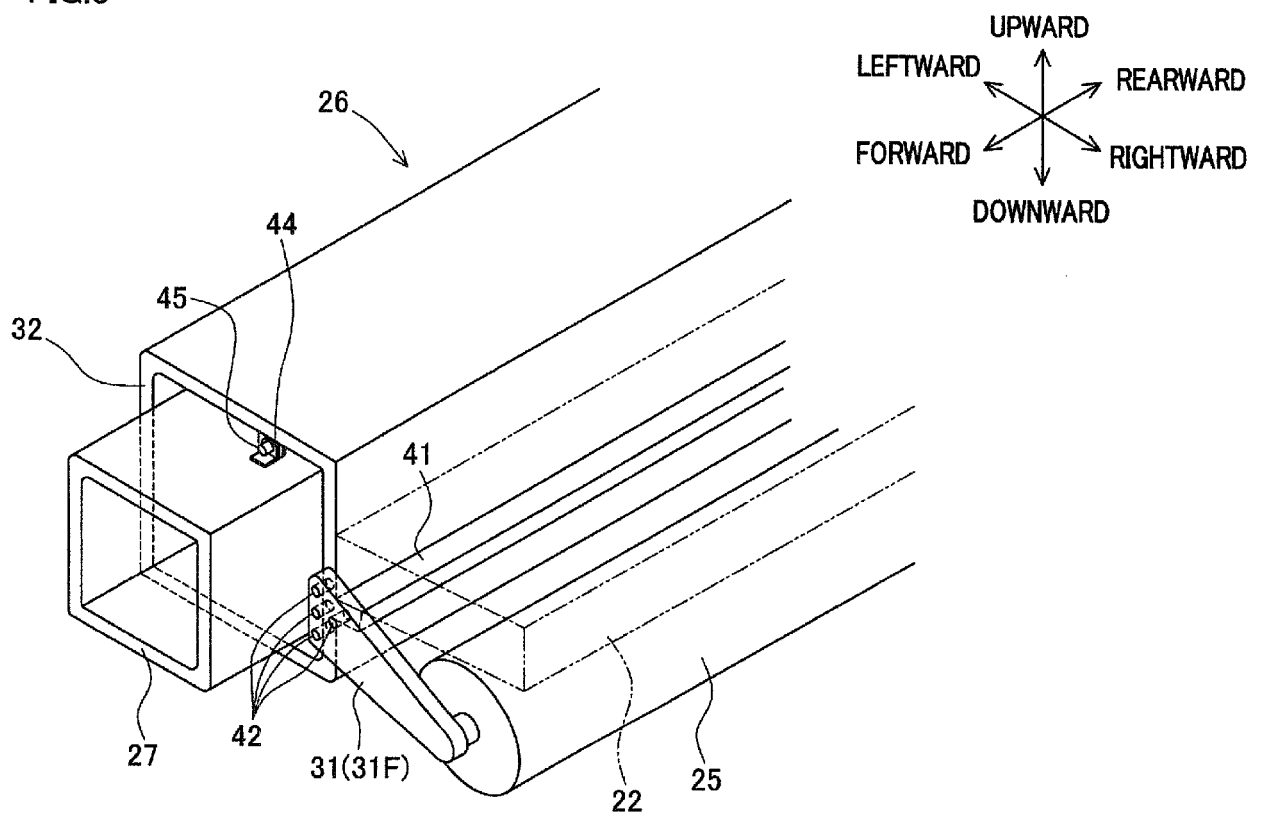


FIG.4

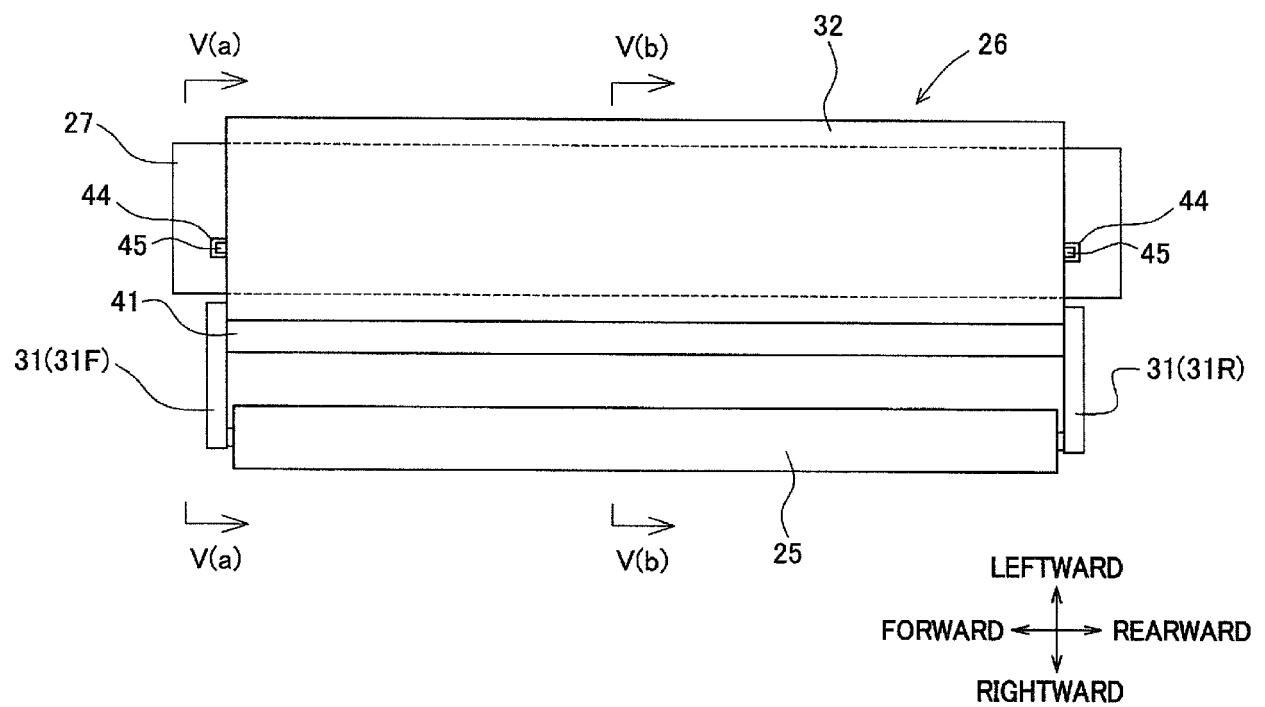
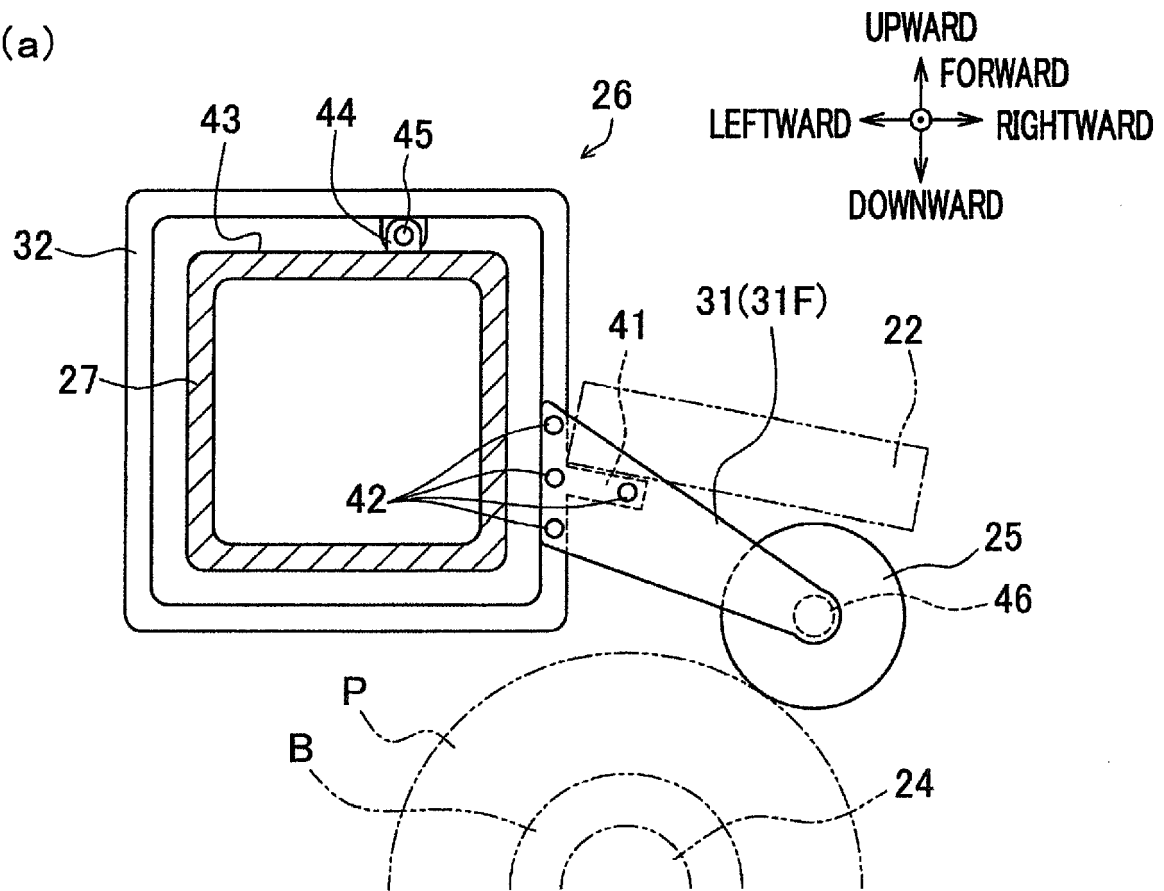


FIG.5

(a)



(b)

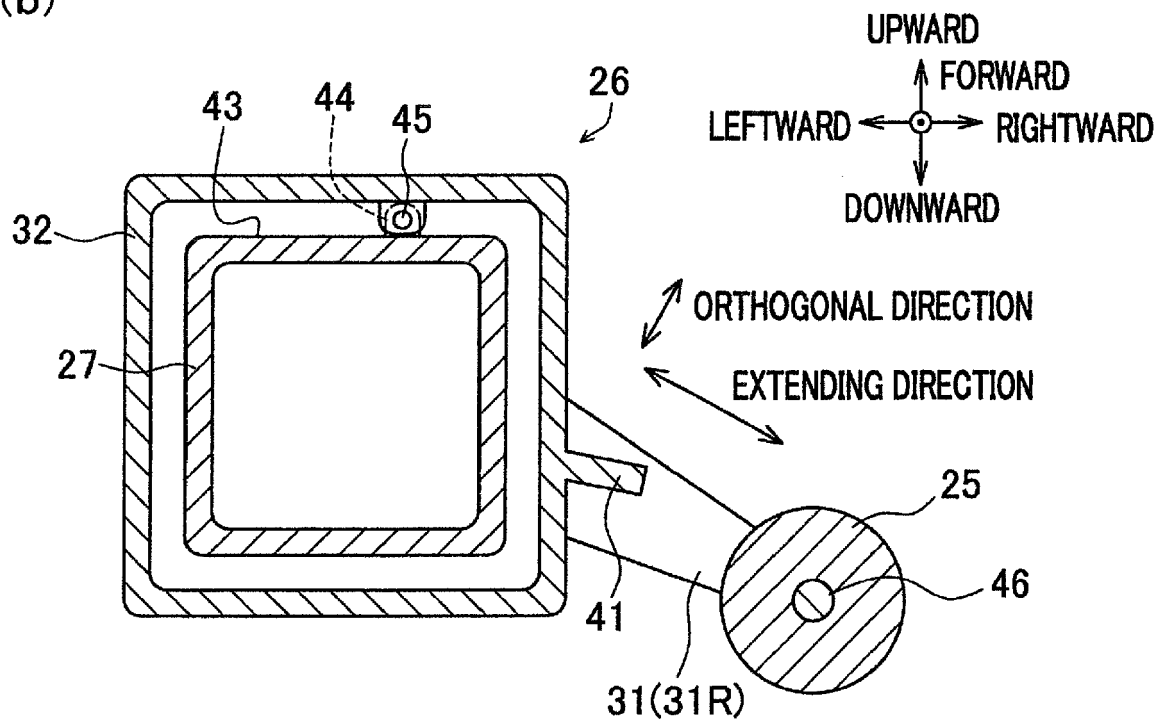
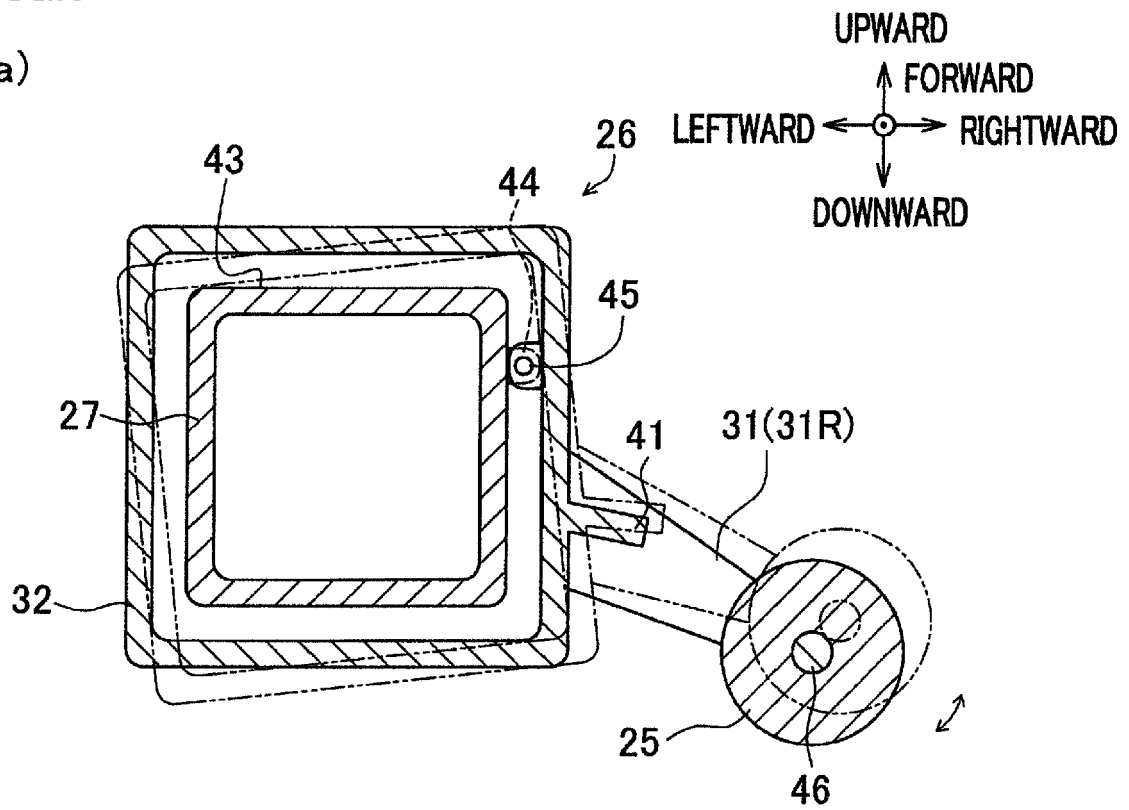


FIG. 6

(a)



(b)

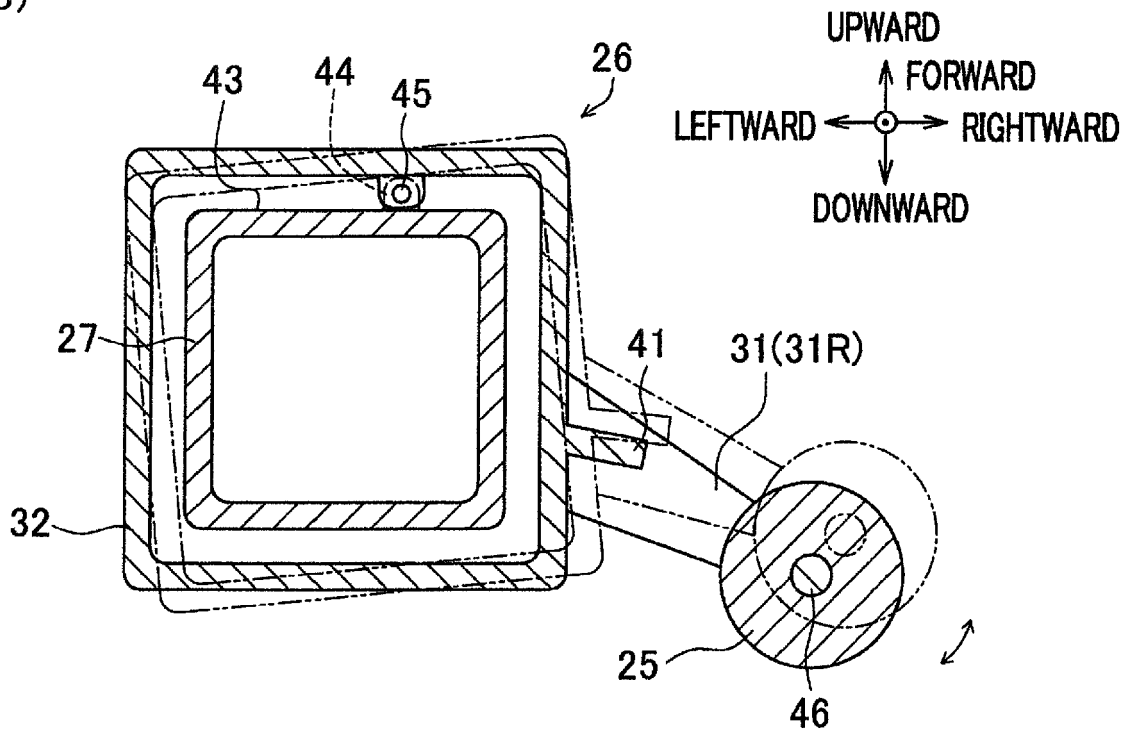


FIG.7

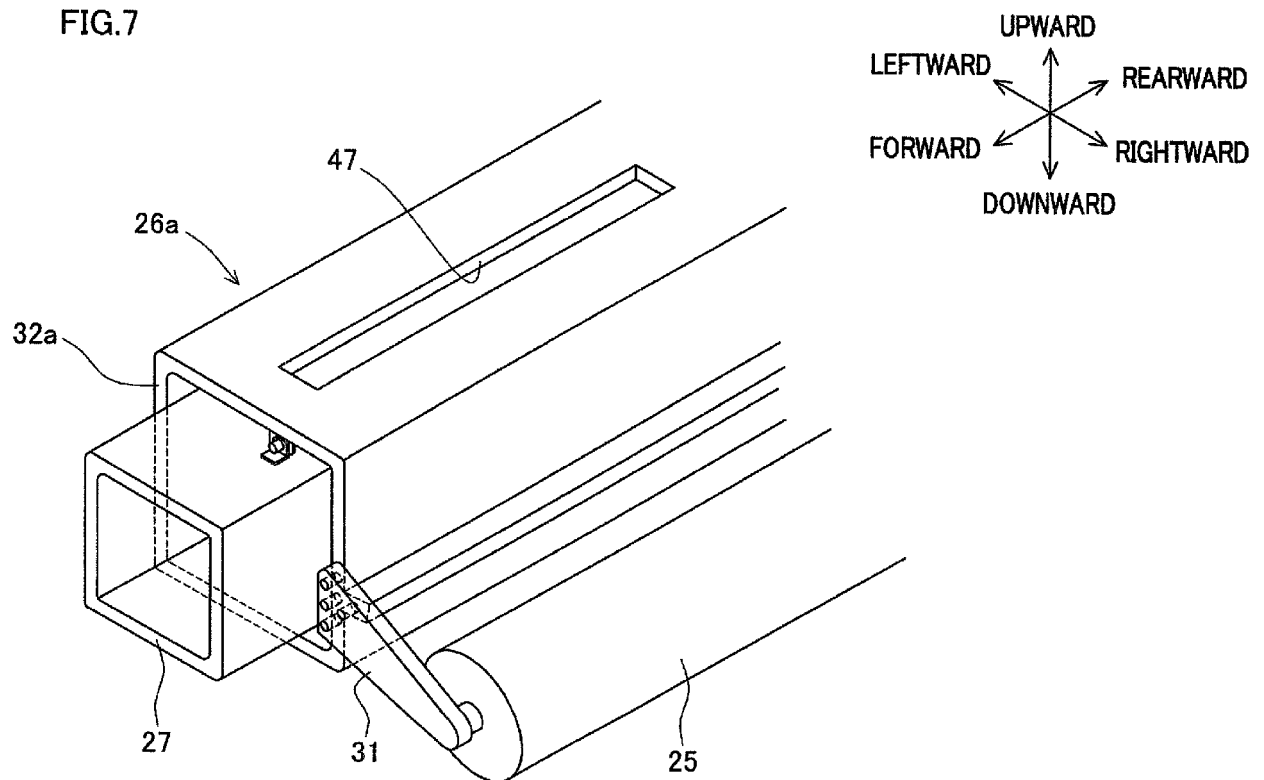


FIG.8

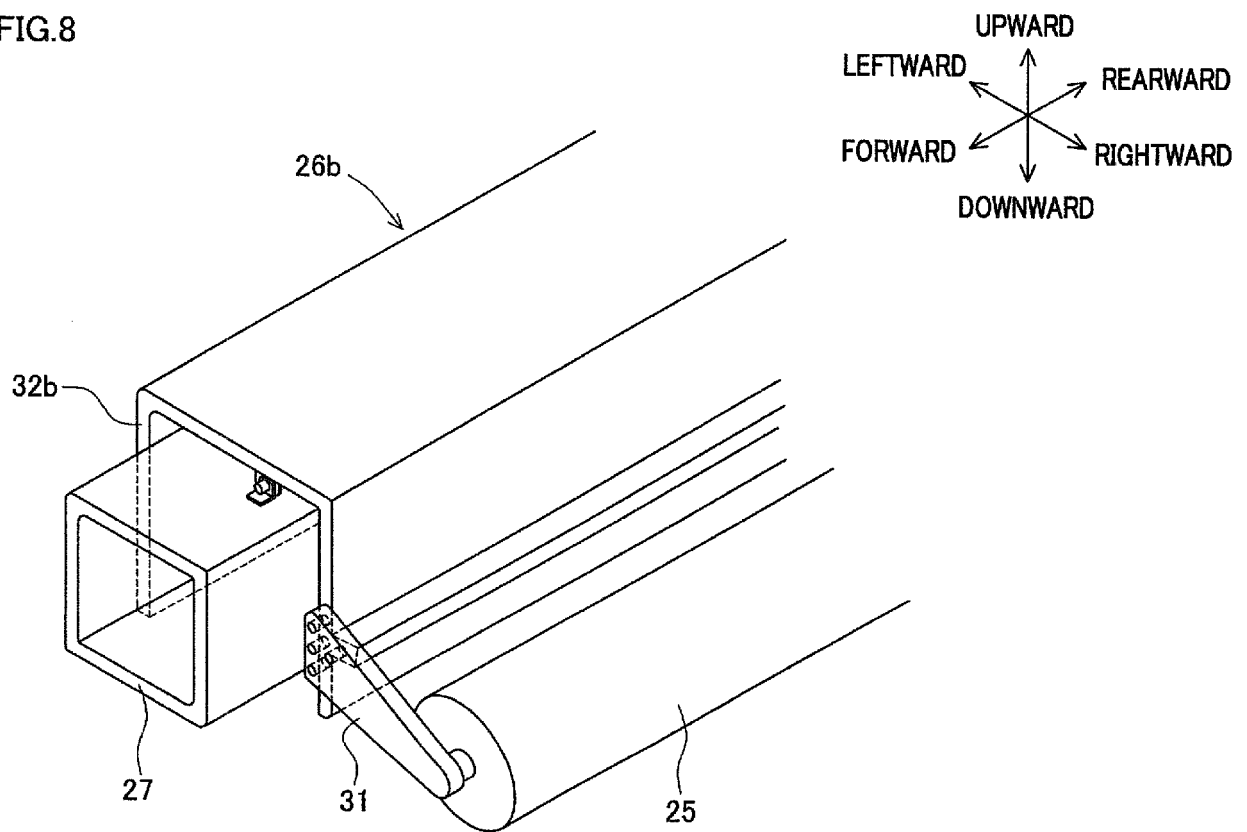
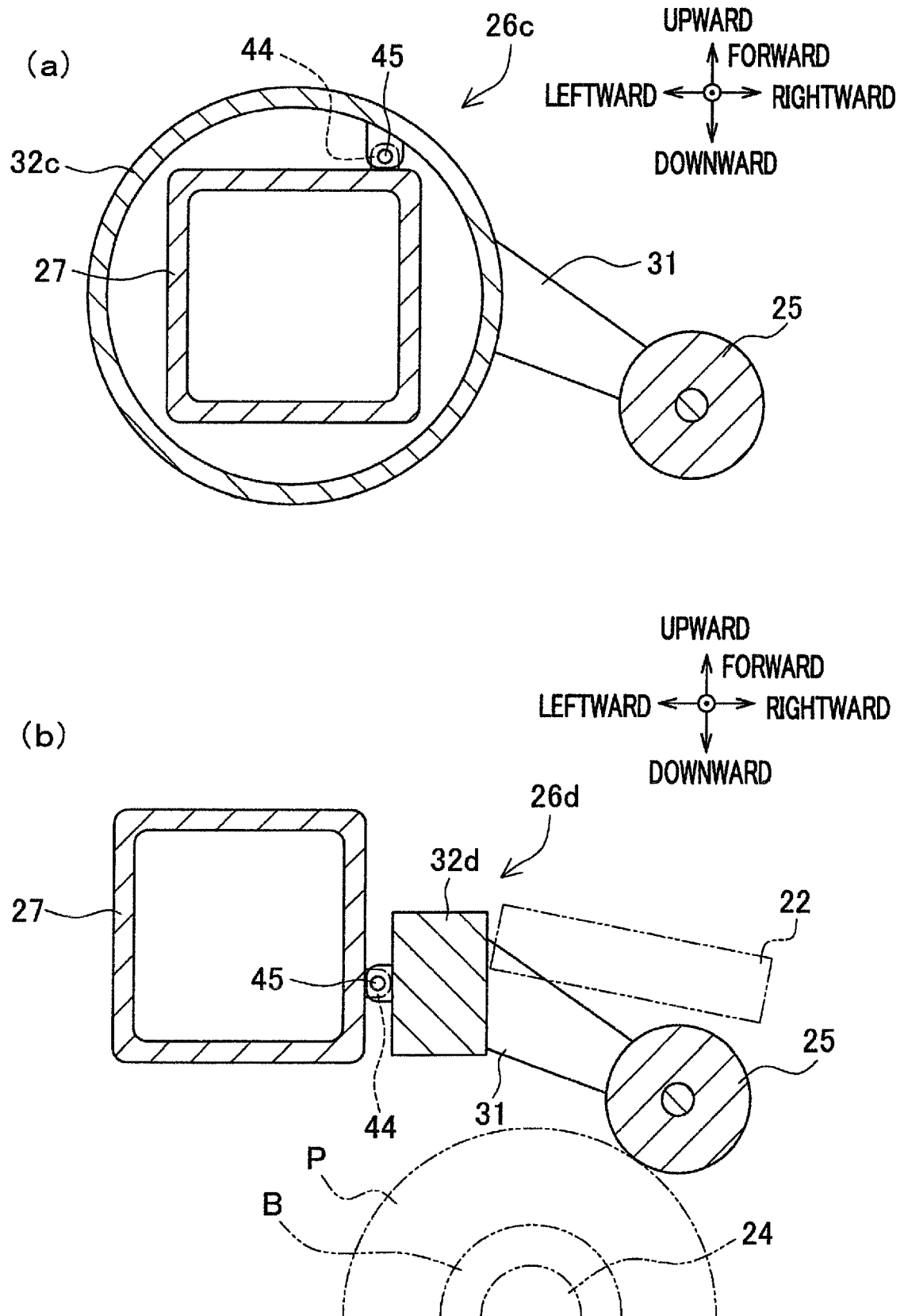


FIG.9





EUROPEAN SEARCH REPORT

 Application Number
 EP 18 17 6945

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 2008 290821 A (TMT MACHINERY INC) 4 December 2008 (2008-12-04)	1-3	INV. B65H54/52 B65H54/72 B65H67/048
A	* paragraphs [0021], [0035]; figures * -----	4-10	
X	DE 103 14 293 A1 (BARMAG BARMER MASCHF [DE]) 30 October 2003 (2003-10-30)	1,3	
A	* paragraphs [0006], [0027], [0035], [0038]; figures * -----	2,4-10	
A	US 5 653 395 A (IWADE TAKASHI [JP] ET AL) 5 August 1997 (1997-08-05) * figure 1 * -----	8	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B65H
Place of search		Date of completion of the search	Examiner
The Hague		26 October 2018	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			

 1
 EPO FORM 1503 03/02 (P04C01)

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

EP 18 17 6945

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.

26-10-2018

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 2008290821 A	04-12-2008	CN 101311090 A	26-11-2008
		JP 4990681 B2	01-08-2012
		JP 2008290821 A	04-12-2008
		KR 20080103404 A	27-11-2008

DE 10314293 A1	30-10-2003	NONE	

US 5653395 A	05-08-1997	DE 69415632 D1	11-02-1999
		DE 69415632 T2	20-05-1999
		EP 0650914 A1	03-05-1995
		US 5653395 A	05-08-1997
		WO 9426645 A1	24-11-1994

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

- DE 102006001041 A1 [0002]
- JP 2003238031 A [0064]
- JP 2012158436 A [0064]