

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a take-up winder which is configured to wind a plurality of yarns spun out from a spinning device.

[0002] A take-up winder, as is known in the prior art, forms a plurality of packages by winding a plurality of yarns spun out from a spinning device onto bobbins, respectively. According to Patent Literature 1 (PCT application entering national phase in Japan No. 2008-531438), to begin with, a plurality of yarns spun out from respective spinning devices are fed to a winder via godet rollers. The winder includes components such as a winding spindle to which a plurality of bobbins are attached, a plurality of guide rollers guiding (distributing) yarns supplied from the godet roller to the bobbins, and a traversing unit that traverses the yarns wound onto the bobbins in axial directions of the bobbins. As a yarn forwarded to a bobbin via each guide roller is wound onto the bobbin attached to the winding spindle while being traversed by the traversing unit, a package is formed.

[0003] The guide roller guiding the yarn to each of the plurality of yarns to each bobbin is a roller rotated in accordance with the running of the yarn contacting the guide roller. In this regard, the damage to the yarn is typically increased as the bending angle of the yarn on the yarn path from the godet rollers to the bobbin is large, and the yarn quality is deteriorated. However, when the yarn is bended by the above-described guide roller which is a driven roller rotated in accordance with the running of the yarn, the damage on the yarn is restrained even if the bending angle is large.

[0004] In addition to the above, Patent Literature 2 (Japanese unexamined patent publication No. 2011-256466) recites a take-up winder similar to the take-up winder recited in Patent Literature 1, in which a plurality of guide rollers (distribution rollers) are drive rollers that are driven by motors, respectively.

SUMMARY OF THE INVENTION

[0005] As described in Patent Literature 1, the damage on the yarn on account of the bending of the yarn path is restrained when the guide rollers are driven rollers driven in accordance with the running of the yarns. However, the damage is not sufficiently restrained for the reasons below. To cause the guide rollers to be driven in accordance with the running of the yarns, it is necessary to provide, from the running yarns to the guide rollers, a force which is sufficient to overcome the air resistance to the guide rollers. In doing so, load is applied to the yarns and a tension variation occurs, with the result that the yarn quality is lowered. Furthermore, the shape of the formed package is improper on account of the tension variation of the yarns. It is noted that the air resistance to the guide rollers is increased and the influence on the yarn quality

becomes significant, as the winding speed of the yarns is increased. Furthermore, because the drive force transferred from the yarn to each guide roller is insufficient, the surface speed of the guide roller is lower than the speed of the yarn. This worsens the abrasion of the surface of each guide roller caused by the yarn.

[0006] In this regard, as described in Patent Literature 2, the problem above is resolved in such a way that a drive force sufficient to overcome the air resistance is provided from a driving source such as a motor to each guide roller, and the guide roller is actively driven. In the meanwhile, in order to improve the workability of operations such as yarn threading onto the guide rollers when the yarns are threaded onto the winder and maintenance operations such as cleaning and replacement of the guide rollers, the guide rollers are preferably movable between positions for the yarn winding and positions where the operator is able to easily perform the operations. In this connection, when the guide rollers are driven by the motors or the like, it is necessary to move not only the guide rollers but also the driving sources such as the motors. Because the weight to be moved is heavy in this case, a structure required for the movement must be a large-scale structure and the burden on the operator is heavy when the operator is required to manually move the components.

[0007] An object of the present invention is to provide a take-up winder in which a plurality of guide rollers are actively driven, and the plurality of guide rollers can be easily moved at the time of yarn threading and or the like.

[0008] According to the first aspect of the invention, a take-up winder includes: a winding spindle to which bobbins are attached along an axial direction of the winding spindle, the winding spindle being configured to wind yarns spun out from a spinning device onto the respective bobbins; guide rollers configured to guide the yarns to the respective bobbins; and roller drivers configured to drive the respective guide rollers, the guide rollers being detachably connected to the roller drivers and being movable independently of the roller drivers.

[0009] According to the present invention, each roller driver provides a drive force sufficient to overcome the air resistance to the guide roller and actively drives the guide roller. With this, no load is applied to the yarn when the yarn passes through the guide roller, with the result that the damage to the yarn is significantly reduced. Furthermore, according to the present invention, the guide rollers are detachably connected to the roller drivers. It is therefore possible to disconnect the guide rollers from the roller drives and move the guide rollers to predetermined positions with which operations such as yarn threading and maintenance can be easily done. Because the components to be moved do not include the roller drivers, the weight to be moved is small, and hence the arrangement for moving the guide rollers, such as the guides, is simple. Furthermore, the operation to manually move the guide rollers by the operator can be easily done.

[0010] According to the second aspect of the inven-

tion, the take-up winder of the first aspect is arranged so that the guide rollers are movable with respect to the roller drivers, in the axial direction of the winding spindle.

[0011] Because in the present invention the guide rollers can be drawn out along the axial direction of the winding spindle, operations such as yarn threading onto the guide rollers are easily done.

[0012] According to the third aspect of the invention, the take-up winder of the second aspect is arranged so that the guide rollers are lined up in the axial direction of the winding spindle, and are drawn out to be disconnected from the roller drivers in the direction in which the guide rollers are lined up, and connection positions between the guide rollers and the roller drivers are arranged so that, when comparing any two adjacent connection positions, a connection position on the side to which the guide rollers are drawn is far from the associated guide roller as compared to the other connection position.

[0013] According to the present invention, when the guide rollers are disconnected from the motors and drawn out, the interference between one guide roller to be moved and a connection portion of a roller driver connected to another guide roller which is on the drawn side as compared to the one guide roller is prevented.

[0014] According to the fourth aspect of the invention, the take-up winder of any one of the first to third aspects is arranged so that the winding speed of the yarns wound by the winding spindle is more than or equal to 4000m/min.

[0015] When the winding speed of the yarn is 4000m/min or higher, the air resistance to the guide roller is significant, and a large tension variation occurs in the yarn if driven rollers which rotated in accordance with the running of the yarn are used. In this regard, because in the present invention the guide rollers are actively rotated by the roller drivers, a tension variation hardly occurs in the yarn even if the winding speed is high.

[0016] According to the fifth aspect of the invention, the take-up winder of any one of the first to fourth aspects is arranged so that the guide rollers and the roller drivers are connected with one another by magnet couplings in a contactless manner so that power transmission is possible between the guide rollers and the roller drivers.

[0017] According to the present invention, because the guide rollers and the roller drivers are connected with one another in a contactless manner by the magnet coupling, it is possible that the guide rollers are easily disconnected from the roller drivers to move when operations such as threading and the like are performed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

FIG. 1 is a profile of a take-up winder according to an embodiment.

FIG. 2 is a front elevation of the take-up winder.

FIG. 3 is a top view of the roller units and surrounding

components at the time of yarn winding.

FIG. 4 is a cross section of the roller unit.

FIG. 5 is a top view of the roller units and surrounding components when the guide rollers are drawn out.

FIG. 6 is a top view of the roller units and surrounding components according to a variation.

FIG. 7A and 7B are top views of the roller units and surrounding components according to another variation. FIG. 7A shows the state at the time of yarn winding, whereas FIG. 7B shows the state when the guide rollers are drawn out.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] Now, an embodiment of the present invention will be described. FIG. 1 is a profile of a take-up winder of the present embodiment. FIG. 2 is a front elevation of the take-up winder. Hereinafter, a front-back direction, a left-right direction, and an up-down direction are defined as shown in FIG. 1 and FIG. 2 and these directions are suitably used for the explanations.

[0020] The take-up winder 1 shown in FIG. 1 and FIG. 2 forms packages P by winding, onto respective bobbins B, yarns Y serially spun out from a spinning device 2 which is provided above the take-up winder 1. As indicated by the two-dot chain lines in FIG. 2, a plurality of take-up winders 1 are lined up in the left-right direction. With respect to each take-up winder 1, the operator performs various operations from the front side (i.e., on the side close to the viewer of FIG. 2), such as yarn threading onto each part of the apparatus, attachment of a bobbin B to the bobbin holder 7, and maintenance operations of cleaning and part replacement.

[0021] The take-up winder 1 includes two godet rollers 11 and 12 receiving yarns Y spun out from the spinning device 2 and a winding device 3 that winds the yarns Y supplied from the godet rollers 11 and 12.

[0022] As shown in FIG. 2, a frame 14 is provided on the left side of the winding device 3. The two godet rollers 11 and 12 are rotatably supported by a roller supporter 16 attached to the frame 14 and are positioned above the front end portion of the winding device 3. The godet roller 12 is provided on the back side of the godet roller 11 and above the godet roller 11. The two godet rollers 11 and 12 are drive rollers driven by unillustrated motors, respectively, and send the yarns Y supplied from the spinning device 2 to the winding device 3.

[0023] As shown in FIG. 1, on the frame 14, a plurality of guide rollers 13 are lined up in the front-back direction. These guide rollers 13 guide (distribute) the yarns to the bobbins B of the winding device 3 such that the yarn paths are changed by bending the yarns that are supplied from the godet roller 12 in a parallel manner. The details of the guide rollers 13 will be given later. In the vicinity of each guide roller 13, a fulcrum guide 17 is provided to function as a traversal fulcrum when the yarn Y is traversed and wound onto the bobbin B in the winding device 3 as described later.

[0024] The winding device 3 includes components such as a winding device body 5, a disc-shaped turret 6 rotatably attached to the winding device body 5, two bobbin holders 7 to which the bobbins B are attached along the axial direction thereof, traverse guides 8 configured to traverse the respective yarns Y wound onto the bobbins B, and a contact roller 9 configured to contact bobbins B (or packages P) attached to the bobbin holders 7.

[0025] The two bobbin holders 7 are rotatably supported by the turret 6 on the back side thereof so that the axial direction of the bobbin holders 7 is in parallel to the front-back direction. The two bobbin holders 7 are rotated by motors (not illustrated), respectively. As each bobbin holder 7 rotates, the bobbins B attached to the bobbin holder 7 rotate together with the bobbin holder 7. Furthermore, as the turret 6 supporting the two bobbin holders 7 rotates, the positions of the two bobbin holders 7 are switched between a winding position (in an upper part of FIG. 1) and doffing position (in a lower part of FIG. 1).

[0026] Each of the plurality of yarns Y is forwarded to each bobbin B via the corresponding guide roller 13, fulcrum guide 17, and traverse guide 8. The yarns are then wound onto the plurality of bobbins B attached to the bobbin holder 7 at the winding position respectively, while being traversed by the traverse guide 8 in the axial direction of the bobbin B about the fulcrum guide 17. As a result, a plurality of packages P are formed on the respective bobbins B. Furthermore, during the yarn winding described above, the contact roller 9 adjusts the shape of each package P such that the contact roller 9 rotates while contacting the outer circumference of the package P and applying a predetermined contact pressure to the package P.

[0027] Now, the guide rollers 13 guiding the yarns Y to bobbins B will be detailed. As shown in FIG. 1, to the frame 14, a roller supporter 18 which is long in the front-back direction is attached via two vertically-arranged guides 19 and 20 to be slidable in the front-back direction (i.e., in the direction in which the guide rollers 13 are lined up). To the roller supporter 18, roller units 21 which include the guide rollers 13, respectively, are attached. Furthermore, to the roller supporter 18, fulcrum guides 17 are attached to be movable together with the roller units 21.

[0028] FIG. 3 is a top view of the roller units and surrounding components. In FIG. 3, the roller units 21 are shown in cross section. On the other hand, FIG. 4 is a cross section of the roller unit. Each roller unit 21 includes the guide roller 13 and a cylindrical holder 22 that rotatably supports the guide roller 13.

[0029] The guide roller 13 is substantially disc-shaped, and the yarn Y is wound onto a groove which is V-shaped in cross section and formed on the outer lateral circumference of the guide roller 13. This guide roller 13 is connected to a rotation shaft 23. The rotation shaft 23 is supported by bearings 27 and 28 in the holder 22 to be rotatable with respect to the holder 22. This holder 22 is

fixed to the roller supporter 18 as the holder 22 is inserted into an attaching hole 18a made through the roller supporter 18.

[0030] In addition to the above, the frame 14 is provided with motors 24 (roller drivers) rotating the respective guide rollers 13. More specifically, as shown in FIG. 3, a motor supporter 25 fixed to the frame 14 is provided on the left side of the roller supporter 18. The plurality of motors 24 are attached to this motor supporter 25. Each motor 24 is able to provide a force sufficient to overcome the air resistance to the guide roller 13. Therefore, being different from the case where the guide roller 13 is a driven roller rotated in accordance with the running of the yarn Y, no load is applied to the yarn Y passing through the guide roller 13, and hence the damage to the yarn Y is significantly reduced. In particular, when the winding speed of the yarn Y by the winding device 3 (bobbin holder 7) is high (e.g., 4000m/min or higher), the air resistance to the guide roller 13 is very high. Even in such a case, the damage to the yarn Y is almost eliminated as the motor 24 provides the drive force (described above) sufficient to overcome the air resistance.

[0031] In the meanwhile, the present embodiment is arranged so that the rotation shaft 23 of the guide roller 13 is detachably connected to the output shaft 24a of the motor 24. More specifically, the guide roller 13 and the motor 24 are connected with each other by a magnet coupling 30 so that power transfer therebetween is possible in a contactless manner. The magnet coupling 30 includes a pair of connecting portions 31 and 32 that are attached to the rotation shaft 23 and the output shaft 24a, respectively, and oppose each other with a predetermined gap therebetween. The opposing surfaces of the respective connecting portions 31 and 32 are provided with magnets, respectively. The magnetic force generated between the connecting portions 31 and 32 causes the power (torque) of the motor 24 to be transferred to the guide roller 13 in a contactless manner.

[0032] Now, the yarn threading onto the winding device 3 will be described. To begin with, the operator sucks the yarns Y sent out from the godet roller 12 above the front end portion of the winding device 3 by a suction gun, and holds the yarns. While manually operating the suction gun, the operator threads each of the plurality of yarns Y onto the corresponding guide roller 13 and the fulcrum guide 17.

[0033] In the meanwhile, as shown in FIG. 2, in the present embodiment the take-up winders 1 are lined up in the left-right direction, and hence almost no space is available for the operator between neighboring take-up winders 1. The operator is therefore required to perform various operations such as the yarn threading and the like in the front-back direction with respect to the take-up winder 1.

[0034] In this regard, to facilitate the yarn threading onto the guide rollers 13 and the fulcrum guides 17, the operator draws the guide rollers 13 and the fulcrum guides 17 to the front. FIG. 5 is a top view of the roller

units and surrounding components when the guide rollers are drawn out.

[0035] As described above, the roller supporter 18 supporting the guide rollers 13 and the fulcrum guides 17 is movable in the front-back direction (in the direction in which the guide rollers 13 are lined up) with respect to the frame 14. In the state in which the guide rollers 13 are at the positions for the yarn winding (i.e., the positions immediately above the bobbins B as indicated by the full lines in FIG. 1), the roller supporter 18 is drawn to the front as shown in FIG. 5, so that the guide rollers 13 and the fulcrum guides 17 are moved to the drawn positions (indicated by the two-dot chain lines in FIG. 1). In this state, the operator in front of the take-up winder 1 can easily move the suction gun and threads the yarns Y onto the guide rollers 13 and the fulcrum guides 17.

[0036] In regard to each of the guide rollers 13, the connecting portion 31 on the guide roller 13 side and the connecting portion 32 on the motor 24 side are connected with each other so that power can be transferred therebetween in a contactless manner. For this reason, as the roller supporter 18 is drawn to the front, the connecting portions 31 and 32 are parted from each other in the front-back direction. As such, the guide roller 13 is easily detached from the motor 24.

[0037] When drawn to the front, each guide roller 13 is disconnected from the motor 24, and hence the guide roller 13 becomes a driven roller rotated in accordance with the running of the yarn Y. For this reason, when the yarn Y is threaded onto the guide roller 13, load is applied to the yarn Y and a tension variation occurs because the yarn Y rotates the guide roller 13. Furthermore, on account of the air resistance to the guide roller 13, the surface speed of the guide roller 13 is lower than the speed of the yarn Y, with the result that the friction occurs between the surface of guide roller 13 and the yarn Y, and hence there is concern over the damages to the yarn Y and the surface of the guide roller 13.

[0038] However, because each guide roller 13 functions as a driven roller rotated in accordance with the running of the yarn only before the yarn threading, and the yarn Y is sucked by the suction gun and to be disposed of, the deterioration in the yarn quality does not occur at this stage.

[0039] In addition to the above, when the running speed of the yarn Y is high at the time of the yarn threading, it is difficult to ensure the sucking of the yarn by the suction gun when the yarn threading is conducted by moving the suction gun, and hence the yarn threading onto the winder 1 is difficult. Therefore, in this embodiment, at the time of the yarn threading, the yarn supplying speed of the godet rollers 11 and 12 is lowered as compared to the speed in the yarn winding. As such, the running speed of the yarn Y is lowered and then the running speed is increased to a production speed after the yarn Y is threaded onto the winder 1.

[0040] The air resistance at the time of the rotation is typically in proportion to the cube of the speed. In con-

sideration of this, the air resistance to the guide roller 13 can be significantly reduced as compared to the air resistance in the yarn winding, only by slightly decreasing the speed in the yarn threading as compared to the yarn winding. As such, even if the guide roller 13 is rotated in accordance with the running of the yarn Y, the guide roller 13 can be sufficiently accelerated by the yarn Y, and hence the damage to the surface of the guide roller 13 is restrained.

[0041] After finishing the threading of the plurality of yarns Y onto the plurality of guide rollers 13 and the plurality of fulcrum guides 17, respectively, the operator pushes the roller supporter 18 backward so as to return the guide rollers 13 and the fulcrum guides 17 to the positions at the time of the yarn winding. In so doing, as shown in FIG. 3, because the rotation shaft 23 of each guide roller 13 and the output shaft 24a of the corresponding motor 24 are connected with each other so that power transfer therebetween is possible through the magnet coupling 30, the guide roller 13 becomes rotatable by the motor 24.

[0042] While the description above relates to the yarn threading onto the guide roller 13, the guide rollers 13 may be drawn forward (to the front side) when maintenance operations such as cleaning and replacement of the guide rollers 13 are conducted.

[0043] As described above, according to the present embodiment, the guide rollers 13 are detachably connected to the motors 24, respectively. On account of this arrangement, when operations such as yarn threading and maintenance are conducted with the respect to the guide rollers 13, the guide rollers 13 are disconnected from the motors 24 and drawn out along the axial direction of the bobbin holders 7. In so doing, because the weight to be moved becomes light on account of the exclusion of the motors 24, the guide rollers 13 are movable in the front-back direction by a simple structure such as the guides 19 and 20 (see FIG. 1). Furthermore, the operation to draw out the guide rollers 13 by the operator can be easily done.

[0044] In addition to the above, in particular, because in the present embodiment the guide rollers 13 and the motors 24 are connected with one another in a contactless manner by the magnet couplings 30, it is possible to easily disconnect and move the guide rollers 13 from the motors 24 when operations such as yarn threading and the like are conducted.

[0045] Now, variations of the embodiment will be described. The components already described in the embodiment above are denoted by the same reference numerals, and thus detailed description thereof will be hereinafter omitted.

[0046]

1] While in the embodiment above the plurality of guide rollers 13 are driven by the plurality of corresponding motors 24, respectively, the plurality of guide rollers may be driven by a single motor. For

example, in FIG. 6, the plurality of roller driving pulleys 35 connected to respective guide rollers 13 by magnet couplings 30 and a motor pulley 36 directly connected to a motor 24 are provided. Furthermore, an endless belt 38 wraps around the plurality of pulleys 35 and 36. As a drive force is transferred from the single motor 24 to the motor driving pulleys 35 via the belts 38, the plurality of guide rollers 13 are simultaneously rotated.

[0047]

2] In the embodiment above the positions where the connecting portions 31 on the guide roller 13 side are connected with the connecting portions 32 on the motor 24 side are on a single plane which is in parallel to the direction in which the guide rollers 13 are lined up, as shown in FIG. 3 and FIG. 5. Alternatively, as shown in FIG. 7, the connection positions (indicated by the two-dot chain lines) may be arranged so that, when comparing any two adjacent connection positions, a connection position on the side to which the guide rollers 13 are drawn is far from the associated guide roller 13 as compared to the other connection position. In FIG. 7, between neighboring guide rollers 13, the connection positions are deviated from each other by 'a' in the axial direction of the guide rollers 13. In this arrangement, when the guide rollers 13 are disconnected from the motors 24 and drawn to the front in order to perform operations such as yarn threading and the like, the interference between each connecting portion 31 on the guide roller 13 and each connecting portion 32 on the motor 24 side, which is closer to the drawing side as compared to the connection portion 31 (i.e., on the side of being connected to a guide roller 13), is prevented.

[0048]

3] The means for detachably connecting the guide roller 13 with the motor 24 is not limited to the magnet coupling 30 of the embodiment above. For example, the guide roller 13 may be connected with the motor 24 by a known mechanical clutch.

[0049]

4] While in the embodiment above the guide rollers 13 can be disconnected from the motors 24 and moved along the axial direction of the bobbin holders 7 (winding spindles), the moving direction of the guide rollers 13 is not limited to this. That is to say, the moving direction of the guide rollers 13 is suitably set in accordance with the position where the operator performs an operation.

[0050]

5] While in the embodiment above the intervals of the guide rollers 13 are unchanged when the guide rollers 13 are moved, the intervals of the guide rollers 13 may be narrowed when they are drawn out, as in a traversal fulcrum guide recited in Japanese Unexamined Patent Publication No. 60-183471, for example.

[0051]

6] While in the embodiment above the fulcrum guides 17 are provided in addition to the guide rollers 13, the guide rollers 13 may be able to function as the fulcrum guides 17 and the fulcrum guides 17 may be omitted.

Claims

1. A take-up winder comprising:

a winding spindle to which bobbins are attached along an axial direction of the winding spindle, the winding spindle being configured to wind yarns spun out from a spinning device onto the respective bobbins;
guide rollers configured to guide the yarns to the respective bobbins; and
roller drivers configured to drive the respective guide rollers,
the guide rollers being detachably connected to the roller drivers and being movable independently of the roller drivers.

2. The take-up winder according to claim 1, wherein, the guide rollers are movable with respect to the roller drivers, in the axial direction of the winding spindle.

3. The take-up winder according to claim 2, wherein, the guide rollers are lined up in the axial direction of the winding spindle, and are drawn out to be disconnected from the roller drivers in the direction in which the guide rollers are lined up, and
connection positions between the guide rollers and the roller drivers are arranged so that, when comparing any two adjacent connection positions, a connection position on the side to which the guide rollers are drawn is far from the associated guide roller as compared to the other connection position.

4. The take-up winder according to any one of claims 1 to 3, wherein, the winding speed of the yarns wound by the winding spindle is at least 4000m/min.

5. The take-up winder according to any one of claims 1 to 4, wherein, the guide rollers and the roller drivers are connected

with one another by magnet coupling in a contactless manner so that power transmission is possible between the guide rollers and the roller drivers.

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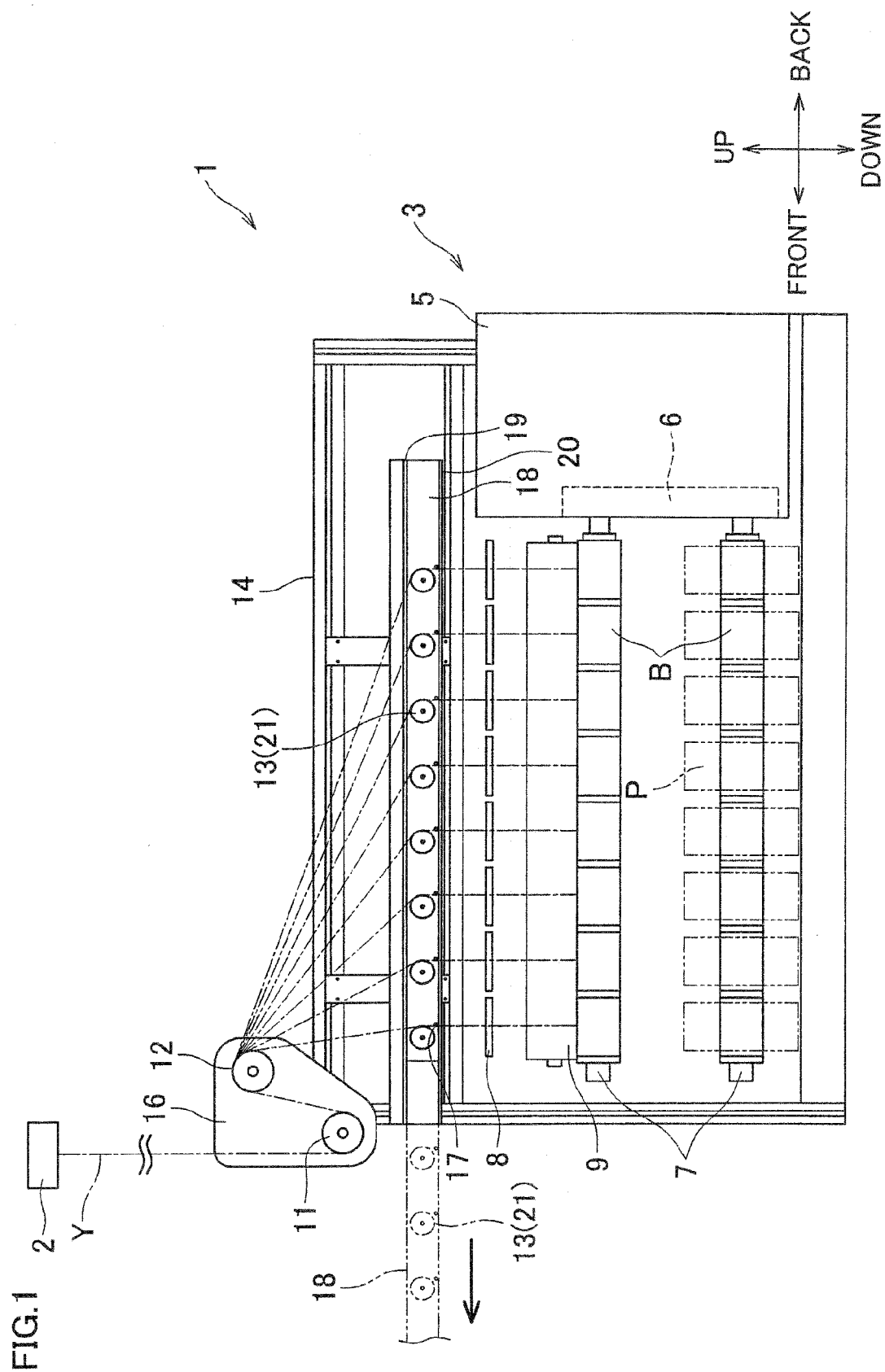


FIG.2

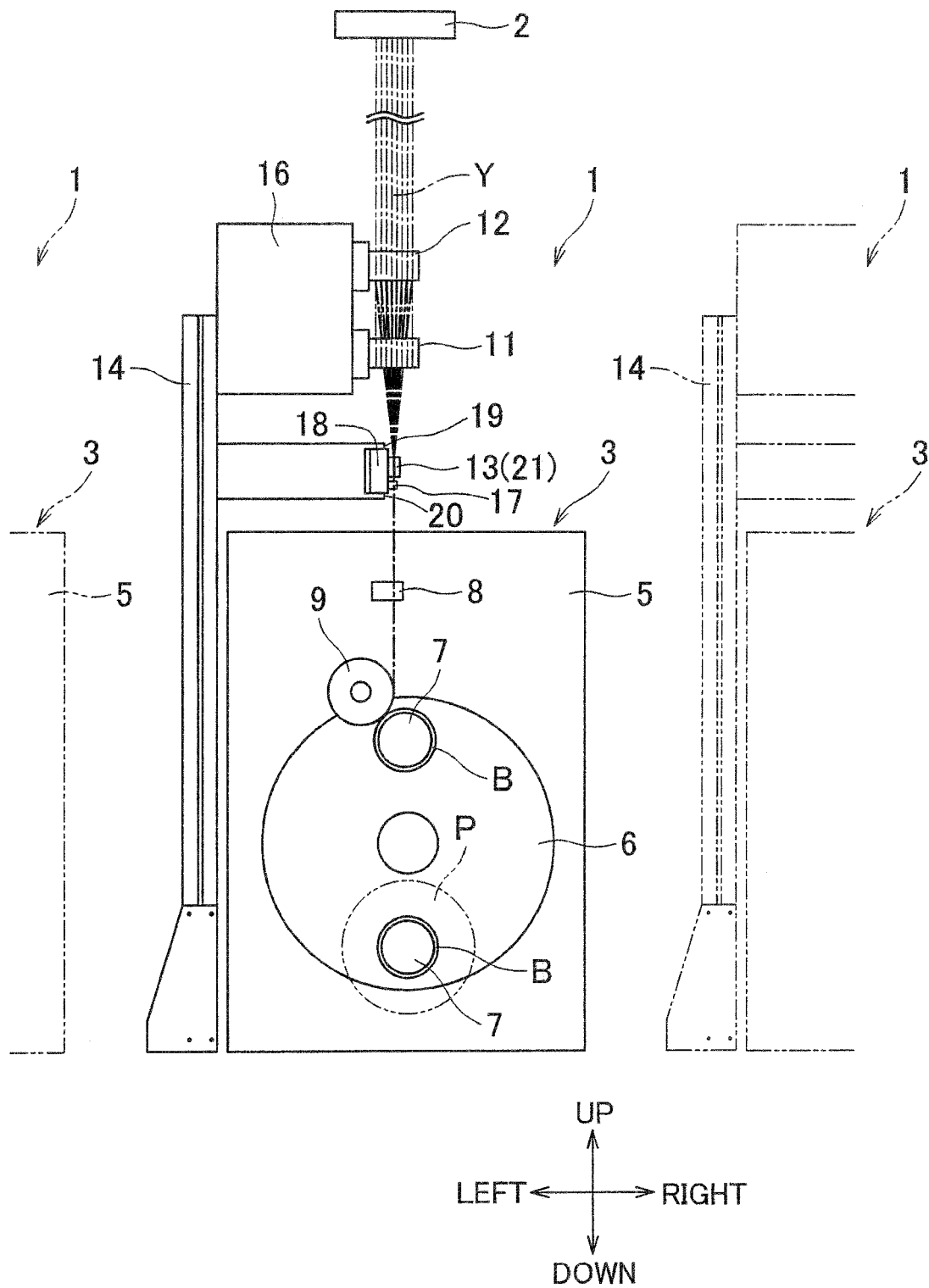


FIG.3

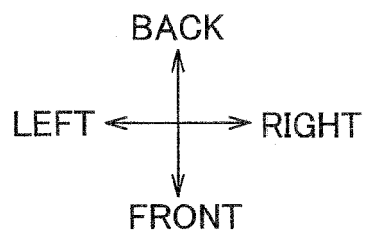
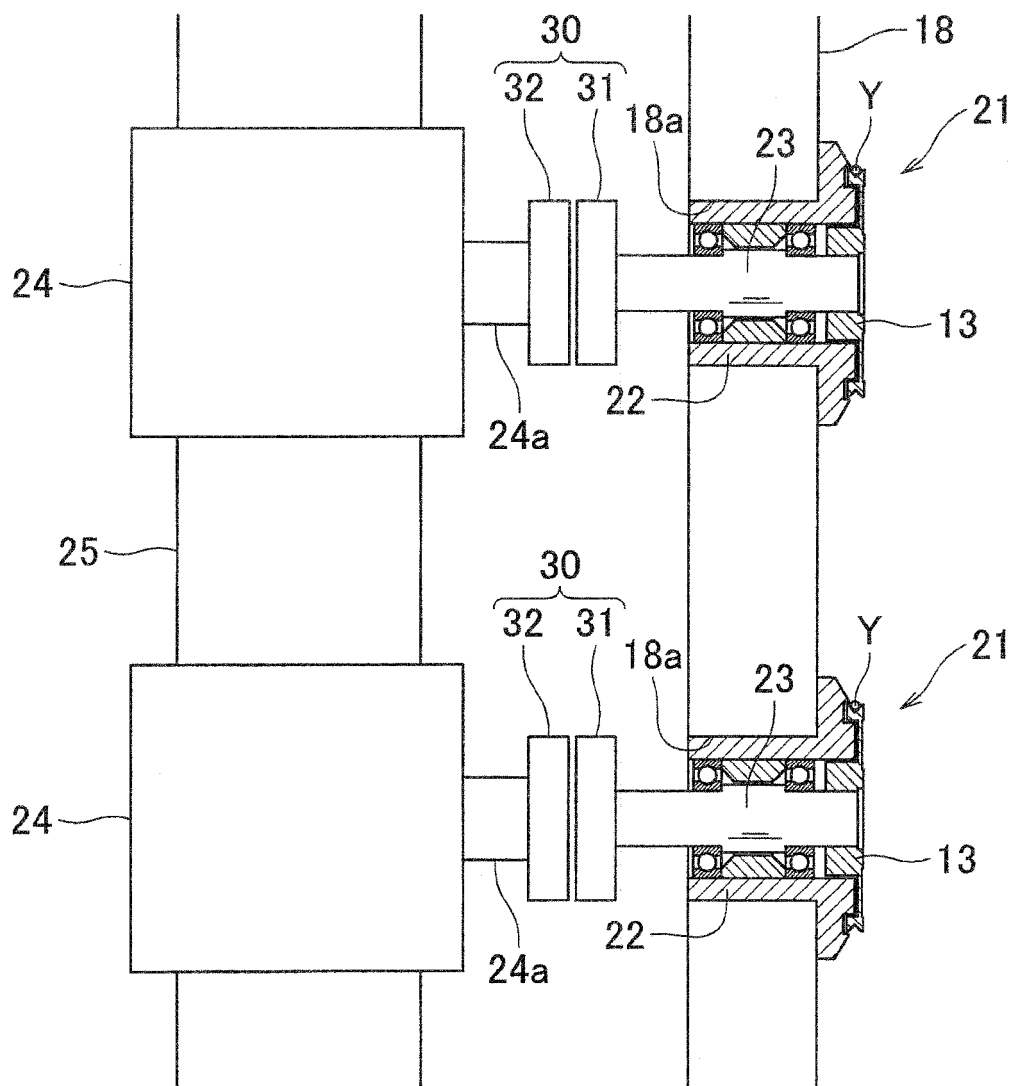


FIG.4

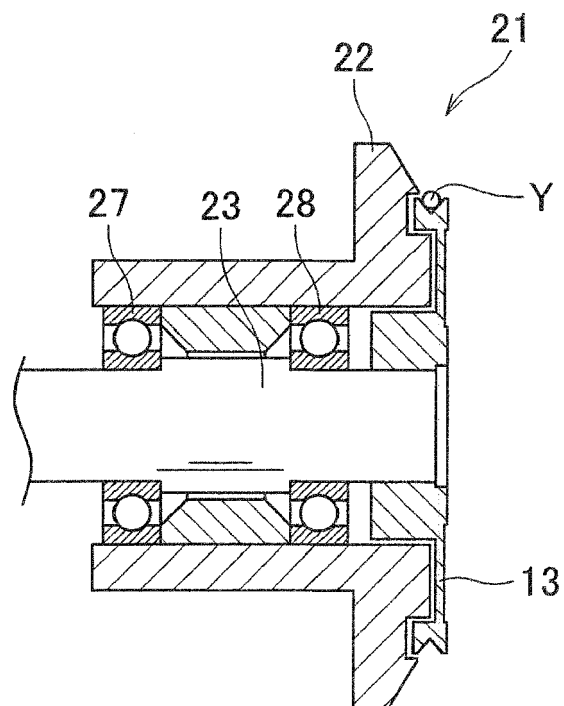


FIG.5

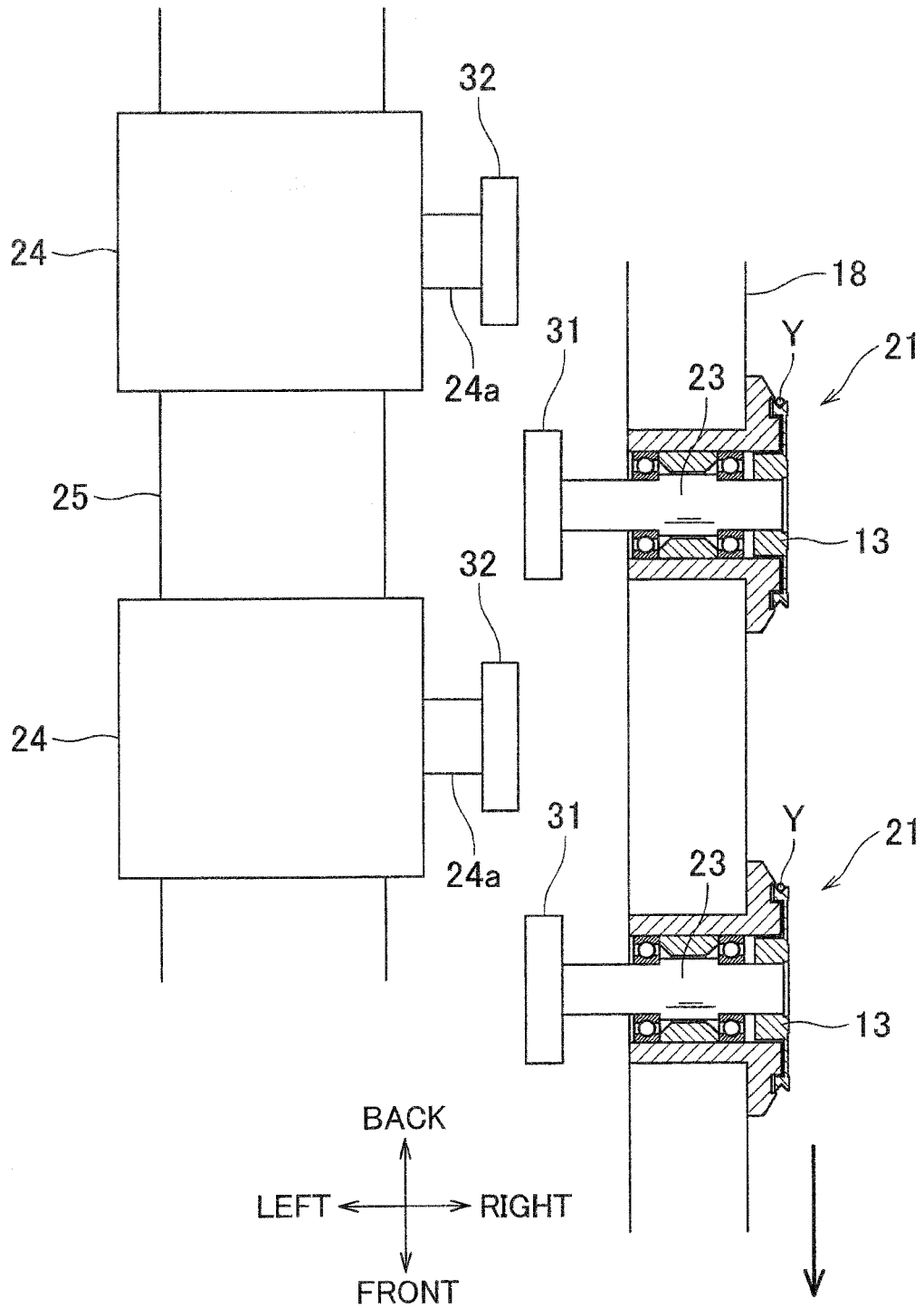


FIG.6

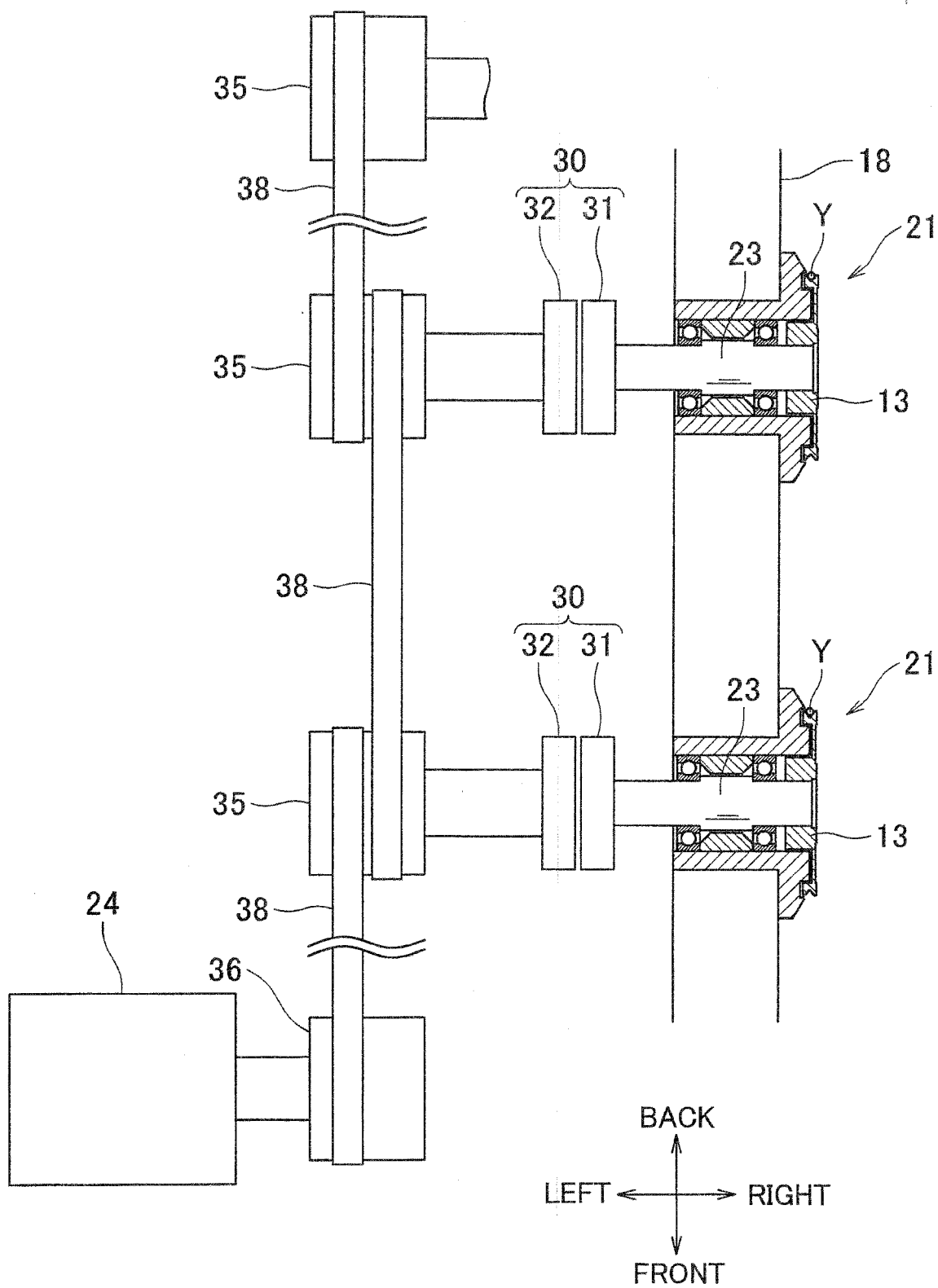


FIG.7A

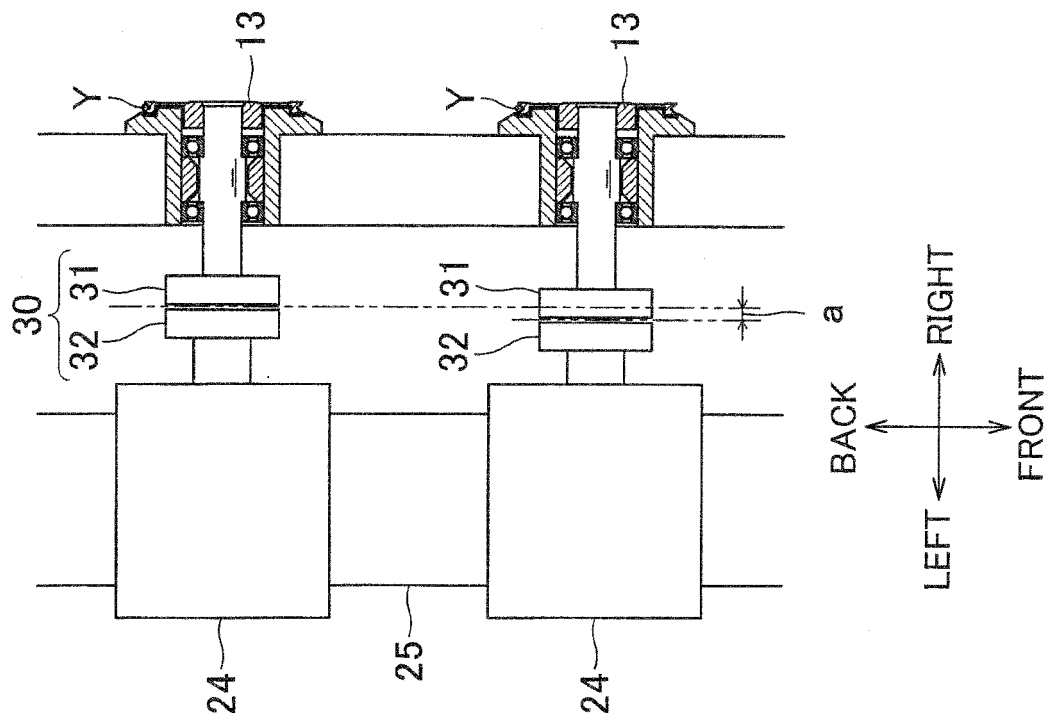
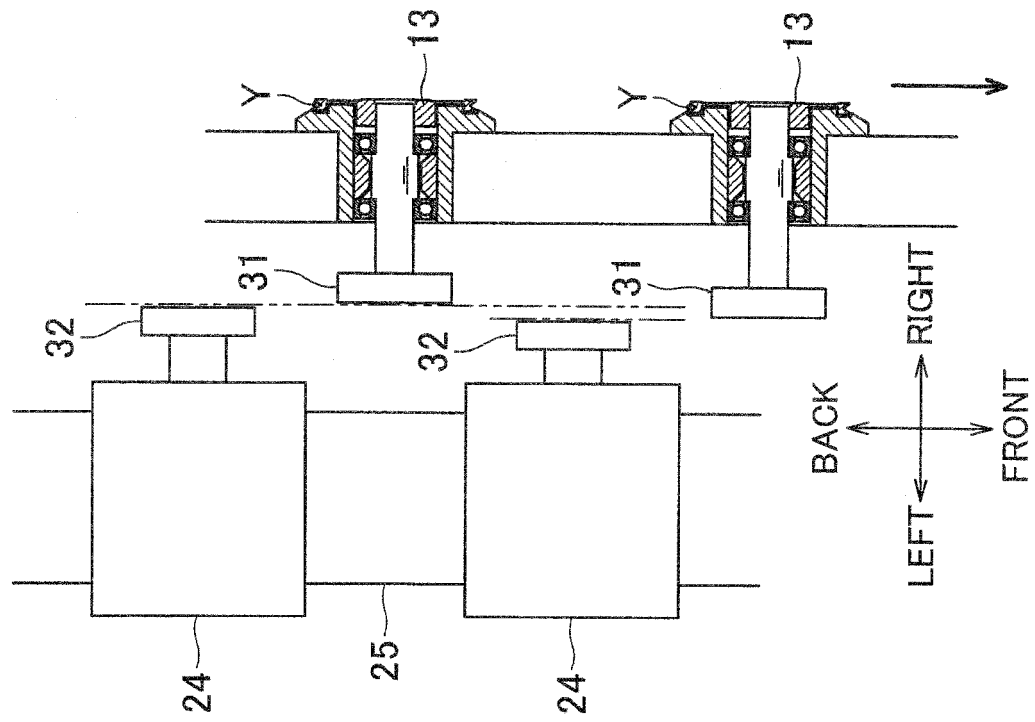


FIG.7B



REFERENCES CITED IN THE DESCRIPTION

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