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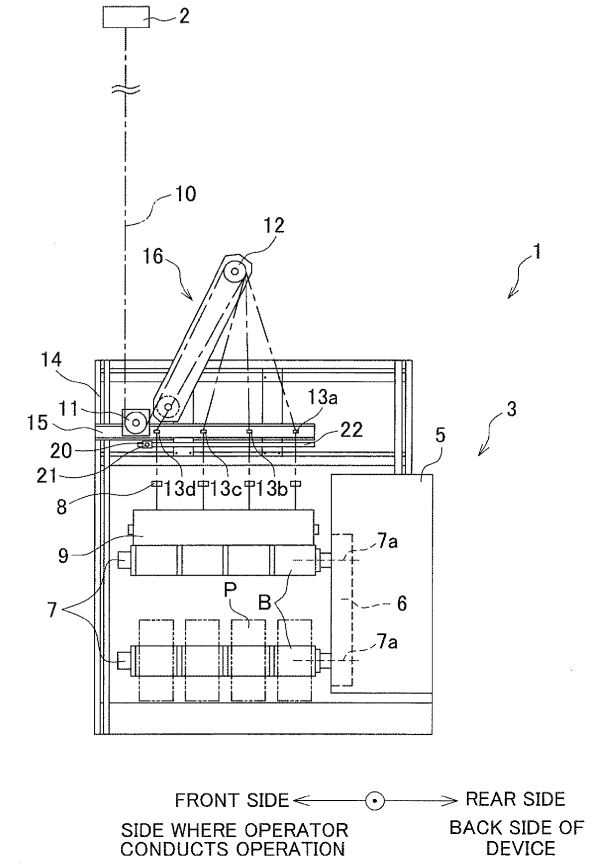
(54) Spinning winder

(57) Yarns threaded on a godet roller are fed to corresponding distribution guides by a simple structure. A spinning winder includes components such as two godet rollers 11 and 12 receiving yarns 10 supplied from a spinning machine, fulcrum guides 13a to 13d which are aligned in crosswise directions along a bobbin holder and distribute the yarns 10 wound onto the downstream-side godet roller 12 to bobbins attached to the bobbin holder, respectively, and a yarn threading guide 20 which is arranged to be movable in the alignment directions of the fulcrum guides 13a to 13d between the fulcrum guides 13a to 13d and the bobbin holder, while holding the yarns 10.

FIG.1



EP 2 497 732 A2

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a spinning winder for winding a plurality of yarns spun out from a spinning unit onto a plurality of bobbins attached to a winding axis.

[0002] For example, a spinning winder recited in Patent Literature 1 (WO2008/138827) is arranged so that a plurality of yarns spun out from a spinning unit are wound while being aligned side by side along the axes of godet rollers, and then wound respectively onto a plurality of bobbins which are attached in series to a winding axis which extends in directions orthogonal to the axes of the godet rollers. In addition to this, to guide the yarns supplied from the godet rollers to the bobbins, a plurality of distribution guides are provided along the winding axis, on the upstream of the bobbins in the yarn running direction.

[0003] The last godet roller is arranged to be movable relative to the distribution guides, and the yarns are distributed to the distribution guides by the movement of the last godet roller. More specifically, as shown in Fig. 6 and Fig. 7 of Patent Literature 1, the godet roller is arranged to be movable along the alignment directions of the distribution guides (i.e., the axial directions of the winding axis) between a yarn winding position (indicated by full lines) for winding the yarns and a position (indicated by dotted lines; hereinafter, yarn threading start position) which is away from the yarn winding position and where the godet roller is outside the position of the spinning winder at the time of winding yarns. The godet roller on which the yarns are threaded is moved in an alignment direction, so that the yarns are moved to the corresponding distribution guides and the yarn threading is carried out.

[0004] Alternatively, as shown in Fig. 1 and Fig. 3 of Patent Literature 1 (International Publication No. 2008/138827 (Figs. 1, 3, 6, and 7)), the godet roller is fixed whereas the distribution guides are arranged to be movable along the axial directions of the winding axis between a yarn winding position (indicated by full lines) for winding the yarns and a position (indicated by dotted lines; hereinafter, yarn threading start position) which is away from the yarn winding position and where the distribution guides are outside the position of the spinning winder at the time of winding yarns. The yarns are moved to the corresponding distribution guides and the yarn threading is carried out.

[0005] The spinning winder recited in Patent Literature 1, however, is disadvantageous in that, because the godet roller or the distribution guides is/are arranged to be movable to move the yarns to the corresponding distribution guides, a very large installation area is required when the movable range of the godet rollers or the distribution guides which are outside the spinning winder at the position of winding yarns is taken into account, and hence the design freedom is limited.

SUMMARY OF THE INVENTION

[0006] An object of the present invention is therefore to provide a spinning winder in which yarns threaded on a godet roller are fed to corresponding distribution guides by a simple structure.

[0007] A spinning winder of the present invention includes: a godet roller on which a plurality of yarns supplied from a spinning unit are wound while being aligned in directions in parallel to an axis of the godet roller; a winding axis to which a plurality of bobbins are attached in series along the same, the winding axis winding the yarns supplied from the godet roller onto the respective bobbins; a plurality of distribution guides which are disposed in predetermined alignment directions in parallel to the winding axis and distribute the yarns supplied from the godet roller to the respective bobbins attached to the winding axis; and a yarn holding component which is arranged to be movable in the alignment directions of the distribution guides while holding the yarns.

[0008] In this spinning winder of the present invention, a small and light yarn holding component holding the yarns is used, and this yarn holding component is moved in an alignment direction along the distribution guides while the godet roller and the distribution guides are kept unmoved. With this, the yarns are fed to the corresponding distribution guides by a simple structure.

[0009] In addition to the above, preferably, each of the distribution guides includes a yarn threading portion to which a yarn is threaded from one side in the alignment directions, and the yarn holding component is arranged to be movable in an inclined direction which is between the alignment directions and directions orthogonal to the alignment directions, and to move in the inclined direction from said one side to the other side of the distribution guides while holding the yarns to be aligned in directions orthogonal to the alignment directions.

[0010] According to this arrangement, the yarns held by the yarn holding component are aligned in directions orthogonal to the alignment directions of the distribution guides, and each yarn can be threaded onto the yarn threading portion of the distribution guide from one side in the alignment directions. For this reason, by moving the yarn holding component holding the yarns in the inclined direction from one side to the other side in the alignment directions, it is possible to serially thread the yarns held by the yarn holding component onto the respective distribution guides from one side in the alignment directions.

[0011] In this connection, preferably, the axis of the godet roller intersects with the alignment directions, and the yarn holding component moves along the alignment directions from the other side to said one side of the distribution guides, and then moves in the inclined direction from said one side to the other side of the distribution guides.

[0012] According to this arrangement, the yarns are serially threaded onto the distribution guides from one side in the alignment directions in such a way that, after the yarn holding component is moved along the alignment directions to position the yarns held by the yarn holding component at one side of the distribution guides, the yarn holding component is moved in the inclined direction.

[0013] In addition to the above, preferably, the yarn holding component is a rod-shaped component extending in directions intersecting with the alignment directions, the rod-shaped component has, on its outer circumference, grooves at least on one side of the rod-shaped component in the alignment directions, and the grooves are formed at intervals in axial directions of the rod-shaped component to correspond to the respective yarns.

[0014] According to this arrangement, when the yarn holding component is moved along the alignment directions from the other side to the one side of the distribution guides so as to position the yarns on the one side of the distribution guides, the yarns are held as entering one side of the grooves of the yarn holding component in the alignment directions. As the yarn holding component holding the yarns is moved in the inclined direction from the one side to the other side of the distribution guides, the yarns entering the grooves of the yarn holding component are passed to the yarn threading portions of the distribution guides because the direction in which the yarn enters the groove of the yarn holding component is identical with the direction in which the yarn is threaded onto the yarn threading portion of the distribution guide.

[0015] In addition to the above, preferably, the yarns are threaded onto the yarn holding component at a predetermined retracted position, the godet roller is arranged to be movable between a yarn winding position where the yarns are wound onto the winding axis and a yarn threading position which is close to the yarn holding component at the retracted position as compared to the yarn winding position, and when threading the yarns onto the yarn holding component, the godet roller is moved to the yarn threading position.

[0016] According to this arrangement, because the yarns are threaded onto the yarn holding component at a position close to the godet roller, the posture of the running yarn is stable as compared to the posture of the yarn at a position far from the godet roller, with the result that the yarn threading is easily done.

[0017] A small and light yarn holding component holding the yarns is used, and this yarn holding component is moved in an alignment direction along the distribution guides while the godet roller and the distribution guides are kept unmoved. With this, the yarns are fed to the corresponding distribution guides by a simple structure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a front elevation of a spinning winder according to an embodiment of the present invention.

Fig. 2 is a perspective view of the godet rollers and the fulcrum guides.

Fig. 3 is an enlarged perspective view of the fulcrum guide.

Fig. 4 illustrates the movement trace of the yarn threading guide at the time of threading the yarns onto the fulcrum guides.

Fig. 5 illustrates the first half of the yarn threading onto the fulcrum guides by the yarn threading guide.

Fig. 6 illustrates the second half of the yarn threading onto the fulcrum guides by the yarn threading guide.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] Now, an embodiment of the present invention will be described. Fig. 1 is a front elevation of a spinning winder. It is noted that, hereinafter, as shown in Fig. 1, the leading end side of a later-described bobbin holder 7 will be referred to as a front side where an operator operates the spinning winder. As shown in Fig. 1, the spinning winder 1 is arranged so that, to a winding unit 3 at a lower part, a plurality of yarns 10, which are continuously spun and supplied from a spinning machine 2 at an upper part while being aligned in the directions orthogonal to the plane of Fig. 1 (i.e., in the crosswise directions when viewed from the front side), are supplied by two godet rollers 11 and 12, and the yarns are wound by the winding unit 3.

[0020] The winding unit 3 will be described first. The winding unit 3 is provided below the spinning machine 2 and forms a plurality of packages P by winding, onto respective bobbins B, a plurality of yarns 10 supplied from the spinning machine 2 via the two godet rollers 11 and 12.

[0021] This winding unit 3 includes components such as a main body frame 5, a disc-shaped turret 6 attached to the main body frame 5 in a rotatable manner, two bobbin holders 7 (winding axes) each of which is supported by the turret 6 at one end and to each of which a plurality of bobbins B are attached in series along an axis 7a, a plurality of traverse guides 8 that are provided above the bobbins B attached to the bobbin holder 7 and traverse the yarns 10 that are to be wound onto the bobbins B, and a contact roller 9 which is arranged to be vertically movable with respect to the main body frame 5 so as to approach and move away from the bobbins B attached to the bobbin holder 7.

[0022] The winding unit 3 winds the yarns 10 onto the rotating bobbins B, respectively, in such a way that the bobbin holder 7 is rotated by an unillustrated drive motor and therefore the bobbins B attached to this bobbin holder 7 are rotated. Immediately before wound onto a bobbin B, a yarn 10 is traversed in the axial directions of the bobbin B about a later-described fulcrum guide 13 by the traverse guide 8 which is arranged to be able to reciprocate in the axial directions of the bobbin B, with the result

that a package P is formed. Furthermore, when the yarn 10 is wound onto the bobbin B, the contact roller 9 rotates while applying a predetermined contact pressure to the package P, so as to properly shape the package P.

[0023] Fig. 2 is a perspective view of the godet rollers and the fulcrum guides. As shown in Fig. 1, the spinning winder 1 includes a frame 14 provided to be further from the viewer than the winding unit 3 in Fig. 1, two godet rollers 11 and 12 that draw the yarns 10 supplied from the spinning machine 2, a plurality of fulcrum guides 13a to 13d (distribution guides) that distribute the yarns 10 threaded onto the godet roller 12 on the downstream to the respective bobbins B attached to the bobbin holder 7 of the winding unit 3 and function as the fulcrum of the traversal by the traverse guides 8, and a yarn threading guide 20 (yarn holding component) for threading the yarns 10 supplied from the godet roller 12 onto the fulcrum guides 13a to 13d.

[0024] As shown in Fig. 1 and Fig. 2, above the main body frame 5 of the winding unit 3, the two godet rollers 11 and 12 are rotatably supported by the frame 14 such that the axes 11a and 12a thereof are orthogonal to the axis 7a of the bobbin holder 7. These two godet rollers 11 and 12 are drive rollers driven by an unillustrated drive motor. The godet roller 11 is provided immediately below the spinning machine 2, whereas the godet roller 12 is provided above and behind the godet roller 11.

[0025] The godet roller 12 is arranged to be movable, by an elevation mechanism 16 (see Fig. 1) such as a linear motor, between a yarn winding position (indicated by full lines in Figs. 1 and 2) above the substantial center of the fulcrum guides 13a to 13d in the alignment directions and a yarn threading position (indicated by two-dot chain lines in Figs. 1 and 2) which is below the yarn winding position and is in the vicinity of the yarn threading guide 20 which is close to the edge as compared to the fulcrum guides 13.

[0026] The fulcrum guides 13a to 13d are aligned at the same intervals as the bobbins B along the axis 7a of each bobbin holder 7. The fulcrum guides 13a to 13d are provided below the downstream-side godet roller 12 at the yarn winding position, immediately above the traverse guides 8 and the bobbins B attached to the bobbin holder 7.

[0027] In addition to the above, as shown in Fig. 3, each fulcrum guide 13 is fixedly supported by a supporting plate 15 attached to the frame 14, and an insertion slit 40 and a guide hole 41 are formed therein. The fulcrum guide 13 is arranged so that the yarn 10 sucked by an unillustrated suction pipe are threaded onto the guide hole 41 as the yarn Y is allowed to pass through the insertion slit 40 from behind.

[0028] As shown in Fig. 1 and Fig. 2, the yarns 10 supplied from the spinning machine 2 are fed downward and for a start wound onto the godet roller 11 while being aligned along the axis 11a. Thereafter, the yarns 10 wound onto the godet roller 11 diagonally run upward while being kept to be in parallel to each other and are then wound onto the godet roller 12 which is at the yarn winding position. The yarns 10 wound onto the godet roller 12 are threaded onto the fulcrum guides 13a to 13d, respectively, and then fed to the winding unit 3 below. It is noted that, since the godet roller 12 is provided not side by side with the fulcrum guides 13a to 13d but above the fulcrum guides 13a to 13d, the bending angle of the yarn 10 at each fulcrum guide 13 is small, and hence the running speed of the yarn 10 can be increased.

[0029] The yarn threading guide 20 is rod-shaped (or column-shaped) and extends in directions orthogonal to the alignment directions of the fulcrum guides 13a to 13d. On the circumference of each yarn threading guide 20, grooves 20a are formed to correspond to the respective fulcrum guides 13a to 13d. The grooves 20a are formed at regular intervals in the length of the guide 20 and fully surround the guide 20. The yarn threading guide 20 is connected to a bar 23. The bar 23 is arranged to be movable in directions orthogonal to the alignment directions of the fulcrum guides 13a to 13d, with respect to a slidable component 21 which is slidable in the alignment directions of the fulcrum guides 13a to 13d. As the bar 23 moves, the yarn threading guide 20 moves in a direction orthogonal to the alignment directions of the fulcrum guides 13a to 13d.

[0030] An example of the mechanism of movement of the yarn threading guide 20 is shown in Fig. 4. The bar 23 is biased by the spring 32 and is connected at its base end side to a cam follower 31 which is movable in the cam groove 30. The cam groove 30 is formed as a closed loop made up of a linear portion extending along the alignment directions of the fulcrum guides 13a to 13d and inclined portions inclined with respect to the linear portion. As the cam follower 31 is guided along the cam groove 30 by an unillustrated motor, the yarn threading guide 20 moves in a direction along the alignment directions of the fulcrum guides 13a to 13d and moves, along the horizontal plane in parallel to the supporting plate 15, in an inclined direction across the fulcrum guides 13a to 13d.

[0031] Now, the operation of yarn threading onto the fulcrum guides 13a to 13d will be described. Fig. 4 illustrates the movement trace of the yarn threading guide at the time of yarn threading, and is a schematic plan view of the yarn threading guide and the fulcrum guide when viewed from the top. Fig. 5 and Fig. 6 illustrate the yarn threading by the yarn threading guide. In the case of Fig. 4, the yarn threading guide 20, the slidable component 21, and the bar 23 move in the order of (1) to (6), and the movement trace of each component is depicted at predetermined time intervals. The components are drawn in solid lines at the position (1) which is the origin, and are drawn in dashed lines at the subsequent positions (2) to (6).

[0032] Since the yarns 10 wound onto the godet roller 12 are aligned in directions orthogonal to the alignment directions of the fulcrum guides 13a to 13d, it is necessary to change the intervals of the yarns 10 and the alignment

directions of the yarns 10 when threading the yarns 10 wound on the godet roller 12 onto the fulcrum guides 13.

[0033] First, as shown in Fig. 5(a), the yarn threading guide 20 is positioned at the origin ((1) in Fig. 4) which is in front of the foremost fulcrum guide 13d, and the godet roller 12 is moved to the yarn threading position. Thereafter, the yarns 10 supplied from the godet roller 12 are sucked and captured by the suction pipe 25.

[0034] Subsequently, as shown in Fig. 5(b), while the yarn threading guide 20 is kept at the origin, the operator operates the suction pipe 25 to thread the yarns 10 individually onto the respective grooves 20a of the yarn threading guide 20. In so doing, as the godet roller 12 is moved to the yarn threading position which is closer to the yarn threading guide 20 as compared to the yarn winding position, the yarns 10 are threaded onto the yarn threading guide 20 at the position close to the godet roller 12. On this account, the posture of the running yarn 10 is stable as compared to the posture of the yarn 10 at a position far from the godet roller 12, with the result that the yarn threading is easily done.

[0035] Thereafter, as shown in Fig. 3(c), while the yarn threading guide 20 is kept at the origin, the godet roller 12 is moved from the yarn threading position to the yarn winding position. Then, as shown in Fig. 5(d), the yarn threading guide 20 is moved in a direction A (see Fig. 4) along the guide rail 22 to the rearmost position (position (4) in Fig. 4) which is behind the rearmost fulcrum guide 13a. As a result, the yarns 10 threaded on the yarn threading guide 20 are moved to a position further behind the rearmost fulcrum guide 13a.

[0036] Thereafter, the yarn threading guide 20 is moved along the alignment directions of the fulcrum guides 13a to 13d while the bar 23 is moved back, so that the yarns 10 are threaded onto the fulcrum guides 13a to 13d. In so doing, as shown in Fig. 4, the yarn threading guide 20 is moved from the rear side of the fulcrum guide 13a to the front side of the fulcrum guide 13d, along an inclined direction which forms an angle θ with the alignment directions of the fulcrum guides 13a to 13d. The angle θ is determined in accordance with the intervals 11 of the fulcrum guides 13a to 13d and the intervals 12 of the grooves 20a of the yarn threading guide 20.

[0037] As shown in Fig. 6(a), after the yarn threading guide 20 is positioned at the rearmost position indicated by (2) in Fig. 4 and the yarns 10 are positioned to be behind the rearmost fulcrum guide 13a, the yarn threading guide 20 is moved in the inclined direction (the direction B in Fig. 4).

[0038] As a result, first, when the yarn threading guide 20 is moved to the position (3) in Fig. 4, the rearmost fulcrum guide 13a intersects the yarn 10a closest to the base end of the yarn threading guide 20, and hence this yarn 10a is threaded onto the fulcrum guide 13a as shown in Fig. 6(b). Subsequently, as the yarn threading guide 20 continues the movement in the inclined direction, the yarn threading guide 20 moves in the order of (3) $\rightarrow$ (4) $\rightarrow$ (5) in Fig. 4, with the result that the yarns 10 on the yarn threading guide 20 are threaded onto the fulcrum guides 13a to 13d from the yarn 10a on the base end side, as shown in Fig. 6(c).

[0039] Subsequently, as shown in Fig. 6(d), as the yarn threading guide 20 is moved to a position in front of the foremost fulcrum guide 13d, all yarns 10a to 10d having been threaded on the yarn threading guide 20 are serially threaded onto the fulcrum guides 13a to 13d. Thereafter, the yarn threading guide 20 having finished the yarn threading onto the all fulcrum guides 13a to 13d is retracted at the origin in front of the fulcrum guides 13a to 13d, where the yarn threading guide 20 does not obstruct the running of the yarns 10 when they are wound.

[0040] In the spinning winder 1 of the present embodiment, the yarns 10 are fed to the corresponding fulcrum guides 13 in such a way that the yarn threading guide 20 holding the yarns 10 is moved along the alignment directions of the fulcrum guides 13a to 13d between the fulcrum guides 13a to 13d and the bobbin holder 7, while the godet roller 12 and the fulcrum guides 13a to 13d are kept unmoved.

[0041] The alignment directions of the yarns 10 held by the yarn threading guide 20 are orthogonal to the alignment directions of the fulcrum guides 13a to 13d, each fulcrum guide 13 allows a yarn to be threaded thereon from behind, and the yarn 10 enters the groove 20a of the yarn threading guide 20 in the same direction as in the yarn threading onto the fulcrum guide 13. For these reasons, as the yarn threading guide 20 is moved in the inclined direction from the rear side to the front side, the yarns held by the yarn threading guide 20 are serially passed to and threaded onto the fulcrum guides 13 without interfering with the supporting plate 15.

[0042] As such, the yarn threading guide 20 is small in size because it is simply required to hold yarns 10 and move, and the structure of the device including the yarn threading guide 20 and its moving mechanism is simplified. For this reason, the failure rate is decreased and the manufacturing cost is lowered. Furthermore, in regard to the retraction of the yarn threading guide 20 at the time of yarn winding onto the bobbin B, the area required for the retraction is small because the size of the guide 20 is small. Moreover, since the yarn threading guide 20 simply moves between the fulcrum guides 13a to 13d and the bobbin holder 7, it is unnecessary to take into account of the movable range of the yarn threading guide 20 as an additional space, and hence the design freedom is improved.

[0043] Now, various modifications of the present embodiment will now be described. It is noted that the same components as in the embodiment are denoted by the same reference numerals as in the embodiment, respectively, and the description thereof will be omitted.

[0044] According to the present embodiment, the yarn threading guide 20 moves in the direction A along the alignment directions of the fulcrum guides 13a to 13d to position the yarns 10 to be behind the rearmost fulcrum

guide 13a, and then moves in the inclined direction (direction B) so that the yarns are threaded onto the fulcrum guides 13a to 13d. Alternatively, the yarn threading guide 20 does not move in the inclined direction and moves only along the alignment directions of the fulcrum guides 13a to 13d. Also with this arrangement, the yarns 10 held by the yarn threading guide 20 are moved to positions corresponding to the respective fulcrum guides 13a to 13d, as the yarn threading guide 20 is moved. Once the yarns 10 are fed to the corresponding fulcrum guides 13, the operator can conduct the yarn threading very easily.

[0045] In addition to the above, while in the present embodiment the godet roller 12 at the yarn winding position is above the fulcrum guides 13a to 13d, the godet roller 12 may be provided on the front side or rear side of the fulcrum guides 13a to 13d in the alignment directions thereof.

[0046] In addition to the above, while in the present embodiment the axis 12a of the godet roller 12 is orthogonal to the axis 7a of the bobbin holder 7, these axes may intersect with each other or may be in parallel to each other.

[0047] In addition to the above, while in the present embodiment the fulcrum guide 13 functions not only as a fulcrum of traversal but also as a distribution guide for distributing yarns 10 to bobbins B, a fulcrum guide for traversal and a distribution guide may be independently provided.

Claims

1. A spinning winder comprising:

a godet roller on which a plurality of yarns supplied from a spinning unit are wound while being aligned in directions in parallel to an axis of the godet roller;
a winding axis to which a plurality of bobbins are attached in series along the same, the winding axis winding the yarns supplied from the godet roller onto the respective bobbins;
a plurality of distribution guides which are disposed in predetermined alignment directions in parallel to the winding axis and distribute the yarns supplied from the godet roller to the respective bobbins attached to the winding axis; and
a yarn holding component which is arranged to be movable in the alignment directions of the distribution guides while holding the yarns.

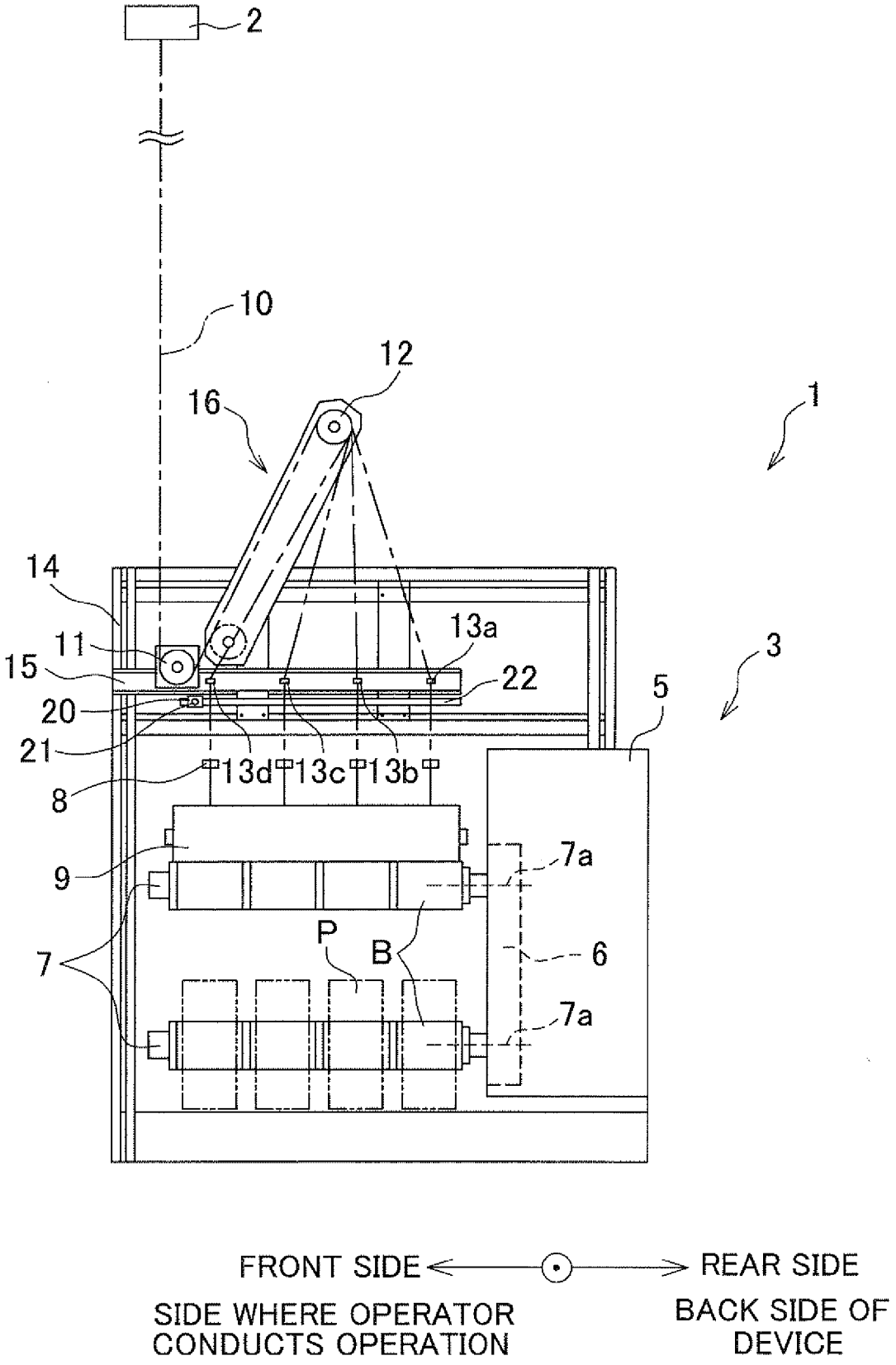
2. The spinning winder according to claim 1, wherein,
each of the distribution guides includes a yarn threading portion to which a yarn is threaded from one side in the alignment directions, and
the yarn holding component is arranged to be movable in an inclined direction which is between the alignment directions and directions orthogonal to the alignment directions, and to move in the inclined direction from said one side to the other side of the distribution guides while holding the yarns to be aligned in directions orthogonal to the alignment directions.

3. The spinning winder according to claim 2, wherein,
the axis of the godet roller intersects with the alignment directions, and
the yarn holding component moves along the alignment directions from the other side to said one side of the distribution guides, and then moves in the inclined direction from said one side to the other side of the distribution guides.

4. The spinning winder according to claim 3, wherein,
the yarn holding component is a rod-shaped component extending in directions intersecting with the alignment directions,
the rod-shaped component has, on its outer circumference, grooves at least on one side of the rod-shaped component in the alignment directions, and
the grooves are formed at intervals in axial directions of the rod-shaped component to correspond to the respective yarns.

5. The spinning winder according to any one of claims 1 to 4, wherein,
the yarns are threaded onto the yarn holding component at a predetermined retracted position,
the godet roller is arranged to be movable between a yarn winding position where the yarns are wound onto the winding axis and a yarn threading position which is close to the yarn holding component at the retracted position as compared to the yarn winding position, and
when threading the yarns onto the yarn holding component, the godet roller is moved to the yarn threading position.

FIG.1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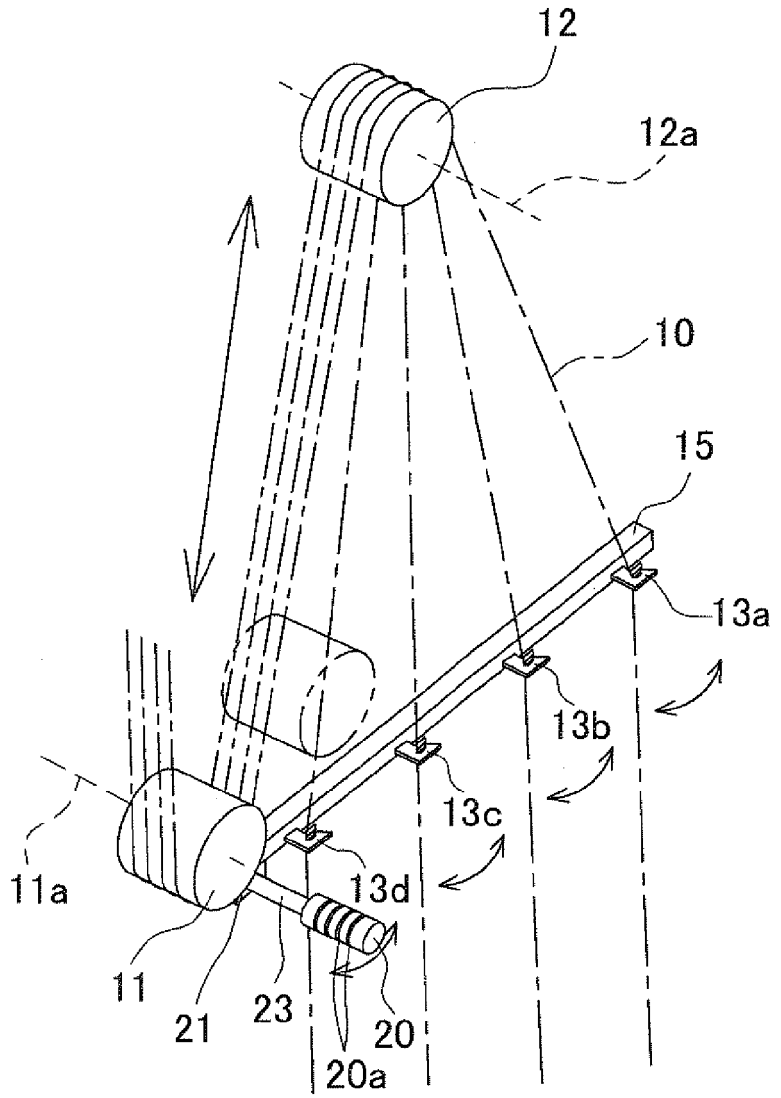
12
16
1
14
11
15
20
21
8
13a
22
3
5
13d
13c
13b
9
7a
7
P
B
6
7a
FRONT SIDE
REAR SIDE
SIDE WHERE OPERATOR CONDUCTS OPERATION
BACK SIDE OF DEVICE

FIG.2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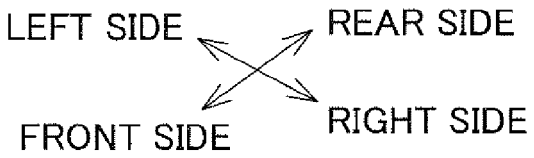
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RIGHT SIDE

FIG.3

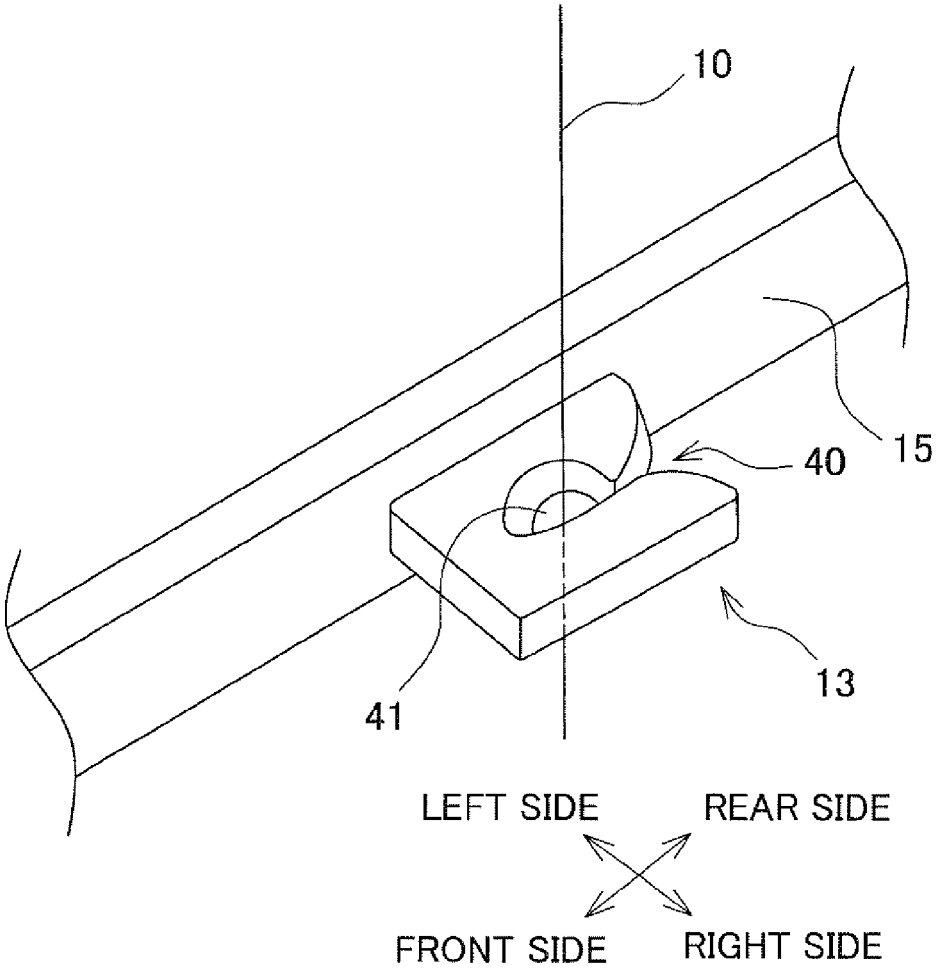
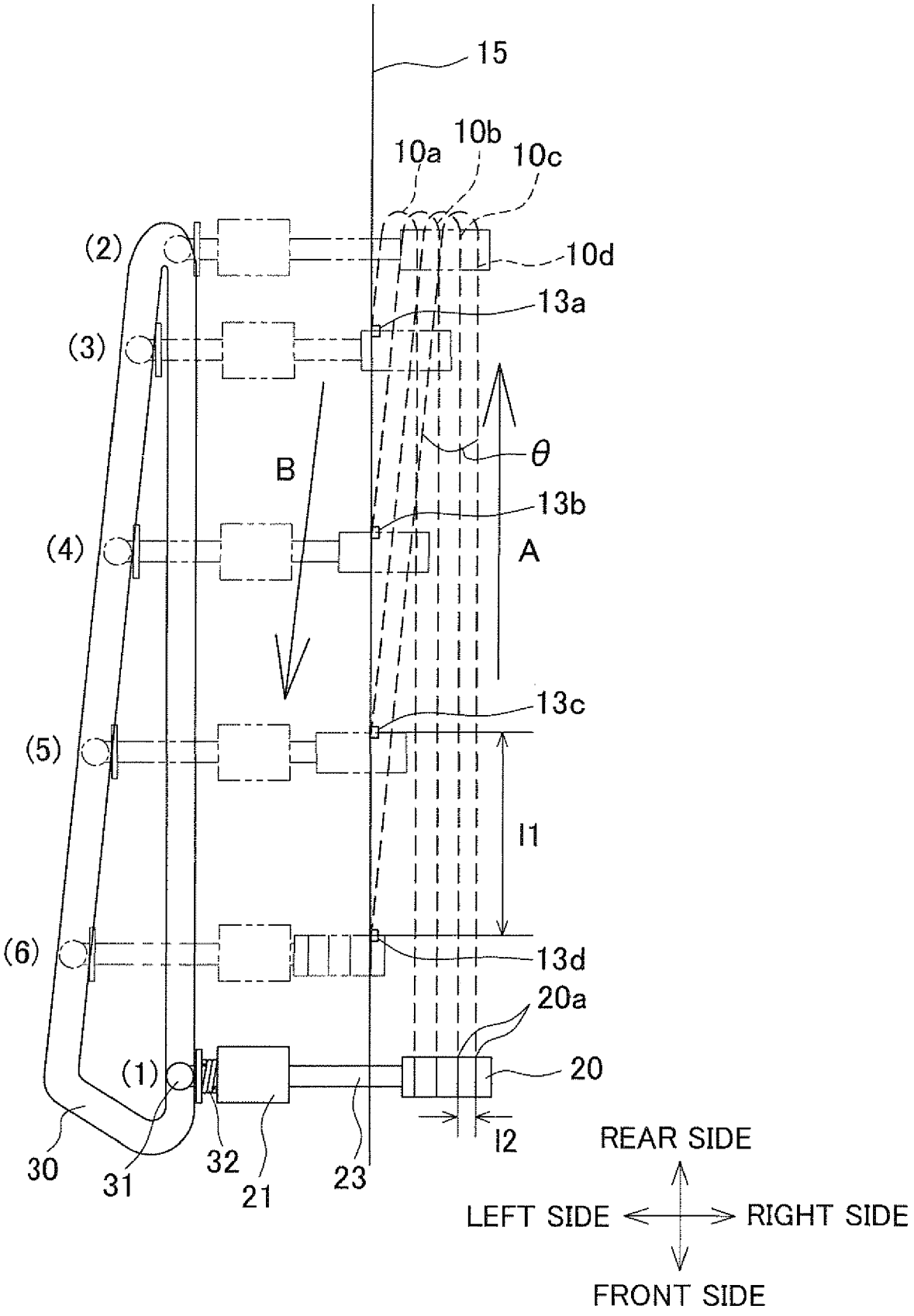


FIG.4


15
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10c
10d
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(6)
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RIGHT SIDE
FRONT SIDE

FIG.5

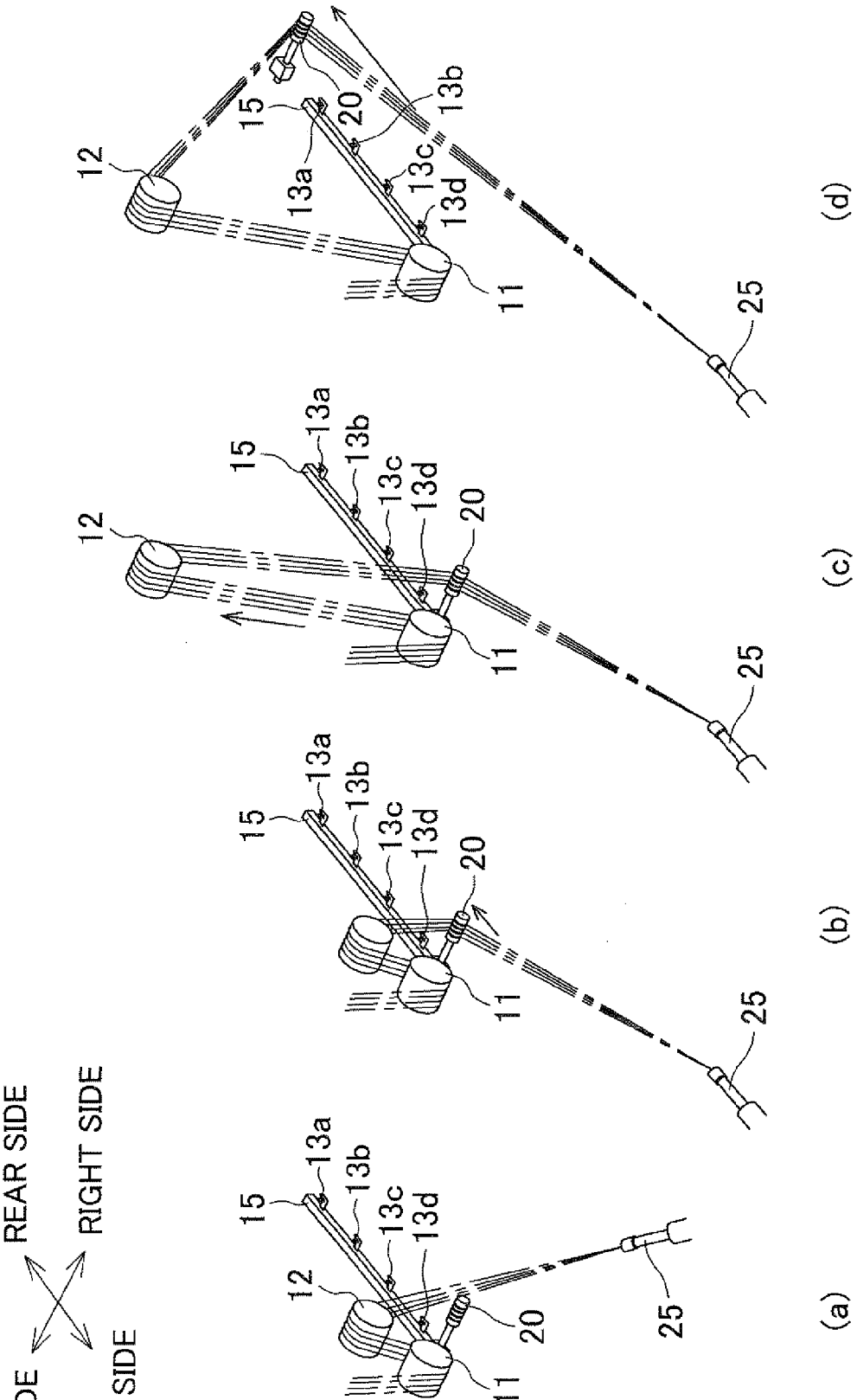
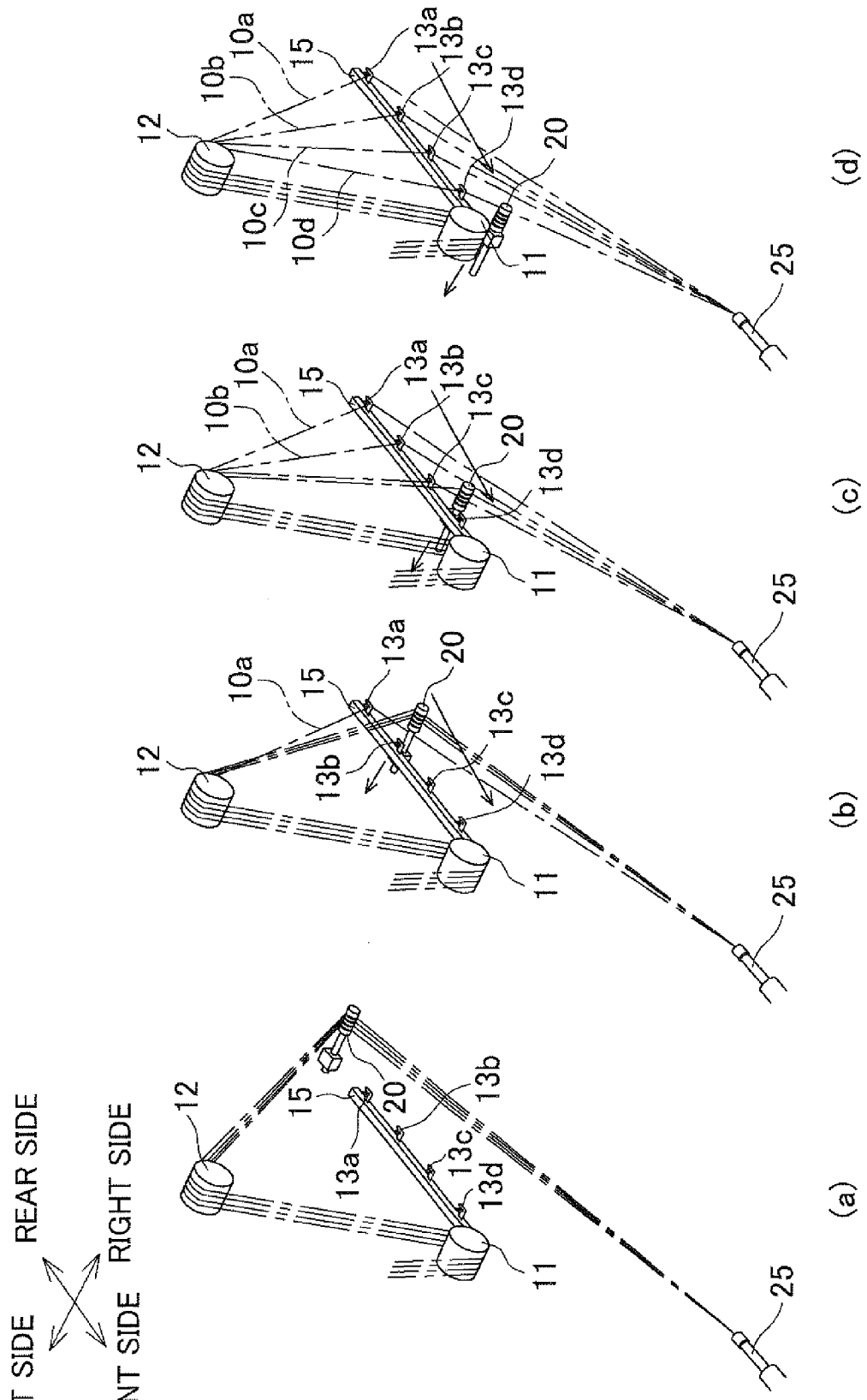

REAR SIDE
RIGHT SIDE
LEFT SIDE
FRONT SIDE
(a)
(b)
(c)
(d)
11
12
13a
13b
13c
13d
15
20
25

FIG.6


LEFT SIDE
REAR SIDE
FRONT SIDE
RIGHT SIDE
(a)
(b)
(c)
(d)
12
15
20
13a
13b
13c
13d
11
25
10a
10b
10c
10d

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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