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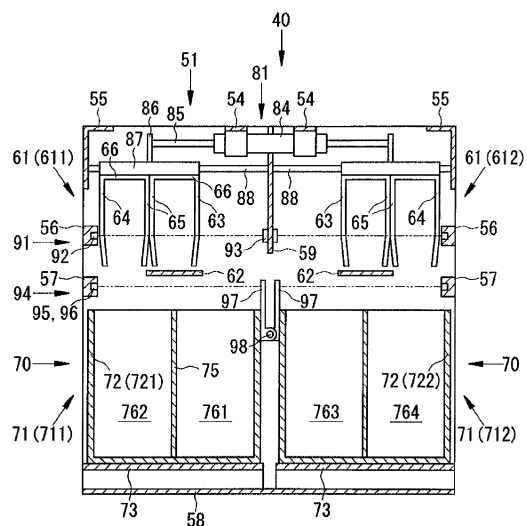
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(54) **Bobbin accommodating device and automatic winder**

(57) A bobbin accommodating device 40 adapted to accommodate yarn absent bobbins B discharged from a winding unit 10 includes introduction ports 671, 672 into which the yarn absent bobbins B are introduced, a holding section 61 adapted to temporarily hold the yarn absent bobbins B introduced through the introduction ports 671, 672 while maintaining a uniform orientation of end portions thereof and, in a case the amount of the held yarn absent bobbins B has reached a prescribed amount, to discharge the held yarn absent bobbins B, and an accommodating section 71 adapted to allocate to a plurality of compartments and accommodate the yarn absent bobbins B discharged from the holding section 61. The holding section 61 includes an allocating and discharging mechanism 81 adapted to allocate the held yarn absent bobbins B to each of the compartments of the accommodating section 71.

FIG. 5



UPPER

LEFT → RIGHT

LOWER

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a bobbin accommodating device adapted to accommodate yarn absent bobbins discharged from a winding unit, and an automatic winder including the same.

2. Description of the Related Art

[0002] Conventionally, there is known an automatic winder configured by arranging a plurality of winding units side by side. A bobbin tray type automatic winder, e.g., includes a plurality of winding units, a bobbin transporting device, a yarn absent bobbin taking-out device, or the like. The bobbin transporting device transports to each of the winding units, a bobbin around which a yarn spun by a spinning machine is wound (hereinafter referred to as a yarn present bobbin). Each of the winding units forms a package by unwinding the yarn from the yarn present bobbin.

[0003] Processed bobbins of which yarn has been unwound in each winding unit (hereinafter referred to as a yarn absent bobbin) are discharged from the winding unit. The discharged yarn absent bobbins are transported by trays of the bobbin transporting devices. The yarn absent bobbin taking-out device takes out the yarn absent bobbins on the trays of the bobbin transporting device. The yarn absent bobbins taken out by the yarn absent bobbin taking-out device are discharged from a yarn absent bobbin chute section. The discharged yarn absent bobbins are accommodated in a collection box, e.g.

[0004] When the yarn absent bobbins are discharged from the yarn absent bobbin chute section, orientation of end portions thereof (a top-bottom direction) is made uniform. However, after the yarn absent bobbins pass through the yarn absent bobbin chute section and are haphazardly introduced into the collection box or the like, the yarn absent bobbins may jump or the like and change the orientation of the end portions thereof, leading to disarray with random orientations. When returning the yarn absent bobbins to the spinning machine thereafter, the orientations of the end portions of the yarn absent bobbins needs to be made uniform again. Therefore, in a case where the orientations of the end portions of the yarn absent bobbins are random, an alignment task needs to be performed to make the orientations uniform before returning the yarn absent bobbins to the spinning machine.

[0005] As an art of collecting the bobbins in the collection box or the like with uniform orientation of the end portions of the bobbins, Japanese Unexamined Patent Publication No. 60-81338, e.g., discloses a device adapted to temporarily hold a yarn present bobbin (a fully-wound bobbin), which is not a yarn absent bobbin, in a

hopper and to accommodate the yarn present bobbin in an accommodation box thereafter. The accommodation box is partitioned by a separator and the hopper is arranged in each compartment. Japanese Unexamined Patent Publication No. 6-293473 discloses a device adapted to make orientation of end portions of yarn present bobbins (fully-wound bobbins) uniform while moving a chute and to hold the yarn present bobbins in a collection box. The device has a configuration in which the yarn present bobbins are sequentially collected one by one by moving the chute.

SUMMARY OF THE INVENTION

[0006] The present invention is made to solve the above-described problem. The purpose of the present invention is to provide a bobbin accommodating device and an automatic winder that are capable of preventing the yarn absent bobbins from jumping in an accommodating section or the like, leading to a change in orientation of the end portions thereof, and collecting the yarn absent bobbins with uniform orientation of the end portions thereof.

[0007] The problem to be solved by the present invention is as mentioned above, and now, the means for solving such problem will be described below.

[0008] That is, the bobbin accommodating device of a first invention is a bobbin accommodating device adapted to accommodate yarn absent bobbins discharged from a winding unit and includes an introduction port, a holding section and an accommodating section. The yarn absent bobbins are introduced into the introduction port. The holding section temporarily holds the yarn absent bobbins introduced through the introduction port while maintaining a uniform orientation of end portions thereof and, in a case where the amount of the yarn absent bobbins has reached a prescribed amount, discharges the held yarn absent bobbins. The accommodating section allocates into a plurality of compartments and accommodates the yarn absent bobbins discharged from the holding section. The holding section includes an allocating and discharging mechanism adapted to allocate the held yarn absent bobbins to each of the compartments of the accommodating section.

[0009] A bobbin accommodating device of a second invention is the bobbin accommodating device of the first invention, in which the accommodating section is configured to be capable of installing therein, a collection box adapted to accommodate the yarn absent bobbins. The collection box has an interior portion divided into a plurality of compartments.

[0010] A bobbin accommodating device of a third invention is the bobbin accommodating device of the first invention or the second invention, further including a held bobbin detecting sensor and a control section. The held bobbin detecting sensor is capable of detecting the amount of the yarn absent bobbins held in the holding section. The control section discharges from the holding

section, the yarn absent bobbins held in the holding section based on a detection result of the held bobbin detecting sensor.

[0011] A bobbin accommodating device of a fourth invention is the bobbin accommodating device of any one of the first invention through the third invention, in which the holding section includes a bottom portion for regulating a movement of the yarn absent bobbins in a vertical direction, which is a direction where the yarn absent bobbins fall, and a first side wall portion and a second side wall portion both for regulating a movement of the yarn absent bobbins in a horizontal direction. The allocating and discharging mechanism forms either of a first discharge port between the bottom portion and the first side wall portion or a second discharge port between the bottom portion and the second side wall portion by driving at least any one of the bottom portion, the first side wall portion and the second side wall portion.

[0012] A bobbin accommodating device of a fifth invention is the bobbin accommodating device of the fourth invention, in which the bottom portion of the holding section is a rectangular plate member having long sides and short sides, and the first side wall portion and the second side wall portion are arranged along the long sides, which face each other, of the bottom portion. The allocating and discharging mechanism alternately forms the first discharge port and the second discharge port by simultaneously moving the first side wall portion and the second side wall portion with respect to the bottom portion.

[0013] A bobbin accommodating device of a sixth invention is the bobbin accommodating device of the fourth invention or the fifth invention, in which the holding section is configured such that the bottom portion is removable.

[0014] A bobbin accommodating device of a seventh invention is the bobbin accommodating device of the fourth invention, in which the bottom portion of the holding section includes a first bottom portion and a second bottom portion each having long sides and short sides, and the first side wall portion and the second side wall portion are arranged along the long sides, which face each other, of the bottom portion. The allocating and discharging mechanism alternately inclines the bottom portion to the first bottom portion side and to the second bottom portion side and, in a case where the bottom portion is inclined to the first bottom portion side, forms the first discharge port with the first side wall portion and, in a case where the bottom portion is inclined to the second bottom portion side, forms the second discharge port with the second side wall portion.

[0015] A bobbin accommodating device of an eighth invention is the bobbin accommodating device of the seventh invention, in which the first bottom portion and the second bottom portion each having a base portion, a first receiving section and a second receiving section, are symmetric to each other, and while the first receiving section is arranged in a unified manner with the base portion in a side of the base portion where the first bottom portion

and the second bottom portion are adjacent to each other, the second receiving section is arranged in a unified manner with the base portion in a side opposite to the side of the base portion where the first bottom portion and the second bottom portion are adjacent to each other. A shape of a cross section, which is formed by the base portion, the first receiving section and the second receiving section, in a direction vertical with respect to a swinging shaft of the first bottom portion and the second bottom portion is a recess.

[0016] A bobbin accommodating device of a ninth invention is the bobbin accommodating device of any one of the fifth invention through the eighth invention, in which the holding section further includes a first-1 side wall portion and a first-2 side wall portion both arranged along the short sides of the bottom portion, and an adjustment mechanism adapted to adjust an interval between the first-1 side wall portion and the first-2 side wall portion.

[0017] A bobbin accommodating device of a tenth invention is the bobbin accommodating device of any one of the third invention through the ninth invention, in which the accommodating section further includes a collection box detecting sensor adapted to detect an installation state of the collection box. The control section stops discharge of the yarn absent bobbins by the holding section in a case where it is detected based on a detection result of the collection box detecting sensor that the collection box is not installed in the accommodating section.

[0018] A bobbin accommodating device of an eleventh invention is the bobbin accommodating device of the tenth invention, in which the collection box detecting sensor doubles as an accommodated bobbin amount detecting sensor adapted to detect the amount of the yarn absent bobbins accommodated in the collection box. The control section stops the discharge of the yarn absent bobbins by the holding section in a case where it is detected based on a detection result of the accommodated bobbin amount detecting sensor that the amount of the yarn absent bobbins accommodated in the collection box has reached a prescribed amount.

[0019] A bobbin accommodating device of a twelfth invention is the bobbin accommodating device of the eleventh invention, in which at least two of each the holding section and the accommodating section are arranged side by side. A first accommodating section is set as a priority machine adapted to accommodate the yarn absent bobbins on a priority basis and a second accommodating section is set as an auxiliary machine adapted to accommodate the yarn absent bobbins in a case where the priority machine is unable to accommodate the yarn absent bobbins.

[0020] An automatic winder of a thirteenth invention includes the bobbin accommodating device of any one of the first invention through the twelfth invention and a bobbin supplying device adapted to perform preparation processing for supplying the yarn present bobbins to the winding unit. The bobbin accommodating device is arranged on a part of the bobbin supplying device.

[0021] An automatic winder of a fourteenth invention includes the bobbin accommodating device of the twelfth invention, a bobbin transporting device, a bobbin taking-out device and a yarn absent bobbin chute section. The bobbin transporting device collects the yarn absent bobbins from the winding unit. The bobbin taking-out device takes out the yarn absent bobbins from the bobbin transporting device. The yarn absent bobbin chute section guides the yarn absent bobbins that have been taken out by the bobbin taking-out device to the introduction port of the bobbin accommodating device while maintaining the uniform orientation of the end portions of the yarn absent bobbins that have been taken out. The yarn absent bobbin chute section determines according to a state of the priority machine whether to guide the yarn absent bobbins to the priority machine or the auxiliary machine.

[0022] An automatic winder of a fifteenth invention is the automatic winder of the fourteenth invention, in which the yarn absent bobbin chute section includes a separator adapted to switch directions to guide the yarn absent bobbins between the prior machine and the auxiliary machine. In a case where a side of the bobbin taking-out device of the yarn absent bobbin chute section is upstream and a side of the bobbin accommodating device is downstream, the separator is arranged with a tip end portion thereof facing downstream and a swinging center thereof located upstream of the tip end portion.

[0023] With the bobbin accommodating device and the automatic winder of the present invention, the yarn absent bobbins are prevented from jumping or the like, leading to a change in the orientation of the end portions thereof, thereby allowing the collection of the yarn absent bobbins with the uniform orientation of the end portions thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1 is a simplified front view illustrating an automatic winder according to Embodiment 1;
 FIG. 2 is a front cross-sectional view illustrating a structure of a bobbin supplying device;
 FIG. 3 is a perspective view illustrating the bobbin supplying device;
 FIG. 4 is a plan view illustrating a bobbin accommodating device;
 FIG. 5 is a cross-sectional view of FIG. 4 taken along a V-V line;
 FIG. 6 is a cross-sectional view of FIG. 4 taken along a VI-VI line;
 FIG. 7A is a simplified perspective view illustrating a state of being in a process of mounting a partition to a first collection box;
 FIG. 7B is a simplified perspective view illustrating a state after mounting the partition to the first collection box;

FIG. 8A is a cross-sectional view illustrating a state of being in a process of installing the first collection box in a first accommodating section;

FIG. 8B is a cross-sectional view illustrating a state after installing the first collection box in the first accommodating section;

FIGS. 9A, 9B and 9C are each a cross-sectional view illustrating a state where the yarn absent bobbins held in a first holding section are discharged to a first compartment (1-1 compartment) of the first collection box;

FIGS. 10A, 10B and 10C are each a cross-sectional view illustrating a state where the yarn absent bobbins held in the first holding section are discharged to a second compartment (1-2 compartment) of the first collection box following the states of FIGS. 9;

FIG. 11 illustrates a case where the yarn absent bobbins are collected in the first collection box of the first accommodating section and the amount thereof reaches a prescribed amount;

FIG. 12 is a simplified view illustrating an alternative embodiment of a yarn absent bobbin chute section;
 FIG. 13 is a plan view illustrating a bobbin accommodating device of an automatic winder according to Embodiment 2;

FIG. 14 is a cross-sectional view of FIG. 13 taken along a XIV-XIV line;

FIG. 15 is a cross-sectional view of FIG. 13 taken along a XV-XV line;

FIGS. 16A, 16B and 16C are each a cross-sectional view illustrating a state where the yarn absent bobbins held in the first holding section are discharged to the first compartment (1-1 compartment) of the first collection box;

FIGS. 17A, 17B and 17C are each a cross sectional view illustrating a state where the yarn absent bobbins held in the first holding section are discharged to the second compartment (1-2 compartment) of the first collection box following the states of FIGS. 16.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0025] (Embodiment 1) Next, an automatic winder 100 according to Embodiment 1 of the present invention will be described by use of FIGS. 1 to 12. The automatic winder 100 of the present embodiment is a bobbin tray type automatic winder.

[0026] First, an outline of the automatic winder 100 will be described. As illustrated in FIG. 1, the automatic winder 100 mainly includes a plurality of winding units 10, a bobbin transporting device 11, a bobbin supplying device 12, a bobbin taking-out device 13, and a bobbin accommodating device 40.

[0027] Yarn present bobbins YB around which a yarn spun in a spinning machine (not illustrated) is wound are loaded in bulk in a container 8 and are transported to the

bobbin supplying device 12, then are introduced into the bobbin supplying device 12. The bobbin supplying device 12 isolates one yarn present bobbin YB from a group of the introduced yarn present bobbins YB and mounts the yarn present bobbin YB by inserting the yarn present bobbin YB into a tray 22 of the bobbin transporting device 11. The bobbin transporting device 11 transports the yarn present bobbin YB to each of the winding units 10. Each of the winding units 10 forms a package by unwinding a yarn from the yarn present bobbin YB mounted to the tray 22.

[0028] A processed yarn absent bobbin B of which yarn has been unwound in each winding unit 10 is discharged from the winding unit 10. The discharged yarn absent bobbin B is transported by the tray 22 of the bobbin transporting device 11. The yarn absent bobbin taking-out device 13 takes out the yarn absent bobbin B placed on the tray 22 of the bobbin transporting device 11. The taken-out yarn absent bobbin B is collected. A new yarn present bobbin YB is mounted downstream by the bobbin supplying device 12 to the tray 22 from which the yarn absent bobbin B has been taken out. A minimal residual yarn present bobbin, which is a bobbin around which a considerably short yarn is wound, is also discharged, and the above-described yarn absent bobbin B includes the minimal residual yarn present bobbin.

[0029] Next, each device that constitutes the automatic winder 100 will be described in more detail by use of FIGS. 1 to 3.

[0030] Each of the plurality of the winding units 10 arranged side by side is configured to unwind the yarn wound around the yarn present bobbin YB mounted to the tray 22 and to rewind the yarn around a winding bobbin to form a package.

[0031] The bobbin transporting device 11 is configured to automatically supply the yarn present bobbin YB to each winding unit 10 and to collect the yarn absent bobbin B from each winding unit 10. The bobbin transporting device 11 includes a bobbin transport path 21 and a plurality of the trays 22. The bobbin transport path 21 transports the trays 22 by a conveyor and the like. The yarn present bobbin YB or the yarn absent bobbin B is mounted to a large number of the trays 22 transported on the bobbin transport path 21.

[0032] The bobbin supplying device 12 is configured to supply the yarn present bobbin YB to the tray 22, on which neither the yarn present bobbin YB nor the yarn absent bobbin B are placed, of the transported trays 22. The bobbin supplying device 12 includes a bobbin introducing section 23, an isolating section 24, a tray placing section 25, and a bobbin moving section 26.

[0033] The bobbin introducing section 23 is a section into which the group of yarn present bobbins YB, which has been transported by the container 8, is introduced.

[0034] The isolating section 24 is configured to isolate the yarn present bobbin YB while elevating the group of the yarn present bobbins YB introduced into the bobbin introducing section 23. The isolating section 24 includes

an endless belt 27 and a plurality of bobbin receiving members 28. The endless belt 27 is vertically arranged to constitute a conveyor. The plurality of bobbin receiving members 28 is mounted to the endless belt 27.

[0035] A surface for having the yarn present bobbin YB placed thereon is arranged in the bobbin receiving member 28. The surface is configured to have only one yarn present bobbin YB thereon at a time. The yarn present bobbin YB transported to a lower part of the isolating section 24 is placed one by one on the bobbin receiving member 28 by the endless belt 27, which is circularly driven, and is transported upward. In such a manner, the yarn present bobbin YB in the bobbin introducing section 23 can be taken one by one and be isolated.

[0036] The tray placing section 25 receives the yarn present bobbin YB transported upward by the isolating section 24 and determines an end portion on a side of unwinding the yarn present bobbin YB (a top side) and an end portion on a side of supporting the yarn present bobbin YB (a bottom side), then mounts the yarn present bobbin YB by inserting into the tray 22 of the bobbin transporting device 11 with the supporting end portion (the bottom side) downward. The tray 22 is in a stand-by state in a part below the tray placing section 25, and the yarn present bobbin YB is mounted by being inserted into the tray 22. The configuration of the tray placing section 25 is publicly known and is disclosed, e.g., in Japanese Patent Application Publication No. 8-169525.

[0037] The bobbin moving section 26 is arranged between the bobbin introducing section 23 and the isolating section 24 and is configured to move the group of the yarn present bobbins YB from the bobbin introducing section 23 to the isolating section 24. The bobbin moving section 26 includes a rocking and transporting section 29. The rocking and transporting section 29 is a member adapted to transport to the isolating section 24, a prescribed amount of yarn present bobbins YB of the group of the yarn present bobbins YB introduced into the bobbin introducing section 23 by rocking them. The rocking and transporting section 29 is configured to be driven and rocked between a position in which the rocking and transporting section 29 is inclined to the isolating section 24 side (a state in FIG. 2) and a position in which the rocking and transporting section 29 is inclined to the bobbin introducing section 23 side, which is a side opposite to the isolating section 24.

[0038] The rocking and transporting section 29 in a state of being inclined to the isolating section 24 side blocks the group of the yarn present bobbins YB in the bobbin introducing section 23 from flowing into the isolating section 24. In a case of transporting the yarn present bobbins YB in the bobbin introducing section 23 to the isolating section 24, firstly, the rocking and transporting section 29 is rocked so as to be in a state of inclining to the bobbin introducing section 23 side. At this time, the blocked yarn present bobbins YB are placed on an upper surface of the rocking and transporting section 29. Subsequently, the rocking and transporting section

29 is rocked again so as to be in the state of inclining to the isolating section 24. Since the rocking and transporting section 29 is rocked in a state where a certain amount of the yarn present bobbins YB are placed thereon, only the yarn present bobbins YB, which are placed on the rocking and transporting section 29, are introduced into the isolating section 24. By rocking the rocking and transporting section 29, only the prescribed amount of the yarn present bobbins YB of the group of the yarn present bobbins YB in the bobbin introducing section 23 is transported to the isolating section 24.

[0039] The bobbin taking-out device 13 is a device adapted to take out the yarn absent bobbin B from the tray 22, which has the yarn absent bobbin B discharged from the winding unit 10 placed thereon, among the trays 22 transported to the bobbin transporting device 11. The bobbin taking-out device 13 includes a frame 31, a belt member 32, a taking-out lever 33, a residual yarn present bobbin chute section 35, a yarn absent bobbin chute section 36, a residual yarn detecting sensor (not illustrated). A bobbin around which a small amount of yarn is wound (a residual yarn present bobbin) may be mixed in the yarn absent bobbins B discharged from the winding unit 10.

[0040] The frame 31 constitutes a base body of the bobbin taking-out device 13. The belt member 32 is a means for transporting the yarn absent bobbin B. The belt member 32 is an endless belt and is arranged towards a vertical direction. The taking-out lever 33 is an arm swingably arranged in the frame 31. A taking-out pulley 34 is arranged at a tip end of the taking-out lever 33. The taking-out lever 33 applies the taking-out pulley 34 to the yarn absent bobbin B on the tray 22 on the transport path 21 to move the yarn absent bobbin B to a side of the belt member 32, and thereafter takes out the yarn absent bobbin B upward from the tray 22 to feed to the belt member 32.

[0041] The residual yarn detecting sensor (not illustrated) is a detection means for detecting the residual yarn present bobbin among the yarn absent bobbins B transported upward along the belt member 32. The residual yarn detecting sensor is arranged in a middle of a path where transportation is performed by the belt member 32. The residual yarn present bobbin chute section 35 and the yarn absent bobbin chute section 36 are arranged in the path where the belt member 32 transports the yarn absent bobbin B.

[0042] The yarn absent bobbin B of which residual yarn has been detected by the residual yarn detecting sensor is discharged to the residual yarn present bobbin chute section 35 as a residual yarn present bobbin. The residual yarn bobbin chute section 35 is inclined, and slides the residual yarn present bobbin to introduce into a collection container (not illustrated) for the residual yarn bobbin.

[0043] In the meantime, the yarn absent bobbin B having no residual yarn is discharged to the yarn absent bobbin chute section 36. The yarn absent bobbin chute section 36 is also inclined and slides the yarn absent bobbin

B having no residual yarn to introduce it into the bobbin accommodating device 40. In the bobbin taking-out device 13, the yarn absent bobbin B is taken out with the end portion thereof on the unwinding side (the top side) facing upward. Therefore, the yarn absent bobbin B having no residual yarn is introduced from the yarn absent bobbin chute section 36 into the bobbin accommodating device 40 in a position in which the end portion thereof on the unwinding side (the top side) faces in a transporting direction.

[0044] The yarn absent bobbin chute section 36 is arranged from the bobbin taking-out device 13 towards the bobbin accommodating device 40. In the present embodiment, since a first introduction port 671 and a second introduction port 672 are arranged in the bobbin accommodating device 40, a tip end portion of the yarn absent bobbin chute section 36 is branched into a first guiding path 371 and a second guiding path 372 respectively corresponding to the first introduction port 671 and the second introduction port 672.

[0045] At a branching portion of the first guiding path 371 and the second guiding path 372 of the yarn absent bobbin chute section 36, a separator 38 is installed. The separator 38 switches between the first introduction port 671 and the second introduction port 672 both serving as an introduction port of the yarn absent bobbin B by switching directions for guiding the yarn absent bobbin B. The separator 38 can be switched by a drive source (not illustrated). The switching is performed by a control section 77 arranged in the bobbin supplying device 12.

[0046] In FIG. 3, a side of the bobbin taking-out device 13 of the yarn absent bobbin chute section 36 and a side of the bobbin accommodating device 40 (a side where the first guiding path 371 and the second guiding path 372 are arranged) are respectively referred to as upstream and downstream. A tip end portion 381 of the separator 38 in FIG. 3 faces upstream. A swinging shaft 382 is arranged downstream of the tip end portion 381. A position where the swinging shaft 382 is arranged is adjacent to the branching portion of the first guiding path 371 and the second guiding path 372 and is on a path where the yarn absent bobbin B passes through. The separator 38 switches the directions for guiding the yarn absent bobbin B by swinging the tip end portion 381 with the swinging shaft 382 as a center.

[0047] FIG. 12 illustrates an alternative embodiment of the separator 38. The tip end portion 381 of the separator 38 in FIG. 12 faces downstream. The swinging shaft 382 is arranged upstream of the tip end portion 381. A position where the swinging shaft 382 is arranged is away from the branching portion of the first guiding path 371 and the second guiding path 372 and is off the path where the yarn absent bobbin B passes through. The separator 38 switches directions for guiding the yarn absent bobbin B by swinging the tip end portion 381 with the swinging shaft 382 as a center. In a case of this alternative embodiment, even when the yarn absent bobbin B is introduced while the separator 38 is swinging,

the yarn absent bobbin B is not likely to be sandwiched between the separator 38 and a side of the yarn absent bobbin chute section 36.

[0048] Next, a configuration of the bobbin accommodating device 40 of the present invention will be described in more detail. As illustrated in FIG. 3, in the present invention, the bobbin accommodating device 40 is installed above and across the rocking and transporting section 29 of the bobbin moving section 26.

[0049] For the sake of convenience, a side where the yarn absent bobbin B is introduced from the yarn absent bobbin chute section 36 is referred to as a front side of the bobbin accommodating device 40 and a side opposite to the front side is referred to as a rear side thereof. A right side and a left side of the bobbin accommodating device 40 are defined by viewing from the rear side.

[0050] As illustrated in FIGS. 4 to 7, the bobbin accommodating device 40 includes a device main body 51, a holding section 61, and an accommodating section 71. In a left side of the device main body 51, a first holding section 611 and a first accommodating section 711 are respectively arranged as the holding section 61 and the accommodating section 71. In a right side of the device main body 51, a second holding section 612 and a second accommodating section 712 are respectively arranged as the holding section 61 and the accommodating section 71. In the present embodiment, the bobbin accommodating device 40 has a substantially left-right symmetric configuration, and the holding section 61 and the accommodating section 71 are substantially symmetric about a center in a left-right direction of the device main body 51. Therefore, a description will be made on a configuration of the first holding section 611 and the first accommodating section 711 both on the left side and a description on a configuration of the second holding section 612 and the second accommodating section 712 on the right side may be appropriately omitted in some cases.

[0051] The device main body 51 is a part constituting a base body of the bobbin accommodating device 40. A front wall portion 52 is arranged in a front side of the device main body 51. The first introduction port 671 and the second introduction port 672 are arranged in the front wall portion 52 respectively corresponding to the first guiding path 371 and the second guiding path 372 of the yarn absent bobbin chute section 36. A cover (not illustrated) is arranged on an upper part of the device main body 51 to prevent the yarn absent bobbin B from bouncing out or the like when the automatic winder 100 is being operated.

[0052] A rear wall portion 53 facing the front wall portion 52 is arranged in a rear side of the device main body 51. Upper surface portions of the front wall portion 52 and the rear wall portion 53 are coupled by a first coupling section 54 and a second coupling section 55. Two of the first coupling sections 54 are arranged parallel to each other near a center in the upper surface portions of the front wall portion 52 and the rear wall portion 53. The second coupling sections 55 are respectively arranged

in left end portions and right end portions of the upper surface portions of the front wall portion 52 and the rear wall portion 53. Right side portions and left side portions of the front wall portion 52 and the rear wall portion 53 are coupled by a third coupling section 56 and a fourth coupling section 57. Lower surface portions of the front wall portion 52 and the rear wall portion 53 are coupled by a fifth coupling section 58. A sixth coupling section 59 is arranged inside the device main body 51 so as to partition between a space where the first holding section 611 is installed and a space where the second holding section 612 is installed. An opening portion 70 is respectively arranged on a right side surface and a left side surface of the device main body 51 for moving a collection box 72 into/out of the accommodating section 71. The opening portion 70 is a region surrounded by the front wall portion 52, the rear wall portion 53, the fourth coupling section 57 and the fifth coupling section 58.

[0053] The accommodating section 71 is adapted to accommodate the yarn absent bobbins B discharged from the holding section 61 in a plurality of compartments. The accommodating section 71 is configured to be capable of installing and replacing the collection box 72. In the present embodiment, the first accommodating section 711 and the second accommodating section 712 are arranged as the accommodating section 71. The first accommodating section 711 is configured to be capable of installing and replacing a first collection box 721, and the second accommodating section 712 is configured to be capable of installing and replacing a second collection box 722. Each interior portion of the first collection box 721 and the second collection box 722 is divided into a plurality of compartments.

[0054] Installment and replacement of the collection box 72 in the accommodating section 71 is performed through the opening portion 70 arranged in the device main body 51. A placing section 73 adapted to place the collection box 72 is arranged in the accommodating section 71. The placing section 73 is configured to be capable of adjusting a position in a vertical direction according to a height of the collection box 72. A regulating section 74 is arranged in the placing section 73. The regulating section 74 is configured to be capable of adjusting a position in a front-rear direction with respect to the placing section 73 according to a front-rear size of the collection box 72. In this manner, even when the collection box 72 to be installed in the accommodating section 71 is changed to a collection box different in size in accordance with the length of the yarn absent bobbin B, the first collection box 721 can be installed in a prescribed reference position. In the present embodiment, positions of the placing section 73 and the regulating section 74 are adjusted such that a front side and an upper end side of the first collection box 721 is positioned in the prescribed reference position.

[0055] As illustrated in FIG. 7, a partition 75 is mounted such that the interior portions of the first collection box 721 and the second collection box 722 are each divided

into the plurality of compartments. By inserting the partition 75 into each of the first collection box 721 and the second collection box 722, each of the interior portions of the first collection box 721 and the second collection box 722 can be partitioned into two compartments. The first collection box 721 is partitioned by the partition 75 into a first compartment (1-1 compartment) 761 and a second compartment (1-2 compartment) 762. The second collection box 722 is partitioned by the partition 75 into a third compartment (2-1 compartment) 763 and a fourth compartment (2-2 compartment) 764.

[0056] The first collection box 721 and the second collection box 722 are, in a state where the partition 75 is inserted, set such that a length of a short side of each compartment 761, 762, 763 and 764 is shorter than the length of the yarn absent bobbin B. A length of a long side of each compartment 761, 762, 763 and 764 is set to be slightly longer than the length of the yarn absent bobbin B. The partition 75 can be removed by upwardly taking out even in a state where the yarn absent bobbins B are accommodated in the first collection box 721 and the second collection box 722.

[0057] The holding section 61 temporarily holds the yarn absent bobbins B introduced from the first introduction port 671 and the second introduction port 672 while maintaining a uniform orientation of end portions thereof. In the present embodiment, the first holding section 611 and the second holding section 612 are arranged as the holding section 61. In a case where the amount of the held yarn absent bobbins B has reached a prescribed amount, the first holding section 611 allocates between the first compartment (1-1 compartment) 761 and the second compartment (1-2 compartment) 762 of the first collection box 721 and discharges the held yarn absent bobbins B. In a case where the amount of the held yarn absent bobbins B has reached a prescribed amount, the second holding section 612 allocates between the third compartment (2-1 compartment) 763 and the fourth compartment (2-2 compartment) 764 of the second collection box 722 and discharges the held yarn absent bobbins B.

[0058] The holding section 61 includes a bottom portion 62, a first side wall portion 63, a second side wall portion 64 and a third side wall portion 65. The bottom portion 62 is a member adapted to regulate a movement of the yarn absent bobbin B in a vertical direction, which is a direction where the yarn absent bobbins B fall. The bottom portion 62 is a rectangular plate member having long sides and short sides. The bottom portion 62 is, in the first holding section 611, installed above and across the partition 75 adapted to partition between the first compartment (1-1 compartment) 761 and the second compartment (1-2 compartment) 762 of the first collection box 721 and is, in the second holding section 612, installed above and across the partition 75 adapted to partition between the third compartment (2-1 compartment) 763 and the fourth compartment (2-2 compartment) 764 of the second collection box 722. The bottom portion 62 is inserted into a slit formed in the rear wall portion 53

and is supported by a slit arranged in the front wall portion 52. The bottom portion 62 can be removed from the device main body 51 by taking out from the slits.

[0059] The first side wall portion 63, the second side wall portion 64 and the third side wall portion 65 are members for regulating movement of the yarn absent bobbin B in a horizontal direction (left-right direction). The first side wall portion 63, the second side wall portion 64 and the third side wall portion 65 are arranged along long sides, which face each other, of the bottom portion 62. The first side wall portion 63, the second side wall portion 64 and the third side wall portion 65 are configured by arranging side by side two identical shaped side wall members of which cross sections are both substantially U-shaped. Lower end portions of the side wall members 66 are slightly curved inward. Therefore, lower end portions of the first side wall portion 63 and the third side wall portion 65 are slightly curved so as to be close to each other, and lower end portions of the second side wall portion 64 and the third side wall portion 65 are also slightly curved so as to be close to each other. By curbing the lower end portions of the first side wall portion 63 and the second side wall portion 64 and the third side wall portion 65 in such a manner, when discharging a plurality of yarn absent bobbins B, the yarn absent bobbins B are likely to collectively fall.

[0060] The front wall portion 52 as a first-1 side wall portion, and a first-2 side wall portion 68 are arranged in front and rear of the first side wall portion 63, the second side wall portion 64, and the third side wall portion 65. The front wall portion 52 (first-1 side wall portion) and the first-2 side wall portion 68 are members for regulating movement of the yarn absent bobbin B in a horizontal direction (front-back direction) (see FIG. 6). The first-2 side wall portion 68 is arranged across the first coupling section 54 and the second coupling section 55. The first-2 side wall portion 68 is extended such that a lower end portion thereof is adjacent to the bottom portion 62. The first-2 side wall portion 68 includes an adjustment mechanism for adjusting a position according to the length of the yarn absent bobbin B. Specifically, the first-2 side wall portion 68 is configured to be capable of moving in the front-back direction, in a fixed position with respect to the first coupling section 54 and the second coupling section 55. This allows accommodation of the yarn absent bobbin B by adjusting the position of the first-2 side wall portion 68 even when the yarn absent bobbin B is replaced by a yarn absent bobbin B with a different length. In the front wall portion 52 (first-1 side wall portion) and the first-2 side wall portion 68, a cushioning member 169 is mounted for reducing impact at the time of collision of the yarn absent bobbin B introduced from the yarn absent bobbin chute portion 36.

[0061] A guiding section 87 is arranged in an upper part of the holding section 61. A through hole parallel to the left-right direction of the device main body 51 is formed in the guiding section 87, and a shaft 88 is formed through the through hole. The shaft 88 is arranged across

the second coupling section 55 and the sixth coupling section 59 so as to be parallel to the left-right direction of the device main body 51. The holding section 61 can thus move in the left-right direction of the device main body 51 along the shaft 88.

[0062] The first holding section 611 can switch positions between a state where the first side wall portion 63 and the third side wall portion 65 are above the bottom portion 62 (a state of the first holding section 611 illustrated in FIGS. 9A and 10C, which is hereinafter referred to as a "state 1-1") and a state where the second side wall portion 64 and the third side wall portion 65 are above the bottom portion 62 (a state of the first holding section 611 illustrated in FIGS. 9C and 10A, which is hereinafter referred to as a "state 1-2"). Furthermore, the second holding section 612 also can independently switch positions between a state the first side wall portion 63 and the third side wall portion 65 are above the bottom portion 62 (hereinafter referred to as a "state 2-1") and a state where the second side wall portion 64 and the third side wall portion 65 is above the bottom portion 62 (hereinafter referred to as a "state 2-2").

[0063] The holding section 61 includes an allocating and discharging mechanism 81 adapted to allocate the held yarn absent bobbins B to each compartment 761, 762, 763 and 764 of the accommodating section 71. The allocating and discharging mechanism 81 moves the first holding section 611 and the second holding section 612 to form a first discharge port 82 between the bottom portion 62 and the first side wall portion 63 (see FIG. 9B) and a second discharge port 83 between the bottom portion 62 and the second side wall portion 64 (see FIG. 10B).

[0064] The allocating and discharging mechanism 81 includes an actuator 84. The actuator 84 is held in the first coupling section 54. A fixing section 86 is arranged in an upper part of the first holding section 611. A rod 85 of the actuator 84 is fixed to the fixing section 86. By extending and contracting the rod 85 of the actuator 84, the first holding section 611 can be switched between the "state 1-1" and the "state 1-2". The second holding section 612 can be switched independently between the "state 2-1" and the "state 2-2".

[0065] A held bobbin detecting sensor 91 is a sensor adapted to detect the amount of the yarn absent bobbins B held in the holding section 61. In the present embodiment, in a case where the amount of the yarn absent bobbins B held in the first holding section 611 or the second holding section 612 has reached a prescribed amount, the held bobbin detecting sensor 91 detects the amount of the yarn absent bobbins B by detecting a position of an upper surface of the yarn absent bobbin B. A photoelectric sensor including a light projecting/receiving section 92 and a mirror section 93 is used as the held bobbin detecting sensor 91. The light projecting/receiving section 92 is arranged in the third coupling section 56 of the device main body 51. The mirror section 93 is arranged on the sixth coupling section 59 of the device

main body 51. Through holes 99 are formed in each of the first side wall portion 63, the second side wall portion 64 and the third side wall portion 65 to allow light from the light projecting/receiving section 92 to reflect in the mirror section 93 through the through holes 99.

[0066] The held bobbin detecting sensor 91 is configured such that when a prescribed amount of the yarn absent bobbins B is collected in the holding section 61, and thereafter the upper surface of the yarn absent bobbin B blocks the light from the light projecting/receiving section 92, the light projecting/receiving section 92 detects the blocked light and inputs a detection signal to a control section 77 (see FIGS. 9A and 10A). The control section 77 activates the actuator 84 based on the detection signal from the held bobbin detecting sensor 91 to discharge from the holding section 61, the yarn absent bobbins B held in the holding section 61.

[0067] This operation will be described with the first holding section 611 as an example. As illustrated in FIG. 9A, when a prescribed amount of the yarn absent bobbins B is held in the first holding section 611 under the "state 1-1", and thereafter the upper surface of the yarn absent bobbin B blocks the light from the light projecting/receiving section 92, the held bobbin detecting sensor 91 inputs the detection signal to the control section 77. As illustrated in FIG. 9B, the control section 77 activates the actuator 84 based on the detection signal from the held bobbin detecting sensor 91 to shift the first holding section 61 from the "state 1-1" in FIG. 9A to the "state 1-2" in FIG. 9C. In a process of shifting from the "state 1-1" to the "state 1-2", when the first discharge port 82 is formed between the bottom portion 62 and the first side wall portion 63, the yarn absent bobbins B held in the first holding section 611 are discharged from the first holding section 611 to the first compartment (1-1 compartment) 761. As illustrated in FIG. 9C, when the first holding section 611 reaches the "state 1-2", the actuator 84 stops and, in this state, the first holding section 611 continues to hold the yarn absent bobbins B.

[0068] The yarn absent bobbins B are continuously held from the state in FIG. 9C and, as illustrated in FIG. 10A, when a prescribed amount of the yarn absent bobbins B is held in the first holding section 611 under the "state 1-2", and thereafter the upper surface of the yarn absent bobbin B blocks light from the light projecting/receiving section 92, the held bobbin detecting sensor 91 inputs the detection signal to the control section 77. As illustrated in FIG. 10B, the control section 77 activates the actuator 84 based on the detection signal from the held bobbin detecting sensor 91 to shift the first holding section 611 from the "state 1-2" in FIG. 10A to the "state 1-1" in FIG. 10C. In a process of shifting from the "state 1-2" to the "state 1-1", when the second discharge port 83 is formed between the bottom portion 62 and the second side wall portion 64, the yarn absent bobbins B held in the first holding section 611 are discharged from the first holding section 611 to the second compartment (1-2 compartment) 762. As illustrated in FIG. 10C, when the

first holding section 611 reaches the "state 1-1", the actuator 84 stops and, in this state, the first holding section 611 continues to hold the yarn absent bobbins B.

[0069] A collection box detecting sensor 94 is a sensor adapted to detect an installation state of the collection box 72. In the present embodiment, the collection box detecting sensor 94 is installed in each of the first accommodating section 711 and the second accommodating section 712. A photoelectric sensor including a light emitting section 95 and a light receiving section 96 is used as the collection box detecting sensor 94. A reflecting section 97 adapted to reflect light from the light emitting section 95 towards the light receiving section 96 is also arranged. The light emitting section 95 and the light receiving section 96 are arranged in the fourth coupling section 57 of the device main body 51. The reflecting section 97 is swingably supported by a shaft 98 arranged across an interior portion of the device main body 51 in a front-rear direction.

[0070] In a case where the collection box 72 is installed in the accommodating section 71, the reflecting section 97 is pushed by the collection box 72, thereby being upright (see FIG. 8B). The reflecting section 97 is, in a state of being upright, configured to reflect the light of the light emitting section 95 towards the light receiving section 96. In a case where the collection box 72 is not installed in the accommodating section 71 (including a case where the collection box 72 is not properly installed in a prescribed position, e.g., a case where the collection box 72 is not fully pushed into an interior portion of the accommodating section 71), the reflecting section 97 is in an inclined state (see FIG. 8A). The reflecting section 97 is configured, in the inclined state, to reflect the light of the light emitting section 95 in a direction where the light receiving section 96 cannot receive the light.

[0071] The collection box detecting sensor 94 is configured such that in a case where the collection box 72 is installed in the accommodating section 71, the light receiving section 96 detects the light from the light emitting section 95, which is reflected by the reflecting section 97, and inputs a detection signal to the control section 77. In this case, the control section 77, based on the detection signal from the collection box detecting sensor 94, brings the holding section 61 into a state where the yarn absent bobbins B can be discharged. In a case where the collection box 72 is not installed in the accommodating section 71 (including the case of not being properly installed), since the reflecting section 97 is inclined, the light from the light emitting section 95 is not detected by the light receiving section 96. In this case, the control section 77, based on the detection signal from the collection box detecting sensor 94, brings the holding section 61 into a state where the yarn absent bobbins B cannot be discharged.

[0072] The collection box detecting sensor 94 doubles as an accommodated bobbin amount detecting sensor. The collection box detecting sensor 94 as the accommodated bobbin amount detecting sensor detects the

amount of the yarn absent bobbins B accommodated in the collection box 72. The collection box detecting sensor 94 serving as the accommodated bobbin amount detecting sensor is configured such that when a prescribed amount of the yarn absent bobbins B is accommodated in the collection box 72, and thereafter the upper surface of the yarn absent bobbins B blocks the light from the light emitting section 95 or the light reflected from the reflecting section 97, the light receiving section 96 detects the blocked light and inputs the detection signal to the control section 77. The control section 77 activates a notifying section such as a lamp based on the detection signal from the collection box detecting sensor 94, which serves as the accommodated bobbin amount detecting sensor, to notify to an operator that the prescribed amount of the yarn absent bobbins B has been collected.

[0073] In the present embodiment, priority is set between the first accommodating section 711 on a left side and the second accommodating section 712 on a right side. The first accommodating section 711 on the left side is set as a priority machine adapted to accommodate the yarn absent bobbins B on a priority basis. The second accommodating section 712 on the right side is set as an auxiliary machine adapted to accommodate the yarn absent bobbins B in a case where the first accommodating section 711 set as the priority machine is unable to accommodate the yarn absent bobbins B. Cases where the first accommodating section 711 is unable to accommodate the yarn absent bobbins B are: (1) a case where the yarn absent bobbins B are collected in the first collection box 721 of the first collecting section 711 and the amount thereof has reached a prescribed amount; and (2) a case where the first collection box 721 of the first accommodating section 711 is not installed (including a case of not being properly installed). In case (2), there is included a case where the operator is replacing the first collection box 721 after the yarn absent bobbins B are collected in the first collection box 721. In this case, by activating a drive source of the separator 38 in the yarn absent bobbin chute section 36 and switching directions for guiding the yarn absent bobbins B, the control section switches from the first introduction port 671 (the first accommodating section 711) to the second introduction port 672 (the second accommodating section 712).

[0074] With the bobbin accommodating device 40 and the automatic winder 100 according to the above-described present embodiment, the following effects are provided.

[0075] The bobbin accommodating device 40 includes the holding section 61 adapted to temporarily hold the yarn absent bobbins B while maintaining uniform orientation of the end portions thereof and the accommodating section 71 adapted to allocate to a plurality of compartments and to accommodate the yarn absent bobbins B discharged from the holding section 61. Since the holding section 61 collectively discharges a prescribed amount of the yarn absent bobbins B, the yarn absent bobbins B can be prevented from jumping in the accommodating

section 71, leading to a change in the orientation of the end portions thereof, thereby allowing collection of the yarn absent bobbins with the uniform orientation of the end portions thereof. Furthermore, since the yarn absent bobbins B held in the holding section 61 are allocated in the plurality of compartments of the accommodating section 71 and are discharged, the yarn absent bobbins B can be equally accommodated without being concentratedly discharged to one part of the accommodating section 71.

[0076] The bobbin accommodating device 40 is configured to be capable of installing therein, the collection box 72 adapted to accommodate the yarn absent bobbins B. The collection box 72 has an interior portion divided into a plurality of compartments. Since the yarn absent bobbins B can be directly accommodated in the collection box 72, which the operator can handle, it is not required for the operator to collect the yarn absent bobbins B in another container for returning the yarn absent bobbins B to a spinning machine. Collecting operation of the yarn absent bobbins B can thus be easily performed in a short time.

[0077] In a case where the amount of the yarn absent bobbins B held in the holding section 61 has reached a prescribed amount, the bobbin accommodating device 40 causes the yarn absent bobbins B held in the holding section 61 to be discharged from the holding section 61. Since this allows the holding section 61 to hold an appropriate amount of the yarn absent bobbins B, the yarn absent bobbin B does not spill over the holding section 61. Furthermore, since the yarn absent bobbins B are not discharged to the accommodating section 71 in a small amount, the yarn absent bobbins B can be prevented from jumping in the accommodating section 71, leading to a change in the orientation of the end portions thereof.

[0078] In the bobbin accommodating device 40, the allocating and discharging mechanism 81 moves the first side wall portion 63 and the second side wall portion 64 to form the first discharge port 82 between the bottom portion 62 and the first side wall portion 63, and the second discharge port 83 between the bottom portion 62 and the second side wall portion 64. The yarn absent bobbins B can thus be allocated with a simple configuration.

[0079] In the bobbin accommodating device 40, by simultaneously moving the first side wall portion 63 and the second side wall portion 64 with respect to the bottom portion 62, the allocating and discharging mechanism 81 alternately forms the first discharge port 82 and the second discharge port 83. The yarn absent bobbins B held in the holding section 61 can thus be moved in a parallel manner and discharged to the accommodating section 71, thereby allowing suppression of impact of the yarn absent bobbins B at the time of discharging the yarn absent bobbins B to the accommodating section 71.

[0080] In the bobbin accommodating device 40, the bottom portion 62 is configured in a removable manner. Therefore, in cases where the yarn absent bobbins B are

stuck in the holding section 61, or the like, the operator can easily perform maintenance on the holding section 61 by removing the bottom portion 62.

[0081] In the bobbin accommodating device 40, the holding section 61 includes the front wall portion 52 as the first-1 side wall portion and the first-2 side wall portion 68 both arranged along short sides of the bottom portion 62, and an adjustment mechanism (not illustrated) adapted to adjust an interval of the front wall portion 52 as the first-1 side wall portion and the first-2 side wall portion 68. Therefore, size of the holding section 61 in a longitudinal direction can be adjusted in accordance with the size of the yarn absent bobbins B to be temporarily held, thereby allowing accommodation of a plurality of types of the yarn absent bobbins B.

[0082] In a case of detecting that the collection box 72 is not installed in the accommodating section 71, the bobbin accommodating device 40 stops the discharge of the yarn absent bobbins B by the holding section 61. The yarn absent bobbins B can thus be prevented from being discharged from the holding section 61 in a state where the collection box 72 is not installed in the accommodating section 71.

[0083] In the bobbin accommodating device 40, the collection box detecting sensor 94 doubles as the accommodated bobbin amount detecting sensor adapted to detect the amount of the yarn absent bobbins B accommodated in the collection box 72. Since the collection box detecting sensor 94 doubles as the accommodated bobbin amount detecting sensor, the number of sensors can be reduced. Furthermore, when the accommodated bobbin amount detecting sensor detects that the amount of the yarn absent bobbins B accommodated in the collection box 72 has reached a prescribed amount, the discharge of the yarn absent bobbins B from the holding section 61 is stopped, thereby preventing the yarn absent bobbins B from spilling over the collection box 72.

[0084] The bobbin accommodating device 40 includes at least two of each the holding section 61 and the accommodating section 71 arranged side by side. The first accommodating section 711 is set as the priority machine adapted to accommodate the yarn absent bobbins B on a priority basis and the second accommodating section 712 is set as the auxiliary machine adapted to accommodate the yarn absent bobbins B in a case where the priority machine is unable to accommodate the yarn absent bobbins B. By arranging a plurality of the accommodating sections 711 and 712, even when collecting operation of the yarn absent bobbins B is being performed in one of the accommodating sections, the yarn absent bobbins B can be continuously accommodated. Furthermore, setting priority between the collecting section 711 and the collecting section 712 allows prevention of the accommodating sections 711 and 712 from both being full around the same time.

[0085] In the automatic winder 100, the bobbin accommodating device 40 is arranged on a part of the bobbin supplying device 12. This allows supply of the yarn

present bobbins YB and accommodation of the yarn absent bobbins B both to be performed in positions adjacent to each other, thereby minimizing movement of the operator. Furthermore, a space required for installing the automatic winder 100 can be reduced.

[0086] In the automatic winder 100, the yarn absent bobbin chute section 36 determines whether to guide the yarn absent bobbins B to the priority machine or to the auxiliary machine according to a state of the priority machine. Thus, even when collecting operation of the yarn absent bobbins B is being performed in one of the accommodating sections 71, the yarn absent bobbins B can be continuously accommodated in the other of the collecting sections 71.

[0087] (Embodiment 2) Next, an automatic winder according to Embodiment 2 of the present invention will be described by use of FIGS. 13 to 17. The automatic winder of the second embodiment is mainly different from the automatic winder 100 of Embodiment 1 in terms of a configuration of a holding section 61' of a bobbin accommodating device 140, however, identical collection boxes 72, 721, 722 may be used.

[0088] As illustrated in FIGS. 13 to 17, the bobbin accommodating device 140 includes a device main body 51', the holding section 61' and an accommodating section 71'. A first holding section 611' and a second holding section 612' are arranged as the holding section 61'. In a case where the amount of the held yarn absent bobbins B has reached a prescribed amount, the first holding section 611' allocates the held yarn absent bobbins B between the first compartment (1-1 compartment) 761 and the second compartment (1-2 compartment) 762 of the first collection box 721 and discharges the held yarn absent bobbins B. In a case where the amount of held yarn absent bobbins B has reached a prescribed amount, the second holding section 612' allocates the held yarn absent bobbins B between the third compartment (2-1 compartment) 763 and the fourth compartment (2-2 compartment) 764 of the second collection box 722 and discharges the held yarn absent bobbins B.

[0089] The holding section 61' includes the bottom portion 62', the first side wall portion 63' and the second side wall portion 64'. The bottom portion 62' is a member adapted to regulate movement of the yarn absent bobbins B in a vertical direction, which is a direction where the yarn absent bobbins B fall. The bottom portion 62' includes a first bottom portion 621 and a second bottom portion 622 both having long sides and short sides. The first bottom portion 621 and the second bottom portion 622 each has a shape symmetric to each other. The first bottom portion 621 and the second bottom portion 622 are swingably arranged with respect to the device main body 51' with a shaft 67 as an axial center. The first bottom portion 621 and the second bottom portion 622 each has a base portion 623, a first receiving section 624 and a second receiving section 625. The first receiving section 624 and the second receiving section 625 are each arranged in a unified manner with the base portion 623

on a side of the base portion 623. The first receiving section 624 is arranged in a unified manner with the base portion 623 on a side of the base portion 623 where the first bottom portion 621 and the second bottom portion 622 are adjacent to each other, and the second receiving section 625 is arranged in a unified manner with the base portion 623 on a side opposite to the side of the base portion 623 where the first bottom portion 621 and the second bottom portion 622 are adjacent to each other. A shape of a cross section formed by cutting the first bottom portion 621 and the second bottom portion 622 vertically with respect to the shaft 67 is a recess such that the base portion 623, the first receiving section 624 and the second receiving section 625 can hold the yarn absent bobbins B.

[0090] The first bottom portion 621 and the second bottom portion 622 are mounted to a fixing section 66', each arranging the first receiving section 624 adjacent to each of them. The second receiving section 625 is inverted at substantially 90 degrees with respect to the first receiving section 624. The fixing section 66' is mounted to the shaft 67. The shaft 67 is rotatably arranged across the front wall portion 52 and the rear wall portion 53 of the device main body 51'. The shaft 67 is, in the first holding section 611', installed above and across the partition 75 adapted to partition between the first compartment (1-1 compartment) 761 and the second compartment (1-2 compartment) 762 of the first collection box 721 and is, in the second holding section 612', installed above and across the third compartment (2-1 compartment) 763 and the fourth compartment (2-2 compartment) 764 of the second collection box 722.

[0091] The first side wall portion 63' and the second side wall portion 64' are members adapted to regulate movement of the yarn absent bobbin B in a horizontal direction (left-side direction). The first side wall portion 63' is arranged along a free end of the second receiving section 625 of the first bottom portion 621. The second side wall portion 64' is arranged along a free end of the second receiving section 625 of the second bottom portion 622. The first side wall portion 63' and the second side wall portion 64' are supported by each swinging section 68'. Each swinging section 68' is arranged on a shaft 69 in a hanging manner. The shaft 69 is arranged across the front wall portion 52 and the rear wall portion 53. The first side wall portion 63' and the second side wall portion 64' can thus be swung with respect to the device main body 51'.

[0092] A cam 87' as the guiding section 87 is fixed to the shaft 67, which supports the bottom portion 62, in a side of the front side wall portion 52 of the device main body 51'. A follower 89, which abuts against the cam 87', is arranged in the swinging section 68' adapted to support the first side wall portion 63' and the second side wall portion 64'. In a case where the bottom portion 62' is inclined to the first bottom portion 621 side, the cam 87' has a shape by which the cam 87' pushes up the first side wall portion 63' via the follower 89 to form a first

discharge port 82' between the first bottom portion 621 and the first side wall portion 63' (see FIG. 16B) and at this time, a second discharge port 83' between the second bottom portion 622 and the second side wall portion 64' is closed since the second side wall portion 64' is not pushed up. In a case where the bottom portion 62' is inclined to the second bottom portion 622 side, the cam 87' has a shape by which the cam 87' pushes up the second side wall portion 64 via the follower 89 to form the second discharge port 83' between the second bottom portion 622 and the second side wall portion 63' (see FIG. 17B) and at this time, the first discharge port 82' between the first bottom portion 621 and the first side wall portion 63' is closed since the first side wall portion 63' is not pushed up.

[0093] The first holding section 611 is capable of switching positions between a state where the bottom portion 62' is inclined to the second bottom portion 622 side and the first discharge port 82' between the first bottom portion 621 and the first side wall portion 63' is closed (a state of the first holding section 611' illustrated in FIGS. 16A and 17C, which is hereinafter referred to as a "state 3-1") and a state where the bottom portion 62' is inclined to the first bottom portion 621 side and the second discharge port 83' between the second bottom portion 622 and the second side wall portion 64' is closed (a state of the first holding section 611' illustrated in FIGS. 16C and 17A, which is hereinafter referred to as a "state 3-2"). The second holding section 612' is also capable of switching positions between a state where the bottom portion 62' is inclined to the second bottom portion 622 side and the first discharge port 82' between the first bottom portion 621 and the first side wall portion 63' is closed (hereinafter referred to as a "state 4-1") and a state where the bottom portion 62' is inclined to the first bottom portion 621 side and the second discharge port 83' between the second bottom portion 622 and the second side wall portion 64' is closed (hereinafter referred to as a "state 4-2").

[0094] The holding section 61' includes an allocating and discharging mechanism 181 adapted to allocate the held yarn absent bobbins B to each compartment 761, 762, 763 and 764 of the accommodating section 71. The allocating and discharging mechanism 181 moves (swings) the first holding section 611 and the second holding section 612 to form the first discharge port 82' between the bottom portion 62' and the first side wall portion 63' (see FIG. 16B) and the second discharge port 83' between the bottom portion 62' and the second side wall portion 64' (see FIG. 17B).

[0095] The allocating and discharging mechanism 181 includes an actuator 84'. The actuator 84' is arranged in an outer side of the front wall portion 52. The actuator 84' includes an extendable rod 85'. A lever 86' is arranged in the shaft 67, which supports the bottom portion 62'. The rod 85' of the actuator 84' is coupled to the lever 86'. By extending/contracting the rod 85' of the actuator 84' and thereby swinging the bottom portion 62', the first holding section 611' can be switched between the "state

3-1" and the "state 3-2". The second holding section 612' can be switched between the "state 4-1" and the "state 4-2".

[0096] The held bobbin detecting sensor 91 is a sensor adapted to detect the amount of the yarn absent bobbins B held in the holding section 61'. In the present embodiment, a photoelectric sensor including the light projecting/receiving section 92 and the mirror section 93 is used as the held bobbin detecting sensor 91. A configuration is made such that when a prescribed amount of the yarn absent bobbins B is collected in the holding section 61', and thereafter an upper surface of the yarn absent bobbin B blocks light from the light projecting/receiving section 92, the light projecting/receiving section 92 detects the blocked light and inputs a detection signal to the control section 77 (see FIGS. 16A and 17A). The control section 77 activates the actuator 84' based on the detection signal from the held bobbin detecting sensor 91 to discharge from the holding section 61' the yarn absent bobbins B held in the holding section 61'.

[0097] This operation will be described with the first holding section 611' as an example. As illustrated in FIG. 16A, a prescribed amount of the yarn absent bobbins B is held in the first holding section 611 under the "state 3-1", and thereafter the upper surface of the yarn absent bobbin B blocks the light from the light projecting/receiving section 92, the held bobbin detecting sensor 91 inputs the detection signal to the control section 77. As illustrated in FIG. 16B, the control section 77 activates the actuator 84' based on the detection signal from the held bobbin detecting sensor 91 to shift the first holding section 611' from the "state 3-1" in FIG. 16A to the "state 3-2" in FIG. 16C. In a process of shifting from the "state 3-1" to the "state 3-2", when the first discharge port 82 is formed between the first bottom portion 621 and the first side wall portion 63', the yarn absent bobbins B held in the first holding section 611' are discharged from the first holding section 611' to the first compartment (compartment 1-1) 761. As illustrated in FIG. 16C, when the first holding section 611' reaches the "state 3-2", the actuator 84' stops and, in this state, the first holding section 611' continues to hold the yarn absent bobbins B.

[0098] The yarn absent bobbins B are continuously held from the state in FIG. 16C and as illustrated in FIG. 17A, when a prescribed amount of the yarn absent bobbins B is held in the first holding section 611' under the "state 3-2", and thereafter the upper surface of the yarn absent bobbin B blocks the light from the light projecting/receiving section 92, the held bobbin detecting sensor 91 inputs the detection signal to the control section 77. As illustrated in FIG. 17B, the control section 77 activates the actuator 84' based on the detection signal from the held bobbin detecting sensor 91 to shift the first holding section 611' from the "state 3-2" in FIG. 17A to the "state 3-1" in FIG. 17C. In a process of shifting from the "state 3-2" to the "state 3-1", when the second discharge port 83' is formed between the second bottom portion 622 and the second side wall portion 64', the yarn

absent bobbins B held in the first holding section 611' are discharged from the first holding section 611' to the second compartment (compartment 1-2) 762. As illustrated in FIG. 17C, when the first holding section 611' reaches the "state 3-1", the actuator 84' stops and, in this state, the first holding section 611' continues to hold the yarn absent bobbins B.

[0099] With the bobbin accommodating device 140 and the automatic winder according to the above-described second embodiment, the following effects are provided.

[0100] In the bobbin accommodating device 140, the allocating and discharging mechanism 181 alternately inclines the bottom portion 62' to the first bottom portion 621 side and the second bottom portion 622 side. The allocating and discharging mechanism 181 forms the first discharge port 82' with the first side wall portion 63' in a case where the bottom portion 62' is inclined to the first bottom portion 621 side, and forms the second discharge port 83' with the second side wall portion 64' in a case where the bottom portion 62' is inclined to the second bottom portion 622 side. The yarn absent bobbins B can thus be discharged without being sandwiched by the first discharge port 82', the second discharge port 83', and the like.

[0101] In the bobbin accommodating device 140, the first bottom portion 621 and the second bottom portion 622 each having the base portion 623, the first receiving section 624 and the second receiving section 625, are symmetric to each other. The first receiving section 624 is arranged in a unified manner with the base portion 623 on a side of the bottom portion 623 where the first bottom portion 621 and the second bottom portion 622 are adjacent to each other, and the second receiving section 625 is arranged in a unified manner with the base portion 623 on a side opposite to the side of the base portion 623 where the first bottom portion 621 and the second bottom portion 622 are adjacent to each other. A shape of a cross section, which is formed by the base portion 623, the first receiving section 624 and the second receiving section 625, in a direction vertical with respect to the shaft 67, which is a swinging shaft of the first bottom portion 621 and the second bottom portion 622, is a recess. Therefore, at the time of shifting from a state of holding the yarn absent bobbins B to a state of discharging the yarn absent bobbins B, by inclining the first bottom portion 621 and the second bottom portion 622, the first discharge port 82' and the second discharge port 83', which are adapted to discharge the yarn absent bobbins B downward, can be formed large. Furthermore, in the state of holding the yarn absent bobbins B, the yarn absent bobbins B can be held without being carelessly discharged.

[0102] The embodiments of the present invention have been described thus far, but the present invention is not limited to the above-described embodiments and various changes may be made thereto.

Claims

1. A bobbin accommodating device (40; 140) adapted to accommodate yarn absent bobbins (B) discharged from a winding unit (10) comprising:

an introduction port (671, 672) into which the yarn absent bobbins (B) are introduced;
a holding section (61) adapted to temporarily hold the yarn absent bobbins (B) introduced through the introduction port (671, 672) while maintaining a uniform orientation of end portions thereof and, in a case where an amount of the held yarn absent bobbins (B) has reached a prescribed amount, to discharge the held yarn absent bobbins (B); and

an accommodating section (71) adapted to allocate to a plurality of compartments and accommodate the yarn absent bobbins (B) discharged from the holding section (61); **characterized in that**

the holding section (61) includes an allocating and discharging mechanism (81) adapted to allocate the held yarn absent bobbins (B) to each of the compartments of the accommodating section (71).

2. The bobbin accommodating device (40; 140) according to claim 1, **characterized in that** the accommodating section (71) is configured to be capable of installing therein, a collection box (72) adapted to accommodate the yarn absent bobbins (B) and the collection box (72) has an interior portion divided into a plurality of compartments.

3. The bobbin accommodating device (40; 140) according to claim 1 or claim 2, further **characterized by:**

a held bobbin detecting sensor (91) adapted to be capable of detecting an amount of the yarn absent bobbins (B) held in the holding section (61); and

a control section (77) adapted to discharge from the holding section (61), the yarn absent bobbins (B) held in the holding section (61) based on a detection result of the held bobbin detecting sensor (91).

4. The bobbin accommodating device (40; 140) according to any one of claim 1 through claim 3, **characterized in that** the holding section (61) includes a bottom portion (62) adapted to regulate a movement of the yarn absent bobbins (B) in a vertical direction, which is a direction where the yarn absent bobbins (B) fall, and a first side wall portion (63) and a second side wall portion (64) both adapted to regulate a movement of the yarn absent bobbins (B) in

- a horizontal direction; and
the allocating and discharging mechanism (81) forms either of a first discharge port (82) between the bottom portion (62) and the first side wall portion (63) or a second discharge port (83) between the bottom portion (62) and the second side wall portion (64) by driving at least any one of the bottom portion (62), the first side wall portion (63) and the second side wall portion (64).
5. The bobbin accommodating device (40) according to claim 4, **characterized in that** the bottom portion (62) of the holding portion (61) is a rectangular plate member having long sides and short sides, and the first side wall portion (63) and the second side wall portion (64) are arranged along the long sides, which face each other, of the bottom portion (62); and the allocating and discharging mechanism (81) alternately forms the first discharge port (82) and the second discharge port (83) by simultaneously moving the first side wall portion (63) and the second side wall portion (64) with respect to the bottom portion (62).
 6. The bobbin accommodating device (40) according to claim 4 or claim 5, **characterized in that** the holding section (61) is configured such that the bottom portion (62) is removable.
 7. The bobbin accommodating device (140) according to claim 4, **characterized in that** the bottom portion (62') of the holding section (61') includes a first bottom portion (621) and a second bottom portion (622) each having long sides and short sides, and the first side wall portion (63') and the second side wall portion (64') are arranged along the long sides, which face each other, of the bottom portion (62'); and the allocating and discharging mechanism (81) alternately inclines the bottom portion (62') to the first bottom portion (621) side and to the second bottom portion (622) side and, in a case where the bottom portion (62') is inclined to the first bottom portion (621) side, forms the first discharge port (82') with the first side wall portion (63') and, in a case where the bottom portion (62') is inclined to the second bottom portion (622) side, forms the second discharge port (83') with the second side wall portion (64').
 8. The bobbin accommodating device (140) according to claim 7, **characterized in that** the first bottom portion (621) and the second bottom portion (622) each having a base portion (623), a first receiving section (624) and a second receiving section (625) are symmetric to each other; the first receiving section (624) is arranged in a unified manner with the base portion (623) in a side of the base portion (623) where the first bottom portion (621) and the second bottom portion (622) are adjacent to each other, and the second receiving section (625) is arranged in a unified manner with the base portion (623) in a side opposite to the side of the base portion (623) where the first bottom portion (621) and the second bottom portion (622) of the base portion (623) are adjacent to each other; and a shape of a cross section, which is formed by the base portion (623), the first receiving section (624) and the second receiving section (625), in a direction vertical with respect to a swinging shaft of the first bottom portion (621) and the second bottom portion (622) is a recess.
 9. The bobbin accommodating device (140) according to claim 5 through claim 8, **characterized in that** the holding section (61') further includes a first-1 side wall portion (52) and a first-2 side wall portion (68') both arranged along the short sides of the bottom portion (62'), and an adjustment mechanism adapted to adjust an interval between the first-1 side wall portion (52) and the first-2 side wall portion (68').
 10. The bobbin accommodating device (40; 140) according to any one of claim 3 through claim 9, **characterized in that** the accommodating section (71) further includes a collection box detecting sensor (94) adapted to detect an installation state of the collection box (72); and the control section (77) stops discharge of the yarn absent bobbins (B) by the holding section (61) in a case where it is detected based on a detection result of the collection box detecting sensor (94) that the collection box (72) is not installed in the accommodating section (71).
 11. The bobbin accommodating device (40; 140) according to claim 10, **characterized in that** the collection box detecting sensor (94) doubles as an accommodated bobbin amount detecting sensor (94) adapted to detect an amount of the yarn absent bobbins (B) accommodated in the collection box (72); and the control section (77) stops the discharge of the yarn absent bobbins (B) by the holding section (61) in a case where it is detected based on a detection result of the accommodated bobbin amount detecting sensor (94) that an amount of the yarn absent bobbins (B) accommodated in the collection box (72) has reached a prescribed amount.
 12. The bobbin accommodating device (40; 140) according to claim 11, **characterized in that** at least two of each the holding section (61) and the accommodating section (71) are arranged side by side; and a first accommodating section (71) is set as a priority machine adapted to accommodate the yarn absent bobbins (B) on a priority basis and a second accommodating section (71) is set as an auxiliary machine

adapted to accommodate the yarn absent bobbins (B) in a case where the priority machine is unable to accommodate the yarn absent bobbins (B).

13. An automatic winder (100) comprising: 5

the bobbin accommodating device (40; 140) according to any one of claim 1 through claim 12; and
 a bobbin supplying device (12) adapted to perform preparation processing for supplying yarn present bobbins (YB) to the winding unit (10);
characterized in that the bobbin accommodating device (40; 140) is arranged on a part of the bobbin supplying device (12). 10 15

14. An automatic winder (100) **characterized by:**

the bobbin accommodating device (40; 140) according to claim 12; 20
 a bobbin transporting device (11) adapted to collect the yarn absent bobbins (B) from the winding unit (10);
 a bobbin taking-out device (13) adapted to take out the yarn absent bobbins (B) from the bobbin transporting device (11); and 25
 a yarn absent bobbin chute section (36) adapted to guide the yarn absent bobbins (B) that have been taken out by the bobbin taking-out device (13) to the introduction port of the bobbin accommodating device (40) while maintaining a uniform orientation of end portions of the yarn absent bobbins (B) that have been taken out; 30
 wherein the yarn absent bobbin chute section (36) determines according to a state of the priority machine whether to guide the yarn absent bobbins (B) to the priority machine or the auxiliary machine. 35

15. The automatic winder (100) according to claim 14, 40
characterized in that the yarn absent bobbin chute section (36) includes a separator (38) adapted to switch directions to guide the yarn absent bobbins (B) between the priority machine and the auxiliary machine; and 45
 in a case where a side of the bobbin taking-out device (13) of the yarn absent bobbin chute section (36) is upstream and a side of the bobbin accommodating device (40; 140) is downstream, the separator (38) is arranged with a tip end portion thereof facing downstream and a swinging center thereof located upstream of the tip end portion. 50

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FIG. 1

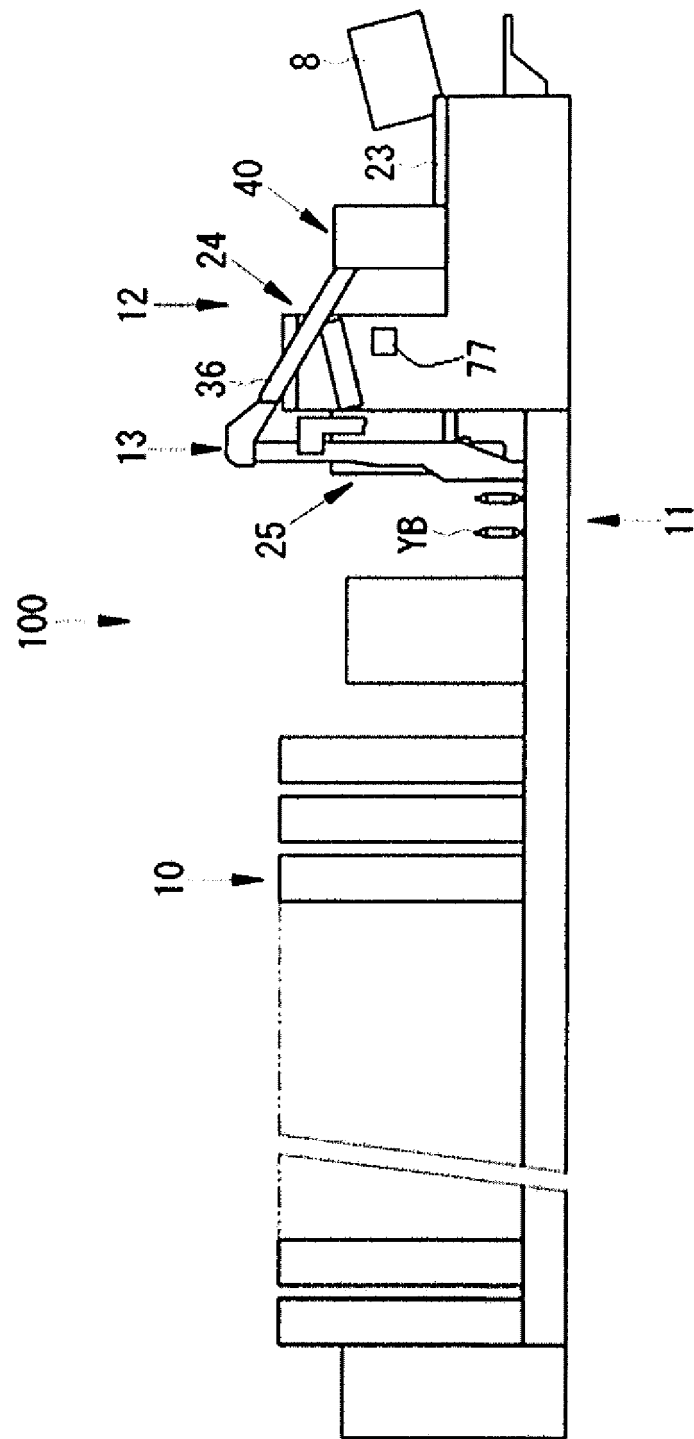


FIG. 2

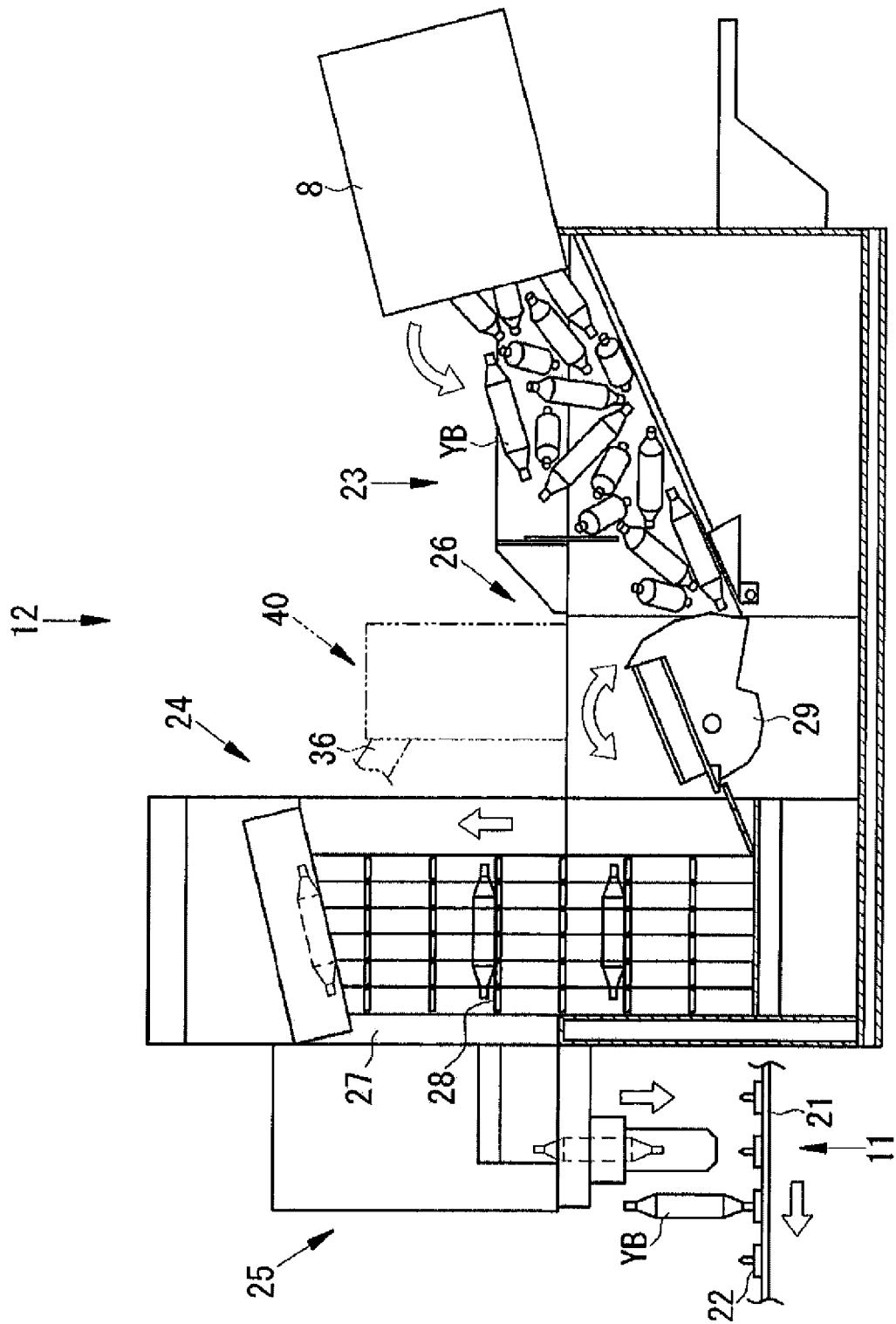


FIG. 3

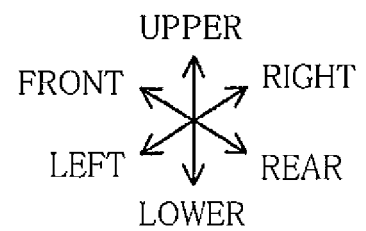
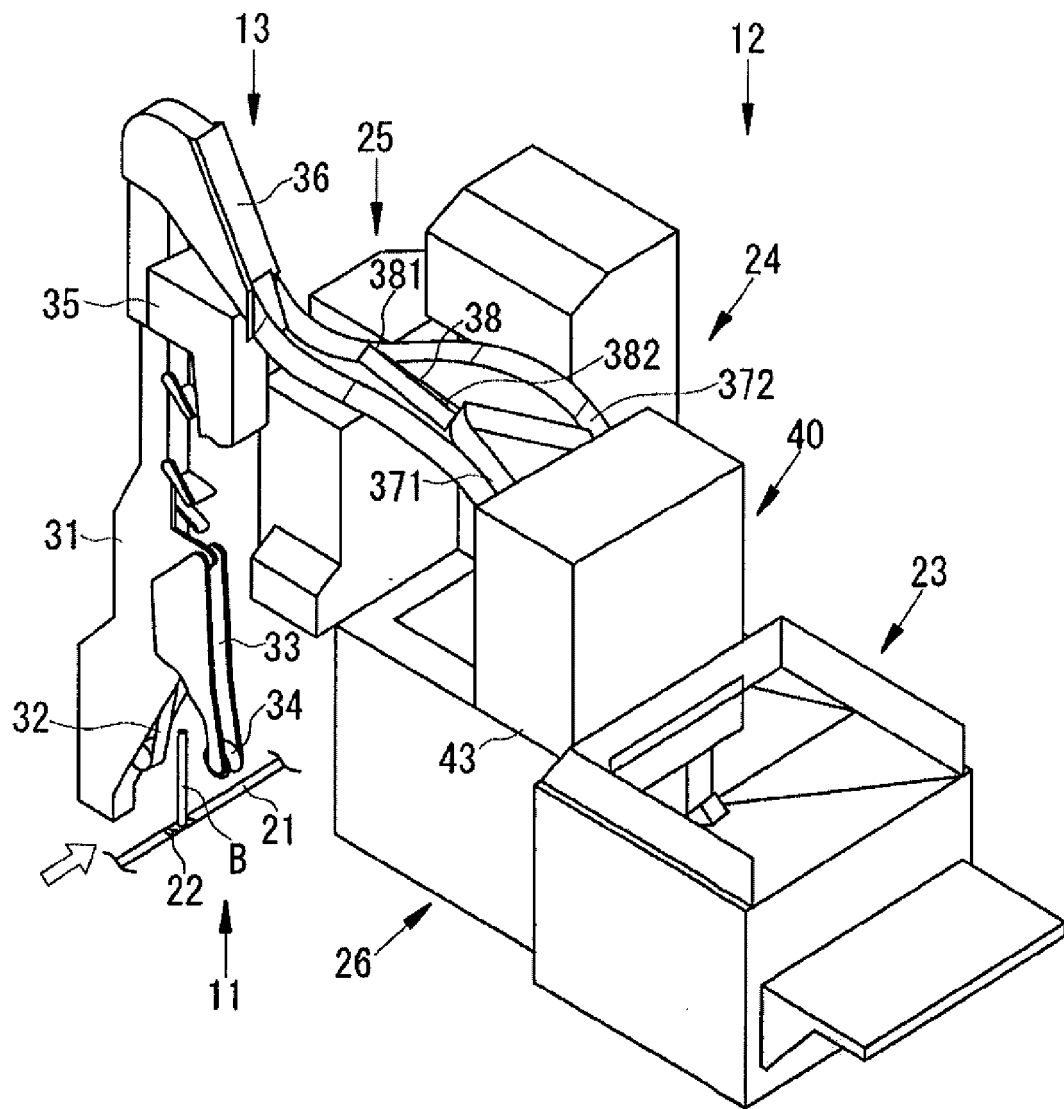


FIG. 4

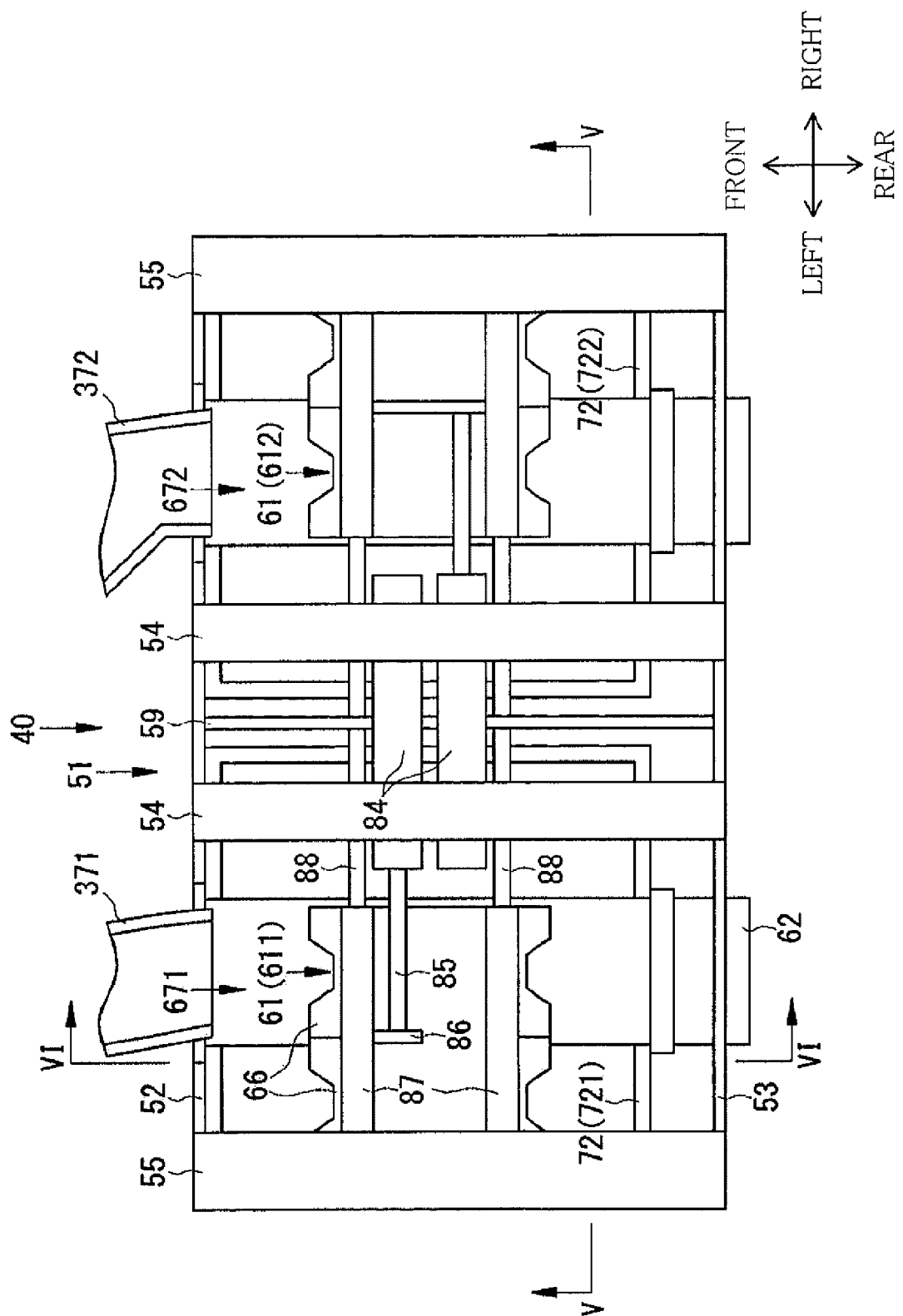


FIG. 5

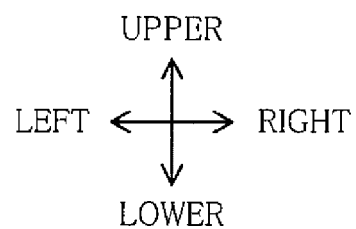
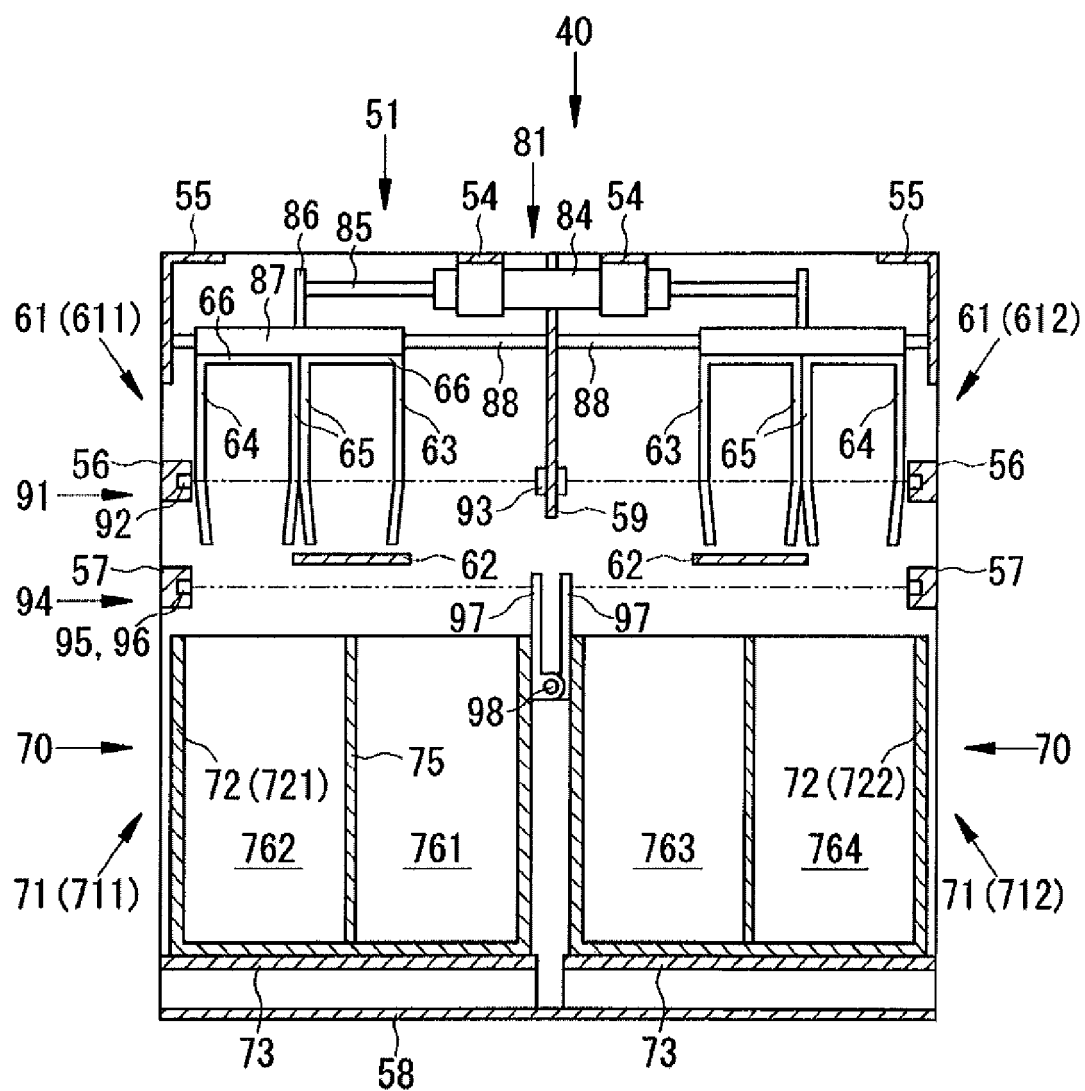


FIG. 6

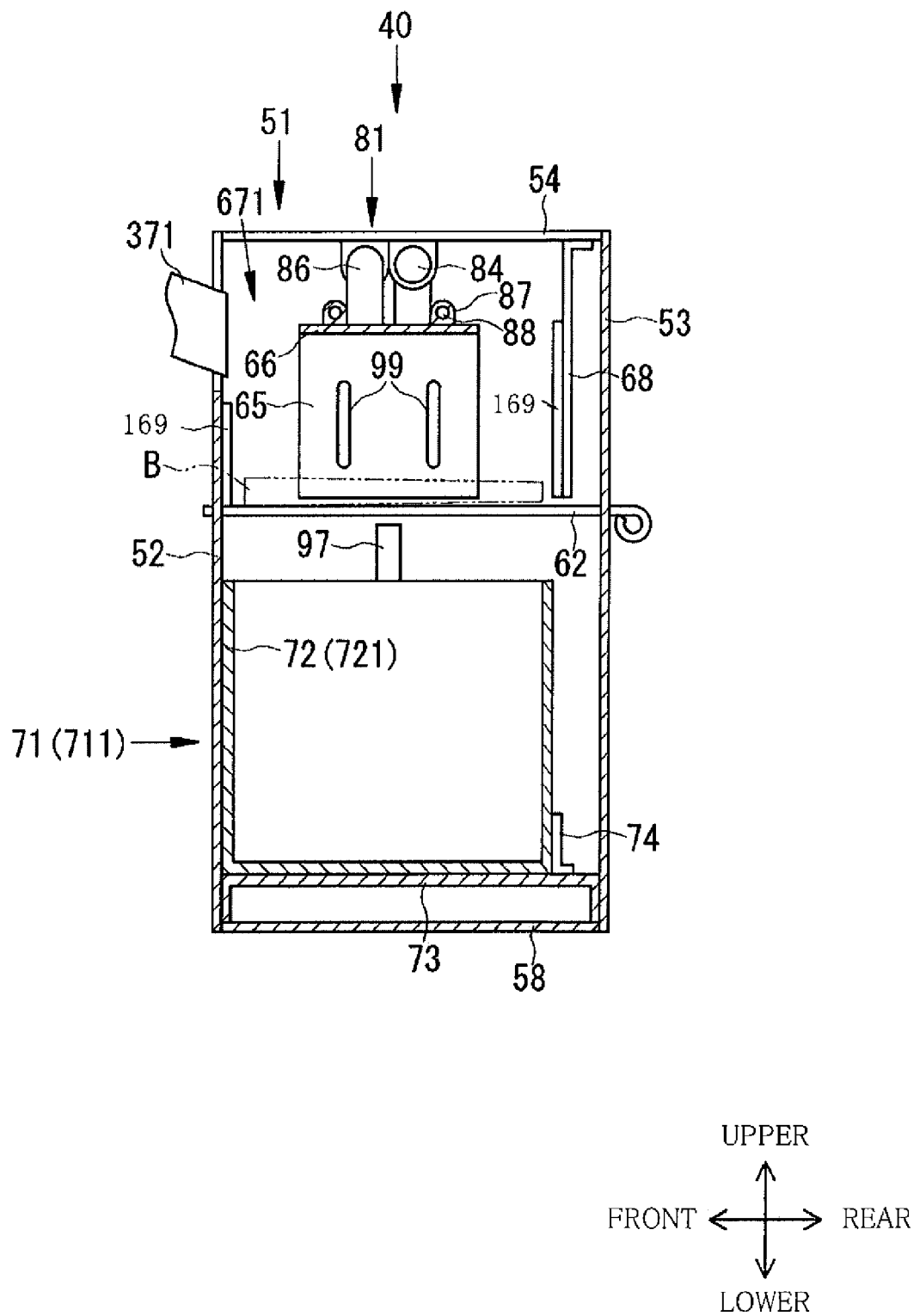


FIG. 7A

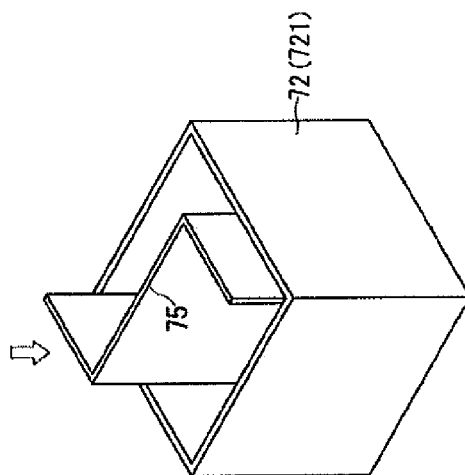


FIG. 7B

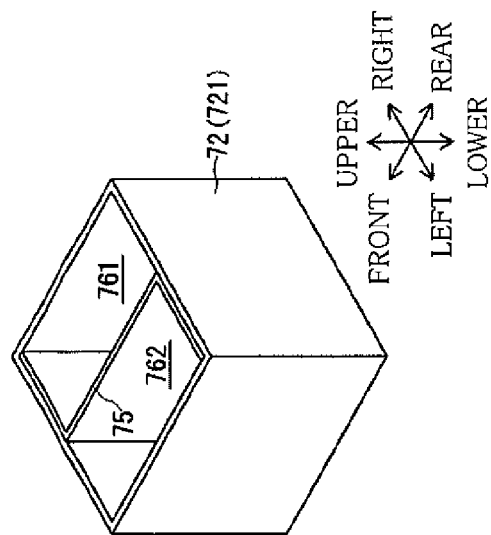


FIG. 8A

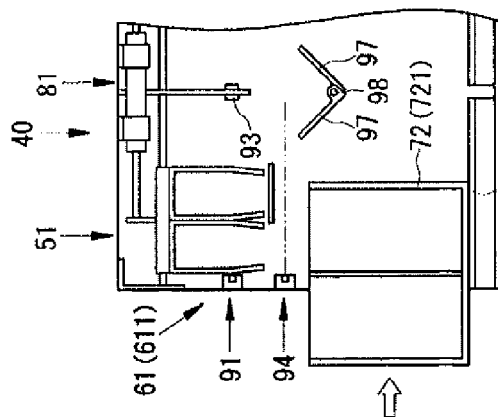


FIG. 8B

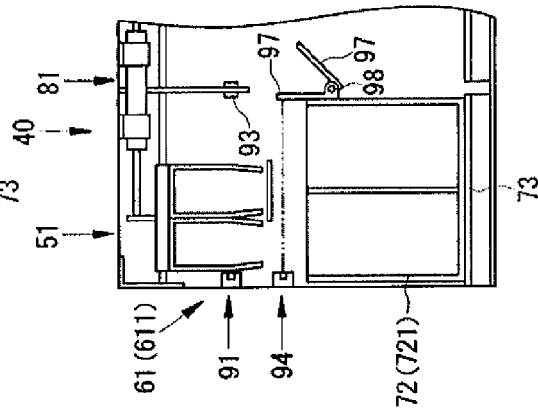


FIG. 9C

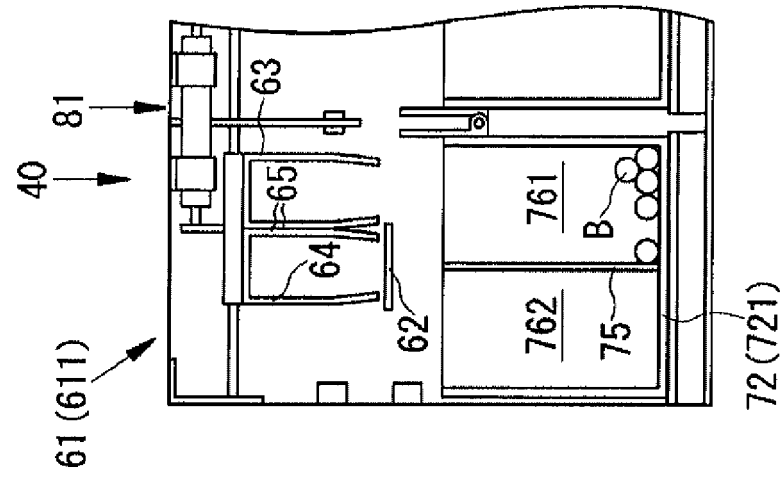


FIG. 9B

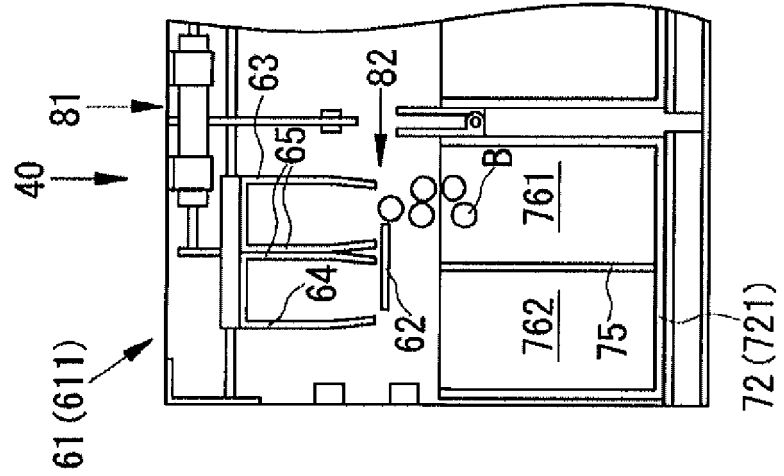


FIG. 9A

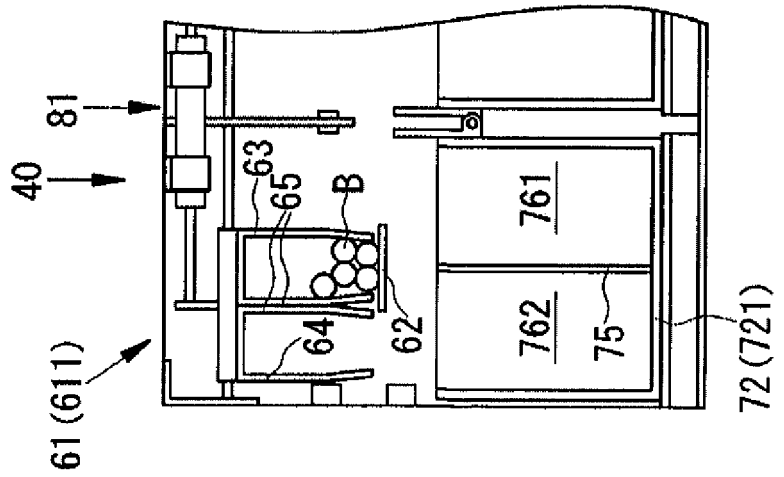


FIG. 10C

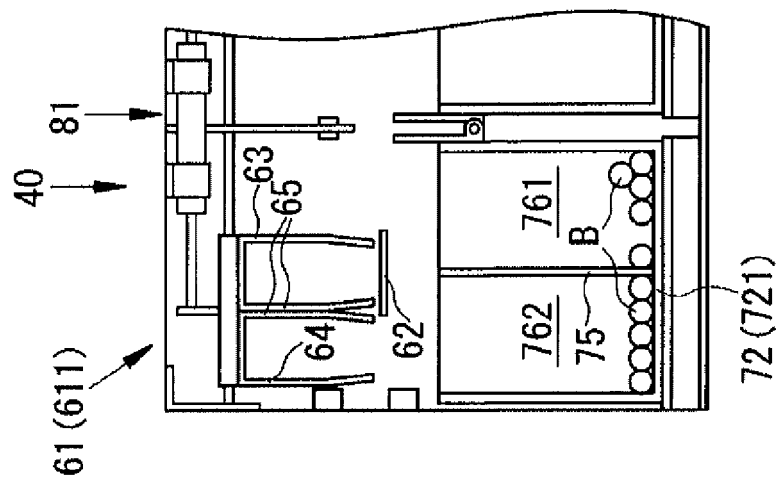


FIG. 10B

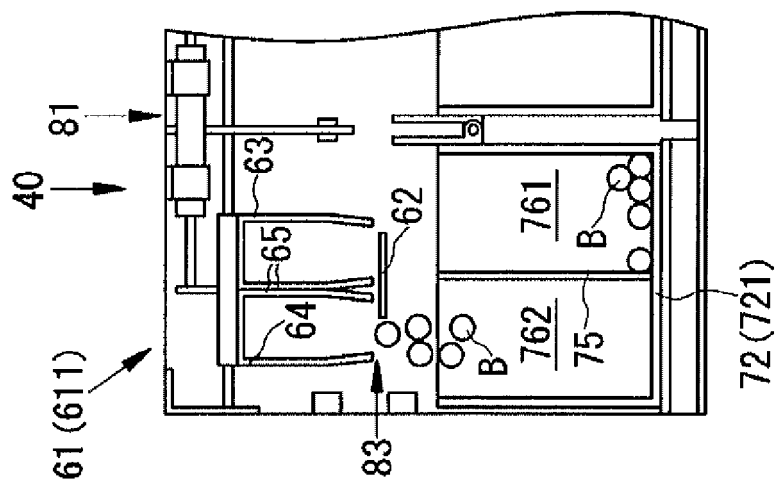


FIG. 10A

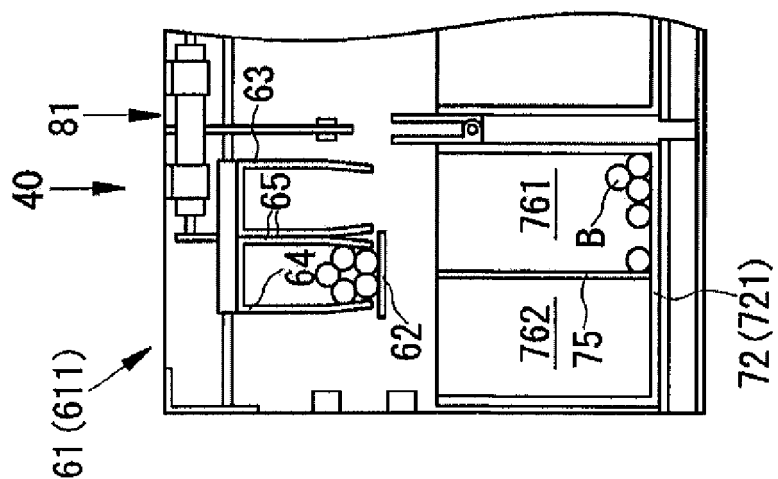


FIG. 12

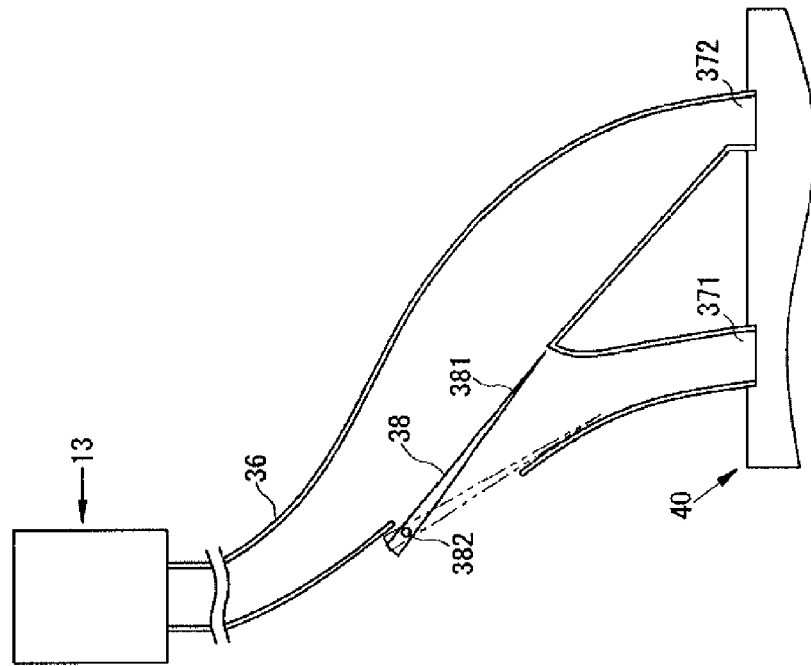


FIG. 11

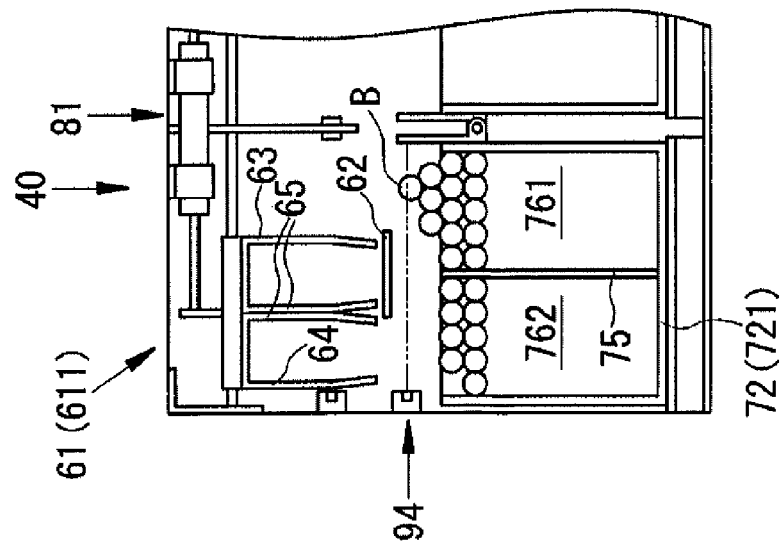


FIG. 13

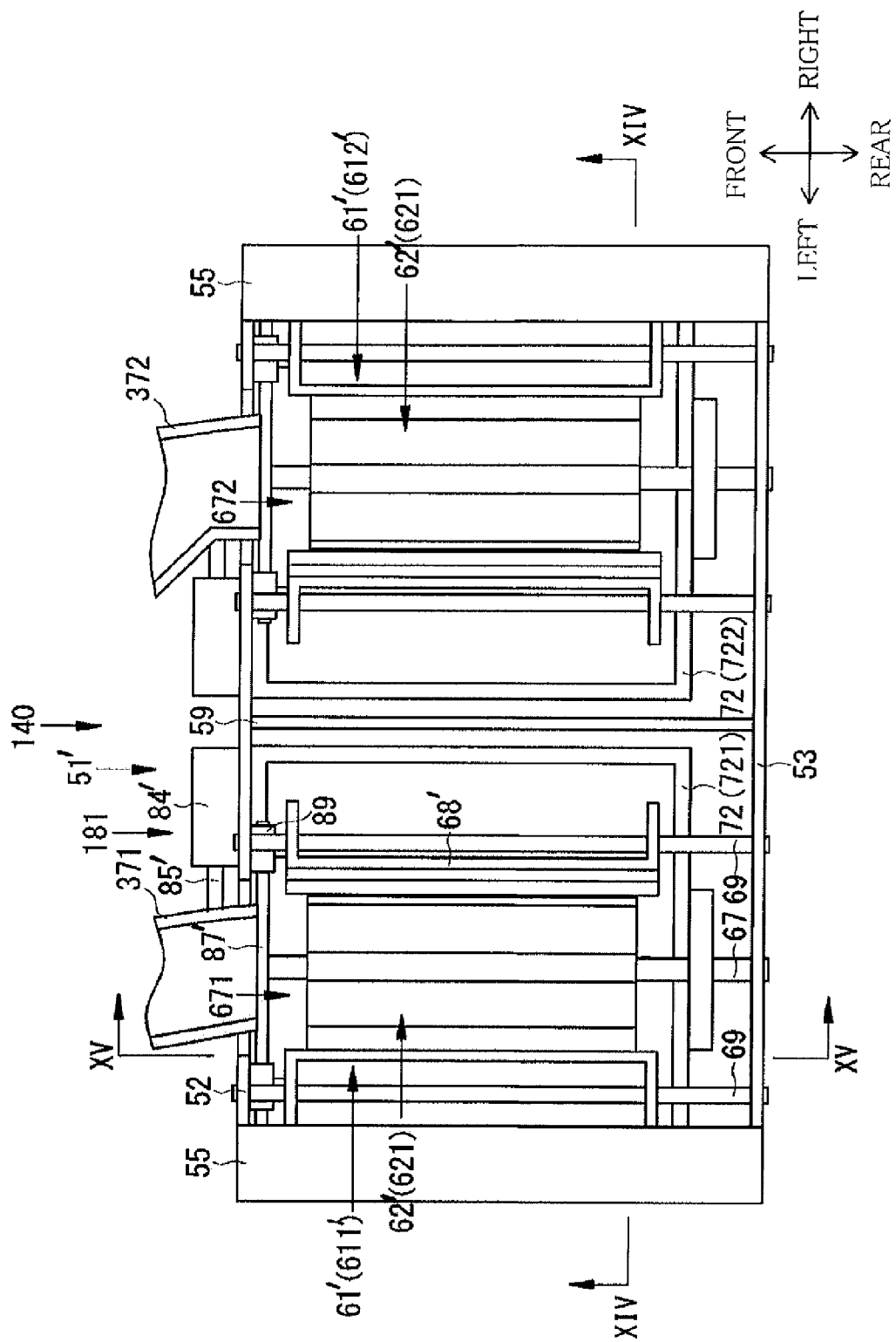


FIG. 14

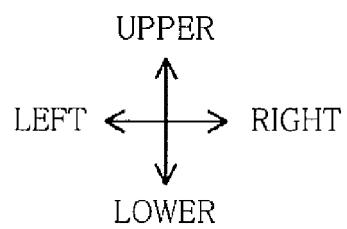
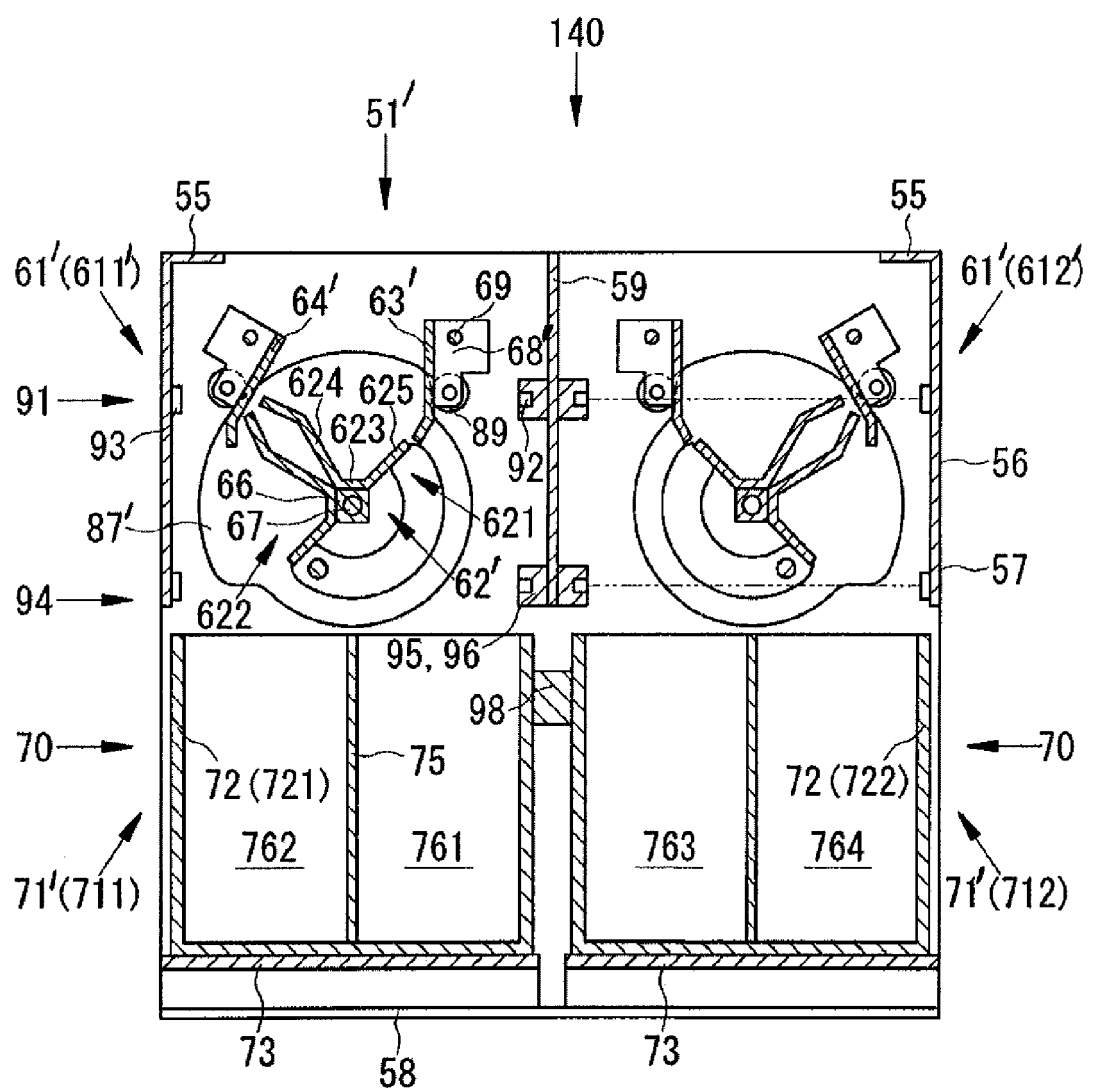


FIG. 15

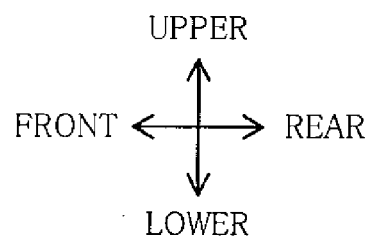
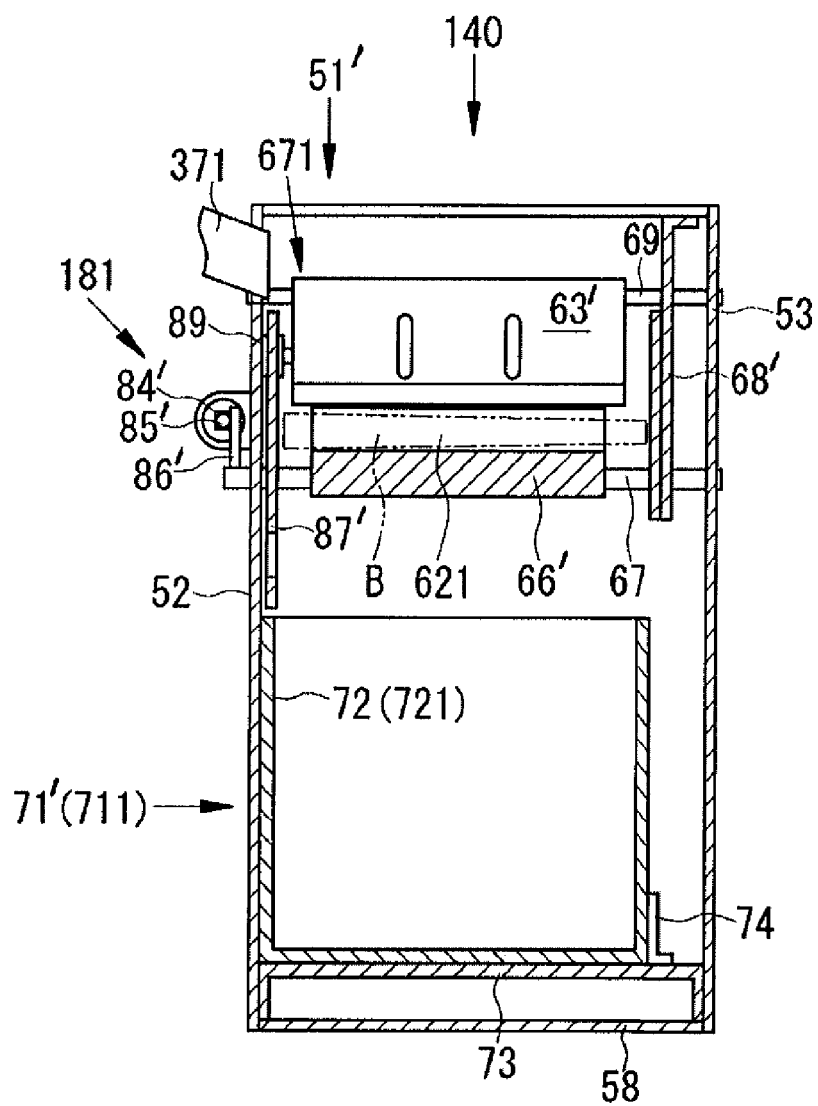


FIG. 16C

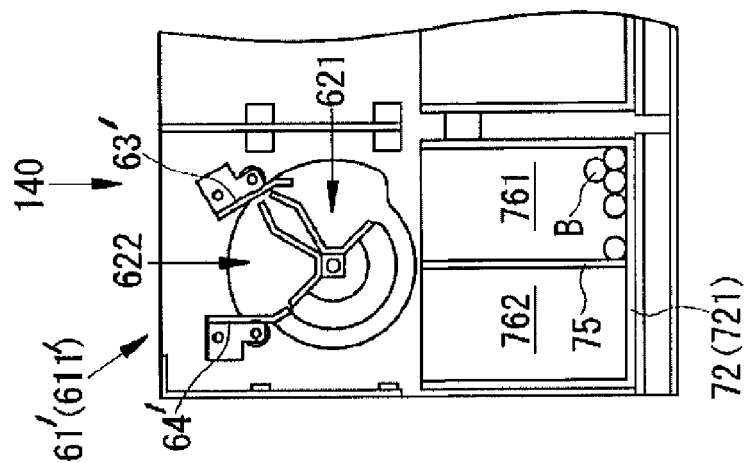


FIG. 16B

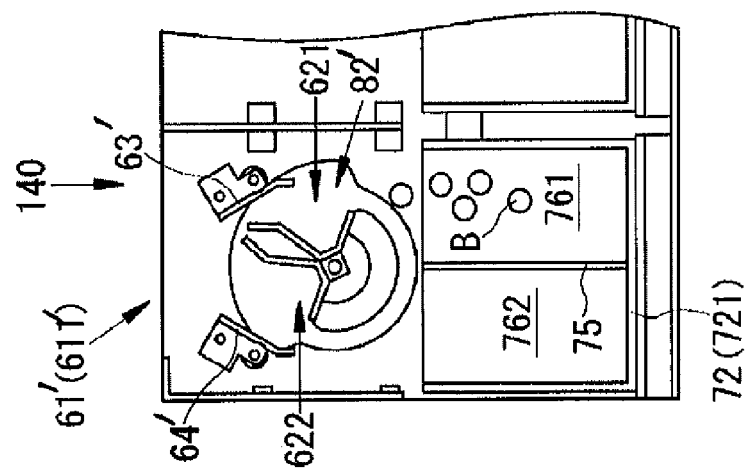


FIG. 16A

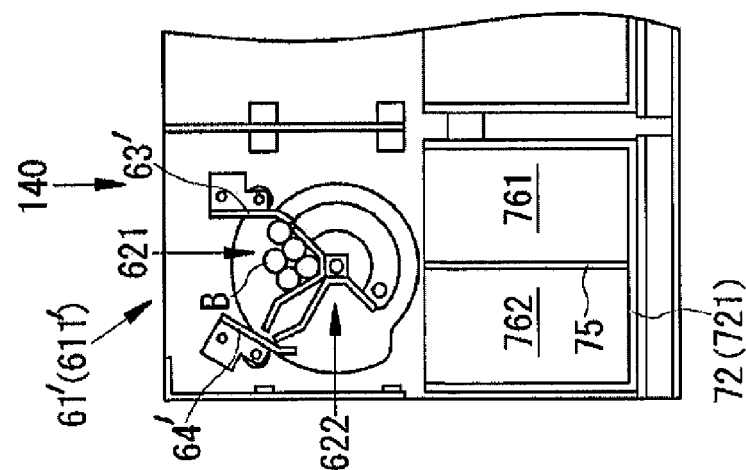


FIG. 17C

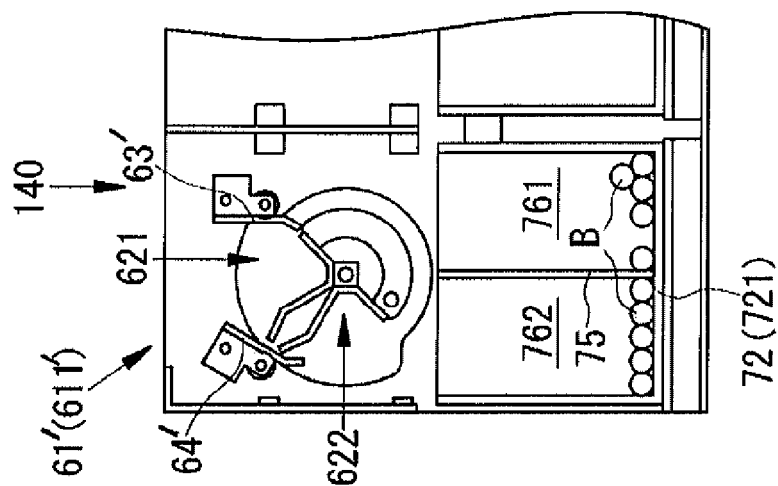


FIG. 17B

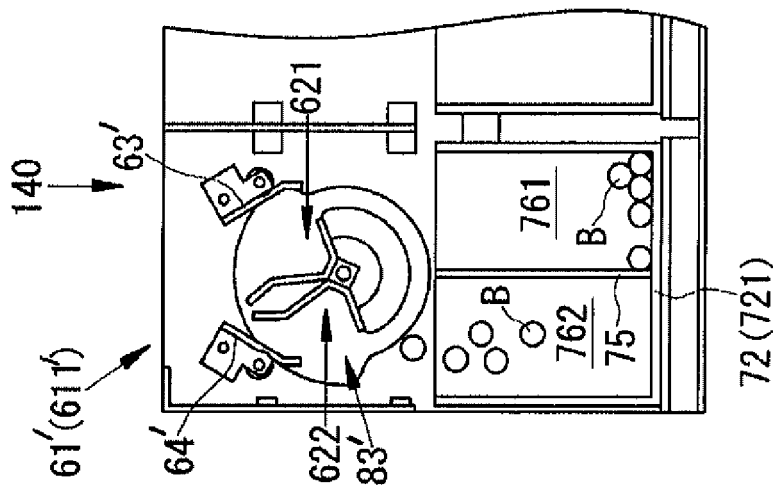
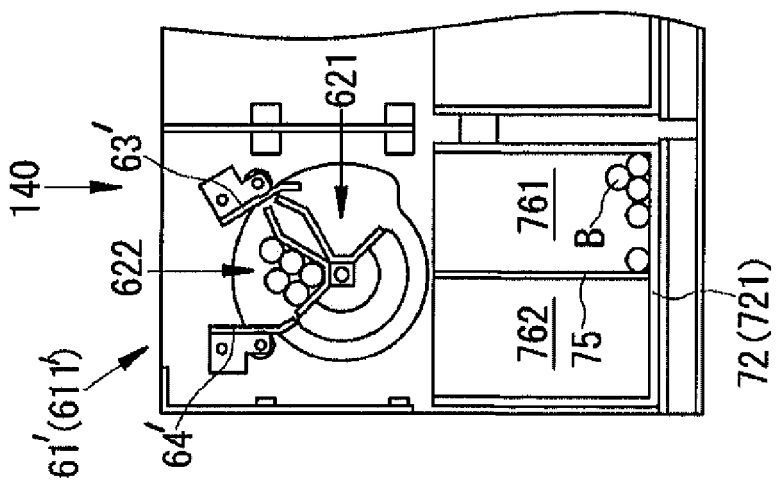


FIG. 17A



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 60081338 A [0005]
- JP 6293473 A [0005]
- JP 8169525 A [0036]