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(54) **A contents-filling vessel reversing apparatus**

(57) A contents-filling vessel reversing apparatus for reversing a vessel (Y) accommodating the contents to be filled into a packaging container from a upright state to a nearly inverted state, thereby dropping downward and filling the contents into a container disposed underneath. A vessel is held at one end of a vessel holding

member (9,10) that is rotated around an axis (12). The axis (O) is situated at a position higher than the center in the vertical direction of the vessel supplied to the gripping stop position where the vessel is gripped in a upright state by the holding member.

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Description

Background of the Invention

Field of the Invention

[0001] The present invention relates to a contents-filling vessel reversing apparatus for use in a bag packaging machine, namely an apparatus for reversing a vessel accommodating contents to be filled into a container such as, for example, a packaging bag. More specifically, the present invention relates to a contents-filling vessel reversing apparatus for reversing a vessel accommodating contents to be filled into a container from a upright state to an inverted state, thereby dropping downward and filling the contents into a packaging container disposed underneath, when foods or the like are packaged in the packaging container.

Prior Art

[0002] In the automatic packaging of foods and the like, filling of contents is usually carried out as follows, namely, vessels accommodating a predetermined amount of contents such as foods or the like to be filled in a packaging container are successively supplied in a upright state, this vessel in the upright state is held by a holding device and the holding device is rotated in a vertical plane around a predetermined center of rotation to reverse the vessel into an inverted state, thereby dropping downward and filling the contents into a packaging container disposed underneath. An example of this kind of the apparatus for reversing a vessel is disclosed in, for example, Japanese Non-examined Patent Application No. 8-282602.

[0003] With the reversing apparatus disclosed in this publication, a vessel in an upright state is supplied to a vessel accommodation part of the reversing device, this reversing device is rotated 180 degrees around a rotating shaft to reverse the vessel, and the reversing device is once stopped at this position to drop the vessel downward. The vessel collides with and received by a vessel receiving table disposed below, thereby ejecting downwardly the contents accommodated in it.

[0004] One of alternatives to the arrangement mentioned above is to grip the vessel on the outer circumference thereof or the upper/lower ends thereof by a pair of gripping members capable of approaching to and separating away from each other.

[0005] In either case, a vessel is reversed by rotating the holding members or gripping members around an axis. For ejecting the contents from a vessel, most of the apparatuses or devices in the prior art comprises arrangements similar to the arrangements disclosed in Japanese Non-examined Patent Application No. 8-282602 where a vessel is discharged and collides with a stopper to eject the contents by making use of the impact caused. There are also some cases where a vessel is not dis-

charged when the holding member is rotated 180 degrees and stopped, while the contents are ejected from the vessel due to a shock caused at the stopping. Even in these cases, the vessel is dropped downwardly after ejection of the contents and stopped and received by a stopper for collection.

[0006] In the meantime, with a reversing apparatus of this kind, there is a subject of how to set the rotating speed of the holding members or the like used therein. In other words, if the rotating speed is low, the contents in the vessel may run out when the vessel is tilted to a position where the mouth thereof faces obliquely and downwardly during the rotation. This phenomenon may be caused easily especially with solid materials so-called bulky substances and becomes remarkable as the amount of the contents to be filled increases. If the rotating speed is increased in order to prevent this problem and to improve work efficiency, the contents accommodated in the vessel may fly out from the vessel at an undesired position during the rotation in the tangential direction of the rotary trajectory due to increased centrifugal force.

[0007] Other disadvantages attributable to high-speeding have also been found. Namely, if the rotating speed is increased, an impact caused by collision of the vessel with the stopper becomes great, accordingly resulting in chipping of the vessel and in mixing of fragments into the packaging container. The noise problem due to collision is also serious.

[0008] According to Japanese Utility Model Registration No. 2539246, a vessel is held on the outer end of an arm and the arm is stopped suddenly when rotated 180 degrees, thereby discharging the contents from the vessel due to inertia force. If the contents to be filled are solid matters, however, the same problems as experienced with the apparatus disclosed in Japanese Non-examined Patent Application No. 8-282602 referred to above will arise. In addition, if a higher speed is employed for contents to be filled with a higher viscosity, they will not drop directly underneath when the arm is stopped, but there is a tendency that they are discharged in a direction along with the rotary trajectory of the arm, which results in the problems that the contents to be filled are adhered to the side wall of a guide.

Summary of the Invention

[0009] The present invention is made in light of the problems with the prior art as mentioned above. An object of the present invention is to present a contents-filling vessel reversing apparatus by which processing capability can be improved without causing flying out of contents from a vessel even if the rotating speed of the holding member is increased.

[0010] It is also another object of the present invention to solve the problems such as chipping of the vessels and noise generation resulting from high-speeding as seen in the prior art by adopting arrangements for ejecting

contents from the vessel without causing a collision of the vessel directly with a stopper.

[0011] Among the problems seen in the conventional apparatuses, regarding the problem of flying out of contents from the vessel, the inventors of the present invention paid attention to the fact that, in the conventional apparatuses, the center of rotation of the vessel gripping members is set to the same height as that of the center of a vessel located at the holding position, and found that this could be resolved by setting the center of rotation of the vessel gripping members at a height higher than the center position of the vessel located at the holding position. It has also been found out that it is possible to solve the problems of chipping of the vessels and noise generation by handing a vessel over to a vessel carrying-out apparatus on the way of a process when the holding member is returning back to the original position for receiving a next vessel without dropping the vessel at the position where the vessel is reversed.

[0012] More specifically, in order to solve the problems and to accomplish the objects mentioned above, the present invention presents a contents-filling vessel reversing apparatus for reversing a contents-filling vessel accommodating contents to be filled from an upright state to a nearly inverted state, thereby dropping downward and filling the contents into a packaging container disposed underneath, said apparatus comprising a vessel holding member for holding said vessel supplied to a holding position, said vessel holding member being designed to rotate in a vertical plane around a center of rotation, wherein the position of said center of rotation is set higher than the position of the center in the vertical direction of said vessel positioned at said holding position.

[0013] With these features, the centrifugal force acting on the vessel or the contents in the vessel during the reversing operation is directed obliquely backward with regard to the direction of movement of the vessel, and acts to force the contents toward the bottom of the vessel, thereby preventing the contents from flying out from the vessel. Therefore, even contents with low adhesion, namely so-called bulky substance, can be dealt with at a high rotational speed at which contents could fly out when the conventional apparatus mentioned above is used. If desired, further high-speeding is possible.

[0014] According to another embodiment of the invention, said holding member comprises a pair of gripping members attached to the rotating device and being capable of approaching to and separating away from each other to grip and to release said vessel, and said apparatus further comprises :

a reversing device including a rotating device equipped with a main rotating member rotatable around said center of rotation, said rotating device rotating intermittently the main rotating member in one direction and stopping the main rotating member at a first and a second positions, and said gripping

members attached to said rotating device, said gripping members being designed to stop at a gripping stop position where said gripping members can grip a vessel supplied in said upright state when said main rotating member stops at the first stop position, and to stop at a reversal stop position where said vessel is held in said nearly inverted state when said main rotating member stops at the second position; a reversal stop position regulating device for regulating said reversal stop position of said gripping members;

an empty vessel carrying-out device provided at an empty vessel discharging position on the way along which said gripping members return from said reversal stop position to said gripping stop position, said empty vessel carrying-out device receiving an empty vessel from which the contents to be filled have been ejected and transferring it to downstream process; and

a gripping member opening/closing apparatus for making said gripping members close to grip a vessel at said gripping stop position and for making said gripping members open at said empty vessel discharging position, thereby discharging the empty vessel towards said empty vessel carrying-out device.

[0015] In the apparatus with the compositions mentioned above, the gripping members grip a vessel and rotate, and when the gripping members stop at the reversal stop position, the vessel is in a reversed state and stopped, thereby discharging the contents in the vessel due to the inertia force. The empty vessel is still gripped by the gripping members even after it is reversed and the contents is discharged, and is released towards the vessel carrying-out device on the way returning to the gripping stop position. Therefore, there is no direct collision of a vessel with a stopper plate as observed in the prior art and problems of chipping of vessels, entry of foreign matters into a packaging container and deterioration of working environments do not occur.

[0016] Further, the reversal stop position can be regulated to any desired position by the reversal stop position regulating device and, therefore, it is possible to regulate the reversal stop position according to properties and amount of the contents to be filled, processing rate or the like to ensure accurate dropping of the contents into a packaging container disposed directly underneath.

[0017] According to another embodiment, the main rotating member comprises a main rotating shaft rotating intermittently in one direction every 180 degrees, and the rotating device further comprises a supporting shaft supported by the main rotating shaft in parallel to the main rotating shaft in an axial direction and designed to be reciprocally rotatable around an axis thereof between an initial position and a rotated position. The contents-filling vessel reversing apparatus further comprises a supporting shaft rotating device for rotating the supporting shaft.

The reversing stop position regulating device regulates the rotated position of the supporting shaft, and the pair of gripping members are mounted on one end of the supporting shaft.

[0018] With these compositions mentioned above, the supporting shaft rotating device is designed to change the relative position of the supporting shaft to the main rotating shaft in the direction of rotation by turning the supporting shaft. Therefore, even when two sets of gripping members are provided and these are rotated intermittently every 180 degrees by the reversing device, it is possible to change the reversal stop position while the gripping stop position is fixed.

[0019] As noted, the supporting shaft is rotated during the reversal operation. By setting appropriately the way of rotating of the supporting shaft, for example by not tilting the vessel greatly at the earlier stage of reversal and tilting the vessel rapidly and greatly at the last end stage of reversal, depending on type, properties, and amount of contents to be filled, it is possible to prevent the contents from flying out from the vessel at an stage earlier than desired.

[0020] According to another embodiment of the present invention, the supporting shaft is formed to be hollow, and the gripping member opening/closing device comprises a sliding shaft inserted into the hollow section of the supporting shaft and movable in the axial direction. The sliding shaft is connected at one end to the gripping members, and the gripping members are opened and closed interlockingly with the axial direction movement of the sliding shaft.

[0021] According to the composition mentioned above where a sliding shaft is disposed within a supporting shaft, peripheral arrangement of the reversal mechanism of the apparatus can be made compact, and ease of cleaning is improved.

[0022] According to another embodiment, the supporting shaft rotating device is equipped with a grooved cam securely positioned with an axis thereof coinciding with the axis of said main rotating shaft, a lever fixed to the other end of said supporting shaft and a cam roller mounted on the lever so as to roll in and move along a groove formed in the grooved cam. Further, in a predetermined range in the groove extending in the opposite directions from a position corresponding to the rotated position of the supporting shaft, at least a radius of curvature of an inner wall of said groove is made shorter than a radius of curvature of the inner wall in a rest range in the groove so that a width of the groove in said predetermined range is larger than a width of the groove in the rest range. Still further, the reversal stop regulating device is provided with a positioning stopper which abuts against the lever to position the lever at the reversal stop position, and a stopper position regulating device for regulating the position of the stopper.

[0023] According to the compositions mentioned above, it is possible to change the reversal stop position only by adjusting the position of the stopper, and the grip-

ping stop position is unchanged even when the reversal stop position is changed. Therefore, the adjustment can be done easily.

[0024] According to yet another embodiment of the present invention, two supporting shafts are provided symmetrically with respect to the axis of the main rotating shaft, and each of the supporting shafts is provided with a pair of the gripping members. Therefore it is possible to improve processing capability of the apparatus.

[0025] As noted above, according to the present invention, even in the case the contents to be filled are ones with low adhesion, namely so-called bulky substance, it is possible to prevent the contents from flying out from the vessel during rotation even when rotated at a high rotational speed, thereby improving processing capability. With the conventional art mentioned above, when dealing with relatively large amount of bulky contents, spilling out or flying out of the contents happens at any rotational speed and therefore, complete filling is not possible. According to the present invention, however, filling of such a large amount of bulky contents can be done surely. Besides, chipping of the vessel in use can be prevented, thereby preventing entry of foreign matters into the packaging container, and noise generation can be reduced, thereby contributing to improvement of working environments. Moreover, it is possible to drop, at the reversal position, contents surely into a packaging container disposed underneath. Regulations for this purpose can also be done easily.

Brief Description of the Drawings

[0026]

FIG. 1 is a partly sectioned front view showing a apparatus for reversing a vessel accommodating contents to be filled according to a preferred embodiment of the present invention,

FIG. 2 is a partly sectioned plan view thereof,

FIG. 3 is a partly sectioned right side view thereof,

FIG. 4 is a rear view showing the principal part of the apparatus,

FIG. 5 is a plan view showing a stopper mechanism,

FIG. 6 is a right side view showing the principal part of the stopper mechanism, and

FIG. 7 is a diagrammatic view showing relationship between the height of the center of rotation of the vessel and the height of the center of the vessel.

Detailed Explanation of Preferred Embodiments

[0027] Referring now to the drawings, a preferred embodiment of the present invention will be explained hereinafter. FIG. 1 is a partly sectioned front view showing a contents-filling vessel reversing apparatus 1 (referred to simply as "apparatus" hereinafter) for reversing a contents-filling vessel (referred to simply as "vessel" hereinafter) accommodating contents to be filled according to

a preferred embodiment of the present invention. FIG. 2 is a sectional plan view, FIG. 3 is a partly sectioned side view, and FIG. 4 is a rear view showing the principal part of the apparatus. According to the present embodiment, two sets of mechanisms for gripping and reversing a vessel Y are provided as will be described hereinafter.

[0028] The apparatus 1 has a machinery mount 2. A stand 3 is erected on the machinery mount 2, and a frame 4 in a nearly box-shaped configuration is secured on the stand 3. Two vertical wall portions 5, 6 are formed in parallel with and separated from each other above and below at the lower part of the frame 4 as viewed in FIG. 2. The walls form supporting parts 5, 6 for a main rotating shaft 7. The main rotating shaft 7 is supported through bearings 8, 8 disposed at the opposite ends thereof. Two through holes are formed through the shaft 7 at right and left symmetrical positions with respect to the center of the main rotating shaft 7. Supporting shafts 9, 10 are inserted through the through holes, respectively, and are rotatably supported by bearings 11 disposed at the opposite ends of the main rotating shaft 7, respectively. (For convenience of explanation, one shown at the left in FIG. 2 is referred to as a first supporting shaft 9 while one shown at the right is referred to as a second supporting shaft 10. When no discrimination is needed or they are identified unmistakably, however, they are simply referred to as supporting shaft 9 or supporting shaft 10.) The supporting shafts 9, 10, and members associated therewith and constructions thereof are identical. Therefore, the following description mainly deals with the supporting shaft 9 and the associated members only.

[0029] In the figures, the supporting shaft 9 and the associated members are at a gripping stop position capable of gripping a vessel Y, while the supporting shaft 10 and the associated members are at a reversal stop position, i.e. vessel Y is in a nearly inverted state. The vessel Y according to the present embodiment is a cylindrical vessel having a bottom and is supplied successively by a supply conveyor 71 to the position shown (see FIG. 1).

[0030] A through hole is formed through the supporting shaft 9, and a sliding shaft 12 is inserted through this through hole. Although the sliding shaft 12 is movable in the axial direction, no turning is possible. One end of the sliding shaft 12 (lower side in FIG. 2) is projected from the supporting shaft 9, and a cylindrical part 14 formed at the base part of a gripping member supporting block 13 is fitted on this projecting portion. The block 13 is fixed to an flange part 9a formed at one end of the supporting shaft 9. The supporting block 13 is equipped with a fork part 15, and a left gripping member 16 and a right gripping member 17 which rotate together with supporting pins 16a, 17a, respectively, are mounted on the respective tip ends of the fork part 15.

[0031] A link linkage member 18 is securely mounted on the end of the sliding shaft 12 projecting from the cylindrical part 14 of the gripping member supporting block 13. On the opposite side surface of the cylindrical part

14, one end of a link 18a is rotatably connected to the link linkage member 18 (see the second supporting shaft 10 and the associated members in FIG. 2.), and one end of connecting arm part 17b of the right gripping member 17 is rotatably connected to the other end of the link 18a. An engagement pin 19 is fixed to stand on an engagement arm part 17c of the right gripping member 17 extending in a direction nearly orthogonal to the connecting arm part 17b, and an elongated hole 16c formed through a linking arm part 16b of the left gripping member 16 is fitted to this pin 19 so that a motion is transmitted between both gripping members 16, 17.

[0032] A spring receiving part 12a with an increased diameter is formed on the sliding shaft 12 at a portion inside of the cylindrical part 14 of the gripping member supporting block 13, and a compression spring 20 is disposed between this receiving part 12a and an inside end face of the cylindrical part 14 of the supporting block 13. Therefore, this spring acts to urge the right and left gripping members 16, 17 in the closing direction.

[0033] A roller 21 is attached to the opposite end of the sliding shaft 12 through an attachment shaft 22. With regard to this roller 21, a gripping member opening/closing cam 25 is disposed and securely mounted on the front end of a rod 24a of an air cylinder 24 that is mounted on the frame 4 through an attachment bracket 23. The opening/closing cam 25 is in the shape of a nearly semicircle ring (see FIG. 4), and a face thereof facing the roller 21 comprises flat part 25a and inclined part 25b. The inclined part 25b inclines in a direction where it is gradually separated away more from the roller 21 as going towards the end thereof (see FIGS. 2 and 4, in this condition illustrated, the roller 21 associated with the first supporting shaft 9 is placed on the flat part 25a and the roller 21 associated with the second supporting shaft 10 is disengaged from the cam 25).

[0034] When the main rotating shaft 7 is in the stationary state and the first supporting shaft 9 and the associated sliding shaft 12 are in the position shown in FIG. 2, the air cylinder 24 is actuated to retract its rod 24a, the cam 25 is moved backwardly, and the gripping members 16, 17 are closed, thereby gripping the vessel Y. The main rotating shaft then starts to rotate (in the present embodiment, it rotates in the clockwise direction as viewed in FIG. 1 and in the counterclockwise direction as viewed in FIG. 4). And when the roller 21 associated with the first supporting shaft 9 is disengaged from the cam 25, the air cylinder 24 is actuated in the reverse direction, thereby returning the cam 25 to its original position. As will be described later, after the main rotating shaft 7 is stopped at the reversal stop position where the vessel Y is reversed (in the drawings, the second supporting shaft 10 is in this position), and when it resumes rotating in the same direction in order to return to the gripping stop position, the roller 21 is rested on the inclined part 25b of the cam 25 on the way of returning, and then on the flat part 25a, thereby opening again gripping members 16, 17. This will be described again later.

[0035] Next, a mechanism for reversing the vessel Y will be described. Numeral 31 denotes a motor mounted on the main rotating shaft supporting part 6 of the frame 4 (see FIG. 2). An output shaft 32 of the motor 31 extends through the supporting part 6, and a driving gear 33 located between the supporting parts 5 and 6 is fixed to the front end thereof. This driving gear 33 meshes with a driven gear 34 fixed to the main rotating shaft 7. According to the present embodiment, the motor 31 turns intermittently in the same direction to rotate the main rotating shaft 7 every 180 degrees in the clockwise direction as viewed in FIG. 1 and in the counterclockwise direction as viewed in FIG. 4. In this case, the supporting shafts 9, 10 are also rotated in one around the center of the main rotating shaft 7. Therefore, the vessel Y gripped by the gripping members 16, 17 attached to the supporting shafts 9, 10 also rotate around the axis of the main rotating shaft 7. As clearly illustrated in FIG. 1, the axis of the main rotating shaft 7, and, therefore, also the center of rotation of the gripping members 16, 17 is situated at a position higher than the center in the vertical direction of the vessel in the upright state supplied to the gripping stop position. This point will be explained later again.

[0036] In FIG. 2, a cam lever 35 is fixedly secured at one end thereof to the end part of the supporting shafts 9 (10) projecting upwardly from the main rotating shaft 7 (see FIG. 4). A cam roller 36 is mounted on the other end of the lever 35. Corresponding to these cam rollers 36, a grooved cam 37 is fixed to the main rotating shaft supporting part 6. A groove 38 is formed on the cam 37 and the cam roller 36 is fitted in and rolls along the groove 38. The groove 38 is provided with a uniform part 38a where the inside and outside walls 39 and 40 of the groove 38 are concentric with each other, having its center at the center of the main rotating shaft 7. The width of the uniform part 38a of the groove 38 nearly corresponds to the diameter of the cam roller 36. The groove 38 is also provided with an enlarged part 38b with an increased width. Namely, the inside wall 39 has a concentric part 39a, and a displacement part 39b where the radius of curvature is decreased gradually and is increased gradually again as going in the counterclockwise direction from the left upper part to the lower part in FIG. 4. Further, the outside wall 40 has a concentric part 40a, and a displacement part 40b where the radius of curvature is increased gradually and is decreased again at the upper part. Therefore, the supporting shafts 9, 10 are unable to rotate as long as the cam roller 36 is located in the uniform part 38a while rotating is possible in the enlarged part 38b.

[0037] In FIG. 4, corresponding to the end part of the cam lever 35 associated with the second supporting shaft 10 on which end part the cam roller 36 is mounted, there is a stopper mechanism 45 for regulating the stop position or the reversal position of the gripping members 16, 17 mounted on this cam lever 35 and, thus the position of the second supporting shaft 10.

[0038] In addition to FIG. 4, referring to FIGS. 5 and

6, FIG. 5 is a plan view showing details of the stopper mechanism 45 and FIG. 6 is its right side view. Numeral 46 denotes a rail of the stopper mechanism 45 that is secured to the main rotating shaft supporting part 6 of the frame 4. In FIGS. 4 and 5, a slide member 47 is mounted on the rail 46 to be movable in the lateral direction as viewed in FIGS. 4 and 5. A slide plate 48 is fixed integrally on the slide member 47, a stopper roller 50 is mounted on the left side end part of the slide plate 48 as viewed in FIG. 5 by a supporting shaft 49, and a contacting part 51 contacting a shock absorber 52 (which will be described later) is provided on the slide plate 48 to stand on the right side of the roller 50. Responding to the contacting part 51, the shock absorber 52 is mounted on the main rotating shaft supporting part 6 through a bracket 54. The contacting part 51 of the slide plate 48 is provided to contact with a contacting shaft 53 of the shock absorber 52. The position of this shock absorber 52 is adjustable in the axial direction of the contacting shaft 53.

[0039] When the main rotating shaft 7 starts to rotate from the state shown in FIG. 1, etc., the first supporting shaft 9 is unable to rotate around its axis during an early stage, since the cam roller 36 on the cam lever 35 attached to the shaft 9 moves along and rolls in such a portion where the width of the groove 38 of the cam 37 is uniform, and the shaft 9 simply rotates or does a revolution around the axis of the main rotating shaft 7 integrally with the main rotating shaft 7. When the cam roller 36 comes to the displacement part 40b of the outside wall 40 of the groove 38 and further to the displacement part 39b of the inside wall, the width of the groove 38 becomes greater than the diameter of the cam roller 36. In this occasion, due to a load exerted to the supporting shaft 9, the cam roller 36 moves in such a manner that the cam roller 36 rolls on the inside wall 39b, and the cam lever 35 and the supporting shaft 9 rotate around the axis of the supporting shaft 9 in the clockwise direction as viewed in FIG. 4. In other words, the cam lever 35 and the gripping members 16, 17 attached to the lever 35 rotate around the axis of the main shaft 7 in a slightly delayed state with regard to the main rotating shaft 7.

[0040] When the main rotating shaft 7 is turned 180 degrees and is stopped, the cam lever 35 and the supporting shaft 9 now rotate counterclockwise around the axis of the supporting shaft 9, since the gripping members 16, 17 continue their motion due to the inertia force. The end part of the cam lever 35 on which the cam roller 36 is mounted collides with the stopper roller 50 described previously, and the cam lever 35, and thus the supporting shaft 9 also stop while the impact is being absorbed by the shock absorber 52. In FIGS. 1 to 4, the second supporting shaft 10 and the associated members are corresponding to this state. On this occasion, the vessel Y stops suddenly in a nearly reversed state as shown in FIG. 1, thereby discharging the contents accommodated in it into a guide cylinder 56 located underneath. As illustrated, the vessel Y is not in a completely inverted state. This is because considerations are given to the direction

along which the contents in the vessel Y are discharged at the sudden stop of the vessel Y, which considerations are dealt with in the description of the prior art mentioned above. The direction of discharging can be set in the optimum state by regulating the final stop position of gripping members 16, 17, i.e., the reversal stop position, by regulating the position of the shock absorber 52 of the stopper mechanism 45 described previously.

[0041] Next, the main rotating shaft 7 again resumes rotating in the same direction at a predetermined timing, and the second supporting shaft 10 positioned at the reversal stop position in the figures starts returning movement to the gripping stop position described previously where the first supporting shaft 9 exists in the figures. As the main rotating shaft 7 rotates, the supporting shaft 10 rotates together with the main rotating shaft 7 in such a manner that the cam lever 35 presses the shock absorber 52 through the stopper roller 50, and the cam lever 35 is disengaged from the stopper roller 50. When the cam roller 36 rolls on and moves along such a portion where the radius of curvature of the displacement part 39b of the inside wall 39 of the groove 38 becomes greater gradually, the supporting shaft 10 rotates by a predetermined angle in the direction opposite to the previous one, and the positional relationship between the supporting shaft 10 and the main rotating shaft 7 is restored to the original state.

[0042] Meanwhile, when the main rotating shaft 7 rotates in this returning process, the roller 21 attached to the sliding shaft 12 described previously rests on the inclined part 25b of the gripping member opening/closing cam 25 also described previously, and then rides on the flat part 25a at a predetermined turning position to open the gripping members 16, 17, thereby discharging the vessel Y having being gripped till then. This is the vessel discharging position, at which a vessel carrying-out apparatus 61 is disposed for receiving emptied vessels and transferring them to downstream process (see FIGS. 1, 3). The operations of discharging the vessel Y are carried out while the main rotating shaft 7 continues rotating.

[0043] The vessel carrying-out apparatus 61 is equipped with an empty vessel collection conveyor 62, and a vessel collection guide 63 is mounted on the stand 3 by a bracket 64. The guide 63 extends between a receiving side end of the conveyor 62 and a cutout 56a formed through the guide cylinder 56. The vessel Y being gripped by the gripping members 16, 17 can pass through the cutout 56a. The gripping members 16, 17 open, and the empty vessel Y discharged and received on the empty vessel collection guide 63 moves onto the conveyor 62 and is transferred to downstream process while being guided by guide bars 65. The main rotating shaft 7 continues rotating, and stops after rotated by 180 degrees, while the gripping members 16, 17 return to the gripping stop position in the opened state.

[0044] Referring to FIG.7, detailed explanation will be given regarding the arrangement where the axis of the main rotating shaft is situated at a position higher than

the center of a vessel in the upright state supplied to the gripping stop position. In FIG.7, symbols O and O' respectively denote the center of rotation of the gripping members 16,17 employed in the present invention and the center of rotation of the gripping members 16,17 employed in the conventional reversing apparatus with respect to the vessel Y supplied to the same gripping stop position. The figure shows the manner of the rotation of the vessel Y in the present invention which is shown by solid lines and of the vessel Y' in the conventional apparatus which is shown by double dashed chain lines. Centrifugal force acting in each case is indicated by arrows V and V', respectively.

[0045] As it is apparent from FIG. 7, in the conventional case, when vessel Y' is rotated, the direction of centrifugal force V' acting on vessel Y', i.e., on the contents inside, is orthogonal to the direction of movement of the vessel Y'. In contrast, in the embodiment of the present invention, it is oriented obliquely backward with regard to the direction of movement of the vessel Y. In other words, the centrifugal force V generated in the present invention acts to force the contents in the vessel Y toward the part of the cylindrical side wall of the vessel farther from the center of rotation of the vessel Y and, therefore acts to force the contents toward the bottom of the vessel Y. Namely, the contents in the vessel Y are forced in the direction opposite to the direction of the movement of the vessel Y, thereby preventing the contents from flying out from the vessel Y during rotating. When the center of rotation of the main rotating shaft 7 is situated at a position higher than that shown in FIGS. 1 and 7, the direction of action of the centrifugal force V is tilted further to the left in FIG. 7, thereby enhancing tendency of forcing the contents toward the bottom of the vessel Y.

[0046] In the embodiment mentioned above, the gripping members 16, 17 which grip the vessel on the outer circumference thereof in cooperation are used as a holding member for folding the vessel Y. Alternatively, however, these members may be such a type of gripping members that grip the vessel on the upper and lower ends thereof. Further, this is not limited to the embodiment where a pair of gripping members are used, and, for example, a reversing apparatus (holding member) disclosed in Japanese Non-examined Patent Application No. 8-282602 given as an example of conventional art may be used.

[0047] According to the present embodiment described above, it is designed that the rotating speed of the motor 31 changes with two steps mode during one operation. In other words, since discharging an empty vessel Y at too high speed may cause problems, a relatively low-speed is employed in the stages before completion of discharging of the vessel, and then the speed is shifted to a higher speed after discharging the vessel, thereby ensuring reliable and thorough ejection of the contents accommodated in the vessel Y at the reversal stop position.

[0048] Although, according to the embodiment de-

scribed above, two supporting shafts are provided and two sets of gripping members are used for one main rotating shaft, when one set of gripping members is used, the gripping members can be mounted directly on the main rotating shaft. On this occasion, a servo motor may be used as a driving motor for appropriately regulating the rotational angle from the gripping stop position to the reversal stop position and the rotational angle in the returning process from the reversal stop position to the gripping stop position, so that the stopper mechanism used in the embodiment described above is unnecessary.

Claims

1. A contents-filling vessel reversing apparatus for reversing a contents-filling vessel accommodating contents to be filled from an upright state to a nearly inverted state, thereby dropping downward and filling the contents into a packaging container disposed underneath, said apparatus being **characterized in :**

that said apparatus comprises a vessel holding member for holding said vessel supplied to a holding position, said vessel holding member being designed to rotate in a vertical plane around a center of rotation, and

that the position of said center of rotation is set higher than the position of the center in the vertical direction of said vessel positioned at said holding position.

2. Contents-filling vessel reversing apparatus according to Claim 1, **characterized in :**

that said holding member comprises a pair of gripping members capable of approaching to and separating away from each other to grip and to release said vessel, and

that said apparatus further comprises :

a reversing device including a rotating device equipped with a main rotating member rotatable around said center of rotation, said rotating device rotating intermittently the main rotating member in one direction and stopping the main rotating member at a first and a second positions, and said gripping members attached to said rotating device, said gripping members being designed to stop at a gripping stop position where said gripping members can grip a vessel supplied in said upright state when said main rotating member stops at the first stop position, and to stop at a reversal stop position where said vessel is held in said nearly inverted state when said main rotating mem-

ber stops at the second positions;
a reversal stop position regulating device for regulating said reversal stop position of said gripping members;
an empty vessel carrying-out device provided at an empty vessel discharging position on the way along which said gripping members return from said reversal stop position to said gripping stop position, said empty vessel carrying-out device receiving an empty vessel from which the contents to be filled have been ejected and transferring it to downstream process; and
a gripping member opening/closing apparatus for making said gripping members close to grip a vessel at said gripping stop position and for making said gripping members open at said empty vessel discharging position, thereby discharging the empty vessel towards said empty vessel carrying-out device.

3. A contents-filling vessel reversing apparatus according to Claim 2, **characterized in :**

that said main rotating member comprises a main rotating shaft rotating intermittently in one direction every 180 degrees,

that said rotating device further comprises a supporting shaft supported by said main rotating shaft in parallel to said main rotating shaft in an axial direction, and designed to be reciprocally rotatable around an axis thereof between an initial position and a rotated position,

that said contents-filling vessel reversing apparatus further comprises a supporting shaft rotating device for rotating said supporting shaft, and **that** said reversing stop position regulating device regulates said rotated position of said supporting shaft, and said pair of gripping members are mounted on one end of said supporting shaft.

4. A contents-filling vessel reversing apparatus according to Claim 3, **characterized in :**

that said supporting shaft is formed to be hollow to have a through hole,

that said gripping member opening/closing device comprises a sliding shaft inserted through said through hole of said supporting shaft and being movable in an axial direction thereof, said sliding shaft being connected at one end thereof to said gripping members, and

that said gripping members are opened and closed interlockingly with the axial direction movement of said sliding shaft.

5. A contents-filling vessel reversing apparatus according to Claim 3 or 4, **characterized in :**

that said supporting shaft rotating device is equipped with a grooved cam securely positioned with an axis thereof coinciding with the axis of said main rotating shaft, a lever fixed to the other end of said supporting shaft and a cam roller mounted on the lever so as to roll in and move along a groove formed in said grooved cam, 5 10

that, in a predetermined range in said groove extending in the opposite directions from a position corresponding to said rotated position, at least a radius of curvature of an inner wall of said groove is made shorter than a radius of curvature of the the inner wall in a rest range in the groove so that a width of the groove in said predetermined range is larger than a width of the groove in the rest range, and 15 20

that said reversal stop regulating device is provided with a positioning stopper which abuts against said lever to position the lever at said reversal stop position, and a stopper position regulating device for regulating the position of the stopper. 25

6. A contents-filling vessel reversing apparatus according to any one of Claims 3 to 5, **characterized in :**

that two said supporting shafts are provided symmetrically with respect to the axis of said main rotating shaft, and each of said supporting shafts is provided with said pair of gripping members. 30 35

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Fig. 1

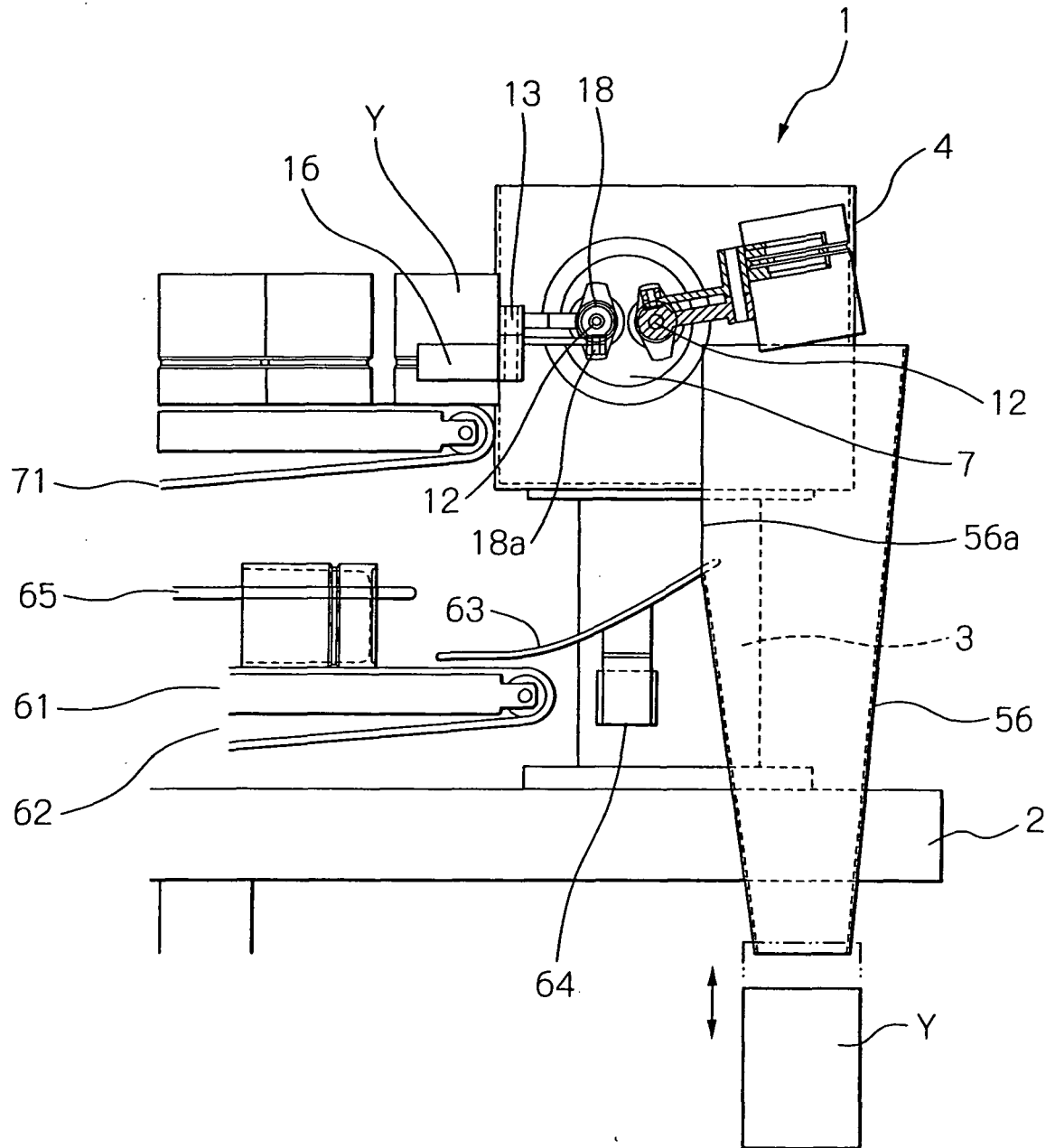


Fig. 2

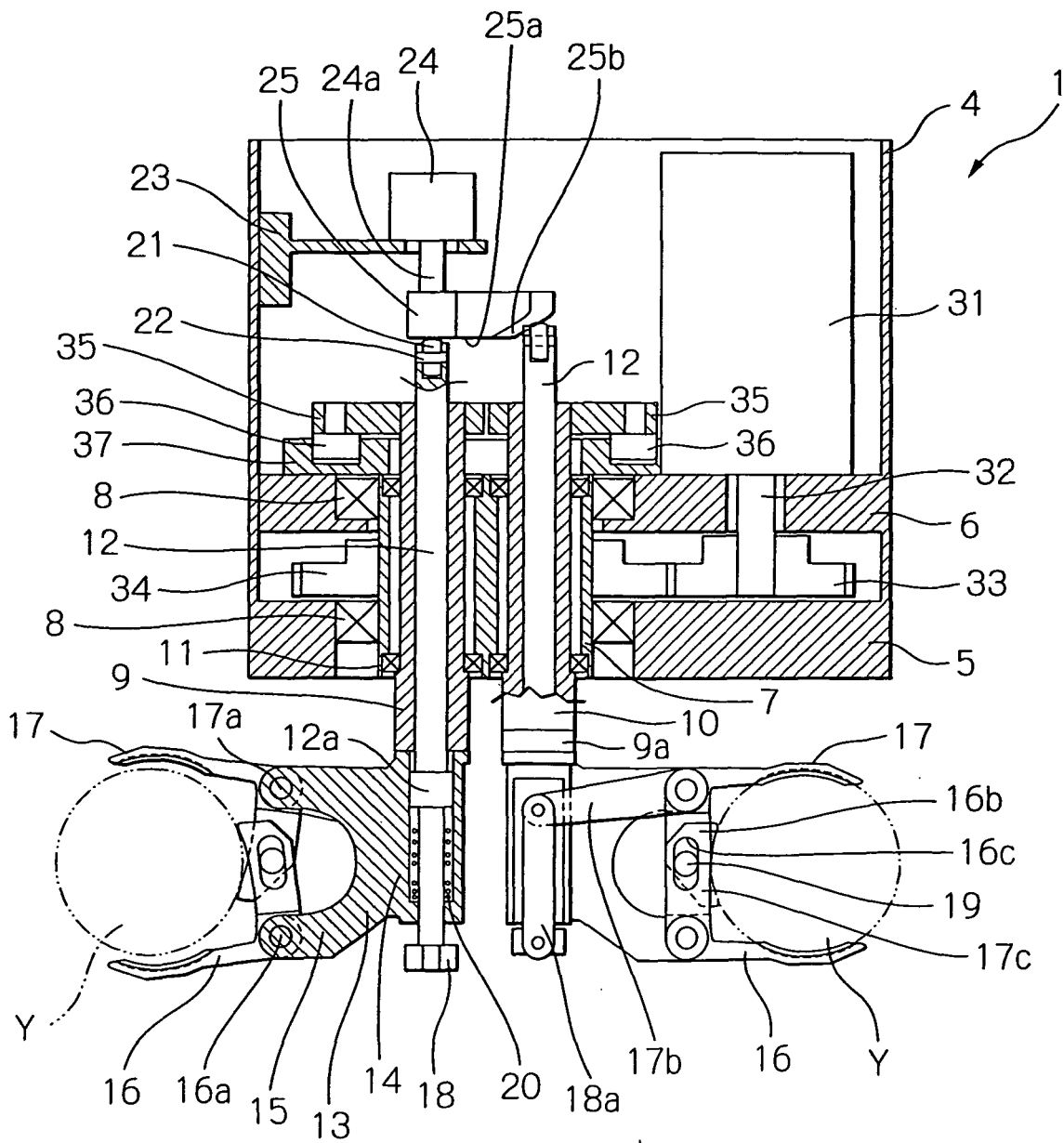


Fig. 3

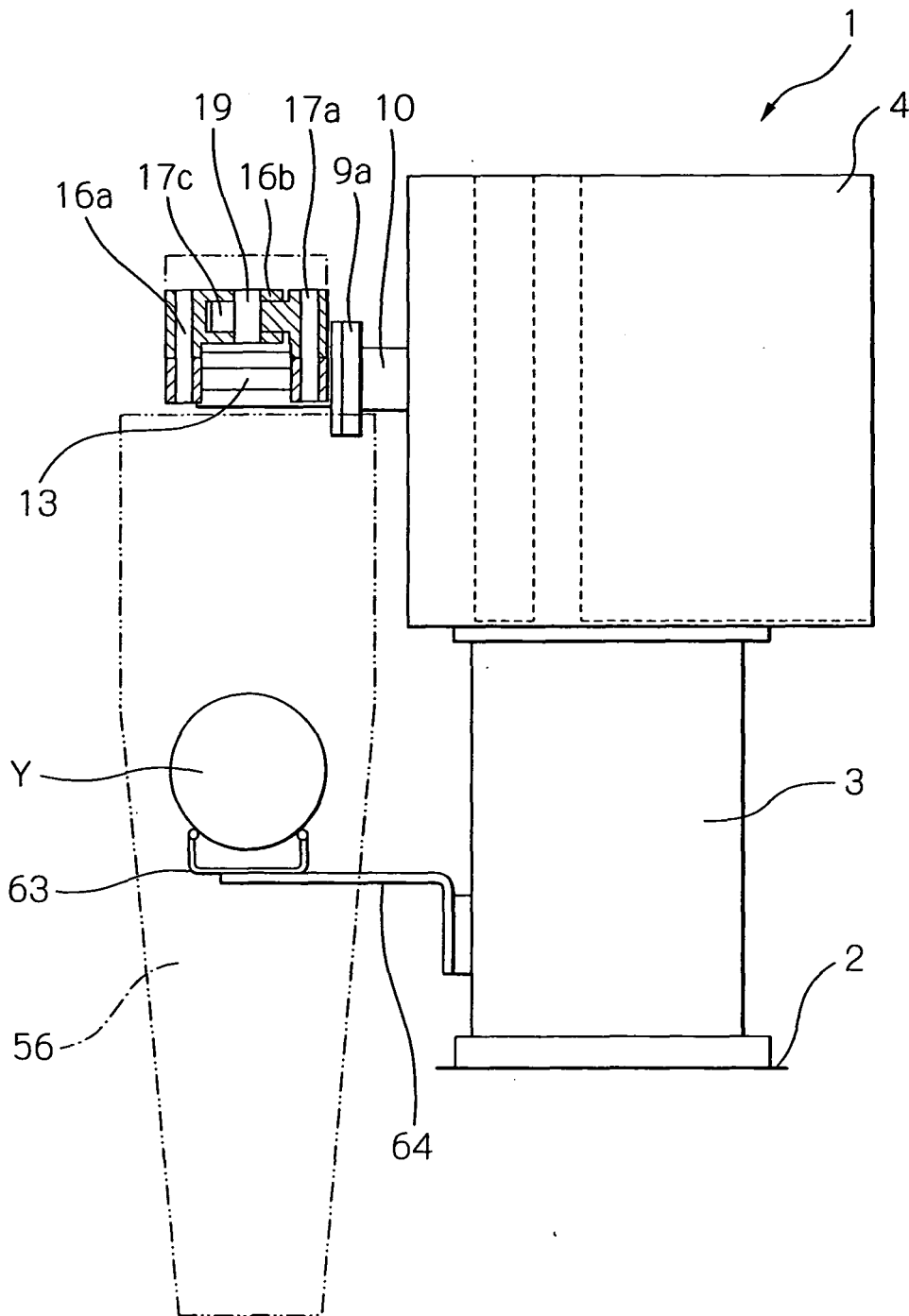


Fig. 4

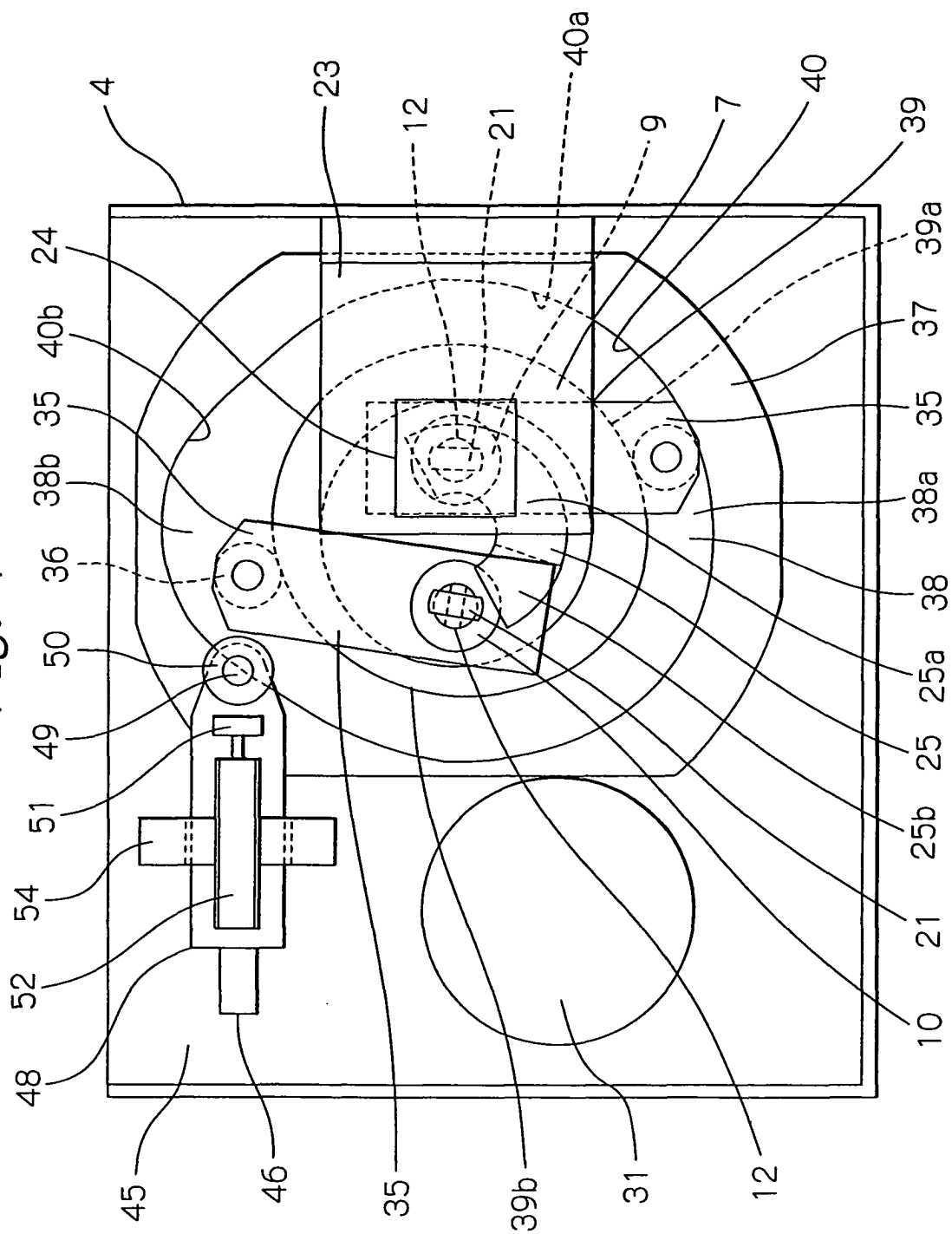


Fig. 5

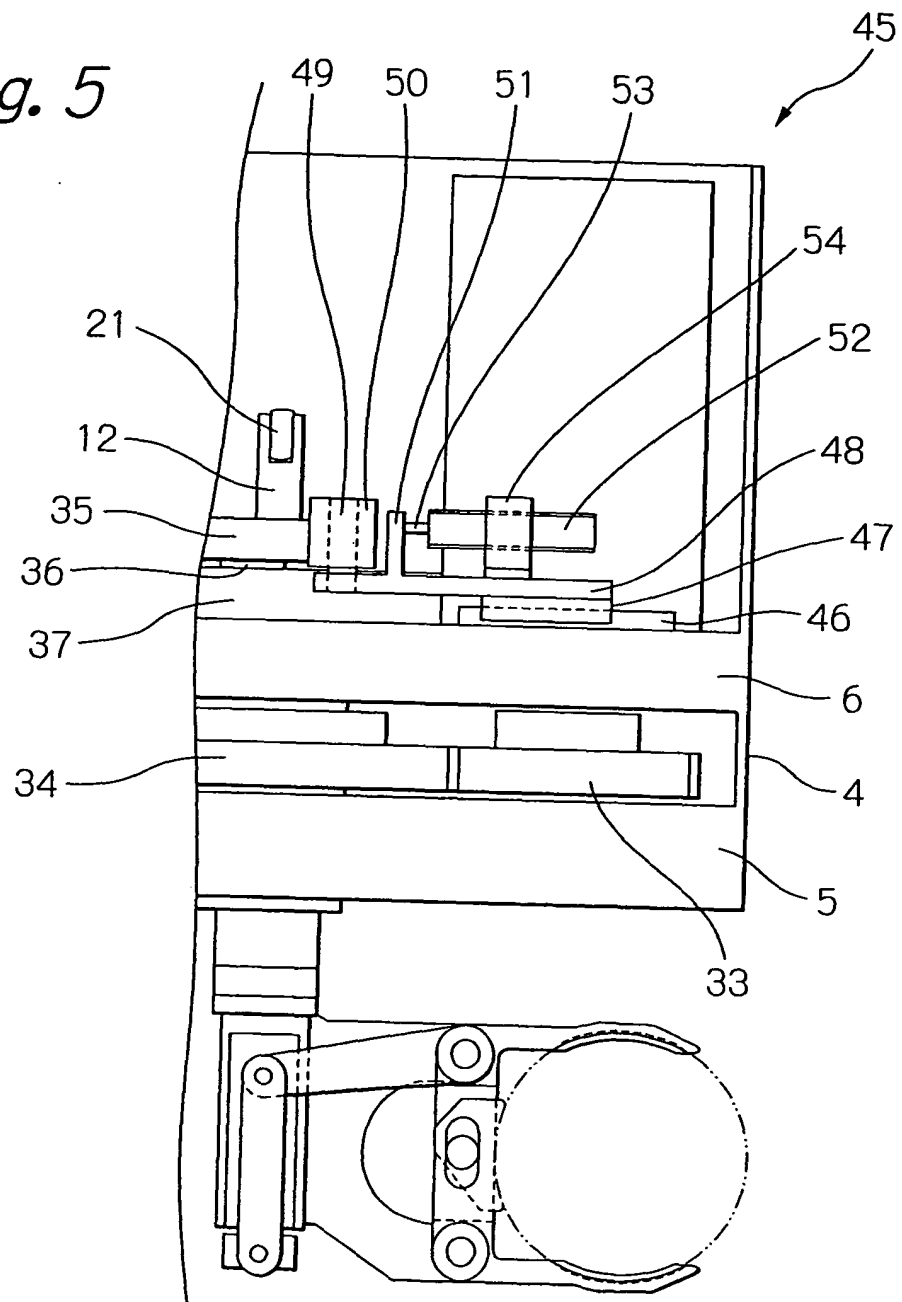


Fig. 6

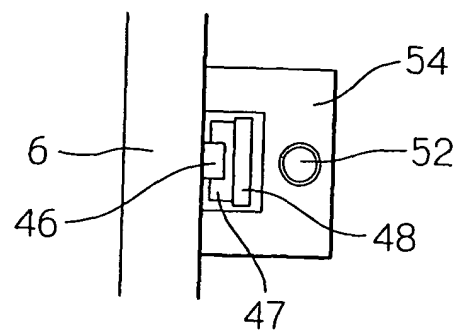


Fig. 7

