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(54) Door mechanism for commodity take-out port in vending machine

(57) The present invention provides a door mechanism for a commodity takeout port 10 in a vending machine which allows a commodity to be easily taken out and which enables a door plate 20 to be quickly closed after the commodity has been taken out. The door mechanism is configured to vary rotative movement resistance offered to a door plate 20 depending on the opening angle of the door plate 20. This makes it possible to reduce the closing speed of the door plate 20 obtained while the fully open door plate 20 is rotatively moved in a closing direction through a predetermined opening angle and to increase the closing speed for the other opening angles. Accordingly, the user can open the door plate 20 with one hand, while taking out a commodity with one hand while the door plate 20 is open. The door plate 20 can thus be closed without leaving the commodity takeout port 10 open for an unnecessarily long time. This prevents the entry of dirt, dust, rainwater, or the like.

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Description

[0001] The present invention relates to a commodity takeout port in a vending machine through which commodities such as drinks in bins, cans, or PET bottles are sold.

[0002] A known door mechanism for a commodity takeout port of a vending machine of this kind comprises a door plate having an upper end rotatively movably supported at an upper end of the commodity takeout port, the door plate being capable of opening and closing the commodity takeout port. The commodity takeout port is opened by manual operation, and is closed automatically. However, With the door mechanism for the commodity takeout port in the vending machine, the door plate is closed by its own weight. Consequently, the user may have his or her hand caught in the commodity takeout port when taking out a commodity, or noise may be generated when the door plate is closed. Thus, a known door mechanism comprises a damper that offers rotative movement resistance to the rotative movement of a support shaft supporting the door plate.

[0003] However, with the door mechanism for the commodity takeout port in the conventional vending machine, even with a reduction in the speed at which the door plate is closed, the user is likely to have his or her hand caught in the commodity takeout port when taking out a commodity. Accordingly, the user must hold the door plate open with one hand, while taking out the commodity with the other hand. Further, with a further reduction in the closing speed of the door plate, even if the user can take out commodity only with one hand, the time for which the commodity takeout port remains open is unnecessarily increased. Consequently, dust or the like is likely to enter the commodity takeout port.

[0004] It is an object of the present invention to provide a door mechanism for a commodity takeout port in a vending machine which allows a commodity to be easily taken out and which enables a door plate to be quickly closed after the commodity has been taken out.

[0005] To accomplish this object, the present invention comprises a door plate which allows a commodity takeout port to be manually opened and which can automatically close the commodity takeout port, and a damper that offers rotative movement resistance to the door plate rotatively moved in a direction in which the commodity takeout port is closed. The damper is provided with a cam that rotatively moves integrally with the door plate to vary the rotative movement resistance offered to the door plate depending on an opening of the door plate.

[0006] Thus, the damper varies the rotative movement resistance to the door plate depending on the opening angle of the door plate. This makes it possible to reduce the closing speed obtained while the fully open door plate is rotatively moved in a closing direction through a predetermined opening angle and to increase the closing speed for the other opening angles. Accordingly, the user can open the door plate only with one hand, while taking out a commodity with one hand while the door plate is open. After the commodity has been taken out, the door plate can be closed without leaving the commodity takeout port open for an unnecessarily long time. This prevents the entry of dirt, dust, rainwater, or the like.

[0007] These and other objects, characteristics, and benefits of,the present invention will be apparent from the following description and the drawings.

FIG. 1 is a perspective view of a vending machine showing a first embodiment of the present invention;
FIG. 2A is a sectional view of a damper for a commodity takeout port structure;
FIG. 2B is a sectional view of the damper for the commodity takeout port structure;
FIG. 2C is a Sectional view of the damper for the commodity takeout port structure;
FIG. 3 is a perspective view of a cam shaft of the damper;
FIG. 4 is a diagram showing an operation of a guide pin which operation is associated with an angle at which a door plate is closed;
FIG. 5 is a side sectional view showing a closing operation of the door plate; and
FIG. 6 is a side sectional view showing a closing operation of a door plate according to a second embodiment of the present invention.

[0008] FIGS. 1 to 5 show a first embodiment of the present invention.

[0009] A door mechanism for a commodity takeout port in a vending machine is composed of a commodity takeout port 10 through which a user takes out a commodity, a door plate 20 having an upper end rotatively movably supported and which can open the commodity takeout port when rotatively moved forward, and a damper 30 that offers rotative movement resistance to the rotative movement of the door plate 20.

[0010] The commodity takeout port 10 is provided by forming an opening in a lower part of an outer door 2 of a vending machine 1 in the form of a horizontally long rectangle.

[0011] The door plate 20 consists of a horizontally long rectangular member formed of a transparent resin. The door plate 20 externally covers the commodity takeout port 10. A width-wise pair of cylindrical support shafts 21 having the same axis is formed at the top of the width-wise opposite ends of the door plate 20 integrally with the door plate 20. Further, a fitting hole 22 is formed in a central portion of an end surface of one of two support shafts 21; the fitting hole 22 is fitted around a shaft 32 of the damper 30 which will be described later.

[0012] The damper 30 comprises a housing 31 shaped like a bottomed cylinder, a shaft 32 that transmits rotative movement resistance to the door plate 20,

a cam 33 that varies the rotative movement resistance offered to the door plate 20, a piston 34 that can slide through the housing 31, and a guide pin 35 serving as an abutting member assembled on the piston 34.

[0013] The housing 31 is provided with a pair of mounting flanges 31a on an outer surface. A screw through-hole 31b is formed in each of the mounting flanges 31a. The housing 31 is mounted at one end of each of two support plates 11 provided at laterally opposite ends in the commodity takeout port 10 using the mounting flanges 31a, the support plates 11 being extended in a vertical direction.

[0014] The shaft 32 has one end connected to the support shaft 21 of the door plate 20. The shaft 32 rotatively moves with the support shaft 21 when the door plate 20 is opened and closed. Further, the other end of the shaft 32 is fixed to one end surface of the cam 33. The shaft 32 and the cam 33 are integrated together.

[0015] The one end surface of the cam 33 is fixed to the other end of the shaft 32. An abutting surface 33a is formed on the other end surface of the cam 33 in a circumferential direction; the guide pin 35 abuts against the other end of the cam 33. The abutting surface 33a is formed by obliquely cutting the one end surface of the cam 33. The abutting surface 33a has an angle of inclination corresponding to rotative movement resistance offered to the door plate 20.

[0016] The piston 34 is slidably housed inside the housing 31. The guide pin 35 is provided on one end surface of the piston 34. A spring 34a abuts against the other end surface of the piston 34 to urge the piston 34 toward the cam 33; the spring 34a is provided between the housing 31 and the piston 34 as an urging member.

[0017] The guide pin 35 is provided on the one end surface of the piston 34 so as to extend perpendicularly to an axial direction of the piston 34. The guide pin 35 abuts against the abutting surface 33a.

[0018] With the door mechanism for the commodity takeout port in the vending machine which mechanism is configured as described above, when the door plate 20 is rotatively moved forward and thus opened until it is fully open, the cam 33 rotatively moves together with the shaft 32. As shown in FIG. 2A, the guide pin 35 is urged toward a shaft 32 side of the abutting surface 33a by the urging force of the spring 34a. The guide pin 35 then abuts against a point P of the abutting surface 33a. Then, the door plate 20 starts to close owing to its own weight. Then, as shown in FIGS. 2B and 2C, the cam 33 rotatively moves as the abutting surface 33a slidably moves with respect to the guide pin 35 against the urging force of the spring 34a. As shown in FIG. 4, the abutting surface 33a of the cam 33, which rotatively moves with respect to the guide pin 35, is formed to have a large angle of inclination between the point P and a point R. Consequently, a large rotative movement resistance is offered to the closing operation of the door plate 20. In this case, the inclination of the abutting surface 33a is formed so that about three seconds are required to close the door plate 20 from an opening angle of 135° to an opening angle of 125°. Further, as shown in FIG. 4, the angle of inclination of the abutting surface 33a of the cam 33, which rotatively moves with respect to the guide pin 35, is formed to have a smaller angle of inclination between the point R and a point Q than between the points P and R. This prevents a large rotative movement resistance from being offered to the closing operation of the door plate 20. As a result, the door plate 20 is completely closed.

[0019] Thus, according to the present invention, the rotative movement resistance is varied depending on the opening angle of the door plate 20. This makes it possible to reduce the closing speed obtained while the fully open door plate 20 is rotatively moved in a closing direction through a predetermined opening angle and to increase the closing speed for the other opening angles. Accordingly, the user can open the door plate 20 with one hand, while taking out a commodity with one hand while the door plate 20 is open. The door plate 20 can thus be closed without leaving the commodity takeout port 10 open for an unnecessarily long time. This prevents the entry of dirt, dust, rainwater, or the like.

[0020] Further, the damper 30 is composed of the cam 33, which rotatively moves with the support shaft 21 of the door plate 20, the guide pin 35, which abuts against the abutting surface 33a, and the spring 34a, which urges the guide pin 35 toward the cam 33. This allows the rotative movement resistance offered to the door plate 20 to be changed by changing the angle of inclination of the abutting surface 33a. Consequently, the rotative movement resistance offered to the door plate 20 can be easily set as required.

[0021] Further, the abutting surface 33a is formed so as to reduce the rotative movement resistance offered to the door plate 20 as the door plate 20 is closed. This enables the door plate 20 to be closed immediately after the commodity has been taken out. The door plate 20 can thus be closed without leaving the commodity takeout port 10 open for an unnecessarily long time. This prevents the entry of dirt, dust, rainwater, or the like.

[0022] Furthermore, the abutting surface 33a is formed so as to offer the predetermined rotative movement resistance to the support shaft 21 of the door plate 20 while the fully open door plate 20 is rotatively moved in the closing direction through the predetermined angle and to reduce the rotative movement resistance offered to the support shaft 21 of the door plate 20 after the fully open door plate 20 has been rotatively moved in the closing direction through the predetermined angle. This makes it possible to reduce the closing speed obtained while the fully open door plate 20 is rotatively moved through the predetermined opening angle and to increase the closing speed of the door plate 20 for the other opening angles. Accordingly, the user can open the door plate 20 with one hand, while taking out a commodity with one hand while the door plate 20 is open. The door plate 20 can thus be closed without leaving

the commodity takeout port 10 open for an unnecessarily long time. This prevents the entry of dirt, dust, rainwater, or the like.

[0023] Moreover, the abutting surface 33a is formed so that about three seconds are required to close the fully open door plate 20 through an angle of 10°. This enables the door plate 20 to be kept open for at least about three seconds after the door plate 20 has been opened. Therefore, when opening the door plate 20 to take out a commodity, the user can easily take it out without having his or her hand caught in the commodity takeout port 10.

[0024] Further, the commodity takeout port 10 is opened by rotatively moving the door plate 20 forward from the commodity takeout port 10. This enables the commodity takeout port 10 to be externally covered. It is therefore possible to prevent the entry of dirt, dust, rainwater, or the like.

[0025] As shown in the present embodiment, the support shaft 21 and the shaft 32 are fixed to each other by inserting the shaft 32 into the shaft 21. However, the shaft 32 may be formed to be cylindrical so that the support shaft 21 and the shaft 32 can be fixed to each other by inserting the support shaft 21 around the shaft 32.

[0026] Further, as shown in the present embodiment, the large rotative movement resistance is offered to the door plate 20 while the fully open door plate 20 is rotatively moved in the closing direction through the predetermined angle. Then, the rotative movement resistance offered to the door plate 20 is reduced after the fully open door plate 20 has been rotatively moved in the closing direction through at least the predetermined angle. However, the rotative movement resistance offered to the support shaft 21 of the door plate 20 may be reduced while the fully open door plate 20 is rotatively moved in the closing direction through the predetermined angle. Then, the rotative movement resistance offered to the door plate 20 is increased after the fully open door plate 20 has been rotatively moved in the closing direction through at least the predetermined angle. In this case, a rotative movement speed can be reduced when the door plate 20 is completely closed. This serves to reduce a shock sound generated when the door plate 20 collides against a part of the outer door 2 which is located below the commodity takeout port 10.

[0027] FIG. 6 shows a second embodiment of the present invention. The same reference numerals are used for components of the second embodiment which are similar to those of the first embodiment.

[0028] The door, mechanism for the commodity takeout port in the vending machine according to the present embodiment is configured so that a door plate 40 has an upper end rotatively movably supported and is rotatively moved backward to open the commodity takeout port 10. A width-wise pair of cylindrical support shafts 41 having the same axis is formed at the top of the width-wise opposite ends of the door plate 40 integrally with the door plate 40. Further, a fitting hole 42 is formed in a central portion of an end surface of one of two support shafts 41; the fitting hole 42 is fitted around the shaft 32 of the damper 30.

[0029] With the door mechanism for the commodity takeout port in the vending machine which mechanism is configured as described above, when the door plate 40 is rotatively moved backward and thus opened until it is fully open as shown in FIG. 6, the cam 33 rotatively moves together with the shaft 32. The guide pin 35 is urged toward the shaft 32 side of the abutting surface 33a by the urging force of the spring 34a. The guide pin 35 is then positioned at the point P of the abutting surface 33a. Then, the door plate 40 starts to close owing to its own weight. Then, the cam 33 rotatively moves as the abutting surface 33a slidably moves with respect to the guide pin 35 against the urging force of the spring 34a. In this case, the abutting surface 33a of the cam 33, which rotatively moves with respect to the guide pin 35, is formed to have a large angle of inclination between the points P and R. Consequently, a large rotative movement resistance is offered to the closing operation of the door plate 40. In this case, the inclination of the abutting surface 33a is formed so that about three seconds are required to close the door plate 40 from an opening angle of 84° to an opening angle of 74°. Further, the angle of inclination of the abutting surface 33a of the cam 33, which rotatively moves with respect to the guide pin 35, is formed to have a smaller angle of inclination between the points R and Q than between the points P and R. This prevents a large rotative movement resistance from being offered to the closing operation of the door plate 40. As a result, the door plate 40 is completely closed.

[0030] As described above, according to the present invention, the commodity takeout port 10 is opened by rotatively moving the door plate 40 backward from the commodity takeout port 10. Consequently, the commodity takeout port 10 can be opened by rotatively moving the door plate 40 backward. This prevents the door plate 40 from being extended from a front surface of the commodity takeout port 10. Therefore, commodities can be further easily taken out.

[0031] The preferred embodiment described in the specification is illustrative and is not limitative. The accompanying claims indicate the scope of the present invention. The present invention encompasses all variations included in the meanings of the claims.

Claims

1. A door mechanism for a commodity takeout port in a vending machine, the door mechanism comprising:

   a door plate 20 which allows a commodity takeout port 10 to be manually opened and which can automatically close the commodity

takeout port 10; and

a damper 30 that offers rotative movement resistance to the door plate 20 rotatively moved in a direction in which the commodity takeout port 10 is closed, and

wherein the damper 30 is provided with a cam 33 that rotatively moves integrally with the door plate 20 to vary the rotative movement resistance offered to the door plate 20 depending on an opening of the door plate 20.

2. The door mechanism for the commodity takeout port in the vending machine according to claim 1, wherein the damper 30 comprises the cam 33, an abutting member 35 that abuts against an abutting surface 33a provided at one end of the cam 33 in its axial direction, and an urging member 34a that urges the abutting member 35 toward the cam 33,

the abutting surface 33a is formed to incline with respect to a direction in which the cam 33 rotatively moves, and

the angle of inclination of the abutting surface 33a varies at predetermined positions in the rotative movement direction.

3. The door mechanism for the commodity takeout port in the vending machine according to claim 2, wherein the abutting surface 33a is formed so as to reduce the rotative movement resistance offered to the door plate 20 as the door plate 20 rotatively moves in the closing direction of the door plate 20.

4. The door mechanism for the commodity takeout port in the vending machine according to claim 2, wherein the abutting surface 33a is formed so as to offer a predetermined rotative movement resistance to the door plate 20 while the fully open door plate 20 is rotatively moved in the closing direction through a predetermined angle and to reduce the rotative movement resistance offered to the door plate 20 below the predetermined rotative movement resistance after the door plate 20 has been rotatively moved in the closing direction through at least the predetermined angle.

5. The door mechanism for the commodity takeout port in the vending machine according to claim 4, wherein the abutting surface 33a is formed so that about three seconds are required to allow the fully open door plate 20 to reach a position at which the door plate 20 is located after rotatively moving in the closing direction through the predetermined angle.

6. The door mechanism for the commodity takeout port in the vending machine according to claim 1, 2, 3, 4, or 5, wherein the commodity takeout port 10 is opened by rotatively moving the door plate 20 forward from the commodity takeout port 10.

7. The door mechanism for the commodity takeout port in the vending machine according to claim 1, 2, 3, 4, or 5, wherein the commodity takeout port 10 is opened by rotatively moving the door plate 20 backward from the commodity takeout port 10.

Fig. 1

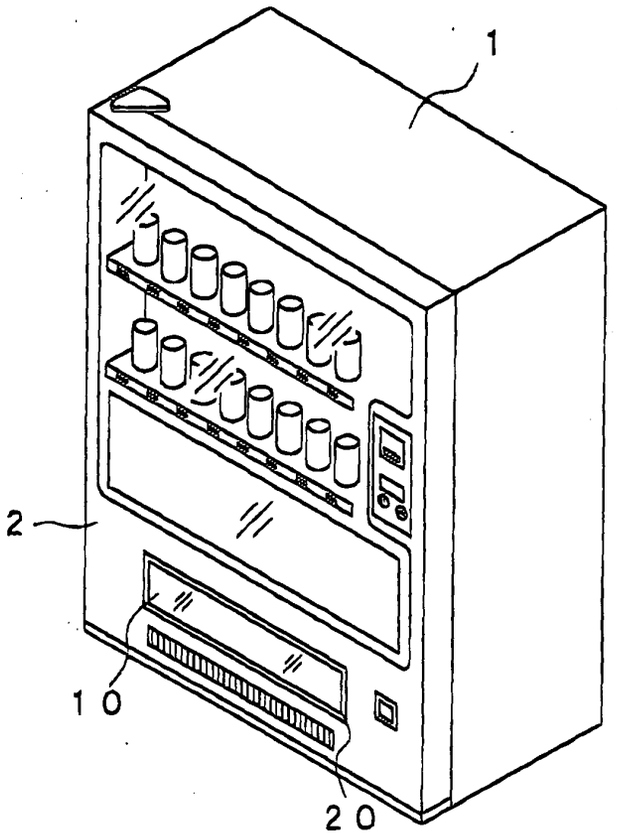


Fig. 2A

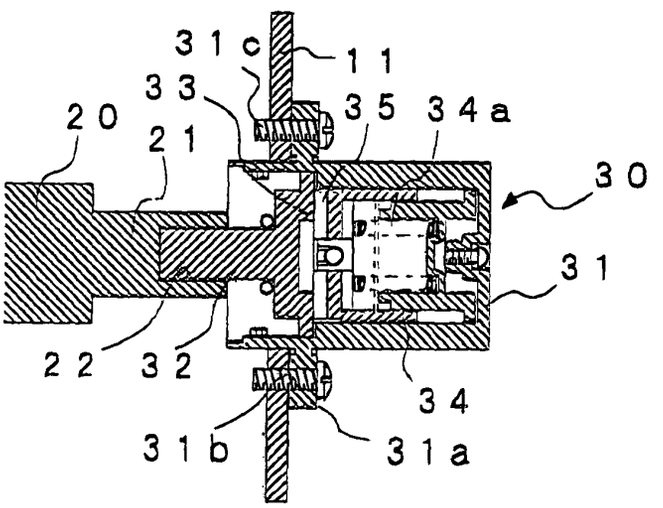
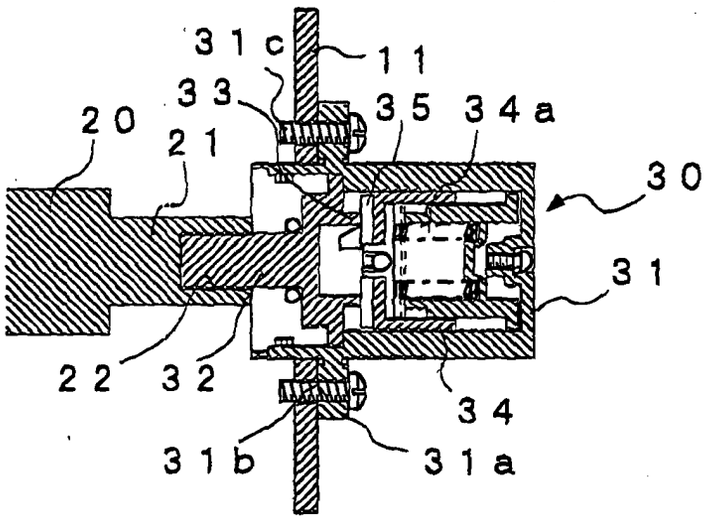


Fig. 2B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33
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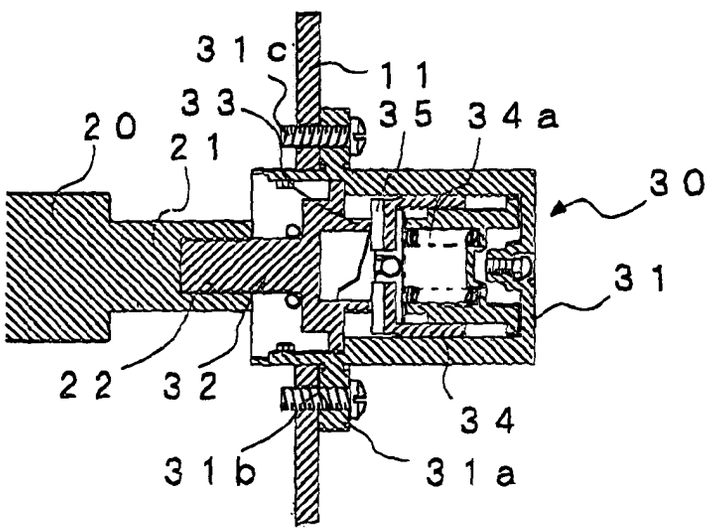
34a
20
21
30
31
22
32
34
31b
31a

Fig. 2C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31a

Fig. 3

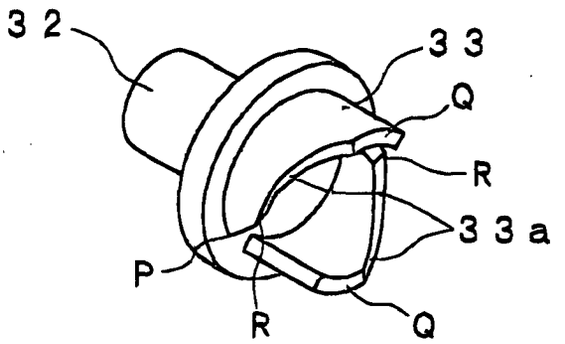

Fig. 4

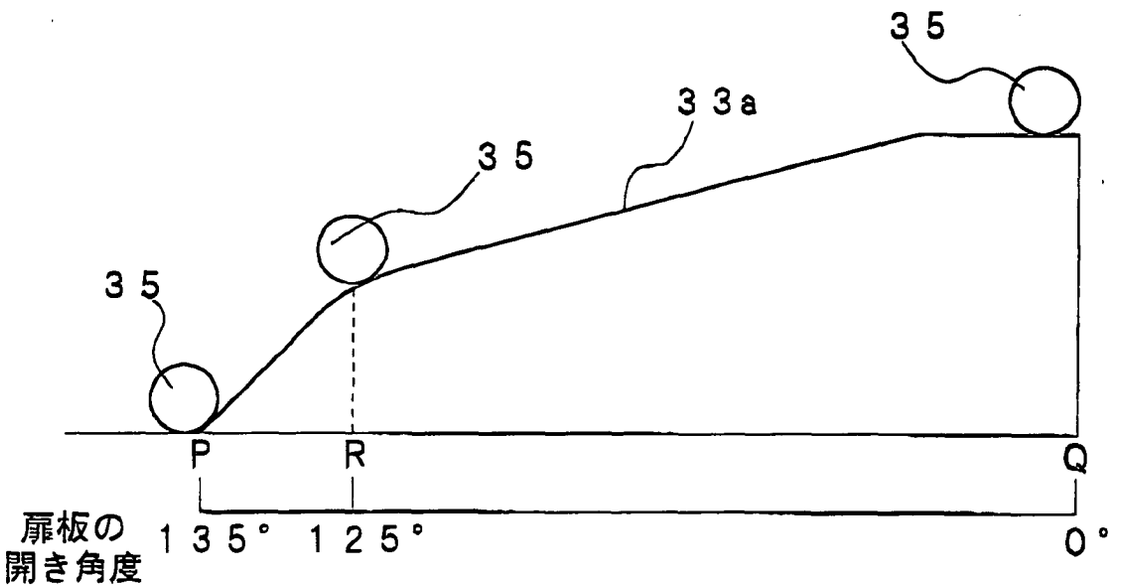

Fig. 5