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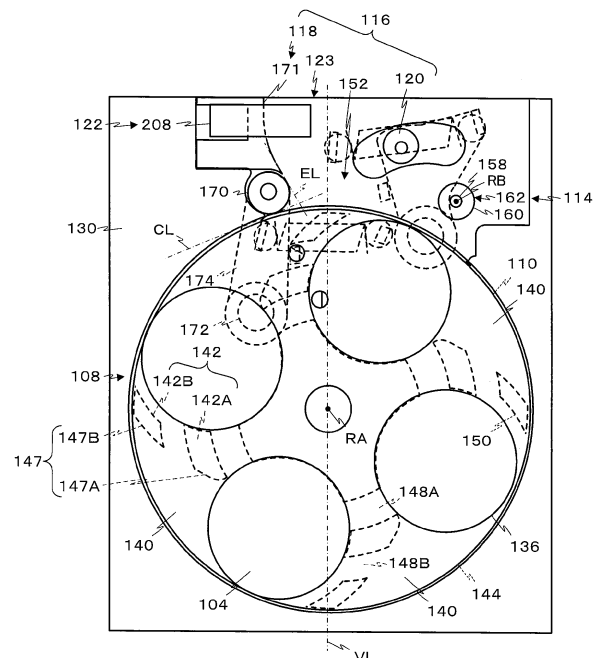
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(54) **Coin dispenser**

(57) An object of the present invention is to expand a dispensable diameter range of a coin dispenser that can dispense coins having diameters within a predetermined range without the need of part replacement and some sort of adjustment.

Coins are dropped into and sorted by through holes one by one by forward rotation of a rotating disk, are guided by a circular coin guiding wall of a storage hole while the coins are pushed by pushers on a lower surface, the coins are then guided in the circumferential direction of the rotating disk by an outlet rotor constituting an outlet guide, are guided by a hopper, and are ejected by an ejecting roller. If coin jamming occurs, the rotating disk is rotated backward, and the coin pushed by a rear surface tip of the pusher is guided by a cylindrical surface of the outlet rotor. Since it is the cylindrical surface, the angle formed by the pushing force by the pusher and the reactive force from the outlet rotor is increased, the coin is returned into the storage hole, backward rotation can be continued, and the coin jamming can be eliminated.

FIG.2



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a coin dispenser that can dispense coins having different diameters one by one.

[0002] Particularly, the present invention relates to a coin dispenser that can dispense coins having widely different diameters one by one.

[0003] Furthermore, the present invention relates to a low-cost coin dispenser that can dispense coins having widely different diameters one by one.

[0004] The "coins" used in the present specification include coins serving as money and tokens serving as money substitute such as medals.

2. Description of Related Art

[0005] Conventionally, in a case in which many coins stored in bulk in a storing bowl are to be dispensed one by one by using a rotating disk disposed in a bottom hole of the storing bowl, coin jamming rarely occurs, wherein the coin(s) are sandwiched between the rotating disk and the storing bowl or the rotating disk and a base, and rotation of the rotating disk is stopped. Therefore, in order to automatically eliminate the coin jamming, the rotating disk is rotated backward for a short period of time such as one to several rotations.

[0006] Also, a coin dispenser that can dispense coins having diameters in a predetermined range without part replacement and position adjustment.

[0007] As a conventional technique that rotates a rotating disk backward upon dispensing of the coins having the diameters in the predetermined range and occurrence of coin jamming, as shown in FIG. 13 (only necessary symbols are shown), there is known a hopper-type coin dispenser having: a fixed base plate forming a surface of an installation base; a coin-carrying bored disk rotor (D) on which rear curved wings (11) interposed between mutually adjacent coin receiving holes are provided to project from a back side of the disk-rotor main body having the plurality of coin receiving holes formed in a radially symmetrically distributed shape as a whole; a reversible motor for rotating and driving the bored disk rotor that is attached to a back side of the base plate; a coin housing hopper that is also detachably attached to a surface of the base plate and surrounds a peripheral part of the bored disk rotor (D); a coin lead-out opening (17) cut away to have a certain opening width in a part of the coin housing hopper that faces a coin carrying path (G) formed by rotation of the bored disk rotor (D); a coin dispensing passage that is formed into a tunnel shape, which is directly connected to the coin lead-out opening (17) of the coin housing hopper, by a coin-count-sensor receiving base attached and fixed to the surface of the

base plate; a separate roller (36) that is installed to face a downstream side of a moving direction of forward rotation of the bored disk rotor (D) between the coin lead-out opening (17) and the coin dispensing passage (21) opposed to each other; a coin dispensing roller (35) that is installed so as to face an upstream side of the moving direction in which the bored disk rotor (D) rotates forward also between the coin lead-out opening (17) and the coin dispensing passage opposed to each other and is elastically biased so as to maintain an opening width opposed to the separate roller (36) to be narrower than the diameter of a minimum coin (Cs); and a coin dispensing guide that is projecting from the surface of the base plate to the coin carrying path (G) formed by rotation of the bored disk rotor (D) and guides the coin (Cs) from the coin lead-out opening (17) toward the coin dispensing passage; the hopper-type coin dispenser that pushes and carries the coin (Cs), which has been received from the coin housing hopper to the coin receiving hole of the disk-rotor main body, by the rear curved wing (11) of the bored disk rotor (D), which is rotated forward in a first direction, and dispenses the coin from the coin lead-out opening (17) to the coin dispensing passage; wherein, if it is assumed that the minimum coin (Cs) pushed in the first direction by the rear curved wing (11) of the bored disk rotor (D) rotating forward is in contact with a front-side projecting curved surface of the rear curved wing (11), the dispensing roller (35), and an upstream-side opening edge of the coin lead-out opening (17) by first to third contact points (P1), (P2), and (P3), respectively, a virtual straight line connecting the first and second contact points (P1) and (P2) leans to outside from the center (O) of the minimum coin (Cs) by a certain distance; if it is assumed that the minimum coin (Cs) pushed in a second direction by the rear curved wing (11) of the bored disk rotor (D) rotating backward at this point is in contact with a rear-side recessed curved surface (12r) of the rear curved wing (11), the dispensing roller (35), and the upstream-side opening edge of the coin lead-out opening (17) by the first to third contact points (P1), (P2), and (P3), respectively, the rotation circle trajectory of the first contact point (P1) is leaned to outside from the center (O) of the minimum coin (Cs) by a certain distance (L2); and the upstream-side opening edge of the coin lead-out opening (17) is formed as a coin guiding wall surface (58) formed of a smooth recessed curve or straight line that circumscribes a cylindrical inner surface of the coin housing hopper so that an opening width with which the third contact point (P3) forming the upstream-side opening edge of the coin lead-out opening (17) and the separate roller (36) positioned in the downstream side are opposed to each other is wider than the diameter of a maximum coin (see Japanese Patent No. 4343199, FIG. 1 to FIG. 6, paragraph numbers 0025 to 0053).

[0008] In the above described conventional technique, in order to guide the coin so as to collect the minimum coin Cs into the circular carrying path G upon backward rotation of the bored disk rotor D, when the minimum coin

Cs is in contact with the contact points P1 to P3, the center O of the minimum coin Cs has to be positioned inside of the rotation circle trajectory of the contact point P1 by the certain distance L2, and the coin guiding wall surface 58 has to be formed to be composed of the smooth recessed curve or straight line that circumscribes the cylindrical inner surface of the coin housing hopper. Therefore, there is a problem that the applicable diameter of the minimum coin is narrowed at least by the certain distance L2, and the range of applicable coins is small.

[0009] This is for obtaining resultant force F3 of a predetermined value or more since the resultant force F3 of the pushing force F1 that works from the rear-side recessed curved surface 12r to the minimum coin center O and the reactive force F2 from the coin guiding surface 58 has to exceed sliding (friction) resistance R of the minimum coin Cs and the coin guiding surface 58.

[0010] Therefore, since the diameter of the minimum coin Cs is always the diameter to which the certain distance L2 is added, there is a problem that the application range of coin diameters is limited.

SUMMARY OF THE INVENTION

[0011] A first object of the present invention is to provide a coin dispenser having a wide application range of coin diameters.

[0012] A second object of the present invention is to provide a coin dispenser that does not require addition of the certain distance L2, in other words, that can carry out backward rotation of the rotating disk even when the center of the coin is positioned outside of the rotation circle trajectory of the first contact point P1 of the rear curved wing. In other words, it is to provide a coin dispenser that can return the coin into the storage hole by backward rotation of the rotating disk even when the center of the coin is positioned outside of the rotation circle trajectory of the first contact point P1.

[0013] A third object of the present invention is to provide a coin dispenser that is low cost and can return the coin into the storage hole upon backward rotation of the rotating disk even when the center of the coin is positioned outside of the rotation circle trajectory of the first contact point P1 of the rear curved wing.

[0014] Other objects of the present invention which have not been described herein clearly will become apparent from the following explanation and the accompanying drawings.

[0015] The present invention has a below configuration in order to achieve the above described objects.

[0016] A coin dispenser for dispensing coins of a plurality of denominations having different diameters without setting adjustment, comprising: a base for supporting a surface of the coins; a coin guiding wall for guiding the coins on the base, is disposed on the base and forms a circular storage hole partially having an opening; a rotating disk is rotatable in a first rotating direction and a second rotating direction opposite to the first rotating direc-

tion about a rotating axis in the storage hole, forms a plurality of through holes disposed along a circumferential direction at eccentric positions with respect to the rotating axis, and has a pusher disposed between the mutually adjacent through holes in a back side of the rotating disk and projecting to the base side; a first coin guide is disposed outside of the storage hole on the base and in a rear end side of the opening in the first rotating direction; a second coin guide is disposed outside of the storage hole on the base and disposed in a front end side of the opening in the first rotating direction; and an ejecting roller is disposed outside of the storage hole on the base with a predetermined interval from the second coin guide and is elastically biased so as to get closer to the second coin guide; wherein, when the rotating disk is rotated in the first rotating direction, the coin on the base is pushed and moved by a front surface of the pusher positioned in the first rotating direction side while guiding the coin by the coin guiding wall, and the coin is then pushed by the front surface of the pusher and moved to a part between the second coin guide and the ejecting roller while guiding the coin by the first coin guide subsequent to the coin guiding wall to eject the coin by biasing force of the ejecting roller; when the rotating disk is rotated in the second rotating direction, the coin partially positioned outside of the storage hole on the base is pushed by a rear surface of the pusher positioned in the second rotating direction side and moved while guiding the coin along the first coin guide to return the coin into the storage hole; and the first coin guide is comprised of a rotor rotatable about an axis approximately vertical to the base.

[0017] In the coin dispenser of the present invention, when the rotating disk is rotated in the first rotating direction (hereinafter, also referred to as forward rotation), in the process in which the coin is pushed by the front surface of the pusher and slid on the base, the coin is guided by a cylindrical surface of a rotor constituting the first guide and pushed in the circumferential direction of the rotating disk, is pushed into the part between the second guide and the ejecting roller, and is finally ejected by the ejecting roller.

[0018] When the rotating disk is rotated in the second rotating direction (hereinafter, also referred to as backward rotation), the coin is pushed by the rear surface of the pusher and is pushed against the ejecting roller and the rotor. Therefore, the resultant force of the pushing force toward the center of the coin by the rear surface of the pusher and the reactive force from the rotor causes returning force toward the inside of the storage hole to work. In this case, since the first guide has the cylindrical surface, the angle formed by the pushing force and the reactive force is a large angle compared with that in a case in which the first guide is a continuous arc-shaped or straight guide. In other words, the resultant force that works as the returning force is increased compared with that of the continued arc-shaped or straight outlet guide. Furthermore, since the rotor rotates, the coin and the

cylindrical surface are in rolling contact, and moving resistance of the coin is extremely small. As a result, even in a case in which the center of the coin is positioned outside of the backward-rotation trajectory of the rear surface of the pusher, the coin can be returned into the storage hole. In other words, even when the center of the coin is positioned outside of the backward-rotation trajectory of the back side of the pusher, the rotating disk can be rotated backward while rotating the coin together. Therefore, there is an advantage that the range of applicable coins can be expanded.

[0019] Furthermore, since the relation between the coin and the first guide is rolling contact, dispensing resistance is reduced, and there is an advantage that the coin can be smoothly dispensed.

[0020] In a preferred example of the coin dispenser of the present invention, an outer circumference of the rotor is formed so that: when the rotating disk is rotated in the first rotating direction, at a point when a minimum diameter coin among the coins of the plurality of denominations is brought into contact with the front surface of the pusher, the first coin guide, and the ejecting roller, a center of the minimum diameter coin is positioned in the second coin guide side with respect to a virtual straight line connecting a contact point of the front surface of the pusher and the minimum diameter coin and a contact point of the ejecting roller and the minimum diameter coin; and, when the rotating disk is rotated in the second rotating direction, at a point when the minimum diameter coin is brought into contact with the rear surface of the pusher, the ejecting roller, and the first coin guide, the center of the minimum diameter coin is positioned in the storage hole side with respect to a virtual straight line connecting a contact point of the rear surface of the pusher and the minimum diameter coin and a contact point of the first coin guide and the minimum diameter coin.

[0021] In this case, when the rotating disk is rotated forward and the minimum diameter coin is brought into contact with the front surface of the pusher, the first coin guide, and the ejecting roller, the center of the minimum diameter coin is positioned in the second coin guide side with respect to the virtual straight line connecting the contact point of the front surface of the pusher and the minimum diameter coin and the contact point of the ejecting roller and the minimum diameter coin; therefore, the pushing force in the direction toward the ejecting roller works on the minimum diameter coin. Furthermore, when the rotating disk is rotated backward and the minimum diameter coin is brought into contact with the rear surface of the pusher, the ejecting roller, and the first coin guide, the center of the minimum diameter coin is positioned in the storage hole side with respect to the virtual straight line connecting the contact point of the rear surface of the pusher and the minimum diameter coin and the contact point of the first coin guide and the minimum diameter coin. Therefore, the pushing force toward the storage hole works on the minimum diameter coin. Therefore, there is an advantage that the minimum diameter coin

can be more reliably dispensed and push-returned into the storage hole.

[0022] In a preferred example of the present invention, the rotor is comprised of a ball bearing roller.

[0023] In this case, since the rotor is a ball bearing roller, the moving resistance of the coin is reduced, and there is an advantage that the coin can be more smoothly dispensed and push-returned into the storage hole. Furthermore, when a generally sold ball bearing roller is used, there is an advantage that the dispenser can be manufactured at low cost.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The features and advantages of the invention will be more clearly understood from the following description taken in conjunction with the accompanying drawings.

FIG. 1 is a vertical cross sectional view of a coin dispenser of an embodiment of the present invention.

FIG. 2 is a plan view of a state in which a storing bowl of the coin dispenser of the embodiment of the present invention is removed.

FIG. 3 is a plan view of the coin dispenser of the embodiment of the present invention (only the storing bowl and pushers of a rotating disk are shown, and the others are not shown).

FIG. 4 is an explanatory drawing of a hopper of the coin dispenser of the embodiment of the present invention.

FIG. 5 is a working explanatory drawing (guide by an outlet rotor upon forward rotation) of the coin dispenser of the embodiment of the present invention. FIG. 6 is a working explanatory drawing (during entrance upon forward rotation) of the coin dispenser of the embodiment of the present invention.

FIG. 7 is a working explanatory drawing (immediately before ejection upon forward rotation) of the coin dispenser of the embodiment of the present invention. FIG. 8 is a working explanatory drawing (upon ejection upon forward rotation) of the coin dispenser of the embodiment of the present invention.

FIG. 9 is a working explanatory drawing (immediately after ejection) of the coin dispenser of the embodiment of the present invention.

FIG. 10 is a working explanatory drawing (upon start of backward rotation) of the coin dispenser of the embodiment of the present invention.

FIG. 11 is a working explanatory drawing (upon start of guide by the outlet rotor upon backward rotation) of the coin dispenser of the embodiment of the present invention.

FIG. 12 is a working explanatory drawing (upon end of guide by the outlet rotor upon backward rotation) of the coin dispenser of the embodiment of the present invention.

FIG. 13 is an explanatory drawing of a conventional technique.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] The present embodiment is an example of a coin dispenser that can dispense 1-yen coins 1C, 5-yen coins 5C, 10-yen coins 10C, 50-yen coins 50C, 100-yen coins 100C, and 500-yen coins 500C of Japanese coins without the need of some sort of adjustment and part replacement. In other words, this is an example of the coin dispenser that can dispense the coins one by one in a range from a minimum diameter coin SC having a diameter of 20 millimeters of the 1-yen coin 1C to a maximum diameter coin LC having a diameter of 26 millimeters of the 500-yen coin without some sort of adjustment and part replacement.

[0026] However, the present invention is not limited to the above described denominations, but can be also applied to foreign coins, play medals, etc.

[0027] For the convenience of explanation, except for the cases in which coins of particular denominations are explained, coins C are used as a collective term, and the minimum diameter coin SC will be explained as "1-yen coin 1C" since it is a 1-yen coin 1C.

[0028] As shown in FIG. 1, a coin dispenser 100 has a function to sort the 1-yen coin 1C to the 500-yen coin 500C, which are in bulk, one by one and then eject the coins one by one. In the present embodiment, the coin dispenser 100 roughly has: a frame 102, a base 104, a storing bowl 106, a rotating disk 108, a coin guiding wall 110, regulating pins 112, an outlet guide (corresponding to a first coin guide of the present invention) 114, a fixed part 118 and an ejecting roller 120 constituting a hopper 116, a coin detector 122, and a coin outlet 123. The frame 102, the base 104, the storing bowl 106, the rotating disk 108, the coin guiding wall 110, the regulating pins 112, the fixed part 118 and the ejecting roller 120 constituting the hopper 116, the coin detector 122, and the coin outlet 123 are conventionally publicly known structures. The invention of the present application relates to the structure of the outlet guide 114.

[0029] First, the frame 102 will be explained mainly with reference to FIG. 1.

[0030] The frame 102 has a function that functional parts such as the base 104, the storing bowl 106, etc. are attached thereto, and the frame 102 in the present embodiment has a hollow rectangular box shape made of a metal plate.

[0031] An upper-surface opening of the frame 102 is covered with the base 104.

[0032] An electric motor 124 which is equipped with a decelerator and can be rotated forward and backward is fixed to a back side of the base 104, and an output shaft 126 thereof passes through a circular through hole 128 formed in the base 104 and projects to the upper side of the base 104. If coin jamming occurs, the electric motor

124 is rotated backward for a predetermined period of time and by a predetermined number of rotations, thereby contributing to automatic removal of the coin jamming.

[0033] The base 104 is horizontally disposed in the present embodiment, but may be disposed to be tilted.

[0034] Next, the base 104 will be explained mainly with reference to FIG. 1.

[0035] The base 104 has a function that the coins C are pushed and moved on an upper surface thereof by the rotating disk 108. The base 104 is a flat plate made of stainless steel or a resin having antifriction properties, and an upper surface thereof is formed to have predetermined flatness.

[0036] A coin peripheral guiding plate 130 which forms the coin guiding wall 110 and has a predetermined thickness is closely fixed to the upper surface of the base 104.

[0037] Therefore, the base 104 can be replaced by another mechanism that has a similar function.

[0038] Next, the storing bowl 106 will be explained mainly with reference to FIG. 1.

[0039] The storing bowl 106 has a function to store many coins C in bulk. In the present embodiment, the storing bowl 106 has an approximately vertical tubular shape made of resin, and the inside of the tube is formed into a coin storing unit 132 extending in the vertical direction. The coin storing unit 132 is formed so that a horizontal cross section of an upper portion 106A is rectangular and that a horizontal cross section of a lower portion 106U is formed into a circular bottom hole 134. An intermediate portion 106M between the upper portion 106A and the lower portion 106U is formed into a slope on which the coins C can slide.

[0040] In a lower end part of the storing bowl 106, an attachment part 135 projecting in a lateral direction like a flange is formed, and the storing bowl 106 is fixed to the base 104, specifically, to the coin peripheral guiding plate 130 by using this attachment part 135.

[0041] Therefore, the storing bowl 106 can be changed to another device that has a similar function.

[0042] Next, the rotating disk 108 will be explained mainly with reference to FIG. 1 to FIG. 3.

[0043] The rotating disk 108 has a function to be rotated at a predetermined speed, stir the coins C in the storing bowl 106, push and rotate together the coins C fallen into through holes 136 formed at eccentric positions, and eliminate coin jamming by backward rotation when coin jamming occurs.

[0044] In the present embodiment, the rotating disk 108 is disposed in the bottom hole 134 of the storing bowl 106, is rotated forward counterclockwise in FIG. 2 at a predetermined speed upon dispensing of the coins C by a direct-current electric motor 124 fixed to a back side of the base 104, and is rotated at a predetermined speed clockwise, which is in the opposite direction, if coin jamming occurs.

[0045] The rotating disk 108 has a stirrer 138 having a conical shape or a polygonal pyramid shape at the center, stirs the coins C by rotating in the bottom hole 134,

and facilitates fall of the coins C into the through holes 136.

[0046] The rotating disk 108 has pushers 142 on back sides of respective ribs 140 between the through holes 136.

[0047] The pusher 142 undergoes rotary movement in a storage hole 144 of the coin peripheral guiding plate 130, which is closely fixed to the upper surface of the base 104 and has a predetermined thickness. As shown in FIG. 2, a pushing front surface 147 thereof has a curved shape so as to be retreated from a rotating axis RA side of the rotating disk 108 to a rotating-direction rear position side toward a circumferential edge side. Specifically, the pusher 142 is comprised of a first pusher 142A close to the rotating axis RA side and a second pusher 142B close to the circumferential edge side. An arc-shaped first relief groove 148A is formed in the rotating axis RA side of the first pusher 142A, and a second relief groove 148B is formed between the first pusher 142A and the second pusher 142B so that a first regulating pin 112A and a second regulating pin 112B, which will be described later, can pass therethrough. The front surface of the first pusher 142A is a first pushing front surface 147A, and the front surface of the second pusher 142B is a second pushing front surface 147B.

[0048] Therefore, while the coin C which has fallen into the through hole 136 is brought into contact with and supported by the base 104 by the surface thereof and is guided by the coin guiding wall 110 of the storage hole 144, the coin C is pushed by the first pusher 142A by the rotation of the rotating disk 108 and is rotated together with the rotating disk 108 in a moving passage MP. Then, when the coin C reaches a predetermined position of an outlet passage 152, pushing is switched to that by the second pusher 142B, and the coin C is moved to the hopper 116 while guiding and pushing the coin by the outlet guide 114 and the ejecting roller 120.

[0049] On the other hand, the coin C that is rotated together with and moved by the rotating disk 108 without being guided by the coin guiding wall 110 is ejected from the base 104 and is forcibly guided in the circumferential direction of the rotating disk 108, in other words, to the upper side of FIG. 2 by the later-described first regulating pin 112A and the second regulating pin 112B positioned in the moving passage MP of the coins C.

[0050] When coin jamming occurs, the rotating disk 108 is rotated backward. As a result of this backward rotation, a rear surface tip 150E of a rear surface 150 of the second pusher 142B pushes the circumferential surface of the coin C and moves the coin in the opposite direction of that of forward rotation.

[0051] Next, the coin guiding wall 110 will be explained mainly with reference to FIG. 1 to FIG. 3.

[0052] The coin guiding wall 110 has a function to guide the circumferential surface of the coin C, which is rotated together by the rotating disk 108. In the present embodiment, the coin guiding wall 110 is an inner wall surface of the approximately circular storage hole 144 formed in

the coin peripheral guiding plate 130, which is formed into a rectangle approximately same as the base 104 and has a thickness slightly larger than the thickness of the thickest coin C among the coins C of handling targets; and part thereof is cut to form a storage hole outlet 154. In other words, the coin guiding wall 110 has a C-shape, and the storage hole outlet 154 is formed to have a diameter of about 1.5 times the diameter of the maximum diameter coin. Specifically, the storage hole outlet 154 is a slit-like opening formed by an upstream-side end 110E and a downstream-side end 110L of the coin guiding wall 110.

[0053] The coin peripheral guiding plate 130 is closely fixed to the upper surface of the base 104, and the lower surface of the attachment part 135 of the storing bowl 106 is detachably closely fixed to the upper surface of the coin peripheral guiding plate 130. In this state, the axial cores of the rotating axis RA, the bottom hole 134, and the storage hole 144 are disposed to mutually match. In other words, the vertical axes of the rotating disk 108, the bottom hole 134, and the storage hole 144 are mutually the same. The diameter of the rotating disk 108 is formed to be slightly smaller than the diameter of the storage hole 144, and a tip of the pusher 142 in the circumferential edge side of the rotating disk 108 is formed to have a diameter slightly smaller than that of the storage hole 144 so that it can be rotated in the storage hole 144.

[0054] While the coin C which has fallen into the through hole 136 is pushed by the pusher 142 in the state in which the lower surface thereof is supported by the base 104 in the above described manner, the circumferential surface thereof is guided by the coin guiding wall 110, and the coin is moved in the moving passage MP. In other words, the moving passage MP has an approximately circular ring shape.

[0055] Therefore, the coin peripheral guiding plate 130 is only required to have a function to guide the coins C so that the coins C are guided by the coin guiding wall 110 and moved in the moving passage MP.

[0056] The base 104 and the coin peripheral guiding plate 130 may be integrally formed.

[0057] Next, the regulating pins 112 will be explained mainly with reference to FIG. 3.

[0058] The regulating pins 112 have a function to guide the coin C, which is rotated together by the rotating disk 108, in the circumferential direction of the rotating disk 108, in other words, to the storage hole outlet 154 side and have a function to be pushed downward by the coin C, which is pushed by the rear surface 150 of the pusher 142, and allow the coin C to move in the opposite direction in the moving passage MP when the rotating disk 108 is rotated backward. In the present embodiment, the regulating pins are comprised of the first regulating pin 112A and the second regulating pins 112B elastically projecting from the upper surface of the base 104. However, if the coin C moves by itself toward the storage hole outlet 154 side by centrifugal force, the regulating pins 112 are not necessarily required, and the regulating pins 112 can

be arbitrarily installed. In the present embodiment, the regulating pins 112 are disposed just in case.

[0059] Each of the first regulating pin 112A and the second regulating pin 112B is a cylinder fixed to rise from a second end of a plate spring (not shown) having a first end fixed to the back side of the base 104. The head of the cylinder projects to above the base 104 from a through hole formed in the base 104, but projects by a degree that the head does not abut the back side of the rotating disk 108. A slope 156 (first slope 156A, second slope 156B) tilted so that the component force that pushes the pin into the base 104 is caused to work by the coin C pushed in the opposite direction in the moving passage MP is formed on the head. The shape of the head employs, for example, the invention disclosed in Japanese Utility Model No. 2594435.

[0060] In the present embodiment, as shown in FIG. 10, a first extension line EA of the first slope 156A and a second extension line EB of the second slope 156B are formed to intersect with each other by an obtuse angle Z. When the coin C (in the present embodiment, 1-yen coin 1C) is rotated together in the opposite direction by the rear surface 150 of the pusher 142 upon backward rotation of the rotating disk 108 and abuts the second slope 156B, the component force moving toward the axis RA side works with respect to the 1-yen coin 1C. As a result, the 1-yen coin 1C is brought into contact with the first slope 156A and the second slope 156B and then pushes down the first regulating pin 112A and the second regulating pin 112B on which they are formed, thereby carrying out continuous backward rotation of the rotating disk 108. In a case in which a bisector BIS of the obtuse angle Z orthogonally intersects with a straight line FL which passes through the axis RA, the center 1CC of the 1-yen coin 1C is set to be positioned on the bisector BIS in the vicinity of the intersecting part (this is the same also in cases of other denominations). When formed in this manner, even in a case in which the coin C abuts the first slope 156A or the second slope 156B, the component force that works from the abutting first slope 156A or the second slope 156B causes the coin to be brought into contact with both of the first slope 156A and the second slope 156B approximately uniformly, and large force is prevented from working on part of the circumferential surface of the coin C. Therefore, there is an advantage that the coin C is not damaged.

[0061] Therefore, when the coin C is pushed by the pusher 142 upon forward rotation of the rotating disk 108 and collides with the first regulating pin 112A and the second regulating pin 112B, while the coin C is pushed by the pusher 142, the coin C is guided by the first regulating pin 112A and the second regulating pin 112B and guided toward the storage hole outlet 154. When the rotating disk 108 is rotated backward, the coin C pushed by the rear surface 150 of the pusher 142 pushes the first slope 156A and the second slope 156B at the heads of the first regulating pin 112A and the second regulating

ulating pin 112A and the second regulating pin 112B and moves them into the base 104. As a result, the coin C is kept being pushed by the rear surface 150 of the pusher 142 and is moved in the opposite direction of the forward-rotation direction in the moving passage MP.

[0062] Next, the outlet passage 152 will be explained mainly with reference to FIG. 3.

[0063] The outlet passage 152 is a passage through which the coin C moved from the storage hole outlet 154 can be moved to the later-described coin outlet 123 and is formed to be continued to the downstream of the storage hole outlet 154. Therefore, the outlet passage 152 is not required to be formed into a channel shape of which three sides are surrounded or into a rectangular shape of which four sides are surrounded, and the outlet passage 152 is only required to guide at least the lower surface of the coin C. In the present embodiment, the outlet passage 152 is formed of the upper surface of the base 104.

[0064] Therefore, the coin C moved from the storage hole outlet 154 passes through the outlet passage 152 and is released from the later-described coin outlet 123.

[0065] Next, the outlet guide 114 will be explained mainly with reference to FIG. 3.

[0066] The outlet guide 114 has a function to guide the coin C toward the hopper 116 upon forward rotation of the rotating disk 108 and, upon backward rotation of the rotating disk 108, to guide the coin C and returns the coin into the storage hole 144. A cylindrical surface 160 positioned in the lateral side of an upstream-side end 110E side of the storage hole outlet 154 is comprised of an outlet rotor 162 which is rotatable about a second axis RB. The outlet rotor 162 uses a roller 164 in the present embodiment, more specifically, uses generally commercially available small ball bearing. This is for a reason that, although the roller 164 can use a roller bearing or a bush, the dispenser can be formed at low cost since the commercially available ball bearing is a mass-produced product. If the ball bearing is used as the roller 164, an outer race corresponds to the roller 164, and an inner race is fixed to a first supporting shaft 158 or attached so as not to fall therefrom.

[0067] The roller 164 is rotatably attached to an upper portion of the first supporting shaft 158, which is vertical to the base 104. Therefore, the outer circumferential surface of the roller 164 is the cylindrical surface 160.

[0068] The outlet rotor 162 is disposed in a lateral side of the outlet passage 152 in the middle of the part between the upstream-side end 110E and the ejecting roller 120 and is disposed with a predetermined distance away from a first straight line L1, which forms a tangent line with the ejecting roller 120 positioned at a later-described standby position SP and is connected to the upstream-side end 110E. Specifically, the outlet rotor 162 is disposed so that the first straight line L1 and the cylindrical surface 160 of the outlet rotor 162 are away from each other at least by the distance that is half of the diameter of the outlet rotor 162. Regarding the position of the outlet

rotor 162, in a case in which the minimum diameter coin serving as a target which is the 1-yen coin 1C in the present embodiment is pushed by the rotating disk 108 rotated backward, therefore, by the rear surface tip 150E of the pusher 142 and is brought into contact with the ejecting roller 120 positioned at the standby position SP and the outlet rotor 162 (FIG. 11), the center 1CC of the 1-yen coin 1C is positioned outside of a backward-rotation trajectory CCL formed by the rear surface tip 150E. The diameter of the outlet rotor 162 is determined comprehensively in consideration of the permissible size of the dispenser, the application range of the diameters of the coins C, etc. In the case in which the 1-yen coin 1C to the 500-yen coins 500C serve as targets in the present embodiment, the diameter of the outlet rotor 162 is preferred to be 7 to 8 millimeters. Furthermore, the position thereof is preferred to be disposed at a position closer to the upstream-side end 110E than from an intermediate point M of the upstream-side end 110E and the ejecting roller 120. A reason therefor is that coin C is dropped in a first gap 166 between the upstream-side end 110E and the outlet rotor 162 and a second gap 168 between the outlet rotor 162 and the ejecting roller 120, coin jamming may occur if the dropped distance is large, and the dispensable small-diameter-side coin range is limited if the dropped distance is small. The permissible range of the dropped distance of the 1-yen coin 1C in the first gap 166 is about one-fifth of the radius of the 1-yen coin 1C. This is for a reason that, if the 1-yen coin 1C is dropped more than that, the 1-yen coin 1C cannot be smoothly moved, and a pressed dent may remain on the 1-yen coin 1C, which is made of aluminum.

[0069] In a case in which the rotating disk 108 is rotated forward in the manner shown in FIG. 5, when the 1-yen coin 1C is pushed against the outlet rotor 162 and the ejecting roller 120 by the second pusher 142B, the center of the 1-yen coin 1C is positioned in the fixed part 118 side with respect to a straight line (not shown) connecting a contact point of the pushing front surface 147 of the pusher 142 and the 1-yen coin 1C and a contact point of the ejecting roller 120 and the 1-yen coin 1C, is pushed toward the later-described fixed part 118 by resultant force F23 of pushing force F21 from the second pusher 142B toward the coin center 1CC and reactive force F22 from the ejecting roller 120 toward the coin center 1CC, is pushed between the fixed part 118 and the ejecting roller 120 (FIG. 6), and finally ejected by the ejecting roller 120. A point for dispensing the 1-yen coin 1C upon forward rotation is to implement a setting so that the resultant force F23 of the pushing force F21 from the pusher 142 toward the coin center 1CC and the reactive force F22 from the ejecting roller 120 is toward the fixed part 118 side and that the coin is guided to a position at which the resultant force F23 exceeds the resistance force of the rotational resistance of the ejecting roller 120, etc. When such a setting is implemented, even the 1-yen coin 1C can be smoothly dispensed without damaging the coin.

[0070] In a case in which the rotating disk 108 is rotated backward, the rotating disk 108 can rotate the 1-yen coin 1C together in the backward direction by implementing a setting so that, as shown in FIG. 11, the center of the 1-yen coin 1C is positioned in the storage hole 144 side with respect to a straight line (not shown) connecting a contact point of the rear surface 150 of the pusher 142, specifically, the rear surface tip 150E of the second pusher 142B and the 1-yen coin 1C and a contact point of the outlet rotor 162 and the 1-yen coin 1C, that resultant force F13 of pushing force F11 from the rear surface tip 150E toward the center 1CC of the 1-yen coin 1C and reactive force F12 from the outlet rotor 162 toward the center 1CC of the 1-yen coin 1C is toward the storage hole 144 side, and the coin is guided to a position at which the resultant force exceeds the resistance force of rotation resistance of the outlet rotor 162, etc. By virtue of this setting, even when the coin center 1CC is positioned outside of the backward-rotation trajectory CCL of the rear surface tip 150E of the pusher 142, the 1-yen coin 1C can be returned into the storage hole 144. Therefore, the rotating disk 108 can be continuously rotated backward, and coin jamming can be effectively eliminated.

[0071] As a result, corresponding to the distance by which the coin center CC of the 1-yen coin 1C is positioned outside of the backward-rotation trajectory CCL, the coin C having a smaller diameter can be rotated together upon backward rotation, and there is an advantage that the application range of coin diameters is widened.

[0072] Next, the hopper 116 will be explained mainly with reference to FIG. 2 and FIG. 4.

[0073] The hopper 116 has a function to eject the coin C, which is pushed in the circumferential direction of the rotating disk 108 by the pushing front surface 147B of the pusher 142, by spring force of an elastic part. In the present embodiment, the hopper 116 is comprised of the fixed part 118 (corresponding to a second coin guide of the present invention) and the ejecting roller 120.

[0074] First, the fixed part 118 will be explained.

[0075] The fixed part 118 has a function to receive the coin C, which has been pushed by the pusher 142 and pushed out to the storage hole outlet 154, and guide the coin in the circumferential direction of the rotating disk 108, in other words, a function to define one side of the outlet passage 152. In the present embodiment, the fixed part 118 is comprised of a fixed roller 170 and a fixed guide 171.

[0076] The fixed roller 170 is not completely fixed and is preferred to be set so as to be slightly moved and buffer excessive force when the excessive force is applied in the later described manner. This is for improving the durability of the dispenser. Also, the fixed roller 170 is not required to be a roller, but may be a plate formed to be integrated with the fixed guide 171. For example, part of the coin peripheral guiding plate 130 may have an arc-shaped circumferential surface corresponding to the fixed roller 170, and the fixed guide 171 may be formed

to be continued thereto. Therefore, the fixed part 118 can be changed to another device having a similar function.

[0077] In the present embodiment, the fixed roller 170 is projecting upward from a first lever 174 rotatably supported by a second supporting shaft 172 projecting downward to the back side of the base 104, and a roller 178, which is penetrating through a through hole (not shown) formed in the base 104 and is rotatably supported by a tip of a third supporting shaft 176 positioned in the upper side of the base 104, is a ball bearing 178. The first lever 174 is biased clockwise in FIGs. 2 and 4 by the spring force of an elastic part, which is a first spring 180 in the present embodiment. At the position of FIG. 2, in other words, at the position adjacent to the downstream-side end 110L of the storage hole 144, turning of the first lever 174 is stopped and maintained in a still state by a first stopper 182.

[0078] At this still position, the inner circumferential surface of the circumferential surface of the ball bearing 178 is disposed on a virtual circle of the storage hole 144 so as to form part of the inner surface of the storage hole 144.

[0079] The spring force of the first spring 180 is set so that, when the coin C is collided in a normal case, the first spring 180 is not moved, but is slightly moved for relief when force larger than the normal case works. This is for a reason that even slight movement for relief can buffer the overload caused by the coin C and contributes to improvement of the durability of the dispenser.

[0080] Next, the fixed guide 171 will be explained.

[0081] The fixed guide 171 has a function to guide the coin C, which has been guided by the fixed roller 170, in a predetermined direction and a function to sandwich the coin C with the ejecting roller 120 and finally eject the coin. In the present embodiment, a first straight part 184, a curved part 186, and a second straight part 188 are sequentially formed therein from the fixed roller 170 side.

[0082] The first straight part 184 is formed so that the first extension line EL thereof forms a tangent line with respect to the fixed roller 170 and that a tangent line CL with respect to the fixed roller 170 extended from an end of the coin guiding wall 110 forms an acute angle close to 90 degrees therewith.

[0083] The second straight part 188 is formed to be parallel to a perpendicular line VL (for the sake of convenience, will be referred to as a perpendicular line) passing through the rotating axis RA in FIG. 2.

[0084] The curved part 186 is formed to be a circular arc that smoothly connects the first straight part 184 and the second straight part 188 to each other.

[0085] The second straight part 188, which determines the final dispensing direction of the coin C, is arbitrarily determined by the dispensing direction of the coin C, is not required to be parallel to the perpendicular line VL, but may be a curved line.

[0086] In the present embodiment, the fixed guide 171 is formed to be separated from the base 104 and the coin peripheral guiding plate 130, but may be integrally formed

with one of or both of them.

[0087] Next, the ejecting roller 120 will be explained mainly with reference to FIG. 4.

[0088] The ejecting roller 120 has a function to eject the coin C, which has been pushed into the outlet passage 152 and of which part or whole is guided by the fixed guide 171. In the present embodiment, the ejecting roller 120 is a roller which is fixed upward from an end of a second lever 192 of which part is rotatably supported by a fourth supporting shaft 190 projecting downward from the back side of the base 104, and the roller is rotatably attached to an upper end of a fifth supporting shaft 196, which penetrates through an arc-shaped long hole 194 formed in the base 104 like an arc about the fourth supporting shaft 190 and is projecting to the upper side of the base 104. In the present embodiment, the ejecting roller 120 is a ball bearing 197. The ejecting roller 120 can be changed to another device having a similar function.

[0089] The second lever 192 is elastically biased so as to get close to the fixed part 118 side by a second spring 202 of which ends are stopped by a first stopper part 198 formed at part thereof and a second stopper part 200 projecting downward from the base 104. The second lever 192 is stopped by a second stopper 204, which is projecting downward from the back side of the base 104, so as to be still at a position at which a straight-line distance L between the fixed part 118 and the ejecting roller 120 is slightly smaller than an expected minimum diameter of dispensed coins. Specifically, the shortest distance L between the fixed roller 170 and the ejecting roller 120 forms an entrance gap 206 which is slightly smaller than the diameter of the 1-yen coin 1C.

[0090] Therefore, from a point immediately after the center 1CC of the 1-yen coin 1C pushed by the pusher 142 crosses a straight line DL connecting a contact point PA of the fixed roller 170 and the 1-yen coin 1C and a contact point PB of the ejecting roller 120 and the circumferential surface of the 1-yen coin 1C, the ejecting roller 120 starts ejection by the spring force of the second spring 202; and, finally, in a state in which the 1-yen coin 1C is supported between the first straight part 184 and the fixed roller 170, the coin is ejected by the ejecting roller 120 in the direction parallel to the first straight part 184. The ejected coin C is gently subjected to change of direction by the curved part 186, is then straightly guided by the second straight part 188, and is ejected in the direction parallel to the perpendicular line VL.

[0091] The forward rotation of the rotating disk 108 causes the 1-yen coin 1C to be guided by the outlet rotor 162 and be pushed by the pushing force F21 by the second pusher 142B, the 1-yen coin 1C is guided to the fixed part 118 side by the resultant force F23 caused by the reactive force F22 from the ejecting roller 120, and part of the 1-yen coin 1C enters the entrance gap 206. When the rotating disk 108 is further rotated forward, the coin C is pushed into the entrance gap 206 by the pushing force of the second pusher 142B (FIG. 6); therefore, the

ejecting roller 120 is moved in the direction to get away from the fixed roller 170 against the spring force of the second spring 202. Specifically, immediately after the entrance gap 206 is widened and the center 1CC of the 1-yen coin 1C passes the straight line DL connecting the contact point PA and the contact point PB (FIG. 7), the ejecting force caused by the second spring 202 works on the 1-yen coin 1C; therefore, ejection is started, and, finally, the coin is ejected by the ejecting roller 120 immediately after part thereof is brought into contact with an end 184E of the first straight line 184 and the fixed roller 170. While the ejected coin C is guided by the fixed guide 171, is dispensed in the direction parallel to the perpendicular line VL. In the process of this dispensing, the coin C is detected by the coin detector 122.

[0092] Next, the coin detector 122 will be explained.

[0093] The coin detector 122 has a function to detect the coin C, which is ejected by the hopper 116, and a magnetic metal sensor 208 is used in the present embodiment. Therefore, the coin detector 122 can be changed to another system such as a photoelectric sensor, a mechanical sensor, or the like.

[0094] In the present embodiment, the coin detector 122 is disposed to be opposed to the outlet passage 152 in the lateral side of the second straight part 188, but may be disposed in the downstream of the coin outlet 123.

[0095] In the end, the coin outlet 123 will be explained with reference to FIG. 2.

[0096] The coin outlet 123 has a function feed coin C from the base 104, is not particularly required to be formed into a slit-shaped passage or the like, and the coin outlet 123 is formed at a downstream end of the outlet passage 152. In other words, an end of the base 104 opposed to the outlet passage 152 is the coin outlet 123.

[0097] Next, working of the coin dispenser 100 will be explained with reference to FIG. 3 to FIG. 12.

[0098] When the coins of diameters within a predetermined range are to be dispensed by one dispenser without part replacement and position adjustment, the minimum diameter coin SC is the most problematic. Therefore, the 1-yen coin 1C will be taken as an example for explanation.

[0099] Working is different in a case in which the coin 1C is moved along the coin guiding wall 110 of the storage hole 144 and a case in which the coin C is guided and dispensed by the regulating pins 112. Therefore, the explanation will be given separately in the cases.

[0100] First, the case in which the 1-yen coin 1C is moved along the coin guiding wall 110 will be explained.

[0101] The coin C in the storing bowl 106 is dropped into the through hole 136 by the rotation of the rotating disk 108; the surface of the front side or back side thereof is brought into contact with and supported by the base 104; and, while the coin is pushed by the first pusher 142A and guided by the coin guiding wall 110 which is the circumferential wall of the storage hole 144, the coin is moved to the storage hole outlet 154 side (FIG. 3).

[0102] The coin C, which has reached the storage hole outlet 154, is dropped into the first gap 166 from the upstream-side end 110E, is supported by the cylindrical surface 160 of the outlet rotor 162, and is prevented from being dropped more than that. Then, the coin is guided by the cylindrical surface 160, is slightly moved to the entrance gap 206 side, is then dropped into the second gap 168, and is then brought into contact with and guided by the ejecting roller 120 positioned at the standby position SP (FIG. 5).

[0103] When the 1-yen coin 1C is brought into contact with the second pushing front surface 147B of the second pusher 142B, the cylindrical surface 160, and the ejecting roller 120, since the resultant force F23 of the pushing force F21 from the second pushing front surface 147B toward the coin center 1CC of the 1-yen coin 1C and the reactive force F22 from the ejecting roller 120 is toward the fixed roller 170 side as described above, the 1-yen coin 1C is guided by the cylindrical surface of the ejecting roller 120, is moved toward the entrance gap 206 side, and is positioned in the entrance gap 206 (FIGs. 5, 6).

[0104] Further rotation of the rotating disk 108 causes the 1-yen coin 1C to be pushed into the entrance gap 206 by the second pushing front surface 147B. As a result, the coin is moved in the circumferential direction of the rotating disk 108 along the arc-shaped circumferential surface of the fixed roller 170. Therefore, the ejecting roller 120 is turned clockwise in FIG. 2, and the entrance gap 206 is further expanded.

[0105] Then, the 1-yen coin 1C is further moved in the circumferential direction of the rotating disk 108, and, immediately after the center 1CC of the 1-yen coin 1C passes the straight line L connecting the contact point PA of the circumferential direction thereof and the fixed roller 170 and the contact point PB of the ejecting roller 120 and the circumferential surface of the 1-yen coin 1C, the coin receives ejecting force from the ejecting roller 120 (FIG. 7).

[0106] Then, in a state in which the circumferential direction of the 1-yen coin 1C is in contact with a tip part 182E of the first straight part 184 and the fixed roller 170, the circumferential surface of the 1-yen coin 1C is pushed by the spring force of the spring 202, and the coin is ejected toward the curved part 186 (FIG. 8).

[0107] The ejected 1-yen coin 1C is guided by the curved part 186, is then guided by the second straight part 188, and is ejected from the coin outlet 123 to the direction parallel to the perpendicular line VL (FIG. 9).

[0108] Next, the case in which the 1-yen coin 1C is guided by the regulating pins 112A and 112B and pushed into the entrance gap 206 without being guided by the coin guiding wall 110 will be explained.

[0109] In this case, the 1-yen coin 1C is moved to the entrance gap 206 without contacting the outlet rotor 162 and is then ejected by the ejecting roller 120 in a state in which the coin is in contact with the tip part 182E of the first straight part 184 and the fixed roller 170 as described above.

[0110] Then, a case in which the rotating disk 108 is rotated backward for eliminating coin jamming will be explained.

[0111] In this case, a case in which the forward rotation of the rotating disk 108 is stopped at a phase in which the 1-yen coin 1C is pushed into the entrance gap 206 is problematic. Therefore, this situation will be explained as a starting point.

[0112] When backward rotation of the rotating disk 108 is started, the pusher 142B is rotated clockwise in FIG. 10. Therefore, since the 1-yen coin 1C is no longer pushed by the second pushing front surface 147B, the ejecting roller 120 is turned counterclockwise by the spring force of the second spring 202 and returns to the standby position SP (FIG. 10). As a result, the 1-yen coin 1C is returned to the storage hole 144 side and is temporarily stopped still at a position corresponding to the standby position SP of the ejecting roller 120.

[0113] Further backward rotation of the rotating disk 108 causes the 1-yen coin 1C to be pushed to the right side in FIG. 10 by the rear surface tip 150E of the second pusher 142B. In this process, the 1-yen coin 1C is sandwiched by the rear surface tip 150E and the ejecting roller 120, the center of the 1-yen coin 1C is positioned in the storage hole 144 side with respect to the straight line connecting the contact point of the rear surface tip 150E and the 1-yen coin 1C and the contact point of the ejecting roller 120 and the 1-yen coin 1C, the rear surface tip 150E is brought into contact with one point of the circumferential surface of the 1-yen coin 1C and pushes it by pushing force F41, and reactive force F41 is generated from the ejecting roller 120. Therefore, resultant force F43 thereof works on the center 1CC of the 1-yen coin 1C. As a result, the 1-yen coin 1C is pushed in a lateral direction toward the storage hole 144, in other words, is pushed toward the second gap 168.

[0114] Then, as shown in FIG. 11, when the 1-yen coin 1C is brought into contact with the ejecting roller 120 and the outlet rotor 162, the 1-yen coin 1C is sandwiched between the rear surface tip 150E and the outlet rotor 162. At this point, since the center of the 1-yen coin 1C is positioned in the storage hole 144 side with respect to the straight line connecting the contact point of the rear surface tip 150E and the 1-yen coin 1C and the contact point of the outlet rotor 162 and the 1-yen coin 1C, the pushing force F11 caused by the rear surface tip 150E does not work on the ejecting roller 120, and the ejecting roller 120 is therefore maintained in a still state.

[0115] The reactive force F12 having the same value as the pushing force F11 works on the coin center 1CC of the 1-yen coin 1C from the outlet rotor 162. Since the resultant force F13 of the pushing force F11 and the reactive force F12 is toward the storage hole 144, further backward rotation of the rotating disk 108 causes the 1-yen coin 1C to reach the first gap 166 while being guided by the circumferential surface of the outlet rotor 162, the coin is then guided by the upstream-side end 110E and returned into the storage hole 144, and the coin is moved

along the coin guiding wall 110.

[0116] The coin C positioned in the downstream of the first regulating pin 112A and the second regulating pin 112B can pass therethrough by moving over the first slope 156A and the second slope 156B at the tips of the first regulating pin 112A and the second regulating pin 112B. Therefore, the rotating disk 108 is continuously rotated. Therefore, the rotating disk 108 can be rotated backward by an angle that is sufficient to eliminate coin jamming, and coin jamming can be eliminated.

Claims

1. A coin dispenser for dispensing coins of a plurality of denominations having different diameters without setting adjustment, comprising:

a base (104) for supporting a surface of the coins;

a coin guiding wall (110) for guiding the coins on the base, is disposed on the base (104) and forms a circular storage hole (144) partially having an opening (154);

a rotating disk (108) is rotatable in a first rotating direction and a second rotating direction opposite to the first rotating direction about a rotating axis (RA) in the storage hole (144), forms a plurality of through holes (136) disposed along a circumferential direction at eccentric positions with respect to the rotating axis (RA), and has a pusher (142) disposed between the mutually adjacent through holes (136) in a back side of the rotating disk (108) and projecting to the base (104) side;

a first coin guide (114) is disposed outside of the storage hole (144) on the base (104) and in a rear end side of the opening (154) in the first rotating direction;

a second coin guide (118) is disposed outside of the storage hole (144) on the base (104) and disposed in a front end side of the opening (154) in the first rotating direction; and

an ejecting roller (120) is disposed outside of the storage hole (114) on the base (104) with a predetermined interval from the second coin guide (118) and is elastically biased so as to get closer to the second coin guide (118); wherein, when the rotating disk (108) is rotated in the first rotating direction, the coin on the base (104) is pushed and moved by a front surface (147) of the pusher (142) positioned in the first rotating direction side while guiding the coin by the coin guiding wall (110), and the coin is then pushed by the front surface (147) of the pusher (142) and moved to a part between the second coin guide (118) and the ejecting roller (120) while guiding the coin by the first coin guide (114) sub-

sequent to the coin guiding wall (110) to eject the coin by biasing force of the ejecting roller (120);

when the rotating disk (108) is rotated in the second rotating direction, the coin partially positioned outside of the storage hole (144) on the base (104) is pushed by a rear surface (150) of the pusher (142) positioned in the second rotating direction side and moved while guiding the coin along the first coin guide (114) to return the coin into the storage hole (144); and the first coin guide (114) is comprised of a rotor (162) rotatable about an axis (RB) approximately vertical to the base (104).

2. The coin dispenser according to claim 1, wherein, an outer circumference of the rotor (162) is formed so that:

when the rotating disk (108) is rotated in the first rotating direction, at a point when a minimum diameter coin among the coins of the plurality of denominations is brought into contact with the front surface (147) of the pusher (142), the first coin guide (114), and the ejecting roller (120), a center of the minimum diameter coin is positioned in the second coin guide (118) side with respect to a virtual straight line connecting a contact point of the front surface (147) of the pusher (142) and the minimum diameter coin and a contact point of the ejecting roller (120) and the minimum diameter coin; and, when the rotating disk (108) is rotated in the second rotating direction, at a point when the minimum diameter coin is brought into contact with the rear surface (150) of the pusher (142), the ejecting roller (120), and the first coin guide (114), the center of the minimum diameter coin is positioned in the storage hole (144) side with respect to a virtual straight line connecting a contact point of the rear surface (150) of the pusher (142) and the minimum diameter coin and a contact point of the first coin guide (114) and the minimum diameter coin.

3. The coin dispenser according to any one of claims 1 and 2, wherein the rotor (162) is comprised of a ball bearing roller (164).

FIG.1

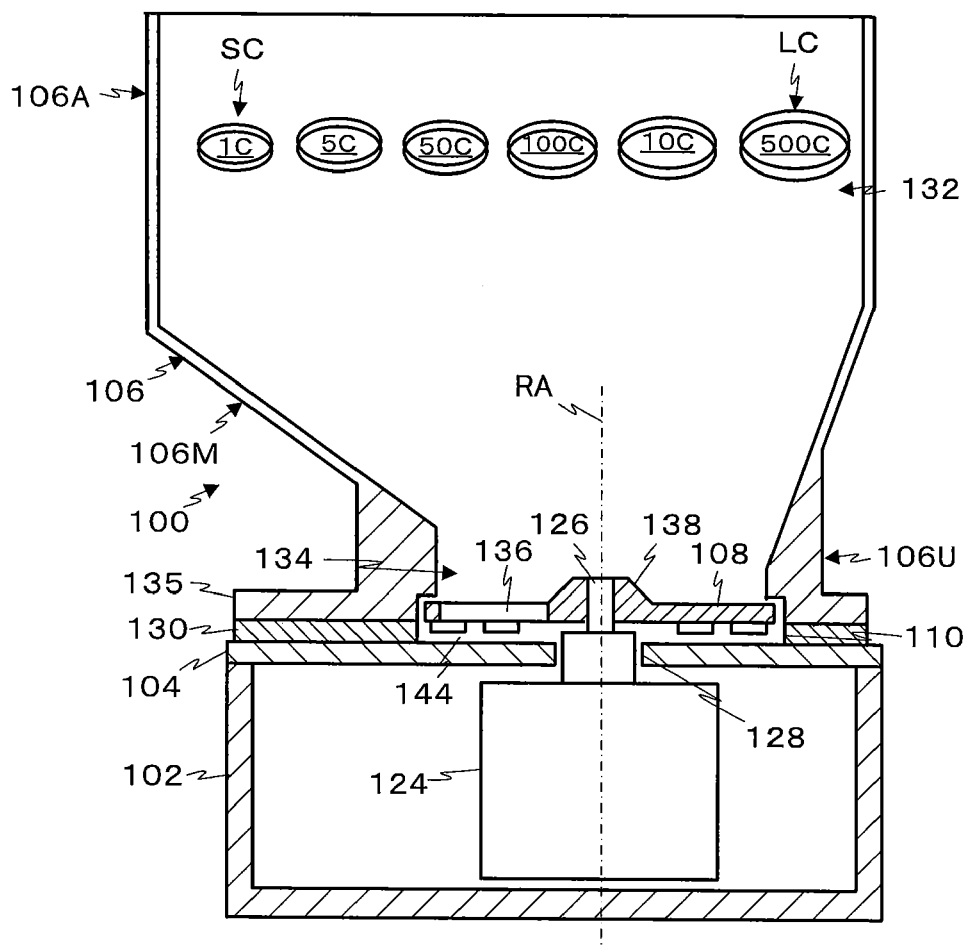


FIG.2

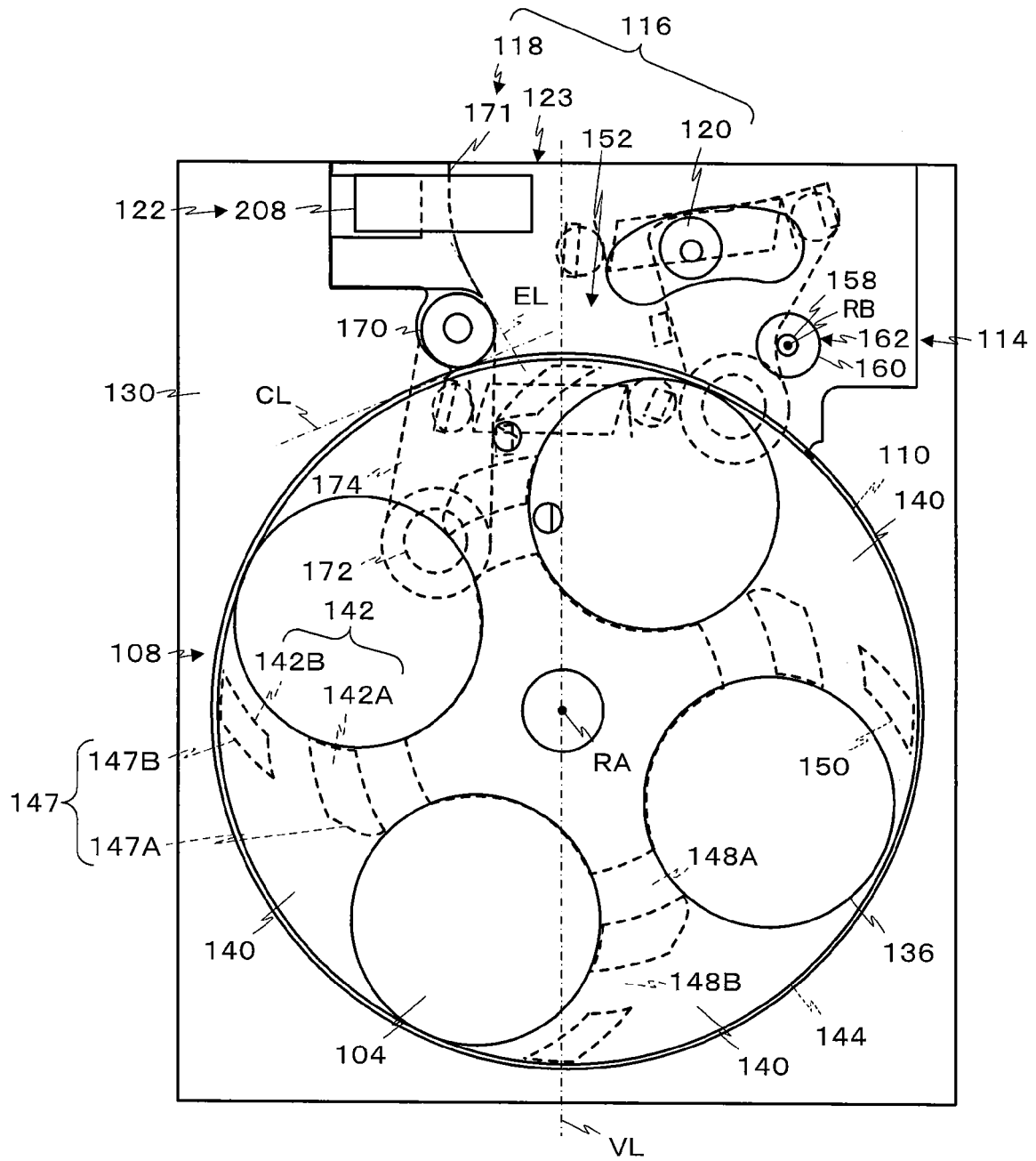


FIG.3

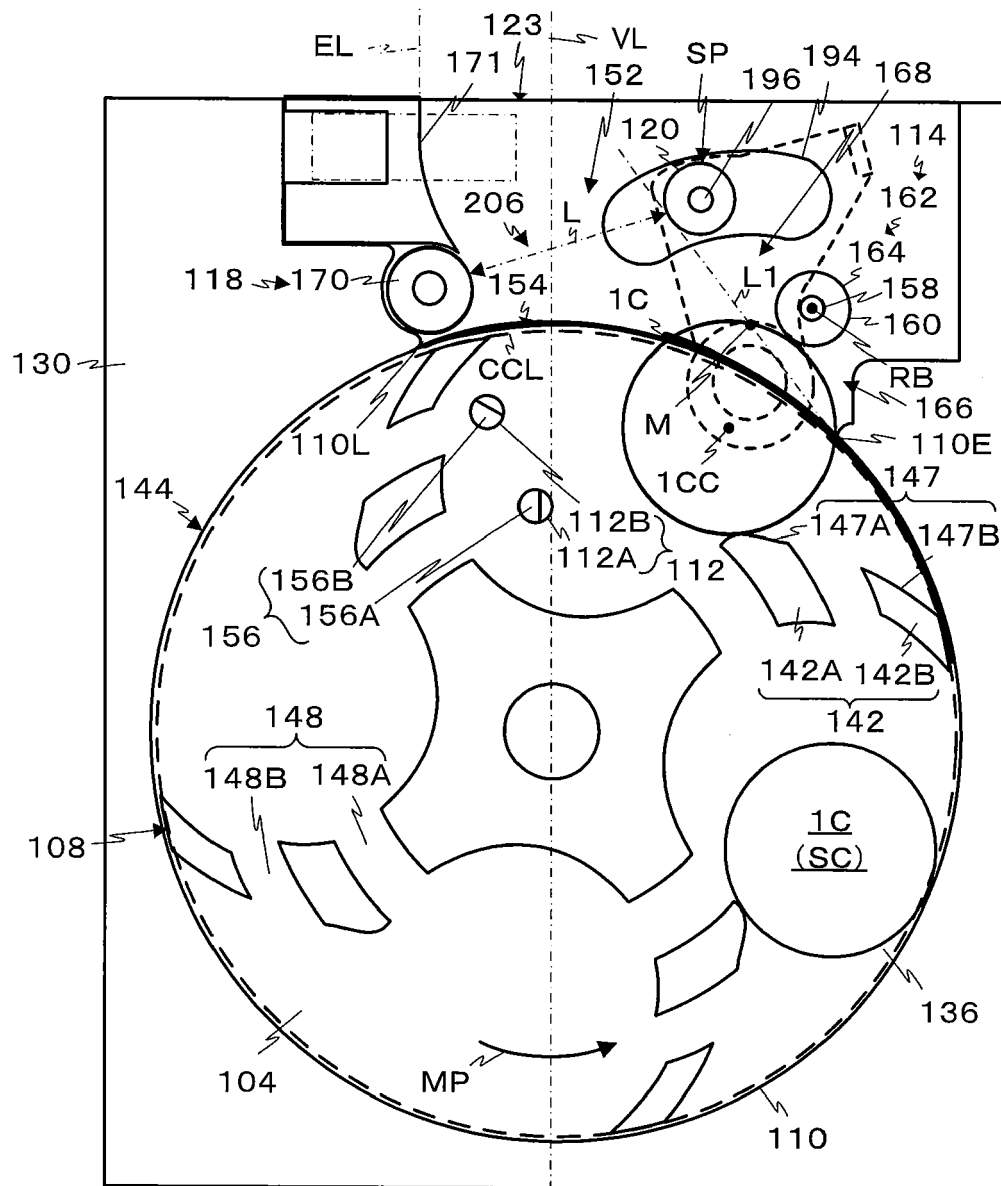


FIG.4

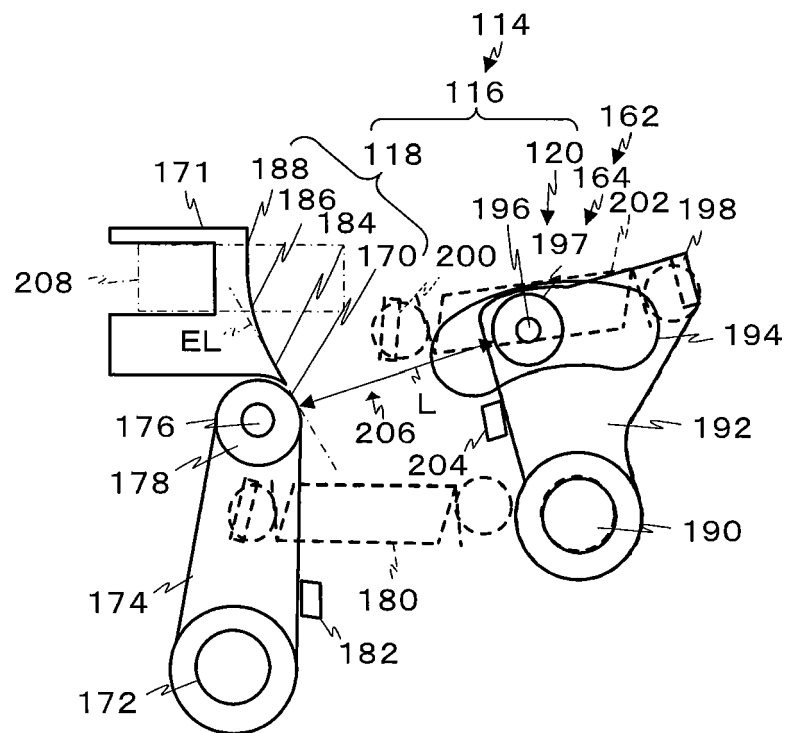


FIG.5

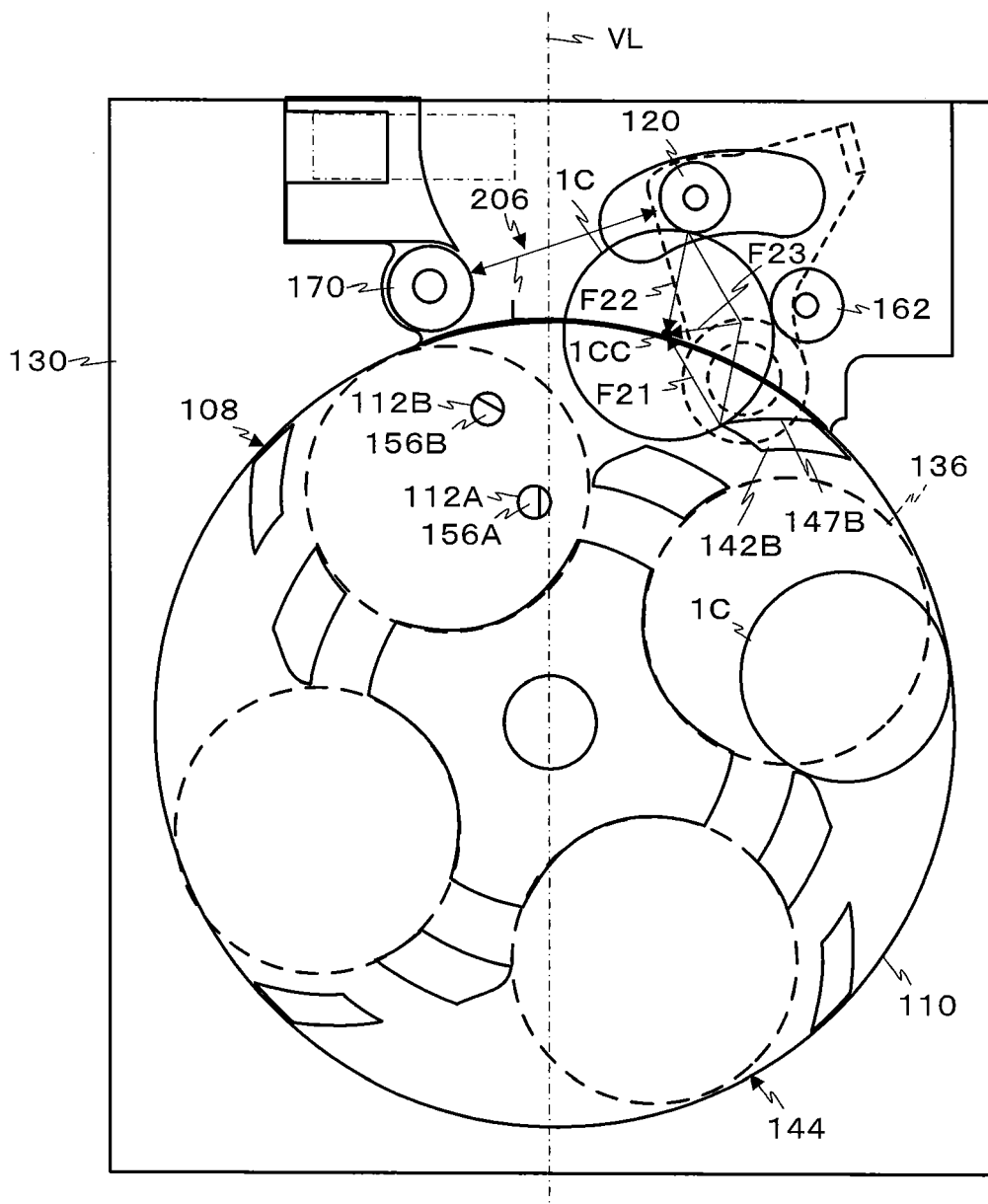


FIG.6

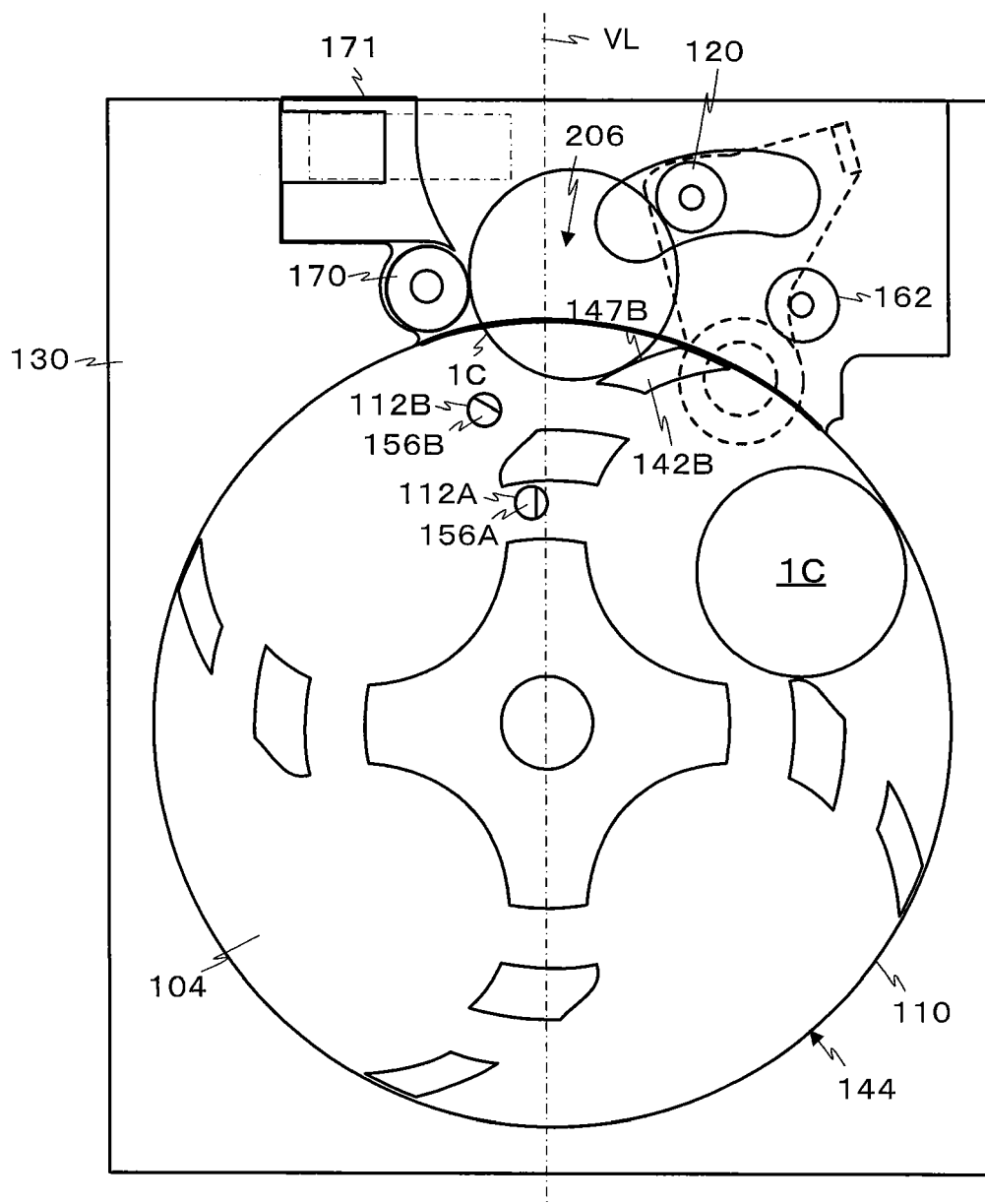


FIG. 7

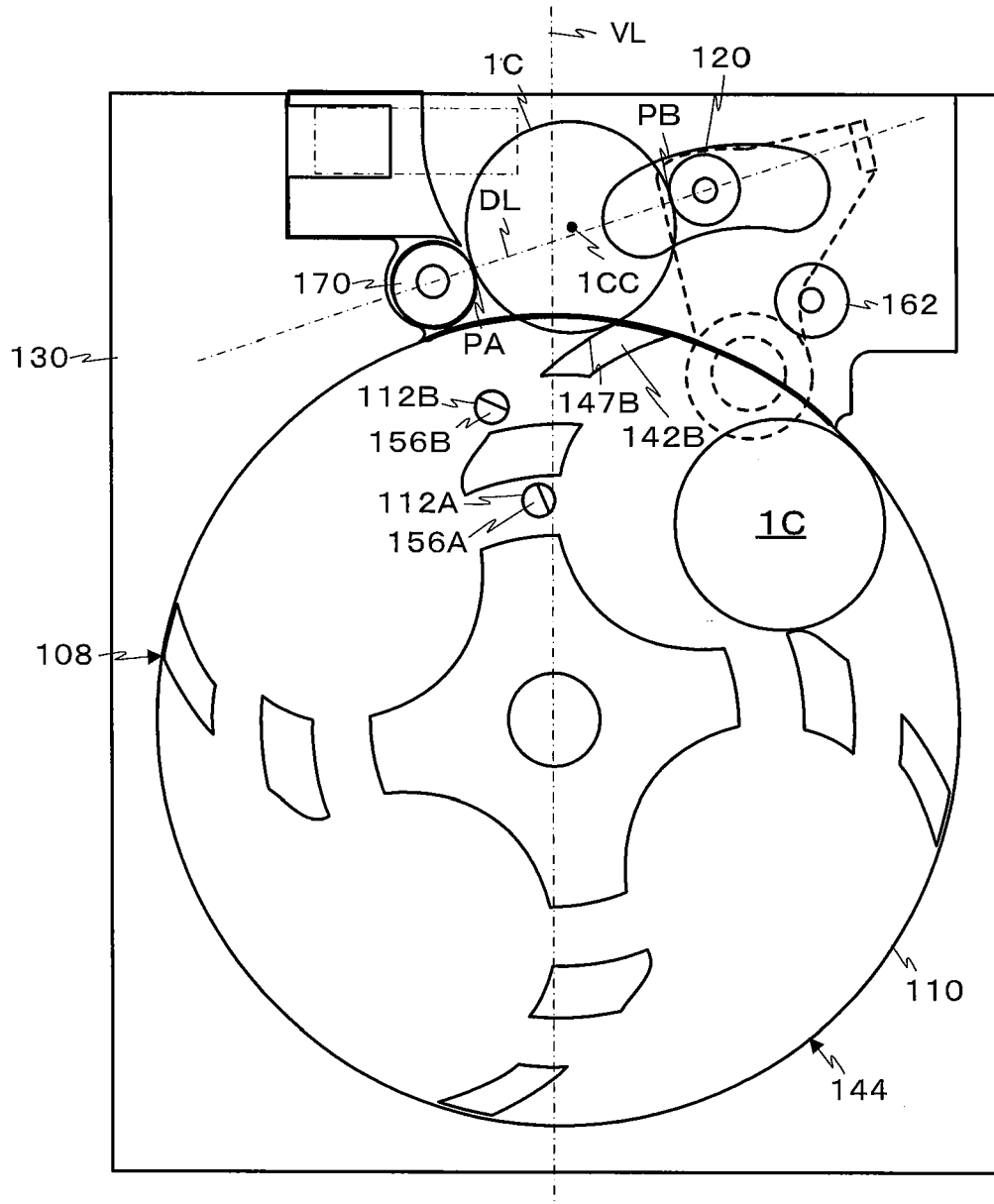


FIG.8

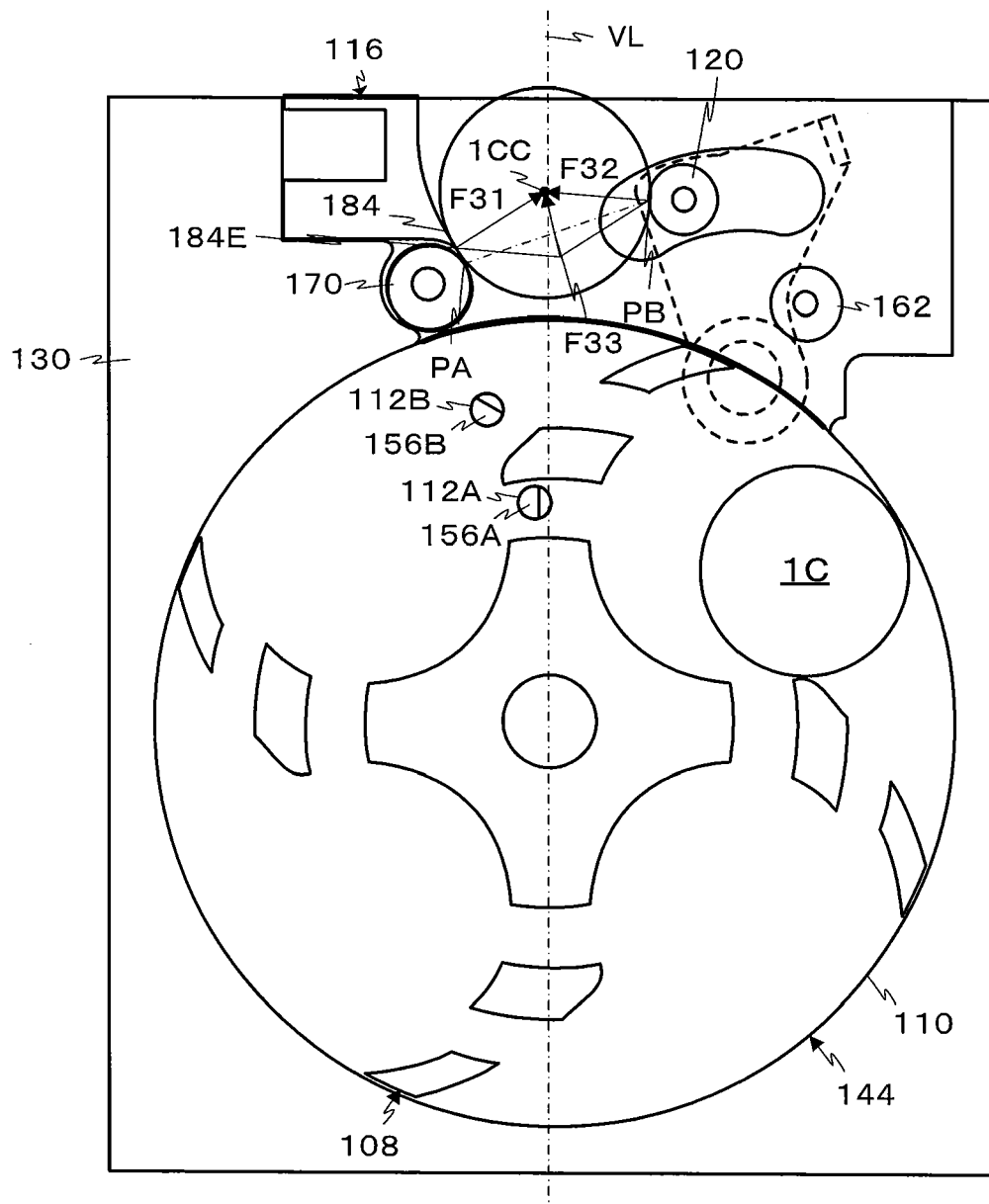


FIG.9

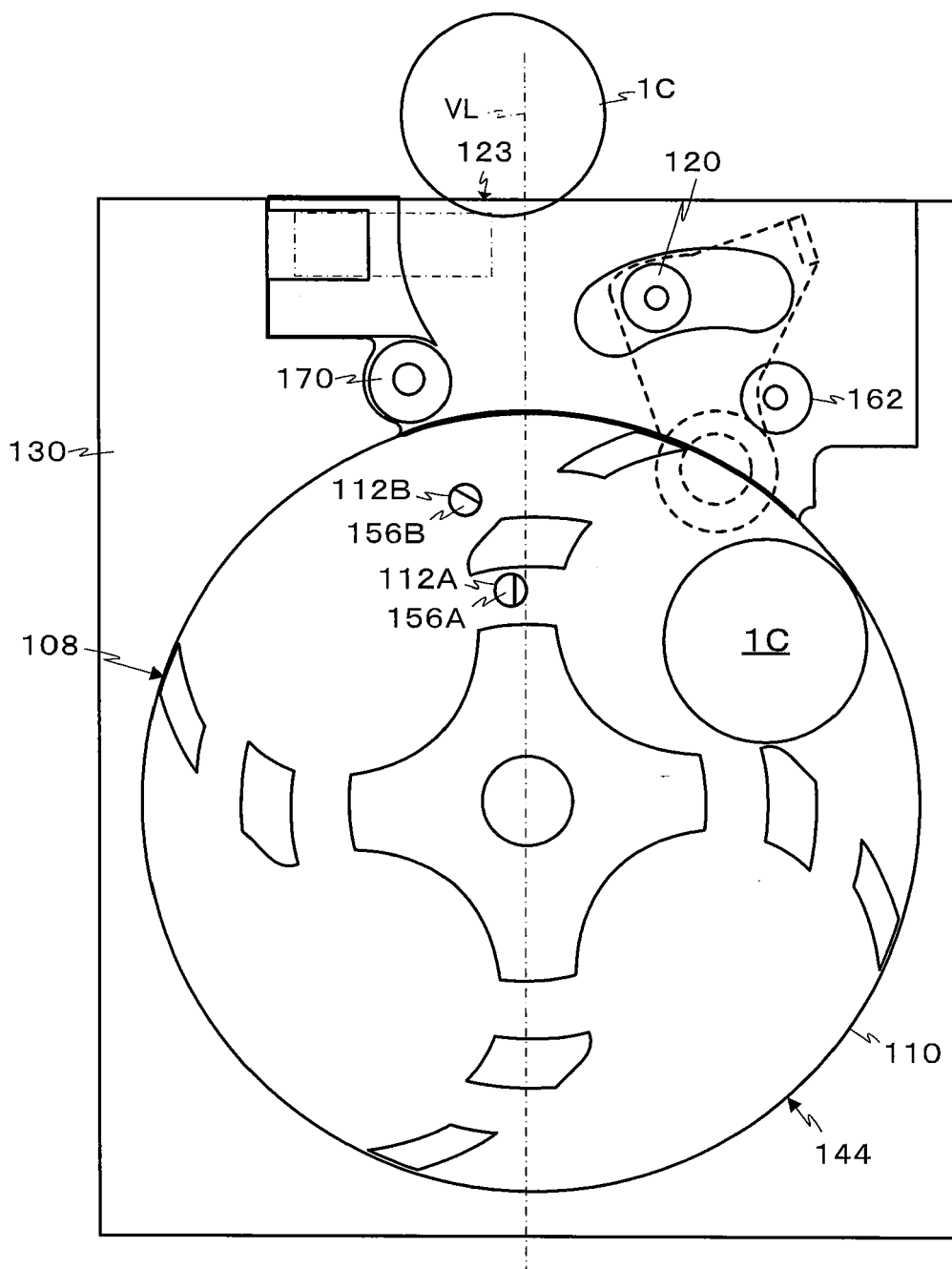


FIG.10

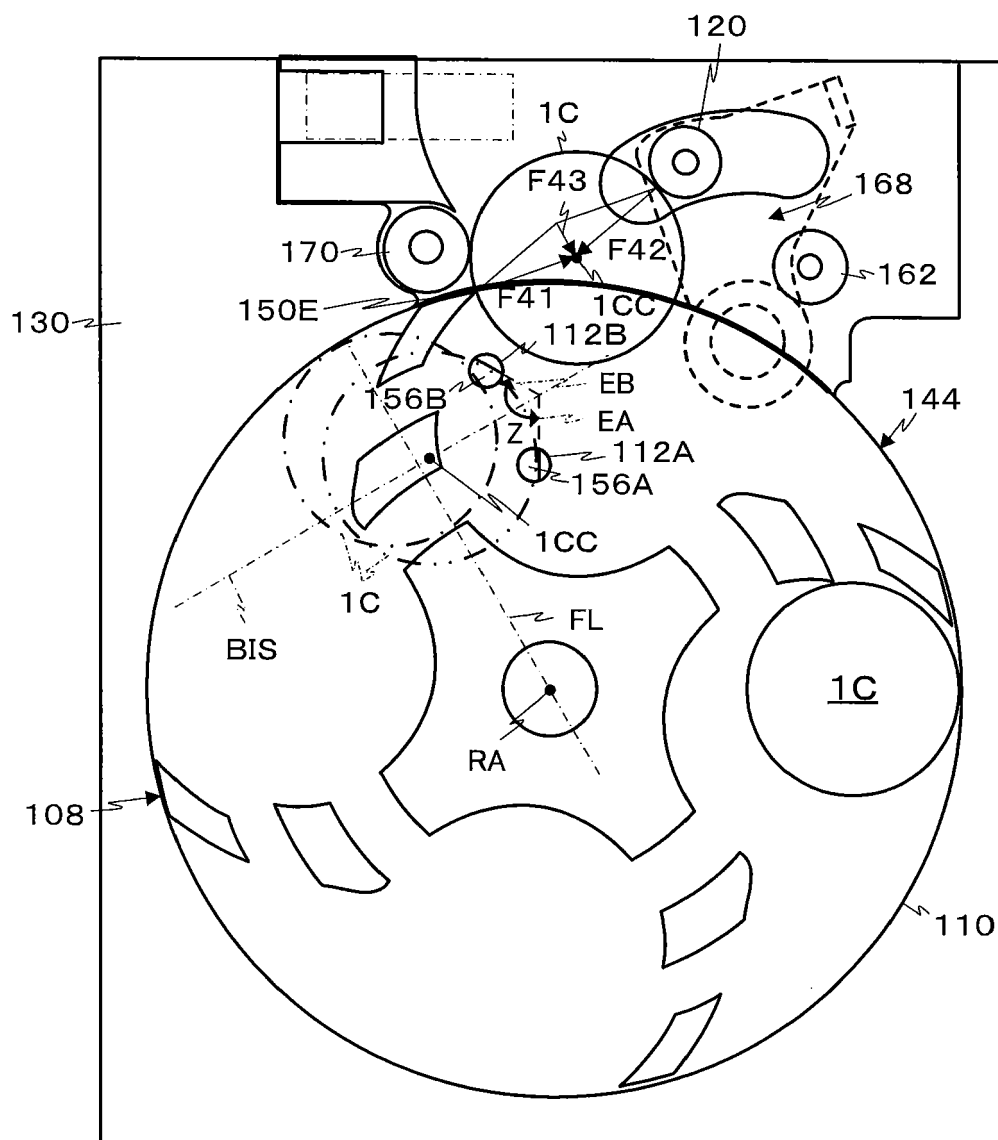


FIG. 11

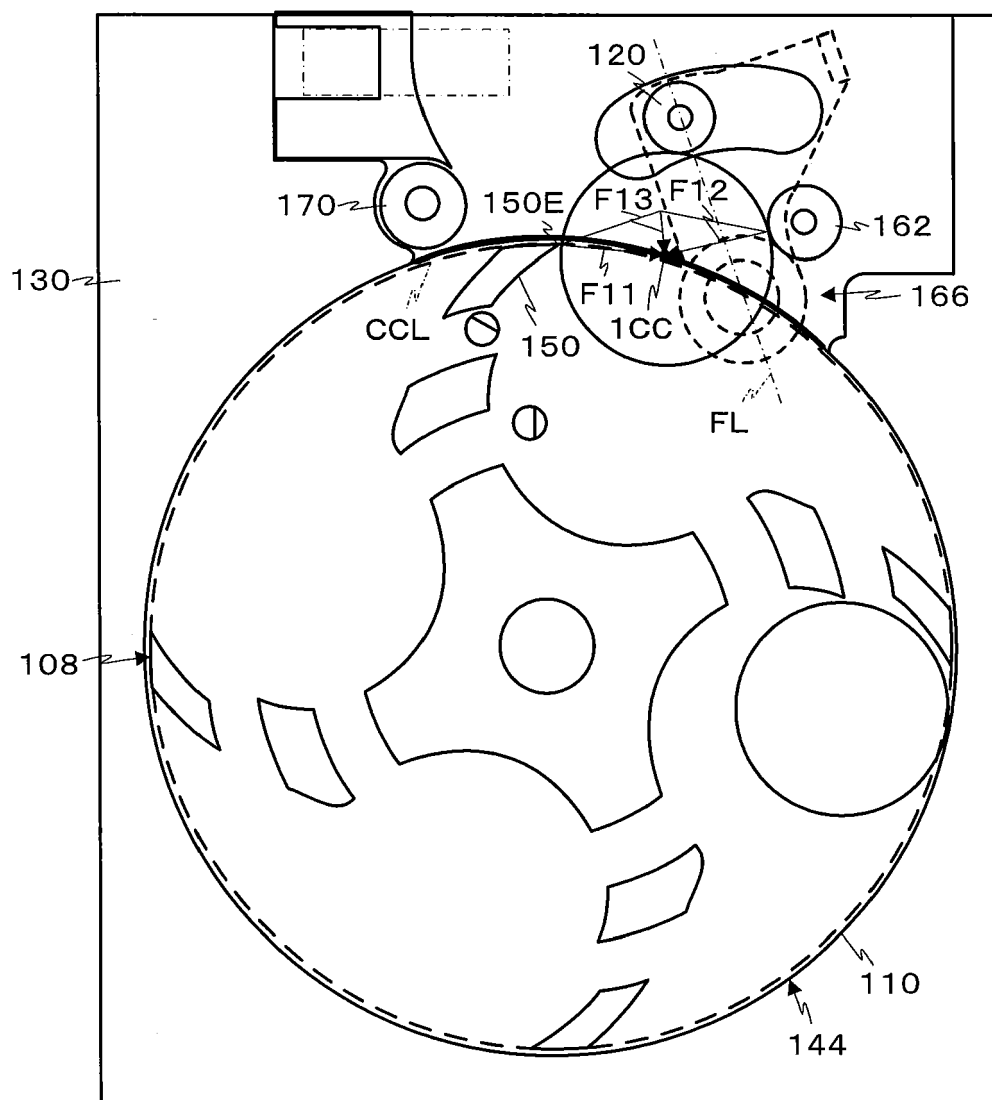


FIG.12

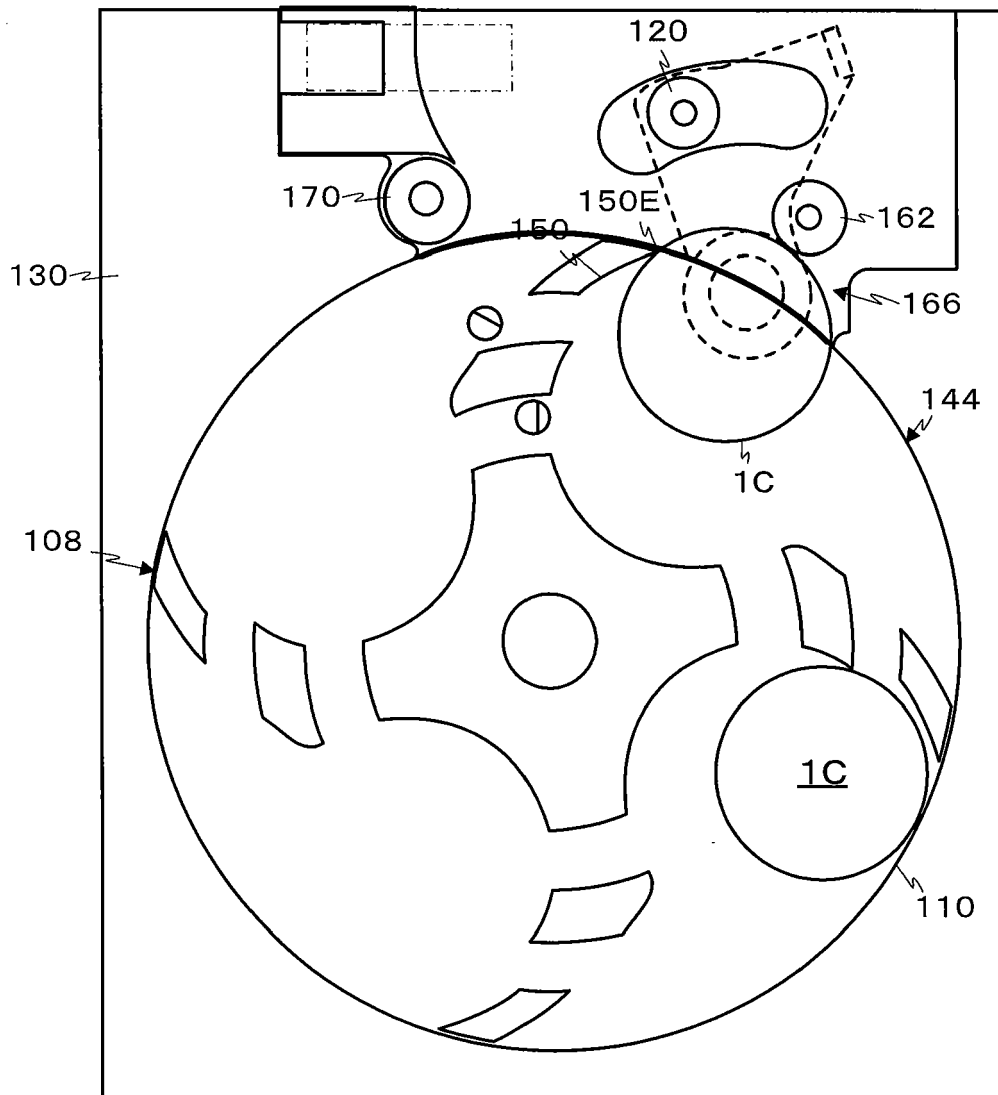
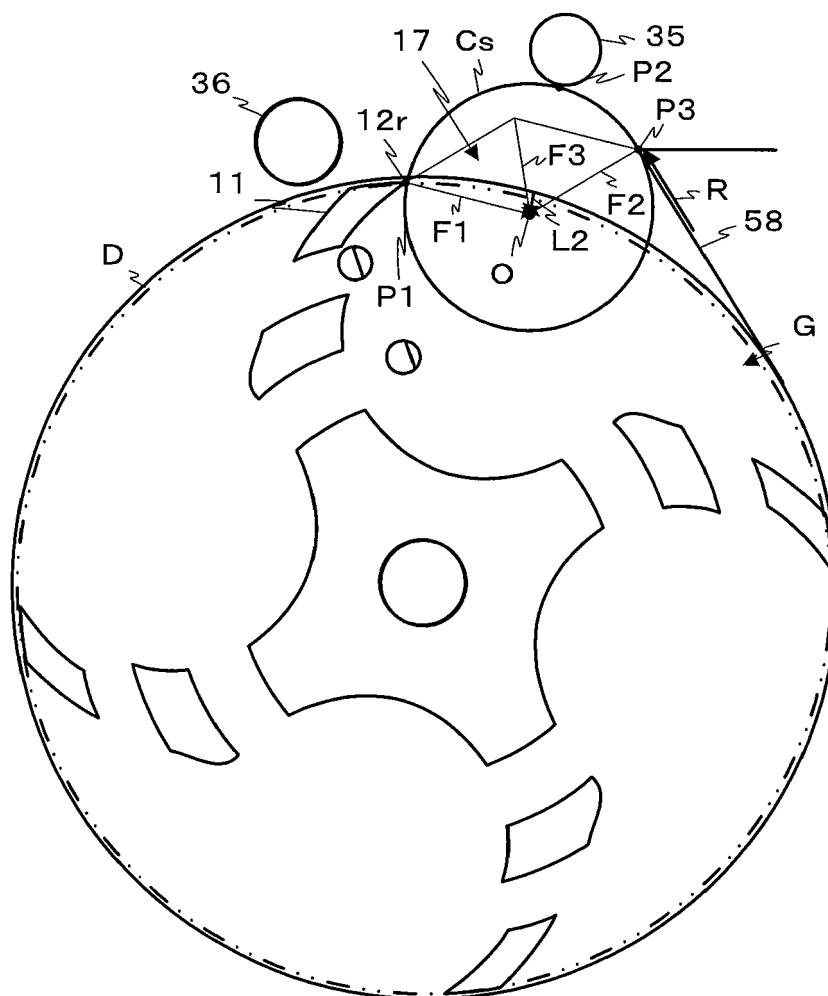


FIG.13





EUROPEAN SEARCH REPORT

Application Number
EP 14 15 1912

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y,D	JP 2008 040742 A (MATSUSHITA KINZOKU KOGYO KK) 21 February 2008 (2008-02-21) * abstract * * paragraph [0086] * * figures 1-6, 10, 11, 28, 32, 33 *	1-3	INV. G07D9/00 G07D1/00
Y	EP 1 811 467 A1 (ASAHI SEIKO CO LTD [JP]) 25 July 2007 (2007-07-25) * abstract * * paragraph [0027] - paragraph [0032] * * figure 7 *	1-3	
A	JP 2007 179412 A (ASAHI SEIKO CO LTD) 12 July 2007 (2007-07-12) * abstract * * figure 4 *	1-3	
A	US 2002/189919 A1 (ABE HIROSHI [JP]) 19 December 2002 (2002-12-19) * abstract * * figure 8 *	1-3	
A	JP H09 161123 A (LAUREL BANK MACHINE CO) 20 June 1997 (1997-06-20) * abstract * * figures 3-7 *	1-3	G07D A63F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 6 March 2014	Examiner Mandato, Davide
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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