(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 787 491 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
08.10.2014 Bulletin 2014/41

(51) Int Cl.:
G07D 9/00 *(2006.01)*

(21) Application number: **14163351.1**

(22) Date of filing: **03.04.2014**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **06.04.2013 JP 2013080026**

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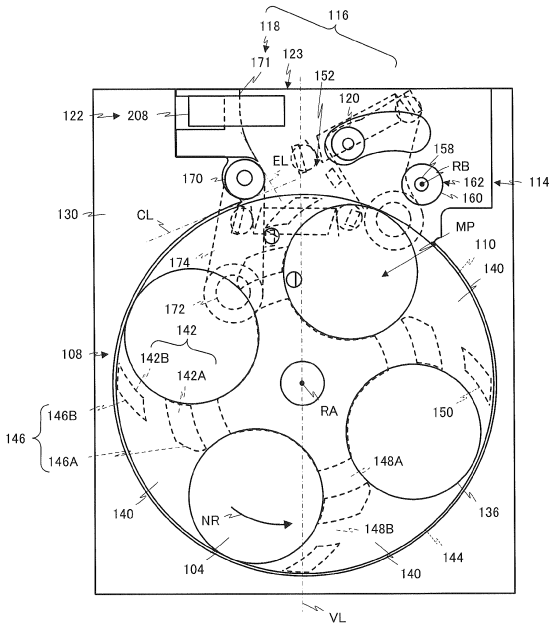
(54) **Coin dispenser**

(57) An object of the present invention is to provide a coin dispenser that forms no pressed dent on coins by regulating pins, which causes the coins to move thereover upon backward rotation of a rotating disk.

Coins are dropped into through holes and sorted one by one by forward rotation of a rotating disk, and each coin is guided in the circumferential direction of the rotating disk by a pair of regulating pins while being pushed by a pusher on a lower surface and slid on a base and is then dispensed by an ejecting roller. If coin jamming occurs, the coin, which is pushed in the opposite direction of the dispensing case by a back surface of the pusher, is guided by a pair of slopes formed on tips of the pair of regulating pins so as to get away from the base and is moved over the regulating pins. As a result, the rotating disk is continuously rotated, and coin jamming is eliminated. Since the pair of slopes are disposed so as to sandwich the coin, which is pushed in the opposite direction, in a V-shape. Therefore, the coin is always brought into contact with and pushed up by the pair of slopes. Therefore, pushing force does not concentrate on one part of the coin, and no pressed dent is formed.

FIG.3



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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] 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

[0003] In a coin dispenser, which rotates many coins stored in a storing bowl in bulk together by a rotating disk disposed in a bottom hole of the storing bowl, guides the coins in the circumferential direction of the rotating disk by a pair of regulating pins projecting above a base, and then ejects the coins one by one by an ejector, if coin jamming occurs, the coin jamming is eliminated by rotating the rotating disk backward.

[0004] As a first conventional technique of this type, in order to prevent movement of the coin, which is rotated together by the rotating disk in the opposite direction upon backward rotation, from being disturbed by the regulating pins, the rotating disk is continuously rotated backward by causing the coins rotated together therewith to be placed on the regulating pins and moved over the regulating pins so as to effectively eliminate the coin jamming (see Japanese Utility Model No. 2594435, FIG. 3, paragraph numbers 0023 to 0029).

[0005] In this first conventional technique, slopes are formed by mechanical processing. Therefore, outer edges of the slopes are formed to be sharp circumferential edges.

[0006] As a second conventional technique, it is known that cylindrical coin receiving pins and coin-escape guiding pieces having mounting slopes disposed in the back side of the coin receiving pins are provided. Therefore, when a rotating disk is rotated forward, a coin is guided to an outlet side by vertical side walls of the coin receiving pins. When the rotating disk is rotated backward, the coin is caused to be placed on and moved over the coin receiving pins by the mounting slopes of the coin-escape guiding pieces, thereby enabling continuous backward rotation of the rotating disk (see Japanese Patent No. 4644632, FIG. 16 to FIG. 27, paragraph numbers 0054 to 0055).

[0007] In the second conventional technique, the coin-escape guiding pieces are cut and raised from a metal plate. Therefore, the edges of the slopes thereof are formed to be sharp edges.

[0008] Recently, from the viewpoints of convenience, cost reduction, etc., coins having diameters in a predetermined range such as 1-yen coins, 5-yen coins, 10-yen coins, 50-yen coins, 100-yen coins, and 500-yen coins of Japanese coins have been required to be dispensed by a single coin dispenser. In other words, the coins having diameters of 20 millimeters to 26.5 millimeters are required to be dispensed by a single coin dispenser.

[0009] However, if the conventional techniques are simply employed, there are various concerns, and they cannot be simply employed.

[0010] More specifically, from the viewpoints of manufacturing readiness and cost reduction, a pair of slopes is formed to be parallel. Therefore, if a coin of a material having comparatively low hardness such as 1-yen coin made of aluminum is pressed against the sharp edge of the slope, a pressed dent may be formed.

[0011] This concern will be explained in detail with reference to FIG. 1.

[0012] As shown in FIG. 1, in a coin dispenser 10 using a rotating disk 12, rotation of the rotting disk 12 causes coins C to be dropped into a plurality of vertically penetrating through holes 14 at eccentric positions of the rotating disk 12 and brought into contact with a base 16 by the surfaces thereof. In this state, while being pushed by pushing projecting strips 20 (first pushing projecting strips 20A) formed on the lower surface of ribs 18 between the through holes 14, the coin is guided by a circular guiding wall 24 of a storage hole 22, is rotated together by the rotating disk 12, is guided by a guide plate 30, and reaches an outlet opening 26 of the storage hole 22. The coin C, which has reached the outlet opening 26, is brought into contact with an ejecting roller 26 or is guided by regulating pins 28, specifically, cylindrical side walls of a pair of first regulating pin 28A and a second regulating pin 28B perpendicular to the base 16 to be pushed into the part between a fixed roller 32 and an ejecting roller 34 and sandwiched by the fixed roller 32 and the ejecting roller 34 from the left and right. Then, immediately after the coin center CC of the coin C passes a straight line connecting a first contact point PA of the fixed roller 32 and the coin C and a second contact point PB of the ejecting roller 34 and the coin C (for the sake of convenience, referred to as an ejection border line SL), the coin is ejected by the elastic force caused by a spring (not shown) attached to the ejecting roller 34.

[0013] If the coins C are jammed, the rotating disk 12 is rotated backward. Therefore, the coin C is rotated together by back sides 36 (first back side 36A, second back side 36B) of the pushing projecting strips 20 in the opposite direction of dispensing of the coin C. In this process of rotation together therewith, the coin C is placed on a first slope 38A and a second slope 38B of the first regulating pins 28A, are placed on the pair of first regulating pin 28A and the second regulating pin 28B, and are moved over the first regulating pin 28A and the second regulating pin 28B. As a result, continuous backward rotation of the rotating disk 12 can be carried out.

[0014] Each of the through holes 14 into which the coins C are dropped is formed to have a diameter of about 28 millimeters since a 500-yen coin 500C which is a maximum diameter coin LC is dropped thereinto. Below

the through hole 14, a coin storing chamber 40, in which the coin C having a lower surface supported by the base 16 can be positioned, is defined in a droplet shape by the back sides 36 (first back side 36A, second back side 63B) of the pushing projecting strips 20, pushing surfaces 42 (first pushing surface 42A, second pushing surface 42B), an arc-shaped inner edge 44 in the rotating axis RA side, and the circular guiding wall 24. In this coin storing chamber 40, the 500-yen coin 500C is roughly stored at a constant position since the movable range of the 500-yen coin 500C is small. However, since small-diameter coins SC such as 1-yen coins 1C, 5-yen coins 5C, and 50-yen coins 50C have movable regions about 1.5 times the diameter thereof, the small-diameter coins are expected to be brought into contact with the first slope 38A and the second slope 38B at various positions upon backward rotation of the rotating disk 12. Particularly, as shown in FIG. 1, when the small-diameter coin SC is positioned between the first regulating pin 28A and the second regulating pin 28B, the circumferential edge of the small-diameter coin SC is brought into contact with and also placed on edges of the first slope 38A and the second slope 38B; therefore, depending on the pushing force thereof, a pressed dent(s) may be formed on the circumferential edge of the small-diameter coin SC. Particularly, since the 1-yen coin 1C made of aluminum and the 5-yen coin 5C made of brass are comparatively soft, the risk of formation of pressed dents is high.

SUMMARY OF THE INVENTION

[0015] A first object serving as a basic object of the present invention is to provide a coin dispenser that forms no pressed dent on a coin by regulating pins, which causes the coin to move thereover upon backward rotation of a rotating disk, even in a case of a coin dispenser having a wide application range of coin diameters. Other objects of the present invention not clearly described herein will be elucidated from below explanations and accompanying drawings.

[0016] A first preferred mode of the present invention for achieving this object is a coin dispenser having: a base for supporting a surface of a coin and constituting a carrying path in which the coin is carried; a rotating disk rotatable in a first rotating direction and a second rotating direction opposite to the first rotating direction about a rotating axis perpendicular to the base and having a pusher for pushing the coin on the carrying path; first and second regulating pins projecting so as to be able to elastically advance to and retreat from a surface of the base in the carrying path, disposed at a predetermined interval in an approximately diameter direction of the rotating disk, having first and second slopes having a predetermined angle with respect to an axis perpendicular to the base at tips projecting from the surface of the base, having first and second straight lines extended parallel to the first and second slopes and the base intersecting with each other by a predetermined angle, having the first and second slopes disposed in a downstream side of the first rotating direction, and guiding, toward an outer circumference of the rotating disk, the coin carried by rotation of the rotating disk in the first rotating direction, while moving the coin, which is carried by rotation of the rotating disk in the second rotating direction, along the first and second slopes toward the opposite side of the base; and an ejector for ejecting the coin guided by the first and second regulating pins toward the outer circumference of the rotating disk.

[0017] A second preferred mode of the present invention according to the above described first mode is the coin dispenser, wherein, when the rotating disk is rotated in the second rotating direction, a center of the coin having a circumferential surface in contact with the first and second slopes is guided onto a bisector bisecting the predetermined angle formed by the mutually intersecting first and second straight lines.

[0018] A third preferred mode of the present invention according to the second mode is the coin dispenser, wherein lower ends of the first and second slopes are configured to be positioned on the same plane as an upper surface of the base or below the upper surface.

[0019] In the first preferred mode of the present invention, the first and second regulating pins are provided so as to elastically project from the upper surface of the base on the carrying path of the base. When the rotating disk is rotated in the forward-rotation direction, the coin on the carrying path is pushed to the first and second regulating pins by the pusher provided on the rotating disk, is guided toward the outer circumference of the rotating disk by the first and second regulating pins, and are ejected by the ejector.

[0020] At the upper ends of the first and second regulating pins, the first and second slopes having a predetermined angle with respect to the axis orthogonal to the base are formed. The first and second slopes are disposed so that the straight lines parallel to the slopes and the base intersect with each other by a predetermined angle.

[0021] As a result of formation in this manner, when the rotating disk is rotated in the backward-rotation direction, the coin is pushed in the backward-rotation direction in the carrying path by the pusher, and the lower circumferential edge of the circumferential surface of the coin abuts the first and second slopes of the first and second regulating pins. Furthermore, the coin is continuously pushed by the pusher in the state in which the lower circumferential edge of the coin is in contact with the first and second slopes, the lower circumferential edge of the coin is moved along the first and second slopes upward so as to get away from the upper surface of the base, and the coin can finally move over the first and second regulating pins.

[0022] Therefore, even when rotation of the rotating disk in the backward-rotation direction is continued for predetermined time or angle, the coin is moved along the first and second slopes of the first and second regulating

pins. Therefore, as a result, coin jamming can be eliminated, and the circumferential edge of the coin is not pushed against the circumferential surfaces of the first and second regulating pins. Therefore, formation of pressed dents on the coin can be suppressed.

[0023] In the second preferred mode of the present invention, when the rotating disk is rotated in the backward-rotation direction, the first and second slopes are disposed so that the center of the coin having the circumferential surface abutting the first and second slopes is positioned on the bisector bisecting the predetermined angle formed when the straight lines parallel to the first and second slopes and the base intersect with each other.

[0024] As a result of formation in this manner, the force applied from the coin, which abuts the first and second slopes and is further pushed by the pusher of the rotating disk, to the first and second regulating pins is decomposed uniformly to the regulating pins. In other words, the force generated between the coin and each of the regulating pins is smaller than the force applied from the pusher to the coin. Therefore, formation of pressed dents on the coin can be suppressed.

[0025] In the third preferred mode of the present invention, the lower ends of the first and second slopes provided on the first and second regulating pins are configured to be on the same plane as the upper surface of the base or below the upper surface of the base. As a result of formation in this manner, the circumferential surface of the coin moved in the carrying path toward the backward-rotation direction and the cylindrical surfaces of the first and second regulating pins do not abut with each other. Therefore, formation of pressed dents on the coin can be suppressed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] 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 an explanatory drawing of a conventional coin dispenser.

FIG. 2 is a vertical cross-sectional view of a coin dispenser of an embodiment of the present invention.

FIG. 3 is a plan view in a state in which a storing bowl of the coin dispenser of the embodiment of the present invention has been removed.

FIG. 4 is a plan view of the coin dispenser of the embodiment of the present invention (showing only the storing bowl and pushers of a rotating disk, and not showing others).

FIG. 5 is an explanatory drawing of an ejector in the coin dispenser of the embodiment of the present invention.

FIG. 6 shows explanatory drawings of a regulating pin in the coin dispenser of the embodiment of the present invention; wherein (A) is a perspective view, and (B) is a side view.

FIG. 7 shows explanatory drawings of a regulating-pin unit in the coin dispenser of the embodiment of the present invention; wherein (A) is a perspective view of the regulating-pin unit, and (B) is a plan view of the regulating-pin unit.

FIG. 8 is an exploded perspective view of the regulating-pin unit in the coin dispenser of the embodiment of the present invention.

FIG. 9 shows part (first half) of manufacturing step drawings of the regulating pin in the coin dispenser of the embodiment of the present invention.

FIG. 10 shows part (last half) of manufacturing step drawings of the regulating pin in the coin dispenser of the embodiment of the present invention.

FIG. 11 is an explanatory drawing for explaining slopes of the regulating pins in the coin dispenser of the embodiment of the present invention.

FIG. 12 is a working explanatory drawing (upon forward rotation) of the coin dispenser of the embodiment of the present invention.

FIG. 13 is a working explanatory drawing (during entrance upon forward rotation) of the coin dispenser of the embodiment of the present invention.

FIG. 14 is a working explanatory drawing (immediately before ejection upon forward rotation) of the coin dispenser of the embodiment of the present invention.

FIG. 15 is a working explanatory drawing (upon ejection upon forward rotation) of the coin dispenser of the embodiment of the present invention.

FIG. 16 is a working explanatory drawing (upon start of backward rotation) of the coin dispenser of the embodiment of the present invention.

FIG. 17 is a working explanatory drawing (upon start of guiding by the slopes upon backward rotation) of the coin dispenser of the embodiment of the present invention.

FIG. 18 is a working explanatory drawing (guiding by ejecting roller and outlet rotor) of the coin dispenser of the embodiment of the present invention.

FIG. 19 is a working explanatory drawing (guiding by outlet rotor) of the coin dispenser of the embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0027] The present embodiment is an example in which 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 are applied to a coin dispenser that can dispense them 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 26.5 millimeters of the 500-yen coin 500c without some sort of adjustment and part replacement.

[0028] However, the present invention is not limited to the above described denominations, but can be also applied to some of six denominations of Japanese yen, foreign coins, play medals, etc. Furthermore, the present invention can be also applied to a coin dispenser that can dispense coins having diameters within a predetermined range by replacing some of parts.

[0029] 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.

[0030] As shown in FIG. 2, 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 114, a fixed part 118 and an ejecting roller 120 constituting an ejector 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 ejector 116, the coin detector 122, and the coin outlet 123 are conventionally publicly known structures. The invention of the present application relates to the arrangement of a slope 212 formed at a tip of the regulating pin 112.

[0031] First, the frame 102 will be explained mainly with reference to FIG. 2.

[0032] 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.

[0033] An upper-surface opening of the frame 102 is covered with the base 104.

[0034] 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, thereby contributing to automatic removal of the coin jamming. The backward-rotation amount of the rotating disk 108 in the case of occurrence of coin jamming is not limited to time control, but can be configured so that the rotating disk is rotated backward by a predetermined angle based on an output from an encoder provided in relation to the output shaft 126.

[0035] The base 104 is horizontally disposed in the present embodiment, but may be disposed to be tilted.

[0036] Next, the base 104 will be explained mainly with reference to FIG. 2.

[0037] 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.

[0038] 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.

[0039] Therefore, the base 104 can be replaced by another mechanism that has a similar function.

[0040] Next, the storing bowl 106 will be explained mainly with reference to FIG. 2.

[0041] 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.

[0042] 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.

[0043] Therefore, the storing bowl 106 can be changed to another device that has a similar function.

[0044] Next, the rotating disk 108 will be explained mainly with reference to FIG. 2 and FIG. 3.

[0045] 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.

[0046] In the present embodiment, the rotating disk 108 is disposed in the bottom hole 134 of the storing bowl 106, is rotated forward in a forward-rotation direction NR, which is a counterclockwise direction in FIG. 3, 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 backward at a predetermined speed in a backward-rotation direction RR, which is a clockwise direction in the opposite direction of the forward-rotation direction NR, if coin jamming occurs. The tip of the output shaft 126 is inserted in a hole 133 formed at the center of the rotating disk 108, and the rotating disk 108 is fixed to the output shaft 126 by a screw, etc.

[0047] The rotating disk 108 has a stirrer 138 having a polygonal pyramid shape at the center of the upper surface thereof, stirs the coins C by rotating in the bottom

hole 134, and facilitates fall of the coins C into the through holes 136.

[0048] The rotating disk 108 has pushers 142 on back sides of respective ribs 140 between the through holes 136.

[0049] 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. 3, a pushing front surface 146 thereof has a curved shape so as to be retreated from a first rotating axis RA side of the rotating disk 108 to the rear position side of the forward-rotation direction NR toward a circumferential edge side. Specifically, the pusher 142 is comprised of a first pusher 142A close to the first rotating axis RA side and a second pusher 142B close to the circumferential edge side. An arc-shaped first clearance groove 148A is formed in the first rotating axis RA side of the first pusher 142A, and a second clearance 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 146A, and the front surface of the second pusher 142B is a second pushing front surface 146B.

[0050] 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 in the forward-rotation direction NR 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 ejector 116 while guiding and pushing the coin by the outlet guide 114 and the ejecting roller 120.

[0051] 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. 3 by the regulating pins 112, specifically, the later-described first regulating pin 112A and the second regulating pin 112B positioned in the carrying path MP of the coins C.

[0052] When coin jamming occurs, the rotating disk 108 is rotated backward. As a result of this backward rotation, a back side 150 of the second pusher 142B pushes the circumferential surface of the coin C and moves the coin in the backward-rotation direction RR, which is the opposite direction of forward rotation.

[0053] At the center of the lower surface of the rotating disk 108, a central regulator 145 is formed to project downward. The central regulator 145 is formed into the shapes of four petals by concave surfaces 145A, which are part of the circumferential surfaces of the through holes 136 in the first axis RA side extended downward, and projecting portions 145B, which form inner edges of the first clearance grooves 148A. Since the petal shapes are formed by the number of the through holes 136, it can be formed into three petal shapes, five petal shapes, etc.

[0054] Next, the coin guiding wall 110 will be explained mainly with reference to FIG. 2 to FIG. 4.

[0055] 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.

[0056] 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 first rotating axis RA of the rotating disk 108, 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. Furthermore, 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.

[0057] 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 carrying path MP. In other words, the carrying path MP has an approximately circular ring shape.

[0058] 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 carrying path MP.

[0059] In the present embodiment, the base 104 and the coin peripheral guiding plate 130 are formed as separated elements, but are not limited to be formed in this manner. The base 104 and the coin peripheral guiding

plate 130 may be integrally formed. Also, the coin peripheral guiding plate 130 may be integrally formed with the attachment part 135 of the storing bowl 106.

[0060] Next, the carrying path MP will be explained with reference to FIG. 11.

[0061] As described above, the carrying path MP is a path through which the coin C pushed by the pusher 142 is carried, the outer edge thereof is defined by the circular coin guiding wall 110, the inner edge thereof is defined by the central regulator 145 at the center of the rotating disk 108, and the carrying path MP is approximately formed into a circular ring shape.

[0062] Next, a midpoint circle MC will be explained.

[0063] In the present invention, the midpoint circle MC of the carrying path MP refers to a circle having a radius r which is the distance between a midpoint MDP of the coin guiding wall 110 and the part of the concave surface 145A closest to the first rotating axis RA and the first rotating axis RA. However, the midpoint circle MC is not necessarily a circle, but is at least required to include part of a circular arc formed by the radius r in the vicinity of the first regulating pin 122A and the second regulating pin 122B.

[0064] Next, the regulating pins 112 will be explained mainly with reference to FIG. 6 to FIG. 11.

[0065] The regulating pins 112 have a function to guide the coin C, which is rotated together by the rotating disk 108, toward the outer circumference of the rotating disk 108, in other words, a function to guide the coin to the storage hole outlet 154 side and have a function to, when the rotating disk 108 is rotated backward, allow the coin C, which is pushed by the back side 150 of the pusher 142, to be moved in the opposite direction in the carrying path MP of the coin C so that the coin C can be moved over the regulating pins 112. In the present embodiment, the regulating pins are comprised of the first regulating pin 112A and the second regulating pin 112B elastically projecting from the upper surface of the base 104.

[0066] The first regulating pin 112A and the second regulating pin 112B are formed to have the same shape, and only the attachment mode thereof is different. Therefore, the first regulating pin 112A shown in FIG. 6 will be representatively explained, the same parts of the second regulating pin 112B are denoted by the same reference numerals to which B of alphabets is added, and the explanation thereof will be omitted.

[0067] The first regulating pin 112A as a whole is cylindrical, the intermediate portion thereof is formed into a first cylindrical portion 210A having a predetermined diameter, a first slope 212A formed at a predetermined angle is formed at part of the upper end thereof, and a first mounting portion 214A having a smaller diameter than the first cylindrical portion 210A is formed at the lower end thereof. The diameter of the first cylindrical portion 210A is preferred to be the diameter of a commercially-available steel material and is manufactured by using, for example, a stainless-steel rod material having a diameter of 3 to 5 millimeters. As the stainless-steel rod material, a commercially-available polished rod may be used as it is or may be used after subjecting it to diameter reduction and surface hardening by dies.

[0068] The diameter of the first cylindrical portion 210A is the same as the diameter of the commercially-available rod; wherein, "the same" is an idea which also includes a case in which the diameter is slightly reduced from the commercially-available diameter by cutting or polishing for forming a smooth surface. The cross-sectional shape of the first cylindrical portion 210A is not required to be a circle in a strict sense, but may be an elliptical shape close to a circle or a polygonal shape having six or more sides or may be cylindrical.

[0069] The length of the first cylindrical portion 210A refers to the length from a first step 218A, which is a step to the first mounting portion 214A, to a first lower end 220A, which is positioned at the lowest position of the first slope 212A, and the length is formed to be practically shorter than the thickness of the base 104. "Practically shorter" means that, when the first regulating pin 112A is inserted in a first through hole 224A of the base 104 in the state in which the first regulating pin 112A is fixed to a later-described plate spring 222 (first plate spring 222A), the lower end 220A is positioned on the same plane as the upper surface of the base 104 or below the upper surface. In this state, the height of projection of the first regulating pin 112A from the base 104 is set to be the same as or slightly lower than the thickness of the thinnest coin C. This is for preventing the coin C, which is placed on the coin C sliding on the base 104, from being guided to the storage hole outlet 154 side by the regulating pins 112.

[0070] The first slope 212A is a planar slope formed by a predetermined angle from the intermediate portion of the first cylindrical portion 210A to a first top portion 216A. As the slope angle of the first slope 212A, in the present embodiment, the angle β with respect to a cylinder axis SA of the first cylindrical portion 210A is 45 degrees. In other words, the first slope 212A is tilted by 45 degrees with respect to the base 104. As long as the first slope 212A can implement a push-up function of pushing up the coin C by the first top portion 216A of the first regulating pin 112A, the slope angle is not limited. However, in order to prevent formation of a pressed dent on the coin C which is comparatively soft, the slope angle is preferred to be 40 degrees or more. However, if the angle β is too large, the diameter of the first cylindrical portion 210A becomes large, and the slope angle is therefore preferred to be 50 degrees or less. Thus, the angle β is most preferred to be 45 degrees.

[0071] The first slope 212A may have the shape of a concave surface or a convex surface having a comparatively large curvature as long as it has the above described push-up function instead of being a complete flat surface. In other words, as long as the shape does not form a pressed dent on the coin C, the shape is not required to be a flat surface.

[0072] As shown in FIG. 6, the first top portion 216A is

preferred to be formed into a flat portion having a predetermined area so that the load applied when the coin C is moved thereover does not concentrate on one part (point). In the present embodiment, the flat portion is inevitably a crescent shape.

[0073] The first mounting portion 214A constitutes an attachment part for firm attachment to the later-described first plate spring 222A and, specifically, has a cylindrical shape having a diameter smaller than the first cylindrical portion 210A. The diameter of the first mounting portion 214A is preferred to be about two thirds of the diameter of the first cylindrical portion 210A.

[0074] The length of the first mounting portion 214A is formed to be slightly longer than the thickness of the plate spring 222 since it is swaged with the first plate spring 222A.

[0075] Therefore, the peripheral surface of the first regulating pin 112A positioned in the back side of the first slope 212A is formed into a first cylindrical surface 223A, which is part of a cylinder.

[0076] Next, a manufacturing method of the first regulating pin 112A will be explained with reference to FIG. 9 and FIG. 10.

[0077] First, a rod 226 serving as a material is fixed to a chuck 228 of a complex machine of a lathe in a cantilever state in which the rod is projected by a predetermined length (FIG. 9A).

[0078] Then, after the chuck 228 is rotated, a chamfering tool 230 is caused to abut a tip of the rod 226, and a rod tip edge 232 is chamfered (FIG. 9B).

[0079] Then, the chuck 228 is stopped at a predetermined rotation position, and a milling cutter 234 is sequentially moved to the tip side while approaching an axis SL of the rod 226, thereby forming the first slope 212A (FIG. 9C).

[0080] Then, in the state in which the chuck 228 is rotated, at a position distant from the first lower end 220A of the first slope 212A of the rod 226 by a predetermined distance, a cutting tool 236 is moved to the axis SL side to form the first mounting portion 214A having a diameter smaller than the diameter of the cylindrical portion 210A(FIG. 10D).

[0081] Then, in the state in which the chuck 228 is rotated, a cutting-off tool 238 is caused to abut the first mounting portion 214A, which is distant from the first step 218A by a predetermined distance, to cut off the tip side, thereby manufacturing the single first regulating pin 112A (FIG. 10E).

[0082] In a case in which a new first regulating pin 112A is to be manufactured, the above described procedure is repeated. The series of manufacturing steps can be automated in the complex machine of the lathe. Therefore, the regulating pin can be manufactured at low cost.

[0083] After this, in this state or after surface hardening by thermal treatment, the first regulating pin 112A is integrated with the first plate spring 222A.

[0084] The first regulating pin 112A is subjected to thermal treatment in order to enhance durability by surface hardening.

[0085] Next, the plate spring 222 will be explained with reference to FIG. 7 and FIG. 8.

[0086] The plate spring 222 has a function to enable downward escape when the first regulating pin 112A or the second regulating pin 112B receives excessive force from the upper side. Therefore, as long as it has a similar function, it is not limited to a plate spring. However, if the plate spring 222 is employed, there is an advantage that plate springs can be mass-produced at low cost by plate pressing.

[0087] In the present embodiment, the plate spring 222 is comprised of the first plate spring 222A and a second plate spring 222B.

[0088] First, the first plate spring 222A will be explained.

[0089] The first plate spring 222A has a function to elastically support the regulating pin 112, in other words, has a function that the first regulating pin 112A and the second regulating pin 112B are fixed thereto.

[0090] In the present embodiment, the first plate spring 222A has a predetermined thickness and a width as a result of subjecting a spring material such as a plate material of a steel ribbon to press dividing, and is formed into a typical boomerang shape (L-shape) in a planar view. Then, a circular first shaft hole 240A at a first end, a circular second mounting hole 243A at a second end, a first mounting hole 242A having the same diameter as the second mounting hole 243A in the vicinity of a bent portion, and a first long hole 244A having a predetermined length between the first mounting hole 242A and the first shaft hole 240A are formed by press punching. The first plate spring 222A is not required to have a boomerang shape, but may have a linear plate shape. Therefore, the first plate spring 222A is not limited to that of the present embodiment as long as it has a similar function.

[0091] In order to prevent the first regulating pin 112A or the second regulating pin 112B from above described projection by a predetermined length due to warpage of the first plate spring 222A, the second plate spring 222B has a function to push the first plate spring 222A against the base 104 side from the lower side.

[0092] In the present embodiment, the second plate spring 222B is formed by formation into the same shape as the first plate spring 222A and then bending a plate-spring tip 246 upward. Therefore, the parts thereof same as those of the first plate spring 222A are shown with the same numbers with the alphabet A replaced by B, and explanation thereof will be omitted. If the first plate spring 222A without warpage is used, the second plate spring 222B is not necessarily required.

[0093] The first regulating pin 112A and the second regulating pin 112B are fixed to the first plate spring 222A and are integrated as a regulating-pin structure 248.

[0094] In the present embodiment, the first mounting portion 214A of the first regulating pin 112A is inserted in the first mounting hole 242A and is firmly fixed by swag-

ing. Similarly, the second mounting portion 214B of the second regulating pin 112B is inserted in the second mounting hole 243A and fixed by swaging. However, the fixing method is not limited to swaging.

[0095] Next, the configuration of a regulating-pin unit 250 which is a combination of the regulating-pin structure 248 and the second plate spring 222B attached to the back side of the base 104 will be explained.

[0096] The regulating-pin structure 248 is disposed in the upper side, and the second plate spring 222B is disposed in the lower side. In other words, the regulating-pin structure 248 is disposed in the base 104 side, and the second plate spring 222B is disposed in the side which is adjacent to the regulating-pin structure 248 and opposite to the base 104; and, in a state in which the first shaft hole 240A and the second shaft hole 240B at the end are overlapped with each other, a tubular bush 252 loosely penetrates therethrough. A coil spring 254 is disposed outside of the bush 252, a screw 256 is caused to penetrate through a hole 258 of the bush 252 and screwed into the base 104, and a retainer 262 is pressed toward the base 104 side by a head 260 of the screw 256 to fix the bush 252 to the base 104. As a result, the regulating-pin structure 248 and the second plate spring 22B are externally mounted so that they can carry out swinging motion with respect to the bush 252.

[0097] On the other hand, the coil spring 254 is positioned outside of the bush 252, and the free length of the coil spring 254 is set to be longer than the length of the bush 252; therefore, the coil spring 254 is compressed by the retainer 262 and presses the second plate spring 222B toward the first plate spring 222A side. In other words, the first plate spring 222A is pressed toward the base 104 side via the coil spring 254 and the second plate spring 222B.

[0098] At this point, the plate-spring tip 246 of the second plate spring 222B presses the tip of the first plate spring 222B against the base 104 side. Therefore, even if the first plate spring 222A is warped, the tip of the first plate spring 222A is pushed toward the base 104 side by the plate-spring tip 246. Therefore, the first plate spring 222A is brought into close contact with the base 104. As a result, the first regulating pin 112A and the second regulating pin 112B are projected from the upper surface of the base 104 by a degree that the regulating pins do not abut the back side of the rotating disk 108, and the tips thereof can be positioned in the first clearance groove 148A or in the second clearance groove 148B.

[0099] Moreover, a turn preventing pin 264 projects downward from the base 104 and penetrates through the first long hole 244A and a second long hole 244B.

[0100] Thus, the regulating-pin structure 248 and the second plate spring 222B are regulated so as not to turn about the bush 252.

[0101] By virtue of this, the first regulating pin 112A and the second regulating pin 112B can be elastically vertically moved with respect to the base 104. If excessive force is applied downward thereto, the regulating pins sink in the first through hole 224A and the second through hole 224B so that excessive pressures are not applied to the coin C to prevent pressed dents.

[0102] Next, a state in which the first regulating pin 112A and the second regulating pin 112B are projecting above the base 104 will be explained.

[0103] As shown in FIG. 11, the circumferential surfaces of the first cylindrical surface 223A and a second cylindrical surface 223B of the first regulating pin 112A and the second regulating pin 112B are disposed so as to face the coin C, which is pushed by the pusher 142 of the rotating disk 108 rotated in the forward-rotation direction NR, and guide the coin C serving as a dispensing target by the cylindrical surfaces when the coin is brought into contact therewith from any direction so that no pressed dent are formed on the coin C.

[0104] The first slope 212A and a second slope 212B are disposed so as to face the coin C, which is pushed by the back side 150 of the pusher 142 by the rotation of the rotating disk 108 in the backward-rotation direction RR, and the first slope 212A and the second slope 212B are formed so as to work together to guide the coin C to the top portion side thereof. More specifically, the first slope 212A and the second slope 212B are obliquely opposed to each other with the midpoint circle MC therebetween. In other words, with respect to the coin C, which is pushed in the backward-rotation direction RR in the opposite direction of the forward-rotation direction NR in the carrying path MP, component force works in the direction to lift up the coin from the base 104.

[0105] Furthermore, the first slope 212A and the second slope 212B are formed so as to lift up the coin C from the surface of the base 104 in the above described manner at a position at which the component force received from the first slope 212A in the direction that gets away from the first rotating axis RA and the component force received from the second slope 212B in the direction toward the first rotating axis RA side are balanced in a virtual plane in which the coin C is parallel to the base 104.

[0106] Specifically, as shown in FIG. 4, the first slope 212A and the second slope 212B are disposed in the first rotating axis RA side and in the opposite side of the first rotating axis RA with the midpoint circle MC therebetween. In other words, the first regulating pin 112A is disposed in the inner side of the midpoint circle MC, and the second regulating pin 112B is disposed in the outer side of the midpoint circle MC.

[0107] The first slope 212A faces the circumferential edge side of the rotating disk 108, in other words, the coin guiding wall 110 side, and the second slope 212B faces the first rotating axis RA side of the rotating disk 108, in other words, the center side of the storage hole 144. In further other words, the first slope 212A and the second slope 212B are disposed so as to sandwich the coin C, which is moved in the backward-rotation direction RR of the rotating disk 108, in a V-shape.

[0108] In further detail, in the present embodiment, as shown in FIG. 11, a first extension line EA of the first

slope 212A and a second extension line EB of the second slope 212B are formed so as to intersect with each other by an obtuse angle α. In other words, the first slope 212A and the second slope 212B are opposed to each other with the midpoint MC of the carrying path MP therebetween, and the first extension line EA of the upper edge of the first slope 212A and the second extension line EB of the upper edge of the second slope 212B intersect with each other by the predetermined obtuse angle α in the front side of the backward-rotation direction RR of the rotating disk 108.

[0109] The extension planes of the first slope 212A and the second slope 212B three dimensionally intersect with each other. However, for the convenience of explanation, the extension lines of the upper edges of the first slope 212A and the second slope 212B are shown in the drawing as the first extension line EA and the second extension line EB, respectively.

[0110] In the case in which the coin C (the 1-yen coin 1C in FIG. 11) is rotated in the backward-rotation direction RR of the rotating disk 108, when the coin C is rotated together by the back side 150 (first back side 150A, second back side 150B) of the pusher 142 in the backward-rotation direction RR and abuts the second slope 212B, the component force of movement toward the first rotating axis RA side works on the coin C. As a result, the coin C is brought into contact with the first slope 212A and the second slope 212B, lower outer circumferential edge of the coin C is then pushed up along the first slope 212A and the second slope 212B, is pushed up to the top portions of the first regulating pin 112A and the second regulating pin 112B, and then can move thereover. The subsequent coin C similarly moves over the first regulating pin 112A and the second regulating pin 112B. Therefore, continuous backward rotation of the rotating disk 108 is carried out.

[0111] In the case in which a bisector BIS divided the obtuse angle α by an equal angle γ and a straight line FL passing through the first rotating axis RA intersect with each other, the center CC of the coin C is set to be positioned on the bisector BIS in the vicinity of the intersecting part. When formed in this manner, even when the coin C is brought into contact with the first slope 212A or the second slope 212B, the coin is approximately uniformly brought into contact with both of the first slope 212A and the second slope 212B by the component force which works from the abutting first slope 212A or the second slope 212B, and large force does not work on part of the circumferential surface of the coin C. Therefore, there is an advantage that no pressed dent is formed on the coin C.

[0112] Therefore, upon forward rotation of the rotating disk 108, when the coin C is pushed by the pusher 142 and brought into contact with the first regulating pin 112A and the second regulating pin 112B, while the coin C is being pushed by the pusher 142, the coin C is guided by the first cylindrical surface 223A of the first regulating pin 112A and the second cylindrical surface 223B of the second regulating pin 112B and is guided toward the storage hole outlet 154. When the rotating disk 108 is rotated in the backward-rotation direction RR, the coin C pushed by the back side 150 of the pusher 142 is brought into contact with the first slope 212A and the second slope 212B of the top portions of the first regulating pin 112A and the second regulating pin 112B. Therefore, upward reactive force from the first slope 212A and the second slope 212B toward the rotating disk 108 side works on the coin C, the coin C is lifted up from the base 104 since the coin C is positioned in the through hole 136; and the coin C is placed on the first top portion 216A and a second top portion 216B, finally moves over the first regulating pin 112A and the second regulating pin 112B, is kept being pushed by the back side 150 of the pusher 142, and is continuously moved in the backward-rotation direction RR opposite to the forward-rotation direction NR in the carrying path MP.

[0113] The manufacturing method of the regulating pins 112 is not limited to the mechanical processing of the above described embodiment, but can be also manufactured by a die casting method or resin molding method. However, the resin molding method is expensive since a resin having antifriction properties and mechanical strength has to be used, and the die casting method is suitable for many of mass productions using metals. However, mechanical processing is preferred for manufacturing of a moderate amount in terms of an advantage of cost.

[0114] Next, the outlet passage 152 will be explained mainly with reference to FIG. 4.

[0115] 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.

[0116] 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.

[0117] Next, the outlet guide 114 will be explained mainly with reference to FIG. 4.

[0118] The outlet guide 114 has a function to guide the coin C toward the ejector 116 when the rotating disk 108 is rotated in the forward-rotation direction NR and to guide the coin C and returns the coin into the storage hole 144 when the rotating disk 108 is rotated in the backward-rotation direction RR. 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 roller or a bush, the dispenser can be formed at low cost since the commercially available ball bearing roller is a mass-produced product. If the ball bearing roller 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.

[0119] 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.

[0120] 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 of the coin guiding wall 110 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 SC serving as a target which is the 1-yen coin 1C in the present embodiment is pushed by the back-side tip 150E of the pusher 142 of the rotating disk 108 rotated backward and is brought into contact with the ejecting roller 120 positioned at the standby position SP and the outlet rotor 162 (FIG. 18), the center 1CC of the minimum diameter coin SC is positioned outside of a backward-rotation trajectory CCL formed by the back-side tip 150E. The diameter of the outlet rotor 162 is determined comprehensibly 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 (FIG. 4). 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.

[0121] In a case in which the rotating disk 108 is rotated forward in the manner shown in FIG. 12, the coin C is pushed against the outlet rotor 162 and the ejecting roller 120 by the second pusher 142B, resultant force F23 in the direction toward the fixed part 118 side caused by the pushing force F21 from the second pusher 142B toward the center CC of the coin C and the reactive force F22 from the ejecting roller 120 toward the center CC of the coin C is generated; and the 1-yen coin 1C is pushed so as to turn around the ejecting roller 120, is pushed into the part between the fixed part 118 and the ejecting roller 120 (FIG. 13), and is finally ejected by the ejecting roller 120 (FIG. 15).

[0122] When the rotating disk 108 is rotated backward, as shown in FIG. 16, resultant force F 13 of the pushing force F11 from the pusher 142, specifically, the second back side 150B of the second pusher 142B toward the center CC of the coin C and the reactive force F12 from the second slope 212B toward the center CC of the coin C is directed toward the first rotating axis RA side, component force in the direction that gets away to the upper side of the base 104 is generated, and the coin C is therefore moved toward the first rotating axis RA side in the above described manner. Therefore, since the coin C is moved to the first rotating axis RA side, the lower circumferential edge thereof is brought into contact with the first slope 212A and the second slope 212B. As a result of contact with the second slope 212B, the coin C receives, from the second slope 212B, the force in the direction that gets away from the first rotating axis RA. As a result, at the position at which the force from the first slope 212A and the second slope 212B is balanced, the coin C is moved upward, is placed thereon, and is finally moved over the first regulating pin 112A and the second regulating pin 112B; and the rotating disk 108 can be continuously rotated backward by rotating the coin C together with the rotating disk 108 in the opposite direction, and coin jamming can be effectively eliminated.

[0123] Next, the ejector 116 will be explained mainly with reference to FIG. 5.

[0124] The ejector 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 146B of the pusher 142, by spring force of an elastic part. In the present embodiment, the ejector 116 is comprised of the fixed part 118 and the ejecting roller 120.

[0125] First, the fixed part 118 will be explained.

[0126] 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.

[0127] 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.

[0128] In the present embodiment, the fixed roller 170 is a ball bearing roller 178 which 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, 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.

[0129] The first lever 174 is biased clockwise, in other words, toward the ejecting roller 120 side in FIGs. 3 and 5 by the spring force of an elastic part, which is a first spring 180 in the present embodiment. At the position of FIG. 4, 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.

[0130] At this still position, the inner circumferential surface of the circumferential surface of the ball bearing roller 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.

[0131] 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.

[0132] Next, the fixed guide 171 will be explained.

[0133] 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.

[0134] The first straight part 184 is formed so that the extension line EL thereof forms a tangent line with respect to the fixed roller 170 and that a tangent line CL (FIG. 3) 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.

[0135] 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 first rotating axis RA in FIG. 3.

[0136] 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.

[0137] 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.

[0138] 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.

[0139] Next, the ejecting roller 120 will be explained mainly with reference to FIG. 5.

[0140] 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 roller 197.

[0141] Therefore, the ejecting roller 120 can be changed to another device having a similar function.

[0142] 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 209, 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, between the fixed roller 170 and the ejecting roller 120, an entrance gap 206 of the straight-line distance L which is slightly shorter than the diameter of the minimum diameter coin SC.

[0143] Therefore, as shown in FIG. 14, from a point immediately after the center CC of the coin C pushed by the pusher 142 crosses a straight line DL connecting a first contact point PA of the fixed roller 170 and the coin C and a second contact point PB of the ejecting roller 120 and the circumferential surface of the coin C, the ejecting roller 120 starts ejection by the spring force of the second spring 202; and, finally, in a state in which the coin C is supported between the first straight part 184 and the fixed roller 170, the coin is ejected in the direction parallel to the first straight part 184 by the resultant force F33 of the pushing force F31 from the ejecting roller 120 and the reactive force F32 from a tip 184E of the first straight part 184 (FIG. 15). 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.

[0144] The forward rotation of the rotating disk 108 causes the coin C to be guided by the outlet rotor 162 and be pushed by the pushing force F21 by the second pusher 142B, the coin C 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 coin C 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. 13); 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 CC of the coin C passes the straight line DL connecting the first contact point PA and the second contact point PB (FIG. 14), 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 182E 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.

[0145] Next, the coin detector 122 will be explained.

[0146] The coin detector 122 has a function to detect the coin C, which is ejected by the ejector 116, and a magnetic metal sensor 208 is used in the present embodiment. In the present embodiment, the coin detector 122 is not limited thereto, but can be changed to another device having a similar function, for example, another system such as a photoelectric sensor, a mechanical sensor, or the like.

[0147] 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.

[0148] In the end, the coin outlet 123 will be explained with reference to FIG. 3.

[0149] 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.

[0150] Next, working of the coin dispenser 100 will be explained with reference to FIG. 11 to FIG. 19.

[0151] Working is different in a case in which the coin C 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.

[0152] First, the case in which the coin C is moved along the coin guiding wall 110 will be explained.

[0153] 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. 4).

[0154] 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 and 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. 12).

[0155] When the coin C is brought into contact with the second pushing front surface 146B of the second pusher 142B, the outlet rotor 162, and the ejecting roller 120, since the resultant force F23 of the pushing force F21 from the second pushing front surface 146B toward the coin center CC of the coin C and the reactive force F22 from the ejecting roller 120 is toward the fixed roller 170 side as described above, the coin C 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 (FIG. 13).

[0156] Further rotation of the rotating disk 108 causes the coin C to be pushed into the entrance gap 206 by the second pushing front surface 146B. As a result, the coin is moved in the circumferential direction of the rotating disk 108 along the circular circumferential surface of the fixed roller 170. Therefore, the ejecting roller 120 is turned clockwise in FIG. 3, and the entrance gap 206 is further expanded.

[0157] Then, the coin C is further moved in the circumferential direction of the rotating disk 108, and, immediately after the center 1 CC of the coin C passes the straight line DL connecting the first contact point PA of the circumferential surface thereof and the fixed roller 170 and the second contact point PB of the ejecting roller 120 and the circumferential surface of the coin C, the coin receives ejecting force from the ejecting roller 120 (FIG. 14).

[0158] Then, in a state in which the circumferential surface of the coin C is in contact with a tip part 184E of the first straight part 184 and the fixed roller 170, the circumferential surface of the coin C is pushed by the spring force of the second spring 202, and the coin is ejected toward the curved part 186.

[0159] The ejected coin C 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.

[0160] Next, the case in which the coin C is guided by the first and second regulating pins 112A and 112B and

pushed into the entrance gap 206 without being guided by the coin guiding wall 110 will be explained.

[0161] In this case, the coin C 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 184E of the first straight part 184 and the fixed roller 170 as described above.

[0162] Next, a case in which the rotating disk 108 is rotated backward for elimination of coin jamming will be explained.

[0163] When the rotating disk 108 starts backward rotation, the second pusher 142B turns in the clockwise in FIG. 16 in the backward-rotation direction RR. Therefore, the 1-yen coin 1C is pushed to the right side in FIG. 16 by the back side 150 of the second pusher 142B. In this process, the back side 150 is brought into contact with and pushes one point of the circumferential surface of the coin C, rotates the coin C together in the backward-rotation direction RR along the coin guiding wall 110, and brings the coin to contact with the second slope 212B, first.

[0164] By subsequent backward rotation of the rotating disk 108, the lower circumferential edge of the coin C is pushed against the inward second slope 212B, is pushed to the first rotating axis RA side, and receives the force in the direction in which the coin is lifted up from the base 104. As a result, the coin C is pushed to the first slope 212A side and is also brought into contact with the first slope 212A. The coin C is pushed from the outward first slope 212A in the direction that gets away from the first rotating axis RA in other words, toward the outer circumferential side of the rotating disk 108 and receives the force in the direction in which the coin is lifted up from the base 104. The coin C receives the force from the second slope 212B toward the inner circumferential side of the rotating disk 108 and the force from the first slope 212A toward the outer circumferential side of the rotating disk 108; therefore, at the position at which the force is balanced, specifically, in a state in which the center CC of the coin C is positioned on the bisector BIS (shown by a chain line in FIG. 17), the coin is lifted up from the base 104, is placed on the first top portion 216A and the second top portion 216B of the first regulating pin 112A and the second regulating pin 112B, and finally moves thereover.

[0165] Subsequent backward rotation of the rotating disk 108 pushes the coin C against the ejecting roller 120 and the outlet rotor 162, in other words, the coin C is pushed toward the second gap 168.

[0166] Then, as shown in FIG. 18, when the coin C is brought into contact with the ejecting roller 120 and the outlet rotor 162, the pushing force F41 by the back-side tip 150E works on the ejecting roller 120 from a lateral direction approximately orthogonal to the straight line FL connecting the fourth supporting shaft 190 and the fifth supporting shaft 196. Therefore, the ejecting roller 120 maintains a still state.

[0167] Reactive force F42 having the same value as the pushing force F41 works on the center CC of the coin C from the outlet rotor 162. Since the resultant force F43 of the pushing force F41 and the reactive force F42 is toward the storage hole 144, while being guided by the circumferential surface of the outlet rotor 162 by further backward rotation of the rotating disk 108, the coin C reaches the first gap 166.

[0168] As shown in FIG. 19, pushing force F51 toward the coin center CC from the back-side tip 150E works also in the first gap 166, reactive force F52 works from the upstream-side end 110E, and the resultant force F53 thereof is toward the storage hole 144. Therefore, the coin C is returned into the storage hole 144 and is moved along the coin guiding wall 110.

[0169] The coin C positioned in the downstream of the first regulating pin 112A and the second regulating pin 112B in the backward-rotation direction RR of the rotating disk 108 can be placed on and pass through the first slope 212A and the second slope 212B in the above described manner. Therefore, the rotating disk 108 is continuously rotated. Therefore, the rotating disk 108 can be rotated backward by a degree enough for eliminating coin jamming, and coin jamming can be eliminated.

Claims

1. A coin dispenser comprising:

a base (104) for supporting a surface of a coin (C) and constituting a carrying path (MP) in which the coin (C) is carried;

a rotating disk (108) rotatable in a first rotating direction (NR) and a second rotating direction (RR) opposite to the first rotating direction (NR) about a rotating axis (RA) perpendicular to the base and having a pusher (142) for pushing the coin (C) on the carrying path (MP);

first and second regulating pins (112A, 112B) projecting so as to be able to elastically advance to and retreat from a surface of the base (104) in the carrying path (MP), disposed at a predetermined interval in an approximately diameter direction of the rotating disk (108), having first and second slopes (212A, 212B) having a predetermined angle (β) with respect to an axis perpendicular to the base (104) at tips projecting from the surface of the base (104), having first and second straight lines (EA, EB) extended parallel to the first and second slopes (212A, 212B) and the base (104) intersecting with each other by a predetermined angle (α), having the first and second slopes (212A, 212B) disposed in a downstream side of the first rotating direction (NR), and guiding, toward an outer circumference of the rotating disk (108), the coin (C) carried by rotation of the rotating disk (108) in the first rotating direction (NR), while moving the

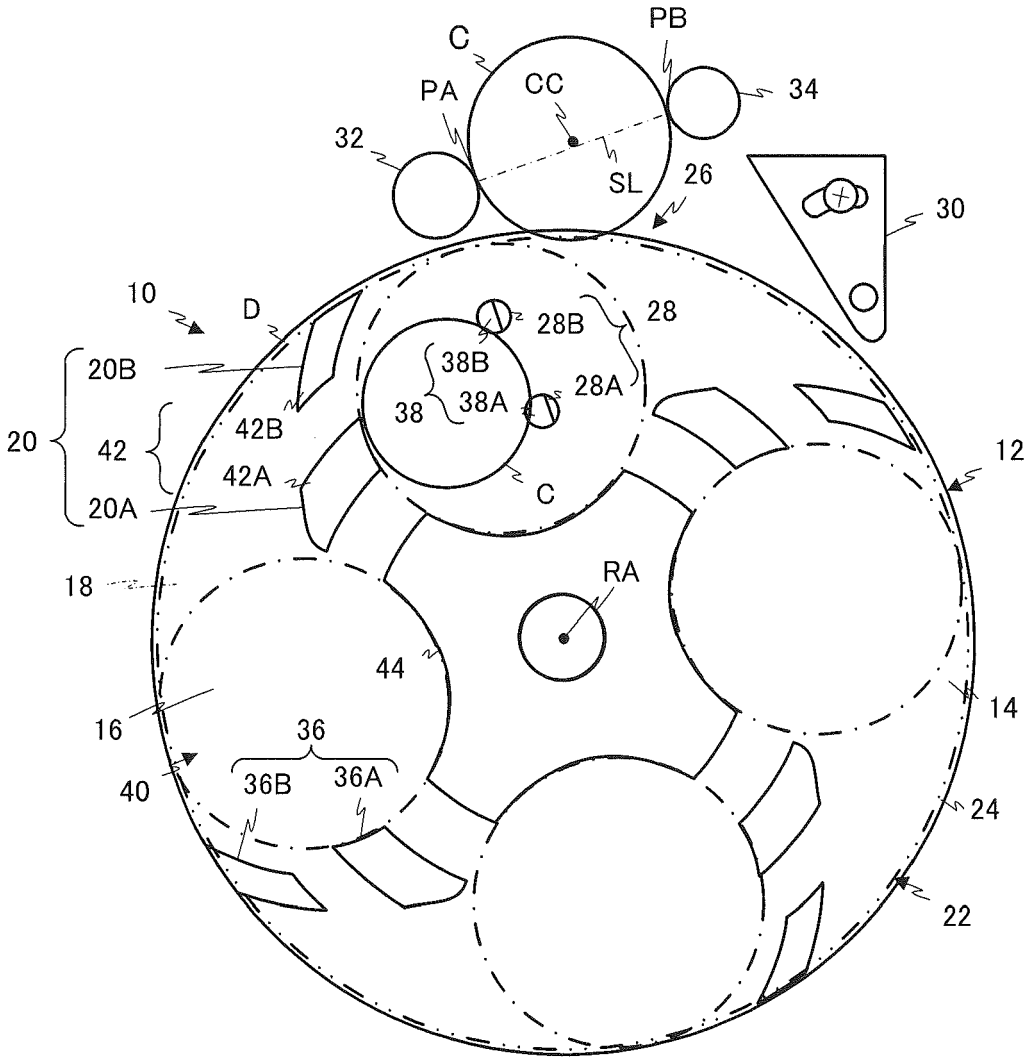
coin (C), which is carried by rotation of the rotating disk (108) in the second rotating direction (RR), along the first and second slopes (212A, 212B) toward the opposite side of the base (104); and

an ejector (116) for ejecting the coin (C) guided by the first and second regulating pins (112A, 112B) toward the outer circumference of the rotating disk (108).

2. The coin dispenser according to claim 1, wherein, when the rotating disk (108) is rotated in the second rotating direction (RR), a center (CC) of the coin (C) having a circumferential surface in contact with the first and second slopes (212A, 212B) is guided onto a bisector (BIS) bisecting the predetermined angle (α) formed by the mutually intersecting first and second straight lines (EA, EB).

3. The coin dispenser according to claim 2, wherein lower ends of the first and second slopes (212A, 212B) are configured to be positioned on the same plane as an upper surface of the base (104) or below the upper surface.

FIG.1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SL
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D
28B
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38B
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28A
20
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12
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C
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18
44
16
14
36
36B
36A
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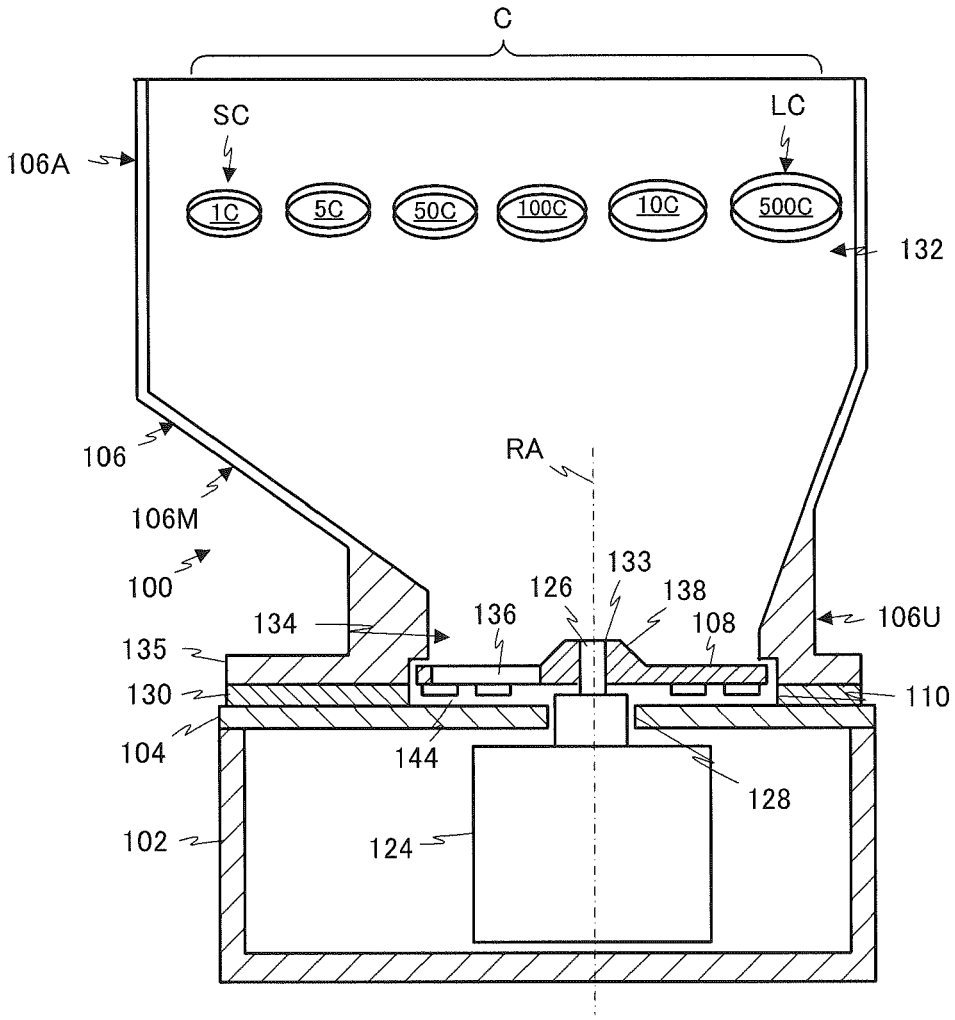
24
22

FIG.2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1C
5C
50C
100C
10C
500C
132
106
RA
106M
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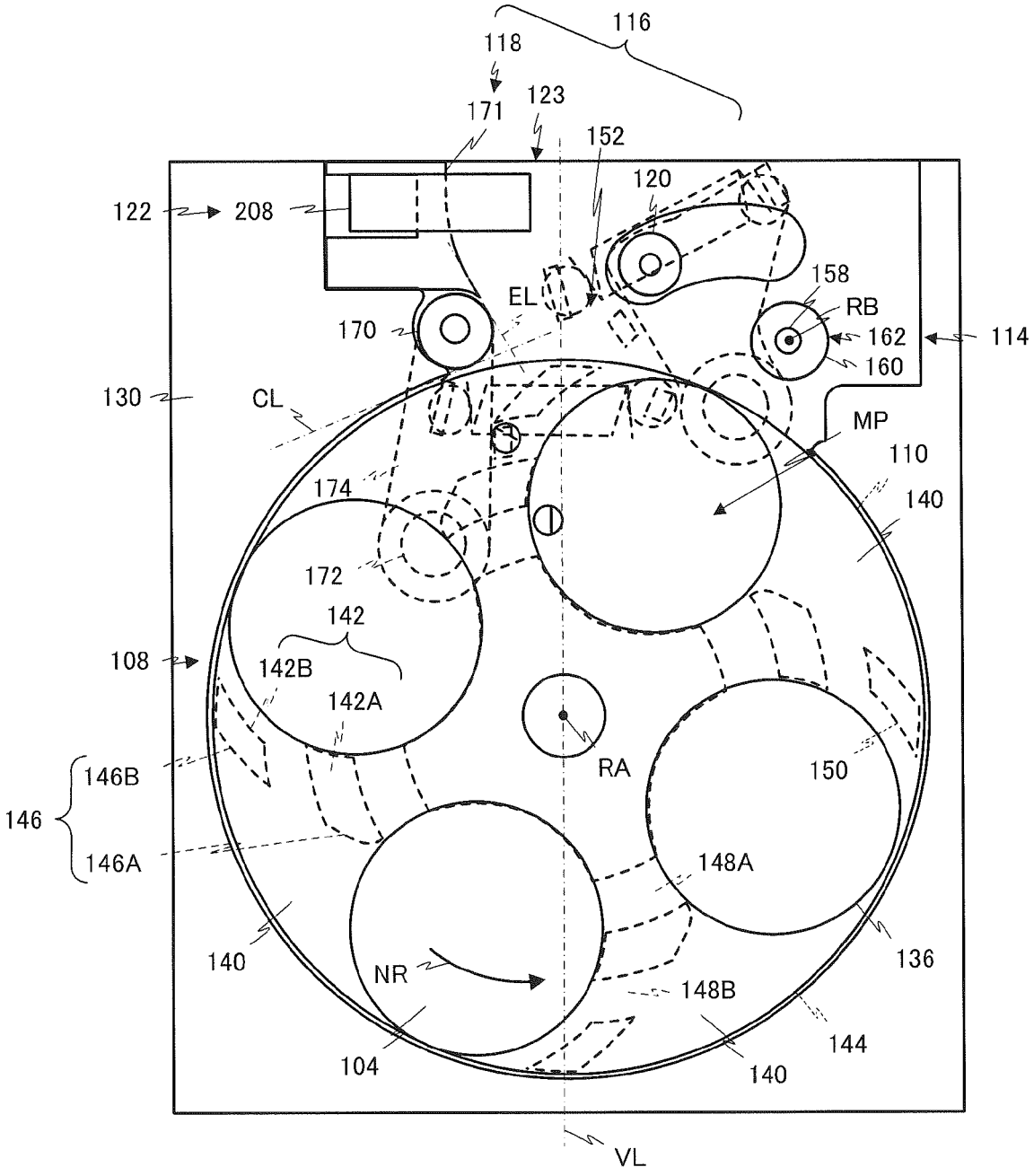
135
130
110
104
144
128
102
124

FIG.3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RB
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160
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CL
MP
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174
140
172
142
108
142B
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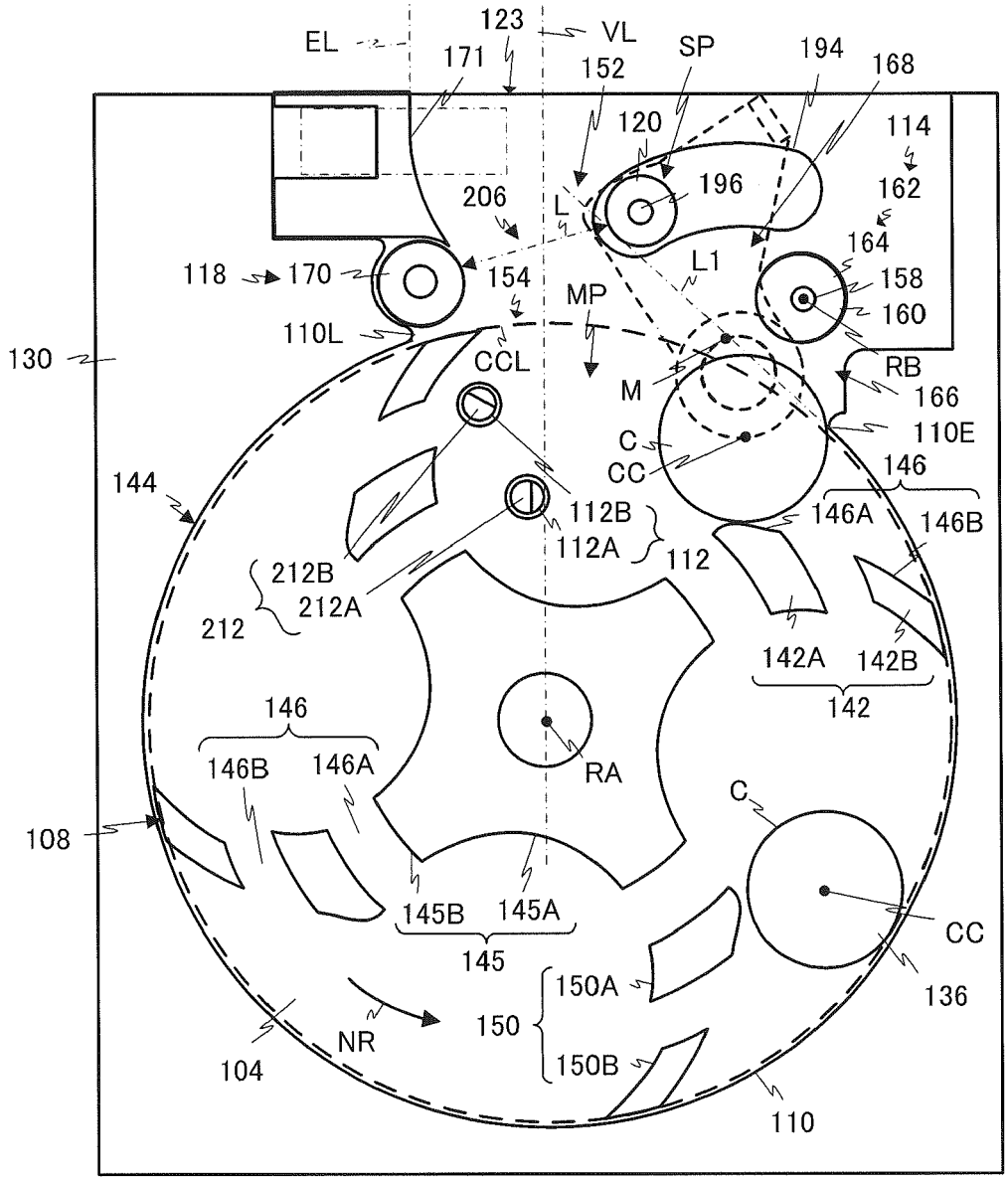
146B
146
146A
RA
150
148A
140
NR
136
148B
144
104
140
VL

FIG.4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160
110L
130
CCL
M
RB
166
C
110E
CC
146
144
112B
146A
146B
112A
112
212B
212A
212
142A
142B
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150B
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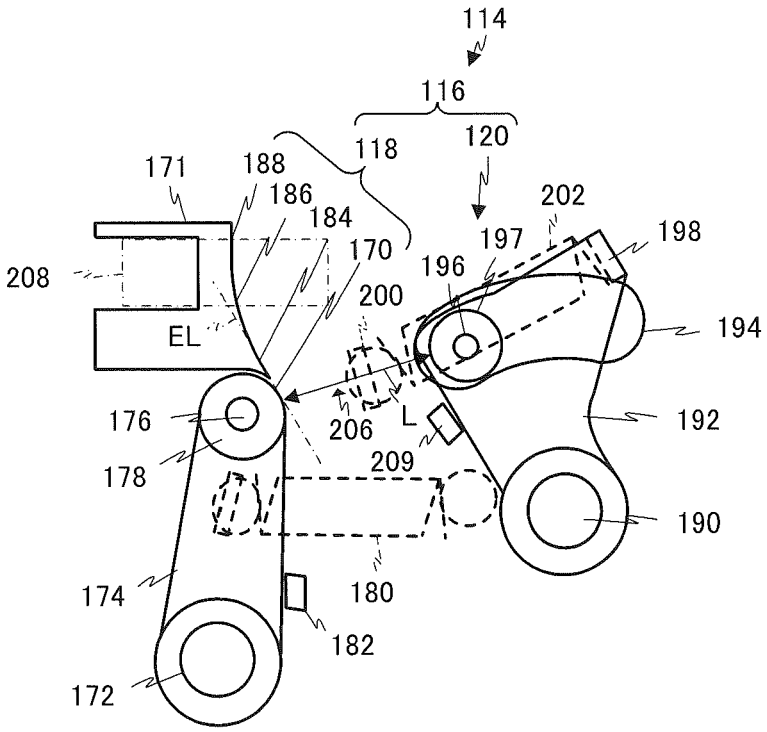
FIG.5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L
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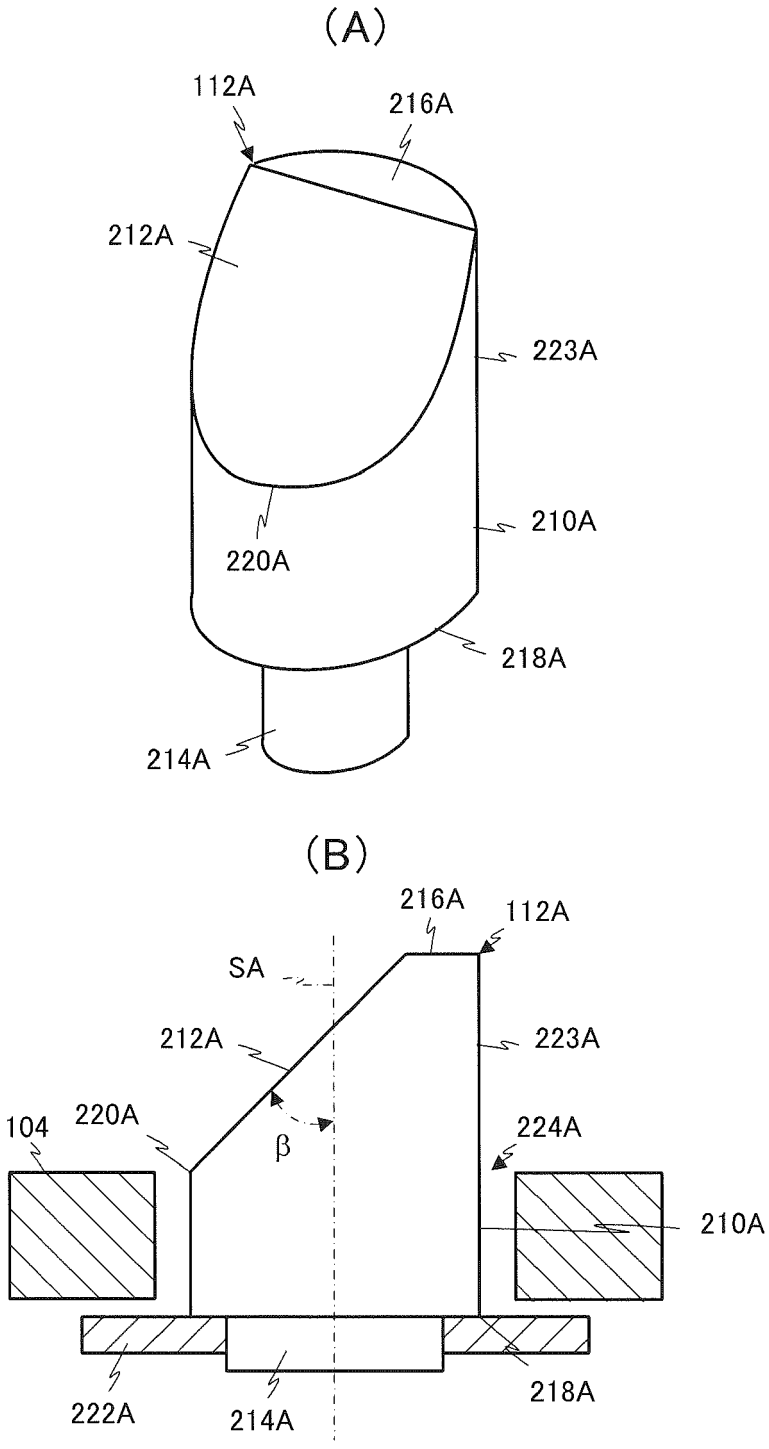
172

FIG.6


(A)
112A
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212A
223A
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220A
218A
214A
(B)
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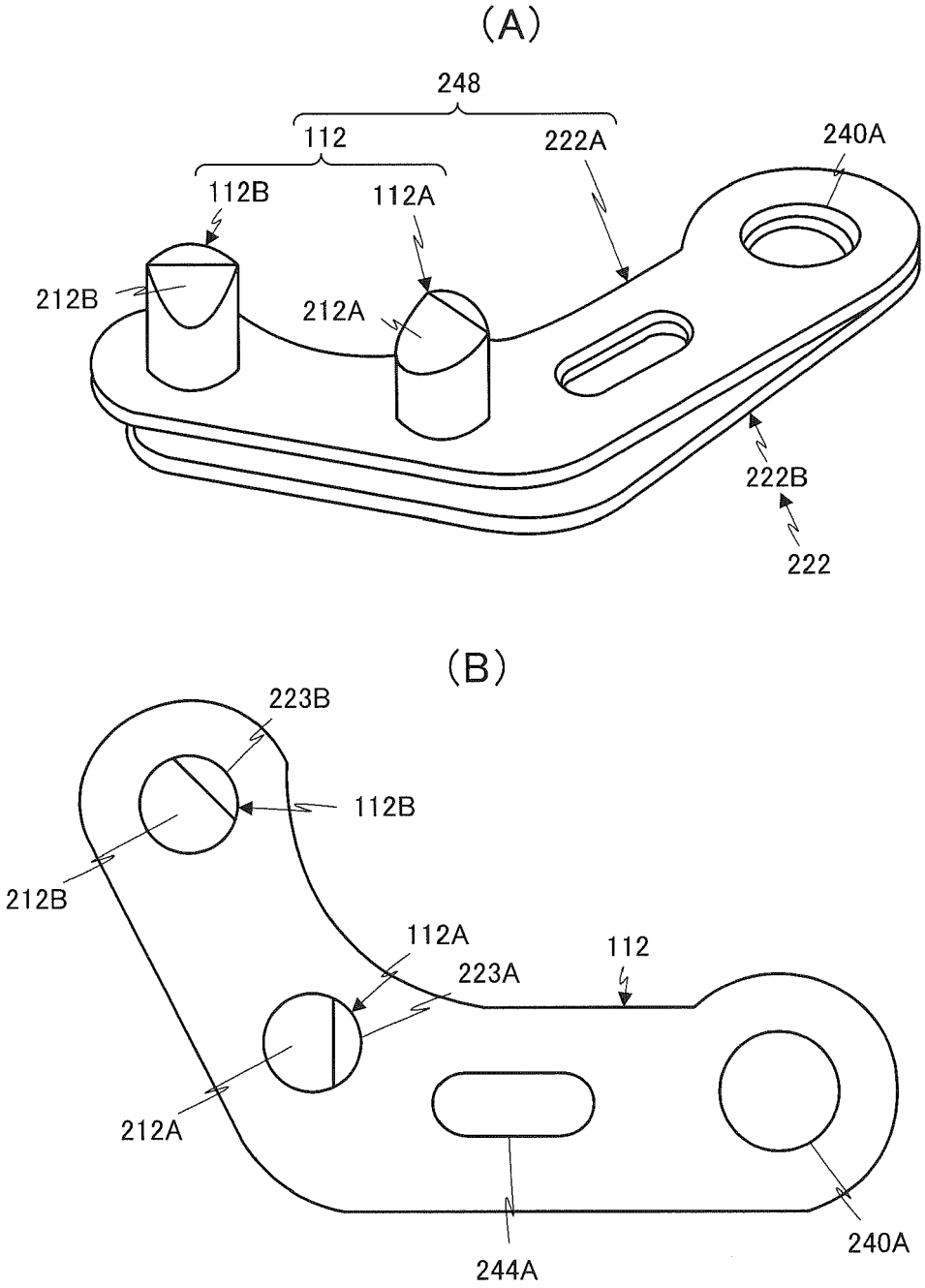
223A
104
220A
β
224A
210A
222A
214A
218A

FIG.7


(A)
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112A
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(B)
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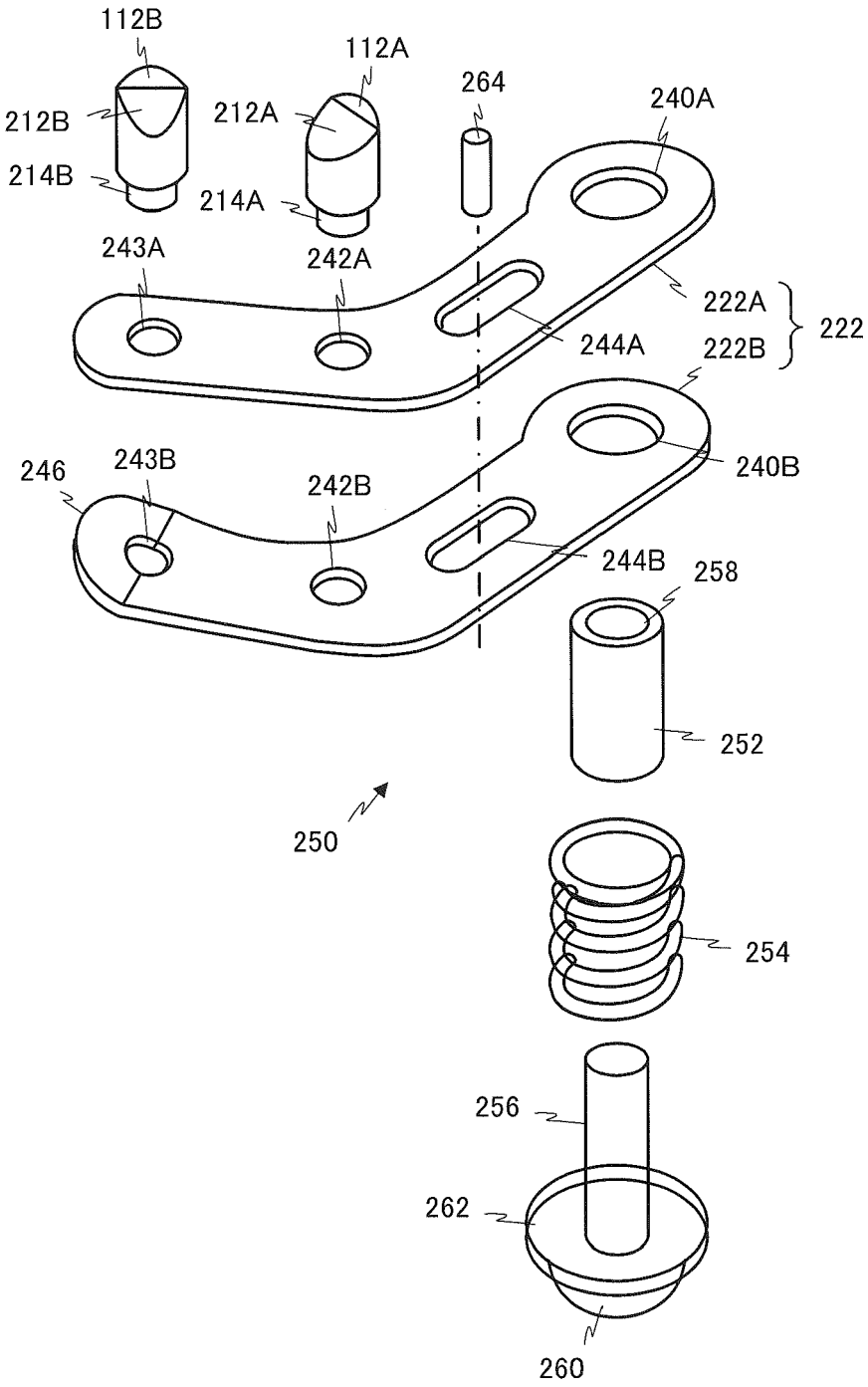
112A
112
223A
212A
240A
244A

FIG.8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243B
242B
244B
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256
262
260

FIG.9

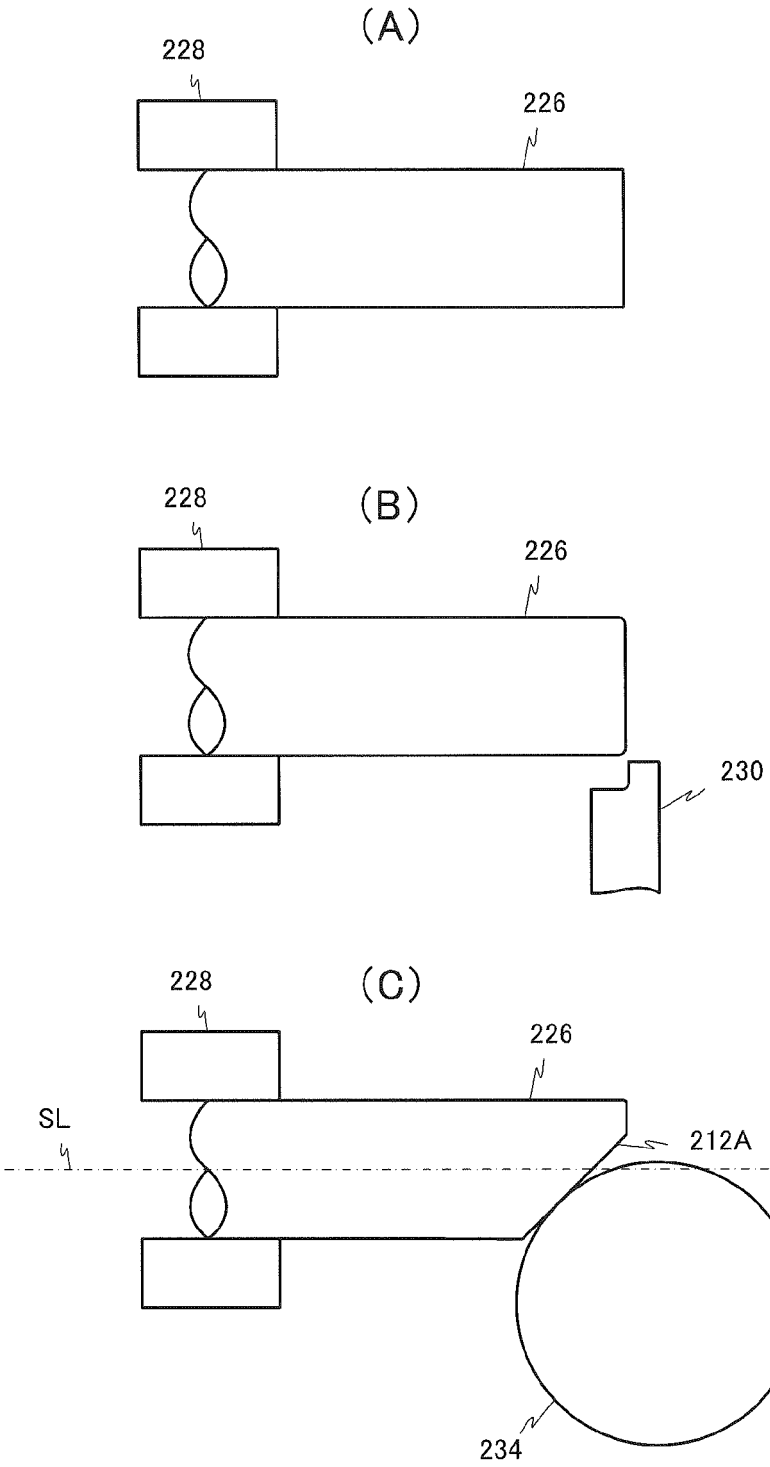
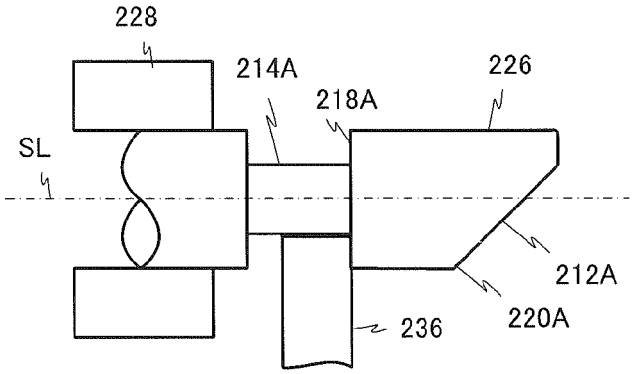


FIG.10

(D)



(E)

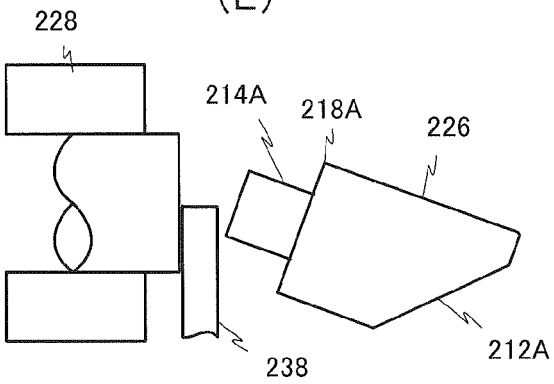
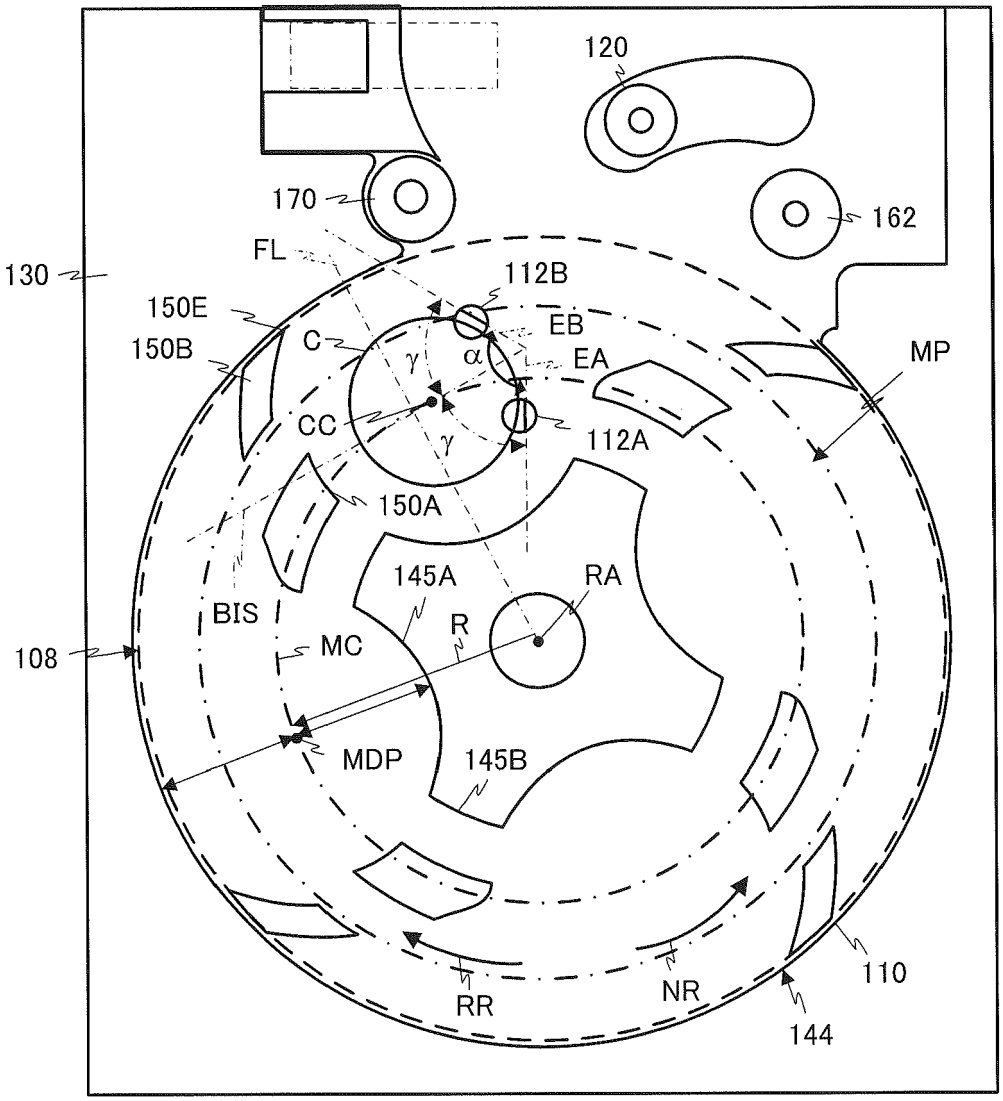


FIG.11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RA
BIS
R
108
MC
MDP
145B
110
RR
NR
144

FIG.12

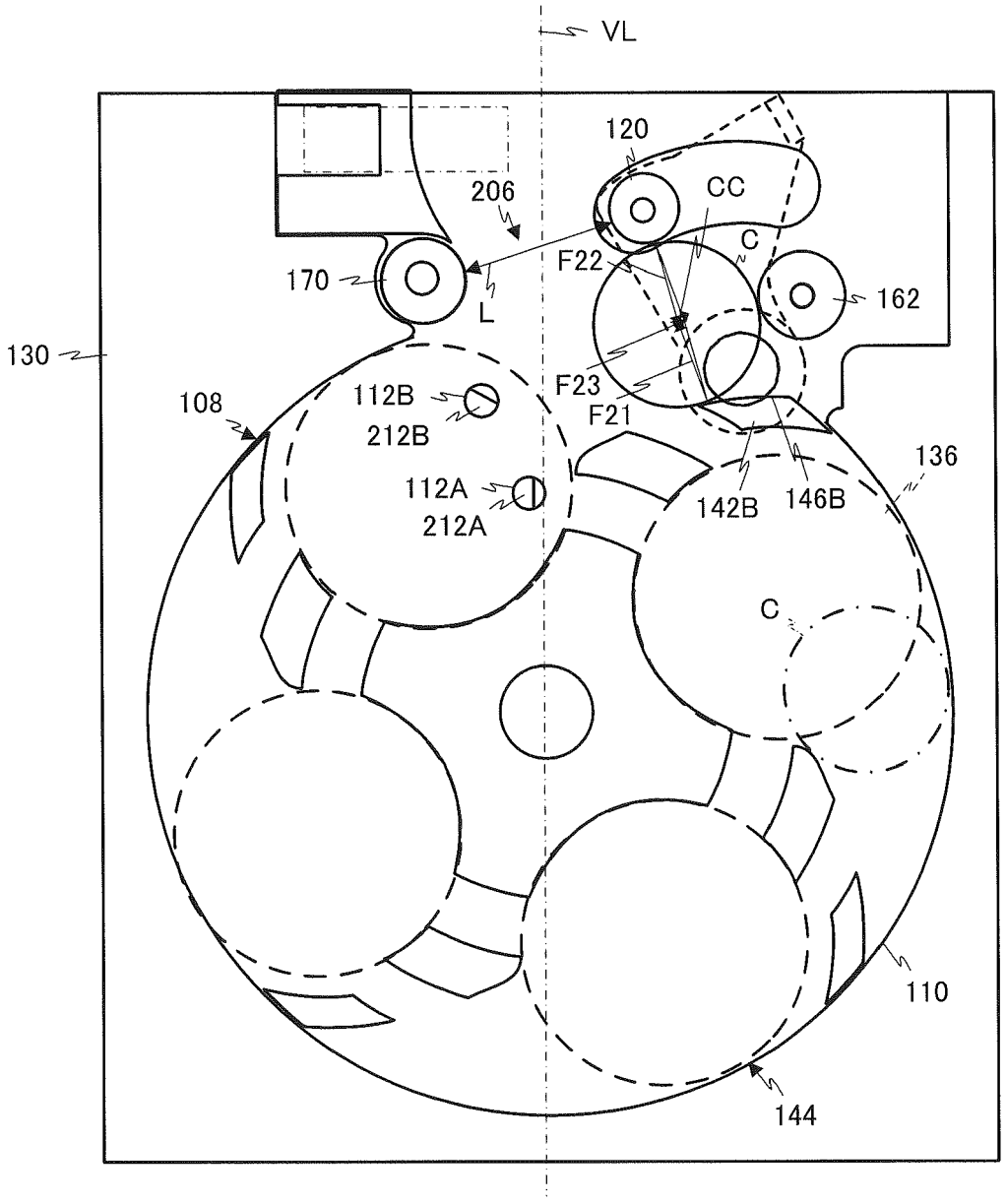
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FIG.13

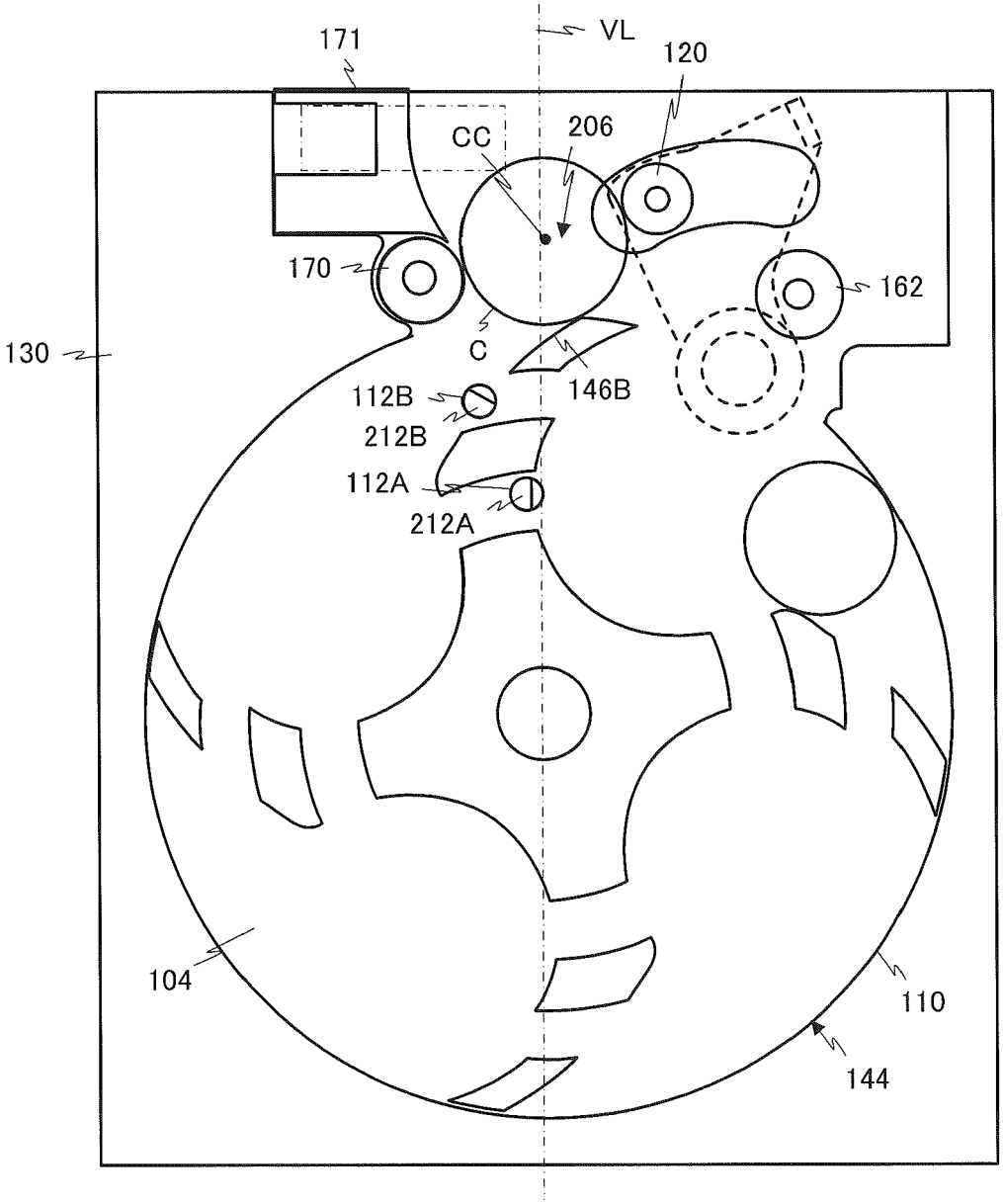
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FIG.14

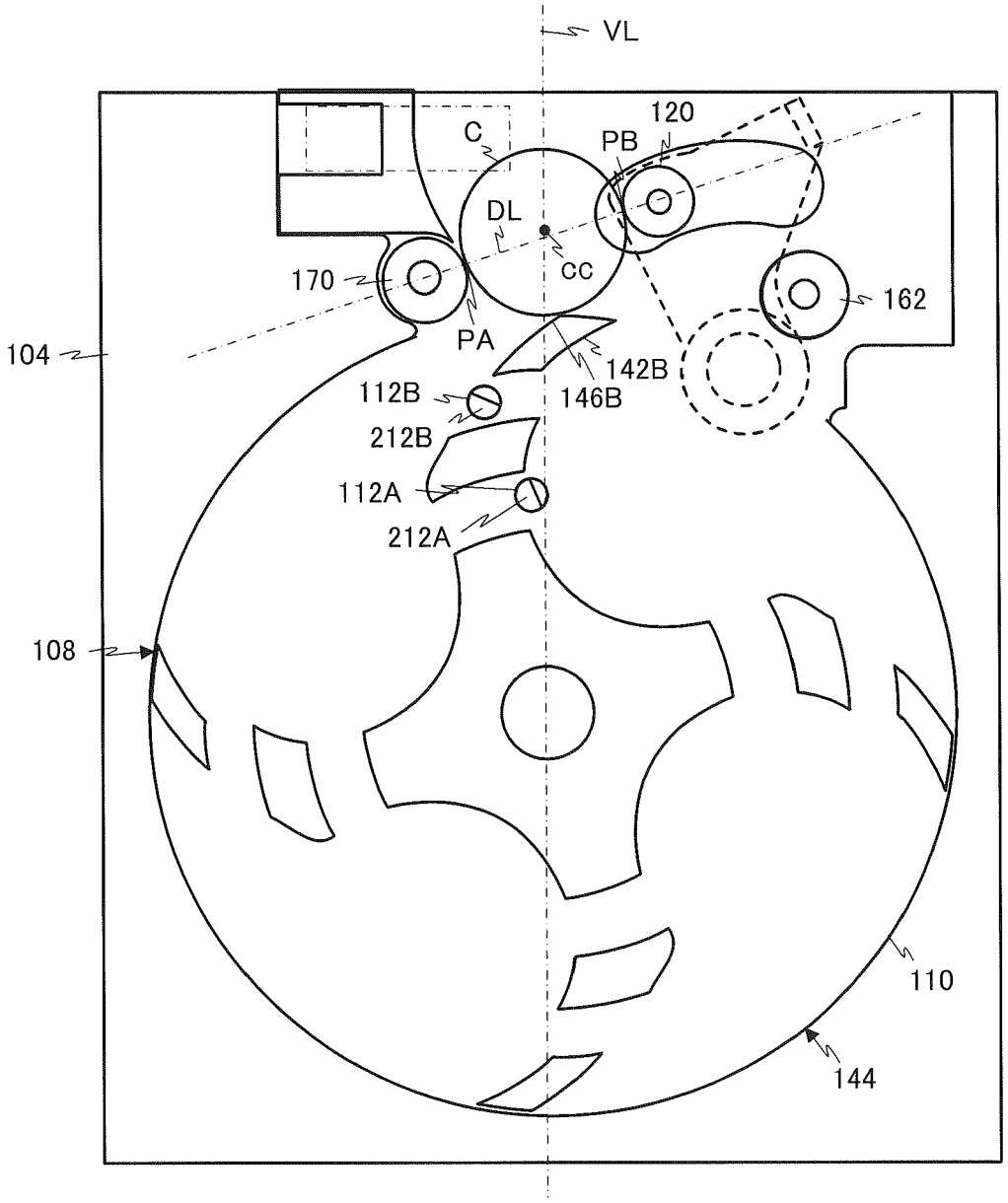
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FIG.15

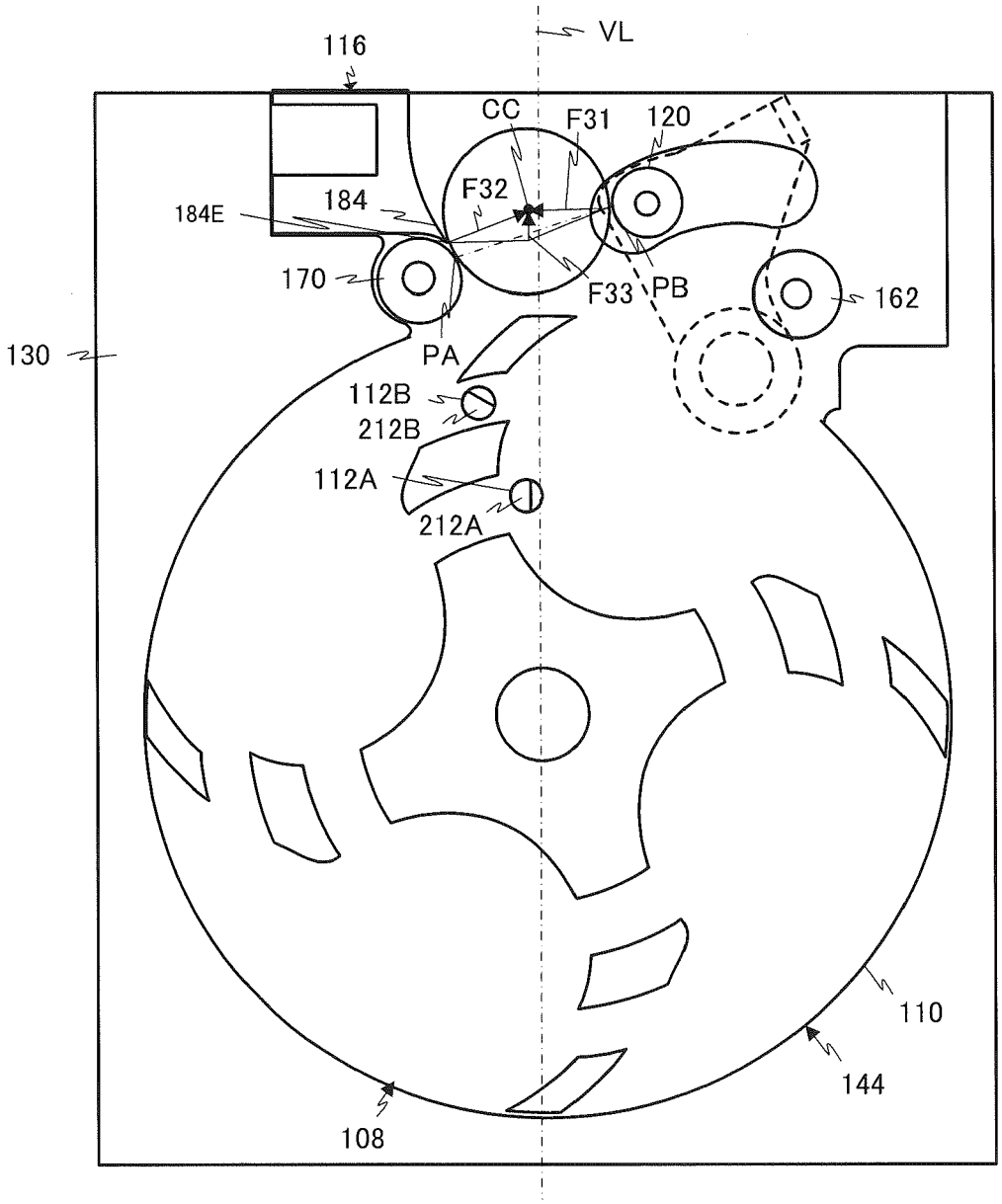
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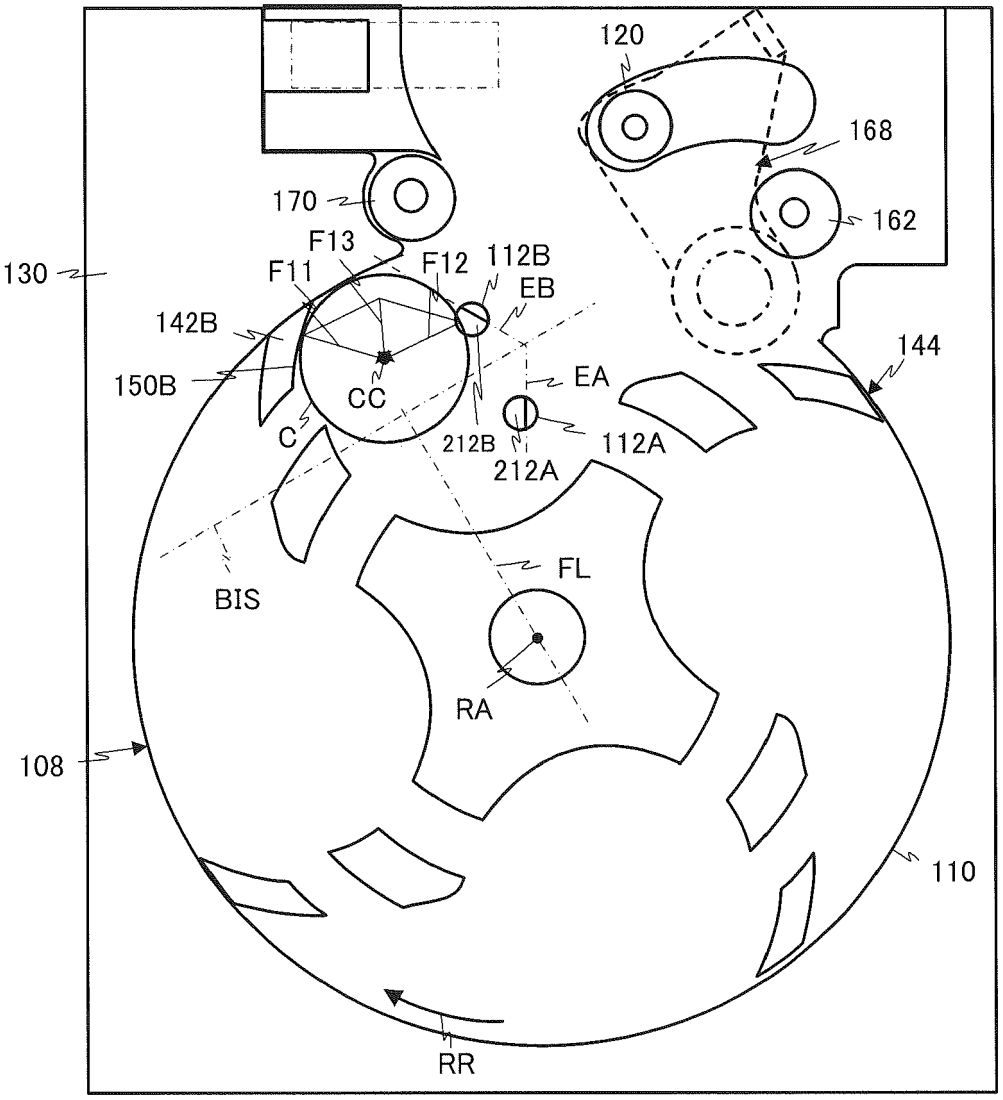
FIG.16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RR

FIG.17

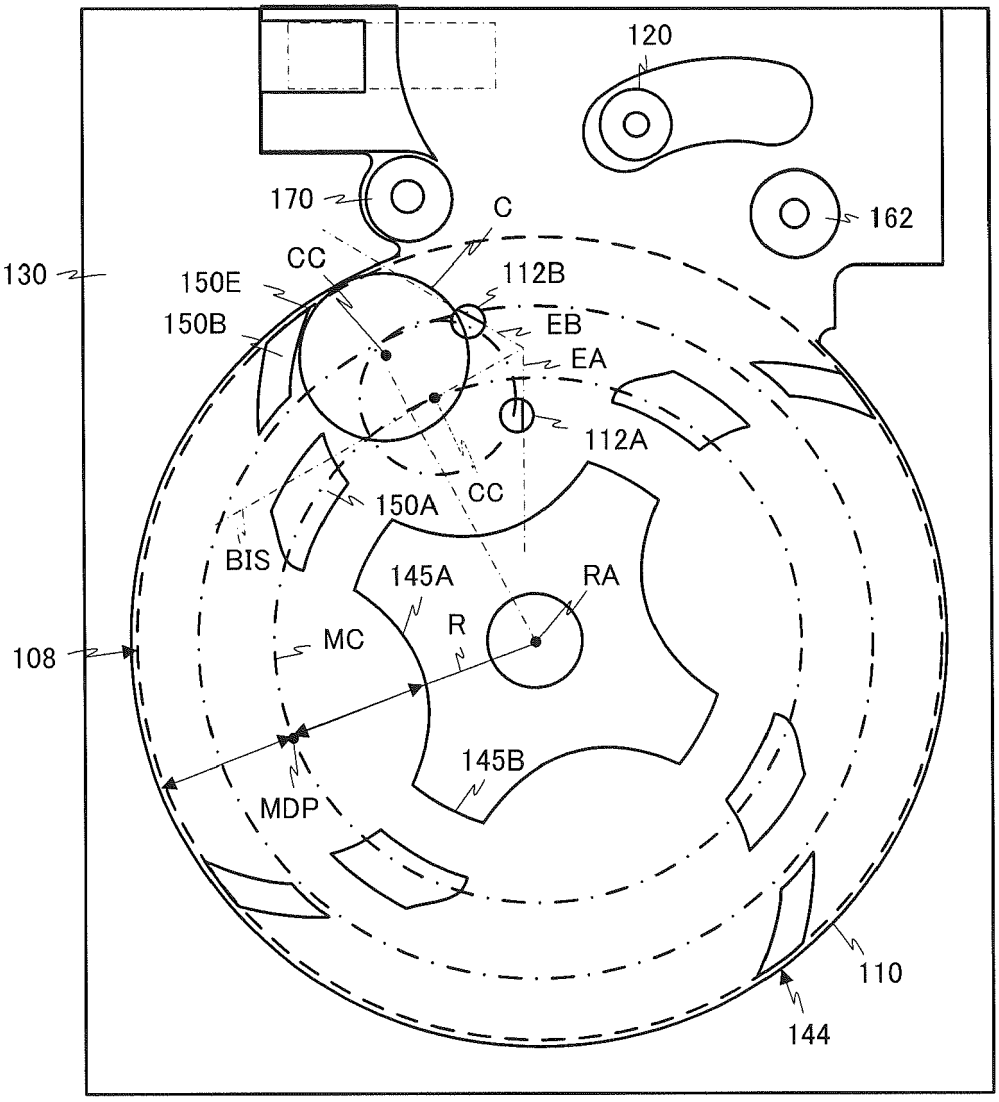
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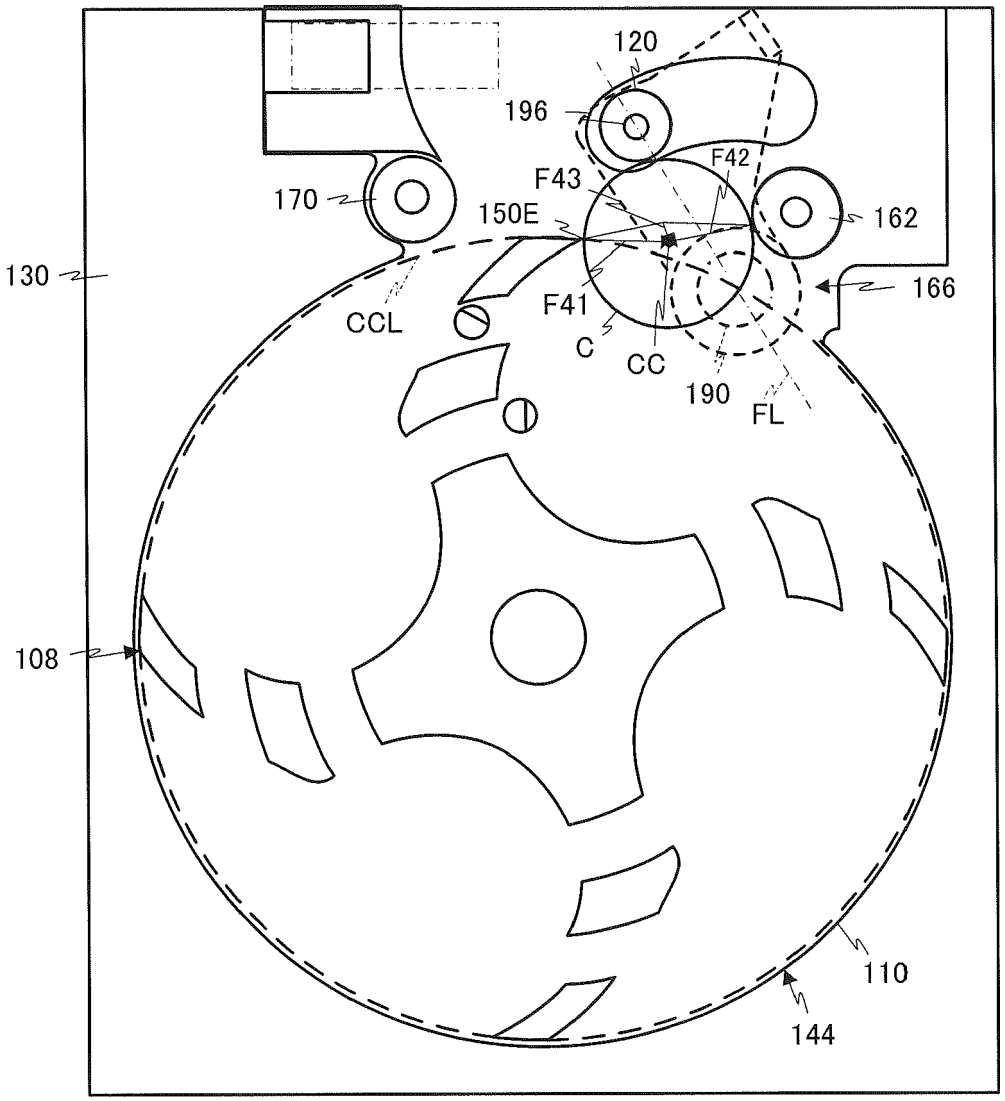
FIG.18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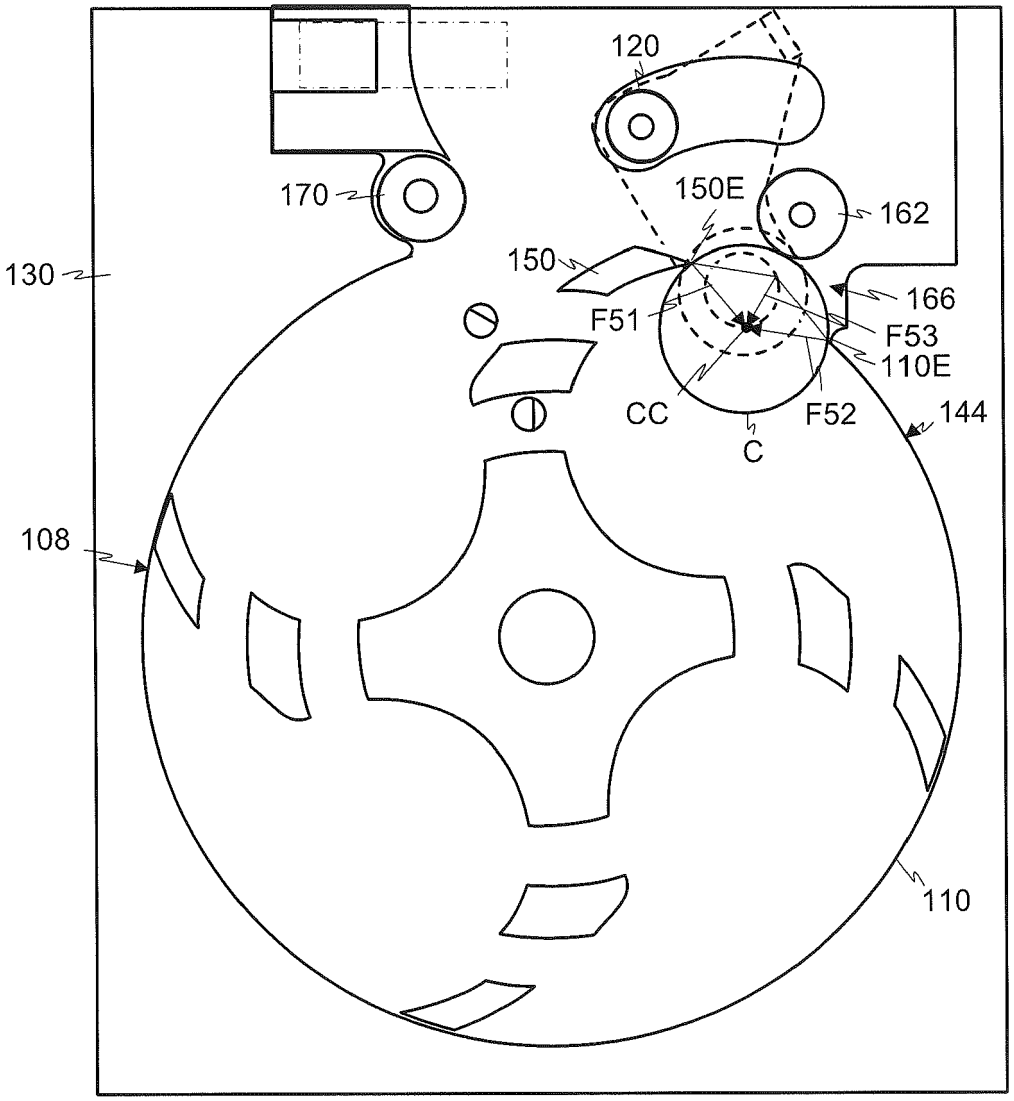
F I
G.19



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EUROPEAN SEARCH REPORT

Application Number
EP 14 16 3351

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 811 467 A1 (ASAHI SEIKO CO LTD [JP]) 25 July 2007 (2007-07-25) * column 6, line 53 - column 7, line 8; figures 2, 5, 6 *	1-3	INV. G07D9/00
X	US 2006/040604 A1 (WEI MING-SHAN [TW]) 23 February 2006 (2006-02-23)	1	
A	* page 2, left-hand column, line 9 - line 28 * * page 2, right-hand column, line 4 - line 10; figure 3 *	2,3	

TECHNICAL FIELDS SEARCHED (IPC)
G07D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 July 2014	Neville, David

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10-07-2014

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		EP 1811467 A1	25-07-2007
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US 2006040604 A1	23-02-2006	NONE	

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Patent documents cited in the description

- JP 2594435 B **[0004]**
- JP 4644632 B **[0006]**