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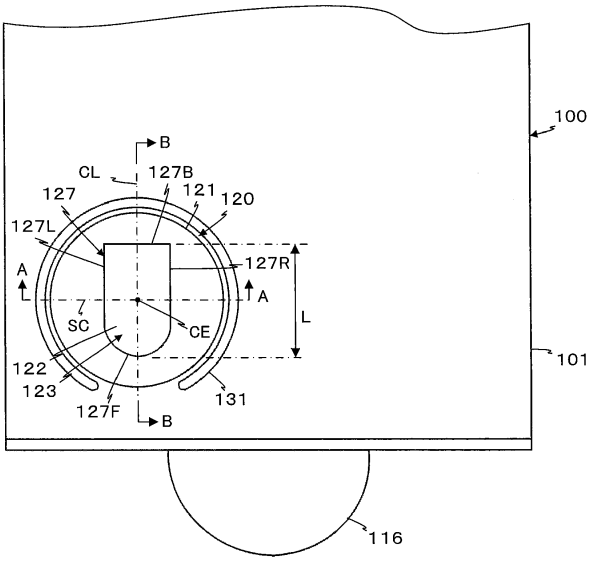
## (54) Coin inlet of coin acceptance and payout apparatus

(57) An object of the present invention is to provide a coin inlet that has a wide receiving range of coins even though it is small in a coin acceptance and payout apparatus.

[Solving Means]

In a a coin acceptance and payout apparatus that has a coin inlet opened upward, concaved downward, and disposed on an upper surface of an outer-surface frame, carries a loaded coin to a next step by a carrying belt disposed at a bottom of the coin inlet, then stores the coin separately by a denomination, and dispenses the coin to a coin receiving opening based on a payment command; wherein the coin inlet has a circular shape in a planar view.

FIG. 7




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## Description

[Technical Field]

**[0001]** The present invention relates to a coin inlet for accepting money in a coin acceptance and payout apparatus, which stores coins of a plurality of denominations received in bulk and then dispenses a predetermined number of the coins of a predetermined denomination (s) to a coin receiving opening based on a dispensing command.

**[0002]** Particularly, the present invention relates to a coin inlet for accepting money that can smoothly send coins to a next step even when the coins of a plurality of denominations are received in any directions in bulk in a coin acceptance and payout money, which stores coins of a plurality of denominations received in bulk and then dispenses a predetermined number of the coins of a predetermined denomination (s) to a coin receiving opening based on a dispensing command.

**[0003]** The "coins" used in the present specification include all the coins such as Japanese coins, U.S. coins, and Euro coins.

[Background Art]

**[0004]** As a first conventional technique, it is known that, in a coin acceptance and payout apparatus that has a coin inlet opened upward, concaved downward and disposed on an outer-surface frame, carries a coin (s) loaded by a rotating disk disposed at a bottom of the coin inlet to a next step, then stores the coins separately by denominations, and dispenses the coins to a coin receiving opening based on a payment command; wherein, the coin inlet has a circular shape in a planar view, furthermore, the coins are stored in bulk in a cylindrical space as a whole formed by a circular peripheral surface vertically extending from an upper surface and the rotating disk disposed at a bottom surface, and the coins are ordered one by one at a circumferential edge part of the disk by the rotation of the lowermost rotating disk, are sorted one by one, and are sent to a next step (Patent Literature 1).

**[0005]** As a second conventional technique, it is known that, in a coin acceptance and payout apparatus that has a coin inlet opened upward, concaved downward, and disposed on an apparatus main body, carries a loaded coin(s) to a next step by a carrying belt disposed at a bottom of the coin inlet, then stores the coins separately by denominations, and dispenses the coins to a coin receiving opening based on a payment command; wherein, the coin inlet has a rectangular shape in a planar view, and the coins are sent to a next step by the carrying belt disposed at the bottom (Patent Literature 2).

[Citation List]

[Patent Literatures]

**[0006]**

[Patent Literature 1] Japanese Patent No. 3479428 (paragraph numbers 0016 to 0020, FIG. 1 to FIG. 3)
[Patent Literature 2] Japanese Patent Application Laid-Open No. 2000-182116 (paragraph numbers 0019 to 0021, FIG. 1 to FIG. 3)

[Disclosure of the Invention]

[Problems to be Solved by the Invention]

**[0007]** In the first conventional technique, the coins are ordered in one row along a peripheral wall by the rotation of the rotating disk and then sent to the next step.

**[0008]** If it is used as a coin acceptance and payout apparatus, normally, about 10 coins are loaded at most to the coin inlet. Therefore, the diameter of the rotating disk may be small, and an electric motor which drives the rotating disk may be small.

**[0009]** On the other hand, in the coin acceptance and payout apparatus, after charging with coins (change) for payout of a predetermined amount is carried out before operating, operating of the apparatus is started. This charge of change is required to be carried out in a short period of time in order to increase the operating rate of the apparatus and improve labor productivity; therefore, it is desired to carry out the charge of a large amount at once. Therefore, in the first conventional technique, since all the coins loaded to the coin inlet are placed on the rotating disk, the diameter of the rotating disk has to be increased, the size of the apparatus is increased, the output of the motor for driving the rotating disk has to be increased, and there is a problem that energy consumption upon normal use in which at most about 10 coins are loaded is large.

**[0010]** The coin acceptance and payout apparatus of the second conventional technique is used as a changing machine in Japan and is generally installed below a POS register. A teller (cashier) receives coins from a client, then loads the coins into the coin inlet, then takes out change coins dispensed to the coin receiving opening, and hands them to the client. Therefore, it is preferred that the coin inlet be formed rectangular which is long in the extending direction of the carrying belt as described above so that the cashier can easily loads coins thereinto. This is for a reason that, when a person loads coins into the coin inlet, the coins held in the palm are loaded into the coin inlet by an operation of opening the palm or by naturally dropping the coins placed on the palm; therefore, there is a tendency that the coins are dispersed and dropped along the extending direction of the palm. In other words, it is preferred that, when the cashier faces the front, the coin inlet is formed to be long to the front

side.

**[0011]** However, instead of loading the coins by the cashier, the coins are loaded by the client himself/herself in some cases, and a case in which the coins have to be loaded from a lateral direction with respect to the extending direction of the carrying belt rarely exists.

**[0012]** This will be explained with reference to FIG. 1 and FIG. 2.

**[0013]** In FIG. 2, at the center of a vertically-long rectangular register table 10, a price input-terminal display device 12 is installed, and a cashier 14 inputs the price of a product(s) purchased by a client 16 to the input-terminal display device 12 by a barcode reading device or the like. When input of all the products is finished, sum processing is carried out, and a bill is displayed by the input-terminal display device 12.

**[0014]** A POS register 18 is disposed in an upstream-side end lateral side of the register table 10, wherein issuing of receipts and acceptance/payout of currency are carried out. In a case in which the client 16 loads coins by himself/herself to a coin acceptance and payout apparatus 20, the coin acceptance and payout apparatus 20 is disposed at an end of the register table 10 separately from the POS register 18. In this case, as shown by a chain line, it is preferred that a coin inlet 22 of the coin acceptance and payout apparatus 20 be disposed to be vertically long in the direction extending to the front side of the client 16. However, a rear part of the coin acceptance and payout apparatus 20 projects out from the register table 10 and affects the layout of other equipment; therefore, in some cases, inevitably, the coin inlet 22 has to be disposed to be horizontally long as shown by a solid line. In that case, the short side of the coin inlet 22 is opposed to the extending direction of the palm of the client 16; therefore, the client 16 has to load coins while paying attention so that the coins do not fall outside the coin inlet 22, and usability has been bad. Note that 25 represents a coin receiving opening.

**[0015]** In the second conventional technique, the load of the coins placed on the carrying belt affects the driving force of the carrying belt. Therefore, the influence is large if the depth of the coin inlet is deepened, while there is no large influence in a case in which a lateral-side part of the carrying belt is enlarged. In other words, in the case in which the size of the coin inlet is increased to a lateral side with respect to the carrying belt, there is almost no influence on the driving force of the carrying belt. Therefore, the case in which the size of the coin inlet is increased for supplying change is more advantageous than the first conventional technique.

**[0016]** However, in the second conventional technique, the coin inlet is a rectangle which is long in the extending direction of the carrying belt. Therefore, it is preferred to load coins from this long-side direction in which a receivable range is wide even when the loading positions upon coin loading are deviated. On the other hand, if coins are loaded from a short-side direction or from a direction oblique to the long side, the short-side part of the coin inlet is opposed to the direction in which the palm is opened (long-side direction of the palm). More specifically, since the size of the coin inlet in the direction in which the palm is opened is comparatively short, the risk that the coins are deviated from the coin inlet and fall to a floor surface is increased, and the coins has to be loaded with corresponding attentiveness. Therefore, there has been a demand to enable loading with not so much attentiveness.

**[0017]** As another usage, as shown in FIG. 3 to FIG. 4, the coin acceptance and payout apparatus 20 is sometimes installed in a payment machine.

**[0018]** Depending on an installed location, the payment machine includes a case of a vertically-long payment machine 24D in which a depth can be largely reserved and a case in which a depth cannot be reserved, wherein a horizontally-long payment machine 24W which is horizontally long is formed, and necessary devices are built therein. Each of coin inlets 26 of the vertically-long payment machine 24D and the horizontally-long payment machine 24W is disposed on the front surface of a machine main body 28 thereof; therefore, from the coin inlet 26, a guiding path 30 having a predetermined slope to the coin inlet 26 of the coin acceptance and payout apparatus 20 has to be disposed. As a result, the coins from the guiding path 30 cannot be received by the existing coin inlet 26, the position of the coin inlet 22 has to be changed, or the size thereof has to be increased. As a result, since the coin acceptance and payout apparatus 20 is different from standard specifications, there is a problem that cost is increased.

**[0019]** In the horizontally-long payment machine 24W, since the short side of the coin inlet 26 is positioned with respect to the short side of the coin inlet 22, the selection range of the coin inlet 22 is further narrowed, and there is a problem similar to that described above.

**[0020]** Therefore, in order to solve these problems, at a single coin inlet, a coin inlet having a large application range of the loading positions of coins has been desired.

**[0021]** In order to obtain the coin inlet having the large application range of the loading positions of the coins, it is conceivable to increase the coin inlet per se. However, since it leads to increase in the size of the whole coin acceptance and payout apparatus 20, this cannot be promptly employed.

**[0022]** A first object which is a basic object of the present invention is to provide a coin inlet having a large receiving range of coins even though it is small in a coin acceptance and payout apparatus.

**[0023]** A second object which is a basic object of the present invention is to provide a coin inlet of a coin acceptance and payout apparatus, wherein driving force is not increased even when loaded coins at a coin inlet are increased, and the size of an electric motor is not required to be increased.

**[0024]** A third obj ect which is a subordinate obj ect of the present invention is to provide a coin acceptance and payout apparatus at a low price by causing a coin inlet

to have a shape which can be easily produced.

**[0025]** A fourth object which is a subordinate object of the present invention is to provide a coin inlet of a coin acceptance and payout apparatus with which the position of the coin inlet can be easily recognized by a client.

**[0026]** Therefore, it is an object of the present invention to achieve at least the first and second objects.

[Means to Solve the Problems]

**[0027]** In order to achieve these objects, a first mode of the present invention is configured in a below manner.

**[0028]** A coin inlet of a coin acceptance and payout apparatus has the coin inlet opened upward, concaved downward, and disposed on an upper surface of an outer-surface frame, carries a loaded coin to a next step by a carrying belt disposed at a bottom of the coin inlet, then stores the coin separately by a denomination, and dispenses the coin to a coin receiving opening based on a payment command; wherein, the coin inlet has a loading opening having a circular shape in a planar view.

**[0029]** A second mode of the present invention is configured in a below manner.

**[0030]** A coin inlet of a coin acceptance and payout apparatus has the coin inlet opened upward, concaved downward, and disposed on an upper surface of an outer-surface frame, carries a loaded coin to a next step by a carrying belt disposed below the coin inlet, then stores the coin separately by a denomination, and dispenses the coin to a coin receiving opening based on a payment command; wherein the coin inlet has a loading opening having a semispherical shape and a circular shape in a planar view and is formed into a downward slope toward the carrying belt in an entire circumference of the carrying belt.

**[0031]** A third mode of the present invention is configured in a below manner.

**[0032]** A coin inlet of a coin acceptance and payout apparatus has the coin inlet opened upward, concaved downward, and disposed on an upper surface of an outer-surface frame, carries a loaded coin to a next step by a carrying belt disposed below the coin inlet, then stores the coin separately by a denomination, and dispenses the coin to a coin receiving opening based on a payment command; wherein the coin inlet has a loading opening having a circular shape in a planar view and is formed into a cylindrical peripheral wall vertically extending from an upper surface of the loading opening and into a downward slope toward the carrying belt in an entire circumference of the carrying belt, the slope continued to a lower end of the cylindrical peripheral wall.

**[0033]** A fourth mode of the present invention is configured in a below manner.

**[0034]** A coin inlet of a coin acceptance and payout apparatus has the coin inlet opened upward, concaved downward, and disposed on an upper surface of an outer-surface frame, carries a loaded coin to a next step by a carrying belt disposed below the coin inlet, then stores the coin separately by a denomination, and dispenses the coin to a coin receiving opening based on a payment command; wherein the coin inlet has a loading opening having a circular shape in a planar view and is disposed so that a long side of the carrying belt is exposed to be longer than a short side thereof at a center of the circular shape in the planar view; and the carrying belt is set so that distances from ends of the short side and the long side of the carrying belt to edges of the coin inlet are smaller than an expected maximum coin diameter.

**[0035]** A fifth mode of the present invention is configured in a below manner.

**[0036]** The coin inlet of the coin acceptance and payout apparatus of modes 1 to 4 of the present invention, wherein a circular light emitter is disposed around the coin inlet.

[Effects of the Invention]

**[0037]** In the first mode of the present invention, the coin inlet has the circular shape in the planar view. Therefore, in a case in which the extending direction of the long side of the belt is longitudinal, all the positions from the center of the coin inlet are the same (including practically the same) ; therefore, even when coins are loaded from any directions, the distances from the center of the coin inlet are the same, the coins can be received even if the positions of loading the coins are different, and there is an advantage that the first object of the invention of the present application can be achieved.

**[0038]** Furthermore, since carrying of the coin to the next step is carried out by the carrying belt disposed at the bottom of the coin inlet, even in a case in which the amount of coins which can be loaded is increased, the driving power of the carrying belt is not affected almost at all as long as the depth of the coin inlet is not increased. Therefore, there is an advantage that the second object which is a main object of the present invention can be achieved.

**[0039]** In the second mode of the present invention, main configurations are the same as those of the first mode. Therefore, there is an advantage that the first object and the second object which are the basic objects of the invention of the present application can be achieved as well as the first mode.

**[0040]** The coin inlet is semispherical and is formed into the downward slope toward the carrying belt in the entire circumference of the carrying belt. Therefore, the coin loaded to the coin inlet can slide down the slope and be moved onto the carrying belt. Therefore, there is an advantage that the coin can be smoothly sent to the next step.

**[0041]** In the third mode of the present invention, main configurations are the same as those of the first mode. Therefore, there is an advantage that the first object and the second object which are the basic objects of the invention of the present application can be achieved as well as the first mode.

**[0042]** Furthermore, the cylindrical peripheral wall, which is vertically extending from the upper surface of the coin receiving opening, and the downward slope, which is continued to the lower end of the cylindrical peripheral wall and is toward the carrying belt, are formed in the entire circumference of the carrying belt. Therefore, the coin loaded into the coin inlet can slide down the slope and be moved onto the carrying belt. Therefore, there is an advantage that the coin can be smoothly sent to a next step.

**[0043]** In the fourth mode of the present invention, main configurations are the same as those of the first mode. Therefore, there is an advantage that the first object and the second object which are the basic objects of the invention of the present application can be achieved as well as the first mode.

**[0044]** Furthermore, the carrying belt is disposed so that the long side of the belt is exposed to be longer than the short side thereof at the center of the circular shape in the planar view; and the carrying belt is set so that distances from the ends of the short side and the long side of the carrying belt to the edges of the coin inlet are smaller than the expected maximum coin diameter. Therefore, there are advantages that the downward slope toward the carrying belt is large and that the storage amount of coins can be increased.

**[0045]** In the fifth mode of the present invention, main configurations are the same as those of the first mode. Therefore, there is an advantage that the first and second objects which are the basic objects of the invention of the present application can be achieved.

**[0046]** Furthermore, the circular light emitter is disposed around the coin inlet. Therefore, the position of the coin inlet can be highlighted by emitting light by the light emitter. Therefore, there is an advantage that miss-loading upon coin loading by clients can be reduced.

[Brief Description of Drawings]

**[0047]**

[FIG. 1] FIG. 1 is a perspective view of a coin acceptance and payout apparatus provided with a conventional coin inlet.

[FIG. 2] FIG. 2 is a plan view showing an example around a POS register for explaining a conventional technique.

[FIG. 3] FIG. 3 shows a vertically-long payment machine in which a conventional coin acceptance and payout apparatus is built; wherein, (A) is a plan view, and (B) is a lateral view.

[FIG. 4] FIG. 4 shows a horizontally-long payment machine in which a conventional coin acceptance and payout apparatus is built; wherein, (A) is a plan view, and (B) is a lateral view.

[FIG. 5] FIG. 5 is a perspective view of a coin acceptance and payout apparatus of a first embodiment of the present invention.

[FIG. 6] FIG. 6 is a schematic configuration drawing of the coin acceptance and payout apparatus of the first embodiment of the present invention.

[FIG. 7] FIG. 7 is a partial plan view of the coin acceptance and payout apparatus of the first embodiment of the present invention.

[FIG. 8] FIG. 8 is a cross-sectional view of a line A-A of FIG. 7.

[FIG. 9] FIG. 9 is a cross-sectional view of a line B-B of FIG. 7.

[FIG. 10] FIG. 10 is a working explanatory drawing of the line A-A of FIG. 7.

[FIG. 11] FIG. 11 is a working explanatory drawing of the cross section of the line B-B of FIG. 7.

[FIG. 12] FIG. 12 is a cross-sectional view at a position similar to that of the cross section of the line A-A of FIG. 7 in a coin acceptance and payout apparatus of a second embodiment of the present invention.

[FIG. 13] FIG. 13 is a cross-sectional view at a position similar to that of the cross section of the line B-B of FIG. 7 in the coin acceptance and payout apparatus of the second embodiment of the present invention.

[Description of Embodiments]

**[0048]** A best mode of a coin dispenser in the present invention is a coin inlet of a coin acceptance and payout apparatus that has the coin inlet opened upward, concaved downward, and disposed on an upper surface of an outer-surface frame, carries a loaded coin to a next step by a carrying belt disposed below the coin inlet, then stores the coin separately by a denomination, and dispenses the coin to a coin receiving opening based on a payment command; wherein

the coin inlet has a loading opening having a circular shape in a planar view and is disposed so that a long side of the carrying belt is exposed to be longer than a short side thereof at a center of the circular shape in the planar view; and

the carrying belt is set so that distances from ends of the short side and the long side of the carrying belt to edges of the coin inlet are smaller than an expected maximum coin diameter.

[First Embodiment]

**[0049]** The present first embodiment is an example of a coin acceptance and payout apparatus, which receives coins of 8 denominations, i.e. , 2 euros, which is the currency of European Union, 1 euro, 50 cents, 20 cents, 10 cents, 5 cents, 2 cents, and 1 cent, stores them separately by the denominations, pays a predetermined number of coins of a predetermined denomination(s) based on a dispensing command from a higher-level device. However, coins around the world such as coins of Japanese yen or US dollars can be applied as target

coins of the present invention.

**[0050]** An outline of a coin acceptance and payout apparatus 100 will be explained with reference to FIG. 5 and FIG. 6.

**[0051]** The coin acceptance and payout apparatus 100 includes a coin receiving device 102 disposed in an outer-surface frame 101, a coin separating and feeding device 104, a denomination discriminating device 106, a carrying device 108, a sorting unit 110, a coin storing unit 112, a payment device 114, and a coin receiving opening 116.

**[0052]** First, the coin receiving device 102 will be explained with reference to FIG. 7 to FIG. 9.

**[0053]** The coin receiving device 102 has a function to feed coins C of a plurality of denominations, which have been loaded in bulk into a coin inlet 120, to the coin separating and feeding device 104 of a next step within a range that the coins do not exceed a predetermined amount per unit time.

**[0054]** Specifically, the coin receiving device 102 includes the coin inlet 120, a collapsing roller 124, a first electric motor 126 which drives a carrying belt 122, and a control circuit (not shown) of the first electric motor 126.

**[0055]** First, the coin inlet 120 according to the present invention will be explained.

**[0056]** The coin inlet 120 has a function to guide a coin (s), which are loaded by a client, directly onto the carrying belt 122 or, after loading by the client, receive the coin guided by a coin guide and guide the coin onto the carrying belt 122.

**[0057]** The coin inlet 120 is disposed on a front-end left-side upper surface of the outer-surface frame 101 and consists of a loading opening 121 of the coin inlet 120 and a storing unit 123 disposed therebelow. In other words, the upper surface of the storing unit 123 is the loading opening 121, and the loading opening 121 has a circular shape in a planar view. The "circular shape in a planar view" may be a shape which can be determined to be a circular shape by visual check even if it is not an exact circle having an equal distance from a center CE; however, this is an idea that does not include an oval like a rugby ball. As a result of disposing the coin inlet 120 on the front-end left-side upper surface of the outer-surface frame 101 like the present first embodiment, the coin inlet 120 is positioned at a position closest to the client even if the coin acceptance and payout apparatus 100 is disposed to be either vertical or lateral with respect to the client; therefore, there is an advantage that loading by the client is facilitated and that convenience of the client is increased.

**[0058]** The diameter of the loading opening 121 is formed to be larger than the width WB of the later-described carrying belt 122 in the present first embodiment. Specifically, the diameter is formed to be about two times the width W of a carrying opening 127, but is set to be smaller than two times thereof. Furthermore, specifically, the width W of the carrying opening 127 is set based on the relation with the diameter of a maximum-diameter coin, which is expected to be used; therefore, the diameter of the coin inlet 120 is preferred to be about two times the width W of the carrying opening 127.

**[0059]** The storing unit 123 is a part concaved downward from the loading opening 121 and is formed into a semispherical shape in the present first embodiment. More specifically, as shown in FIG. 8 and FIG. 9, the storing unit 123 is formed into a semispherical shape by forming the storing unit 123 along a lower part of a virtual circle CCL, which is drawn by a predetermined radius R about the center CE positioned on a long-side center line CL and slightly above the upper surface of the outer-surface frame 101. The semispherical shape is an idea that is not required to be an exact semisphere, but only required to be a shape which can be apparently said as a semispherical shape.

**[0060]** At a wall surface 125 at the bottom of the coin inlet 120, in other words, the bottom surface of the semispherical wall surface 125 partitioning the storing unit 123, the carrying opening 127 having a rectangular long-hole shape is formed to be long in the long-side direction of the outer-surface frame 101.

**[0061]** As shown in FIG. 8, the width W of the carrying opening 127 is formed to be slightly narrower than the width WB of the carrying belt 122, and the long-side center line CL in the long-side direction thereof passes through the center CE of the loading opening 121 and is parallel to the long-side edges of the outer-surface frame 101. A long-side left edge 127L and a right edge 127R of the carrying opening 127 project downward like ribs and constitute guiding walls of a coin C, the heights thereof at smallest parts are less than two times the thickness of a thickest coin expected to be used, and the width W therebetween exceeds the diameter of a maximum-diameter coin expected to be used and is set to be in a range equal to or less than 1.5 times thereof. This is for preventing coin jamming (clogging of a coin(s) due to some reason) and carrying the coin(s) to a next step as soon as possible. Lower ends of the left edge 127L and the right edge 127R are formed to be parallel to the upper surface of the later-described carrying belt 122, and the distance therebetween is set to be smaller than the thickness of a thinnest coin expected to be used. This is for preventing the coin C from falling from the gap therebetween.

**[0062]** A maximum distance MD between the left edge 127L and the loading opening 121, in other words, a distance MD between the left edge 127L on a short-side center line SC, which passes through the long-side center line LC and forms a right angle with the long-side center line LC, and a left end 121L of the loading opening 121 is set to be smaller than the diameter of the maximum-diameter coin. The relation between a right end 121R, which is opposed to the left end 121L, and the right edge 127R is also similarly set. This is for sufficiently obtaining a slope angle of the semispherical wall surface 125 so that the coin loaded into the coin inlet 120 quickly slides down onto the carrying belt 122.

**[0063]** A long-side size L between a front end part 127F

and a rear end part 127B in the vertical direction of the carrying opening 127 is set to be larger than the width W. In other words, the carrying opening 127 is formed into a vertically-long rectangular shape, and the long-side size L is about three times the diameter of the maximum-diameter coin expected to be used.

**[0064]** As is clear from FIG. 7, the front end part 127F is formed into an arc-shaped semicircular shape. This is for guiding a coin(s) leaning on the wall surface 125 to the long-side center line CL side of the carrying belt 122 when the carrying belt 122 is moved in an opposite carrying direction (front end 127F side) and, then, for quickly bringing the coin into surface contact with the carrying belt 122 when the carrying belt 122 is moved in the carrying direction (rear end part 127B side).

**[0065]** As is clear from FIG. 9, the front end part 127F is extended downward so as to be approximately vertical with respect to the carrying belt 122, and the interval between a lower end thereof and the carrying belt 122 is set to an interval smaller than the thickness of the thinnest coin expected to be used. This is for preventing the coin from being sandwiched between the gap therebetween in a case of backward feeding of the carrying belt 122.

**[0066]** The rear end part 127B is linearly formed and is formed so as to form a right angle with the long-side center line CL as shown in FIG. 8. The size of the front end part 127F, the rear end part 127B, and the loading opening 121, in other words, the distance on the long-side center line CL is set to be smaller than three times the diameter of the maximum-diameter coin expected to be used.

**[0067]** Next, the carrying belt 122 will be explained.

**[0068]** The carrying belt 122 has a function to carry the coin (s), which have been loaded into the coin inlet 120 and dropped from the storing unit 123 onto the carrying belt 122, to a next step.

**[0069]** The carrying belt 122 is disposed immediately below the carrying opening 127 and is disposed along the long-side center CL. Specifically, the carrying belt 122 is stretched between a pair of rollers 125F and 125B, is provided to be slightly tilted upward in the carrying direction, and has a width wider than the width of the carrying opening 127, and the long-side-direction length thereof is set to be longer than that of the carrying opening 127.

**[0070]** The carrying belt 122 can be moved in a forward-rotation direction, in which the coin C is carried forward (next step) by the first electric motor 126, and in a backward-rotation direction, in which the coin C is returned. The first electric motor 126 becomes a forward-rotation, backward-rotation, or stopped state depending on a command from a control device (not shown).

**[0071]** Next, the collapsing roller 124 will be explained.

**[0072]** The collapsing roller 124 is disposed above the roller 125B of the carrying belt 122 with a gap, which is about three times the thinnest coin, between the collapsing roller and the carrying belt 122, and part of the circumferential surface thereof is projecting to the storing unit 123.

**[0073]** If the upper surface of the carrying belt 122 is moved in the carrying direction (in FIG. 9, leftward direction), the lower surface of the collapsing roller 124 is rotated in the opposite direction of the moving direction of the carrying belt 122; and, if the carrying belt 122 is moved in the returning direction, the collapsing roller 124 is configured to be in a still state. The carrying direction represents the carrying direction to the next step and, in the present first embodiment, refers to a direction of carrying to the coin separating and feeding device 104 of the next step.

**[0074]** By virtue of this, if three or more thinnest coins are overlapped with one another on the carrying belt 122 and reach the collapsing roller 124, the uppermost coin is moved in the returning direction and shoved and dropped by the collapsing roller 124, wherein it has the function to regulate them so that many coins C are not dropped at once to the coin separating and feeding device 104 of the next step. Furthermore, if the carrying belt 122 is moved in the carrying direction, the collapsing roller 124 feeds the coins C, which are stacked in the storing unit 123, to the carrying-belt-122 side by frictional force.

**[0075]** The upper-side circumferential surface of the collapsing roller 124 is set to have, with respect to the rear end part 127B of the carrying opening 127, an interval narrower than the thickness of the thinnest coin. This is for preventing the coin C from being sandwiched in this gap.

**[0076]** A single or a plurality of photoelectric sensor(s) 128, which are coin detecting devices, are disposed so that the light axes thereof go across slightly above the carrying belt 122 below the coin inlet 120.

**[0077]** If the light axis of the photoelectric sensor 128 is interrupted, it is considered that the coin C has been loaded, and the first electric motor 126 is driven to move the carrying belt 122 in the coin-accepting direction. The light axis of the photoelectric sensor 128 is disposed to be less than the thickness of the thinnest coin from the carrying belt 122. Therefore, at the left edge 127L and the right edge 127R, a single or a plurality of slit (s) 129 for releasing the light axes are formed.

**[0078]** Moreover, if a full sensor 136 of the later-described coin separating and feeding device 104 detects a full state, the first electric motor 126 is stopped.

**[0079]** Therefore, the coin separating and feeding device 104 can stably sort and feed the coins one by one without receiving the coins of more than the full amount from the coin receiving device 102.

**[0080]** The photoelectric sensor(s) 128 can be replaced by or combined with a magnetic sensor (s) installed in the lower side of the carrying belt 122.

**[0081]** A ring-shaped light emitter 131 is disposed on the outer-surface frame 101 around the coin inlet 120 so as to surround the coin inlet 120 and, in a situation in which a coin (s) are accepted, continuously or intermittently emits light. More specifically, if a coin receiving command from the higher-level device is output, the light

emitter 131 emits light and highlights the position of the coin inlet 120. For example, the coin receiving command from the higher-level device is given to emit light when a product-price inputting process at a POS register is finished and a payment amount is determined.

**[0082]** Next, the coin separating and feeding device 104 will be explained.

**[0083]** The coin separating and feeding device 104 has a function to separate the coins C of a plurality of denominations, which have been received in bulk from the coin receiving device 102, one by one and feed them to the next step.

**[0084]** The coin separating and feeding device 104 is disposed below the coin receiving device 102 and includes a rotating disk 130, a coin storing container 132, a coin receiver 134, and the full sensor 136.

**[0085]** The rotating disk 130 has receiving units 138, which receive the coins C one by one, is disposed to be tilted at a predetermined angle, and is rotated at a predetermined speed.

**[0086]** The receiving units 138 have Y-shaped plates 146, on which three concave parts 142 are formed at a regular interval, are fixed onto the upper surface of a rotating disk 140 so as to be concentric to the rotating disk 140.

**[0087]** If the diameter of the rotating disk 140 is increased, the number of the receiving units 138 can be increased to 4 or more. If the diameter of the rotating disk 140 is reduced, the number of the receiving units 138 can be reduced to 2 or less.

**[0088]** A pusher 148, which carries out pivotal motion, is disposed on one side of the concave part 142 (for example, see Japanese Patent No. 4784806).

**[0089]** In other words, the approximately semicircular receiving unit 138 is formed by the pusher 148 and the concave part 142.

**[0090]** The receiving unit 138 is set to have a size that cannot receive two juxtaposed minimum-diameter coins but can receive a single maximum-diameter coin.

**[0091]** The pusher 148 is normally positioned in a still state at a position close to one side of the concave part 142 so as to form the receiving unit 138. If the pusher 148 carries out pivotal motion and is moved to a predetermined position, the pusher 148 feeds the retained coin to the circumferential direction of the rotating disk 140.

**[0092]** It is preferred that the movement of the pusher 148 be carried out by, for example, a groove cam by utilizing the rotary motion of the rotating disk 140.

**[0093]** The receiving unit 138 receives the coins C, which are stored in bulk in a lower part opposed to the coin storing container 132, one by one. At a predetermined position above the rotation center of the rotating disk 130, the pusher 148 pushes the coin C of the receiving unit 138 to the circumferential direction and passes the coin C to the coin receiver 134 having a knife shape.

**[0094]** The rotating disk 130 is rotated at a predetermined speed by an unshown electric motor via a decelerator.

**[0095]** The full sensor 136 has a function to output a full signal if the amount of coins in the coin storing container 132 is equal to or more than a predetermined amount and is, for example, a transmission-type photoelectric sensor.

**[0096]** If the full sensor 136 outputs the full signal, the first electric motor 126 is stopped, and supply of the coins C from the coin receiving device 102 is stopped.

**[0097]** If the full sensor 136 stops outputting the full signal, the first electric motor 126 is restarted, and the coins C on the carrying belt 122 are supplied to the coin storing container 132.

**[0098]** Next, the denomination discriminating device 106 will be explained.

**[0099]** The denomination discriminating device 106 has a function to discriminate the authenticity and denomination of the coins C, which have been fed from the coin separating and feeding device 104 one by one.

**[0100]** The denomination discriminating device 106 has a function to discriminate the authenticity and denomination of the coin C based on detection data, which is physical information related to the material, thickness, diameter, etc. , of the coin obtained by a magnetic sensor 150.

**[0101]** The denomination discriminating device 106 includes the magnetic sensor 150, a slide base (not shown) disposed in the same plane as the upper surface of the rotating disk 140, the impeller 152 for feeding the coin C, and a detection guide 154.

**[0102]** The slide base has a function to guide one surface of the coin C pushed by the impeller 152.

**[0103]** The impeller 152 has a function to move the coins C, which have been received from the coin separating and feeding device 104, and pass the coins through the coin holding part 158 one by one.

**[0104]** Furthermore, the impeller 152 has a function to pass the coins C, which have passed the coin holding part 158, to the carrying device 108.

**[0105]** The impeller 152 is parallel to the slide base, is rotatable in a plane close thereto, forms the coin holding part 158 with three pushers 156 disposed at regular intervals by the same number as that of the receiving units 138, and forms a Y-shape.

**[0106]** The detection guide 154 has a function to linearly guide the coin C, which is opposed to the coin holding part 158 and passes therethrough, and fix the position of the coin C with respect to the magnetic sensor 150.

**[0107]** Next, the carrying device 108 will be explained.

**[0108]** The carrying device 108 has a function to carry the coins C, of which authenticity and denomination have been discriminated, to a sorting unit 110.

**[0109]** The carrying device 108 includes an endless carrier 160, which is moved in one direction in a single plane; a slide plate 162, on which one surface of the coin C pushed by the endless carrier 160 slides; and a straight guide rail 164, which guides the circumferential surface of the coin C.

**[0110]** The slope angle of the slide plate 162 is pre-

ferred to be about 45 degrees in order to downsize the whole coin acceptance and payout apparatus 100.

**[0111]** The endless carrier 160 in the present first embodiment is a chain 170 stretched between a first sprocket 166 and a second sprocket 168, which are disposed at a predetermined interval. However, the endless carrier 160 may be a belt.

**[0112]** The chain 170 is installed in a flattened running-track shape, and the first sprocket 166 is disposed immediately lateral to the impeller 152 of the denomination discriminating device 106.

**[0113]** The chain 170 is preferred to be a metal chain from the viewpoint of durability and cost, but may be made of resin.

**[0114]** Pushing pins 172 are fixed to a lateral surface of the chain 170 at predetermined intervals.

**[0115]** The plurality of pushing pins 172 are attached to the chain 170 at the intervals corresponding to the intervals of the pushers 156.

**[0116]** The first sprocket 166 is rotated at a predetermined speed, and the pusher 156 and the pushing pin 172 are set so that the coin C, which is pushed to a carrying path 174 of the pushing pin 172 by the pusher 156, is immediately pushed by the pushing pin 172. The carrying path 174 is a path through which the coin C, which is pushed by the pushing pin 172, is moved while being guided by the guide rail 164.

**[0117]** The guide rail 164 has a function to guide a lower-end peripheral surface of the coin C so that the coin C pushed by the pushing pin 172 is moved in the carrying path 174.

**[0118]** The guide rail 164 is disposed along and slightly below the chain 170 having a straight shape of the upper side of the running-track shape.

**[0119]** With respect to the slide plate 162, the guide rail 164 is slightly projecting than the maximum thickness of handled coins in the orthogonal direction.

**[0120]** Therefore, the lower surface of the coin C pushed by the pushing pin 172 is guided by the slide plate 162, and the lower-end peripheral surface thereof is guided by the guide rail 164.

**[0121]** As described later, the guide rail 164 in the present first embodiment also serves as a sorting unit.

**[0122]** The sorting unit 110 has a function to drop the coins C into predetermined sorting holes respectively by denominations.

**[0123]** The sorting unit 110 has an upper sorting unit 180, which is disposed along the guide rail 164 in the upper side of the guide rail 164, and a lower sorting unit 182, which is disposed in the lower side along the guide rail 164.

**[0124]** In the upper sorting unit 180, a 2-cent coin sorting hole 184, a 5-cent coin sorting hole 186, a 10-cent coin sorting hole 188, a 20-cent coin sorting hole 190, and an overflow-coin sorting hole 192 are disposed sequentially toward the moving direction of the carrying device 108.

**[0125]** In the lower sorting unit 182, a reject-coin sorting hole 194, a 1-cent coin sorting hole 196, a 2-euro coin sorting hole 198, a 50-cent coin sorting hole 200, and a 1-euro coin sorting hole 202 are disposed sequentially toward the moving direction of the carrying device 108.

**[0126]** In a case in which the upper sorting unit 180 and the lower sorting unit 182 of the carrying device 108 are disposed in this manner, at the same location of the carrying device 108, the coins C can be sorted to the upper side and the lower side. Therefore, there are advantages that the carrying distances of the coins can be shortened, and the coin acceptance and payout apparatus 100 can be downsized.

**[0127]** Since the disposition of the denominations with respect to the sorting holes is an example, they can be freely disposed in accordance with needs.

**[0128]** At each of the coin sorting holes 184, 186, 188, 190, 194, 196, 198, 200, and 202, a gate device (not shown) actuated by an electrical actuator is disposed.

**[0129]** In the present first embodiment, the gate devices of the sorting holes 194, 196, 198, 200, and 202 also serve as the guide rail 164.

**[0130]** Thus, the guide rail 164 is formed by fixed guides, which are fixed between the reject-coin sorting hole 194, the 2-euro coin sorting hole 198, the 50-cent coin sorting hole 200, and the 1-euro coin sorting hole 202, and movable guides, which are electrically moved, and normally forms a single straight shape.

**[0131]** When the carried coins are dropped to the sorting holes 194, 196, 198, 200, and 202, the movable guides are moved from normal positions so that the carried coins are not guided to the movable guides and are dropped to the predetermined sorting holes (see Japanese Patent No. 4997374).

**[0132]** The gate devices opposed to the respective coin sorting holes 184, 186, 188, 190, 194, 196, 198, 200, and 202 are selectively opened/closed based on timing signals from timing sensors (not shown) and the authenticity and denominations discriminated by the coin information detected by the coin holding part 158.

**[0133]** As a result, the coins C carried by the carrying device 108 are dropped to the predetermined sorting holes respectively by the denominations.

**[0134]** The coin storing unit 112 has a function to store the coins C, which have been sorted respectively by the denominations in the sorting unit 110, respectively by the denominations and a function to dispense a predetermined number of the coins of a predetermined denomination(s) according to a command from the higher-level device such as a POS register.

**[0135]** In the present first embodiment, the coin storing unit 112 is formed by arranging, in two rows, a first coin dispenser row 212 and a second coin dispenser row 214, in which coin dispensers 210, each of which dispenses the coins C one by one by a rotating disk (not shown) are parallely juxtaposed below the sorting unit 110 so as to be opposed to the upper sorting unit 180 and the lower sorting unit 182 respectively by the denominations.

**[0136]** The "first" and "second" of the first coin dispenser row 212 and the second coin dispenser row 214 are denoted for distinguishing them from each other, and it does not have particular meaning in terms of interpretation of the right.

**[0137]** Each of the coin dispensers 210 is shown by a reference sign 210 with a denomination.

**[0138]** Next, the payment device 114 will be explained.

**[0139]** The payment device 114 has a function to carry the coins C, which have been delivered from the coin dispensers 210 of the respective denominations, to the coin receiving opening 116 as soon as possible.

**[0140]** Specifically, the payment device 114 has a function to promptly converge the behavior of the coin(s) C ejected from the coin dispenser 210, quickly bring the coin C into surface contact with the upper surface of a payment carrying belt 216, and carry the coin C to the coin receiving opening 116 by the payment carrying belt 216 and, in the present first embodiment, includes at least the payment carrying belt 216.

**[0141]** Next, the payment carrying belt 216 will be explained with reference to FIG. 6.

**[0142]** The payment carrying belt 216 has a function to carry the coin(s) C, which have been dropped onto the upper surface 218 thereof, to the coin receiving opening 116. In the present first embodiment, the payment carrying belt 216 is a flat belt 220 and is stretched between a pair of rollers 222 and 224, and the upper surface 218 thereof is disposed so that the front side thereof is lowered at a predetermined angle toward the coin-receiving-opening-116 side. This slope angle is preferred to be an angle at which the standing coin C is rolled to the coin-receiving-opening-116 side in a state in which the flat belt 220 is still. This is for quickly carrying the coin C to the coin receiving opening 116 by the moving of the payment carrying belt 216 and the rolling of the coin C.

**[0143]** As a method of judging the rolling, in a case in which, after the coin is sandwiched by finger tips and caused to be still in a visually vertical state on the payment carrying belt 216, which is in a still state, the pinching is released, if the coin starts rolling to the coin-receiving-opening-116 side, the present slope-angle condition is satisfied.

**[0144]** One of the rollers, the roller 222 in the present first embodiment is selectively driven so that the upper surface 218 is moved toward the coin receiving opening 116 by a second electric motor 226.

**[0145]** A pair of guide plates 228 and 230, which are vertical with respect to the upper surface of the flat belt 220 are disposed at a predetermined interval so as to guide the coins C, which are carried by the flat belt 220.

**[0146]** The coins C carried by the flat belt 220 are fed into the bowl-shaped coin receiving opening 116.

**[0147]** The second electric motor 226 starts rotating at the same time as output of a coin dispensing command to the coin dispenser 210 and stops rotating after the time sufficient for carrying elapses.

**[0148]** The coins delivered from the coin dispensers 210 are dropped onto the upper surface 218 of the payment carrying belt 216. The coins dropped onto the payment carrying belt 216 are brought into surface contact with the payment carrying belt 216 as described above, are carried toward the coin receiving opening 116 by the movement of the payment carrying belt 216, are dropped from an end thereof to the coin receiving opening 116, and are stored therein.

**[0149]** Next, working of the present first embodiment will be explained.

**[0150]** First, working in coin accepting will be explained with reference to also FIG. 10 and FIG. 11.

**[0151]** If the coins C of a plurality of denominations are loaded into the coin inlet 120, the loaded coins C are positioned directly onto the carrying belt 122 from the loading opening 121; or, after the coins are dropped onto the wall surface 125 of the storing unit 123 of the coin inlet 120, the coins slide on the wall surface 125 and are positioned on the carrying belt 122.

**[0152]** More specifically, the coins C dropped to the positions close to the edge (including the left end 121L and the right end 121R) of the loading opening 121 slide down on the wall surface 125 and are positioned on the carrying belt 122. Since the loading opening 121 is formed within a range having an equal distance with respect to the center CE, if the dropped positions of the coins C are within the range of the loading opening 121, the coins C slide onto the carrying belt 122 in a manner similar to that described above, and carrying to the next step of the coins C is therefore smoothly carried out. Therefore, the coin loading range is the same in all the directions of the loading opening 121. Therefore, flexible supporting can be made even when the coin acceptance and payout apparatus 100 is disposed vertically or laterally with respect to clients or disposed vertically or laterally in a payment machine.

**[0153]** If the coin C is placed on the carrying belt 122, the light axis of the photoelectric sensor 128 is interrupted by the loaded coin C; therefore, a coin detection signal is output, and the first electric motor 126 is rotated in a forward-rotation direction based on the coin detection signal.

**[0154]** Therefore, since the upper surface of the carrying belt 122 is moved to the coin-separating-and-feeding-device-104 side, the coins C are dropped from the end of the carrying belt 122 and dropped into the coin storing container 132 of the coin separating and feeding device 104.

**[0155]** If the coins C are overlapped with each other and carried on the carrying belt 122, since the collapsing roller 124 is rotated backward, the lower surface of the roller 124 is moved in the opposite direction of the upper surface of the carrying belt 122, movement of the stacked coins C is prevented by the collapsing roller 124, and the coins C are dropped onto the carrying belt 122.

**[0156]** The dropped coins C are carried again toward the coin separating and feeding device 104 in a manner similar to that described above by movement of the car-

rying belt 122.

**[0157]** If the photoelectric sensor 128 no longer detects the coins C, the first electric motor 126 is stopped, and drive of the carrying belt 122 is stopped.

**[0158]** Furthermore, an unshown motor is rotated according to the coin detection signal of the photoelectric sensor 128, and the rotating disk 140 is rotated in a counterclockwise direction in FIG. 6.

**[0159]** The impeller 152 works together with the rotating disk 140 at a transmission ratio of 1:1 and is rotated in a clockwise direction in FIG. 5.

**[0160]** Furthermore, the first sprocket 166 is rotated in a counterclockwise direction in FIG. 6, and the chain 170 is circulated counterclockwise.

**[0161]** Therefore, the coins C dropped into the coin storing container 132 are stirred by the plate 146 and the pusher 148, and the positions thereof are variously changed. In the process of changing the positions, only one of the coins C is received by each receiving unit 138.

**[0162]** Thus, in a state in which one surface of the coin C is in surface contact with the rotating disk 140, the coin C is positioned in the receiving unit 138, is pushed by a partial lateral surface of the plate 146, and is moved together with the rotation of the rotating disk 140.

**[0163]** Immediately after the receiving unit 138 passes an uppermost position, the pusher 148 carries out pivotal motion in the counterclockwise direction and is moved in the circumferential direction of the rotating disk 140.

**[0164]** As a result, the coin C positioned in the receiving unit 138 is pushed to the circumferential direction of the rotating disk 140 by the pusher 148 and, immediately after the coin is guided by the coin receiver 134, the coin C is pushed by the pusher 156 of the impeller 152, which is rotated together with the rotating disk 140.

**[0165]** If the coins C dropped into the coin storing container 132 are equal to or more than a predetermined amount, a full signal is output from the full sensor 136, the first electric motor 126 is stopped even if a loaded coin(s) is detected by the photoelectric sensor 128 to prevent excessive loading of the coins C to the coin separating and feeding device 104.

**[0166]** In a case in which: the coins C in the coin storing container 132 are sent out by the rotation of the rotating disk 130, the full signal is no more output from the full sensor 136, and the photoelectric sensor 128 is outputting a coin signal, the first electric motor 126 is restarted, and the coins C on the carrying belt 122 are fed to the coin separating and feeding device 104.

**[0167]** The coin C, which is pushed by the pusher 156, is moved in a moving passage while one surface thereof is in contact with the slide base.

**[0168]** The coin C at this point is moved while the coin peripheral surface is pressed against the detection guide 154.

**[0169]** In this moving process, first, the coin C is opposed to the magnetic sensor 150, wherein information about the diameter, thickness, and material thereof is obtained.

**[0170]** Then, the authenticity and denomination of each coin is discriminated by comparing these outputs with reference values.

**[0171]** After the coin C is opposed to the magnetic sensor 150, the coin C is pushed out to the moving passage of the pushing pins 172 of the carrying device 108 by the pusher 156.

**[0172]** Immediately after the coin C is pushed out to the moving passage, the coin C is pushed by the pushing pin 172, which is moved by the chain 170.

**[0173]** As a result, the coin C is carried in the moving passage while the peripheral surface thereof is guided by the guide rail 164 and while one surface thereof is in surface contact with the slide plate 162.

**[0174]** While the coins C are carried in the moving passage, based on a memorized denomination, etc. and based on a timing signal from the unshown timing sensor, the gate devices corresponding to the sorting holes are actuated, and the coins C of predetermined denominations are dropped to the predetermined sorting holes.

**[0175]** Specifically, in a case of a false coin, the gate of the reject-coin sorting hole 194 is opened for a predetermined period of time, the false coin moved along the guide rail 164 is dropped into the reject-coin sorting hole 194, is guided by an unshown chute, is dropped onto the payment carrying belt 216, and is returned to the coin receiving opening 116 by the payment carrying belt 216, which is activated by the coin signal of the photoelectric sensor 128 and carrying out carrying motion.

**[0176]** If the discriminated denomination is a 2-cent coin 2C, the gate of the 2-cent coin sorting hole 184 is opened for a predetermined period of time based on a timing signal, the 2-cent coin 2C moved while being guided by the guide rail 164 is dropped into the 2-cent coin sorting hole 184, and, then, the 2-cent coin 2C is guided by an unshown chute and stored in a 2-cent-coin coin dispenser 210-2C.

**[0177]** If the discriminated denomination is a 5-cent coin 5C, the gate of the 5-cent coin sorting hole 186 is opened for a predetermined period of time based on a positional signal output from the timing sensor, the 5-cent coin 5C moved while being guided by the guide rail 164 is dropped into the 5-cent coin sorting hole 186, and, then, the 5-cent coin 5C is guided by an unshown chute and stored in a 5-cent-coin coin dispenser 210-5C.

**[0178]** If the discriminated denomination is a 1-cent coin 1C, the gate of the 1-cent coin sorting hole 196 is opened for a predetermined period of time based on a signal output from the timing sensor.

**[0179]** Therefore, the 1-cent coin 1C moved while being guided by the guide rail 164 is dropped into the 1-cent coin sorting hole 196, and, then, the 1-cent coin 1C is guided by an unshown chute and stored in a 1-cent-coin coin dispenser 210-1C.

**[0180]** If the discriminated denomination is a 10-cent coin 10C, the gate of the 10-cent coin sorting hole 188 is opened for a predetermined period of time based on a positional signal output from the timing sensor, the 10-

cent coin 10C moved while being guided by the guide rail 164 is dropped into the 10-cent coin sorting hole 188, and, then, the 10-cent coin 10C is guided by an unshown chute and stored in a 10-cent-coin coin dispenser 210-10C.

**[0181]** If the discriminated denomination is a 2-euro coin 2E, the gate of the 2-euro coin sorting hole 198 is opened for a predetermined period of time based on a positional signal output from the third timing sensor.

**[0182]** Therefore, the 2-euro coin 2E moved while being guided by the guide rail 164 is dropped into the 2-euro coin sorting hole 198, and, then, the 2-euro coin 2E is guided by an unshown chute and stored in a 2-euro-coin coin dispenser 210-2E.

**[0183]** If the discriminated denomination is a 20-cent coin 20C, the gate of the 20-cent coin sorting hole 190 is opened for a predetermined period of time based on a positional signal output from the timing sensor, the 20-cent coin 20C moved while being guided by the guide rail 164 is dropped into the 20-cent coin sorting hole 190, and, then, the 20-cent coin 20C is guided by an unshown chute and stored in a 20-cent-coin coin dispenser 210-20C.

**[0184]** If the discriminated denomination is a 50-cent coin 50C, the gate of the 50-cent coin sorting hole 200 is opened for a predetermined period of time based on a positional signal output from the timing sensor, the 50-cent coin 50C moved while being guided by the guide rail 164 is dropped into the 50-cent coin sorting hole 200, and, then, the 50-cent coin 50C is guided by an unshown chute and stored in a 50-cent-coin coin dispenser 210-50C.

**[0185]** If the discriminated denomination is a 1-euro coin, the gate of the 1-euro coin sorting hole 202 is opened for a predetermined period of time based on a positional signal output from the timing sensor, the 1-euro coin 1E moved while being guided by the guide rail 164 is dropped into the 1-euro coin sorting hole 202, and, then, the 1-euro coin 1E is guided by an unshown chute and stored in a 1-euro-coin coin dispenser 210-1E.

**[0186]** If the coin stored amount of any of the coin dispensers 210 exceeds a predetermined value, in other words, in a case of an overflow state, the gate of the corresponding sorting hole is not opened.

**[0187]** In other words, since the coin is not dropped to any of the sorting holes, the coin is dropped to the overflow-coin sorting hole 192 and is stored in an overflow-coin storing device OF.

**[0188]** Then, working upon payment will be explained.

**[0189]** In the present first embodiment, when the coin C is dispensed to the coin receiving opening 116, a coin dispensing command is output from the higher-level device such as a POS register is output.

**[0190]** According to the dispensing command, the rotating disks (not shown) of the coin dispensers 210 are rotated, furthermore, the second electric motor 226 is driven, and the upper surface 218 of the payment carrying belt 216 is moved toward the coin receiving opening 116.

**[0191]** The coins C are ejected by the rotation of the rotating disks, dropped onto the payment carrying belt 216, and sent out to the coin receiving opening 116 by the movement of the upper surface 218 of the payment carrying belt 216.

**[0192]** The coin dispensers 210 detects dispensing of the coins C by a coin detector (not shown) and outputs detection signals. Therefore, if the detection signals reaches a predetermined number, the rotation of the rotating disks is rapidly stopped to prevent excessive dispensing of the coins C.

[Second Embodiment]

**[0193]** Next, a second embodiment will be explained with reference to FIG. 12 and FIG. 13.

**[0194]** The second embodiment is approximately the same as the first embodiment. However, the coin inlet 120 is semispherical in the first embodiment. On the other hand, in the second embodiment, a storing unit 123 is formed by a cylindrical wall 232, which is vertically standing with respect to the carrying belt 122 from loading opening 121, and a slope 234, which is continued to a lower end of the cylindrical wall 232 and continued to the carrying opening 127; and the slope 234 has a funnel shape and is formed at a slope angle at which the coins C certainly slide thereon. Therefore, the storing unit 123 has an upper part which is cylindrical and has a lower part which is conical.

**[0195]** Even with this structure, the coin inlet 120 is circular in a planar view and has working/effects similar to those of the first embodiment.

[Reference Signs List]

**[0196]**

| | |
|---|---|
| 100 | COIN ACCEPTANCE AND PAYOUT APPARATUS |
| 101 | OUTER-SURFACE FRAME |
| 102 | COIN RECEIVING DEVICE |
| 104 | COIN SEPARATING AND FEEDING DEVICE |
| 106 | DENOMINATION DISCRIMINATING DEVICE |
| 108 | CARRYING DEVICE |
| 110 | SORTING UNIT |
| 112 | COIN STORING UNIT |
| 114 | PAYMENT DEVICE |
| 116 | COIN RECEIVING OPENING |
| 120 | COIN INLET |
| 121 | LOADING OPENING |
| 121L | LEFT END |
| 121R | RIGHT END |
| 122 | CARRYING BELT |
| 123 | STORING UNIT |
| 124 | ROLLER |
| 125 | WALL SURFACE |

| | |
|---|---|
| 125F, 125B | ROLLER |
| 126 | FIRST ELECTRIC MOTOR |
| 127 | CARRYING OPENING |
| 127B | REAR END PART |
| 127F | FRONT END PART |
| 127L | LEFT EDGE |
| 127R | RIGHT EDGE |
| 128 | PHOTOELECTRIC SENSOR |
| 128L | LEFT EDGE |
| 128R | RIGHT EDGE |
| 129 | SLIT |
| 131 | LIGHT EMITTER |
| 130 | ROTATING DISK |
| 132 | COIN STORING CONTAINER |
| 134 | COIN RECEIVER |
| 136 | FULL SENSOR |
| 138 | RECEIVING UNIT |
| 140 | ROTATING DISK |
| 142 | CONCAVE PART |
| 146 | PLATE |
| 148 | PUSHER |
| 150 | MAGNETIC SENSOR |
| 152 | IMPELLER |
| 154 | DETECTION GUIDE |
| 156 | PUSHER |
| 158 | COIN HOLDING PART |
| 160 | ENDLESS CARRIER |
| 162 | SLIDE PLATE |
| 164 | GUIDE RAIL |
| 166 | FIRST SPROCKET |
| 168 | SECOND SPROCKET |
| 170 | CHAIN |
| 172 | PUSHING PIN |
| 174 | CARRYING PATH |
| 180 | UPPER SORTING UNIT |
| 182 | LOWER SORTING UNIT |
| 184 | 2-CENT COIN SORTING HOLE |
| 186 | 5-CENT COIN SORTING HOLE |
| 188 | 10-CENT COIN SORTING HOLE |
| 190 | 20-CENT COIN SORTING HOLE |
| 192 | OVERFLOW-COIN SORTING HOLE |
| 194 | REJECT-COIN SORTING HOLE |
| 196 | 1-CENT COIN SORTING HOLE |
| 198 | 2-EURO COIN SORTING HOLE |
| 200 | 50-CENT COIN SORTING HOLE |
| 202 | 1-EURO COIN SORTING HOLE |
| 210 | COIN DISPENSER |
| 212 | FIRST COIN DISPENSER ROW |
| 214 | SECOND COIN DISPENSER ROW |
| 216 | PAYMENT CARRYING BELT |
| 218 | UPPER SURFACE |
| 220 | FLAT BELT |
| 222, 224 | ROLLER |
| 226 | SECOND ELECTRIC MOTOR |
| 228, 230 | GUIDE PLATE |
| 232 | CYLINDRICAL WALL |
| 234 | SLOPE |

## Claims

**1.** A coin inlet of a coin acceptance and payout apparatus that has the coin inlet opened upward, concaved downward, and disposed on an upper surface of an outer-surface frame, carries a loaded coin to a next step by a carrying belt disposed at a bottom of the coin inlet, then stores the coin separately by a denomination, and dispenses the coin to a coin receiving opening based on a payment command; wherein
the coin inlet has a loading opening having a circular shape in a planar view.

**2.** A coin inlet of a coin acceptance and payout apparatus that has the coin inlet opened upward, concaved downward, and disposed on an upper surface of an outer-surface frame, carries a loaded coin to a next step by a carrying belt disposed below the coin inlet, then stores the coin separately by a denomination, and dispenses the coin to a coin receiving opening based on a payment command; wherein
the coin inlet has a loading opening having a semispherical shape and a circular shape in a planar view and is formed into a downward slope toward the carrying belt in an entire circumference of the carrying belt.

**3.** A coin inlet of a coin acceptance and payout apparatus that has the coin inlet opened upward, concaved downward, and disposed on an upper surface of an outer-surface frame, carries a loaded coin to a next step by a carrying belt disposed below the coin inlet, then stores the coin separately by a denomination, and dispenses the coin to a coin receiving opening based on a payment command; wherein
the coin inlet has a loading opening having a circular shape in a planar view and is formed into a cylindrical peripheral wall vertically extending from an upper surface of the loading opening and into a downward peripheral wall toward the carrying belt in an entire circumference of the carrying belt, the peripheral wall continued to a lower end of the cylindrical peripheral wall.

**4.** A coin inlet of a coin acceptance and payout apparatus that has the coin inlet opened upward, concaved downward, and disposed on an upper surface of an outer-surface frame, carries a loaded coin to a next step by a carrying belt disposed below the coin inlet, then stores the coin separately by a denomination, and dispenses the coin to a coin receiving opening based on a payment command; wherein
the coin inlet has a loading opening having a circular shape in a planar view and is disposed so that a long side of the belt is exposed to be longer than a short side thereof at a center of the circular shape in the planar view; and

the carrying belt is set so that distances from ends of the short side and the long side of the carrying belt to edges of the coin inlet are smaller than an expected maximum coin diameter.

**5.** The coin inlet of the coin acceptance and payout apparatus of claim 1 to 4, wherein
a circular light emitter is disposed around the coin inlet.

FIG. 1

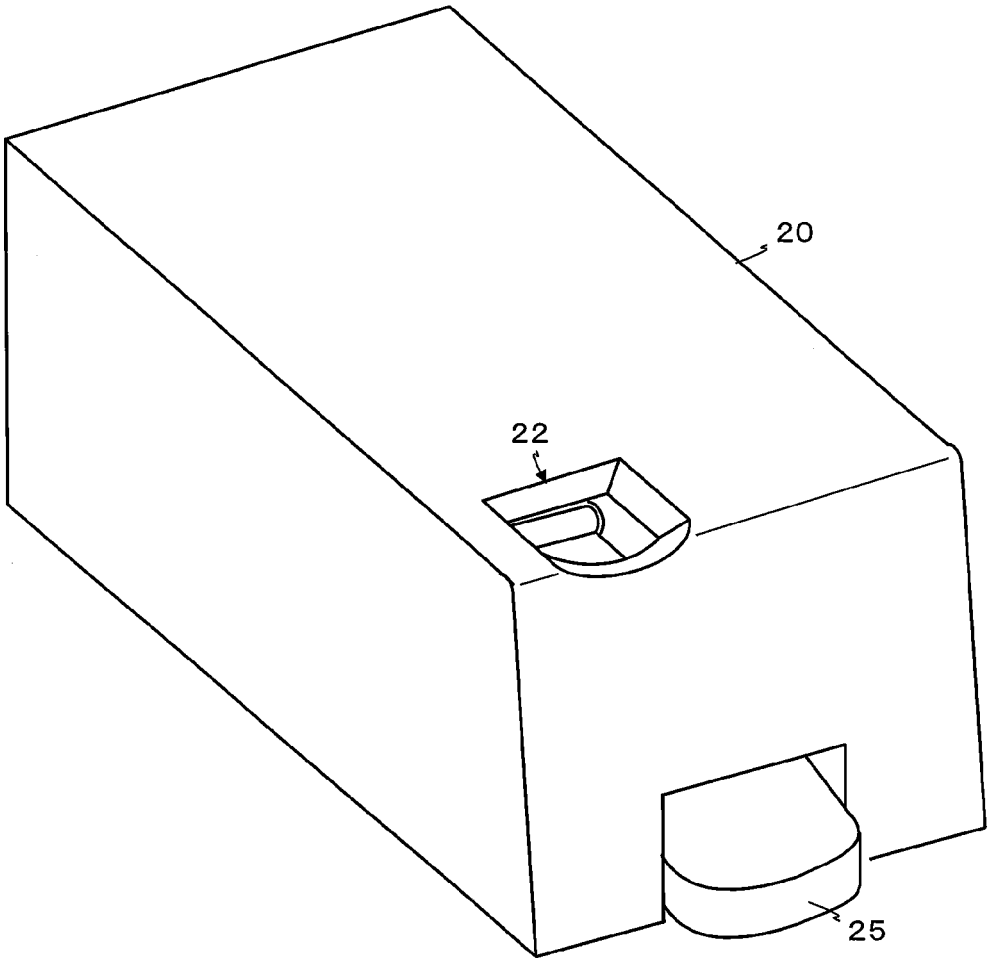


FIG. 2

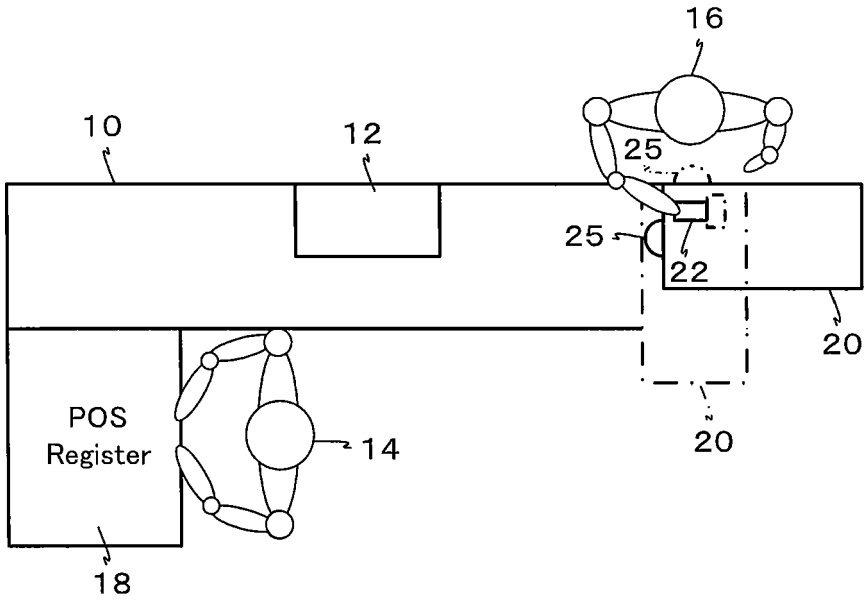


FIG. 3

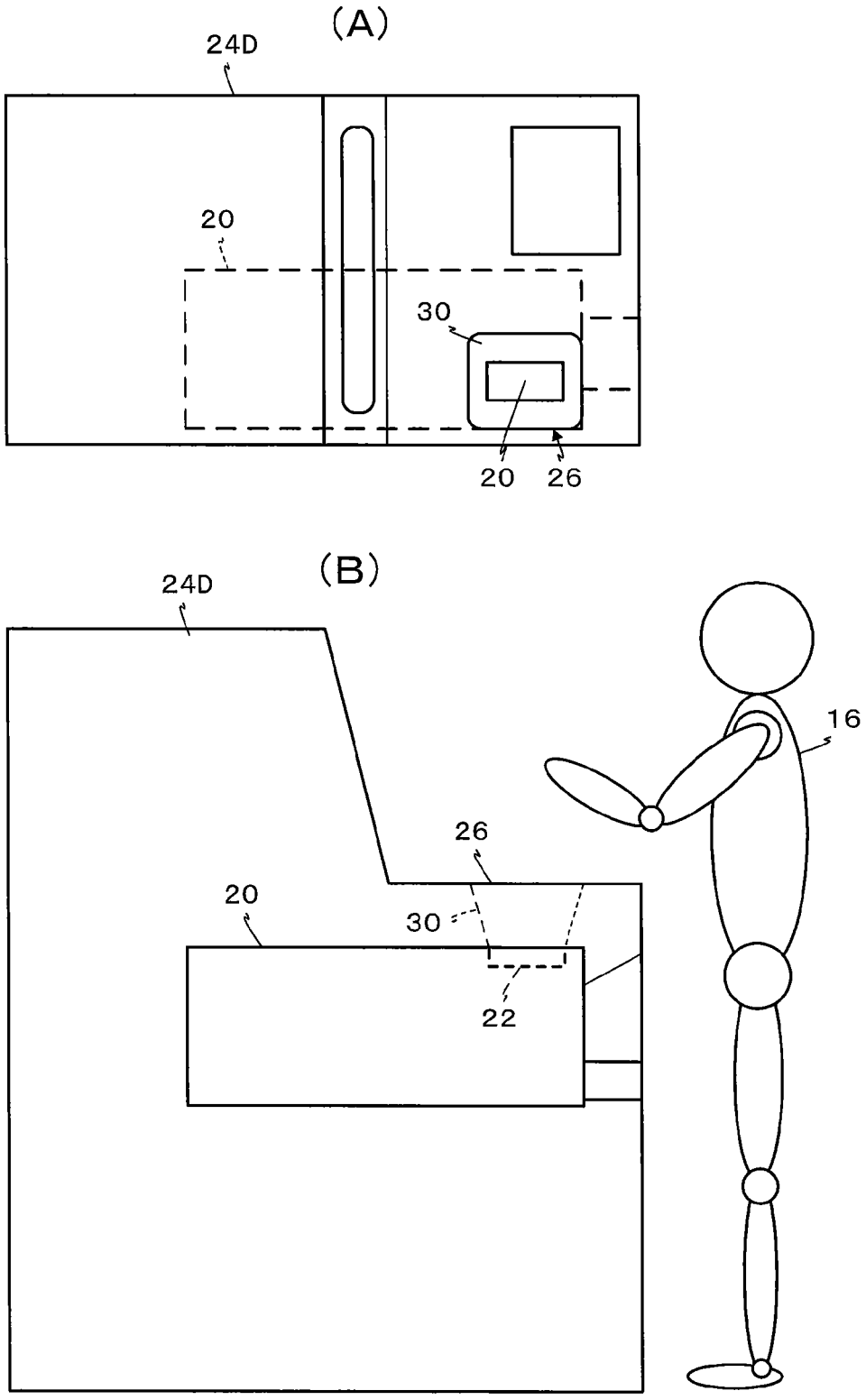


FIG. 4

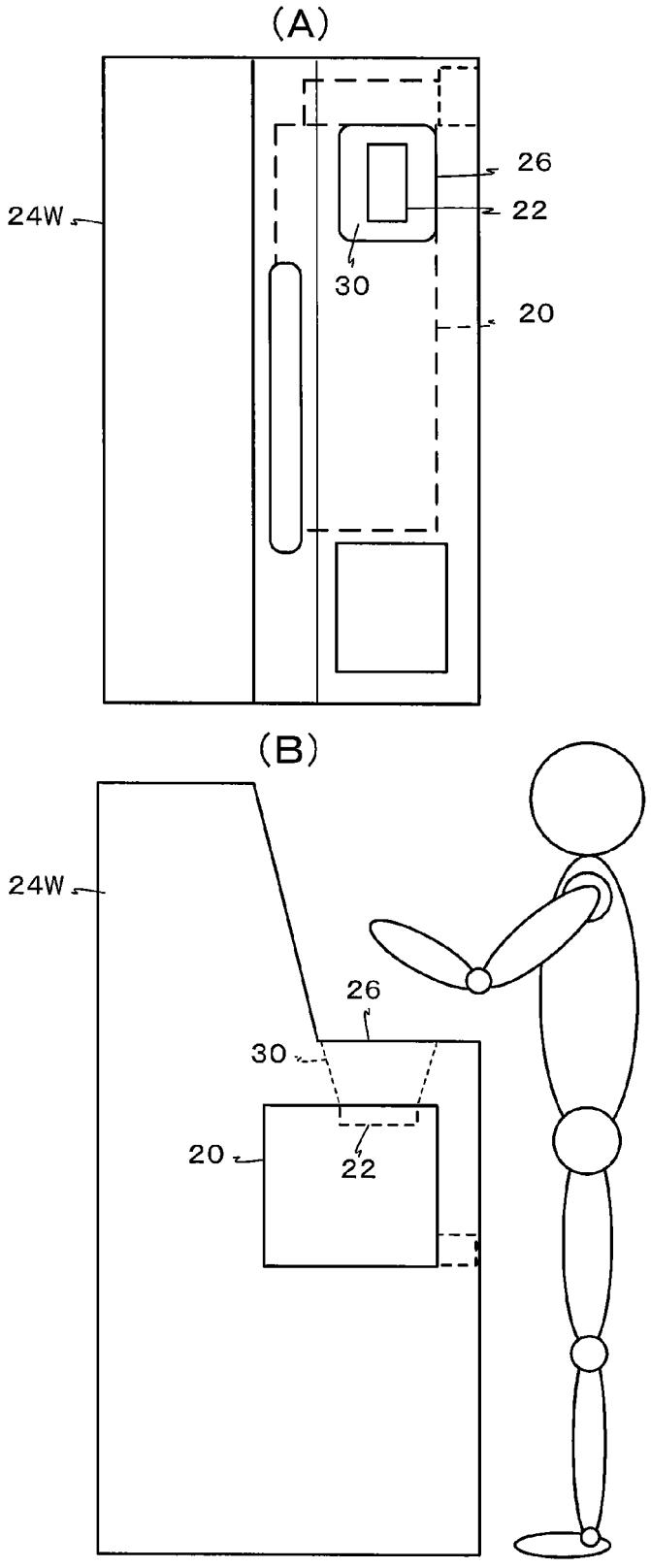


FIG. 5

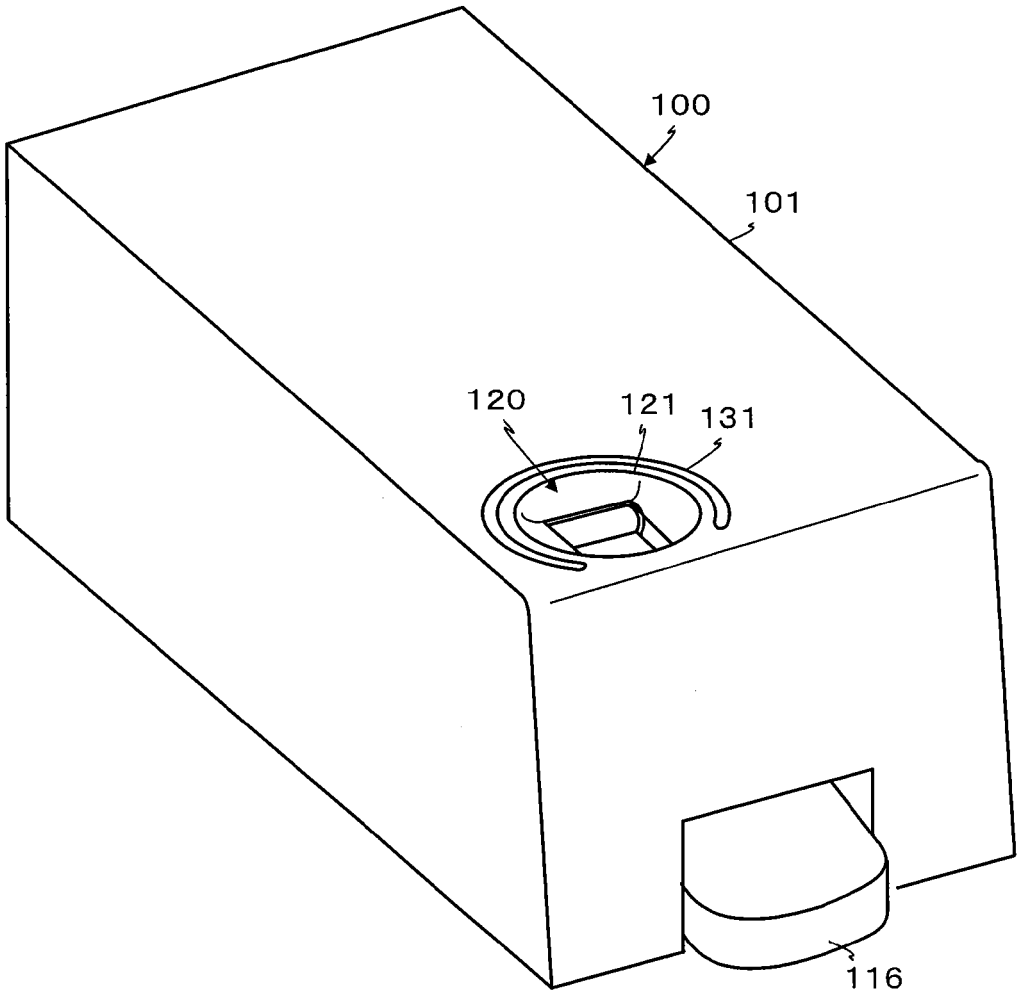


FIG. 6

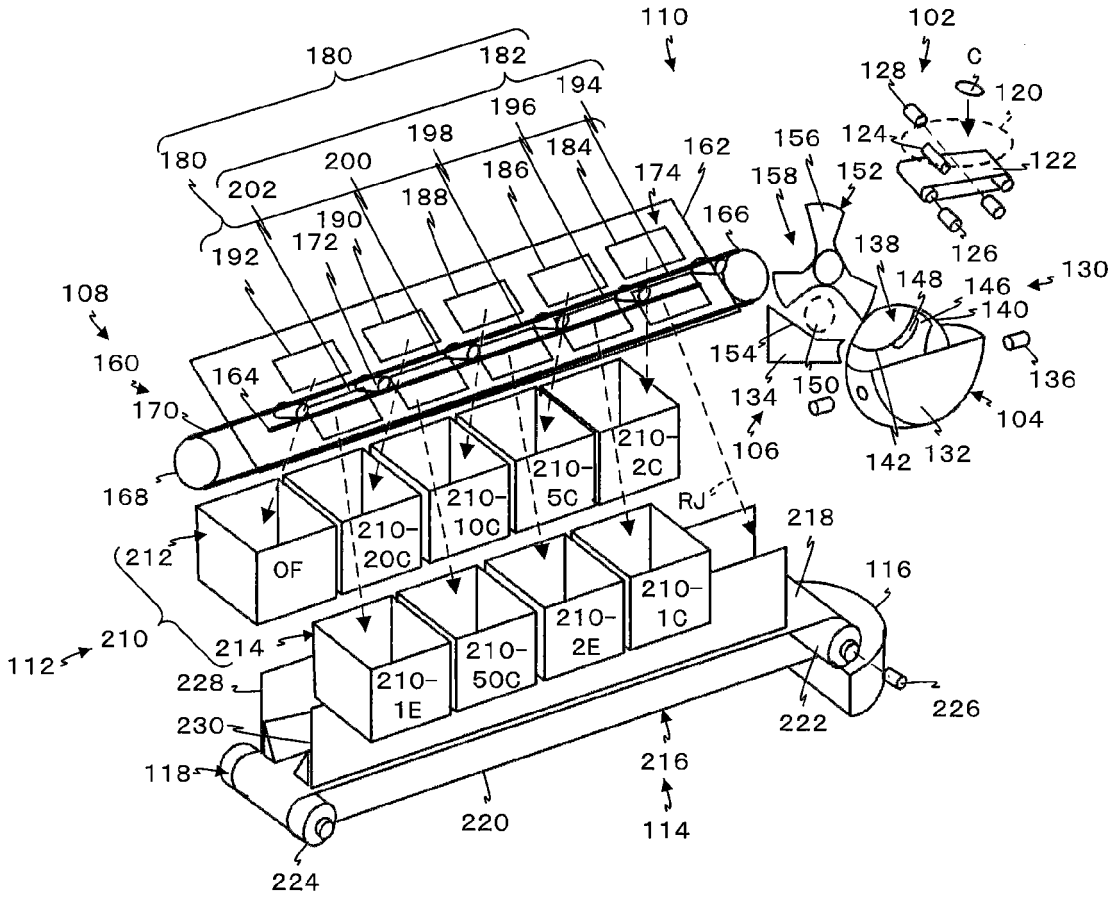

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FIG. 7

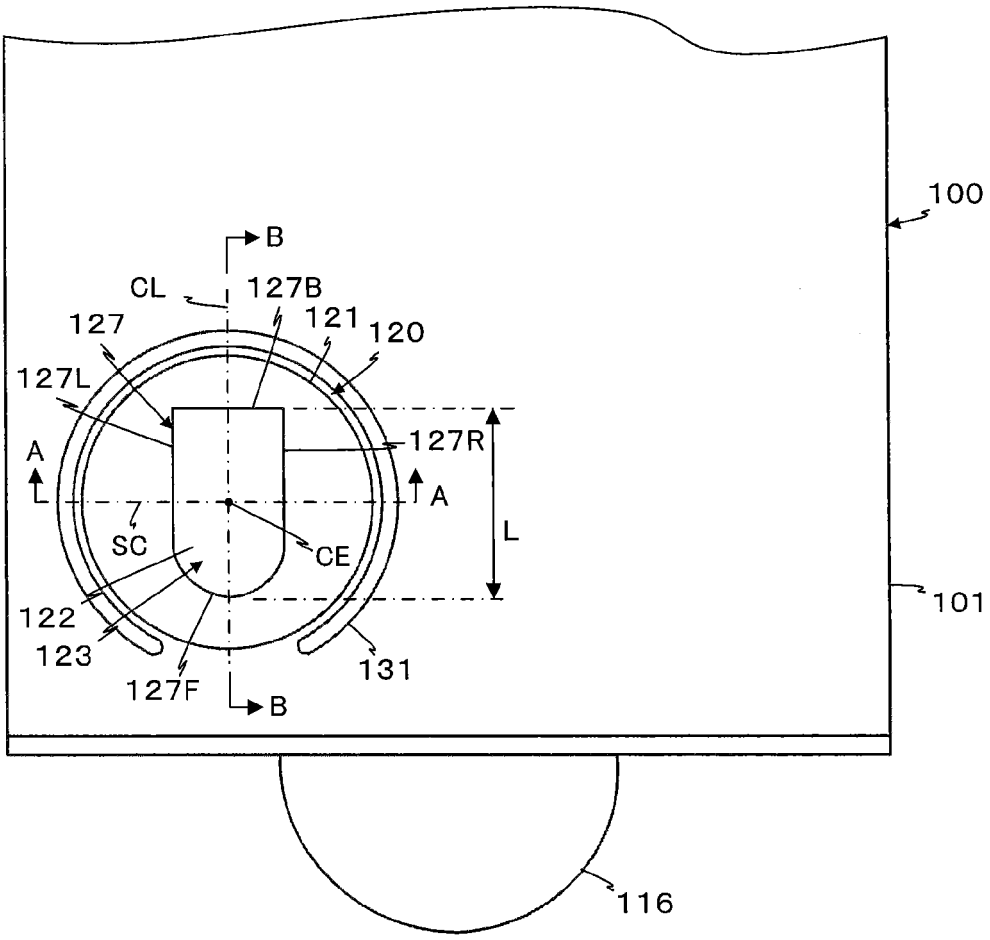

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FIG. 8

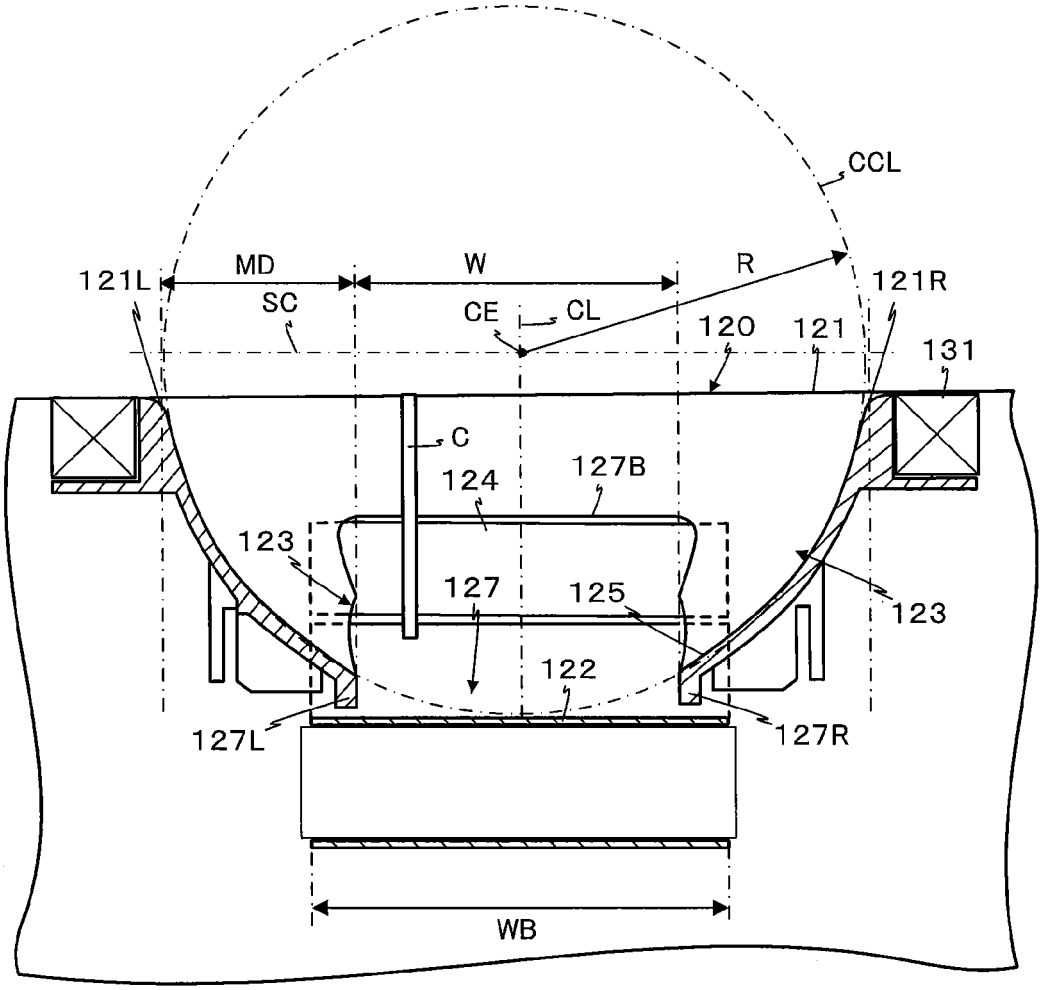

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FIG. 9

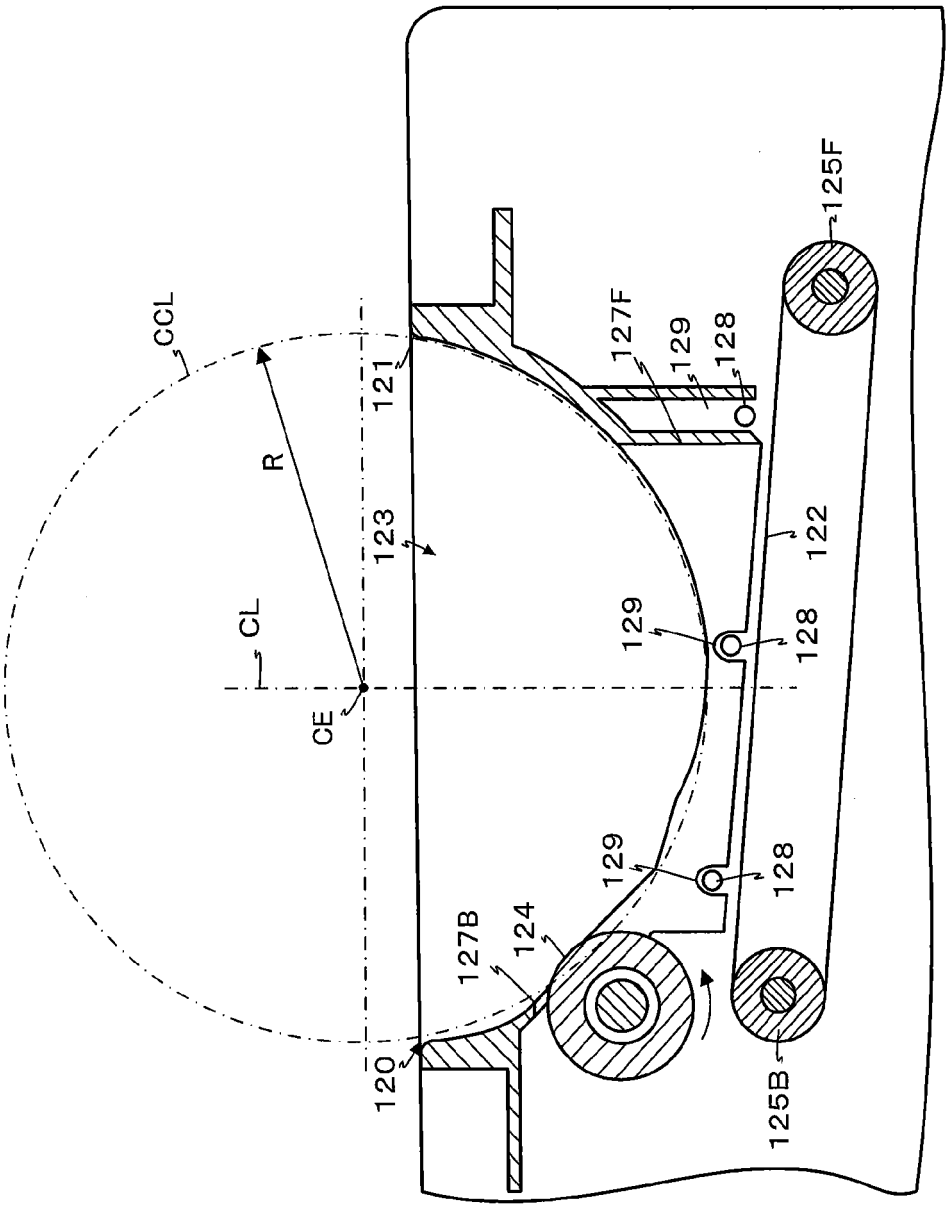

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FIG. 10

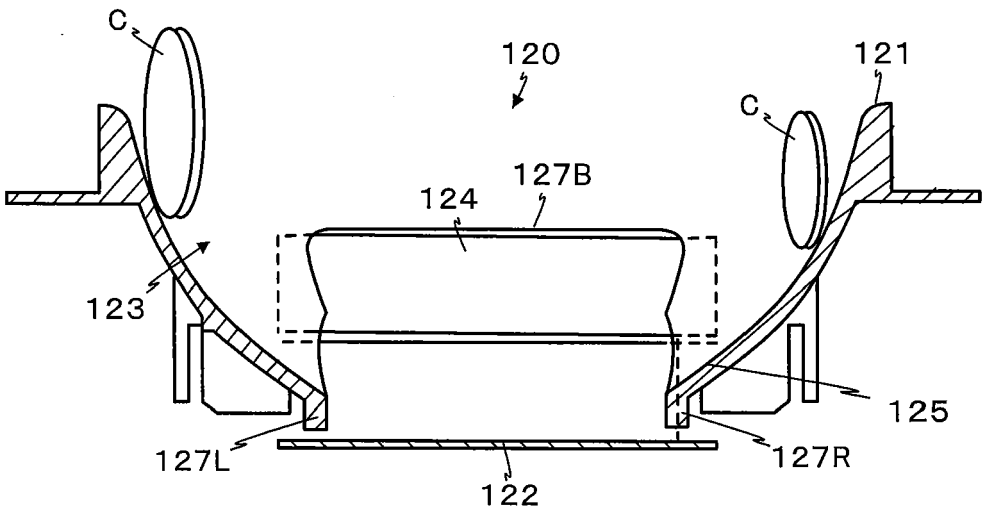


FIG. 11

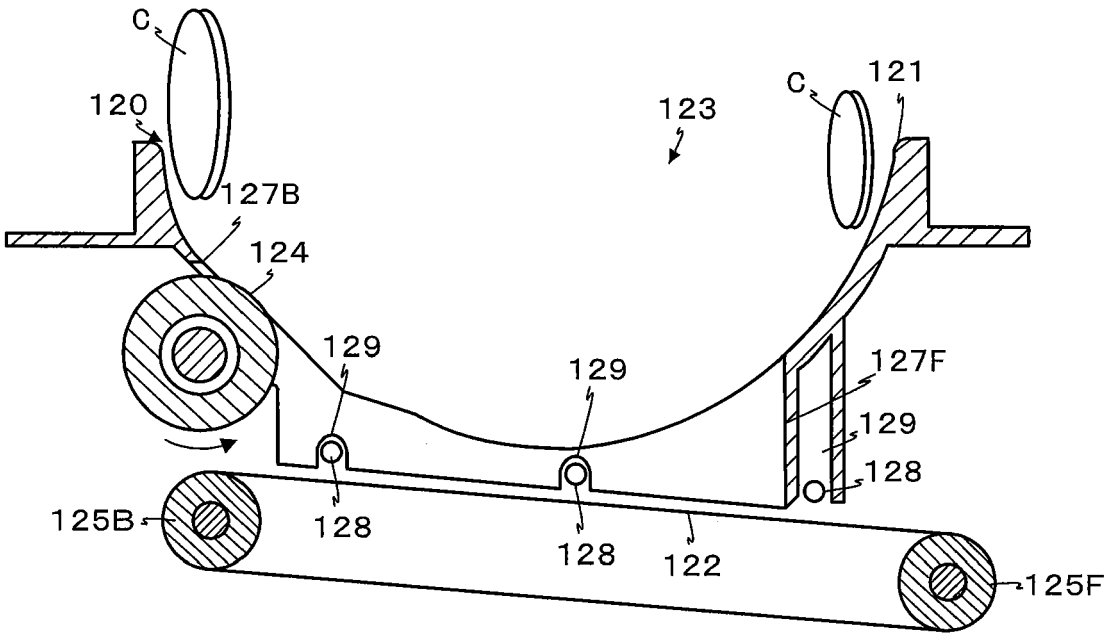

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FIG. 12

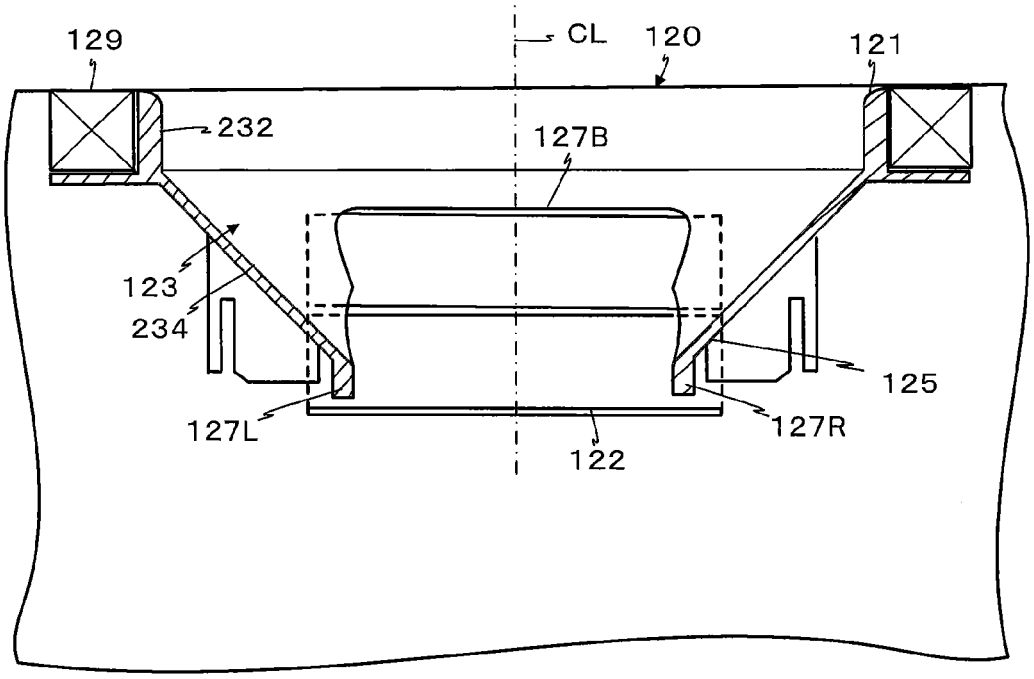
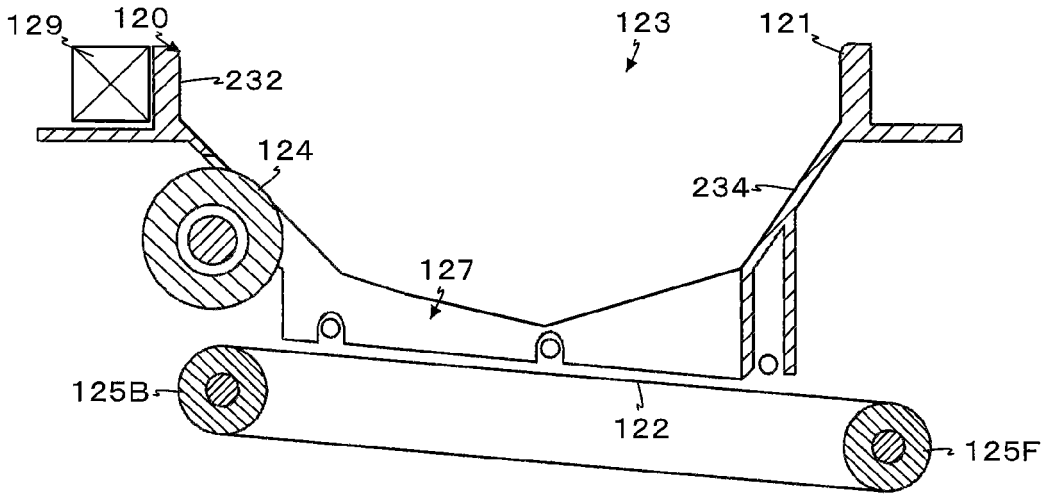


FIG. 13



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Application Number
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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 6 March 2015 | Lavin Liermo, Jesus |

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| Place of search | Date of completion of the search | Examiner |
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