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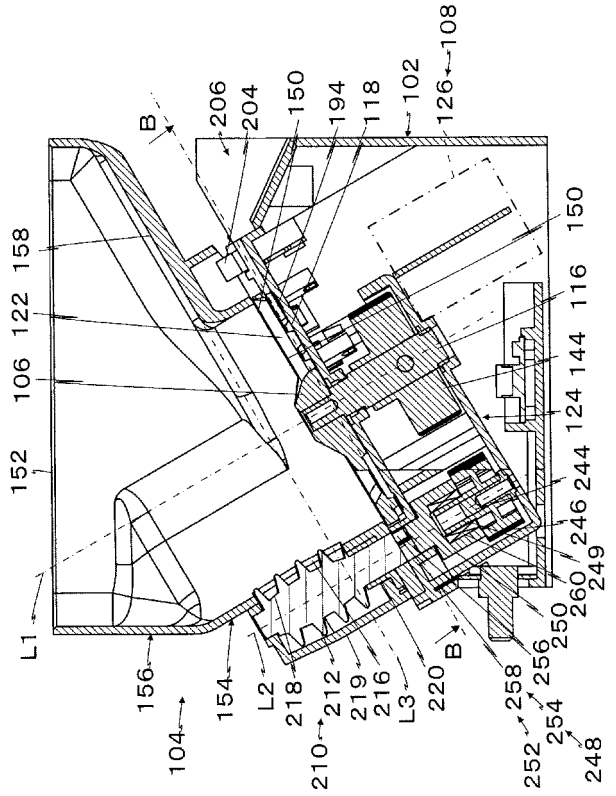
(54) **Coin hopper**

(57) A coin hopper (100) which dispenses coins one by one via a rotary disc (106) disposed below a cylindrical storage bowl (104). An outer circumferential face (213) of a stirring member (210,222) rotates around an axial line which is substantially parallel with a rotation axial line of the rotary disc forms a part of an inner wall of the storage bowl.

Fig. 4



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Description

[0001] The present invention relates to a coin hopper that separates and dispenses coins one by one by means of a rotary disc.

[0002] More specifically, the present invention relates to a coin hopper that prevents occurrence of coin bridge (the phenomenon that coins clump to form a space above the rotary disc) by means of simple equipment. The term "coin" used herein is a collective term for circular discs such as currency and tokens.

[0003] In a coin hopper that dispenses coins one by one by means of a rotary disc disposed under a cylindrical storage bowl, there have been proposed various techniques for preventing coin bridges in the storage bowl.

[0004] As a first conventional art, there is known a method of disposing a rotary circular plate on a lateral wall of the storage bowl above the rotary disc, for preventing formation of a scaffold for coin which may cause coin bridges in the inner wall surface of the storage bowl.

[0005] In other words, when a coin attempts to balance while using the rotary circular plate as a scaffold, the rotary circular disc is rotated by the pushing force of the coin, so that the rotary circular plate does not provide a scaffold, and occurrence of coin bridge is prevented (see JP-B-3493415, for example).

[0006] As a second conventional art, there is known a method of elastically supporting a part of wall of coin holding hopper (see Japanese Unexamined Utility Model publication 63-43266, for exampie).

[0007] As a third conventional art, there is known a method of constituting a part of a coin holder by a belt that moves upward (see Japanese Utility Model No. 2586629, for example).

[0008] The first conventional art faces the problem that a coin bridge cannot be prevented when a coin bridge is formed using a wall surface of storage bowl other than the rotary circular plate as a scaffold.

[0009] The second conventional art faces the problem that the position of the wall surface which is elastically supported balances with the weight of coin or the like so that it becomes substantially a stationary wall and fails to eliminate coin bridges.

[0010] The third conventional art is advantageous in that the coin being in contact with a lower wall surface of holder is actively moved because the lower wall surface moves along a predetermined length, so that a scaffold for coin bridge is not formed and hence coin bridge does not occur.

[0011] However, when a belt is used as is the case of the third conventional art, such a belt need to be bridged across a pair of rollers, so that the size of the equipment increases and hence cannot be applied in a small coin hopper.

[0012] In addition, since the belt is disposed right above the rotary disc, and receives weights of plenty of coins, a problem of large consumed energy for driving the belt arises.

[0013] Furthermore, since the belt is driven by a common driving mechanism for the rotary disc, the belt is attached to an upper part of the rotary disc integrally with the rotary disc.

[0014] Accordingly, there arises a problem that a coin, when sandwiched between the rotary disc and the slide base of the coin, is interfered by the belt and can not be readily removed.

[0015] In accordance with a first aspect of the present invention, we provide a coin hopper which dispenses coins one by one via a rotary disc disposed below a coin storage bowl,
wherein an outer circumferential face of a stirring member adapted to rotate around an axial line which is substantially parallel with a rotation axial line of the rotary disc forms a part of an inner wall of the storage bowl.

[0016] The present invention prevents coin bridges in a storage bowl without significantly increasing the energy consumption.

[0017] The present invention also provides a coin hopper having a coin bridge preventing function that enables easy response to troubles of rotary disc.

[0018] In this configuration, coins in the storage bowl are separated and dispensed one by one by rotation of the rotary disc.

[0019] A part of the outer circumferential face of the stirring member forms a part of an inner wall of the storage bowl.

[0020] The stirring member is rotated about an axial line which is substantially parallel with the rotation axial line of the rotary disc.

[0021] Therefore, the coin in the storage bowl that is in contact with the circumferential face of the actively moving stirring member is actively moved by the friction force with the stirring member.

[0022] In other words, even when a coin attempts to form a coin bridge using the inner face of the storage bowl as a scaffold, it cannot form a coin bridge because the scaffold is actively moved.

[0023] In addition, since the axial line of the stirring member is substantially parallel with the axial line of the rotary disc, the stirring member extends linearly from bottom to top of the storage bowl.

[0024] Therefore, if the weight of coins in the storage bowl is exerted on the stirring member, the stirring member will not be subject to most of the weight of the coins in the storage bowl because it is in linear contact with the coins.

[0025] In other words, since the rotation resistance of the stirring member is small, the energy consumption for driving the stirring member is small.

[0026] This provides an advantage of least energy consumption.

[0027] Furthermore, the stirring member rotates about an axial line which is substantially parallel with the rotation axial line of the rotary disc.

[0028] This provides an advantage of applicability in a small coin hopper because only a space that is enough

for the stirring member to rotate about the axial line is required.

[0029] The stirring member is preferably in the form of a drum in which diameter at the center is larger than those at both ends in the coin hopper.

[0030] In this configuration, since the stirring member is in the form of a drum in which diameter at the center is larger than those at both ends, the coin is moved two-dimensionally because it receives a moving force toward the rotation axial line of the rotary disc, as well as a moving force of a lateral direction which is parallel with the rotary disc, due to rotation of the stirring member.

[0031] Therefore, the moving direction of the coin is diversified so that occurrence of coin bridge is effectively prevented.

[0032] The circumferential face of the stirring member is preferably formed with a spiral groove in the coin hopper.

[0033] In this configuration, a coin is pushed down or up by a wall defining the spiral groove by rotation of the stirring member, while receiving a moving force in the lateral direction which is parallel with the rotary disc.

[0034] Therefore, the coin is moved three-dimensionally because it is moved in the vertical direction while moved two-dimensionally as described above, so that the moving direction of coin is diversified and an advantage of efficiently preventing a coin bridge is provided.

[0035] The rotary disc may be disposed at a slant to the horizontal, and the stirring member extends from the lowermost end of the rotary disc.

[0036] In this configuration, since the rotary disc is arranged at a slant, the coins stirred by the rotary disc are more likely to retain in a rearward position in the rotation direction than the lowermost end of the rotary disc where the rotation force received from the rotary disc and the gravity balance. Since the stirring member is disposed at this retaining position, there arises an advantage that the coins in the storage bowl are effectively stirred by rotation of the rotary disc, and thus a coin bridge is effectively prevented.

[0037] The storage bowl may have a cylindrical part extending along the axial line of the rotary disc, and an increased amount storage part having a slant bottom face which is substantially parallel with the rotary disc, and the circumferential face of the stirring member is arranged in the inner wall surface of the cylindrical portion above an extended line of the slant bottom face in the coin hopper.

[0038] In this configuration, a part of a wall surface of the cylindrical part is formed by the circumferential face of the stirring member.

[0039] A coin that slides down the slant bottom face leans against the wall surface of the cylindrical part located on an extended line of the slant bottom face, and a coin bridge is formed using this wall surface as a scaffold.

[0040] However, since the wall surface of the cylindrical part moves by rotation of the stirring member, there arises an advantage that the scaffold of the coin bridge is broken and a coin bridge will not be formed.

[0041] The stirring member is preferably rotatably attached to the storage bowl, and connected to a driving unit of the rotary disc via a clutch in the coin hopper.

[0042] When a coin is nipped by the rotary disc, the storage bowl is removed from the rotary disc side prior to conducting an operation.

[0043] In this case, since the stirring member is rotatably attached to the storage bowl, and connected to the driving unit of the rotary disc via a clutch, it can be removed integrally with the storage bowl from the rotary disc side.

[0044] Further, when the storage bowl is attached to the rotary disc, the storage bowl can be attached to the rotary disc side by connecting the clutch, so that easy attachment/detachment is enabled.

[0045] This provides an advantage of easy maintenance of the rotary disc.

[0046] The clutch may be a meshing clutch which is axially connectable and disconnectable in the coin hopper.

[0047] When the storage bowl is detached from the rotary disc side, the meshing clutch can be disconnected by axially leaving and the meshing clutch can be connected by axially approaching.

[0048] This provides an advantage of easy maintenance of the rotary disc.

[0049] In accordance with a second aspect of the present invention, we provide coin hopper which dispenses coins one by one via a rotary disc disposed below a coin storage bowl, comprising:

a stirring member which rotates about an axial line disposed substantially parallel with the rotation axial line of the rotary disc, and has an outer circumferential face forming a part of an inner wall of the storage bowl, the stirring member being rotatably supported by the storage bowl, and having at its lower end a meshing clutch piece; and

a further clutch piece meshing with the clutch piece of the stirring member, the further clutch piece being disposed laterally of the rotary disc and rotated by a driving unit of the rotary disc.

[0050] In this configuration, coins in the storage bowl are separated and dispensed one by one by rotation of the rotary disc.

[0051] A part of the outer circumferential face of the stirring member forms a part of the inner wall of the storage bowl.

[0052] The stirring member is rotated about an axial line which is substantially parallel with the rotation axial line of the rotary disc.

[0053] Therefore, the coin in the storage bowl that is in contact with the circumferential face of the actively moving stirring member is actively moved by the friction force with the stirring member.

[0054] In other words, even when a coin attempts to form a coin bridge using the inner face of the storage bowl as a scaffold, it cannot form a coin bridge because the scaffold is actively moved.

[0055] Further, the stirring member extends linearly from bottom to top of the storage bowl.

[0056] Therefore, if weight of coins in the storage bowl is exerted on the stirring member, the stirring member will not be subject to most of the weight of the coins in the storage bowl because it is in linear contact with the coin.

[0057] In other words, since the rotation resistance of the stirring member is small, the driving energy is small. Therefore, an advantage that the energy consumption of the stirring member is small arises.

[0058] Furthermore, the stirring member rotates about an axial line which is substantially parallel with the rotation axial line of the rotary disc.

[0059] This provides an advantage of applicability in a small coin hopper because only a space that is enough for the stirring member to rotate about the axial line is required.

[0060] Further, since the stirring member is rotatably attached to the storage bowl, and connected to the driving unit of the rotary disc via a clutch, it can be removed integrally with the storage bowl from the rotary disc side.

[0061] Further, when the storage bowl is attached to the rotary disc, the storage bowl can be attached to the rotary disc side by connecting the clutch, so that easy attachment/detachment is enabled.

[0062] This provides an advantage of easy maintenance of the rotary disc.

[0063] Preferably, the hopper further comprises a lateral stirring member that forms a wall surface of the storage bowl and rotates about an axial line which is substantially orthogonal to the wall surface.

[0064] In this configuration, a lateral stirring member is provided in addition to the stirring member.

[0065] Therefore, a coin bridge is prevented by movement in the circumferential direction of the rotary disc or movement in the vertical direction of the wall surface of the storage bowl through rotation of the stirring member about axial line which is parallel with the axial line of the rotary disc.

[0066] Additionally, since the lateral stirring member rotates about an axial line which is substantially orthogonal to the wall surface of the storage bowl, the coin that contacts therewith receives a lateral rolling force above the rotary disc.

[0067] Therefore, the coin is laterally rolled by the lateral rolling force, so that the stirring effect of coins are further improved and a coin bridge can be prevented.

[0068] The lateral stirring member may be driven by said stirring member in the coin hopper.

[0069] This configuration eliminates the necessity of providing a separate driving unit for the lateral stirring member, so that reduction in size and cost of the apparatus is realized.

[0070] Some examples of coin hoppers according to the invention will now be described with reference to the accompanying drawings, in which:-

Fig. 1 is a plan view of a coin hopper embodying the present invention;
Fig. 2 is an exploded perspective view seen from rear and above of the coin hopper embodying the present invention;
Fig. 3 is an exploded perspective view seen from front and above the coin hopper embodying the present invention;
Fig. 4 is a section view along the line A-A in Fig. 1;
Fig. 5 is a section view along the line B-B in Fig. 4;
Fig. 6 is an overall perspective view of the second embodiment of the present invention;
Fig. 7 is a view of the second embodiment of the present invention seen in the direction of the arrow C in Fig. 8; and,
Fig. 8 is a section view of the second embodiment of the present invention along the line D-D in Fig. 7.

First Embodiment

[0071] First, one embodiment of a coin hopper to which the present invention is applied will be explained. A coin hopper 100 includes a boxy base 102, a cylindrical storage bowl 104 disposed above the base 102, a rotary disc 106 and a driving unit 108.

[0072] First, the base 102 will be explained.

[0073] The base 102 incorporates therein the driving unit 108 and a deceleration mechanism 124 as will be describe later, and has a top face 110 having a function of guiding a coin conveyed by the rotary disc 106.

[0074] The top face 110 of the base 102 of the present embodiment is inclined downward from the front side to the back side. As shown in Fig. 2, the top face 110 of the base 102 is formed with a circular recess 112 having a depth which is slightly larger than the thickness of the rotary disc 106.

[0075] In the center of a bottom face 118 of the circular recess 112, a rotary shaft 116 is rotatably disposed about a rotation axial line L1 which is substantially orthogonal to the bottom face 118.

[0076] To an upper end of the rotary shaft 116, the rotary disc 106 having a plurality of through holes 122 is fixed.

[0077] The rotary shaft 116 is rotated by an electric motor 126 which is the driving unit 108 via the deceleration mechanism 124 disposed in the base 102.

[0078] The deceleration mechanism 124 is disposed on the back side of the base 102, and configured as follows.

[0079] As shown in Fig. 5, a driving gear 130 fixed to an output shaft 128 of the motor 126 meshes with a first intermediate gear 134 which is rotatably attached to a first stationary shaft 132.

[0080] A second intermediate gear 136 which is

formed integrally and coaxially with the first intermediate gear 134 meshes with (is attached to) a third intermediate gear 140 that is rotatably attached to the second stationary shaft 138.

[0081] A fourth intermediate gear 142 which is formed integrally and coaxially with the third intermediate gear 140 meshes with a first driven gear 144 fixed to a lower end of the rotary shaft 116.

[0082] Therefore, the rotary disc 106 is usually rotated counterclockwise as indicated by the arrow in Fig. 1 by the motor 126 at a certain deceleration ratio determined by the gears 130, 134, 136, 140, 142 and 144.

[0083] Next, the storage bowl 104 will be explained.

[0084] The storage bowl 104 has a circular bottom opening 150 and a rectangular top opening 152.

[0085] The storage bowl 104 includes a cylindrical part 154 which is substantially concentric with the rotation axial line L1 of the rotary disc 106, and a increased amount storage part 156 which continuously extends upward and frontward.

[0086] In other words, the cylindrical part 154 extends orthogonally to the base 102.

[0087] That is, the cylindrical part 154 is inclined, relative to the horizontal line.

[0088] The increased amount storage part 156 extends parallel with the top face 110 of the base 102 from the middle part of the cylindrical part 154, or in other words, it extends orthogonally to the cylindrical part 154 and has a slant bottom face 138 which is inclined.

[0089] Therefore, the bottom end of the cylindrical part 154 is the bottom opening 150, and the upper end of the increased amount storage part 156 is the upper opening 152.

[0090] The inclination of the slant bottom face 158 is so designed that the coin placed thereon will naturally slide down by its own weight.

[0091] Next, an attachment device 160 for attaching the storage bowl 104 to the base 102 will be explained.

[0092] The attachment device 160 is preferably implemented by a one-touch attachment device which allows attachment/detachment of the base 102 to/from the storage bowl 104 by at least two operations.

[0093] This allows rapid recovery by detachment of the storage bowl 104, for example, when a coin is nipped between the bottom face 118 and the rotary disc 106.

[0094] In a front part of the base 102, a pair of left and right first attachment hole 162 and second attachment hole 164 are formed.

[0095] On one side of the attachment holes 162, 164, a first latch 166 and a second latch 168 in the form of transverse beam are respectively formed.

[0096] In a bottom face of the front upper end of a storage bowl base 165 having a rectangular plate shape formed outer circumference of the lower end of the cylindrical part 154 of the storage bowl 104, a first hook 170 and a second hook 172 are formed so as to face with the latches 166, 168.

[0097] In a rear part of the base 102, a pair of left and right third attachment hole 174 and fourth attachment hole 176 are formed, and a third latch 178 is formed on a lateral wall of the base 102, and a fourth latch part 180 is formed on the other lateral wall.

[0098] In the left and right ends of the rear lower part of storage bowl base 165, an elastic first stay 182 and a second stay 184 are formed downwardly, and the stays are formed at their lower ends with an outwardly extending third hook 186 and a fourth hook 187.

[0099] For attaching the storage bowl 104 to the base 102, the hooks 170, 172 are inserted to respective corresponding attachment holes 162, 164 and the hooks 170, 172 are respectively hooked on the latches 166, 168.

[0100] Then the rear end of the storage bowl 104 is swiveled downward about the latches 166, 168, whereby the lower ends of the hooks 186, 187 are respectively inserted into the attachment holes 174, 176.

[0101] As a result, the outwardly extending slant portions 188, 189 of the hooks 186, 187 come into contact with edge walls of the attachment holes 174, 176 and receive the inward force, so that the stays 182, 184 are elastically sagged inwardly.

[0102] This sagging makes the hooks 186, 187 advance into the attachment hole 174, 176.

[0103] When the bottom face of the storage bowl base 165 comes into surface contact with the top face 110 of the base 102, the hooks 186, 187 face with the latches 178, 180, and hook on the respective latches 178, 180 due to movement by the returning force by the elasticity of the stays 182, 184, and whereby the storage bowl 104 is fixed to the base 102.

[0104] Inversely, for detaching the storage bowl 104, the hooks 186, 187 are caused to retreat into the attachment holes 174, 176 to release the hooks with respect to the latches 178, 180.

[0105] Then the rear end of the storage bowl 104 is drawn up, and after the hooks 186, 187 have moved outside the attachment holes 174, 176, it is slide rearward (left in Fig. 3) to remove the hooks 170, 172 from the attachment holes 162, 164, whereby the storage bowl 104 is detected from the base 102.

[0106] Next, the rotary disc 106 will be explained.

[0107] The rotary disc 106 has a function of separating and dispensing coins reserved in the storage bowl 104 one by one.

[0108] The rotary disc 106 is provided with a plurality of through holes 122 which are larger in size than objective coins, arranged at a predetermined interval on the circle centered at the rotary shaft 116.

[0109] The rotary disc 106 is located in the circular recess 112, and outer peripheries of the through holes 122 are located right under the lower opening 150.

[0110] As a result, a coin leaning against the inner face of the cylindrical part 154 will drop through the through hole 122 without being supported by the outer peripheral edge of the rotary disc 106.

[0111] On a bottom face of a rib 192 between through holes 122 of the rotary disc 106, a pushing projection 194

extending peripherally from the center is formed.

[0112] On the top face of the periphery of the rotary disc 106, a stirring projection 196 of a triangular pyramid shape is formed.

[0113] In the coin hopper 100, coins are reserved or stored in the storage bowl 104 in bulk stacked state.

[0114] When the rotary disc 106 rotates, coins change their positions in various ways while being stirred by the through holes 122 of the rotary disc 106 and by the stirring projection 196, and drop into the though holes 122 where they are supported by the bottom face 118 of the base 102.

[0115] In this case, since the coin is pushed at its periphery by the pushing projection 194 formed on the bottom face of the rotary disc 106, it moves together with the rotary disc 106 under guidance by the inner face of the circular recess 112.

[0116] During this movement, the coins are guided circumferentially of the rotary disc 106 by a first pin 198 and a second pin 200 projecting from the bottom face 118, and then dispensed one by one through a dispensing port 202.

[0117] The dispensed coin is flipped out by a dispensing device disposed at the dispensing port 202 (not shown) consisting, for example, of a pair of a stationary guide roller and a movable guide roller.

[0118] The flipped out coin is then detected by a metal sensor 204, and the detection signal is used for counting the number of dispensed coins.

[0119] The coin having passed the metal sensor 204 is guided to a predetermined position by a dispensing chute 206.

[0120] In the forgoing description, one embodiment of the coin hopper 100 to which the present invention is applicable has been explained, however, the present invention is not limited to this embodiment, and may be applied to any coin hoppers having combination of the storage bowl 104 and the rotary disc 106.

[0121] For example, the present invention may be applied to the coin hopper 100 in which the rotary disc 106 is disposed horizontally.

[0122] Next, a stirring member 210 according to the present invention will be explained.

[0123] The stirring member 210 forms a part of a wall surface of the storage bowl 104, and has a circumferential face that moves laterally (right and left direction in Fig. 1) at at least predetermined speed.

[0124] Specifically, the stirring member 210 is a circumferential face 214 of a rotor 212 which rotates about a rotation axial line L2 which is substantially parallel with the rotation axial line L1 of the rotary disc 106.

[0125] A part of the circumferential face 214 of the rotor 212 is located within the opening 216 formed in the cylindrical part 154.

[0126] Therefore, the circumferential face 214 forms a part of the inner face of the storage bowl 104.

[0127] The distance between the circumferential face 214 and the edge of the opening 216 is set to be smaller than thickness of a coin so as to prevent the coin from entering therebetween.

[0128] Preferably, the circumferential face 214 is disposed above an extended line L3 of the slant bottom face 158.

[0129] This allows effective stirring of the coins retained in the cylindrical part 154.

[0130] The rotor 212 has a cylindrical shape, and preferably has a drum shape in which the middle part is diametrically larger than the upper and lower ends.

[0131] Since a lateral moving force is exerted on a coin as the contacting part of the coin moves from the small-diametrical part to the large-diametrical part and inversely from the large-diametrical part to the small-diametrical part, the coin can be stirred more effectively.

[0132] Preferably, the rotor 212 is formed with a spiral groove 218 on the circumferential face, and the rotor 212 is rotated so that the spiral groove 218 moves upward from below.

[0133] Since a coin is moved so as to be removed from the rotary disc 106 by the spiral groove 218, the rotational resistance of the rotary disc 106 is decreased.

[0134] Preferably, the spiral groove 218 has a width (in the direction of elongation of axial line L2) which is twice to three times the thickness of a coin, and a depth (in the direction orthogonal to the axial line L2) which is one fifth or sixth the diameter of a coin.

[0135] The rotor 212 is a longitudinally disposed member fixed to the outer circumferential face of the cylindrical part 154 of the storage bowl 104, and has an upper end rotatably supported to a semi-cylindrical cover 219 and a lower end rotatably supported to the storage bowl base 165 via a bearing 220.

[0136] In the present embodiment, such a stirring members 210 is provided in duplicate.

[0137] Since a second stirring member 222 has the same structure as the stirring member 210, explanation of structure is omitted, and the same part in the stirring member 210 is denoted by the same reference numeral.

[0138] The second stirring member 222 is disposed at a rearward position of rotation than the lowermost end of the inclined rotary disc 106 in the rotation direction of the rotary disc 106, or specifically, at an angle of about 45 degrees with respect to the lowermost end of the rotary disc 106.

[0139] In other words, as the rotary disc 106 moves, a coin receives a force for moving the coin rearward in the rotation direction than the lowermost end of the rotary disc 106, or receives an upward moving force.

[0140] On the other hand, the coin receives a force by which it is moved in the lower position or in the downward direction by the gravity.

[0141] Therefore, the position where the upward moving force and the downward moving force balance is a position of about 45 degrees with respect to the lowermost end of the rotary disc 106, which is also a position where the coin is most likely to accumulate and cause formation of a coin bridge.

[0142] Therefore, by providing the second stirring member 222 in the position where a coin bridge is more likely to occur, it is possible to prevent formation of a coin bridge effectively.

[0143] Three or more stirring members 210, 222 may be provided, and they may be disposed on the wall surface of the increased amount storage part 156.

[0144] Therefore, the axial line that is substantially parallel with the rotation axial line L1 of the rotary disc 106 also includes the axial line L2 which is inclined in significant degree with respect to the rotation axial line L1.

[0145] When either one of the stirring members 210, 222 is provided, it is most preferable to provide the stirring member 222 at a rearward position of rotation than the lowermost end of the rotary disc 106 as described above.

[0146] Next, a driving unit 230 for the stirring members 210 and 222 will be explained.

[0147] The stirring member driving unit 230 is driven by the motor 126 which is the same for the rotary disc 106.

[0148] Sharing the motor 126 with the rotary disc 106 is effective in reduction of size and cost of the coin hopper 100.

[0149] Specifically, an intermediate gear 234 which is rotatably attached to a third stationary shaft 232 meshes with the fourth intermediate gear 142.

[0150] The intermediate gear 234 meshes with a second driven gear 238 which is rotatably attached to a fourth stationary shaft (not shown) fixed to the base 102.

[0151] A fifth intermediate gear 242 rotatably attached to the fourth stationary shaft 240 meshes with the second driven gear 238.

[0152] A third driven gear 246 rotatably attached to a fifth stationary shaft 244 meshes with the fifth intermediate gear 242.

[0153] The third driven gear 246 and the stirring member 210 are connected via a clutch 248.

[0154] The clutch 248 allows easy connection and disconnection between the driving unit 230 and the stirring member 210.

[0155] The clutch 248 consists of a clutch piece 250 rotated from a shaft part 249 extending upward of the third driven gear 246 and a clutch piece 252 on the lower end of the rotor 212, and is connected or disconnected as appropriate.

[0156] The clutch 248 is preferably a meshing clutch 254 consisting of the clutch pieces 250 and 252.

[0157] The meshing clutch 254 consists of a meshing hole 256 which is symmetrically formed about the rotary axial center on the upper end face of the clutch piece 250, and a projection 258 to be inserted into the meshing hole 256, formed on the lower end face of the clutch piece 252.

[0158] When the meshing clutch 254 is used, it is preferred to interpose a torque limiter 260 between the shaft part 249 and the clutch piece 250.

[0159] When a predetermined value of rotation resistance is exerted on the circumferential face of the stirring member 210, the torque limiter 260 slides and prevents the stirring member 210 from being forcedly rotated, so that energy consumption of the motor 260 is reduced.

[0160] Therefore, by approaching the clutch piece 252 to the clutch piece 250 and inserting the projection 258 into the meshing hole 256, the meshing clutch 254 is connected.

[0161] In other words, an attaching operation of the storage bowl 104 to the base 102 results in meshing of the meshing clutch 254.

[0162] In this state, rotation of the third driven gear 246 is transmitted to the rotor 212 via the meshing clutch 254.

[0163] By axially moving the rotor 212 from the meshing state of the meshing clutch 254, or by a detaching operation of the storage bowl 104 from the base 102, the meshing clutch 254 can be disconnected.

[0164] Although omitted in the drawings, a similar meshing clutch is provided between the lower end of the stirring member 222 and the upper part of the second driven gear 238.

[0165] Next, the operation of the present embodiment will be explained.

[0166] The storage bowl 104 reserves a plurality of coins in stacked bulk state.

[0167] In Figs. 1 and 3, when the rotary disc 106 is rotated counterclockwise, the stirring members 210, 222 are rotated clockwise via the respective gears.

[0168] As a result, the circumferential face located at the opening 216 of the storage bowl 104 of the stirring member 210, 222 moves in the right direction.

[0169] Accordingly, the coin in contact with the circumferential face 214 of the stirring members 210, 222 receives a force for lateral movement in the left direction via the coin by rotation of the rotary disc 106 and receives a force for lateral movement in the right direction from the circumferential face 214.

[0170] These forces move the coin and prevent the wall surface of the storage bowl 104 from being used as a scaffold, so that coin bridges will not be formed.

[0171] Especially when many coins reside in the storage bowl 104, the coins are pushed against the wall surface of the cylindrical part 154 above the extended line L3 at a large force due to the weight of the coins sliding on the slant bottom face 158.

[0172] The coins are retained due to the large pushing force against the inner face of the storage bowl 104, so that a scaffold for coin bridge is likely to occur.

[0173] However, since the circumferential face 214 of the stirring member 210, 222 is located in this position, the coins receive a lateral moving force by the circumferential face 214 of the stirring member, and will not form a scaffold for coin bridge.

[0174] Furthermore, since the stirring member 210, 222 has a drum-like shape, a coin will be moved by the outer circumferential face 214 as the contact part thereof moves from the upper end to the middle part of the stirring member 210, 222.

[0175] In other words, since the coin is pushed against the slant bottom face 158, this movement also breaks a

scaffold for coin bridge.

[0176] Furthermore, a peripheral part of the coin is located in the spiral groove 218.

[0177] The wall defining of the spiral groove 218 moves upward from below by rotation of the stirring members 210, 222.

[0178] Since the coin whose peripheral part is situated at the spiral groove 218 is moved upward by the defining wall of the spiral groove 126, this also breaks a scaffold for coin bridge.

[0179] Accordingly, since a scaffold for coin bridge is broken by rotation of the stirring member 210, 222, a coin bridge will not occur.

[0180] For detaching the storage bowl 104 from the base 102, hooks 186, 187 are removed from the third latch 178 and the fourth latch 180 by pushing them into the base 102, and then the storage bowl base 165 is pivoted upward about the first latch 166 and the second latch 168.

[0181] As a result, the projection 258 in the lower end face of the stirring member 210, 222 leaves the meshing hole 256 of the clutch piece 252, and the meshing clutch 254 is disconnected automatically.

[0182] Subsequently, by removing the hooks 170, 172 from the latches 166, 168, it is possible to readily remove the storage bowl 104 from the base 102.

[0183] For attaching the storage bowl 104 to the base 102, the hooks 170, 172 are hooked on the latches 166, 168 in a reverse way, and then the storage bowl base 165 is pivoted to cause the hooks 182, 184 to be inserted into the attachment holes 174, 176 and pushed therein.

[0184] In this course, the projection 258 on the lower end face of the stirring member 210, 222 comes into the meshing hole 256 and the meshing clutch 254 connects automatically.

[0185] When the projection 258 and the meshing hole 256 are in different phases, the phases are aligned by rotation of the stirring members 210, 222 by moving the circumferential face 214 laterally with a finger tip.

[0186] Additionally, the hooks 186, 188 are hooked on the latches 178, 180, and the storage bowl 104 is fixed to the base 102.

[0187] The rotary disc 106 may be arranged in the lower end part of the cylindrical part 154.

[0188] Therefore, the rotary disc 106 disposed below the storage bowl 104 according to the present invention includes both the state where it is disposed in the lower end part of the cylindrical part 154 and the state where it is disposed right below the cylindrical part 154.

[0189] Further, the rotor 212 may be rotated so that the spiral groove 218 moves downward from above.

[0190] Further, in addition to the rotor 212, a reciprocable member that pushes and moves a coin reserved in the cylindrical part 154 toward the rotation axial line L1 of the rotary disc 106 may be provided.

[0191] In the present invention, the clutch 248 between the driving unit 230 and the stirring member 210, 222 may be implemented by a friction clutch. In the friction clutch, it is not necessary to attach the torque limiter 260 because slip occurs when a load of greater than a predetermined value is applied on the stirring member 210, 222.

Second Embodiment

[0192] In Figures 6 to 8, the parts identical to those of the first embodiment are denoted by the same numeral, and only different parts will be explained below.

[0193] For clarification of explanation, the stirring member of the first embodiment is conveniently referred to as a vertical stirring member.

[0194] As illustrated in Figures 6 to 8, right above the vertical stirring member 210, 222 of the first embodiment, a lateral stirring member 300 is arranged.

[0195] The lateral stirring member 300 includes a first lateral stirring member 302 and a second lateral stirring member 304.

[0196] Since the first lateral stirring member 302 and the second lateral stirring member 304 have the same structure, the first lateral stirring member 302 will be representatively explained.

[0197] As shown in Fig. 8, a lateral shaft 306 is arranged right above the first vertical stirring member 210, and rotatably supported by a casing 308.

[0198] A lateral axial line 312 of the lateral shaft 306 is arranged so as to be substantially orthogonal to the wall surface 314 of the cylindrical part 154 of the storage bowl 104.

[0199] To an end of the lateral shaft 306 in the storage bowl 104, the first stirring member 302 in the form of a circular disc is fixed.

[0200] The first stirring member 302 is conical, and a rib-like stirring projection 319 is formed in a conic surface 316.

[0201] Since the surface of the first stirring member 302 substantially connects the wall surface 314 of the cylindrical part 154, it forms an inner wall surface of the storage bowl 104.

[0202] A helical gear 322 is fixed to the lateral shaft 306 which meshes with a helical gear 324 fixed to the upper end of the first stirring member 210.

[0203] As a result, when the rotary disc 106 is rotated counterclockwise in Fig. 6, the first stirring member 210 is rotated counterclockwise, and the spiral groove 218 moves from bottom to the top, and the lateral shaft 306 is rotated via the helical gears 324, 322 and the first lateral stirring member 302 is rotated clockwise as indicated by the arrow.

[0204] As a result, since the coin in contact with the first lateral stirring member 302 receives a lateral rolling force, it fails to become a scaffold for a coin bridge.

[0205] Further, coins around the coin that directly receives the lateral rolling force also fails to become a scaffold for coin bridge because they are also influenced.

[0206] Therefore, the second embodiment prevents occurrence of a coin bridge more effectively than the first

embodiment.

[0207] The lateral stirring member 300 may be either the first lateral stirring member 302 or the second lateral stirring member 304.

[0208] When only one lateral stirring member 300 is provided, it is preferably arranged in the position slightly deviated in the rotation direction of the rotary disc 106 from the position facing the lowermost part of the rotary disc 106, namely, in the position of the second lateral stirring member 304 facing with the second vertical stirring member 222.

[0209] The lateral stirring member 300 may be a circular disc.

Claims

1. A coin hopper (100) which dispenses coins one by one via a rotary disc (106) disposed below a coin storage bowl (104),
wherein an outer circumferential face (212) of a stirring member (210,222) adapted to rotate around an axial line (L2) which is substantially parallel with a rotation axial line (L1) of the rotary disc forms a part of an inner wall of the storage bowl.

2. The coin hopper according to claim 1, wherein the stirring member is in the form of a drum in which its diameter at the center is larger than those at both ends.

3. The coin hopper according to claim 1 or 2, wherein the circumferential face of the stirring member is formed with a spiral groove (216).

4. The coin hopper according to any of the preceding claims, wherein the rotary disc is disposed at a slant to the horizontal, and the stirring member extends from the lowermost end of the rotary disc.

5. The coin hopper according to claim 4, wherein the storage bowl has a cylindrical part (154) extending along the axial line of the rotary disc, and a larger storage part (156) having a slanted bottom face (158) which is substantially parallel with the rotary disc, the circumferential face of the stirring member being arranged in the inner wall surface of the cylindrical portion above an extended line (L3) of the slant bottom face.

6. The coin hopper according to any of the preceding claims, wherein the stirring member is rotatably attached to the storage bowl, and connected to a driving unit (108) of the rotary disc via a clutch (248).

7. The coin hopper according to claim 6, wherein the clutch is a meshing clutch (254) which is axially connectable and disconnectable.

8. A coin hopper which dispenses coins one by one via a rotary disc disposed below a coin storage bowl, comprising:

a stirring member (210,222) which rotates about an axial line (L2) disposed substantially parallel with the rotation axial line of the rotary disc, and has an outer circumferential face forming a part of an inner wall of the storage bowl, the stirring member being rotatably supported by the storage bowl, and having at its lower end a meshing clutch piece (258); and
a further clutch piece (256) meshing with the clutch piece of the stirring member, the further clutch piece being disposed laterally of the rotary disc and rotated by a driving unit of the rotary disc.

9. The coin hopper according to any of the preceding claims, further comprising a lateral stirring member (300) that forms a wall surface of the storage bowl and rotates about an axial line which is substantially orthogonal to the wall surface.

10. The coin hopper according to claim 9, wherein the lateral stirring member is driven by said stirring member.

Fig. 1

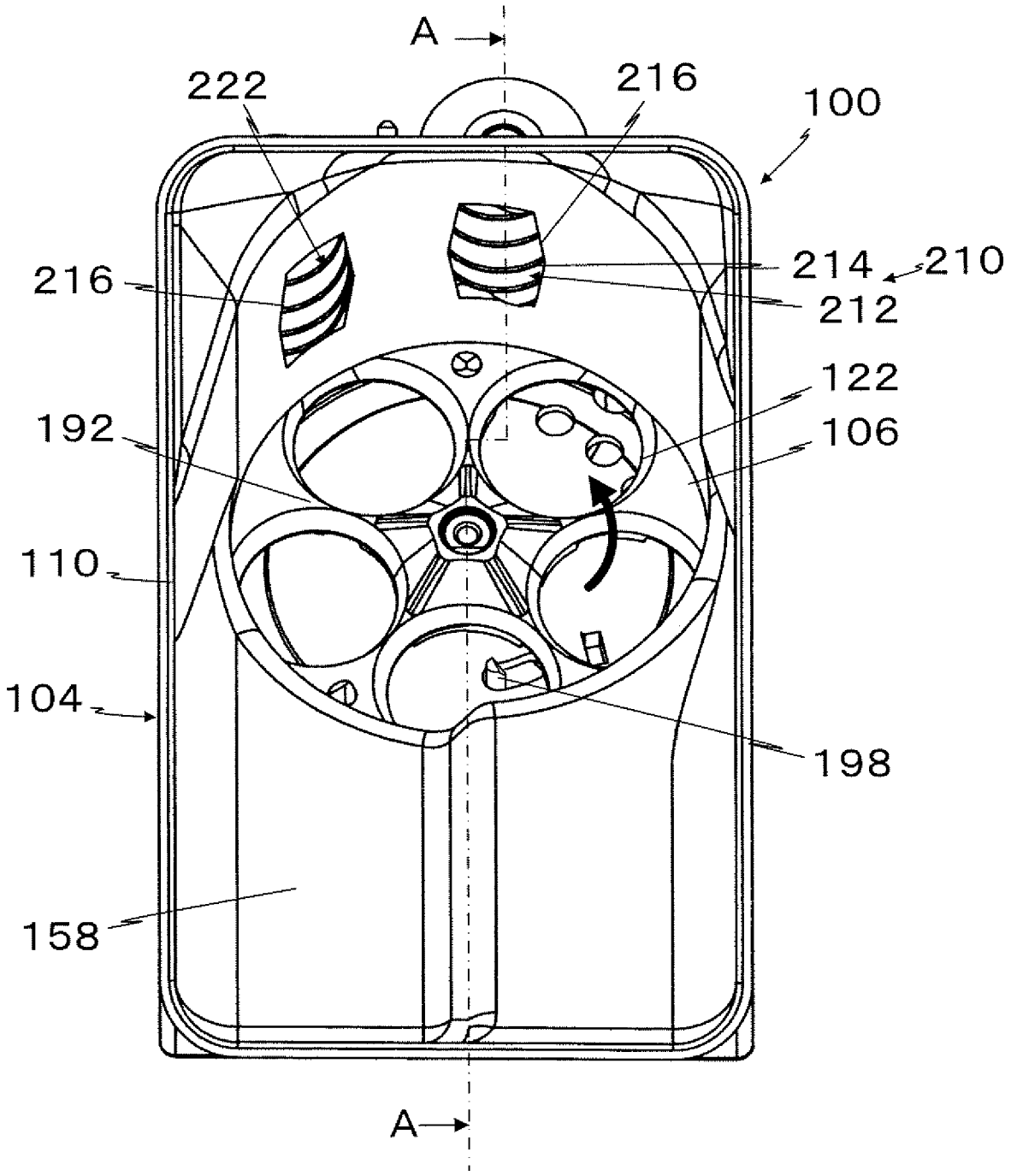

Fig. 2

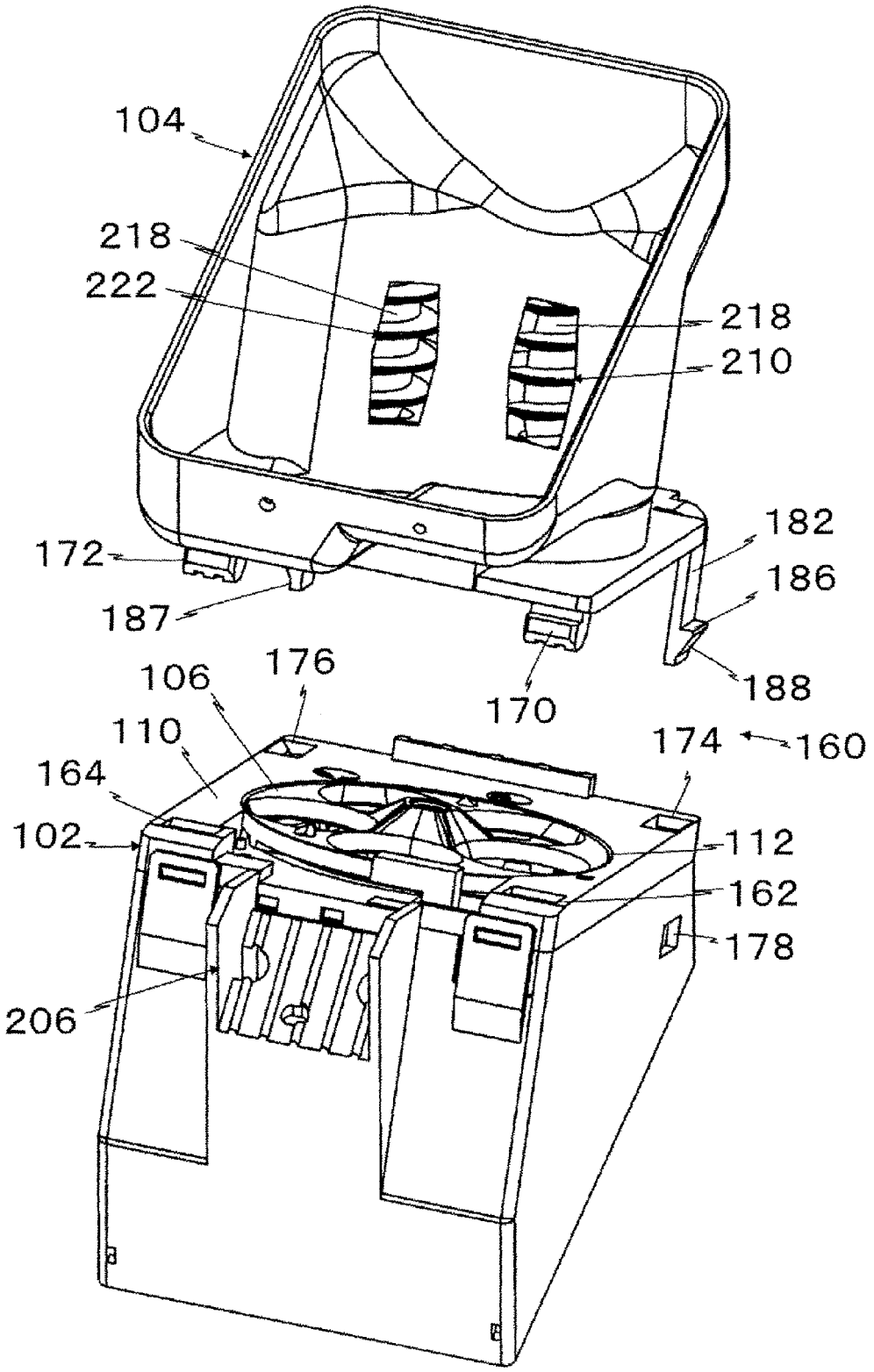
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Fig. 3

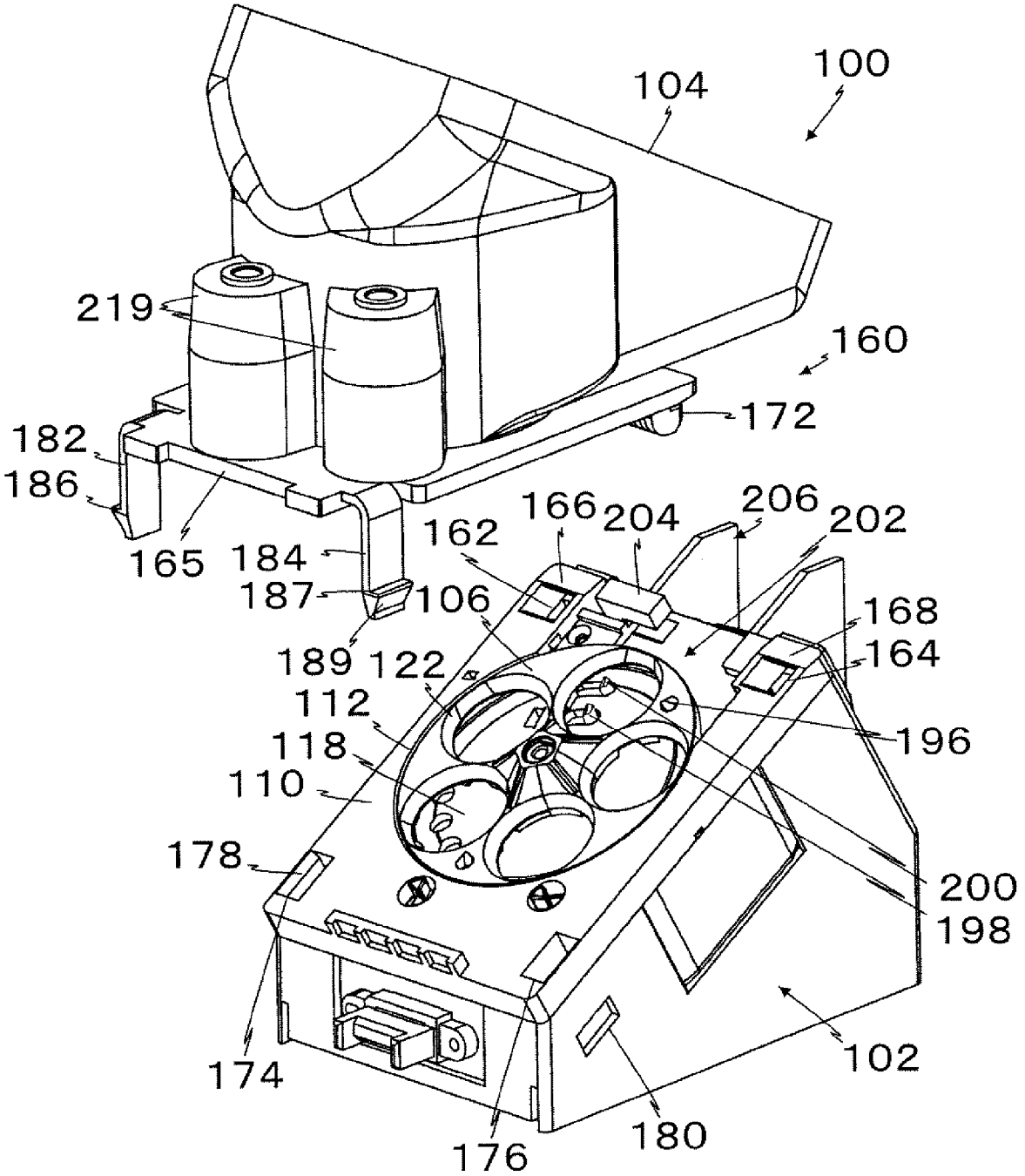
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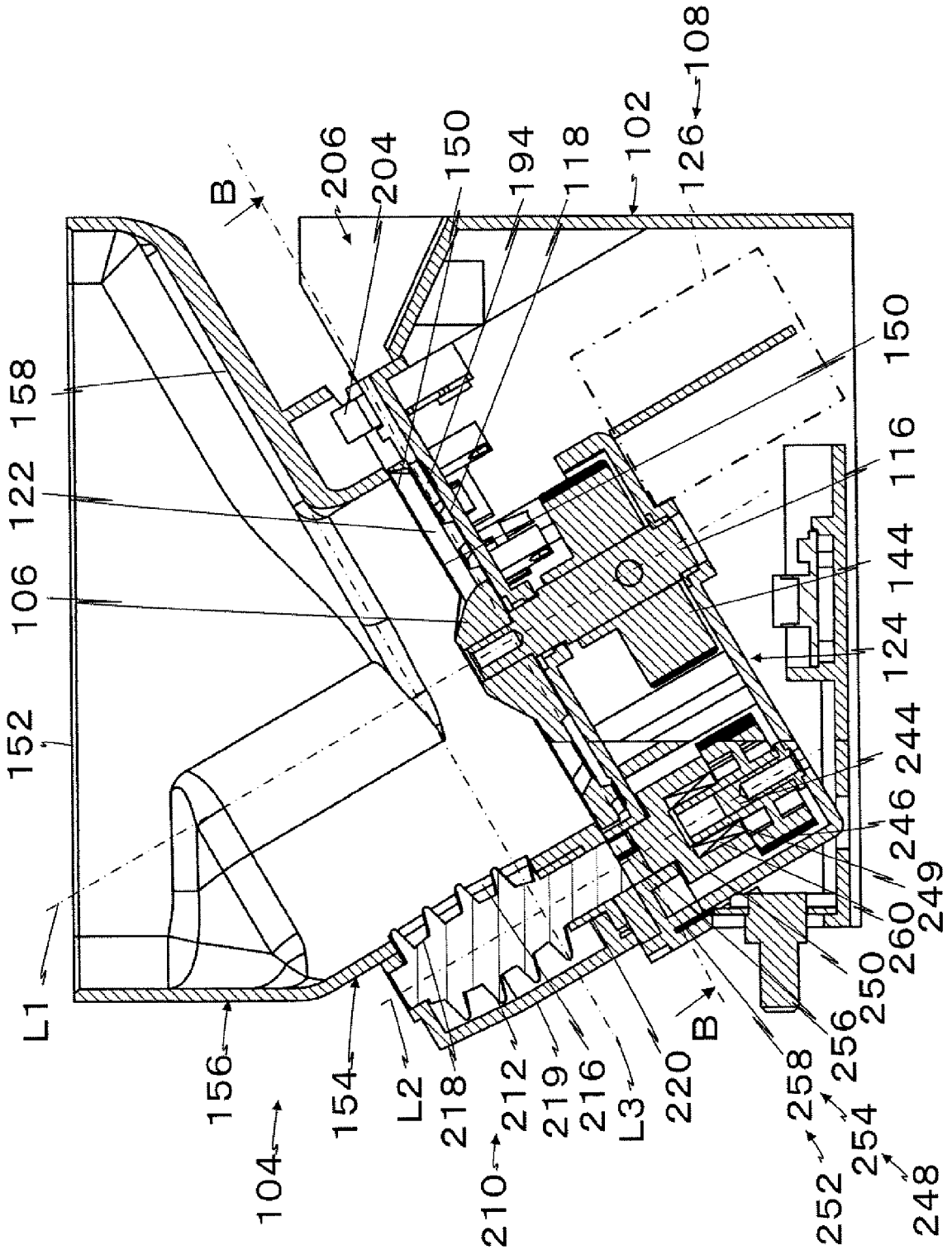
Fig. 4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L1
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L3
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Fig. 5

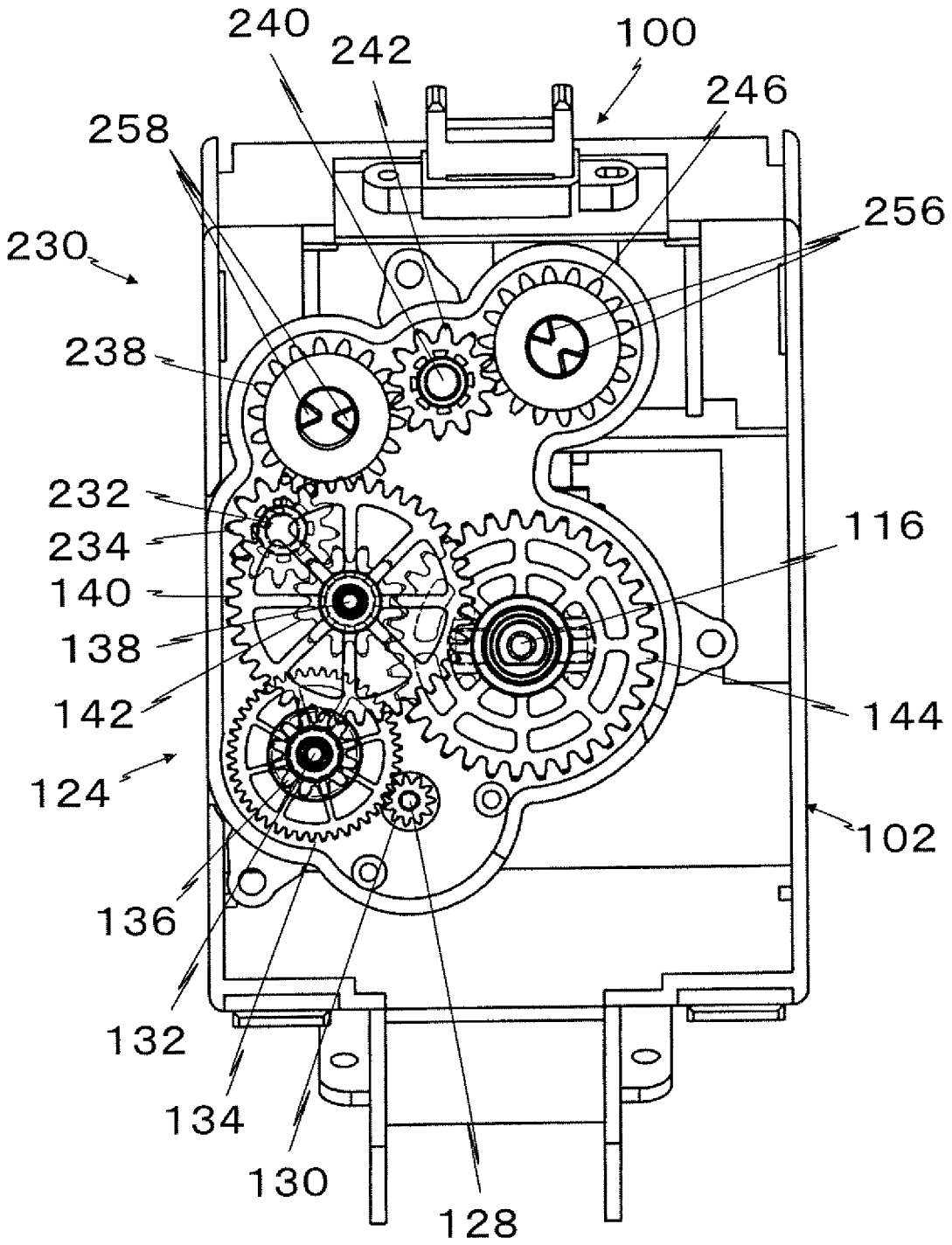
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Fig. 6

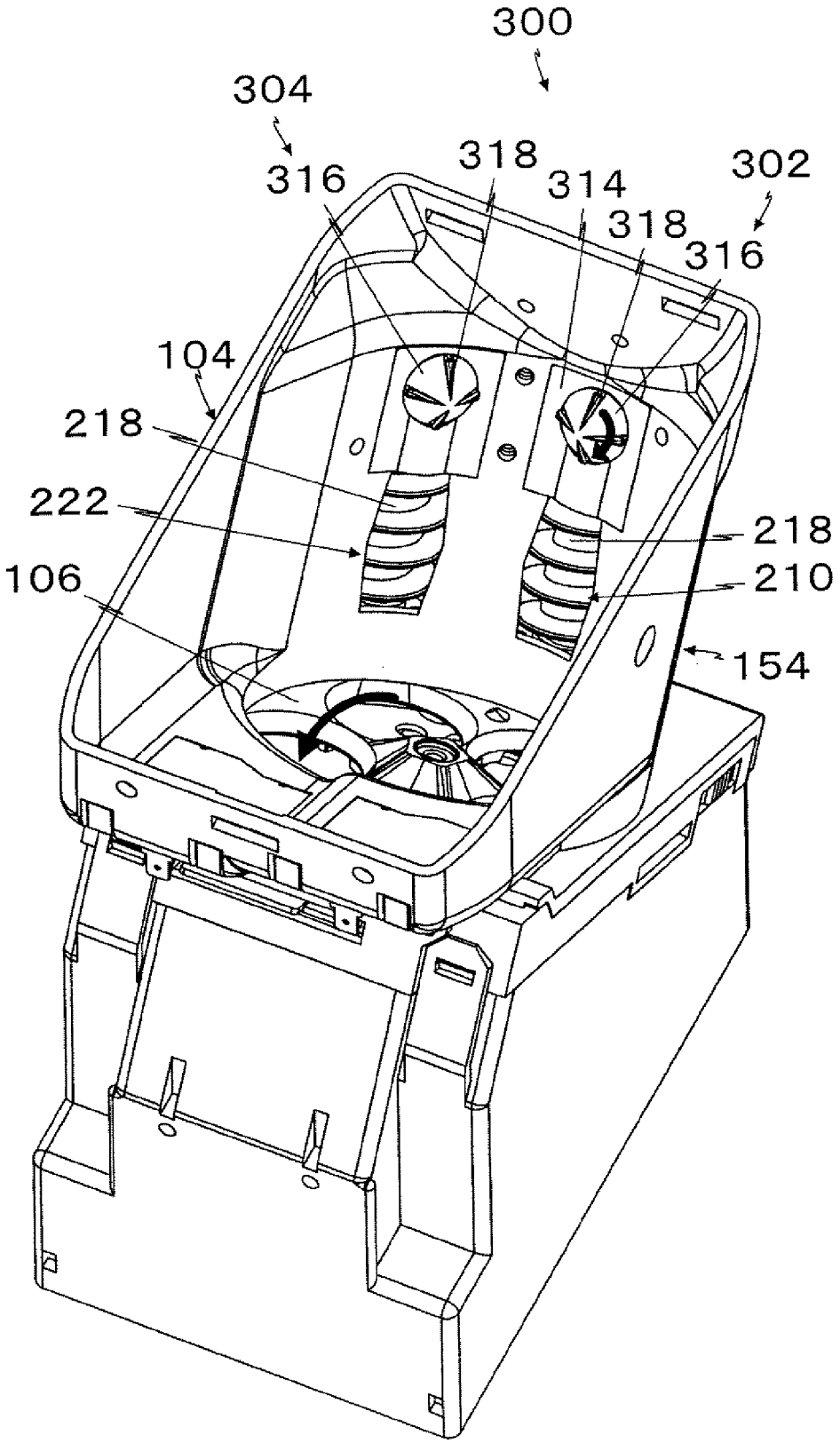


Fig. 7

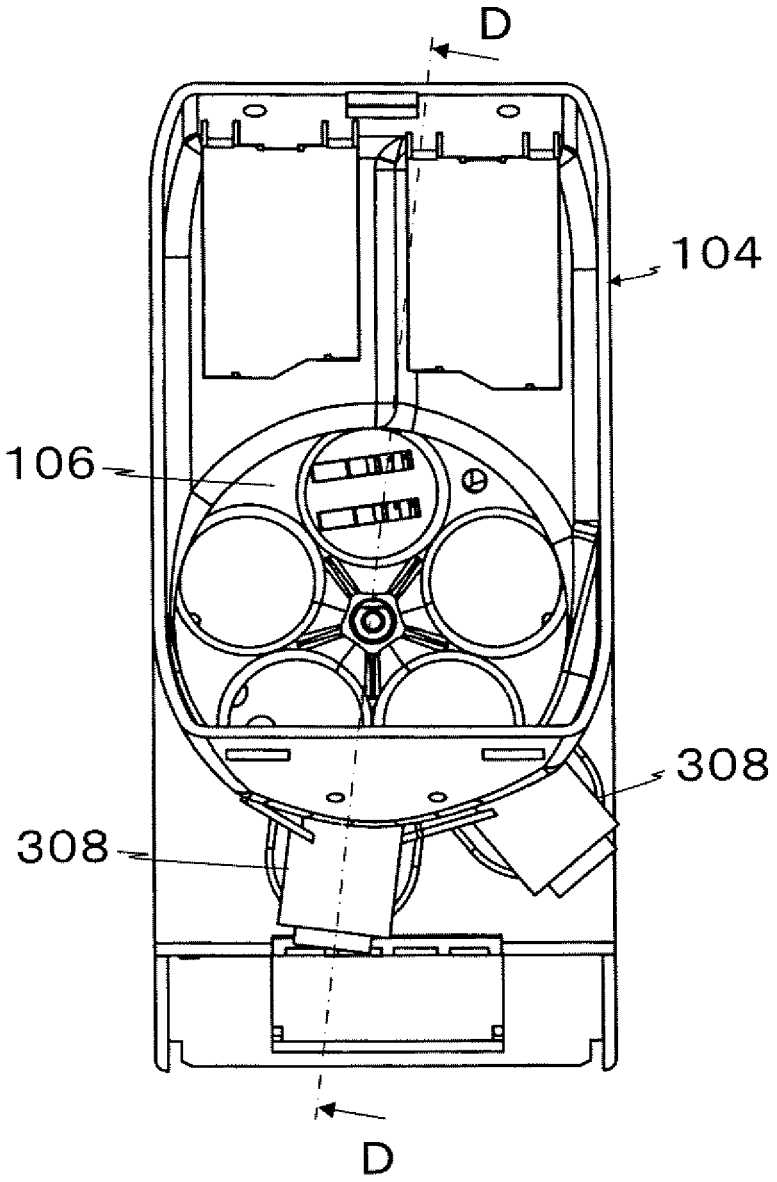
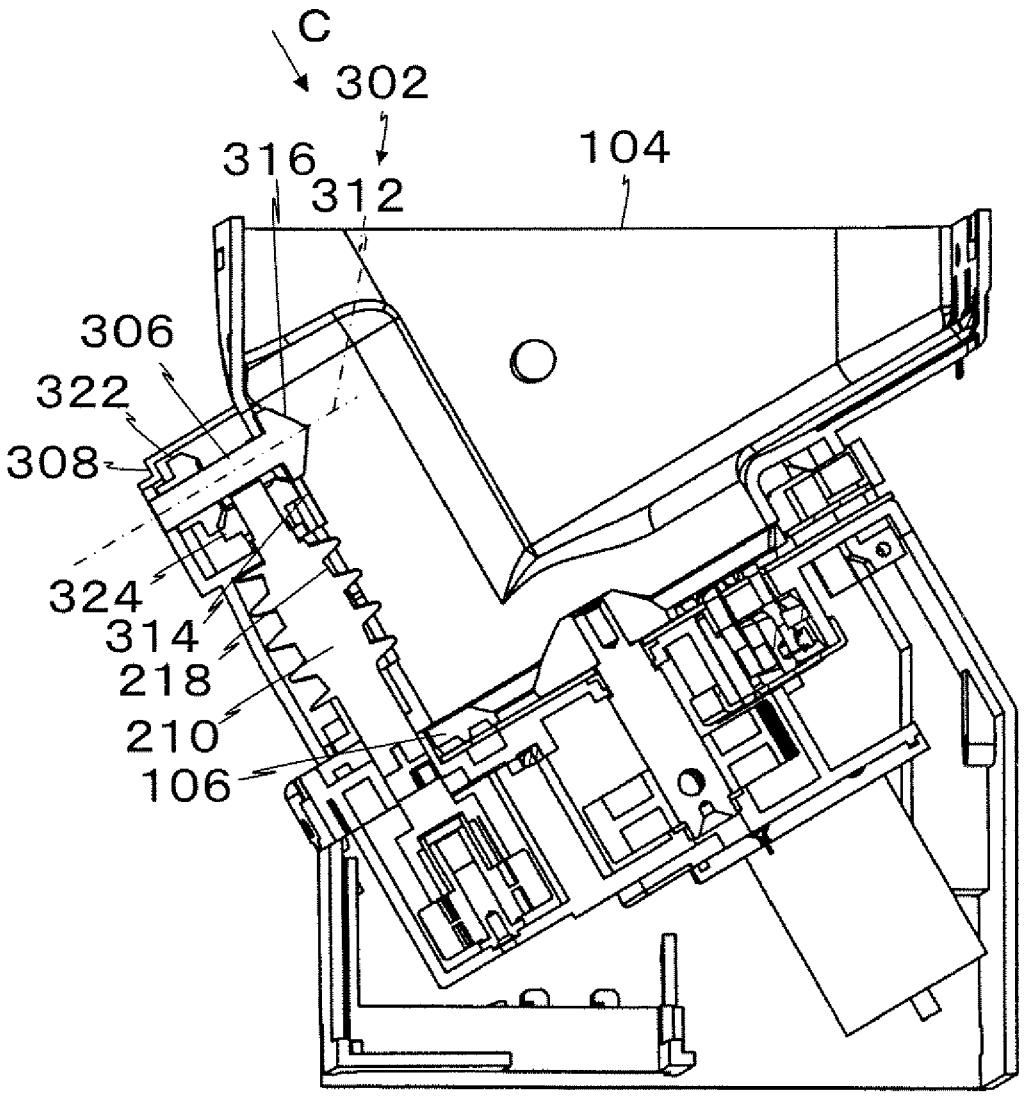


Fig. 8



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EUROPEAN SEARCH REPORT

Application Number
EP 06 11 6468

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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
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