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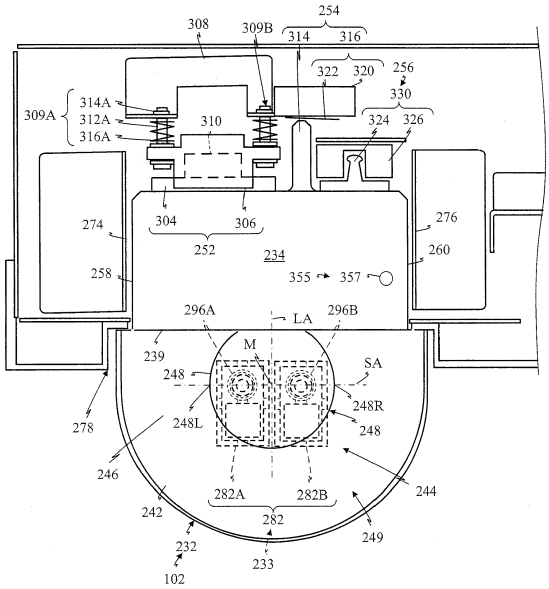
(54) Coin tray of coin payment apparatus

(57) An object of the present invention is to provide a coin tray of a coin payment apparatus, wherein the coin tray mounted with a coin sensor is attachable/detachable to/from a body of the coin payment apparatus, and the coin sensor is not damaged even when live-line insertion/removal is carried out.

[Solving Means]

When a coin tray mounted with a coin sensor is mounted on a body in a state in which an outside frame of a coin payment apparatus is detached and a state sensor is not connected, first, a coin-sensor connecter is connected, a tray mounted sensor then becomes a connected state, the state sensor then becomes a connected state when the outside frame is mounted, and the coin payment apparatus becomes operable. When the coin tray is to be detached, reversely, the outside frame is detached to cause the state sensor to be in a non-connected state, and, then, the coin tray is pulled. As a result, first, the tray mounted sensor becomes a non-connected state, and the coin-sensor connecter then becomes a non-connected state. Therefore, live-line insertion/removal is prevented.

FIG. 6



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Description

[Technical Field]

[0001] The present invention relates to a coin tray for receiving coins in a coin payment apparatus that feeds a predetermined number of stored coins to the coin tray based on a dispensing command.

[0002] Particularly, the present invention relates to a coin tray for receiving coins, the coin tray attachable/detachable to an apparatus body in a coin payment apparatus that feeds a predetermined number of coins of a predetermined denomination(s) among stored coins of a plurality of denominations to the coin tray based on a dispensing command.

[0003] Further particularly, the present invention relates to a coin tray for receiving coins, the coin tray attachable/detachable to an apparatus body, the coin tray provided with a coin sensor in a coin payment apparatus that feeds a predetermined number of coins of a predetermined denomination(s) among stored coins of a plurality of denominations to the coin tray based on a dispensing command.

[0004] Note that the "coin(s)" used in the present specification includes all coins such as Japanese coins, US coins, Euro coins, etc.

[Background Art]

[0005] As a first conventional technique, there is known a coin processing apparatus configured to house coins, which have been loaded in an inlet, separately by denominations and then dispense the coin(s) from a dispensing opening, the coin processing apparatus having: a tray that has slopes on four sides and can receive the coins dispensed to the dispensing opening and collect the coins to the center; and an optical sensor means configured to detect remaining coins in the tray by disposing two sets of light-emitting elements and light-receiving elements so that two optical axes intersect with each other when viewed from the top and are oblique to each other when viewed from the side (Patent Literature 1).

[0006] As a second conventional technique, there is known a coin processing apparatus that carries out coin acceptance and payout processing, the coin processing apparatus having: an apparatus body that can house loaded coins in a coin storage separately by denominations and dispense the housed coins; a dispensing tray that is mounted to be adjacent to a coin dispensing opening for dispensing the coins from the coin storage of the apparatus body, receives and stores the coins dispensed from the coin dispensing opening, and is attachable/detachable to/from the apparatus body; and a one-time collection chute that is mounted at a mount position of the dispensing tray, feeds the coins dispensed from the coin dispensing opening to the front of the apparatus, and is attachable/detachable to/from the apparatus body; wherein, mounting of the dispensing tray or the one-time collection chute is detected by a detection switch, and operation of the coin processing apparatus is limited depending on the type of the chute (Patent Literature 2).

[0007] As a third conventional technique, there is known a coin processing apparatus configured to dispense coins, which are stored in a chassis, from a dispensing opening, the coin processing apparatus having: a tray that has a bottom surface and slopes at four sides of the bottom surface and can receive the coins dispensed to the dispensing opening and collect the coins onto the bottom surface; a proximity sensor that has a coil wound around a core provided in a back side of the bottom surface; and a remaining-coin detecting means configured to detect remaining coins in the tray by the proximity sensor (Patent Literature 3).

[0008] As a fourth conventional technique, there is known an equipment electric-line connecting apparatus that has a body and equipment attachable/detachable to/from the body and is configured to connect/disconnect a power source line and a signal line in conjunction with equipment attachment/detachment of the equipment to/from the body; wherein, if the electric-line connecting apparatus is separated into a power line connecter and a signal line connecter and to be connected, the signal line connecter is connected after the power line connecter is connected first; and, if the apparatus is to be disconnected, the power line connecter is disconnected after the signal line connecter is disconnected (Patent Literature 4).

[Citation List]

[Patent Literatures]

[0009]

[Patent Literature 1] Japanese Patent No. 4552871 (paragraph numbers 0017 to 0019, FIG. 1 to FIG. 11)
[Patent Literature 2] Japanese Patent Application Laid-Open No. 2001-297351 (paragraph numbers 0018 to 0022, FIG. 1 to FIG. 6)
[Patent Literature 3] Japanese Patent Application Laid-Open No. 2011-65427 (paragraph numbers 0010 to 0012, FIG. 1 to FIG. 5)
[Patent Literature 4] Japanese Patent Application Laid-Open No. 2008-129733 (paragraph numbers 0006 to 0007, FIG. 1 to FIG. 3)

[Disclosure of the Invention]

[Problems to be Solved by the Invention]

[0010] In the first conventional technique, in the coin processing apparatus which dispenses the coins, an optical sensor for detecting the remaining coins of the tray, which receives and stores the dispensed coins, and informing a user of the presence of the remaining coins is disposed; and, this is effective for preventing reception

of the coins from being forgotten. The tray in the first conventional apparatus is attached to the chassis in a fixed state. Therefore, while the optical sensor is actuated, the power line thereof is not connected or disconnected.

[0011] However, the tray (coin tray), which receives and stores the coins, is formed to project from a body of a coin processing machine so as to facilitate the user to take out the coins. Therefore, the packaging style of transportation from a manufacturing factory to an installation location such as a supermarket is preferred to reduce the packaging volume and increase transportation efficiency by detaching the coin tray from the body and packaging the coin tray in a single box. Furthermore, depending on demands of clients, a coin tray having a shape different from that of a standard product is mounted in some cases.

[0012] However, the first conventional technique has problems that the transportation efficiency is low and that the coin tray to which the demands of the clients are reflected cannot be mounted since the coin tray is integrated with the body.

[0013] On the other hand, in the second conventional technique, a coin dispensing receiving opening or the one-time collection chute of the coin processing apparatus (coin acceptance and payout processing apparatus, coin changing machine, etc.) can be selectively mounted on the apparatus body. However, a sensor of the coins is not mounted on the dispensing receiving opening or the one-time collection chute. Therefore, in order to solve the problem of the first conventional technique, it is conceivable to combine the technical idea that enables the coin receiving opening to be attachable/detachable to/from the body disclosed in the second conventional technique with the first conventional technique.

[0014] In this case, the coin receiving opening is attachably/detachably provided with the body, the coin tray and the body are separately carried to an installation location, and, then, an installer mounts the coin tray on the body at, for example, a supermarket, which is the installation location.

[0015] Upon this mounting, the coin receiving opening may be mounted or detached in a state in which the power of the coin processing apparatus is on. In this case, since the coin receiving opening is mounted in the state in which the power of the body is on, so-called live-line insertion/removal is carried out, an inrush current flows into the optical sensor, light-emitting diodes or optical transistors constituting the optical sensor may be damaged, and the first conventional technique and the second conventional technique cannot be simply combined. Therefore, a coin tray having a remaining-coin detection sensor, which does not cause any failure even when live-line insertion/removal is carried out, is desired.

[0016] The coin processing apparatus of the third conventional technique has an object to detect the remaining coins in the coin tray as well as the first conventional technique and replaces the optical sensor of the first conventional technique with the proximity sensor having the coil wound around the core. Since the proximity sensor can detect the coins without being affected by dust, etc., the proximity sensor is advantageous compared with the optical sensor if it is used in the coin processing apparatus. Normally, a proximity sensor has the structure having the coil wound around the core, and the proximity sensor integrated with an oscillator circuit and a detector circuit is commercially available. If a proximity sensor not integrated with an oscillator circuit and a detector circuit is used, the circuits have to be provided on a control board in the body side, which increases cost; therefore, this cannot be promptly employed.

[0017] If the commercially-available proximity sensor integrated with the oscillator circuit and the detector circuit is replaced with the optical sensor of the first conventional apparatus and if the coin tray mounted with the proximity sensor is attachable/detachable to/from the body in combination with the second conventional technique, as well as the above description, live-line insertion/removal may be carried out, the oscillator circuit or the detector circuit may be damaged if the live-line insertion/removal is carried out, and this cannot be promptly employed. Therefore, a coin receiving opening that does not cause any failure even when live-line insertion/removal is carried out and has a coin remaining-amount detection sensor not affected by dust, etc. is desired.

[0018] The fourth conventional technique is the invention related to an application of the present applicant, wherein the connecter is used in place of a switch in order to prevent occurrence of the problem due to live-line insertion/removal; upon connection, the power line is configured to be connected after the signal line is connected first; and, upon disconnection, the signal line is configured to be disconnected after the power line is disconnected first.

[0019] Therefore, in a case in which the power of the body is on, if the connecter of the power line is connected or disconnected, an inrush current acts on the equipment connected to the power line. Therefore, even if this invention is applied to combination with the first conventional technique and the second conventional technique or the third conventional technique, there is a problem that damage, etc. of constituent parts by live-line insertion/removal cannot be prevented.

[0020] A first object serving as a basic object of the present invention is to provide a coin tray of a coin payment apparatus, wherein the coin tray mounted with a coin sensor is attachable/detachable to/from a body of the coin payment apparatus, and the coin sensor is not damaged even when live-line insertion/removal is carried out.

[0021] A second object serving as a subordinate object of the present invention is to provide a coin tray of a coin payment apparatus, wherein the coin tray mounted with coin sensors is attachable/detachable to/from a body of the coin payment apparatus, the coin sensors are not damaged even when live-line insertion/removal is carried

out, and a remaining coin(s) can be detected even when one of the coin sensors malfunctions.

[0022] A third object serving as a subordinate object of the present invention is to provide a coin tray of a coin payment apparatus, wherein the coin tray mounted with coin sensors is attachable/detachable to/from a body of the coin payment apparatus, the coin sensors are not damaged even when live-line insertion/removal is carried out, and even a wide variety of coin materials can be detected.

[0023] A fourth object serving as a subordinate object of the present invention is to inexpensively provide a coin tray of a coin payment apparatus, wherein the coin tray mounted with coin sensors is attachable/detachable to/from a body of the coin payment apparatus, and the coin sensors are not damaged even when live-line insertion/removal is carried out.

[0024] The four objects of the present invention have been described. However, the present invention is only required to achieve at least the first object serving as the basic object.

[Means to Solve the Problems]

[0025] In order to achieve the objects, a first mode of the present invention is configured in a below manner.

[0026] A coin payment apparatus feeds a coin stored in a body based on a payment command, receives the fed coin by a coin tray detachably attached to the body, and detects presence/absence of the coin in the coin tray by a coin sensor provided at the coin tray; wherein the coin sensor is electrically connected to the body side by a coin-sensor connecter that connects or disconnects electrical connection by connection/disconnection between a body-side connecter attached to the body side and a tray-side connecter attached to the coin tray side; the coin payment apparatus further comprises a state sensor that directly or indirectly detects whether the coin payment apparatus is in an actuatable state; the coin sensor and the state sensor are electrically connected in series to a power source via the coin-sensor connecter; when the coin tray is to be mounted on the body, the state sensor is configured to be connected after the coin-sensor connecter is connected; and, when the coin tray is to be detached from the body, the coin-sensor connecter is configured to be disconnected after the connection of the state sensor is disconnected.

[0027] A second mode of the present invention is configured in a below manner.

[0028] A coin payment apparatus feeds a coin stored in a body based on a payment command, receives the fed coin by a coin tray detachably attached to the body, and detects presence/absence of the coin in the coin tray by a coin sensor provided at the coin tray; wherein the coin sensor is a proximity sensor; the coin sensor is electrically connected to the body side by a coin-sensor connecter that connects or disconnects electrical connection by connection/disconnection between a body-side connecter attached to the body side and a tray-side connecter attached to the coin tray side; the coin payment apparatus further comprises a state sensor that directly or indirectly detects whether the coin payment apparatus is in an actuatable state; the coin sensor and the state sensor are electrically connected in series to a power source via the coin-sensor connecter; when the coin tray is to be mounted on the body, the state sensor is configured to be connected after the coin sensor is connected; and, when the coin tray is to be detached from the body, the coin sensor is configured to be disconnected after the connection of the state sensor is disconnected.

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

[0030] A coin payment apparatus feeds a coin stored in a body based on a payment command, receives the fed coin by a coin tray detachably attached to the body, and detects presence/absence of the coin in the coin tray by a coin sensor provided at the coin tray; wherein the coin sensor is electrically connected to the body side by a coin-sensor connecter that connects or disconnects electrical connection by connection/disconnection between a body-side connecter attached to the body side and a tray-side connecter attached to the coin tray side; the coin payment apparatus further comprises a state sensor that directly or indirectly detects whether the coin payment apparatus is in an actuatable state; the coin payment apparatus further comprises a tray mounted sensor consisting of an actuator integrally provided with the coin tray and an open/close switch attached to the body side; the coin sensor, the tray mounted sensor, and the state sensor are electrically connected in series to a power source via the coin-sensor connecter; a positional relation between the actuator and the open/close switch and a positional relation between the body-side connecter and the tray-side connecter are set so that, when the coin tray is to be mounted on the body, the state sensor is configured to be connected after the coin-sensor connecter and the open/close switch are connected and so that, when the coin tray is to be detached from the body, the coin-sensor connecter and the open/close switch are configured to be disconnected after the connection of the state sensor is disconnected.

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

[0032] A coin payment apparatus feeds a coin stored in a body based on a payment command, receives the fed coin by a coin tray detachably attached to the body, and detects presence/absence of the coin in the coin tray by a coin sensor provided at the coin tray; wherein the coin sensor includes at least two proximity sensors; the coin sensor is electrically connected to the body side by a coin-sensor connecter that connects or disconnects electrical connection by connection/disconnection between a body-side connecter attached to the body side and a tray-side connecter attached to the coin tray side; the coin payment apparatus further comprises a state sensor that directly or indirectly detects whether the coin

payment apparatus is in an actuatable state; the coin payment apparatus further comprises a tray mounted sensor consisting of an actuator integrally provided with the coin tray and an open/close switch attached to the body side; the plurality of proximity sensors are connected in series via the coin-sensor connecter to the tray mounted sensor, the state sensor, and a power source connected in series; the plurality of proximity sensors are connected in parallel to each other; when the coin tray is to be mounted on the body, the state sensor is configured to be connected after the coin sensor and the open/close switch are connected; and, when the coin tray is to be detached from the body, the coin sensor and the open/close switch are configured to be disconnected after the connection of the state sensor is disconnected.

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

[0034] A coin payment apparatus feeds a coin stored in a body based on a payment command, receives the fed coin by a coin tray detachably attached to the body, and detects presence/absence of the coin in the coin tray by a coin sensor provided at the coin tray; wherein the coin sensor includes a plurality of proximity sensors; the coin sensor is electrically connected to the body side by a coin-sensor connecter that connects or disconnects electrical connection by connection/disconnection between a body-side connecter attached to the body side and a tray-side connecter attached to the coin tray side; the coin payment apparatus further comprises a state sensor that directly or indirectly detects whether the coin payment apparatus is in an actuatable state; the coin payment apparatus further comprises a tray mounted sensor consisting of an actuator integrally provided with the coin tray and an open/close switch attached to the body side; the plurality of proximity sensors are connected in series via the serially-connected coin-sensor connecter to the tray mounted sensor and a power source, are connected in parallel to each other, and are subjected to application of mutually different frequencies; when the coin tray is to be mounted on the body, the state sensor is configured to be connected after the coin sensor and the open/close switch are connected; and, when the coin tray is to be detached from the body, the coin sensor and the tray mounted sensor are configured to be disconnected after the connection of the state sensor is disconnected.

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

[0036] A coin payment apparatus feeds a coin stored in a body based on a payment command, receives the fed coin by a coin tray detachably attached to the body, and detects presence/absence of the coin in the coin tray by a coin sensor provided at the coin tray; wherein the coin sensor is electrically connected to the body side by a coin-sensor connecter that connects or disconnects electrical connection by connection/disconnection between a body-side connecter attached to the body side and a tray-side connecter attached to the coin tray side; the coin payment apparatus further comprises a tray mounted sensor consisting of an actuator integrally provided with a member moved when the coin tray is attached/detached to/from the body and an open/close switch attached to the body side; the coin sensor, the tray mounted sensor, and a state sensor are electrically connected in series to a power source via the coin-sensor connecter; the coin payment apparatus comprises the coin tray, wherein, a positional relation between the actuator and the open/close switch and a positional relation between the body-side connecter and the tray-side connecter are set so that, when the coin tray is to be mounted on the body, the state sensor is connected after the coin sensor is connected and so that, when the coin tray is to be detached from the body, the coin sensor and the open/close switch are disconnected after the connection of the state sensor is disconnected; and the coin payment apparatus comprises a retainer consisting of a retained body disposed in the coin tray side and a retainer disposed in the body side; the retainer is set so as to retain the retained body in a state in which the coin sensor, the tray mounted sensor, and the power source are connected in series.

[0037] A seventh mode of the present invention is configured in a below manner.

[0038] A coin payment apparatus feeds a coin stored in a body based on a payment command, receives the fed coin by a coin tray detachably attached to the body, and detects presence/absence of the coin in the coin tray by a coin sensor provided at the coin tray; wherein the coin sensor is a plurality of proximity sensors; furthermore, the coin sensor is electrically connected to the body side by a coin-sensor connecter that connects or disconnects electrical connection by connection/disconnection between a body-side connecter attached to the body side and a tray-side connecter attached to the coin tray side; the coin payment apparatus further comprises a state sensor that directly or indirectly detects whether the coin payment apparatus is in an actuatable state; the coin payment apparatus further comprises a tray mounted sensor consisting of an actuator integrally provided with a member moved when the coin tray is attached/detached to/from the body and an open/close switch attached to the body side; the plurality of proximity sensors are connected in series via the coin-sensor connecter to the tray mounted sensor, the state sensor, and a power source; the plurality of proximity sensors are connected in parallel to each other and are subjected to application of mutually different frequencies; the coin payment apparatus comprises the coin tray, wherein a positional relation between the actuator and the open/close switch and a positional relation between the tray-side connecter and the body-side connecter are set so that, when the coin tray is to be mounted on the body, the state sensor is connected after the coin sensor and the tray mounted sensor are connected and so that, when the coin tray is to be detached from the body, the coin sensor and the tray mounted sensor are disconnected after the connec-

tion of the state sensor is disconnected; the coin payment apparatus comprises a retainer consisting of a retained body disposed in the coin tray side and a retainer body disposed in the body side; and the retainer is set so as to retain the retained body in a state in which the coin sensor, the tray mounted sensor, the state sensor, and the power source are connected in series.

[Effects of the Invention]

[0039] In the first mode of the present invention, the coin tray is provided with the coin sensor and is attachable/detachable to/from the body. The electrical connection of the coin sensor is connected or disconnected by connection and disconnection of the tray mounted sensor. Furthermore, the state sensor, which directly or indirectly detects whether the coin payment apparatus is in the actuatable state, cancels electrical connection if the coin payment apparatus is not in the actuatable state and establishes electrical connection if it is in the actuatable state. The coin sensor, the tray mounted sensor, and the state sensor are connected in series to the power source via the coin-sensor connecter.

[0040] Furthermore, the coin sensor is electrically connected to or disconnected from the power source in the body side by connection/disconnection between the body-side connecter attached to the body side and the tray-side connecter attached to the coin tray side.

[0041] Therefore, even in a case in which the coin tray is mounted on the tray and is electrically connected to the body side by the coin-sensor connecter, if the tray mounted sensor or the state sensor is not connected, current does not flow to the coin sensor disposed at the coin tray.

[0042] The tray mounted sensor becomes a connected state when the coin tray is mounted at a predetermined position, where the coin-sensor connecter is connected. The state sensor detects whether the coin payment apparatus is in the actuatable state or not. In other words, if the coin payment apparatus is in the actuatable state, it is electrically connected to enable electricity distribution; and, if not in the actuatable state, electricity cannot be distributed.

[0043] Therefore, the coin payment apparatus becomes the actuatable state only after the state sensor is connected after the coin tray is mounted on the body, the coin-sensor connecter is connected, and the tray mounted sensor is connected. Reversely, when the coin tray is to be detached, the coin tray can be detached from the body only after the tray mounted sensor and the coin-sensor connecter are disconnected after the state sensor is disconnected. In other words, when the coin tray is to be mounted on the body, the state sensor is connected after the coin sensor and the tray mounted sensor are connected; and, when the coin tray is to be detached from the body, the tray mounted sensor and the coin-sensor connecter are disconnected after the state sensor is disconnected. Therefore, the coin tray is not detached from the body in a live-line state, and sudden supply of current to the coin sensor and sudden disconnection thereof do not occur.

[0044] Therefore, since live-line insertion/removal is not carried out when the coin tray is attached to or detached from the body, there is an advantage that the first object serving as the basic object of the invention of the present application can be achieved.

[0045] In the second mode of the present invention, since main configurations are practically the same as those of the first mode of the present invention, there is an advantage that the first object serving as the basic object of the invention of the present application can be achieved as well as the first invention.

[0046] Moreover, detection of coins is not affected by dust, etc. since the coin sensor is the proximity sensor; therefore, there is an advantage that the second object of the present invention can be achieved.

[0047] In the third mode of the present invention, since main configurations are practically the same as those of the first mode of the present invention, there is an advantage that the first object serving as the basic object of the invention of the present application can be achieved as well as the first invention.

[0048] Furthermore, since the tray mounted sensor consists of the actuator integrally provided with the coin tray and the open/close switch attached to the body side and can be therefore formed inexpensively, there is an advantage that the fourth object serving as the subordinate object of the invention of the present application can be achieved.

[0049] In the fourth mode of the present invention, since main configurations are practically the same as those of the first mode of the present invention, there is an advantage that the first object serving as the basic object of the invention of the present application can be achieved as well as the first invention.

[0050] Furthermore, since the coin sensor consists of the plurality of proximity sensors, there is an advantage that detection of coins are not affected by dust, etc. as well as the second invention.

[0051] Moreover, there are the plurality of proximity sensors, the proximity sensors are connected in series to the tray mounted sensor, the state sensor, and the power source, and the proximity sensors are connected in parallel. Therefore, as long as at least one of the plurality of proximity sensors is normal, the remaining coin(s) in the coin tray can be detected although the detection range is narrowed. Therefore, there is an advantage that the second object of the invention of the present application can be achieved.

[0052] In the fifth mode of the present invention, since main configurations are practically the same as those of the first mode of the present invention, there is an advantage that the first object serving as the basic object of the invention of the present application can be achieved.

[0053] Moreover, the coin sensor consists of the plu-

rality of proximity sensors, and they are connected in parallel; therefore, there is an advantage that coin detection is not affected by dust, etc. as well as the second invention. Furthermore, there are the plurality of proximity sensors, and they are connected in parallel. Therefore, if at least one of the plurality of proximity sensors is effective, the remaining coin(s) in the coin tray can be detected although the detection range is narrowed. Therefore, there is an advantage that the second object of the invention of the present application can be achieved.

[0054] Furthermore, since mutually different frequencies are applied to the plurality of proximity sensors, respectively, the metal materials which can be detected are different for each of the frequencies. As a result, the detectable coin range can be expanded; therefore, there is an advantage that the third object serving as the subordinate object can be achieved.

[0055] In the sixth mode of the present invention, since main configurations are practically the same as those of the first mode of the present invention, there is an advantage that the first object serving as the basic object of the invention of the present application can be achieved.

[0056] Furthermore, since the tray mounted sensor consists of the actuator integrally provided with a member moved when the coin tray is attached to or detached from the body and the open/close switch attached to the body side, the open/close switch can use a commercially-available switch and can be formed inexpensively. Therefore, there is an advantage that the fourth object serving as the subordinate object of the present invention can be achieved.

[0057] Moreover, in a state in which the coin sensor, the tray mounted sensor, the state sensor, and the power source are connected in series by the retainer, they are retained at retention positions. Therefore, there is an advantage that unintentional detachment of the coin retaining tray from the body can be controlled.

[0058] In the seventh mode of the present invention, since the main configurations are practically the same as those of the first mode of the present invention, there is an advantage that the first object serving as the basic object of the present invention can be achieved.

[0059] Furthermore, since the tray mounted sensor consists of the actuator integrally provided with the member moved when the coin tray is attached to or detached from the body and the open/close switch attached to the body side, the open/close switch can use a commercially-available switch and can be formed inexpensively. Therefore, there is an advantage that the fourth object of the present invention can be achieved.

[0060] Moreover, since the coin sensor consists of the plurality of proximity sensors, there is an advantage that coin detection is not affected by dust, etc. as well as the second invention.

[0061] Furthermore, there are the plurality of proximity sensors, and they are connected in parallel. Therefore, if at least one of the proximity sensors is effective, the remaining coin(s) in the coin tray can be detected although the detection range is narrowed. Therefore, there is an advantage that the second object of the present invention can be achieved.

[0062] Moreover, since the mutually different frequencies are applied to the plurality of proximity sensors, respectively, the detectable metal materials are different for each of the frequencies. Therefore, as a result, the detectable coin range can be expanded. Therefore, there is an advantage that the fourth object serving as the subordinate object of the present invention can be achieved.

[0063] Furthermore, in the state in which the coin sensor, the tray mounted sensor, the state sensor, and the power source are connected in series by the retainer, they are retained at the retention positions. Therefore, there is an advantage that unintentional detachment of the coin retaining tray from the body can be controlled.

[Brief Description of Drawings]

[0064]

[FIG. 1] FIG. 1 is an overall perspective view of a coin acceptance and payout apparatus of an embodiment of the present invention.

[FIG. 2] FIG. 2 is a schematic configuration drawing of the coin acceptance and payout apparatus of the embodiment of the present invention.

[FIG. 3] FIG. 3 is a schematic configuration perspective view of the coin acceptance and payout apparatus of the embodiment of the present invention.

[FIG. 4] FIG. 4 is a cross-sectional view of a T surface of FIG. 3.

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

[FIG. 6] FIG. 6 is an enlarged plan view of the coin tray of the coin acceptance and payout apparatus of the embodiment of the present invention.

[FIG. 7] FIG. 7 is an enlarged back side view of the coin tray of the coin acceptance and payout apparatus of the embodiment of the present invention.

[FIG. 8] FIG. 8 is an explanatory drawing of the relation between a payment apparatus and the coin tray of the coin acceptance and payout apparatus of the embodiment of the present invention.

[FIG. 9] FIG. 9 is a cross-sectional view of a line A-A of FIG. 8.

[FIG. 10] FIG. 10 is a working explanatory drawing of a proximity sensor of the coin tray of the coin acceptance and payout apparatus of the embodiment of the present invention.

[FIG. 11] FIG. 11 shows structure drawings of proximity sensors of the coin acceptance and payout apparatus of the embodiment of the present invention; wherein, (A) is a plan view, and (B) is a cross-sectional view of a line B-B of (A).

[FIG. 12] FIG. 12 is a circuit diagram of the proximity

sensors of the coin acceptance and payout apparatus of the embodiment of the present invention.

[FIG. 13] FIG. 13 is a control circuit diagram of the coin acceptance and payout apparatus of the embodiment of the present invention.

[FIG. 14] FIG. 14 is a timing chart diagram of the coin acceptance and payout apparatus of the embodiment of the present invention.

[Description of Embodiment]

[0065] A best mode of a coin dispenser of the present invention is

a coin tray that receives a coin fed from a coin stored in a body based on a payment command; wherein, the coin tray is provided with a coin sensor that detects presence/absence of the coin; in a coin payment apparatus detachably attached to the body, the coin sensor is a plurality of proximity sensors; furthermore, the coin sensor is electrically connected to the body side by a coin-sensor connecter that connects or disconnects electrical connection by connection/disconnection between a body-side connecter attached to the body side and a tray-side connecter attached to the coin tray side; furthermore, the coin payment apparatus includes a state sensor that directly or indirectly detects whether the coin payment apparatus is in an actuatable state; furthermore, the apparatus includes a tray mounted sensor consisting of an actuator integrally provided with a member moved when the coin tray is attached to or detached from the body and an open/close switch attached to the body side; the plurality of proximity sensors are connected in series to the tray mounted sensor, the state sensor, and the power source via the coin-sensor connecter; the plurality of proximity sensors are connected in parallel to each other; furthermore, mutually-different frequencies are applied to the proximity sensors, respectively; a positional relation between the actuator and the open/close switch and a positional relation between the coin-sensor connecter and the tray-side connecter are set in the coin tray so that, when the coin tray is to be mounted on the body, the state sensor is connected after the coin sensor and the tray mounted sensor are connected and so that, when the coin tray is to be detached from the body, the coin sensor and the tray mounted sensor are disconnected after the connection of the state sensor is disconnected; a retainer consisting of a retained body disposed in the coin tray side and a retainer disposed in the body side is included; a tip of the retained body has a widen shape having a bulged tip; the retainer has a pair of balls disposed to elastically get close to each other; and the retainer is set to retain the retained body in a state in which the coin sensor, the tray mounted sensor, the state sensor, and the power source are connected in series.

[Embodiment]

[0066] The present embodiment is an example of a payment apparatus 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. The present embodiment will be explained as an embodiment of a coin tray of a coin payment apparatus by focusing on a coin tray 102 related to a payment device 114 of a coin acceptance and payout apparatus 100.

[0067] An outline of the coin acceptance and payout apparatus 100 will be explained with reference to FIG. 1 and FIG. 2.

[0068] The coin acceptance and payout apparatus 100 consists of a body 101 and the coin tray 102. The body 101 includes a coin receiving device 105 fixed to an inner frame 104 disposed in an outside frame 103, a coin separating and feeding device 106, a denomination discriminating device 107, a carrying device 108, a sorting unit 110, a coin sorting unit 112, and the payment device 114.

[0069] First, the coin receiving device 105 will be explained mainly with reference to FIG. 3 to FIG. 5.

[0070] The coin receiving device 105 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 106 of a next step within a range that the coins do not exceed a predetermined amount per unit time.

[0071] Specifically, the coin receiving device 105 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.

[0072] First, the coin inlet 120 will be explained.

[0073] 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.

[0074] The coin inlet 120 is disposed on a front-end left-side upper surface of the outside frame 103 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.

[0075] The storing unit 123 is a part concaved downward from the loading opening 121 and is formed into a semispherical shape in the present embodiment. At a bottom surface of a semispherical wall surface 125 partitioning the storing unit 123, a carrying opening 127 having a rectangular long-hole shape is formed to be long in a long-side direction of the outside frame 103.

[0076] Next, the carrying belt 122 will be explained.

[0077] The carrying belt 122 has a function to carry the

coin (s) C, 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.

[0078] The carrying belt 122 is disposed immediately below the carrying opening 127. Specifically, the carrying belt 122 is stretched between a pair of rollers, 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.

[0079] 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).

[0080] Next, the collapsing roller 124 will be explained.

[0081] The collapsing roller 124 is disposed above the roller 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.

[0082] If the carrying belt 122 is moved in the carrying 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 of moving toward the next step and, in the present embodiment, refers to a direction of carrying to the coin separating and feeding device 106 of the next step.

[0083] 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 C 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 106 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.

[0084] If a full sensor 136 of the later-described coin separating and feeding device 106 detects a full state, the first electric motor 126 is stopped.

[0085] Therefore, the coin separating and feeding device 106 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 105.

[0086] Next, the coin separating and feeding device 106 will be explained.

[0087] The coin separating and feeding device 106 has a function to separate the coins C of a plurality of denominations, which have been received in bulk from the coin receiving device 105, one by one and feed them to the next step.

[0088] The coin separating and feeding device 106 is disposed below the coin receiving device 105 and includes a rotating disk 140, a coin storing container 132, a coin receiver 134, and the full sensor 136.

[0089] The rotating disk 140 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.

[0090] 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.

[0091] 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).

[0092] In other words, the approximately semicircular receiving unit 138 is formed by the pusher 148 and the concave part 142.

[0093] 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.

[0094] 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 C to the circumferential direction of the rotating disk 140.

[0095] 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 140, 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.

[0096] The rotating disk 140 is rotated at a predetermined speed by an unshown electric motor via a decelerator.

[0097] 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.

[0098] 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 105 is stopped.

[0099] 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.

[0100] Next, the denomination discriminating device 107 will be explained.

[0101] The denomination discriminating device 107 has a function to discriminate the authenticity and denomination of the coins C, which have been fed from the coin separating and feeding device 106 one by one.

[0102] The denomination discriminating device 107 has a function to discriminate the authenticity and de-

nomination 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.

[0103] The denomination discriminating device 107 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.

[0104] The slide base has a function to guide one surface of the coin C pushed by the impeller 152.

[0105] The impeller 152 has a function to move the coins C, which have been received from the coin separating and feeding device 106, and pass the coins through the coin holding part 158 one by one.

[0106] 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.

[0107] 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.

[0108] 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.

[0109] Next, the carrying device 108 will be explained.

[0110] 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.

[0111] 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.

[0112] The endless carrier 160 in the present embodiment is a chain 170 stretched between a first sprocket 166 and a second sprocket 168, which are disposed at a predetermined interval. 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 107. Pushing pins 172 are fixed to a lateral surface of the chain 170 at predetermined intervals.

[0113] The plurality of pushing pins 172 are attached to the chain 170 at the intervals corresponding to the intervals of the pushers 156.

[0114] 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.

[0115] 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.

[0116] 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.

[0117] With respect to the slide plate 162, the guide rail 164 is slightly projecting than the maximum thickness of handled coins C in the orthogonal direction.

[0118] 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.

[0119] As described later, the guide rail 164 in the present embodiment also serves as a sorting unit.

[0120] The sorting unit 110 has a function to drop the coins C into predetermined coin sorting holes respectively by denominations.

[0121] 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.

[0122] 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.

[0123] 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.

[0124] Since the disposition of the denominations with respect to the coin sorting holes is an example, they can be freely disposed in accordance with needs.

[0125] 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.

[0126] In the present embodiment, the gate devices of the coin sorting holes 194, 196, 198, 200, and 202 also serve as the guide rail 164.

[0127] Thus, the guide rail 164 is formed by fixed guides, which are fixed between the coin sorting holes 194, 196, 198, 200, and 202, and movable guides, which are electrically moved, and normally forms a single straight shape. When the carried coins C 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 C are not guided to the movable guides and are dropped to the predetermined sorting holes (see Japanese Patent No. 4997374).

[0128] 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.

[0129] As a result, the coins C carried by the carrying device 108 are dropped to the predetermined coin sorting holes 184, 186, 188, 190, 194, 196, 198, 200, or 202 respectively by the denominations.

[0130] 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 C of a predetermined denomination (s) according to a command from the higher-level device such as a POS register.

[0131] In the present 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.

[0132] 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.

[0133] Each of the coin dispensers 210 is shown by a reference sign 210 with a denomination.

[0134] Next, the payment device 114 will be explained.

[0135] 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 tray 102 as soon as possible.

[0136] 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 218 of a payment carrying belt 216, and carry the coin C to the coin tray 102 by the payment carrying belt 216 and, in the present embodiment, includes at least the payment carrying belt 216.

[0137] Next, the payment carrying belt 216 will be explained with reference to FIG. 2.

[0138] 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 tray 102. In the present 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-tray-102 side. This slope angle is preferred to be an angle at which the standing coin C is rolled to the coin-tray-102 side in a state in which the flat belt 220 is still. This is for quickly carrying the coin C to the coin tray 102 by the moving of the payment carrying belt 216 and the rolling of the coin C.

[0139] One of the rollers, the roller 222 in the present embodiment is selectively driven so that the upper surface 218 is moved toward the coin tray 102 by a second electric motor 226.

[0140] 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.

[0141] The coins C carried by the flat belt 220 are fed into the bowl-shaped coin tray 102.

[0142] 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.

[0143] The coins C delivered from the coin dispensers 210 are dropped onto the upper surface 218 of the payment carrying belt 216. The coins C 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 tray 102 by the movement of the payment carrying belt 216, are dropped from an end thereof to the coin tray 102, and are stored therein.

[0144] Next, the coin tray 102 will be explained with reference to FIG. 5 to FIG. 9.

[0145] As shown in FIG. 5, the coin tray 102 has a function to receive the coin(s) C carried by the carrying belt 216 and store the coins until they are taken out by a client or a worker (hereinafter, referred to as a recipient) and has a bowl shape formed to be detachable/attachable to the inner frame 104 in the present embodiment.

[0146] More specifically, the coin tray 102 of the present embodiment consists of a tray 232 having a bowl shape and a mount member 234 having a rectangular shape in a planar view for mounting on the inner frame 104.

[0147] First, the tray 232 will be explained.

[0148] The tray 232 has a function to receive the coin(s) C fed from the carrying belt 216, store the coins so that the recipient can easily take them out, and have a coin sensor 233 attached thereto. In the present embodiment, the tray 232 has a tongue shape in a plane and consists of a semicircular part 236, a rectangular part 238 extended from a maximum diameter part of the semicircular part 236 by a predetermined length and the interval of the maximum diameter, and a partition wall 239 defining the semicircular-part-236 side of the rectangular part 238. A peripheral part 240 of the semicircular part 236 and the rectangular part 238 has a predetermined thickness, for example, a thickness of about 40 millimeters; and a steep slope 242 tilted by a steep slope from the peripheral part 240 toward the inner lower side, a gentle slope 246 tilted downward gently from a lower end of the steep slope 242 toward a center part 244, and a semicircular flat placing part 248 positioned at the center part 244 are formed. The steel slope 242 forms a barrier having a predetermined height so that the coins C do not jump out due to the momentum of dispensing. The gentle slope 246 has a slope on which the coins C slide down toward the placing part 248. The placing part 248 is an elliptical flat surface continued to the lower end of the gentle slope 246,

and the diameter thereof is set to be equal to or more than the diameter of the maximum diameter coin and two times or less thereof. Therefore, it is set to have the dimensions so that some of small-diameter coins can be juxtaposed and brought into surface contact with the placing part 248. The partition wall 239 is disposed at the rectangular part 238 that is opposite to the semicircular part 236 and is formed so as to have a predetermined height from the placing part 248, in the present embodiment, a height that exceeds about half of the gentle slope 246 and 60% thereof. The diameter of the semicircular part 236, therefore, the width of the rectangular part 238 is set to be equal to or more than five times the diameter of the maximum diameter coin and equal to or less than eight times thereof. This is for facilitating take-out of the coins C on the placing part 248 and for downsizing. More specifically, this is for enabling the recipient to take out the coins by a single grabbing motion even in a case in which many coins C are fed and even in a case in which the coins slide down on the gentle slope 246 and accumulated on the placing part 248. Therefore, although the upper side of the placing part 248 and the gentle slope 246 surrounded by the peripheral part 240 serves as a received-coin storing part 249, the fed coins C are normally stored on the placing part 248. In the present embodiment, at least the tray 232 is manufactured of a non-magnetic material such as a resin. As described later, this is for preventing the tray from affecting detection of the coins C since a proximity sensor 282 is used as the coin sensor 233.

[0149] Next, the mount member 234 will be explained.

[0150] The mount member 234 has a function to integrate the coin tray 102 with the inner frame 104 by insertion into a mount-member receiving part 250 (FIG. 9) of the inner frame 104 of the coin acceptance and payout apparatus 100 (FIG. 9) and, furthermore, mount a coin-sensor connecter 252, a tray mounted sensor 254, and part of a retainer 256.

[0151] In the present embodiment, the mount member 234 is formed into a thick plate shape that is a rectangle horizontally extending to the semicircular-part-236 side of the rectangular part 238 in a planar view and has a predetermined thickness. More specifically, as shown in FIG. 9, the mount member 234 is formed into a reversed rectangular flat-pan shape having a closed upper surface side and an opened lower surface side. Further specifically, the mount part 234 is partitioned by a left side face 258, a right side face 260, a rear side face 262, and a top board 264, and a lower surface 266 is opened. A back cover 268 extending to the lower surface of the tray 232 is fixed to and integrated with the lower surface 266 in a state in which it is fitted therein and is formed into a thick plate shape as a whole. The back cover 268 forms a step part 269 which is bent in a crank shape immediately below the partition wall 239 at an intermediate part thereof and lowers the step toward the rear side face 262. In other words, it is formed so that the distance to the extension line of the top board 264 is small in the rear-side-face-262 side of the mount member 234 and is slightly large in the tray-232 side.

[0152] Next, the mount-member receiving part 250 will be explained.

[0153] The mount-member receiving part 250 has a function to receive the mount part 234 and retain the coin tray 102 so that it is not moved almost at all in vertical/horizontal and backward directions with respect to the inner frame 104. In the present embodiment, the mount-member receiving part 250 is a rectangular space, which is formed in the inner frame 104 and is formed so as to be mated with the mount member 234. The mount-member receiving part 250 consists of a bottom board 270 of the inner frame 104, an upper guide 272 fixed to be parallel to the bottom board 270 and be slightly distant from the height of the left side face 258 and the right side face 260 in the upper side of the bottom board 270, and a left guide 274 and a right guide 276 disposed outside the left side face 258 and the right side face 260 at an interval slightly wider than the interval between the left side face 258 and the right side face 260 and is a cross-sectionally-rectangular space having an opening 278 in a front lower part of the coin acceptance and payout apparatus 100 and is extending in a front-back direction. A stopper 280 slightly projecting upward from the bottom board 270 in the vicinity of the opening 278 is formed. In the present embodiment, the stopper 280 consists of an end face of a thin plate 281 disposed on the bottom board 270.

[0154] Therefore, when the mount member 234 is inserted from the opening 278 to the mount-member receiving part 250, the mount member 234 can be inserted to a deep part of the inner frame 104 while the lower surface thereof is guided by the bottom board 270, the left side face 258 is guided by the left guide 274, the right side face 260 is guided by the right guide 276, and the top board 264 is guided by the upper guide 272. However, when the step part 269 reaches the stopper 280, the mount member 234 cannot be pushed into the deep part more than that.

[0155] Next, the coin sensor 233 will be explained.

[0156] The coin sensor 233 has a function to detect whether the coin(s) C are present on the coin tray 102, specifically, the received-coin storing part 249 or not and, in the present embodiment, is the proximity sensor 282 disposed in the back side of the placing part 248. However, since the coin sensor 233 is only required to have the above described function, a transmission-type photoelectric sensor having a light axis above the placing part 248, a reflection-type photoelectric sensor which detects reflected light from the coin(s) C, or the like can be also employed. However, the proximity sensor 282 is preferred since it can be disposed in the back side and is not affected by dust, etc.

[0157] The proximity sensor 282 includes at least one proximity sensor and, in the present embodiment, includes two proximity sensors, more specifically, a first proximity sensor 282A and a second proximity sensor 282B. However, three or more proximity sensors 282 can

be employed. If a plurality of coin sensors 233 are disposed, the detection range of the coin(s) C can be expanded, and detection accuracy can be increased, which is effective.

[0158] As shown in FIG. 7, the first proximity sensor 282A and the second proximity sensor 282B are juxtaposed in the back side of the placing part 248. Since the first proximity sensor 282A and the second proximity sensor 282B have the same configuration, the first proximity sensor 282A will be representatively explained with reference to FIG. 11, and the same parts of the second proximity sensor 282B are denoted with the same numbers with a symbol B replacing A to omit the explanation thereof.

[0159] The first proximity sensor 282A includes a core 284A made of ferrite, a coil 296A, and a detection circuit 288A. The core 284A is formed in a rectangular flat pan shape as a whole.

[0160] Specifically, a side wall 292A standing from four sides of a rectangular bottom wall 290A at a right angle with respect to the bottom wall 290A, a coil core 294A, and the coil 296A are included. The coil 296A is formed in a ring shape and externally mounted on the coil core 294A. The coil core 294A is eccentric from the center in the long-side direction of the bottom wall 290A, is disposed at the center in the short-side direction thereof, and is formed in a cylindrical shape upright with respect to the bottom wall 290A, and the height thereof is the same as that of the side wall 292A. The detection circuit 288A is a rectangular substrate disposed in the left side of the coil 296A surrounded by the side wall 292A (FIG. 11 (B)) and is fixed to the bottom wall 290A, for example, by adhesion.

[0161] The first proximity sensor 282A and the second proximity sensor 282B formed in the above described manner are attached to the back side of the tray 232 opposed to the placing part 248 by, for example, adhesion in a state in which the end faces of the coil cores 294A and the side walls 292 are practically in close contact therewith. Regarding the specific attachment positions of the first proximity sensor 282A and the second proximity sensor 282B, as shown in FIG. 6, they are disposed in a state in which the side walls 292A and 292B of the first proximity sensor 282A and the second proximity sensor 282B are adjacent to each other so that the centers of the coil cores 294A are positioned on a shorter axis line SA, which passes through the center M of the approximately-circular placing part 248 and orthogonal to the longer axis line LA extending in the long-side direction of the coin acceptance and payout apparatus 100, and are positioned at the positions equally distant from the center M. Specifically, the center of the coil core 294A is positioned at approximately the center between the center M of the shorter axis line SA and a left end 248L of the placing part 248, and the coil core 294B is also similarly disposed at approximately the center between the center M of the shorter axis line SA and a right end 248R of the placing part 248. In this state, the magnetic flux formed between the coil core 294A and the side wall 292A or between the coil core 294B and the side wall 292B reaches the received-coin storing part 249 above part of the gentle slope 246 and, as a matter of course, to the placing part 248.

[0162] Next, the coin-sensor connecter 252 will be explained.

[0163] The coin-sensor connecter 252 has a function to connect the coin sensor 233, which is attached to the coin tray 102, at least to a power source 300 and a body control circuit 302, which are disposed in the inner frame 104. In the present embodiment, the coin-sensor connecter 252 employs a so-called drawer-type connecter consisting of a tray-side connecter 304, which is a so-called male type, and a body-side connecter 306, which is a female type.

[0164] The tray-side connecter 304 is attached in a backward direction to a left end of the rear side face 262 of the mount member 234. In other words, the tray-side connecter 304 is attached horizontally since it forms a right angle with respect to the vertical rear side face 262. At predetermined positions of the outer surface of the tray-side connecter 304, a plurality of contact points of power lines and signal lines are disposed.

[0165] Next, the body-side connecter 306 will be explained.

[0166] The body-side connecter 306 is movably attached in the long-side direction of the body 101 to an L-shaped bracket 308, which is disposed on the bottom board 270 at a position opposed to the tray-side connecter 304, by a pair of elastic supporters 309A and 309B. The body-side connecter 306 is a so-called female-type connecter having a hole 310, which receives the tray-side connecter 304.

[0167] Next, the elastic supporters 309A and 309B will be explained.

[0168] The elastic supporters 309A and 309B have a function to support the body-side connecter 306 so that the connecter is movable forward and backward in the long-side direction of the coin acceptance and payout apparatus 100 (in the top-bottom direction in FIG. 6). Since the elastic supporters 309A and 309B have the same structure, the elastic supporter 309A will be representatively explained, and the same parts are shown with B replacing A to omit explanations.

[0169] First ends of cylindrical guide rods 312A extending in the extending direction of the body 101 are fixed to left/right both ends of the body-side connecter 306. The guide rods 312A and 312B are disposed to be parallel to each other. The guide rod 312A employs a fall-preventing structure (not shown) by, for example, a snap ring slidably inserted in the extending direction of the axis line to a slide bearing 314A disposed on a vertical part of the bracket 308 and is attached to an end so as to prevent fall-off. Furthermore, a spring 316A is externally mounted at the outside of the guide rod 312A, and the body-side connecter 306 is elastically biased so as to be moved toward the front side of the body 101, in other

words, toward the opening 278. Furthermore, contact points opposed to the contact points of the outer surface of the tray-side connecter 304 are disposed on the inner surface of the hole 310 of the body-side connecter 306.

[0170] Therefore, when the mount member 234 of the coin tray 102 is inserted in the mount-member receiving part 250 and is pushed toward the rear side of the body 101, the mount part 234 is guided by the bottom board 270, the upper guide 272, the left guide 274, and the right guide 276 and is linearly moved toward the rear side. In this moving process, since the body-side connecter 306 is pushed in to elastically deform the spring 316A, the pushing force from the body-side connecter 306 with respect to the tray-side connecter 304 becomes stronger; therefore, the tray-side connecter 304 is moved into the hole 310 of the body-side connecter 306, and the contact points disposed thereon become a contacted state. Then, in this electrically contacted state, the step part 269 reaches the stopper 280, specifically, the end of the thin plate 281 and cannot be further moved to the rear side. In other words, the coin tray 102 cannot be pushed in after the step part 269 reaches the stopper 280. Note that, the female type may be disposed on the coin tray 102, and the male type may be disposed in the body 101 side.

[0171] Next, the tray mounted sensor 254 will be explained.

[0172] The tray mounted sensor 254 has a function to turn on electrical connection when the coin tray 102 is mounted at a predetermined position of the inner frame 104, which is the body 101. In the present embodiment, the tray mounted sensor 254 includes an actuator 314 and an open/close switch 318.

[0173] The actuator 314 is attached backward to the center part of the rear side face 262 of the mount member 234. In other words, since the actuator 314 forms a right angle with respect to the vertical rear side face 262, the actuator 314 is a rod body horizontally projecting toward the rear side by a predetermined length.

[0174] Next, the open/close switch 318 will be explained. The open/close switch 318 has a function to be electrically connected when the coin tray 102 is mounted at a normal position with respect to the body 101, therefore, the inner frame 104; and, in the present embodiment, the open/close switch 318 is a microswitch 320, which is fixed to the upper guide 272 at the position. A passive piece 322 of the microswitch 320 is determined at a position where the passive piece 322 is pushed by movement of the actuator 314 and, after the coin-sensor connecter 252 becomes a connected state, is pushed by the further pushed actuator 314 to causes the microswitch 320 to be in a connected (on) state. Therefore, although various sensors can be used as the open/close switch 318, mechanical switches are effective in terms of detection reliability, influence of dust, etc., and cost. Among them, the microswitch 320 is the most preferred since it has various types and is inexpensive. The normal position is the position at which, immediately after the contact points at the coin-sensor connecter 252 are connected, the passive piece 322 is pushed to cause the microswitch 320 to be in the connected state.

[0175] Next, the retainer 256 will be explained.

[0176] The retainer 256 has a function to retain the state in which the coin tray 102 is mounted on the body 101 (inner frame 104). In the present embodiment, the retainer 256 employs a so-called ball catch 330, which retains a retained body 328 at a predetermined position with predetermined force by sandwiching the retained body 328 having a bulged tip by a retainer 326 including a pair of balls 324A and 324B (FIG. 13) biased so as to get close to each other.

[0177] In the present embodiment, the retained body 328 is formed in a T shape by a transverse beam part 332 and a retained rod 334, which is projecting in a right-angle direction from the center of the transverse beam part 332 by a predetermined length, and the transverse beam part 332 is fixed at a right end of the rear side face 262. In other words, the retained rod 334 is extending toward the rear side by the predetermined length, the tip thereof is formed into a widen part 333, and a narrow part 336 is formed in the transverse beam 332 side of the widen part 333.

[0178] The retainer 326 is attached to the bottom board 270, the balls 324A and 324B are disposed on the opposed surfaces of a gate-shaped retainer body 335 to be opposed to each other, and the balls are disposed to elastically get close to each other, but are formed to have a predetermined gap therebetween. When the widen part 333 of the retained rod 334 is moved to the part between the pair of balls 324A and 324B, the distance between the balls 324A and 324B is increased by the widen part 333, then, after the widen part 333 passes therethrough, the distance therebetween is reduced by the elastic force acting on the balls 324A and 324B, and the movement in the returning direction is configured to be restricted since the narrow part 336 is sandwiched by the balls 324A and 324B. This retention is set to be carried out immediately after the actuator 314 moves the passive piece 322 and causes the microswitch 320 to be in an electrically connected state. In other words, the retainer 326 is set to retain the retained body 328 in a state in which the coin-sensor connector 252 and the tray mounted sensor 254 are connected. When the coin tray 102 is pulled to the front side with the force of a predetermined value or more, the balls 324A and 324B are caused to be distant from each other by the widen part 333; therefore, retention of the retained body 328 can be cancelled, and it can be detached from the body 101.

[0179] Next, a detection circuit 285A and a detection circuit 285B will be explained with reference to FIG. 12.

[0180] Since the detection circuits 285A and 285B have the same structure, the detection circuit 285A will be representatively explained, and the same parts of the detection circuit 285B are denoted with the same numerical numbers with B replacing A to omit the explanation thereof. The detection circuit 285A includes an oscillator

circuit 338A, a detector circuit 340A, anA/D converter 342A, and a discriminating circuit 344A. These circuits are connected to the power source 300 and the body control circuit 302 in the body 101 side via a power line 345A, a signal line 346A, and the coin-sensor connecter 252. The oscillator circuit 338A supplies a high-frequency current of a predetermined frequency to the coil 296A. As a result, the coil 296A generates magnetic flux therearound, and the magnetic flux exceeds the coin tray 102 manufactured of a non-magnetic material and reaches the received-coin storing part 249 above the placing part 248. The oscillator circuit 338A is connected to the detector circuit 340A. The detector circuit 340A extracts a voltage component from the output of the oscillator circuit 338A and outputs that to the A/D converter 342A. The A/D converter 342A converts the (analog) output to a numerical-value signal and outputs that to the discriminating circuit 344A. The discriminating circuit 344A discriminates whether the output exceeds a predetermined voltage value or not and, if exceeding, outputs a coin signal CS to the body control circuit 302 via the coin-sensor connecter 252. More specifically, if the coin(s) C are stored in the coin tray 102, the magnetic flux generated from the coin 296A is attenuated by the metal constituting the coin(s) C, specifically, a loss is generated by the eddy current generated in the coin(s) C. Therefore, as a result, the output of the A/D converter 342A is reduced. Therefore, the discriminating circuit 344A discriminates that it is above (below) a predetermined reference level and outputs the coin signal CS. If the coin(s) C is not present on the coin tray 102, the output of the A/D converter 324A is not reduced; therefore, the discriminating circuit 344A does not output the coin signal CS.

[0181] Next, a state sensor 350 will be explained mainly with reference to FIG. 13.

[0182] The state sensor 350 has a function to directly or indirectly detect whether the coin acceptance and payout apparatus 100 is in an operable state or not. The state sensor 350 employs a mechanism that carries out detection indirectly and consists of an outside-frame sensor 352, which detects that the outside frame 103 is mounted on the inner frame 104. Specifically, a second microswitch 354 is attached to the inner frame 104; and a second passive piece 356 thereof is configured so that, when the outside frame 103 is mounted at a normal position, the second passive piece 356 is pushed by the outside frame 103 and causes the second microswitch 354 to be in a connected (on) state. Therefore, when the outside frame 103 is detached from the inner frame 104, the second microswitch 354 becomes a disconnected (off) state.

[0183] However, the state sensor 350 is not limited to that of the present embodiment. As an example of indirect detection, in a case in which the coin acceptance and payout apparatus 100 is disposed in a chassis of other equipment, a door sensor which detects opening/closing of an open/close door of the chassis can be utilized as the state sensor 350. As an example of direct detection, in a case in which the coin acceptance and payout apparatus 100 becomes actuatable by an on-operation of a publicly-known control key switch and becomes non-actuatable by an off-operation thereof, the control key switch can be utilized as the state sensor 350.

[0184] In the present embodiment, the coin tray 102 has a lock structure 355, which cannot be attached and detached only in a state in which the outside frame 103 is detached from the inner frame 104. The lock structure 355 enables attaching and detaching operations only in a state in which the outside frame 103 is detached in order to disable the operation of detaching and attaching the coin tray 102 from/to the inner frame 104. Specifically, the lock structure 355 has a structure in which a through hole 357 penetrating through the mount member 234 in a vertical direction is formed, a hole (not shown) is formed in the upper guide 272, and a fixing pin (not shown) penetrate through these holes. However, the lock structure 355 is not limited to that of the present embodiment as long as it has a similar function.

[0185] Next, the body control circuit 302 will be explained with reference to FIG. 12.

[0186] The body control circuit 302 has a function to control the entire coin acceptance and payout apparatus 100. However, in the present embodiment, only the control related to the coin sensor 233 will be explained.

[0187] At the body control circuit 302, the power lines 345A and 345B and the signal lines 346A and 346B ae connected to the coin sensor 233, to the first proximity sensor 282A and the second proximity sensor 282B in the present embodiment, via the coin-sensor connecter 252. The body control circuit 302 includes an OR circuit 358 and a controller 360 connected to at least the signal lines 346A and 346B. The first proximity sensor 282A and the second proximity sensor 282B are connected in parallel to the controller 360 via the OR circuit 358. If the coin signal CS is output from the first proximity sensor 282A or the second proximity sensor 282B, the controller 360 discriminates that the coin(s) C is present on the con tray 102; if the coin signal CS is not output, the controller 360 discriminates that the coin(s) C is not present on the coin tray 102; and, the controller 360 controls the coin acceptance and payout apparatus 100 based on the discrimination result. For example, if it is discriminated that the coin(s) C is present on the coin tray 102, a notification of the coin C remaining on the coin tray 102 is given by, for example, sound, light, or display.

[0188] Next, a connection circuit 362 including the coin sensor 233, the coin-sensor connecter 252, the tray mounted sensor 254, the detection circuits 285A and 285B, the power source 300, the body control circuit 302, and the state sensor 350 will be explained with reference to FIG. 13.

[0189] In the connection circuit 362, at least, the coin sensor 233 is electrically connected in series to the power source 300 via the coin-sensor connecter 252, the signal lines 346A and 346B are connected to the body control circuit 302 via the coin-sensor connecter 252, and, fur-

thermore, the coin sensor 233, the tray mounted sensor 254, and the state sensor 350 are electrically connected in series to the power source 300 via the coin-sensor connecter 252. In other words, in the present embodiment, the first proximity sensor 282A and the second proximity sensor 282B are electrically connected in series to the power source 300, the tray mounted sensor 254, and the state sensor 350 via the power lines 345A and 345B and the coin-sensor connecter 252. The body control circuit 302 is connected in series to the first proximity sensor 282A and the second proximity sensor 282B via the coin-sensor connecter 252; however, the first proximity sensor 282A and the second proximity sensor 282B are electrically connected in a parallel state to the body control circuit 302. Therefore, if either one of the first proximity sensor 282A and the second proximity sensor 282B outputs the coin signal CS, the body control circuit 302 carries out control on the assumption that the coin(s) C is remaining in the received-coin storing part 249. For example, if the coin signal CS is received continuously for a predetermined period of time or more, it is assumed that the coin(s) C of the coin tray 102 has been forgotten, and an alarm of reminder is output by, for example, sound, light, or display.

[0190] In the present embodiment, in a front view (the state viewed from the coin tray 102 side), the flat belt 220 serving as the payment device 114 is disposed to be opposed to the gentle slope 246 in the right side of the placing part 248 of the coin tray 102 (FIG. 8). In other words, the flat belt 220 is opposed to the gentle slope 246 in the right side of the placing part 248. Since the flat belt 220 is disposed at a position higher than the coin tray 102, a slope 364 is disposed so as to bridge the part between the end of the flat belt 220 and the gentle slope 246 in the right side of the placing part 248. In the present embodiment, the slope 364 is disposed across the entire width of the rectangular part 238, and a guide board 366 for guiding the coins C to the gentle slope 246 is disposed at an end thereof. By virtue of this, the coins C dropped from the flat belt 220 slide on the slope 364 as shown by an arrow, are dropped onto the gentle slope 246 while being guided by the guide board 366, slide on the gentle slope 246, are stopped still on the placing part 248, and then stored thereon.

[0191] Next, working of the present embodiment will be explained.

[0192] First, processing in coin acceptance will be simply explained.

[0193] 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.

[0194] More specifically, the coins C dropped to the positions close to the edge of the loading opening 121 slide down on the wall surface 125 and are positioned on the carrying belt 122. 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. Therefore, since the upper surface of the carrying belt 122 is moved to the coin-separating-and-feeding-device-106 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 106.

[0195] 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. The dropped coins C are carried again toward the coin separating and feeding device 106 in a manner similar to that described above by movement of the carrying belt 122.

[0196] 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.

[0197] 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. 2. 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. 2. Furthermore, the first sprocket 166 is rotated in a counterclockwise direction in FIG. 1, and the chain 170 is circulated counterclockwise.

[0198] 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.

[0199] 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.

[0200] 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.

[0201] 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.

[0202] 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 106. In a case in which: the coins C in the coin storing container 132 are sent out by the rotation of the rotating disk 140, 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 106.

[0203] 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. The coin C at this point is moved while the coin peripheral surface is pressed against the detection guide 154. 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. Then, the authenticity and denomination of each coin is discriminated by comparing these outputs with reference values.

[0204] 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. 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. 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.

[0205] 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 coin sorting holes are actuated, and the coins C of predetermined denominations are dropped to the predetermined coin sorting holes.

[0206] 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 coin sorting hole is not opened.

[0207] In other words, since the coin is not dropped to any of the coin sorting holes, the coin is dropped to the overflow-coin sorting hole 192 and is stored in an overflow-coin storing device OF.

[0208] Then, processing upon coin payment will be explained.

[0209] In the present embodiment, when the coin C is dispensed to the coin tray 102, a coin dispensing command is output from the higher-level device such as a POS register is output to the coin acceptance and payout apparatus 100.

[0210] According to the dispensing command, the body control circuit 302 causes the rotating disks (not shown) of the coin dispensers 210 to be rotated and, furthermore, causes the second electric motor 226 to be driven to move the upper surface 218 of the payment carrying belt 216 toward the coin tray 102.

[0211] 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 tray 102 by the movement of the upper surface 218 of the payment carrying belt 216.

[0212] 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.

[0213] Next, working in a case of mounting the coin tray 102 will be explained also with reference to FIG. 14.

[0214] First, the outside frame 103 is detached from the inner frame 104. This is for causing the fixing pin to penetrate through the through hole 357 after mounting the coin tray 102.

[0215] When the coin tray 102 is to be mounted on the body 101, the mount member 234 is inserted in the opening 278 of the body 101 and pushed into the mount-member receiving part 250. As a result, the mount member 234 is guided by the left guide 274, the right guide 276, the bottom board 270, and the upper guide 272 and is linearly moved toward the rear side of the body 101. In this moving process, first, the tray-side connecter 304 is moved into the hole 310 of the body-side connecter 306, the contact points thereof are brought into contact with each other, and the coin-sensor connecter 252 is electrically connected (on); however, at this point, the tray mounted sensor 254 has not been in a connected state yet, and the retainer 256 is also not in a retained state.

[0216] When the coin tray 102 is further pushed in, the tray-side connecter 304 is further pushed into the hole 310, the contact points at the coin-sensor connecter 252 are brought into a reliably mutually connected state, and, since the tray cannot be moved into the hole 310 more than that after it has been pushed in by a predetermined distance, the tray-side connecter 304 pushes the body-side connecter 306 and moves that to the rear side. As a result, the mount member 234 is further moved to the rear side; therefore, the actuator 314 pushes the passive piece 322 and turns on the microswitch 320, and the tray mounted sensor 254 becomes a connected (on) state. In parallel with this, the widen part 333 of the retained body 328 moves the balls 324A and 324B against the elastic force in the direction in which they get away from each other, and the coin tray 102 is further pushed in; as a result, immediately after the tray mounted sensor 254 becomes a connected state, the balls 324A and 324B are opposed to the narrow part 336 of the retained body 328 ; therefore, the balls 324A and 324B get close to each other by the elastic force acting on them and sandwich the narrow part 336. Therefore, since the retained body 328 has to be pulled out with the force of a predetermined value or more in order to detach the retained body 328 from the retainer body 335, the coin tray 102 is retained by the retainer 256. In other words, after the coin-sensor connecter 252 becomes a connected state, the open/close switch 318 is connected. Thereafter, the

fixing pin (not shown) is caused to penetrate through the through hole 357 so that the coin tray 102 cannot be detached from the inner frame 104, therefore, from the body 101. Then, the outside frame 103 is mounted on the inner frame 104. As a result, the second passive piece 356 of the state sensor 350 is pushed by the outside frame 103 and connects (on) the second microswitch 354, and the state sensor 350 becomes a connected (on) state. As a result, the coin sensor 233 is connected in series to the power source 300 via the power lines 345A and 345B and the coin-sensor connecter 252 and is connected to the body control circuit 302 via the signal lines 346A and 346B and the coin-sensor connecter 252. Therefore, the coin sensor 233 is connected to the power source 300 and is enabled to detect a remaining coin(s), and, since safety of working of the body 101 side is ensured by mounting the outside frame 103, the coin acceptance and payout apparatus 100 becomes operable.

[0217] Next, working in detachment of the coin tray 102 will be explained.

[0218] First, the outside frame 103 is detached from the inner frame 104. As a result, the second passive piece 356 is no longer pushed by the outside frame 103; therefore, the second microswitch 354 is turned off, and the state sensor 350 becomes a non-connected state. Then, after the fixing pin is pulled out from the through hole 357, the tray 232 is pulled to the front side. As a result, the widen part 333 causes the balls 324A and 324B to get away from each other and passes between the balls. Therefore, retention by the retainer 256 is cancelled.

[0219] Then, the actuator 314 no longer pushes the passive piece 322. Therefore, the microswitch 320 is turned off, and the tray mounted sensor 254 becomes a non-connected (off) state. Then, the tray-side connecter 304 is pulled out from the body-side connecter 306. Therefore, the contact points thereof are separated from each other, the coin-sensor connecter 252 becomes a non-connected (off) state, and, then, the coin tray 102 is detached from the body 101.

[Reference Signs List]

[0220]

C	COIN
101	BODY
102	COIN TRAY
233	COIN SENSOR
252	COIN-SENSOR CONNECTER
254	TRAY MOUNTED SENSOR
256	RETAINER
282A, 282B	PROXIMITY SENSOR
300	POWER SOURCE
306	BODY-SIDE CONNECTER
304	TRAY-SIDE CONNECTER
314	ACTUATOR
318	OPEN/CLOSE SWITCH
328	RETAINED BODY
350	STATE SENSOR

Claims

1. A coin payment apparatus that feeds a coin (C) stored in a body (101) based on a payment command, receives the fed coin (C) by a coin tray (102) detachably attached to the body (101), and detects presence/absence of the coin (C) in the coin tray (102) by a coin sensor (233) provided at the coin tray (102);
wherein

the coin sensor (233) is electrically connected to the body (101) side by a coin-sensor connecter (252) that connects or disconnects electrical connection by connection/disconnection between a body-side connecter (306) attached to the body (101) side and a tray-side connecter (304) attached to the coin tray (102) side;
the coin payment apparatus further comprises a state sensor (350) that directly or indirectly detects whether the coin payment apparatus is in an actuatable state;
the coin sensor (233) and the state sensor (350) are electrically connected in series to a power source (300) via the coin-sensor connecter (252);
when the coin tray (102) is to be mounted on the body (101), the state sensor (350) is configured to be connected after the coin-sensor connecter (252) is connected; and,
when the coin tray (102) is to be detached from the body (101), the coin-sensor connecter (252) is configured to be disconnected after the connection of the state sensor (350) is disconnected.

2. A coin payment apparatus that feeds a coin (C) stored in a body (101) based on a payment command, receives the fed coin (C) by a coin tray (102) detachably attached to the body (101), and detects presence/absence of the coin (C) in the coin tray (102) by a coin sensor (233) provided at the coin tray (102);
wherein

the coin sensor (233) is a proximity sensor (282);
the coin sensor (233) is electrically connected to the body (101) side by a coin-sensor connecter (252) that connects or disconnects electrical connection by connection/disconnection between a body-side connecter (306) attached to the body (101) side and a tray-side connecter (304) attached to the coin tray (102) side;
the coin payment apparatus further comprises a state sensor (350) that directly or indirectly de-

tects whether the coin payment apparatus is in an actuatable state;
the coin sensor (233) and the state sensor (350) are electrically connected in series to a power source (300) via the coin-sensor connecter (252);
when the coin tray (102) is to be mounted on the body (101), the state sensor (350) is configured to be connected after the coin sensor (233) is connected; and,
when the coin tray (102) is to be detached from the body (101), the coin sensor (233) is configured to be disconnected after the connection of the state sensor (350) is disconnected.

3. A coin payment apparatus that feeds a coin (C) stored in a body (101) based on a payment command, receives the fed coin (C) by a coin tray (102) detachably attached to the body (101), and detects presence/absence of the coin (C) in the coin tray (102) by a coin sensor (233) provided at the coin tray (102);
wherein

the coin sensor (233) is electrically connected to the body (101) side by a coin-sensor connecter (252) that connects or disconnects electrical connection by connection/disconnection between a body-side connecter (306) attached to the body (101) side and a tray-side connecter (304) attached to the coin tray (102) side;
the coin payment apparatus further comprises a state sensor (350) that directly or indirectly detects whether the coin payment apparatus is in an actuatable state;
the coin payment apparatus further comprises a tray mounted sensor (254) consisting of an actuator (314) integrally provided with the coin tray (102) and an open/close switch (318) attached to the body (101) side;
the coin sensor (233), the tray mounted sensor (254), and the state sensor (350) are electrically connected in series to a power source (300) via the coin-sensor connecter (252);
a positional relation between the actuator (314) and the open/close switch (318) and a positional relation between the body-side connecter (306) and the tray-side connecter (304) are set so that, when the coin tray (102) is to be mounted on the body (101), the state sensor (350) is configured to be connected after the coin-sensor connecter (252) and the open/close switch (318) are connected and so that, when the coin tray (102) is to be detached from the body (101),
the coin-sensor connecter (252) and the open/close switch (318) are configured to be disconnected after the connection of the state sensor (350) is disconnected.

4. A coin payment apparatus that feeds a coin (C) stored in a body (101) based on a payment command, receives the fed coin (C) by a coin tray (102) detachably attached to the body (101), and detects presence/absence of the coin (C) in the coin tray (102) by a coin sensor (233) provided at the coin tray (102);
wherein

the coin sensor (233) includes at least two proximity sensors (282A and 282B);
the coin sensor (233) is electrically connected to the body (101) side by a coin-sensor connecter (252) that connects or disconnects electrical connection by connection/disconnection between a body-side connecter (306) attached to the body (101) side and a tray-side connecter (304) attached to the coin tray (102) side;
the coin payment apparatus further comprises a state sensor (350) that directly or indirectly detects whether the coin payment apparatus is in an actuatable state;
the coin payment apparatus further comprises a tray mounted sensor (254) consisting of an actuator (314) integrally provided with the coin tray (102) and an open/close switch (318) attached to the body (101) side;
the plurality of proximity sensors (282A and 282B) are connected in series via the coin-sensor connecter (252) to the tray mounted sensor (254), the state sensor (350), and a power source (300) connected in series;
the plurality of proximity sensors (282A and 282B) are connected in parallel to each other;
when the coin tray (102) is to be mounted on the body (101), the state sensor (350) is configured to be connected after the coin sensor (233) and the open/close switch (318) are connected; and,
when the coin tray (102) is to be detached from the body (101), the coin sensor (233) and the open/close switch (318) are configured to be disconnected after the connection of the state sensor (350) is disconnected.

5. A coin payment apparatus that feeds a coin (C) stored in a body (101) based on a payment command, receives the fed coin (C) by a coin tray (102) detachably attached to the body (101), and detects presence/absence of the coin (C) in the coin tray (102) by a coin sensor (233) provided at the coin tray (102);
wherein

the coin sensor (233) includes a plurality of proximity sensors (282A and 282B);
the coin sensor (233) is electrically connected to the body side by a coin-sensor connecter (252) that connects or disconnects electrical

connection by connection/disconnection between a body-side connecter (306) attached to the body (101) side and a tray-side connecter (304) attached to the coin tray (102) side;
the coin payment apparatus further comprises a state sensor (350) that directly or indirectly detects whether the coin payment apparatus is in an actuatable state;
the coin payment apparatus further comprises a tray mounted sensor (254) consisting of an actuator (314) integrally provided with the coin tray (102) and an open/close switch (318) attached to the body (101) side;
the plurality of proximity sensors (282A and 282B) are connected in series via the serially-connected coin-sensor connecter (252) to the tray mounted sensor (254) and a power source (300), are connected in parallel to each other, and are subjected to application of mutually different frequencies;
when the coin tray (102) is to be mounted on the body (101), the state sensor (350) is configured to be connected after the coin sensor (233) and the open/close switch (318) are connected; and,
when the coin tray (102) is to be detached from the body (101), the coin sensor (233) and the tray mounted sensor (254) are configured to be disconnected after the connection of the state sensor (350) is disconnected.

6. A coin payment apparatus that feeds a coin (C) stored in a body (101) based on a payment command, receives the fed coin (C) by a coin tray (102) detachably attached to the body (101), and detects presence/absence of the coin (C) in the coin tray (102) by a coin sensor (233) provided at the coin tray (102);
wherein

the coin sensor (233) is electrically connected to the body (101) side by a coin-sensor connecter (252) that connects or disconnects electrical connection by connection/disconnection between a body-side connecter (306) attached to the body (101) side and a tray-side connecter (304) attached to the coin tray (102) side;
the coin payment apparatus further comprises a tray mounted sensor (254) consisting of an actuator (314) integrally provided with a member moved when the coin tray (102) is attached/detached to/from the body (101) and an open/close switch (318) attached to the body (101) side;
the coin sensor (233), the tray mounted sensor (254), and a state sensor (350) are electrically connected in series to a power source (300) via the coin-sensor connecter (252);
the coin payment apparatus comprises the coin tray (102), wherein, a positional relation between the actuator (314) and the open/close switch (318) and a positional relation between the body-side connecter (306) and the tray-side connecter (304) are set so that, when the coin tray (102) is to be mounted on the body (101), the state sensor (350) is connected after the coin sensor (233) is connected and so that, when the coin tray (102) is to be detached from the body (101), the coin sensor (233) and the open/close switch (318) are disconnected after the connection of the state sensor (350) is disconnected; and
the coin payment apparatus comprises a retainer (256) consisting of a retained body (328) disposed in the coin tray (102) side and a retainer (326) disposed in the body (101) side;
the retainer (326) is set so as to retain the retained body (328) in a state in which the coin sensor (233), the tray mounted sensor (254), and the power source (300) are connected in series.

7. A coin payment apparatus that feeds a coin (C) stored in a body (101) based on a payment command, receives the fed coin (C) by a coin tray (102) detachably attached to the body (101), and detects presence/absence of the coin (C) in the coin tray (102) by a coin sensor (233) provided at the coin tray (102);
wherein

the coin sensor (233) includes a plurality of proximity sensors (282A and 282B);
furthermore, the coin sensor (233) is electrically connected to the body (101) side by a coin-sensor connecter (252) that connects or disconnects electrical connection by connection/disconnection between a body-side connecter (306) attached to the body (101) side and a tray-side connecter (304) attached to the coin tray (102) side;
the coin payment apparatus further comprises a state sensor (350) that directly or indirectly detects whether the coin payment apparatus is in an actuatable state;
the coin payment apparatus further comprises a tray mounted sensor (254) consisting of an actuator (314) integrally provided with a member moved when the coin tray (102) is attached/detached to/from the body (101) and an open/close switch (318) attached to the body (101) side;
the plurality of proximity sensors (282A and 282B) are connected in series via the coin-sensor connecter (252) to the tray mounted sensor (254), the state sensor (350), and a power source (300);
the plurality of proximity sensors (282A and 282B) are connected in parallel to each other

and are subjected to application of mutually different frequencies;
the coin payment apparatus comprises the coin tray (102), wherein a positional relation between the actuator (314) and the open/close switch (318) and a positional relation between the tray-side connecter (304) and the body-side connecter (306) are set so that, when the coin tray (102) is to be mounted on the body (101), the state sensor (350) is connected after the coin sensor (233) and the tray mounted sensor (254) are connected and so that, when the coin tray (102) is to be detached from the body (101), the coin sensor (133) and the tray mounted sensor (254) are disconnected after the connection of the state sensor (350) is disconnected;
the coin payment apparatus comprises a retainer (256) consisting of a retained body (328) disposed in the coin tray (102) side and a retainer body (335) disposed in the body (101) side; and
the retainer (328) is set so as to retain the retained body (328) in a state in which the coin sensor (233), the tray mounted sensor (254), the state sensor (350), and the power source (300) are connected in series.

FIG. 1

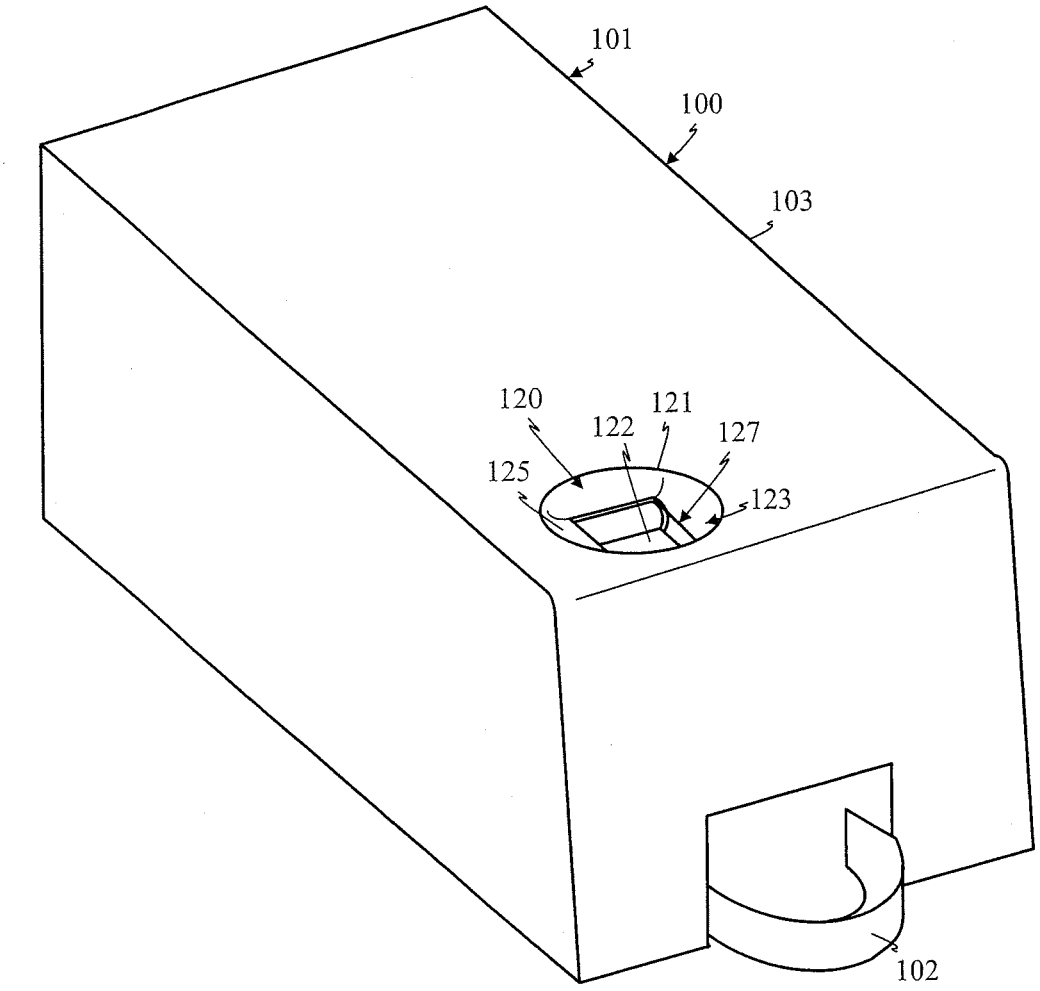
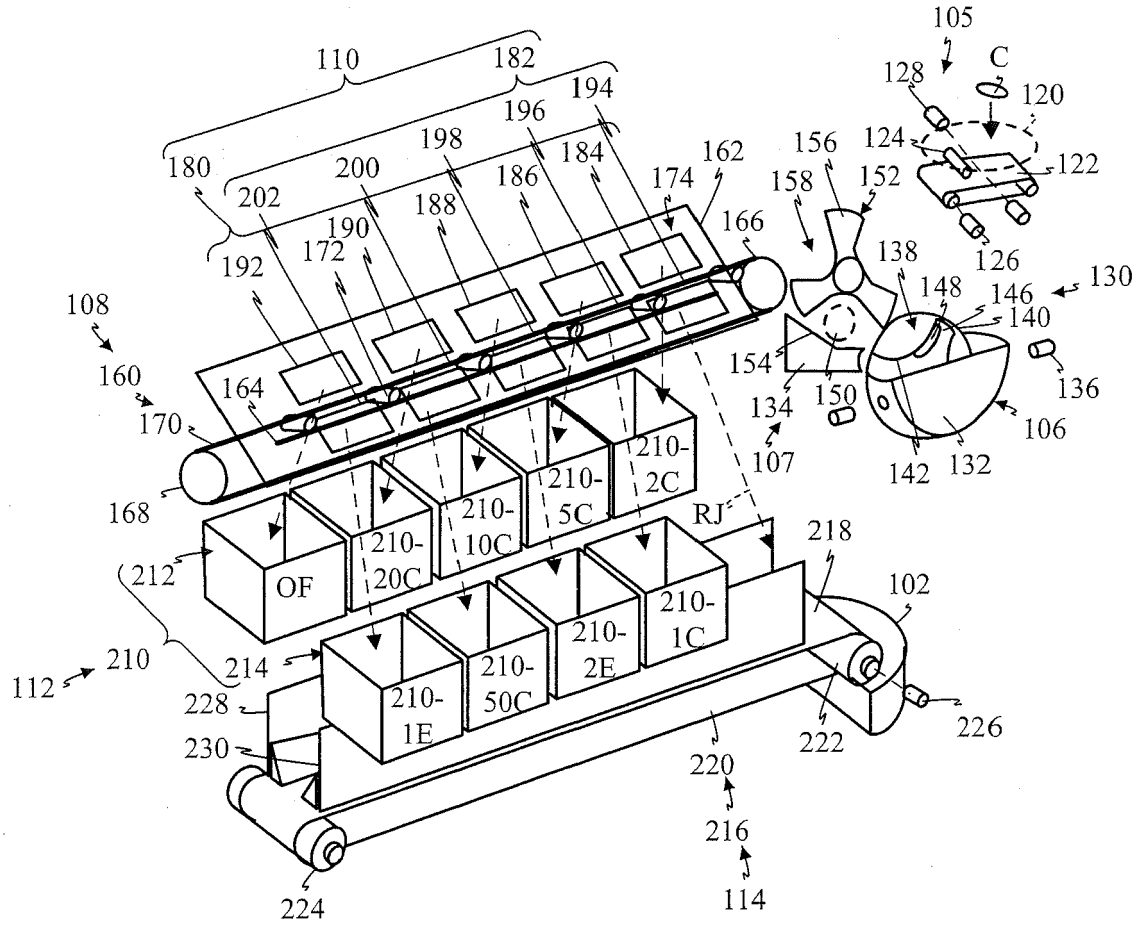


FIG. 2


105
C
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190
166
172
192
138
126
130
148
146
140
108
160
164
154
136
170
134
150
106
107
142
132
168
210-
2C
210-
5C
210-
10C
RJ
218
212
OF
210-
20C
102
210-
1C
210-
2E
112
210
214
210-
50C
228
210-
1E
230
222
226
220
216
224
114

FIG. 3

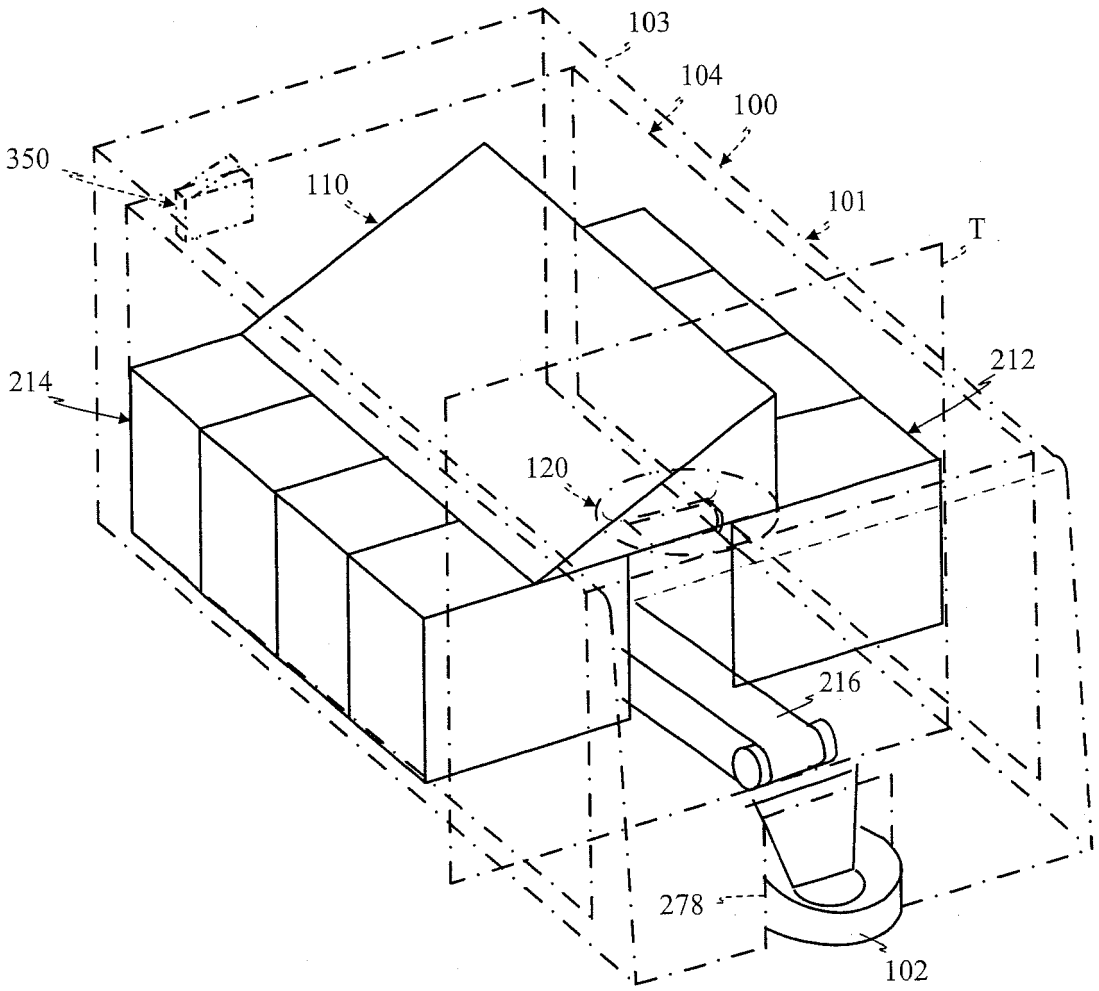


FIG. 4

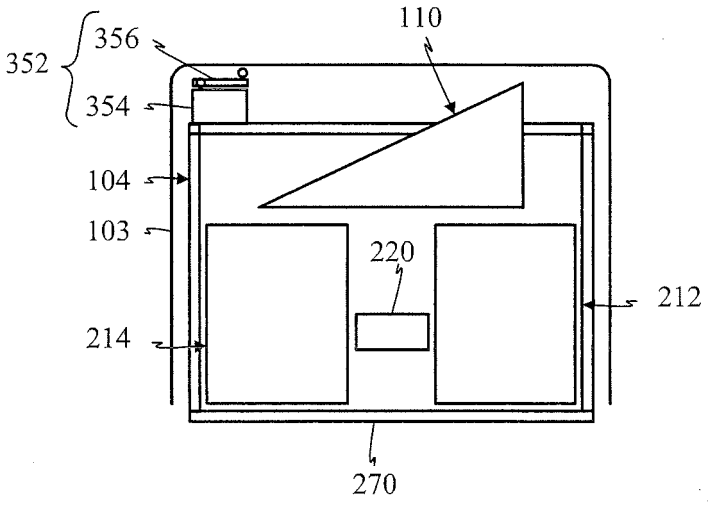
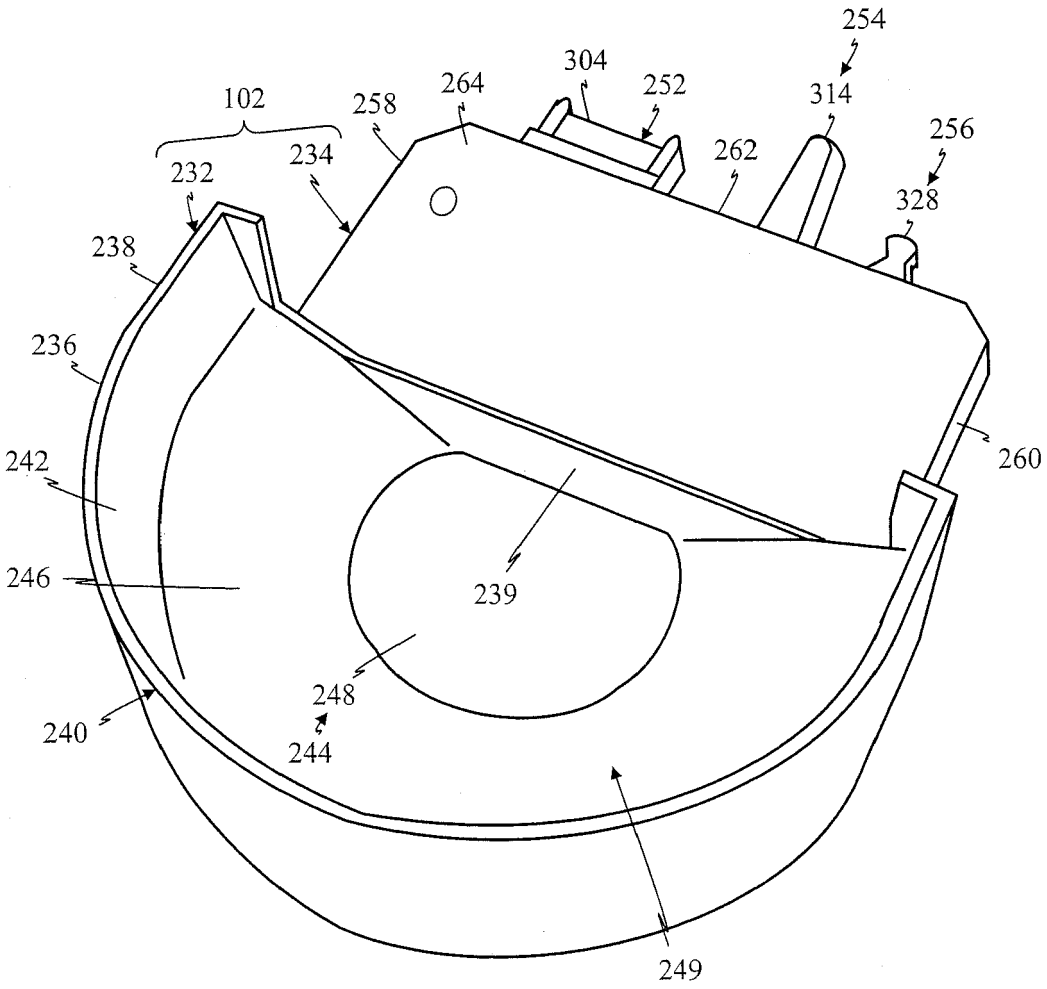


FIG. 5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304
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328
238
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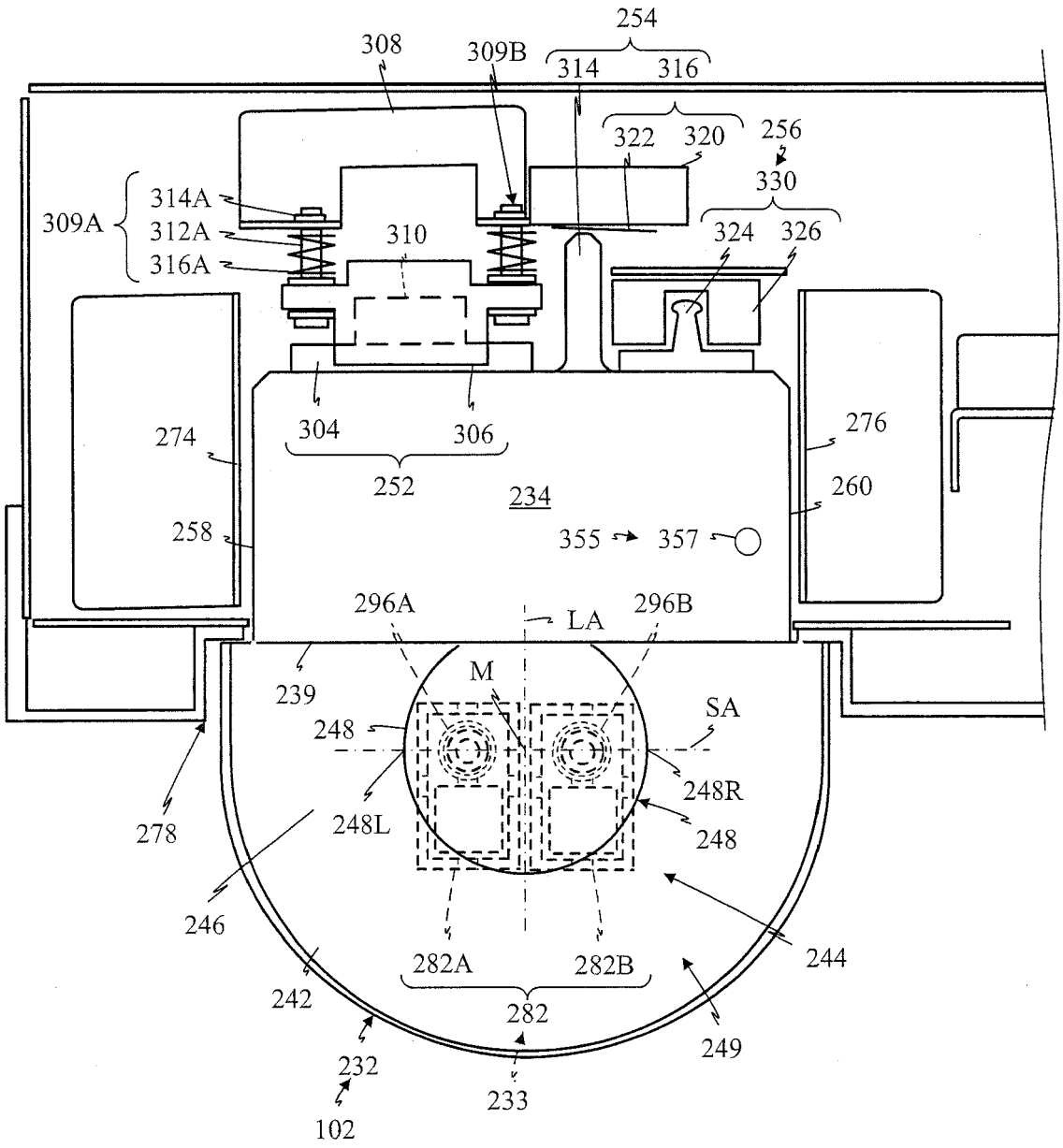
240
244
249

FIG. 6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309A
314A
312A
316A
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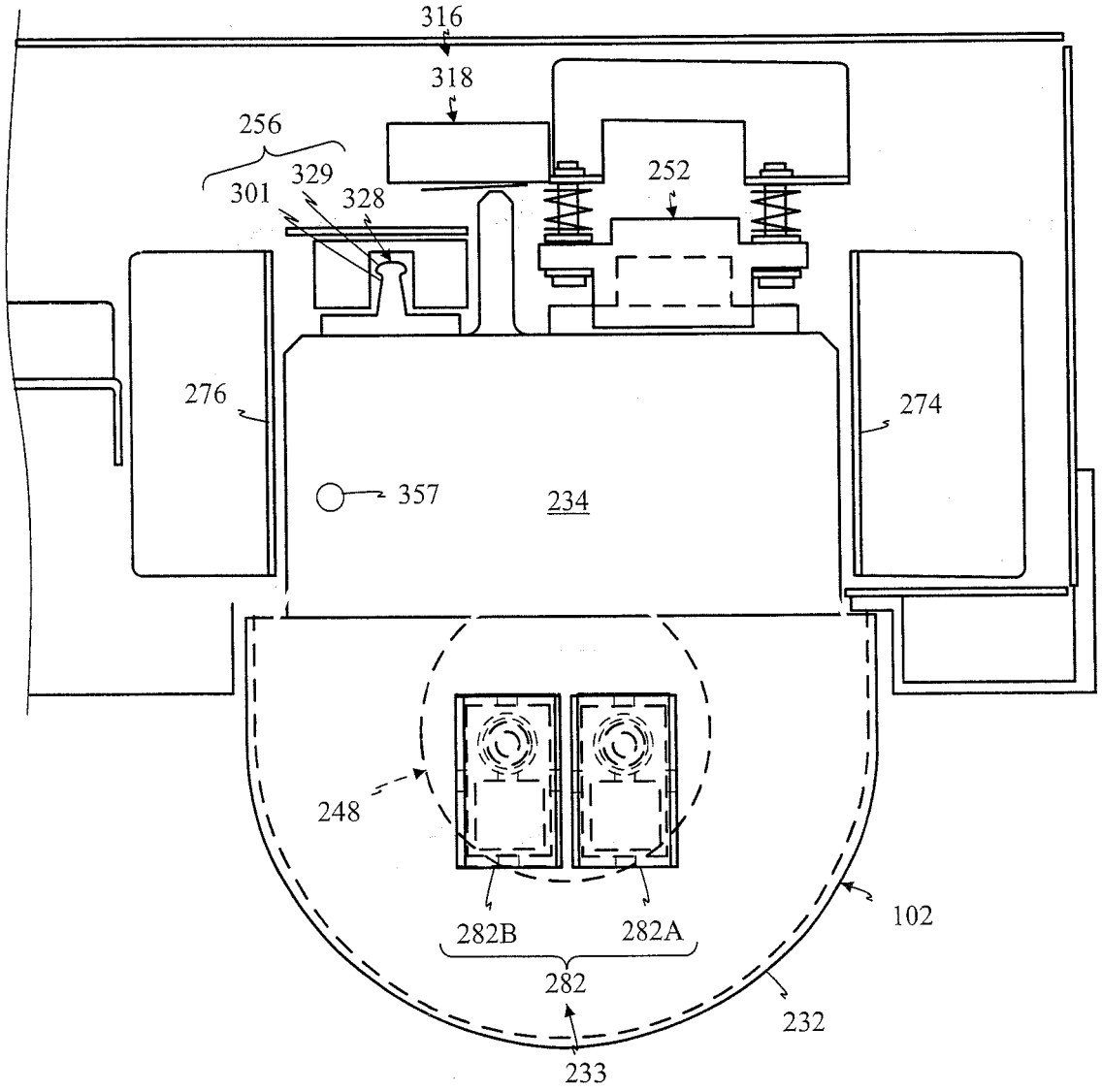
234
274
276
260
258
355
357
296A
LA
296B
239
M
SA
248
248R
248L
278
246
244
282A
282B
282
242
249
232
233
102

FIG. 7


316
318
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301
328
252
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274
357
234
248
282B
282A
282
102
232
233

FIG. 8

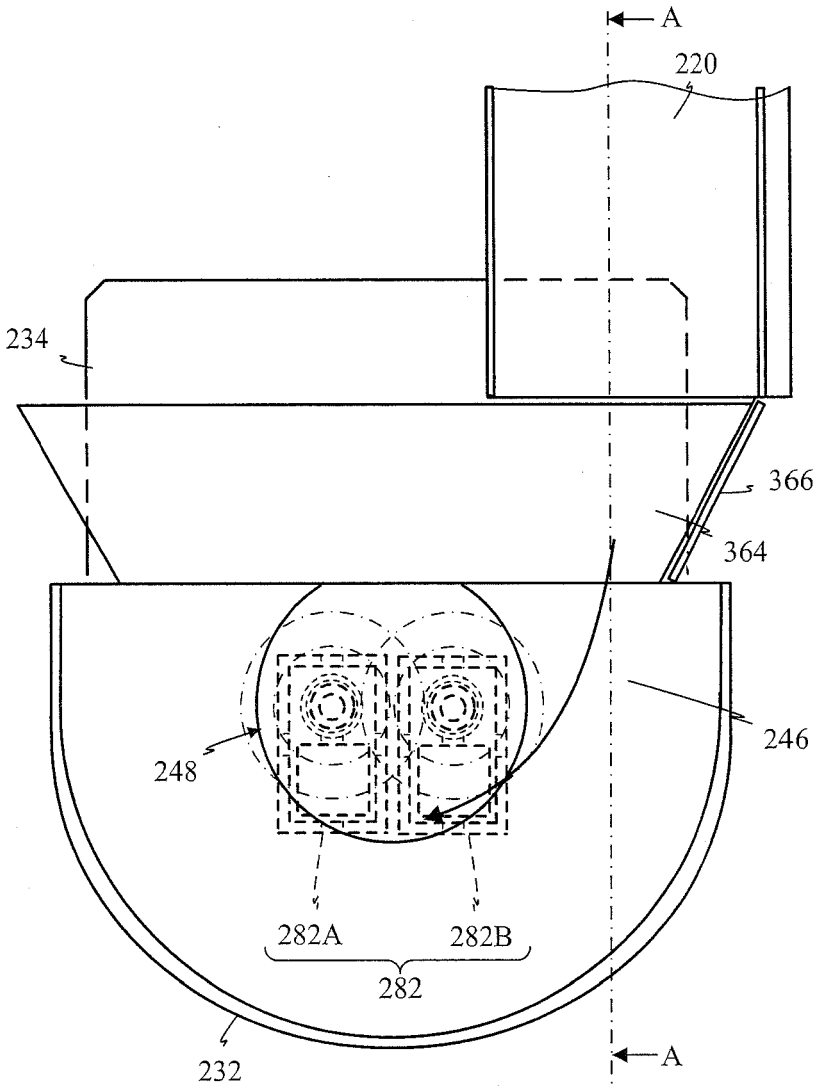
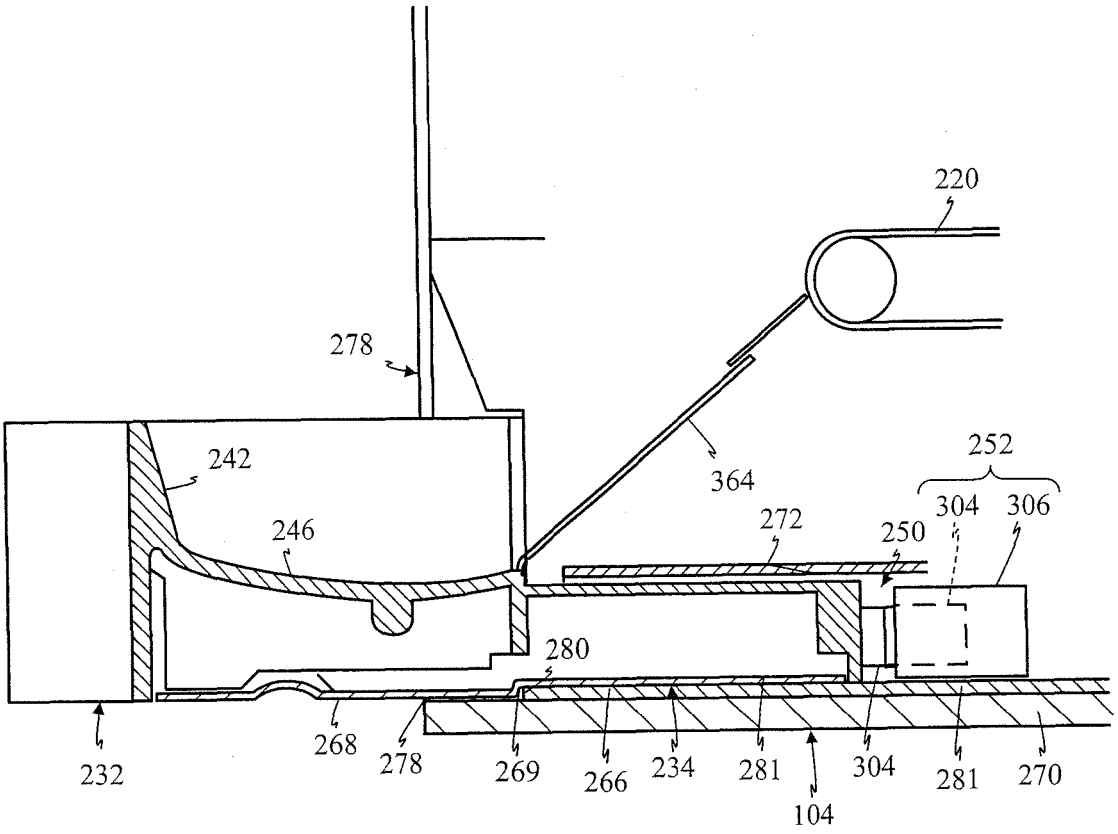


FIG. 9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270
104

FIG. 10

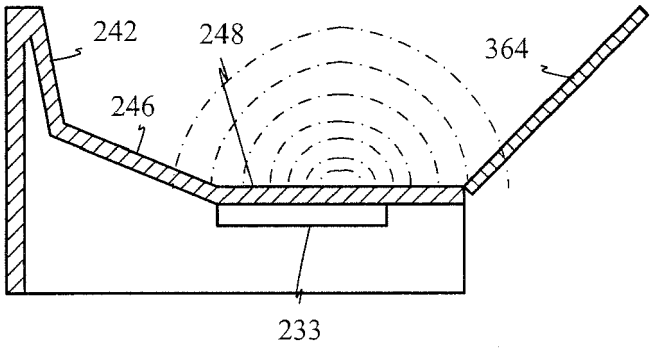


FIG. 11

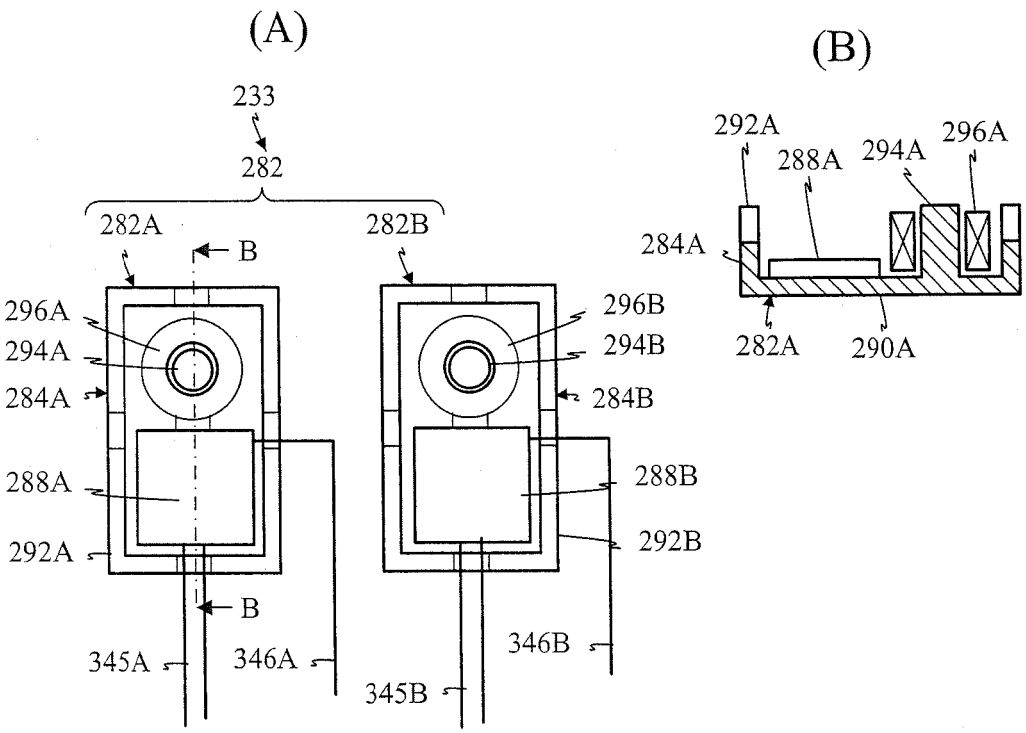

(A)
233
282
282A
282B
B
296A
294A
284A
288A
292A
296B
294B
284B
288B
292B
345A
346A
345B
346B
(B)
292A
288A
294A
296A
284A
282A
290A

FIG. 12

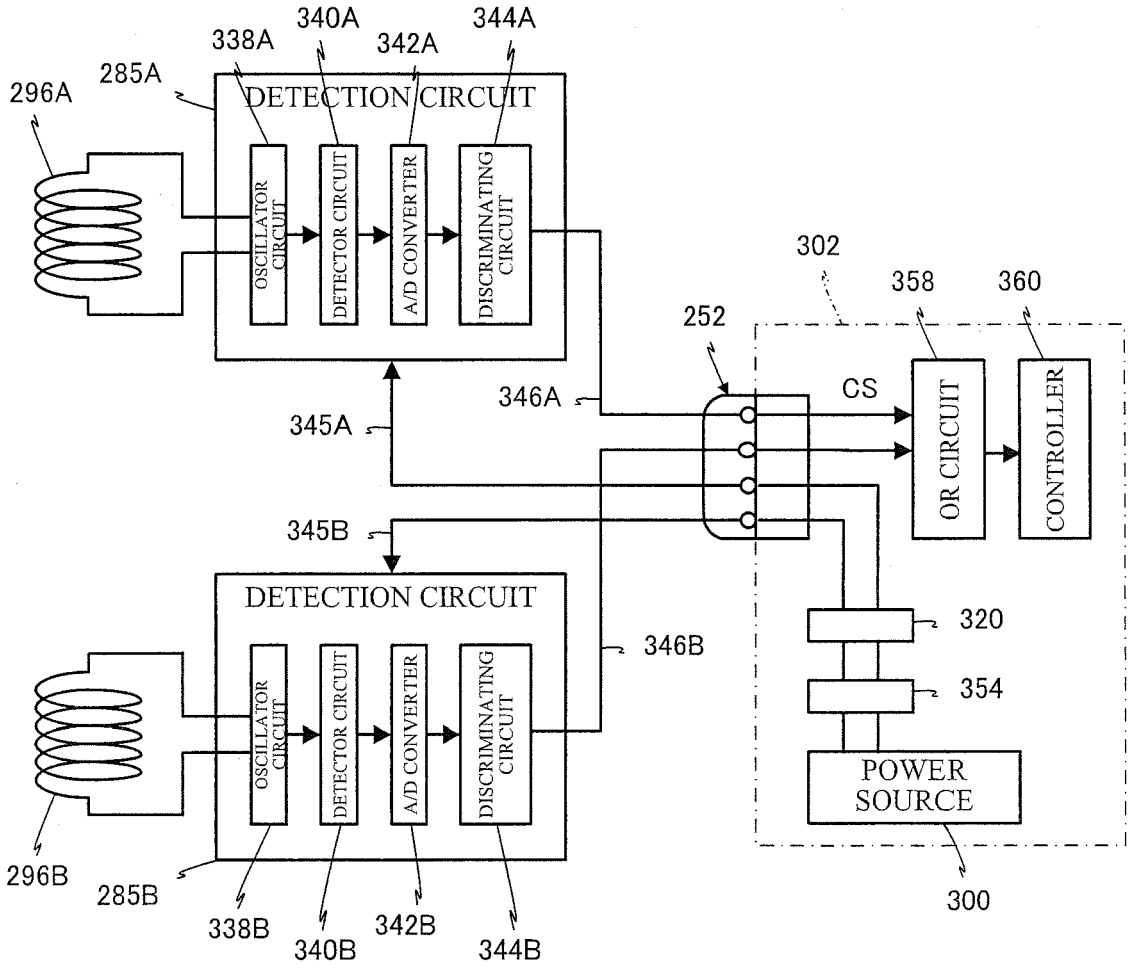
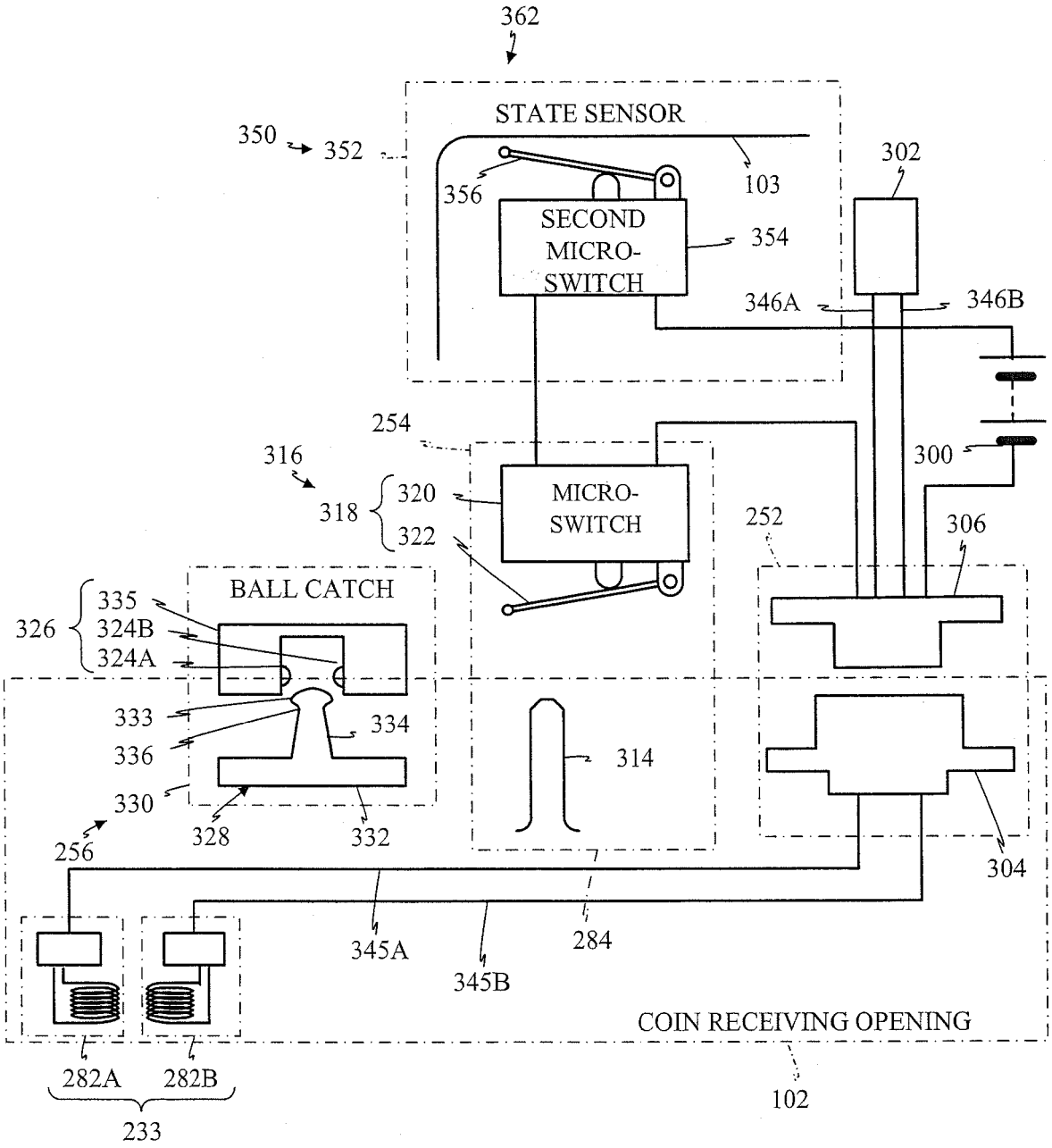

296A
285A
338A
340A
342A
344A
DETECTION CIRCUIT
OSCILLATOR CIRCUIT
DETECTOR CIRCUIT
A/D CONVERTER
DISCRIMINATING CIRCUIT
345A
346A
345B
346B
302
252
358
360
CS
OR CIRCUIT
CONTROLLER
320
354
POWER SOURCE
300
296B
285B
338B
340B
342B
344B

FIG. 13


362
STATE SENSOR
350
352
103
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SECOND MICRO-SWITCH
354
302
346A
346B
254
316
318
320
322
MICRO-SWITCH
300
252
306
BALL CATCH
326
335
324B
324A
333
334
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345B
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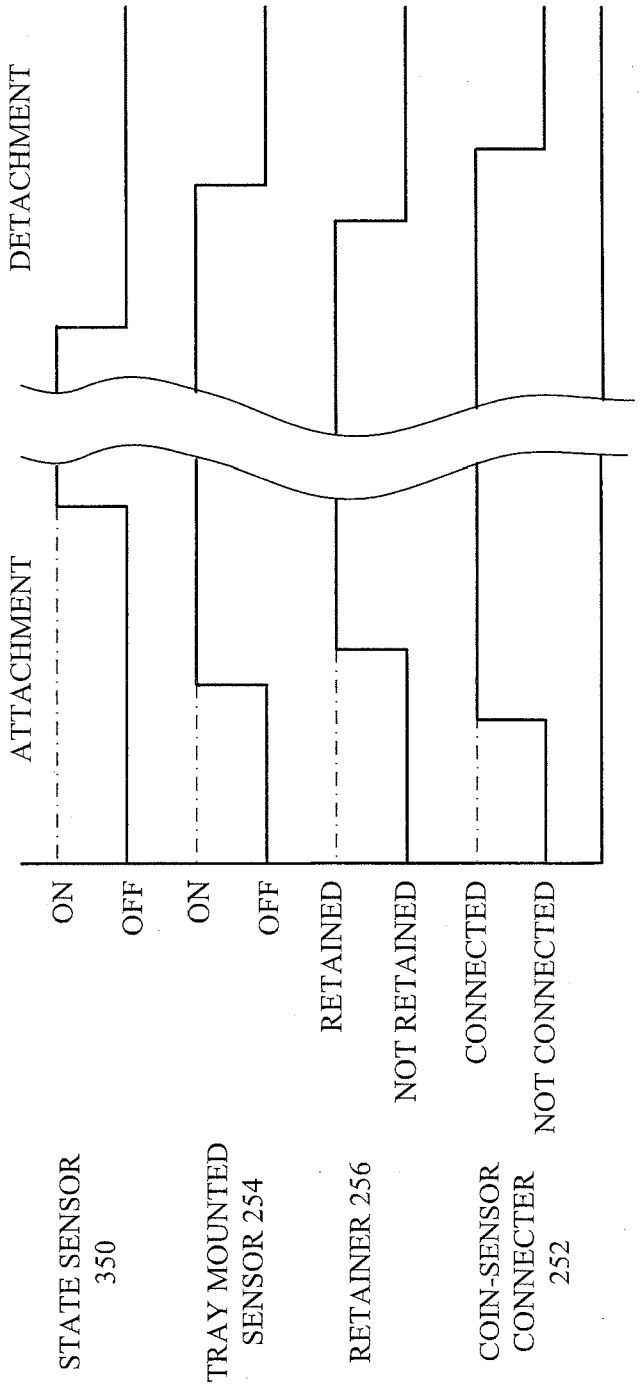
COIN RECEIVING OPENING
282A
282B
233
102

FIG. 14


ATTACHMENT
DETACHMENT
STATE SENSOR 350
ON
OFF
TRAY MOUNTED SENSOR 254
ON
OFF
RETAINER 256
RETAINED
NOT RETAINED
COIN-SENSOR CONNECTER 252
CONNECTED
NOT CONNECTED

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EUROPEAN SEARCH REPORT

Application Number
EP 14 19 4251

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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
The Hague	18 February 2015	Bauer, Sebastian

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18-02-2015

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