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(54) COIN PAYOUT DEVICE

(57) A coin payout device is provided to prevent parts from being damaged when coin jams is resolved. A payout slide (7) that reciprocates by driving a drive motor M is provided below a coin tube (4). Coin receiving holes (7a) to (7e) are formed in the payout slide (7), one of which can receive only one coin dropping out of the coin tube (4). While the payout slide (7) reciprocates once, the coin received in one of the coin receiving hole (7a) to (7e), and the received coin is paid out. The average period of time for energizing the drive motor M, which is required to reciprocate the payout slide (7) once, is approximately 0.7 seconds. In an inventory operation, when an operator pushes a button, the drive motor M is energized for 0.4 seconds. Therefore, the amount of movement of the payout slide in the inventory operation is significantly smaller than the amount of movement in a normal payout operation.

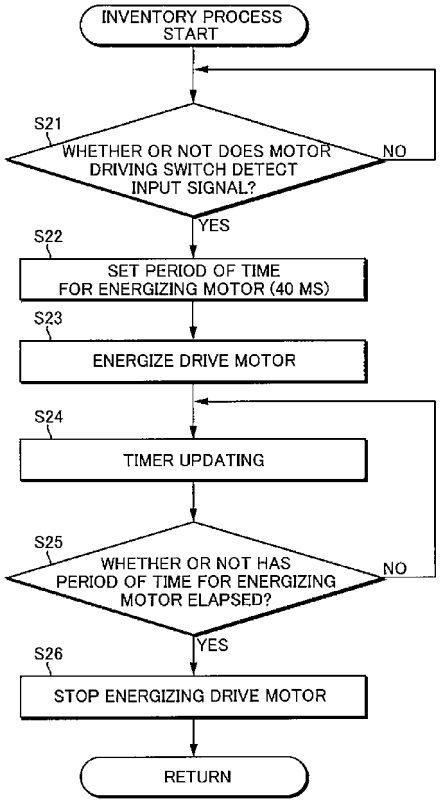

FIG.8

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Description

Technical field

[0001] The present invention relates to a coin payout device that pays out the coins accommodated in a coin tube, and more specifically, to a coin payout device having a function to resolve coin jams.

Background art

[0002] A device disclosed, for example, in Patent literature 1 has been known as a coin payout device installed in a vending machine. This coin payout device has a configuration in which a payout slide is provided to be able to reciprocate below a coin tube. By reciprocating the payout slide, the coins stacked and accommodated in the coin tube are received in the payout slide and then paid out.

[0003] In this coin payout device, a coin jam is likely to occur while the payout slide reciprocates. To resolve the coin jam, a drive motor coupled with the payout slide is automatically rotated in the reverse direction or normal direction. When it is not possible to resolve the coin jam by such an automatic operation, this is considered as an error and the control for payout is stopped, and then an operation by human such as an operator (referred to as "inventory operation") is required. In this way, in a conventional coin payout device, an operator may drive a drive motor in order to resolve coin jams or check the operation of the payout slide by maintenance and inspection.

Citation list

Patent Literature

[0004]

PTL1: Japanese Patent Application Laid-Open Publication No. 2001-357426

Summary of Invention

Technical Problem

[0005] With a conventional coin payout device, the drive motor is controlled to be rotated in the normal or reverse direction for a predetermined period of time during an inventory operation by the operator. However, if the coin jam is serious, the jam may not be resolved only by reciprocating the payout slide. In this case, there is a problem that if an inventory operation is adopted to resolve the trouble, the coins worse get stuck and parts such as a payout slide and so forth are damaged. Moreover, if it is not possible to resolve the jam by the inventory operation, the coin payout device should be removed from the vending machine, or taken apart. This causes a problem that operator's work becomes complex and the down time is prolonged, so that loss occurs.

[0006] It is therefore an object of the present invention to provide a coin payout device configured to prevent parts from being damaged to resolve coin jams, and to easily resolve the coin jams.

Solution to Problem

[0007] It is assumed that a coin payout device according to the present invention sequentially pays out the coins in a coin tube through predetermined movement of a movable member provided below the coin tube by a driving force from a drive motor. The structure and configuration of the movable member according to the present invention is not limited as long as the movable member is moved by a driving force from a drive motor, and the coins in a coin tube are paid out during the movement of the movable member. For example, as a payout slide 7 described in the following embodiments, the movable member may linearly reciprocate, and, during one reciprocating motion, may receive and pay out a coin. Alternately, the movable member may rotate in a predetermined direction to pay out a coin.

[0008] With the above-described configuration, the invention recited in claim 1 includes a coin payout device configured to sequentially pay out coins in a coin tube through predetermined movement of a movable member by a driving force from a drive motor, the movable member being provided below the coin tube. The coin payout device includes: a payout determining means for determining payout of a coin; a payout control means for paying out the coin through movement of the movable member by a predetermined amount by driving the drive motor based on a result of determination by the payout determining means; an operation input means that can be operated by an operator; an operation signal output means for outputting an operation signal based on an operation inputted to the operation input means; and a motor driving means for driving the drive motor based on the operation signal outputted from the operation signal output means. The motor driving means drives the drive motor with an amount of driving smaller than an amount of driving of the drive motor for which the payout control means pays out the coin.

[0009] The invention recited in claim 2 includes a timer means for timing a period of time over which the drive motor is driven by the motor driving means. The motor driving means drives the drive motor when the operation signal is outputted, and stops driving the drive motor when the timer means times a preset drive stopping time. A period of time until the drive stopping time is set shorter than an average period of time over which the drive motor is driven while the payout control means pays out the coin.

[0010] The invention recited in claim 3 is characterized in that the amount of driving of the drive motor driven by the motor driving means is equal to or smaller than half

of an amount of driving of the drive motor driven by the payout control means.

[0011] The invention recited in claim 4 includes a coin payout device configured to sequentially pay out coins in a coin tube through predetermined movement of a movable member by a driving force from a drive motor, the movable member being provided below the coin tube. The coin payout device includes: a payout determining means for determining payout of a coin; a payout control means for paying out the coin through movement of the movable member by a predetermined amount by driving the drive motor based on a result of determination by the payout determining means; an operation input means that can be operated by an operator; an operation detecting means that is able to detect an operation being inputted to the operation input means; and a motor driving means for driving the drive motor only while the operation detecting means detects the operation being inputted to the operation input means. The motor driving means can stop driving the drive motor with a smaller amount of driving of the drive motor than an amount of driving of the drive motor (M) controlled by the payout control means.

[0012] The invention recited in claim 5 is characterized in that: the operation input means is formed of a push button that can be pushed by the operator; and the operation detecting means detects a start of the operation when the push button is pushed, and detects termination of the operation when the push button is released from being pushed.

[0013] The invention recited in claim 6 is characterized in that: the operation input means is configured to be able to operate the drive motor by selecting a driving direction of the drive motor; and the motor driving means drives the drive motor in a direction according to the operation inputted to the operation input means.

[0014] According to the present invention, the payout control means moves the movable member by driving the drive motor. At this time, the movable member should move in the range over which a coin is paid out. A method of stopping driving the drive motor by the payout control means is not limited. For example, as described in the embodiments, the driving of the drive motor may be stopped when the movable member (payout slide 7) reaching a preset position (original position) is detected. Alternatively, a period of time over which the drive motor is driven, which is required to ensure that the coin is paid out, is calculated and stored in advance, and the driving of the drive motor may be stopped after the period of time has elapsed from the time the drive motor starts driving. In addition, according to the present invention, although the direction in which the drive motor is driven is not limited, it is preferred that the direction in which the drive motor is driven can be selected while the drive motor is driven by the motor driving means, as recited in claim 6. In addition, the manner of motion of the drive motor according to the present invention is not limited. The motion may include, for example, rotary motion as an electric motor and a linear motion as a linear motor.

[0015] According to the invention recited in claims 1 to 3, the motor driving means drives the drive motor with a smaller amount of driving than an amount of driving when the drive motor is driven by the payout control means. Therefore, the amount of movement of the movable member in a manual operation by the operator is smaller than the amount of movement for paying out a coin in a normal use condition. In this way, with the invention recited in claims 1 to 3, the amount of driving of the drive motor may be controlled such that the amount of movement of the movable member controlled by the motor driving means is smaller than the amount of movement of the movable member controlled by the payout control means. Here, in view of the object of the present invention, it is preferred that the amount of movement of the movable member (the amount of driving of the drive motor) controlled by the motor driving means is equal to or less than half of the amount of movement of the movable member (the amount of driving of the drive motor) controlled by the payout control means. Here, according to the invention recited in claims 1 to 3, means for which the motor driving means stops driving the drive motor is not limited. For example, as the invention recited in claim 2, an average period of time for driving the drive motor, which is controlled by the payout control means, is calculated, and then, the period of time for driving the drive motor, which is controlled by the motor driving means, may be shorter than the calculated average period of time. Alternatively, another configuration is possible where a means for detecting the position of the movable member is provided, and the driving of the drive motor is stopped when the movable member reaching a predetermined position is detected. With invention recited in claims 4 and 5, the motor driving means drives the drive motor only during the operation by the operation input means. Therefore, it is possible to reduce an amount of movement of the movable member during the operation by the operator as compared to a case where a coin is paid out in a normal use condition.

Advantageous Effects of Invention

[0016] With the present invention, it is possible to move a movable member less to resolve a coin jam than to pay out a coin, and therefore the driving force from the drive motor is not overly applied to the position at which the coin jam occurs. Accordingly, it is possible to prevent the stuck coins from worse getting stuck, or prevent parts such as a movable member and so forth from being damaged. Moreover, the movable member is moved slightly and stopped at an appropriate position, and therefore it is possible to easily specify the location at which a coin jam occurs or the location at which a failure occurs. Consequently, it is possible to improve the operability to easily solve the coin jam.

Brief Description of Drawings

[0017]

Fig. 1 is a perspective view showing a coin processing apparatus;
Fig. 2 is an exploded perspective view showing a state in which parts of a coin payout device are taken apart;
Fig. 3 is an exploded perspective view showing a state in which other parts of the coin payout device are taken apart;
Fig. 4 is a planar cross-sectional view showing a standby state of the coin payout device;
Fig. 5 is a planar cross-sectional view showing a payout state of the coin payout device;
Fig. 6 is a block diagram showing a control unit for the coin payout device;
Fig. 7 is a flowchart showing a coin payout process;
Fig. 8 is a flowchart showing an inventory process;
Fig. 9 is a flowchart showing an inventory termination process;
Fig. 10 is a flowchart showing an inventory process according to Embodiment 2; and
Fig. 11 is a flowchart showing an inventory process according to Embodiment 3.

Description of Embodiments

[0018] Now, the coin payout device according to Embodiment 1 of the present invention will be described with reference to Figs. 1 to 9. Fig. 1 is a perspective view showing a coin processing apparatus formed integrally with a coin payout device. Fig. 2 is an exploded perspective view showing a state in which parts of the coin payout device are taken apart. A coin processing apparatus 101 shown in Fig. 1 is installed in, for example, a vending machine to introduce a coin inputted from a coin entry port of the vending machine into a slot 102 of the coin processing apparatus 101. After the coin is introduced into the slot 102, an identification device 103 checks if the coin is real or fake and also checks the type of the coin. Then, the coin is introduced into a coin payout device 1 according to the type.

[0019] The coin payout device 1 according to the present embodiment includes a coin tube 4 formed by coupling a tube body 2 with a tube case 3 to face one another as shown in Fig. 2. In the coin tube 4, coins are stacked and accumulated in a vertical direction, and storage tubes 5a to 5e each having an upper open end and a bottom open end are aligned. For example, the storage tubes 5a and 5b store 100 yen coins, the storage tube 5c stores 10 yen coins, the storage tube 5d stores 50 yen coins and the storage tube 5e stores 500 yen coins. Coins are identified in the coin identification device 103, and then drop from the respective upper open ends of the storage tubes 5a to 5e into the storage tubes 5a to 5e. As a result, the coins are stored in the storage tubes 5a to 5e. Therefore, with the present embodiment, the diameters of the storage tubes 5a to 5e correspond to the respective sizes of coins to be stored in the storage tubes 5a to 5e. A plurality of screw fixing parts 2a slightly projecting downward are formed on the bottom surface of the tube body 2. A tube base 6 is screwed to those screw fixing parts 2a. In this case, a predetermined gap is formed between the tube body 2 and the tube base 6, so that the payout slide 7 reciprocatably comes in and comes out of the gap.

[0020] The payout slide 7 is formed of a rectangular thin plate member having a thickness that allows the payout slide 7 to pass through the gap between the tube body 2 and the tube base 6. Coin receiving holes 7a to 7e are formed in the payout slide 7 to penetrate the payout slide 7 in the direction of the thickness of the payout slide 7. The coin receiving holes 7a to 7e have the shapes that fit the storage tubes 5a to 5e, respectively, and are arranged to face the storage tubes 5a to 5e, respectively, when the payout slide 7 comes in between the tube body 2 and the tube base 6 and stops at a predetermined position. In addition, the thicknesses of the payout slide 7, that is, the depth of each of the coin receiving holes 7a to 7e is designed to accept only one coin. Here, although detailed description will be explained later, cutouts 6a to 6e having the same respective curvatures as of the storage tubes 5a to 5e and the coin receiving holes 7a to 7e. These cutouts 6a to 6e are arranged to face the bottom open ends of the storage tubes 5a to 5e, respectively. Here, more than two-thirds of the bottom open end of each of the storage tubes 5a to 5e face an upper surface 6f of the tube base 6 (see Fig. 4). Therefore, when the payout slide 7 slides to the position at which the coin receiving holes 7a to 7e face the storage tubes 5a to 5e, respectively, the coins placed in the bottoms of the storage tubes 5a to 5e, that is, only the respective ones drop into the coin receiving holes 7a to 7e, and then are placed in the coin receiving holes 7a to 7e on the upper surface 6f of the tube base 6.

[0021] Then, the payout slide 7 having the above-described configuration moves forward and backward in the coin payout device 1 by the driving force from a drive motor M. This drive motor M is coupled with the payout slide 7 via a motion conversion mechanism 8 as shown in Fig. 3. The motion conversion mechanism 8 includes a pair of cam bodies 9, 9 and a payout link 10. The pair of cam bodies 9, 9 is coupled with a speed reducer (not shown) that reduces the output of the drive motor M. The payout link 10 operates integrally with the cam bodies 9, 9 to convert rotational motion into reciprocating linear motion. A cam body 9 has a disk-like planar part 9a; a shaft part 9b projecting from one side (upper surface) of the planar part 9a along the axis of rotation; and an engagement pin 9c that projects from the other side (lower surface) of the planar part 9a and is provided on the position out of the axis of rotation. Then, the shaft part 9b is coupled with the speed reducer (not shown), so that the cam body 9 rotates slowly with the rotation of the

drive motor M.

[0022] On the other hand, the payout link 10 includes a quadratic prism-shaped first link part 10a extending along the longitudinal side surface of the payout slide 7, and a second link part 10b extending outwardly from one end of the first link part 10a. A pair of guide grooves 11 extending in the longitudinal direction is formed on the upper surface of the first link part 10a. The engagement pins 9c of the cam bodies 9 are movably fitted into the guide grooves 11, respectively. By this means, the payout link 10 reciprocates once in the coin payout device 1 in the direction orthogonal to the longitudinal direction of the coin payout device 1 every time the cam bodies 9 rotate once. In addition, three coupling pins 12 project from the side surface of the payout link 10 that faces to the direction of forward movement of the payout link 10, and are fixed into pin holes 13 of the payout slide 7, respectively. In this way, the payout link 10 and the payout slide 7 are fixedly connected with one another, and therefore the payout slide 7 reciprocates integrally with the payout link 10 by the driving force from the drive motor M.

[0023] In addition, guide holes 14a to 14d are formed in the payout link 10 such that the guide holes 14a to 14d penetrate the payout link 10 in the direction of movement of the payout link 10 (the direction in which the payout link 10 moves forward and backward). These guide holes 14a to 14d are aligned to face the coin receiving holes 7a to 7d, respectively, when the payout link 10 and the payout slide 7 are connected with one another. In addition, these guide holes 14a to 14d are located a little below the coin receiving holes 7a to 7d, respectively. Anti-drop pieces 15a to 15d that reciprocate integrally with the payout link 10 or move relatively with the payout link 10, are provided in the guide holes 14a to 14d, respectively. Each of the anti-drop pieces 15a to 15d includes one end which is cut in a concave in the direction of forward movement of the anti-drop pieces 15a to 15d. Meanwhile, the other ends of the anti-drop pieces 15a to 15d face movement restriction pins 16a to 16d, respectively in the opposite direction from the forward movement of the anti-drop pieces 15a to 15d (see Fig. 4 and Fig. 5).

[0024] The movement restriction pins 16a to 16d can project and retract by respective electromagnetic solenoids. To be more specific, the movement restriction pins 16a to 16d move to project downward under a non-excitation condition and moves upward to retract under an excitation condition. All the movement restriction pins 16a to 16d are arranged to be able to project and retract in the vertical direction. These movement restriction pins 16a to 16d come in the movement loci of the anti-drop pieces 15a to 15d when projecting, and are out of the movement loci of the ant-drop pieces 15a to 15d when retracting.

[0025] In addition, as shown in Fig. 3, a second link part 10b of the payout link 10 has a pair of plate members 17a and 17b which are arranged a predetermined distance away from one another and face one another. Each of these plate members 17a and 17b has a side surface formed into a concave to fit the part of the payout slide 7 along which the coin receiving hole 7e is formed. An anti-drop piece 18a of a rocking member 18 can come in between the pair of the plate members 17a and 17b. As shown in Fig. 4 and Fig. 5, the rocking member 18 is supported in a housing 110 to rock about a rocking shaft 18b between the payout link 10 and a back surface 110a of the housing 110. In addition, the rocking member 18 includes an abutting part 18c. A rocking restriction pin 16e is located on the rocking locus of the abutting part 18c. Like the movement restriction pins 16a to 16d, this rocking restriction pin 16e can project and retract in a vertical direction by an electromagnetic solenoid. To be more specific, the rocking restriction pin 16e projects on the rocking locus of the abutting part 18c of the rocking member 18 under a normal un-excitation state, and, on the other hand, moves upward to retract, and therefore is out of the rocking locus of the abutting part 18c under an excitation state.

[0026] Then, an elastic piece 19 which is deformable in the vertical direction is provided in the anti-drop piece 18a of the rocking member 18. The elastic piece 19 has a bottom surface from which a convex pin 19a projects. A slide groove 20 is formed in the plate member 17b in the second link part 10b. The convex pin 19a is fitted into the slide groove 20 and can slide in the slide groove 20. This slide groove 20 is formed in a long hole along the longitudinal direction of the payout link 10. When the payout link 10 reciprocates, the convex pin 19a slides in the slide groove 20 to rock the rocking member 18.

[0027] In a normal state of the rocking member 18, the tip of the anti-drop piece 18a is located below the coin receiving hole 7e while contacting the cutout 6e of the tube base 6, as shown in Fig. 4. In this state, the drive motor M is driven to slide the payout link 10 and the payout slide 7 to the back surface 110a side, so that a force is applied to slide the convex pin 19a in the slide groove 20. As a result, the rocking member 18 attempts to rock about the rocking shaft 18b clockwise in the figure. However, when the rocking restriction pin 16e is projecting, the abutting part 18c abuts on the rocking restriction pin 16e to restrict the rocking member 18 from rocking. Therefore, under this state, when the payout link 10 slides to the back surface 110a side, the convex pin 19a is pushed up by the side edge of the slide groove 20 and the elastic piece 19 deforms to bend upward, so that the convex pin 19a drops out of the slide groove 20. Consequently, while the rocking member 18 keeps in the state shown in Fig. 4, the payout link 10 and the payout slide 7 slide to the back surface 110a side. As a result of this, most of the anti-drop piece 18a is located under the coin receiving hole 7e. Therefore, even if the payout slide 7 moves to the back surface 110a side, the anti-drop piece 18a may prevent a coin from dropping out of the coin receiving hole 7e.

[0028] On the other hand, in a case where the rocking restriction pin 16e is out of the rocking locus of the abut-

ting part 18c because the electromagnetic solenoid is excited when the payout slide 7 moves to the back surface 110a side, the convex pin 19a slides in the slide groove 20 to rock the rocking member 18 as shown in Fig. 5. In this way, when the rocking restriction pin 16e is out of the rocking locus of the abutting part 18c, the anti-drop piece 18a completely leaves the coin receiving hole 7e with the movement of the payout slide 7. Therefore, it is possible to drop a coin in the coin receiving hole 7e into a payout part 21 located in the lower part.

[0029] Next, paying out the coins in the coin receiving holes 7a to 7d and restriction on the coin payout will be described. During a standby state of the coin payout device 1, the payout slide 7 and the payout link 10 rest at the original position shown in Fig. 4. In this state, the movement restriction pins 16a to 16d are located in approximately the center between the payout link 10 and the back surface 110a of the housing 110. Here, the movement restriction pins 16a to 16d are normally in a non-excitation state and keep projecting. In addition, the anti-drop pieces 15a to 15d are held in the guide holes 14a to 14d in the payout link 10 while a small distance is maintained with respect to the cutouts 6a to 6d of the tube base 6 and also a small distance is maintained with respect to the movement restriction pins 16a to 16d, as shown in the figure. Then, the guide holes 14a to 14d have respective holding means (not shown) that removably hold the anti-drop pieces 15a to 15d. The principle for holding the anti-drop pieces 15a to 15d by these holding means accounts for the relationship between the elastic piece 19 with the convex pin 19a and the slide groove 20 formed in the second link part 10b.

[0030] That is, in the standby state shown in Fig. 4, the coin receiving holes 7a to 7d face the bottom open ends of the storage tubes 5a to 5d, respectively. By this means, coins drop from the storage tubes 5a to 5d to the coin receiving holes 7a to 7d, and the respective ones are accommodated in the coin receiving holes 7a to 7d. In this state, when the drive motor M is driven, the payout link 10 and the payout slide 7 integrally slide to the back surface 110a of the housing 110 and reach the payout position shown in Fig. 5. At this payout position, the coin receiving holes 7a to 7d of the payout slide 7 completely leave the upper surface 6f of the tube base 6.

[0031] Meanwhile, at the original position shown in Fig. 4, the anti-drop pieces 15a to 15d are held by the holding means in the guide holes 14a to 14d, respectively. Therefore, when the payout link 10 slides to the back surface 110a, the holding force of the holding means allows the anti-drop pieces 15a to 15d to move integrally with the payout link 10 to the back surface 110a. At this time, only the movement restriction pin 16a is excited and the movement restriction pins 16b to 16d are maintained in a non-excitation state in Fig. 5. As a result, only the movement restriction pin 16a is out of the movement locus of the anti-drop piece 15a while the movement restriction pins 16b to 16d project on the movement loci of the anti-drop pieces 15b to 15d. Therefore, there is no restriction to move the anti-drop piece 15a, so that the anti-drop piece 15a moves integrally with the payout link 10 and the payout slide 7 to the back surface 110a. Here, escape holes 111a to 111d facing the anti-drop pieces 15a to 15d, respectively, are formed in the back surface 110a. Here, when the anti-drop pieces 15a to 15d move, those escape holes 111a to 111d receive the anti-drop pieces 15a to 15d.

[0032] Meanwhile, the movement restriction pins 16b to 16d project on the movement loci of the anti-drop pieces 15b to 15d as described above, and therefore, as soon as the payout link 10 moves to the buck surface 110a, the ant-drop pieces 15b to 15d contact the movement restriction pins 16b to 16d. The anti-drop pieces 15a to 15d are held by the holding means in the guide holes 14a to 14d, respectively. Here, when a force equal to or greater than the holding force of the holding means is applied to the anti-drop pieces 15a to 15d, the anti-drop pieces 15a to 15d may not be held by the holding means. As described above, when the movement restriction pins 16b to 16d contact the anti-drop pieces 15b to 15d, respectively, a force equal to or greater than the holding force of the holding means acts. As a result, the payout link 10 moves relatively with the anti-drop pieces 15b to 15d. In this way, in a state where the payout slide 7 reaches the payout position shown in Fig. 5, the coin receiving holes 7b to 7d are located above the upper parts of the anti-drop pieces 15b to 15d. Therefore, the anti-drop pieces 15b to 15d prevent the coins in the coin receiving holes 7b to 7b from dropping.

[0033] Here, when the drive motor M is further driven in a state where the payout slide 7 and the payout slide 10 are in the payout position shown in Fig. 5, the payout link 10 and the payout slide 7 return to the original position shown in Fig. 4. At this time, the anti-drop piece 15a is held in the guide hole 14a by the holding force of the holding means, and therefore moves integrally with the payout link 10, to the original position. In addition, the anti-drop pieces 15b to 15d are no longer fitted into the guide holes 14b to 14d. Therefore, the payout link 10 first moves relatively with the anti-drop pieces 15b to 15d during the movement from the payout position shown in Fig. 5 to the original position shown in Fig. 4. Then, when the payout link 10 reaches the original position, the anti-drop pieces 15b to 15d are held again by the holding means in the guide holes 14b to 14d.

[0034] Next, a controller that controls the coin payout device 1 having the above-described configuration will be described. Here, with the present embodiment, although a configuration is adopted where the controller that controls the coin payout device 1 is provided separately from a controller that controls the coin identification device 103 and a calculating unit that calculates change based on an amount of money having been put into or a selected product, another embodiment is possible where one controller covers such as various controls.

[0035] Fig. 6 is a block diagram showing the configuration of a controller that controls the coin payout device

1. A payout controller 50 includes: a ROM that stores various programs; a CPU that reads and processes the programs stored in the ROM based on input signals; and a RAM used as a temporary storage area for calculation. A change calculating unit 51, an original position switch 52, an inventory switch 53, a motor normal rotation switch 54, a motor reverse rotation switch 55 and a timer T are connected to the input side of the payout controller 50. The change calculating unit 51 calculates change based on an amount of money that has been put into and a selected product. The original position switch 52 detects the payout slide 7 being located at the original position shown in Fig. 4. For example, the original position switch 52 may be a limit switch configured to close the circuit when the payout slide 7 reaches the original position. However, the original position switch 52 is not limited to the limit switch as long as it can detects the payout slide 7 being located at the original position. The original position switch 52 may be a photo sensor or a magnetic sensor, instead of the limit switch, and detection means are not limited to a specific one. Moreover, the original position switch 52 may directly detect the position of the payout slide 7 as described above. Alternatively, the original position switch 52 may indirectly detect the position of the payout slide 7 by detecting, for example, the position of the payout link 10 or a change in the rotational position of the cam body 9.

[0036] The inventory switch 53 detects the operation by an operator and is provided in, for example, the housing 110, a remote controller that can communicate with the payout controller 50, and so forth. Here, a push button which can be pushed by the operator is provided integrally with the controller 50 on a substrate fixed to a predetermined position in the housing 110 (see Fig. 1). When the inventory switch 53 detects the operator pushing the push button, the mode of the payout controller 50 is switched from a normal mode that represents a normal use state to a maintenance mode in which the operation by the operator is accepted. After that, the process progresses according to the operation by the operator which is detected by various switches. Here, when the inventory switch 53 detects the operation by the operator in the maintenance mode, the mode of the payout controller 50 is switched to the normal mode. Like the inventory switch 53, the motor normal rotation switch 54 and the motor reverse rotation switch 55 are provided in the push button to detect the operation by the operator. The motor normal rotation switch 54 and the motor reverse rotation switch 55 may be provided in the housing 110, a remote controller and so forth. Both the switches 54 and 55 are enabled only when the mode of the payout controller 50 is set in the maintenance mode. In the maintenance mode, when the motor normal rotation switch 54 detects the operation by the operator, the drive motor M rotates in one direction (normal direction). Meanwhile, when the motor reverse rotation switch 55 detects the operation by the operator, the drive motor M rotates in the other direction (reverse rotation).

[0037] The timer T outputs a clock pulse signal to the payout controller 50 per predetermined period of time (e.g. 100 ms). Clock pulse signals outputted from the timer T are used in the payout controller 50 to time the period of time for which the drive motor M is driven.

[0038] In addition, the drive motor M coupled with the payout slide 7, the movement restriction pins 16a to 16d, the rocking restriction pin 16e (electromagnetic solenoid) and an alarm 56 that warns occurrence of a coin jam, are connected to the output side of the payout controller 50. Now, maj or processes performed by the payout controller 50 will be described with reference to Fig. 7 to Fig. 9.

[0039] First, a coin payout process performed during which the payout controller 50 is set in the normal mode, will be explained with reference to Fig. 7. This coin payout process is started at the time a payout command to pay out change is inputted from the change calculating unit 51 to the payout controller 50.

(Step S1)

[0040] When a change payout command is inputted to the payout controller 50, the CPU analyzes the input command.

(Step S2)

[0041] Next, the CPU energizes the electromagnetic solenoids for the restriction pins 16a to 16e corresponding to the selected coins to be paid out, based on the result of the analysis in the step S1. Here, with the present embodiment, only one coin is paid out by one reciprocating motion of the payout slide 7. For example, in order to pay out one 500 yen coin, one 100 yen coin, one 50 yen coin, and one 10 yen coin, the payout slide 7 reciprocates four times. Meanwhile, for example, in order to pay out three 10 yen coins and one 50 yen coin, the payout slide 7 also reciprocates four times. In this way, in order to pay out multiple types of coins, the CPU excites the corresponding electromagnetic solenoids in a preset order.

(Step S3)

[0042] Next, the CPU energizes the drive motor M to be driven to rotate.

(Step S4)

[0043] Next, the CPU sets 1000 ms as the maximum period of time for one coin payout operation, that is, for one reciprocating motion of the payout slide 7. Here, the number of times clock pulse signals are inputted from the timer T is stored on a predetermined storage area in the RAM as a timer count value. For example, when a clock pulse signal is inputted from the timer T per 100 ms, "10" is stored on the storage area as a timer count value. Here, with the present embodiment, the average

period of time over which the drive motor M drives, which is required for one reciprocating motion of the payout slide 7, is approximately 700 ms. In other words, the average period of time over which the drive motor M drives, which is required for which the payout slide 7 moves from the original position and returns to the original position, is approximately 700 ms. Therefore, here, the maximum period of time for payout is set to have a sufficient period of time for which the payout slide 7 reciprocates once and reaches the original position.

(Step S5)

[0044] In step S5, the CPU determines whether or not the original position detecting switch 52 detects the payout slide 7 reaching the original position. When the CPU determines that the payout slide 7 reaches the original position, the step moves to step S10, and, on the other hand, determines that the payout slide 7 has not reached the original position, the step moves to step S6.

(Step S6)

[0045] In the step S5, when determining that the payout slide 7 has not reached the original position, the CPU performs timer updating. To be more specific, the CPU determines whether or not a clock pulse signal is inputted from the timer T, and, when a clock pulse signal is inputted, the CPU subtracts the timer count value having been stored on the storage area in the step S4 and stores the resulting value.

(Step S7)

[0046] Next, the CPU determines whether or not the timer count value stored on the storage area is "0" according to the result of the timer updating in the step S6, and also determines whether or not the maximum period of time for payout has elapsed. As a result of this, when the CPU determines that the maximum period of time for payout has elapsed, the step moves to step S8. On the other hand, when determining that the maximum period of time for payout has not elapsed, the CPU repeats the step S5 to the step S7 until the payout slide 7 reaches the original position or the maximum period of time for payout has elapsed.

(Step S8)

[0047] In the step S7, the case where the CPU determines that the maximum period of time for payout has elapsed means that the payout slide 7 has not reached the original position though the drive motor M is driven. Therefore, the CPU determines that a coin jam occurs and performs predetermined error handling. Here, the error handling includes: sending an error command to the alarm 56 to inform the operator that a coin jam occurs; and automatically resolving the coin jam by stopping energizing the solenoid or by rotating the drive motor M reversely.

(Step S9)

[0048] Next, the CPU stops energizing the drive motor M.

(Step S10)

[0049] Moreover, in the step S5, when determining that the original position detecting switch 52 detects the payout slide 7 reaching the original position, the CPU recognizes that the payout is normally carried out and determines whether or not to continue the coin payout process. When determining that the coin payout process continues, the CPU moves the step to the step S2 to pay out again the corresponding coin, and, on the other hand, when determining that the coin payout process does not continue, the CPU moves the step to step S9 and ends the coin payout process.

[0050] Next, "inventory process" will be described with reference to Fig. 8. The inventory process is performed by an operator to resolve coin jams or do maintenance. This inventory process is started at the time the mode of the payout controller 50 is switched to the maintenance mode after the inventory switch 53 detects an operation by the operator while the payout controller 50 is set in the normal mode.

(Step S21)

[0051] When the mode is switched to the maintenance mode, the CPU waits until the motor normal rotation switch 54 or the motor reverse rotation switch 55 (hereinafter referred to as "motor driving switch) detects the operation by the operator.

(Step S22)

[0052] Then, when the motor driving switch detects the operation by the operator, the CPU stores the timer count value on a predetermined storage area in the RAM and sets the period of time over which the drive motor M is energized (40 ms).

(Step S23)

[0053] Next, the CPU energizes the drive motor M. At this time, in the step S21, when the motor normal rotation switch 54 detects the operation by the operator, the CPU energizes the drive motor M to be driven to rotate in the normal direction. On the other hand, when the motor reverse rotation switch 55 detects the operation by the operator, the CPU energizes the drive motor M to be driven to rotate in the reverse direction.

(Step S24)

[0054] Next, like in the step S6, the CPU determines whether or not a clock pulse signal is inputted from the timer T, and, when a clock pulse signal is inputted, subtracts the timer count value which has been stored on the storage area in the step S22 and stores the resulting value.

(Step S25)

[0055] Next, the CPU determines whether or not the timer count value is "0" according to the result of the timer updating in the step S24, and therefore determines whether or not the period of time for energization (40 ms) has elapsed. As a result of this, when determining that the period of time for energization has elapsed, the CPU moves the step to step S26. On the other hand, when determining that the period of time for energization has not elapsed, the CPU repeats the step S25 and the step S26 until the period of time for energization has elapsed.

(Step S26)

[0056] Then, in the step S25, when determining that the period of time for energization (40 ms) has elapsed, the CPU stops energizing the drive motor M.

[0057] With the inventory process described above, the drive motor M is energized only for 40 ms for one operation, in order to resolve a coin jam through a manual operation by an operator or do maintenance. As described above, the average period of time over which the drive motor M drives (period of time for energization) is approximately 700 ms, which is required for one reciprocating motion of the payout slide 7. Therefore, if the period of time for energizing the drive motor M is 40 ms which is shorter than the above-described average period of time, the amount of movement of the payout slide 7 is significantly smaller than in coin payout. Accordingly, it is possible to prevent the driving force from the drive motor M from being excessively applied to the portion in which a coin jam occurs, and therefore prevent the coin jam from worse getting stuck or parts such as the payout slide 7 and the tube base 6 from being damaged, when the operator attempts to resolve the coin jam.

[0058] Next, an inventory termination process for terminating the above-described inventory process will be explained with reference to Fig. 9. This inventory termination process is started at the time the inventory switch 53 detects the operation by the operator while the payout controller 50 is set in the maintenance mode.

(Step S31)

[0059] First, the CPU energizes the drive motor M.

(Step S32)

[0060] Next, the CPU sets the maximum period of time for energizing the motor (700 ms) on a predetermined storage area in the RAM. Here, a method of setting the maximum period of time for energizing the motor is the same as in the step S4 and the step S22.

(Step S33)

[0061] In step S33, the CPU determines whether or not the original position detecting switch 52 detects the payout slide 7 reaching the original position. When determining that the payout slide 7 reaches the original position, the CPU moves the step to step S37. On the other hand, when determining that the payout slide 7 has not reached the original position, the CPU moves the step to step S34.

(Step S34)

[0062] In the step S33, when determining that the payout slide 7 has not reached the original position, the CPU performs timer updating like in the step S6 and the step S24.

(Step S35)

[0063] When determining that the maximum period of time for energizing the motor has elapsed, according to the result of the timer updating in the step S34, the CPU moves the step to step S36. On the other hand, when determining that the maximum period of time for energizing the motor has not elapsed, the CPU repeats the step S33 to the step S35 until the payout slide 7 reaches the original position, or the maximum period of time for energizing the motor has elapsed.

(Step S36)

[0064] In the step S35, when determining that the maximum period of time for energizing the motor has elapsed, the CPU recognizes that the coin jam is not resolved and performs error handling like in the step S8.

(Step S37)

[0065] Finally, the CPU stops energizing the drive motor M and ends the inventory termination process.

[0066] In this way, by adding the inventory termination process, it is possible to ensure that the payout slide 7 is returned to the original position when the mode of the coin payout device 1 is switched from the maintenance mode to the normal mode. That is, by the inventory process shown in Fig. 8, the drive motor M is driven per 40 ms and the payout slide 7 slightly moves, and therefore, when the inventory process is terminated, the payout slide 7 may not have reached the original position. Thus,

by adding the inventory termination process, it is ensured that the payout slide 7 is returned to the original position when the mode of the payout controller 50 is switched from the maintenance mode to the normal mode. By this means, it is possible to prevent overpay or incorrect payout by a payout operation in the normal mode.

[0067] Next, an inventory process according to Embodiment 2 will be described with reference to Fig. 10. Here, in this inventory process, a motor driving switch is provided in a button which can be pushed, and the drive motor M is continuously driven only while the button is being pushed. This inventory process is started at the time the mode of the payout controller 50 is switched to the maintenance mode after the inventory switch 53 detects the operation by the operator while the mode of the payout controller 50 is set in the normal mode.

(Step S41)

[0068] When the mode of the payout controller 50 is switched to the maintenance mode, the CPU waits until the motor driving switch (the motor normal rotation switch 54 or the motor reverse rotation switch 55) detects the operation by the operator.

(Step S42)

[0069] When the motor driving switch detects the operation by the operator, the CPU energizes the drive motor M. In the step S41, when the motor normal rotation switch 54 detects the operation by the operator, the drive motor M is energized to be driven to rotate in the normal rotation direction, and, on the other hand, when the motor reverse rotation switch 55 detects the operation by the operator, the drive motor M is energized to be driven to rotate in the reverse rotation direction.

(Step S43) (Step S44)

[0070] Next, the CPU monitors whether or not the motor driving switch continues to detect the operation by the operator, and, when the motor driving switch continues to detect the operation by the operator, the CPU continues to energize the drive motor M. Then, when the motor driving switch stops detecting the operation by the operator, the step moves to step S45.

(Step S45)

[0071] In the step S44, when determining that the motor driving switch stops detecting the operation by the operator, the CPU stops energizing the drive motor M and goes into the standby state again.

[0072] As described above, with the inventory process according to Embodiment 2, it is possible to drive the drive motor M only during the operation by the operator, and therefore stop the payout slide 7 at the position that the operator desires. Consequently, it is possible to improve the operability. Here, the driving speed of the drive motor M in the inventory process is slower than that in the coin payout process (normal mode), and therefore it is possible to further improve the operability. In this way, in order to reduce the driving speed of the drive motor M in the inventory process, a configuration is possible where the drive motor M is intermittently energized while the operation by the operator is detected. Moreover, in order to simplify the structure, a configuration is possible where a limit switch is provided in a button that the operator can push and the limit switch closes the circuit at the same time the button is pushed.

[0073] Next, the coin payout device 1 according to Embodiment 3 will be explained with reference to Fig. 11. With Embodiment 3, a plurality of stopping position detecting switches are provided to detect the payout slide 7 being located at a predetermined position. For example, stopping position detecting switches may be provided at two or three points on the way the payout slide 7 moves from the original position to the payout position. Alternately, the stopping position detecting switches may be provided per predetermined angle to detect a change in the rotational position of the cam bodies 9. Then, these stopping position detecting switches are connected to the input side of the payout controller 50 to perform an inventory process based on the position of the payout slide 7 detected by the stopping position detecting switch. In this inventory process according to Embodiment 3, the drive motor M is driven when the motor driving switch detects the operation by the operator, and, when the stopping position detecting switches, which are newly provided, detect the payout slide 7 reaching a predetermined stopping position, the drive motor M stops driving. This inventory process is started at the time the mode of the payout controller 50 is switched to the maintenance mode after the inventory switch 53 detects the operation by the operator while the mode of the payout controller 50 is set in the normal mode.

(Step S51)

[0074] Upon the payout controller 50 being switched to the maintenance mode, the CPU waits until the motor driving switch (the motor normal rotation switch 54 or the motor reverse rotation switch 55) detects the operation by the operator.

(Step S52)

[0075] Then, when the motor driving switch detects the operation by the operator, the CPU energizes the drive motor M. In this case, when the operation by the operator is detected by the motor normal rotation switch 54, the drive motor M is energized to be driven to rotate in the normal rotation direction, and, on the other hand, the operation by the operator is detected by the motor reverse rotation switch 55, the drive motor M is energized to be driven to rotate in the reverse rotation direction.

(Step S53)

[0076] Next, the CPU determines whether or not the stopping position detecting switch detects the payout slide 7 reaching a predetermined position. The CPU waits until the stopping position detecting switch detects the payout slide 7 reaching a predetermined position, and, when determining that the payout slide 7 reaches a predetermined stopping position, moves the step to step S54.

(Step S54)

[0077] In the step S53, When determining that the payout slide 7 reaches a predetermined stopping position, the CPU stops energizing the drive motor M and goes into the standby state again.

[0078] As described above, with Embodiment 3, it is possible to slightly move the payout slide 7 to a preset position, and therefore resolve a coin jam without damaging parts, like in the above-described embodiments. Moreover, it is possible to change the travel distance of the payout slide 7 with location depending on the arrangement of the stopping position detecting switches. Therefore, for example, in a location where a coin jam is not likely to occur, the travel distance of the payout slide 7 is increased to some extent, and, on the other hand, in a location where a coin jam is likely to occur, the travel distance of the payout slide 7 is reduced. By this means, it is possible to further improve the operability.

[0079] Here, the payout slide 7 in the embodiments is equivalent to a movable member according to the present invention. The change payout command analysis shown Fig. 7, which is performed by the payout controller 50, is equivalent to a payout determining means according to the present invention. The coin payout process shown in Fig. 7, which is performed by the payout controller 50, in the embodiments is equivalent to a payout control means according to the present invention. The motor normal rotation switch 54 and the motor reverse rotation switch 55 in the embodiments are equivalent to operation signal output means according to the present invention. The button including these switches is equivalent to an operation input means according to the present invention. The inventory process shown in Fig. 8, Fig. 10 and Fig. 11, which is performed by the payout controller 50 in the embodiments, is equivalent to a motor driving means according to the present invention. The timer T in the embodiments is equivalent to a timer means according to the present invention.

Reference Signs List

[0080]

4 coin tube
7 payout slide
50 payout controller
M drive motor
T timer

Claims

1. A coin payout device (1) configured to sequentially pay out coins in a coin tube (4) through predetermined movement of a movable member (7) by a driving force from a drive motor (M), the movable member (7) being provided below the coin tube (4), the coin payout device (1) comprising:

   a payout determining means for determining payout of a coin;
   a payout control means for paying out the coin through movement of the movable member (7) by a predetermined amount by driving the drive motor (M) based on a result of determination by the payout determining means;
   an operation input means that can be operated by an operator;
   an operation signal output means for outputting an operation signal based on an operation inputted to the operation input means; and
   a motor driving means for driving the drive motor (M) based on the operation signal outputted from the operation signal output means,
   wherein the motor driving means drives the drive motor (M) with an amount of driving smaller than an amount of driving of the drive motor (M) for which the payout control means pays out the coin.

2. The coin payout device (1) according to claim 1, further comprising a timer means (T) for timing a period of time over which the drive motor (M) is driven by the motor driving means, wherein:

   the motor driving means drives the drive motor (M) when the operation signal is outputted, and stops driving the drive motor (M) when the timer means times a preset drive stopping time; and
   a period of time until the drive stopping time is set shorter than an average period of time over which the drive motor (M) is driven while the payout control means pays out the coin.

3. The coin payout device (1) according to one of claim 1 and claim 2, wherein the amount of driving of the drive motor (M) driven by the motor driving means is equal to or smaller than half of an amount of driving of the drive motor (M) driven by the payout control means.

4. A coin payout device (1) configured to sequentially pay out coins in a coin tube (4) through predetermined movement of a movable member (7) by a driv-

ing force from a drive motor (M), the movable member (7) being provided below the coin tube (4), the coin payout device (1) comprising:

a payout determining means for determining payout of a coin;
a payout control means for paying out the coin through movement of the movable member (7) by a predetermined amount by driving the drive motor (M) based on a result of determination by the payout determining means;
an operation input means that can be operated by an operator;
an operation detecting means that is able to detect an operation being inputted to the operation input means; and
a motor driving means for driving the drive motor (M) only while the operation detecting means detects the operation being inputted to the operation input means,
wherein the motor driving means can stop driving the drive motor (M) with a smaller amount of driving of the drive motor (M) than an amount of driving of the drive motor (M) controlled by the payout control means.

5. The coin payout device (1) according to claim 4, wherein:

the operation input means is formed of a push button that can be pushed by the operator; and the operation detecting means detects a start of the operation when the push button is pushed, and detects termination of the operation when the push button is released from being pushed.

6. The coin payout device (1) according to one of claims 1 to 5, wherein:

the operation input means is configured to be able to operate the drive motor (M) by selecting a driving direction of the drive motor (M); and
the motor driving means drives the drive motor (M) in a direction according to the operation inputted to the operation input means.

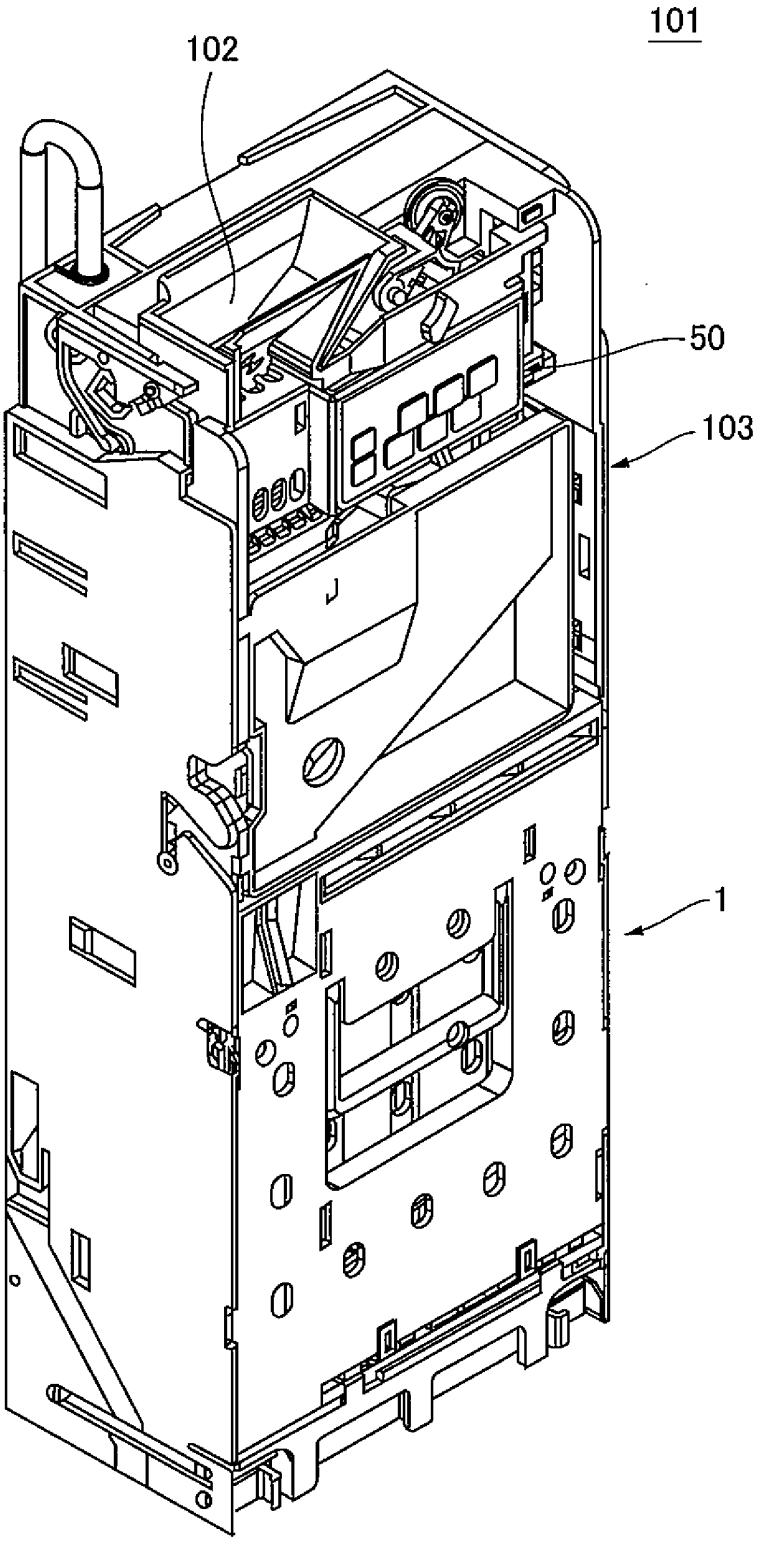


FIG.1

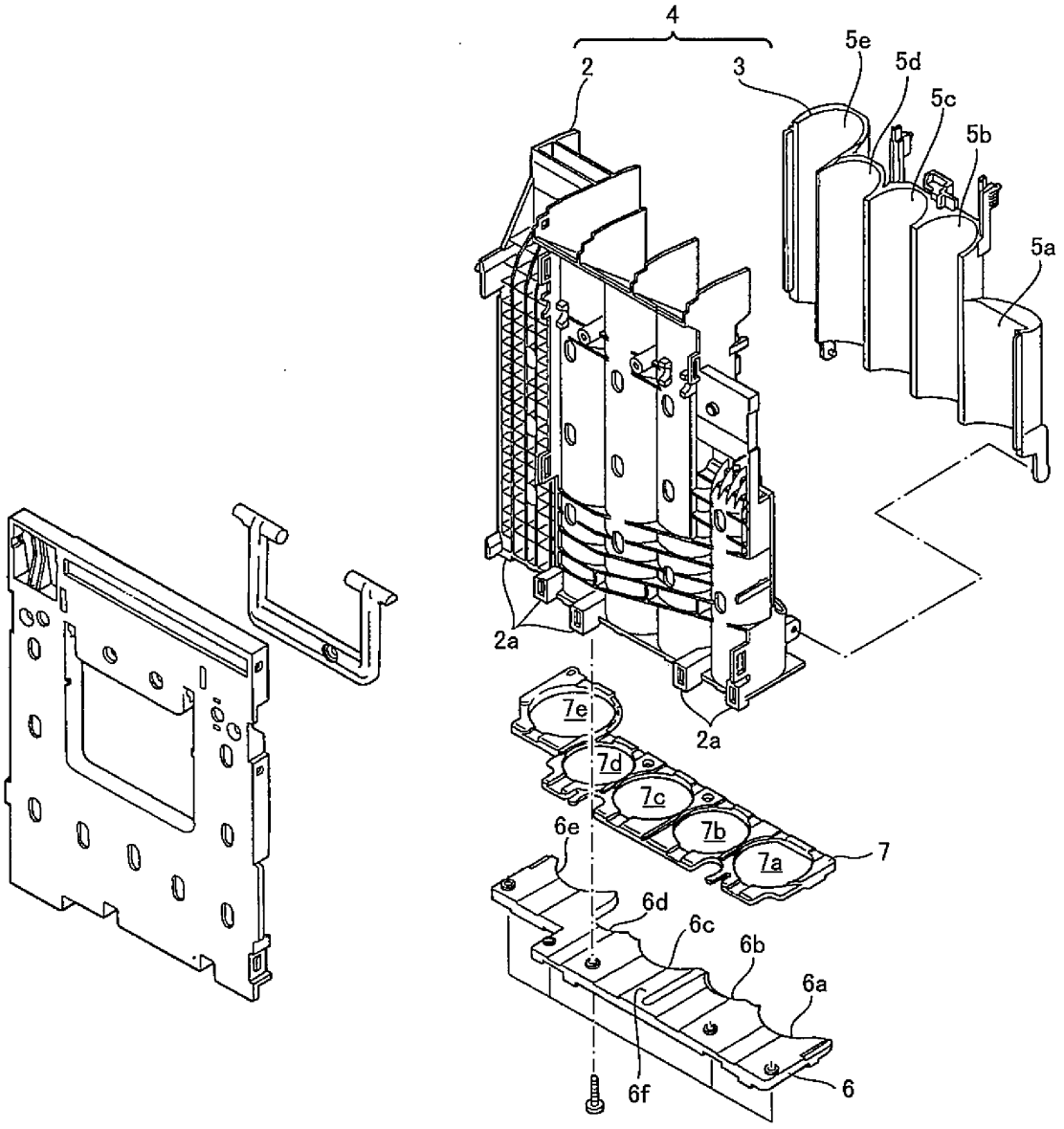
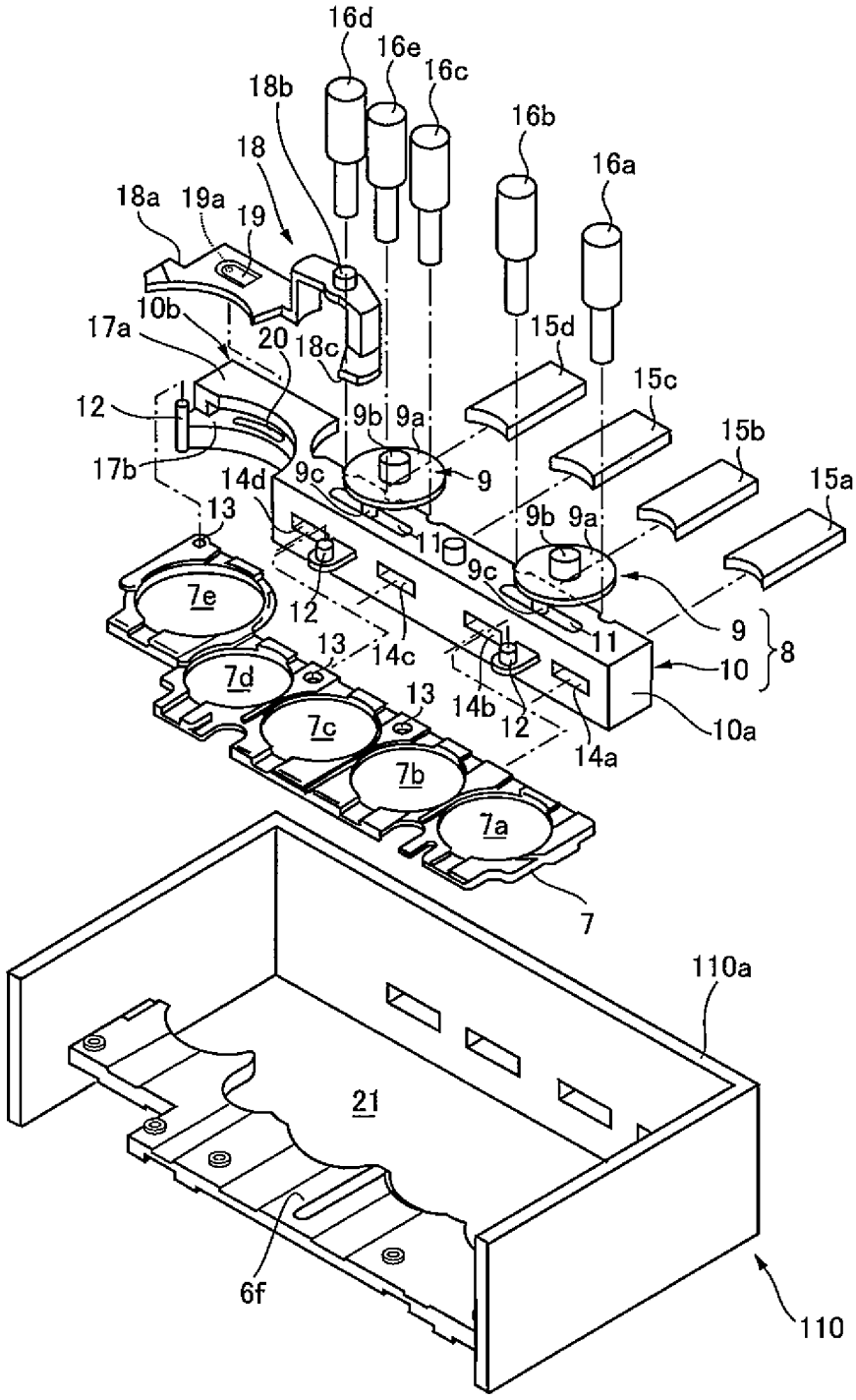


FIG.2


16d
16e
16c
18b
16b
16a
18
18a
19a
19
10b
17a
20
18c
15d
15c
12
9b
9a
15b
17b
14d
9c
9
15a
13
11
9b
9a
9c
7e
12
9
13
14c
11
8
7d
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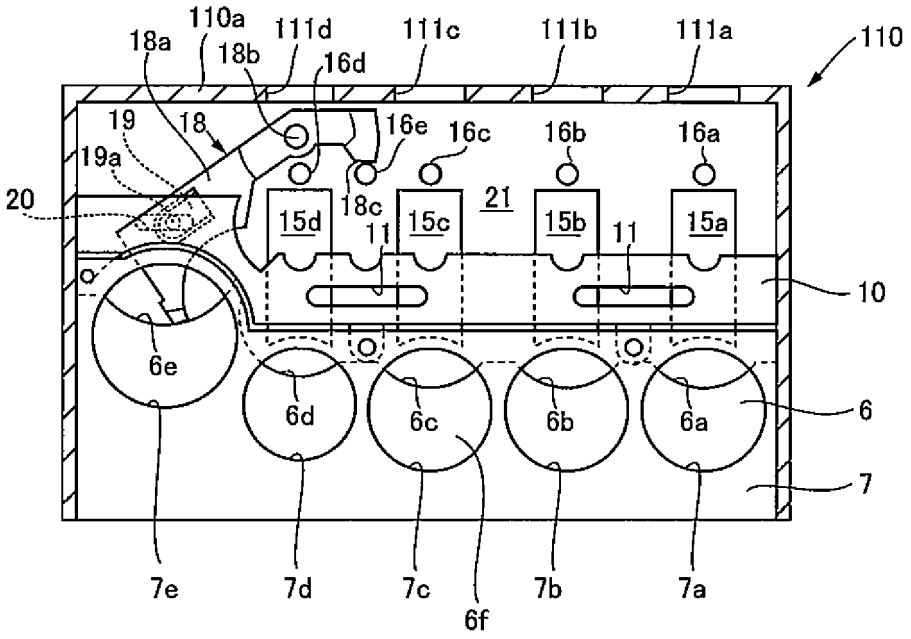
14b
12
10a
7c
14a
7b
7a
7
110a
21
6f
110

FIG.3


110a
111d
111c
111b
111a
110
18a
18b
16d
19
18
16e
16c
16b
16a
19a
20
15d
18c
15c
21
15b
11
15a
11
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6c
6b
6a
6
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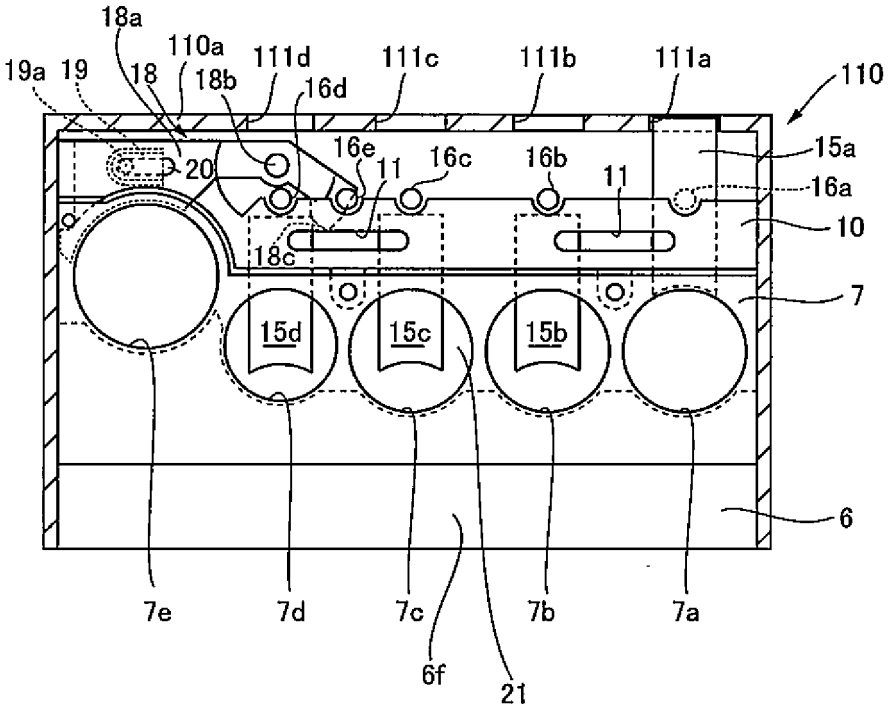
7e
7d
7c
6f
7b
7a

FIG.4


18a
110a
111d
111c
111b
111a
110
19a
19
18
18b
16d
16e
11
16c
16b
11
15a
16a
10
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15d
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15b
6
7e
7d
7c
7b
7a
6f
21

FIG.5

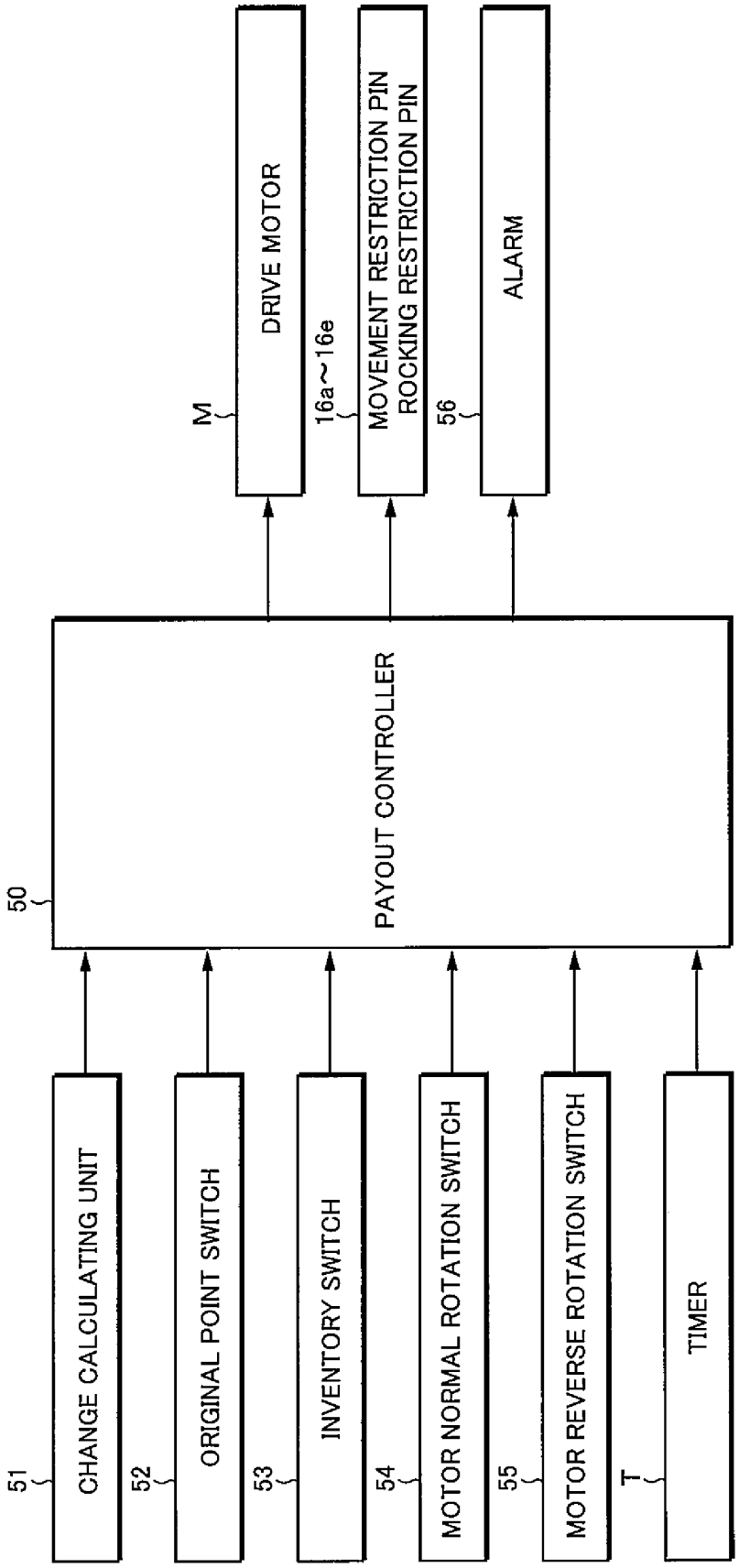
CHANGE CALCULATING UNIT
51
ORIGINAL POINT SWITCH
52
INVENTORY SWITCH
53
MOTOR NORMAL ROTATION SWITCH
54
MOTOR REVERSE ROTATION SWITCH
55
TIMER
T
PAYOUT CONTROLLER
50
DRIVE MOTOR
M
MOVEMENT RESTRICTION PIN
ROCKING RESTRICTION PIN
16a~16e
ALARM
56

FIG.6

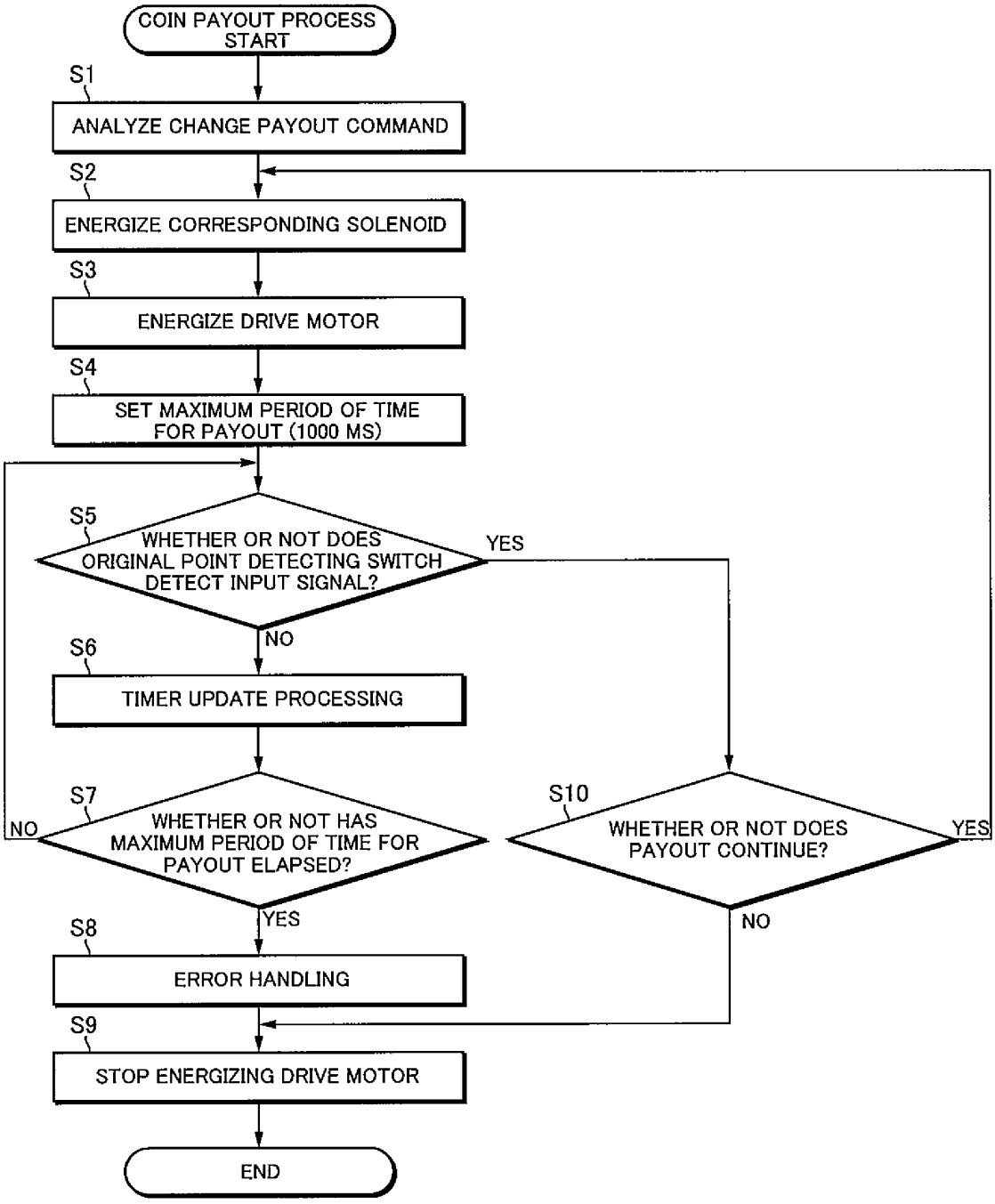
COIN PAYOUT PROCESS START
S1
ANALYZE CHANGE PAYOUT COMMAND
S2
ENERGIZE CORRESPONDING SOLENOID
S3
ENERGIZE DRIVE MOTOR
S4
SET MAXIMUM PERIOD OF TIME FOR PAYOUT (1000 MS)
S5
WHETHER OR NOT DOES ORIGINAL POINT DETECTING SWITCH DETECT INPUT SIGNAL?
YES
NO
S6
TIMER UPDATE PROCESSING
S7
WHETHER OR NOT HAS MAXIMUM PERIOD OF TIME FOR PAYOUT ELAPSED?
NO
YES
S8
ERROR HANDLING
S9
STOP ENERGIZING DRIVE MOTOR
END
S10
WHETHER OR NOT DOES PAYOUT CONTINUE?
YES
NO

FIG.7

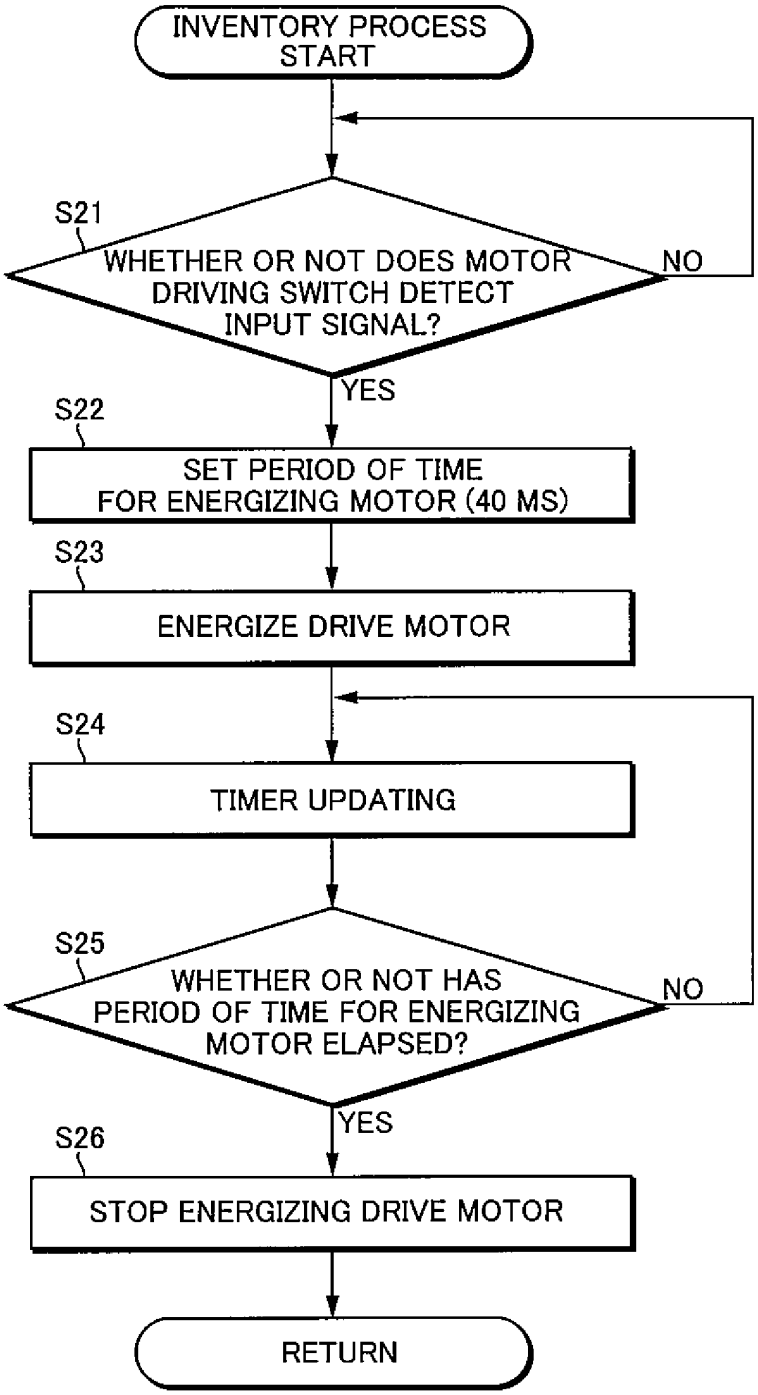
INVENTORY PROCESS START
S21
WHETHER OR NOT DOES MOTOR DRIVING SWITCH DETECT INPUT SIGNAL?
NO
YES
S22
SET PERIOD OF TIME FOR ENERGIZING MOTOR (40 MS)
S23
ENERGIZE DRIVE MOTOR
S24
TIMER UPDATING
S25
WHETHER OR NOT HAS PERIOD OF TIME FOR ENERGIZING MOTOR ELAPSED?
NO
YES
S26
STOP ENERGIZING DRIVE MOTOR
RETURN

FIG.8

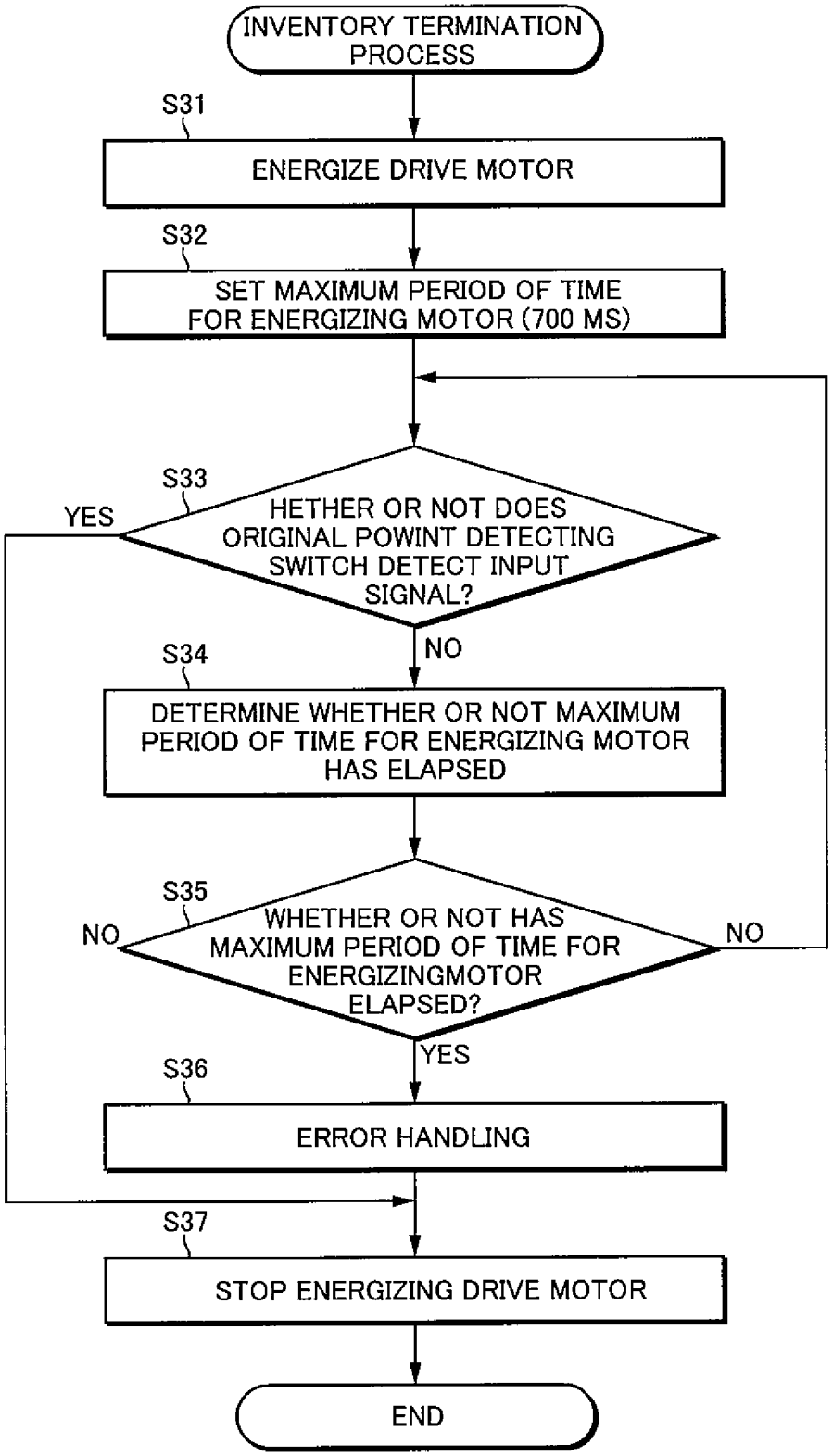
INVENTORY TERMINATION PROCESS
S31
ENERGIZE DRIVE MOTOR
S32
SET MAXIMUM PERIOD OF TIME FOR ENERGIZING MOTOR (700 MS)
S33
HETHER OR NOT DOES ORIGINAL POWINT DETECTING SWITCH DETECT INPUT SIGNAL?
YES
NO
S34
DETERMINE WHETHER OR NOT MAXIMUM PERIOD OF TIME FOR ENERGIZING MOTOR HAS ELAPSED
S35
WHETHER OR NOT HAS MAXIMUM PERIOD OF TIME FOR ENERGIZINGMOTOR ELAPSED?
NO
NO
YES
S36
ERROR HANDLING
S37
STOP ENERGIZING DRIVE MOTOR
END

FIG.9

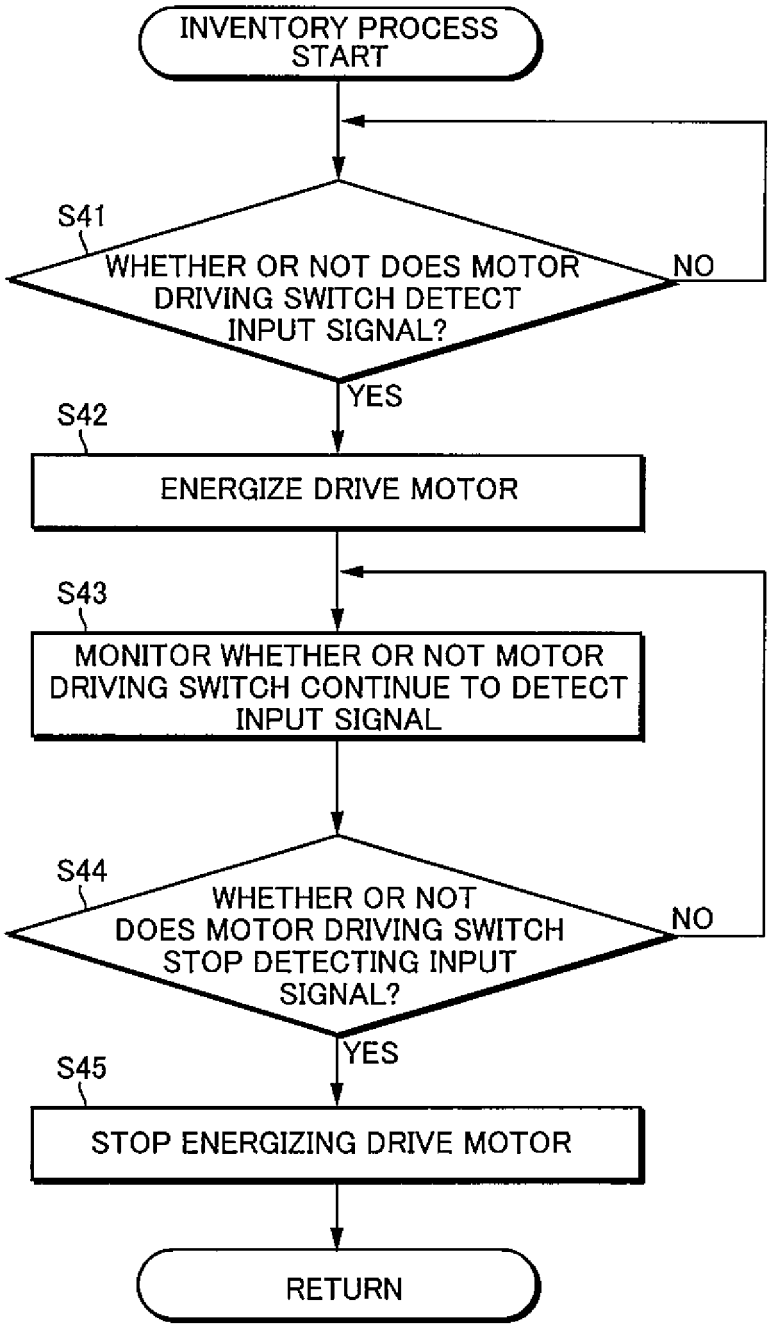
INVENTORY PROCESS START
S41
WHETHER OR NOT DOES MOTOR DRIVING SWITCH DETECT INPUT SIGNAL?
NO
YES
S42
ENERGIZE DRIVE MOTOR
S43
MONITOR WHETHER OR NOT MOTOR DRIVING SWITCH CONTINUE TO DETECT INPUT SIGNAL
S44
WHETHER OR NOT DOES MOTOR DRIVING SWITCH STOP DETECTING INPUT SIGNAL?
NO
YES
S45
STOP ENERGIZING DRIVE MOTOR
RETURN

FIG.10

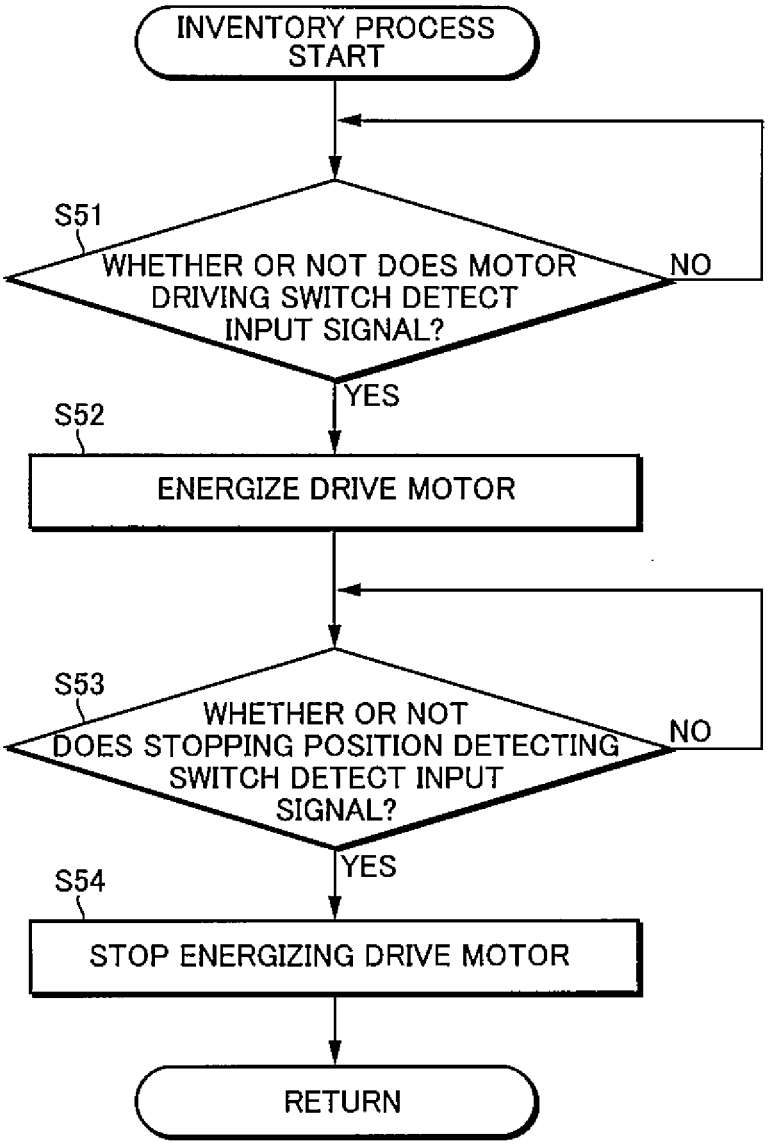
INVENTORY PROCESS START
S51
WHETHER OR NOT DOES MOTOR DRIVING SWITCH DETECT INPUT SIGNAL?
NO
YES
S52
ENERGIZE DRIVE MOTOR
S53
WHETHER OR NOT DOES STOPPING POSITION DETECTING SWITCH DETECT INPUT SIGNAL?
NO
YES
S54
STOP ENERGIZING DRIVE MOTOR
RETURN

FIG.11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2011/000894

A. CLASSIFICATION OF SUBJECT MATTER
G07D1/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G07D1/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2011
Kokai Jitsuyo Shinan Koho	1971-2011	Toroku Jitsuyo Shinan Koho	1994-2011

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 8-124001 A (Nippon Conlux Co., Ltd.), 17 May 1996 (17.05.1996), & US 5679070 A & KR 10-0164260 B	1-6
Y	JP 8-129660 A (Matsushita Electric Industrial Co., Ltd.), 21 May 1996 (21.05.1996), (Family: none)	1-3,6
Y	JP 49-27297 A (Omron Tateisi Electronics Co.), 11 March 1974 (11.03.1974), (Family: none)	4,5

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"&" document member of the same patent family

Date of the actual completion of the international search 01 June, 2011 (01.06.11)	Date of mailing of the international search report 14 June, 2011 (14.06.11)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2001357426 A **[0004]**