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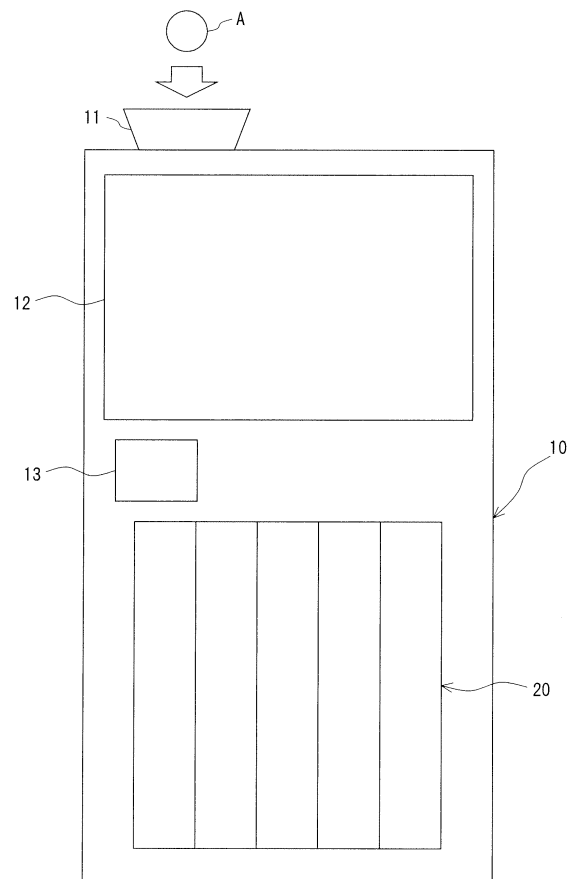
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(54) **Coin paying apparatus**

(57) A coin paying apparatus 20, comprising a motor 25 and solenoids 26A-26E capable of simultaneously paying a plurality of coins A, a voltage sensor 23 for detecting a supply voltage to the motor 25 and the solenoids 26A-26E, and a control unit 22 for controlling the maximum value of the simultaneously paid out number of coins A simultaneously paid by the motor 25 and the solenoids 26A-26E based on the voltage detected by the voltage sensor 23.

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Description

(i) Field of the invention

[0001] The present invention relates to a coin paying apparatus provided, for example, in an automatic vending machine, and paying out a difference between an input amount and a vend item price.

[0002] Heretofore, as this type of a coin paying apparatus, there has been known an apparatus, in which when a power source is supplied to a coin paying motor, a projection of a rotary cam is projected inside a corresponding cam-groove of a pay-out slide corresponding to a coin desired to be paid out by a solenoid plunger independently disposed every rotary cam rotated in the same phase, and as a result, a plurality of pay-out slides are simultaneously driven, so that a plurality of coins stored in the coin passage hole inside the pay-out slide are simultaneously paid out (for example, see Japanese Patent Publication No.HB-44921).

[0003] In general, to simultaneously pay out a plurality of coins, it is necessary to simultaneously drive coin paying out means such as a plurality of motors and solenoids, and this makes a load placed on the power source of the coin paying out means great.

[0004] However, according to the conventional coin paying apparatus, since a plurality of coins are simultaneously payable, when the voltage of the power supply is lowered and the supply voltage to the coin paying out means is lowered, there are often the cases where a part or the whole of the coin paying out means do not operate normally because of the lowered torque of the motor, and this has caused a problem that the coin is clogged or not paid out when it is to be paid out.

[0005] The present invention has been made in view of the above described problem, and an object of the invention is to provide a coin paying apparatus capable of stably paying out a coin even when the supply voltage to coin paying out means is lowered.

[0006] To achieve the object of the present invention, a coin paying apparatus is proposed, in which the coin paying out means capable of simultaneously paying a plurality of coins, voltage detection means for detecting the supply voltage to the coin paying out means, and control means for controlling the maximum value of the simultaneously paid out number of coins simultaneously paid out by the coin paying out means based on the voltage detected by the voltage detection means are provided.

[0007] According to the present invention, since the maximum value of the simultaneously paid out number of coins is controlled based on the voltage detected by the voltage detection means, when the supply voltage to the coin paying out means, for example, is lowered, the maximum value of the simultaneously paid out number of coins can be reduced, and this can reduce the possibility that the coin is clogged or not paid out when a plurality of coins are to be paid out, and even when the supply

voltage to the coin paying out means is lowered, the coin paying out can be continued, and a stable paying out of the coin can be performed.

[0008] The above and other objects, and features and advantages of the present invention will be apparent from the following description with reference to the accompanying drawings.

[0009] In the Drawings;

FIG. 1 is a schematic front view of a coin processing apparatus;

FIG. 2 is an oblique view of a coin paying apparatus shown in FIG. 1;

FIG. 3 is a front view showing a coin stored in a coin tube shown in FIG. 2;

FIG. 4 is another front view showing the coin stored in the coin tube shown in FIG. 2;

FIG. 5 is a principal part enlarged view of the coin paying apparatus shown in FIG. 2;

FIG. 6 is a block diagram showing a control system configuration of a coin paying apparatus main body shown in FIG. 2;

FIG. 7 is a flowchart explaining the operation of the coin paying apparatus shown in FIG. 2;

FIG. 8 is a view to explain the operation to pay out the coin from the coin tube shown in FIG. 3;

FIG. 9 is a view to explain the operation to pay out the coin from the coin tube shown in FIG. 3;

FIG. 10 is another view to explain the operation to pay out the coin from the coin tube shown in FIG. 3; and

FIG. 11 is another flowchart explaining the operation of the coin paying apparatus shown in FIG. 2.

Detailed description of the invention

[0010] FIGS. 1 to 11 show one embodiment of the present invention. FIG. 1 is a schematic front view of a coin processing apparatus; FIG. 2 is an oblique view of a coin paying apparatus shown in FIG. 1; FIG. 3 is a front view showing a coin stored in a coin tube shown in FIG. 2; FIG. 4 is another front view showing the coin stored in the coin tube shown in FIG. 2; FIG. 5 is a principal part enlarged view of the coin paying apparatus shown in FIG. 2; FIG. 6 is a block diagram showing a control system configuration of a coin paying apparatus main body shown in FIG. 2; FIG. 7 is a flowchart explaining the operation of the coin paying apparatus shown in FIG. 2; FIG. 8 is a view to explain the operation to pay out the coin from the coin tube shown in FIG. 3; FIG. 9 is a view to explain the operation to pay out the coin from the coin tube shown in FIG. 3; FIG. 10 is another view to explain the operation to pay out the coin from the coin tube shown in FIG. 3; and FIG. 11 is another flowchart explaining the operation of the coin paying apparatus shown in FIG. 2.

[0011] As shown in FIG. 1, when a coin processing apparatus 10 is inputted with a coin A from a coin input port 11 provided in the upper portion, a coin processing

apparatus main body 12 checks the authenticity of the coin A, and stores the true coin in a coin paying apparatus 20 or pays out the coin A stored in the coin paying apparatus 20, and is operated by a built-in power source 13. In the present embodiment, though the power source 13 is incorporated, it is not limited to this, and the power may be supplied from the outside of the coin processing apparatus 10, for example, from an automatic vending machine provided with a coin processing apparatus 10.

[0012] The coin paying apparatus 20 provided inside the coin processing apparatus 10, as shown in FIG. 2, is formed of a coin paying apparatus main body 21, and five coin tubes 31 to 35 as well as sliders 41 to 45 of the same configuration.

[0013] The coin tubes 31 to 35 store the coin A, respectively, and are disposed mutually adjacent, and store the coin A discriminated as true by the coin processing apparatus main body 12 for each coin species. In the present embodiment, for example, as shown in FIG. 3, a 50 cent coin A1 is stored in the coin tube 31, a 20 cent coin A2 in the coin tube 32, and a 10 cent coin A3 in the coin tube 33, and a 5 cent coin A4 in the coin tube 34, a 1 cent coin A5 in the coin tube 35 for each species of the coin A, but it is not limited to this, and for example, as shown in FIG. 4, the 50 cent coin A1 may be stored in the coin tubes 31 and 32, and the coins of the same species may be stored in different coin tubes.

[0014] Below the coin tubes 31 to 35, the sliders 41 to 45 are provided, respectively, and the sliders 41 to 45 slide as shown by arrows of FIG. 5 respectively by a motor and solenoids described later. The slider 41 stores the coin of the lowest position stored inside the coin tube 31 into a hole 41a, and pays out the coin to a coin paying out port (not shown) provided below one by one. Since the sliders 42 to 45 are the same as the slider 41, the description thereof will be omitted.

[0015] As shown in FIG. 6, the coin paying apparatus main body 21 is formed of a control unit 22, a voltage sensor 23, a communication unit 24, a motor 25, and solenoids 26A to 26E, and operates by the voltage, for example, the voltage of 12 [V] supplied from the power source 13 of the coin processing apparatus 10.

[0016] The control unit 22 controls the whole of the coin paying apparatus main body 21, and is connected with the voltage sensor 23, the communication unit 24, the motor 25, and the solenoids 26A to 26E. The control unit 22 is made of a known computer provided with a CPU and a memory such as a RAM and a ROM, and based on the program stored inside its own memory and the data inputted from the voltage sensor 23 and the communication unit 24, outputs a control signal to the motor 25, the solenoids 26A to 26E, and the communication unit 24.

[0017] The voltage sensor 23 detects the voltage supplied to the motor 25 and the solenoids 26A to 26E, and converts the detected voltage signal into voltage data by a known A/D converter circuit and the like, and outputs the same to the control unit 22. The motor 25 and the

solenoids 26A to 26E are usually applied with a voltage of 12 [V].

[0018] The communication unit 24 communicates with the coin processing apparatus main body 12, and based on the control signal inputted from the control unit 22, transmits a paid-up data to the coin processing apparatus main body 12, and receives a paying out command and the paying amount data from the coin processing apparatus main body 12, and outputs the same to the control unit 22.

[0019] The motor 25 is a drive source of the sliders 41 to 45 described above, and the respective solenoids 26A to 26E are disposed correspondingly to the respective sliders 41 to 45. The motor 25 and the solenoids 26A to 26E operate based on the control signal inputted from the control unit 22, thereby to drive the desired sliders 41 to 45, and are allowed to pay out one to five coins A from the coin tubes 31 to 35. In the present embodiment, though the sliders 41 to 45 are driven by using the motor 25 and the solenoids 26A to 26E, it is not limited to this, and the motor alone or the solenoids alone or other drive means may be used irrespective of a single or a plural quantity.

[0020] The coin paying apparatus 20, when supplied with the power from the power source 13 and activated, performs the processing shown in FIG. 7.

[0021] That is, the control unit 22 determines whether or not the paying out command received from the coin processing apparatus main body 12 through the communication unit 24 is inputted (step S11), and repeats the processing of step S11 until the paying out command is inputted.

[0022] When the paying out command is inputted, the control unit 22 determines whether or not the voltage data inputted from the voltage sensor 23 is 8 [V] or more (step S12).

[0023] When the voltage data is 8 [V] or more, determining that the voltage supplied to the motor 25 and the solenoids 26A to 26E is normal, the control unit 22 drives the motor 25 and the solenoids 26A to 26E, thereby to set an upper limit of the number of the coins A simultaneously paid up (hereinafter, referred to as the simultaneously paid out number of coins) to five (step S13).

[0024] As a determination result of step S12, when the voltage data is below 8 [V], determining that the voltage supplied to the motor 25 and the solenoids 26A to 26E is abnormal, the control unit 22 sets a upper limit of the simultaneously paid out number of coins to two (step S14). As a result, when the supply voltage to the motor 25 and the solenoids 26A to 26E is lowered, the maximum value of the simultaneously paid out number of coins is reduced.

[0025] After the processing of step S13 or step S14, the control unit 22 performs paying out processing based on the set upper limit of the simultaneously paid out number of coins and paying amount data received together with the paying out command from the coin processing apparatus main body 12 through the commu-

nication unit 24 (step S15). That is, the control unit 22 drives the motor 25 and the solenoids 26A to 26E, thereby to pay out the coin A corresponding to the paying amount data with the set simultaneously paid out number of coins taken as an upper limit, and after the completion of the paying out, transmits the paid-up data to the coin processing apparatus main body 12 through the communication unit 24.

[0026] Specifically, in the coin tubes 31 to 35 shown in FIG. 3, when the control unit 22 receives the paying amount data of 75 cents, in the case where the upper limit of the simultaneously paid out number of coins is set to five by the processing of step S13, as shown in FIG. 8, the control unit 22 pays out a 50 cent coin A1 from the coin tube 31, a 20 cent coin A2 from the coin tube 32, and a 5 cent coin A4 from the coin tube 34, respectively simultaneously. As a result, when a plurality of coins A are to be paid out, the paying out time can be shortened.

[0027] Further, when the upper limit of the simultaneously paid out number of coins is set to two by the processing of step S14, as shown in FIG. 9, the control unit 22 pays out simultaneously a 50 cent coin A1 from the coin tube 31 and a 20 cent coin A2 from the coin tube 32, respectively (first paying out), and next, pays out a 5 cent coin A4 from the coin tube 34 (second paying out). As a result, when the supply voltage to the motor 25 and the solenoids 26A to 26E is below the predetermined value, in the case where a plurality of coins A are to be paid out, the possibility of the coin A being clogged or not paid out can be lowered than when the supply voltage is above the predetermined value.

[0028] In the present embodiment, though the upper limit of the simultaneously paid out number of coins is set to two in the processing of step S14, it is not limited to this, and the number can be any number smaller than five and can even be one. When the upper limit of the simultaneously paid out number of coins is set to one in the processing of step S14, and moreover, the control unit 22 receives the paying amount data of 75 cent in the coin tubes 31 to 35 shown in FIG. 3, as shown in FIG. 10, the control unit 22 pays out a 50 cent coin A1 from the coin tube 31 (first paying out), and next, pays out a 20 cent coin A2 from the coin tube 32 (second paying out), and finally, pays out a 5 cent coin A4 from the coin tube 34 (third paying out). As a result, when the plural number of coins A is paid out, the possibility of the coins A being clogged or not paid out can be further lowered.

[0029] Further, as shown in FIG. 11, as a result of the determination at step S12, when the voltage data is below 8 [V], in place of the processing of step S14, the control unit 22 determines whether or not the voltage data inputted from the voltage sensor 23 is 6 [V] or more (step S16).

[0030] When the voltage data is 6 [V] or more, that is, the voltage data is not less than 6 [V] and less than 8 [V], the control unit 22 may set the upper limit of the simultaneously paid out number of coins to two (step S17), and when the voltage data is below 6 [V], the control unit 22

may set the upper limit of the simultaneously paid out number of coins to one (step S18). As a result, based on the supply voltage to the motor 25 and the solenoids 26A to 26E, the maximum value of the simultaneously paid out number of coins can also be reduced step by step.

[0031] In this manner, according to the present invention, based on the voltage data detected by the voltage sensor 23, the maximum value of the simultaneously paid out number of coins is set, and therefore, for example, when the supply voltage to the motor 25 and the solenoids 26A to 26E is lowered, the maximum value of the simultaneously paid out number of coins can be reduced, and this reduces the possibility of the coins A being clogged or not paid out when a plurality of coins A are to be paid out, and even when the supply voltage to the motor 25 and the solenoids 26A to 26E is lowered, the paying out of the coin A can be continued, and a stable paying out of the coin A can be performed.

[0032] Further, when the supply voltage to the motor 25 and the solenoids 26A to 26E is below 8 [V], the maximum value of the simultaneously paid out number of coins is reduced from the maximum value of the simultaneously paid out number of coins when the supply voltage to the motor 25 and the solenoids 26A to 26E is 8 [V] or more, and therefore, in the case where the supply voltage to the motor 25 and the solenoids 26A to 26E is below the predetermined value, the possibility of the coin A being clogged or not paid out when a plurality of coins A are to be paid out can be further reduced than when the supply voltage is equal to or more than the predetermined value, and therefore, even when the supply voltage to the motor 25 and the solenoids 26A to 26E is lower than the ordinary voltage, the paying out of the coin A can be continued, and a stable paying out of the coin A can be performed.

[0033] Further, when the supply voltage to the motor 25 and the solenoids 26A to 26E is 8 [V] or more, the maximum value of the simultaneously paid out number of coins is set to the maximum value of the number of coins simultaneously payable by the motor 25 and the solenoids 26A to 26E, and therefore, when a plurality of coins A are to be paid out, the paying time can be shortened, thereby to improve customer service.

[0034] Further, when the supply voltage to the motor 25 and the solenoids 26A to 26E is below 8 [V], the maximum value of the simultaneously paid out number of coins is set to one, and therefore, in the case where the supply voltage to the motor 25 and the solenoids 26A to 26E is below the predetermined value, the possibility of the coin A being clogged or not paid out when a plurality of coins A are to be paid out can be further reduced, and therefore, even when the supply voltage to the motor 25 and the solenoids 26A to 26E is lowered than the ordinary voltage, a paying out of the coin A can be continued, and moreover, a stable paying out of the coin A can be performed.

[0035] The embodiment described herein is exemplary

and not limiting. The scope of the invention is shown by the attached claims, and all the modifications contained in the meaning of those claims are included in the present invention.

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Claims

1. A coin paying apparatus (20), comprising:

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coin paying out means (25,26A-26E) capable of simultaneously paying a plurality of coins;
voltage detection means (23) for detecting a supply voltage to the coin paying out means (25,26A-26E); and
control means (22) for controlling the maximum value of the simultaneously paid out number of coins simultaneously paid out by the coin paying out means (25,26A-26E) based on the voltage detected by voltage detection means (23).

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2. The coin paying apparatus (20) according to claim 1, wherein the control means (22) includes reduction means by which when a voltage detected by the voltage detection means (23) is below a predetermined value, the maximum value of the simultaneously paid out number of coins is reduced than the maximum value of the simultaneously paid out number of coins when the detected voltage is equal to or more than said predetermined value.

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3. The coin paying apparatus (20) according to claim 1, wherein the control means (22) includes means for setting the maximum value of the simultaneously paid out number of coins to the maximum value of the number of coins payable simultaneously by the coin paying out means (25,26A-26E) when a voltage detected by the voltage detection means (23) is equal to or more than a predetermined value.

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4. The coin paying apparatus (20) according to claim 2, wherein the control means (22) includes means for setting the maximum value of the simultaneously paid out number of coins to the maximum value of the number of coins payable simultaneously by the coin paying out means (25,26A-26E) when a voltage detected by the voltage detection means (23) is equal to or more than a predetermined value.

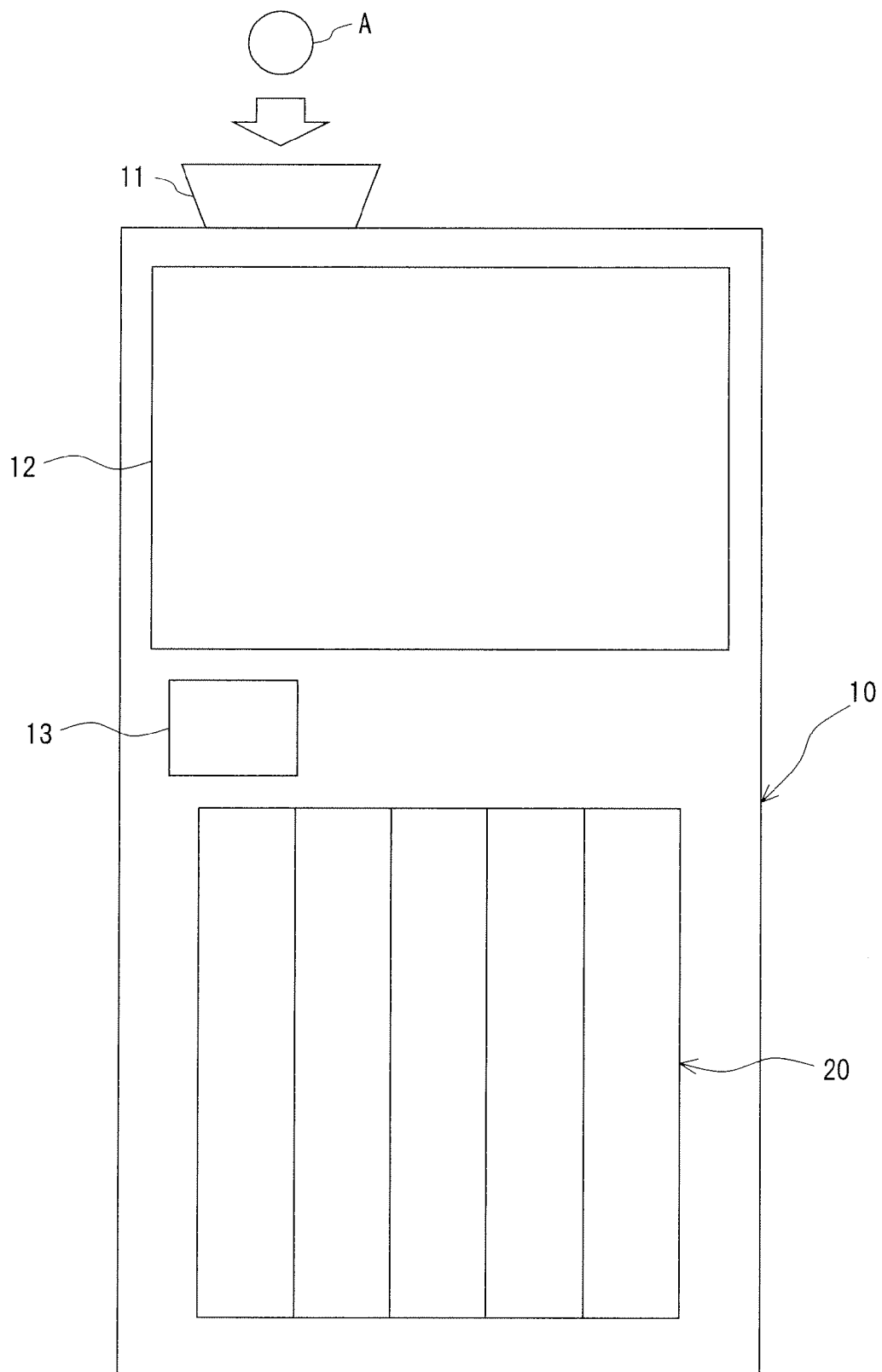
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5. The coin paying apparatus (20) according to claims 2, 3 or 4, wherein the reduction means sets the simultaneously paid out number of coins to one.

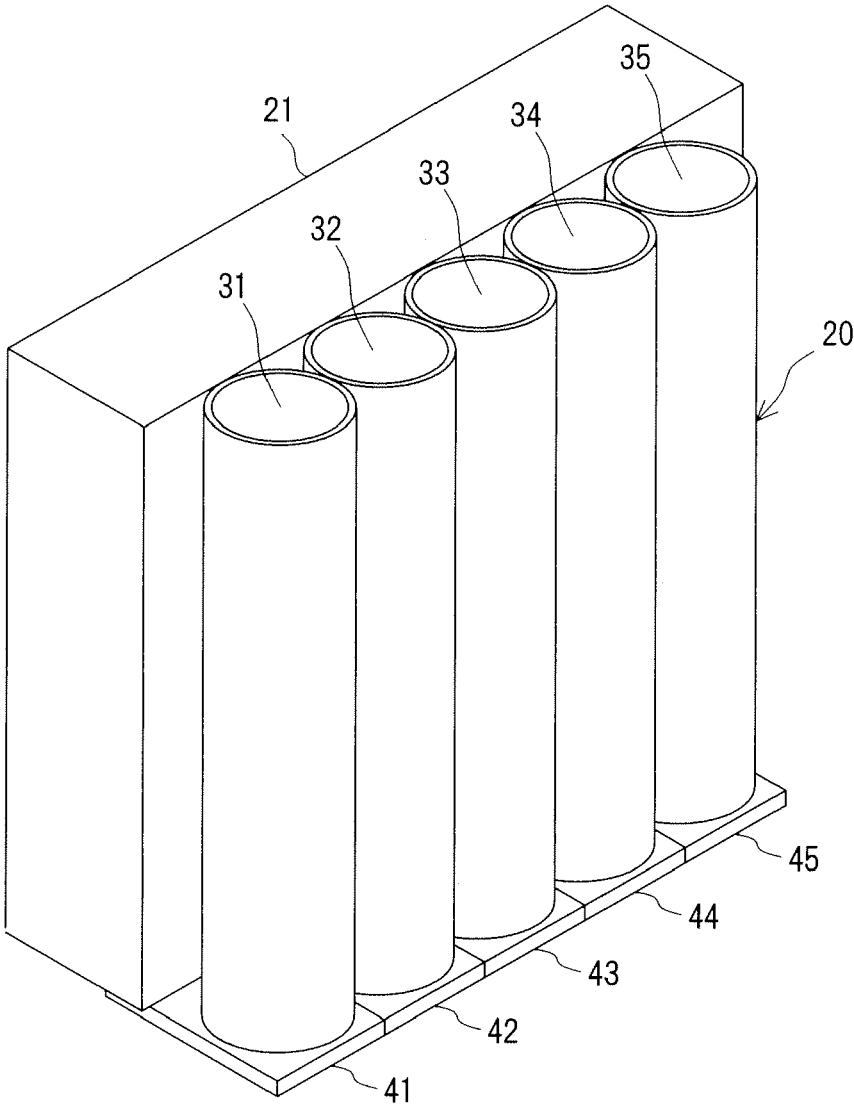
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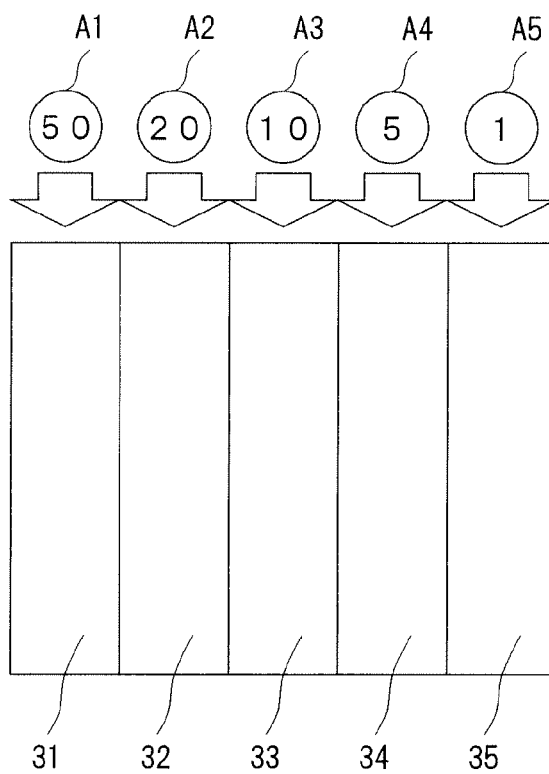
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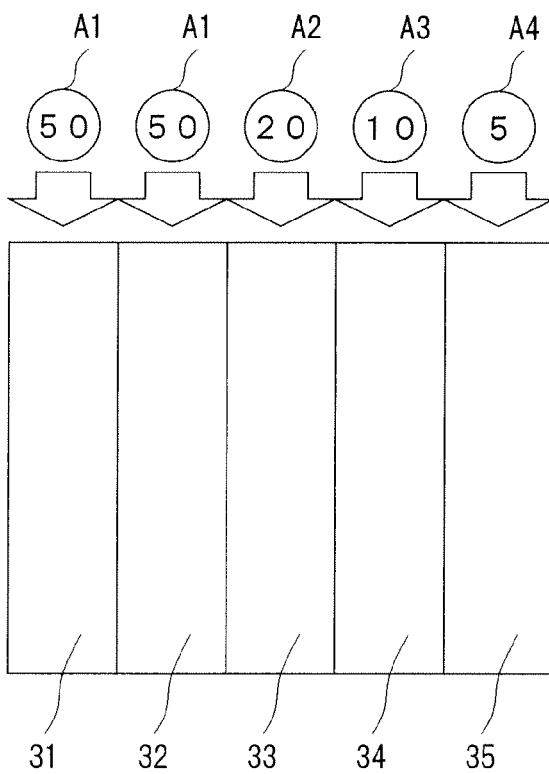
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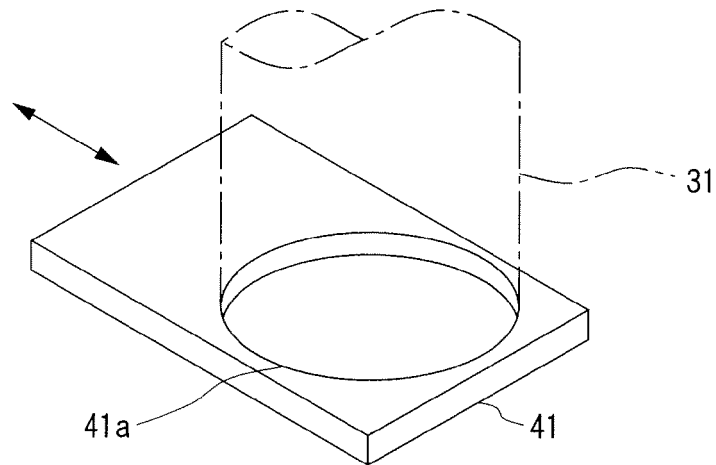
F i g . 3



F i g . 4



F i g . 5



F i g . 6

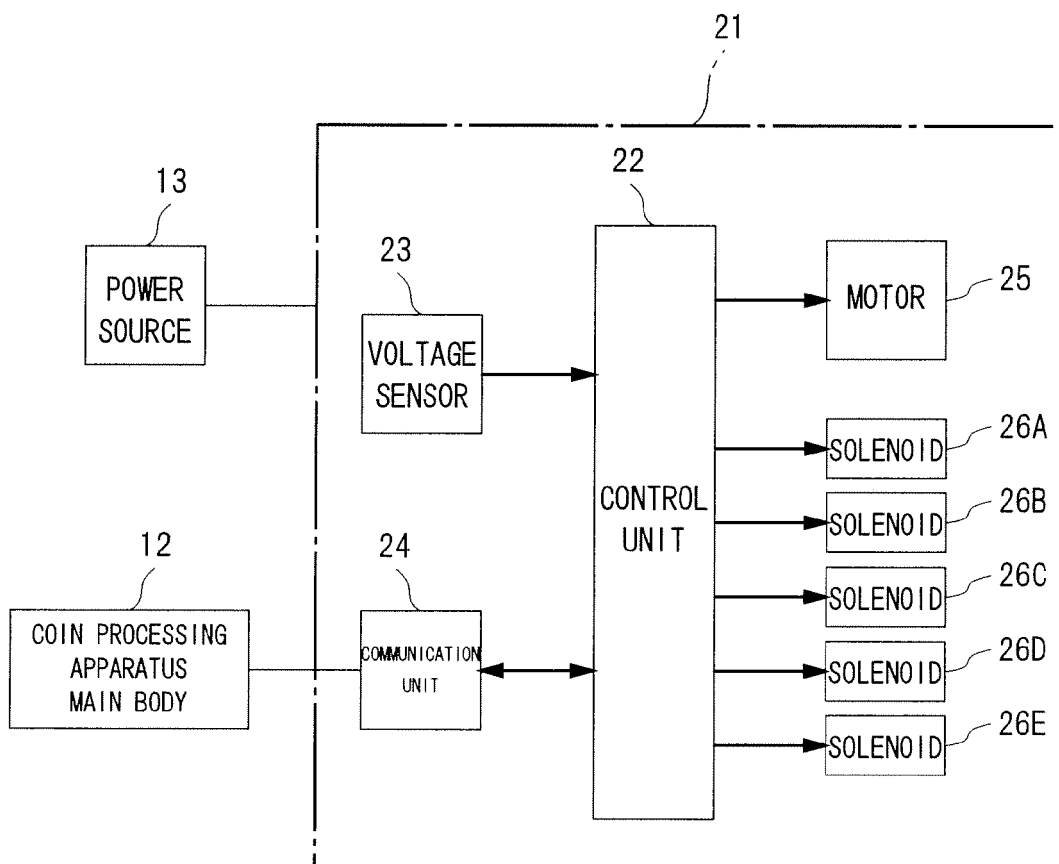


Fig. 7

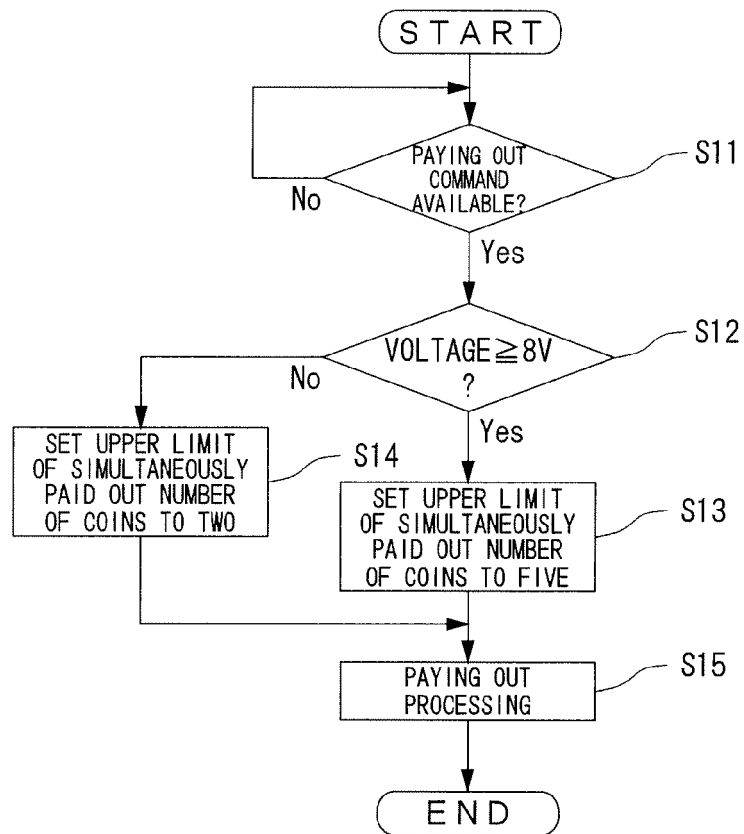
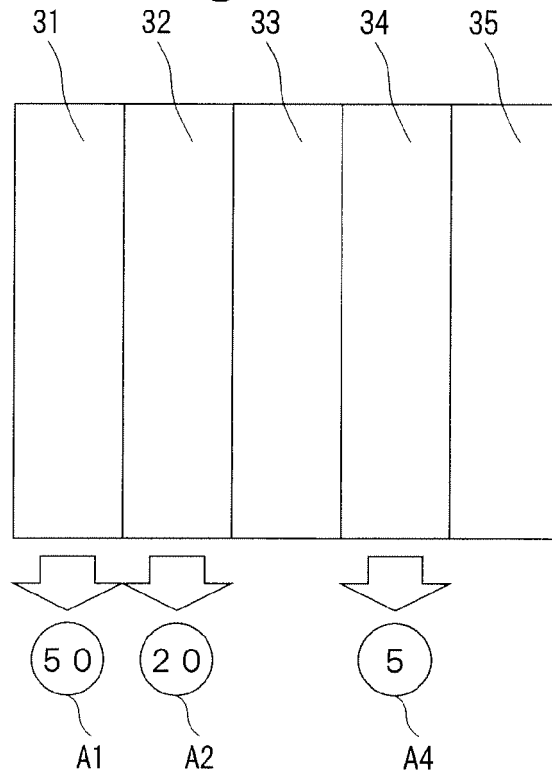
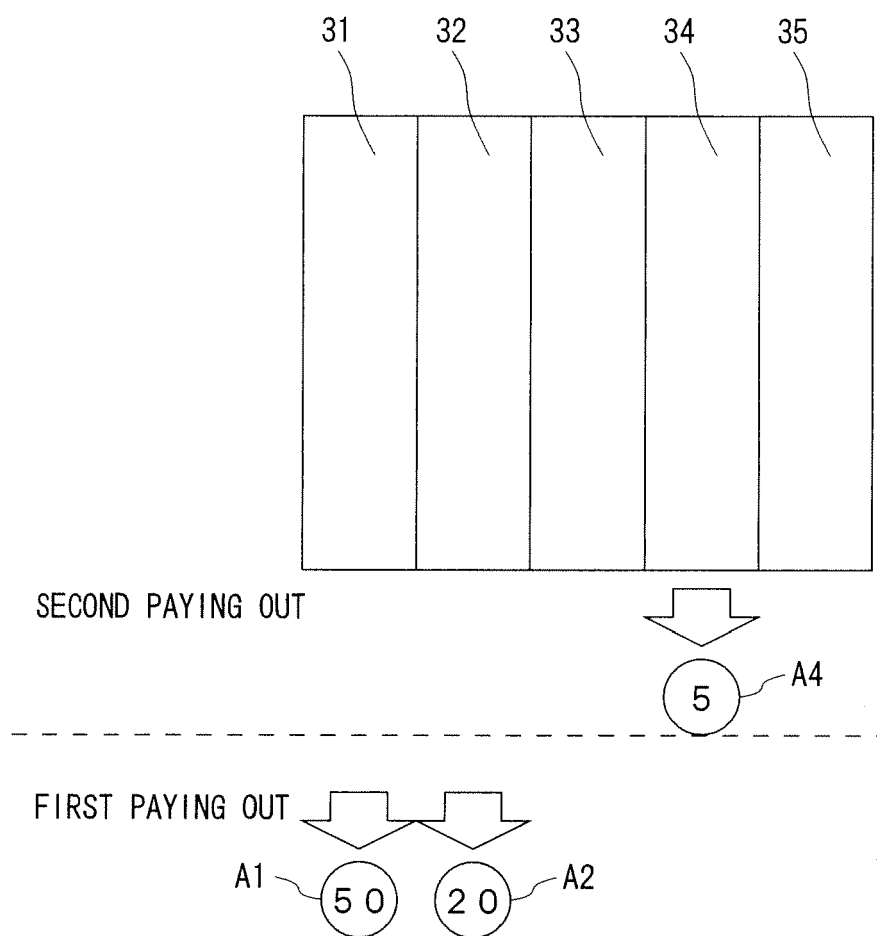


Fig. 8



F i g . 9



F i g . 1 0

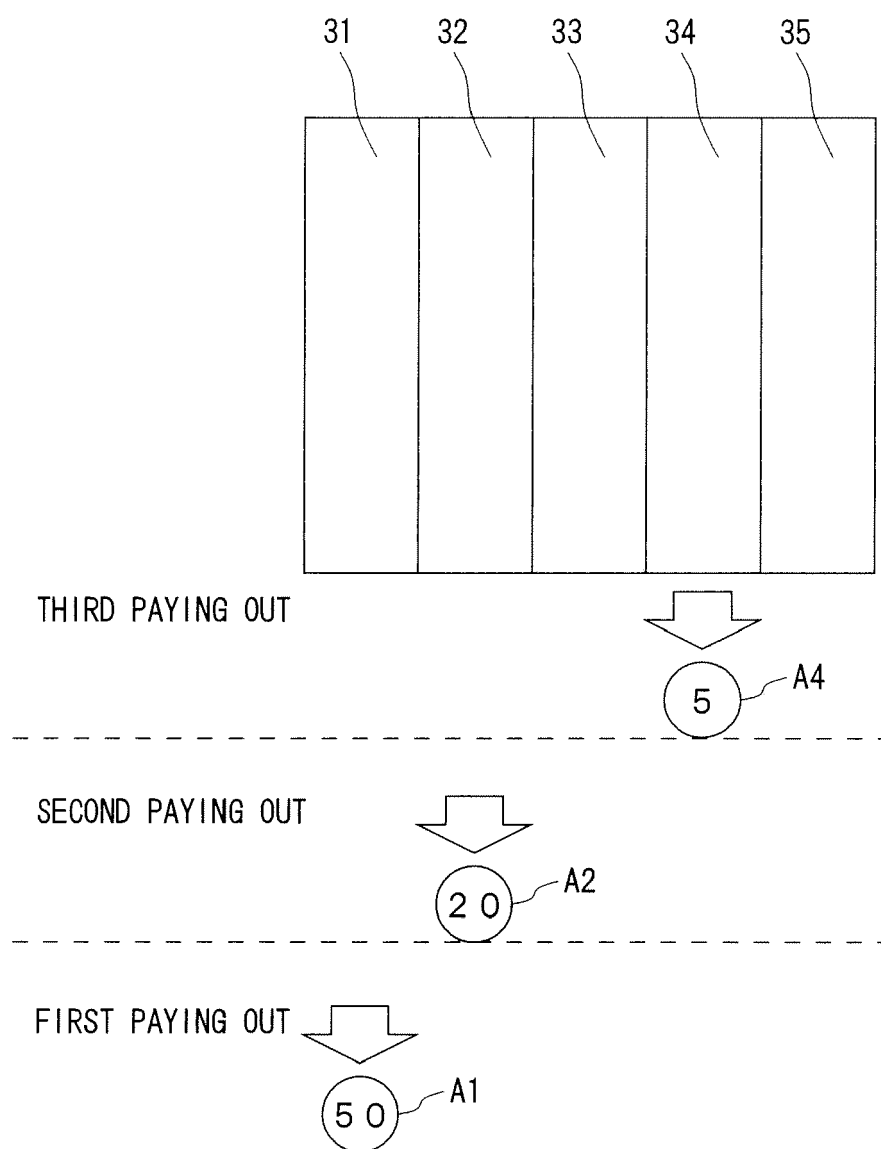


Fig. 11

