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(54) **Vending machine**

(57) If the amount of the inserted cash using a coin mechanism (4) is higher than the price of a commodity selected, a control device (10) controls a non-contact IC card reader/writer (9) so that electronic money corresponding to change is input to a non-contact IC card (100). If this money input process cannot be normally

executed, the control device (10) controls the coin mechanism (4) so that the inserted cash is discharged. If the money input process can be normally executed, the control device (10) controls a commodity delivering device (20) so that the commodity selected is delivered.

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Description

[0001] The present invention relates to a vending machine that sells commodities using electronic money, and in particular, to a process of handling change when a commodity is sold.

[0002] A conventional vending machine comprises a coin mechanism which identifies and houses the inserted coins and which discharges change, commodity selection buttons provided for the respective commodities and used to select any of the commodities on sale, a commodity delivering device that delivers commodities selected using any of the commodity selection buttons, and a control device that controls various devices. Further, each of the commodity selection buttons has a ready lamp indicating that the commodity corresponding to the commodity selection button is available. When a user inserts coins to the vending machine, the machine lights the ready lamps corresponding to commodities at prices equal to or more inexpensive than the amount of the inserted money. Then, when one of the commodity selection buttons whose ready lamps are lighted is pressed, the commodity corresponding to the button is delivered. If the amount of the inserted money exceeds the price of the commodity, then after delivering the commodity, the machine discharges the difference between the amount of the inserted money and the price of the commodity as change.

[0003] In recent years, vending machines have emerged which can sell commodities not only with cash but also with electronic money by using an IC card functioning as an electronic wallet. Japanese Patent Publication 2002-170151 proposes, as a function of such a vending machine, a method for filling change into an IC card as electronic money when a commodity is sold in cash.

[0004] When data is written to or read from an IC card, an error may occur for some reason to make the write or read fail. However, the vending machine described in the above patent document is not adapted to handle such errors. Thus, disadvantageously, users may not receive change. However, the vending machine described in the patent document uses what is called a contact type IC card having a contact section connected to an IC card reader/writer section of the vending machine. Consequently, the above problem is relatively unlikely to occur. However, for non-contact type IC cards functioning as electronic wallets and which have prevailed in recent years, the incidence of errors is expected to be higher than that for contact type IC cards. Accordingly, this problem is critical.

[0005] It is an object of the present invention to provide a vending machine that avoids precluding change from being delivered to a user, thus allowing commodities to be appropriately sold.

[0006] To accomplish this object, the present invention proposes a vending machine comprising a coin mechanism which identifies and houses the inserted

coins and which discharges change, commodity selecting means for selecting any of commodities on sale, a commodity delivering device that delivers the commodities housed, a non-contact IC chip interface that writes and reads data to and from a non-contact IC chip functioning as an electronic wallet, and a control device that controls sales, the vending machine being characterized in that if the amount of the inserted cash to the coin mechanism is higher than the price of the commodity on sale which is selected using the commodity selecting means, the control device controls the non-contact IC chip interface so that electronic money corresponding to change that is a difference between the amount of the inserted money and the price of the commodity is input to the non-contact IC chip, and if the process of inputting money to the non-contact IC chip cannot be normally executed, the control device controls the coin mechanism so that the inserted cash is discharged, and if the money input process can be normally executed, the control device controls the commodity delivering device so that the commodity selected is delivered.

[0007] According to the present invention, if the process of inputting electronic money corresponding to change to the non-contact IC chip fails, the control device returns the inserted cash without delivering the commodity. If the process of inputting money to the non-contact IC chip cannot be executed, the sale of the commodity is cancelled to obviate the need for change. This avoids precluding change from being delivered to a user, thus allowing the commodities to be appropriately sold. The present invention is applicable to a vending machine comprising a bill validator which identifies and houses the inserted bills.

[0008] Further, the present application proposes that if the commodity discharging process cannot be normally executed, the control device control the non-contact IC chip interface so that electronic money the amount of which is equal to the price of the commodity is input to the non-contact IC chip.

[0009] According to the present invention, if the delivering of the commodity fails, the price of the commodity can be returned to the user as electronic money. It is thus possible to prevent the situation in which the vending machine does not provide the commodity even though it has received the required cash.

[0010] Moreover, the present application proposes the vending machine characterized in that the control device independently stores, in predetermined storage means, money input information including the amount of money input to the non-contact IC chip and sale information including the price of the commodity sold.

[0011] For vending machines of this kind, a company that sells commodities using the vending machines is commonly different from a company that settles electronic money. According to the present application, the information on money input to the non-contact IC chip is stored separately from the commodity sale information. This conveniently eliminates the need for classifying

ing the information in accordance with the companies. Further, when the vending machine comprises output means for outputting the money input information and sale information stored in the storage means, the information can be easily checked. This further improves convenience.

[0012] The objects, configurations, and effects of the present invention other than those previously described will be apparent from the detailed description below.

[0013] In the Drawings;

Fig. 1 is a front view of a vending machine;

Fig. 2 is a block diagram of control in the vending machine; and

Fig. 3 is a flowchart illustrating operations of the vending machine.

[0014] A vending machine according to an embodiment of the present invention will be described with reference to the drawings. Fig. 1 is a front view of the vending machine. Fig. 2 is a block diagram of control in the vending machine. Fig. 3 is a flowchart illustrating operations of the vending machine.

[0015] As shown in Fig. 1, plural sets of a commodity sample 2 and a commodity selection button unit 3 are installed side by side on a front surface of a vending machine 1; each commodity selection button unit 3 is installed closed to the corresponding commodity sample 2. The vending machine 1 also comprises a coin mechanism 4, a bill validator 5, a display 6 composed of 7-segment LED or the like which indicates the number of commodities on sale, the total price of commodities, and the like, and an antenna 7 for communication with a non-contact IC card 100. A commodity delivery port 8 is formed at a lower portion of the front surface of the vending machine 1.

[0016] The button unit 3 is formed of a commodity selection button, a ready lamp composed of a LED or the like and indicating that the corresponding commodity is available, and a sellout lamp composed of a LED or the like and indicating that the commodity is sold out; the button and the lamps are integrated together.

[0017] The coin mechanism 4 identifies the type of an inserted coin through an insert port and notifies a control device 10 of the type. The coin mechanism 4 then accommodates the coin in an inserted coin housing section. Before conveying the inserted coin to the inserted coin housing section, the coin mechanism 4 holds it at a temporary holding position within the coin mechanism. Then, upon receiving an accommodation instruction from the control device 10, the coin mechanism 4 accommodates the coin in the inserted coin housing section. On the other hand, upon receiving a discharge instruction from the control device 10, the coin mechanism 4 discharges the coin to a coin return port. Further, the coin mechanism 4 accommodates change coins in a change coin housing section to discharge a predetermined amount of change on the basis of an instruction

from the control device 10.

[0018] The bill validator 5 identifies the type of an inserted bill through an insert port and notifies the control device 10 of the type. The bill validator 5 accommodates the inserted bill in a bill housing section. Before conveying the inserted bill to the bill housing section, the bill validator 5 holds it at a temporary holding position within the bill validator. Then, upon receiving an accommodation instruction from the control device 10, the bill validator 5 accommodates the bill in the bill housing section. On the other hand, upon receiving a discharge instruction from the control device 10, the bill validator 5 discharges the bill through the insert port.

[0019] The antenna 7 constitutes a part of a non-contact IC card reader/writer 9 that writes and reads data to and from the non-contact IC card 100 in a non-contact manner. When enabled to communicate under the control of the control device 10, described later, the non-contact IC card reader/writer 9 provides an electric wave from the antenna 7. The non-contact IC card reader/writer 9 then waits for a response from the non-contact IC card 100. The non-contact IC card 100 is operated by the electric wave supplied by the non-contact IC card reader/writer 9. Therefore, the non-contact IC card reader/writer 9 and the non-contact IC card 100 start to communicate when a user places the non-contact IC card 100 near the antenna 7 while the non-contact IC card reader/writer 9 is enabled to communicate. This operation by the user is called "holding the non-contact IC card to the antenna".

[0020] Fig. 2 is a schematic block diagram of a control system of the vending machine 1 according to the present embodiment. As shown in Fig. 2, the control device 10 connects to the coin mechanism 4, the bill validator 5, the non-contact card reader/writer 9, the plurality of (the figure shows only one of the button units for simplification) button units 3, the display 6, a commodity delivering device 20 that delivers commodities housed to the commodity delivery port 8, and a printer 30 that can output various documents. Fig. 2 shows only the devices relating to the spirit of the present invention for simplification. For example, a cooling system such as a compressor is omitted.

[0021] The control device 10 comprises a storage section 11 that stores various pieces of information. The storage section 11 independently stores money input information including at least the amount of electronic money input to the non-contact IC card 100 and which is equal to the amount of change, and sale information including the price of a commodity sold.

[0022] Now, with reference to the flowchart in Fig. 3, description will be given of operations of the vending machine according to the present embodiment. Here, description will be given of operations performed if the coin mechanism 4 runs out of change.

[0023] The control device 10 detects that cash has been inserted to the coin mechanism 4 or the bill validator 5 (step S1). The control device lights the ready

lamps corresponding to commodities that can be purchased with the amount of the inserted money (step S2). Then, the control device 10 detects that one of the commodity selection buttons whose ready lamps are lighted has been pressed (step S3). The control device 10 then determines whether or not the sale of the commodity corresponding to the commodity selection button results in the need for change, that is, whether or not the amount of the inserted money is higher than the price of the commodity (step S4).

[0024] If change is required, the control device 10 controls the non-contact IC card reader/writer 9 so that the non-contact IC card reader/writer 9 inputs electronic money corresponding to the amount of the change to the non-contact IC card 100 (step S5). If this money input process has not succeeded, the control device 10 controls the coin mechanism 4 or the bill validator 5 so that the inserted cash will be returned (steps S6 and S7). The failure of the money input process includes, for example, a failure to detect the non-contact IC card 100 within a predetermined time or the occurrence of a communication error in spite of the successful detection of the non-contact IC card 100 within the predetermined time, and a failure to input money because of the amount of money input exceeding the maximum amount set in the card.

[0025] If the need for change does not occur in step S4 and if the money input process succeeded in step S6, the control device 10 stores the money input information including the amount of money input in the storage section 11. The control device 10 also controls the commodity delivering device 20 so that the commodity is delivered (step S8). If this delivering process has succeeded, the control section 10 stores the sale information including the price of the commodity sold in the storage section 11, to finish the process (step S9). On the other hand, if the delivering process has not succeeded, the control section 10 controls the non-contact card reader/writer 9 so that the electronic money corresponding to the price of the commodity is input to the non-contact IC card 100 (step S10). At this time, the money input information including the amount of money input is stored in the storage section 11.

[0026] The above process enables the electronic money corresponding to the change to be input to the non-contact IC card 100 even if the coin mechanism 4 is out of change. This makes it possible to avoid the loss of sale opportunities, that is, to avoid the situation in which "commodities cannot be sold in bills owing to the shortage of change". In particular, if the process of inputting the electronic money corresponding to the amount of the change to the non-contact IC card 100 has failed, the inserted cash is returned without delivering the commodity. This makes it possible to avoid the situation in which "the cash cannot be returned to the user though the commodity has been sold to the user". Even if the commodity delivering process has failed, the electronic money corresponding to the price of the com-

modity can be input to the non-contact IC card 100. This makes it possible to avoid the situation in which "the cash cannot be returned to the user through the commodity has not been sold to the user."

[0027] Further, the money input information for the non-contact IC card 100 is stored in the storage section 11 independently of the commodity sale information. This eliminates the need to classify these pieces of information, thus improving convenience. For example, it is possible to allow the printer 30 to separately output the money input information and commodity sale information stored in the storage section 11. It is also possible to transmit the money input information and commodity sale information stored in the storage section 11, to a management computer via a network. In this case, the money input information may be transmitted to a management computer in an electronic money managing company. The commodity sale information may be transmitted to a management computer in a vending machine managing company.

[0028] In the above embodiment, the operations are described which are performed if the coin mechanism 4 is out of change. However, if the coin mechanism 4 has sufficient change, it may discharge required change or the user may choose whether to discharge the change from the coin mechanism 4 or to input money to the non-contact IC card 100.

[0029] The embodiment of the present invention has been described. However, the present invention is not limited to this. For example, in the above embodiment, a post-commodity selecting system is described with which the user selects a commodity after inserting cash. However, the present invention can be implemented using a pre-commodity selecting system with which the user inserts cash after selecting a commodity.

[0030] Moreover, in the above embodiment, the card in which a non-contact IC chip is buried is illustrated as an electronic money recording medium. However, the non-contact IC chip may be buried in another component. The non-contact IC chip may be buried in, for example, a cellular phone, a watch, a PDA, a bracelet, or a ring.

Claims

1. A vending machine comprising a coin mechanism (4) which identifies and houses the inserted coins and which discharges change, commodity selecting means (3) for selecting any of commodities on sale, a commodity delivering device (20) that delivers the commodities housed, a non-contact IC chip interface (9) that writes and reads data to and from a non-contact IC chip (100) functioning as an electronic wallet, and a control device (10) that controls sales,

wherein if the amount of the inserted cash to the coin mechanism (4) is higher than the price of

the commodity on sale which is selected using the commodity selecting means (3), the control device (10) controls the non-contact IC chip interface (9) so that electronic money corresponding to change that is a difference between the amount of the inserted money and the price of the commodity is input to the non-contact IC chip (100), and

if the process of inputting money to the non-contact IC chip (100) cannot be normally executed, the control device (10) controls the coin mechanism (4) so that the inserted cash is discharged, and if the money input process can be normally executed, the control device (10) controls the commodity delivering device (20) so that the commodity selected is delivered.

2. The vending machine according to claim 1, further comprising a bill validator (5) that identifies and houses an inserted bill, and

wherein if the amount of the inserted cash to the bill validator (5) is higher than the price of the commodity on sale which is selected using the commodity selecting means (3), the control device (10) controls the non-contact IC chip interface (9) so that electronic money corresponding to change that is a difference between the amount of the inserted money and the price of the commodity is input to the non-contact IC chip (100), and

if the process of inputting money to the non-contact IC chip (100) cannot be normally executed, the control device (10) controls the bill validator (5) so that the inserted cash is discharged, and if the money input process can be normally executed, the control device (10) controls the commodity delivering device (20) so that the commodity selected is delivered.

3. The vending machine according to claim 1 or 2, wherein if the commodity delivering process cannot be normally executed, the control device (10) controls the non-contact IC chip interface (9) so that electronic money the amount of which is equal to the price of the commodity is input to the non-contact IC chip (100).

4. The vending machine according to claim 1, 2, or 3, wherein the control device (10) independently stores, in predetermined storage means (11), money input information including the amount of money input to the non-contact IC chip (100) and sale information including the price of the commodity sold.

5. The vending machine according to claim 4, further comprising output means (30) for outputting the money input information and sale information stored in the storage means (11).

Fig. 1

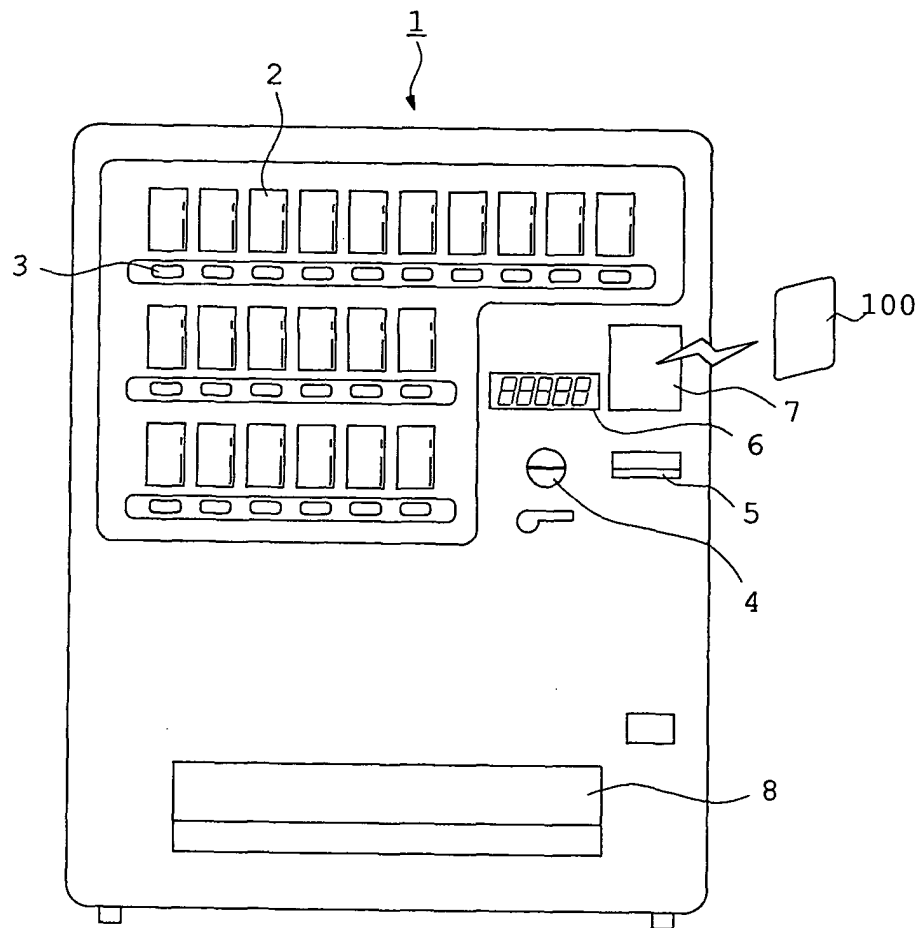


Fig. 2

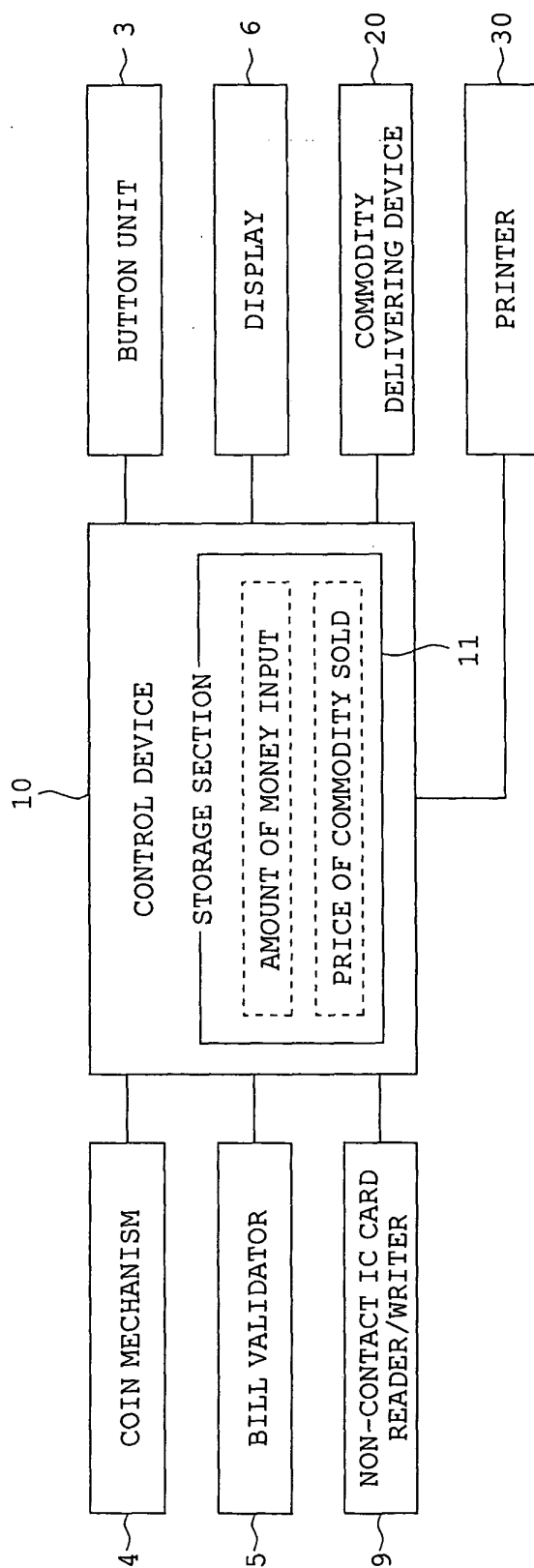
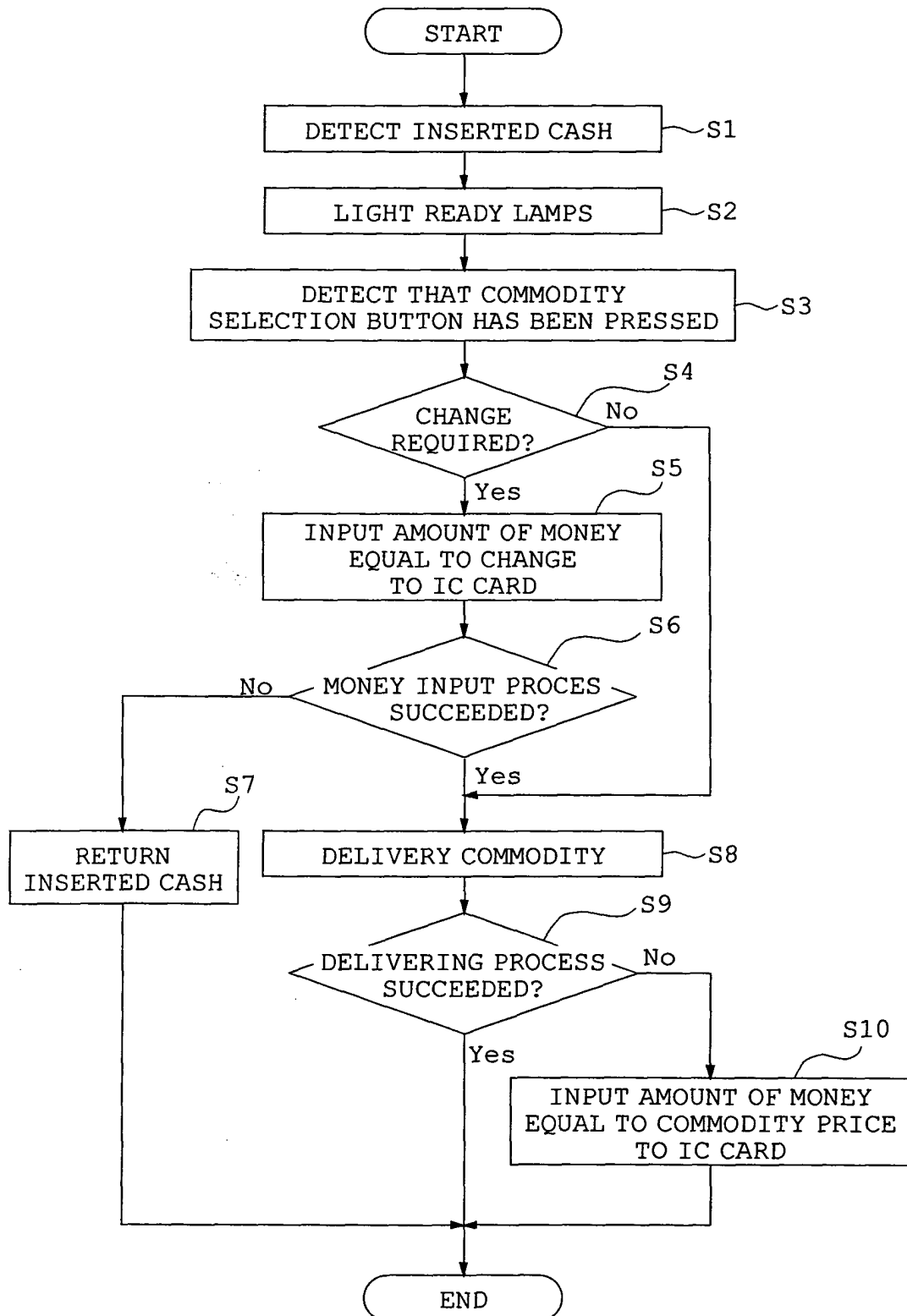


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 05 25 0435

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
D,X	PATENT ABSTRACTS OF JAPAN vol. 2002, no. 10, 10 October 2002 (2002-10-10) -& JP 2002 170151 A (HITACHI LTD), 14 June 2002 (2002-06-14) * abstract; claims 1,7,12 *	1-5	G07F5/24
X	PATENT ABSTRACTS OF JAPAN vol. 2002, no. 10, 10 October 2002 (2002-10-10) & JP 2002 170149 A (MITSUBISHI ELECTRIC CORP), 14 June 2002 (2002-06-14) * abstract *	1-5	
X	PATENT ABSTRACTS OF JAPAN vol. 2002, no. 07, 3 July 2002 (2002-07-03) & JP 2002 083345 A (FUJI ELECTRIC CO LTD), 22 March 2002 (2002-03-22) * abstract *	1-5	
A	US 2003/050890 A1 (ITAKO EIJI) 13 March 2003 (2003-03-13) * column 0002 - column 0012 *	1-5	TECHNICAL FIELDS SEARCHED (Int.Cl.7) G07F
A	EP 1 100 059 A (MARS INCORPORATED) 16 May 2001 (2001-05-16) * column 0025 - column 0026 *	1-5	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 April 2005	Examiner Diepstraten, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 25 0435

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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29-04-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2002170151 A	14-06-2002	NONE	
JP 2002170149 A	14-06-2002	NONE	
JP 2002083345 A	22-03-2002	NONE	
US 2003050890 A1	13-03-2003	JP 2003085623 A	20-03-2003
EP 1100059 A	16-05-2001	GB 2356268 A	16-05-2001
		CN 1296234 A	23-05-2001
		EP 1100059 A1	16-05-2001
		JP 2001188937 A	10-07-2001