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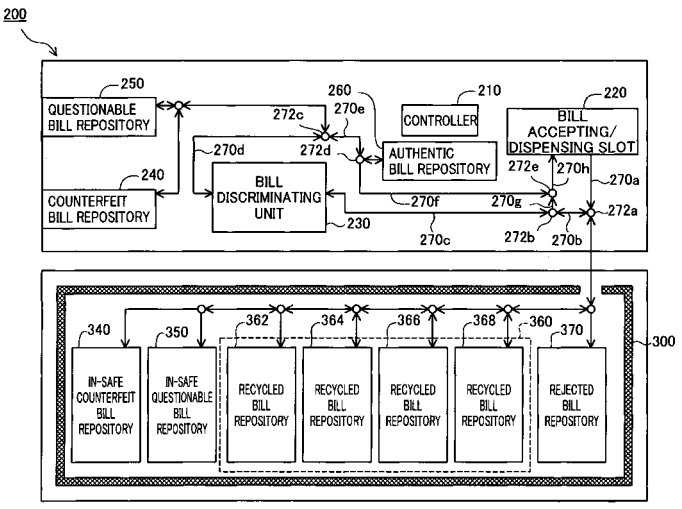
(54) Bill handling device and control method for same

(57) The bill handling device includes a accepting/dispensing slot 220 for making a deposit or withdrawal of paper money bills; a bill discriminating unit 230 for discriminating authenticity of bills which have been input to the accepting/dispensing slot; a first repository 260 which escrows authentic bills; a second repository 240 different from the first repository 260 for storing counterfeit bills; a third repository 250 different from the first repository260 and the second repository240 for storing questionable bills; and a transport unit 270, 272 for transporting authentic bills in the first repository and questionable bills in the third repository to the accepting/dispensing slot in the event that a refund instruction from the user is detected.

Fig.3



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Description

BACKGROUND OF THE INVENTION

Technical Field

[0001] The present invention relates to a bill handling device for making deposits and withdrawals of currencies or bills or bank notes.

Description of the Related Art

[0002] Automated teller machines to date have been designed to refuse to accept any non-authentic deposited bills, and to instead return such bills. However, there are some countries that have a legal responsibility to handle counterfeit bills and questionable bills of questionable authenticity in a different manner from authentic bills and prohibit from returning counterfeit bills to the end user. With a view to complying with such requirements, one known technology involves discriminating deposited bills; placing the deposited bills in different escrow depositories depending on whether they are authentic bills, counterfeit bills, or questionable bills of uncertain authenticity; and failing to return counterfeit bills or questionable bills.

[0003] However, there are instances in which an authentic bill might be determined to be a questionable bill due to deterioration the bill has experienced in circulation, so the frequency of encountering questionable bills tends to be quite high. According to the conventional art, since neither counterfeit bills nor questionable bills are returned but are instead placed in repositories, there was a risk of insufficient repository capacity if questionable bills are encountered frequently. Moreover, in the determination process, while a human would be able to determine a counterfeit bill upon discovery of a single location different from that of an authentic bill in order to determine that a questionable bill is a counterfeit bill, for the purpose of determining a questionable bill to be authentic it will be a time consuming process to examine the bill in its entirety in order to ascertain whether any discrepancies from an authentic bill are due to deterioration experienced in circulation, or to measurement error. Consequently, if large numbers of questionable bills are encountered as a result of deterioration experienced by authentic bills while in circulation, considerable labor will be entailed in the determination process.

[0004] It is accordingly an object of the present invention to address at least one of the above issues, to provide various ways for handling questionable bills, or to eliminate the problem of insufficient repository capacity, and reduce the labor entailed in discriminating authenticity for questionable bills.

SUMMARY OF THE INVENTION

[0005] In order to address the above problems at least in part, the present invention is furnished with the constitution described below.

[0006] The invention in a first aspect provides a bill handling device comprising: an accepting/dispensing slot for making a deposit or withdrawal of paper money bills or currencies; a bill discriminating unit for discriminating authenticity of bills which have been input to the accepting/dispensing slot; a first repository which escrows authentic bills; a second repository different from the first repository for storing the counterfeit bills; a third repository different from the first repository and the second repository for storing the questionable bills; and transport unit for transporting authentic bills in the first repository and questionable bills in the third repository to the accepting/dispensing slot in the event that a refund instruction from the user is detected. According to this aspect, handling of questionable bills may take place in various ways. As a result, it is possible to return undeposited questionable bills, thus eliminating the problem of insufficient repository capacity, and reducing the labor entailed in discriminating authenticity for questionable bills.

[0007] The bill handling device pertaining to the first aspect of the present invention may further comprise a safe; and a fourth repository disposed within the safe, and having a recycled bill repository for storing bills which are available for withdrawals and a rejected bill repository for storing bills which are unavailable for withdrawals, wherein in the event that a deposit instruction from the user is detected, the transport unit transports authentic bills from the first repository to the fourth repository. According to this mode, deposited authentic bills will be transported into the safe, thus affording enhanced security.

[0008] In the bill handling device pertaining to the first aspect of the present invention, in the event that a deposit instruction from the user is detected, the transport unit may transport questionable bills in the third repository to the rejected bill repository. According to this mode, it is possible to avoid putting questionable bills back in circulation.

[0009] In the bill handling device pertaining to the first aspect of the present invention, the transport unit may transport questionable bills stored in the third repository to the rejected bill repository instead of transporting the bill to the accepting/dispensing slot, even if a refund instruction from the user is detected. According to this mode, it is possible to avoid putting questionable bills back in circulation.

[0010] The bill handling device pertaining to the first aspect of the present invention may further comprise a fifth repository disposed within the safe and which stores questionable bills, wherein in the event that a deposit instruction from the user is detected, the transport unit transports questionable bills stored in the third repository to the fifth repository. According to this mode, questionable bills will be transported into the safe, thus affording enhanced security. Moreover, questionable bills will be

kept separate from counterfeit bills, and the labor entailed in authenticity determination overall can be reduced by focusing on determining authenticity of questionable bills whose authenticity may be difficult to determine.

[0011] In the bill handling device pertaining to the first aspect of the present invention, the transport unit may transport questionable bills stored in the third repository to the fifth repository instead of transporting the bill to the accepting/dispensing slot, even if a refund instruction from the user is detected. According to this mode, questionable bills will be transported into the safe, thus affording enhanced security. Moreover, questionable bills will be kept separate from counterfeit bills, and the labor entailed in authenticity determination overall can be reduced by focusing solely on determining authenticity of questionable bills whose authenticity may be difficult to determine.

[0012] The bill handling device pertaining to the first aspect of the present invention may further comprise a counterfeit bill repository disposed within the safe and which stores counterfeit bills which have been stored in the second repository. According to this mode, counterfeit bills will be transported into the safe, thus affording enhanced security.

[0013] In the bill handling device pertaining to the first aspect of the present invention, at least either one of the second repository and the third repository may be installed in the paper money handling device removably from the paper money handling device. According to this mode, rapid response to questionable bills or counterfeit bills is possible.

[0014] The invention in a second aspect provides a method of controlling a bill handling device comprising: discriminating bill which has been input to an accepting/dispensing slot; in the event that the bill is authentic bill, escrowing the bill in a first repository; in the event that the bill is counterfeit bill, storing the bill in a second repository different from the first repository; in the event that the bill is questionable bill of uncertain authenticity, storing the bill in a third repository different from the first repository and the second repository; and in the event that a refund instruction has been received, transporting authentic bills which have been stored in the first repository and questionable bills which have been stored in the third repository to the accepting/dispensing slot. According to this aspect, handling of questionable bills may take place in various ways. As a result, it is possible to return undeposited questionable bills, thus eliminating the problem of insufficient repository capacity, and reducing the labor entailed in discriminating authenticity for questionable bills.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] [kiso-0066]

Other objects and advantages of the invention will become apparent upon reading the following detailed description in conjunction with the drawings in which:

FIG. 1 is a model depiction of the exterior of an ATM pertaining to Embodiment 1;

FIG. 2 is an illustration depicting a model block configuration of the ATM pertaining to Embodiment 1;

FIG. 3 is an illustration depicting a model configuration of a bill handling unit 200;

FIG. 4 is a flowchart illustrating operation of the ATM 10 from insertion of a bill to sorting into the repositories;

FIG. 5 is a flowchart illustrating operation subsequent to sorting into the repositories;

FIG. 6 is a flowchart illustrating operation of a cash deposit process sub-routine in Embodiment 1;

FIG. 7 is a flowchart illustrating operation of a cash refund process sub-routine in Embodiment 1;

FIG. 8 is a flowchart illustrating operation of a cash deposit process sub-routine in Embodiment 2; and

FIG. 9 is a flowchart illustrating operation of a cash refund process sub-routine in Embodiment 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

1. Embodiment 1

(1) Configuration of Automated Teller Machine

[0016] The configuration of an automated teller machine (hereinafter "ATM") pertaining to Embodiment 1 will be described below making reference to FIGS. 1 and 2. FIG. 1 is a model depiction of the exterior of the ATM pertaining to Embodiment 1. FIG. 2 is an illustration depicting a model block configuration of the ATM pertaining to Embodiment 1. The ATM 10 includes a main controller 100, a card/statement processor 110, a customer control interface 120, a memory 130, an operator control interface 140, an external interface 150, and a bill handling unit 200.

[0017] The main controller 100 controls operation of, for example, the card/statement processor 110, the customer control interface 120, the memory 130, the operator control interface 140, the external interface 150, and the bill handling unit200. The card/statement processor 110 includes a reader/writer 112 and a printer 114. The reader/writer 112 performs reading of data from or writing of data to a card. The printer 114 performs printing of transaction records or printing of passbook entries.

[0018] The customer control interface 120 detects a deposit or withdrawal instruction input through operation by the customer. The detected deposit or withdrawal instruction is transmitted from the customer control interface 120 to the main controller 100. As the customer control interface 120 it would be possible to employ, for example, a touch screen having a display function and capable of detecting instructions from customers and displaying messages from the ATM 10 to the customer. The memory 130 stores data being processed by the main controller 100, and bill templates utilized by the bill han-

dling unit 200 when discriminating the authenticity and denomination of bills. The operator control interface 140 detects operations performed by operator from the financial institution. The external interface 150 connects the ATM 10 to a network 400. The ATM 10 is connected to a host computer (not shown) via the network 400.

[0019] The bill handling unit 200 carries out discrimination of bills which have been deposited to the ATM 10, and transmits the discrimination results to the main controller 100 as well as sorting the bills and placing them in internal repositories. Upon receiving an instruction from the main controller 100, the bill handling unit 200 will retrieve and dispense bills from the internal repositories.

[0020] The configuration of the bill handling unit 200 will now be described. FIG. 3 is an illustration depicting a model configuration of the bill handling unit 200. The bill handling unit 200 includes a controller 210, a bill accepting/dispensing slot 220, a bill validator 230 (we say "a bill discriminating unit 230"), a counterfeit bill repository 240, a questionable bill repository 250, an authentic bill repository 260, transport paths 270a through 270h, bill sorting gates 272a through 272e, and a safe 300. The transport paths are classified into two types: transport paths 270b, 270c, 270d, and 270e for two-way transit, and transport paths 270a, 270f, 270g, and 270h for one-way transit.

[0021] The controller 210 controls operation of the bill accepting/dispensing slot 220, the bill discriminating unit 230, the counterfeit bill repository 240, the questionable bill repository 250, the authentic bill repository 260, the transport paths 270, and the bill sorting gates 272. The bill accepting/dispensing slot 220 accepts bills for deposit to the ATM 10 and dispenses bills from the ATM 10. The bill accepting/dispensing slot 220 is equipped with a door 220a and a sensor 220b for detecting whether a bill is present.

[0022] The bill discriminating unit 230 discriminates the authenticity and denomination of bills being accepted by the ATM 10 or bills being dispensed from the ATM 10. Paper money input to the ATM 10 will be classified into the following four categories by the bill discriminating unit 230.

(a) Category 1: Documents not recognized as bills. Applicable examples would be receipts inadvertently sandwiched between bills and input to the bill accepting/dispensing slot 220; folded bills; torn bills, and so on. In Embodiment 1, the determination as to whether a document is a bill can be made based on the dimensions of the document, for example.

(b) Category 2: Counterfeit bills. Bills have a number of security features. Security features are technological features designed to foil counterfeiting. For example, watermarks, holograms, microprinting, and special inks are used as security features. In Embodiment 1, bills lacking any of the expected security features will be determined to be counterfeit.

(c) Category 3: Questionable bills. A questionable bill is one of uncertain authenticity which is possibly counterfeit. In Embodiment 1, bills having all of the expected security features, but having any one or several characteristic quantities which are out-of-spec, will be determined to be a questionable bill. For example, highly skillful forgeries, authentic bills having characteristic quantities which are out-of-spec as a result of damage during circulation, and the like would be determined to be questionable bills.

(d) Category 4: Authentic bills. In Embodiment 1, bills having all of the expected security features and characteristic quantities which are all within-spec will be determined to be authentic bills.

[0023] The counterfeit bill repository 240 stores bills which have been classified into Category 2. The questionable bill repository 250 stores bills which have been classified into Category 3. The authentic bill repository 260 stores bills which have been classified into Category 4. Bills which have been classified into Category 1 will not be stored in any of the repositories, but instead transported to the bill accepting/dispensing slot 220 and returned to the customer.

[0024] In the present embodiment, the counterfeit bill repository 240, the questionable bill repository 250, and the authentic bill repository 260 are escrow repositories for temporary storage of bills. By making the questionable bill repository 250 an escrow repository, for questionable bills, it becomes possible for subsequent handling of the questionable bills to take place in any of various ways, i.e. either being returned to the customer, or stored without being returned to the customer. The reason for making the authentic bill repository 260 an escrow repository is that, at the point in time at which a bill is stored in the authentic bill repository 260, it is not yet certain whether the bill will be subsequently deposited or returned.

[0025] The safe 300 is situated in the lower part of the bill handling unit 200, and constitutes a repository whose exterior is encased in metal, for example. The safe 300 includes an in-safe counterfeit bill repository 340, an in-safe questionable bill repository 350, a recycled bill repository 360, and a rejected bill repository 370.

[0026] The in-safe counterfeit bill repository 340 stores bills which were stored in the counterfeit bill repository 240. The in-safe questionable bill repository 350 stores bills which were stored in the questionable bill repository 250. Of bills that were stored in the authentic bill repository 260, those bills which will are suitable for reuse are stored in the recycled bill repository 360. The rejected bill repository 370 will store bills that were stored in the authentic bill repository 260 but which are unsuitable for reuse. Bills suitable for reuse are authentic bills with minimal damage such that reuse is possible. However, depending on the denomination of a bill, even bills with minimal damage may not be used as bill for dispensing purposes. Bills unsuitable for reuse are bills which, while authentic, are not bills suitable for reuse.

[0027] Since the ATM 10 includes the in-safe counterfeit bill repository 340 and the in-safe questionable bill repository 350 in addition to the recycled bill repository 360 and the rejected bill repository 370 inside the safe 300, it will be possible to prevent destruction of evidence for questionable bills and counterfeit bills through theft and to provide enhanced security. Moreover, from a security standpoint, it is undesirable to store large numbers of questionable or counterfeit bills in escrow repositories located outside the safe 300; in the present embodiment, however, since the ATM 10 is equipped with the in-safe counterfeit bill repository 340 and the in-safe questionable bill repository 350 situated inside the safe 300, it will be possible to accommodate large numbers of counterfeit bills and questionable bills. Furthermore, by providing the in-safe counterfeit bill repository 340 and the in-safe questionable bill repository 350 as separate repositories, it will be possible for the ATM 10 to handle questionable bills and counterfeit bills separately. As a result, discrimination of easily-discriminated counterfeit bills can be entrusted to the machine, permitting the human operator to focus on discriminating questionable bills which are more difficult to discriminate, thereby reducing the human labor entailed in discrimination overall.

[0028] The recycled bill repository 360 is provided with multiple recycled bill repository receptacles 362 through 368 set apart for individual bill denominations. It would also be acceptable to provide two or more storage receptacles for storing bills of the same denomination.

[0029] The transport paths 270 transport bills among the bill accepting/dispensing slot 220, the bill discriminating unit 230, the counterfeit bill repository 240, the questionable bill repository 250, the authentic bill repository 260, the in-safe counterfeit bill repository 340 and the in-safe questionable bill repository 350 inside the safe 300, the recycled bill repository receptacles 362 through 368 inside the safe 300, and the rejected bill repository 370 inside the safe 300. The bill sorting gates 272 are disposed at branch points along the transport paths 270, and shunt bills transported from a transport path 270 in any one three directions onto one of the transport paths 270 among the transport paths 270 in the remaining two directions.

[0030] In FIG. 3, the transport path 270d rises upward on the left side of the bill discriminating unit 230, then veers to the right and passes over the bill discriminating unit 230, passing through the sorting gate 272c and the transport path 270e to connect with the bill sorting gate 272d in proximity of the authentic bill repository 260. For this reason, the transport path 270d over the bill discriminating unit 230 can also be utilized as a transport path for gaining time for the purpose of the discrimination process, making possible efficient installation of the transport path 270d. Where this section of the transport path 270d is constituted, for example, by a conveyor belt, it will be possible to minimize installation space in the height direction. In the present embodiment, because there are positioned substantially on the same horizontal position the bill accepting/dispensing slot 220, the bill discriminating unit 230, and the authentic bill repository 260, it will be possible to minimize the height of the upper part of the bill handling unit 200 and to increase the height of the safe 300. For this reason, large numbers of bills can be stored in the repositories inside the safe.

(2) ATM Operation

(a) General Operation

[0031] Operation of the ATM 10 will be discussed with reference to FIGS. 4 and 5. FIG. 4 is a flowchart illustrating operation of the ATM 10 from insertion of a bill to sorting into the repositories. FIG. 5 is a flowchart illustrating operation subsequent to sorting into the repositories.

[0032] When the main controller 100 of the ATM 10 detects that a Deposit Cash button displayed on the customer control interface 120 has been selected (Step S100), it will open the door 220a of the bill accepting/dispensing slot 220 via the controller 210 of the bill handling unit 200 (Step S105).

[0033] When the main controller 100 then detects that a Count Cash button displayed on the customer control interface 120 has been selected (Step S110), it will then shut the door 220a of the bill accepting/dispensing slot 220 via the controller 210 (Step S115).

[0034] The controller 210 will then control the transport paths 270 and the bill sorting gates 272 to transport the bills which have been loaded into the bill accepting/dispensing slot 220 to the bill discriminating unit 230 one at a time (Step S120), where the authenticity and denomination of the bills will be determined.

[0035] The bill discriminating unit 230 will then send the discrimination results to the controller 210. If the discrimination results indicate that a bill belongs to Category 1 (Step S125, Yes), the controller 210 will control the transport paths 270 and the bill sorting gates 272 to transport the bill identified as belonging to Category 1 to the bill accepting/dispensing slot 220 (Step S130).

[0036] If the discrimination results indicate that a bill does not belong to Category 1 (Step S125, No) but rather belongs to Category 2 (Step S135, Yes), the controller 210 will control the transport paths 270 and the bill sorting gates 272 to transport the bill identified as belonging to Category 2 to the counterfeit bill repository 240 (Step S140).

[0037] If the discrimination results indicate that a bill does not belong to either Category 1 or Category 2 (Step S135, No) but rather belongs to Category 4 (Step S145, Yes), the controller 210 will control the transport paths 270 and the bill sorting gates 272 to transport the bill identified as belonging to Category 4 to the authentic bill repository 260 (Step S150).

[0038] Where a bill does not belong to Category 1, 2, or 4, the bill will be classified as Category 3. The controller 210 will then control the transport paths 270 and the bill

sorting gates 272 to transport the bill identified as belonging to Category 3 to the questionable bill repository 250 (Step S155).

[0039] The controller 210 will then transmit to the main controller 100 the amount of money of the bills which were read by the bill discriminating unit 230. At this point, the money amount will be transmitted on a per-category basis. When the main controller 100 receives the money amount, it will display the results on the customer control interface 120 (Step S200) and wait for an instruction from the customer. At this point, the main controller 100 may display bill denominations on a per-category basis.

[0040] If the main controller 100 detects that the Deposit Cash button displayed on the customer control interface 120 has been selected (Step S205, Yes), it will execute a cash deposit process sub-routine (Step S210). If on the other hand the main controller 100 detects that the Refund Cash button displayed on the customer control interface 120 has been selected (Step S215, Yes), it will execute a cash refund process sub-routine (Step S220).

(b) Operation of Cash Deposit Process Sub-routine

[0041] FIG. 6 is a flowchart illustrating operation of the cash deposit process sub-routine in Embodiment 1. In the case of a Category 2 bill currently stored in the counterfeit bill repository 240 (Step S300, Yes), the controller 210 will control the transport paths 270 and the bill sorting gates 272 to transport the Category 2 bill to the in-safe counterfeit bill repository 340 (Step S305).

[0042] In the event that the bill is not a Category 2 bill (Step S300, No) but rather a Category 4 bill currently stored in the authentic bill repository 260 (Step S310, Yes), the controller 210 will control the transport paths 270 and the bill sorting gates 272 to transport the Category 4 bill to the bill discriminating unit 230 (Step S315), whereupon the bill discriminating unit 230 will decide the denomination of the bill, as well as deciding whether the bill is recyclable. If the bill is deemed not recyclable (Step S320, No), the controller 210 will transport the Category 4 bill to the rejected bill repository 370 (Step S325). If the bill is deemed recyclable (Step S320, Yes), the controller 210 will transport the Category 4 bill to the recycled bill repository 360 (Step S330). Depending on denomination, Category 4 bills will be transported to the appropriate recycled bill repository receptacle from the recycled bill repository receptacles 362 through 368.

[0043] In the event that the bill is not a Category 4 bill but rather a Category 3 bill currently stored in the questionable bill repository 250 (Step S310, No), the controller 210 will control the transport paths 270 and the bill sorting gates 272 to transport the Category 3 bill to the rejected bill repository 370 (Step S335). The reason is that it would be undesirable to make bills not certified as authentic available for reuse.

(c) Operation of Cash Refund Process Sub-routine

[0044] FIG. 7 is a flowchart illustrating operation of the refund process sub-routine in Embodiment 1. In the case of a Category 2 bill currently stored in the counterfeit bill repository 240 (Step S400, Yes), the controller 210 will control the transport paths 270 and the bill sorting gates 272 to transport the Category 2 bill to the in-safe counterfeit bill repository 340 (Step S405). The reason is that returning a counterfeit bill would allow the counterfeit bill to be returned to circulation.

[0045] In the event that the bill is not a Category 2 bill, but rather a Category 3 bill currently stored in the questionable bill repository 250 or a Category 4 bill currently stored in the authentic bill repository 260 (Step S400, No), the controller 210 will control the transport paths 270 and the bill sorting gates 272 to transport the Category 3 bill or the Category 4 bill to the bill accepting/dispensing slot 220 (Step S415). For example, via the transport paths 270d, 270c the bill will be shunted onto the transport path 270g by the bill sorting gate 272b and transported to the bill accepting/dispensing slot 220. The controller 210 will then open the door 200a of the bill accepting/dispensing slot 220 (Step S420). Once the controller 210 detects from a signal from the sensor 220b that the bill has been retrieved (Step S425, Yes), it will shut the door 200a of the bill accepting/dispensing slot 220 (Step S430).

[0046] According to Embodiment 1 described above, it is possible to refund questionable bills which have not been deposited and to handle questionable bills in any of various ways, making it possible to eliminate the problem of insufficient repository capacity, as well as reduce the human labor entailed in discriminating authenticity for questionable bills.

[0047] According to Embodiment 1, if a questionable bill is deposited, it will be transported to the rejected bill repository 370 and will not be made available for reuse. It is accordingly possible to prevent recirculation of questionable bills.

[0048] According to Embodiment 1, deposited authentic bills will be transported to either the recycled bill repository 360 or rejected bill repository 370 inside the safe 300, questionable bills will be transported to the rejected bill repository 370 inside the safe 300, and counterfeit bills will be transported to the safe counterfeit bill repository 340 inside the safe 300, making it possible to prevent destruction of evidence through theft and provide enhanced security.

2. Embodiment 2

(1) Configuration of ATM

[0049] Embodiment 2 will be described below. Embodiment 2 represents an embodiment wherein questionable bills will not be returned to customers. Since the configuration of Embodiment 2 is substantially identical to the configuration of Embodiment 1, identical parts will be as-

signed identical symbols and will not be discussed in detail.

(2) ATM Operation

[0050] In Embodiment 2, operation up to the point that a bill loaded into the ATM is placed in the counterfeit bill repository 240, the questionable bill repository 250, or the authentic bill repository 260 is the same as the operation in Embodiment 1, and will not be described. The differences in operation from Embodiment 1 will be discussed below.

(a) Operation of Cash Deposit Process Sub-routine

[0051] FIG. 8 is a flowchart illustrating operation of the cash deposit process sub-routine in Embodiment 2. In the case of a Category 2 bill currently stored in the counterfeit bill repository 240, or in the case of a Category 4 bill currently stored in the authentic bill repository 260, the operation will be the same as the operation in Embodiment 1, so the steps have been assigned the same numbers and are not described.

[0052] In the case of a Category 3 bill currently stored in the questionable bill repository 250 (Step S310, No), the controller 210 will control the transport paths 270 and the bill sorting gates 272 to transport the Category 3 bill to the in-safe questionable bill repository 350 (Step S340). This is so that closer inspection may be carried out. The main controller 100 will then instruct the card/statement processor 110 to issue a receipt (Step S345). The reason is that subsequent closer inspection may lead to a determination that the bill is authentic. In the event that upon closer inspection the bill is determined as authentic, the funds will be deemed to have been deposited on the date of issue of the receipt.

(b) Operation of Cash Refund Process Sub-routine

[0053] FIG. 9 is a flowchart illustrating operation of the refund process sub-routine in Embodiment 2. In the case of a Category 2 bill currently stored in the counterfeit bill repository 240 or in the case of a Category 4 bill currently stored in the authentic bill repository 260, the operation will be the same as the operation in Embodiment 1, so the steps have been assigned the same numbers and are not described.

[0054] In the event that the bill is not a Category 2 bill or a Category 4 bill, but rather a Category 3 bill currently stored in the questionable bill repository 250 (Step S410, No), the controller 210 will control the transport paths 270 and the bill sorting gates 272 to transport the Category 3 bill to the in-safe questionable bill repository 350 (Step S435). This is so that closer inspection may be carried out. The main controller 100 will then instruct the card/statement processor 110 to issue a receipt (Step S440). The reason is that subsequent closer inspection may lead to a determination that the bill is authentic. In the event that upon closer inspection the bill is determined as authentic, the funds will be deemed to have been deposited on the date of issue of the receipt.

[0055] According to Embodiment 2 described above, questionable bills will be transported into the in-safe questionable bill repository 350 and will not be refunded, thus preventing questionable bills from being put back into circulation.

[0056] According to Embodiment 2, deposited authentic bills, counterfeit bills, and questionable bills will be respectively transported to the recycled bill repository 360 or the rejected bill repository 370 inside the safe 300, to the safe counterfeit bill repository 340, or to the in-safe questionable bill repository 350, making it possible to prevent destruction of evidence through theft and provide enhanced security.

[0057] According to Embodiment 2, questionable bills and counterfeit bills will be kept separate, so the human labor entailed in authenticity determination overall can be reduced by having the human operator focus on determining authenticity of questionable bills whose authenticity may be difficult to determine.

3. Alternative Embodiments:

[0058]

(1) While Embodiment 1 and Embodiment 2 describe an ATM 10 by way of example, the device could also be a teller machine used by employees of a financial institution.

(2) While not mentioned specifically in Embodiment 1 and Embodiment 2, the counterfeit bill repository 240 and the questionable bill repository 250 may be removably installed in the ATM 10. In the event that a counterfeit bill or questionable bill is encountered, the operator could then quickly retrieve and inspect the counterfeit bill or questionable bill from the ATM 10 or teller machine.

(3) In Embodiment 1, during operation of the cash deposit process sub-routine, Category 3 bills are transported to the rejected bill repository 370, but could instead be transported to the in-safe questionable bill repository 350. The reason is that the probability that further inspection will reveal the bill as counterfeit is not zero. Depending on circumstances, it would be possible to transport the bill to the recycled bill repository 360.

(4) While Embodiment 1 and Embodiment 2 describe different ATMs, it would be possible, for example, to provide a single ATM with an operation changeover switch 142 enabling operation to be switched between one in which questionable bills will be returned to customers and one in which questionable bills will not be returned to customers. Alternatively, in place

of providing an operation changeover switch 142 for switching between operations involving returning questionable bills to customers or not, device operation could be switched between returning questionable bills to customers or not in response to a command received from a host computer (not shown), for example. Various ways of handling questionable bills will be possible thereby.

(5) Furthermore, switching between operations involving returning questionable bills to customers or not may take place in response to conditions of utilization, to bill discrimination results, or to the bill circulation environment. For example, questionable bills could be returned to customers under normal circumstances, switching to not returning questionable bills in the event that some prescribed condition is met. For example, switching to an operation in which questionable bills will not be returned could take place when: (a) the customer has a history of having used a counterfeit bill in the past; (b) the customer cannot be identified; (c) for deposited bills, where there is a high proportion of questionable bills, or where there are large numbers of questionable bills; or (d) where skillful forgeries have been encountered in the marketplace.

[0059] For example, the host computer (not shown) could be configured to keep records of prior counterfeit bill use, and during each transaction the ATM 10 could query the host computer for a record of counterfeit bill use, and decide whether the customer has a record of counterfeit bill use. Instances in which a customer cannot be identified include instances where funds are deposited anonymously, for example. In the present embodiment, the controller 210 will send the results of discrimination of each individual bill to the main controller 100, and thus by counting the numbers thereof the main controller 100 will be able to calculate the proportion and number of questionable bills. If the proportion of questionable bills is high or where a large number of questionable bills have been detected, the main controller 100 may then switch the ATM 10 to operation wherein questionable bills will not be returned. Instances in which skillful forgeries have been encountered in the marketplace would include cases where other financial institutions have encountered skillful forgeries, for example. In such instances, the main controller 100, in response to a command from the host computer, may switch the ATM 10 to operation wherein questionable bills will not be returned. In other words, the device may be configured so as to be switchable between returning and not returning questionable bills on a case-by-case basis depending on conditions of utilization, to bill discrimination results, or to the bill circulation environment. By so doing, inspection of questionable bills will take place only under abnormal circumstances such as those mentioned above, thus reducing the labor entailed in inspection.

[0060] While the invention has been shown herein based on certain preferred embodiments, the embodiments of the invention set forth herein are intended to facilitate understanding of the invention and should not be construed as limiting of the invention in any way. The intention is to cover all modifications and improvements falling within the spirit and scope of the invention as defined by the appended claims.

Claims

1. A bill handling device comprising:

an accepting/dispensing slot for making a deposit or withdrawal of paper money bills or currencies;
a bill discriminating unit for discriminating authenticity of bills which have been input to the accepting/dispensing slot;
a first repository which escrows authentic bills;
a second repository different from the first repository for storing counterfeit bills;
a third repository different from the first repository and the second repository for storing questionable bills; and
a transport unit for transporting authentic bills in the first repository and questionable bills in the third repository to the accepting/dispensing slot in the event that a refund instruction from the user is detected.

2. The bill handling device in accordance with claim 1, further comprising:

a safe; and
a fourth repository disposed within the safe, and having a recycled bill repository for storing bills which are available for withdrawals, and a rejected bill repository for storing bills which are unavailable for withdrawals,

wherein in the event that a deposit instruction from the user is detected, the transport unit transports authentic bills from the first repository to the fourth repository.

3. The bill handling device in accordance with claim 2, wherein
in the event that a deposit instruction from the user is detected, the transport unit transports questionable bills in the third repository to the rejected bill repository.

4. The bill handling device in accordance with claim 2, wherein
the transport unit transports the questionable bills stored in the third repository to the rejected bill re-

pository instead of transporting the bills to the accepting/dispensing slot, even if a refund instruction from the user is detected.

5. The bill handling device in accordance with claim 2, further comprising:

a fifth repository disposed within the safe and which stores questionable bills,

wherein in the event that a deposit instruction from the user is detected, the transport unit transports questionable bills stored in the third repository to the fifth repository.

6. The bill handling device in accordance with claim 5, wherein
the transport unit transports the questionable bills stored in the third repository to the fifth repository instead of transporting the bills to the accepting/dispensing slot, even if a refund instruction from the user is detected.

7. The bill handling device in accordance with claim 1, further comprising:

a counterfeit bill repository disposed within the safe and which stores counterfeit bills which have been stored in the second repository.

8. The bill handling device in accordance with claim 1, wherein
at least either one of the second repository and the third repository is installed in the paper money handling device removably from the paper money handling device.

9. A method of controlling a bill handling device, comprising:

discriminating bill which has been input to an accepting/dispensing slot;
in the event that the bill is authentic bill, escrowing the bill in a first repository;
in the event that the bill is counterfeit bill, storing the bill in a second repository different from the first repository;
in the event that the bill is questionable bill of uncertain authenticity, storing the bill in a third repository different from the first repository and the second repository; and
in the event that a refund instruction has been received, transporting authentic bills which have been stored in the first repository and questionable bills which have been stored in the third repository to the accepting/dispensing slot.

Fig.1

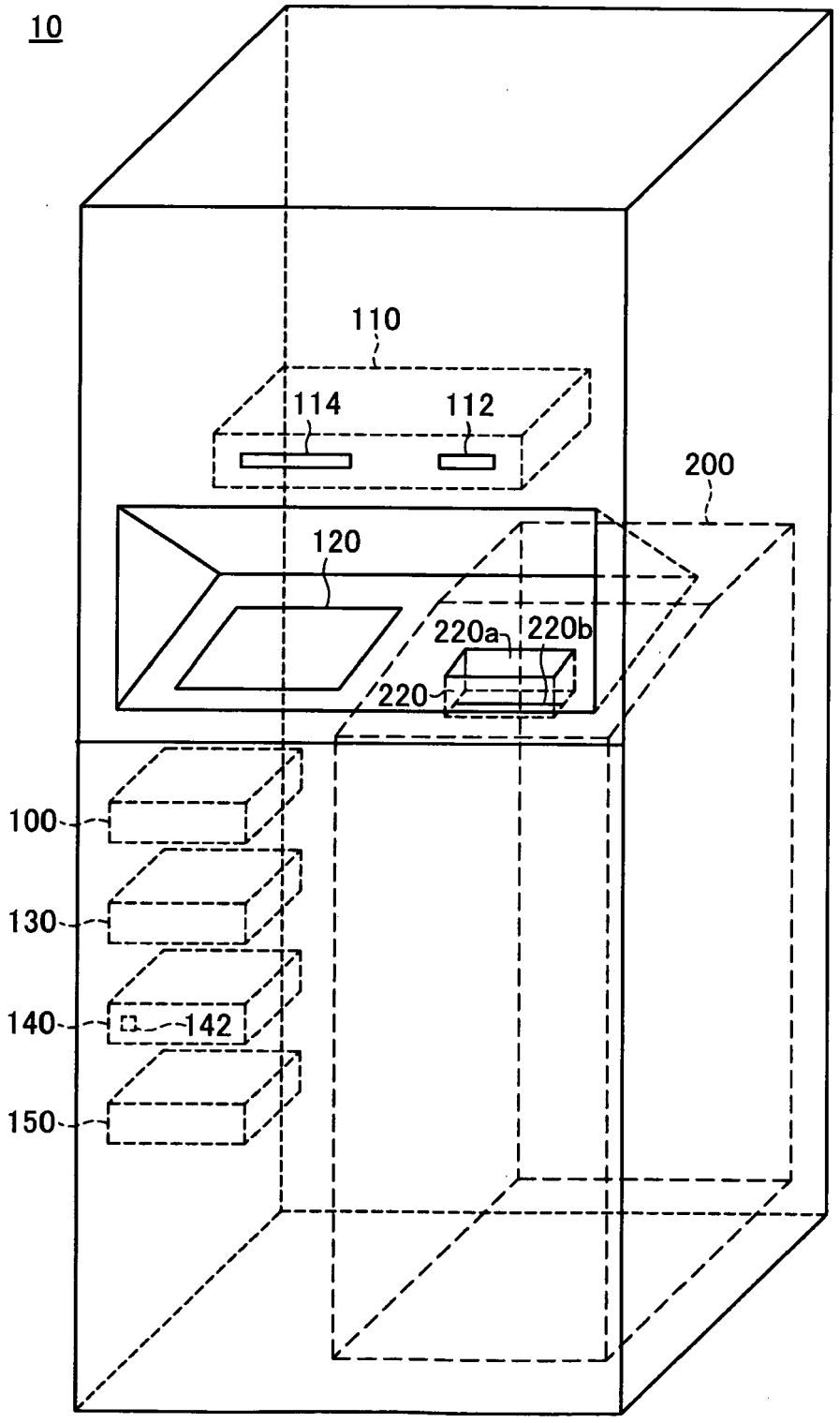
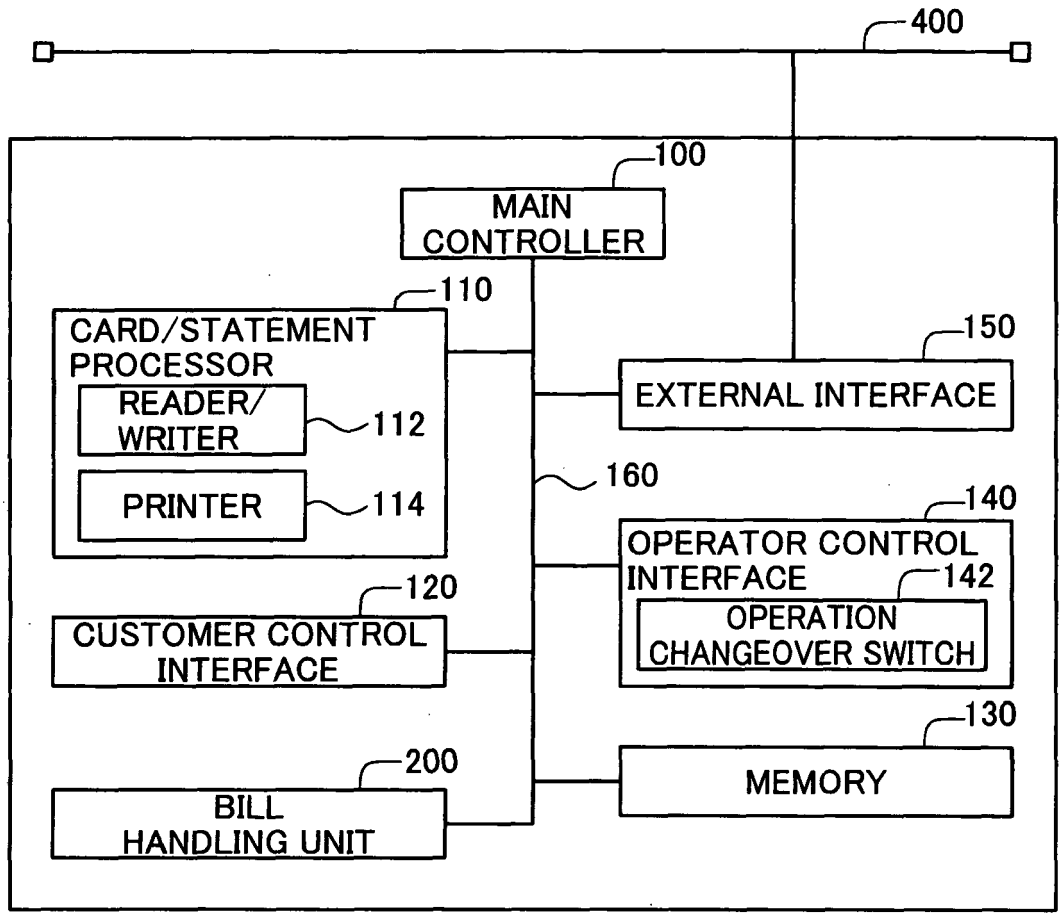


Fig.2


400
100
MAIN CONTROLLER
110
CARD/STATEMENT PROCESSOR
READER/ WRITER
112
PRINTER
114
150
EXTERNAL INTERFACE
160
140
OPERATOR CONTROL INTERFACE
142
OPERATION CHANGEOVER SWITCH
120
CUSTOMER CONTROL INTERFACE
130
MEMORY
200
BILL HANDLING UNIT

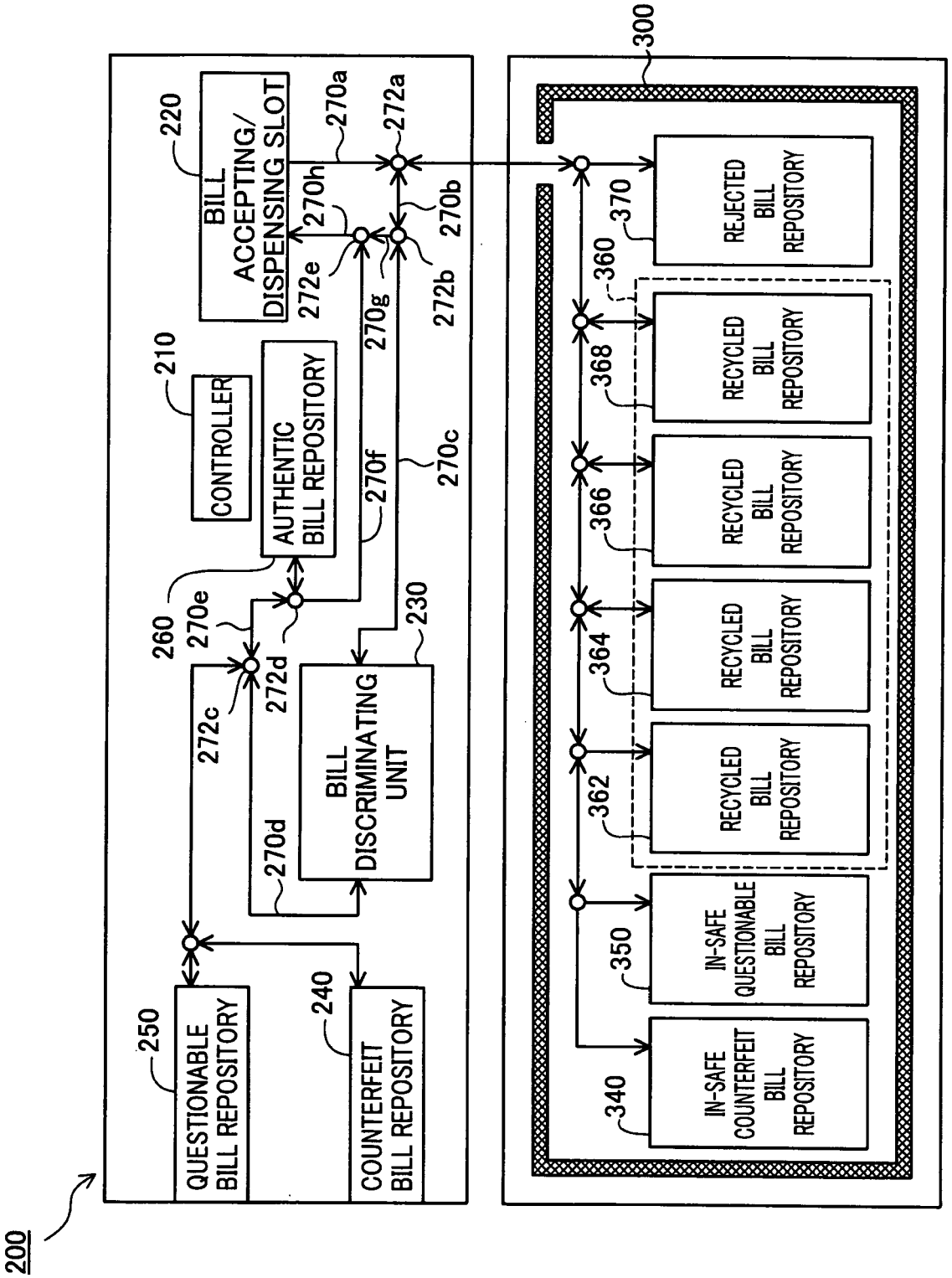

200
300
220
BILL ACCEPTING/ DISPENSING SLOT
270a
272a
270h
272e
270b
272b
210
CONTROLLER
AUTHENTIC BILL REPOSITORY
270g
270f
270c
260
270e
272c
272d
230
BILL DISCRIMINATING UNIT
270d
250
QUESTIONABLE BILL REPOSITORY
240
COUNTERFEIT BILL REPOSITORY
370
REJECTED BILL REPOSITORY
360
368
RECYCLED BILL REPOSITORY
366
RECYCLED BILL REPOSITORY
364
RECYCLED BILL REPOSITORY
362
RECYCLED BILL REPOSITORY
350
IN-SAFE QUESTIONABLE BILL REPOSITORY
340
IN-SAFE COUNTERFEIT BILL REPOSITORY

Fig.3

Fig.4

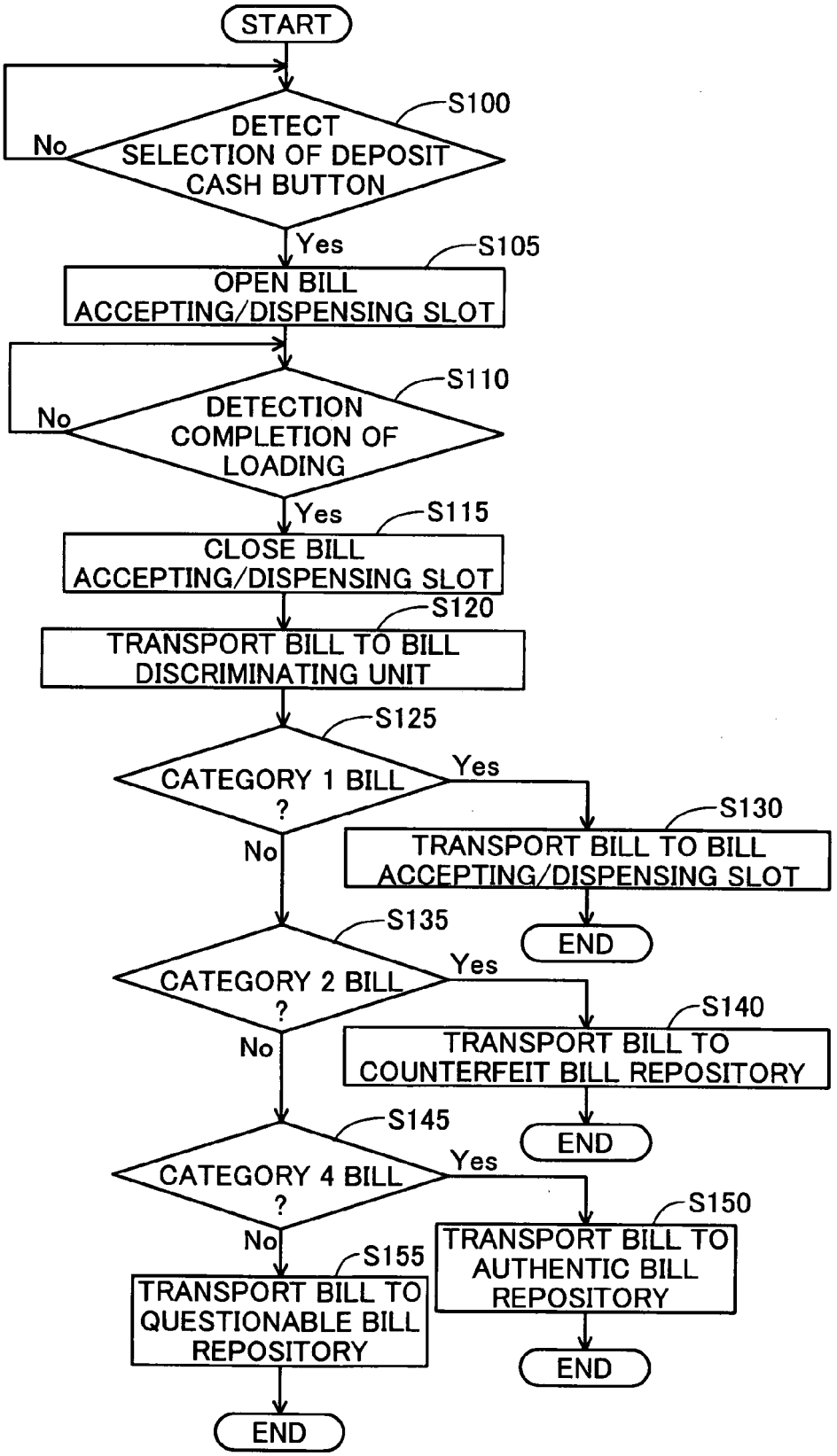

START
S100
DETECT SELECTION OF DEPOSIT CASH BUTTON
No
Yes
S105
OPEN BILL ACCEPTING/DISPENSING SLOT
S110
DETECTION COMPLETION OF LOADING
No
Yes
S115
CLOSE BILL ACCEPTING/DISPENSING SLOT
S120
TRANSPORT BILL TO BILL DISCRIMINATING UNIT
S125
CATEGORY 1 BILL ?
Yes
No
S130
TRANSPORT BILL TO BILL ACCEPTING/DISPENSING SLOT
END
S135
CATEGORY 2 BILL ?
Yes
No
S140
TRANSPORT BILL TO COUNTERFEIT BILL REPOSITORY
END
S145
CATEGORY 4 BILL ?
Yes
No
S150
TRANSPORT BILL TO AUTHENTIC BILL REPOSITORY
END
S155
TRANSPORT BILL TO QUESTIONABLE BILL REPOSITORY
END

Fig.5

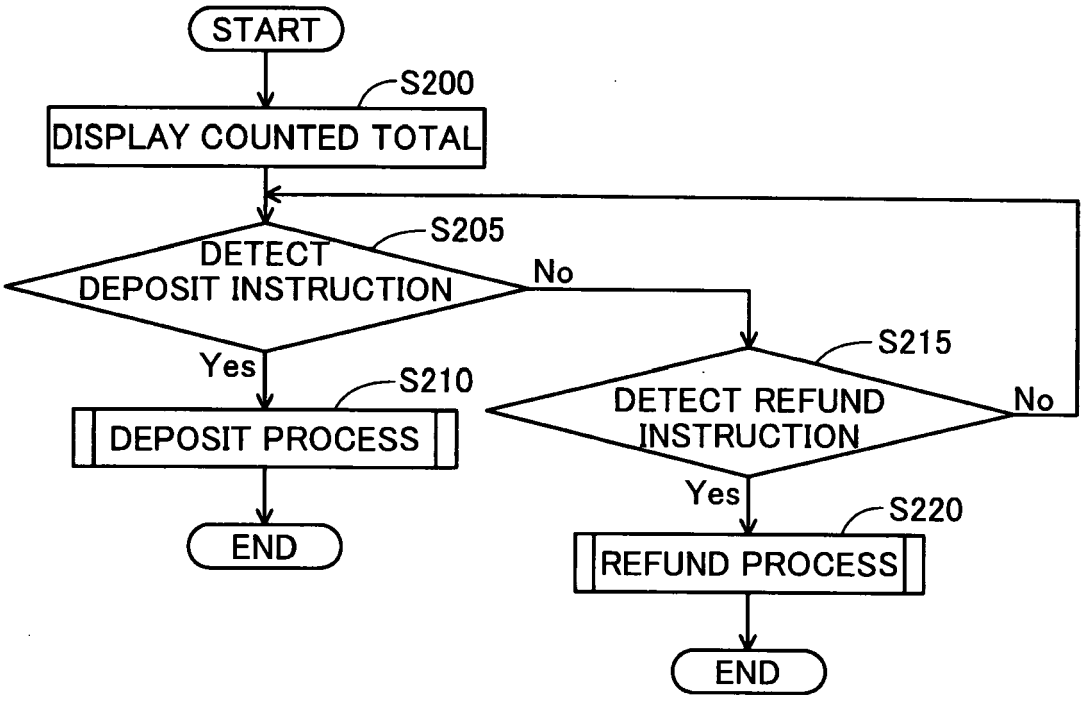

START
S200
DISPLAY COUNTED TOTAL
S205
DETECT DEPOSIT INSTRUCTION
No
Yes
S210
DEPOSIT PROCESS
END
S215
DETECT REFUND INSTRUCTION
No
Yes
S220
REFUND PROCESS
END

Fig.6

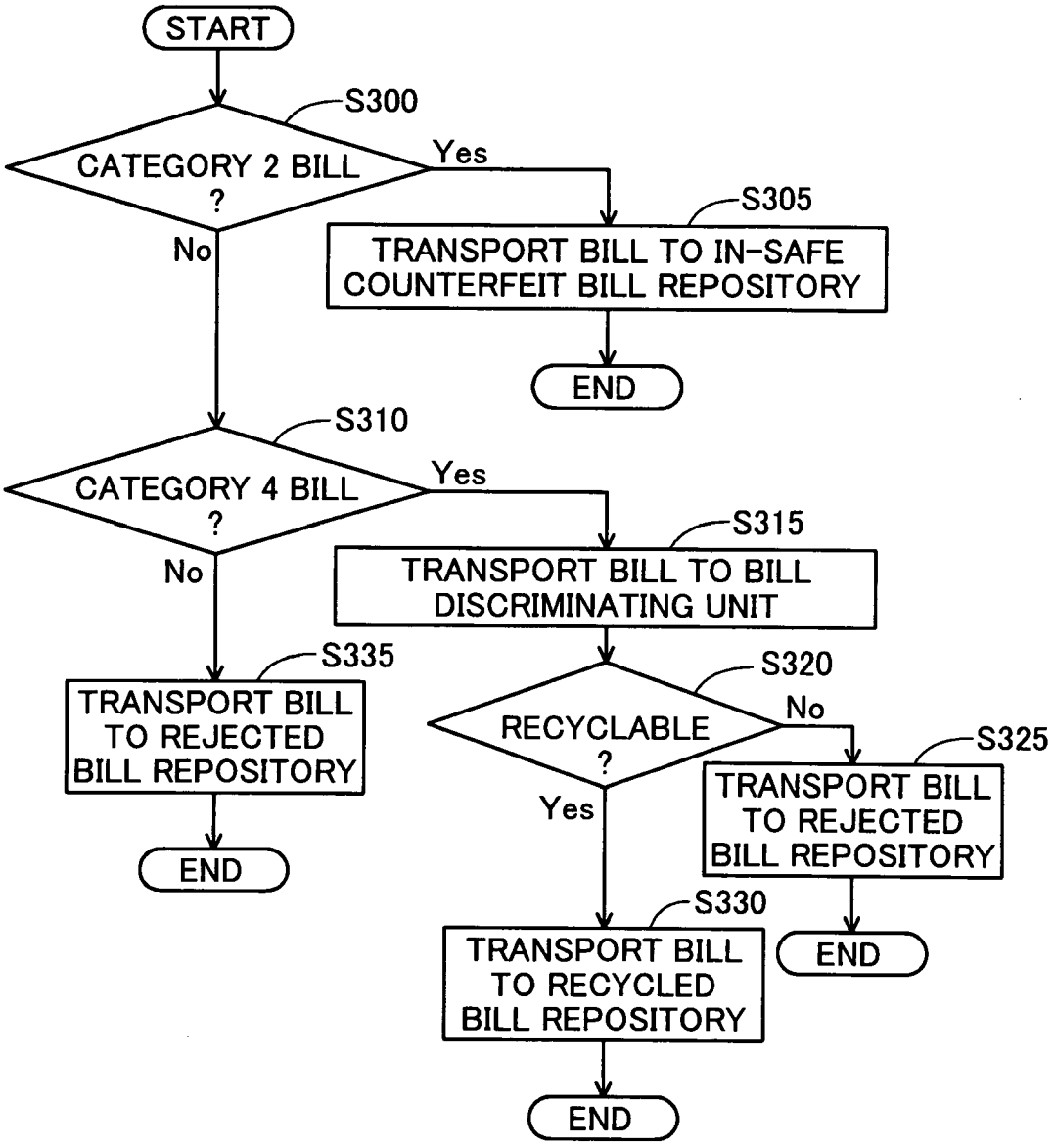

START
S300
CATEGORY 2 BILL ?
Yes
No
S305
TRANSPORT BILL TO IN-SAFE COUNTERFEIT BILL REPOSITORY
END
S310
CATEGORY 4 BILL ?
Yes
No
S315
TRANSPORT BILL TO BILL DISCRIMINATING UNIT
S335
TRANSPORT BILL TO REJECTED BILL REPOSITORY
END
S320
RECYCLABLE ?
No
Yes
S325
TRANSPORT BILL TO REJECTED BILL REPOSITORY
END
S330
TRANSPORT BILL TO RECYCLED BILL REPOSITORY
END

Fig.7

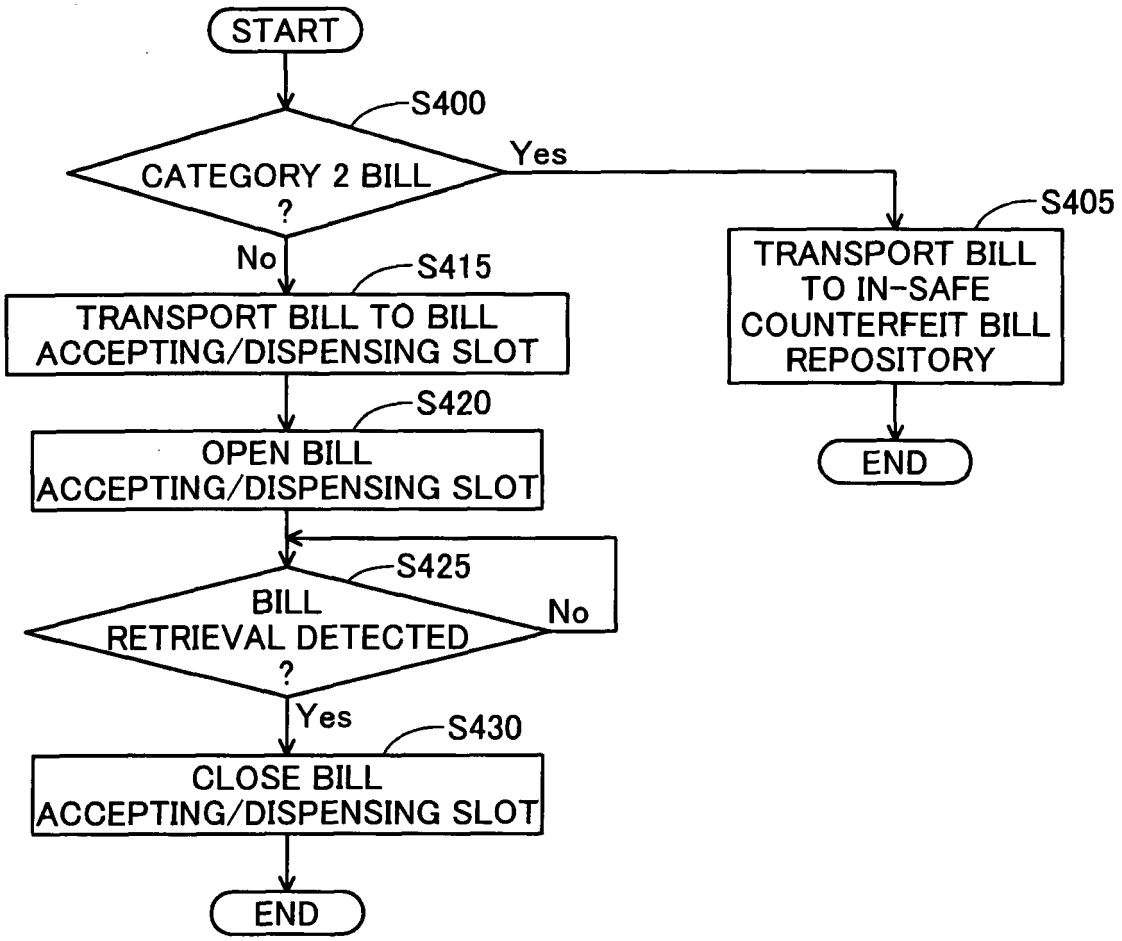

START
S400
CATEGORY 2 BILL ?
Yes
No
S405
TRANSPORT BILL TO IN-SAFE COUNTERFEIT BILL REPOSITORY
END
S415
TRANSPORT BILL TO BILL ACCEPTING/DISPENSING SLOT
S420
OPEN BILL ACCEPTING/DISPENSING SLOT
S425
BILL RETRIEVAL DETECTED ?
No
Yes
S430
CLOSE BILL ACCEPTING/DISPENSING SLOT
END

Fig.8

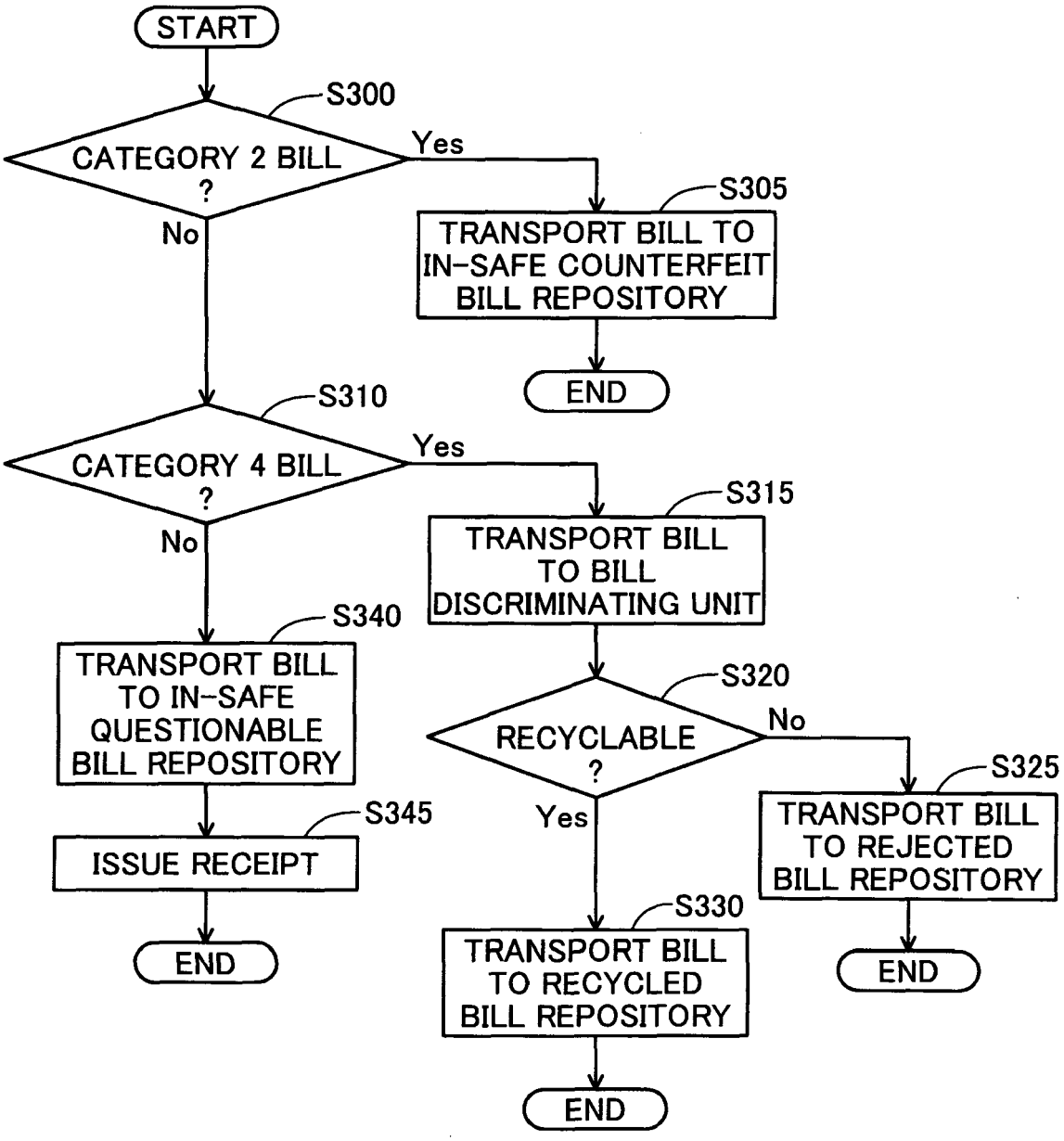
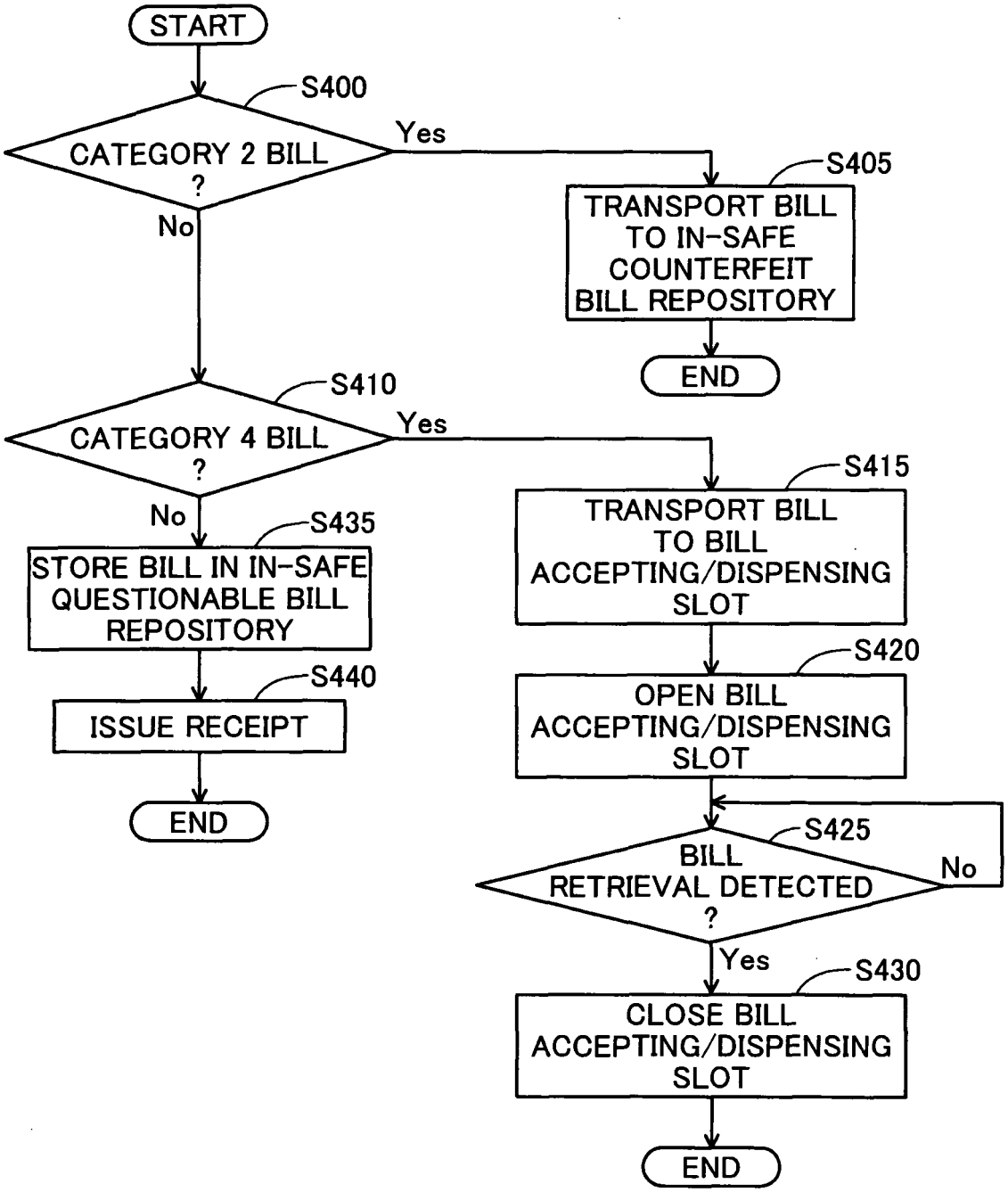

START
S300
CATEGORY 2 BILL ?
Yes
No
S305
TRANSPORT BILL TO IN-SAFE COUNTERFEIT BILL REPOSITORY
END
S310
CATEGORY 4 BILL ?
Yes
No
S315
TRANSPORT BILL TO BILL DISCRIMINATING UNIT
S320
RECYCLABLE ?
No
Yes
S325
TRANSPORT BILL TO REJECTED BILL REPOSITORY
END
S330
TRANSPORT BILL TO RECYCLED BILL REPOSITORY
END
S340
TRANSPORT BILL TO IN-SAFE QUESTIONABLE BILL REPOSITORY
S345
ISSUE RECEIPT
END

Fig.9


START
S400
CATEGORY 2 BILL ?
Yes
No
S405
TRANSPORT BILL TO IN-SAFE COUNTERFEIT BILL REPOSITORY
END
S410
CATEGORY 4 BILL ?
Yes
No
S415
TRANSPORT BILL TO BILL ACCEPTING/DISPENSING SLOT
S420
OPEN BILL ACCEPTING/DISPENSING SLOT
S425
BILL RETRIEVAL DETECTED ?
No
Yes
S430
CLOSE BILL ACCEPTING/DISPENSING SLOT
END
S435
STORE BILL IN IN-SAFE QUESTIONABLE BILL REPOSITORY
S440
ISSUE RECEIPT
END