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(54) **Automatic teller machine**

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Description

CLAIM OF PRIORITY

[0001] The present application claims priority from Japanese application P2003-382555 filed on Nov 12, 2003, the content of which is hereby incorporated by reference into this application.

BACKGROUND

[0002] This invention relates to an automatic teller machine, and more particularly to an automatic teller machine which has a function of exchanging spoiled notes for unspoiled notes, an automatic teller method, and an automatic teller program.

[0003] Notes are degraded due to wearing, staining, tearing, wrinkling, foreign object sticking or the like during use. Generally, such rather degraded notes are referred to as "spoiled notes". On the other hand, notes of little degradation are referred to as "unspoiled notes". Unused notes or notes near unused states among the unspoiled notes are referred to as "mint notes". As the spoiled notes that have been rather degraded make users unpleasant, normally, it is only mint notes/unspoiled notes that are withdrawn from the automatic teller machine. A degradation degree of a note depends on individual's subjectivity. Consequently, some users may feel that notes withdrawn from the automatic teller machine are spoiled. To improve services rendered to such users, a function must be provided to exchange spoiled ones of notes withdrawn for unspoiled notes.

[0004] Meanwhile, there has been known a money transaction device which enables selection of withdrawal of new money (mint notes) or withdrawal of circulating money (unspoiled notes, spoiled notes) according to user's selection instruction (e.g., JP 9-62895 A).

[0005] GB-A-2 247 097 discloses a bank note processing apparatus including a mechanism for counting and verifying bank notes. The two-part form of present claims 1 and 2 has been based on this document.

[0006] JP-A-09 062 895 discloses a money transaction device which can pay out new and circulating bank notes and is also able to exchange money input by a user.

[0007] EP-A-0 871 149 discloses a self-service deposit apparatus including means for identifying the user.

SUMMARY

[0008] However, in conventional note exchanging, a function of withdrawing new notes (mint notes) has only been added to the device which has an exchanging function, and the exchanging has been treated separately from a note input/output transaction at a bank. Thus, in the case of exchanging notes withdrawn, note exchanging must be executed after a withdrawal transaction is finished. Additionally, to improve safety, during note exchanging, individual identification is preferably executed

to identify who carries out a note exchanging operation. However, the execution of individual identification just to exchange notes involves a problem in terms of reduced usability for the users.

[0009] This invention has been made in light of the aforementioned problems, and it is therefore an object of this invention to provide an automatic teller machine and an automatic teller method which enable exchanging of spoiled notes for unspoiled notes (mint notes) in note transaction (withdrawal).

[0010] The object is met by the automatic teller machine according to this invention as defined in claim 1. It includes a note input/output unit, a control unit for controlling each unit, a memory, a note housing unit for housing notes, and an input unit for accepting user's operation, allows withdrawal of a sum of notes according to an input from the user, accepts a redeposit of at least a part of the notes withdrawn before completion of a transaction, and allows withdrawal of a sum equivalent to the redeposited notes from the notes housed in the housing unit and determined to be mint notes.

[0011] According to this invention, since note exchanging can be executed by a series of note input/output transactions, the user can exchange spoiled notes for unspoiled notes (mint notes) without going to the other device or stopping the transaction, and usability can be improved for the user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG. 1 is a block diagram of an automatic teller machine according to a first illustrative example of this invention.

FIGS. 2A and 2B are appearance diagrams of the automatic teller machine according to the first example.

FIG. 3 is an explanatory diagram of a display and input device according to the first embodiment of this invention.

FIG. 4 is an explanatory diagram of the display and input device according to the first example.

FIG. 5 is a flowchart of note exchanging according to the first example.

FIG. 6 is a flowchart of fitness check and classification of counterfeit/ genuine according to the first example.

FIG. 7 is a flowchart of another fitness check and classification of counterfeit/ genuine according to the first example.

FIG. 8 is a flowchart of classification of counterfeit/ genuine and fitness check according to the first example.

FIG. 9 is an explanatory diagram of feature extraction according to the first example.

FIG. 10 is a block diagram showing a constitution of an automatic teller machine according to a second

illustrative example of this invention.

FIG. 11 is a flowchart of note exchanging according to the second example.

FIG. 12 is a flowchart of fitness check and classification of counterfeit/genuine according to the second example.

FIG. 13 is a flowchart of another fitness check and classification of counterfeit/ genuine according to the second example.

FIG. 14 is a flowchart of note exchanging according to a first embodiment of this invention.

FIG. 15 is a flowchart of fitness check and classification of counterfeit/ genuine according to the first embodiment of this invention.

FIG. 16 is a flowchart of another fitness check and classification of counterfeit/genuine according to the first embodiment of this invention.

FIG. 17 is a diagram showing an example of a display screen according to the first embodiment of this invention.

FIG. 18 is a flowchart of note exchanging according to a second embodiment of this invention.

FIG. 19 is a flowchart of fitness check and classification of counterfeit/ genuine according to the second embodiment of this invention.

FIG. 20 is a flowchart of another fitness check and classification of counterfeit/ genuine according to the second embodiment of this invention.

FIG. 21 is an appearance diagram of an automatic teller machine according to a third illustrative example of this invention.

FIG. 22 is a block diagram showing a constitution of the automatic teller machine according to the third example.

FIG. 23 is a flowchart of note exchanging according to the third example.

FIG. 24 is a flowchart of fitness check and classification of counterfeit/ genuine according to the third example.

FIG. 25 is a flowchart of another fitness check and classification of counterfeit/genuine according to the third example.

FIG. 26 is a block diagram showing a configuration of a banknote transaction system according a fifth illustrative example of this invention.

FIG. 27 is a block diagram showing a constitution of an automatic teller machine according to a sixth illustrative example of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] Preferred embodiments and illustrative examples of this invention will be described in detail below with reference to the accompanying drawings.

[0014] FIG. 1 is a block diagram showing a constitution of an automatic teller machine according to a first illustrative example.

[0015] A note input/output unit 101 is a unit that notes are put in and withdrawn from thereof. The note input/output unit 101 includes a note deposit opening and a note withdrawal opening, passes notes which is put into the note deposit opening to a conveying device 141, and allows withdrawal of the notes conveyed by the conveying device 141 to the outside of the automatic teller machine. A note separator 102 separates the notes put into the note input/output unit 101, and passes the notes one by one to a note validator 103.

[0016] The note validator 103 is a unit which validates fitness or classify counterfeit/ genuine notes. Fitness means quality of a note. And validating fitness means checking whether the note has good quality to be used in the market or not. The note validator 103 includes a main memory 104 and a sensor 105, detects a deposited/ withdrawn note by the sensor 105, and collates the note with a pattern previously stored in the main memory 104 to check fitness or classify counterfeit/genuine thereof. A control unit 106 includes a CPU (not shown) and a main memory 107. An auxiliary memory 108 consists of a large-capacity memory such as a hard disk drive, and stores programs for controlling the note input/output unit 101, note housing units (120 to 124), the note validator 103 and the like to carry out note transactions.

[0017] A temporary stacker 110 temporarily houses notes put into the note input/output unit 101. Note recycling boxes 120, 121 are notes housing devices for put in and withdrawing notes, and housing notes withdrawn from the note input/output unit 101. The note recycling boxes 120, 121 also house notes suited to withdrawal among the notes put into the note input/output unit 101. A note box 122 for spoiled notes houses much degraded notes. Note boxes 123, 124 for counterfeit notes house notes determined to be counterfeit by the note validator 103. Notes may be housed in different boxes for counterfeit notes depending on suspicions of counterfeit notes (apparent counterfeit notes, notes suspected to be counterfeit). The note conveying device 141 includes a belt, a roller and the like. An arrow of the conveying device 141 indicates a note conveying direction.

[0018] A card input/output unit 202, a bankbook input/output unit 203, and a display and input device (e.g., touch panel type liquid crystal display device) 204 are connected to the control unit 106.

[0019] A user of the automatic teller machine puts a card into the card input/output unit 202. The user puts a bankbook into the bankbook input/output unit 203 when necessary. The user starts a transaction according to contents displayed in the display and input device 204. Then, the notes put into the note input/output unit 101 are separated one by one by the note separator 102, and sent one by one to the note validator 103 by the conveying device 141. The notes subjected to check fitness and to classify into the notes counterfeit/genuine thereof and the like by the note validator 103. Then the notes are sent to the note recycling boxes 120, 121, the note box 122 for spoiled notes, or the note boxes 123, 124 for coun-

terfeit notes, and housed therein. Notes withdrawn by an operation of the user are sent out from the note recycling boxes 120, 121 to the note validator 103 by the conveying device 141. Then the notes are subjected to check fitness and to classify into the notes counterfeit/ genuine thereof and the like by the note validator 103. The notes sent to the note input/output unit 101 to be housed. The notes housed in the note input/output unit 101 are withdrawn by opening its cover.

[0020] FIGS. 2A and 2B are appearance diagrams of the automatic teller machine according to the first example. FIG. 2A shows an appearance of the automatic teller machine, and FIG. 2B shows a screen example displayed in the display and input device 204 of the automatic teller machine.

[0021] An automatic teller machine 201 includes the card input/output unit 202, the bankbook input/output unit 203, the display and input device 204, a card box 206, a banknote box 207, and the like. A card inserted into the card input/output unit 202 is housed in the card box 206, and information recorded in a magnetic stripe, an IC chip or the like of the card is obtained. A bankbook inserted into the bankbook input/output unit 203 is housed in the bankbook box 207, and information recorded in a magnetic stripe, an IC chip or the like of the bankbook is obtained. The display and input device 204 is, for example, a touch panel type LCD (Liquid Crystal Display), displays transaction contents to the user and a button for accepting user's input, and information indicating pressing/non-pressing of the button is obtained.

[0022] FIGS. 3 and 4 are explanatory views showing screen examples displayed in the display and input device 204.

[0023] FIG. 3 shows a screen example displayed to the user when the user finishes a transaction by the automatic teller machine and notes are withdrawn from the note input/output unit 101. This screen is displayed to prompt the user to select "end transaction" or "execute exchange". FIG. 4 is a screen example displayed when the user puts notes to be exchanged into the note input/output unit 101, and the automatic teller machine verifies the sum of the put notes. This screen is displayed to prompt verification of coincidence of the sum of the notes put by the user with a displayed sum.

[0024] Next, description will be made of an operation for exchanging spoiled notes carried out by the automatic teller machine of the first illustrative example of this invention.

[0025] The user of the automatic teller machine inserts a card into the card input/output unit 202. When necessary (e.g., when bankbook balance update is desired), the user inserts a bankbook into the bankbook input/output unit 203. The display and input device 204 includes, e.g., a touch panel type LCD. The user presses a button of a screen 205 displayed in the display and input device 204 to select a desired type of transaction (e.g., deposit, withdrawal, transfer, bankbook balance update or the like). Hereinafter, the case of selecting the withdrawal

will be described.

[0026] The user further operates the display and input device 204 to input necessary information (e.g., password or the like), and subsequently inputs the sum of money to be withdrawn. By control of the control unit 106, notes corresponding to the sum of money to be withdrawn are delivered one by one from the note recycling box 120. The note recycling boxes 120, 121 are note housing devices which can take in/pay notes, and house notes altogether for, e.g., each denomination. The delivered notes are passed through the sensor 105 of the note validator 103 to be housed in the note input/output unit 101, and then withdrawn. The user receives the notes withdrawn. According to the conventional note transaction device, the transaction is finished here, and the card is ejected from the card input/output unit 202. If the bankbook has been inserted, the bankbook is ejected from the bankbook input/output unit 203.

[0027] According to the automatic teller machine of the present example; the transaction continues more here. A display screen 301 shown in FIG. 3 is displayed in the display and input device 204 to prompt the user to select "end transaction" or "execute exchange". When feeling no particular abnormality in the notes withdrawn, the user presses an "END TRANSACTION" button. In this case, the card is ejected from the card input/output unit 202. If the bankbook has been inserted, the bankbook is ejected from the bankbook input/output unit 203 to finish the transaction.

[0028] On the other hand, when determining that the notes withdrawn include notes (namely spoiled notes) degraded due to wearing, staining, tearing, wrinkling, foreign object sticking thereon or the like, the user can exchange the spoiled notes for other notes. In this case, the user puts the notes determined to be spoiled into the note input/output unit 101. The put notes are separated one by one by the note separator 102 installed in the note input/output unit 101, and sent to the sensor 105. The note validator 103 determines a denomination of the notes by using a signal output from the sensor 105. The control unit 106 makes control to send notes whose denomination is unclear in the denomination determination again to the note input/output unit 101, thereby rejecting acceptance thereof. The note whose denomination is unclear is referred to as a "category 1".

[0029] For notes whose denomination has been clarified and classified correctly, the notes are next subjected to classification of counterfeit/ genuine. The following two processing methods are available for notes determined to be counterfeit as a result of the classification of counterfeit/ genuine notes.

[0030] According to the first counterfeit notes processing method, the notes determined to be counterfeit are sent to the note input/output unit 101 to reject acceptance. In this case, the note boxes 123, 124 for counterfeit notes need not be disposed.

[0031] According to the second counterfeit note processing method, user ID's (e.g., identification infor-

mation or the like of users recorded in cards) are stored in the auxiliary memory 108, and the notes determined to be counterfeit are housed in the note boxes 123, 124 for counterfeit notes in order of coincidence with a memorizing sequence of the ID's. Thus, it is possible to record which user has used the counterfeit notes. In this case, the counterfeit notes may be further classified, notes determined to be apparently counterfeit may be housed in the note box 123 for counterfeit notes, and notes suspected to be counterfeit may be housed in the note box 124 for counterfeit notes. The counterfeit notes may not be classified, and notes determined to be counterfeit may be housed in one note box for counterfeit notes. It should be noted that the note determined to be apparently counterfeit is referred to as a "category 2", and the note suspected to be counterfeit is referred to as a "category 3".

[0032] Each of notes whose counterfeit-genuine determination result is genuine is subjected to fitness check by the note validator 103, and a minimum value of a degree of spoilage, i.e., a value of a note of least degradation among the put notes, is stored in the main memory 104. The note determined to be genuine is referred to as a "category 4".

[0033] The control unit 106 makes control to house the put notes in the temporary stacker 110. Then, to obtain acceptance from the user, a display screen 401 shown in FIG. 4 is displayed in the display and input device 204 to indicate the sum of notes to be exchanged. Here, if the user presses a "CANCEL" button, the automatic teller machine returns the notes housed in the temporary stacker 110 through the sensor 105 to the note input/output unit 101. Subsequently, the display screen 301 of FIG. 3 is displayed again in the display and input device 204, and the process stands by until a button is pressed.

[0034] On the other hand, if the user presses an "ACCEPT" button, the control unit 106 makes control to first pass the notes housed in the temporary stacker 110 sequentially through sensor 105, and houses them in the note box 122 for spoiled notes. Next, the control unit 106 makes control to send notes corresponding to the sum of the notes put into the note input/output unit 101 by the user from the note recycling boxes 120, 121. The notes are sequentially passed through the sensor 105, and subjected to fitness check by the note validator 103.

[0035] Notes determined to be higher in a degree of spoilage (degraded) than the degree of spoilage stored in the main memory 104 as a result of the fitness check are first housed in the temporary stacker 110. Here, when the temporary stacker 110 is filled, the notes are sent therefrom to the sensor 105, and subjected to denomination determination by the note validator 103. Then, based on a result of the denomination determination, the notes are housed in one of the note recycling boxes 120, 121.

[0036] Notes determined to be lower in a degree of spoilage (not degraded) than the degree of spoilage stored in the main memory 104 as a result of the fitness check are sent to the note input/output unit 101, and with-

drawn when notes equivalent to the sum of money put into by the user are prepared. The user receives the notes withdrawn. At this time, the card is ejected from the card input/output unit 202. If the bankbook has been inserted, the bankbook is ejected from the bankbook input/output unit 203.

[0037] By such a series of operations, the notes determined to be spoiled are put again by the user to be exchanged for unspoiled notes.

[0038] FIG. 5 is a flowchart showing a note exchanging operation of the automatic teller machine.

[0039] As described above, the withdrawal operation of the user causes the automatic teller machine to pay notes to the user (501). Next, the control unit 106 displays the display screen 310 shown in FIG. 3 to prompt the user to select "end transaction" or "execute exchange" (502). With the screen, the user selects "execute exchange" or "end transaction" by the button on the screen. In the case of exchanging notes, the user must put the notes into the note input/output unit 101 before button pressing. Then, the control unit 106 determines whether the user has pressed the "END TRANSACTION" button or not (503). If the "END TRANSACTION" button has been pressed, the transaction is finished. If the "END TRANSACTION" button has not been pressed, the control unit 106 determines whether the "EXEC EXCHANGE" button has been pressed or not (504). If the "EXEC EXCHANGE" button has not been pressed, the control unit 106 returns to the step 503 to repeat the process. If the "EXEC EXCHANGE" button has been pressed, the control unit 106 makes control to take the notes out which put into the note input/output unit 101 one by one, and to send said notes to the note validator 103 (505). Then, each of the put notes is subjected to denomination determination by the note validator 103 (506), and fitness check and classification of counterfeit/genuine are carried out (550). Referring to FIG. 6, the fitness check and the classification of counterfeit/genuine will be detailed later. By the fitness check and the classification of counterfeit/genuine, a degree of spoilage of each note is determined, and the note is determined to be genuine or counterfeit.

[0040] Next, the control unit 106 determines whether the fitness check and the classification of counterfeit/genuine have been completed or not for all the notes in the note input/output unit 101 (514). If not completed, the notes put the note input/output unit 101 are sent again to note validator 103 (505), and the fitness check and the classification of counterfeit/genuine are repeated. When it is determined that the fitness check and the classification of counterfeit/genuine have been completed for all the notes, the control unit 106 displays the sum of money put into the note input/output unit 101 in the display and input device 204 shown in FIG. 4 to prompt verification (515). The user verifies the returned notes and the sum of put notes, presses the "CANCEL" button when the sum of put notes is determined to be incorrect, and presses the "ACCEPT" button when the sum is determined to

be correct.

[0041] The control unit 106 determines whether the "CANCEL" button has been pressed or not (516). Determination that the "CANCEL" button has been pressed is a case in which the user has canceled the note exchanging. In this case, the notes housed in the temporary stacker 110 are sent to the note input/output unit 101, and withdrawn (522). Then, the control unit 106 returns to the step 502, and executes displaying again to prompt the user to select "end transaction" or "execute exchange".

[0042] When it determines that the "CANCEL" button has not been pressed, the control unit 106 determines whether the "ACCEPT" button has been pressed or not (517). When it determines that the "ACCEPT" button has not been pressed, the control unit 106 returns to the step 516. When it is determined that the "ACCEPT" button has been pressed, the notes are sequentially delivered from the note recycling box (518). Then, the control unit 106 executes fitness check for the delivered notes (519), and determines, based on the fitness check and classification of counterfeit/genuine in the step 550, whether a degree of spoilage of the delivered notes is smaller or not than a minimum value (value of a note determined to be cleanest) of the degree of spoilage of the put notes stored in the main memory (511 of FIG. 6) (520). In the case of notes whose degrees of spoilage are determined not to be smaller, i.e., the notes not cleaner than the put notes are sent to the note recycling box to be housed (523). Then, returning to the step 518, other notes are delivered from the note recycling box to repeat the process. In the case of determination that the degree of spoilage is smaller, since notes cleaner than the put notes can be withdrawn, the notes are sent to the note input/output unit 101, the sum equal to the sum of money put into is withdrawn to the user (521), and the transaction is finished.

[0043] FIG. 6 is a flowchart showing the fitness check and the classification of counterfeit/genuine (550 of FIG. 5) in detail.

[0044] As a result of the classification of denomination in the step 506 of FIG. 5, the control unit 106 first determines whether the denomination has been classified correctly or not (507). If the denomination has not been classified correctly, i.e., in the case of the unclarified denomination, acceptance of the notes is rejected, and the notes are sent to the note input/output unit 101 (513), and returned to the user.

[0045] The control unit 106 executes classification of counterfeit/genuine notes if the denomination has been classified correctly (508). If a result of the counterfeit/genuine classification determines that the notes are not genuine (509), acceptance of the notes is rejected, the notes are sent to the note input/output unit 101 (513), and returned to the user. If the result of the counterfeit/genuine classification determines that the notes are genuine (509), the notes are subjected to fitness check (510).

[0046] The control unit 106 makes control to store a degree of spoilage of the notes in the main memory(511).

The spoilage degree is determined by the fitness check. In this event, when a plurality of notes are put into the note input/output unit 101, degrees of spoilage are determined for all the notes, and a smallest degree of spoilage (cleanest) is stored in the main memory 104. Next, the notes are housed in the temporary stacker 110 (512), and the process returns to the note exchanging shown in FIG. 5.

[0047] FIG. 7 is a flowchart showing another example of fitness check and classification of counterfeit/ genuine in detail.

[0048] In the process of FIG. 6, the control unit 106 returns the notes determined to be counterfeit to the user. However, in the process of FIG. 7, the notes determined to be counterfeit are housed in the note boxes 123, 124 for counterfeit notes. For the notes determined to be counterfeit and housed, identification information (e.g., note serial number) of the notes and an ID of the user (e.g., user's account number) are correlated, and the information is stored in the main memory 104. Steps similar to those of FIG. 6 are denoted by similar reference numerals, and description thereof will be omitted.

[0049] In the step 509, if the result of the counterfeit/genuine classification determines that the notes are not genuine (counterfeit), the control unit 106 makes control to first store the ID of the user in the main memory 104 (601). Then, the control unit 106 determines whether the notes determined to be counterfeit are apparently counterfeit or not (the notes are apparently counterfeit, or the notes are suspected to be counterfeit) (602).

[0050] In the case of the apparently counterfeit notes (category 2), the control unit 106 makes control to house the notes in the note box 123 for counterfeit notes (603). In the case of the notes which are not apparently counterfeit but suspected to be counterfeit (category 3), the control unit 106 makes control to house the notes in the note box for counterfeit notes (note box 124 for counterfeit notes) different from the note box 123 for counterfeit notes which houses the apparently counterfeit notes (603).

[0051] By the process of FIG. 7, it is possible to specify the user who has put the notes determined to be counterfeit again. Further, it is possible to house the apparently counterfeit notes and the notes suspected to be counterfeit separately.

[0052] Now, a method of note fitness check and classification of counterfeit/ genuine will be described.

[0053] FIG. 8 is a flowchart showing the process of classification of counterfeit (508 of FIG. 6) and fitness check (510 of FIG. 6) executed by the note validator 103.

[0054] The note validator 103 first senses the notes input thereto by the sensor 105, and obtains a sensor signal (701). Then, features of the notes used for the fitness check or the classification of counterfeit/genuine are extracted from the sensor signal (702).

[0055] FIG. 9 is an explanatory diagram showing the feature extraction of the step 702.

[0056] The features used for the fitness check or the

classification of counterfeit/genuine include, e.g., a difference value from a standard signal, an integral value, a differential value, amplitude, variation, and the like. The note validator 103 executes the note fitness check or the classification of counterfeit/ genuine by using one or a plurality of such bits of information.

[0057] Next, the note validator 103 inputs information regarding the extracted feature to a classifier (703), and a classification result of the classifier (i.e., fitness degree or counterfeit/genuine) is output (704). For the classifier, for example, a linear discriminant function, a quadratic discriminant function, a neural network, a support vector machine or the like can be used.

[0058] The classification result in the case of the fitness check is a discrete value indicating an unspoiled/ spoiled note. To compare degrees of spoilage, values of spoilage degrees can be directly output. For a method of calculating a degree of spoilage, for example, there are a method of identification which prepares a class for each degree of spoilage, a method which uses a ratio or a difference of distances from a template of an unspoiled note class and a template of a spoiled note class, and a method which uses projection to an axis indicating the spoilage feature in the feature space. The classification result in the case of the classification of counterfeit/genuine becomes a discrete value corresponding to each of genuine and counterfeit notes, or a discrete value corresponding to each of a genuine note, an apparently counterfeit note and a note suspected to be counterfeit.

[0059] As described above, according to the automatic teller machine of the first illustrative example of this invention, in a series of withdrawal transactions, the user puts notes determined to be spoiled among the notes withdrawn again, and thus the spoiled notes can be exchanged for unspoiled notes. Moreover, since the note exchanging is executed without finishing the transaction, convenience of withdrawal to the user can be improved. If the notes are determined to be counterfeit, the measures can be taken to reject acceptance of the notes and to return the notes to the user, house the notes together with the ID of the user, or the like. Thus, it is possible to improve safety of the automatic teller machine without mixing counterfeit notes during the note transaction.

[0060] Next, description will be made of an automatic teller machine according to a second illustrative example of this invention.

[0061] According to above-mentioned the automatic teller machine of the first example, the notes of low degrees of spoilage are withdrawn from the housed notes in response to the spoiled note exchanging request from the user. However, the automatic teller machine of the second example is constituted to pay mint notes in response to a spoiled note exchanging request from a user. Components similar in operation to those of the first example are denoted by similar reference numerals, and description thereof will be omitted.

[0062] FIG. 10 is a block diagram showing a constitution of the automatic teller machine according to the sec-

ond illustrative example of this invention.

[0063] A note box 901 for mint notes houses unused notes or substantially unused notes (mint notes).

[0064] The user of the automatic teller machine inserts a card into the card input/output unit 202. When bankbook balance update is desired, the user inserts the bankbook into the bankbook input/output unit 203. The user presses a button on the screen 205 displayed in the display and input device 204 to select a desired type of transaction (e.g., deposit, withdrawal, transfer, bankbook balance update or the like). Hereinafter, the case of selecting the withdrawal will be described.

[0065] The user further operates the display and input device 204 to input necessary information (e.g., password or the like), and subsequently inputs the sum of money to be withdrawn. By control of the control unit 106, notes corresponding to the sum of money to be withdrawn are delivered one by one from the note recycling box 120. The delivered notes are passed through the sensor 105 of a note validator 103 to be housed in a note input/output unit 101, and then withdrawn. The user receives the notes withdrawn. According to the conventional note transaction device, the transaction is finished here, and the card is ejected from the card input/output unit 202. If the bankbook has been inserted, the bankbook is ejected from the bankbook input/ output unit 203.

[0066] According to the note transaction device of this example, the transaction further continues here. The display screen 301 shown in FIG. 3 is displayed in the display and input device 204 to prompt the user to select "end transaction" or "execute exchange". When feeling no particular abnormality in the notes withdrawn, the user presses an "END TRANSACTION" button. In this case, the card is ejected from the card input/output unit 202. If the bankbook has been inserted, the bankbook is ejected from the bankbook input/output unit 203 to finish the transaction.

[0067] On the other hand, when determining that the notes withdrawn include spoiled notes, the user can exchange the spoiled notes for other notes. In this case, the user puts the notes determined to be spoiled into the note input/output unit 101. The put notes are separated one by one by the note separator 102 installed in the note input/output unit 101, and sent to the sensor 105. The note validator 103 determines a denomination of the notes by using a signal output from the sensor 105. The control unit 106 makes control to send notes (category 1) whose denomination is unclear in the denomination determination again to the note input/output unit 101, thereby rejecting acceptance thereof.

[0068] For notes whose denomination has been clarified and classified correctly, the notes are next subjected to classification of counterfeit/ genuine.

[0069] Then, to obtain acceptance from the user, the control unit 106 displays the display screen 401 shown in FIG. 4 in the display and input device 204 to notify the sum of notes (category 4) determined to be genuine as a result of the counterfeit-genuine classification to the

user. Here, if the user presses a "CANCEL" button, the automatic teller machine returns the notes housed in the temporary stacker 110 through the sensor 105 to the note input/output unit 101. Subsequently, the display screen 301 of FIG. 3 is displayed again in the display and input device 204, and the process stands by until a button is pressed.

[0070] On the other hand, if the user presses an "ACCEPT" button, the control unit 106 makes control to first house the notes of the temporary stacker 110 in the note box 122 for spoiled notes. Next, the control unit 106 makes control to send notes corresponding to the sum of money put into by the user from the note box 901 for mint notes, and send the notes through the sensor 105 to the note input/output unit 101. When notes equivalent to the sum of money put into by the user are prepared, the notes are withdrawn. The user receives the notes withdrawn. At this time, the card is ejected from the card input/output unit 202. If the bankbook has been inserted, the bankbook is ejected from the bankbook input/output unit 203.

[0071] With such a series of operations, the notes determined to be spoiled are put again by the user to be exchanged for unspoiled notes.

[0072] FIG. 11 is a flowchart showing a note exchanging operation according to the second example. FIGS. 12 and 13 are flowcharts of detailed operations of fitness check and classification of counterfeit/genuine.

[0073] The second example is different from the first example in that fitness check (510 of FIG. 6) and spoilage degree memorizing operation (511 of FIG. 6) are not executed for notes put into again, in that fitness check (519 of FIG. 5) and spoilage degree determination (520 of FIG. 5) are not executed, and in that notes withdrawn to be exchanged are not subjected to fitness check, and notes previously housed in the note box 901 for mint notes are delivered to be withdrawn (1001 of FIG. 11). Other operations are similar to those (FIGS. 5, 6, and 7) of the first example, and thus description thereof will be omitted.

[0074] As described above, according to the automatic teller machine of the second illustrative example of this invention, in addition to the effects of the first example, the user puts notes determined to be spoiled again into the note input/output unit 101, and thus the spoiled notes can be always exchanged for mint notes. For example, it is possible to prevent a situation in which unspoiled notes withdrawn in response to an exchanging request are determined to be spoiled by the user to cause re-exchanging, whereby convenience can be improved for the user.

[0075] Next, description will be made of an automatic teller machine according to a first embodiment of this invention.

[0076] The first embodiment is a modification of the first example. By identifying notes when note exchanging is carried out, exchanging of notes alone withdrawn from the automatic teller machine is allowed. Components similar in operation to those of the first example are de-

noted by similar reference numerals, and description thereof will be omitted.

[0077] FIG. 14 is a flowchart of a note exchanging operation according to the first embodiment. FIGS. 15 and 16 are flowcharts of detailed operations of fitness check and classification of counterfeit/genuine. Description of operations similar to those (FIGS. 5, 6, and 7) of the first example will be omitted. According to the first embodiment, information to identify a note is obtained before notes are withdrawn to a user, and stored in the main memory 104 (1201 of FIG. 14). The information to identify the notes is, for example, a symbol or a number written in each note, a barcode, an IC chip embedded in a note or the like. The control unit 106 obtains information which enables identification of each note from such note identification information.

[0078] Then, in fitness check and classification of counterfeit/genuine (FIGS. 15 and 16), the control unit 106 similarly obtains note identification information for notes put therein to be exchanged. Then, the control unit 106 compares the obtained note identification information with the note identification information stored in the step 1201 (1202). Subsequently, determination is made as to whether the notes have been withdrawn from the same automatic teller machine or not (1203). If the notes have been withdrawn from the same automatic teller machine, as described above, the control unit 106 executes fitness check (510), and stores the smallest value (cleanest) of a degree of spoilage of the notes (511) in main memory 104. Then, the accepted note is housed in the temporary stacker 110 (512).

[0079] On the other hand, if the notes have not been withdrawn from the same automatic teller machine, the control unit 106 rejects acceptance of the notes, sends the notes to the note input/output unit 101 (513), and returns the notes to the user.

[0080] It should be noted that, as shown in FIG. 16, as a result of counterfeit note determination, the notes of a category 2 may be housed in a note box 123 for counterfeit notes, and the notes of a category 3 may be housed in a note box 124 for counterfeit notes.

[0081] Additionally, when a deposited sum is displayed (515 of FIG. 14), the control unit 106 may display a display screen 1601 shown in FIG. 17. In other words, the denomination and the number of notes not accepted because the notes have not been withdrawn from the same automatic teller machine may be displayed to the user.

[0082] As described above, according to the automatic teller machine of the first embodiment, in addition to the effects of the first example, acceptance (redeposit) of notes other than notes withdrawn from the same automatic teller machine can be rejected, and safety of withdrawn note exchanging can be further improved by preventing deposit of counterfeit notes or the like.

[0083] Next, description will be made of an automatic teller machine according to a second embodiment of this invention.

[0084] The second embodiment is a modification of

the second example. As in the first embodiment, by identifying notes when note exchanging is carried out, exchanging of notes alone withdrawn from the automatic teller machine is accepted. Components similar in operation to those of the second example are denoted by similar reference numerals, and description thereof will be omitted.

[0085] FIG. 18 is a flowchart of a note exchanging operation according to the second embodiment. FIGS. 19 and 20 are flowcharts of detailed operations of fitness check and classification of counterfeit/ genuine. Description of operations similar to those (FIGS. 11, 12, and 13) of the second example will be omitted. According to the second embodiment, the control unit 106 first obtains information to identify a note before notes are withdrawn to a user, and stores the information in the main memory 104 (1201 of FIG. 18). The information to identify the notes is, for example, a symbol or a number written in each note, a barcode, an IC chip embedded in a note and the like. The control unit 106 obtains information which enables identification of each note from such note identification information.

[0086] Then, in fitness check and classification of counterfeit/ genuine (FIGS. 19 and 20), the control unit 106 similarly obtains note identification information for notes put thereinto to be exchanged. Then, the control unit 106 compares the obtained note identification information with the note identification information stored in the step 1201 (1202). Subsequently, determination is made as to whether the notes have been withdrawn from the same automatic teller machine or not (1203). If the notes have been withdrawn from the same automatic teller machine, as in the first example the control unit 106 executes fitness check (510), and houses the notes of a smallest value (cleanest) of a degree of spoilage (511). Then, the accepted note is housed in the temporary stacker 110 (512).

[0087] On the other hand, if the notes have not been withdrawn from the same automatic teller machine, the control unit 106 rejects acceptance of the notes, sends the notes to the note input/output unit 101 (513), and returns the notes to the user.

[0088] As shown in FIG. 20, as a result of counterfeit note determination, the notes of a category 2 may be housed in the note box 123 for counterfeit notes, and the notes of a category 3 may be housed in a note box 124 for counterfeit notes.

[0089] Additionally, when a deposited sum is displayed (515 of FIG. 18), the control unit 106 may display a display screen 1601 shown in FIG. 17. In other words, the denomination and the number of notes not accepted because the notes have not been withdrawn from the same automatic teller machine may be displayed to the user.

[0090] As described above, according to the automatic teller machine of the second embodiment, as in the first embodiment, acceptance (redeposit) of notes other than notes withdrawn from the same automatic teller machine can be rejected, and safety of withdrawn note exchanging

can be further improved by preventing deposit of counterfeit notes and the like.

[0091] Next, description will be made of an automatic teller machine according to a third illustrative example of this invention.

[0092] According to the third example, the automatic teller machine includes a sensor for detecting a position of a user, and determines whether or not the user is near the device to be able to operate the same. Components similar in operation to those of the first example are denoted by similar reference numerals, and thus description thereof will be omitted.

[0093] FIG. 21 is an external view of the automatic teller machine of the third example. FIG. 22 is a block diagram showing a constitution of the automatic teller machine of the third example.

[0094] The automatic teller machine of the third example includes at least one of a camera 1701, a distance sensor 1702, and a pressure sensor 1703 to check presence of a user in front of the automatic teller machine. The camera 1701 is disposed in a position to photograph a front portion of the automatic teller machine, to determine the presence of the user in front of the automatic teller machine by recognizing a taken image. The distance sensor 1702 uses, e.g., infrared rays to measure a distance from an object. The pressure sensor 1703 uses, e.g., a piezoelectric element to determine whether pressure has been applied to the pressure sensor 1703 or not (e.g., whether the user is on the pressure sensor 1703 or not).

[0095] FIG. 23 is a flowchart of a note exchanging operation carried out by the control unit 106 according to the third example. FIGS. 24 and 25 are flowcharts of detailed operations of fitness check and classification of counterfeit/ genuine.

[0096] First, as described above, the control unit 106 makes control to put notes into the note input/output unit 101 (501), and detects a position of the user by the camera 1701 or the sensor (distance sensor 1702 or pressure sensor 1703) (1901). In the case of using the camera 1701, for example, the position of the user is detected based on a difference between an input image and the background. In the case of using the distance sensor 1702, the position of the user is detected based on a distance between the automatic teller machine and the user. In the case of using the pressure sensor 1703, the position of the user is detected based on weight of the user on the sensor.

[0097] The control unit 106 determines whether the user detected in the step 1901 is in a prescribed area (area in which the user can operate the automatic teller machine) or not (1902). If the user is in the prescribed area, i.e., the user can operate the automatic teller machine, the process moves to a step 1917. If the user is not in the prescribed area, i.e., the user cannot operate the automatic teller machine, the process moves to a step 1903.

[0098] In the step 1917, the control unit 106 determines

whether note exchanging has been executed or not (execution/non-execution of note exchanging). If note exchanging has not been executed, the control unit 106 displays the display screen 301 of FIG. 3 (502). On the other hand, if note exchanging has been executed, the control unit 106 determines whether an "END TRANSACTION" button has been pressed or not (503). If the "END TRANSACTION" button has been pressed, a card is ejected from a card input/output unit 202. If a bankbook has been inserted, the bankbook is ejected from a bankbook input/output unit 203. On the other hand, if the "END TRANSACTION" button has not been pressed, the control unit 106 determines whether an "EXEC EXCHANGE" button has been pressed or not (504). If the "EXEC EXCHANGE" button has not been pressed, the process returns to the step 503. If the "EXEC EXCHANGE" button has been pressed (1918), the process moves to the step 1901.

[0099] In the step 1903, the control unit 106 determines whether deposited notes are left in the card input/output unit 101 or not. If deposited notes are left in the note input/output unit 101, the notes are delivered from the note input/output unit 101, sent to the note validator 103 (1904), classification of denomination is executed (1905), and fitness check and classification of counterfeit/genuine shown in FIG. 24 are executed.

[0100] Subsequently, the control unit 106 determines whether fitness check and classification of counterfeit/genuine have been completed or not for all the notes (1915). If fitness check and classification of counterfeit/genuine have not been completed for all the notes, the control unit 106 returns to the step 1904 to make determination for the remaining notes. On the other hand, if fitness check and classification of counterfeit/genuine have been completed for all the notes, a card is housed in the card box 206. If a bankbook has been inserted, the bankbook is housed in a bankbook box 207 (1917), and the transaction is finished.

[0101] FIG. 24 is a flowchart showing the fitness check and the classification of counterfeit/genuine in detail.

[0102] The control unit 106 first determines whether the denomination has been classified correctly or not as a result of the note denomination determination in the step 1905 (1906). If the denomination has not been classified correctly, i.e., in the case of the unclarified denomination, acceptance of the notes is rejected. The notes are sent to the note input/output unit 101 (1914), and returned to the user. On the other hand, the control unit 106 executes classification of counterfeit/genuine notes if the denomination has been classified correctly (1907).

[0103] The control unit 106 determines whether the notes are genuine or not as a result of the classification of counterfeit/genuine (1908). If the result of the counterfeit/genuine classification confirms that the notes are not genuine, acceptance of the notes is rejected, and the notes are sent to the note input/output unit 101 (1914), and returned to the user. On the other hand, if the result of the counterfeit/genuine classification confirms that the

notes are genuine, the notes are subjected to fitness check (1910).

[0104] If a result of fitness check reveals that the notes are unspoiled, the control unit 106 makes control to house the notes in a note recycling box 120 or 121 according to the denomination (1911). If the notes are not unspoiled, the control unit 106 determines that the notes are spoiled, and the notes are housed in the note box 122 for spoiled notes (1912). Then, the control unit 106 adds the sum in the note input/output unit 101 to user's bank balance (1912). With the step 1912, if the user is not in front of the automatic teller machine (user cannot operate the automatic teller machine) after an end of the transaction, the sum of notes is added to user's bank balance. Accordingly, stealing of withdrawn note by a third party is prevented.

[0105] Additionally, in the fitness check and the classification of counterfeit/genuine of FIG. 23, if the notes are determined to be counterfeit after the classification of counterfeit/genuine as shown in FIG. 6 of the first example, an ID of the user may be stored, and the notes may be housed in the note boxes 123, 124 for counterfeit notes shown in FIG. 25.

[0106] As described above, according to the automatic teller machine of the third illustrative example of this invention, when it is determined that the user cannot operate the automatic teller machine (e.g., user is not in front of the automatic teller machine), the notes are housed in the automatic teller machine, and the sum thereof is added to user's bank balance. Thus, it is possible to eliminate a danger of stealing by the third party, and to improve safety of the automatic teller machine.

[0107] Next, description will be made of an automatic teller machine according to a fourth illustrative example of this invention.

[0108] According to the first and second examples, the degree of spoilage of the note is based on the deposited note. However, according to the automatic teller machine of the fourth example, a process of withdrawing notes alone whose degrees of spoilage are equal to or less than a prescribed threshold value (parameter for fitness check) is carried out, and the threshold value is dynamically updated.

[0109] The control unit 106 executes fitness check for notes put to be exchanged, and calculates degrees of spoilage. Then, by using the calculated degrees of spoilage, the parameter for fitness check is updated. For example, a weighted average of values of the calculated degrees of spoilage and the stored parameter for fitness check is calculated, and this average is set as a new parameter for fitness check. Thereafter, in the fitness check for the deposited notes, the control unit 106 makes control to house the notes in a note box for spoiled notes if the values of the degrees of spoilage exceed the parameter for fitness check, and withdraw the notes whose degrees of spoilage are less than the parameter for fitness check.

[0110] As described above, according to the automatic

teller machine of the fourth example, by dynamically updating the parameter for fitness check in the automatic teller machine, degrees of spoilage different from user to user are numerically classified, and a weighted average thereof is obtained. Thus, the parameter for fitness check can be further approximated to an average value. As a result, since notes determined to be spoiled by many users are not withdrawn, convenience can be improved for the users.

[0111] Next, description will be made of a banknote transaction system according to a fifth illustrative example.

[0112] According to the automatic teller machine of the fifth example, a parameter for fitness check that is a threshold value for fitness check is set for each user. As in the fourth example, the control unit 106 executes fitness check for notes put thereinto to be exchanged, and calculates degrees of spoilage. Then, by using the calculated degrees of spoilage, the parameter for fitness check is updated. For example, a weighted average of values of the calculated degrees of spoilage and the stored parameter for fitness check is calculated, and this average is set as a new parameter for fitness check.

[0113] Thereafter, the control unit 106 makes control to withdraw notes alone whose values of degrees of spoilage are less than the new parameter for fitness check to the same users. To specify individual identification information (e.g., ID or account number) of a card is used. As shown in FIG. 26, the control unit 106 may make control to send the information of the parameter for fitness check for each user through a network 2102 to a shared server 2101, and store the information therein. The information of the parameter for fitness check can be shared by a plurality of automatic teller machines (201a, 201b, and 201c). Thus, no matter which automatic teller machine 201 the user uses, the same information of the parameter for fitness check can be shared based on the information of the shared server 2101.

[0114] As described above, according to the automatic teller machine of the fifth illustrative example of this invention, by dynamically updating the parameter for fitness check, and sharing the parameter for fitness check through the network 2102, no matter which automatic teller machines installed in a plurality of places the user uses, notes less than the same degree of fitness check can be withdrawn. Moreover, since the notes can be withdrawn not only according to user's note exchanging request but also based on the parameter for fitness check shared during the withdrawal, convenience can be improved for the users.

[0115] Next, description will be made of an automatic teller machine according to a sixth illustrative example.

[0116] The automatic teller machine of the sixth example includes a cleaning mechanism for cleaning notes. Components similar in operation to those of the first to fifth examples, or first and second embodiments are denoted by similar reference numerals, and description thereof will be omitted.

[0117] FIG. 27 is a block diagram showing a constitution of the automatic teller machine of the sixth example.

[0118] The automatic teller machine includes a cleaning mechanism 2201. For example, the cleaning mechanism 2201 executes wrinkle removal from notes by an iron or sterilization.

[0119] As described above, after note withdrawal, the control unit 106 displays a screen of FIG. 3 for execution/non-execution of note exchanging on a display screen. When determining that the notes withdrawn from the automatic teller machine are spoiled, a user puts notes again into the note input/output unit 101. The control unit 106 makes control to temporarily house the put notes through the cleaning mechanism 2201 in the temporary stacker 110. In this event, the notes are cleaned by the cleaning mechanism 2201. Then, the cleaned notes are sent again to the note input/output unit 101, and withdrawn to the user.

[0120] As described above, according to the automatic teller machine of the sixth illustrative example of this invention, since the notes requested by the user are cleaned and withdrawn, accumulation of the notes more than necessary in the note box 122 for spoiled notes is prevented. Moreover, since the user directly returns the notes housed in the note input/output unit 101, loss caused by counterfeit note exchanging can be prevented, and safety of a withdrawn note exchanging device can be enhanced.

[0121] Each of the automatic teller machines of the first to sixth examples, or first and second embodiments uses the note recycling boxes 120, 121 because of a recycling function of reusing the deposited notes as notes to be withdrawn. However, this invention is not limited to the constitution. One of the note recycling boxes 120, 121 may be used as a deposited note housing dedicated box (notes are only taken in, but not withdrawn) which has a note taking-in function only, and the other may be used as a withdrawn note housing dedicated box (notes are only withdrawn, but not taken in) which has a note withdrawing function only. Even in the automatic teller machine which has no recycling functions but the deposit/withdrawal function, notes withdrawn can be exchanged as in the first to sixth examples, or first and second embodiments.

[0122] Furthermore, the embodiments of this invention have been described by taking the example of notes (bank notes). However, essence of this invention is not changed even when the embodiments are applied to money such as coins, securities, and the like.

[0123] While the present invention has been described in detail and pictorially in the accompanying drawings, the present invention is not limited to such detail but covers various modifications which fall within the scope of the appended claims.

Claims

1. An automatic teller machine, comprising:

a note input/output unit (101) for receiving an input note for deposit or outputting a note for withdrawal;
 a note housing unit (120 to 124) which houses notes;
 an input unit (204 to 207) for receiving information inputted by a user;
 a control unit (106) for controlling each of the units; and
 a memory unit (107) for storing information necessary for processing by the control unit (106), wherein the note input/output unit (101) allows a withdrawal of a sum of notes from the note housing unit (120 to 124) in response to a user's transaction request accepted by the input unit (204 to 207), and a redeposit of part of the notes withdrawn therein is accepted before completion of the transaction,
 wherein the control unit (106) selects notes determined to be unspoiled from the notes housed in the note housing unit (120 to 124), and wherein the note input/output unit (101) allows a withdrawal of a sum of the selected unspoiled notes equivalent to the redeposited notes,
characterised in that
 the memory unit (107) stores withdrawn note identification information to identify notes withdrawn from the note input/output unit (101), the control unit (106) determines whether the redeposited notes are notes withdrawn from the automatic teller machine (201) or not based on the withdrawn note identification information stored in the memory unit (107), and the note input/output unit (101) allows the withdrawal of unspoiled notes equivalent to the redeposited notes only if the redeposited notes are notes withdrawn from the same automatic teller machine (201).

2. A method used for an automatic teller machine (201) comprising: a note input/output unit (101) for receiving a note inputted for deposit and outputting a note for withdrawal; a note housing unit (120 to 124) for housing notes; an input unit (204 to 207) which receives information inputted by a user; a control unit (106) for controlling each of the units; and a memory unit (107) for storing information necessary for processing by the control unit (106), the method comprising the following steps:

allowing, by the note input/output unit (101), a withdrawal of a sum of notes from the note housing unit (120 to 124) in response to a user's transaction request accepted by the input unit

(204 to 207);

accepting a redeposit of part of the notes withdrawn therein before completion of the transaction; and

allowing, by the note input/output unit (101), a withdrawal of a sum of the notes equivalent to the redeposited notes, which are determined to be unspoiled from the notes housed in the note housing unit (120 to 124),

characterised in that

the memory unit (107) stores withdrawn note identification information to identify notes withdrawn from the note input/output unit (101), the control unit (106) determines whether the redeposited notes are notes withdrawn from the automatic teller machine (201) or not based on the withdrawn note identification information stored in the memory unit (107), and the note input/output unit (101) allows the withdrawal of unspoiled notes equivalent to the redeposited notes only if the redeposited notes are notes withdrawn from the same automatic teller machine (201).

3. The machine of claim 1 or the method of claim 2, wherein

the note housing unit (120 to 124) comprises a mint note housing unit (901) which houses mint notes, and

the note input/output unit (101) allows a withdrawal of a sum of mint notes equivalent to the redeposited notes from the mint note housing unit (901).

4. The machine of claim 1 or the method of claim 2, wherein

the automatic teller machine (201) further comprises an identification unit (1701 to 1703) which identifies a user thereof, and

the control unit (106) accepts the redeposit of the notes withdrawn if the identification unit (1701 to 1703) detects the user through sensing, and if the transaction is not completed.

5. The machine of claim 1 or the method of claim 2, wherein the automatic teller machine (201) further comprises:

a sensor (105) for obtaining information on notes put into the note input/output unit (101); and

a note validating unit (103) for checking fitness of the notes based on the information obtained by the sensor (105),

wherein the note validating unit (103) judges whether the notes housed in the note housing unit (120 to 124) are unspoiled or not and the note input/output unit (101) preferably allows withdrawal of a sum of notes equivalent to the redeposited notes from the notes determined to

be unspoiled.

6. The machine or method of claim 5, wherein the note validating unit (103) determines a degree of spoilage of the redeposited notes, and sets a fitness check parameter used to determine whether the notes are unspoiled or not based on the determined degree of spoilage, the memory unit (107) stores the fitness check parameter, and the control unit (106) determines whether the notes housed in the note housing unit (120 to 124) are unspoiled or not based on the fitness check parameter. 5
7. The machine or method of claim 6, wherein the input unit (204 to 207) obtains identification information of the user, and the note validating unit (103) sets the fitness check parameter for each identification information of the user to be stored in the memory unit (107). 10
8. The machine or method of claim 7, wherein the automatic teller machine (201) is connected via a network (2102) to a shared server (2101), the shared server (2101) stores the fitness check parameter for each identification information of the user through the network (2102), and the fitness check parameter for each identification information of the user stored in the shared server (2101) is obtained through the network (2102). 15
9. The machine of claim 1 or the method of claim 2, wherein the automatic teller machine (201) further comprises a cleaning unit (2202) for cleaning notes, and the note input/output unit (101) allows a withdrawal of notes cleaned by the cleaning unit (2202) as unspoiled notes from the redeposited notes. 20
10. A computer program for causing the automatic teller machine (201) to execute the method of any of claims 2 to 9. 25

Patentansprüche

1. Bankautomat mit:

einer Noten-Ein-/Ausgabe-Einheit (101) zum Aufnehmen einer eingegebenen Note zur Einzahlung oder Ausgeben einer Note zur Auszahlung; 30

einer Notengehäuseeinheit (120 bis 124) zur Unterbringung von Noten;

einer Eingabeeinheit (204 bis 207) zum Empfangen von durch einen Benutzer eingegebener Information; 35

einer Steuereinheit (106) zum Steuern jeder der

Einheiten; und

einer Speichereinheit (107) zum Speichern von Information, die zum Verarbeiten durch die Steuereinheit (106) notwendig ist, wobei die Noten-Ein-/Ausgabe-Einheit (101) die Entnahme einer Summe von Noten aus der Notengehäuseeinheit (120 bis 124) gemäß einer Benutzertransaktionsanfrage ermöglicht, die durch die Eingabeeinheit (204 bis 207) empfangen wurde, und wobei ein Wiedereinzahlen eines Teils der entnommenen Noten darin vor Beendigung der Transaktion akzeptiert wird, wobei die Steuereinheit (106) als unbeschädigt bestimmte Noten aus den in der Notengehäuseeinheit (120 bis 124) untergebrachten Noten auswählt, und wobei die Noten-Ein-/Ausgabe-Einheit (101) die Entnahme einer Summe der ausgewählten unbeschädigten Noten ermöglicht, die den wieder eingezahlten Noten äquivalent ist, **dadurch gekennzeichnet, dass** die Speichereinheit (107) Identifikationsinformation für entnommene Noten speichert, um aus der Noten-Ein-/Ausgabe-Einheit (101) entnommene Noten zu identifizieren, die Steuereinheit (106) auf Grundlage der in der Speichereinheit (107) gespeicherten Identifikationsinformation für entnommene Noten feststellt, ob es sich bei den wiedereingezahlten Noten um aus dem Bankautomaten (201) entnommene Noten handelt oder nicht, und die Noten-Ein-/Ausgabe-Einheit (101) die Entnahme von unbeschädigten Noten, die äquivalent zu den wiedereingezahlten Noten sind, nur erlaubt, falls die wiedereingezahlten Noten Noten sind, die von dem gleichen Bankautomaten (201) entnommen wurden.

2. Verfahren zur Verwendung in einem Bankautomaten (201) mit: einer Noten-Ein-/Ausgabe-Einheit (101) zum Aufnehmen einer eingegebenen Note zur Einzahlung oder Ausgeben einer Note zur Auszahlung; einer Notengehäuseeinheit (120 bis 124) zur Unterbringung von Noten; einer Eingabeeinheit (204 bis 207) zum Empfangen von durch einen Benutzer eingegebener Information; einer Steuereinheit (106) zum Steuern jeder der Einheiten; und einer Speichereinheit (107) zum Speichern von Information, die zum Verarbeiten durch die Steuereinheit (106) notwendig ist, wobei in dem Verfahren: 40

durch die Noten-Ein-/Ausgabe-Einheit (101) die Entnahme einer Summe von Noten aus der Notengehäuseeinheit (120 bis 124) gemäß einer Benutzertransaktionsanfrage ermöglicht wird, die durch die Eingabeeinheit (204 bis 207) empfangen wurde, ein Wiedereinzahlen eines Teils der entnomme-

- nen Noten darin vor Beendigung der Transaktion akzeptiert wird,
 durch die Noten-Ein-/Ausgabe-Einheit (101) die Entnahme einer Summe von als unbeschädigt bestimmten Noten aus den in der Notengehäuseeinheit (120 bis 124) untergebrachten Noten ermöglicht wird, die den wiedereingezahlten Noten äquivalent ist,
dadurch gekennzeichnet, dass
 die Speichereinheit (107) Identifikationsinformation für entnommene Noten speichert, um aus der Noten-Ein-/Ausgabe-Einheit (101) entnommene Noten zu identifizieren,
 die Steuereinheit (106) auf Grundlage der in der Speichereinheit (107) gespeicherten Identifikationsinformation für entnommene Noten feststellt, ob es sich bei den wiedereingezahlten Noten um aus dem Bankautomaten (201) entnommene Noten handelt oder nicht, und
 die Noten-Ein-/Ausgabe-Einheit (101) die Entnahme von unbeschädigten Noten, die äquivalent zu den wiedereingezahlten Noten sind, nur erlaubt, falls die wiedereingezahlten Noten Noten sind, die von dem gleichen Bankautomaten (201) entnommen wurden.
3. Automat nach Anspruch 1 oder Verfahren nach Anspruch 2, wobei
 die Notengehäuseeinheit (120 bis 124) eine Gehäuseeinheit (901) aufweist, in der frische Noten untergebracht sind, und
 die Noten-Ein-/Ausgabe-Einheit (101) die Entnahme einer Summe von frischen Noten aus der Gehäuseeinheit für frische Noten (901) ermöglicht, die äquivalent zu den wiedereingezahlten Noten ist.
4. Automat nach Anspruch 1 oder Verfahren nach Anspruch 2, wobei
 der Bankautomat (201) ferner eine Identifikationseinheit (1701 bis 1703) aufweist, die einen Benutzer des Automaten identifiziert, und
 die Steuereinheit (106) das Wiedereinzahlen der entnommenen Noten akzeptiert, falls die Identifikationseinheit (1701 bis 1703) den Benutzer durch Messung erfasst und falls die Transaktion nicht beendet ist.
5. Automat nach Anspruch 1 oder Verfahren nach Anspruch 2, wobei der Bankautomat (201) ferner aufweist:
 einen Sensor (105), um Information über Noten zu erhalten, die in die Noten-Ein-/Ausgabe-Einheit (101) gelegt werden; und
 eine Notenvalidierungseinheit (103) zum Prüfen des Zustands der Noten auf Grundlage der durch den Sensor (105) erhaltenen Information, wobei die Notenvalidierungseinheit (103) beurteilt, ob die in der Notengehäuseeinheit (120 bis 124) untergebrachten Noten unbeschädigt sind oder nicht und die Noten-Ein-/Ausgabe-Einheit (101) vorzugsweise die Entnahme einer Summe von Noten aus den als unbeschädigt bestimmten Noten erlaubt, die äquivalent zu den wiedereingezahlten Noten ist.
6. Automat oder Verfahren nach Anspruch 5, wobei
 die Notenvalidierungseinheit (103) einen Beschädigungsgrad der wiedereingezahlten Noten bestimmt und einen Zustandsprüfparameter festsetzt, der dazu verwendet wird, auf Grundlage des bestimmten Beschädigungsgrads festzustellen, ob die Noten unbeschädigt sind oder nicht,
 die Speichereinheit (107) den Zustandsprüfparameter speichert, und
 die Steuereinheit (106) auf Grundlage des Zustandsprüfparameters feststellt, ob die in der Notengehäuseeinheit (120 bis 124) untergebrachten Noten unbeschädigt sind oder nicht.
7. Automat oder Verfahren nach Anspruch 6, wobei
 die Eingabeeinheit (204 bis 207) eine Identifikationsinformation des Benutzers erhält, und
 die Notenvalidierungseinheit (103) den Zustandsprüfparameter für jede Identifikationsinformation des Benutzers zum Speichern in der Speichereinheit (107) festsetzt.
8. Automat oder Verfahren nach Anspruch 7, wobei
 der Bankautomat (201) über ein Netz (2102) an einen Shared-Server (2101) angeschlossen ist,
 der Shared-Server (2101) den Zustandsprüfparameter für jede Identifikationsinformation des Benutzers über das Netz (2102) speichert, und
 der Zustandsprüfparameter für jede in dem Shared-Server (2101) gespeicherte Identifikationsinformation des Benutzers über das Netz (2102) erhalten wird.
9. Automat nach Anspruch 1 oder Verfahren nach Anspruch 2, wobei
 der Bankautomat (201) ferner eine Reinigungseinheit (2202) zum Reinigen von Noten aufweist, und
 die Noten-Ein-/Ausgabe-Einheit (101) die Entnahme von durch die Reinigungseinheit (2202) gereinigten Noten aus den wiedereingezahlten Noten als unbeschädigte Noten ermöglicht.
10. Computerprogramm zum Veranlassen des Bankautomats (201), das Verfahren nach einem der Ansprüche 2 bis 9 auszuführen.

Revendications

1. Machine bancaire, comportant :

- une unité d'entrée/sortie de billets (101) pour recevoir un billet entré pour un dépôt ou délivrer en sortie un billet pour un retrait,
 une unité d'hébergement de billets (120 à 124) qui loge des billets, 5
 une unité d'entrée (204 à 207) pour recevoir des informations entrées par un utilisateur,
 une unité de commande (106) pour commander chacune des unités, et
 une unité de mémoire (107) pour mémoriser des informations nécessaires à traiter par l'unité de commande (106), 10
 dans laquelle l'unité d'entrée/sortie de billets (101) permet un retrait d'une somme de billets de l'unité d'hébergement de billets (120 à 124) en réponse à une demande de transaction d'un utilisateur acceptée par l'unité d'entrée (204 à 207), et un nouveau dépôt d'une partie des billets retirés dans celle-ci est accepté avant la fin de la transaction, 20
 dans laquelle l'unité de commande (106) sélectionne des billets déterminés comme étant non abîmés parmi les billets placés dans l'unité d'hébergement de billets (120 à 124), et
 dans laquelle l'unité d'entrée/sortie de billets (101) permet un retrait d'une somme des billets non abîmés sélectionnés équivalente aux billets redéposés, 25
caractérisée en ce que
 l'unité de mémoire (107) mémorise des informations d'identification de billets retirés pour identifier des billets retirés de l'unité d'entrée/sortie de billets (101), 30
 l'unité de commande (106) détermine si les billets redéposés sont des billets retirés de la machine bancaire (201) ou non sur la base des informations d'identification de billets retirés mémorisées dans l'unité de mémoire (107), et
 l'unité d'entrée/sortie de billets (101) permet le retrait de billets non abîmés équivalents aux billets redéposés seulement si les billets redéposés sont des billets retirés de la même machine bancaire (201). 40
2. Procédé utilisé pour une machine bancaire (201) 45
 comportant : une unité d'entrée/sortie de billets (101) pour recevoir un billet entré pour un dépôt et délivrer en sortie un billet pour un retrait, une unité d'hébergement de billets (120 à 124) pour loger des billets, une unité d'entrée (204 à 207) qui reçoit des informations entrées par un utilisateur, une unité de commande (106) pour commander chacune des unités, et une unité de mémoire (107) pour mémoriser des informations nécessaires à traiter par l'unité de commande (106), le procédé comportant les étapes suivantes consistant à : 50

permettre, par l'unité d'entrée/sortie de billets

(101), un retrait d'une somme de billets de l'unité d'hébergement de billets (120 à 124) en réponse à une demande de transaction d'un utilisateur acceptée par l'unité d'entrée (204 à 207), accepter un nouveau dépôt d'une partie des billets retirés de celle-ci avant la fin de la transaction, et
 permettre, par l'unité d'entrée/sortie de billets (101), un retrait d'une somme des billets équivalente aux billets redéposés, qui sont déterminés comme étant non abîmés parmi les billets placés dans l'unité d'hébergement de billets (120 à 124),

caractérisé en ce que :

l'unité de mémoire (107) mémorise des informations d'identification de billets retirés pour identifier des billets retirés de l'unité d'entrée/sortie de billets (101),
 l'unité de commande (106) détermine si les billets redéposés sont des billets retirés de la machine bancaire (201) ou non sur la base des informations d'identification de billets retirés mémorisées dans l'unité de mémoire (107), et
 l'unité d'entrée/sortie de billets (101) permet le retrait de billets non abîmés équivalents aux billets redéposés seulement si les billets redéposés sont des billets retirés de la même machine bancaire (201).

3. Machine selon la revendication 1 ou procédé selon la revendication 2, dans lesquels :
 l'unité d'hébergement de billets (120 à 124) comporte une unité d'hébergements de billets neufs (901) qui contient des billets neufs, et l'unité d'entrée/sortie de billets (101) permet un retrait d'une somme de billets neufs équivalente aux billets redéposés à partir de l'unité d'hébergements de billets neufs (901). 35
4. Machine selon la revendication 1 ou procédé selon la revendication 2, dans lesquels la machine bancaire (201) comporte de plus une unité d'identification (1701 à 1703) qui identifie un utilisateur de celle-ci, et l'unité de commande (106) accepte le nouveau dépôt des billets retirés si l'unité d'identification (1701 à 1703) détecte l'utilisateur via une détection, et si la transaction n'est pas achevée. 40
5. Machine selon la revendication 1 ou procédé selon la revendication 2, dans lesquels la machine bancaire (201) comporte de plus : 55

un capteur (105) pour obtenir des informations sur des billets placés dans l'unité d'entrée/sortie

de billets (101), et
 une unité de validation de billets (103) pour vérifier la conformité des billets sur la base des informations obtenues par le capteur (105),
 dans lequel l'unité de validation de billets (103) 5
 détermine si les billets placés dans l'unité d'hébergement de billets (120 à 124) sont non abîmés ou non et l'unité d'entrée/sortie de billets (101) permet de préférence le retrait d'une somme de billets équivalente aux billets redéposés 10
 parmi les billets déterminés comme étant non abîmés.

6. Machine ou procédé selon la revendication 5, dans 15
 lesquels :

l'unité de validation de billets (103) détermine un degré de détérioration des billets redéposés, et définit un paramètre de contrôle de conformité utilisé pour déterminer si les billets sont non abîmés ou non sur la base du degré de détérioration déterminé,
 l'unité de mémoire (107) mémorise le paramètre de contrôle de conformité, et
 l'unité de commande (106) détermine si les 25
 billets placés dans l'unité d'hébergement de billets (120 à 124) sont non abîmés ou non sur la base du paramètre de contrôle de conformité.

7. Machine ou procédé selon la revendication 6, dans 30
 lesquels :

l'unité d'entrée (204 à 207) obtient des informations d'identification de l'utilisateur, et
 l'unité de validation de billets (103) définit le paramètre de contrôle de conformité pour chacune 35
 des informations d'identification de l'utilisateur destinées à être mémorisées dans l'unité de mémoire (107). 40

8. Machine ou procédé selon la revendication 7, dans 45
 lesquels :

la machine bancaire (201) est connectée via un réseau (2102) à un serveur partagé (2101), 45
 le serveur partagé (2101) mémorise le paramètre de contrôle de conformité pour chacune des informations d'identification de l'utilisateur via le réseau (2102), et
 le paramètre de contrôle de conformité pour 50
 chaque information d'identification de l'utilisateur mémorisée dans le serveur partagé (2101) est obtenu via le réseau (2102).

9. Machine selon la revendication 1 ou procédé selon 55
 la revendication 2, dans lesquels
 la machine bancaire (201) comporte de plus une unité de nettoyage (2202) pour nettoyer les billets, et

l'unité d'entrée/sortie de billets (101) permet un retrait de billets nettoyés par la machine de nettoyage (2202) en tant que billets non abîmés parmi les billets redéposés.

10. Programme informatique pour amener la machine bancaire (201) à exécuter le procédé selon l'une quelconque des revendications 2 à 9.

FIG. 1

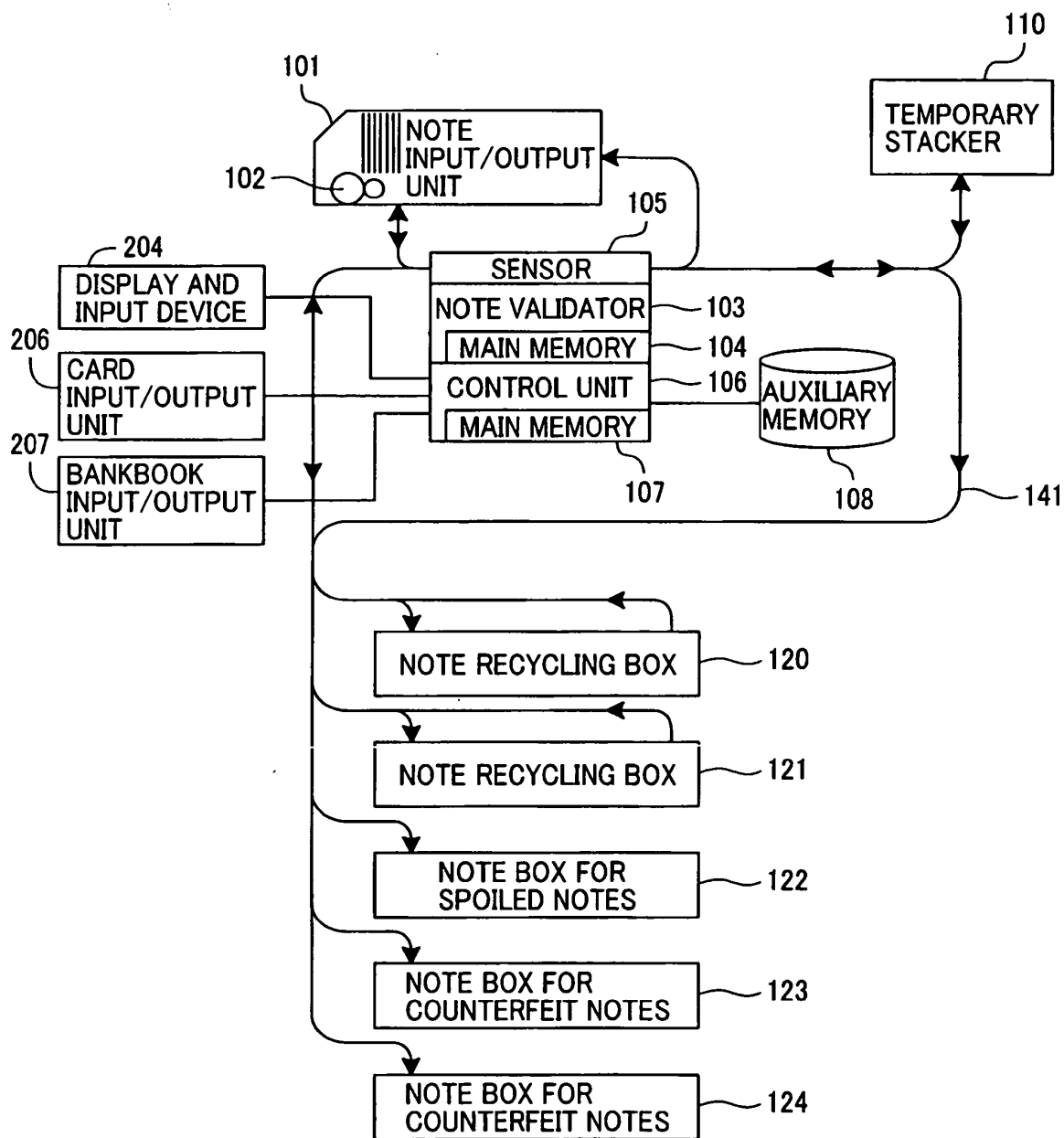


FIG.2A

FIG.2B

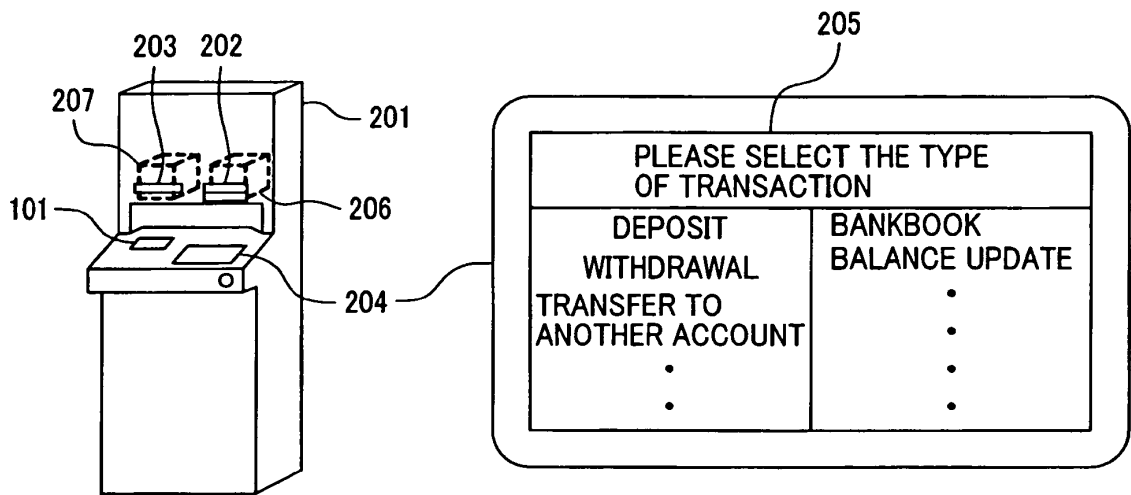


FIG.3

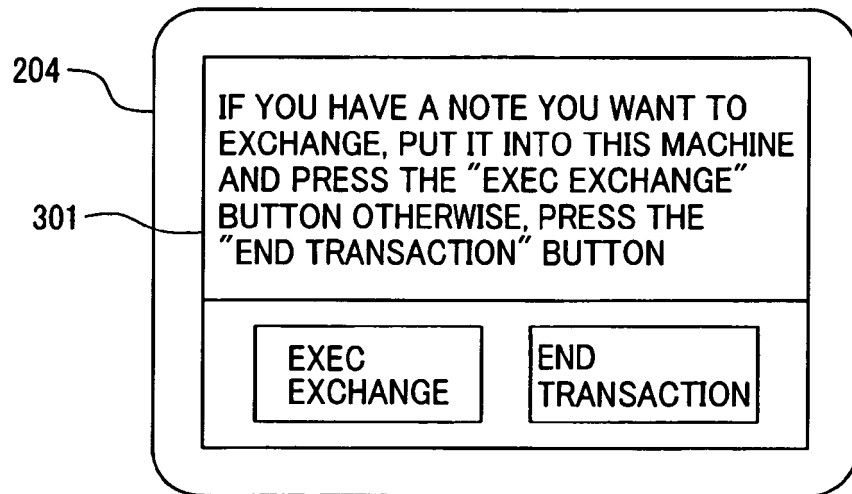


FIG.4

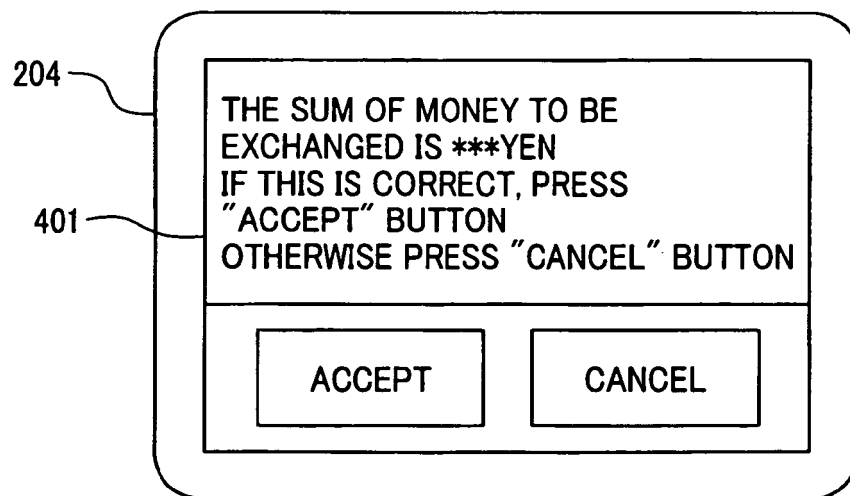


FIG.5

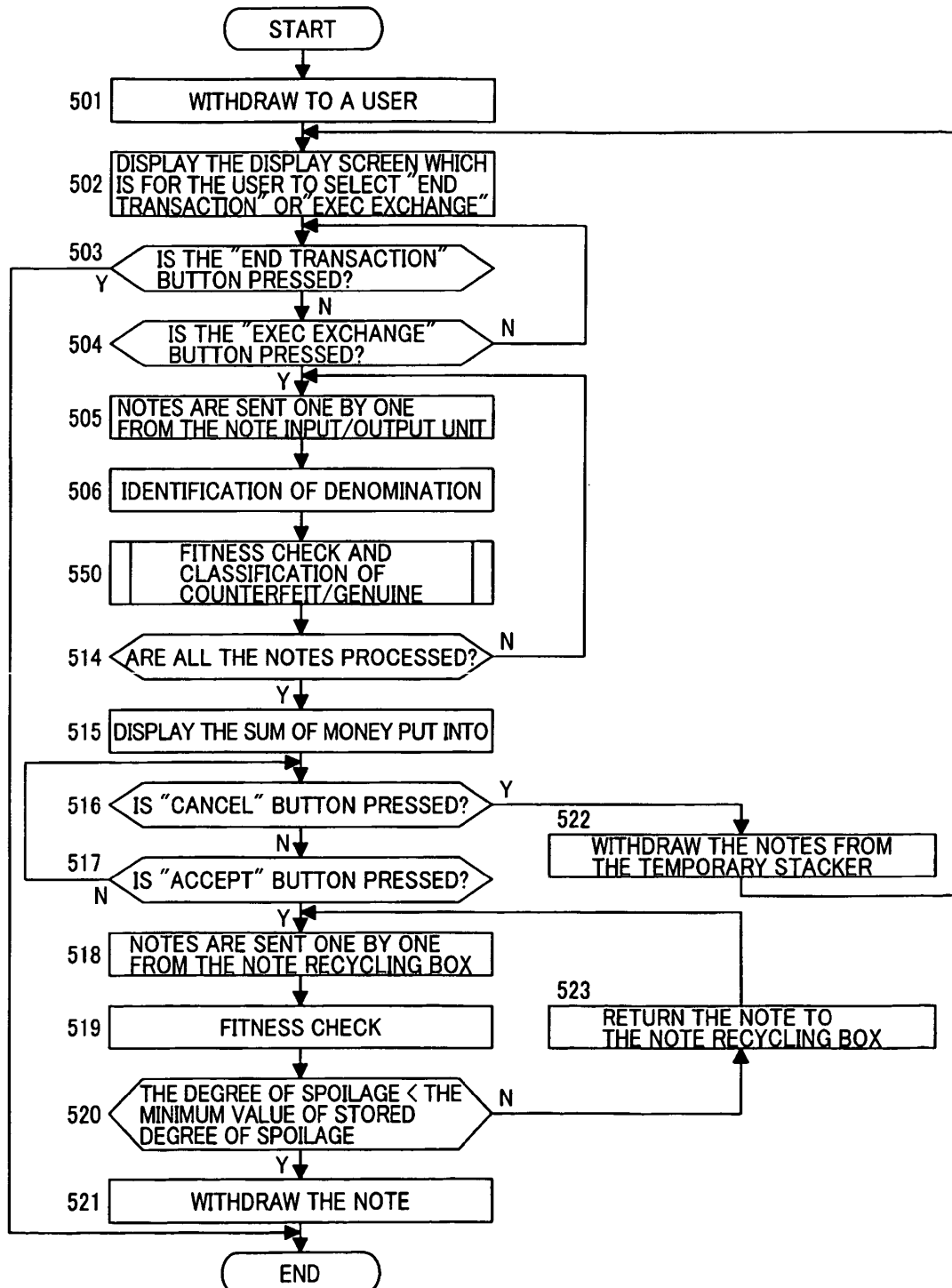


FIG.6

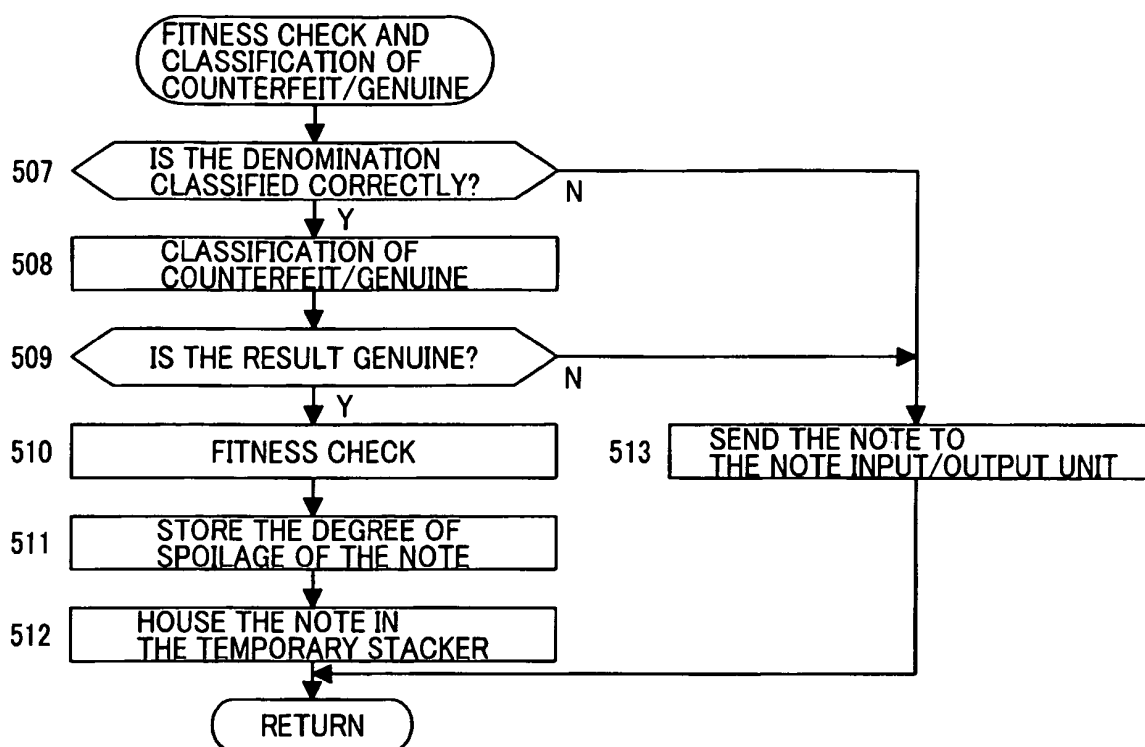


FIG.7

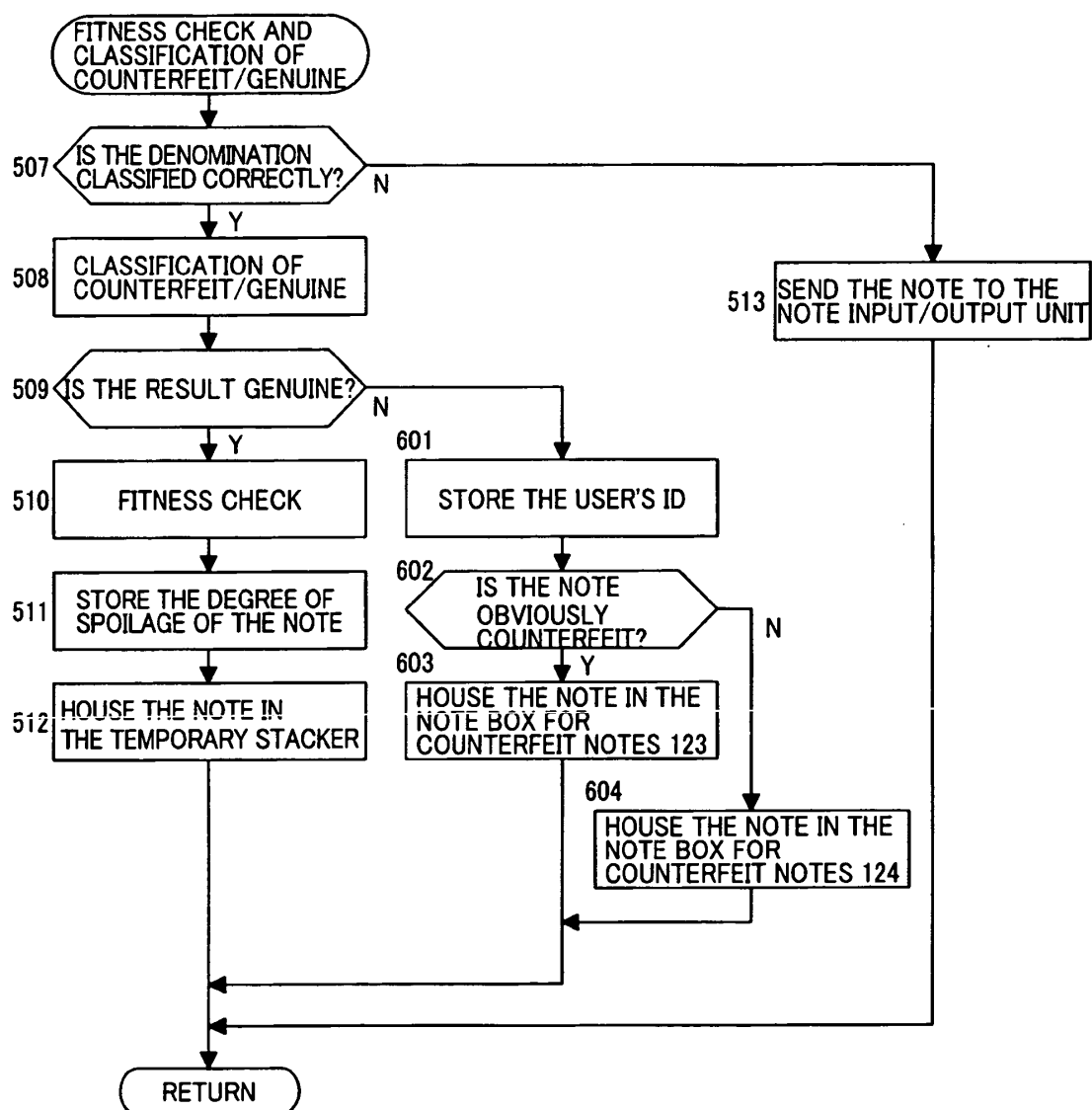


FIG.8

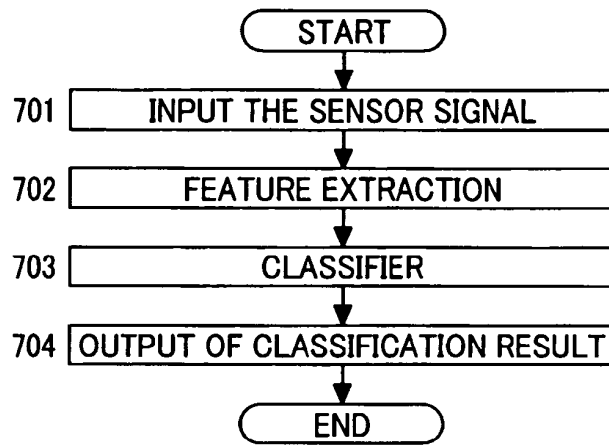


FIG.9

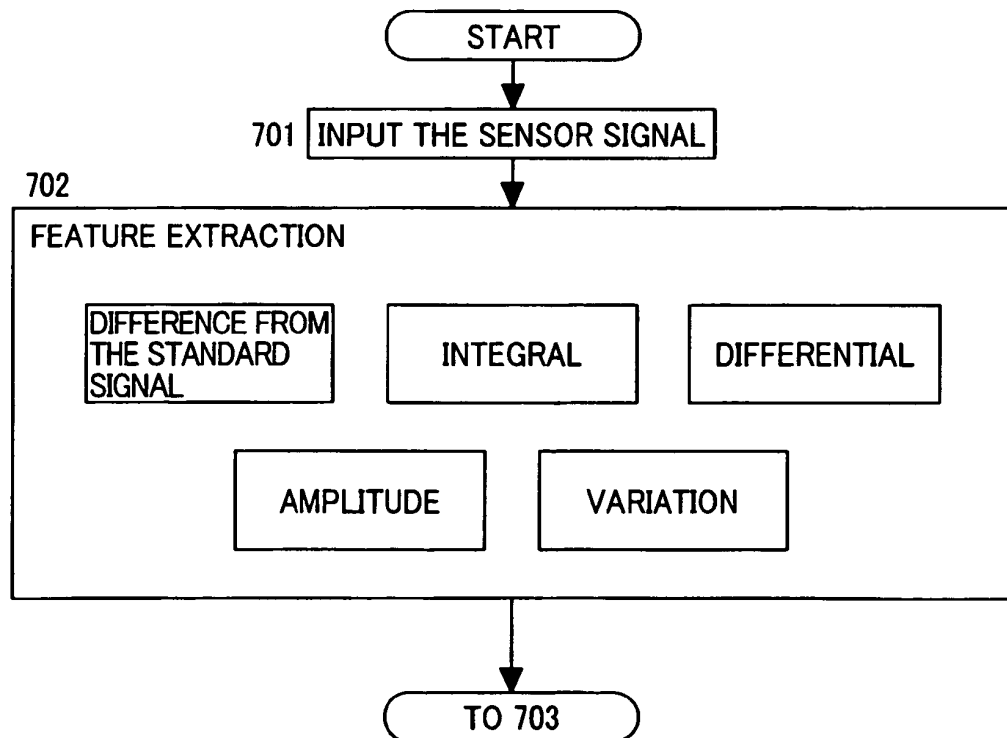


FIG.10

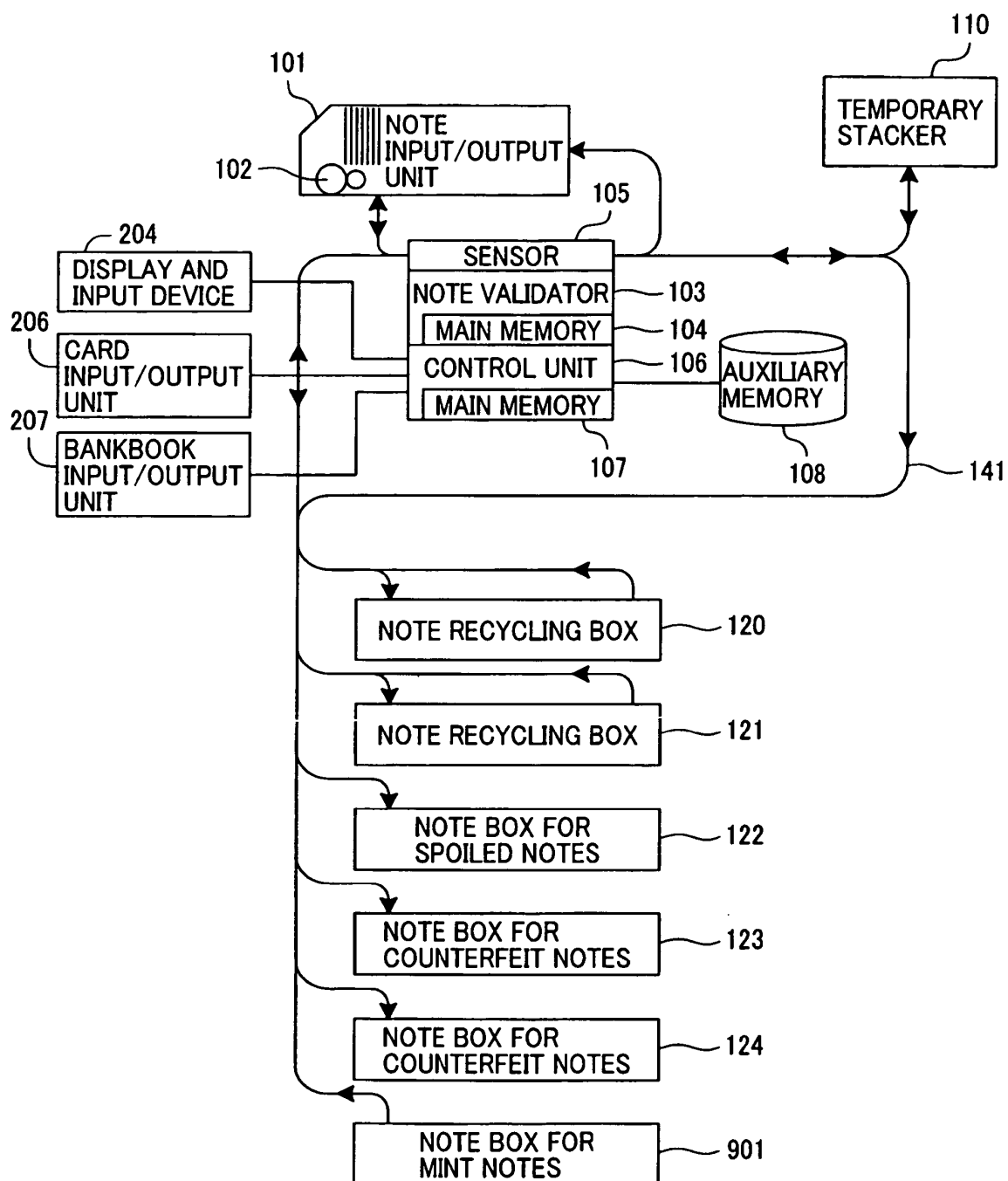


FIG.11

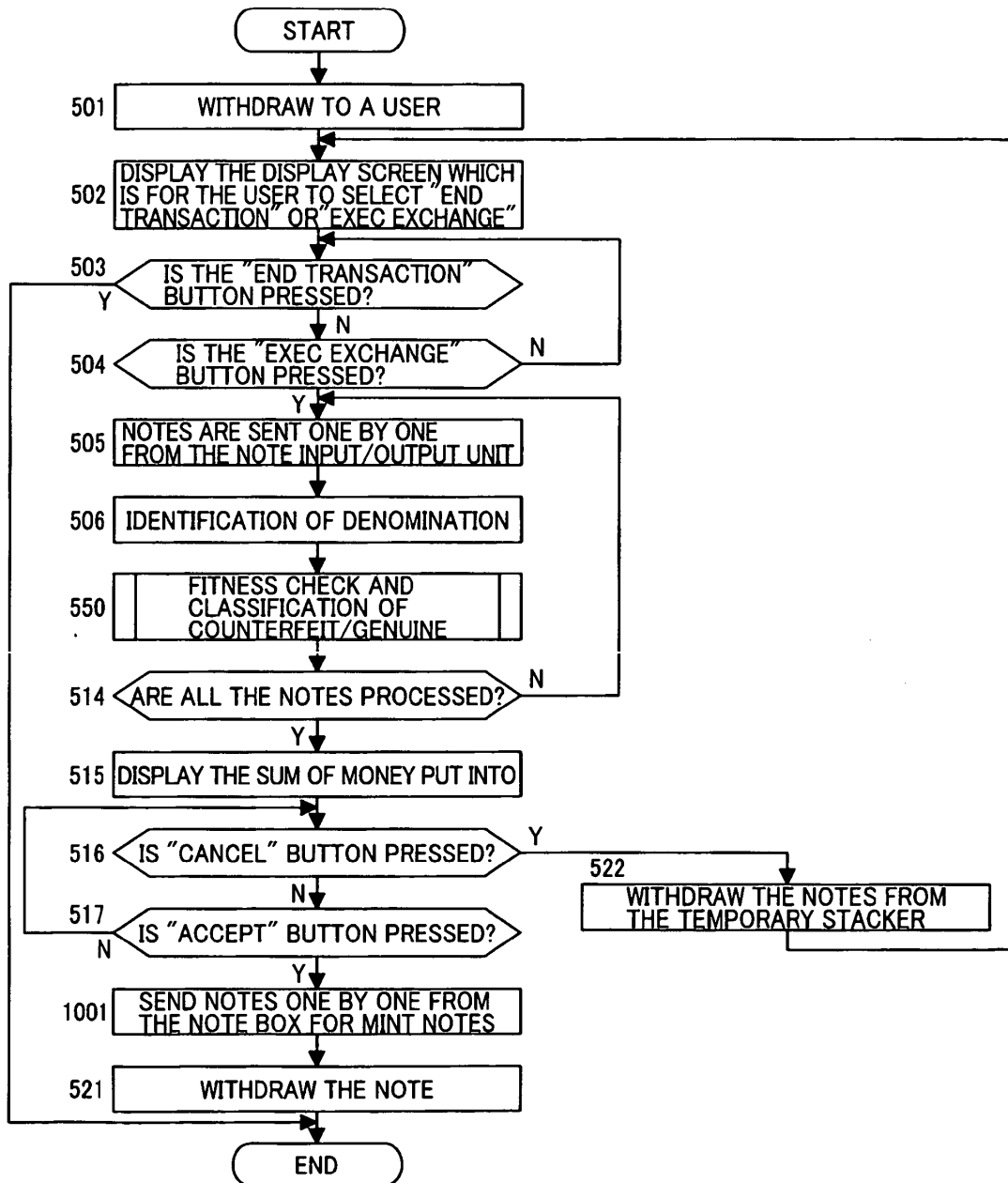


FIG.12

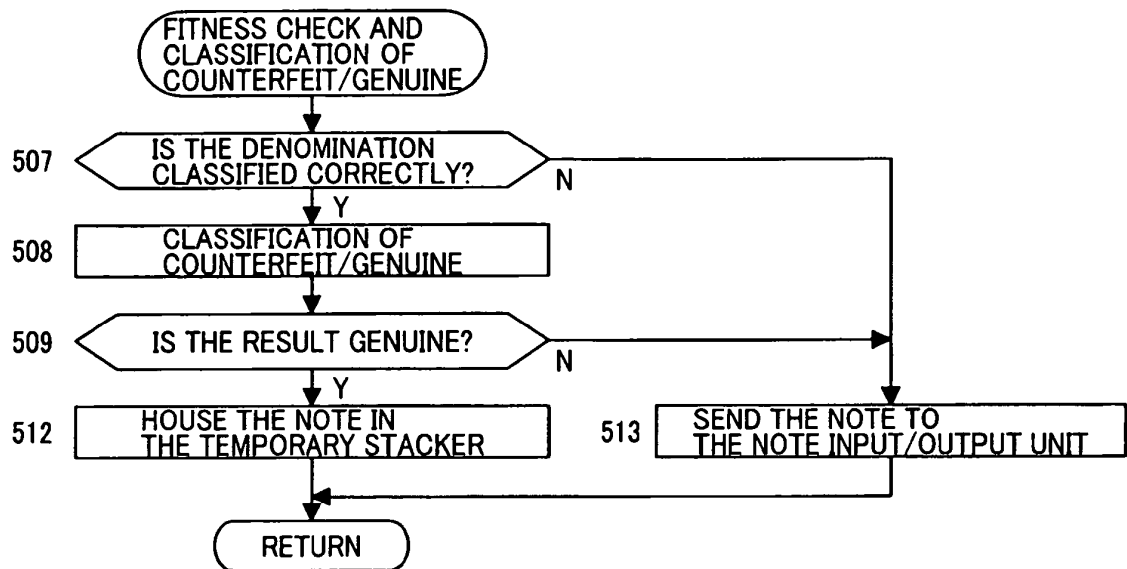


FIG.13

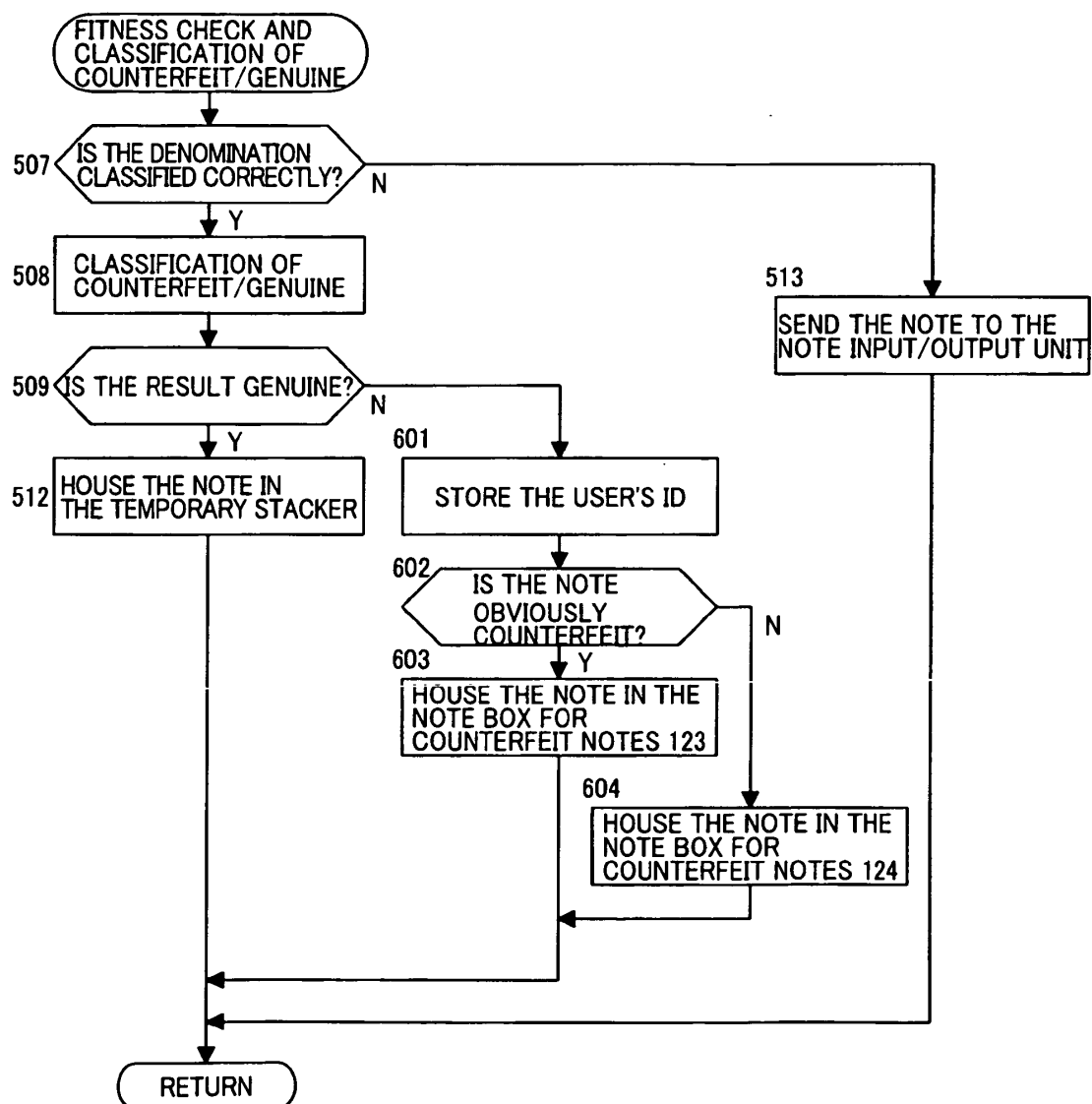


FIG.14

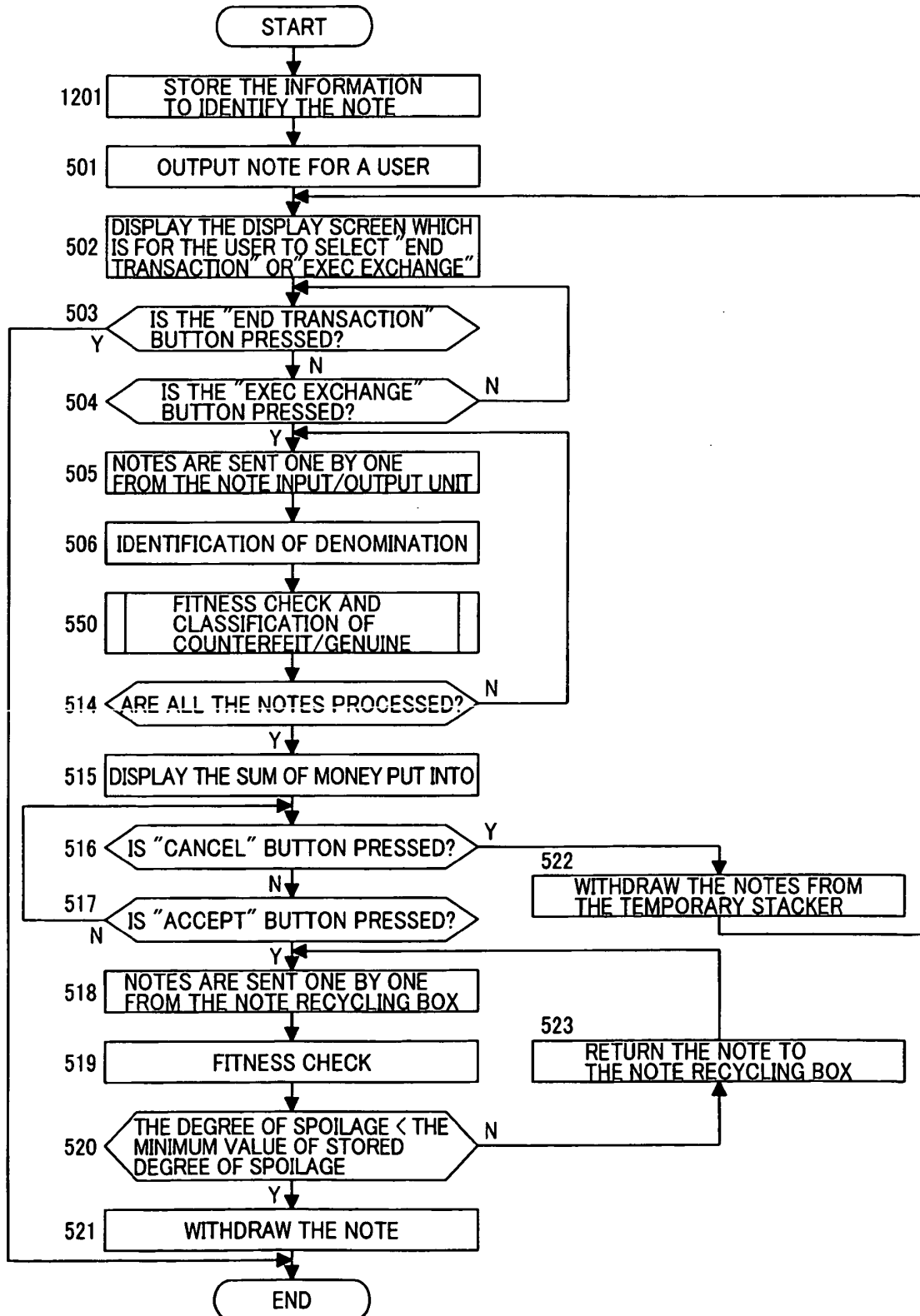


FIG.15

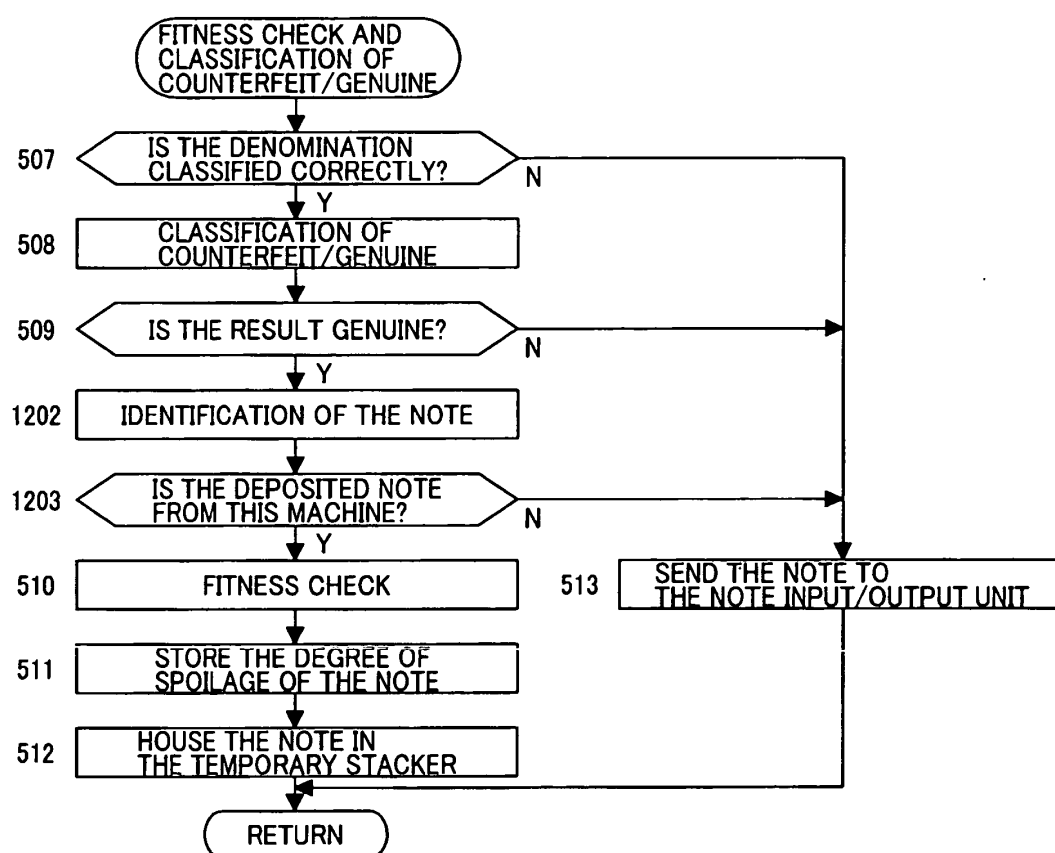


FIG. 16

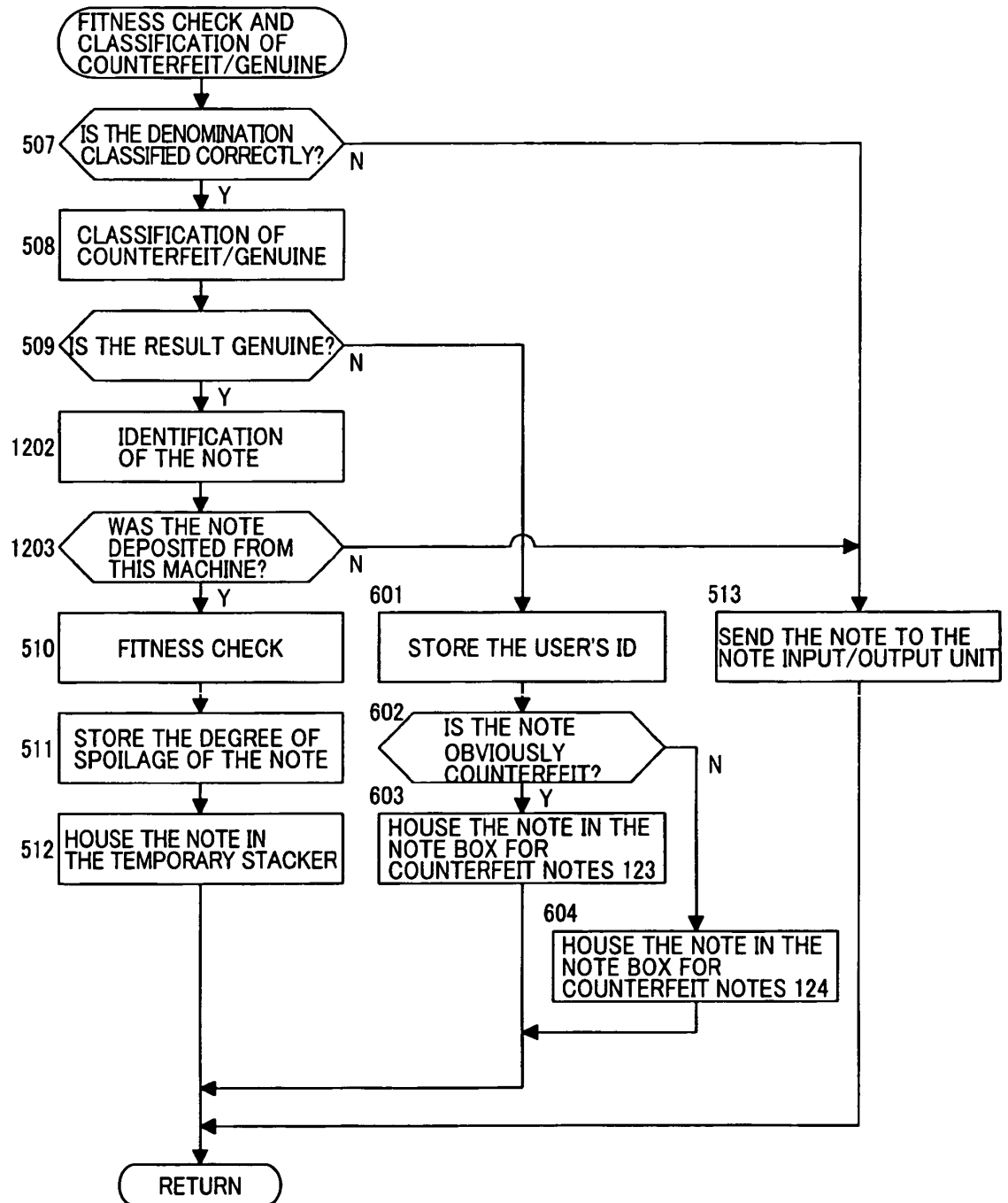


FIG.17

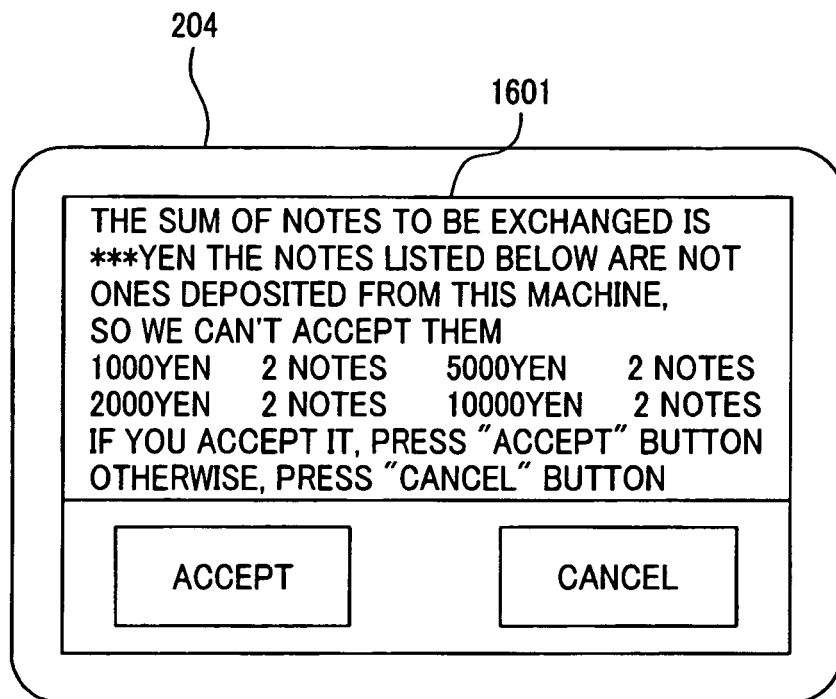


FIG.18

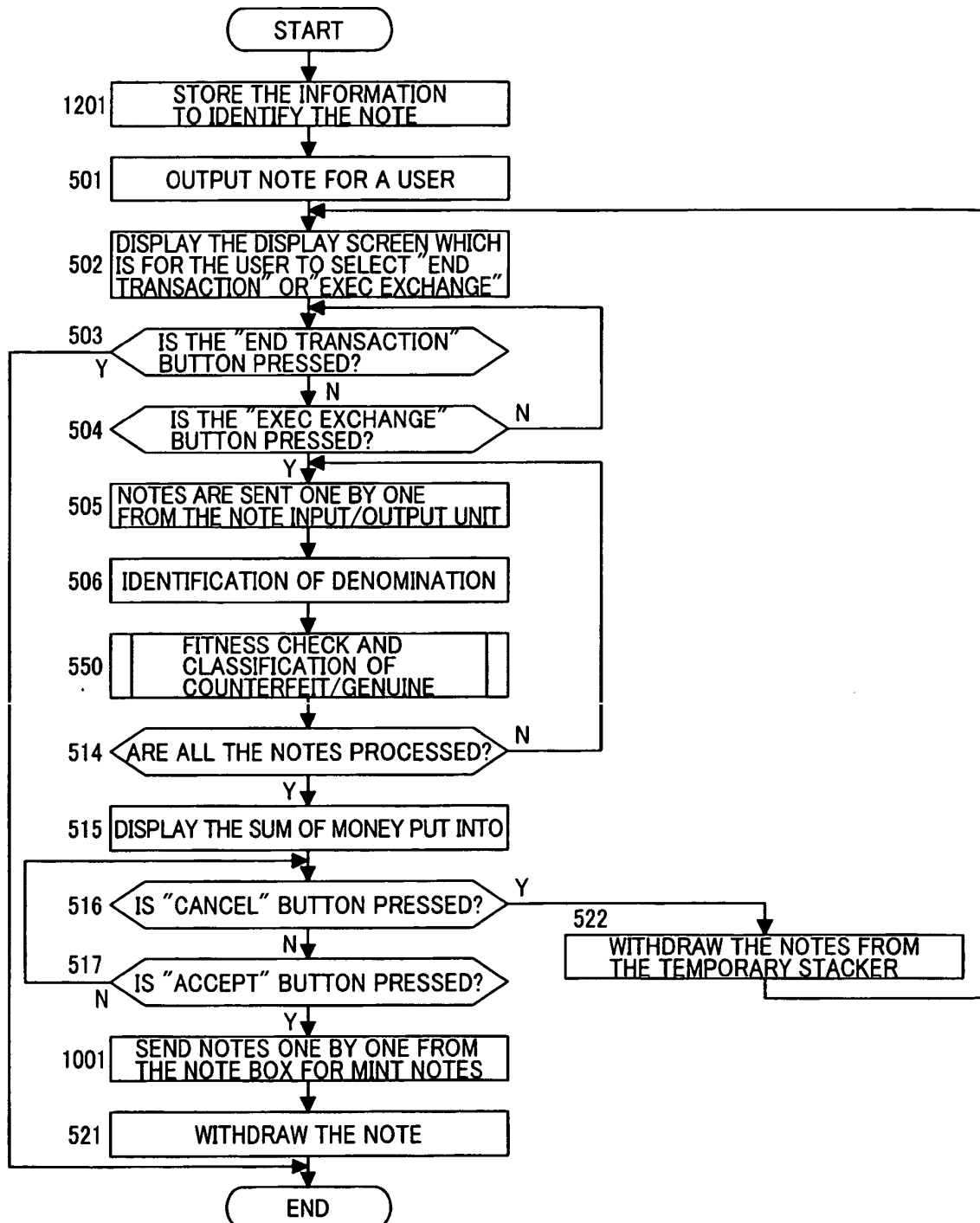


FIG.19

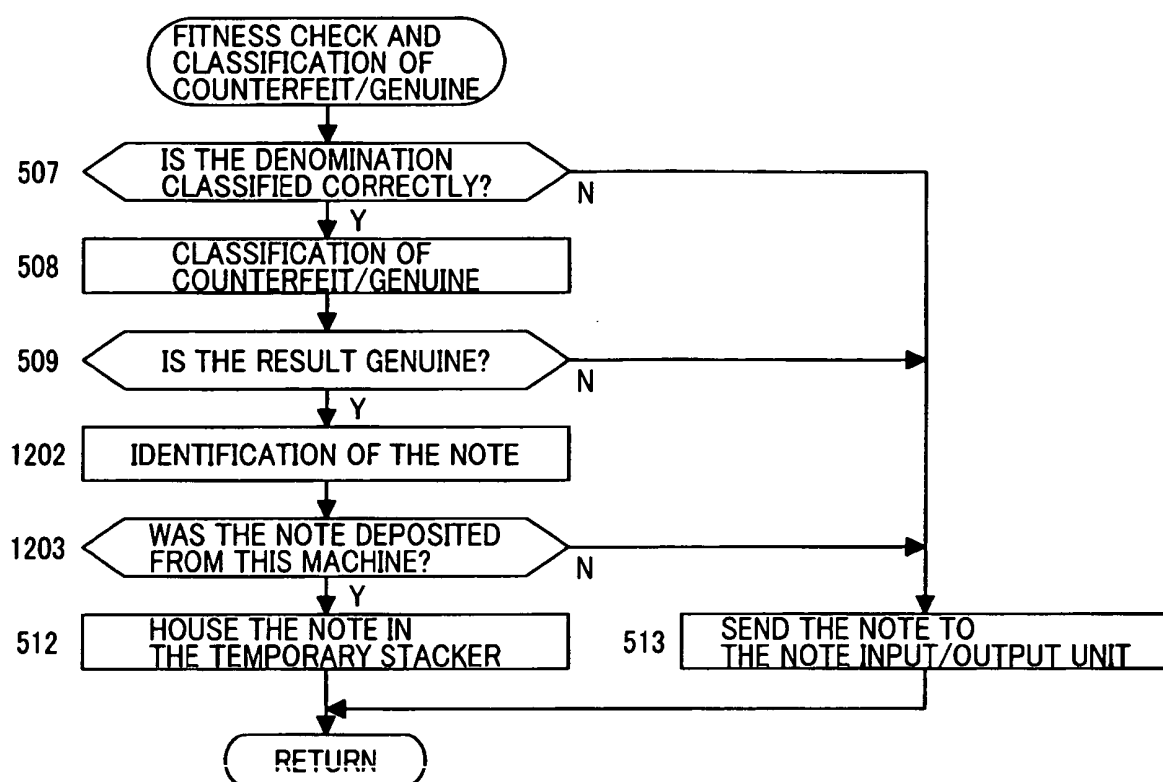


FIG.20

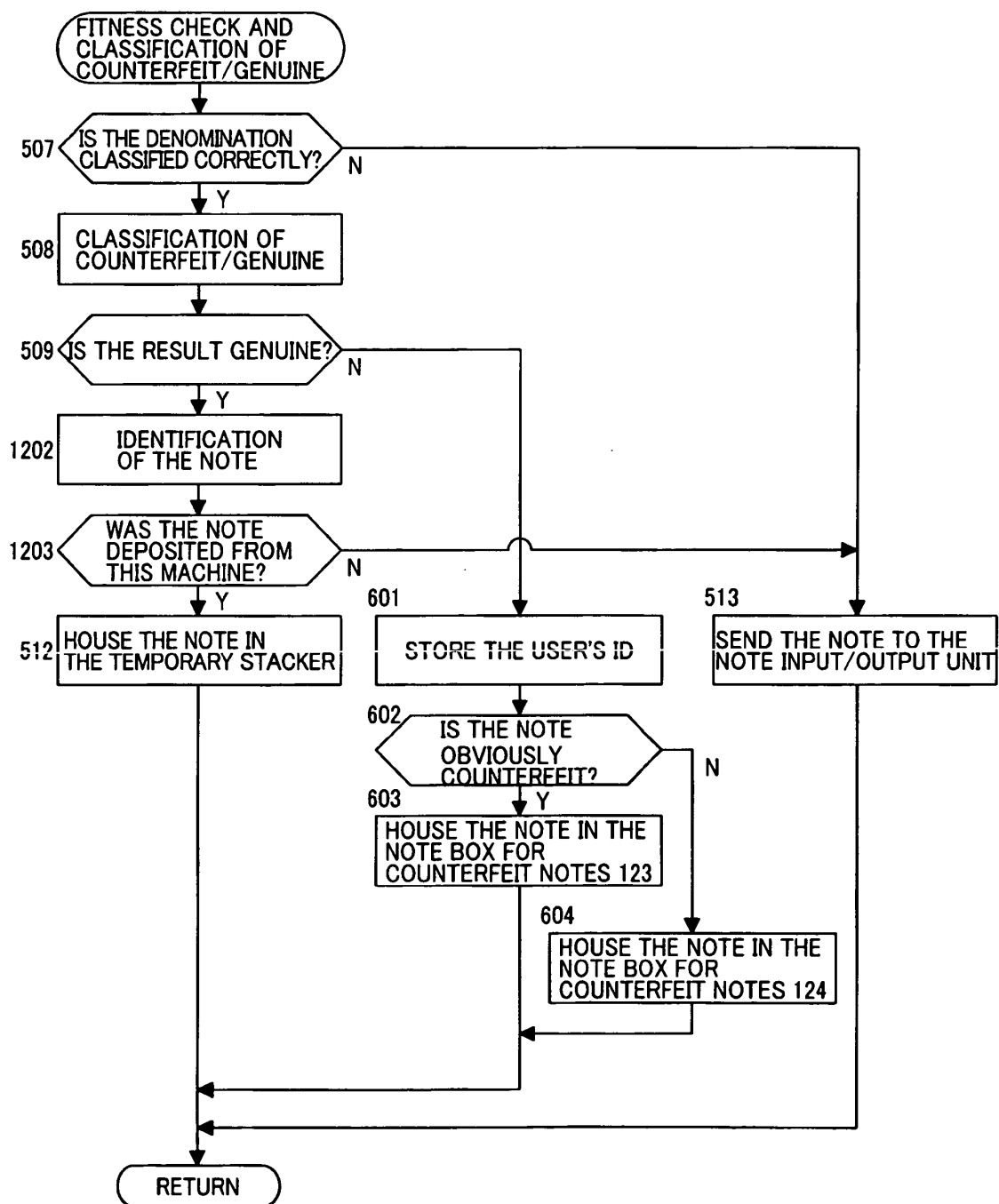


FIG.21

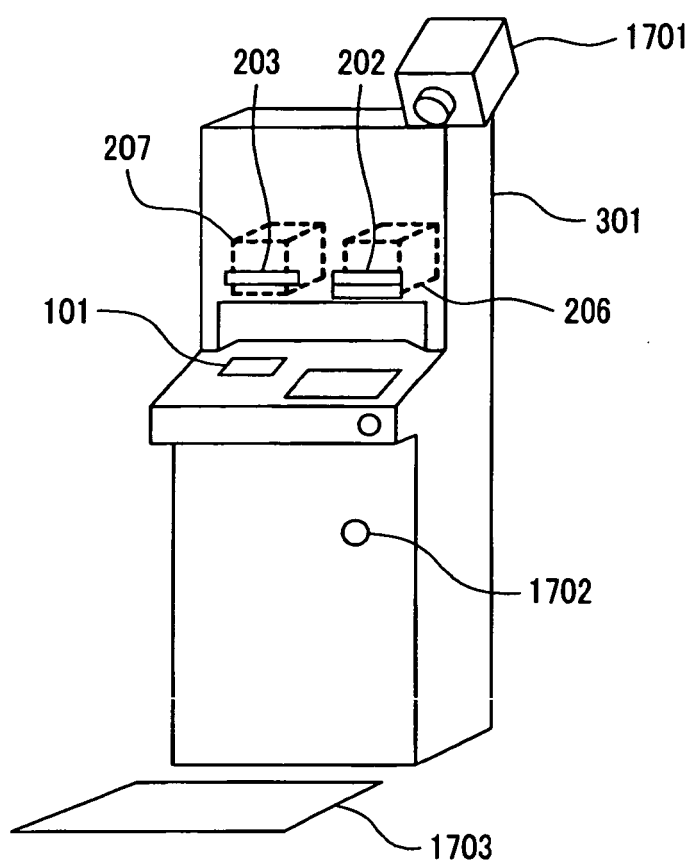


FIG.22

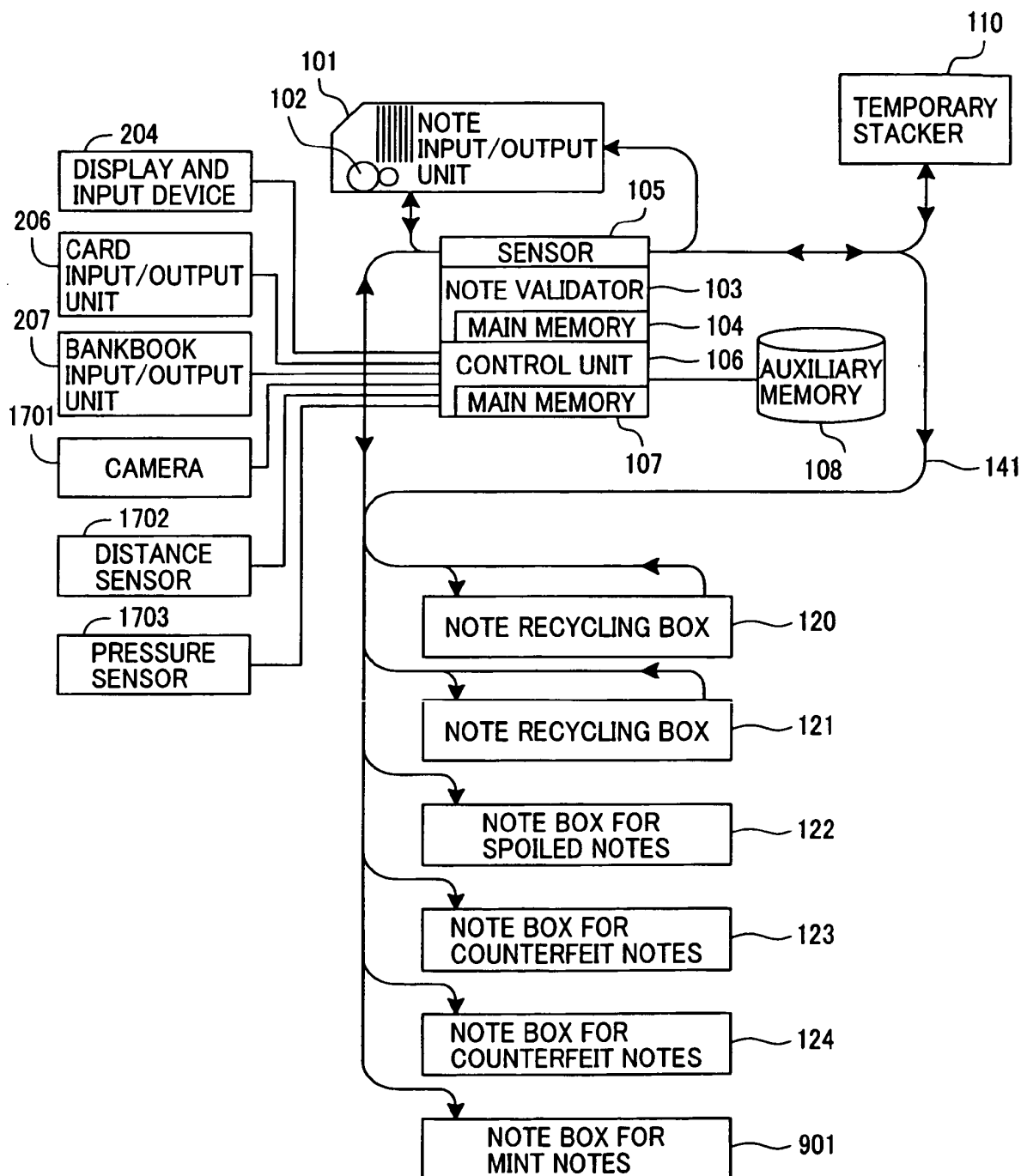


FIG.23

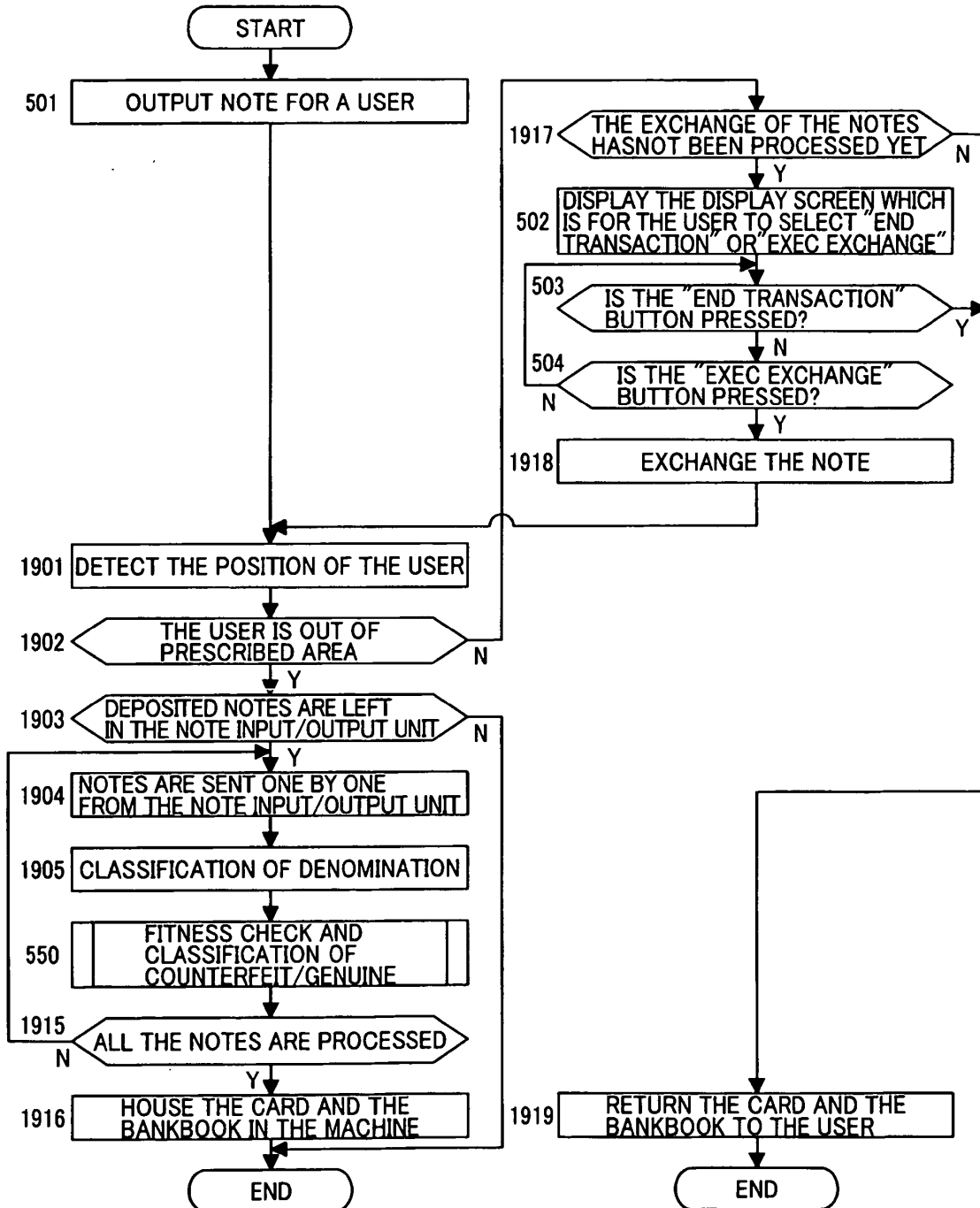


FIG.24

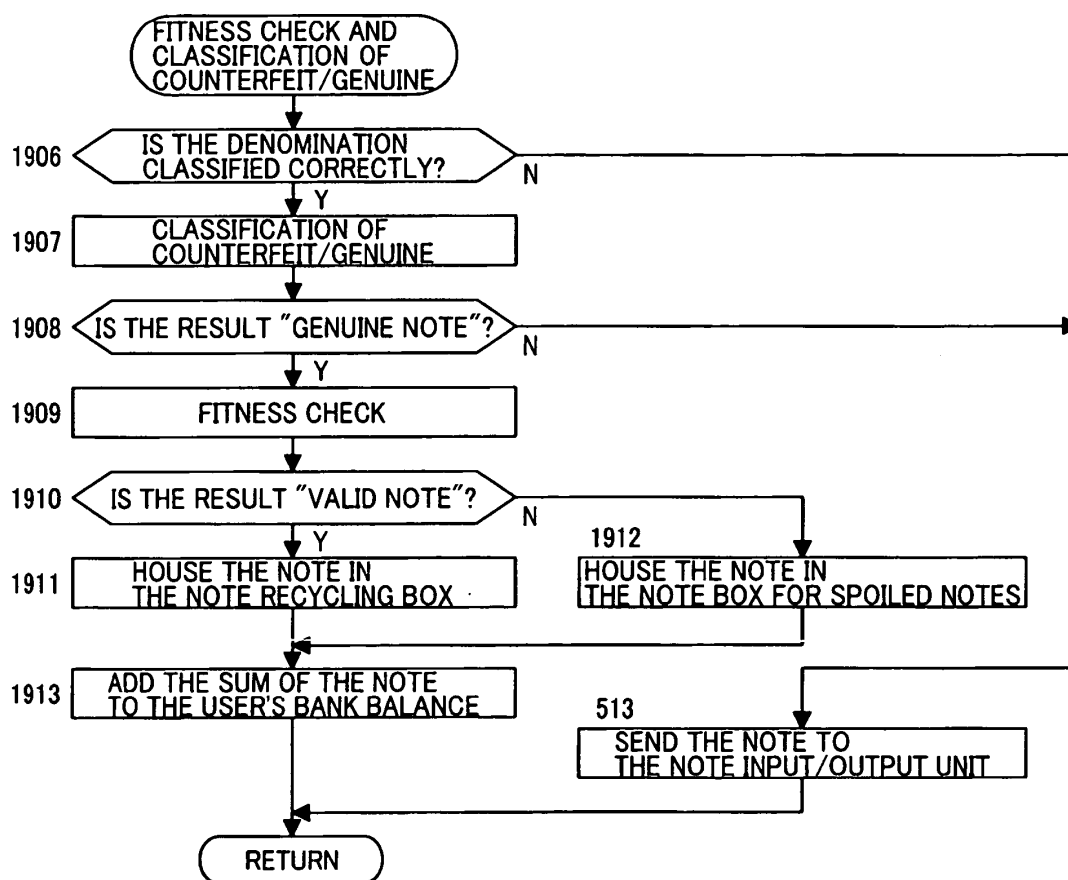


FIG.25

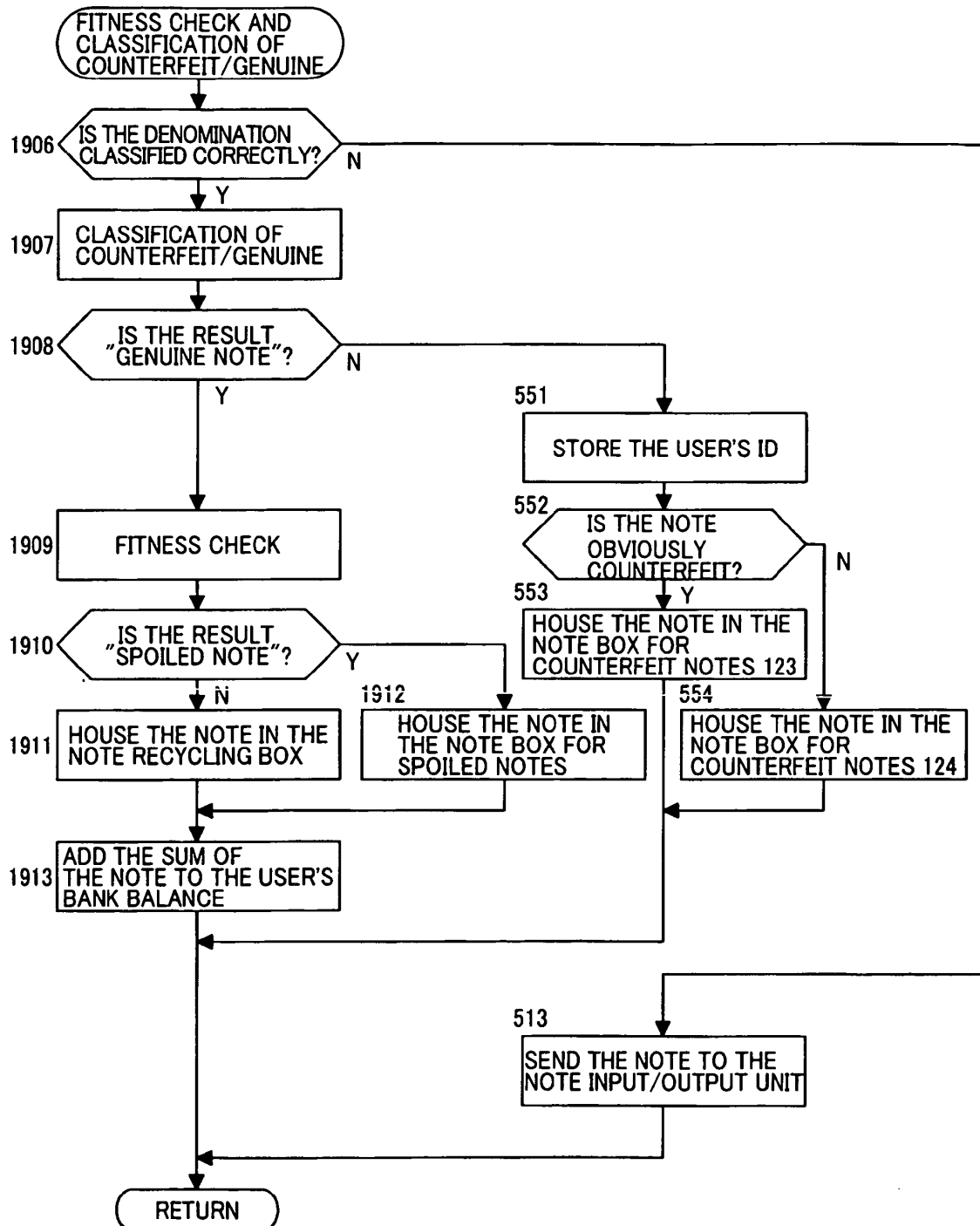


FIG.26

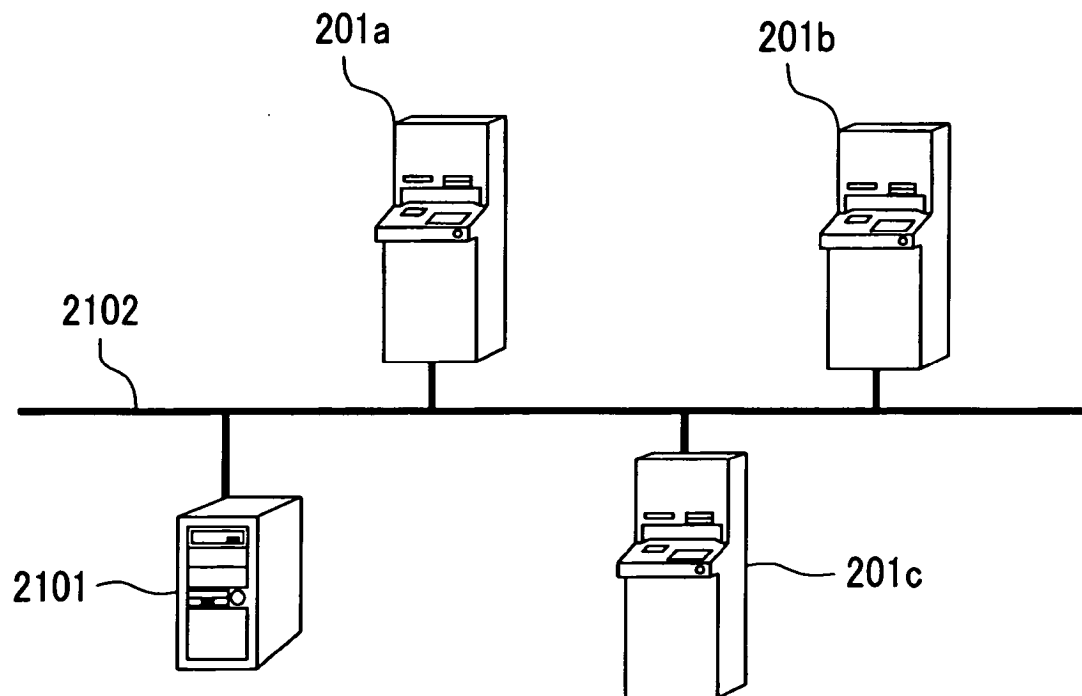
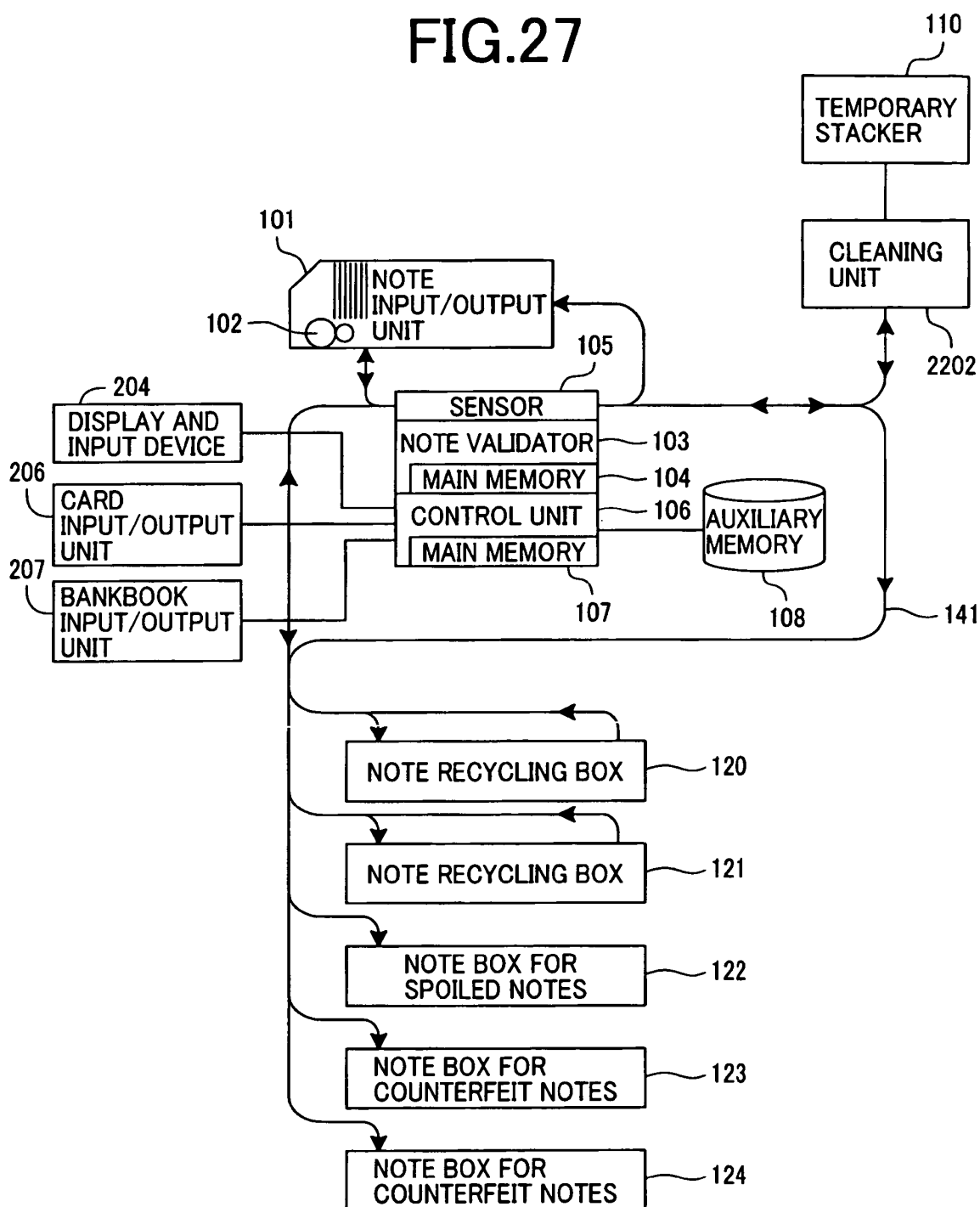


FIG.27



REFERENCES CITED IN THE DESCRIPTION

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