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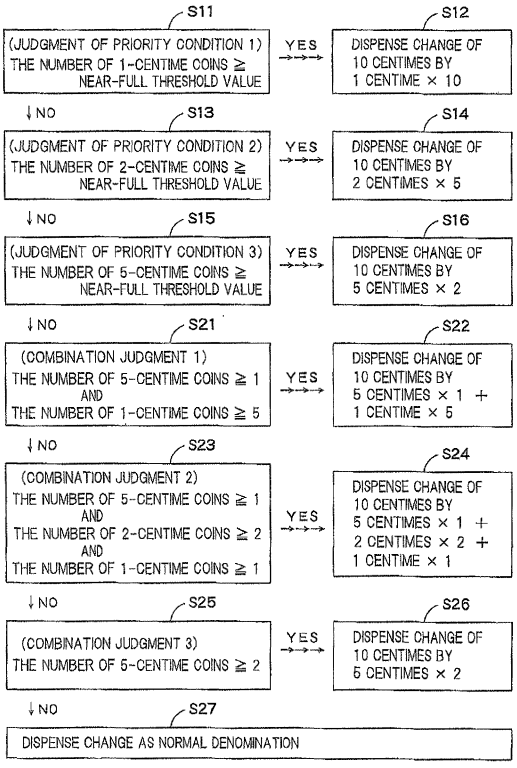
(54) Money handling apparatus and money handling method

(57) The object of the present invention is to provide a money handling apparatus and a money handling method capable of efficiently dispensing, as a change, money whose denomination corresponds to a calculational minimum denomination is alternatively dispensed as money of one or a plurality of denominations each of which is smaller than the calculational minimum denomination, the calculational minimum denomination being a denomination which is minimum among denominations absolutely-necessary for possible changes based on calculation in light of possible purchase sums. In the present invention, under a predetermined condition, money whose denomination corresponds to a calculational minimum denomination is alternatively dispensed as money of one or a plurality of denominations each of which is smaller than the calculational minimum denomination.



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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a money handling apparatus including: an inlet unit into which money is deposited; a recognition unit configured to recognize the money having been deposited into the inlet unit; a money storing unit configured to store the money having been recognized by the recognition unit, the money storing unit being capable of dispensing the money as a change; and an outlet unit from which the money having been dispensed from the money storing unit is taken out. In addition, the present invention relates to a money handling method using the money handling apparatus.

BACKGROUND ART

[0002] There has been conventionally well known a money handling apparatus including: an inlet unit into which money is deposited; a recognition unit being configured to recognize the money having been deposited into the inlet unit; a money storing unit configured to store the money having been recognized by the recognition unit, the money storing unit being capable of dispensing the money as a change; and an outlet unit from which the money having been dispensed from the money storing unit is taken out.

[0003] In order to reduce the number of processes for refilling money as a change or the number of processes for collecting overflowing money, a technique for changing a denomination of money to be dispensed as a change, depending on the number of money of each denomination in the money storing unit has been put to practical use.

[0004] For example, in a Japanese automatic vending machine for train tickets, suppose that the number of stored 10-yen coins (the stored number of 10-yen coins) exceeds a predetermined threshold value (in a near-full state). In this case, when a sum of 50 yen is dispensed as a change, the machine dispenses five 10-yen coins, instead of dispensing one 50-yen coin. Such a technique is disclosed in, for example, JP10-198835A (see, in particular, claim 3, paragraph 0038 and Fig. 2).

[0005] A conventionally general money handling apparatus (e.g., a conventional Japanese automatic vending machine for train tickets or the like) is intended to use money, which has been deposited, recognized and stored, as a change. Thus, denominations of money which are allowed to be deposited into the money handling apparatus are limited to a calculational minimum denomination of money which is available as a change, and a denomination larger than the calculational minimum denomination. To be specific, when a calculational minimum denomination of the available money is 10 yen, a 5-yen coin and a 1-yen coin cannot be used.

[0006] However, particularly in the Eurozone, it is demanded that money that is not intended to be used as a change, i.e., money whose denomination is smaller than a calculational minimum denomination, which is minimum among denominations absolutely-necessary for possible changes based on calculation in light of possible purchase sums, is also allowed to be deposited into (used in) a money handling apparatus, because such money is circulated as money. Herein, the denomination absolutely-necessary for a change means the largest denomination among respective minimum denominations of respective possible patterns of denominations for the money as the change. In other words, the denomination absolutely-necessary for a change means a minimum denomination among possible purchase sums. More specifically, in an automatic vending machine for train tickets in which every sum is set in 10-centime unit (a calculational minimum denomination is 10 centimes), there is a need in which a 5-centime coin, a 2-centime coin and a 1-centime coin are allowed to be deposited (used).

[0007] In response to such a need, when the machine is simply modified such that a 5-centlme coin, a 2-centime coin and 1-centime coin are allowed to be deposited thereinto, these coins are merely stored because these coins are not dispensed as a change by any conventional money handling method.

[0008] The aforementioned Patent Document 1 discloses that, when money whose denomination is one-stage smaller than a denomination of money to be dispensed as a change is in the near-full state, the money of the smaller denomination is alternatively dispensed as a change (see paragraph 0038). However, Patent Document 1 neither discloses nor suggests a case in which money whose denomination is two-stage or further smaller than a denomination of money to be dispensed as a change is in the near-full state. Further, Patent Document 1 neither discloses nor suggests a concept of a denomination which is smaller than the calculational minimum denomination, which is a denomination that is minimum among denominations absolutely-necessary for possible changes based on calculation in light of possible purchase sums, the denomination absolutely-necessary for a change being the largest denomination among respective minimum denominations of respective possible combinations of denominations for the money as the change.

[0009] The present invention has been made in view of the above circumstances. The object of the present invention is to provide a money handling apparatus and a money handling method capable of efficiently dispensing, as a change, money whose denomination is smaller than a calculational minimum denomination, which is a denomination that is minimum among denominations absolutely-necessary for possible changes based on calculation in light of possible purchase sums, the denomination absolutely-necessary for a change being the largest denomination among respective minimum denominations of respective possible combinations of denominations for the money as the change.

SUMMARY OF THE INVENTION

[0010] The present invention is a money handling apparatus including; an inlet unit into which money is deposited; a recognition unit configured to recognize the money having been deposited into the inlet unit; a money storing unit configured to store the money having been recognized by the recognition unit, the money storing unit being capable of dispensing the money as a change; an outlet unit from which the money having been dispensed from the money storing unit is taken out; and a control unit configured to cause the money storing unit to dispense, as the change, a difference between a purchase sum and a total sum of the money having been deposited and recognized; wherein the control unit has an alternative dispensing function in which, under a predetermined condition, money whose denomination corresponds to a calculational minimum denomination is alternatively dispensed as money of one or a plurality of denominations each of which is smaller than the calculational minimum denomination, the calculational minimum denomination being a denomination which is minimum among denominations absolutely-necessary for possible changes based on calculation in light of possible purchase sums.

[0011] According to the present invention, when a change is dispensed, since money whose denomination corresponds to a calculational minimum denomination is alternatively dispensed as money of one or a plurality of denominations each of which is smaller than the calculational minimum denomination, money of the latter one or the latter plurality of denominations can be efficiently dispensed. Therefore, the disadvantage, which might be produced when money of the latter one or the latter plurality of denominations are allowed be deposited into the money handling apparatus, can be significantly reduced,

[0012] It is preferable that the predetermined condition includes a condition in which each number of banknotes or coins of the one or the plurality of denominations stored in the money storing unit is not less than a predetermined threshold value for the alternative dispensing function.

[0013] To be specific, suppose that a calculational minimum denomination is 10 centimes. In this case, (1) under a condition in which the stored number of 5-centime coins is one or more and the stored number of 1-centime coins is five or more, it is preferable that a change of the sum of 10 centimes is alternatively dispensed by a combination of one 5-centime coin and five 1-centime coins (5 centimes $\times$ 1 + 1 centime $\times$ 5). Alternatively, (2) under a condition in which the stored number of 5-centime coins is one or more, the stored number of 2-centime coins is two or more and the stored number of 1-centime coins is one or more, it is preferable that a change of the sum of 10 centimes is dispensed by a combination of one 5-centime coln, two 2-centlme coins and one 1 centime-coin (5 centimes $\times$ 1 + 2 centimes $\times$ 2 + 1 centime $\times$ 1). Alternatively, (3) under a condition in which the stored number of 5-centime coins is two or more, it is preferable that a change of the sum of 10 centimes is dispensed by a combination of two 5-centime coins (5 centimes $\times$ 2). The order of priority of the above conditions is preferably (1) > (2) > (3).

[0014] When there are combination patterns of money of smaller denominations which can be alternatively dispensed, the aforementioned conditions (1) to (3) can immediately dispense money by using these patterns.

[0015] In addition, a routine for eliminating the so-called near-full state is also preferably employed. For example, in the above example, (4) when the stored number of 1-centime coins is not less than a near-full threshold value (e.g., about 300), it is preferable that a change of the sum of 10 centimes is dispensed by a combination of ten 1-centime coins (1 centime $\times$ 10) in a succeeding money handling process for dispensing a change of the sum of 10 centimes. Alternatively, (5) when the stored number of 2-centime coins is not less than a near-full threshold value (e.g., about 200), it is preferable that a change of the sum of 10 centimes is dispensed by a combination of five 2-centime coins (2 centimes $\times$ 5) in a succeeding money handling process for dispensing a change of the sum of 10 centimes. Alternatively, (6) when the stored number of 5-centime coins is not less than a near-full threshold value (e.g., about 200), it is preferable that a change of the sum of 10 centimes is dispensed by a combination of two 5-centime coins (5 centimes $\times$ 2) in a succeeding money handling process for dispensing a change of the sum of 10 centimes. The order of priority of the above conditions is preferably (4) > (5) > (6). The order of priority of the conditions (4) to (6), in addition to the conditions (1) to (3), is preferably (4) > (5) > (6) > (1) > (2) > (3).

[0016] In addition, a routine for inhibiting deterioration of a so-called near-empty state (a routine for inhibiting further dispensing) is also preferably employed. The following process is preferably employed. For example, when the number of banknotes or coins of a certain denomination is not more than a near-empty threshold value (e.g., about 20), money of the certain denomination is not dispensed as a change, but money whose denomination is one-stage smaller than the certain denomination is dispensed as a change. At this time, when the number of banknotes or coins of the one-stage smaller denomination is also not more than a near-empty threshold value (e.g., about 20), money of the one-stage smaller denomination is also not dispensed as a change, but money whose denomination is further one-stage smaller than the one-stage smaller denomination is dispensed as a change.

[0017] For example, the following process is preferably performed. In the above example, wen the number of 2-euro coins is not more than a near-empty threshold value (e.g., about 20), a or more 1-euro coins whose denomination is one-stage smaller than 2 euros are dispensed as a change. Further, when the number of 1-euro coins is not more than a near-empty threshold value (e.g., about 20), a or more 50-centime coins whose denomination is one-stage smaller than 1 euro are dispensed

as a change. Furthermore, when the number of 50-centime coins is not more than a near-empty threshold value (e.g., about 20), a or more 20-centime coins whose denomination is one-stage smaller than 50 centimes are dispensed as a change.

[0018] In addition, it is preferable that the money handling apparatus according to the present invention further includes a switching unit configured to make the alternative dispensing function valid or invalid, wherein the predetermined condition includes a condition in which the alternative dispensing function is made valid by the switching unit. In this case, the alternative dispensing function can be optionally made valid or invalid according to need.

[0019] For example, it is preferable that the alternative dispensing function is automatically made valid or invalid depending on a time period. Thus, the alternative dispensing function can be automatically made valid or invalid depending on a crowded time period or on an off-hour time period.

[0020] For example, the purchase sum is a sum for purchasing one or more train tickets, and the calculational minimum denomination is 10 centimes, However, the calculational minimum denomination and one or a plurality of denominations each of which is smaller than the calculational minimum denomination (and their combination patterns) are preferably changeable according to a set condition.

[0021] In addition, the present invention is a money handling method using a money handling apparatus including: an inlet unit into which money is deposited; a recognition unit configured to recognize the money having been deposited into the inlet unit; a money storing unit configured to store the money having been recognized by the recognition unit, the money storing unit being capable of dispensing the money as a change; and an outlet unit from which the money having been dispensed from the money storing unit is taken out; the money handling method including: calculating a purchase sum; calculating a total sum of the money having been deposited and recognized; and dispensing, as a change, money of a difference between the purchase sum and the total sum; wherein, in dispensing the change, there is performed an alternative dispensing function in which, under a predetermined condition, money whose denomination corresponds to a calculational minimum denomination is alternatively dispensed as money of one or a plurality of denominations each of which is smaller than the calculational minimum denomination, the calculational minimum denomination being a denomination which is minimum among denominations absolutely-necessary for possible changes based on calculation in light of possible purchase sums.

[0022] According to the present invention, in dispensing a change, since there is performed an alternative dispensing function in which money whose denomination corresponds to a calculational minimum denomination is alternatively dispensed as money of one or a plurality of denominations each of which is smaller than the calculational minimum denomination, money of the latter one or the latter plurality of denominations can be efficiently dispensed. Therefore, the disadvantage, which might be produced when money of the latter one or the latter plurality of denominations can be deposited into the money handling apparatus, can be significantly reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

Fig. 1 is a schematic view of a money handling apparatus according to one embodiment of the present invention;
Fig. 2 is a block view of the money handling apparatus of Fig. 1;
Fig. 3 is a sectional view of a banknote handling apparatus of Fig. 1;
Fig. 4 is a sectional view of a coin handling apparatus of Fig. 1;
Fig. 5 is a block view of a register of Fig. 1;
Fig. 6 is a timing-chart for explaining an example of a money settlement method by the money handling apparatus of Fig. 1; and
Fig. 7 is a flowchart of a change dispensing process by the money handling apparatus of Fig. 1.

EMBODIMENT FOR CARRYING OUT THE INVENTION

[0024] An embodiment according to the present invention will be described herebelow with reference to the drawings. Note that this embodiment is not intended to limit the present invention.

[0025] Fig. 1 is a schematic view of a money handling apparatus according to one embodiment of the present invention. As shown in Fig. 1, the money handling apparatus 10 according to this embodiment is connected to a register 40 configured to register a or more articles to be purchased by a customer (purchased articles) and to calculate a purchase sum of the articles.

[0026] The money handling apparatus 10 according to this embodiment is operated by a clerk or a customer himself/herself so as to be used in a money settlement process between the clerk and the customer. For example, the money handling apparatus 10 deposits money paid by the customer or dispenses a change to be paid to the customer. The register 40 is, e.g., a POS register to be operated by the clerk

[0027] As shown in Fig. 1, the money handling apparatus 10 according to this embodiment includes a coin depositing and dispensing apparatus 13 configured to carry out a money settlement process by depositing and dispensing a or more coins, and a banknote depositing and dispensing apparatus 12 configured to carry out a money settlement process by depositing and dispensing a or more banknotes.

[0028] Herebelow, in order to differentiate constituent

elements of the banknote depositing and dispensing apparatus 12 and constituent elements of the coin depositing and dispensing apparatus 13 from each other, a character "a" is added to a reference number of each constituent element of the banknote depositing and dispensing apparatus 12, and a character "b" is added to a reference number of each constituent element of the coin depositing and dispensing apparatus 13. Since the coin depositing and dispensing apparatus 13 and the banknote depositing and dispensing apparatus 12 differ from each other in objects to be handled therein, i.e., a or more coins and a or more banknotes, concrete structures thereof are different from each other. However, the coin depositing and dispensing apparatus 13 and the banknote depositing and dispensing apparatus 12 have the same basic block structure shown. In Fig. 2.

[0029] The banknote depositing and dispensing apparatus 12 includes a housing 100a, an inlet unit 110a and an outlet unit 120a. The inlet unit 110 is provided for depositing a or more banknotes received from a customer. The outlet unit 120a is provided for dispensing a or more banknotes as a change. When a front cover 101a of the housing 100a is opened, a cassette mounting unit (see 160a of Fig. 3) on which a money transport cassette 30 is mounted is accessible.

[0030] The coin depositing and dispensing apparatus 13 includes a housing 100b, an inlet unit 110a and an outlet unit 120b. The inlet unit 110b is provided for depositing a or more coins received from a customer The outlet unit 120b is provided for dispensing a or more coins as a change. When a front cover 101b of the housing 100b is opened, a cassette mounting unit (see 160b in Fig. 4) on which a money transport cassette 30 is mounted is accessible.

[0031] Fig. 2 is a block view showing a structural example of the money handling apparatus 10. In addition to the inlet unit 110 and the outlet unit 120, the money handling apparatus 10 further includes a transport unit 130, a recognition unit 140, a storing unit 150, the cassette mounting unit 160, a memory 170, a communication unit 180 and a control unit 190.

[0032] The transport unit 130 is configured to transport money having been deposited into the inlet unit 110 to the storing unit 150, or to transport money to be dispensed from the outlet unit 120 from the storing unit 150. In addition, the transport unit 130 is configured to transport money in a money transport cassette 30 (see Fig. 3) mounted on the cassette mounting unit 160 to the storing unit 150 in order to load (fill) the money into the storing unit 150, or to transport money stored in the storing unit 150 into the money transport cassette 30 in order to collect the money from the storing unit 150.

[0033] The recognition unit 140 is configured to detect a denomination, authenticity, fitness, oldness or newness, the number and so on of money being transported by the transport unit 130. For example, the recognition unit 140 includes a sensor such as an image sensor or a magnetic sensor.

[0034] The storing unit 150 is configured to store money having been recognized by the recognition unit 140 for each denomination. When a banknote is stored, the storing unit 150 may be of a stacker type which stores banknotes by stacking the banknotes by denomination. Alternatively, the storing unit 150 may be of a tape-reeling type which stores banknotes by sandwiching the banknotes by denomination between a plurality of tapes and by reeling up the tapes together with the banknotes.

[0035] The cassette mounting unit 160 is configured such that the money transport cassette 30 can be mounted thereon and removed therefrom. The cassette mounting unit 160 is configured to deposit money from the money transport cassette 30 or to dispense money to the money transport cassette 30.

[0036] The memory 170 includes a ROM (Read Only Memory) or a HDD (Hard Disk Drive), which stores various programs and data for controlling the money handling apparatus 10, a RAM (Random Access Memory) serving as a loading area of a program and as a working area when a program is executed, and so on. The memory 170 also stores information about money (denomination, amount, etc.) stored in the storing unit 150 and the money transport cassette 30. Further, the memory 170 may store the number of banknotes or coins having been recognized by the recognition unit 140 for each denomination.

[0037] The communication unit 180 is communicably connected to other apparatuses (a money teller apparatus, a money management apparatus, a POS management apparatus), not shown, which constitute the money handling system, and the register 40.

[0038] The control unit 190 is a computing apparatus configured to control the money handling apparatus 10 as a whole, by executing a program stored in the memory 170.

[0039] The control unit 190 is configured to calculate a sum of money (deposited sum) having been deposited into the inlet unit 110, based on a recognition result of money having been deposited into the inlet unit 110. Further, the control unit 190 receives a total sum of a or more articles purchased by a customer from the register 40 through the communication unit 180, and calculates a sum of change by subtracting the total sum of the purchased articles from a total sum of money received from the customer. The control unit 190 controls the respective units of the money handling apparatus 10, such that a change corresponding to the calculated sum of change is dispensed.

[0040] Fig. 3 is a sectional view showing an example of an inside structure of the banknote depositing and dispensing apparatus 12 of the money handling apparatus 10. The banknote depositing and dispensing apparatus 12 includes an inlet-unit cover 111a, When a clerk (or a customer) deposits a number of banknotes, the banknotes are deposited into the inlet unit 110a by opening the inlet-unit cover 111a. On the other hand, when banknotes of lesser number are deposited, the banknotes

can be deposited into the inlet unit 110a, without opening the inlet-unit cover 111a. The inlet unit 110a is configured to feed out the banknotes having been deposited thereinto, one by one, to the transport unit 130a. The transport unit 130a is configured to pass the fed-out banknotes through the recognition unit 140a, and then to transport the banknotes to the storing unit 150a, the money transport cassette 30 or the outlet unit 120a. The recognition unit 140a recognizes a denomination, authenticity, fitness, oldness or newness, the number and so on of the banknotes being transported. The transport unit 130a stores the banknotes by denomination into the storing unit 150a, based on the recognition result by the recognition unit 140a.

[0041] The transport unit 130a may transport a or more banknotes to the money transport cassette 30 according to need, e.g., when the storing unit 150a is full or the like.

[0042] On the other hand, in order to dispense a or more banknotes, the storing unit 150a is configured to feed out the banknotes, one by one, to the transport unit 130a. The transport unit 130a transports the fed-out banknotes to the outlet unit 120a. The banknote depositing and dispensing apparatus 12 includes an outlet-unit shutter 121a. When a or more banknotes are dispensed, the outlet-unit shutter 121a is opened, so that the banknotes are dispensed.

[0043] In this manner, the banknote depositing and dispensing apparatus 12 can store a or more banknotes having been deposited into the inlet unit 110a to the storing unit 150a. Reversely, the banknote depositing and dispensing apparatus 12 can feed out the banknotes stored in the storing unit 150a to the outlet unit 120a. Namely, the banknote depositing and dispensing apparatus 12 is configured to reuse a or more banknotes, which have been deposited thereinto, as a or more banknotes to be dispensed.

[0044] When the money transport cassette 30 is mounted on the cassette mounting unit 160a, the banknote depositing and dispensing apparatus 12 can load a or more banknotes from the money transport cassette 30 into the storing unit 150a, or can collect a or more banknotes from the storing unit 150a to the money transport cassette 30. When a or more banknotes are loaded, the money transport cassette 30 feeds out the banknotes, one by one, to the transport unit 130a. The transport unit 130a loads the fed-out banknotes into the storing unit 150a. When a or more banknotes are collected, the storing unit 150a feeds out the banknotes, one by one, to the transport unit 130a. The transport unit 130a collects the fed-out banknotes into the money transport cassette 30.

[0045] In this manner, the banknote depositing and dispensing apparatus 12 is configured to load and collect a or more banknotes by using the money transport cassette 30.

[0046] Figs. 4(a) and 4(b) are sectional views showing an example of an inside structure of the coin depositing and dispensing apparatus 13 of the money handling apparatus 10. Fig. 4(a) is a sectional view of the coin depositing and dispensing apparatus 13 seen from a lateral side. Fig. 4(b) is a sectional view of the coin depositing and dispensing apparatus 13 seen from a front side. In Fig. 4(b), illustration of the money transport cassette 30 and a feeding unit 137b is omitted, but the storing units 150b are illustrated.

[0047] As shown in Fig. 4(b), the coin depositing and dispensing apparatus 13 incudes the inlet unit 110b. When a or more coins are deposited, a clerk (or a customer) deposits the coins into the inlet unit 110b. At this time, coins of a plurality of denominations in a mixed state may be deposited thereinto. A discoid feeding unit 133b is configured to feed out coins having been deposited into the inlet unit 110b, one by one, to the transport unit 130b. The transport unit 130b passes the fed-out coins through the recognition unit 140b, and then transports the coins to the storing unit 150b, the money transport cassette 30 or the outlet unit 120b. The recognition unit 140b recognizes a denomination, authenticity, fitness, oldness or newness, the number and so on of the coins being transported. The transport unit 130b sorts the coins by denomination based on the recognition result of the recognition unit 140b, and stores each coin to the storing unit 150b of a corresponding denomination.

[0048] The transport unit 130b may transport a or more coins to the money transport cassette 30 or a collecting box 135b according to need, e.g., when the storing unit 150b is full or the like.

[0049] On the other hand, in order to dispense a or more coins, the storing unit 150b is configured to feed out the coins, one by one, to a transport unit 131b. The plurality of storing units 150b store money by denomination. Each storing unit 150b includes the discoid feeding unit 153b. The feeding unit 153b is configured to feed out coins, one by one, to the transport unit 131b. The transport unit 131b transports the fed-out coins to the outlet unit 120b. Thus, the coin depositing and dispensing apparatus 13 sends the coin to the outlet unit 120b.

[0050] In this manner, the coin depositing and dispensing apparatus 13 can store a or more coins having been deposited into the inlet unit 110b to the storing unit 150b. Reversely, the coin depositing and dispensing apparatus 13 can feed out the coins stored in the storing unit 150b. Namely, the coin depositing and dispensing apparatus 13 is configured to reuse a or more coins having been deposited thereinto, as a or more coins to be dispensed.

[0051] When the money transport cassette 30 is mounted on the cassette mounting unit 160b, the coin depositing and dispensing apparatus 13 can load a or more coins from the money transport cassette 30 into the storing unit 150b, or can collect a or more coins from the storing unit 150b to the money transport cassette 30. When a or more coins are loaded, the money transport cassette 30 dispenses the coins to the feeding unit 137b shown in Fig. 4(a). At this time, the money transport cassette 30 may dispense coins whose denominations are in a mixed state. The feeding unit 137b feeds out the coins to the transport unit 131b. The transport unit 131b

transports the fed-out coins to the feeding unit 133b, and the feeding unit 133b feeds out the coins, one by one, to the transport unit 130b. The transport unit 130b is configured to pass the fed-out coins through the recognition unit 140b, and then to transport the coins to the storing unit 150b or the outlet unit 120b. The recognition unit 140b recognizes a denomination of the coins being transported. The transport unit 130b stores the coins by denomination to the storing unit 150b, based on the recognition result by the recognition unit 140b.

[0052] When a or more coins are collected, the coin depositing and dispensing apparatus 13 feeds out coins, one by one, from the storing unit 150b to the transport unit 131b. The transport unit 131b collects the fed-out coins to the money transport cassette 30.

[0053] In this manner, the coin depositing and dispensing apparatus 13 is configured to load and collect a or more coins by using the money transport cassette 30.

[0054] Next, a structure of the register 40 is described. The left part of Fig. 1 shows an appearance of the register 40. Fig. 5 shows a block structure of the register 40. As shown in Figs. 1 and 5, the register 40 includes a display unit 402 configured to display various information, a keyboard 404 configured to receive a manual input of various information and instructions from a clerk, a printer 406 configured to output a receipt on which transaction contents are printed, a reading unit 408 configured to read article information, a communication unit 410 configured to communicate with the money handling apparatus 10 and a POS management apparatus 26, a control unit 412 and a memory 414.

[0055] The display unit 402 is configured to display transaction contents including article information of a or more articles purchased by a customer, a purchase sum of the articles, a payment sum of the customer, a sum of change and so on.

[0056] For example, the reading unit 408 is a barcode scanner for reading a or more barcodes attached to a or more articles purchased by a customer. When the reading unit 408 reads the barcodes, the register 40 can obtain article information of the articles purchased by the customer so as to register the article information.

[0057] As shown in Fig. 1, the register 40 may include a second display unit (called "customer display") 402a which can be observed by a customer. In this case, the second display unit 402a may display the same information as the information on the display unit 402. In addition, the display unit 402 may be a touch panel. In this case, the display unit 402 can also serve as the keyboard 404.

[0058] The memory 414 includes a ROM (Read Only Memory) or a HDD (Hard Disk Drive), which stores various programs and data for controlling the money handling apparatus 10, a RAM (Random Access Memory) serving as a loading area of a program and as a working area when a program is executed, and so on. In addition, the memory 414 stores a table in which article information and a sum of the article are associated with each other.

[0059] The control unit 412 is a computing apparatus configured to control the resistor 40 as a whole, by executing a program stored in the memory 414. The control unit 412 can obtain the sum of each article so as to calculate a total sum of the articles purchased by a customer, by searching the table in the memory 414 with the use of the article information read by the reading unit 408.

[0060] Further, the control unit 412 can transmit the total sum of the purchased articles to the money handling apparatus 10 through the communication unit 410. Furthermore, the control unit 412 can transmit the article information of the article purchased by the customer to the POS management apparatus (not shown) through the communication unit 410.

[0061] Next, a money settlement method using the money handilng apparatus 10 and the register 40 is described with reference to the timing-chart of Fig. 6.

(STEP S101) Article information of an article to be purchased by a customer is registered in the resistor 40, and a purchase sum is calculated.

(STEP S102) The resistor 40 transmits the purchase sum to the money handling apparatus 10.

(STEP S103) Money paid by the customer is deposited into the money handling apparatus 10. The money may be deposited by the client or by the customer hlmseif/herseif. The money handling apparatus 10 performs a depositing process including recognition and count of the deposited money.

(STEP S104) The money handling apparatus 10 calculates a sum of money having been deposited (deposited sum).

(STEP S105) The money handling apparatus 10 regards the deposited sum calculated in the step S104 as a total sum of money received from the customer. Then, the money handling apparatus 10 calculates a sum of change based on the total sum of money received from the customer and the purchase sum received from the register 40 in the step S102.

(STEP S106). The money handling apparatus 10 dispenses money as a change, based on the sum of change calculated in the step S105, Specifically, the banknote depositing and dispensing apparatus 12 dispenses a or more banknotes as a change from the outlet unit 120a, and the coin depositing and dispensing apparatus 13 dispenses a or more coins as a change from the outlet unit 120b.

[0062] The client may hand over the change money to the customer. Alternatively, the customer himself/herself may receive the change money dispensed from the money handling apparatus 10.

(STEP S107) The money handling apparatus 10 informs the register 40 of the finish of dispensing the change money.

(STEP S108) The printer 406 of the register 40 outputs a receipt on which the transaction contents including the article information of the article pur-

chased by the customer, the purchase sum, the sum paid by the customer and the sum of change are printed. The client hands over the outputted receipt to the customer.

[0063] Next, a control flow performed when a change is dispensed, which is the feature of the present invention, is described with reference to Fig. 7.

(STEP S11) At first, a judgment flow of near-full state is carried out. Namely, in this embodiment, it is judged whether the number of stored 1-centime coins is not less than a near-full threshold value (e.g., about 300) or not.

(STEP S12) When the judgment result of the step S11 is YES, a sum of 10 centimes among a sum of change is alternatively dispensed by a combination of ten 1-centime coins (1 centime × 10). The remaining of the sum of change is dispensed as a change of normal denomination.

(STEP S13) When the judgment result of the step S11 is NO, it is judged whether the number of stored 2-centime coins is not less than a near-full threshold value (e.g., about 200) or not,

(STEP S14) When the judgment result of the step S13 is YES, a sum of 10 centimes among a sum of change is alternatively dispensed by a combination of five 2-centime coins (2 centimes × 5). The remaining of the sum of change is dispensed as a change of normal denomination.

(STEP S15) When the judgment result of the step S13 is NO, it is judged whether the number of stored 5-centime coins is not less than a near-full threshold value (e.g., about 200) or not.

(STEP S16) When the judgment result of the step S13 is YES, a sum of 10 centimes among a sum of change is alternatively dispensed by a combination of two 5-centime coins (5 centimes × 2). The remaining of the sum of change is dispensed as a change of normal denomination.

(STEP S21) When the judgment result of the step S15 is NO, the judgment flow of near-full state is finished. Then, there is started a flow for judging whether a change can be dispensed by money of a or more smaller denominations. Namely, in this embodiment, it is judged whether the number of 5-centime coins is one or more and whether the number of 1-centime coins is five or more.

(STEP S22). When the judgment result of the step S21 is YES, a sum of 10 centimes among a sum of change is alternatively dispensed by a combination of one 5-centime coin and five 1-centime coins (5 centimes × 1 + 1 centime × 5). The remaining of the sum of change is dispensed as a change of normal denomination.

(STEP S23), When the judgment result of the step S21 is NO, it is judged whether the number of 5-centime coin is one or more, and whether the number of 2-centime coins is two ore more, and whether the number of 1-centime coins is one or more.

(STEP S24) When the judgment result of the step S23 is YES, a sum of 10 centimes among a sum of change is alternatively dispensed by a combination of one 5-centime coin, two 2-centime coins and one 1-centime coin (5 centimes × 1 + 2 centimes × 2 + 1 centime × 1). The remaining of the sum of change is dispensed as a change of normal denomination.

(STEP S25) When the judgment result of the step S23 is NO, it is judged whether the number of stored 5-centime coins is two or more.

(STEP S26) When the judgment result of the step S25 is YES, a sum of 10 centimes among a sum of change is alternatively dispensed by a combination of two 5-centime coins (5 centimes × 2). The remaining of the sum of change is dispensed as a change of normal denomination.

(STEP S27) When the judgment result of the step S25 is NO, the flow for judging whether a change can be dispensed by money of a or more smaller denominations is finished. Then, the change is dispensed as a change of normal denomination.

[0064] As described above, according to this embodiment, when a change is dispensed, since money of 10 centimes which denomination corresponds to a calculational minimum denomination is alternatively dispensed as money of one or a plurality of denominations each of which is smaller than the calculational minimum denomination, i,e., as money of one or more denominations of 1 centime, 2 centimes and 5 centimes, money of the latter denomination(s) can be efficiently dispensed, the calculational minimum denomination being a denomination which is minimum among denominations absolutely-necessary for possible changes based on calculation in light of possible purchase sums, the denomination absolutely-necessary for a change being the largest denomination among respective minimum denominations of respective possible combinations of denominations for the money as the change. Therefore, the disadvantage which might be produced when money of the latter denomination(s) can be deposited into the money handling apparatus can be significantly reduced.

[0065] Particularly in this embodiment, unless the number of stored 1-centime coins reaches the near-full state, the alternative dispensing by a combination of ten 1-centime coins (1 centime × 10) is not carried out. Thus, unsatisfactory feeling of a customer can be restrained.

[0066] When a change is alternatively dispensed, a pattern of combination of money of a or more smaller denominations can be optionally changed. For example, the step S21 (or the step S22) and/or the step S25 (or the step S26) may be omitted. Alternatively, there may be added a judgment (or dispensing) for a combination of one 5-centime coin, one 2-centime coin and three 1-centime coins (5 centimes × 1 + 2 centimes × 1 + 1 centime × 3).

[0067] Preferably, this embodiment is further combined with a conventionally known near-empty judgment routine. For example, in the step S27, when the number of banknotes or coins whose denomination is specified for a change is not more than a near-empty threshold value (e.g., about 20), money of this denomination is not dispensed as a change, but money whose denomination is one-stage smaller than the specified denomination is preferably dispensed as a change. At this time, when the number of banknotes or coins whose denomination is one-stage smaller than the specified denomination is also not more than a near-empty threshold value (e.g., about 20), money of the one-stage smaller denomination is also not dispensed as a change, and money whose denomination is further one-stage smaller than the one-stage smaller denomination is dispensed. Similarly, in order that money whose stored number is not more than a near-empty threshold value (e.g., about 20) is not dispensed as a change, the change is preferably dispensed as money of a or more smaller denominations.

[0068] Alternatively, before the judgment process of the step S11 is carried out, the following method can be employed. Namely, it is judged whether the number of banknotes or coins whose denomination is generally specified as a change is not more than a near-empty threshold value (e.g., about 20) or not. Then, when the result is YES, money of this denomination is not dispensed as a change, but money whose denomination is one-stage smaller than this denomination is alternatively dispensed as a change. In this case, the flow of steps succeeding the step S11 may not be carried out. In a case in which money of a or more smaller denominations is dispensed as a change instead of money of a near-empty denomination, when money whose denomination corresponds to a calculational minimum denomination is alternatively dispensed as money of one or a plurality of denominations each of which is smaller than the calculational minimum denomination, the number of dispensed money (coins) is so increased that there is a possibility that a customer experiences unsatisfactory feeling. The above method is preferable when there is such a possibility. Similarly to the above, when the number of banknotes or coins whose denomination is one-stage smaller than a specified denomination is also not more than a near-empty threshold value (e.g., about 20), money of the one-stage smaller denomination is also not dispensed as a change, but money whose denomination is further one-stage smaller than the one-stage smaller denomination is dispensed as the change.

[0069] The present invention is not limited to the aforementioned embodiment, but can be embodied by modifying the constituent elements without departing from the scope of the present invention. In addition, various inventions can be formed by suitably combining the plurality of constituent elements disclosed in the above embodiment. For example, some of the constituent elements may be omitted from all the constituent elements shown in the embodiment. Moreover, the constituent elements belonging to the different embodiments may be suitably combined with each other.

Claims

1. A money handling apparatus comprising:

an inlet unit into which money is deposited;
a recognition unit configured to recognize the money having been deposited into the inlet unit;
a money storing unit configured to store the money having been recognized by the recognition unit, the money storing unit being capable of dispensing the money as a change;
an outlet unit from which the money having been dispensed from the money storing unit is taken out; and
a control unit configured to cause the money storing unit to dispense, as the change, a difference between a purchase sum and a total sum of the money having been deposited and recognized;
wherein the control unit has an alternative dispensing function in which, under a predetermined condition, money whose denomination corresponds to a calculational minimum denomination is alternatively dispensed as money of one or a plurality of denominations each of which is smaller than the calculational minimum denomination,
the calculational minimum denomination being a denomination which is minimum among denominations absolutely-necessary for possible changes based on calculation in light of possible purchase sums.

2. The money handling apparatus according to claims 1, wherein
the predetermined condition includes a condition in which each number of banknotes or coins of the one or the plurality of denominations stored in the money storing unit is not less than a predetermined threshold value for the alternative dispensing function.

3. The money handling apparatus according to claim 1 or 2, wherein
the predetermined condition includes a condition in which the number of banknotes or coins of the calculational minimum denomination stored in the money storing unit is not more than a predetermined threshold value for the alternative dispensing function.

4. The money handling apparatus according to any one of claims 1 to 3, further comprising a switching unit configured to make the alternative dispensing function valid or invalid,

wherein the predetermined condition includes a condition in which the alternative dispensing function is made valid by the switching unit.

5. The money handling apparatus according to claim 4, wherein
the alternative dispensing function is automatically made valid or invalid depending on a time period.

6. The money handling apparatus according to any one of claims 1 to 5, wherein
the purchase sum is a sum for purchasing one or more train tickets, and
the calculational minimum denomination is 10 centimes,

7. A money handling method using a money handling apparatus including: an inlet unit into which money is deposited; a recognition unit configured to recognize the money having been deposited into the inlet unit; a money storing unit configured to store the money having been recognized by the recognition unit, the money storing unit being capable of dispensing the money as a change; and an outlet unit from which the money having been dispensed from the money storing unit is taken out; the money handling method comprising:

calculating a purchase sum;
calculating a total sum of the money having been deposited and recognized; and
dispensing, as a change, money of a difference between the purchase sum and the total sum;
wherein, in dispensing the change, there is performed an alternative dispensing function in which, under a predetermined condition, money whose denomination corresponds to a calculational minimum denomination is alternatively dispensed as money of one or a plurality of denominations each of which is smaller than the calculational minimum denomination, the calculational minimum denomination being a denomination which is minimum among denominations absolutely-necessary for possible changes based on calculation in light of possible purchase sums.

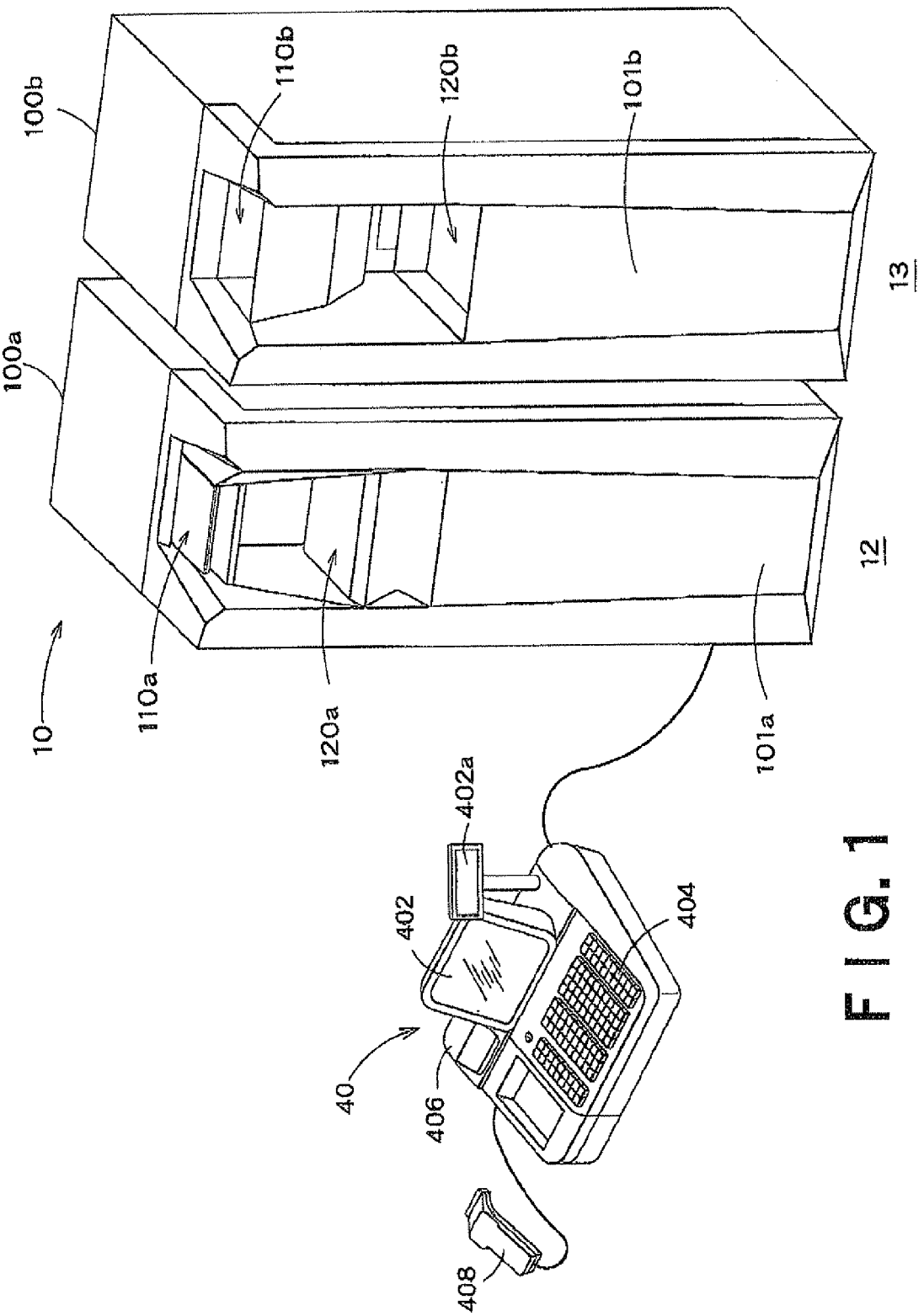
8. The money handling method according to claim 7, wherein
the predetermined condition includes a condition in which each number of banknotes or coins of the one or the plurality of denominations stored in the money storing unit is not less than a predetermined threshold value for the alternative dispensing function.

9. The money handling method according to claim 7 or 8, wherein
the predetermined condition includes a condition in which the number of banknotes or coins of the calculational minimum denomination stored in the money storing unit is not more than a predetermined threshold value for the alternative dispensing function.

10. The money handling method according to any one of claims 7 to 9, wherein
the predetermined condition includes a condition in which the alternative dispensing function is set valid.

11. The money handling method according to claim 10, wherein
the alternative dispensing function is automatically made valid or invalid depending on a time period.

12. The money handling method according to any one of claims 7 to 11, wherein
the purchase sum is a sum for purchasing one or more train tickets, and
the calculational minimum denomination is 10 centimes.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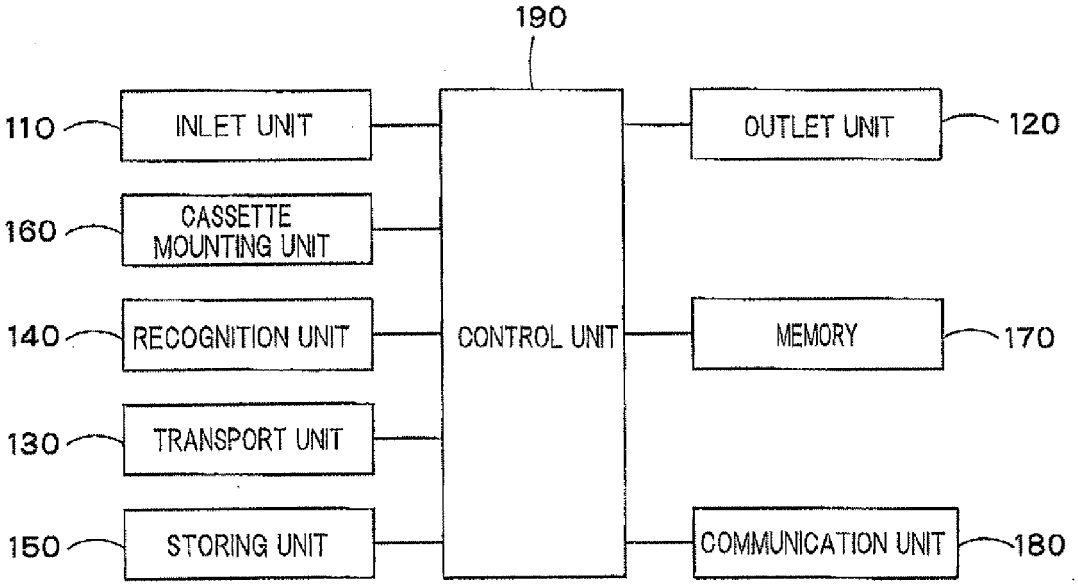
408

FIG. 1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CASSETTE MOUNTING UNIT
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RECOGNITION UNIT
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TRANSPORT UNIT
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STORING UNIT
CONTROL UNIT
OUTLET UNIT
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MEMORY
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COMMUNICATION UNIT
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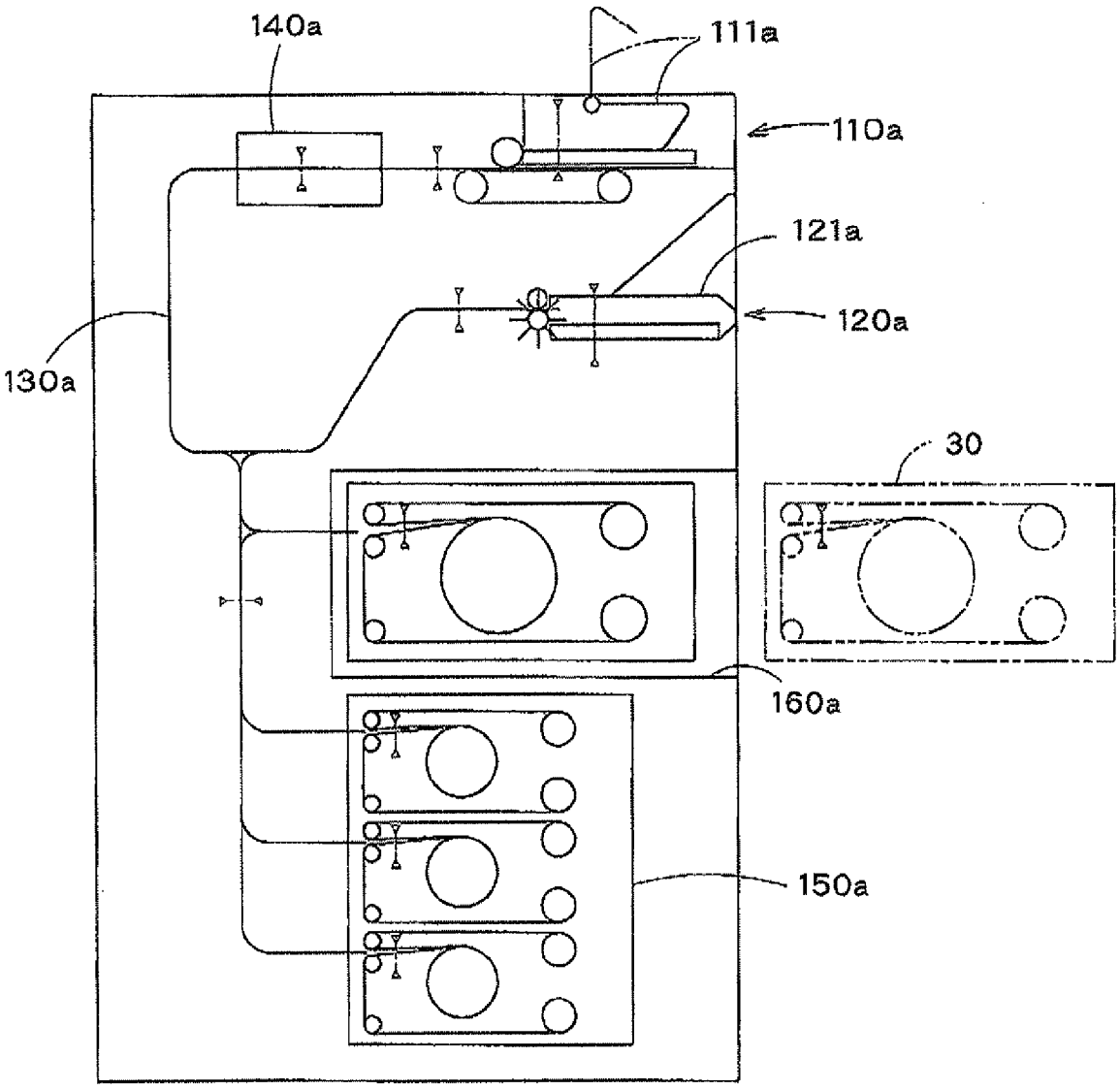
FIG. 2



12

FIG. 3

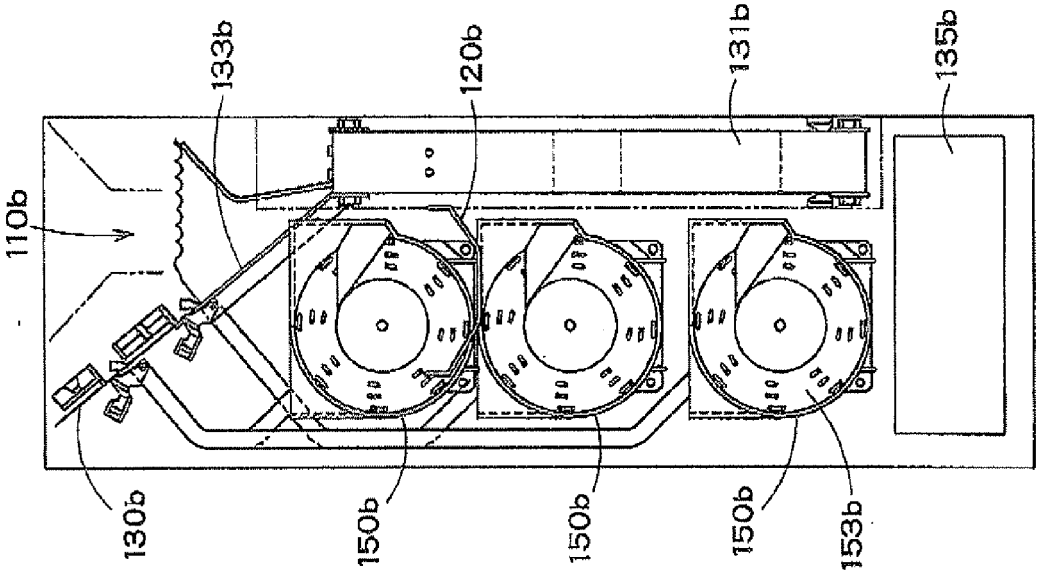


FIG. 4B 13

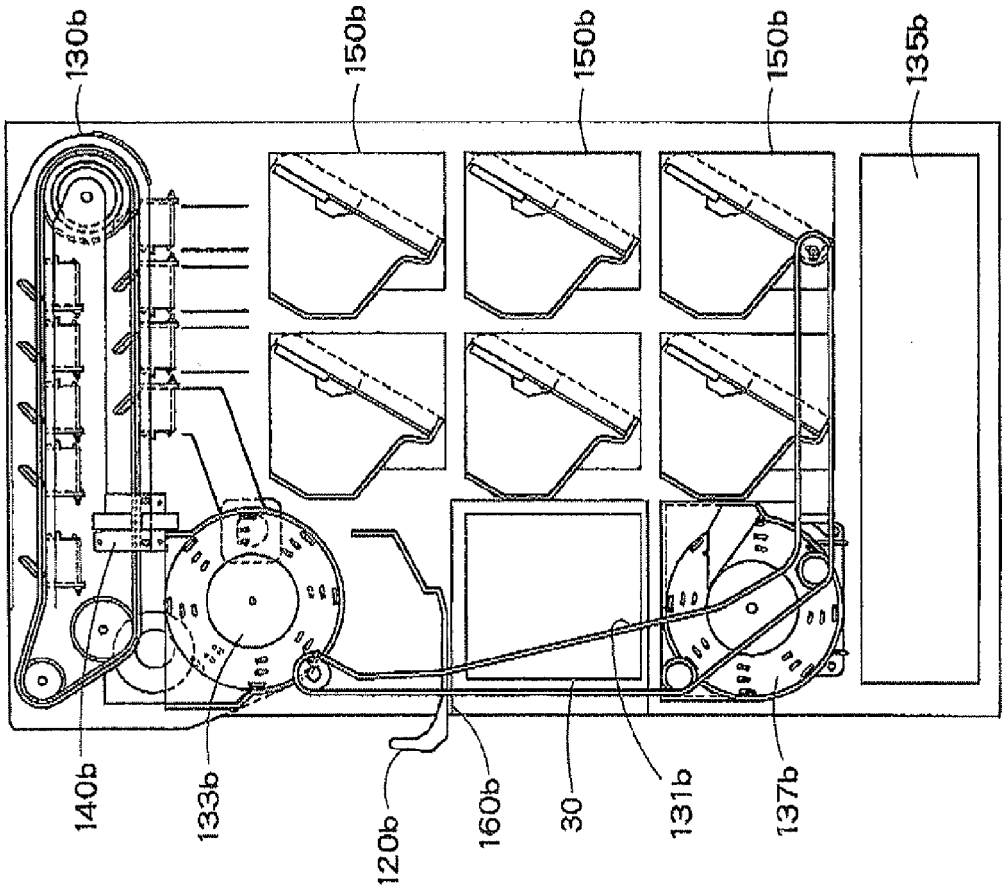
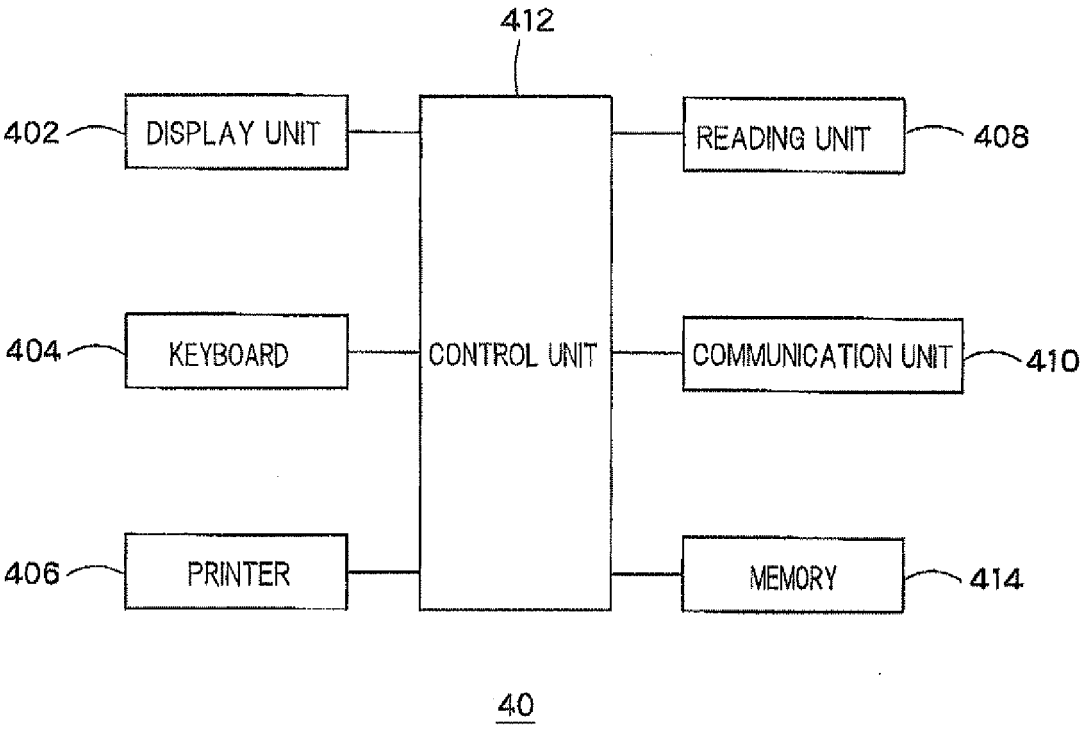


FIG. 4A 13


412
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DISPLAY UNIT
READING UNIT
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404
KEYBOARD
CONTROL UNIT
COMMUNICATION UNIT
410
406
PRINTER
MEMORY
414
40

FIG. 5

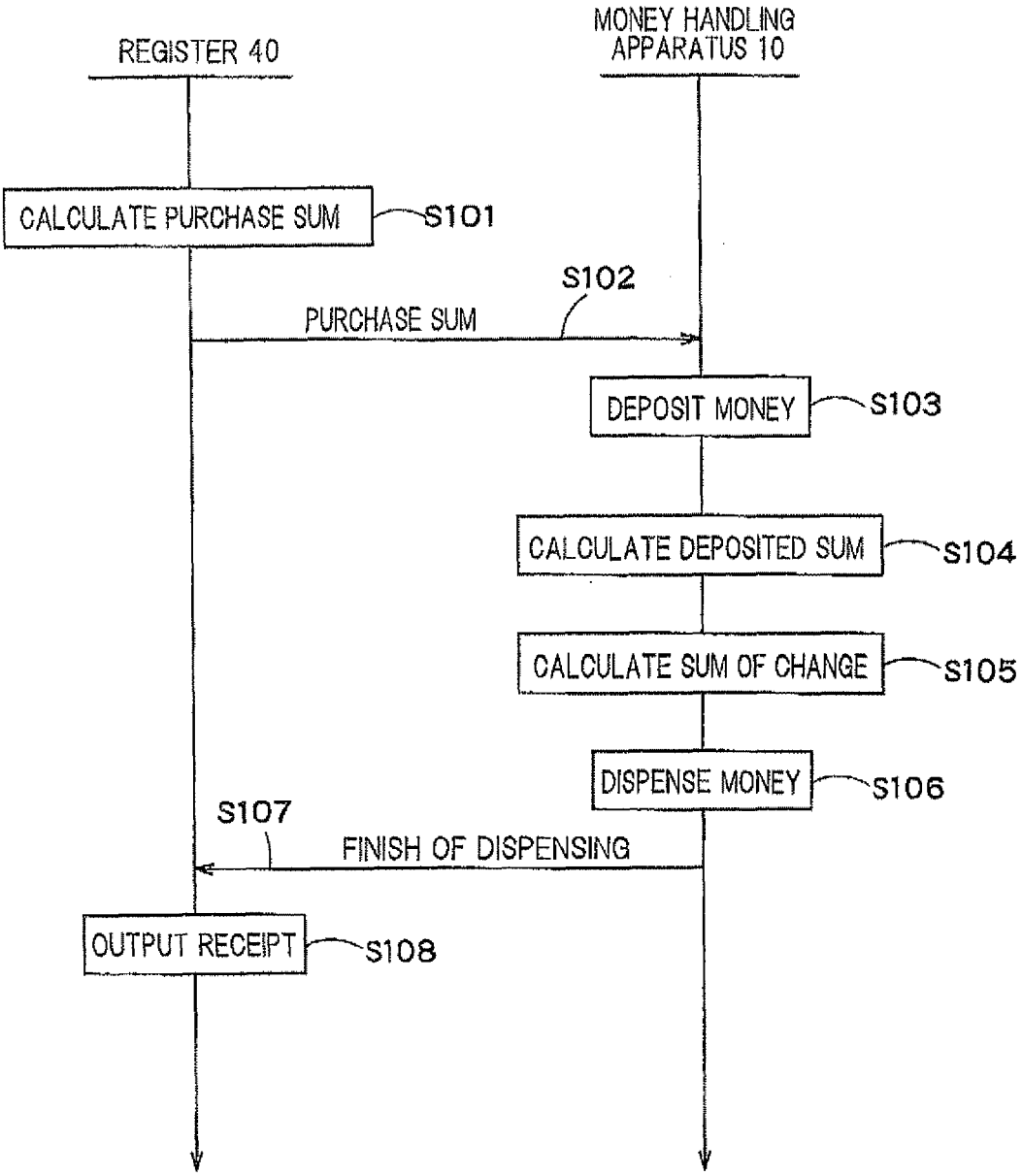
REGISTER 40
MONEY HANDLING APPARATUS 10
CALCULATE PURCHASE SUM
S101
S102
PURCHASE SUM
DEPOSIT MONEY
S103
CALCULATE DEPOSITED SUM
S104
CALCULATE SUM OF CHANGE
S105
DISPENSE MONEY
S106
S107
FINISH OF DISPENSING
OUTPUT RECEIPT
S108

FIG. 6

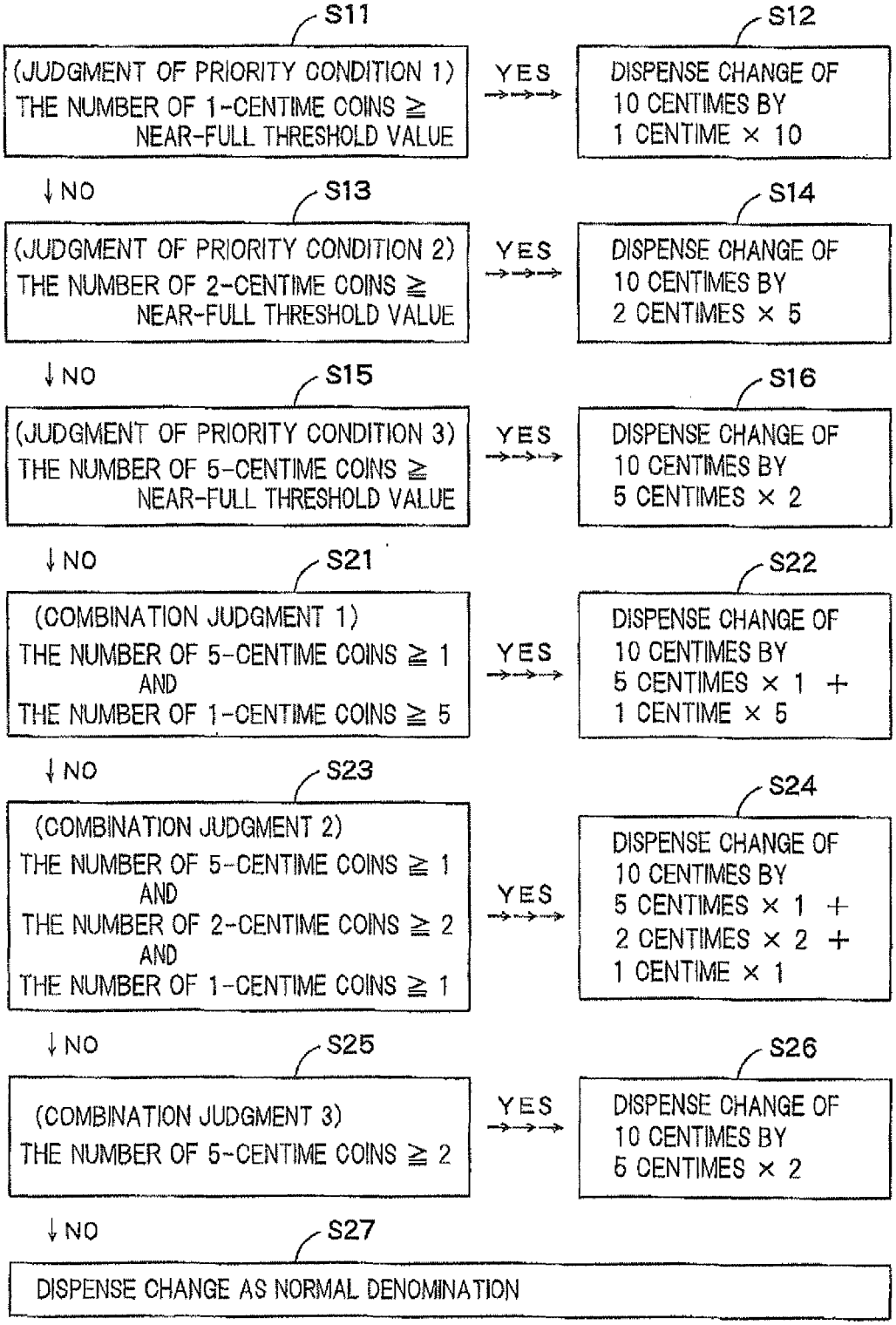
S11
(JUDGMENT OF PRIORITY CONDITION 1)
THE NUMBER OF 1-CENTIME COINS ≧
NEAR-FULL THRESHOLD VALUE
YES
S12
DISPENSE CHANGE OF
10 CENTIMES BY
1 CENTIME × 10
NO
S13
(JUDGMENT OF PRIORITY CONDITION 2)
THE NUMBER OF 2-CENTIME COINS ≧
NEAR-FULL THRESHOLD VALUE
YES
S14
DISPENSE CHANGE OF
10 CENTIMES BY
2 CENTIMES × 5
NO
S15
(JUDGMENT OF PRIORITY CONDITION 3)
THE NUMBER OF 5-CENTIME COINS ≧
NEAR-FULL THRESHOLD VALUE
YES
S16
DISPENSE CHANGE OF
10 CENTIMES BY
5 CENTIMES × 2
NO
S21
(COMBINATION JUDGMENT 1)
THE NUMBER OF 5-CENTIME COINS ≧ 1
AND
THE NUMBER OF 1-CENTIME COINS ≧ 5
YES
S22
DISPENSE CHANGE OF
10 CENTIMES BY
5 CENTIMES × 1 +
1 CENTIME × 5
NO
S23
(COMBINATION JUDGMENT 2)
THE NUMBER OF 5-CENTIME COINS ≧ 1
AND
THE NUMBER OF 2-CENTIME COINS ≧ 2
AND
THE NUMBER OF 1-CENTIME COINS ≧ 1
YES
S24
DISPENSE CHANGE OF
10 CENTIMES BY
5 CENTIMES × 1 +
2 CENTIMES × 2 +
1 CENTIME × 1
NO
S25
(COMBINATION JUDGMENT 3)
THE NUMBER OF 5-CENTIME COINS ≧ 2
YES
S26
DISPENSE CHANGE OF
10 CENTIMES BY
5 CENTIMES × 2
NO
S27
DISPENSE CHANGE AS NORMAL DENOMINATION

FIG. 7

Europäisches Patentamt
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EUROPEAN SEARCH REPORT

Application Number
EP 13 15 0722

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 03/083788 A1 (CASHGUARD AB [SE]; OLOFSSON GUNNAR [SE]) 9 October 2003 (2003-10-09) * page 1, line 1 - page 15, line 30 * -----	1-12	INV. G07D11/00 G07F5/24 G07D1/06
X,D	JP 10 198835 A (TEC CORP) 31 July 1998 (1998-07-31) * the whole document * -----	1-12	

TECHNICAL FIELDS SEARCHED (IPC)

G07D
G07F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	28 March 2013	Bohn, Patrice

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 15 0722

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28-03-2013

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