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(54) **Coin sorting method and apparatus therefor.**

(57) The present invention provides a method and apparatus that can rapidly and accurately sort genuine from counterfeit coins without using a special high-performance CPU.

The invention relates to a method of sorting genuine and counterfeit coins that are passing through a predetermined pathway, wherein a plurality of type-identifying means 14 and 15 is arranged along the predetermined pathway along which a plurality of types of coins M to be sorted are passing. This method of sorting genuine and counterfeit coins comprises the steps of: setting a plurality of mutually non-overlapping assumed domains 1 to 4, one for each of identification factors of the type-identifying means and corresponding to magnitudes of values thereof; determining whether an output from any of the type-identifying means belongs in any of the plurality of assumed domains; and sorting whether or not outputs from the identification means belong within a closed function domain in coordinates of a plurality of dimensions with axes along which the identification factors are plotted, in order to sort in accordance with each of identification factors of the plurality of types.

The invention also relates to an apparatus for sorting genuine and counterfeit coins that are passing through a predetermined pathway, wherein a plurality of type-identifying means 14 and 15 is arranged along the predetermined pathway along which a plurality of types of coins M to be sorted are passing. This apparatus for sorting genuine and counterfeit coins comprises: an assumed region setting means for setting a plurality of mutually non-overlapping assumed domains, one for each of identification contents of the type-identifying means and corresponding to magnitudes of values thereof; a sorting means for determining whether an output from any of the type-identifying means belongs in any of the plurality of assumed domains; a function domain setting means for setting a closed function domain in coordinates of a plurality of dimensions with axes along which the identification factors are plotted, in order to sort in accordance with each of identification factors of the plurality of types; and a sorting means for sorting whether or not outputs from the identification means belong within the closed function domains; wherein genuine and counterfeit coins are sorted by an output from the sorting means.

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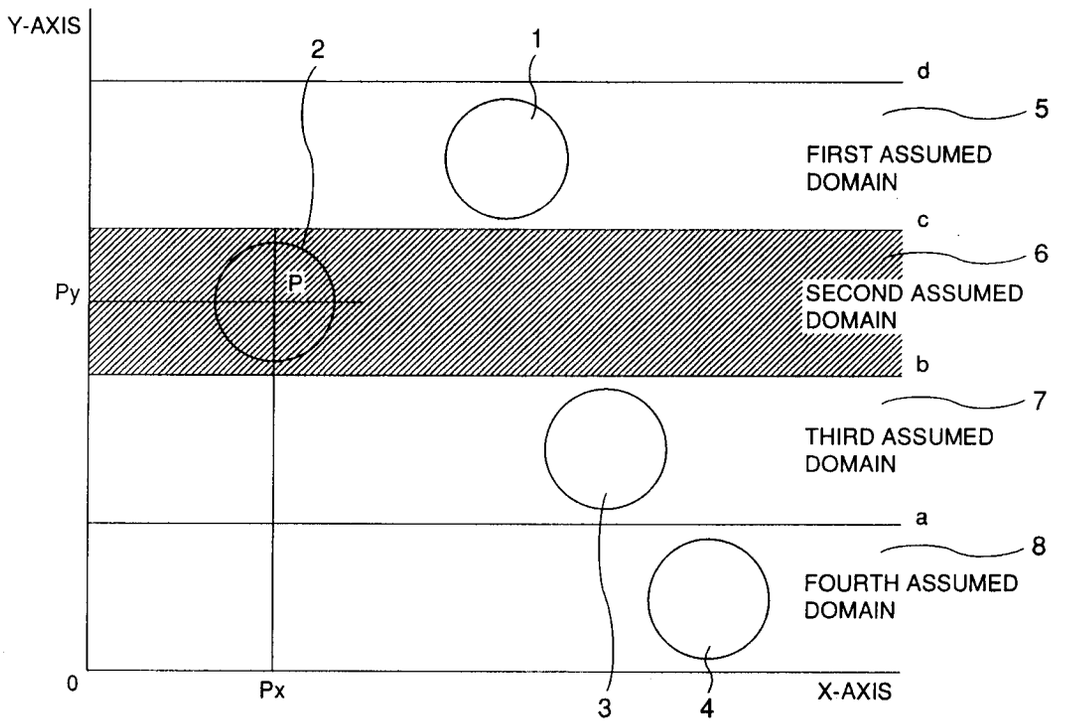
Y-AXIS
2
1
d
5
FIRST ASSUMED DOMAIN
c
6
Py
P
SECOND ASSUMED DOMAIN
b
7
THIRD ASSUMED DOMAIN
a
8
FOURTH ASSUMED DOMAIN
0
Px
3
4
X-AXIS

FIG. 1

BACKGROUND OF THE INVENTION

The present invention relates to a method and apparatus for electronically sorting genuine and counterfeit coins.

Prior Art

Existing patents such as German Patent No. 2,646,025 and European Patent No. 0,367,921 disclose techniques of obtaining the characteristics of a coin as two-dimensional and three-dimensional coordinates, then sorting genuine from counterfeit coins by determining whether or not they belong in a predetermined domain that is defined by these coordinates.

If the coins to be sorted are of a single type, the sorting of genuine from counterfeit coins can be performed simply and accurately by such a genuine/counterfeit coin sorting apparatus.

Problem To Be Solved By the Invention

However, automatic vending machines have recently become expected to handle at least two types of coin, in order to cope with differing types of product and products of higher prices, and thus it is not uncommon in foreign countries for such machines to have to handle six to eight types of coin.

When many different types of coin are handled in such a manner, they are sorted by setting a predetermined coordinate domain for each type of coin. This makes the details of the sorting more complicated, and a fair amount of time is required for the sorting.

One example of a prior art technique for handling many types of coins is disclosed in US Patent No. 5,078,252, in which an embodiment thereof can handle four types of coin. This apparatus is configured in such a manner that inserted coins to be detected are tested in a testing section, measured values that represent characteristics of those coins are extracted therefrom, genuine and counterfeit coins are sorted according to those measured values, and then the coins are guided into either a money path or a return path by mechanical director means, on the basis of the sorting results.

This apparatus must be able to sort genuine coins from counterfeit ones within, for example, 20 milliseconds, in order to be able to measure the coins to be detected then guide them into the appropriate money or return path. If this time is exceeded, coins that have been sorted as genuine could be guided into the return path.

A high-performance CPU is necessary for shortening the sorting time, but there are price limits.

SUMMARY OF THE INVENTION

The present invention was devised in the light of the above described problem and has as its objective the provision of a method and apparatus that can rapidly and accurately sort genuine and counterfeit coins without using a special high-performance CPU.

Means of Solving the Problem

In order to achieve the above objective, the present invention provides a method and an apparatus for sorting genuine and counterfeit coins as follows.

Claim 1 of the present invention provides a method of sorting genuine and counterfeit coins that are passing through a predetermined pathway, wherein a plurality of type-identifying means is arranged along the predetermined pathway along which a plurality of types of coins to be sorted are passing. This method of sorting genuine and counterfeit coins comprises the steps of: setting a plurality of mutually non-overlapping assumed domains, one for each of identification details of the type-identifying means and corresponding to magnitudes of values thereof; determining whether an output from any of the type-identifying means belongs in any of the plurality of assumed domains; and sorting whether or not outputs from the identification means belong within a closed function domain in coordinates of a plurality of dimensions with axes along which the identification details are plotted, in order to sort in accordance with each of identification details of the plurality of types.

Claim 2 of the present invention is in accordance with the method of claim 1, wherein the closed function is a circle or circular symmetrical shape function.

Claim 3 of the present invention is in accordance with the method of claim 1, wherein the closed function is a sphere or spherical symmetrical shape function.

Claim 4 of the present invention provides an apparatus for sorting genuine and counterfeit coins that are passing through a predetermined pathway, wherein a plurality of type-identifying means is arranged along the predetermined pathway along which a plurality of types of coins to be sorted are passing. This apparatus for sorting genuine and counterfeit coins comprises: an assumed region setting means for setting a plurality of mutually non-overlapping assumed domains, one for each of identification contents of the type-identifying means and corresponding to magnitudes of values thereof; a sorting means for determining whether an output from any of the type-identifying means belongs in any of the plurality of assumed domains; a function

domain setting means for setting a closed function domain in coordinates of a plurality of dimensions with axes along which the identification details are plotted, in order to sort in accordance with each of identification details of the plurality of types; and a sorting means for sorting whether or not outputs from the identification means belong within the closed function domains; wherein genuine and counterfeit coins are sorted by an output from the sorting means.

Claim 5 of the present invention is in accordance with the apparatus of claim 4, wherein the closed function is a circle or circular symmetrical shape function.

Claim 6 of the present invention is in accordance with the apparatus of claim 4, wherein the closed function is a sphere or spherical symmetrical shape function.

Note that, in this document, the term "coins" includes tokens (substitute coins), medals, paper money, and cards.

Operation

In accordance with the method of claim 1, a plurality of assumed domains are previously set for the purpose of distinguishing between coin types, and the sorting is performed on the basis thereof. Coins passing along the predetermined pathway are identified by a plurality of identification means that are set to characteristics that are to be identified, and the coin type is determined by sorting whether or not at least one output therefrom belongs in one of the plurality of assumed domains. The outputs from the identification means are then used to sort genuine from counterfeit coins by determining whether or not identification details set for each type of coin belong within a closed function domain in coordinates of a plurality of dimensions with axes along which the identification details are plotted.

In accordance with the method of claim 2, the coins to be detected are sorted to determine whether or not they belong to each closed function domain by using a circular symmetrical shape function for a circle or ellipse in two dimensions as the closed function domain.

In accordance with the method of claim 3, the coins to be detected are sorted to determine whether or not they belong to each closed function domain by using a spherical symmetrical shape function for a sphere or a shape with an elliptical cross-section in three dimensions as the closed function domain.

In accordance with the apparatus of claim 4, the operation of sorting genuine from counterfeit coins is performed by the identification means after the coin type is determined by sorting outputs obtained from the coins to be detected, using a plurality of assumed domains that have been set for each of the coin types to be detected by the domain setting means. The sorting of genuine from counterfeit coins is performed by sorting whether or not an output of the coin to be detected that is obtained by the identification means belongs within a closed function domain, using closed function domains in coordinates of a plurality of dimensions for each of the coin types, set by the setting means.

In accordance with the apparatus of claim 5, the coins to be detected are sorted to determine whether or not they belong to each closed function domain by using a circular symmetrical shape function for a circle or ellipse in two dimensions as the closed function domain.

In accordance with the apparatus of claim 6, the coins to be detected are sorted to determine whether or not they belong to each closed function domain by using a spherical symmetrical shape function for a sphere or a shape with an elliptical cross-section in three dimensions as the closed function domain.

Effects of the Invention

With the method of claim 1, since each type of coin is determined by using a plurality of assumed domains previously set before the genuine/counterfeit sorting is performed, the intended type is extracted once without repeating the function calculation for genuine/counterfeit sorting, so that rapid sorting can be achieved. Since the operation of determining each coin type is done by simply comparing the magnitudes of values, there is no need for time-intensive calculations and thus high-speed processing is enabled. Moreover, the number of times function calculations are performed to sort genuine from counterfeit coins can be determined by the power of the CPU used.

With the method of claim 2, since the coins to be detected are sorted to determine whether or not they belong to each closed function domain by using a circular symmetrical shape function for a circle or ellipse in two dimensions as the closed function domain, the sorting can be performed by comparatively simple calculations in a short period of time.

With the method of claim 3, since the coins to be detected are sorted to determine whether or not they belong to each closed function domain by using a spherical symmetrical shape function for a sphere or a shape with an elliptical cross-section in three dimensions as the closed function domain, the calculation time will be extended somewhat, but more accurate sorting can be performed.

With the apparatus of claim 4, since each type of coin is previously determined by using a plurality of assumed domains set by the domain setting means before the genuine/counterfeit sorting is performed, the intended type is extracted once without repeating the function calculation for genuine/counterfeit sorting, so that an apparatus can be provided to perform rapid sorting without using an expensive CPU. Since the operation of determining each coin type is done by simply comparing the magnitudes of values, there is no need for time-intensive calculations and thus high-speed processing is enabled. Moreover, the number of times function calculations are performed to sort genuine from counterfeit coins can be determined by the power of the CPU used.

With the apparatus of claim 5, since the coins to be detected are sorted to determine whether or not they belong to each closed function domain by using a circular symmetrical shape function for a circle or ellipse in two dimensions as the closed function domain, the details of the sorting are comparatively simple and a comparatively inexpensive CPU would be sufficient for use.

With the apparatus of claim 6, since the coins to be detected are sorted to determine whether or not they belong to each closed function domain by using a spherical symmetrical shape function for a sphere or a shape with an elliptical cross-section in three dimensions as the closed function domain, the details of the calculation will be extended somewhat, but an apparatus that provides more accurate sorting is enabled.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a characteristic chart of operating details of the method in accordance with the present invention;

Fig. 2 is a diagram illustrative of the configuration of a coin sorting apparatus that is one application to which the present invention is applied;

Fig. 3 is a circuit diagram of the circuitry incorporated within the coin sorting apparatus of Fig. 2;

Fig. 4 is a flowchart of the operation of the embodiment shown in Figs. 2 and 3;

Fig. 5 is a flowchart of a coin-type sorting subroutine, from the flowchart of Fig. 4; and

Fig. 6 is a flowchart of a sorting accuracy selection subroutine, from the flowchart of Fig. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A characteristics chart illustrating details of the operation of the method of the present invention is shown in Fig. 1. In this figure, the X-axis and Y-axis each correspond to a characteristic that can be used in sorting genuine coins from counterfeit coins, such as the material, outer diameter, or thickness of the coin.

When such factors are separated along the X-axis and Y-axis in this manner, as shown in the figure, a first coin denoted by reference number 1 has the largest value in the Y-axis direction, and second to fourth coins denoted by reference numbers 2 to 4 have values that decrease sequentially in the Y-axis direction. The second coin has the smallest value plotted along the X-axis, the first coin has the next largest value, followed by the third coin and then the fourth coin.

In this case, from observation of the various values along the X-axis and Y-axis directions, it is clear that the values for the first, third, and fourth coins mutually overlap to some extent in the X-axis direction, but there are no overlapping portions in the Y-axis direction. Therefore, sorting of the first to fourth types of coin can be done by using the values in the Y-axis direction.

In this case, values in the Y-axis direction are divided into four domains from a first assumed domain to which the first coin belongs to a fourth assumed domain to which the fourth coin belongs (0-a, a-b, b-c, and c-d), and an identification means determines whether a value Py in the Y-axis direction obtained from a coin to be detected belongs in any of these assumed domains, in order to sort the coin types.

More specifically, a value Py obtained in the Y-axis direction from an identification means is sequentially compared with each of the boundary values a, b, c, and d of the above four domains, and, if the value Py is determined to be greater than one boundary value but less than the next one, it is taken as belonging in the second assumed domain.

In the example shown in the figure, the second coin belongs in the second assumed domain (b-c). This means that the inserted coin can be sorted as being of a type corresponding to the second assumed domain. Since this sorting is done by determining whether or not a detected value belongs to certain domains, it can be implemented by using a simple comparison circuit.

This sorting can also be achieved in a similar manner by using values in the X-axis direction, or it can be applied to values obtained in a Z-axis direction (not shown in the figure) if three-dimensional coordinates are assumed. This method could be extended to sorting which is done with respect to a plurality of axes, such as by setting assumed domains at an angle to the coordinates shown in Fig. 1, although this would be somewhat complicated.

The configuration of a coin sorting apparatus to which the present invention is applied is shown in Fig. 2. A coin M is received into a main unit 11 from a coin slot 12 provided at one side of an upper end thereof. This coin M drops down along a rail 13. While it is dropping down along the rail 13, electromagnetic characteristics of the coin M are detected by coin sensors 14 and 15. A genuine/counterfeit coin separation member 16 is provided at a right end of the rail 13, and genuine coins and counterfeit coins are guided along corresponding genuine and counterfeit coin paths (not shown in the figure) in accordance with the action of a separation solenoid 17.

Genuine coins are sent along different coin paths A, B, C, and D shown by dot-dash lines in the figure. This separation into coin types is done by a separation solenoid 19 operating a separation member 18. Coins intended for paths A and B are sorted by operating the separation member 18. The coins are sorted into each path by a sorting mechanism provided in the paths, so that they drop down the corresponding path A, B, C, or D. Coins that have fallen into the counterfeit coin path are ejected out of the apparatus from a reject slot that is not shown in the figure.

The circuitry incorporated into the coin sorting apparatus of Fig. 2 is shown in Fig. 3. In the circuitry of Fig. 3, a CPU sends a signal of a predetermined frequency to an excitation drive circuit 22 through a frequency-divider circuit 21, and excitation currents are supplied to excitation coils 14a and 15a of the coin sensors 14 and 15. An electromagnetic field generated by this excitation is detected by detector coils 14b and 15b. The detected electromagnetic field differs according to whether or not a coin has passed between the excitation coils and the detector coils, and whenever a coin passes.

The electromagnetic field detected by the detector coils 14b and 15b is passed to integrating circuits 25 and 26 via amplifier detector circuits 23 and 24, and a peak signal thereof is digitised by an A/D converter circuit 27 and sent to the CPU.

The CPU performs a sorting operation on the thus-obtained signal in accordance with a sequence previously programmed into a ROM 30 and, if necessary, further separates any counterfeit coin by operating the solenoid 17 and the coin separation member 16, and also the solenoid 19 and the coin separation member 18, via drive circuits 28 and 29.

Note that pins P connected to the CPU are provided to enable connection to external circuitry and there are five of these pins in this embodiment.

A flowchart of the operation of the embodiment shown in Figs. 2 and 3 is shown in Fig. 4. The operation of this embodiment will be described below with reference to Fig. 4.

The apparatus is initialised at power-on by a step S1. After error checking in a step S2, sorting accuracy data is read in by a step S3, in accordance with a program within the CPU.

Next, a step S4 checks whether or not a switch, such as a reed switch (not shown in the figure), has been turned on by, for example, bringing a magnet into proximity thereto. If the switch is on, a step S5 onwards performs coin-type sorting accuracy selection processing; if it is not on, a step S10 onwards performs genuine/counterfeit sorting processing.

The description first concerns the coin-type sorting accuracy selection processing. This processing determines the sorting accuracy corresponding to the number of coins that have been inserted by, for example, the coin diameter shown in Fig. 1. A step S5 confirms the insertion of coins, then, if coins have been inserted, a step S6 performs the coin-type processing. Details of this subroutine are shown in Fig. 5, wherein the coin-type processing is performed by steps 61 to 68.

In step S61, each coin is checked to determine whether or not it is a 10-yen coin. If it is a 10-yen coin, the number of 10-yen coins is totalled in a step S65, and this total is stored in a register in the CPU. If it is not a 10-yen coin, a step S62 determines whether or not it is a 50-yen coin and, if it is, a step S66 performs a similar processing to step S65. If the coin is not a 50-yen coin, a step S63 determines whether or not it is a 100-yen coin and a step S64 determines whether or not it is a 500-yen coin. The numbers of coins in each coin type are totalled and stored.

After this processing, the flow returns to the main routine of Fig. 4, where a step S7 once again checks the reed switch to determine whether or not it is off. If it is off, the flow proceeds to sorting accuracy selection processing in a step S8.

The operation of steps S5 to S7 determine the coin types that are to modify the sorting accuracy. In this case, the type of coin that is to modify the sorting accuracy can be selected by simply inserting a predetermined number of coins, after a magnet is brought close to the reed switch and coins are inserted. For example, for 10-yen coins, the coin diameter shown in Fig. 1 is made smaller and thus the sorting level is made stricter when two coins are inserted than when one is inserted. If three coins are inserted, the coin diameter becomes even smaller.

Once the number of coins necessary for accuracy modification has been inserted in the coin type that should modify the sorting accuracy, the magnet is removed from the vicinity of the reed switch and the flow proceeds from step S7 to a step S8.

The contents of the operation of step S8 correspond to the numbers of different types of inserted coins, as shown in steps S71 to S99 of Fig. 6. In other words, a step S71 determines whether or not there is sorting accuracy modification and, if there is, the number of inserted coins is stored in a register (not shown) in a step S99, via steps S72 to S77.

The same sequence is followed of storing numbers of coins in step S99 via steps S78 to S84 for 50-yen coins, steps S86 to S91 for 100-yen coins, and steps 92 to 98 for 500-yen coins.

The end of this storage operation, a step S9 determines whether or not there any modification. If there is modification, the flow returns to step S2 for error checking then the sorting accuracy data is read in step S3.

Step S4 then checks whether the reed switch is on or off. If it is on, the coin-type sorting accuracy selection processing of step S5 onwards is repeated; if it is off, the flow proceeds to the genuine/counterfeit sorting processing of step S10 onwards.

In step S10, standby voltages obtained by the coin sensors 14 and 15 are measured. These measured values are used for selecting whether or not threshold values have been exceeded; these threshold values being previously set by decision processing of a step S11 that determines whether or not coins have been inserted. In this case, after the program has executed step S10, it executes the decision processing of step S11 to determine whether any coins have been inserted.

If the decision processing of step S11 determines that the threshold values that were previously set by the measured standby voltages have not been exceeded, the flow returns to step S2; if they have been exceeded, the flow proceeds to peak voltage measurement in a step S12.

This peak voltage measurement measures the inserted coin according to the coin sensors 14 and 15, obtains the peak values of these measurements as given to the integrating circuits 25 and 26 via the amplifier detector circuits 23 and 24, digitises these values by the A/D converter circuit 27, then temporarily stores them in the CPU.

Deductive processing is performed in a step S13, using the thus-measured peak voltages. This deductive processing is performed to determine whether the measured peak values belong to any of the assumed domains described previously with reference to Fig. 1. This deduces the type of coin to which the inserted coin to be detected belongs.

At this point, calculation processing is performed on the basis of whether this coin is genuine or an counterfeit. In other words, voltages obtained from a plurality of coin sensors are calculated to determine whether a plurality of identification factors lie on axes in coordinates of a plurality of dimensions. For example, assume that values Px and Py have been obtained from the coin sensors for sorting using coordinates in two dimensions along the X-axis and Y-axis shown in Fig. 1.

In this case, the following formula for a circle is used:

$$R^2 = (Px - Xb)^2 + (Py - Yb)^2$$

If the Z-axis is added to give coordinates in three dimensions, a spherical formula could be used.

Using the calculation result of step S14, a step S15 sorts whether or not the calculation result belongs within a closed function domain in coordinates of a plurality of dimensions. For two-dimensional coordinates, the closed function domain is a circular symmetrical shape such as a circle or an ellipse; for three-dimensional coordinates it is a spherical symmetrical shape such as a sphere or a shape with an elliptical cross-section. The calculation result determines whether this is inside or outside the circle or other circular shape, or sphere or other spherical shape. If it is within the corresponding shape, the coin is genuine; if it is outside, the coin is an counterfeit. If it is genuine, a step S16 performs genuine-coin processing; if it is an counterfeit, the flow returns to step S2.

In this manner, coin sorting is performed at an accuracy set by the number of inserted coins.

Claims

1. In a method of sorting genuine and counterfeit coins that are passing through a predetermined pathway, wherein a plurality of type-identifying means are arranged along said predetermined pathway along which a plurality of types of coins to be sorted are passing, a method of sorting genuine and counterfeit coins comprising the steps of:

setting a plurality of mutually non-overlapping assumed domains, one for each of identification factors of said type-identifying means and corresponding to magnitudes of values thereof;

determining whether an output from any of said type-identifying means belongs in any of said plurality of assumed domains; and

sorting whether or not outputs from said identification means belong within a closed function domain in coordinates of a plurality of dimensions with axes along which said identification factors are plotted, in order to sort in accordance with each of identification factors of said plurality of types.

2. A method of sorting coins in accordance with claim 1, wherein said closed function is a circle or circular symmetrical shape function.

3. A method of sorting coins in accordance with claim 1, wherein said closed function is a sphere or spherical symmetrical shape function.

4. In an apparatus for sorting genuine and counterfeit coins that are passing through a predetermined pathway, wherein a plurality of type-identifying means are arranged along said predetermined pathway along which a plurality of types of coins to be sorted are passing, an apparatus for sorting genuine and counterfeit coins comprising:

an assumed region setting means for setting a plurality of mutually non-overlapping assumed domains, one for each of identification contents of said type-identifying means and corresponding to magnitudes of values thereof;

a sorting means for determining whether an output from any of said type-identifying means belongs in any of said plurality of assumed domains;

a function domain setting means for setting a closed function domain in coordinates of a plurality of dimensions with axes along which said identification factors are plotted, in order to sort in accordance with each of identification factors of said plurality of types; and

a sorting means for sorting whether or not outputs from said identification means belong within said closed function domains; wherein:

genuine and counterfeit coins are sorted by an output from said sorting means.

5. An apparatus for sorting coins in accordance with claim 4, wherein said closed function is a circle or circular symmetrical shape function.

6. An apparatus for sorting coins in accordance with claim 4, wherein said closed function is a sphere or spherical symmetrical shape function.

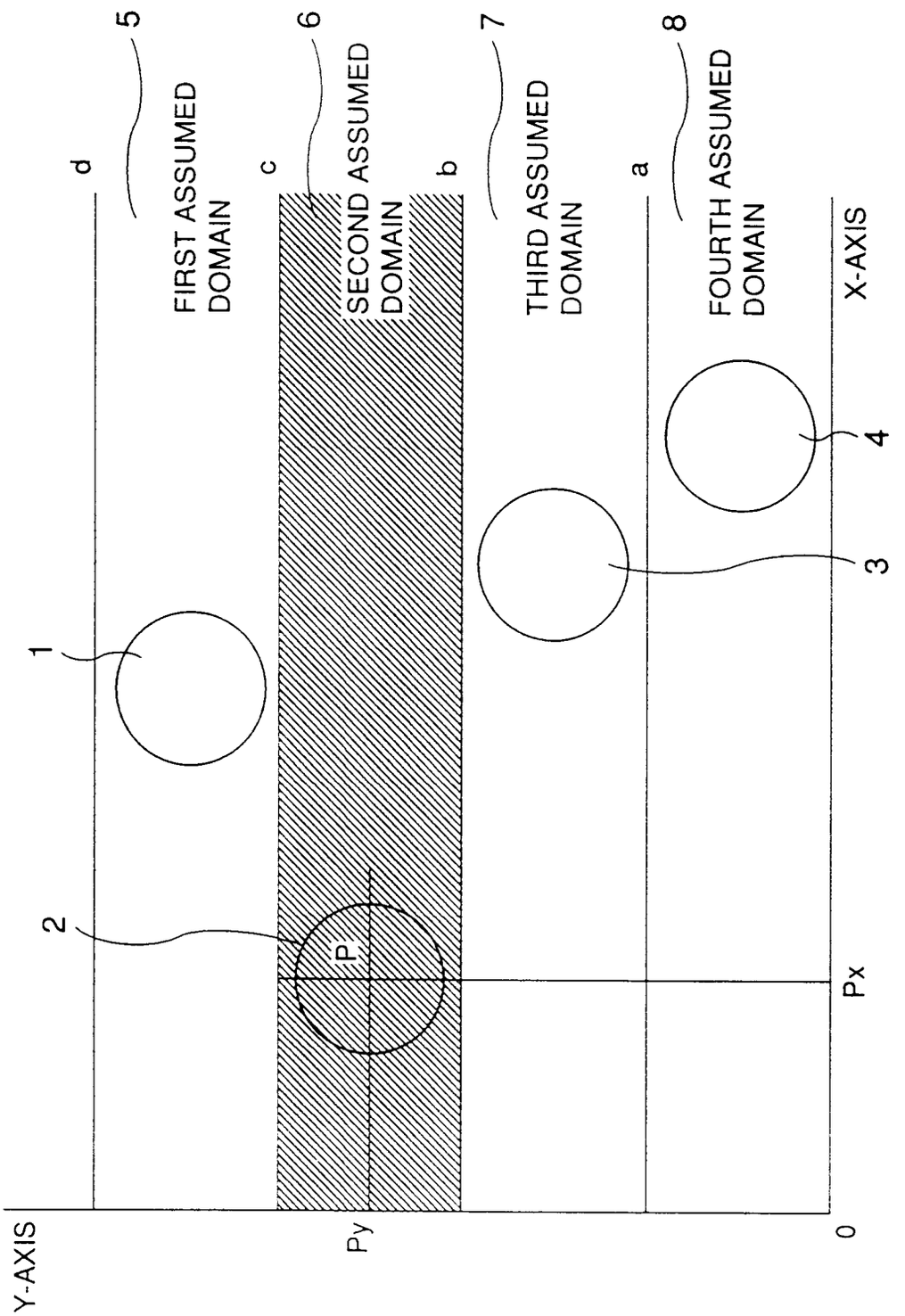
Y-AXIS
d
c
b
a
0
Py
Px
X-AXIS
P
1
2
3
4
5
6
7
8
FIRST ASSUMED DOMAIN
SECOND ASSUMED DOMAIN
THIRD ASSUMED DOMAIN
FOURTH ASSUMED DOMAIN

FIG. 1

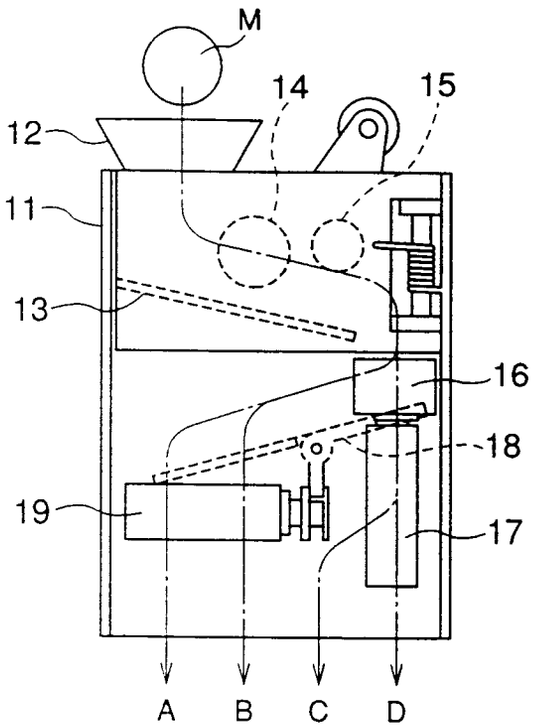
M
14
15
12
11
13
16
18
19
17
A
B
C
D

FIG. 2

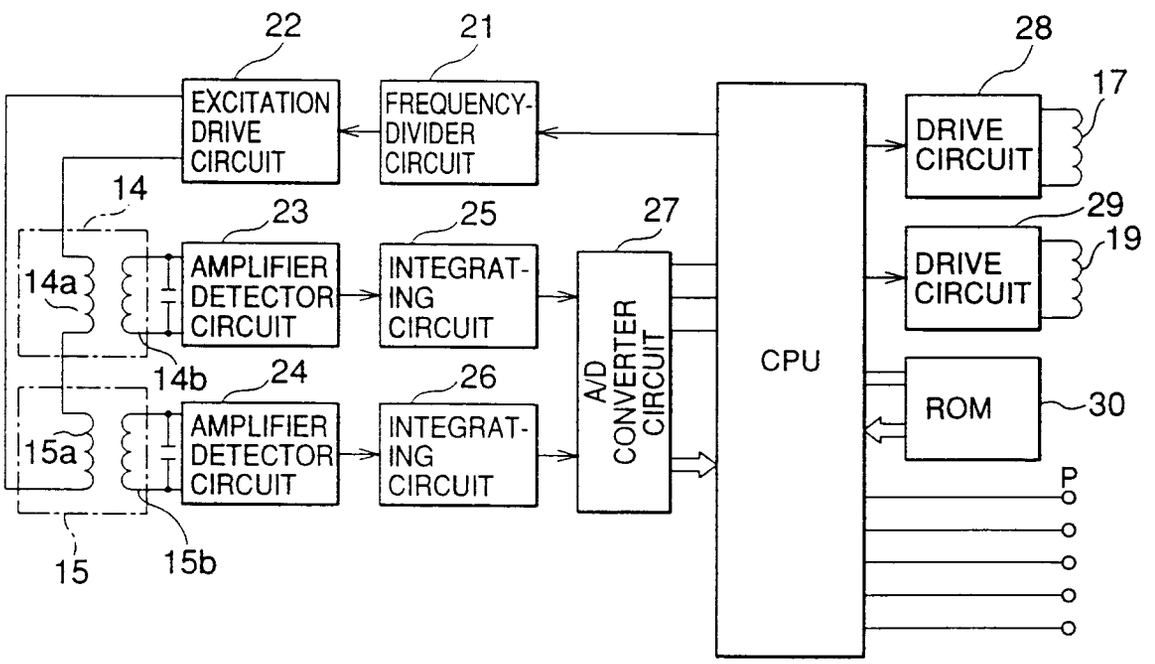
22
21
28
EXCITATION DRIVE CIRCUIT
FREQUENCY-DIVIDER CIRCUIT
17
DRIVE CIRCUIT
14
23
25
27
29
19
14a
AMPLIFIER DETECTOR CIRCUIT
INTEGRAT-ING CIRCUIT
A/D CONVERTER CIRCUIT
CPU
DRIVE CIRCUIT
14b
24
26
ROM
30
15a
AMPLIFIER DETECTOR CIRCUIT
INTEGRAT-ING CIRCUIT
P
15
15b

FIG. 3

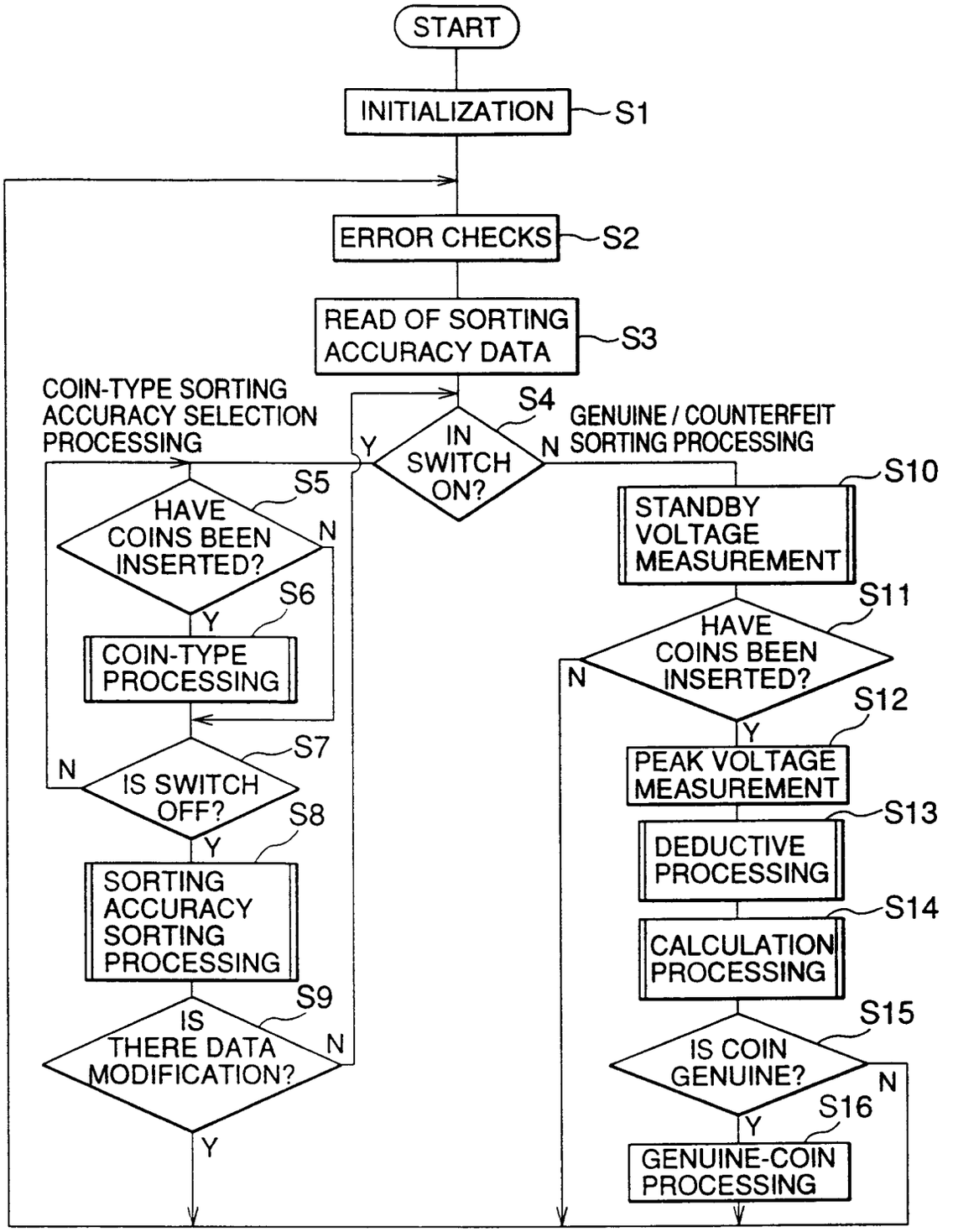
START
INITIALIZATION
S1
ERROR CHECKS
S2
READ OF SORTING ACCURACY DATA
S3
S4
IN SWITCH ON?
Y
N
COIN-TYPE SORTING ACCURACY SELECTION PROCESSING
GENUINE / COUNTERFEIT SORTING PROCESSING
S5
HAVE COINS BEEN INSERTED?
N
Y
S6
COIN-TYPE PROCESSING
S7
IS SWITCH OFF?
N
Y
S8
SORTING ACCURACY SORTING PROCESSING
S9
IS THERE DATA MODIFICATION?
N
Y
S10
STANDBY VOLTAGE MEASUREMENT
S11
HAVE COINS BEEN INSERTED?
N
Y
S12
PEAK VOLTAGE MEASUREMENT
S13
DEDUCTIVE PROCESSING
S14
CALCULATION PROCESSING
S15
IS COIN GENUINE?
N
Y
S16
GENUINE-COIN PROCESSING

FIG. 4

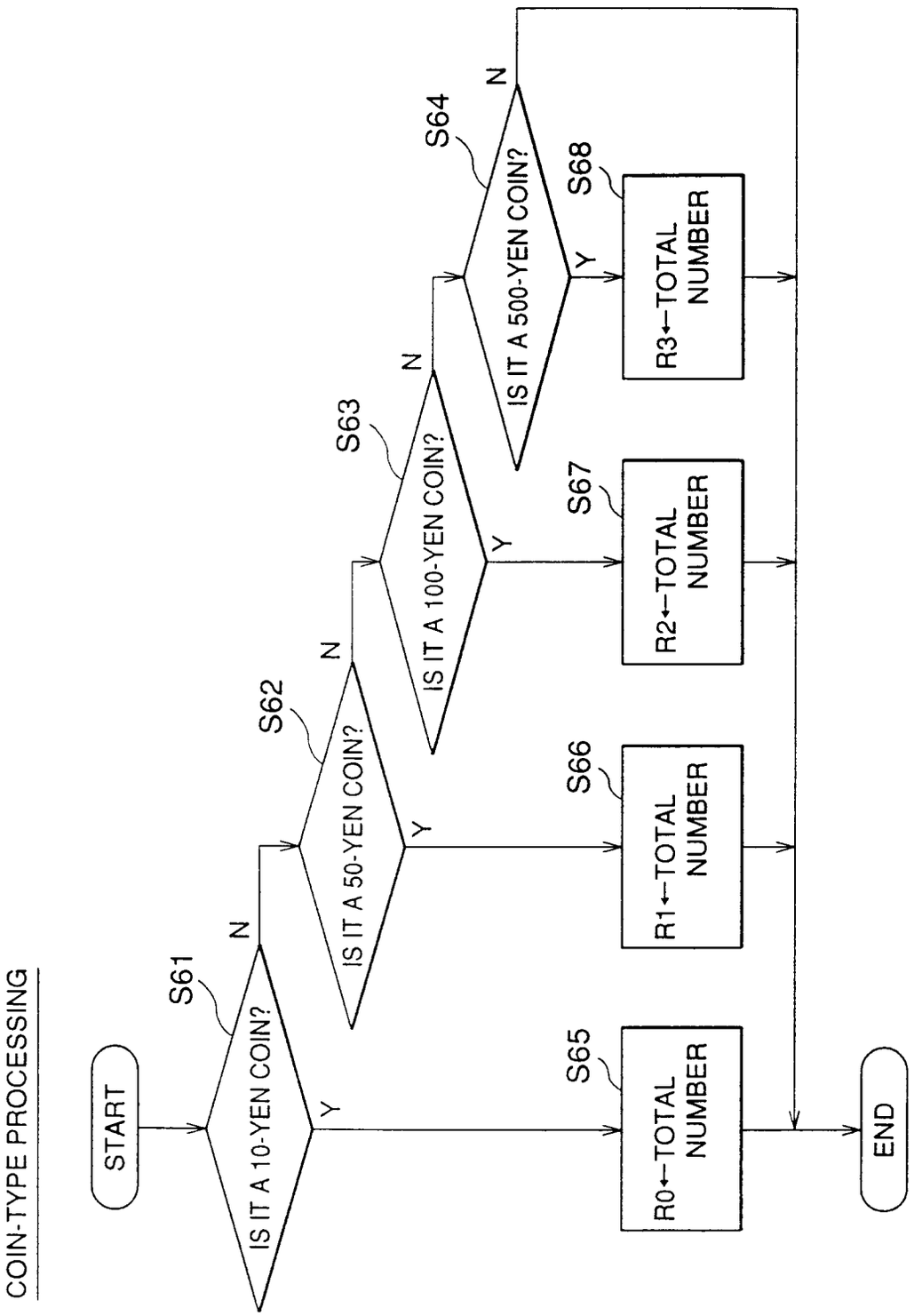
COIN-TYPE PROCESSING
START
S61
IS IT A 10-YEN COIN?
N
Y
S62
IS IT A 50-YEN COIN?
N
Y
S63
IS IT A 100-YEN COIN?
N
Y
S64
IS IT A 500-YEN COIN?
N
Y
S65
R0←TOTAL NUMBER
S66
R1←TOTAL NUMBER
S67
R2←TOTAL NUMBER
S68
R3←TOTAL NUMBER
END

FIG. 5

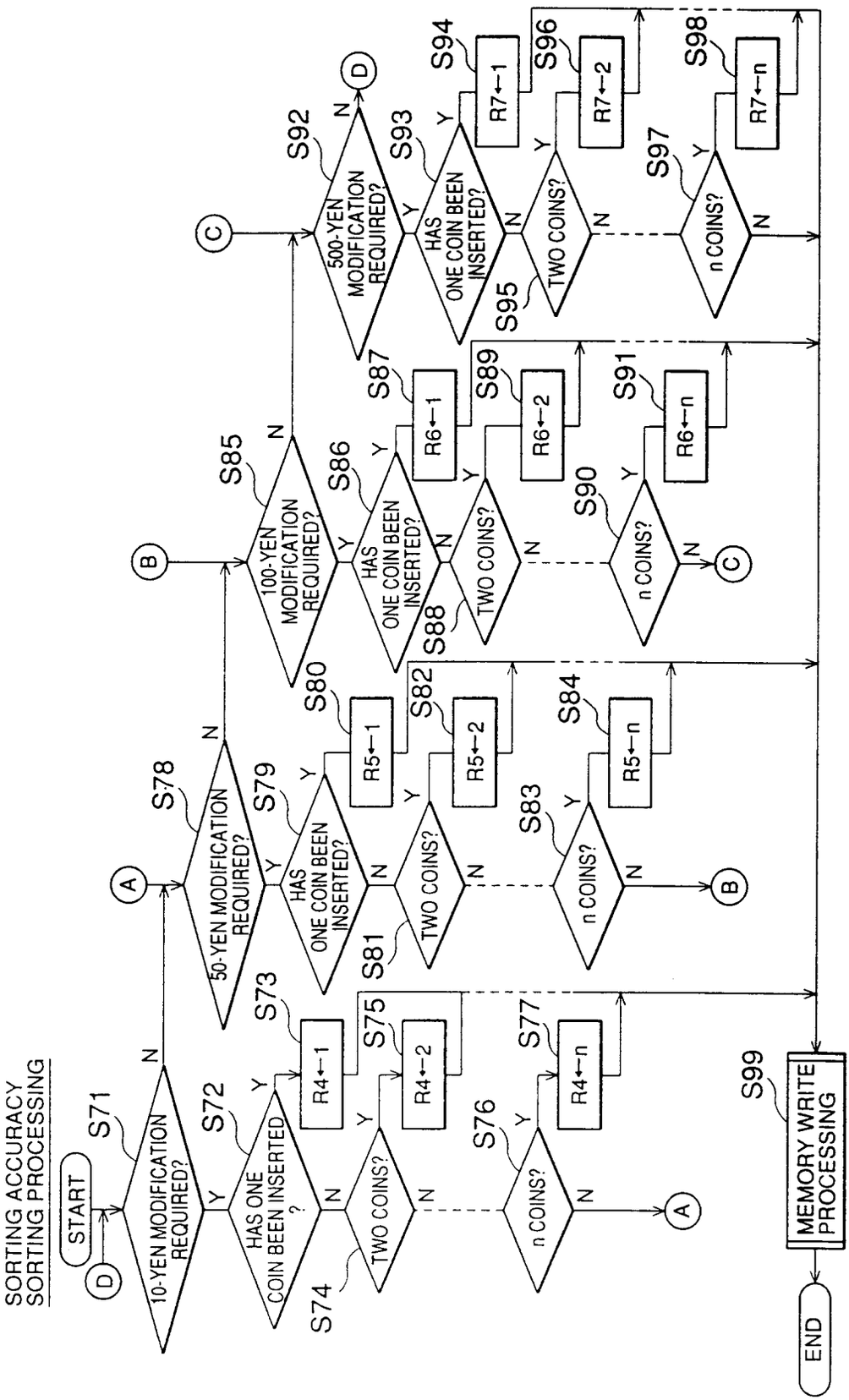
SORTING ACCURACY SORTING PROCESSING
START
10-YEN MODIFICATION REQUIRED?
HAS ONE COIN BEEN INSERTED?
TWO COINS?
n COINS?
50-YEN MODIFICATION REQUIRED?
100-YEN MODIFICATION REQUIRED?
500-YEN MODIFICATION REQUIRED?
R4←1
R4←2
R4←n
R5←1
R5←2
R5←n
R6←1
R6←2
R6←n
R7←1
R7←2
R7←n
MEMORY WRITE PROCESSING
END
S71
S72
S73
S74
S75
S76
S77
S78
S79
S80
S81
S82
S83
S84
S85
S86
S87
S88
S89
S90
S91
S92
S93
S94
S95
S96
S97
S98
S99

FIG. 6