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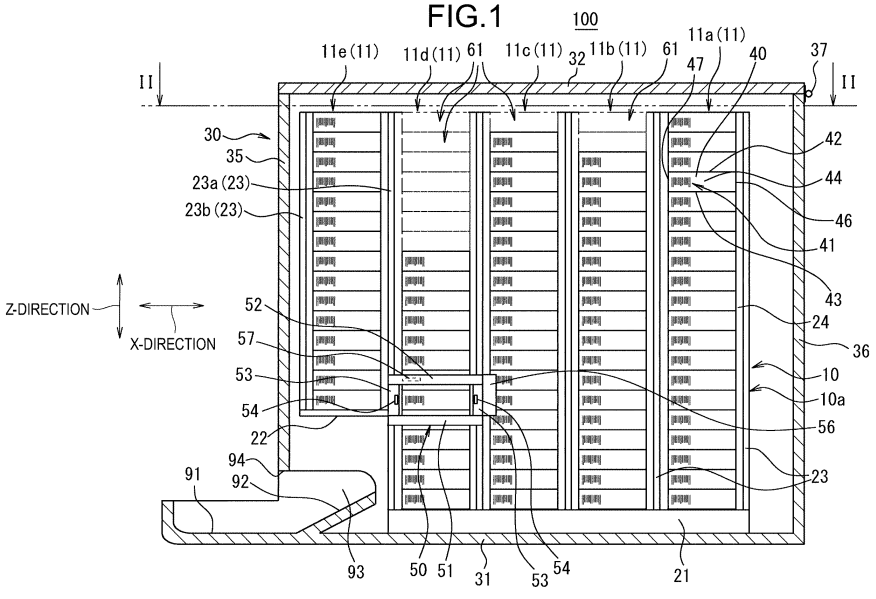
(54) **DISPENSER DEVICE**

(57) A dispensing device (100) includes an accommodation unit (10) that accommodates tobacco commodities (40) of multiple types in a mixed state, a dispensing unit (conveying unit (50)) that dispenses from the accommodation unit (10) the tobacco commodity (40) of the type corresponding to a dispensing order; a storage unit that stores the number of accommodated pieces for each type regarding the tobacco commodities (40) accommodated in the accommodation unit (10); and a notification unit that notifies the type of the tobacco commodity (40) to be restocked in accordance with the number of remaining pieces for each type of the tobacco commodities (40) accommodated in the accommodation unit (10).

FIG.1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a dispensing device that automatically dispenses a tobacco commodity in response to a dispensing order.

BACKGROUND ART

[0002] At stores such as general convenience stores, tobacco commodities of various brands are displayed according to their brands in a so-called store fixture, and a tobacco commodity may be purchased in such a manner that when a purchaser designates a brand, a shop clerk selects the tobacco commodity of that brand from the store fixture or a purchaser himself/herself takes out the tobacco commodity of the desired brand from the store fixture to purchase it. It should be noted that the tobacco commodity as used herein does not refer to an individual paper-wrapped cigarette to be burned but refers to a cuboid-shaped package that accommodates a plurality of paper-wrapped cigarettes or a cuboid-shaped package that accommodates other tobacco products as will be described later.

[0003] Also, Patent Documents 1 to 5 describe devices for automatically dispensing a tobacco commodity of a desired brand.

CITATION LIST

PATENT DOCUMENTS

[0004]

PATENT DOCUMENT 1: Japanese Patent Application Laid Open No. 2011-207575
PATENT DOCUMENT 2: Japanese Patent Application Laid Open No. 2011-207576
PATENT DOCUMENT 3: Japanese Patent Application Laid Open No. 2011-207577
PATENT DOCUMENT 4: Japanese Patent Application Laid Open No. 2011-207578
PATENT DOCUMENT 5: Japanese Patent Application Laid Open No. 2011-209994

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0005] In the meantime, there has been a need for ingenuity that makes it possible to appropriately perform not only dispensing but also restocking of the tobacco commodities.

[0006] The present invention has been made in view of the above-described problem and provides a dispensing device that is capable of appropriately performing restocking of tobacco commodities.

MEANS FOR SOLVING THE PROBLEM

[0007] According to the present invention, there is provided a dispensing device that includes:

an accommodation unit that accommodates tobacco commodities of multiple types in a mixed state;
a dispensing unit that dispenses from the accommodation unit the tobacco commodity of the type corresponding to a dispensing order;
a storage unit that stores the number of accommodated pieces for each type regarding the tobacco commodities accommodated in the accommodation unit; and
a notification unit that notifies the type of the tobacco commodity to be restocked in accordance with the number of remaining pieces for each type of the tobacco commodities accommodated in the accommodation unit.

EFFECT OF THE INVENTION

[0008] According to the present invention, a plurality of tobacco commodities can be accommodated in the accommodation unit and the tobacco commodity corresponding to a dispensing order can be automatically dispensed by the dispensing unit from among the tobacco commodities accommodated in the accommodation unit.

[0009] Furthermore, since the number of accommodated pieces for each type is stored regarding the tobacco commodities accommodated in the accommodation unit and the type of the tobacco commodity to be restocked is notified in accordance with the number of remaining pieces for each type of the tobacco commodities accommodated in the accommodation unit, it is made possible to appropriately perform the restocking of the tobacco commodities by an operator.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Fig. 1 is a schematic cross-sectional front view illustrating a structure of a dispensing device according to the first embodiment.
Fig. 2 is a schematic cross-sectional plan view illustrating the structure of the dispensing device according to the first embodiment.
Fig. 3A, Fig. 3B, Fig. 3C, and Fig. 3D are schematic plan views illustrating takeout operation of a tobacco commodity from an accommodation column.
Figs. 4A, 4B, and 4C are schematic side cross-sectional views illustrating takeout operation of a tobacco commodity from the accommodation column.
Figs. 5A and 5B are schematic diagrams for explanation of a moving mechanism that moves a conveying unit.
Figs. 6A and 6B are schematic front cross-sectional

views illustrating delivery operation of a tobacco commodity from the conveying unit to a take-out slope.

Fig. 7 is a block diagram of the dispensing device according to the first embodiment.

Fig. 8 is a diagram illustrating an example of a restock threshold for each type of the tobacco commodities (the number of remaining pieces restocking of which is necessitated) and the number of pieces to be restocked by one round of restock work.

Fig. 9 is a front view illustrating an example of notification operation performed by a display unit.

Fig. 10 is a diagram for explanation of the operation of the dispensing device according to a second embodiment, which is an explanatory diagram of modification processing of the restock threshold and the number of pieces to be restocked in accordance with sales.

Fig. 11 is a block diagram of the dispensing device according to a third embodiment.

Fig. 12 is a block diagram of a system that includes the dispensing device according to the third embodiment.

Fig. 13 is a schematic front cross-sectional view illustrating a structure of the dispensing device according to a fourth embodiment.

Fig. 14 is a schematic cross-sectional plan view illustrating the structure of the dispensing device according to the fourth embodiment.

Fig. 15 is a schematic side cross-sectional view illustrating the structure of the dispensing device according to the fourth embodiment.

Figs. 16A and Fig. 16B are schematic diagrams for explanation of the moving mechanism that moves the conveying unit.

Figs. 17A and 17B are schematic front cross-sectional views illustrating delivery operation of the tobacco commodity from the conveying unit to the take-out slope.

Figs. 18A and 18B are schematic front views for explanation of delivery operation of the tobacco commodity from the conveying unit to a non-conforming item reservoir tray, the delivery operation being performed via a non-conforming item travel-down slope.

Fig. 19 is a diagram illustrating a state where the tobacco commodity accommodated in an input section is viewed from the left side.

Fig. 20 is a block diagram of the dispensing device according to the fourth embodiment.

Fig. 21 is a schematic front cross-sectional view illustrating the dispensing device in a state where the tobacco commodity in the non-conforming item reservoir tray can be taken out from a housing.

Fig. 22 is a schematic cross-sectional plan view illustrating the structure of the dispensing device according to a fifth embodiment.

Fig. 23 is a diagram illustrating a state where the dispensing device according to the fifth embodiment is viewed in the direction indicated by the arrow A in Fig. 22.

Fig. 24 is a block diagram of the dispensing device according to the fifth embodiment.

DESCRIPTION OF EMBODIMENTS

[0011] The above-described and other objects, features and advantages will become more apparent from the following description of the preferred embodiments and the accompanying drawings.

[0012] Embodiments of the present invention will be described hereinbelow with reference to the drawings. In all the drawings, the similar components are denoted by the same reference numerals, and the description thereof will not be repeated.

(First Embodiment)

[0013] Figs. 1 and 2 are schematic diagrams that illustrate a structure of a dispensing device 100 according to the first embodiment. Fig. 1 is a cross-sectional front view and Fig. 2 is a cross-sectional plan view. Fig. 1 is a cross-sectional view taken along the line I-I of Fig. 2 and Fig. 2 is a cross-sectional view taken along the line II-II of Fig. 1.

[0014] In this embodiment, the left-right direction in Figs. 1 and 2 is referred to as an X-direction and the up-and-down direction (height direction) is referred to as a Z-direction. Also, the direction orthogonal to the X-direction and the Z-direction, in other words, the depth direction of the dispensing device 100 is referred to as a Y-direction.

[0015] Further, for the sake of simpler description of the positional relationship between the respective constituent components, there are cases where the front, rear, left, and right directions are defined for the sake of convenience. Specifically, unless otherwise indicated, the right side in Fig. 1 is referred to as right, the left side as left, the proximal side as front, and the distal side as rear. However, the positional relationship indicated in each drawing may be described in some cases.

[0016] Fig. 3A, Fig. 3B, Fig. 3C, and Fig. 3D are schematic plan views illustrating takeout operation of a tobacco commodity 40 from an accommodation column 11 (for example, an accommodation column 11d).

[0017] Fig. 4A, Fig. 4B, and Fig. 4C are schematic diagrams that illustrate the takeout operation of the tobacco commodity 40 from the accommodation column 11 (for example, the accommodation column 11d) and side cross-sectional views in which the dispensing device 100 is viewed from the left side.

[0018] Fig. 5A and Fig. 5B are schematic diagrams for explanation of a moving mechanism that moves a conveying unit 50, where Fig. 5A is a front view and Fig. 5B is a cross-sectional view (cross-sectional plan view) taken along the line B-B of Fig. 5A.

[0019] Fig. 6A and Fig. 6B are schematic cross-sec-

tional front views that illustrate delivery (dispensing) operation of the tobacco commodity 40 from the conveying unit 50 to a take-out slope 92.

[0020] Fig. 7 is a block diagram of the dispensing device 100 according to the first embodiment.

[0021] Fig. 8 is a diagram illustrating an example of the restock threshold for each type of the tobacco commodities 40 (the number of remaining pieces restocking of which is needed) and the number of pieces to be restocked by one round of restock work.

[0022] Fig. 9 is a front view illustrating an example of notification operation performed by the display unit 120.

[0023] It should be noted that the various constituent components of the present invention do not need to be a component that is independent from other components and may encompass a case where one constituent component is part of another constituent component, a case where a part of one constituent component and a part of another constituent component are overlapped with each other, and other relevant cases.

[0024] As illustrated in Figs. 1 and 2, the dispensing device 100 according to this embodiment includes an accommodation unit 10 configured to accommodate tobacco commodities 40 of multiple types in a mixed state, a dispensing unit (conveying unit 50) configured to dispense from the accommodation unit 10 the tobacco commodity 40 of the type corresponding to a dispensing order, a storage unit (a RAM 80c of Fig. 7) configured to store the number of accommodated pieces for each type regarding the tobacco commodities 40 accommodated in the accommodation unit 10, and a notification unit (for example, a display unit 120 and a speaker 130 (Fig. 7)) configured to notify the type of the tobacco commodity 40 to be restocked in accordance with the number of remaining pieces for each type of the tobacco commodities 40 accommodated in the accommodation unit 10.

[0025] The dispensing device 100 in use is installed in a convenience store or any other store.

[0026] Here, the tobacco commodity 40 does not refer to an individual paper-wrapped cigarette to be burned but refers to a cuboid-shaped package that accommodates a plurality of paper-wrapped cigarettes or a cuboid-shaped package that accommodates other tobacco products other than paper-wrapped cigarettes. As the other tobacco products, snuff tobacco, pipe tobacco, and related items such as a suction tool used in combination with the other tobacco products may be mentioned.

[0027] The tobacco commodity 40 has a rectangular first main surface 42, a rectangular second main surface 43 facing and extending in parallel with the first main surface 42 of another tobacco commodity 40, and has a first side surface 44, a second side surface 45 (FIG. 2), a first end surface 46 and a second end surface 47 each of which has a rectangular shape.

[0028] The first side surface 44 is arranged along one long side of the first main surface 42 and one long side of the second main surface 43 and is orthogonal to the first main surface 42 and the second main surface 43.

[0029] The second side surface 45 is arranged along the other long side of the first main surface 42 and the other long side of the second main surface 43 and is orthogonal to the first main surface 42 and the second main surface 43 and oriented in parallel with the first side surface 44.

[0030] The first end surface 46 is arranged along one short side of the first main surface 42 and one short side of the second main surface 43 and is orthogonal to the first main surface 42, the second main surface 43, the first side surface 44, and the second side surface 45.

[0031] The second end surface 47 is arranged along the other short side of the first main surface 42 and the other short side of the second main surface 43, and is orthogonal to the first main surface 42, the second main surface 43, the first side surface 44, and the second side surface 45 and oriented in parallel with the first end surface 46.

[0032] For example, the notification unit is configured to include at least either of a display unit 120 (Figs. 7 and 2) such as a liquid crystal display device and a speaker 130.

[0033] It is preferable that the notification of the type of the tobacco commodity 40 to be restocked is performed using both a visual notification by indication on the display unit 120 and an audible notification by the sound from the speaker 130.

[0034] In the case of this embodiment, when the number of remaining pieces of the tobacco commodities 40 of a certain type has decreased to reach a predetermined number as a result of dispensing of the tobacco commodity 40 being performed from the dispensing device 100, among the tobacco commodities 40 accommodated in the accommodation unit 10, then the notification to the effect that the tobacco commodity(commodities) 40 of the type should be restocked is performed by the notification unit.

[0035] Specifically, when the number of remaining pieces of the tobacco commodities 40 of one type accommodated in the accommodation unit 10 reaches a predetermined number, then the notification unit notifies the fact that the tobacco commodity(commodities) 40 of the type should be restocked.

[0036] Here, in this specification, the number of remaining pieces (the above-mentioned predetermined number) which necessitates restocking of the tobacco commodity(commodities) 40 is referred to as "restock threshold".

[0037] In the case of this embodiment, the restock threshold is specified for each type of the tobacco commodities 40. For example, as illustrated in Fig. 8, with regard to the tobacco commodity 40 of the type (brand) "tobacco A", the restock threshold is set to 5; with regard to the tobacco commodity 40 of the type "tobacco B", the restock threshold is set to two 2; and with regard to the tobacco commodity 40 of the type "tobacco C", the restock threshold is set to 0.

[0038] In this manner, the above-mentioned predeter-

mined number is specified for each type of the tobacco commodities 40.

[0039] It is preferable that the notification by the notification unit includes not only the notification of the type of the tobacco commodities 40 to be restocked but also the notification of the number of the tobacco commodities 40 to be restocked. Specifically, the notification unit notifies the number of the tobacco commodities 40 to be restocked.

[0040] Here, the number of the tobacco commodities 40 to be restocked at the time of one round of restock work is specified, for example, for each type of the tobacco commodities 40.

[0041] For example, with regard to popular items, the number of items to be restocked is set to a larger number while the number of items to be restocked is set to a smaller number with regard to not so particularly popular items.

[0042] For example, as illustrated in Fig. 8, with regard to the tobacco commodity 40 of the type "tobacco A", the number of pieces to be restocked at one time is set to 10; with regard to the tobacco commodity 40 of the type "tobacco B", the number of pieces to be restocked at one time is set to 5; and with regard to the tobacco commodity 40 of the type "tobacco C", the number of pieces to be restocked at one time is set to 2.

[0043] The dispensing device 100 according to this embodiment is configured to read identification information specific to each type of the tobacco commodities 40 and perform dispensing of the tobacco commodities 40 in accordance with a dispensing order on the basis of the identification information.

[0044] Here, the identification information is information specific to a type of the tobacco commodity 40 (i.e., brand) and the type (brand) of the tobacco commodity 40 can be identified on the basis of the identification information. In the case of this example, the identification information is a barcode 41 indicated on the outer surface of the package of the tobacco commodity 40. The barcode 41 is indicated, for example, on the first side surface 44.

[0045] The dispensing device 100 includes a reader unit (barcode reader unit 57) that reads the identification information (barcode 41) from the individual tobacco commodities 40 and is configured to recognize the types of the tobacco commodities 40 on the basis of the identification information that has been read by the reader unit.

[0046] The dispensing device 100 is configured to store the tobacco commodities 40 of multiple types in the accommodation unit 10 in a mixed state. Further, the dispensing device 100 is configured to store the identification information read from the individual tobacco commodities 40 in association with accommodation position information that differ from one tobacco commodity 40 to another (for example, stores the identification information in the RAM 80c illustrated in Fig. 7), refer to the stored contents, and dispense from the accommodation unit 10 the tobacco commodity 40 of the type corresponding to the dispensing order.

[0047] It should be noted that storing the identification information refers to storing the information obtained by reading the barcode 41 by the barcode reader unit 57 and is not limited to storing of the barcode 41 as such.

[0048] Also, the accommodation position information corresponds to the individual tobacco commodities 40 accommodated in the accommodation unit 10 in a one-to-one correspondence relationship.

[0049] In the case of this embodiment, the accommodation unit 10 includes an accommodation column 11 that accommodates multiple tobacco commodities 40 in a vertically stacked state. Here, to accommodate multiple tobacco commodities 40 in a vertically stacked state means stacking multiple tobacco commodities 40 in a state where each pair of the tobacco commodities 40 adjacent to each other in the vertical direction (up-and-down direction) are in contact with each other and accommodating the multiple tobacco commodities 40 in this state.

[0050] It should be noted that the dispensing device 100 is configured to accommodate the tobacco commodities 40 of multiple types in a mixed state even in one single accommodation column 11. As a result, the accommodation position information includes height position information of the individual tobacco commodities 40.

[0051] In the case of this embodiment, the accommodation unit 10 is configured to include a plurality of the accommodation columns 11 arranged at different locations from each other in the horizontal direction.

[0052] As a result, the accommodation position information includes, in addition to the height position information, horizontal position information indicative of the position of the tobacco commodity 40 in the horizontal direction.

[0053] In the case of this embodiment, the accommodation unit 10 has one row of the accommodation columns 11 as illustrated in Fig. 2. More specifically, the accommodation unit 10 includes, for example, five accommodation columns 11 (accommodation column 11a, 11b, 11c, 11d, and 11e) aligned in the X-direction in one row.

[0054] Here, as illustrated in Figs. 1 and 2, the dispensing device 100 has a housing 30 and the accommodation unit 10 is arranged inside the housing 30.

[0055] The shape of the housing 30 is not limited to a particular one and the housing 30 is formed, for example, in a cuboidal shape.

[0056] The housing 30 is configured to include a horizontally arranged bottom plate section 31, a top plate section 32 arranged above the bottom plate section 31 and facing the bottom plate section 31 in parallel therewith, a front side wall section 33 (Fig. 2) standing from a peripheral portion of the front side of the bottom plate section 31, a rear side wall section 34 standing from a peripheral portion of the rear side of the bottom plate section 31 and facing the front side wall section 33 in

parallel therewith, a right side wall section 36 standing from a peripheral portion of the right side of the bottom plate section 31, and a left side wall section 35 facing the right side wall section 36 in parallel therewith.

[0057] It should be noted that the display unit 120 is provided, for example, on the outer surface of the housing 30. As an example, as illustrated in Fig. 2, the display unit 120 is provided on the front surface of the front side wall section 33.

[0058] Also, the speaker 130 is provided, for example, in the housing 30 with at least a sound release hole (not shown) of the speaker 130 exposed to the outside of the housing 30.

[0059] For example, a take-out opening 94 for taking out the tobacco commodity 40 from the inside of the housing 30 to the outside is formed at the lower portion of the one side in the X-direction (for example, the left side) of the housing 30.

[0060] A take-out slope 92 is formed at the location inside the take-out opening 94 in the housing 30. The take-out slope 92 is configured such that, for example, the tobacco commodity 40 to be dispensed moves downward via the take-out opening 94 to the outside of the housing 30.

[0061] For example, a slope sidewall 93 standing upright from the take-out slope 92 is formed on both sides (front and rear) in the width direction of the take-out slope 92.

[0062] A take-out saucer 91 that receives the tobacco commodity 40 that has been moved downward on the take-out slope 92 is provided on the outer portion of the take-out opening 94.

[0063] A clerk can take out the tobacco commodity 40 dispensed onto the take-out saucer 91 from the take-out saucer 91 to sell the tobacco commodity 40.

[0064] As illustrated in Figs. 1 and 2, the accommodation unit 10 includes, for example, a plate-like support base 21 horizontally arranged on the bottom plate section 31 and a plurality of partition walls 23 standing upright from the support base 21.

[0065] In the case of this embodiment, five partition walls 23 arranged in parallel with each other at equal intervals are provided so as to stand upright from the support base 21. And four accommodation columns 11a, 11b, 11c, and 11d are each formed between corresponding one of the pairs of the partition walls 23.

[0066] These accommodation columns 11a, 11b, 11c, and 11d are each configured to be capable of accommodating a multiple number of the tobacco commodities 40 in a vertically stacked state. Specifically, a multiple number of the tobacco commodities 40 can be placed on the support base 21 in each of the accommodation columns 11a, 11b, 11c, and 11d.

[0067] The number of the tobacco commodities 40 that can be accommodated in each of the accommodation columns 11a, 11b, 11c, and 11d varies depending on the thickness dimension of the tobacco commodity 40 (the distance between the first main surface 42 and the second main surface 43) and, for example, in the case of a tobacco commodity 40 of a standard dimensions, twenty tobacco commodities 40 can be accommodated in each of the accommodation columns 11a, 11b, 11c, and 11d.

[0068] It should be noted that the leftmost partition wall 23 (partition wall 23a) among the five partition walls 23 standing upright from the support base 21 is positioned, for example, on the right side of the take-out slope 92.

[0069] Further, the dispensing device 100 includes a plate-like support base 22 provided on the partition wall 23a and a partition wall 23 (partition wall 23b) standing upright from the support base 22.

[0070] The support base 22 is extended horizontally from the portion of the partition wall 23a that is higher than the slope sidewall 93 toward the left side and is positioned above the slope sidewall 93.

[0071] The partition wall 23b stands upright from the left end of the support base 22 and faces the partition wall 23a to be in parallel therewith. The height dimension of the partition wall 23b is smaller than the height dimension of the partition wall 23 and the upper end position of the partition wall 23b is flush with the upper end position of the partition wall 23.

[0072] One accommodation column 11 (accommodation column 11e) is formed between the partition wall 23a and the partition wall 23b. Multiple tobacco commodities 40 can also be accommodated in the accommodation column 11e in a vertically stacked state. That is, a plurality of tobacco commodities 40 can be loaded upon the support base 22 in the accommodation column 11e.

[0073] It should be noted that the number of the tobacco commodities 40 that can be accommodated in the accommodation column 11e is, for example, 15 in the case where the tobacco commodity 40 is of standard dimensions.

[0074] Hence, in the case of this embodiment, it is possible to accommodate a total of 95 tobacco commodities 40 in the accommodation unit 10.

[0075] It should be noted that the number of the accommodation columns 11 and the number of the tobacco commodities 40 that can be accommodated in each accommodation column 11 can be modified as required. Also, while this embodiment describes an example where the accommodation columns 11 are arranged in one row, the accommodation columns 11 may be arranged in multiple rows in the housing 30.

[0076] The dimension of the internal space of each accommodation column 11 in the X-direction, i.e., the opposing interval between the two adjacent partition walls 23 is specified to be larger than the longitudinal dimension of the standard tobacco commodity 40 (the length of the long side of the first main surface 42 and the second main surface 43, i.e., the distance between the first end surface 46 and the second end surface 47).

[0077] Also, the dimension in the Y-direction of each partition wall 23 (depth dimension) is specified, for example, to be larger than the width dimension of a standard tobacco commodity 40 (the length of the short side of the

first main surface 42 and the second main surface 43, i.e., the distance between the first side surface 44 and the second side surface 45).

[0078] It should be noted that, in this embodiment, an example is illustrated where the accommodation column 11 accommodates a plurality of tobacco commodities 40 in a vertically stacked state. Meanwhile, the accommodation column 11 may accommodate the tobacco commodities 40 aligned in a vertical direction at intervals. In this case, the accommodation column 11 includes support sections (not shown) in multiple stages supporting the one or more of the tobacco commodities 40. The support sections are provided, for example, in pairs each including a right one and a left one and, for example, a pair of support sections are respectively provided on the partition walls 23 on both sides of the accommodation column 11 so as to protrude in the accommodation column 11. Alternatively, the support sections may be a plate-like partition bridging the two partition walls 23 on both sides of the accommodation column 11.

[0079] As illustrated in Fig. 2, the accommodation unit 10 further includes a rear wall 24 standing upright from the support base 21 in a state where it is orthogonal to the individual partition walls 23. The rear wall 24 has dimensions covering the entire regions in the X- and Z-directions of the accommodation unit 10 so as to close the rear end of the respective accommodation columns 11.

[0080] Each accommodation column 11 has an open front side so that the tobacco commodities 40 can be withdrawn from the front side by the conveying unit 50.

[0081] Also, each accommodation column 11 is open upward.

[0082] Further, the accommodation unit 10 includes a spacer section 25 provided on the rear wall 24 for each accommodation column 11. The spacer section 25 is provided on the surface in the rear wall 24 on the side of the accommodation column 11 (that is, the front surface). The vertical dimension of the spacer section 25 is specified to be equal to the vertical dimension of each accommodation column 11 and the spacer section 25 is provided from the lower end to the upper end of each accommodation column 11.

[0083] The dimension in the X-direction of the spacer section 25 is specified to be smaller than the longitudinal dimension of a standard tobacco commodity 40. The spacer section 25 is arranged at an intermediate position between two adjacent partition walls 23 and is spaced away from each partition wall 23.

[0084] By virtue of this, the tobacco commodity 40 accommodated in the accommodation column 11 is arranged to be spaced from the rear wall 24 by the thickness of the spacer section 25 and the tobacco commodity 40 can be readily held by and between a pair of arm units 54 of the conveying unit 50 which will be described later.

[0085] As mentioned above, the dispensing device 100 in use is installed in a convenience store or any other store. In a normal state, no clerk at the store or customer coming to the store is capable of access the tobacco commodities 40 accommodated in the accommodation unit 10 inside the housing 30. In the case of this embodiment, restocking of the dispensing device 100 with the tobacco commodities 40 is manually performed by an operator (typically, a clerk). More specifically, a certain portion of the housing 30 defines an opening/closing section (opening/closing lid or opening/closing door) that is operable to be opened and closed. By opening the opening/closing section, the internal space of the housing 30 is opened to the outside so that a state is entered where the accommodation unit 10 can be restocked with the tobacco commodities 40.

[0086] In the case of this embodiment, the top plate section 32 defines the opening/closing lid. As illustrated in Fig. 1, one end of the top plate section 32 (for example, its right end) is connected by means of a hinge unit 37 to the upper end of the right side wall section 36 and the top plate section 32 is configured to be pivotable about the hinge unit 37 as a fulcrum. When the top plate section 32 is taken out of the state of Fig. 1 and opened about the hinge unit 37 as the fulcrum in a clockwise direction, the upper end of the housing 30 is opened so that the accommodation column 11 can be restocked with the tobacco commodities 40 from above the housing 30.

[0087] It should be noted that a not-shown key is preferably provided in the opening/closing section such that the opening/closing section is placed in a locked state where it cannot be opened.

[0088] In the case of this embodiment, a dispensing unit which dispenses from the accommodation unit 10 the tobacco commodity 40 of the type corresponding to a dispensing order is configured to include a conveying unit 50 that is movable relative to the accommodation unit 10 and configured to take out the tobacco commodity 40 from the accommodation unit 10 and convey the tobacco commodity 40.

[0089] The forward region of the accommodation unit 10 (accommodation columns 11) defines a movement area 10c in which the conveying unit 50 moves.

[0090] The conveying unit 50 is configured to move in the X-direction and the Z-direction in the movement area 10c by a moving mechanism which will be described later.

[0091] Here, it is assumed that the tobacco commodity 40 is to be accommodated (input) in each of the accommodation columns 11 by an operator such that the first main surface 42 of the tobacco commodity 40 is oriented upward, the second main surface 43 is oriented downward, the first side surface 44 is oriented toward the proximal side, the second side surface 45 is oriented toward the distal side, the first end surface 46 is oriented rightward, and the second end surface 47 is oriented leftward.

[0092] Specifically, the tobacco commodity 40 is to be accommodated in each of the accommodation columns 11 such that the first side surface 44 of each tobacco commodity 40 is oriented toward the movement area 10c.

[0093] The conveying unit 50 is configured to be capable of selectively taking out the tobacco commodity 40

accommodated in the accommodation unit 10. In the case of this example, the conveying unit 50 is configured to take out the tobacco commodity 40 using a pair of arm units 54 to hold the tobacco commodity 40 between them.

[0094] The conveying unit 50 includes, for example, a table-like section 51 that can support the tobacco commodity 40 that has been taken out, a ceiling section 52 positioned above the table-like section 51, a pair of (left and right) side wall sections 53, and a Z-direction moving unit 56.

[0095] The ceiling section 52 is formed, for example, in a shape of a plate and, as will be described later, arranged horizontally by being supported by the moving mechanism.

[0096] The right side wall section 53 is fixed to the right end of the ceiling section 52 and extends downward from the right end of the ceiling section 52 in a pendent fashion.

[0097] The Z-direction moving unit 56 is fixed to the right side surface of the right side wall section 53. The Z-direction moving unit 56 is supported by the moving mechanism which will be described later.

[0098] The table-like section 51 is formed, for example, in a shape of a plate and arranged horizontally in a normal state.

[0099] As illustrated in Fig. 6A, in a normal state, the ceiling section 52 and the table-like section 51 face with each other so as to be parallel to each other, and the interval where the ceiling section 52 and the table-like section 51 faces with each other is specified to be wider than the thickness dimension of the tobacco commodity 40. Also, the interval where the left and right side wall sections 53 faces with each other is specified to be wider than the longitudinal dimension of the tobacco commodity 40. Also, for example, the front-rear dimensions of the ceiling section 52 and the table-like section 51 are specified to be wider than the width dimension of the tobacco commodity 40 (see Fig. 3D, and Fig. 4C).

[0100] As illustrated in Fig. 6A and Fig. 6B, the right end of the table-like section 51 is pivotally supported by the hinge unit 58 with respect to the lower end of the right side wall section 53, and is configured to be rotatable downward (counterclockwise in Fig. 6A).

[0101] The left side wall section 53 is supported by the left end of the ceiling section 52 and extends downward from the left end of the ceiling section 52 in a pendent fashion.

[0102] As illustrated in Figs. 1 and 2, a barcode reader unit 57 that reads the barcode 41 of the tobacco commodity 40 is provided at the rear part of the ceiling section 52. The barcode reader unit 57 optically reads the barcode 41 and is exposed to the rear surface of the ceiling section 52.

[0103] The conveying unit 50 includes a pair of (left and right) arm units 54 that selectively take out one tobacco commodity 40 from the accommodation unit 10.

[0104] The pair of arm units 54 are each formed, for example, in a shape of an elongated plate that extends in the front-rear direction. One arm unit 54 of the pair of arm units 54 is held by the right side wall section 53 and the other arm unit 54 is held by the left side wall section 53. The pair of arm units 54 are arranged at the same height with each other.

[0105] As illustrated in Fig. 3A and Fig. 4A, in normal states, the pair of arm units 54 are accommodated in the left and right side wall sections 53. It should be noted that, in the accommodated state illustrated in Fig. 3A and Fig. 4A, the front end and the rear end of the arm unit 54 may protrude from the side wall section 53 or may not protrude therefrom.

[0106] An arm drive mechanism is provided in each of the left and right side wall sections 53. The arm drive mechanism is configured to perform the operation (Fig. 3B, Fig. 4B) of causing the arm unit 54 to protrude rearward (leftward in Fig. 3A, Fig. 4A) and the operation (Fig. 3D, Fig. 4C) of causing the arm unit 54 that has been made to protrude to be accommodated again in the side wall section 53.

[0107] Specifically, by one of the respective arm drive mechanisms, the forward and backward movements of the corresponding one of the arm unit 54 are performed.

[0108] The arm drive mechanism is configured to include, for example, a motor and a drive transmission mechanism configured by a gear and the like that transmits the motor driving force to the arm unit 54.

[0109] More specifically, for example, the arm drive motor 86a illustrated in Fig. 7 and a not-shown drive transmission mechanism are provided in the left side wall section 53. When the motor shaft of the arm drive motor 86a rotates in one direction, the left-side arm unit 54 is made to protrude rearward (Fig. 3B, Fig. 4B). When the motor shaft of the arm drive motor 86a rotates in the inverse direction, the left-side arm unit 54 is again accommodated in the left side wall section 53 (Fig. 3D, Fig. 4C).

[0110] Likewise, for example, the arm drive motor 86b illustrated in Fig. 7 and a not-shown drive transmission mechanism are provided in the right side wall section 53. When the motor shaft of the arm drive motor 86b rotates in one direction, the right-side arm unit 54 is thereby made to protrude rearward (Fig. 3B, Fig. 4B). When the motor shaft of the arm drive motor 86b rotates in the inverse direction then the right-side arm unit 54 is again accommodated in the right side wall section 53 (Fig. 3D, Fig. 4C).

[0111] The operations of the arm drive motors 86a, 86b driving the corresponding one of the pair of arm units 54 are performed in synchronization with each other and the pair of arm units 54 move forward and backward in synchronization with each other.

[0112] Further, an arm swing mechanism is provided in each of the left and right side wall sections 53. The arm swing mechanisms are configured to perform the operation (Fig. 3C) of swinging the respective arm units 54 on a horizontal plane in a direction where the distal ends (rear ends) of the arm units 54 that have been made to protrude are moved to be close to each other and the

operation (the operation from Fig. 3C to Fig. 3A) of restoring the arm units 54 that have been made to swing to their original positions.

[0113] Specifically, by the arm swing mechanisms, the opening and closing operations of the pair of arm units 54 are performed.

[0114] The arm swing mechanism is configured to include, for example, a spring that biases the arm unit 54 in one orientation in the swing direction and a solenoid that attracts the arm unit 54 in the reverse orientation in the swing direction against the biasing of the spring.

[0115] More specifically, for example, the arm drive solenoid 87a illustrated in Fig. 7 and a not-shown spring are provided in the left side wall section 53. When the arm drive solenoid 87a is actuated, the left-side first arm unit 54 swings against the biasing of the spring and the distal end of the left-side arm unit 54 is moved to be close to the distal end of the right-side arm unit 54 (Fig. 3C). Also, when the arm drive solenoid 87a stops its actuation, the left-side first arm unit 54 swings according to the biasing of the spring and the distal end of the left-side arm unit 54 is moved away from the distal end of the right-side arm unit 54 (Fig. 3A).

[0116] Likewise, for example, the arm drive solenoid 87b illustrated in Fig. 7 and a not-shown spring are provided in the right side wall section 53. When the arm drive solenoid 87b is actuated, the right-side arm unit 54 swings against the biasing of the spring and the distal end of the right-side arm unit 54 is moved to be close to the distal end of the left-side arm unit 54 (Fig. 3C). Also, when the arm drive solenoid 87b stops its actuation, the right-side arm unit 54 swings according to the biasing of the spring and the distal end of the right-side arm unit 54 is moved away from the distal end of the left-side arm unit 54(Fig. 3A).

[0117] The operations of the arm drive solenoids 87a, 87b causing the corresponding one of the pair of arm units 54 to swing are performed in synchronization with each other and the pair of arm units 54 are opened and closed in synchronization with each other.

[0118] Also, the conveying unit 50 includes a rotation mechanism that rotates the table-like section 51 relative to the side wall section 53. The rotation mechanism is configured to include a table rotation motor 85 (Fig. 7) and a transmission mechanism that transmits the rotation of the motor shaft of the table rotation motor 85 to the table-like section 51 to rotate the table-like section 51 relative to the side wall section 53.

[0119] When the motor shaft of the table rotation motor 85 rotates in one direction, the table-like section 51 is rotated counterclockwise in Fig. 6A and, as illustrated in Fig. 6B, the table-like section 51 is placed in an inclined state.

[0120] Also, when the motor shaft of the table rotation motor 85 rotates in an inverse direction, then the table-like section 51 is rotated clockwise in Fig. 6B and the state of the table-like section 51 illustrated in Fig. 6A is restored.

[0121] Also, the moving mechanism that moves the conveying unit 50 in the X-direction and the Z-direction is configured, for example, as described below.

[0122] As illustrated in Fig. 5A or Fig. 5B, the moving mechanism includes a first ball screw 71, a first rotation unit 72, a pair of first moving blocks 73, a pair of first guide rails 74, a second ball screw 75, a second rotation unit 76, a pair of second moving blocks 77, and a pair of second guide rails 78.

[0123] The one first guide rail 74 of the pair of first guide rails 74 is fixed, for example, to the inner surface of the left side wall section 35 and extends in the Z-direction (up-and-down direction). Also, the other first guide rail 74 is fixed, for example, to the inner surface of the right side wall section 36 and extends in the Z-direction. The pair of first guide rails 74 are both arranged at the same position in the depth direction (Y-direction).

[0124] The one first moving block 73 is provided in the one first guide rail 74, and the first moving block 73 is configured to be slidable in the longitudinal direction of the first guide rail 74.

[0125] Likewise, the other first moving block 73 is provided in the other first guide rail 74, and the first moving block 73 is configured to be slidable in the longitudinal direction of the first guide rail 74.

[0126] The first ball screw 71 extends in the X-direction (extends horizontally in the left-right direction) and extends through the ceiling section 52 of the conveying unit 50 and the Z-direction moving unit 56 in the X-direction. The left end of the first ball screw 71 is fixed to the one first moving block 73 and the right end of the first ball screw 71 is fixed to the other first moving block 73. By virtue of this, the first ball screw 71 is provided between and bridges the pair of first moving blocks 73.

[0127] Also, the first rotation unit 72 is in threaded engagement with the first ball screw 71. The first rotation unit 72 is held by the ceiling section 52 and is configured to be rotatable relative to the ceiling section 52 about the rotation axis extending in the X-direction.

[0128] The one second guide rail 78 of the pair of second guide rails 78 is fixed, for example, to the upper surface of the bottom plate section 31 and extends in the X-direction (horizontally in the left-right direction). Also, the other second guide rail 78 is provided between and bridges, for example, the inner surface of the left side wall section 35 and the inner surface of the right side wall section 36 in the vicinity of the top plate section 32, and extends in the X-direction. The pair of second guide rails 78 are arranged at the same position with each other in the depth direction(Y-direction).

[0129] The one second moving block 77 is provided in the one second guide rail 78 and the second moving block 77 is configured to be slidable in the longitudinal direction of the second guide rail 78.

[0130] Likewise, the other second moving block 77 is provided in the other second guide rail 78 and the second moving block 77 is configured to be slidable in the longitudinal direction of the second guide rail 78.

[0131] The second ball screw 75 extends in the Z-direction (extends vertically), and extends through the Z-direction moving unit 56 in the Z-direction. The lower end of the second ball screw 75 is fixed to the one second moving block 77 and the upper end of the second ball screw 75 is fixed to the other second moving block 77. By virtue of this, the second ball screw 75 is provided between and bridges the pair of second moving blocks 77.

[0132] Also, the second rotation unit 76 is in threaded engagement with the second ball screw 75. The second rotation unit 76 is held by the Z-direction moving unit 56 and is configured to be rotatable relative to the Z-direction moving unit 56 about the rotation axis extending in the Z-direction.

[0133] It should be noted that the pair of first guide rails 74 and the pair of second guide rails 78 are arranged at different positions from each other in the depth direction and, for example, the first guide rail 74 is arranged to be closer to the distal side than the second guide rail 78.

[0134] More specifically, the first ball screw 71 is arranged to be closer to the distal side than the second rotation unit 76 such that the second rotation unit 76 and the first ball screw 71 do not interfere with each other (Fig. 5B).

[0135] Further, the moving mechanism includes an X-drive motor 82 (Fig. 7) configured to rotate the first rotation unit 72 in one direction and the reverse direction, a transmission mechanism configured to transmit the rotation of the X-drive motor 82 to the first rotation unit 72, a Z-drive motor 83 (Fig. 7) configured to rotate the second rotation unit 76 in one direction and the reverse direction, and a transmission mechanism configured to transmit the rotation of the Z-drive motor 83 to the second rotation unit 76.

[0136] When the motor shaft of the X-drive motor 82 rotates in the one direction, the first rotation unit 72 is rotated in one direction relative to the ceiling section 52. By virtue of this, the first rotation unit 72 threadedly advances in one direction (for example, leftward) with respect to the first ball screw 71 and thereby the conveying unit 50 is moved leftward.

[0137] Also, when the motor shaft of the X-drive motor 82 rotates in the reverse direction, the first rotation unit 72 is rotated in the reverse direction with respect to the ceiling section 52. By virtue of this, the first rotation unit 72 threadedly advances in the reverse direction (for example, rightward) with respect to the first ball screw 71 and thereby the conveying unit 50 is moved rightward.

[0138] When the motor shaft of the Z-drive motor 83 rotates in the one direction, the second rotation unit 76 is rotated in one direction relative to the Z-direction moving unit 56. By virtue of this, the second rotation unit 76 threadedly advances in one direction (for example, upward) relative to the second ball screw 75, and the conveying unit 50 is elevated.

[0139] Also, when the motor shaft of the Z-drive motor 83 rotates in the reverse direction, the second rotation unit 76 is rotated in the reverse direction relative to the Z-direction moving unit 56. By virtue of this, the second rotation unit 76 threadedly advances in the reverse direction (for example, downward) relative to the second ball screw 75, and the conveying unit 50 is lowered.

[0140] It should be noted that, in a case where the direction of movement of the conveying unit 50 extends obliquely (a case where the line interconnecting the position before the movement and the position after the movement is inclined), the rotation of the X-drive motor 82 and the rotation of the Z-drive motor 83 may be sequentially performed. However, when the rotations are performed in parallel with each other, it is made possible to move the conveying unit 50 along the shortest path and thus shorten the time required to move the conveying unit 50.

[0141] As illustrated in Fig. 7, the dispensing device 100 includes a control unit 80 configured to comprehensively control the operation of the individual units of the dispensing device 100.

[0142] Specifically, the control unit 80 is configured to control the operations of the display unit 120, the speaker 130, the table rotation motor 85, the X-drive motor 82, the Z-drive motor 83, the barcode reader unit 57, the arm drive motors 86a, 86b, and the arm drive solenoids 87a, 87b.

[0143] The control unit 80 is configured to include a ROM 80b that stores control program, a CPU 80a that carries out the control operation in accordance with the control program, and a RAM 80c functioning as a work area for the CPU 80a or the like.

[0144] The control unit 80 recognizes the number of remaining pieces for each type regarding the tobacco commodities 40 accommodated in the accommodation unit 10. Specifically, the control unit 80 calculates the number of remaining pieces for each type regarding the tobacco commodities 40 accommodated in the accommodation unit 10 and causes the result of the calculation in the RAM 80c at any time. By virtue of this, the information on the number of remaining pieces for each type of the tobacco commodities 40 in the accommodation unit 10 is always maintained in the latest state.

[0145] Also, a table as illustrated in Fig. 8 is stored in the RAM 80c. The table indicates the correspondence relationship between the types of the tobacco commodities 40 and the restock threshold as well as the number of pieces to be restocked at one time. The control unit 80 refers to this table to determine whether or not any type of the tobacco commodities 40 should be restocked. When the control unit 80 has determined that the tobacco commodities 40 of the determined type should be restocked, the control unit 80 causes the display unit 120 and the speaker 130 to issue notification about the type of the tobacco commodity 40 to be restocked and notification of the number of pieces to be restocked.

[0146] It should be noted that the table indicating the correspondence relationship between the types of the tobacco commodities 40 and the restock threshold as

well as the number of pieces to be restocked at one time can be updated at any time so that it is the latest one.

[0147] Also, the identification information read by the barcode reader unit 57 is input to the control unit 80. The CPU 80a causes the RAM 80c to store each piece of the identification information of each of the tobacco commodities 40 in association with each piece of the accommodation position information differing from one tobacco commodity 40 to another.

[0148] Here, as described above, the accommodation position information is configured to include, for example, the height position information and the horizontal position information.

[0149] The height position information may be Z-coordinate information indicative of the coordinate in the height direction (i.e., the Z-coordinate which is the coordinate in the Z-direction) and may be tier number information indicative of the specific tier of position in the accommodation column 11.

[0150] As the Z-coordinate information, for example, information indicative of the Z-coordinate of the conveying unit 50 at the time of reading of the barcode 41 by the barcode reader unit 57, or the coordinate having a predetermined correlation with the Z-coordinate can be used.

[0151] Also, the barcode reader unit 57 may be configured to be capable of optically recognizing the boundary position between the tobacco commodities 40 vertically stacked in the accommodation column 11. It should be noted that the conveying unit 50 may include a camera so that the boundary position between the tobacco commodities 40 vertically stacked in the accommodation column 11 may be recognizable based on the imaging result of the camera.

[0152] In this case, the intermediate position of the upper and lower ends of each tobacco commodity 40 can be obtained as the height position information of each tobacco commodity 40 on the basis of the boundary position of vertically stacked tobacco commodities 40.

[0153] Also, the horizontal position information may be column information indicative of the accommodation column 11 in which the tobacco commodity 40 is accommodated. It may also be information indicative of the coordinate of the tobacco commodity 40 in the horizontal direction. Specifically, the horizontal position information may include X-coordinate information indicative of the X-coordinate which is the coordinate of the tobacco commodity 40 in the X-direction.

[0154] As the horizontal position information, for example, information indicative of the X-coordinate of the conveying unit 50 at the time of reading of the barcode 41 by the barcode reader unit 57 or the coordinate having a predetermined correlation with the X-coordinate can be used.

[0155] Further, the dispensing device 100 includes a dispensing order acquisition unit 81.

[0156] The dispensing order acquisition unit 81 is, for example, an operation unit provided on the outer surface of the housing 30, an operation tablet provided at a location away from the housing 30, or the like.

[0157] When a clerk or a purchaser of the tobacco commodity 40 performs a predetermined operation on the dispensing order acquisition unit 81, the brand of the tobacco commodity 40 that the purchaser is going to purchase is allowed to be designated.

[0158] It should be noted that, by the operation on the dispensing order acquisition unit 81, the brands of the various tobacco commodities 40 are allowed to be searched for and designated, for example, by various search schemes such as alphabetical search, brand name search, tar value search, and nicotine value search. Alternatively, personal authentication information (information authenticated by voiceprint authentication, vein authentication, reading of a recording medium, or the like) for the purchaser may be used to identify the purchaser and search for the brand of the item that was previously purchased.

[0159] Here, the fact that the brand of the tobacco commodity 40 that the purchaser purchases is designated by the operation on the dispensing order acquisition unit 81 is described as the fact that the dispensing order acquisition unit 81 acquires a dispensing order. The dispensing order acquired by the dispensing order acquisition unit 81 is notified from the dispensing order acquisition unit 81 to the control unit 80.

[0160] Further, the dispensing device 100 includes a lid switch 84 configured to detect whether or not the top plate section 32 is closed. Specifically, the lid switch 84 is configured to detect the fact that the top plate section 32 is closed or the fact that the top plate section 32 is opened.

[0161] The result of the detection by the lid switch 84 is input at any time to the control unit 80 and the control unit 80 constantly monitors whether or not the top plate section 32 is closed.

[0162] Next, the operation will be described.

[0163] First, the dispensing operation of the tobacco commodity 40 accommodated in the accommodation unit 10 will be described.

[0164] When the dispensing order is input from the dispensing order acquisition unit 81 to the control unit 80, the control unit 80 refers to the storage contents of the RAM 80c and determine whether or not the tobacco commodity 40 of the type (brand) corresponding to the dispensing order is accommodated in the accommodation unit 10.

[0165] If it is not accommodated therein, then it is not possible to dispense the tobacco commodity 40 that corresponds to the dispensing order. In this case, the control unit 80 may provide notification to the effect that the dispensing of the tobacco commodity 40 is not possible by using a not-shown notification unit.

[0166] If it is accommodated therein, then the control unit 80 reads the accommodation position information of the tobacco commodity 40 of the type that corresponds to the dispensing order. It should be noted that in a case

where a plurality of tobacco commodities 40 of the type that corresponds to the dispensing order are accommodated in the accommodation unit 10, the control unit 80 reads the accommodation position information of the tobacco commodity 40 that was accommodated first (at the earliest timing) in the accommodation unit 10 among them.

[0167] Further, the control unit 80 performs operation control on the X-drive motor 82 and the Z-drive motor 83 so as to move the conveying unit 50 toward the position corresponding to the accommodation position information that has been read.

[0168] It should be noted that, the tobacco commodity 40 of the type that corresponds to the dispensing order may be referred to as the tobacco commodity 40 to be dispensed.

[0169] In this context, the operation in the case will be described in which the tobacco commodity 40 to be dispensed is accommodated in the accommodation column 11d.

[0170] First, as illustrated in Figs. 3A and 4A, the conveying unit 50 is moved to the position in front of the accommodation column 11d and corresponding to the tobacco commodity 40 of the type corresponding to the dispensing order.

[0171] In addition, the barcode reader unit 57 is made to read the barcode 41 of the tobacco commodity 40 to be dispensed. Specifically, the barcode reader unit 57 is made to read the barcode 41 of the tobacco commodity 40 residing at the position identified by the accommodation position information read by the control unit 80.

[0172] Further, the control unit 80 determines whether or not the barcode 41 that has been read by the barcode reader unit 57 agrees with the dispensing order.

[0173] If it is in agreement, then, in the manner as described below, under the control of the control unit 80, the tobacco commodity 40 to be dispensed is taken out by the conveying unit 50 from the accommodation column 11d.

[0174] First, as illustrated in Figs. 3B and 4B, the pair of arm units 54 are made to protrude rearward from the side wall section 53 and are inserted into the accommodation column 11d.

[0175] Here, as illustrated in Fig. 3B, the distal end of the arm unit 54 is configured to be inserted into the gap between the spacer section 25 and the partition wall 23.

[0176] Next, as illustrated in Fig. 3C, the pair of arm units 54 swing in the direction in which their distal ends become close to each other and the tobacco commodity 40 to be dispensed is held between the pair of arm units 54.

[0177] Next, as illustrated in Fig. 3D, the pair of arm units 54 are accommodated again in the side wall section 53. By virtue of this, the tobacco commodity 40 held by the pair of arm units 54 is taken out from the accommodation column 11d and, further, is taken into the region of interval where the table-like section 51 and the ceiling section 52 face with each other.

[0178] It should be noted that withdrawal of the tobacco commodity 40 by the pair of arm units 54 is performed after the distal ends of the pair of arm units 54 have been inserted into the gap between the spacer section 25 and the partition wall 23 as described above. By virtue of this, it is made possible to take out the tobacco commodity 40 in a state where the tobacco commodity 40 is stably held by the pair of arm units 54 and more reliably take the tobacco commodity 40 into the region of interval where the table-like section 51 and the ceiling section 52 faces with each other.

[0179] Here, as illustrated in Fig. 4B, etc., the table-like section 51 and the ceiling section 52 protrude more rearward than the side wall section 53. In addition, the height position of the table-like section 51 is aligned with the tobacco commodity 40 adjacent to lower side of the tobacco commodity 40 to be dispensed whereas the height position of the ceiling section 52 is aligned with the tobacco commodity 40 adjacent to upper side of the tobacco commodity 40 to be dispensed.

[0180] As a result, when the tobacco commodity 40 to be dispensed is taken out from the accommodation column 11d, moving of the tobacco commodities 40 adjacent to this tobacco commodity 40 above and below it can be suppressed by the ceiling section 52 and the table-like section 51, so that it is made possible to suppress the upper and lower adjacent tobacco commodities 40 from being taken out.

[0181] After the tobacco commodity 40 to be dispensed has been taken into the region of interval where the table-like section 51 and the ceiling section 52 face with each other, the distal ends of the pair of arm units 54 are opened, whereby as illustrated in Fig. 4C, the tobacco commodity 40 drops onto the table-like section 51 and is thus placed in the state where it is supported by the table-like section 51.

[0182] Subsequently, the conveying unit 50 is moved to the dispensing position illustrated in Fig. 6A.

[0183] Subsequently, as illustrated in Fig. 6B, when the table-like section 51 rotates downward, the tobacco commodity 40 to be dispensed is delivered from the table-like section 51 to the take-out slope 92 and goes down on the take-out slope 92 to be dispensed onto the take-out saucer 91.

[0184] Hence, a clerk can take out the tobacco commodity 40 to be dispensed from the take-out saucer 91 to sell it.

[0185] It should be noted that, if the barcode 41 that was read when the conveying unit 50 had moved to the position corresponding to the tobacco commodity 40 of the type that corresponds to the dispensing order as in Fig. 3A and Fig. 4A does not agree with the dispensing order, then the control unit 80 may provide notification that the dispensing of the tobacco commodity 40 is not possible by using a not-shown notification unit. Alternatively, dispensing of the tobacco commodity 40 that was accommodated in the accommodation unit 10 at the second earliest timing among the tobacco commodities 40

accommodated in the accommodation unit 10 and having the type that corresponds to the dispensing order or dispensing of the tobacco commodity 40 having the second nearest expiration date may be performed by the conveying unit 50.

[0186] Also, when the tobacco commodity 40 to be dispensed has been taken out from the accommodation column 11 as described above, then the tobacco commodities 40 that were stacked on the tobacco commodity 40 that has been taken out are shifted downward by one tier. As a result, the control unit 80 performs the update processing to update the accommodation position information stored in the RAM 80c.

[0187] The update processing may be processing for changing the height position information through arithmetic operation by the known thickness of the individual tobacco commodities 40 or may be processing for reacquiring the height position information of all the tobacco commodities 40 that were positioned above the tobacco commodity 40 to be dispensed.

[0188] It should be noted that when the tobacco commodity 40 is dispensed from the dispensing device 100, an empty space 61 (Fig. 1) in which the tobacco commodity 40 can be input is created in the accommodation unit 10. It should be noted that the control unit 80 is supposed to update at any time the information indicative of the specific region of the accommodation unit 10 where the empty space 61 exists.

[0189] Also, the control unit 80 subtracts one from the information of the number of remaining pieces of the tobacco commodity 40 of the type to be dispensed every time one tobacco commodity 40 is dispensed from the dispensing device 100.

[0190] Further, every time the information of the number of remaining pieces for each type of the tobacco commodities 40 in the accommodation unit 10 changes, the control unit 80 refers to the table of Fig 8 regarding the tobacco commodity 40 whose number of remaining pieces has changed and determines whether or not the number of remaining pieces decreases until it reaches the restock threshold.

[0191] In addition, when the number of remaining pieces of the tobacco commodities 40 of the type whose number of remaining pieces changed has decreased until it reaches the restock threshold, then the notification about the fact that the tobacco commodity 40 of this type should be restocked and the notification of the number of pieces to be restocked should be performed by the display unit 120 and the speaker 130.

[0192] For example, as illustrated in Fig. 9, the notification "Please restock ten pieces of tobacco A." is performed on the display screen of the display unit 120 and the speaker 130 performs a similar audible notification or output of an alarm sound.

[0193] The clerk who noticed the notification can perform the restocking of the tobacco commodities 40 in the manner described below.

[0194] For example, the operation to stop the notification operation by the speaker 130 is performed on the operation unit provided on the outer surface of the housing 30. By virtue of this, the notification operation by the speaker 130 is stopped.

[0195] Next, the top plate section 32 is opened, the tobacco commodities 40 of the type instructed by the notification are restocked by the instructed number in the empty spaces 61 of the accommodation unit 10, and then the top plate section 32 is closed.

[0196] Further, the operation to stop the notification operation of the display unit 120 is performed on the operation unit on the outer surface of the housing 30. By virtue of this, the notification operation by the display unit 120 is stopped.

[0197] Also, when the top plate section 32 is closed, the lid switch 84 detects the closure and the control unit 80 recognizes the closure.

[0198] Then, the control unit 80 moves the conveying unit 50 sequentially to the front position of the region that was previously an empty space 61 and causes the barcode reader unit 57 to sequentially read the barcodes 41 (identification information) of the tobacco commodities 40 that have been input into the empty spaces 61. In addition, the identification information of each tobacco commodity 40 read by the barcode reader unit 57 is stored in the RAM 80c in association with the accommodation position information of each tobacco commodity 40. It should be noted that the control unit 80 moves the conveying unit 50 sequentially to the front positions of all the empty spaces 61 (including the empty space(s) 61 which was/were not restocked with the tobacco commodity(commodities) 40) and, if each empty space 61 is restocked with the tobacco commodity 40, the control unit 80 causes the barcode reader unit 57 to read the barcode 41 of the tobacco commodity 40.

[0199] Also, the control unit 80 performs the processing of updating the information of the number of remaining pieces for each type of the tobacco commodities 40 in the accommodation unit 10.

[0200] Further, regarding the number of remaining pieces for each type of the tobacco commodities 40 in the accommodation unit 10, on the basis of the updated information, the control unit 80 determines whether or not the accommodation unit 10 has been restocked with the tobacco commodity(commodities) 40 of the type corresponding to the one that was notified by the number corresponding to the one that has been notified.

[0201] If the type of the restocked tobacco commodity 40 is different from the content of the notification or if the number of the restocked tobacco commodities 40 is smaller than the number that has been notified, then the control unit 80 causes the display unit 120 and the speaker 130 to perform the notification about how many more tobacco commodities 40 of which type should be restocked. Hence, when the operator again restocks the accommodation unit 10 with the tobacco commodity 40 in accordance with this notification, a state is entered where the accommodation unit 10 is restocked with the

tobacco commodities 40 of the type with which it should be restocked and by the number by which it should be restocked with the tobacco commodities 40.

[0202] It should be noted that at the phase where the accommodation unit 10 has been restocked with the tobacco commodities 40 in the empty spaces 61, the accommodation position information of these tobacco commodities 40 are yet to be stored in the RAM 80c. Accordingly, it is not possible to handle these tobacco commodities 40 as the target items to be dispensed. Specifically, the dispensing device 100 is configured to selectively dispense only those tobacco commodities 40 whose accommodation position information have already been stored.

[0203] Also, the conveying unit 50 in the idling time in which dispensing of the tobacco commodity 40 is not performed should preferably be configured to move the tobacco commodities 40 in the accommodation unit 10 as will be described below to create a situation where restocking of tobacco commodities 40 in the accommodation unit 10 together at one time is facilitated.

[0204] For example, as illustrated in Fig. 1, in a case where empty spaces 61 exist in the accommodation columns 11 and the total number of the empty spaces 61 has reached 10, the processing of putting together the empty spaces 61, for example, into the accommodation column 11 having the largest number of the empty spaces 61 is performed.

[0205] In the example of Fig. 1, one of the three tobacco commodities 40 from the top of the accommodation column 11d is moved to the accommodation column 11c and the other two to the accommodation column 11b respectively by the conveying unit 50, and thereby ten empty spaces 61 consecutively arranged in the vertical direction can be formed in the accommodation column 11d.

[0206] In this manner, it is made possible to create a situation where a carton of the tobacco commodities 40 can be restocked at a time in the accommodation column 11.

[0207] According to the first embodiment described above, the dispensing device 100 can accommodate tobacco commodities 40 in the accommodation unit 10 and automatically dispense the tobacco commodity 40 that corresponds to the dispensing order by the dispensing unit (conveying unit 50) from among the tobacco commodities 40 accommodated in the accommodation unit 10.

[0208] Further, the dispensing device 100 includes the storage unit (RAM 80c) that stores the number of accommodated pieces for each type regarding the tobacco commodity 40 accommodated in the accommodation unit 10 and the notification unit (the display unit 120 and the speaker 130) that notifies the type of the tobacco commodity 40 to be restocked in accordance with the number of remaining pieces for each type of the tobacco commodities 40 accommodated in the accommodation unit 10. Hence, appropriate restocking of the tobacco commodities 40 is made possible by an operator restocking the accommodation unit 10 with the tobacco commodities 40 according to the notification.

(Second Embodiment)

[0209] The dispensing device 100 according to this embodiment differs from the dispensing device 100 according to the above-described first embodiment in the aspects described below and is configured in the same manner as the dispensing device 100 according to the above-described first embodiment in the remaining aspects.

[0210] In the case of this embodiment, the dispensing device 100 includes a management unit (control unit 80) that manages sales information for each type of the tobacco commodities 40.

[0211] In addition, the notification unit (the display unit 120 and the speaker 130) performs notification of the type of the tobacco commodity to be restocked on the basis of sales information.

[0212] Fig. 10 is a diagram for explanation of the operation of the dispensing device 100 according to this embodiment, which is an explanatory diagram of modification processing of the restock threshold and the number of pieces to be restocked in accordance with sales.

[0213] In the case of this embodiment, the control unit 80 of the dispensing device 100 manages the number of the tobacco commodities 40 that were dispensed from the dispensing device 100 in the most recent predetermined period (for example, the previous day and the day before that (past two days)) for each type. In addition, the control unit 80 calculates the daily average of the fluctuation of the actual number of sales (actual number of sales) above the estimated number of sales which is estimated in advance for each type (estimated number of sales).

[0214] For example, assume here that the estimated number of sales per day is set to 5 for the "tobacco A". In this case, if the actual number of sales per day of the "tobacco A" was 10, then the number of increase in the sales per day in the past two days (average increase in sales in past two days) regarding the "tobacco A" will be 5 as illustrated in Fig. 10.

[0215] In this case, normally, while the restock threshold of the "tobacco A" is 5 as illustrated in Fig. 8, for example, a process of increasing it by 5 to set it to 10 is performed as illustrated in Fig. 10. Specifically, the notification of restocking is to be performed with regard to the "tobacco A", at the stage where the number of remaining pieces in the accommodation unit 10 becomes 10.

[0216] Also, with regard to the tobacco commodity 40 whose restock threshold has been changed, a process of changing the number of pieces to be restocked by one round of the restock work is performed. For example, with regard to the "tobacco A" whose restock threshold has been increased by 5, a process of increasing the

number of pieces to be restocked by one round of the restock work by 5 to set it to 15 is performed.

[0217] Here, the "average increase in sales in past two days" indicated in Fig. 10 is the sales information. Specifically, the management unit (control unit 80) generates the sales information on the basis of the number of dispensed pieces of the tobacco commodities 40 by the dispensing unit (conveying unit 50).

[0218] Also, assume here that the estimated number of sales per day is set to 2 with regard to the "tobacco B". In this case, when the actual number of sales per day of the "tobacco B" was 3, then, with regard to the "tobacco B", the number of increase in the sales per day in the past two days (average increase in sales in past two days) will be 1 as illustrated in Fig. 10.

[0219] In this case, normally, while the restock threshold of the "tobacco B" is 2 as illustrated in Fig. 8, for example, a process of increasing it by 1 to set it to 3 is performed as illustrated in Fig. 10. Specifically, with regard to the "tobacco B", the notification of restocking is to be performed at the state where the number of remaining pieces in the accommodation unit 10 becomes 3.

[0220] Further, with regard to the "tobacco B" whose restock threshold has increased by 1, a process of increasing the number of pieces to be restocked by one round of the restock work by, for example, 2 to set it to 7 is performed.

[0221] Also, with regard to the "tobacco C", assume that the estimated number of sales per day is set to 1. In this case, when the actual number of sales per day of the "tobacco C" was 0, then, with regard to the "tobacco C", the number of increase in the sales per day in the past two days (average increase in sales in past two days) will become -1 as illustrated in Fig. 10.

[0222] In this case, normally, while the restock threshold of the "tobacco C" is 0 as illustrated in Fig. 8, a process of maintaining the restock threshold without changing it is performed. Specifically, with regard to the "tobacco C", the notification of restocking is performed at the stage where the number of remaining pieces in the accommodation unit 10 becomes 0.

[0223] Further, with regard to the "tobacco C" whose restock threshold was not changed, the number of pieces to be restocked by one round of the restock work is not changed, either, and thus it will be 2.

[0224] According to this embodiment, since the sales information for each type of the tobacco commodities 40 is managed and notification of the type of the tobacco commodity 40 to be restocked is performed on the basis of the sales information, it is made possible to perform the notification of restocking earlier for the tobacco commodity 40 of stronger sales (at a stage where the number of remaining pieces is greater).

[0225] Also, by generating the sales information on the basis of the number of dispensed pieces of the tobacco commodities 40 by the dispensing unit (conveying unit 50), it is made possible to generate the sales information based on the facts in real time and include it in the notification of restocking.

(Third Embodiment)

[0226] Fig. 11 is a block diagram of the dispensing device 100 according to the third embodiment.

[0227] Fig. 12 is a block diagram of a system that includes the dispensing device 100 according to the third embodiment.

[0228] The dispensing device 100 according to this embodiment differs from the dispensing device 100 according to the above-described first embodiment in the aspects described below and is configured in the same manner as the dispensing device 100 according to the above-described first embodiment in the remaining aspects.

[0229] In the above-described second embodiment, the example has been described where the dispensing device 100 generates the sales information on the basis of the number of dispensed pieces of the tobacco commodity 40 by the dispensing unit of the dispensing device 100. Meanwhile, in the case of this embodiment, the dispensing device 100 acquires the sales information from an external device.

[0230] Therefore, the dispensing device 100 according to this embodiment includes a sales information acquisition unit 140 that acquires the sales information from the external device as illustrated in Fig. 11.

[0231] The sales information acquisition unit 140 includes, for example, a communication function, acquires the sales information from the external device of the dispensing device 100, and notifies the sales information that has been acquired to the control unit 80. As an example, the sales information acquisition unit 140 acquires the sales information, as illustrated in Fig. 12, via the network 300 such as the Internet.

[0232] The arrangement of the sales information acquisition unit 140 is not particularly limited but, for example, the sales information acquisition unit 140 is provided on the outer surface of the housing 30.

[0233] As illustrated in Fig. 12, the external device that supplies the sales information to the sales information acquisition unit 140 of the dispensing device 100 may be, for example, a server 200 of a manufacturer, a sales company, or a distribution company of the tobacco commodities 40.

[0234] The server 200 manages the sales information in the most recent predetermined period for each of the various tobacco commodities 40. Here, the sales information may be generated based on sales throughout the country, or may be generated based on sales by region.

[0235] The server 200 transmits (supplies) the latest sales information to the dispensing device 100 at any time via the network 300.

[0236] The dispensing device 100 updates the sales information into the latest one every time the sales information acquisition unit 140 receives (acquires) the sales information from the server 200 and the dispensing de-

vice 100 performs notification of restocking on the basis of the latest sales information.

[0237] The server 200 supplies (distributes) pieces of the sales information all at once to the dispensing devices 100 individually arranged at a plurality of stores. Specifically, as illustrated in Fig. 12, the server 200 supplies the common sales information to the dispensing device 100 installed at the store A 410, the dispensing device 100 installed at the store B 420, and the like.

[0238] In the case of this embodiment as well, in the same manner as in the second embodiment, the dispensing device 100 performs processing on the basis of the sales information for changing (incrementing) the restock threshold and changing (incrementing) the number of pieces to be restocked in one round of the restock work.

[0239] As described above, the embodiments, which have been explained with reference to the drawings, are exemplifications of the present invention and other various features can be adopted.

[0240] Also, in the foregoing, the example has been described where it is assumed that the restocking of the tobacco commodities 40 by the operator is performed such that the tobacco commodities 40 are neatly stacked but the present invention is not limited to this example.

[0241] For example, the dispensing device may include a hopper into which the tobacco commodity 40 is input and a conveyor configured to catch the tobacco commodities 40 sequentially moving downward from the hopper to convey them horizontally and the barcode reader unit may be configured to read the barcode 41 from the tobacco commodity 40 in the process where the tobacco commodity 40 is conveyed by the conveyor.

[0242] Further, it is also preferable that the dispensing device includes an alignment mechanism configured to align the tobacco commodities 40 sequentially conveyed on the conveyor.

[0243] Further, it is also preferable that the dispensing device includes an accommodation mechanism configured to sequentially pick up the tobacco commodities 40 aligned on the conveyor to convey them toward the accommodation unit 10 and cause the accommodation unit 10 to accommodate them.

[0244] Also, while the example has been described in the foregoing where the barcode 41 is checked immediately before the tobacco commodity 40 to be dispensed is taken out from the accommodation column 11, the confirmation of the barcode 41 at this phase may not be performed.

[0245] In the foregoing, the example has been described where the conveying unit 50 holds the tobacco commodity 40 between the pair of arm units 54 arranged in the horizontal direction to be spaced from each other and thereby withdraws the tobacco commodity 40 from the accommodation column 11, but the structure of the arm is not limited to this example. For example, the tobacco commodity 40 may be held from above and below by a pair of arms arranged in the vertical direction to be spaced from each other.

[0246] Also, in the foregoing, the examples have been described in which the number of pieces to be restocked of the tobacco commodity 40 by one round of the restock work is defined in advance as illustrated in Fig. 8 and in which it is changed on the basis of the sales information as illustrated in the accommodation unit 10, but the present invention is not limited to these examples.

[0247] Among the tobacco commodities 40, there may be a tobacco commodity of a type that is distributed in the form of a carton which is one pack of ten pieces. In the case of the tobacco commodity 40 of this type, for example, in a case where six pieces were restocked from a new carton in the previous round of restocking for the dispensing device 100, four tobacco commodities 40 remain in the carton. Hence, work efficiency will be better if the remaining four pieces are restocked from the carton in the next round than restocking of six pieces in the same manner as in the previous round.

[0248] Hence, it is a preferable example that the dispensing device 100 determine and stores the number of remaining pieces of the carton regarding the tobacco commodity 40 in the form of a carton for each type of the tobacco commodities 40 on the basis of the number of pieces to be restocked of each round, and notifies the number of the remaining pieces of the carton at the time of the restocking of the next round as the number of items to be restocked.

[0249] Specifically, the control unit 80 stores the number of pieces in the last single digit (hereinafter, X) of the total number of the tobacco commodities 40 input to the dispensing device 100 with regard to the tobacco commodity 40 of a particular type (the type which is distributed in the form of a carton) for each type of the tobacco commodities 40. In addition, with regard to the tobacco commodity 40 of a certain type among the tobacco commodities 40 of the particular type, the predetermined number of pieces to be restocked at one time is Y. If (10 - X) is equal to or larger than Y, then the control unit 80 notifies Y as the number of items to be restocked. If (10 - X) is less than Y, then the control unit 80 notifies (10 - X) as the number of pieces to be restocked.

[0250] Further, the storage unit of the dispensing device 100 may store a proper quantity of inventory for each type (brand) of the tobacco commodities 40. The control unit 80 computes, for each brand, a difference value between the number of remaining pieces accommodated in the accommodation unit 10 and the above-described proper quantity of inventory acquired by referring to the storage unit, and notifies the brand accommodated in the accommodation unit 10 in excess of the proper quantity of inventory on the basis of the difference value. Also, the control unit 80 may be configured to dispense the tobacco commodity(commodities) 40 of the brand accommodated in excess of the proper number of remaining pieces from the accommodation unit 10 to create an empty space in the accommodation unit 10, and notifies the brand lower than the restock threshold and the number of pieces to be restocked corresponding to the

brand. Here, the proper quantity of inventory may be set in advance for each brand and stored in the storage unit or the proper quantity of inventory may be able to be updated according to the sales information.

[0251] In this case, for example, in a situation where the number of remaining pieces of the "tobacco A" in the accommodation unit 10 reached the restock threshold and accordingly the accommodation unit 10 should be originally restocked with ten pieces of the "tobacco A", if only five empty spaces are available in the accommodation unit 10, then the dispensing device 100 notifies the brand accommodated excessively in the accommodation unit 10 in excess of the proper quantity of inventory or dispenses the excessive quantity of the brand so as to create the empty space.

[0252] Also, it is preferable that multiple dispensing devices 100 in cooperation with each other perform management of the number of accommodation and the management of restocking of tobacco commodities 40 of multiple types.

[0253] Specifically, one or more dispensing devices 100 of the multiple dispensing devices 100 may store the total number of the tobacco commodities 40 accommodated in the accommodation units 10 of the multiple dispensing devices 100 with regard to each of the multiple types of the tobacco commodities 40 to determine whether or not the total number becomes equal to or lower than the restock threshold and notify the type of the tobacco commodity 40 to be restocked and the number of pieces to be restocked if it has become the restock threshold.

[0254] Further, it is preferable that one or more dispensing devices 100 of the multiple dispensing devices 100 store the number and positions of the empty spaces in the accommodation unit 10 of each dispensing device 100 (in which accommodation column 11 the empty space exists). In this case, it is also preferable to perform the notification about which dispensing device 100 is the dispensing device 100 that should restock the tobacco commodity 40 and the notification about which accommodation column 11 is the accommodation column 11 that should be restocked with the tobacco commodity 40 when the type of the tobacco commodity 40 to be restocked and the number of pieces to be restocked are to be notified.

(Fourth Embodiment)

[0255] In the meantime, after the tobacco commodity was delivered to a dealer, it may be revealed that the tobacco commodity is a non-conforming item (defective item or the like) unsuitable for sale, and there has been a need for ingenuity that makes it possible to appropriately avoid sale of non-conforming items.

[0256] The present invention has been made in view of the above-described problem and provides a dispensing device that is capable of appropriately avoiding sale of non-conforming items.

[0257] According to the present invention, provided is a dispensing device that includes:

an accommodation unit that accommodates tobacco commodities;

a dispensing unit that dispenses from the accommodation unit the tobacco commodity of the type corresponding to a dispensing order from among the tobacco commodities accommodated in the accommodation unit;

an acquisition unit that acquires non-conforming item information;

a reader unit that reads information from the tobacco commodities; and

a determination unit that compares the information read by the reader unit with the non-conforming item information and determines whether or not the tobacco commodity corresponding to the information that has been read is a non-conforming item, wherein the tobacco commodity that has been determined as the non-conforming item by the determination unit is excluded from items to be dispensed by the dispensing unit.

[0258] According to the present invention, a plurality of tobacco commodities can be accommodated in the accommodation unit and the tobacco commodity corresponding to a dispensing order can be automatically dispensed from among the tobacco commodities accommodated in the accommodation unit by the dispensing unit.

[0259] Meanwhile, by comparing the information read from the tobacco commodity with the non-conforming item information, it is determined whether or not the tobacco commodity is a non-conforming item and the tobacco commodity which is a non-conforming item is excluded from the target items to be dispensed by the dispensing unit, which makes it possible to appropriately avoid sale of non-conforming items.

[0260] Figs. 13 to 15 are schematic diagrams that illustrate the structure of the dispensing device 100 according to the fourth embodiment, where Fig. 13 is a front cross-sectional view, Fig. 14 is a cross-sectional plan view, and Fig. 15 is a side cross-sectional view. Fig. 13 is a cross-sectional view taken along the line I-I of Fig. 14 and Fig. 14 is a cross-sectional view taken along the line II-II of Fig. 13. Also, Fig. 15 corresponds to a cross-sectional view taken along the line III-III of Fig. 13 but Fig. 15 illustrates a state where the table-like section 51 of the conveying unit 50 extends vertically downward as illustrated in Fig. 18B.

[0261] In this embodiment, the left-right direction in Figs. 13 and 14 is referred to as an X-direction and the up-and-down direction (height direction) is referred to as a Z-direction. Also, the direction orthogonal to the X-direction and the Z-direction, in other words, the depth direction of the dispensing device 100 is referred to as a Y-direction.

[0262] Further, for the sake of simpler description of

the positional relationship between the respective constituent components, there are cases where the front, rear, left, and right directions are defined for the sake of convenience. Specifically, unless otherwise indicated, the right side in Fig. 13 is referred to as right, the left side as left, the proximal side as front, and the distal side as rear. However, the positional relationship indicated in each drawing may be described in some cases.

[0263] Figs. 16A and Fig. 16B are schematic diagrams for explanation of the moving mechanism that moves the conveying unit 50, where Fig. 16A is a front view and Fig. 16B is a cross-sectional view (cross-sectional plan view) taken along the line B-B of Fig. 16A.

[0264] Figs. 17A and 17B are schematic front cross-sectional views illustrating delivery (dispensing) operation of the tobacco commodity 40 from the conveying unit 50 to the take-out slope 92.

[0265] Figs. 18A and 18B are schematic front views for explanation of the delivery operation of the tobacco commodity 40d from the conveying unit 50 to non-conforming item reservoir tray 1400, the delivery operation being performed via the non-conforming item travel-down slope 142.

[0266] Fig. 19 is a diagram illustrating a state where the tobacco commodity 40 accommodated in the input column 15 is viewed from the left side via the transmissive partition wall 26. It should be noted that illustration of the partition wall 26 is not provided in Fig. 19.

[0267] Fig. 20 is a block diagram of the dispensing device 100 according to the fourth embodiment.

[0268] Fig. 21 is a schematic front cross-sectional view illustrating the dispensing device 100 in a state where the tobacco commodity 40d on the non-conforming item reservoir tray 1400 can be taken out from a housing 30.

[0269] In the explanations of this embodiment, redundant portions already appearing in the context of the above-described first embodiment are not repeated.

[0270] As illustrated in Figs. 13 and 14, the dispensing device 100 according to this embodiment includes an accommodation unit 10 configured to accommodate tobacco commodities 40 of multiple types; a dispensing unit (conveying unit 50) configured to dispense from the accommodation unit 10 the tobacco commodity 40 of the type corresponding to a dispensing order from among the tobacco commodities 40 accommodated in the accommodation unit 10; an acquisition unit 1300(Fig. 19) configured to acquire non-conforming item information; a reader unit (reading unit 121) configured to read information (for example, manufacturing information 49) from the tobacco commodity 40; and a determination unit (control unit 80 (Fig. 19)) configured to compare the information read by the reader unit with the non-conforming item information and determine whether or not the tobacco commodity 40 corresponding to the information that has been read is a non-conforming item. The dispensing device 100 excludes the tobacco commodity 40 that has been determined as the non-conforming item by the determination unit from items to be dispensed by the dispensing unit.

[0271] The information read by the reader unit (reading unit 121) for determination of whether or not the tobacco commodity 40 is a non-conforming item is, for example, manufacturing information 49 illustrated in Fig. 19. The manufacturing information 49 includes, for example, information for identifying the production line that manufactured the tobacco commodity 40, the manufacturing date, etc. and is indicated on the outer surface of the package of the tobacco commodity 40. The manufacturing information 49 is constituted by, for example, a plurality of characters (for example, 7 characters). The manufacturing information 49 is indicated, for example, on the second end surface 47.

[0272] The determination unit (control unit 80) compares the manufacturing information 49 read by the reading unit 121 with the non-conforming item information acquired by the acquisition unit 1300 and thereby determines whether or not the tobacco commodity 40 is a non-conforming item.

[0273] The non-conforming item refers to a tobacco commodity 40 that is not suitable for sale and typically is a defective item. Meanwhile, a tobacco commodity 40 past its expiration date or near the expiration date may be handled as a non-conforming item.

[0274] The tobacco commodity 40 which is a non-conforming item is to be conveyed to the non-conforming item reservoir tray 1400 which will be described later.

[0275] It should be noted that the following explanations may refer to the tobacco commodity 40 which is a non-conforming item simply as "tobacco commodity 40d".

[0276] Also, tobacco commodities 40 other than the non-conforming item may be referred to as "eligible item".

[0277] Also, on the outer surface of the package of the tobacco commodity 40, for example, as illustrated in Fig. 19, expiration date information 48 indicative of the expiration date of the tobacco commodity 40 is indicated. The expiration date information 48 is arranged, for example, on the second end surface 47 and on the upper side of the manufacturing information 49.

[0278] Further, on the outer surface of the tobacco commodity 40, type information 401 indicative of the type (brand) of the tobacco commodity 40 may be indicated.

[0279] The acquisition unit 1300 includes, for example, a communication function and acquires the non-conforming item information from an external device of the dispensing device 100 and notifies the control unit 80 of the acquired non-conforming item information. As an example, the acquisition unit 1300 acquires the non-conforming item information via the Internet.

[0280] In this manner, the acquisition unit 1300 acquires the non-conforming item information via a network.

[0281] The arrangement of the acquisition unit 1300 is not limited in particular but, for example, the acquisition unit 1300 may be provided on the outer surface of the housing 30 so that it is arranged in the vicinity of the

reader unit (reading unit 121) and the accommodation unit 10.

[0282] Typically, the non-conforming item information can be defined as information indicative of which tobacco commodity 40 manufactured by which production line and on which date is a non-conforming item.

[0283] Here, the dispensing device 100 in use is installed in a convenience store or any other store. Meanwhile, the external device may be provided outside the store or may be provided inside the store.

[0284] In the case of this embodiment, the accommodation unit 10 has, as illustrated in Fig. 14, one row of the accommodation columns 11. More specifically, the accommodation unit 10 includes, for example, four accommodation columns 11 (accommodation column 11a, 11b, 11c, 11d) aligned in the X-direction in one row.

[0285] In the case of this embodiment, the accommodation unit 10 is capable of accommodating a total of 80 tobacco commodities 40.

[0286] The leftmost partition wall 23 (partition wall 23a) among the five partition walls 23 standing upright from the support base 21 is positioned, for example, on the right side of the take-out slope 92.

[0287] Further, the dispensing device 100 includes a plate-like support base 22 provided on the partition wall 23a and a partition wall 26 standing upright from the support base 22.

[0288] The support base 22 is extended horizontally from the portion of the partition wall 23a that is higher than the slope sidewall 93 toward the left side and is positioned above the slope sidewall 93.

[0289] The partition wall 26 stands upright from the left end of the support base 22 so as to be opposed to the partition wall 23a in parallel therewith. The height dimension of the partition wall 26 is smaller than the height dimension of the partition walls 23, and the upper end position of the partition wall 26 is flush with the upper end position of the partition walls 23.

[0290] An input column 15 into which the tobacco commodities 40 are input is formed between the partition wall 23a and the partition wall 26. In the input column 15 as well, a plurality of tobacco commodities 40 can be accommodated in a vertically stacked state. Specifically, in the input column 15, multiple tobacco commodities 40 can be loaded on the support base 22.

[0291] Although the number of the tobacco commodities in the input column 15 is not limited in particular, it is 15, for example, in a case where the tobacco commodity 40 has standard dimensions.

[0292] The input column 15 is a dedicated space for temporarily accommodating the tobacco commodities 40 restocked by an operator. The dispensing of the tobacco commodity 40 by the conveying unit 50 is not performed via the input column 15.

[0293] The dimension of the internal space of the input column 15 in the X-direction, that is, the interval between the partition wall 23a and the partition wall 26 opposed to each other is specified to be larger than the longitudinal dimension of the standard tobacco commodity 40.

[0294] Also, the dimension in the Y-direction of the partition wall 26 (depth dimension) is specified, for example, to be larger than the width dimension of a standard tobacco commodity 40 (the length of the short side of the first main surface 42 and the second main surface 43, that is, the distance between the first side surface 44 and the second side surface 45).

[0295] As illustrated in Fig. 14, the accommodation unit 10 further includes a rear wall 24 standing upright from the support base 21 in a state where it is orthogonal to each partition wall 23 and the partition wall 26. The rear wall 24 has dimensions covering the entire region of the accommodation unit 10 in the X-direction and the Z-direction and closes the rear end of each accommodation column 11 and the input column 15.

[0296] Each accommodation column 11 and the input column 15 have an opened front side so that the tobacco commodity 40 can be taken out via the front side by the conveying unit 50.

[0297] Also, each accommodation column 11 and the input column 15 are open upward.

[0298] In the case of this embodiment, the spacer section 25 is also provided on the front surface of the rear wall 24 corresponding to the input column 15.

[0299] By virtue of this, the tobacco commodity 40 accommodated in the input column 15 is arranged to be spaced from the rear wall 24 by the thickness of the spacer section 25 and the tobacco commodity 40 can be readily held by and between a pair of arm units 54 of the conveying unit 50 which will be described later.

[0300] As mentioned above, the dispensing device 100 in use is installed in a convenience store or any other store. In a normal state, it is ensured that no clerk at the store or customer coming to the store is allowed to access the tobacco commodities 40 accommodated in the accommodation unit 10 inside the housing 30.

[0301] In the case of this embodiment, restocking of the accommodation unit 10 with the tobacco commodities 40 is manually performed by an operator (typically, a clerk).

[0302] More specifically, at least a portion of the housing 30 corresponding to the input column 15 defines an opening/closing section (opening/closing lid or opening/closing door) that is operable to be opened and closed. By opening the opening/closing section, the clerk can restock the input column 15 with the tobacco commodities 40.

[0303] In the case of this embodiment, the top plate section 32 defines the opening/closing lid. As illustrated in Fig. 13, one end of the top plate section 32 (for example, its right end) is connected by means of a hinge unit 37 to the upper end of the right side wall section 36 and the top plate section 32 is configured to be pivotable about the hinge unit 37 as a fulcrum. When the top plate section 32 is taken out of the state of Fig. 13 and opened about the hinge unit 37 as the fulcrum in a clockwise direction, the upper end of the housing 30 is opened so

that the input column 15 can be restocked with the tobacco commodities 40 from above the housing 30.

[0304] It should be noted that a not-shown key is preferably provided in the opening/closing section such that the opening/closing section is placed in a locked state where it cannot be opened.

[0305] The forward region of the accommodation unit 10(accommodation columns 11) and the input column 15 defines a movement area 10c in which the conveying unit 50 moves.

[0306] Here, it is assumed that the tobacco commodity 40 is to be accommodated (input) in the input column 15 by an operator such that the first main surface 42 of the tobacco commodity 40 is oriented upward, the second main surface 43 is oriented downward, the first side surface 44 is oriented toward the proximal side, the second side surface 45 is oriented toward the distal side, the first end surface 46 is oriented rightward, and the second end surface 47 is oriented leftward.

[0307] When the tobacco commodity 40 is input to the input column 15, the manufacturing information 49 is read by the reading unit 121 from the tobacco commodity 40 in the input column 15 while the barcode 41 is read by the barcode reader unit 57 from the tobacco commodity 40 in the input column 15 (details of the operation example will be described later).

[0308] Also, when reading of the manufacturing information 49 by the reading unit 121 and reading of the barcode 41 by the barcode reader unit 57 have been completed, the tobacco commodity 40 is conveyed by the conveying unit 50 from the input column 15 to the accommodation column 11.

[0309] Meanwhile, with regard to the tobacco commodity 40 (tobacco commodity 40d) that has been determined as a non-conforming item by comparison of the manufacturing information 49 with the non-conforming item information, at the stage where it has been revealed that the tobacco commodity 40 (tobacco commodity 40d) is a non-conforming item, the tobacco commodity 40 (tobacco commodity 40d) is to be conveyed by the conveying unit 50 to the non-conforming item reservoir tray 1400.

[0310] The tobacco commodities 40 are accommodated in each accommodation column 11 with the same orientation as that in the input column 15. Specifically, the tobacco commodity 40 is to be accommodated in each accommodation column 11 such that the first main surface 42 of the tobacco commodity 40 is oriented upward, the second main surface 43 is oriented downward, the first side surface 44 is oriented toward the proximal side, the second side surface 45 is oriented toward the distal side, the first end surface 46 is oriented rightward, and the second end surface 47 is oriented leftward.

[0311] In this manner, the tobacco commodities 40 are accommodated in the individual accommodation columns 11 and the input column 15 in such a manner that the first side surface 44 of each tobacco commodity 40 is oriented to the side of the movement area 10c.

[0312] As illustrated in Figs. 13 and 14, the reading unit 121 is arranged, for example, to the left of the input column 15 (to the left of the partition wall 26) and is movable upward and downward along the reading unit guide rail 124.

[0313] The reading unit guide rail 124 is fixed to the inner surface of the left side wall section 35 at the left of the input column 15 and extends in the Z-direction (up-and-down direction).

[0314] The reading unit 121 includes a moving mechanism (not shown) for raising and lowering the reading unit 121 along the reading unit guide rail 124, an elevating motor 125 (Fig. 20) which is an actuator of the moving mechanism, an imaging unit 123 for reading the manufacturing information 49 from the tobacco commodity 40 in the input column 15, and a light source 122 for illuminating the second end surface 47 of the tobacco commodity 40 in the input column 15.

[0315] The partition wall 26 arranged on the left side of the input column 15 is made from translucent material such as glass and the light source 122 and the imaging unit 123 are arranged so as to face the partition wall 26. That is, the light source 122 and the imaging unit 123 are oriented rightward.

[0316] When the light source 122 emits light, the light emitted from the light source 122 passes the partition wall 26 and illuminates the second end surface 47 of the tobacco commodity 40 in the input column 15.

[0317] Also, in a state where the second end surface 47 of the tobacco commodity 40 in the input column 15 is illuminated by the light source 122, the manufacturing information 49 indicated on the second end surface 47 is read (imaged) by the imaging unit 123.

[0318] For example, in the process of the reading unit 121 moving from the upper end to the lower end of the input column 15, the pieces of manufacturing information 49 of the individual tobacco commodities 40 accommodated in the input column 15 can be sequentially read (scanned). It should be noted that the direction of scanning of the manufacturing information 49 of the tobacco commodities 40 accommodated in the input column 15 is not limited to a top-to-bottom direction but may be a bottom-to-top direction.

[0319] The image of the manufacturing information 49 imaged by the imaging unit 123 is input to the control unit 80 and the content (character string) of the manufacturing information 49 is determined by the control unit 80 based on image authentication, and thus information indicative of this character string is obtained. In the following, the information on the character string that has been determined in this manner may be simply referred to as "manufacturing information 49".

[0320] It should be noted that, in this embodiment, an example is illustrated where the input column 15 accommodates a plurality of tobacco commodities 40 in a vertically stacked state, but the input column 15 may accommodate the tobacco commodities 40 in a vertical direction at intervals. In this case, input column 15 includes support sections (not shown) in multiple stages supporting the

individual tobacco commodity or commodities 40. The support sections are provided, for example, in pairs each including a right one and a left one and, for example, a pair of support sections are respectively provided on the partition walls 23a, 26 on both sides of the input column 15 so as to protrude in the input column 15. Alternatively, the support sections may be a plate-like partition bridging the two partition walls 23a, 26 on both sides of the input column 15.

[0321] It should be noted that the accommodation column 11 may also align and accommodate the tobacco commodities 40 in the vertical direction at intervals in the same manner as the input column 15.

[0322] In this manner, the dispensing device 100 includes the column (input column 15) that accommodates a plurality of tobacco commodities 40 in a vertically stacked state or in a vertical direction at intervals, and the reader unit (reading unit 121) reads the information (manufacturing information 49) indicated on the lateral surface (for example, second end surface 47) of the tobacco commodity 40 in the state where the tobacco commodity 40 is accommodated in the column.

[0323] Also, the reader unit (reading unit 121) is provided so as to be movable upward and downward at the side of the column (input column 15) and reads the information (manufacturing information 49) while moving upward or downward along the column.

[0324] Also, the dispensing device 100 includes the input section (input column 15) into which the tobacco commodity 40 is input and the accommodation mechanism (conveying unit 50) that conveys the tobacco commodity 40 from the input section and causes the tobacco commodity 40 to be accommodated in the accommodation unit 10. The reader unit (reading unit 121) reads the information (manufacturing information 49) from the tobacco commodity 40 prior to being accommodated in the accommodation unit 10.

[0325] Also, the conveying unit 50 has both the functionality as the dispensing unit and the functionality as the accommodation mechanism. Specifically, the dispensing unit also functions as the accommodation mechanism.

[0326] The conveying unit 50 is configured to be capable of selectively withdraw the tobacco commodity 40 accommodated in the input column 15 or the accommodation unit 10.

[0327] The conveying unit 50 includes a pair of (right and left) arm units 54 that selectively take out one tobacco commodity 40 from the input column 15 or the accommodation unit 10.

[0328] Also, the conveying unit 50 includes a rotation mechanism that rotates the table-like section 51 relative to the side wall section 53. The rotation mechanism is configured to include a table rotation motor 85 (Fig. 20) and a transmission mechanism that transmits the rotation of the motor shaft of the table rotation motor 85 to the table-like section 51 to rotate the table-like section 51 relative to the side wall section 53.

[0329] When the motor shaft of the table rotation motor 85 rotates in one direction, the table-like section 51 is rotated counterclockwise in Fig. 17A and the state where the table-like section 51 is inclined is entered as illustrated in Fig. 17B.

[0330] Also, when the motor shaft of the table rotation motor 85 further rotates in the one direction beyond the state of the table-like section 51 illustrated in Fig. 17B, the table-like section 51 is placed in a state where it extends vertically downward from the right side wall section 53 as illustrated in Fig. 18B.

[0331] Also, when the motor shaft of the table rotation motor 85 rotates in an inverse direction, then the table-like section 51 is rotated clockwise in Fig. 17B or 18B and the state of the table-like section 51 illustrated in Fig. 17A or 18A is restored.

[0332] The dispensing device 100 further includes a non-conforming item reservoir tray 1400 that accumulates the tobacco commodities 40d which is a non-conforming item. The non-conforming item reservoir tray 1400 is provided in the housing 30, for example, on the bottom plate section 31.

[0333] When it has been determined by the determination unit (control unit 80) that the tobacco commodity 40 is a non-conforming item, the conveying unit 50 conveys the tobacco commodity 40 (tobacco commodity 40d) to the non-conforming item reservoir tray 1400.

[0334] In this manner, the dispensing device 100 includes the housing 30 that accommodates the accommodation unit 10, the non-conforming item reservoir unit (non-conforming item reservoir tray 1400) arranged in the housing 30 and configured to accumulate the tobacco commodity 40d which is a non-conforming item as determined by the determination unit (control unit 80), and the conveyance mechanism (conveying unit 50) that conveys the tobacco commodity 40d which is a non-conforming item to the non-conforming item reservoir unit.

[0335] Also, the conveying unit 50 has both of the functionality as the dispensing unit and the functionality as the conveyance mechanism. Specifically, the dispensing unit also functions as the conveyance mechanism.

[0336] Here, the non-conforming item reservoir tray 1400 is arranged such that the movement area of the second ball screw 75 is avoided. More specifically, for example, as illustrated in Fig. 14, the non-conforming item reservoir tray 1400 is arranged to the right of the accommodation unit 10. Accordingly, the non-conforming item reservoir tray 1400 is arranged off the traffic line of the conveying unit 50.

[0337] Therefore, the dispensing device 100 includes a non-conforming item travel-down slope 142 that causes the tobacco commodity 40d discharged downward from the conveying unit 50 to go down toward the non-conforming item reservoir tray 1400 as illustrated in Figs. 18B and 15.

[0338] The non-conforming item travel-down slope 142 is provided, for example, as illustrated in Figs. 14 and 15, in front of the non-conforming item reservoir tray

1400, on the bottom plate section 31.

[0339] The upper surface of the non-conforming item travel-down slope 142 is inclined downward and rearward. As illustrated in Figs. 18B and 15, the tobacco commodity 40d that has been discharged downward from the conveying unit 50 goes down rearward along the upper surface of the non-conforming item travel-down slope 142 and is input to the non-conforming item reservoir tray 1400.

[0340] Here, the non-conforming item travel-down slope 142 has the split structure as will be described later to make it possible to avoid interference between the non-conforming item travel-down slope 142 and the second ball screw 75 and interference between the non-conforming item travel-down slope 142 and the lower-side second moving block 77.

[0341] Specifically, the non-conforming item travel-down slope 142 includes a first portion 142a arranged to the rear (on the side close to the non-conforming item reservoir tray 1400) and a second portion 142b arranged in front (on the side away from the non-conforming item reservoir tray 1400).

[0342] The upper surfaces of the first portion 142a and the second portion 142b are each inclined downward and rearward and these upper surfaces are arranged on the same plane.

[0343] The first portion 142a and the second portion 142b are spaced from each other in the front-rear direction and a slit 142c is formed between the first portion 142a and the second portion 142b.

[0344] As illustrated in Fig. 15, the lower portion of the second ball screw 75 and the second moving block 77 are movable in the X-direction through this slit 142c.

[0345] By virtue of this, as illustrated in Fig. 18B, the conveying unit 50 can be moved to the upper position of the non-conforming item travel-down slope 142.

[0346] It should be noted that a portion of the second guide rail 78 (right end) is arranged at the lower end of the slit 142c.

[0347] The dispensing device 100 further includes an opening/closing door 111 for taking out the tobacco commodity 40d from the non-conforming item reservoir tray 1400 to the outside of the housing 30 when removal of the tobacco commodity 40d which is a non-conforming item has been permitted.

[0348] For example, in the right side wall section 36, a non-conforming item take-out opening 95 extending through the inside and outside of the housing 30 is formed at the portion to the right of the non-conforming item reservoir tray 1400, and the opening/closing door 111 is provided on the side of the outer surface of the right side wall section 36. The opening/closing door 111 is movable between the position where it closes the non-conforming item take-out opening 95 (Fig. 13) and the position where the non-conforming item take-out opening 95 is opened (Fig. 21). Specifically, in normal cases, the opening/closing door 111 closes the non-conforming item take-out opening 95 as illustrated in Fig. 13. Meanwhile, when the removal of the tobacco commodity 40d has been permitted, then the opening/closing door 111 is raised to the position where the non-conforming item take-out opening 95 is opened as illustrated in Fig. 21.

[0349] The dispensing device 100 includes a door open/close motor 113 (Fig. 20) which is an actuator that raises and lowers the opening/closing door 111, and a transmission mechanism (not shown) that transmits the rotation of the door open/close motor 113 to the opening/closing door 111 to raise or lower the opening/closing door 111.

[0350] It should be noted that the dispensing device 100 includes a door guide 112 (Figs. 13, 14) that guides the opening/closing door 111 upward and downward on the outer surface side of the right side wall section 36.

[0351] In this manner, the dispensing device 100 is configured to be capable of taking out the tobacco commodity 40d in the non-conforming item reservoir unit (non-conforming item reservoir tray 1400) from the housing 30 when removal of the non-conforming item has been permitted.

[0352] As illustrated in Fig. 20, the dispensing device 100 includes a control unit 80 configured to comprehensively control the operation of the individual units of the dispensing device 100.

[0353] Specifically, the control unit 80 is configured to control the operations of the light source 122, the imaging unit 123, the elevating motor 125, the door open/close motor 113, the table rotation motor 85, the X-drive motor 82, the Z-drive motor 83, the barcode reader unit 57, the arm drive motors 86a, 86b, and the arm drive solenoids 87a, 87b.

[0354] The control unit 80 is configured to include a ROM 80b that stores control program, a CPU 80a that carries out the control operation in accordance with the control program, and a RAM 80c functioning as a work area for the CPU 80a or the like.

[0355] Although the arrangement of the control unit 80 is not in particular limited, the control unit 80 may be arranged, for example, inside the housing 30 so that it is arranged in the vicinity of the reader unit (reading unit 121) and the accommodation unit 10.

[0356] The non-conforming item information acquired by the acquisition unit 1300, the information (manufacturing information 49) read by the imaging unit 123, and the identification information read by the barcode reader unit 57 are input to the control unit 80. The CPU 80a performs processing of storing these pieces of information in the RAM 80c.

[0357] Next, the operation will be described.

[0358] First, the operation of dispensing the tobacco commodity 40 accumulated in the accommodation unit 10 will be described.

[0359] When the dispensing order is input from the dispensing order acquisition unit 81 to the control unit 80, the control unit 80 refers to the storage contents of the RAM 80c and determine whether or not the tobacco commodity 40 of the type (brand) corresponding to the dis-

pensing order is accommodated in the accommodation unit 10.

[0360] If it is not accommodated therein, then it is not possible to dispense the tobacco commodity 40 that corresponds to the dispensing order. In this case, the control unit 80 may provide a notification to the effect that the dispensing of the tobacco commodity 40 is not possible by using a not-shown notification unit.

[0361] If it is accommodated therein, then the control unit 80 reads the accommodation position information of the tobacco commodity 40 of the type that corresponds to the dispensing order. It should be noted that in a case where a plurality of tobacco commodities 40 of the type that corresponds to the dispensing order are accommodated in the accommodation unit 10, the control unit 80 reads the accommodation position information of the tobacco commodity 40 that was accommodated first (at the earliest timing) in the accommodation unit 10 among the tobacco commodities 40. Meanwhile, the expiration date information 48 of the tobacco commodity 40 may be read by the reading unit 121 and stored in the RAM 80c and the accommodation position information of the tobacco commodity 40 having the nearest expiration date (that is, the oldest one) may be read from among the tobacco commodities 40 of the type that corresponds to the dispensing order.

[0362] Further, the control unit 80 performs operation control on the X-drive motor 82 and the Z-drive motor 83 so as to move the conveying unit 50 toward the position corresponding to the accommodation position information that has been read.

[0363] It should be noted that, the tobacco commodity 40 of the type that corresponds to the dispensing order may be referred to as the tobacco commodity 40 to be dispensed.

[0364] The operation in the case where the tobacco commodity 40 to be dispensed is accommodated in the accommodation column 11d proceeds in the same manner as in the first embodiment, so that explanations thereof will not be repeated.

[0365] Next, the operation when the tobacco commodity 40 is input to the input column 15 will be described.

[0366] When the operator inputs the tobacco commodity 40 into the input column 15 and the top plate section 32 which is the opening/closing lid is closed, the control unit 80 recognizes the closure on the basis of the result of detection by the lid switch 84.

[0367] Then, the control unit 80 controls the elevating motor 125, the light source 122, and the imaging unit 123 and thereby the processing of reading the manufacturing information 49 from the second end surface 47 of each tobacco commodity 40 in the input column 15 is performed.

[0368] Also, the control unit 80 causes the RAM 80c to store the individual pieces of manufacturing information 49 that have been read. Here, the control unit 80 stores, for example, the individual pieces of the manufacturing information 49 and the position information of the reading unit 121 in the Z-direction at the time of reading the individual pieces of the manufacturing information 49 in association with each other.

[0369] Also, when the non-conforming item information is stored in advance in the RAM 80c, the control unit 80 compares the individual pieces of manufacturing information 49 with the non-conforming item information to determine whether or not a tobacco commodity 40d which is a non-conforming item exists among the tobacco commodities 40 input to the input column 15.

[0370] If a tobacco commodity 40d which is a non-conforming item exists among the tobacco commodities 40 input to the input column 15, then the control unit 80 performs operation control on the conveying unit 50 so as to convey the tobacco commodity 40d which is a non-conforming item from the input column 15 to the non-conforming item reservoir tray 1400.

[0371] Here, as described above, since the individual pieces of manufacturing information 49 and the position information in the Z-direction of the reading unit 121 at the time of reading of the individual pieces of manufacturing information 49 are stored in the RAM 80c in association with each other, the control unit 80 can recognize the position information in the Z-direction of the tobacco commodity 40d which is a non-conforming item. Hence, the control unit 80 can move the conveying unit 50 to the position in front of the tobacco commodity 40d which is a non-conforming item and perform the processing of causing the tobacco commodity 40d to be withdrawn by the conveying unit 50 from the input column 15.

[0372] The operation of withdrawing the tobacco commodity 40d from the input column 15 is the same as the operation of withdrawing the tobacco commodity 40 from the accommodation column 11, so that detailed explanations thereof will not be repeated.

[0373] By releasing the distal ends of the pair of arm units 54 after the tobacco commodity 40d has been withdrawn from the input column 15, the tobacco commodity 40d drops onto the table-like section 51 and a state is entered where the tobacco commodity 40d is supported by the table-like section 51.

[0374] Subsequently, the conveying unit 50 is moved to the position above the non-conforming item travel-down slope 142 as illustrated in Figs. 18A and 15.

[0375] Subsequently, as illustrated in Figs. 18B and 15, the table-like section 51 is rotated downward until the plate surface of the table-like section 51 becomes vertical, as a result of which the tobacco commodity 40d drops onto the non-conforming item travel-down slope 142.

[0376] The tobacco commodity 40d that has dropped onto the non-conforming item travel-down slope 142 goes down rearward along the upper surface of the non-conforming item travel-down slope 142 and is input to the non-conforming item reservoir tray 1400.

[0377] It should be noted that, if a plurality of the tobacco commodities 40d are included in the tobacco commodities 40 input to the input column 15, the conveying unit 50 is made to repeat the same operation.

[0378] As a result of this, a state is entered where the tobacco commodities 40 (tobacco commodity which are eligible items) other than the non-conforming item are accumulated in the input column 15.

[0379] Next, the processing is performed for reading again the manufacturing information 49 from the second end surface 47 of each tobacco commodity 40 remaining in the input column 15 for comparison that will be performed when a new piece of non-conforming item information is acquired later, and the control unit 80 causes the individual pieces of manufacturing information 49 that have been read to be stored in the RAM 80c. At this point as well, the control unit 80 stores the individual pieces of manufacturing information 49 and the position information of the reading unit 121 in the Z-direction at the time of reading the individual pieces of manufacturing information 49, where these pieces of information are stored in association with each other.

[0380] It should be noted that if no tobacco commodity 40d which is a non-conforming item was not included in the tobacco commodities 40 input to the input column 15, then the processing of reading again the manufacturing information 49 from the tobacco commodity 40 in the input column 15 may not be performed.

[0381] Also, the processing of reading again the manufacturing information 49 from the tobacco commodity 40 in the input column 15 may not be performed in a case where the arrangement of the tobacco commodities 40 remaining in the input column 15 does not change before and after the withdrawal of the tobacco commodity 40d which is a non-conforming item from the input column 15 such as a case where only the uppermost tobacco commodity 40 among the tobacco commodities 40 input to the input column 15 was a non-conforming item and a case where only the uppermost tobacco commodity 40 and one or more adjacent tobacco commodities 40 below the tobacco commodity 40 are non-conforming items.

[0382] Also, if the correspondence relationship between the individual pieces of manufacturing information 49 and the position information of the reading unit 121 in the Z-direction is corrected on the basis of the known thickness of the tobacco commodity 40, the processing of reading again the manufacturing information 49 from the tobacco commodity 40 in the input column 15 may not be performed.

[0383] Next, the processing of conveying the tobacco commodity 40 in the input column 15 to the empty space 61 of the accommodation unit 10 is performed.

[0384] First, the conveying unit 50 is moved to the position in front of any of the tobacco commodities 40 in the input column 15 (for example, the uppermost tobacco commodity 40 among the tobacco commodities 40 remaining in the input column 15).

[0385] Next, by causing the barcode reader unit 57 to read the barcode 41 of the tobacco commodity 40, the identification information is acquired, and the identification information is stored in the RAM 80c. Here, the control unit 80 stores the identification information in association with the position information of the conveying unit 50 in the Z-direction at the time of reading of the identification information.

[0386] Here, with regard to the individual tobacco commodities 40, the position information of the reading unit 121 in the Z-direction at the time of reading of the manufacturing information 49 and the position information in the Z-direction of the conveying unit 50 at the time of reading of the barcode 41 are the same as or equivalent to each other and they can be associated with each other.

[0387] Accordingly, with regard to the individual tobacco commodities 40, the identification information and the manufacturing information 49 are associated with each other to be stored in the RAM 80c.

[0388] Subsequently, the processing of withdrawing the tobacco commodity 40 from the input column 15 by the conveying unit 50 and the processing of conveying the tobacco commodity 40 to the empty space 61 of the accommodation unit 10 are performed.

[0389] First, the operation of withdrawing the tobacco commodity 40 from the input column 15 is the same as the operation of withdrawing the tobacco commodity 40 from the accommodation column 11, so that detailed explanation thereof will not be repeated.

[0390] Here, when the tobacco commodity 40 is conveyed from the input column 15 to the empty space 61, the tobacco commodity 40 is not temporarily placed on the table-like section 51 but the state where the tobacco commodity 40 is held by the pair of arm units 54 is maintained, and the conveying unit 50 is moved to the position in front of the empty space 61 so as to place the tobacco commodity 40 in the empty space 61.

[0391] When the tobacco commodity 40 is arranged in the empty space 61, first, in the state where the tobacco commodity 40 is held by the pair of arm units 54, the pair of arm units 54 are made to protrude rearward from the side wall section 53 and the pair of arm units 54 and the tobacco commodity 40 are inserted into the accommodation column 11. By virtue of this, the tobacco commodity 40 moves to the space above the tobacco commodity 40 residing below the empty space 61 or above the support base 21.

[0392] Next, by releasing the distal ends of the pair of arm units 54, the tobacco commodity 40 is placed on the tobacco commodity 40 positioned below the empty space 61 or the support base 21. Specifically, the tobacco commodity 40 is arranged in the empty space 61.

[0393] Here, the control unit 80 causes the RAM 80c to store the identification information and the manufacturing information 49 of each individual tobacco commodities 40 in association with the accommodation position information that differs depending on the individual tobacco commodities 40.

[0394] As described above, the accommodation position information is configured to includes, for example, the height position information and the horizontal position information.

[0395] The height position information may be Z-coor-

dinate information indicative of the coordinate in the height direction (that is, the Z-coordinate which is the coordinate in the Z-direction) and may be stage information indicative of the specific stage of the position in the accommodation column 11.

[0396] As the Z-coordinate information, for example, it is possible to use the Z-coordinate of the conveying unit 50 when the conveying unit 50 moved to the position in front of the empty space 61 in order to arrange the tobacco commodity 40 in the empty space 61 or the information indicative of the coordinate having predetermined correlation with this Z-coordinate.

[0397] Also, the horizontal position information may be column information indicative of which accommodation column 11 the tobacco commodity 40 is accommodated in but may also be information indicative of the coordinate of the tobacco commodity 40 in the horizontal direction. Specifically, the horizontal position information may be constituted by and include X-coordinate information indicative of the X-coordinate which is the coordinate of the tobacco commodity 40 in the X-direction.

[0398] As the horizontal position information, for example, it is possible to use the X-coordinate of the conveying unit 50 when the conveying unit 50 moved to the position in front of the empty space 61 in order to arrange the tobacco commodity 40 in the empty space 61 or the information indicative of the coordinate having predetermined correlation with this X-coordinate.

[0399] The operation of conveying the tobacco commodity 40 in the input column 15 to the empty space 61 is repeatedly performed as long as the empty space 61 exists.

[0400] In this manner, the tobacco commodities 40 which are eligible item among the tobacco commodities 40 input to the input column 15 are accommodated in the accommodation unit 10, and a state is entered where the identification information, the manufacturing information 49, and the accommodation position information are associated with each other and stored in the RAM 80c for each of the tobacco commodities 40 accommodated in the accommodation unit 10.

[0401] In this manner, a tobacco commodity 40 the identification information, the manufacturing information 49, and the accommodation position information of which are stored in the RAM 80c in association with each other, that is, the tobacco commodity 40 accommodated in the accommodation unit 10, becomes the tobacco commodity 40 to be dispensed.

[0402] It should be noted that if no more empty space 61 is remain at the stage where the tobacco commodity 40 remains in the input column 15, the conveyance of the tobacco commodity 40 from the input column 15 to the accommodation column 11 (empty space 61) is suspended.

[0403] After that, when an empty space 61 is created in the accommodation unit 10, the remaining operation of the conveyance of the tobacco commodity 40 from the input column 15 to the accommodation column 11 (empty space 61) is performed.

[0404] Also, the conveyance of the tobacco commodity 40 from the input column 15 to the empty space 61 may be performed preferentially for the brand whose number of remaining pieces (quantity of inventory) in the accommodation unit 10 is small. Specifically, the control unit 80 stores at any time the number of remaining pieces in the accommodation unit 10 for each brand in the RAM 80c and the control unit 80 causes the conveying unit 50 to perform the conveyance from the input column 15 to the empty space 61 preferentially for the brand having the smaller number of remaining pieces stored in the RAM 80c.

[0405] Also, the number of remaining pieces (hereinafter referred to as "restock threshold") with which the dispensing device 100 needs to be restocked may be specified for each brand. Specifically, the restock threshold for each brand is stored in the RAM 80c and the control unit 80 stores at any time the number of remaining pieces in the accommodation unit 10 for each brand in the RAM 80c. In addition, the control unit 80 causes the conveying unit 50 to perform the conveyance from the input column 15 to the empty space 61 preferentially for the brand whose number of remaining pieces in the accommodation unit 10 is near the restock threshold (the difference is small between the restock threshold and the number of remaining pieces) or the brand whose number of remaining pieces in the accommodation unit 10 is lower than the restock threshold on the basis of the restock threshold and the number of remaining pieces stored in the RAM 80c.

[0406] Further, for each brand, with regard to the non-conforming item, they are excluded from the number of remaining pieces. Specifically, the control unit 80 performs, for each brand, the processing of subtracting the number of the non-conforming items from the number of remaining pieces in the accommodation unit 10 (or the number of remaining pieces in the dispensing device 100 including the number of remaining pieces in the input column 15 and the number of remaining pieces in the accommodation unit 10).

[0407] Also, when the acquisition unit 1300 has acquired new non-conforming item information, the control unit 80 performs comparison between the manufacturing information 49 of all the tobacco commodities 40 of the accommodation unit 10 and the input column 15 and the new non-conforming item information and, if existence of a tobacco commodity 40d which is a non-conforming item has been newly revealed, the control unit 80 causes the conveying unit 50 to perform the operation of conveying this tobacco commodity 40d from the input column 15 or the accommodation unit 10 to the non-conforming item reservoir tray 1400.

[0408] Also, it is preferable that depending on the passage of time after the tobacco commodities 40 were input to the dispensing device 100, in a case where the expiration date of the tobacco commodity 40 in the dispensing device 100 has been reached or in a case where the

expiration date of the tobacco commodity 40 will be reached in no time, the tobacco commodity 40 is excluded from the target items to be dispensed. Specifically, the control unit 80 determines presence or absence of a tobacco commodity 40 past the expiration date or near the expiration date on the basis of the expiration date information 48 of the individual tobacco commodities 40 stored in the RAM 80c, and excludes the tobacco commodity 40 past the expiration date or near the expiration date from the target items to be dispensed. The control unit 80 causes the conveying unit 50 to perform the operation of conveying the tobacco commodity 40 past the expiration date or near the expiration date from the input column 15 or the accommodation unit 10 to the non-conforming item reservoir tray 1400.

[0409] Also, when removal of the tobacco commodity 40d which is a non-conforming item from the dispensing device 100 has been permitted, the opening/closing door 111 is raised as illustrated in Fig. 21 and the non-conforming item take-out opening 95 is opened. In this state, a person in charge of removal work of the non-conforming item can insert his/her hand via the non-conforming item take-out opening 95 into the housing 30 to grasp the tobacco commodity 40d on the non-conforming item reservoir tray 1400 and take out the tobacco commodity 40d from the housing 30.

[0410] It should be noted that, as the method for instructing the dispensing device 100 about permission of removal of the tobacco commodity 40d which is a non-conforming item, for example, a predetermined operation may be mentioned which a person in charge having specific authority performs on an operation unit provided on the outer surface of the housing 30 or on an operation tablet device or the like provided at a position away from the housing 30.

[0411] According to the fourth embodiment described above, the dispensing device 100 can accommodate tobacco commodities 40 in the accommodation unit 10 and automatically dispense the tobacco commodity 40 that corresponds to the dispensing order by the dispensing unit (conveying unit 50) from among the tobacco commodities 40 accommodated in the accommodation unit 10.

[0412] Meanwhile, by comparing the information read from the tobacco commodity 40 with the non-conforming item information, it is determined whether or not the tobacco commodity 40 is a non-conforming item and the tobacco commodity 40d which is a non-conforming item is excluded from the target items to be dispensed by the dispensing unit, which makes it possible to appropriately avoid sale of non-conforming items.

(Fifth Embodiment)

[0413] Next, the dispensing device 100 according to the fifth embodiment will be described with reference to Figs. 22 to 24.

[0414] Fig. 22 is a schematic cross-sectional plan view illustrating the structure of the dispensing device 100 according to the fifth embodiment.

[0415] Fig. 23 is a diagram illustrating a state where the dispensing device 100 according to the fifth embodiment is viewed in the direction indicated by the arrow A in Fig. 22.

[0416] Fig. 24 is a block diagram of the dispensing device 100 according to the fifth embodiment

[0417] The dispensing device 100 according to this embodiment differs from the dispensing device 100 according to the above-described fourth embodiment in the aspects described below and is configured in the same manner as the dispensing device 100 according to the above-described fourth embodiment in the remaining aspects.

[0418] Whilst explanations in the above-described fourth embodiment have been provided on the premise that the manufacturing information 49 is indicated on the second end surface 47 of the tobacco commodity 40, an example will be described in this embodiment where the manufacturing information 49 can be read even when the manufacturing information 49 is indicated on the second side surface 45 of the tobacco commodity 40.

[0419] As illustrated in Fig. 22 or 23, in the case of this embodiment, the dispensing device 100 includes a second reading unit 151 arranged in the rear of the input column 15 (rear wall 24) and a second reading unit guide rail 154.

[0420] The second reading unit guide rail 154 is fixed to the inner surface of the rear side wall section 34 in the rear of the input column 15 and extends in the Z-direction (up-and-down direction).

[0421] The second reading unit 151 is movable upward and downward along the second reading unit guide rail 154.

[0422] The second reading unit 151 includes a moving mechanism (not shown) for raising and lowering the second reading unit 151 along the second reading unit guide rail 154, a second elevating motor 155 (Fig. 24) which is an actuator of the moving mechanism, a second imaging unit 153 (Fig. 24) for reading the manufacturing information 49 from the second side surface 45 of the tobacco commodity 40 in the input column 15, and a second light source 152 (Fig. 24) for illuminating the second side surface 45 of the tobacco commodity 40 in the input column 15.

[0423] In the case of this embodiment, in the rear wall 24, at least the portion which closes the rear end of the input column 15 is made from translucent material such as glass and the second light source 152 and the second imaging unit 153 are arranged so as to face the rear wall 24. That is, the second light source 152 and the second imaging unit 153 are oriented frontward.

[0424] When the second light source 152 emits light, the light emitted from the second light source 152 passes the rear wall 24 and illuminates the second side surface 45 of the tobacco commodity 40 in the input column 15.

[0425] Also, in a state where the second side surface

45 of the tobacco commodity 40 in the input column 15 is illuminated by the second light source 152, the manufacturing information 49 indicated on the second side surface 45 is read (imaged) by the second imaging unit 153.

[0426] For example, in the process of the second reading unit 151 moving from the upper end to the lower end of the input column 15, the pieces of manufacturing information 49 of the individual tobacco commodities 40 accommodated in the input column 15 can be sequentially read (scanned) by the second reading unit 151. It should be noted that the direction of scanning of the manufacturing information 49 of the tobacco commodities 40 accommodated in the input column 15 by the second reading unit 151 is not limited to a top-to-bottom direction but may be a bottom-to-top direction.

[0427] The image of the manufacturing information 49 imaged by the second imaging unit 153 is input to the control unit 80 and the content (character string) of the manufacturing information 49 is determined by the control unit 80 based on image authentication, and thus information indicative of this character string is obtained. The information on the character string that has been determined in this manner may also be simply referred to as "manufacturing information 49".

[0428] Here, this embodiment assumes that the manufacturing information 49 is indicated on the second end surface 47 or the second side surface 45 and it is read by the reading unit 121 or the second reading unit 151.

[0429] The operation of reading (scanning) the manufacturing information 49 from the tobacco commodity 40 accommodated in the input column 15 by the reading unit 121 and the operation of reading (scanning) the manufacturing information 49 by the second reading unit 151 can be performed, for example, in parallel with each other. By this feature, it is made possible to shorten the time required in reading of the manufacturing information 49 from the tobacco commodity 40 to perform the reading in a shortened period of time.

[0430] In this manner, in the case of this embodiment, the dispensing device 100 includes the reader unit (reading unit 121) that reads the information (manufacturing information 49) indicated on the first lateral surface (second end surface 47) of the tobacco commodity 40 and the second reader unit (second reading unit 151) that reads the information (manufacturing information 49) indicated on the second lateral surface (second side surface 45) of the tobacco commodity 40 in the state where the tobacco commodity 40 is accommodated in the column (input column 15).

[0431] The first lateral surface (second end surface 47) and the second lateral surface (second side surface 45) are, for example, orthogonal to each other.

[0432] According to this embodiment, since the dispensing device 100 includes the reading unit 121 and the second reading unit 151, it is made possible to read the manufacturing information 49 even when the manufacturing information 49 is indicated on the second side surface 45 of the tobacco commodity 40.

[0433] As described above, the embodiments, which have been explained with reference to the drawings, are exemplifications of the present invention and other various features can be adopted.

[0434] In the foregoing, the example has been described where it is assumed that the restocking of the tobacco commodities 40 by the operator is performed such that the tobacco commodities 40 are neatly stacked but the present invention is not limited to this example.

[0435] For example, the dispensing device may include a hopper into which the tobacco commodity 40 is input and a conveyor configured to catch the tobacco commodities 40 sequentially moving downward from the hopper to convey them horizontally, and the reader unit may read the manufacturing information 49 from the tobacco commodity 40 on the one hand and the barcode reader unit reads the barcode 41 from the tobacco commodity 40 on the other hand in the process where the tobacco commodity 40 is conveyed by the conveyor.

[0436] Further, it is also preferable that the dispensing device includes an alignment mechanism configured to align the tobacco commodities 40 sequentially conveyed on the conveyor.

[0437] Further, it is also preferable that the dispensing device includes an accommodation mechanism configured to sequentially pick up the tobacco commodities 40 aligned on the conveyor to convey them toward the accommodation unit 10 and cause the accommodation unit 10 to accommodate them.

[0438] Also, in the foregoing, the example has been described where the barcode 41 and the manufacturing information 49 are indicated on two different surfaces of the tobacco commodity 40, respectively, but the barcode 41 and the manufacturing information 49 may be indicated on the same surface of the tobacco commodity 40. In this case, for example, a structure may be adopted in which the light source 122 and the imaging unit 123 are provided on the rear surface side of the ceiling section 52 or the table-like section 51 of the conveying unit 50. Specifically, it is possible to adopt a structure in which the conveying unit 50 includes the reader unit.

[0439] Also, in the foregoing, the example has been described where reading of the manufacturing information 49 from the tobacco commodity 40 is performed before the tobacco commodity 40 is accommodated in the accommodation unit 10, but reading of the manufacturing information 49 from the tobacco commodity 40 may be performed in a state where the tobacco commodity 40 has been accommodated in the accommodation unit 10.

[0440] Also, at the time of dispensing of the tobacco commodity 40 from the dispensing device 100, the manufacturing information 49 may be read from this tobacco commodity 40 to determine whether or not this tobacco commodity 40 is a non-conforming item, and, if it is a non-conforming item, then dispensing of this tobacco commodity 40 may not be performed.

[0441] In this case, if a tobacco commodity 40 of the same type other than the determined non-conforming

item exists in the accommodation unit 10, dispensing of the tobacco commodity 40 is performed.

[0442] Also, in the foregoing, the example has been described where the dispensing device 100 includes the non-conforming item reservoir tray 1400 which is a dedicated space for accumulating the tobacco commodity 40d which is a non-conforming item, but the non-conforming item may also be accommodated in the accommodation unit 10. In this case, the dispensing device 100 stores the accommodation position information of the tobacco commodity 40d which is a non-conforming item in the accommodation unit 10 and does not perform the dispensing of the non-conforming item from the accommodation unit 10 at the time of sale.

[0443] Also, in this case, it is preferable to perform processing of dispensing non-conforming items in the dispensing device 100 all at once (consecutively) by the conveying unit 50 to the take-out saucer 91 when removal of the tobacco commodity 40d which is a non-conforming item from the dispensing device 100 has been permitted.

[0444] Also, in the foregoing, the example has been described where the acquisition unit 1300 that acquires the non-conforming item information and the determination unit that determines whether or not the tobacco commodity 40 is a non-conforming item are arranged in the vicinity of the reader unit (reading unit 121) and the accommodation unit 10.

[0445] Meanwhile, the present invention is not limited to this example and the acquisition unit 1300 and the determination unit may be arranged to be remote from the reader unit (reading unit 121) and the accommodation unit 10. In this case, the information (manufacturing information 49) that has been read by the reader unit is transmitted via a network to the determination unit and compared with the non-conforming item information by the determination unit. Also, a command is transmitted from the determination unit via a network to the control unit 80 so that the tobacco commodity 40d that has been determined as a non-conforming item by the determination unit is not performed, and the control unit 80 ensures that the dispensing of the tobacco commodity 40d is not performed.

[0446] Also, in the foregoing, the example has been described where the manufacturing information 49 is constituted by a plurality of characters but the present invention is not limited to this example.

[0447] For example, the individual tobacco commodities 40 may have an IC tag storing the manufacturing information 49. In this case, the reader unit that reads the information (manufacturing information 49) from the tobacco commodity 40 is configured to include an IC tag reader.

[0448] Also, manufacturing information 49 may be a two-dimensional barcode. In this case, the reader unit that reads the information (manufacturing information 49) from the tobacco commodity 40 is configured to include a two-dimensional barcode reader.

[0449] Also, in the foregoing, the example has been described where the input column 15 out of the accommodation columns 11 and the input column 15 is arranged at the position closest to the take-out slope 92, the take-out opening 94, and the take-out saucer 91 but it is also preferable that the input column 15 is arranged at a position farthest from the take-out slope 92, the take-out opening 94, and the take-out saucer 91.

[0450] Since the accommodation column 11 from which the accommodated tobacco commodity 40 is to be dispensed is arranged closer to the take-out slope 92, the take-out opening 94, and the take-out saucer 91 than the input column 15, the time required in dispensing of the tobacco commodity 40 can be shortened.

[0451] Also, while the example has been described in the foregoing where the barcode 41 is checked immediately before the tobacco commodity 40 to be dispensed is taken out from the accommodation column 11, the confirmation of the barcode 41 at this phase may not be performed.

[0452] In the foregoing, the example has been described, where the conveying unit 50 holds the tobacco commodity 40 between the pair of arm units 54 arranged to be spaced apart from each other in the horizontal direction and thereby withdraws the tobacco commodity 40 from the accommodation column 11, but the structure of the arm is not limited to this example. For example, the tobacco commodity 40 may be held from above and below by a pair of arms arranged in the vertical direction to be spaced from each other.

[0453] Also, combinations of the above-described embodiments can be freely performed.

[0454] This embodiment encompasses the following technical ideas.

(1) A dispensing device comprising:

an accommodation unit that accommodates tobacco commodities of multiple types in a mixed state;
a dispensing unit that dispenses from the accommodation unit the tobacco commodity of the type corresponding to a dispensing order;
a storage unit that stores the number of accommodated pieces for each type regarding the tobacco commodities accommodated in the accommodation unit; and
a notification unit that notifies the type of the tobacco commodity to be restocked in accordance with the number of remaining pieces for each type of the tobacco commodities accommodated in the accommodation unit.

(2) The dispensing device according to (1), comprising a reader unit that reads identification information from each of the tobacco commodities, wherein
the dispensing device recognizes the types of the tobacco commodities on the basis of the identification information read by the reader unit.

(3) The dispensing device according to (1) or (2), wherein when the number of remaining pieces of the tobacco commodities of one type accommodated in the accommodation unit reaches a predetermined number, the notification unit notifies the fact that a tobacco commodity of the one type should be restocked.

(4) The dispensing device according to (3), wherein the predetermined number is specified for each of the types of the tobacco commodities.

(5) The dispensing device according to (1) or (2), comprising a management unit that manages sales information for each type of the tobacco commodities, wherein

the notification unit performs notification of the type of the tobacco commodity to be restocked on the basis of the sales information.

(6) The dispensing device according to (5), wherein the management unit generates the sales information on the basis of the number of dispensed pieces of the tobacco commodities dispensed by the dispensing unit.

(7) The dispensing device according to any one of (1) to (5), wherein the notification unit notifies the number of the tobacco commodities to be restocked.

(8) The dispensing device according to any one of (1) to (7), comprising:

an acquisition unit that acquires non-conforming item information;

a reader unit that reads information from the tobacco commodity; and

a determination unit that compares the information read by the reader unit with the non-conforming item information and determines whether or not the tobacco commodity corresponding to the information that has been read is a non-conforming item, wherein

the tobacco commodity that has been determined as the non-conforming item by the determination unit is excluded from items to be dispensed by the dispensing unit.

(9) The dispensing device according to (8), comprising:

a housing in which the accommodation unit is accommodated;

a non-conforming item reservoir unit that is disposed in the housing and accumulates the tobacco commodity determined as the non-conforming item by the determination unit; and

a conveyance mechanism that conveys the tobacco commodity which is the non-conforming item to the non-conforming item reservoir unit.

(10) The dispensing device according to (9), wherein the dispensing device is configured such that the tobacco commodity in the non-conforming item reservoir unit is allowed to be taken out of the housing when removal of the non-conforming item is permitted.

(11) The dispensing device according to (9) or (10), wherein the dispensing unit also functions as the conveyance mechanism.

(12) The dispensing device according to any one of (8) to (11), comprising:

a column for accommodating a plurality of the tobacco commodities in a vertically stacked state or in a state arranged in a vertical direction at intervals, wherein

the reader unit reads the information indicated on a lateral surface of the tobacco commodity in a state where the tobacco commodity is accommodated in the column.

(13) The dispensing device according to (12), wherein the reader unit is provided to be movable upward and downward at the side of the column and

reads the information while moving upward or downward along the column.

(14) The dispensing device according to any one of (8) to (13), comprising:

an input section into which the tobacco commodity is input; and

an accommodation mechanism which conveys the tobacco commodity from the input section and causes the tobacco commodity to be accommodated in the accommodation unit, wherein

the reader unit reads the information from the tobacco commodity prior to being accommodated in the accommodation unit.

(15) The dispensing device according to any one of (8) to (14), wherein the acquisition unit acquires the non-conforming item information via a network.

[0455] This embodiment further encompasses the following technical ideas.

<1> A dispensing device comprising:

an accommodation unit that accommodates a plurality of tobacco commodities;

a dispensing unit that dispenses the tobacco commodity corresponding to a dispensing order from among the tobacco commodities accommodated in the accommodation unit;

an acquisition unit that acquires non-conforming item information;

a reader unit that reads information from the tobacco commodity; and

a determination unit that compares the informa-

tion read by the reader unit with the non-conforming item information and determines whether or not the tobacco commodity corresponding to the information that has been read is a non-conforming item, wherein
the tobacco commodity that has been determined as the non-conforming item by the determination unit is excluded from items to be dispensed by the dispensing unit.

<2> The dispensing device according to <1>, comprising:

a housing in which the accommodation unit is accommodated;
a non-conforming item reservoir unit that is disposed in the housing and accumulates the tobacco commodity determined as the non-conforming item by the determination unit; and
a conveyance mechanism that conveys the tobacco commodity which is the non-conforming item to the non-conforming item reservoir unit.

<3> The dispensing device according to <2>, wherein the dispensing device is configured such that the tobacco commodity in the non-conforming item reservoir unit is allowed to be taken out of the housing when removal of the non-conforming item is permitted.
<4> The dispensing device according to <2> or <3>, wherein the dispensing unit also functions as the conveyance mechanism.
<5> The dispensing device according to any one of <1> to <5>, comprising:

a column for accommodating a plurality of the tobacco commodities in a vertically stacked state or in a state arranged in a vertical direction at intervals, wherein
the reader unit reads the information indicated on a lateral surface of the tobacco commodity in a state where the tobacco commodity is accommodated in the column.

<6> The dispensing device according to <5>, wherein the reader unit is provided to be movable upward and downward at the side of the column and reads the information while moving upward or downward along the column.
<7> The dispensing device according to any one of <1> to <6>, comprising:

an input section into which the tobacco commodity is input; and
an accommodation mechanism which conveys the tobacco commodity from the input section and causes the tobacco commodity to be accommodated in the accommodation unit, wherein
the reader unit reads the information from the tobacco commodity prior to being accommodated in the accommodation unit.

<8> The dispensing device according to <7>, wherein the dispensing unit also functions as the accommodation mechanism.
<9> The dispensing device according to any one of <1> to <8>, wherein the acquisition unit acquires the non-conforming item information via a network.

[0456] This application claims priority based on Japanese Patent Application No. 2016-198999 and Japanese Patent Application No. 2016-199000 which were filed on October 7, 2016, the disclosure of which is incorporated herein in its entirety.

(Reference Signs List)

[0457]

10: accommodation unit
10c: movement area
11, 11a, 11b, 11c, 11d, 11e: accommodation column
21: support base
22: support base
23, 23a, 23b: partition wall
24: rear wall
25: spacer section
30: housing
31: bottom plate section
32: top plate section
33: front side wall section
34: rear side wall section
35: left side wall section
36: right side wall section
37: hinge unit
40: tobacco commodity
41: barcode (identification information)
42: first main surface
43: second main surface
44: first side surface
45: second side surface
46: first end surface
47: second end surface
50: conveying unit (dispensing unit, conveyance mechanism, accommodation mechanism)
51: table-like section
52: ceiling section
53: side wall section
54: arm unit
56: Z-direction moving unit
57: barcode reader unit
58: hinge unit
61: empty space
71: first ball screw
72: first rotation unit

73: first moving block
74: first guide rail
75: second ball screw
76: second rotation unit
77: second moving block
78: second guide rail
80: control unit
80a: CPU
80b: ROM
80c: RAM
81: dispensing order acquisition unit
82: X-drive motor
83: Z-drive motor
84: lid switch
85: table rotation motor
86a, 86b: arm drive motor
87a, 87b: arm drive solenoid
91: take-out saucer
92: take-out slope
93: slope sidewall
94: take-out opening
95: non-conforming item take-out opening
100: dispensing device
120: display unit
130: speaker
140: sales information acquisition unit
200: server
300: network
410: store A
420: store B
15: input column (column, input section)
26: partition wall
40d: tobacco commodity (non-conforming item)
48: expiration date information
49: manufacturing information (information)
401: type information
111: opening/closing door
112: door guide
113: door open/close motor
121: reading unit (reader unit)
122: light source
123: imaging unit
124: reading unit guide rail
125: elevating motor
1300: acquisition unit
1400: non-conforming item reservoir tray (non-conforming item reservoir unit)
142: non-conforming item travel-down slope
142a: first portion
142b: second portion
142c: slit
151: second reading unit
152: second light source
153: second imaging unit
154: second reading unit guide rail
155: second elevating motor

Claims

1. A dispensing device comprising:

   an accommodation unit that accommodates tobacco commodities of multiple types in a mixed state;
   a dispensing unit that dispenses from the accommodation unit the tobacco commodity of the type corresponding to a dispensing order;
   a storage unit that stores the number of accommodated pieces for each type regarding the tobacco commodities accommodated in the accommodation unit; and
   a notification unit that notifies the type of the tobacco commodity to be restocked in accordance with the number of remaining pieces for each type of the tobacco commodities accommodated in the accommodation unit.

2. The dispensing device according to claim 1, comprising:

   a reader unit that reads identification information from each of the tobacco commodities, wherein the dispensing device recognizes the types of the tobacco commodities on the basis of the identification information read by the reader unit.

3. The dispensing device according to claim 1 or 2, wherein when the number of remaining pieces of the tobacco commodities of one type accommodated in the accommodation unit reaches a predetermined number, the notification unit notifies the fact that a tobacco commodity of the one type should be restocked.

4. The dispensing device according to claim 3, wherein the predetermined number is specified for each of the types of the tobacco commodities.

5. The dispensing device according to claim 1 or 2, comprising a management unit that manages sales information for each type of the tobacco commodities, wherein
   the notification unit performs notification of the type of the tobacco commodity to be restocked on the basis of the sales information.

6. The dispensing device according to claim 5, wherein the management unit generates the sales information on the basis of the number of dispensed pieces of the tobacco commodities dispensed by the dispensing unit.

7. The dispensing device according to any one of claims 1 to 5, wherein the notification unit notifies the number of the tobacco commodities to be re-

stocked.

8. The dispensing device according to any one of claims 1 to 7, comprising:

an acquisition unit that acquires non-conforming item information;
a reader unit that reads information from the tobacco commodity; and
a determination unit that compares the information read by the reader unit with the non-conforming item information and determines whether or not the tobacco commodity corresponding to the information that has been read is a non-conforming item, wherein
the tobacco commodity that has been determined as the non-conforming item by the determination unit is excluded from items to be dispensed by the dispensing unit.

9. The dispensing device according to claim 8, comprising:

a housing in which the accommodation unit is accommodated;
a non-conforming item reservoir unit that is disposed in the housing and accumulates the tobacco commodity determined as the non-conforming item by the determination unit; and
a conveyance mechanism that conveys the tobacco commodity which is the non-conforming item to the non-conforming item reservoir unit.

10. The dispensing device according to claim 9, wherein the dispensing device is configured such that the tobacco commodity in the non-conforming item reservoir unit is allowed to be taken out of the housing when removal of the non-conforming item is permitted.

11. The dispensing device according to claim 9 or 10, wherein the dispensing unit also functions as the conveyance mechanism.

12. The dispensing device according to any one of claims 8 to 11, comprising a column for accommodating a plurality of the tobacco commodities in a vertically stacked state or in a state arranged in a vertical direction at intervals, wherein
the reader unit reads the information indicated on a lateral surface of the tobacco commodity in a state where the tobacco commodity is accommodated in the column.

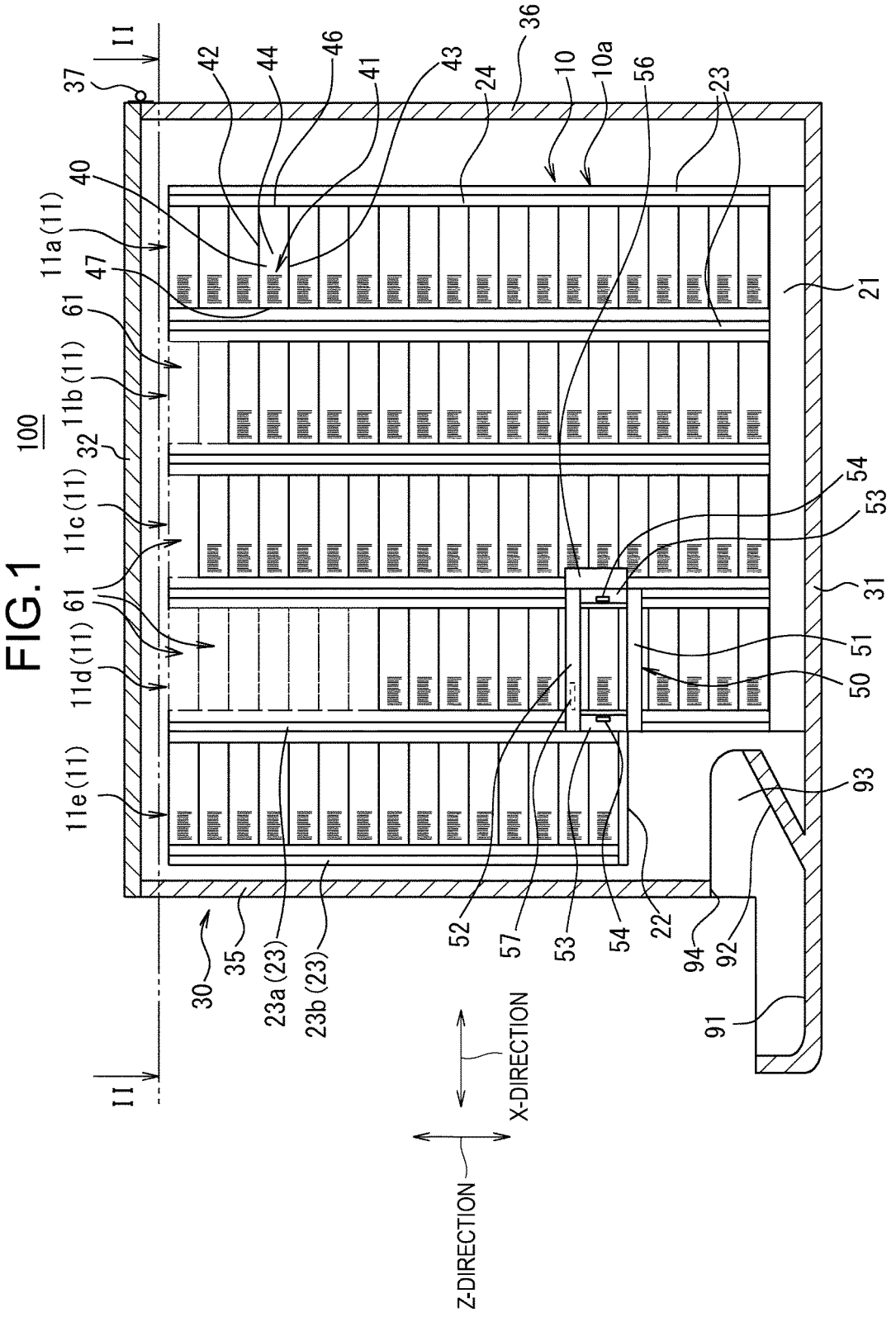
13. The dispensing device according to claim 12, wherein
the reader unit is provided to be movable upward and downward at the side of the column and reads the information while moving upward or downward along the column.

14. The dispensing device according to any one of claims 8 to 13, comprising:

an input section into which the tobacco commodity is input; and
an accommodation mechanism which conveys the tobacco commodity from the input section and causes the tobacco commodity to be accommodated in the accommodation unit, wherein
the reader unit reads the information from the tobacco commodity prior to being accommodated in the accommodation unit.

15. The dispensing device according to any one of claims 8 to 14, wherein the acquisition unit acquires the non-conforming item information via a network.

FIG.1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44
46
41
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10a
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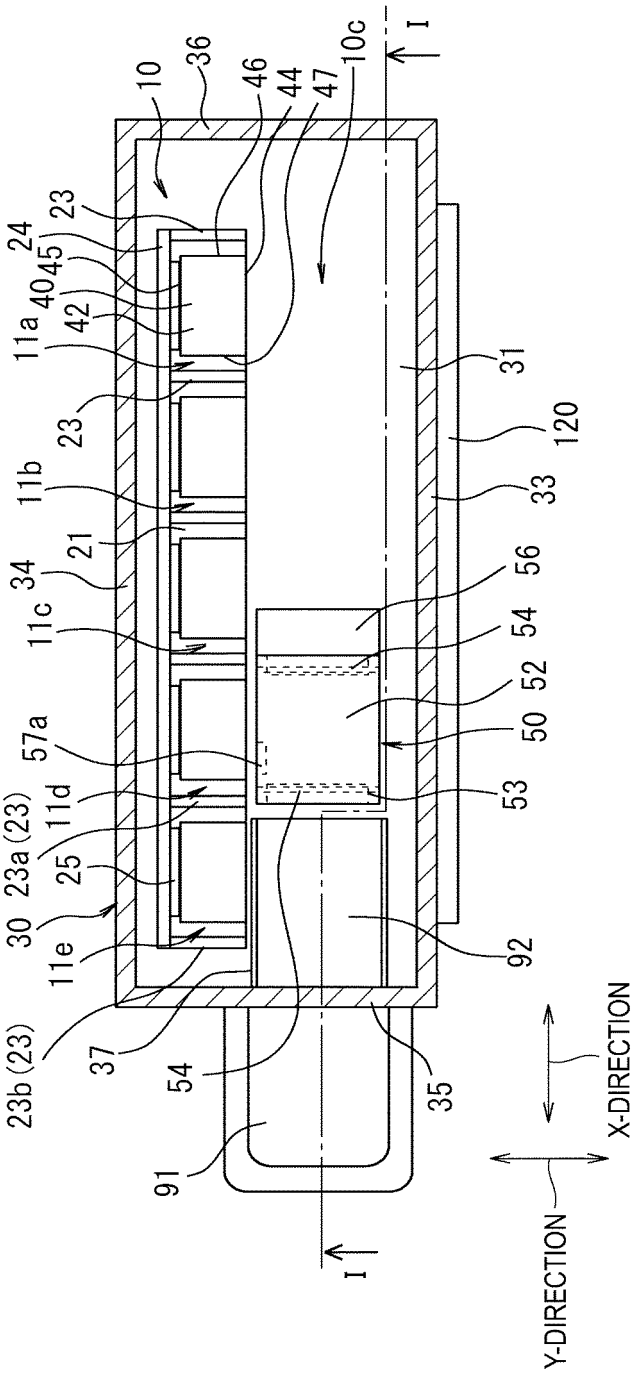
47
61
11b(11)
32
11c(11)
61
11d(11)
11e(11)
21
54
53
31
51
50
93
30
35
23a(23)
23b(23)
52
57
53
54
22
94
92
91
X-DIRECTION
Z-DIRECTION

FIG.2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11b
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23a (23)
25
30
11e
23b (23)
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31
X-DIRECTION
Y-DIRECTION

FIG.3A

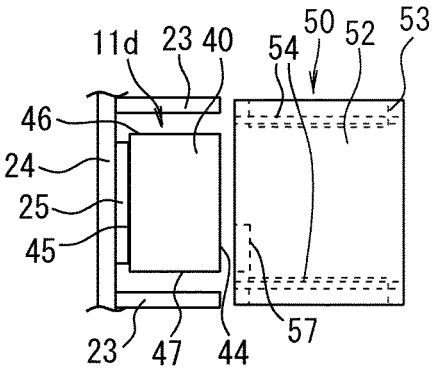


FIG.3B

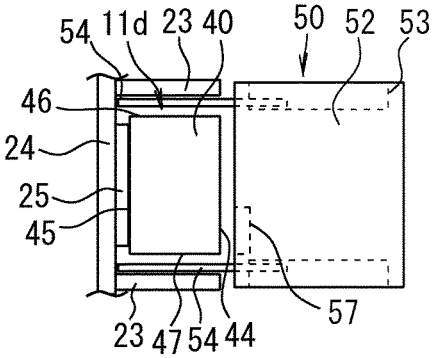


FIG.3C

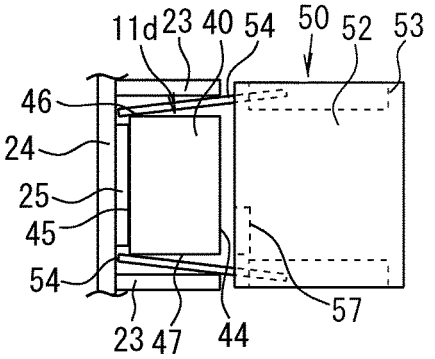


FIG.3D

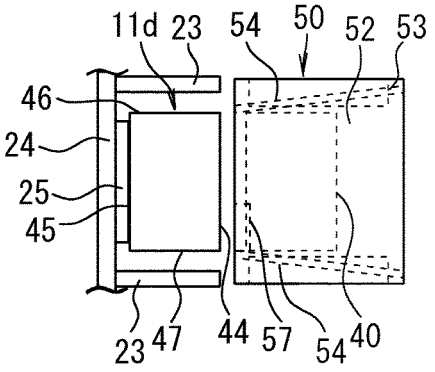


FIG.4A

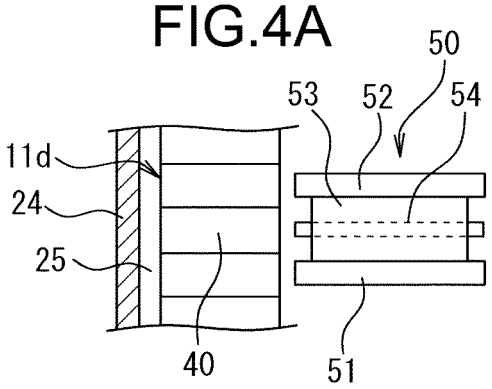


FIG.4B

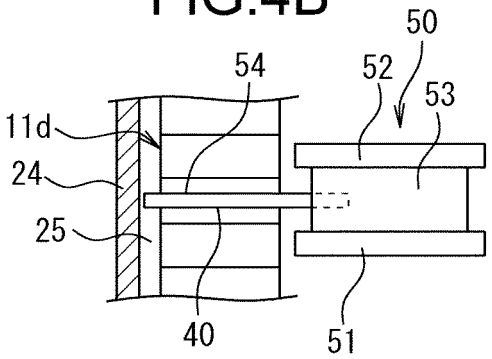


FIG.4C

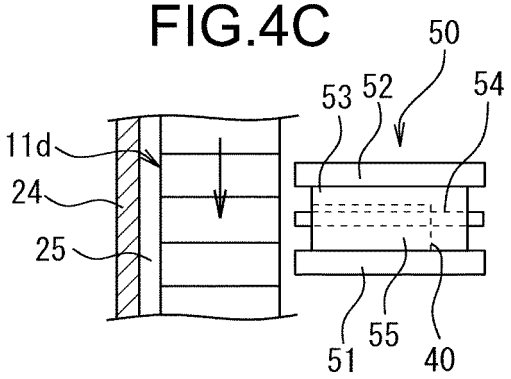
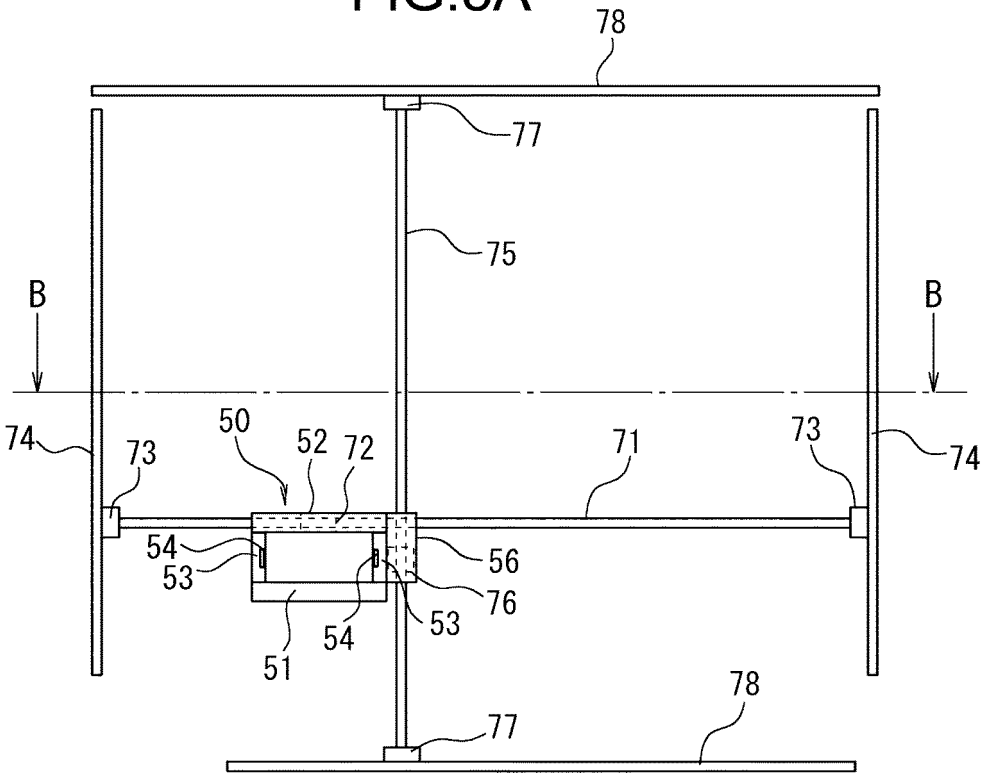


FIG.5A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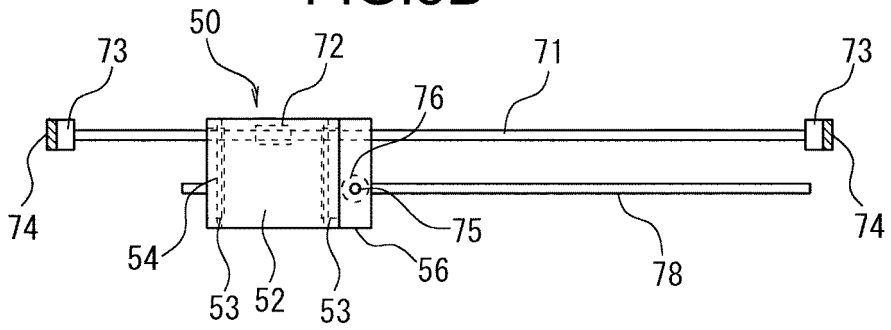
77

FIG.5B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53

FIG.6A

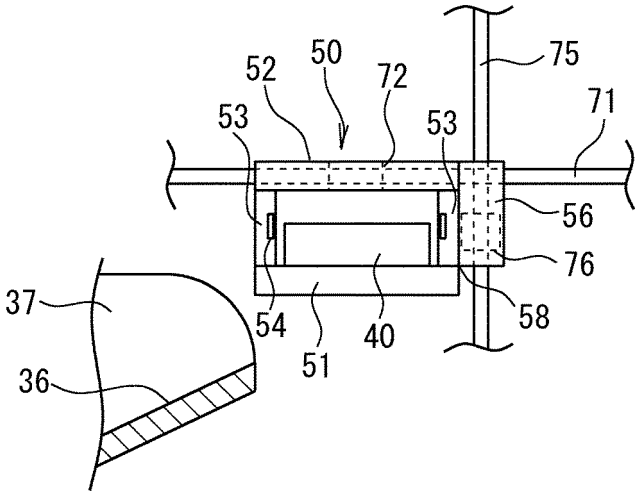
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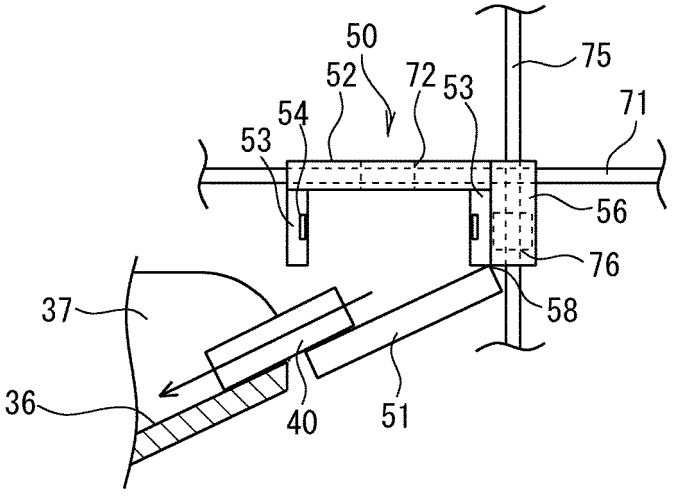
FIG.6B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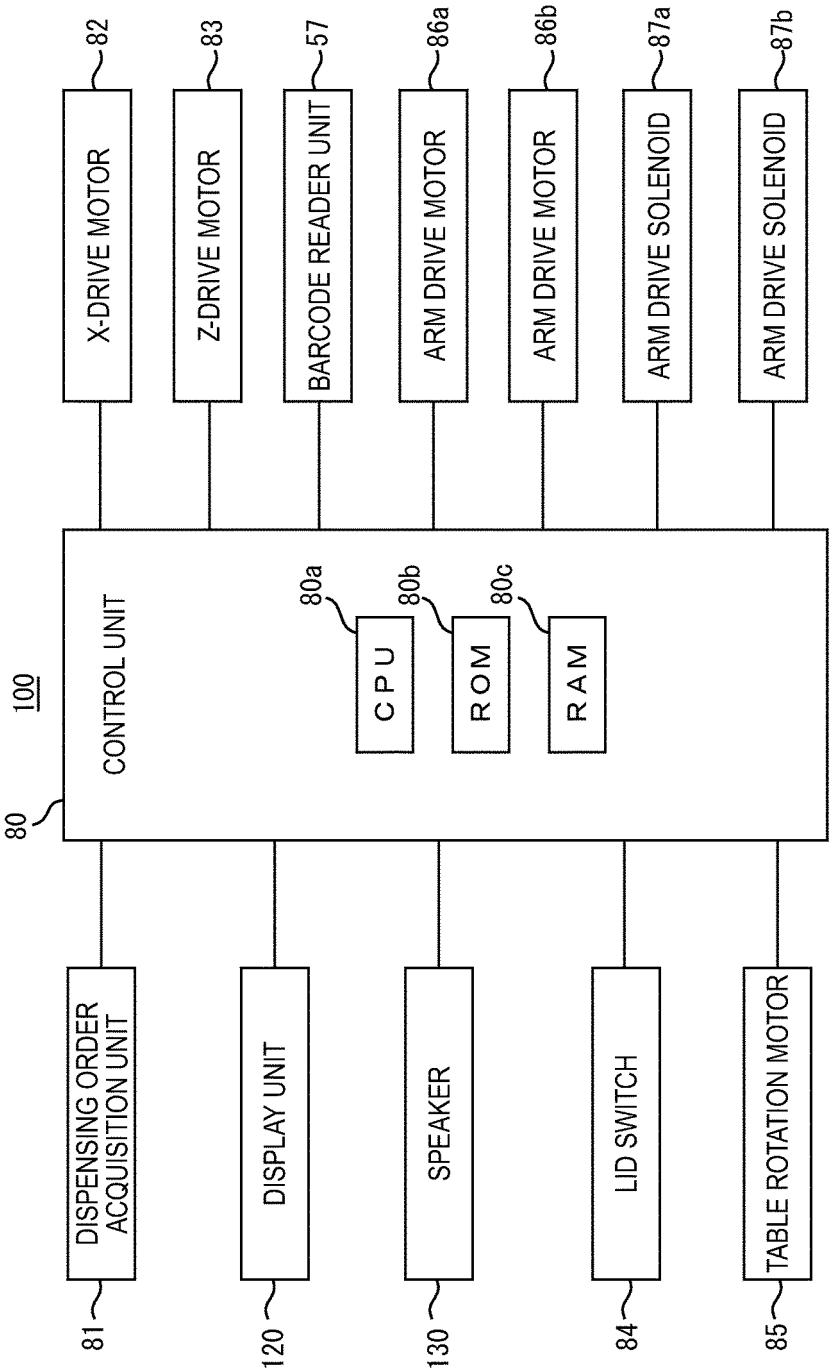
76
37
58
36
40
51

FIG.7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CONTROL UNIT
80a
CPU
80b
ROM
80c
RAM
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X-DRIVE MOTOR
83
Z-DRIVE MOTOR
57
BARCODE READER UNIT
86a
ARM DRIVE MOTOR
86b
ARM DRIVE MOTOR
87a
ARM DRIVE SOLENOID
87b
ARM DRIVE SOLENOID
81
DISPENSING ORDER ACQUISITION UNIT
120
DISPLAY UNIT
130
SPEAKER
84
LID SWITCH
85
TABLE ROTATION MOTOR

FIG.8

TYPE OF TOBACCO COMMODITIES	RESTOCK THRESHOLD	NUMBER OF PIECES RESTOCKED AT ONE TIME
TOBACCO A	5	10
TOBACCO B	2	5
TOBACCO C	0	2
⋮	⋮	⋮

FIG.9

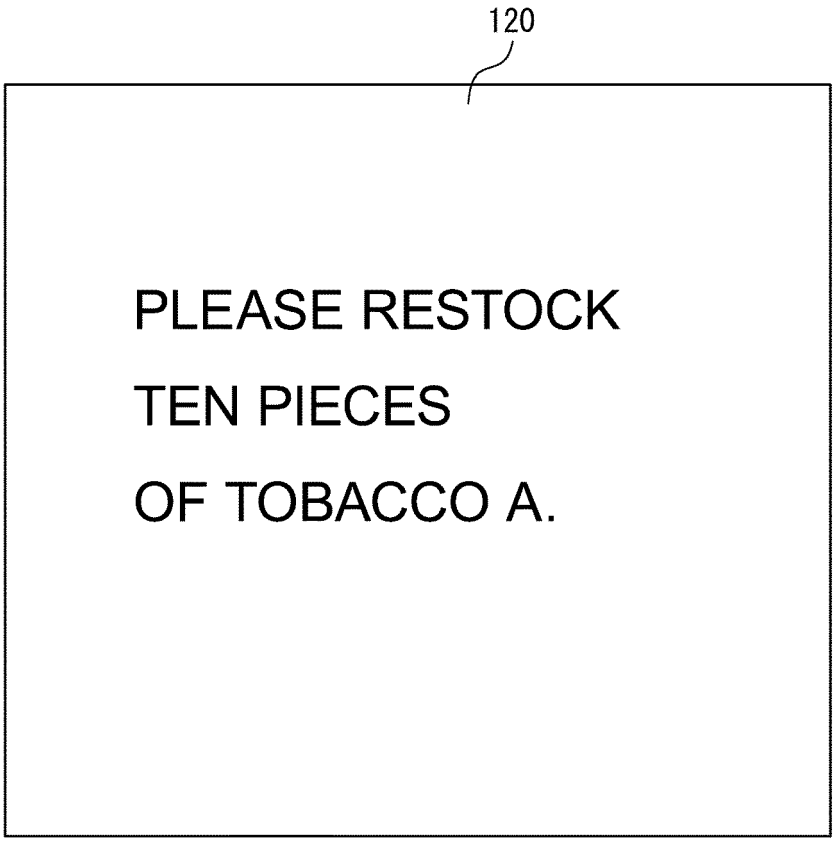


FIG.10

TYPE OF TOBACCO COMMODITIES	AVERAGE INCREASE IN SALES IN PAST TWO DAYS	INCREMENT OF RESTOCK THRESHOLD	INCREMENT OF NUMBER OF PIECES RESTOCKED AT ONE TIME
TOBACCO A	5	5	5
TOBACCO B	1	1	2
TOBACCO C	-1	—	—
. . .	. . .	. . .	. . .

FIG.11

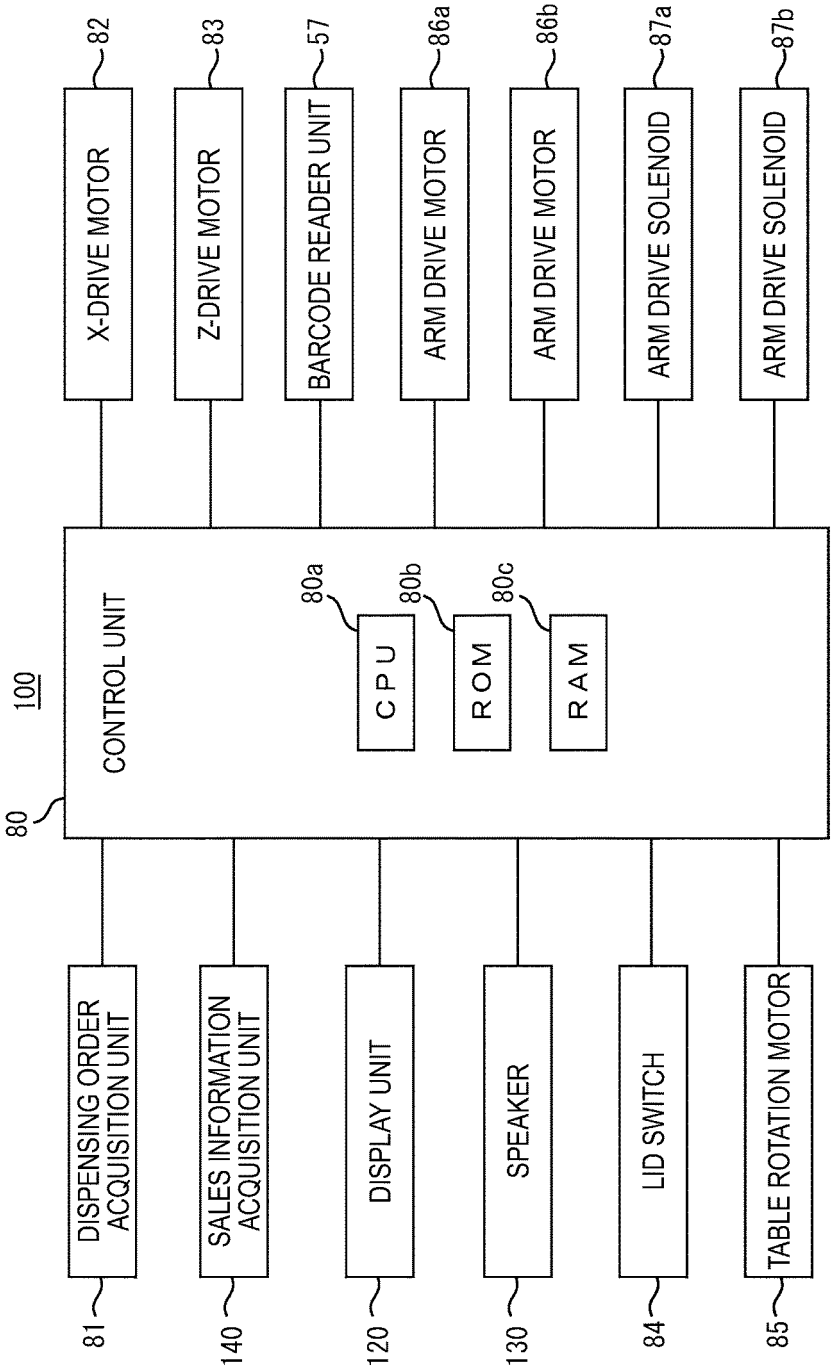

100
80
CONTROL UNIT
80a
CPU
80b
ROM
80c
RAM
X-DRIVE MOTOR
82
Z-DRIVE MOTOR
83
BARCODE READER UNIT
57
ARM DRIVE MOTOR
86a
ARM DRIVE MOTOR
86b
ARM DRIVE SOLENOID
87a
ARM DRIVE SOLENOID
87b
DISPENSING ORDER ACQUISITION UNIT
81
SALES INFORMATION ACQUISITION UNIT
140
DISPLAY UNIT
120
SPEAKER
130
LID SWITCH
84
TABLE ROTATION MOTOR
85

FIG.12

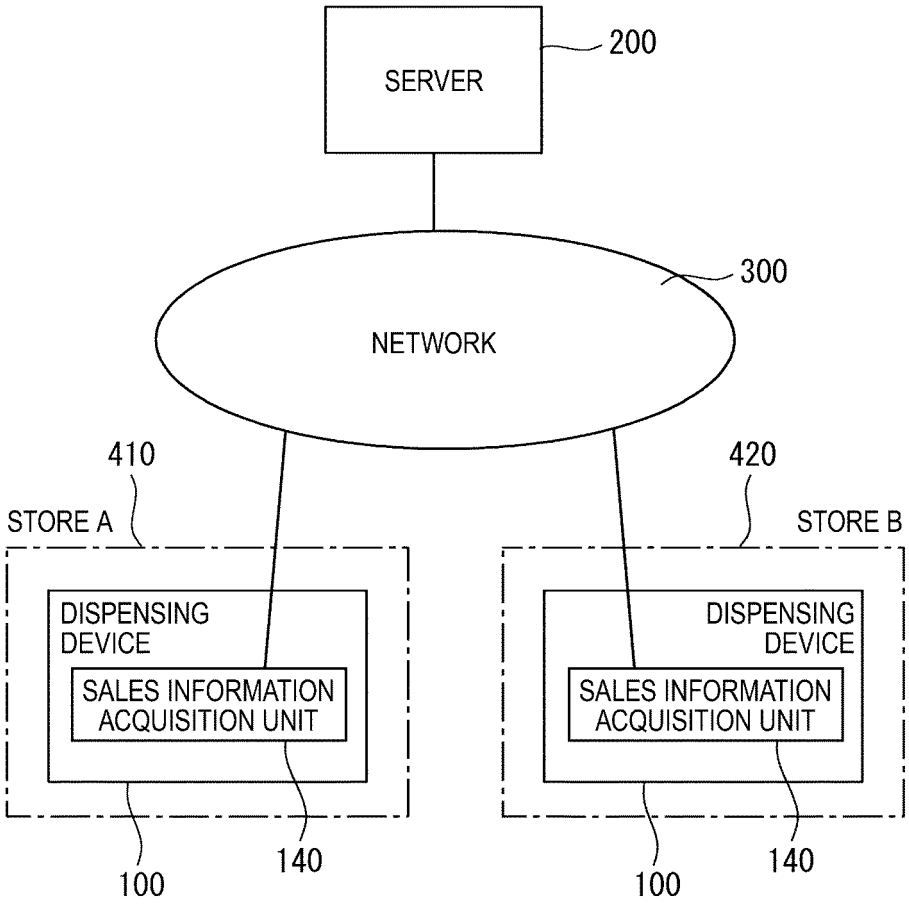

SERVER
200
NETWORK
300
410
420
STORE A
STORE B
DISPENSING DEVICE
SALES INFORMATION ACQUISITION UNIT
DISPENSING DEVICE
SALES INFORMATION ACQUISITION UNIT
100
140
100
140

FIG.13

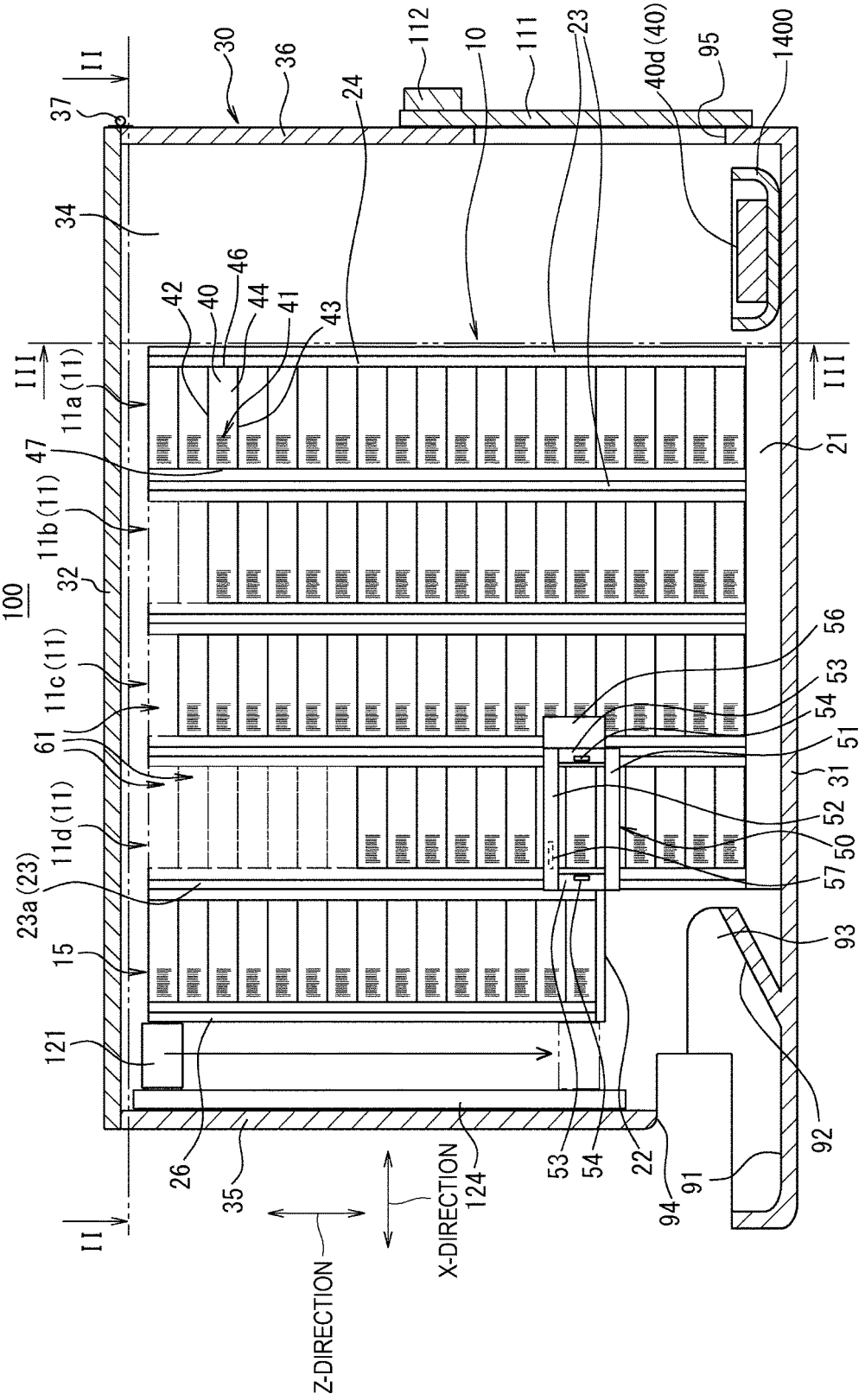

100
30
36
24
112
10
111
23
40d (40)
95
1400
37
II
34
42
40
46
44
41
43
III
11a (11)
47
11b (11)
32
11c (11)
61
11d (11)
23a (23)
15
121
21
56
53
54
51
31
52
50
57
93
92
26
35
124
53
54
22
91
94
II
Z-DIRECTION
X-DIRECTION

FIG.14

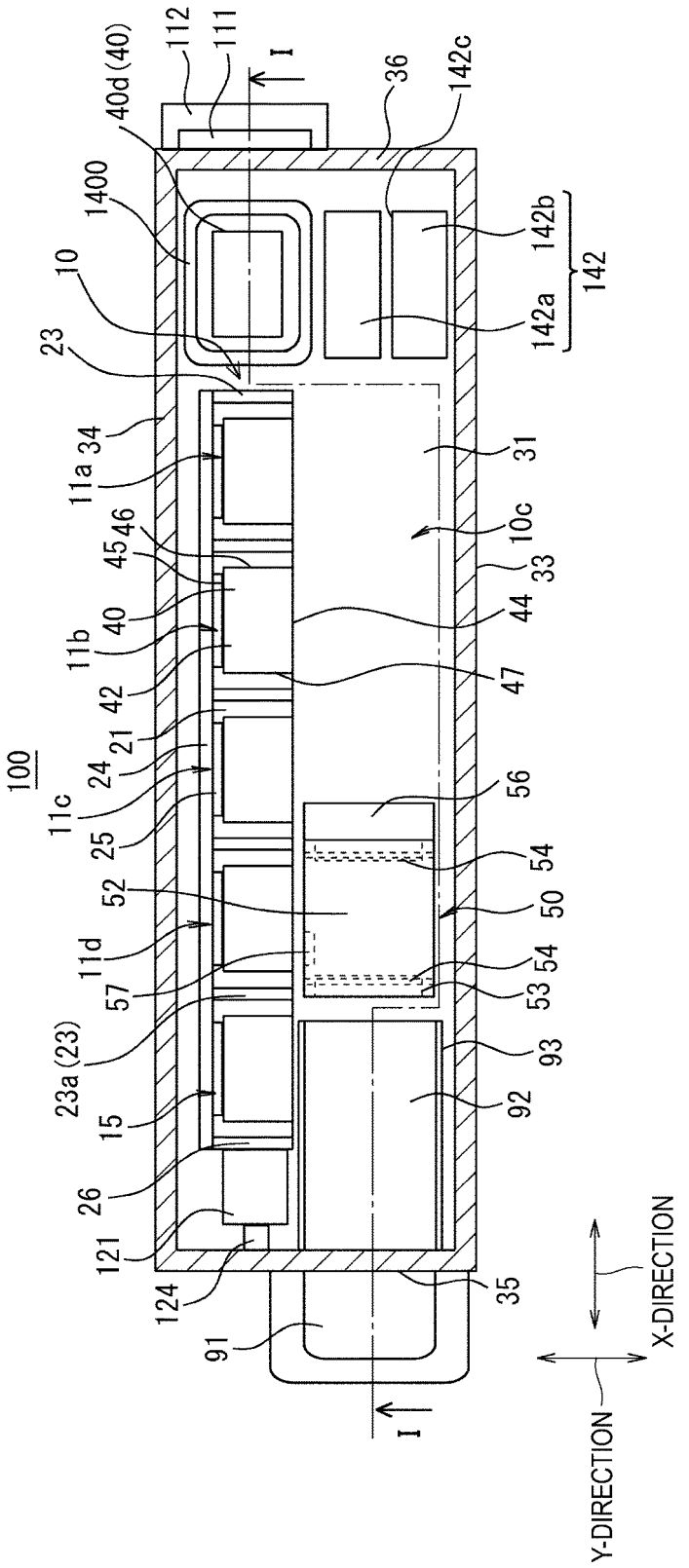

100
112
111
I
40d (40)
36
142c
1400
142b
142
142a
10
23
34
11a
31
46
45
10c
33
40
44
11b
42
47
21
24
56
11c
25
54
52
50
11d
57
54
53
23a (23)
93
15
92
26
121
124
35
91
I
X-DIRECTION
Y-DIRECTION

FIG.15

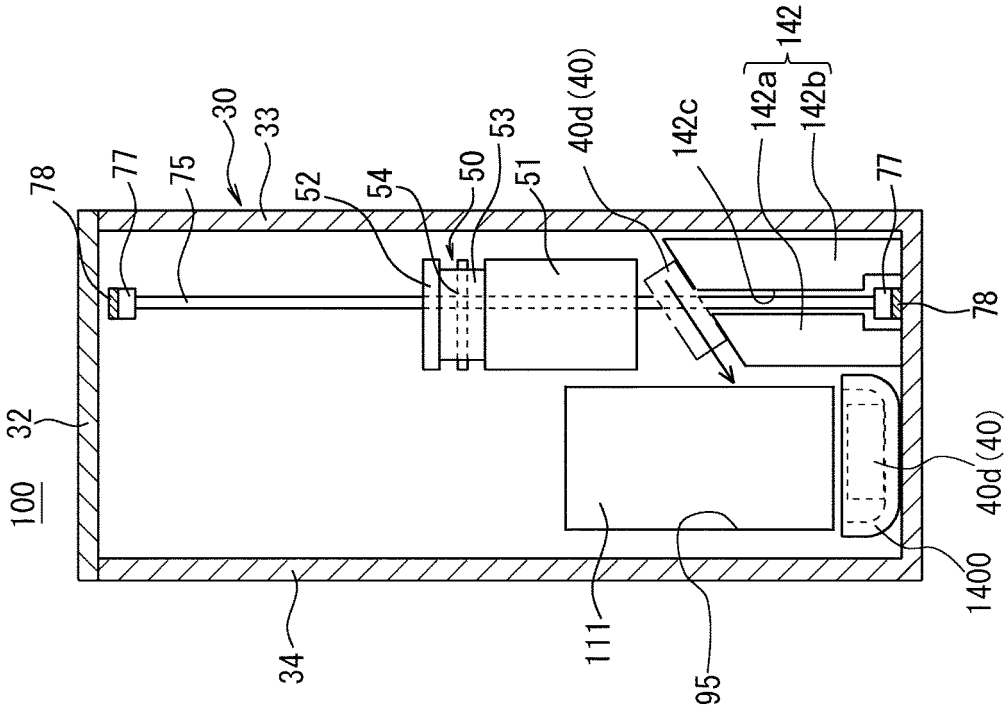

100
32
78
77
75
30
33
52
54
50
53
51
40d (40)
142c
142a
142b
142
77
78
40d (40)
1400
111
95
34

FIG.16A

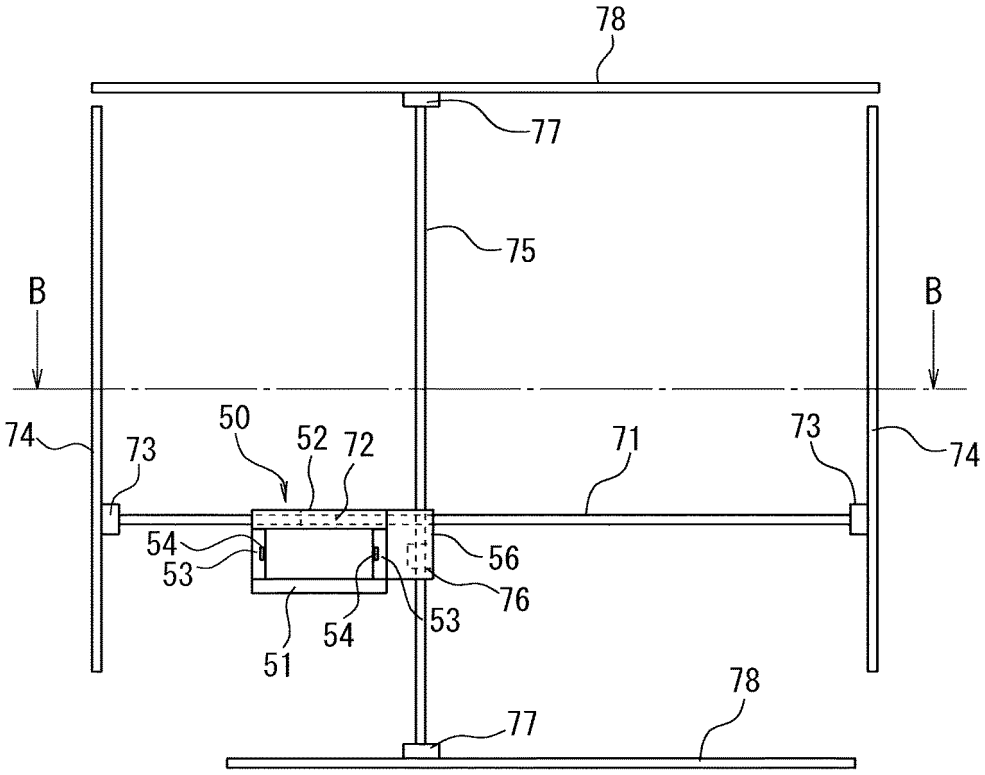


FIG.16B

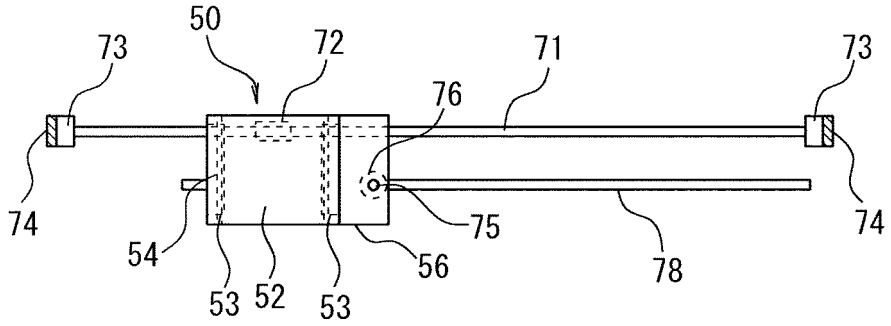


FIG.17A

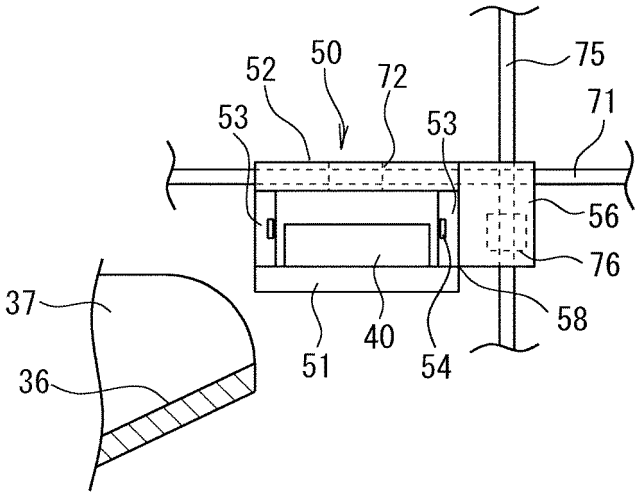


FIG.17B

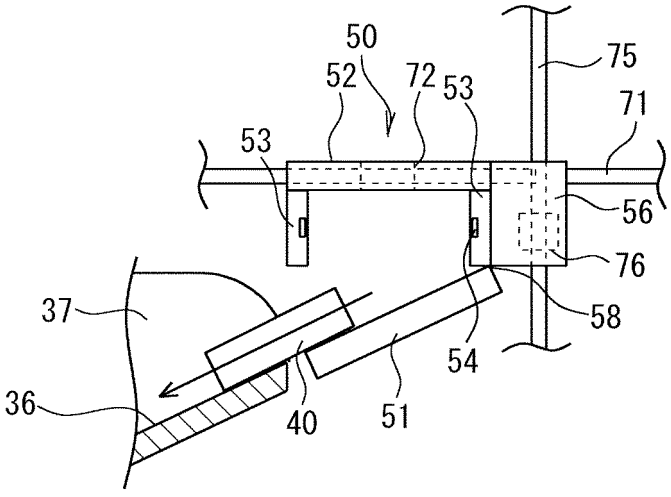


FIG.18A

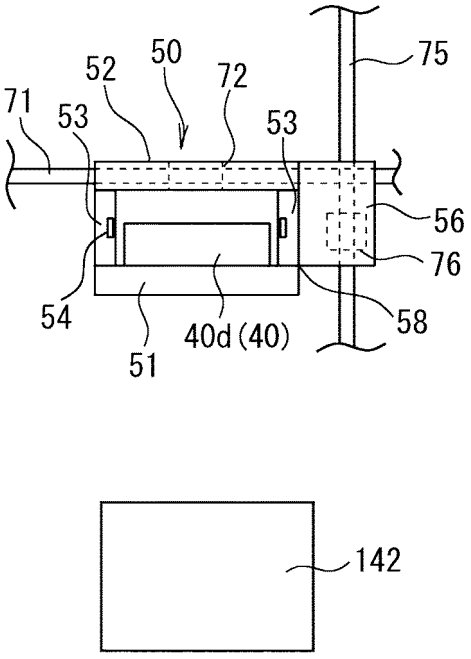


FIG.18B

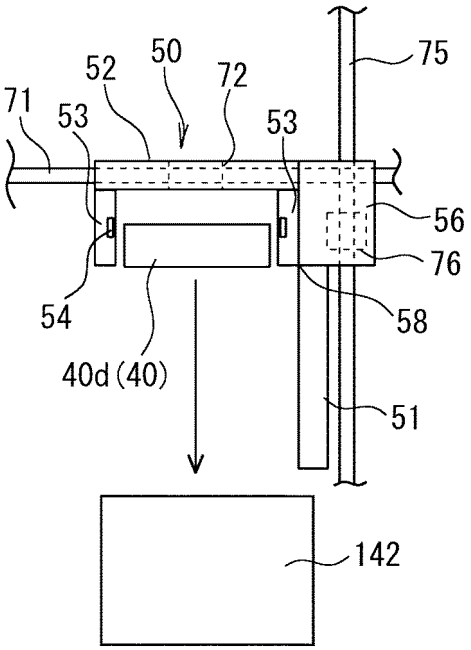


FIG.19

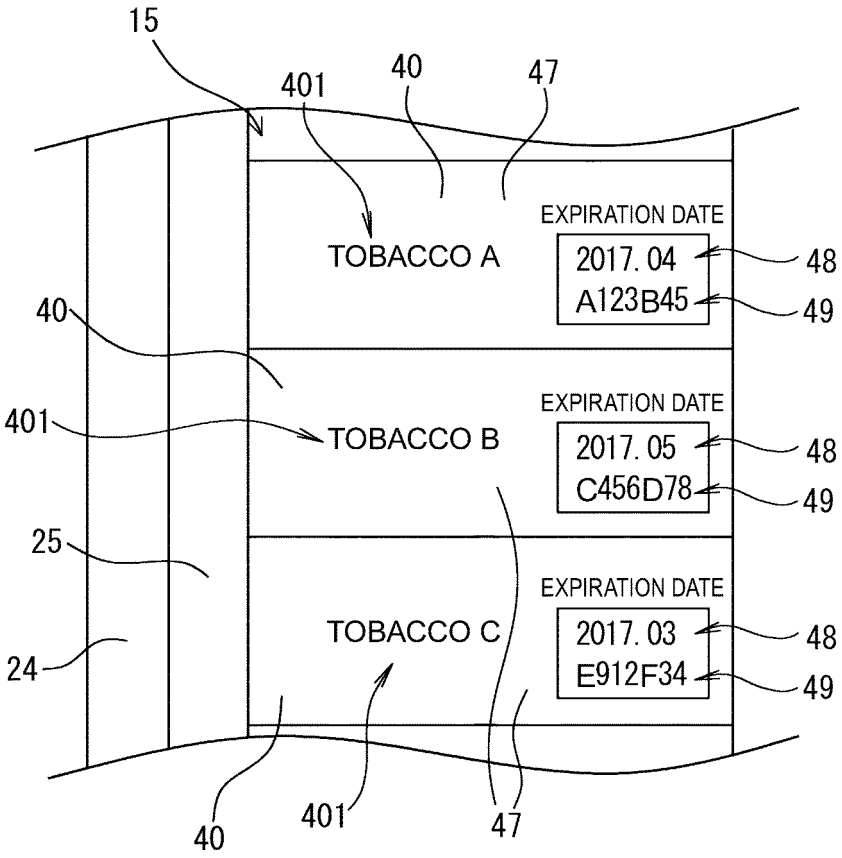

15
401
40
47
EXPIRATION DATE
TOBACCO A
2017. 04
A123B45
48
49
40
401
EXPIRATION DATE
TOBACCO B
2017. 05
C456D78
48
49
25
EXPIRATION DATE
TOBACCO C
2017. 03
E912F34
48
49
24
40
401
47

FIG.20

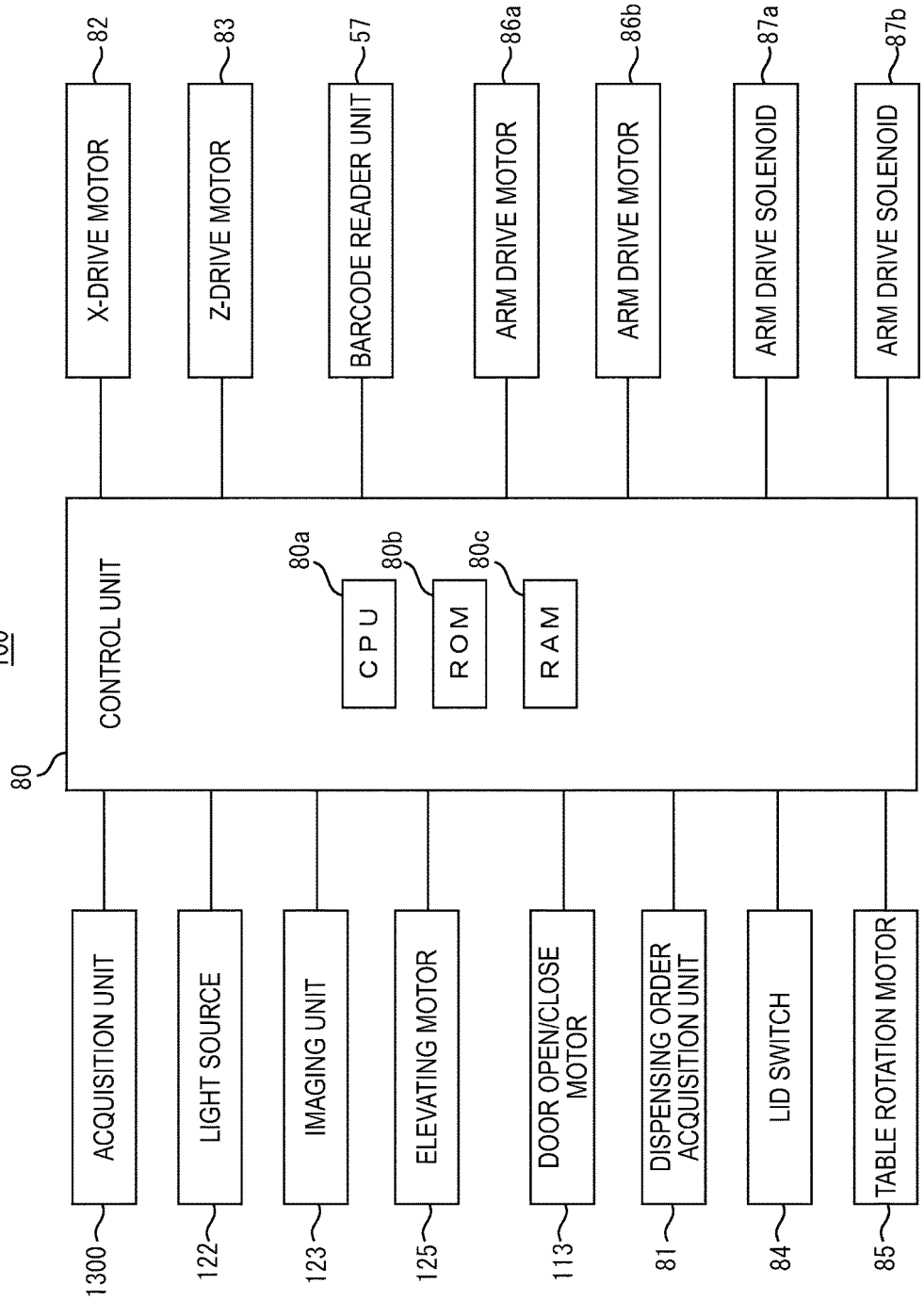

100
80
CONTROL UNIT
80a
CPU
80b
ROM
80c
RAM
82
X-DRIVE MOTOR
83
Z-DRIVE MOTOR
57
BARCODE READER UNIT
86a
ARM DRIVE MOTOR
86b
ARM DRIVE MOTOR
87a
ARM DRIVE SOLENOID
87b
ARM DRIVE SOLENOID
1300
ACQUISITION UNIT
122
LIGHT SOURCE
123
IMAGING UNIT
125
ELEVATING MOTOR
113
DOOR OPEN/CLOSE MOTOR
81
DISPENSING ORDER ACQUISITION UNIT
84
LID SWITCH
85
TABLE ROTATION MOTOR

FIG.21

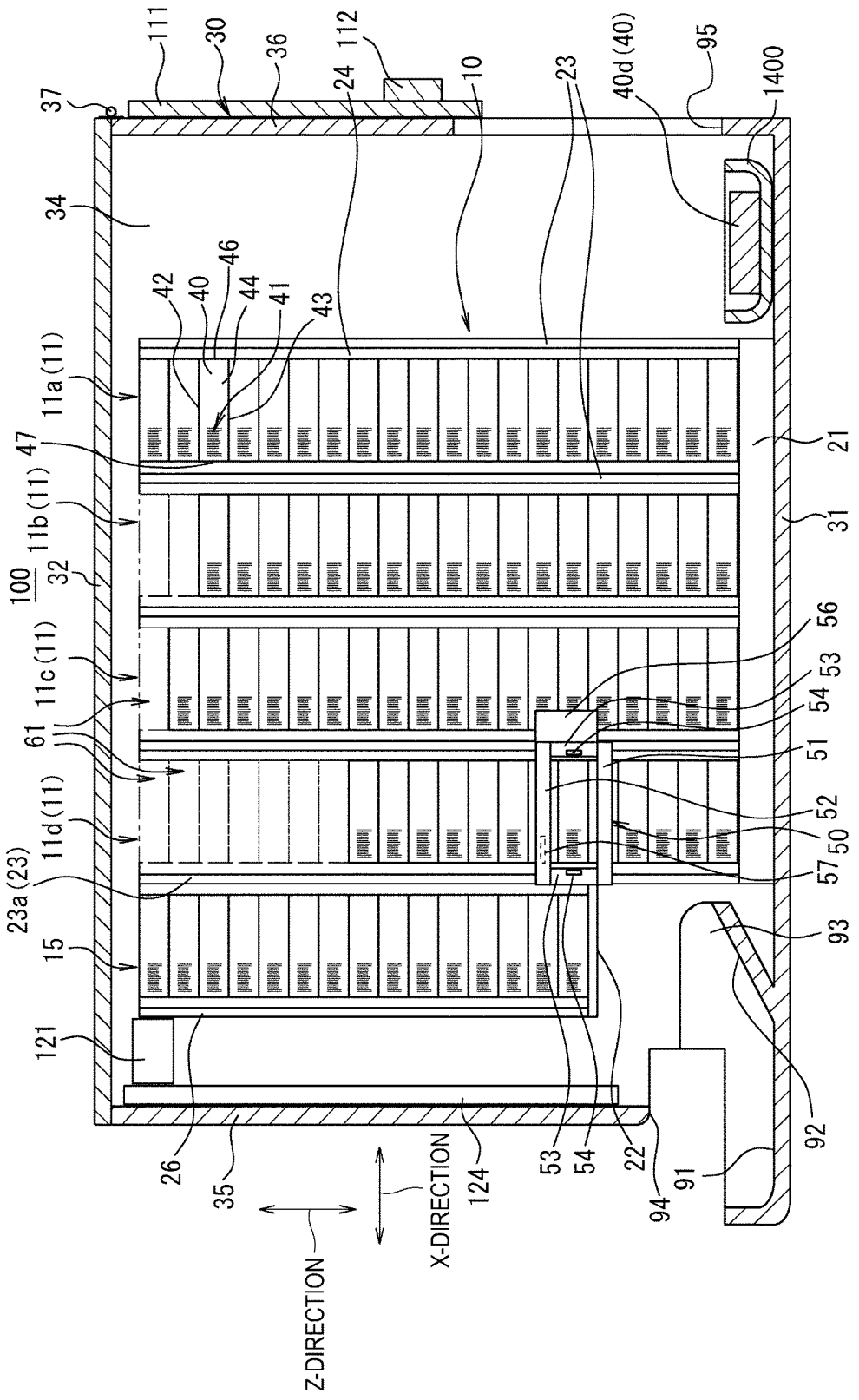

111
30
36
112
24
10
23
40d(40)
95
1400
37
34
42
40
46
44
41
43
11a(11)
47
11b(11)
100
32
11c(11)
61
11d(11)
23a(23)
15
121
21
31
56
53
54
51
52
50
57
93
92
26
35
124
53
54
22
91
94
Z-DIRECTION
X-DIRECTION

FIG.22

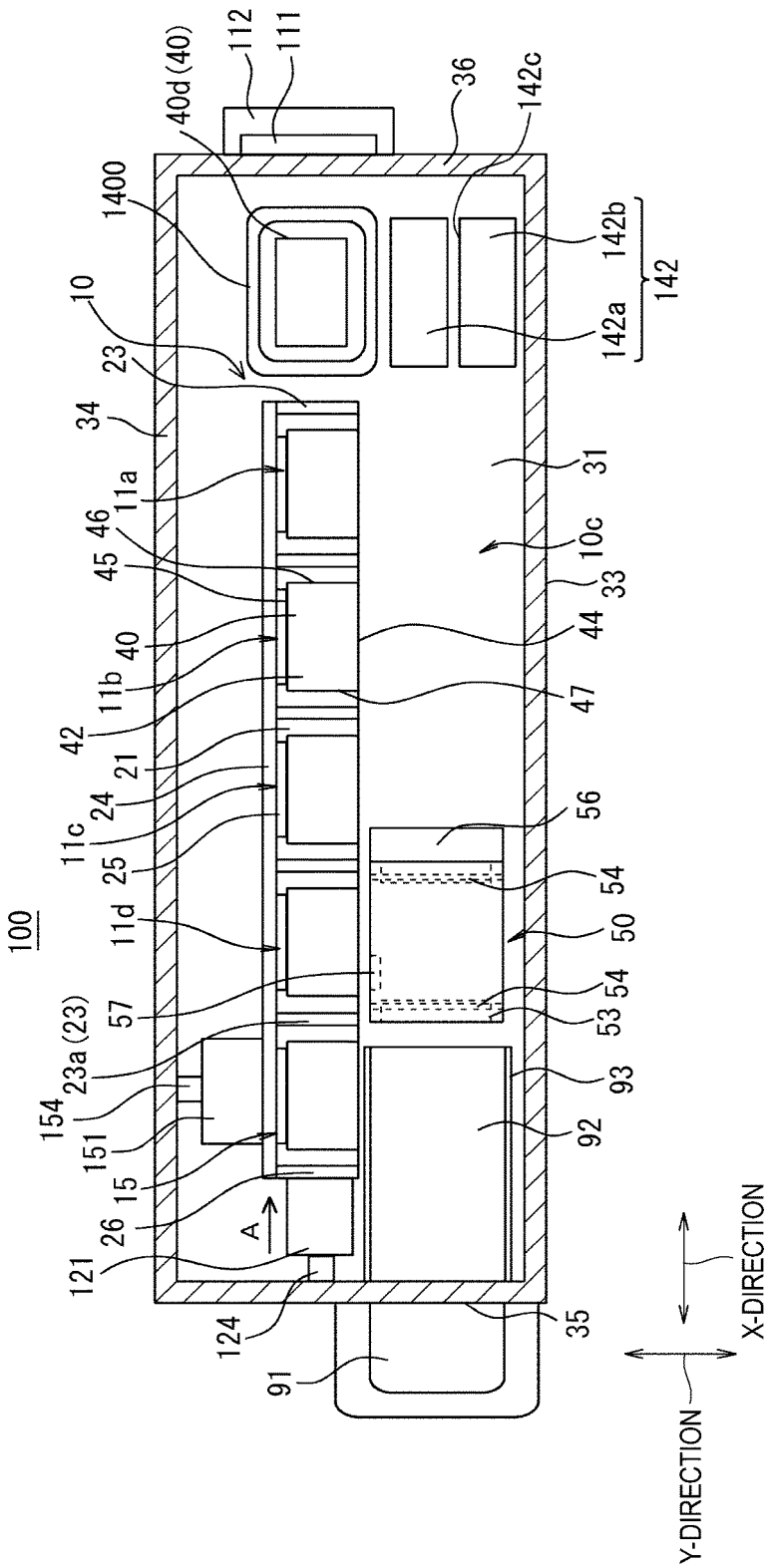

100
1400
40d (40)
112
111
36
142c
142b
142
142a
10
23
34
11a
46
45
40
11b
42
21
24
11c
25
11d
57
23a (23)
154
151
15
26
121
124
91
35
A
31
10c
33
44
47
56
54
50
53
93
92
X-DIRECTION
Y-DIRECTION

FIG.23

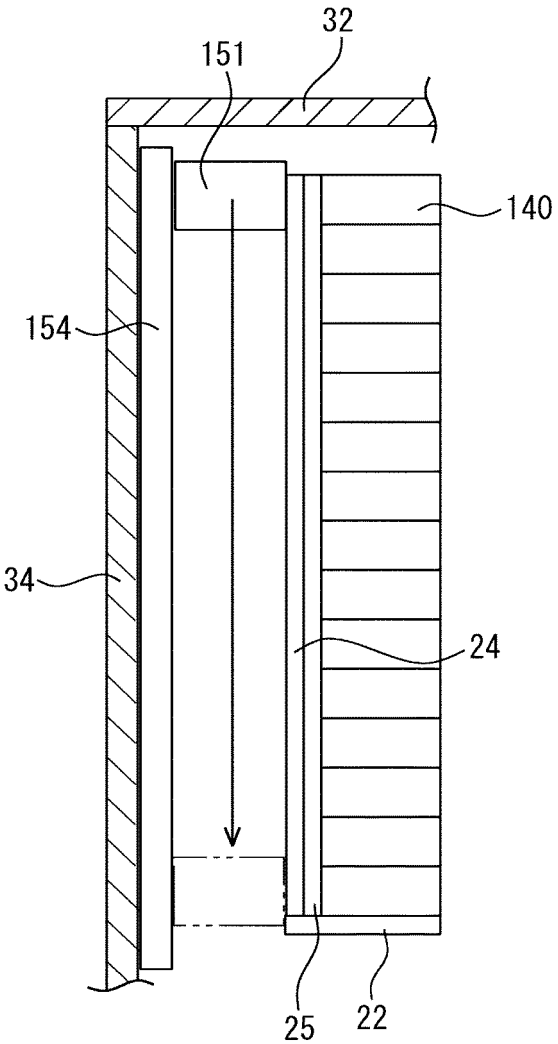
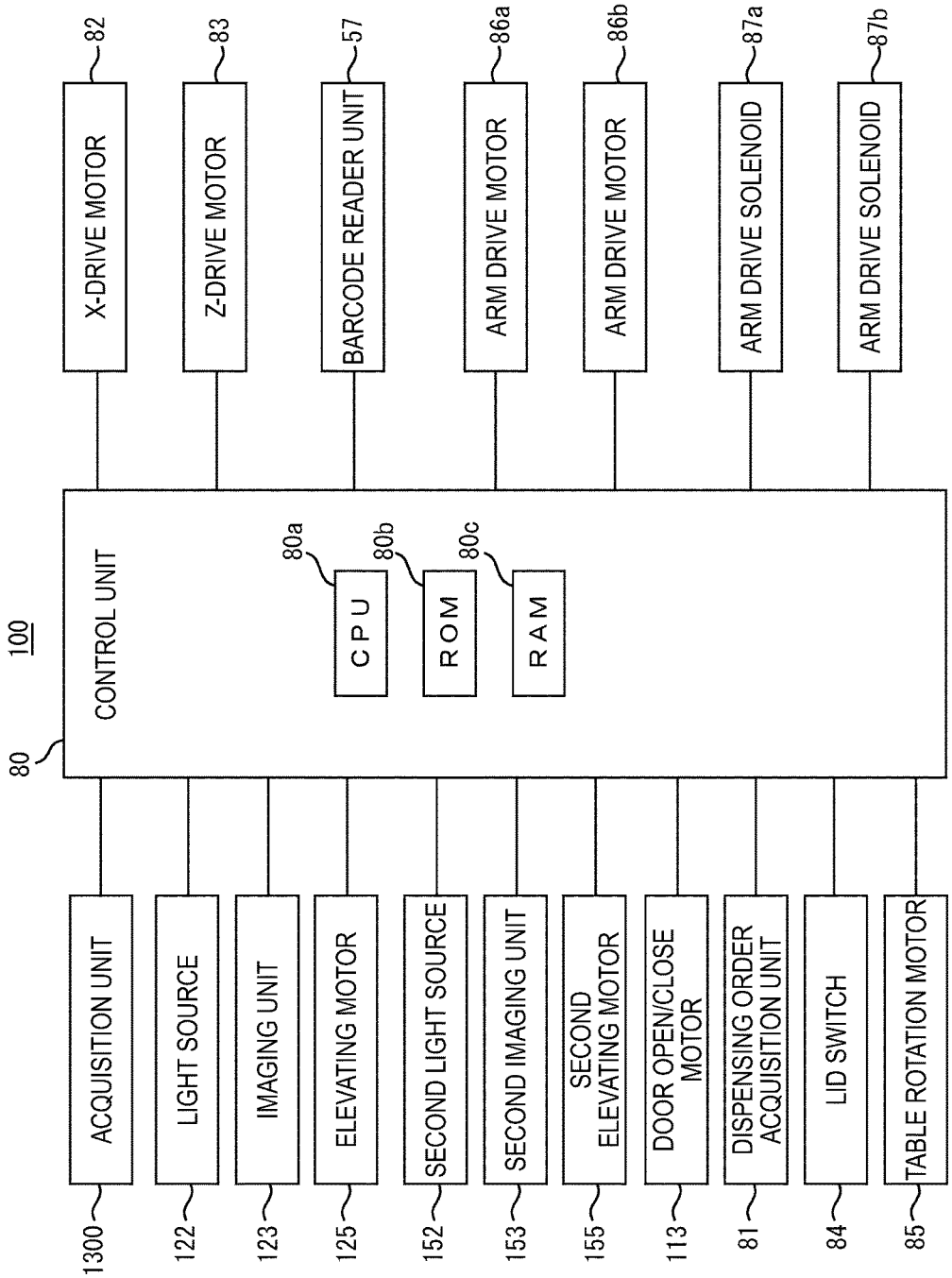


FIG.24


100
80
CONTROL UNIT
80a
CPU
80b
ROM
80c
RAM
82
X-DRIVE MOTOR
83
Z-DRIVE MOTOR
57
BARCODE READER UNIT
86a
ARM DRIVE MOTOR
86b
ARM DRIVE MOTOR
87a
ARM DRIVE SOLENOID
87b
ARM DRIVE SOLENOID
1300
ACQUISITION UNIT
122
LIGHT SOURCE
123
IMAGING UNIT
125
ELEVATING MOTOR
152
SECOND LIGHT SOURCE
153
SECOND IMAGING UNIT
155
SECOND ELEVATING MOTOR
113
DOOR OPEN/CLOSE MOTOR
81
DISPENSING ORDER ACQUISITION UNIT
84
LID SWITCH
85
TABLE ROTATION MOTOR

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/027887

A. CLASSIFICATION OF SUBJECT MATTER
G07F9/02(2006.01)i, *A47F1/10*(2006.01)i, *A47F3/026*(2006.01)i, *A47F7/00*(2006.01)i, *G07F11/00*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G07F9/02, A47F1/10, A47F3/026, A47F7/00, G07F11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2017
Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2015-508200 A (Neo Eco Systems Ltd.), 16 March 2015 (16.03.2015), paragraphs [0085] to [0187]; fig. 1 to 13 & US 2014/0379123 A1 & US 2016/0351001 A1 & WO 2013/114321 A1 page 14, line 10 to page 34, line 24; fig. 1 to 13 & EP 2810258 A1 & CA 2863458 A & CN 104205178 A & KR 10-2014-0130457 A & MX 2014009365 A & RU 2014135575 A	1-15
Y	JP 7-6257 A (Eisuke IMANAGA), 10 January 1995 (10.01.1995), paragraphs [0013] to [0034]; fig. 1 to 9 (Family: none)	1-15

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 October 2017 (30.10.17)	07 November 2017 (07.11.17)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/027887

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2004-355395 A (Seiko Epson Corp.), 16 December 2004 (16.12.2004), paragraph [0010] (Family: none)	8-15
Y	JP 4-123192 A (Sanyo Electric Co., Ltd.), 23 April 1992 (23.04.1992), page 2, upper left column, line 3 to upper right column, line 18 (Family: none)	14-15

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Patent documents cited in the description

- JP 2011207575 A **[0004]**
- JP 2011207576 A **[0004]**
- JP 2011207577 A **[0004]**
- JP 2011207578 A **[0004]**
- JP 2011209994 A **[0004]**
- JP 2016198999 A **[0456]**
- JP 2016199000 A **[0456]**