

DESCRIPTION

PRODUCT STORAGE RACK AND PRODUCT STORAGE DEVICE

Field

[0001] The present invention relates to a product
5 storage rack and a product storage device, and more
specifically relates to a product storage rack and a
product storage device that are applied to a vending
machine selling beverages contained in packages such as
cans or PET bottles as products, for example.

10 Background

[0002] As for the vending machines selling beverages
contained in packages such as cans or PET bottles as
products, for example, ones have been conventionally known
that are provided with product storage racks referred to as
15 slant racks.

[0003] Such a product storage rack has a structure in
which a plurality of layers of product storage columns are
arranged along an upper-lower direction, each of the
product storage columns storing products such that the
20 products are arranged side by side in a line in a
horizontal orientation in a product storage passage that
extends in a manner gradually tilted downward from upstream
to downstream. Each product storage column is provided
with a first stopper member, a second stopper member, and a
25 connection member.

[0004] The first stopper member is disposed swingably in
the product storage passage in a manner that the first
stopper member can advance to and retract from the product
storage passage. The first stopper member abuts a
30 downstream-most product when advancing to the product
storage passage to restrict dispensing of the product.
When retracting from the product storage passage, the first

stopper member allows the product to be dispensed. The second stopper member is disposed swingably in the product storage passage in a manner that the second stopper member can advance to and retract from the product storage passage.

5 The second stopper member abuts the product that is the second from the downstream-most product when advancing to the product storage passage to restrict movement of the product downstream. When retracting from the product storage passage, the second stopper member allows the
10 product to move.

[0005] The connection member connects the first stopper member and the second stopper member and is disposed between a standby position and a dispensing position in a manner slidable therebetween. The connection member
15 positions at a standby position when a solenoid serving as a driving source stops driving, and the connection member advances the first stopper member while retracting the second stopper member. When being moved from the standby position to the dispensing position by the solenoid
20 performing driving, the connection member retracts first stopper member and advances the second stopper member.

[0006] In such a product storage rack, when a dispensing instruction of a product stored in any of the product storage columns is given, the solenoid corresponding to the
25 product storage column performs driving to cause the connection member to move from the standby position to the dispensing position. As a result, the first stopper member retracts from the product storage passage while the second stopper member advances to the product storage passage,
30 resulting in the downstream-most product in the product storage passage being dispensed (e.g., refer to Patent Literature 1).

Citation List

Patent Literature

[0007] Patent Literature 1: Japanese Laid-open Patent Publication No. 2012-194797

5 Summary

Technical Problem

[0008] In the product storage rack proposed in Patent Literature 1 mentioned above, the first stopper member, the second stopper member, and the connection member that are
10 provided to one product storage column are driven independently from the first stopper members, the second stopper members, and the connection members that are provided to other product storage columns, and their driving sources also differ from one another.

15 [0009] When the product storage rack has a structure in which a plurality of product storage columns are provided side by side in left and right, the driving source is required for each product storage column, thereby making it difficult to synchronize dispensing operations of products
20 between any of the product storage columns.

[0010] In view of such an actual situation, the present invention aims to provide a product storage rack and a product storage device that can satisfactorily synchronize dispensing operations of products among any of the product
25 storage columns.

Solution to Problem

[0011] To attain the object, a product storage rack according to the present invention includes: a plurality of product storage columns each of which stores products in a
30 product storage passage extending linearly such that products are arranged side by side in a line along an extending direction of the product storage passage; a

dispensing mechanism that is provided for each of the product storage columns and, when the dispensing mechanism performs driving, dispenses a downstream-most product, which is disposed at a downstream-most side among the products stored in the product storage passage, from the product storage passage; driving force apply unit that applies common driving force for operating the dispensing mechanism; and a driving force transmission unit that transmits the driving force of the driving force apply unit to only a corresponding dispensing mechanism when a dispensing instruction of the product stored in any product storage column is given.

[0012] Further, according to the present invention, in the above product storage rack, the product storage columns each store the products such that the products are arranged side by side in a line in the product storage passage that extends in a manner to be gradually tilted downward from an upstream side to a downstream side, and each of the product storage columns is structured such that the right-left width of the product storage column is capable of being changed, and the dispensing mechanism is provided on the downstream side of the product storage passage, restricts separation of the products stored in the product storage passage from the product storage passage in a standby state, dispenses the downstream-most product from the product storage passage upon operating, and is provided such that the dispensing mechanism is capable of being displaced in a right-left direction.

[0013] Further, according to the present invention, in the above product storage rack, the product storage column is structured such that the product storage column is capable of being connected to another product storage

column by merging of the product storage passage of the product store column and the product storage passage of the another product storage column.

[0014] Further, a product storage device according to the present invention includes a plurality of layers of the above product storage racks along an upper-lower direction. Further, the driving force apply unit applies, as the driving force, power given from a power source, which is common to another driving force apply units provided in other product storage racks.

[0015] Further, in the present invention, in the above product storage device, the dispensing mechanism has a lever member that is provided such that the lever member is capable of swinging in a manner to advance to and retract from a dispensing passage in which the product dispensed through the product storage passage falls, the product storage device includes a plurality of guide protrusions that are provided on a surface, the surface constituting the dispensing passage and facing the dispensing mechanism, along the upper-lower direction in a manner to protrude to the dispensing passage, and when the product falling in the dispensing passage abuts the lever member, the lever member guides the product to the guide protrusion directly under the lever member while swinging in a manner to retract from the dispensing passage.

[0016] Further, in the present invention, in the above product storage rack, the dispensing mechanism includes: a pair of front and rear pulleys configured to rotate around center axes of the pulleys; and a conveyance belt that is endlessly stretched between the pulleys and is displaced in an extending direction of the conveyance belt by the rotation of the pulleys, and an upper extending portion of

the conveyance belt between the pulleys forms the product storage passage to store the products by causing the products to be placed on the upper extending portion in a manner to be arranged side by side along the front-rear direction, and, when a dispensing instruction is given, the pulleys are rotated to displace the conveyance belt, thereby dispensing the downstream-most product.

[0017] Further, in the product storage device according to the present invention includes a plurality of layers of the product storage racks along an upper-lower direction, wherein the driving force apply unit applies, as the driving force, power given from a power source, which is common to another driving force apply units included in another product storage racks.

Advantageous Effects of Invention

[0018] In the present invention, the driving force transmission unit applies common driving force for operating the respective dispensing mechanisms included in the product storage columns provided side by side and the driving force transmission unit transmits the driving force of the driving force transmission unit to only the corresponding dispensing mechanism when the dispensing instruction of the product stored in any product storage column is given. As a result, the driving sources are not required for the respective product storage columns. The present invention, thus, reduces the number of parts, thereby reducing manufacturing cost. In addition, the present invention not only drives the single dispensing mechanism but also drives the multiple dispensing mechanisms synchronously. The present invention, thus, has an advantageous effect of favorably synchronizing product dispensing operations among any product storage columns.

[0019] Furthermore, in the present invention, the multiple product storage columns are provided side by side in the right-left direction and are structured such that the right-left width of each product storage column can be changed, and the dispensing mechanism is provided such that the dispensing mechanism can be displaced in the right-left direction. As a result, the right-left widths of the product storage columns can be changed in accordance with the size of the product to be stored, and the dispensing mechanisms can be displaced. The present invention, thus, can store various sizes of products in a minimized space and dispense the products. The present invention, thus, has an effect of efficiently storing various sizes of products with no gap therebetween and dispensing the products.

Brief Description of Drawings

[0020] FIG. 1 is a sectional side view schematically illustrating a structure of a vending machine to which a product storage device according to an embodiment of the present invention is applied.

FIG. 2 is a diagram schematically illustrating the product storage device illustrated in FIG. 1.

FIG. 3 is a perspective view illustrating one of product storage racks illustrated in FIGS. 1 and 2.

FIG. 4 is an exploded perspective view illustrating one of the product storage racks illustrated in FIGS. 1 and 2.

FIG. 5 is a perspective view illustrating a shelf illustrated in FIGS. 3 and 4.

FIG. 6 is a perspective view illustrating dispensing mechanisms illustrated in FIGS. 3 and 4.

FIG. 7 is another perspective view illustrating the

dispensing mechanisms illustrated in FIGS. 3 and 4.

FIG. 8 is a perspective view illustrating one of the dispensing mechanisms illustrated in FIGS. 6 and 7.

FIG. 9 is another perspective view illustrating one of
5 the dispensing mechanisms illustrated in FIGS. 6 and 7.

FIG. 10 is a sectional side view illustrating one of the dispensing mechanisms illustrated in FIGS. 6 and 7.

FIG. 11 is an exploded perspective view illustrating one of the dispensing mechanisms illustrated in FIGS. 6 and
10 7.

FIG. 12-1 is a perspective view illustrating a main body mechanism portion illustrated in FIGS. 8 to 11.

FIG. 12-2 is another perspective view illustrating the main body mechanism portion illustrated in FIGS. 8 to 11.

FIG. 13-1 is a perspective view illustrating a lever
15 member illustrated in FIGS. 8 to 11.

FIG. 13-2 is another perspective view illustrating the lever member illustrated in FIGS. 8 to 11.

FIG. 14-1 is a perspective view illustrating a stopper
20 member illustrated in FIGS. 8 to 11.

FIG. 14-2 is another perspective view illustrating the stopper member illustrated in FIGS. 8 to 11.

FIG. 15-1 is a perspective view illustrating a pedal member illustrated in FIGS. 8 to 11.

FIG. 15-2 is another perspective view illustrating the
25 pedal member illustrated in FIGS. 8 to 11.

FIG. 16-1 is a perspective view illustrating a slider included in a transmission mechanism illustrated in FIG. 11.

FIG. 16-2 is another perspective view illustrating the
30 slider included in the transmission mechanism illustrated in FIG. 11.

FIG. 17-1 is a perspective view illustrating a dog

clutch included in the transmission mechanism illustrated in FIG. 11.

FIG. 17-2 is another perspective view illustrating the dog clutch included in the transmission mechanism
5 illustrated in FIG. 11.

FIG. 18 is a perspective view illustrating the dispensing mechanism in a standby state.

FIG. 19 is a schematic diagram illustrating a product storage passage when the dispensing mechanism is in the
10 standby state.

FIG. 20 is a perspective view illustrating the dispensing mechanism when the slider slides.

FIG. 21 is another perspective view illustrating the dispensing mechanism when the slider slides.

FIG. 22 is a perspective view illustrating the dispensing mechanism in which the pedal member swings in an
15 upper direction.

FIG. 23 is another perspective view illustrating the dispensing mechanism in which the pedal member swings in
20 the upper direction.

FIG. 24 is a schematic diagram illustrating the product storage passage when the pedal member swings in the upper direction.

FIG. 25 is a schematic diagram illustrating the product storage passage when the pedal member swings
25 further in the upper direction.

FIG. 26 is an explanatory view illustrating a movement of a product dispensed in a dispensing passage.

FIG. 27 is a plan view of the product storage rack.

FIG. 28 is another plan view of the product storage
30 rack.

FIG. 29 is a perspective view illustrating an

appearance structure of a modification of the product storage rack in the embodiment of the present invention.

FIG. 30 is a perspective view illustrating an enlarged major part of the product storage rack illustrated in FIG.

5 29.

FIG. 31 is an exploded perspective view of the major part of the product storage rack illustrated in FIG. 30.

FIG. 32 is another exploded perspective view of the major part of the product storage rack illustrated in FIG.

10 30.

FIG. 33 is a cross-sectional explanatory view illustrating operation of the transmission mechanism illustrated in FIG. 30.

FIG. 34 is another cross-sectional explanatory view illustrating the operation of the transmission mechanism illustrated in FIG. 30.

FIG. 35 is a perspective view illustrating another product storage device provided with a plurality of layers of the product storage racks illustrated in FIG. 29.

20 Description of Embodiments

[0021] The following describes a preferred embodiment of a product storage rack and a product storage device according to the present invention in detail with reference to the accompanying drawings.

25 [0022] FIG. 1 is a sectional side view schematically illustrating a structure of a vending machine to which a product storage device according to the embodiment of the present invention is applied. The vending machine exemplified herein sells beverages contained in packages
30 such as cans or PET bottles as products, for example, and includes a main body cabinet 1 serving as the main body of the vending machine.

[0023] The main body cabinet 1, which is structured by appropriately combining a plurality of metal plates, is formed in a rectangular parallel box shape having an opening 1a (hereinafter referred to as a front surface opening) on its front surface. Inside the main body cabinet 1, a housing chamber 2 having a heat insulation structure is defined in a manner to face the front surface opening 1a.

[0024] On a front portion of the main body cabinet 1, an outer door 3 and an inner door 4 are provided. The outer door 3 opens and closes the front surface opening 1a of the main body cabinet 1. The inner door 4 has a heat insulation structure and opens and closes the front surface of the housing chamber 2.

[0025] In the housing chamber 2, a product storage device 10 and a product chute 5 are provided. The product storage device 10, which is described in detail later, stores products and dispenses a corresponding product in accordance with a dispensing instruction (vending instruction). The product chute 5, which is provided in a lower portion of the product storage device 10, is gradually tilted downward from its rear to its front. The product chute 5 guides the product dispensed from the product storage device 10 to a product take-out port 3a that is provided on the outer door 3 via a product ejection port 4a provided on the inner door 4. The product ejection port 4a is opened and closed by a product ejection door 4b. The product take-out port 3a is opened and closed by a product take-out door 3b. The housing chamber 2 is adjusted to have a desired temperature in its inner atmosphere by a cooling unit and a heating unit, which are not illustrated.

[0026] As illustrated in FIG. 2, the product storage device 10 has a structure in which a plurality of product storage racks 11 are provided along an upper-lower direction between a pair of left and right base side plates 10a.

[0027] FIGS. 3 and 4 each illustrate one of the product storage racks 11 illustrated in FIGS. 1 and 2. FIG. 3 is a perspective view while FIG. 4 is an exploded perspective view. As illustrated in FIGS. 3 and 4, the product storage rack 11 includes shelves 12, partition plates 13, and dispensing mechanisms 20.

[0028] The shelf 12 is made by processing a sheet metal, for example, and is provided between the base side plates 10a in a manner to be gradually tilted downward from the front to the rear. As illustrated in FIG. 5, the shelf 12 has shelf sidewalls 12a that extend toward the upper direction at both left and right end portions. The shelf 12 has a plurality of partition engagement holes 12b formed thereon along a right-left direction at certain intervals, for example about 20 mm, such that the longitudinal direction of the partition engagement hole 12b is the front-rear direction. Furthermore, the shelf 12 has a plurality of mechanism engagement holes 12c formed on the rear end portion thereof along the right-left direction at certain intervals about the same as those of the partition engagement holes 12b.

[0029] The partition plate 13 is made by processing a sheet metal, for example, and is a long plate-like member having the longitudinal direction that is the front-rear direction. The partition plate 13 has a plurality of engagement pieces 13a formed thereon, the engagement pieces 13a protruding from its lower end portion toward the lower

direction.

[0030] The engagement pieces 13a of the partition plate 13 are inserted into partition engagement holes 12b from above. As a result, the partition plate 13 is engaged with
5 the shelf 12 in a manner to extend toward the front-rear direction on the upper surface of the shelf 12. The multiple partition plates 13 are engaged with the shelf 12 between the shelf sidewalls 12a. As a result, as illustrated in FIG. 3, a structure can be formed in which a
10 plurality of (four in the example illustrated in FIG. 3) product storage columns 14 are arranged side by side left and right on the upper surface of the shelf 12.

[0031] The product storage columns 14 each have a product storage passage 14a that extends while being
15 gradually tilted downward from the front, which is the upstream side, toward the rear, which is the downstream side. The product storage column 14 stores products in the product storage passage 14a such that the products are arranged side by side in a line in a horizontal orientation.

[0032] The multiple (four in the example illustrated in FIG. 3) dispensing mechanisms 20 are provided along the right-left direction. As illustrated in FIGS. 6 and 7, the dispensing mechanisms 20 are provided in a state in which a rotation driving shaft 30, which is a long rod-like member
25 extending along the right-left direction, penetrates through the respective dispensing mechanisms 20.

[0033] The rotation driving shaft 30 has a polygonal pillar shape such as a hexagonal pillar shape, for example. The left end portion of the rotation driving shaft 30 is
30 connected to the central portion of a rotation transmission member 31 having a substantially disk shape. The rotation transmission member 31, which is described in detail later,

is provided such that the rotation transmission member 31 can rotate around its center axis. As a result, the rotation driving shaft 30 can also rotate around its center axis serving as the axial center.

5 [0034] The following describes a structure of the dispensing mechanism 20. FIGS. 6 and 7 each illustrate the multiple dispensing mechanisms 20, which have the common structure. The following, thus, describes the structure of one of the dispensing mechanisms 20, and the descriptions
10 of the other dispensing mechanisms 20 are omitted.

[0035] FIGS. 8 to 11 each illustrate the dispensing mechanism 20 illustrated in FIGS. 6 and 7. FIGS. 8 and 9 are perspective views. FIG. 10 is a sectional side view. FIG. 11 is an exploded perspective view. As illustrated in
15 FIGS. 8 to 11, the dispensing mechanism 20 includes a mechanism main body 21. The mechanism main body 21 is a housing made of a resin material, for example, and houses a lever member 22, a stopper member 23, a pedal member 24, a transmission mechanism 40, and a sold-out detection unit 25.

20 [0036] As illustrated in FIGS. 12-1 and 12-2, the mechanism main body 21 has a main body engagement portion 211 and main body penetration portions 212. The following describes the mechanism main body 21, the lever member 22, the stopper member 23, the pedal member 24, and the
25 transmission mechanism 40 in accordance with the direction illustrated in FIG. 8.

[0037] The main body engagement portion 211, which is formed at the front end portion of the mechanism main body 21, is a resin-made spring-shaped portion that can be
30 elastically deformed. The main body engagement portion 211 has an engagement protrusion 211a protruding toward the front direction, and a pair of left and right engagement

hook portions 211b protruding toward the front direction on the lower side of the engagement protrusion 211a that are formed thereon. The engagement protrusion 211a can be inserted into the mechanism engagement hole 12c of the shelf 12. The engagement hook portions 211b can engage with the lower end of the rear end portion of the shelf 12 when the engagement protrusion 211a is inserted into any of mechanism engagement holes 12c.

[0038] The main body penetration portions 212 are formed on the rear end portions on both left and right sides of the mechanism main body 21 in a left and right pair. The main body penetration portion 212 each have a round-shaped main body penetration hole 212a that is formed therein and has an inner diameter slightly larger than the maximum width of the rotation driving shaft 30. The rotation driving shaft 30 penetrates through the main body penetration hole 212a.

[0039] The lever member 22 is made of a resin material, for example. As illustrated in FIGS. 13-1 and 13-2, the lever member 22 has a lever acting portion 221 and lever penetration portions 222. The lever acting portion 221 has a substantially flat plate like shape.

[0040] The lever penetration portions 222 are a left and right pair and formed in a manner to protrude in the front direction from both left and right end portions on the front direction side of the lever acting portion 221. The lever penetration portion 222 each have a round-shaped lever penetration hole 222a that is formed therein and has an inner diameter slightly larger than the maximum width of the rotation driving shaft 30.

[0041] The lever member 22 is disposed such that the lever acting portion 221 protrudes further toward the rear

direction than the mechanism main body 21 and the lever penetration portions 222 are each inside the corresponding one of the main body penetration portions 212. The lever member 22 is stored in the mechanism main body 21 as a result of penetration of the rotation driving shaft 30 into the lever penetration holes 222a. The lever penetration portions 222 are each provided with a lever restriction protrusion 222b protruding toward the lower direction. The lever restriction protrusion 222b is inserted through, from the upper direction, a first restriction oblong hole 213 (refer to FIG. 9) formed on the lower rear end of the mechanism main body 21. The longitudinal direction of the first restriction oblong hole 213 is the front-rear direction. The lever member 22 can swing around the center axis of the rotation driving shaft 30 in a range in which the lever restriction protrusions 222b abut front edges and rear edges of the first restriction oblong holes 213.

[0042] The stopper member 23 is made of a resin material, for example. As illustrated in FIGS. 14-1 and 14-2, the stopper member 23 has a stopper acting portion 231, stopper arm portions 232, and stopper penetration portions 233. The stopper acting portion 231, which extends along the right-left direction, has a stopper acting surface 231a formed on its front edge. On the rear end portion of the stopper acting portion 231, a pedestal portion 231b that is slightly depressed from the upper surface of the stopper acting portion 231 is formed. The stopper arm portions 232 are a left and right pair and extend toward the rear direction from both left and right end portions of the stopper acting portion 231.

[0043] The stopper penetration portions 233 are a left and right pair and each formed in a manner to protrude in

the rear direction from the rear end portion of the stopper arm portion 232. The stopper penetration portions 233 each have a round-shaped stopper penetration hole 233a that is formed therein and has an inner diameter slightly larger than the maximum width of the rotation driving shaft 30.

5 [0044] The stopper member 23 is stored in the mechanism main body 21 such that the stopper acting portion 231 is inserted into a stopper opening 214 formed on the mechanism main body 21, with each of the stopper penetration portions 10 233 disposed inside the corresponding one of the lever penetration portions 222, and the rotation driving shaft 30 penetrating the stopper penetration holes 233a. The stopper penetration portions 233 are each provided with a stopper restriction protrusion 233b protruding toward the 15 lower direction. The stopper restriction protrusion 233b is inserted through, from the upper direction, a second restriction oblong hole 215 (refer to FIG. 9) formed on the lower rear end of the mechanism main body 21. The longitudinal direction of the second restriction oblong 20 hole 215 is the front-rear direction. The stopper member 23 can swing around the center axis of the rotation driving shaft 30 in a range in which the stopper restriction protrusions 233b abut front edges and rear edges of the second restriction oblong holes 215.

25 [0045] Between the stopper member 23 and the lever member 22, a spring member 26 is provided. The spring member 26 urges the stopper member 23 toward a direction in which the stopper restriction protrusions 233b abut the front edges of the second restriction oblong holes 215, 30 i.e., toward the upper direction. The spring member 26 also urges the lever member 22 toward a direction in which the lever restriction protrusions 222b abut the rear edges

of the first restriction oblong holes 213, i.e., toward the upper direction.

[0046] The pedal member 24 is made of a resin material, for example. As illustrated in FIGS. 15-1 and 15-2, the pedal member 24 has a pedal base 241, a pedal main body 242, and a pedal acting portion 243. The pedal base 241 has a columnar shape, and the longitudinal direction is the right-left direction. The pedal base 241 has a round-shaped pedal penetration hole 241a that is formed therein and has an inner diameter slightly larger than the maximum width of the rotation driving shaft 30. The pedal base 241 has an insertion portion 241b that is formed by notching a central region portion thereof in the right-left direction. The pedal base 241 has a plurality of transmission recesses 241c that are formed therein on the left side of the insertion portion 241b in a manner to be arranged side by side in an arc shape.

[0047] The pedal main body 242 has a substantially flat plate like shape and extends from the pedal base 241 toward an outside in a radial direction of the pedal penetration hole 241a, i.e., toward the front direction. The pedal main body 242 has a pedal hook portion 242a that is formed on the lower surface thereof and protrudes toward the lower direction.

[0048] The pedal acting portion 243 has a flat plate like shape and is formed in a manner to extend from the pedal base 241 toward an outside in the radius direction of the pedal penetration hole 241a. The pedal acting portion 243 is formed such that its right-left width is larger than each of the right-left width of the pedal base 241 and the right-left width of the pedal main body 242.

[0049] The pedal member 24 is stored in the mechanism

main body 21 as a result of penetration of the rotation driving shaft 30 into the pedal penetration hole 241a of the pedal base 241 between the stopper penetration portions 233 of the stopper member 23. The pedal member 24 is
5 stored in the mechanism main body 21 such that the pedal member 24 can swing around the center axis of the rotation driving shaft 30.

[0050] The transmission mechanism 40 includes a clutch motor 41, a slider 42, and a dog clutch 43. The clutch
10 motor 41 is stored in the mechanism main body 21 by being held by a motor holding portion 216 (refer to FIGS. 9 and 12-2) of the mechanism main body 21. The clutch motor 41 performs normal rotation driving or reverse rotation driving in accordance with an instruction given by a
15 control unit 60 (refer to FIG. 1) via a harness 44 (refer to FIG. 11).

[0051] The slider 42 is made of a resin material, for example and is provided in a manner that the slider 42 can slide along the right-left direction in the mechanism main
20 body 21. As illustrated in FIGS. 16-1 and 16-2, the slider 42 has a slider main body 421 and a slider holding portion 422.

[0052] The slider main body 421 is structured to have notches having a substantially rectangular parallel box
25 shape and has a motor engagement portion 421a and a hook engagement portion 421b. The motor engagement portion 421a has an internal screw formed therein and engages with the clutch motor 41 by being screwed with an external screw 411 connected to the clutch motor 41. When the clutch motor 41
30 performs the normal rotation driving to rotate the external screw 411 in one direction, the slider 42 slides in the left direction in a manner to approach the clutch motor 41.

When the clutch motor 41 performs the reverse rotation driving to rotate the external screw 411 in the other direction, the slider 42 slides in the right direction in a manner to be separated from the clutch motor 41.

5 [0053] The hook engagement portion 421b has a flat plate like shape and is structured as an opening edge portion of a slider recess 423 formed above the motor engagement portion 421a on the right side of the motor engagement portion 421a. The hook engagement portion 421b can engage
10 with the pedal hook portion 242a when the pedal hook portion 242a enters the slider recess 423.

[0054] The slider holding portion 422 is provided at the rear end of a flat plate protruding from the slider main body 421 toward the rear direction. The slider holding
15 portion 422 has a holding hole 422a formed therein, thereby having a tubular shape.

[0055] The dog clutch 43 is made of a resin material, for example. As illustrated in FIGS. 17-1 and 17-2, the dog clutch 43 has a clutch base 431, a clutch engagement
20 portion 432, and a clutch transmission portion 433. The clutch base 431 has a tubular shape. The outer diameter of the clutch base 431 is larger than the inner diameter of the holding hole 422a of the slider holding portion 422.

[0056] The clutch engagement portion 432 has a tubular
25 shape and is formed in a manner to protrude in the right direction from the right end surface of the clutch base 431. The clutch base 431 and the clutch engagement portion 432 each have a hexagonal shaped connection hole 434 that is formed therein and fits the outer shape of the rotation
30 driving shaft 30. The outer diameter of the clutch engagement portion 432 is smaller than the outer diameter of the clutch base 431 and slightly smaller than the inner

diameter of the holding hole 422a of the slider holding portion 422. In addition, the extending length of the clutch engagement portion 432 in the right-left direction is larger than the length of the slider holding portion 422 in the right-left direction. On the right end of the clutch engagement portion 432, a clutch hook portion 432a is formed.

[0057] The clutch transmission portion 433 extends from a part of the outer circumferential surface of the clutch base 431 in an arc shape. On the left surface of the clutch transmission portion 433, transmission protrusions 433a are formed in a manner to be arranged side by side in an arc shape and protrude in the left direction. The transmission protrusions 433a can enter the transmission recesses 241c.

[0058] The dog clutch 43 is held by the slider 42 in a rotatable manner as a result of the engagement of the clutch hook portion 432a with the right end portion of the slider holding portion 422 after the clutch engagement portion 432 enters the holding hole 422a of the slider holding portion 422 from the left direction. The dog clutch 43 is stored in the mechanism main body 21 as a result of the penetration of the rotation driving shaft 30 into the connection hole 434 while the dog clutch 43 is inserted into the insertion portion 241b of the pedal base 241 of the pedal member 24.

[0059] The sold-out detection unit 25 (refer to FIG. 8) is stored in the mechanism main body 21 such that a sold-out contact 251 can be projected and retracted in the upper direction from an arm opening 232a formed on the right stopper arm portion 232 of the stopper member 23. The sold-out detection unit 25 detects that products are

available when the sold-out contact 251 is disposed under the arm opening 232a by being pressed. The sold-out detection unit 25 detects that no products are available when the sold-out contact 251 is disposed above the arm opening 232a. The detection result of the sold-out detection unit 25 is given to the control unit 60 as a detection signal.

[0060] The dispensing mechanism 20 thus structured is attached to the shelf 12 and provided on the downstream side of the product storage passage 14a of the product storage column 14, as a result of the insertion of the engagement protrusion 211a included in the main body engagement portion 211 of the mechanism main body 21 into a mechanism engagement hole 12c of the shelf 12 and engagement of the engagement hook portions 211b with the lower edge portion of the rear end portion of the shelf 12.

[0061] In the dispensing mechanism 20 in a standby state as illustrated in FIGS. 8 to 10, the slider 42 is disposed at the position separated from the clutch motor 41 and the pedal hook portion 242a of the pedal member 24 enters the slider recess 423 to engage with the hook engagement portion 421b. The pedal member 24 is in a state in which the pedal acting portion 243 protrudes from the mechanism main body 21 in the upper direction to advances to the product storage passage 14a. The slider 42 is disposed at the position separated from the clutch motor 41, resulting in the dog clutch 43 held by the slider holding portion 422 and the pedal member 24 being separated from each other, as illustrated in FIG. 18.

[0062] The pedestal portion 231b of the stopper member 23 is pressed by the pedal main body 242 of the pedal member 24 to swing in the lower direction against urging

force of the spring member 26. As a result, the stopper acting portion 231 enters the stopper opening 214 from the upper direction, thereby achieving a state in which the stopper member 23 retracts from the product storage passage 14a. As a result, the upper surfaces of the stopper acting portion 231 and the stopper arm portions 232 of the stopper member 23, and the upper surface of the pedal main body 242 are flush with the upper surface of the mechanism main body 21.

10 [0063] The lever member 22 is in a posture at which the lever restriction protrusions 222b swing in the upper direction until the lever restriction protrusions 222b abut the rear edges of the first restriction oblong holes 213 because only urging force of the spring member 26 acts on the lever member 22. As a result, as illustrated in FIGS. 1 and 2, a state is achieved in which the lever member 22 advances to a dispensing passage 50 that is provided on the rear direction side of the product storage rack 11 and extends in the upper-lower direction.

20 [0064] A base back plate 10b, which is included in the dispensing passage 50 as a back surface thereof, of the product storage device 10 is provided with a plurality of guide protrusions 51 protruding to the dispensing passage 50. The guide protrusions 51 are each provided in a manner to extend in the right-left direction at a portion that is lower than the height level of the dispensing mechanism 20 of the product storage rack 11. More specifically, between the product storage racks 11 adjacent to each other in the upper-lower direction, the guide protrusion 51 is provided at the mid-height level between the height level of the dispensing mechanism 20 of the product storage rack 11 on the upper direction side and the height level of the

dispensing mechanism 20 of the product storage rack 11 on the lower direction side.

[0065] The rotation transmission member 31 connected to the rotation driving shaft 30 meshes with a part of a transmission cable body 32 having the endlessly connected outer circumferential surface, as illustrated in FIG. 2. A part of the transmission cable body 32 meshes with a driving pulley 33. As a result of rotation of the driving pulley 33 around its center axis caused by a driving motor 34 performing driving, the transmission cable body 32 is displaced along its extending direction. The transmission cable body 32 is displaced with the rotation of the driving pulley 33, resulting in the rotation transmission member 31 rotating around its center axis. As a result, the rotation driving shaft 30 also rotates around its center axis serving as the axial center. The driving motor 34 performs normal rotation driving or reverse rotation driving in accordance with an instruction given by the control unit 60 electrically connected to the driving motor 34. The control unit 60 can detect a rotation angle of the rotation transmission member 31 from the detection result given by a rotation detection unit (not illustrated) such as an encoder provided near each rotation transmission member 31.

[0066] The following describes product dispensing operation by the product storage device 10. In the following description, one of the product storage columns 14 is exemplified for the purpose of explanation.

[0067] When the dispensing mechanism 20 is in the standby state, a state is achieved in which only the pedal member 24 advances to the product storage passage 14a as described above. As illustrated in FIG. 19, the pedal acting portion 243 abuts a downstream-most product W1 in

the product storage passage 14a. This causes the products in the product storage column 14 to be stored in a line along the product storage passage 14a and to be restricted from being separated from the product storage passage 14a.

5 [0068] The control unit 60, to which a dispensing instruction of the product stored in the product storage column 14 is given by a vending machine control unit (not illustrated) overall controlling the operation of the vending machine as a result of selection of the product by
10 a user, causes the clutch motor 41 of the dispensing mechanism 20 placed on the rear direction side of the product storage column 14 to perform the normal rotation driving. As a result, the external screw 411 rotates in one direction, causing the slider 42 to slide in the left
15 direction in a manner to approach the clutch motor 41, as illustrated in FIG. 20. The slider 42 slides in the left direction, resulting in the dog clutch 43 held by the slider 42 also sliding in the left direction. As a result, as illustrated in FIG. 21, each of the transmission
20 protrusions 433a of the dog clutch 43 enters one of the transmission recesses 241c of the pedal member 24, causing the dog clutch 43 to be connected to the pedal member 24. The slider 42 slides in the left direction, thereby releasing the engagement state between the hook engagement
25 portion 421b and the pedal hook portion 242a.

[0069] Once the dog clutch 43 and the pedal member 24 are connected, the control unit 60 causes the driving motor 34 to perform the normal rotation driving. As a result, the driving pulley 33 rotates clockwise when viewed from
30 the right direction, causing the transmission cable body 32 to be displaced, resulting in the rotation transmission member 31 also rotating clockwise when viewed from the

right direction.

[0070] The rotation transmission member 31 rotates in this way, causing the rotation driving shaft 30 to rotate around the center axis clockwise when viewed from the right
5 direction. The rotation driving shaft 30 rotates in this way, also causing the dog clutch 43 fitted to the rotation driving shaft 30 to turn clockwise when viewed from the right direction. As a result, the pedal member 24 connected to the dog clutch 43 swings toward the rear
10 direction as illustrated in FIG. 22.

[0071] When the pedal member 24 swings toward the rear direction, the stopper member 23, in which the pedestal portion 231b is pressed by the pedal main body 242 of the pedal member 24, swings in the upper direction until the
15 stopper restriction protrusions 233b abut the front edges of the second restriction oblong holes 215, as illustrated in FIG. 23, because the pressing pressure by the pedal member 24 is released. As a result, a state is achieved in which the stopper acting portion 231 protrudes in the upper
20 direction from the stopper opening 214 to advance to the product storage passage 14a.

[0072] The state in which the stopper member 23 advances to the product storage passage 14a causes, as illustrated in FIG. 24, the stopper acting surface 231a of the stopper
25 acting portion 231 to abut a product W2 that is the second from the downstream end in the product storage passage 14a, resulting in the product W2 being restricted from moving toward the downstream of the product storage passage 14a. This allows only the downstream-most product W1 to be
30 separated from other products.

[0073] The rotation of the rotation driving shaft 30 is maintained by the rotation of the rotation transmission

member 31 caused by the driving motor 34 performing the driving. The pedal member 24 connected to the dog clutch 43 that turns by the rotation of the rotation driving shaft 30 continues to swing toward the rear direction.

5 [0074] Thereafter, as the rotation angle of the rotation transmission member 31, it is detected that the pedal member 24 swings in the rear direction until the pedal member 24 reaches a posture allowing the downstream-most product W1 to be dispensed to the dispensing passage 50, as
10 illustrated in FIG. 25, based on the detection result of the rotation detection unit. The control unit 60 causes the driving motor 34 to stop the driving once.

[0075] As a result, the downstream-most product W1 is dispensed to the dispensing passage 50 and abuts the lever
15 member 22. The lever member 22 swings in the lower direction in a manner retracting from the dispensing passage 50 against the urging force of the spring member 26, and guides the abutting product to the guide protrusion 51 directly under the lever member 22. As illustrated in FIG.
20 26, after abutting the guide protrusion 51, the product guided to the guide protrusion 51 directly under the lever member 22 abuts the lever member 22 of any dispensing mechanism 20 included in the product storage rack 11 under the product storage rack 11 having the product storage
25 column 14 described above, thereby being guided to the guide protrusion 51 directly under the lever member 22. In this way, the product falls and meanders in the dispensing passage 50. The product having fallen and meandered in the dispensing passage 50 rolls on the product chute 5 to be
30 guided to the product take-out port 3a via the product ejection port 4a.

[0076] The guide protrusion 51 preferably guides the

product W1 near the lever penetration portion 222 of the lever member 22 directly under the guide protrusion 51 when abutting the product W1 falling in the dispensing passage 50. Reaction force (urging force) of the spring member 26
5 that is exerted on the lever member 22 is larger as the guided position is closer to the lever penetration portion 222 through which the rotation driving shaft 30 serving as a swing shaft of the lever member 22 penetrates. The guided position closer to the lever penetration portion 222,
10 thus, can effectively attenuate the falling speed of the product W1.

[0077] To more effectively attenuate impact of the product W1 having fallen on the product chute 5, the guide protrusion 51 is preferably formed so that the protrusion
15 height toward the dispensing passage 50 is larger for those arranged on the upper side of the dispensing passage 50, and smaller for those arranged on the lower side of the dispensing passage 50.

[0078] The control unit 60, which has caused the driving
20 motor 34 to stop the driving once, causes the driving motor 34 to perform the reverse rotation driving. The driving motor 34 performs the reverse rotation driving in this way, resulting in the driving pulley 33 rotating counterclockwise when viewed from the right direction,
25 causing the transmission cable body 32 to be displaced. As a result, the rotation transmission member 31 also rotates counterclockwise when viewed from the right direction. The rotation transmission member 31 rotates in this way, thereby causing the rotation driving shaft 30 to rotate
30 around the center axis counterclockwise when viewed from the right direction. The rotation driving shaft 30 rotates in this way, causing the dog clutch 43 fitting the rotation

driving shaft 30 also to turn counterclockwise when viewed from the right direction. The pedal member 24 connected to the dog clutch 43 swings toward the front direction.

[0079] When the pedal member 24 swings toward the front direction, the stopper member 23, in which the pedestal portion 231b is pressed by the pedal main body 242 of the pedal member 24, swings in the lower direction against the urging force of the spring member 26. Thereafter, the stopper acting portion 231 enters the stopper opening 214 to retract to the product storage passage 14a. As a result, the pedal member 24 returns to the standby state. At this time, the pedal hook portion 242a of the pedal member 24 enters the slider recess 423 of the slider 42.

[0080] Once the pedal member 24 returns to the standby state as described above, the control unit 60 causes the clutch motor 41 to perform the reverse rotation driving to cause the slider 42 to slide in the right direction, resulting in the slider 42 being disposed at a position separated from the clutch motor 41. As a result, the hook engagement portion 421b of the slider 42 and the pedal hook portion 242a engage with each other, thereby restricting the swing of the pedal member 24 even when a product newly disposed at the downstream-most side abuts the pedal acting portion 243. As a result, products are stored in the product storage passage 14a.

[0081] All of the rotation transmission members 31 rotate with the rotation of the driving motor 34 because the rotation transmission members 31 are linked to the driving pulley 33 via the transmission cable body 32. As a result, all of the rotation driving shafts 30 rotate. The rotation of the rotation driving shaft 30 causes the dog clutch 43 to rotate. However, in each of the dispensing

mechanisms 20 other than the dispensing mechanism 20 described above, the dog clutch 43 and the pedal member 24 are not connected while a state is maintained in which the pedal hook portion 242a of the pedal member 24 engages with
5 the hook engagement portion 421b. The other dispensing mechanisms 20, thus, maintain the standby state. As a result, no products are dispensed from the other product storage columns 14.

[0082] In the product storage rack 11 described above,
10 the shelf 12 has the multiple partition engagement holes 12b formed along the right-left direction at certain intervals, and the product storage column 14 is structured by inserting the engagement pieces 13a of the partition plate 13 into any partition engagement holes 12b to cause
15 the partition plate 13 to engage with the shelf 12. This makes it possible to change the right-left width of the product storage column 14 by changing the positions of the partition engagement holes 12b into which the engagement pieces 13a of the partition plate 13 are inserted. The
20 dispensing mechanism 20 can be displaced along the right-left direction in a state in which the rotation driving shaft 30 penetrates through the dispensing mechanism 20, and can be provided on the downstream side of the product storage passage 14a included in a product storage column 14.

25 [0083] In the product storage rack 11, the multiple product storage columns 14 are provided side by side in the right-left direction and are structured such that the right-left width of each product storage column 14 can be changed, and the dispensing mechanism 20 is provided such
30 that the dispensing mechanism 20 can be displaced in the right-left direction. The product storage rack 11, thus, can store and dispense various sizes of products.

[0084] In the product storage rack 11, the product storage column 14 is structured by inserting the engagement pieces 13a of the partition plate 13 into any partition engagement holes 12b of the shelf 12 to cause the partition plate 13 to engage with the shelf 12. In the state as illustrated FIG. 27 in which four product storage columns 14 are structured in a manner to be arranged side by side in the right-left direction, the partition plate 13 disposed at the most center is removed. As a result, as illustrated in FIG. 28, three product storage columns 14 can be structured in a manner to be arranged side by side in the right-left direction by merging the product storage passage 14a of one product storage column 14 of the product storage columns 14 adjacent each other and the product storage passage 14a of the other product storage column 14 of the product storage columns 14 adjacent each other to connect the product storage columns 14. In this case, the new connected product storage column 14 can store products W3 each having the height larger than that of each of products W stored in other product storage columns 14, thereby making it possible to store various sizes of products while an empty space is minimized and to dispense the products. As a result, various sizes of products can be efficiently stored with no gap therebetween and dispensed.

[0085] In the product storage rack 11, the rotation transmission member 31 and the rotation driving shaft 30 form a driving force apply unit that applies common driving force for operating the respective dispensing mechanisms 20 to the dispensing mechanisms 20, and the transmission mechanism 40 forms a driving force transmission unit that transmits the driving force of the driving force apply unit

to only the corresponding dispensing mechanism 20. The product storage rack 11 can include the unit as the common driving force source of the respective dispensing mechanisms 20 included in the product storage rack 11,

5 thereby making it possible to reduce the number of parts to reduce manufacturing cost. Furthermore, not only a single dispensing mechanism 20 but also the multiple dispensing mechanisms 20 can be driven synchronously in the product storage rack 11 depending on the number of driven
10 transmission mechanisms 40, thereby making it possible to dispense products from the multiple product storage columns 14 at the same time. In addition, when the product storage column 14 is provided with the multiple dispensing mechanisms 20, products stored in the product storage
15 column 14 can be dispensed satisfactorily by driving the dispensing mechanisms 20 in a synchronized manner. The dispensing operation of products can be synchronized among any product storage columns 14 satisfactorily.

[0086] In the product storage device 10, the rotation
20 transmission members 31 each provided for one of the product storage racks 11 are caused to rotate by the driving motor 34, which serves as a common power source, performing the driving. The unification of power sources reduces the number of parts, thereby lowering manufacturing
25 cost.

[0087] In the product storage device 10, the multiple guide protrusions 51 protruding toward the product storage racks 11 are provided on the base back plate 10b, which is included in the dispensing passage 50 in which the product
30 dispensed by the dispensing mechanism 20 falls, such that each guide protrusion 51 is lower than the height level of the dispensing mechanism 20 of the corresponding product

storage rack 11, and the lever member 22 of the dispensing mechanism 20 abuts the product falling in the dispensing passage 50 to guide the product to the guide protrusion 51 directly under the dispensing mechanism 20, thereby making it possible for the product to be caused to fall and meander in the dispensing passage 50. This can prevent the package of the product from being damaged. In addition, when the product is a strong carbonated beverage with a relatively high carbon dioxide concentration, this can prevent the occurrence of foaming in the beverage.

[0088] The following describes a modification of the product storage rack. FIG. 29 is a perspective view illustrating an appearance structure of a modification of the product storage rack in the embodiment of the present invention.

[0089] In a product storage rack 70 exemplified herein is structured such that a plurality of product storage columns 70a are provided side by side in left and right. The multiple product storage columns 70a included in the product storage rack 70 have the same structure. The following, thus, describes one of the product storage columns 70a.

[0090] The product storage column 70a includes a dispensing mechanism 80. The dispensing mechanism 80 has a structure in which a conveyance belt 82 is endlessly stretched between a pair of front and rear pulleys 81.

[0091] As illustrated in FIGS. 30 to 32, a pulley 81a on the front direction side has a tubular shape, and has a hollow portion 811 through which a rotation driving shaft 71 penetrates. The rotation driving shaft 71 has a polygonal pillar shape such as a hexagonal pillar shape, for example. The right end portion of the rotation driving

shaft 71 is connected to the center portion of a rotation transmission member 72 having a substantially disk shape. The rotation transmission member 72 is linked to a driving motor 73 serving as a driving source, and can rotate around its center axis by driving force applied from the driving motor 73. This makes it possible for the rotation driving shaft 71 also to rotate around its center axis serving as an axial center. The pulley 81 on the rear direction side is provided such that the pulley 81 can rotate around the axial center of a rotation shaft 74 extending along the right-left direction.

[0092] The conveyance belt 82 is displaced along its extending direction with the rotation of the pulleys 81. Specifically, the conveyance belt 82 is displaced such that an upper direction side extending portion 82a between the pulleys 81 moves in the front direction. The upper direction side extending portion 82a is a portion on which the product is placed, and forms a product storage passage 75 extending linearly in the front-rear direction.

[0093] The dispensing mechanism 80 is provided with a transmission mechanism 90. The transmission mechanism 90 includes a clutch motor 91, a slider 92, and a dog clutch 93. The clutch motor 91 is stored in a mechanism main body 90a having a penetration hole 90b that is formed therein and through which the rotation driving shaft 71 penetrates. The clutch motor 91 performs normal rotation driving or reverse rotation driving in accordance with an instruction given by a control unit (not illustrated).

[0094] The slider 92, which is made of a resin material, for example, is provided such that the slider 92 can slide along the right-left direction in the mechanism main body 90a. The slider 92 has a motor engagement portion 921 and

a slider holding portion 922.

[0095] The motor engagement portion 921, which has an internal screw (not illustrated) formed therein, engages with the clutch motor 91 by being screwed with an external screw 91b linked to an output shaft 91a of the clutch motor 91. When the clutch motor 91 performs the normal rotation driving to rotate the external screw 91b in one direction, the slider 92 slides in the right direction in a manner to approach the clutch motor 91. When the clutch motor 91 performs the reverse rotation driving to rotate the external screw 91b in the other direction, the slider 92 slides in the left direction in a manner to be separated from the clutch motor 91.

[0096] The slider holding portion 922 is provided on the front edge of a portion protruding in the front direction from the main body of the slider 92. The slider holding portion 922 has a holding hole 922a formed therein, thereby having a tubular shape.

[0097] The dog clutch 93, which is made of a resin material, for example, has a clutch base 931 and a clutch engagement portion 932. The clutch base 931 has a tubular shape. The outer diameter of the clutch base 931 is larger than the inner diameter of the holding hole 922a of the slider holding portion 922.

[0098] The clutch engagement portion 932 has a tubular shape, and is formed in a manner protruding in the left direction from the left end surface of the clutch base 931. The clutch base 931 and the clutch engagement portion 932 each have a hexagonal shaped connection hole 933 that is formed therein and fits the outer shape of the rotation driving shaft 71. The outer diameter of the clutch engagement portion 932 is smaller than the outer diameter

of the clutch base 931 and slightly smaller than the inner diameter of the holding hole 922a of the slider holding portion 922. In addition, the extending length of the clutch engagement portion 932 in the right-left direction is larger than the length of the slider holding portion 922 in the right-left direction.

5 [0099] The clutch base 931 is provided with a plurality of transmission protrusions 931a on its right surface. The transmission protrusions 931a are formed in a manner to be arranged side by side in a circumferential shape and each transmission protrusion 931a protrudes from the right surface of the clutch base 931 to the right direction. The transmission protrusions 931a can enter transmission recesses 811a formed on the pulley 81a on the front direction side.

15 [0100] The clutch engagement portion 932 of the dog clutch 93 enters the holding hole 922a of the slider holding portion 922 from the right direction, resulting in the dog clutch 93 being held by the slider 92 in a rotatable manner.

20 [0101] The product storage rack 70 having the structure described above can dispense the product from any product storage column 70a as described below. The following description assumes that the driving motor 73 performs the driving and the rotation driving shaft 71, thus, rotates counterclockwise when viewed from the right direction. In addition, it is assumed that the slider 92 slides in the left direction in a manner to be separated from the clutch motor 91.

25 [0102] The dog clutch 93 rotates with the rotation of the rotation driving shaft 71 while the slider 92 slides in the left direction. As a result, as illustrated in FIG. 33,

the dog clutch 93 and the pulley 81a on the front direction side are separated, resulting in the pulley 81a on the front direction side not rotating. In this state, the conveyance belt 82 is not displaced, and the product is
5 just placed on the upper direction side extending portion 82a.

[0103] When a dispensing instruction of the product stored in any product storage column 70a is given, the control unit causes the corresponding clutch motor 91 to
10 perform the normal rotation driving. As a result, the external screw 91b rotates in one direction. As illustrated in FIG. 34, the slider 92 slides in the right direction in a manner approaching the clutch motor 91. With the slide of the slider 92 in the right direction, the
15 dog clutch 93 held by the slider 92 also slides in the right direction. As a result, the transmission protrusions 931a of the dog clutch 93 each enter one of the transmission recesses 811a of the pulley 81a on the front direction side, resulting in the dog clutch 93 being
20 connected to the pulley 81a on the front direction side.

[0104] Once the dog clutch 93 and the pulley 81a on the front direction side are connected in this way, driving force of the driving motor 73 is applied to the pulley 81a on the front direction side via the rotation driving shaft
25 71 and the dog clutch 93, thereby causing the pulley 81a on the front direction side to rotate counterclockwise when viewed from the right direction. As a result, the conveyance belt 82 is displaced. The conveyance belt 82 is displaced such that the upper direction side extending
30 portion 82a moves in the front direction. This causes the downstream-most product disposed at the foremost position, which is the downstream-most side of the upper direction

side extending portion 82a, to move toward the front direction, resulting in the product being dispensed through the product storage passage 75.

[0105] After the downstream-most product is dispensed, the control unit causes the clutch motor 91 to perform the reverse rotation driving. As a result, the external screw 91b rotates in the other direction. As illustrated in FIG. 33, the slider 92 slides in the left direction in a manner to be separated from the clutch motor 91. The slider 92 slides in the left direction, resulting in the dog clutch 93 held by the slider 92 also sliding in the left direction. As a result, the transmission protrusions 931a of the dog clutch 93 are separated from the respective transmission recesses 811a, resulting in the connection between the dog clutch 93 and the pulley 81a on the front direction side being released. Once the connection between the dog clutch 93 and the pulley 81a on the front direction side is released in this way, the pulley 81a on the front direction side stops rotation. As a result, the conveyance belt 82 stops its displacement.

[0106] In the product storage rack 70 described above, the rotation transmission member 72 and the rotation driving shaft 71 form a driving force apply unit that applies common driving force for operating the respective dispensing mechanisms 80 to the dispensing mechanisms 80, and the transmission mechanism 90 forms a driving force transmission unit that transmits the driving force of the driving force apply unit to only the corresponding dispensing mechanism 80. The product storage rack 70 can include the unit as the common driving force source of the respective dispensing mechanisms 80 included in the product storage rack 70, thereby making it possible to reduce the

number of parts to lower manufacturing cost. Furthermore, not only a single dispensing mechanism 80 but also the multiple dispensing mechanisms 80 can be driven synchronously in the product storage rack 70 depending on the number of driven transmission mechanisms 90, thereby making it possible to dispense products from the multiple product storage columns 70a at the same time. The dispensing mechanism operation of products can be synchronized among any product storage columns 70a satisfactorily.

[0107] The dispensing operation of products can be synchronized among any product storage columns 70a in this way. The dispensing mechanism operation of products can be synchronized also between the product storage columns 70a adjacent each other. In this case, products such as lunch boxes, for example, can be placed across the product storage passages 75 adjacent each other and can dispense the products satisfactorily.

[0108] In a product storage device 100 that has a structure in which the product storage racks 70 are provided as a plurality of layers in the upper-lower direction, as illustrated in FIG. 35, the rotation transmission members 72 are linked by a transmission cable body 76, thereby making it possible to use the driving motor 73 as a common power source of the driving force apply units (the rotation transmission members 72 and the rotation driving shafts 71) of the respective product storage racks 70. The driving force apply unit can apply, as driving force, the power given from the power source common to the other driving force apply units included in the other product storage racks 70.

[0109] In the product storage device 100, the rotation

transmission members 72 each provided for one of the product storage racks 70 are caused to rotate by the driving motor 73, which services as the common power source, performing the driving. The unification of power sources
5 reduces the number of parts, thereby lowering manufacturing cost.

[0110] The preferred embodiment and the modification of the present invention are described above. The present invention is not limited to the embodiment and the
10 modification described above. The present invention can be modified in various ways.

[0111] In the embodiment described above, the rotation transmission members 31 are driven by the common driving motor 34 via the transmission cable body 32, and the
15 rotation transmission members 72 are driven by the common driving motor 73 via the transmission cable body 76. The present invention may allow the respective rotation transmission members to be driven individually.

[0112] In the embodiment described above, the clutch
20 motor 41 included in the transmission mechanism 40 performs the normal rotation driving or the reverse rotation driving, thereby causing the slider 42 to slide, and the clutch motor 91 included in the transmission mechanism 90 performs the normal rotation driving or the reverse rotation driving,
25 thereby causing the slider 92 to slide. The actuator causing the slider 42 to slide is not limited to the clutch motor 41, and the actuator causing the slider 92 to slide is not limited to the clutch motor 91. The actuators may be solenoids, for example.

30 [0113] The embodiment described above is an example in which the product storage device 10 is applied to the vending machine. The present invention may allow the

product storage device to be applied to a showcase.

Reference Signs List

	[0114]	10	PRODUCT STORAGE DEVICE
		11	PRODUCT STORAGE RACK
5		12	SHELF
		13	PARTITION PLATE
		14	PRODUCT STORAGE COLUMN
		14A	PRODUCT STORAGE PASSAGE
		20	DISPENSING MECHANISM
10		21	MECHANISM MAIN BODY
		22	LEVER MEMBER
		23	STOPPER MEMBER
		24	PEDAL MEMBER
		25	SOLD-OUT DETECTION UNIT
15		30	ROTATION DRIVING SHAFT
		31	ROTATION TRANSMISSION MEMBER
		33	DRIVING PULLEY
		34	DRIVING MOTOR
		40	TRANSMISSION MECHANISM
20		50	DISPENSING PASSAGE
		51	GUIDE PROTRUSION
		60	CONTROL UNIT

CLAIMS

1. A product storage rack comprising:

a plurality of product storage columns each of which stores products in a product storage passage extending linearly such that products are arranged side by side in a line along an extending direction of the product storage passage;

a dispensing mechanism that is provided for each of the product storage columns and, when the dispensing mechanism performs driving, dispenses a downstream-most product, which is disposed at a downstream-most side among the products stored in the product storage passage, from the product storage passage;

a driving force apply unit that applies common driving force for operating the dispensing mechanism; and

a driving force transmission unit that transmits the driving force of the driving force apply unit to only a corresponding dispensing mechanism when a dispensing instruction of the product stored in any product storage column is given.

2. The product storage rack according to claim 1, wherein

the product storage columns each store the products such that the products are arranged side by side in a line in the product storage passage that extends in a manner to be gradually tilted downward from an upstream side to a downstream side, and each of the product storage columns is structured such that the right-left width of the product storage column is capable of being changed, and

the dispensing mechanism is provided on the downstream side of the product storage passage, restricts separation of the products stored in the product storage passage from

the product storage passage in a standby state, dispenses the downstream-most product from the product storage passage upon operating, and is provided such that the dispensing mechanism is capable of being displaced in a right-left direction.

3. The product storage rack according to claim 2, wherein the product storage column is structured such that the product storage column is capable of being connected to another product storage column by merging of the product storage passage of the product store column and the product storage passage of the another product storage column.

4. A product storage device comprising a plurality of layers of the product storage racks according to claim 1 along an upper-lower direction, wherein the driving force apply unit applies, as the driving force, power given from a power source, which is common to another driving force apply units provided in other product storage racks.

5. The product storage device according to claim 4, wherein

the dispensing mechanism has a lever member that is provided such that the lever member is capable of swinging in a manner to advance to and retract from a dispensing passage in which the product dispensed through the product storage passage falls,

the product storage device includes a plurality of guide protrusions that are provided on a surface, the surface constituting the dispensing passage and facing the dispensing mechanism, along the upper-lower direction in a manner to protrude to the dispensing passage, and

when the product falling in the dispensing passage abuts the lever member, the lever member guides the product to the guide protrusion directly under the lever member while swinging in a manner to retract from the dispensing
5 passage.

6. The product storage rack according to claim 1, wherein the dispensing mechanism includes:

a pair of front and rear pulleys configured to
10 rotate around center axes of the pulleys; and

a conveyance belt that is endlessly stretched between the pulleys and is displaced in an extending direction of the conveyance belt by the rotation of the pulleys, and

15 an upper extending portion of the conveyance belt between the pulleys forms the product storage passage to store the products by causing the products to be placed on the upper extending portion in a manner to be arranged side by side along the front-rear direction, and, when a
20 dispensing instruction is given, the pulleys are rotated to displace the conveyance belt, thereby dispensing the downstream-most product.

7. A product storage device comprising a plurality of
25 layers of the product storage racks according to claim 6 along an upper-lower direction, wherein the driving force apply unit applies, as the driving force, power given from a power source, which is common to another driving force apply units included in another product storage racks.