

COMMODITY STORAGE APPARATUS OF VENDING MACHINE

BACKGROUND OF THE INVENTION

[0001]

The present invention relates to a commodity storage apparatus of a vending machine, and more particular, to a commodity storage apparatus that delivers a commodity through a bucket between it and a commodity rack with a plurality of commodity storage columns aligned in a left and right direction.

[0002]

Some vending machines include a commodity storage housing of heat insulated structure, in which there are provided a commodity storage column with commodities received therein and a bucket for conveyance of a commodity. While the commodity storage column stores therein a plurality of commodities in an aligned state, it discharges the commodities one by one from a front end thereof in the case where a vend mechanism is driven. With general vending machines, a plurality of commodity storage columns are arranged on a commodity rack in a left and right direction and the commodity racks are provided in plural stages in a vertical direction between a pair of left and right rack support side plates.

[0003]

A bucket serves to deliver a commodity between it and

a commodity storage column and is arranged movably in a region forwardly of commodity racks. More specifically, the bucket is arranged to be enabled by bucket driving means to move up and down and left and right in a region forwardly of commodity racks.

[0004]

The bucket driving means comprises a X-axis conveyance mechanism capable of moving a bucket in a left and right direction, and Y-axis conveyance mechanisms, which cause the bucket including the X-axis conveyance mechanism to move in a vertical direction.

[0005]

With such vending machine, a bucket received a designated commodity from a predetermined commodity storage column is moved downward for discharge and a pin member provided on the bucket abuts against a protrusive member of a door body, which constitutes the front of a commodity storage housing, to put the bucket in an inclined posture, whereby the commodity thus received is discharged (see, for example, JP-A-2008-202935).

[0007]

By the way, the vending machine proposed in JP-A-2008-202935 involves a fear that when the bucket arranged in opposition to a predetermined commodity storage column receives a commodity from the commodity storage column, the bucket is put in an inclined posture of permitting discharge

of the commodity by the weight of the commodity in the case where the commodity has a smooth surface and a comparatively large weight like, for example, bottled beverage, etc. When a bucket is put in an inclined posture at the time of receiving the commodity, there is a fear that the commodity cannot only be received in a desired posture but also the commodity thus received is permitted to fall.

[0008]

In order to solve such problem, it is possible to provide a lock mechanism for locking of a posture and a release mechanism, which is driven by an actuator to release the lock mechanism, on a bucket itself.

[0009]

However, the provision of a lock mechanism and a release mechanism on a bucket itself brings about an increase in number of parts of the bucket, an increase in weight, and hence an increase in cost.

SUMMARY OF THE INVENTION

[0010]

The invention has been thought of in view of the situation and has its object to provide a commodity storage apparatus of a vending machine, which does not bring about an increase in cost and in which a bucket receives a commodity from a predetermined commodity storage column and can move the commodity thus received in a desired posture without

permitting the commodity to fall.

[0011]

In order to attain the object, a commodity storage apparatus of a vending machine, according to claim 1 of the invention, has a feature in a commodity storage apparatus of a vending machine comprising a plurality of commodity racks each formed by aligning a plurality of commodity storage columns in a left and right direction and provided in plural stages in a vertical direction in a commodity storage housing of heat insulated structure, a bucket arranged movably in a region forwardly of the commodity racks to enable delivering a commodity between it and an optional commodity storage column when being arranged in opposition to the commodity storage column, and bucket driving means that drives the bucket, and wherein the bucket comprises a bucket body being a frame, a storage member arranged on the bucket body to be able to swing, normally put in a posture of receiving to be received in the bucket body owing to its weight, and swinging to open a bottom surface thereof to be put in a posture of discharge to permit discharge of a commodity in the case where a pin member, which constitutes the bucket, abuts against a protrusive member of a door body, which constitutes the front of the commodity storage housing, and a restriction member that inhibits a weight of a commodity from putting the storage member in a posture of discharge in the case where the commodity is to be

received from a commodity storage column arranged in opposition thereto.

[0012]

Also, the commodity storage apparatus of a vending machine, according to claim 2 of the invention, adds to claim 1 described above a feature that the restriction member comprises a groove that permits entry of a shaft portion, which constitutes the storage member put in a posture of receiving, and inhibits longitudinal movements of the shaft portion.

[0013]

Also, the commodity storage apparatus of a vending machine, according to claim 3 of the invention, adds to claim 1 described above a feature that the bucket comprises a pusher member that advances and moves relative to a commodity storage column arranged in opposition thereto in order to open a gate member provided at a front end of the commodity storage column, and the restriction member comprises a plate-shaped member that moves to a predetermined position of restriction according to advancing movement of the pusher member to thereby abut against a part of the storage member in a posture of receiving to inhibit the storage member from swinging.

[0014]

According to the invention, since the restriction member, which constitutes the bucket, inhibits a weight of a commodity from putting the storage member in a posture of discharge in

the case where the commodity is to be received from a commodity storage column arranged in opposition thereto, there is no fear that the bucket permits the commodity thus received to fall, and it is unnecessary to provide a lock mechanism and a release mechanism, which constitute separate elements, on the bucket, so that an increase in cost is not brought about. Accordingly, there is produced an effect that an increase in cost is not brought about and the bucket can receive a commodity from a predetermined commodity storage column and move the commodity in a desired posture without permitting the commodity thus received to fall.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front view showing a vending machine, to which a commodity storage apparatus according to an embodiment of the invention is applied;

Fig. 2 is a perspective view showing an internal construction of the vending machine, to which the commodity storage apparatus according to the embodiment of the invention is applied;

Fig. 3 is a perspective view showing a bucket mounted on a X-axis conveyance mechanism, which constitutes bucket driving means, as viewed from the front;

Fig. 4 is a perspective view showing the case where the bucket is viewed from the rear;

Fig. 5 is a side view schematically showing the case where

the bucket is viewed from laterally, and showing an interior in perspective;

Fig. 6 is a side view schematically showing the case where the bucket is viewed from laterally, and showing an interior in perspective;

Fig. 7 is a side view schematically showing the case where the bucket is viewed from laterally, and showing an interior in perspective;

Fig. 8 is a perspective view showing a modification of the bucket according to the embodiment of the invention, as viewed from the front;

Fig. 9 is a perspective view showing a modification of the bucket according to the embodiment of the invention, as viewed from the rear;

Fig. 10 is a side view schematically showing the case where the bucket shown in Figs. 8 and 9 is viewed from laterally, and showing an interior in perspective;

Fig. 11 is a side view schematically showing the case where the bucket shown in Figs. 8 and 9 is viewed from laterally, and showing an interior in perspective;

Fig. 12 is a view illustrating a modification of the bucket according to the embodiment of the invention and an internal structure of sides, which constitute a bucket body;

Fig. 13 is a perspective view showing the internal structure of the sides shown in Fig. 12, as viewed from the

rear;

Fig. 14 is a view illustrating a modification of the bucket according to the embodiment of the invention and an internal structure of sides, which constitute a bucket body;

Fig. 15 is a perspective view showing the internal structure of the sides shown in Fig. 14, as viewed from the rear; and

Fig. 16 is a perspective view schematically showing the positional relationship among an abutting piece of an upper side rear extension, a restriction plate, and a pusher shown in Figs. 14 and 15.

DETAILED DESCRIPTION OF THE INVENTION

[0016]

Referring to the accompanying drawings, a preferred embodiment of a commodity storage apparatus of a vending machine according to the invention will be described below in detail.

[0017]

Figs. 1 and 2, respectively, show a vending machine, to which an commodity storage apparatus according to an embodiment of the invention is applied, Fig. 1 being a front view, and Fig. 2 being a perspective view showing an internal construction.

Here, the vending machine illustrated herein sells a commodity W (see Figs. 5 to 7), such as canned beverage, beverage packed

in PET bottles, beverage packed in paper packs, etc. in a cooled or heated state, and comprises a body cabinet 1.

[0018]

The body cabinet 1 is rectangular-shaped with a front thereof opened and its interior is compartmented into two sections, an upper section of which defines a commodity storage housing 2 and a lower section of which defines a machine room 3. The commodity storage housing 2 comprises a chamber, an interior of which is maintained in a state of a preset temperature, and wall members, which define the commodity storage housing 2, respectively, are made of a heat insulating material. Also, while not shown clearly in the figure, there are provided cooling means for cooling of an internal atmosphere, such as an evaporator, which constitutes a refrigerating cycle, and heating means for heating of an internal atmosphere, such as electric heater, etc. On the other hand, a refrigerator (compressor, condenser) 4, which constitutes a refrigerating cycle together with the evaporator, and various control equipment, etc. are provided in the machine room 3.

[0019]

An external door 5 and an internal door 6 are provided on the front of the body cabinet 1. The internal door 6 comprises a door body formed by fitting thereinto a transparent plate member 7 such as insulating glass, etc. and is

sufficiently large to cover the front of the commodity storage housing 2. In the case where the internal door 6 is to move in a closing manner to close the front of the commodity storage housing 7, it serves a heat insulating member that constitutes the front of the commodity storage housing 2.

[0020]

Formed in a region below a central portion of the transparent plate member 7 of the internal door 6 are a rectangular-shaped commodity carrying-out port 8 and a carrying-out flapper 9 that serves to close the commodity carrying-out port 8. The carrying-out flapper 9 is journaled with a lower end thereof made free to be able to swing in a longitudinal direction and closes the commodity carrying-out port 8 in a normal state owing to its weight.

[0021]

Also, a protrusive member 10 is protrusively provided just above the commodity carrying-out port 8 of the internal door 6. The protrusive member 10 is made of a metallic material and provided in a manner to protrude from a rear surface of the internal door 6, and more specifically, provided in a manner to protrude rearward in the case where the internal door 6 closes the front of the commodity storage housing 2.

[0022]

The external door 5 serves to open and close the front opening of the body cabinet 1 and has a window 11, which is

made of a heat insulating material at need and formed by fitting thereinto a transparent plate member such as insulating glass, etc. Accordingly, the vending machine is of a view type, an interior of which can be visually recognized through the window 11 of the external door 5. Also, arranged on the front of the external door 5 are selection switches 12 intended for selection of a sales commodity, a money inlet slot 13 for charging of money, etc., which elements are necessary at the time of automatic vending of a commodity. In addition, in the specification of the present application, a left direction indicates a leftward direction in the case where the vending machine is seen from the front, and a right direction indicates a rightward direction in the case where the vending machine is seen from the front.

[0023]

Commodity racks 20 and bucket driving means 30 are provided in the commodity storage housing 2. The commodity racks 20 are formed by aligning a plurality of commodity storage columns 21 in a left and right direction, and can receive a plurality of commodities in a state of aligning them in a longitudinal direction in a commodity storage passage 22 defined in each of the commodity storage columns 21. The commodity racks 20 are provided in plural stages in a vertical direction in a manner to bridge a pair of left and right rack support side plates (not shown) mounted in the commodity

storage housing 2.

[0024]

The rack support side plates, which support the commodity racks 20, comprise a lengthy plate-shaped body formed by appropriately working, for example, a sheet metal or the like and are provided in a manner to have mutual surfaces (inner surfaces) thereof facing each other. Specifically, the rack support side plates are provided and mounted to a roof plate, a bottom plate, etc., which constitute the commodity storage housing 2, by means of mounting members such as screws or the like.

[0025]

The respective commodity storage columns 21 on the commodity rack 20 supported by the rack support side plates comprise a conveyance mechanism with an endless belt 24 (see Figs. 12 and 14) stretched around rollers 23 (see Figs. 12 and 13) arranged in parallel fore and aft and commodities W are put and received on an upper surface of the conveyance belt 24. A vend mechanism 25 (see Figs. 12 and 13) is provided at a front end of each of the commodity storage columns 21 to control discharge of a commodity W. The vend mechanism 25 does not include a drive unit separated from a power source such as drive motor, solenoid, or the like and is driven upon transmission of power from an electrically-driven drive mechanism 50 (see Figs. 12 and 13) built in a bucket 40 in the

case where the bucket 40 described later is arranged in opposition to a commodity storage column 21 as designated.

[0026]

The bucket driving means 30 is constructed as a combination of a X-axis conveyance mechanism 31 and a Y-axis conveyance mechanisms 32. The X-axis conveyance mechanism 31 comprises a rail member 311 extending in a region disposed in the body cabinet 1 and extending forwardly of the commodity racks 20 in a left and right direction and is driven by a X-axis motor 312 (see Figs. 3 to 7) to move the bucket 40 put thereon in a direction (a left and right direction), in which the rail member 311 extends.

[0027]

The X-axis motor 312 is, for example, PWM (Pulse Width Modulation) driven. Here, in PWM driving, the drive voltage of a motor is made intermittently ON and OFF, the larger an ON duty, the higher in speed the motor rotates, and the larger an OFF duty, the lower in speed the motor rotates. The construction itself of the X-axis conveyance mechanism 31 is well known and so a detailed explanation therefor is omitted herein.

[0028]

The construction itself of the Y-axis conveyance mechanisms 32 is well known and so a detailed explanation therefor is omitted herein but a simple explanation is given.

The Y-axis conveyance mechanisms 32 are provided on a pair of left and right conveyance support frame. Pulleys are arranged rotatably in the vicinity of upper ends of the conveyance support frames. A length of belt in the form of a lengthy cable is stretched around the pulleys, the belt being connected at one end thereof to a weight and connected at the other end thereof to a holding member, which holds the rail member 311. With the Y-axis conveyance mechanisms 32, a Y-axis motor is driven to rotate the pulleys whereby the rail member 311 held on the holding member and the X-axis conveyance mechanism 31 mounting thereon the bucket 40 are moved in a vertical direction. Here, the Y-axis motor is PWM driven in the same manner as the X-axis motor 312.

[0029]

Figs. 3 to 5, respectively, show the bucket 40 mounted on the X-axis conveyance mechanism 31, which constitutes the bucket driving means 30, Fig. 3 being a perspective view as viewed from the front, Fig. 4 being a perspective view as viewed from the rear, and Fig. 5 being a schematic side view as viewed from laterally. The bucket 40 illustrated herein comprises a bucket body 41, a storage member 42, and an abutting member 43.

[0030]

The bucket body 41 is a box-shaped frame opened at a front surface, a rear surface, and an upper surface thereof. A pair

of left and right sides 411, which constitute the bucket body 41, are provided upright in a manner to have mutual inner surfaces thereof facing each other. The sides 411 receive various equipment in a housing made of a resin, and an electrically-driven drive mechanism 50 and a pusher mechanism 60 (see Figs. 12 and 14) as an example are received therein. In the case where the bucket 40 is arranged in opposition to a commodity storage column 21 as designated, the electrically-driven drive mechanism 50 transmits and gives a driving force to the vend mechanism 25 at a front end of the commodity storage column 21. The pusher mechanism 60 comprises a pusher 62 (see Figs. 12 and 13), which is driven by a pusher motor 61 (see Figs. 12 and 13) to advance and move rearward, and the pusher 62 advances and moves to open a gate member 27 provided at the front end of the commodity storage column 21.

[0031]

The storage member 42 is formed by appropriately combining metallic plate bodies to subject the same to bending or the like and arranged on the bucket body 41 to be able to swing. More specifically, the storage member 42 comprises a storage front portion 421, storage side portions 422, and a storage bottom portion 423.

[0032]

The storage front portion 421 defines the front of the

storage member 42 to have a rectangular-shaped front opening 421a. The storage side portions 422, respectively, extend rearward from both ends of the storage front portion 421 in a manner to have mutual, inner surfaces thereof facing each other, and comprise an upper side rear extension 4221 and a lower side rear extension 4222. The upper side rear extension 4221 extends rearward on the upper side of the storage side portion 422 to have a slot 4221a of major diameter in a vertical direction. A shaft member 424 extends through the slots 4221a with the result that the storage member 42 is provided on the bucket body 41 to be able to swing about an axis of the shaft member 424. The lower side rear extension 4222 extends rearward on the lower side of the storage side portion 422 to have a slot 4222a of major diameter in a longitudinal direction.

[0033]

The storage bottom portion 423 comprises a plate-shaped body arranged between the lower side rear extensions 4222 of the storage side portions 422 to be able to swing through a shaft member 425. More specifically, both ends of the shaft member 425 extend through the slots 4222a of the lower side rear extensions 4222 to be inserted through guide grooves 426 formed on the both sides 411, which constitute the bucket body 41, whereby the storage bottom portion 423 is made able to swing about an axis of the shaft member 425.

[0034]

Here, the guide grooves 426 serve to guide the shaft member 425 inserted therethrough and extend gradually upward as they go forward. Restriction grooves 427 are formed at rear ends of the guide grooves 426 to extend downward contiguously to the guide grooves 426. The restriction grooves 427 restrict longitudinal movements of the shaft member 425 in the case where the shaft member 425 enters.

[0035]

The abutting member 43 is formed by appropriately combining metallic plate bodies to subject the same to bending or the like and arranged coaxially with the storage member 42 to be able to swing relative to the bucket body 41. The abutting member 43 comprises an abutting front 431 and abutting sides 432.

[0036]

The abutting front 431 constitutes the front of the abutting member 43 and is formed to be sized to be able to extend through the front opening 421a of the storage front portion 421 of the storage member 42. A pin member 433 is provided on the abutting front 431 in a manner to protrude forward. The pin member 433 is arranged to be able to swing about an axis of a shaft portion 434 provided on the abutting front 431 in a left and right direction and biased by a spring member 435 to protrude toward a front region, that is, toward the internal door 6 through the front opening 421a of the storage front

portion 421.

[0037]

The pair of left and right abutting sides 432 extend rearward from upper portions of both ends of the abutting front 431 and are connected at rear ends thereof by means of caulking to the shaft member 424 extended through the slots 4221a of the upper side rear extensions 4221 of the storage side portions 422. Thereby, the abutting member 43 is arranged to be able to swing about an axis of the shaft member 424, that is, journaled coaxially with the storage member 42 to be arranged on the bucket body 41 to be able to swing. Also, the left abutting side 432 out of the pair of left and right abutting sides 432 is formed on an upper portion of a rear end thereof with a bent restricting piece 436.

[0038]

The bucket 40 will be generally described. Both the storage member 42 and the abutting member 43 are arranged on the bucket body 41 in a manner to be able to swing about the axis of the shaft member 424, which is common thereto. The shaft member 424 has one end thereof supported on the side 411 of the bucket body 41 to be made rotatable about its axis and extends through the slot 4221a of the storage member 42 to have the other end thereof connected by means of caulking to a rear end of the storage side portion 422 of the abutting member 43. The storage member 42 is normally put in a posture of receiving

being received in the bucket body 41 owing to its weight. In such posture of receiving, as shown in Fig. 5, the shaft member 425 extending through the slots 4222a of the lower side rear extensions 4222 on the storage member 42 enters into the restriction grooves 427 of the sides 411 of the bucket body 41 to be inhibited from moving longitudinally of the shaft member 425.

[0039]

Also, in case of being put in such posture of receiving, the storage bottom portion 423 of the storage member 42 is supported on a bottom portion of the bucket body 41 to close a bottom surface of the storage member 42 to be put in a state of enabling putting a commodity W thereon.

[0040]

On the other hand, the abutting member 43 is put in a standby posture of being received in the bucket body 41 owing to its weight. Even, in such standby posture, the pin member 433 provided on the abutting front 431 protrudes forward through the front opening 421a of the storage front portion 421. In the case where the abutting member 43 is put in a standby posture, the restricting piece 436 formed on the upper portion of the rear end of the left abutting side 432 is positioned in a region above a protrusive portion 422a protruding upward from an upper end of the storage side portion 422 whereby the storage member 42 put in a posture of receiving

is inhibited from moving upward.

[0041]

With the commodity storage apparatus constructed in the above manner, cooling means or heating means is driven in a sales standby state whereby commodities stored in the commodity storage housing 2 are maintained in a state of desired temperature.

[0042]

In the sales standby state, when information of selection of a commodity through the selection switches 12 and receipt information of money charged through the money inlet slot 13, respectively, meet a predetermined sales condition, the bucket driving means 30 is driven to have the bucket 40 arranged in opposition to the commodity storage column 21, in which a selected commodity is stored. When the bucket 40 is arranged in opposition to the commodity storage column, the electrically-driven drive mechanism 50 stored on the sides 411 of the bucket 40 drives the vend mechanism 25 of the commodity storage column 21. Thereby, only one commodity W is moved onto the bucket 40 to be received in and put on the storage bottom portion 423 of the storage member 42 put in a posture of receiving.

[0043]

The bucket 40 with the commodity W received therein is driven by the bucket driving means 30 to move to an

interexchange position optionally set in a region just above the protrusive member 10 and moves downward from the interexchange position.

[0044]

When the bucket moves downward from the interexchange position in this manner, the pin member 433 of the abutting member 43, which constitutes the bucket 40, abuts against the protrusive member 10 as shown in Fig. 6. When the pin member 433 abuts against the protrusive member 10, only the abutting member 43 in a standby posture swings about the axis of the shaft member 424, that is, swings upward. Since the abutting member 43 swings thus, the restricting piece 436 of the abutting member 43 retreats and moves rearward from a region above the protrusive portion 422a of the storage member 42. Thereby, the storage member 42 put in a posture of receiving is put in a state of being able to move upward.

[0045]

As the bucket 40 is driven by the bucket driving means 30 to move downward, the abutting member 43 with the pin member 433 abutting against the protrusive member 10 swings upward and the pin member 433 pushes an upper edge portion of the front opening 421a of the storage front portion 431 whereby the storage member 42 put in a posture of receiving moves upward. The upward movement of the storage member 42 causes the both ends of the shaft member 425 to move to the rear ends of the

guide grooves 426 from the restriction grooves 427 whereby the shaft member 425 is put in a state of being able to move forward in a direction, in which the guide grooves 426 extend.

[0046]

The bucket 40 moves further downward whereby the storage member 42 pushed by the abutting member 43 swings about the axis of the shaft member 424, that is, swings upward. At this time, the both ends of the shaft member 425 move forward in a direction, in which the guide grooves 426 extend, and as shown in Fig. 7, the storage bottom portion 423 separates from a state supported on the bottom portion of the bucket body 41 to swing downward about the axis of the shaft member 425 to be put in a forwardly tilting posture, in which it protrudes forward, whereby the storage member 42 is put in a posture of discharge with a bottom surface thereof opened.

[0047]

When the storage member 42 is put in a posture of discharge in this manner, the storage member 42 pushes the carrying-out flapper 9 forward to open the commodity carrying-out port 8. Thereby, the commodity W is discharged from the commodity carrying-out port 8 through the bottom surface thus opened to reach a predetermined take-out chamber to be put in a state capable of take-out.

[0048]

With the commodity storage apparatus, according to the

embodiment, described above, in the case where the storage member 42 is put in a posture of receiving, the both ends of the shaft member 425, which constitutes the storage member 42, enter into the restriction grooves 427 formed on the sides 411 of the bucket body 41 to be inhibited from moving in a longitudinal direction. Thereby, the storage member 42 is inhibited from swinging about the axis of the shaft member 424. That is, the restriction grooves 427 constitute a restriction member that inhibits the storage member 42 put in a posture of receiving to swing to be put in a posture of discharge.

[0049]

Since the restriction grooves 427 inhibits the storage member 42 put in a posture of receiving to swing to be put in a posture of discharge, the storage member 42 put in a posture of receiving is inhibited from being put in a posture of discharge owing to the weight of a commodity W in the case where the commodity W is received from that commodity storage column 21, to which the storage member is arranged in opposition. Thereby, there is no fear that the bucket 40 permits the commodity W thus received to fall, and it is unnecessary to provide a lock mechanism and a release mechanism, which constitute separate elements, on the bucket 40 itself, so that an increase in cost is not brought about. Accordingly, an increase in cost is not brought about and the bucket 40 can receive a commodity W from a predetermined commodity storage

column 21 and move the commodity W in a desired posture without permitting the commodity thus received to fall.

[0050]

While a preferred embodiment of the invention has been described, the invention is not limited thereto but susceptible of various modifications.

[0051]

For example, while the restriction grooves 427 formed on the sides 411 of the bucket body 41 inhibit the storage member 42 put in a posture of receiving from being put in a posture of discharge in the embodiment described above, a construction shown in Figs. 8 to 11 may be adopted in the invention.

[0052]

Figs. 8 to 11, respectively, show modifications of the bucket according to the embodiment of the invention, Fig. 8 being a perspective view as viewed from the front, and Fig. 9 being a perspective view as viewed from the rear. In addition, elements being structured in the same manner as in the embodiment described above are denoted by the same reference numerals as those in the latter and an explanation therefor is omitted.

[0053]

A bucket 40' illustrated herein comprises a bucket body 41, a storage member 42, and an abutting member 44. The abutting member 44 is formed by appropriately combining

metallic plate bodies to subject the same to bending or the like and arranged coaxially with the storage member 42 to be able to swing relative to the bucket body 41. The abutting member 44 comprises an abutting front 431 and abutting sides 442. The pair of left and right abutting sides 442 extend rearward from upper portions of both ends of the abutting front 431 and are connected at rear ends thereof by means of caulking to a shaft member 424 extended through slots 4221a of upper side rear extensions 4221 of storage side portions 422. Thereby, the abutting member 44 is arranged to be able to swing about an axis of the shaft member 424, that is, journaled coaxially with the storage member 42 to be arranged on the bucket body 41 to be able to swing. Also, the left abutting side 442 out of the pair of left and right abutting sides 442 is formed on an upper portion of a rear end thereof with a support piece 4421. The support piece 4421 serves to support a lengthy restriction rod 4422. As shown in Fig. 10, the restriction rod 4422 is provided in a manner to extend through a left side 411 of the bucket body 41 as shown in Fig. 10 and has its tip end positioned a region above a protrusive piece 422a, which protrudes leftward from the storage side portions 422 of the storage member 42, in the case where the abutting member 44 is in a standby posture. Thereby, the storage member 42 put in a posture of receiving is inhibited from swinging.

[0054]

When the bucket 40' moves downward from the interexchange position to cause a pin member 433 to abut against a protrusive member 10 whereby the abutting member 44 swings forward from the standby posture, the tip end of the restriction rod 4422 retreats and moves rearward from a region above the protrusive piece 422a as shown in Fig. 11. Thereby, the storage member 42 in a posture of receiving is put in a state capable of swinging to be pushed by the abutting member 44, which swings, to swing to be put in a posture of discharge. That is, the restriction rod 4422 supported on the support piece 4421 constitutes a restriction member that inhibits the storage member 42 in a posture of receiving from swinging to be put in a posture of discharge.

[0055]

Such construction inhibits the storage member 42 in a posture of receiving from being put in a posture of discharge owing to the weight of a commodity W when the commodity W is to be received from a commodity storage column 21 arranged in opposition to the storage member. Thereby, there is no fear that the bucket 40' permits the commodity W thus received to fall, and it is unnecessary to provide a lock mechanism and a release mechanism on the bucket 40' itself, so that an increase in cost is not brought about. Accordingly, an increase in cost is not brought about and the bucket 40' can receive a commodity W from a predetermined commodity storage

column 21 and move the commodity in a desired posture without permitting the commodity W thus received to fall.

[0056]

Fig. 12 shows a modification of the bucket according to the embodiment of the invention and an internal structure of sides, which constitute a bucket body. In addition, elements being structured in the same manner as in the embodiment described above are denoted by the same reference numerals as those in the latter and an explanation therefor is omitted. A bucket 40" illustrated herein comprises a bucket body 41, a storage member 42, and an abutting member 44. A restriction plate 45 is provided on a side 411', which constitute the bucket body 41, to be made movable in a vertical direction. In the case where a pusher 62 is stored in the side 411' as shown in Fig. 12, the restriction plate 45 is positioned in a lower limit position as shown in Fig. 13. In the case where the restriction plate is positioned in such lower limit position, it does not abut against an abutting piece 4221b formed at a rear end of the upper side rear extension 4221, which constitutes the storage member 42, but permits the storage member 42 to swing.

[0057]

On the other hand, as shown in Fig. 14, in the case where a pusher mechanism 60 is driven to cause the pusher 62 to advance and move rearward, the restriction plate 45 moves upward to be is positioned in an upper limit position (restriction

position) as shown in Fig. 15. In the case where the restriction plate is positioned in such upper limit position, the restriction plate 45 abuts against the abutting piece 4221b of the storage member 42 as schematically shown in Fig. 16 to inhibit the storage member 42 in a posture of receiving from swinging.

[0058]

That is, the restriction plate 45 constitutes a restriction member that inhibits the storage member 42 in a posture of receiving from swinging to be put in a posture of discharge when the pusher mechanism 60 is driven to cause the pusher 62 to advance and move. Such construction inhibits the storage member 42 in a posture of receiving from being put in a posture of discharge owing to the weight of a commodity W when the commodity W is to be received from a commodity storage column 21 arranged in opposition to the storage member. Thereby, there is no fear that the bucket 40" permits the commodity W thus received to fall, and only the restriction plate 45 is added to the bucket 40" itself eliminating the need of providing a lock mechanism and a release mechanism thereon, so that an increase in cost is not brought about. Accordingly, an increase in cost is not brought about and the bucket 40" can receive a commodity W from a predetermined commodity storage column 21 and move the commodity in a desired posture without permitting the commodity W thus received to fall.

WHAT IS CLAIMED IS:

1. A commodity storage apparatus of a vending machine, comprising:

a plurality of commodity racks each formed by aligning a plurality of commodity storage columns in a left and right direction and provided in plural stages in a vertical direction in a commodity storage housing of heat insulated structure;

a bucket arranged movably in a region forwardly of the commodity racks to enable delivering a commodity with respect to an optional commodity storage column when being arranged in opposition to the commodity storage column; and

bucket driving means that drives the bucket,

wherein the bucket comprises a bucket body being a frame, a storage member arranged on the bucket body to be able to swing, normally put in a posture of receiving to be stored in the bucket body owing to its weight, and swinging to open a bottom surface thereof to be put in a posture of discharge to permit discharge of a commodity in the case where a pin member, which constitutes the bucket, abuts against a protrusive member of a door body, which constitutes the front of the commodity storage housing, and a restriction member that inhibits a weight of a commodity from putting the storage member in a posture of discharge in the case where the commodity is to be received from a commodity storage column arranged in opposition thereto.

2. The commodity storage apparatus of a vending

machine according to claim 1, wherein the restriction member includes a groove that permits entry of a shaft portion, which constitutes the storage member put in a posture of receiving, and inhibits longitudinal movements of the shaft portion.

3. The commodity storage apparatus of a vending machine according to claim 1, wherein the bucket includes a pusher member that advances and moves relative to a commodity storage column arranged in opposition thereto in order to open a gate member provided at a front end of the commodity storage column, and the restriction member includes a plate-shaped member that moves to a predetermined position of restriction according to advancing movement of the pusher member to abut against a part of the storage member in a posture of receiving to inhibit the storage member from swinging.