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IPOS-Reference

AUTOMATIC VENDING MACHINE ✓

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an automatic vending machine which has a plural number of product containing racks arranged side by side in a storage space of a cabinet, and allows the product containing racks to be pulled out to this side, the product containing racks being interlinked by an interlocking mechanism so as to limit the number of racks that can be pulled out at one time.

2. Description of the Related Art

An automatic vending machine is known in which a plural number of product containing racks, as stated above, are arranged side by side in a storage space of the cabinet, and when product items are loaded into the rack, the rack is pulled out from the cabinet and necessary product items are supplied to the pulled out rack.

The weight of one rack fully loaded with products is very heavy, 70 to 80Kg. If a plural number of the fully loaded racks are pulled out at once, the center of gravity of a load of the automatic vending machine is shifted to the front. In an extreme case, there is a danger that the automatic vending machine is laid down.

The interlocking mechanisms, developed to cope with the problem, are known as disclosed in Japanese Utility Model Laid-



Open Publication Nos. Sho. 61-16678 and 61-84977. When the product containing rack is pulled out for supplying products to the product containing racks or for the machine maintenance, the interlocking mechanism limits the number of the pulled out racks to only one, while locking the remaining racks at their storage positions in the cabinet.

The conventional interlocking mechanism is complicated in construction and requires a large number of component parts. To lock the product containing racks at the storage positions in the storage space of the cabinet, a locking mechanism must be provided for each rack, in addition to the interlocking mechanism. This leads to an increase of cost to manufacture.

Recently, the automatic vending machines that are installed extending to the road are socially criticized. The recent market demands for the vending machines, in this field, tend to the thinned vending machines. In this respect, the market requests the development of the interlocking mechanism not attendant with an increase of the depth dimension of the vending machine.

SUMMARY OF THE INVENTION

The present invention has been made in view of the above circumstances, and therefore an object of the present invention is to provide an automatic vending machine with an interlocking mechanism that is simple and compact in its construction, and highly reliable in operation.



To achieve the above object, according to the present invention, there is provided an automatic vending machine improved in that the vending machine includes an interlocking mechanism includes a combination of locking means, horizontally swingable, for locking the product containing racks at predetermined storage positions in a storage space of a rack case, each of the locking means being placed between the adjacent product containing racks, a locking-means releasing slider, vertically movable, being provided, for each product containing rack, on the upper part of the front side of the rack case while being confronted with the locking means, and a locking-means linking slider, horizontally movable, being provided for each product containing rack, wherein in a state that the product containing racks are stored in the rack case, each locking means are put on the front edges of the product containing racks disposed on both side of the locking means, to thereby lock the product containing racks at their positions, and when one of the product containing racks is pulled out by releasing the locking means associated therewith from being locked in a manner that the locking-means releasing slider the product containing racks is pushed upward to push the locking means sideways, the releasing motion of the locking means is successively transferred to the remaining locking means by way of the locking-means linking sliders of the remaining product containing racks, so that the locking means are set at their



locking positions, to thereby the related product containing racks at their storage positions.

The automatic vending machine thus constructed has the following functions: 1) a stopper function; locking means locks the product containing racks at predetermined storage positions, and 2) an interlocking function; when one rack is drawn out of a storage space of the cabinet of the vending machine, the remaining racks are locked at their storage positions in the storage space. Further, the locking-means releasing sliders and the locking-means linking sliders are all installed in the upper portion of the front surface of the vending machine. The locking means is not protruded to the front beyond the product containing rack. With these unique features, a reduced number of component parts are required for constructing the interlocking mechanism. The assembling of the interlocking mechanism into the machine brings about no increase of the depth dimension of the vending machine. Furthermore, the locking means are separate components, and those are linked with one another by means of the locking-means linking sliders, which are provided on the racks. Thus, the mounting locations of the locking means may properly be selected in accordance with the layouts of the product containing racks, the racks to be pulled out at once may be set at a desired number.

In the automatic vending machine thus constructed, each locking means is an L-shaped plate which may be horizontally



swung about a point of fulcrum positioned on the rear end of the locking means, and the front end part of the locking means, bent downward, engages the side edges of the front end of a rack ceiling plate, shaped like a U-channel, provided at the top of the rack case, at the storage position of each product containing rack, and has a slant cam part, shaped like V, which moves sideways the related locking means from its neutral position, following a releasing motion of the locking-means releasing slider.

With the additional unique feature, the product containing rack may be locked at its storage position with the single part, or the locking means, and the locked state of the rack may be removed by pushing upward the locking-means releasing slider.

Where a plural number of product containing racks are stored in a plural number of storage compartments in the storage space of the cabinet, the locking means, which are located at the opposed ends of series of the locking means in the adjacent storage compartments, are interlinked by a linking means. With this unique feature, the interlocking function that prevents a plural number of the racks from being pulled out at once is secured between those storage compartments.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing an external appearance of a part of an automatic vending machine according



to an embodiment 1 of the present invention, which is in a state of the machine when one product containing rack is pulled out;

Fig. 2 is an exploded view showing an assembly of an interlocking mechanism incorporated into the product containing racks in the vending machine of Fig. 1;

Figs. 3A and 3B are explanatory views showing an operation of the interlocking mechanism incorporated into the Fig. 1 machine, where Fig. 3A is a view showing a locked state of the product containing racks, and Fig. 3B is an explanatory view showing a lock-released state of the product containing racks;

Figs. 4A to 4C are views showing different layouts of the locking means for the product containing racks as some applications of the interlocking mechanism;

Figs. 5A and 5B are views useful in explaining the construction and operation of an interlocking mechanism in an embodiment 2 of the present invention, where Fig. 5A shows a locked state of the product containing racks in the right and left compartments, and Fig. 5B shows a state of the product containing racks when the products containing rack in the right compartment is released from its locked state; and

Figs. 6A and 6B are views showing the operations of the locking means and the linking means in the embodiment 2, where Fig. 6A shows a case where the products containing rack is drawn out from the right compartment, and Fig. 6B shows a case



where the products containing rack is drawn out from the left compartment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now, a description will be given in more detail of preferred embodiments of the present invention with reference to the accompanying drawings.

(Embodiment 1)

Figs. 1 to 3 show an embodiment of the invention. In the figures, reference numeral 1 is a cabinet of an automatic vending machine. Numeral 2 indicates product containing racks of the drawer type which are horizontally arranged within a storage space of the cabinet 1 (denoted as A, B, C and D from the left to right side). Each of the product containing racks 2 is suspended from the ceiling of the cabinet 1 in a state that it may be pulled out with the aid of a rail mechanism 3. Each rail mechanism 3 includes a combination of a rack ceiling plate 3a shaped like a U-channel provided at the top of the rack case, a movable transport holder 3b, and a fixed transport holder 3c. The rack ceiling plate 3a is horizontally extended to have the right and left side edges. The front end face of the rack ceiling plate 3a is provided with a slider mounting seat 3d (Fig. 2) for mounting a slider to be described later.

A locking means 4, a locking-means releasing slider 5 and a locking-means linking slider 6, horizontally movable, makes up an interlocking mechanism. The locking means 4 is



provided on the ceiling of the storage space of the cabinet 1, while being located between the adjacent product containing racks 2 of the drawer type. The locking-means releasing slider 5, vertically movable, is provided on the upper front face of each rack.

The locking means 4 is an L-shaped plate which may be horizontally swung about a point of fulcrum where the rear end of the locking means 4 is pivotally mounted on the ceiling of the cabinet 1 by means of a stepped screw 4a. The front end part 4b of the locking means is bent downward, and has a slant cam part 4c, shaped like V, which moves following a releasing motion of the locking-means releasing slider 5.

The locking-means releasing slider 5 is best illustrated in Fig. 2. As shown, both sides of the locking-means releasing slider 5 are bent rearward to form actuator parts 5a, which are confronted with the slant cam parts 4c. An elongated hole 5b, vertically elongated, is formed at the central part of a major portion of the locking-means releasing slider 5. The locking-means releasing slider 5 is vertically movably mounted on the movable transport holder 3b of the rack ceiling plate 3a by means of a stepped screw 5c inserted into the elongated hole 5b, and a washer 5d. A front cover 2a is suspended from the lower side of the locking-means releasing slider 5 to thereby cover the front side of the product containing racks 2. A product insertion hole 2b is formed in the front side of the front cover 2a.

Both sides of the locking-means linking slider 6 are bent rearward to form tabs 6a, shaped like L, which are confronted with the side edges of the locking means 4. Elongated holes 6b, horizontally elongated, are formed in a major portion of the locking-means linking slider 6. The locking-means linking slider 6 is disposed on the rear side of the locking-means releasing slider 5, and horizontally mounted on the movable transport holder 3b of the rack ceiling plate 3a by means of the stepped screw.

The interlocking mechanism thus constructed will be described with reference to Figs. 1, 3A and 3B. Fig. 3A shows a view showing a locked state of the product containing racks 2 which are locked at predetermined storage positions in the cabinet. Each locking means 4 between the adjacent product containing racks 2 takes a neutral position. At this position, the front end part 4b, bent downward, of the locking means 4 engages the side edge of the front end of the rack ceiling plate 3a shaped like a U channel, to thereby prohibit the rack from being drawn out. In this locked state, the locking-means releasing slider 5 has been retracted to a lowered position, and the locking-means linking slider 6 is at a neutral position while being located between the adjacent locking means 4.

When an operator pushes up, by his hand, the front cover 2a of the product containing racks 2 to which products are to be supplementarily supplied, the locking-means releasing slider 5, coupled with the front cover 2a, slides upward in the



direction of an arrow X. The actuator parts 5a of the locking-means releasing slider 5 come in contact with the slant cam parts 4c of the locking means 4, and push the locking means outward (in the directions of arrows Y). In turn, the locking means 4 disengage from the rack ceiling plate 3a, and the products containing rack 2 is released from being locked.

Fig. 1 shows a state of the vending machine in which of those product containing racks 2 arranged side by side, the products containing rack A, located at the leftmost end, is pulled out to this side by removing the locked state of the rack A. When the locked state of the rack A is removed through the operation stated above, the locking means 4 located between the racks A and B is swung counterclockwise about the stepped screw 4a as a fulcrum with the removal operation of the locked state of the rack. At this position, the rack B disposed next to the rack A is locked at its storing position. The motion of the locking means 4 is transmitted to the locking means 4 between the racks B and C by way of the locking-means linking slider 6 provided on the front side of the rack B. In turn, this locking means 4 is swung counterclockwise to lock the rack C next to the rack B. Subsequently, following the motion, the locking means 4 located between the racks C and D is also swung to lock the rack D. When the products containing rack 2 is pulled out to this side, the side edge of the rack ceiling plate 3a of the rack push the locking means 4 to set it at the swing position. As seen from the interlocking operation, when



any of the racks arranged side by side is pulled out to this side, the remaining racks are locked at the storage positions by the locking means 4 associated therewith, and therefore those racks cannot be pulled out. Products are loaded into the rack being pulled out and the rack is pushed back to the storage space. Then, the front cover 2a of another rack 2 is pushed up. In this state, the locking means 4 located on both sides of the new rack are pushed sideways to set up a locking removed state shown in Fig. 3B, and the rack can be pulled out to this side, while the remaining racks are left locked at their predetermined storage positions.

Figs. 4A to 4C show some applications of the interlocking mechanism stated above. In the application of Fig. 4A, five racks A to E are arranged side by side, locking means 4 are located between the adjacent locking means of all the locking means 4. In this application, the number of rack that is allowed to be pulled out at once is limited to one. In the application of Fig. 4B, the locking means 4 is not provided between the racks A and B. In this application, the racks B to E are interlocked to one another as in the case of Fig. 4A, but the rack A is free from the interlocking mechanism and can be pulled out freely. In the application of Fig. 4C the locking means is not provided between the racks B and C. The interlocking function is incorporated into two groups of racks A and B, and C to E. Thus, the mounting locations of the locking means 4 may properly be selected in accordance with the



layouts of the product containing racks, the racks to be pulled out at once may be set at a desired number.

(Embodiment 2)

Figs. 1 to 3 show another embodiment of the invention.

In this embodiment, the inner space of a cabinet of an automatic vending machine is segmented into a plural number of storage compartments (two compartments I and II in the illustrated example). If these compartments are respectively pre-cooled and pre-heated, the cooled and hot product items can be sold. These compartments I and II are provided with products containing rack 2 of the drawer type as stated above. The interlocking mechanisms as stated above in the embodiment 1 are incorporated into those product containing racks, respectively.

In the present embodiment, to interlock those compartments, the right and left compartments II and I, a locking means 4 is additionally provided at the right end of the left compartment I and another locking means 4 is additionally provided at the left end of the right compartment II. The locking means 4 of the compartments I and II are interlinked by a linking means 7, which passes through a partitioning wall. The wall parts the compartments I and II one from the other. The linking means 7 is preferably made of a material of low thermal conduction. For example, a thin wire is preferable for the linking means.



Fig. 5A shows a view showing a locked state of the product containing racks 2 which are locked at the storage positions in the compartments I and II. Fig. 5B shows a state of the product containing racks 2 when the leftmost products containing rack 2 in the right compartment II is released from its locked state. As shown, a motion of the locking means 4 caused by the releasing operation is transferred to the rightmost locking means 4 in the compartment I by way of the linking means 7, so that the locking means in the left compartment I is locked at the storage positions therein. Figs. 6A and 6B show motions of the locking means 4 and the linking means 7, which are caused by the drawing operation of the rack. Of those figures, Fig. 6A shows a case where the products containing rack is drawn out from the right compartment II, and Fig. 6B shows a case where the products containing rack is drawn out from the left compartment I.

As seen from the foregoing description, an automatic vending machine of the present invention has the following functions: 1) a stopper function; locking means in an interlocking mechanism locks the product containing racks at predetermined storage positions, and 2) an interlocking function; when one rack is drawn out of a storage space of the cabinet of the vending machine, the remaining racks are locked at their storage positions in the storage space. Further, locking-means releasing sliders and locking-means linking sliders, which are respectively provided in association with

the locking means, are all installed in the upper portion of the front surface of the vending machine. With this unique feature, a reduced number of component parts are required for constructing the interlocking mechanism. Further, the locking means is not protruded to the front beyond the products containing rack. Therefore, the assembling of the interlocking mechanism into the machine brings about no increase of the depth dimension of the vending machine. Furthermore, the locking means are separate components, and those are linked with one another by means of the locking-means linking sliders, which are provided on the racks. Thus, the mounting locations of the locking means may properly be selected in accordance with the layouts of the product containing racks, the racks to be pulled out at once may be set at a desired number.

If the construction described in embodiment 2 is used, the interlocking mechanism for the product containing racks may be applied to a vending machine in which the inner storage space in the cabinet of the vending machine is segmented into a plural number of compartments.



WHAT IS CLAIMED IS:

[Claim 1]

An automatic vending machine having a plural number of product containing racks arranged side by side in a storage space of a cabinet, each of the product containing racks being supported in a suspended fashion and in a state that said products containing rack may be pulled out with the aid of a rail mechanism including a rack ceiling plate, the improvement characterized in that said vending machine includes an interlocking mechanism includes a combination of locking means, horizontally swingable, for locking said product containing racks at predetermined storage positions in a storage space of a rack case, each of said locking means being placed between the adjacent product containing racks, a locking-means releasing slider, vertically movable, being provided, for each said products containing rack, on the upper part of the front side of the rack case while being confronted with said locking means, and a locking-means linking slider, horizontally movable, being provided for each said products containing rack, wherein in a state that the product containing racks are stored in the rack case, each said locking means are put on the front edges of said product containing racks disposed on both side of said locking means, to thereby lock said product containing racks at their positions, and when one of said product containing racks is pulled out by releasing said locking means associated therewith from being locked in a manner that said





locking-means releasing slider said product containing racks is pushed upward to push said locking means sideways, the releasing motion of said locking means is successively transferred to said remaining locking means by way of said locking-means linking sliders of said remaining product containing racks, so that said locking means are set at their locking positions, to thereby said related product containing racks at their storage positions.

[Claim 2]

The automatic vending machine according to claim 1, in which each said locking means is an L-shaped plate which may be horizontally swung about a point of fulcrum positioned on the rear end of said locking means, and the front end part of said locking means, bent downward, engages the side edges of the front end of a rack ceiling plate, shaped like a U-channel, provided at the top of the rack case, at the storage position of each said products containing rack, and has a slant cam part, shaped like V, which moves sideways the related locking means from its neutral position, following a releasing motion of said locking-means releasing slider.

[Claim 3]

The automatic vending machine according to claim 1 or 2, in which where a plural number of product containing racks are stored in a plural number of storage compartments in the



storage space of the cabinet, the locking means, which are located at the opposed ends of series of the locking means in the adjacent storage compartments, are interlinked by a linking means.

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