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CHAIN ELEVATOR TYPE PRODUCT RACK OF VENDING MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a chain elevator type product rack of a vending machine, and more particularly, to an assembling structure of a rack position sensing switch that is incorporated in the product rack.

2. Description of the Related Art

One example of the aforementioned chain elevator type product rack is disclosed in Unexamined Japanese Utility Model Publication No. Sho. 55-103775 and the like. That is, such product rack is characterized as supporting a plurality of product carrying rack plates in suspension so as to be scattered around the circumference of a transfer chain that is installed between upper and lower sprockets, binding and holding each rack plate in a horizontal position so as to extend along a position controlling guide frame that is laid ahead of the transfer chain along a descending passage of the rack plate, and dropping and delivering a product by reversing the rack plate in the vicinity of a lower turning point of the transfer chain while driving the transfer chain based on a sales command.

Then, a conventional structure of the chain elevator type product rack is shown in Fig. 8. In Fig. 8, reference numeral 1 denotes a rack case with the bottom thereof opened.

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Incorporated into the case 1 are: an endless transfer chain 4 that is installed between a pair of upper and lower sprockets 2, 3; rack plates 5 that are osillatably supported in suspension while scattered around the circumference of the transfer chain 4 and cantilevered; a rack plate position
5 controlling guide frame 6 that is laid between the transfer chain 4 and the rear edge of each rack plate 5 along a rack plate 5 descending passage, the guide frame 6 serving also as a support member for the chain mechanism; a vend motor 7 that
10 is coupled to the sprocket 2; a stop position setting switch (microswitch) 8 that senses the arrival of a rack plate 5 descending from above at a next sales standby position (stop position) and stops the rack plate 5 at such position; and the like. Products 9 are placed on the rack plates 5 on a single
15 product basis, the rack plates being held in a horizontal position along the descending passage.

Further, each rack plate 5 has hook portions on the front ends of a support arm 5a that projects in an obliquely backward direction from the middle part of the rear edge
20 thereof. These hook portions are hooked round coupling pins that project from a chain segment of the transfer chain 4 in both left and right directions, so that the rack plate is supported in suspension. On the other hand, the stop position setting switch 8 is disposed on the back side of the guide
25 frame 6. The front end of a lever type actuator 8a of the switch 8 is projected toward the rear edge of the rack plate 5

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along the rack plate descending passage through an opening formed in the guide frame 6.

When the vend motor 7 is activated based on a sales command to thereby drive the transfer chain 4 with the chain elevator type product rack being constructed as described
5 above, the rack plate 5 carrying the product 9 descends from the standby position together with the transfer chain 4. When the lowermost rack plate 5 gets out of the guide frame 6 while approaching the chain turning point of the sprocket 3, the
10 product 9 is dropped and delivered with the position of the rack plate reversed. At the same time, when the rack plate immediately above the rack plate that has just delivered the product descends to a predetermined sales standby position, the rear edge of such descending rack plate 5 pushes the actuator
15 8a of the stop position setting switch 8 that projects into the transfer passage to thereby operate the switch 8, and this switching operation signal causes the vend motor 7 to stop.

By the way, the aforementioned stop position setting switch may, in some cases, operate erroneously in the following
20 manner so as to affect sales operation control.

When a rack plate 5 stays stopped at the sales standby position, the stop position setting switch 8 is kept turned on with the actuator 8a pushed into the rear edge of the rack plate 5. Here, when the rack plate 5 starts descending for a
25 next sales operation, the rack plate 5 moves away from the actuator 8a, so that the switch 8 is reversely operated once.

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When a higher rack plate 5 thereafter descends to push the actuator 8a, the switch 8 turns on again, so that this switching operation signal causes the vend motor 7 to stop.

Therefore, if a product 9 placed on a rack plate 5 is relatively small in size and when such product 9 is placed in the middle of the rack plate 5 as indicated by the solid line in Fig. 8, such product 9 will not directly interfere with the actuator 8a of the switch 8. However, if a product 9L that is large-sized and heavy is placed on a rack plate 5 so as to nearly touch the plate surface of the guide frame 6 on the back as indicated by the chain line in Fig. 8, the product 9L comes in contact with the actuator 8a of the switch 8 to thereby push the actuator 8a during the descending operation thereof before a next rack plate 5 arrives, and this may sometimes operate the switch 8 reversely. As a result, the control section erroneously judges the arrival of the next rack plate 5 at the sales standby position and erroneously stops the vend motor 7 before the product 9L is delivered. Hence, vend trouble occurs.

SUMMARY OF THE INVENTION

The present invention has been made in view of the aforementioned circumstances, and therefore an object of the present invention is therefore to overcome the aforementioned problems and to provide a chain elevator type product rack of a vending machine that can reliably prevent vend trouble from

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occurring by avoiding unnecessary interference of a product placed on a rack plate with a rack plate stop position setting switch.

Another object of the present invention is to provide
5 an assembling structure of a stop position setting switch that is incorporated in the product rack.

To achieve the above objects, the present invention is characterized in that a rack plate stop position setting device assembled by connecting a stop position setting switch and an
10 actuator mechanism of the switch is arranged behind a guide frame so as to be set back from a rack plate descending passage, and hook portions of a rack plate coupled to a transfer chain push the actuator mechanism, so that the stop position setting switch is operated at the time the rack plate
15 descends.

Further, the present invention is characterized as constructing the rack plate stop position setting device in the following specific modes.

(1) The rack plate stop position setting device is formed
20 as an assembled body assembling the stop position setting switch, the actuator mechanism, and a mounting base. The actuator mechanism is formed by combining an operating cam coming in contact with a pushbutton of the switch, a shaft being mounted on one end of the operating cam, levers
25 projecting from the shaft toward the descending passage of the hook portions of the rack plate, and a return spring. The

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mounting base has the actuator mechanism and the stop position setting switch assembled thereinto. The mounting base is mounted onto the guide frame so as to be set to the sales standby position of the rack plate.

5 (2) Retaining catches are formed on the mounting base, and the mounting base is retained and fixed to the guide frame with the retaining catches engaged with retaining holes formed in the guide frame.

(3) The mounting base is a molded product made of resin,
10 and riblike chain guides for regulating the twisting of the chain are arranged so as to project toward the transfer chain from a wall surface of the mounting base.

In the aforementioned construction, the assembled body of the stop position setting device is disposed behind the
15 guide frame, and the front ends of the levers of the switch actuator mechanism incorporated in the mounting base of the assembled body in no way project into the rack plate descending passage. Therefore, a product placed on a rack plate is not likely to interfere with the switch actuator mechanism at the
20 time the rack plate descends. When a rack plate reaches the predetermined sales standby position while descending from above in association with a sales operation, the hook portions of the rack plate coupled to the transfer chain push the levers of the actuator mechanism, thereby causing the operating cam
25 that follows the levers of the actuator mechanism to reversely operate the stop position setting switch. Hence, vend trouble

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caused by interference of a product placed on a rack plate with the switch actuator can be avoided reliably.

Further, the actuator mechanism is incorporated into the mounting base together with the stop position setting switch, and the mounting base is mounted onto the guide frame with the retaining catches retained in the retaining holes. As a result of this construction, the switch assembly can be removably mounted onto the product rack with ease without having to go through the cumbersome screwing operation.

Still further, the front ends of the riblike chain guides disposed on the mounting base project toward the transfer chain so as to substantially touch the roller and coupling pins of a chain segment from the back. Therefore, the transfer chain passing through the rack plate stop position setting device will be in no way twisted while guided by the chain guides. As a result, interference between the levers of the switch actuator mechanism and the transfer chain due to the coupling pins thereof being inclined, and hence such vend trouble as causing the stop position setting switch to erroneously operate due to such interference can be prevented.

The above and other objects and features of the present invention will be more apparent from the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

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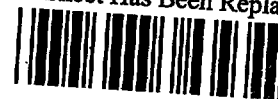


Fig. 1 is a diagram showing a peripheral configuration of a rack plate stop position setting device that is incorporated in a chain elevator type product rack corresponding to Embodiment 1 of the present invention;

5 Fig. 2 is a plan view of the rack plate stop position setting device shown in Fig. 1;

Fig. 3 is a diagram illustrative of a principle according to which the rack plate stop position setting device shown in Fig. 1 is operated;

10 Figs. 4A and 4B are a side view and a plan view showing an assembly of the rack plate stop position setting device shown in Fig. 1 and the structure for mounting the rack plate stop position setting device to a guide frame, respectively;

15 Fig. 5 is a diagram illustrative of an occurrence of vend trouble with the construction shown in Figs. 4A and 4B;

Fig. 6 is a plan view of a rack plate stop position setting device corresponding to Embodiment 2 of the present invention;

20 Figs. 7A, 7B, 7C, 7D and 7E are a back view, a side view, a front view, an end view, and a sectional view showing a specific construction of the rack plate stop position setting device shown in Fig. 6, respectively; and

25 Fig. 8 is a diagram showing a general construction of a conventional chain elevator type product rack from which the embodiments of the present invention are developed.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention will now be described with reference to the drawings. It may be noted that in the drawings showing the embodiments, the same parts and components as those in Fig. 8 are denoted as the same reference numerals, and the descriptions thereof will be omitted.

[Embodiment 1]

In Figs. 1 and 2, a transfer chain 4 laid along a rack plate 5 descending passage is installed so that the transfer chain 4 can move around through a recessed portion 6a formed in a guide frame 6. The recessed portion 6a has a square C-shaped cross section. A rack plate 5 is supported in suspension with latchlike hook portions 5b hooked round coupling pins 4a. The hook portions 5b are formed on the front ends of a bifurcated support arm 5a that projects from the rear edge of the rack plate 5. The coupling pins 4a project from a segment of the transfer chain 4 in both left and right directions. It may be noted that reference numerals 6b, 6c denote steady rest regulating guides for the transfer chain 4. These guides are disposed on the guide frame 6.

On the other hand, on the back side of the guide frame 6 in which the rack plate 5 descending passage is defined is a rack plate stop position setting device 12. The rack plate stop position setting device 12, which is formed by incorporating a rack plate 5 stop position setting switch 8 and an actuator mechanism 10 of the switch 8 into a mounting base

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11, is attached to the guide frame 6 so as to embrace the recessed portion 6a of the guide frame 6 from outside while set to a sales standby position of the rack plate 5. The mounting base 11 is a molded product made of resin and has a square C-shaped cross section.

Here, as shown in Figs. 3 and 4, the actuator mechanism 10 includes: an operating cam 10a that comes in contact with a pushbutton 8b of the stop position setting switch 8 that is constructed of a microswitch; a shaft 10b that is journaled to the mounting base 11 with one end thereof coupled to the operating cam 10a; projecting levers 10c that project toward the descending moving passage of the hook portions 5b of the rack plate 5 from the circumferential surface of the shaft 10b; and a return spring (spiral spring) 10d that bridges between the operating cam 10a and the mounting base 11. The actuator mechanism 10 is incorporated into the mounting base 11 while combined with the stop position setting switch 8. Further, as shown in Figs. 4A and 4B, retaining catches 11a are formed at upper and lower positions on the inner wall surface of the mounting base 11. The retaining catches 11a are retained and fixed at predetermined positions of the guide frame 6 while fitted into retaining holes 6d in the direction indicated by the arrow, the retaining holes 6d formed in the side walls of the recessed portion 6a of the guide frame 6.

When the rack plate 5 has not reached a predetermined sales standby position with the chain elevator type product

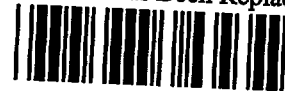
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rack being constructed as described above, the pressure of the return spring 10d incorporated in the actuator mechanism 10 pushes the pushbutton 8b of the stop position setting switch 8 to keep the switch 8 turned off. When the rack plate 5
5 descends from above and reaches the sales standby position, the hook portions 5b on the front ends of the support arm 5a of the rack plate 5 hooked round the coupling pins 4a of the transfer chain 4 come in contact with the levers 10c of the actuator mechanism 10 to push the levers 10c downward. As a result, the
10 operating cam 10a rotates clockwise through the shaft 10b against the pressure of the return spring, so that not only the stop position setting switch 8 is reversely operated to be turned on, but also a vend motor 7 (see Fig. 8) is activated by this switching operation. Then, when the vend motor 7 is
15 activated based on a next sales command and the rack plate 5 that has been stopped in the sales standby position starts moving downward, the hook portions 5b of the rack plate 5 move away from the levers 10c of the actuator mechanism 10. As a result, the operating cam 10a is reversely rotated by the
20 pressure of the return spring 10d. Hence, the stop position setting switch 8 is turned off.

In addition, the actuator mechanism 10, while disposed on the back side of the guide frame 6, is set back from the descending moving passage of the rack plate 5. Therefore,
25 there is no likelihood that a product 9 placed on the rack plate 5 will directly interfere with the actuator mechanism 10.

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As a result, occurrence of vend trouble attributable to the interference of the product with the actuator mechanism can be prevented.

[Embodiment 2]

5 Another embodiment that is obtained by improving the
rack plate stop position setting device 12 according to
Embodiment 1 is shown in Figs. 6 and 7A to 7E. That is, in the
construction described in Figs. 1 to 3, vibration of the
transfer chain 4 is prevented by the steady rest regulating
10 guides 6b, 6c disposed on the guide frame 6. However, if
vertically juxtaposed rack plates 5 are pitched at a large
interval, the chain 4 may, depending on the tension applied
thereto, be twisted in between an upper rack plate and a lower
rack plate. Such twisting causes the actuator mechanism 10 to
15 interfere with the levers 10c with the coupling pins 4a of a
chain segment inclined obliquely as shown in Fig. 5. As a
result, the stop position setting switch 8 is erroneously
operated, which in turn causes the vend trouble of stopping a
next rack plate 5 at an incorrect position before reaching the
20 sales standby position.

A measure has been given to overcome this problem.
That is, as shown in Figs. 6 and 7A to 7E, three riblike chain
guides 11b, 11c, 11d are formed in this embodiment. These
chain guides are juxtaposed so as to project toward the
25 transfer chain 4 from the rear wall of the mounting base 11 of
the rack plate stop position setting device 12. The front ends

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of these chain guides 11b, 11c, 11d confront the transfer chain 4 so as to almost touch the roller and coupling pins extending in both left and right directions of a chain segment. It may be noted that the chain guide 11c that is arranged in the middle of the three chain guides corresponds to the steady rest regulating guide 6b arranged on the guide frame side in Embodiment 1.

As a result of this construction, the transfer chain 4 is guided in such a manner that the transfer chain 4 is interposed between a pair of steady rest regulating guides 6b, 6c and the three chain guides 11b to 11d from both the front and the rear, the steady rest regulating guide being arranged on the guide frame 6 side and the three chain guides 11b to 11d being arranged on both left and right sides as well as in the middle on the mounting base 11. Therefore, the twisting of the chain and the erroneous operation of the stop position setting switch 8 caused by such twisting of the chain as described with reference to Fig. 5 can be prevented reliably. It may be noted that the chain guides 11b to 11d are formed by molding integrally with the mounting base 11 that is a molded product made of resin.

As described in the foregoing, according to the construction of the present invention, the erroneous operation of the switch attributable to interference between the actuator of the stop position setting switch and a product placed on a rack plate, as well as the vend trouble associated with such

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erroneous operation of the switch, which have been addressed as the problems in the conventional example, can be prevented reliably, so that the reliability of sales operation can be improved.

5 Further, by adopting the assembling structure recited in claims 2 and 3 with respect to the stop position setting switch and the actuator mechanism, the operation of incorporating these members into the product rack and the operation of removing these members from the product rack for
10 replacement of parts can be performed at the touch of the retaining catches without going through the cumbersome screwing operation. Still further, as a result of the construction as recited in claim 4, the erroneous operation of the stop position setting switch and vend trouble can be prevented, so
15 that the reliability of sales operation can be improved.

 The foregoing description of a preferred embodiment of the invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and
20 modifications and variations are possible in light of the above teachings or may be acquired from practice of the invention. The embodiment was chosen and described in order to explain the principles of the invention and its practical application to enable one skilled in the art to utilize the invention in
25 various embodiments and with various modifications as are suited to the particular use contemplated. It is intended that

the scope of the invention be defined by the claims appended
hereto, and their equivalents.

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WHAT IS CLAIMED IS:

1 1. A chain elevator type product rack of a vending
2 machine journaling and coupling product carrying rack plates so
3 as to be cantilevered while scattering the rack plates around
4 the circumference of a transfer chain installed between upper
5 and lower sprockets, binding and holding each of the rack
6 plates in a horizontal position so as to extend along a
7 position controlling guide frame laid ahead of the transfer
8 chain along a descending passage of the rack plates, dropping
9 and delivering a product by reversing each rack plate in the
10 vicinity of a lower turning point of the transfer chain while
11 driving the transfer chain based on a sales command, and having
12 a stop position setting switch along the rack plate descending
13 passage, the stop position setting switch sensing a rack plate
14 descending from above and stopping the rack plate at a sales
15 standby position, CHARACTERIZED IN THAT

16 a rack plate stop position setting device assembled by
17 connecting the stop position setting switch and an actuator
18 mechanism of the switch is arranged behind the guide frame so
19 as to be set back from the rack plate descending passage, and
20 hook portions of the rack plate coupled to the transfer chain
21 push the actuator mechanism, so that the stop position setting
22 switch is operated at the time the rack plate descends.

1 2. A chain elevator type product rack of a vending
2 machine according to claim 1, CHARACTERIZED IN THAT the rack
3 plate stop position setting device is formed as an assembled





4 body assembling the stop position setting switch, the actuator
5 mechanism, and a mounting base, the actuator mechanism being
6 formed by combining an operating cam coming in contact with a
7 pushbutton of the switch, a shaft being mounted on one end of
8 the operating cam, levers projecting from the shaft toward the
9 descending passage of the hook portions of the rack plate, and
10 a return spring, the mounting base having the actuator
11 mechanism and the stop position setting switch assembled
12 thereinto; and the mounting base is mounted onto the guide
13 frame so as to be set to the sales standby position of the rack
14 plate.

1 3. A chain elevator type product rack of a vending
2 machine according to claim 2, CHARACTERIZED IN THAT retaining
3 catches are formed on the mounting base; and the mounting base
4 is retained and fixed to the guide frame with the retaining
5 catches engaged with retaining holes formed in the guide frame.

1 4. A chain elevator type product rack of a vending
2 machine according to claim 2, CHARACTERIZED IN THAT the
3 mounting base is a molded product made of resin; and riblike
4 chain guides for regulating the twisting of the transfer chain
5 are arranged so as to project toward the transfer chain from a
6 wall surface of the mounting base.

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