Title: MECHANISM FOR PRODUCT DELIVERED IN AUTOMATIC VENDING MACHINES AND TAMPER-RESISTANT VENDING MACHINE

Abstract: The mechanism for product delivery in automatic vending machines where products are stacked in parallel columns and are dispensed via an opening in the front door comprises between the stacks and the door: a mobile product receiver compartment for collecting the product delivered in machines at a specified lowered height and raising it to a suitable higher height for removing the product delivered by a consumer’s hand, means for raising the said mobile receiver compartment and for lowering it in a reciprocal vertical movement, means for locking the said receiver compartment to the machine at the said specified lowered height and for releasing it from that position, a product collection door for enabling the interior of the machine to remains permanently inaccessible and a safety system that prevents the consumer’s hand from being caught in the closure movement of the product collection door.
MECHANISM FOR PRODUCT DELIVERED IN AUTOMATIC VENDING MACHINES AND TAMPER-RESISTANT VENDING MACHINE

5

SUBJECT-MATTER OF THE INVENTION

The invention relates to automatic vending machines, particularly for foodstuffs and specifically for articles of frozen confectionery. More specifically it relates to an automatic vending machine which does not need an employee or attenant and is operated by the user for the sale of ice-creams contained in containers.

The mechanism of the invention for product delivered in automatic vending machines where products are stacked in parallel columns and are dispensed via an opening in the front door comprises between the stacks and the door:
A mobile product receiver compartment for collecting the product delivered in machines at a specified lowered height and raising it to a suitable higher height for removing the product delivered by a consumer's hand,
Means for raising the said mobile receiver compartment and for lowering it in a reciprocal vertical movement,
Means for locking the said receiver compartment to the machine at the said specified lowered height and for releasing it from that position,
A product collection door for enabling the interior of the machine to remain permanently inaccessible and
A safety system that prevents the consumer's hand from being caught in the closure movement of the product collection door.

The Invention further relates to a tamper-resistant vending machine incorporating the said mechanism. More specifically it relates to a machine for the vending of ice-creams in a frozen state packaged in cylindrical containers.

BACKGROUND OF THE INVENTION

At the present time there are various types of machine for the automatic vending of products on the market, and among these are machines for the vending of packaged foodstuffs and refrigerated canned drinks.

These machines operate for the most part on a column storage system, i.e. the products are stacked in parallel columns and at the bottom of each column is a
device that delivers the products requested, one by one. This mechanism releases the product which falls by the force of gravity into a tray that is accessible to the user from the outside. Due to this design the tray is very low, forcing the user to bend down to pick up the product. Some manufacturers do make the tray slightly higher by reducing the height of the column and subsequently the machine's capacity, with unused space at the bottom may be used for refrigeration or other auxiliary equipment. Moreover, this receiving tray is constantly open to the outside making it liable to vandalism and aggressive behaviour by unscrupulous users attempting to force products out of the machine.

For example in WO 99/54852 there is described an automatic vending machine and a container for articles of frozen confectionery which delivers ice-creams packaged in cylindrical containers.

One problem with known vending machines of the type described hereinbefore is that the interior of the machine generally is accessible through a window in the outer door and there is a risk of acts of vandalism so frequent in this type of machine.

DESCRIPTION OF THE INVENTION

The mechanism of the invention enables the interior of the machine to remain permanently inaccessible, eliminating the risk of acts of vandalism.

In the context of the invention, "ice-creams" mean various frozen confectionery products which can be moulded or extruded, including ice sticks, cups, cones, sandwiches or bars. Frozen confectionery is intended for ice cream, milk ice, water ice, sherbet, sorbet, which can be simple or composite, without or with inclusions or coatings.

The mechanism of the invention is composed of a motor-operated mobile compartment, that moves vertically along guides, to be placed in the front of the machine between the stacks of products and the door. This compartment is made of a lower part that receives the selected product from the column's dispensing device through an opening in the back and has an opening in the front accessible to the user, and a higher part that is in a partition or prolongation of its vertical side. This higher part is made of rigid and resistant
material and extends above the front opening. The compartment is completed by the external structure, which forms a sole piece and is sliding along guides.

In addition, the mechanism has a safety system that prevents the consumer’s hand from being caught in the closure movement of the product collection door.

The mechanism also enables the product descent to be reduced to a very small dimension so that the available space can be occupied by the product to be delivered, thus increasing the storage capacity of the machine.

There is a photocell inside the compartment that detects the presence of the product and a space to fit in a microswitch activated security lock. The microswitch is mounted on a chassis fixed to the dispensing machine and is activated electronically, thus able to block the recipient in its lower position or to release it so that it can move into the upper position.

There is a geared motor attached to the chassis of the machine to enable the vertical movement of the compartment. The geared motor has a lever on the axis connected to two consecutive connecting rods. The free end of the front joint is joined to an anchorage of the upper crosspiece of the structure of the recipient. The said geared motor is capable of elevating the compartment. The compartment is in the lower rest position when the geared motor lever is in the downward position, the lever chain extended and the partition placed in front of the exterior access opening of the machine. The compartment is in the upper activated position when the geared motor's lever is in the upward position, with the lever chain retracted and the access window of the compartment opposite the exterior access opening of the machine.

As a supplementary security measure, there is a special system to avoid accidents when the compartment moves down and to avoid any possible guillotine effect of any object placed in the pick-up opening and only partially put in the compartment. Basically, when the compartment moves down to the rest position, the window can hit the user's hand if it is not removed in time or any object is imprudently put into the compartment, and could cause damage or lesions. For this reason the kinematic chain between the geared motor and the
crosspiece of the recipient is made up of unaligned connecting rods at an angle. This allows for the arm to move to the end of its cycle or return to the upper position and the suspension of the compartment, which can be moved easily to release the obstruction. Once back to normal, the compartment can freely move down to the bottom of the machine, enabling it to be anchored.

Aside from the security and convenience, this device allows for an additional window, which means lengthening the stacking columns downwards hence increasing the machine's capacity.

To supplement the description provided below and to assist better understanding of its features this description is accompanied by a set of illustrative drawings showing a preferred non-restrictive embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1. Shows a perspective front view of the machine when closed,
Figure 2. Shows a perspective view of the machine with the door open, showing the interior of the machine and of its door,
Figure 3. Is a partial cross-sectional view in perspective along AA of Figure 2. of the interior of the machine with the product raising compartment empty in a first, lowered position,
Figure 4. is the view of Figure 3. with the product raising compartment containing a product,
Figure 5. is the view of Figure 4. with the product raising compartment in a second, raised position, showing a hand inserted to collect the product,
Figure 6. is the view of Figure 5. with the product removed and Figure 7. is a detailed partial cross-sectional view in perspective of the product raising compartment.
DESCRIPTION OF A PREFERRED EMBODIMENT

In the following description the same ciphers designate the same elements. The machine comprises an outer insulated body 1 providing a controlled-environment chamber 2, an inner door 3 and an outer door 4 which houses the controls 5 for selection which includes corresponding pushbutton panel.

With controlled-environment chamber 2 lie a product selector dispenser 6 and a coin box and product selector device 7. The product selector dispenser 6 operated by an electric motor (not shown) takes the bottommost product packed in a cylindrical container 8 from a stack of cylinders and by rotating drops the said cylinder 8 through door 9 into discharge hopper 10.

Discharge hopper 10 empties into receiving compartment 11 through slot 12 in inner door 3, receiving compartment 11 being located in outer door 4 with access from the outside through slot 13.

Receiving compartment 11 comprises a protective partition 14 against forcible entry into the internal part of the machine. Receiving compartment 11 has a front closure cover 15 comprising a slot 16 of a size corresponding to slot 13 of outer door 4. The upper part 17 of the cover serves to close the access from the outside. Receiving compartment 11 has a bottom 18 and raising and lowering sliding guides 19. A product descent shock-absorbing pad 20 is provided over bottom 18. Receiving compartment 11 is provided with delivery photoelectric cell 21 and reception photoelectric cell 22. A position triangle 23 helps placing the cylinder in the right position.

Receiving compartment 11 is hung up to a raising and lowering mechanism support bar 24 fixed to plate 25. Pivotally attached to plate 25 by its lower end are two connecting rods 26, 27, which are pivotably connected together. Connecting rod 27 is attached to plate 25 and connecting rod 26 is in its turn pivotally attached to lever 28 by its upper end. Connecting rods 26, 27 together have the same length as the distance between lowered and raised positions of the receiving compartment 11 and serves as anti-trapping safety mechanism as will be explained hereinafter.

Rotary lever 28 driven by geared motor 29, attached on plate 30 serves to raise and lower receiving compartment 11 by making a half round rotation.
(clockwise or counter clockwise). On/off microswitches 31,32 of the geared motor are attached to plate 33.

Receiving compartment 11 can be locked to door 4 of the machine by means of anchoring and locking pin 34 which is attached on plate 35 and engages in hole 36 of the compartment. A microswitch 37 drives anchoring pin 34 out trough hole 34 in a protruded position, which makes the locking mechanism. Locking pin 36 can be driven by any suitable mechanism capable of horizontally displacing it, electromagnetical or mechanical. The retracted position of pin 34 is recovered by action of spring 38. Pin 34 is thus opened and closed by the combined action of spring 38 and microswitch 37.

BASIC OPERATING PRINCIPLE

a) The product is selected on the pushbutton panel 5 and the coins are inserted corresponding to this selection, immediately after the selected pushbutton is pressed.

b) Prior to pressing the pushbutton, the product server receiving compartment 11, is fixed at the bottom by means of the pin 34 that has been actuated by the microswitch 37. Whilst the compartment is fixed at the bottom of the machine, the product descent trapdoor 9 remains closed (Fig. 3). On pressing the desired selection, the product descent trapdoor 9 opens, the product falls to the bottom 18 of the compartment 11 (Arrow f1, Fig.4), the beam of the photocells 21, 22 is broken by the cylinder, turning out the microswitch 37 which enables the release of the pin 34 that fixes the compartment 11 in the lowest position (Fig. 4).

c) When the compartment is free of the pin 34 the trapdoor 9 closes, the raising motor 29 is switched on, raising the product server receiving compartment to the collection slot 13 (Fig. 5). The trapdoor 9 remains closed.

d) The product is removed (Fig. 6) and the beam between the photocells 21 and 22 is re-established; when the photocell beam is re-established, a timer is switched on that begins to operate when the product is removed. When this time has elapsed, the raising and lowering motor 29 is switched on again, lowering the compartment 11.
e) As an additional safety measure, the mechanism 26, 27 prevents trapping a hand since it can counteract the downward motion of the compartment 11; the connecting rods can loosely flex instead of being stiff. In addition, any obstacle is detected and the beam is interrupted, and the compartment returns to the upper position until the obstacle disappears.

f) When the compartment 11 reaches the bottom 18, the geared motor 29 is switched off and the microswitch 37 is turned on, driving the pin 34 that locks the box until required for service again.

g) Another request restarts the whole process described above.
LIST OF COMPONENTS

1  Outer insulated body
2  Controlled-environment chamber
5  3  Inner door
   4  Outer door
   5  Controls for selection
   6  Product selector dispenser
   7  Coin box and product selector
10 8  Product housing cylindrical container
   9  Slidable opening door for selected product descent
   10 Hopper
   11 Product dispenser receiving compartment
   12 Inner door slot
15 13 Outer door slot
   14 Protective partition against forcible entry into the internal part of the machine
   15 Side closure cover of the compartment and its fastening
   16 Side closure cover slot
20 17 Cover upper part
   18 Product dispensing compartment bottom
   19 Product dispensing compartment raising and lowering sliding guides
   20 Product descent shock-absorbing pad
   21 Delivery photoelectric cell, detecting removal of the product
25 22 Reception photoelectric cell, detecting removal of the product
   23 Product positional displacement triangle
   24 Raising and lowering mechanism support bar
   25 Raising and lowering mechanism attachment plate
   26, 27 Anti-trapping safety mechanism
30 28 Product receiving compartment raising and lowering rotary lever
   29 Product receiving compartment raising and lowering geared motor
   30 Raising and lowering geared motor attachment plate
   31, 32 On/off microswitches of the geared motor
   33 Attachment plate of compartment raising and lowering microswitches
35 34 Product receiving compartment anchoring and locking pin
   35 Product receiving compartment locking mechanism attachment plate
   36 Locking pin hole
   37 Compartment anchoring and locking pin opening and closing microswitch
38 Positional recovery spring of the receiving compartment anchoring pin
CLAIMS

1. Mechanism for product delivery in automatic vending machines where products are stacked in parallel columns and are dispensed via an opening in the front door comprising between the stacks and the door:
   A mobile product receiver compartment for collecting the product delivered in machines at a specified lowered height and raising it to a suitable higher height for removing the product delivered by a consumer's hand,
   Means for raising the said mobile receiver compartment and for lowering it in a reciprocal vertical movement,
   Means for locking the said receiver compartment to the machine at the said specified lowered height and for releasing it from that position,
   A product collection door for enabling the interior of the machine to remain permanently inaccessible and
   A safety system that prevents the consumer's hand from being caught in the closure movement of the product collection door.

2. Mechanism as claimed in claim 1, in which the product receiver compartment comprises a front wall which has a window in its lower part and the said front wall serves as the product collection door in its upper part.

3. Mechanism as claimed in claim 2, in which the product receiver compartment is provided with means for detecting the presence of a product in the compartment which actuate the means for raising the compartment containing the product at the said higher height at which the selected product can be removed through the window by a consumer hand.

4. Mechanism as claimed in claim 1, in which the means for raising the product receiver compartment comprises a kinematic chain consisting of a rotary lever connected at one of its ends to a geared motor and at the other end to an assembly of two consecutive pivotably arranged connecting rods with the free end of these rods connected to a upper support bar of the product receiver compartment.
5. Mechanism as claimed in claim 1, in which the means for locking the
compartment to the machine and for releasing the compartment from the
machine comprises a locking pin cooperating with a locking hole in the
receiver compartment, and in which the said locking pin is actuated by a
microswitch for engagement into the said hole and released out of the said
hole by means of a spring acting for retracting the pin.

6. Mechanism as claimed in claim 1, in which the safety system comprises
two pivotably arranged connecting rods which can loosely flex instead of
being stiff and prevent trapping a hand by counteracting the downward
motion of the compartment.

7. Mechanism as claimed in claim 6, in which the distance of the lever
between the axis of the geared motor and the join with the first connecting
rod is equal or greater than the height between the lower and the upper
position of the compartment, and in which the two connecting rods are
articulated freely and with a length of each one so as to allow the arm to go
down completely without forcing the movement of the compartment from
the upper position to the lower position, thus forming an anti-trap device.

8. Mechanism as claimed in claim 1, which further comprises a large opening
dispensing closable trap for delivering the products of the stacks from the
back into the compartment, and in which the compartment is limited at the
top by a horizontal partition shelf.

9. Mechanism as claimed in claim 5, in which the compartment is provided at
its bottom with a product descent absorbing pad.

10. Mechanism as claimed in claim 3, in which the means for detecting the
presence of a product comprises a photocell activating the geared motor and
in which a timer associated with the photocell delays operation of the said
motor.

11. Tamper-resistant vending machine comprising a mechanism as claimed in
anyone of claims 1 to 10.

12. Tamper-resistant vending machine as claimed in claim 11 for delivering
ice-creams packaged in a cylindrical containers in the frozen state.
### INTERNATIONAL SEARCH REPORT

**A. CLASSIFICATION OF SUBJECT MATTER**

- IPC 7 G07F11/16

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

**B. FIELDS SEARCHED**

- Minimum documentation searched (classification system followed by classification symbols)
  - IPC 7 G07F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched.

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

- EPO-Internal, WPI Data, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<td>WO 99 19849 A (GROSS GIVEN MFG CO)</td>
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<td></td>
<td>22 April 1999 (1999-04-22)</td>
<td></td>
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<td>page 4, line 15 - line 34</td>
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<td>page 23, line 25 - page 25, line 34</td>
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<tr>
<td>A</td>
<td>figures 1-3,9,10,14,15,17</td>
<td>2,3,8</td>
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<tr>
<td>E</td>
<td>EP 1 120 756 A (NESTLE SA)</td>
<td>1-12</td>
</tr>
<tr>
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<td>1 August 2001 (2001-08-01)</td>
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<td>the whole document</td>
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<tr>
<td>Y</td>
<td>US 5 377 808 A (BAER SCOTT D ET AL)</td>
<td>4,6,7</td>
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<td></td>
<td>3 January 1995 (1995-01-03)</td>
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<td>claims 1,2; figure 4</td>
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### Further documents are listed in the continuation of box C.

### Patent family members are listed in annex.

* Special categories of cited documents:
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  *"O"* document referring to an oral disclose, use, exhibition or other means
  *"P"* document published prior to the international filing date but later than the priority date claimed

* "T"* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  *"X"* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
  *"Y"* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
  *"Z"* document member of the same patent family

**Date of the actual completion of the international search**

18 October 2001

**Date of mailing of the international search report**

25/10/2001

**Name and mailing address of the ISA**

European Patent Office, P.B. 5318 Patentlaan 2 NL-2280 HV Rijswijk
Tel. (43) 70 340-2040, Fax 31 651 eipo ed

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<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>FR 2 730 840 A (J.C. DECAUX) 23 August 1996 (1996-08-23) page 4, line 3 -page 5, line 3 abstract; figures 1,3,4</td>
<td>1,5,9-12</td>
</tr>
<tr>
<td>A</td>
<td>US 5 385 265 A (SCHLAMP HANS) 31 January 1995 (1995-01-31) abstract; figure 3</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>US 5 799 822 A (CHAN ROBERT K ET AL) 1 September 1998 (1998-09-01) claims; figures 1-3</td>
<td>1</td>
</tr>
<tr>
<td>Patent document cited in search report</td>
<td>Publication date</td>
<td>Patent family member(s)</td>
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<td>EP 1023704 A1</td>
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<td>WO 9919849 A1</td>
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<td></td>
<td></td>
<td>NO 20010451 A</td>
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<tr>
<td>US 5377808 A</td>
<td>03-01-1995</td>
<td>NONE</td>
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<tr>
<td>US 5385265 A</td>
<td>31-01-1995</td>
<td>DE 4202801 A1</td>
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<tr>
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<td></td>
<td>EP 0553470 A1</td>
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<tr>
<td></td>
<td></td>
<td>US 5467892 A</td>
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<td>US 5799822 A</td>
<td>01-09-1998</td>
<td>US 5503300 A</td>
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<td>AU 5547496 A</td>
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<td>US 5975348 A</td>
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<td>WO 9633477 A2</td>
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<td>WO 9428700 A2</td>
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<td>US 5590809 A</td>
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<tr>
<td></td>
<td></td>
<td>US 5772072 A</td>
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<tr>
<td>JP 03058192 A</td>
<td>13-03-1991</td>
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Form: PCT/ISW/210 (patent family annex) (July 1992)