**International Application Number:** PCT/US98/21146

**International Filing Date:** 7 October 1998 (07.10.98)

**Priority Data:**

<table>
<thead>
<tr>
<th>Priority Application Numbers</th>
<th>Priority Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/949,996</td>
<td>14 October 1997 (14.10.97)</td>
</tr>
</tbody>
</table>

**Applicant:** GROSS--GIVEN MANUFACTURING COMPANY [US/US]; 75 West Plato Boulevard, St. Paul, MN 55107 (US).

**Inventors:** SORENSEN, Steven, W.; 2660 Keller Parkway, Maplewood, MN 55109 (US); SKAVNAX, James, E.; 4815 Xerxes Avenue South, Minneapolis, MN 55410 (US); GOTICH, Thomas F.; 4274 MacLaren Place, Eagan, MN 55123 (US); LOTSPEICH, Joseph, A.; 2048 Charlton Ridge, West St. Paul, MN 55118 (US).

**Agent:** BRUESS, Steven, C.; Merchant, Gould, Smith, Edell, Welter & Schmidt, P.A., 3100 Norwest Center, 90 South Seventh Street, Minneapolis, MN 55402-4131 (US).

**Title:** METHOD AND APPARATUS FOR VERTICALLY ARRANGED DISPENSING TRAYS FOR VENDING MACHINES

**Abstract**

An improved method and apparatus for supporting vendable products within a vending machine (20) are disclosed. The support method and apparatus are particularly applicable to vending machines for beverages and other heavy articles, and for vending machines having transparent fronts for customer viewing of the vendable products. The vendable products are supported in a plurality of trays (52) vertically spaced and connected to the sides of a vertical support standard (54), which arranges the trays in vertical tray columns. The trays (52) can be easily removed and repositioned on the vertical support standard (54) to rapidly adjust the relative spacings between adjacent trays in a vertical column. The angular attitudes of individual trays can also be rapidly varied. A plurality of the support standard and connected tray assemblies can be slidably mounted to the vending machine chassis, and selectably pulled out from the chassis to enable the trays to be safely and efficiently individually loaded or serviced from their fronts, sides, or backs, thereby permitting first-in-first-out product vending.

![Diagram of vending machine trays](image-url)
FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL Albania
AM Armenia
AT Austria
AU Australia
AZ Azerbaijan
BA Bosnia and Herzegovina
BB Barbados
BE Belgium
BF Burkina Faso
BG Bulgaria
BJ Benin
BR Brazil
BY Belarus
CA Canada
CF Central African Republic
CG Congo
CH Switzerland
CI Côte d’Ivoire
CM Cameroon
CN China
CU Cuba
CZ Czech Republic
DE Germany
DK Denmark
EE Estonia
ES Spain
FI Finland
FR France
GA Gabon
GB United Kingdom
GE Georgia
GH Ghana
GN Guinea
GR Greece
HU Hungary
IE Ireland
IL Israel
IS Iceland
IT Italy
JP Japan
KE Kenya
KG Kyrgyzstan
KP Democratic People’s Republic of Korea
KR Republic of Korea
KZ Kazakhstan
LC Saint Lucia
LI Liechtenstein
LK Sri Lanka
LR Liberia
LS Lesotho
LT Lithuania
LU Luxembourg
LV Latvia
MC Monaco
MD Republic of Moldova
MG Madagascar
MK The former Yugoslav Republic of Macedonia
ML Mali
MN Mongolia
MR Mauritania
MW Malawi
MX Mexico
NE Niger
NL Netherlands
NO Norway
NZ New Zealand
PL Poland
PT Portugal
RO Romania
RU Russian Federation
SD Sudan
SE Sweden
SG Singapore
SI Slovenia
SK Slovakia
SN Senegal
SZ Swaziland
TD Chad
TG Togo
TJ Tajikistan
TM Turkmenistan
TR Turkey
TT Trinidad and Tobago
UA Ukraine
UG Uganda
US United States of America
UZ Uzbekistan
VN Viet Nam
YU Yugoslavia
ZW Zimbabwe
METHOD AND APPARATUS FOR VERTICALLY ARRANGED DISPENSING TRAYS FOR VENDING MACHINES

Field of the Invention

This invention relates generally to vending machines and more particularly to an improved shelf or tray structure for supporting products in the vending machine in ordered rows or queues of such products.

Background of the Invention

Products are generally housed in vending machines in ordered manner on spaced horizontal shelves of the machine. This is particularly true for vending machines of the type having a transparent viewing panel through the front door of the machine that enables the products available for vending to be directly viewed by the customer prior to vending. In such machines, the products to be vended are generally divided into ordered rows or queues of products extending in the direction from front to back on the shelf, with the foremost product being the product first dispensed from the queue. The front end of the queue is generally referred to as the dispensing end. Such transparent front vending machines are used to vend both hard and soft goods. The well-known helical coil vending machines such as that of U.S. patent 4,061,245 have become popular for dispensing candy and packaged soft goods. More recently, vending machines such as illustrated in U.S. patents 5,505,332 and Des. 362,463 and in our copending U.S. patent application entitled “Apparatus and Method for Vending Products”, filed on October 14, 1997 have used transparent front vending machines for vending beverage containers. This invention, while applicable to all of the above types of machines, is particularly applicable to such machines that are used to vend heavier products such as beverage containers, of various sizes, shapes, and configurations.

Storage of products on large horizontal shelves within a vending machine poses a number of problems to both those designing and servicing the vending machine. When the shelf is used to support heavy products such as liquid containers or beverages, the shelf has a tendency to sag under the weight of the products. When used in transparent front machines, it is difficult to properly support the shelf since the addition of proper support structures can become unsightly to the consumer when viewed through the transparent panel.

Such stationery or fixed shelf configurations also make loading of products into their queues on the shelf difficult. Since it is desirable to place as much product as possible in a vending machine, vertically adjacent shelves are typically placed as close together as the products thereon will allow. Such spacing,
combined with the depth of the shelf, makes it virtually impossible for one loading product on the shelf to fill the queues from the "backs" of the queues. Therefore, the product queues of most of such machines are loaded from the front of the queues, rendering the machine a last-in-first-out type of machine, with the rearmost products in the queue being the oldest products in the queue. To change the order of products in such queues, the service technician is required to first empty the entire queue so that he can reload it in the desired order of product freshness. Such efforts are time consuming. Accordingly, such machines do not readily lend themselves to first-in-first-out product vending.

The large fixed shelf machines also are not very user friendly in enabling variable adjustment of these shelves or between vertical individual columns of product queues, since an entire shelf must be moved to make an adjustment. Accordingly, to maximize machine packing density, individual shelves in such machines must be stocked with products of generally the same height. Such procedure does not allow for flexible product distribution throughout the machine, which may be desired or required for marketing or product presentation purposes.

Providing large horizontal shelves with slide-out capability is generally not an option for shelves required to hold heavy products such as liquids or beverages. A fully loaded such shelf can weigh hundreds of pounds and can result in a dangerous unstable condition to the machine when pulled out, since the cantilevered weight of the shelf can significantly change the center of gravity of the machine. In certain circumstances, a fully loaded pulled-out shelf can even cause the machine to tip over. Also, due to the large width of the shelf, even when pulled-out, it is difficult to load products from the "sides" of the shelf in the hard to reach centermost queues, particularly for higher positioned shelves. The large weight of such shelves are also difficult and costly to support by slide extension braces.

This invention addresses the above described problems and deficiencies of prior art vending machine shelf designs, and provides a method and design configuration for a product support structure that facilitates loading in a safe and efficient manner, even for heavy products such as beverages.

**Summary of the Invention**

This invention provides an improved product support apparatus and method for supporting and configuring queues of products within a vending machine. The invention provides a safe, cost-effective, and use-flexible product support concept that enables first-in-first-out loading of product queues. Queue loading can readily be achieved from the front, the side, or the back of any queue in the machine in a safe and efficient manner. Further, the spacing between individual
product queues positioned above one another can readily be changed to accommodate point of sale display, marketing, or product size requirements, without affecting other product queues in a row of products. The principles of this invention are readily applicable to existing vending machines, including both food and beverage vending machines, and are particularly applicable to such vending machines having transparent front door panels.

Thus, according to one aspect of the invention, there is provided a method of supporting vendable products within a vending machine including the steps of: (a) providing at least one vertical support standard sized and configured for mounting within the internal cavity of a vending machine; (b) securing a plurality of elongate product support members of the type suitable for retainably holding a queue of products to at least one side of the support standard in a stacked vertical column; (c) mounting said vertical support standard and attached product support members in the vending machine in front to back orientation within an internal cavity of the vending machine; and (d) loading the product support members with ordered queues of vendable products. According to yet a further aspect of the invention, the method includes adjustably securing the product support members to the support standard in a manner that enables varying the vertical spacing between adjacent support members within the vertical column. According to a further aspect of the invention the method includes mounting the vertical support standard in slidable manner in the vending machine wherein the vertical support standard can be slidably retainably moved forward relative to the internal cavity of the vending machine so as to expose the product support members attached thereto along their respective lengths.

According to yet a further aspect of the invention, there is provided a method of storing products in a vending machine, including the steps of: (a) providing a plurality of elongate trays of a type suitable for supporting a plurality of vendable products in an ordered queue thereon; (b) arranging the plurality of trays in vertical spaced columns within an internal cavity of a vending machine, with the trays extending in the direction from front to back of the internal cavity; and (c) simultaneously moving a plurality of trays in at least one of the vertical columns of trays in a forward direction at least partially out of the internal cavity, thereby providing access to and along the length of the trays of the extended vertical column. The method includes the step of loading the plurality of trays of the vertical column with vendable products in ordered queues on the trays, wherein the extended position of the tray column allows the products being added to the tray to be added to the back of the product queues, thereby enabling first-in-first-out vending by the machine. According to a preferred aspect of the invention, the vendable products are
beverage containers that can include both glass and plastic such containers and containers of different sizes and shapes.

According to yet a further aspect of the invention there is provided a product support structure for a vending machine of the type having a chassis defining an internal cavity and means for selectably vending products from the internal cavity in response to customer selections, wherein the product support structure includes: (a) a vertical support standard extending between upper and lower ends and configured for mounting in a generally vertical orientation in a vending machine; (b) a plurality of product support members mounted in vertically spaced relationship to at least one side of the support standard, wherein the product support members are of a configuration suitable for retainably holding an ordered queue of vendable products and wherein the product support members are spaced in a vertical column with each of the support members extending in generally horizontal manner from front to back of the support standard; and (c) means for mounting the support standard to the chassis of a vending machine for operative orientation of the product support members within the internal cavity of the machine. According to a further aspect of the invention, the mounting means comprises a slidable mounting mechanism for slidably mounting the vertical support standard to the chassis, preferably from the upper and lower ends of the vertical support standard.

According to yet a further aspect of the invention, there is provided a vending machine for beverage containers, comprising: (a) a chassis defining an internal cavity; (b) a door cooperatively mounted to a front of the chassis and including a transparent panel for viewing into the internal cavity; (c) at least one vertical support standard mounted to the chassis and extending generally in a front to back direction within the internal cavity; and (d) a plurality of trays of a type suitable for holding beverage containers in ordered queues, mounted to the vertical support standard in vertically spaced manner to create at least one vertical column of the trays. According to yet a further aspect of the invention, the vending machine further includes slidable mounting apparatus operatively mounting the vertical support standard to the chassis in slidable manner, wherein the vertical support standard and its attached trays can be slidably moved in a forward direction out of the internal cavity to expose the trays carried by the vertical support standard along their lengths. These and other features of the invention will become apparent to those skilled in the art upon a more detailed description of the invention as applied to a preferred embodiment thereof.
Brief Description of the Drawings

Referring to the Drawing wherein like numerals represent like parts throughout the several views:

Fig. 1 is a front elevational view of one configuration of a beverage container vending machine incorporating the principles of the invention;

Fig. 2 is a top, right, front perspective view of the support frame structure of the vending machine of Fig. 1 with the outer chassis and door removed, illustrating a plurality of beverage tray support assemblies incorporating the principles of this invention attached thereto, and illustrating in phantom one of the support assemblies in extended position; and

Fig. 3 is a right side elevational view of the beverage tray support assemblies of Figs. 1 and 2.

Detailed Description of the Preferred Embodiment

Referring to the figures there is generally illustrated therein a preferred embodiment of a vending machine that incorporates the principles of this invention. While the preferred embodiment of the invention will be described in association with its applicability to a vending machine for bottled and canned beverages, it will be understood that the broad principles of the invention are not limited to such product dispensing application or to the specifics of the preferred embodiment machine disclosed. The described machine represents one clear example of a dispensing system incorporating the principles of the claimed invention, but the invention is not intended to be construed in a limiting manner as a result of the preferred embodiment disclosure.

Referring to the figures, there is generally illustrated at 20 a vending machine for dispensing bottled and canned beverages of varied shapes, sizes, configurations and fluid volumes. The particular configuration illustrated uses an X-Y robotic delivery configuration for capturing and delivering product to a product delivery port and is described more fully in our copending U.S. patent application filed on October 14, 1997, entitled “Apparatus and Method for Vending Products” and assigned to the common assignee of this invention. To the extent that the disclosures of such copending application are required for a better understanding of this invention, they are hereby incorporated by reference. While this particular vending machine configuration is being used to assist in the description of this invention, it will be understood that the use of such machine is purely for illustration purposes and is not to be construed as a limitation on the scope of this invention, or on its applicability to various other types, styles and configurations of vending machines. This particular vending machine merely provides one clear example of a
machine to which the principles of this invention can be applied. The vending machine 20 generally comprises an outer chassis or cabinet 22 and a front hinged door panel 24, which in combination define an inner cavity 25 for housing the products to be vended, the control and refrigeration functions of the machine and other vending machine features well-known in the art. The front door panel 24 frames a transparent glass or clear plastic panel 26 which provides a clear view into the internal cavity of the cabinet and the beverage products stored in ordered manner in queues on trays therein, when the door panel 24 is closed. The door panel 24 includes an appropriate control panel, generally indicated at 28 which includes product selection input means and monetary and credit processing means, well-known in the art. Since the control panel and its various features and functions do not form a part of this invention, they will not be detailed herein. Those skilled in the art will readily recognize many appropriate such control panels and features thereof that could be used in association with a vending machine as hereinafter described. The door panel 24 illustrated in Fig. 1 also includes a coin return slot, generally indicated at 29 and a locking handle assembly 30 that enables the door to be opened and closed in secured manner for purposes of maintenance, loading of the machine, and the like. The door panel 24 also includes a product delivery port, generally indicated at 32, which is approximately at thigh or waist level and depicted with its door in an “open” position in Fig. 1, with a vended bottle product 40 illustrated through the open door. In the machine illustrated the delivery port 42 is positioned at the side of the machine since product is delivered to it by a robotic assembly as described in more detail in our copending application.

The chassis and door panel assembly is supported by a plurality of legs 34 in elevated manner above a floor or support surface to enable ease of cleaning below the machine, the ability to readily lift the machine by means of a pallet jack, fork lift or other moving type of structure and to provide improved ventilation for a refrigeration system for the vending machine.

The chassis or cabinet 22 of the vending machine is supported by an appropriate internal frame assembly generally illustrated in Fig. 2. The frame assembly includes a plurality of front and back upright corner support standards 36a and 36b respectively connected by upper and lower front and back transverse frame members 37a and 37b respectively and intermediate front and back transverse members 38a and 38b respectively. The front and back corner upright support standards 36 and the front and back transverse frame members 37 are interconnected by a plurality of side transverse frame members 39a and 39b respectively for the left and right sides of the frame structure as viewed from the front of the machine. The frame members 36, 37, 38 and 39 collectively define a rectangular frame structure
for supporting the chassis and other components of the machine. The refrigeration unit for the machine is generally located in that portion of the internal cavity defined by the framework, and positioned below the intermediate transverse frame members 38. The product storage portion of the internal cavity defined by the framework is generally located above the intermediate transverse frame members 38.

The beverage containers housed by the upper portion of the internal cavity of the vending machine 20 are supported by means of a plurality of beverage holding trays, which are generally indicated at 52 in Fig. 2. While the preferred embodiment uses beverage "trays", it will be appreciated that the principles of the invention could also be applied to other configurations of beverage or product holding or support structures that might not fit the dictionary description of "tray", such as wire retainer assemblies, or other structures well within the design abilities of those skilled in the art. As used herein, the term "tray" is intended to cover all such product support variations. In the preferred embodiment, the beverage trays 42 are arranged in a plurality of vertical tray column assemblies generally indicated at 50. In the preferred embodiment there are four such vertical tray column assemblies 50a-50d, each having a pair of vertically aligned columns of trays attached to a vertically oriented tray mounting standard 54. For ease of description, not all of the mounting standards have been labeled in the figures. While a particular configuration of a "vertical support standard" will be described with respect to the preferred embodiment disclosed, the term "vertical support standard" as used in this specification and in the claims is intended to include all configurations of mounting structures that are generally oriented in a vertical manner and function to support the product support members or trays as hereinafter described within the internal cavity.

Each tray mounting standard has a pair of vertically oriented and laterally spaced (from front to back) rib members 55a and 55b respectively. The rib support members 55 are integrally formed with interconnecting upper and lower support brace portions 56 and 57 respectively that extend in generally horizontal manner in the direction from front to back of the machine. The collective support and brace member portions 55-57 which comprise the vertically oriented tray mounting standard 54, form in the preferred embodiment a solid slidably movable mounting structure for the beverage trays 52.

The vertical tray mounting standards are slidably mounted to the chassis respectively by means of sturdy upper and lower telescoping pull-out glide assemblies 58 and 59, of a general slide configuration well known in the art. The upper glide assemblies 58 are mounted to the upper front and back transverse frame members 37a and 37b. The lower glide pull-out glide assemblies 59 are mounted to the intermediate front and back transverse frame members 38a and 38b. The upper
and lower glide assemblies 58 and 59 enable the respective vertical tray mounting standards to be pulled out from the front of the chassis in vertical drawer-like manner, as is illustrated in phantom in Fig. 2 and as illustrated at position "A" in Fig. 3. In the preferred embodiment each of the upper and lower glide assemblies 58 and 59 is configured as a pair of opposed glide assemblies that cooperatively sandwich the upper and lower brace portions 56 and 57 of the vertical tray mounting standard to provide the support needed to carry the weight of the standard and its associated tray and product load. In the preferred embodiment configuration the glide assemblies are 24 inch full-extension made by Accuride type C3832A-24. It will be appreciated that other movable support configurations for the vertical support standard can be configured within the context of this invention.

The vertical spaced ribbed support members 55a and 55b of the tray mounting standard 54 include regularly longitudinally spaced mounting holes (generally indicated at 60) for mounting the beverage trays 52 to the tray mounting standard 54. In the preferred embodiment, the mounting holes 60 are positioned along the rib support members 55 such that successive trays 52 mounted to the rib support members 55 can be positioned at relative spacings that accommodate beverage containers of varied heights. In the preferred embodiment, the trays 52 can be mounted along the spaced rib support members 55 so as to accommodate beverage containers held by the trays up to 9 inches in height. Obviously, the relative vertical spacing between the trays 52 and the number of trays mounted to the tray mounting standards 54 is a matter of design and marketing choice. In the preferred embodiment, the trays 52 are secured to the rib support members 55 through the mounting holes 60 by means of mounting clips 62 which enable the trays 52 to be rapidly connected and disconnected from the tray mounting standard 54 when positioning adjustment of the trays 52 is desired. Alternatively, the trays could be secured to the mounting standards by bolts on other appropriate fasteners. In the preferred embodiment, the vertical alignment of holes 60 in the foremost vertical support rib 55a are relatively lower than the corresponding mounting holes 60 in the rearmost vertical rib support member 55b such that when a support tray 52 is mounted to the spaced rib support member 55a and 55b, the tray 52 will be inclined at a downwardly depending angle from back to front of the vending machine to enable beverage containers carried thereby to slide by gravity toward the open front (i.e. dispensing) end of the tray. In the preferred embodiment, the preferred angle of inclination of the tray with the horizontal is from about 8-20 degrees and most preferably about 12 degrees. The degree of inclination is a design parameter that can be varied, depending upon the type, size, weight, configuration, material, etc. of the container being held, the relative coefficient of friction between
the container and the tray floor surface, the type of materials used to construct the tray, the temperature of the internal cavity, etc., as discussed in our referenced copending application.

The vertically oriented tray mounting standard 54 of each tray column assembly 50 is configured to securely support oppositely disposed pairs of beverage trays 52 as indicated in Figs 1 and 2. It will be appreciated that for ease of description the tray mounting assembly of Fig. 2 does not illustrate all of the trays of a complete tray mounting assembly of a vending machine. A more complete tray assembly as it might appear mounted within the vending machine is illustrated in Fig. 1. Referring thereto, it will be noted that the completed assembly includes four tray mounting standards 54 transversely spaced from one another so as to accommodate two beverage trays therebetween, with the outermost tray mounting standards 54 being spaced from the upright corner posts 36 of the frame support structure so as to accommodate a single tray width therebetween. While the widths of the trays can vary in the preferred embodiment the product trays can accommodate beverage containers of up to 3 inches in diameter. It will be appreciated that while all of the beverage trays 52 connected to the vertical mounting standards 54 at a particular height are aligned with one another in Fig. 1, such orientation does not have to be uniform so as to define ordered horizontal rows of beverage product within the machine. In the preferred embodiment illustrated, there are five such “rows” indicated, simulating 5 shelves of product. Due to the flexible height adjustment capabilities for the trays as provided by the vertically oriented tray mounting standards 54, each tray can be positioned along its vertical mounting standard at a different height which would accommodate the particular product size and arrangement configuration desired within the machine.

It will be appreciated that each vertical tray mounting standard supports two vertical “columns” of product trays, one column on either side of the mounting standard. The relative vertical spacings between trays in any “column” can be rapidly and variably adjusted by repositioning the trays in that column to the support standard. Such adjustments made to that column of trays does not affect the vertical intertray spacings of any of the other tray columns of the complete assembly. This provides complete flexibility in arranging the positions of individual shelves (and thus product queues) within the machine, to accommodate point of sale and marketing presentation of queued products of the various trays in the machine.

It will also be appreciated that once the tray column assembly 50 is pulled out on its glide support assemblies from the internal cavity of the machine and away from the other tray column assemblies, each of the trays of that tray column assembly is exposed and fully accessible for servicing, adjusting or loading.
In the preferred embodiment, each of the trays 52 is shaped in the
configuration of a U-shaped channel, generally having a lower surface or floor
support surface 52a and a pair of oppositely disposed side walls 52b upwardly
extending from the floor 52a at right angles with respect thereto. In the preferred
embodiment, the side walls are spaced so as to accommodate beverage containers of
up to 3 inches in diameter; however, it will be recognized that the invention is not
limited by such dimension, or to other non-claimed dimensions described herein, or
to the use of "beverage" supporting trays.

As described in our copending application, the floor 52a can be
designed to minimize sliding friction therealong. The low friction property may be
achieved by numerous different techniques and materials. In the preferred
embodiment the floor or a floor insert is sized to provide support and stability to
beverage containers carried thereby. In the preferred embodiment the floor material
is an acetyl resin material sold under the Delrin® trademark. It will be appreciated
that other materials capable of providing a low friction surface can also be used. For
example, but not by way of limitation, filled polystyrene or glass thermoplastic
composites or bubble construction principles could also be used. For simplifying the
Drawing, the floor insert has not been illustrated in Figs. 2 or 3. In the preferred
embodiment, the cross-sectional configuration chosen for the insert is a ribbed or
corrugated configuration wherein the width of the raised rib portions is
approximately 1/16th of an inch, compared to a 1/4 inch spacing between the ribs
(i.e. a ratio of approximately 1:4). It will be appreciated that other ratios and other
low friction configurations as well as alternate configurations such as wire or
rollerfloor configurations could be used. A low-friction tray floor surface is
desirable to ensure that the beverage containers freely slide by gravity along the
floor surface, toward the open dispensing end of the tray. This is particularly true
for a tray assembly configuration wherein only the weight of the beverage container
and gravity are used to slide the container toward the dispensing end of the tray. The
particular surface configuration of the tray floor, in combination with the angle of
inclination of the tray are design parameters that can be varied, in view of the nature
of the beverage containers that are to be dispensed, in order to provide for optimal
movement of the beverage containers along the tray floor surface. The preferred
ribbed floor configuration is generally illustrated in the frontal view of the trays of
Fig. 1.

The mounting clips or bolts 62 are secured to and/or through the side
walls 52b of the trays 52 at appropriate longitudinal locations therealong for
fastening registry with the mounting holes 60 of the vertical rib support members 55,
as previously described. In the preferred embodiment each of the trays is designed
to hold a collective beverage container weight of up to about 20-25 pounds. The beverage trays indicated in Figs. 2 and 3 comprise the basic tray element portion of a completed tray, and are illustrated without any beverage container release or retainer mechanisms or extended side wall provisions, as are indicated for the embodiment of the vending machine of Fig. 1 and described in more detail in our referenced co-pending application. It will be appreciated that such appropriate structures for handling the products carried by the trays can be added to the trays to accommodate the particular products being vended and the applications for which the trays will be used. The front or dispensing end of the trays 52 which address the glass door are generally indicated by the numeral 53. It will be appreciated that other tray or product support configurations such as, for example, wire grid trays could be used.

While not illustrated in the Figures, interlocking glide movement coordinating structures, well-known in the art can be used to interconnect the movable tray mounting standards so that only one of such standards can be moved out of the chassis at a time. It will also be appreciated that the vending machine would include appropriate lock means for operatively securing the standards in place completing a loading or servicing function thereof.

It will be appreciated that when a tray mounting standard and its attached columns of trays are pulled out in extended manner from the front of the chassis (as shown at “A” in Fig. 3), all of the trays secured to that standard are fully accessible for loading, unloading, or servicing - along their entire lengths. The trays of an extended assembly can be loaded from any position (front, middle, or back) as desired, and first-in-first-out vending is available. The service person can stand on either side of the extended vertical tray column assembly to easily and rapidly service the assembly without undue reaching or stretching. In addition, the vertical tray column assembly can readily accommodate heavy product loads (such as those of beverage containers) without compromising safety since the retracted vertical tray column assemblies that remain in the chassis will maintain the vending machines’ center of gravity at a safe position. Further, due to the vertical nature of the tray support structure, sagging problems associated with prior large shelf structures used for supporting heavy product loads is eliminated.

Those skilled in the art will recognize that this invention provides a user-friendly simple, efficient, safe and cost effective way of storing products in vending machines, that enables first-in-first-out loading of the machine. It will also be appreciated that the ease of product tray height adjustment, by columns of product trays, provides significant marketing advantages as well as the ability to optimize space usage within the machine. These and other features and advantages
of the invention will be readily apparent to those skilled in the art in view of the foregoing description.

It will be appreciated that while a preferred embodiment description and application of the invention have been disclosed, other modifications of the invention not specifically disclosed or referred to herein will be apparent to those skilled in the art in light of the foregoing description. This description is intended to provide concrete examples of a preferred embodiment structure and application clearly disclosing the present invention and its operative principles. Accordingly, the invention is not limited to any particular embodiment or configuration or component parts thereof. All alternatives, modifications and variations of the present invention which fall within the spirit and broad scope of the appended claims are covered.
WE CLAIM:
1. A method of supporting vendable products within a vending machine comprising the steps of:
   a. providing at least one vertical support standard sized and configured for mounting within the internal cavity of a vending machine;
   b. securing a plurality of elongate product support members of the type suitable for retainably holding a queue of products, to at least one side of said support standard in a stacked vertical column;
   c. mounting said vertical support standard and attached product support members in the vending machine in front to back orientation within an internal cavity of the vending machine; and
   d. loading said product support members with ordered queues of vendable products.

2. The method of claim 1, wherein said securing step includes adjustably securing said product support members to said support standard.

3. The method of claim 1, including the step of varying the vertical spacing between at least two adjacent support members within said vertical column.

4. The method of claim 1, including the step of downwardly inclining at least one of said product support members from back to front of the vending machine, wherein products carried by said inclined product support member tend to move by gravity toward the lower disposed end of the product support member.

5. The method of claim 1, wherein said mounting step comprises mounting said vertical support standard in slidable manner in said vending machine, wherein said vertical support standard can be slidably retainably moved forward relative to the internal cavity of the vending machine.

6. The method of claim 5, including the step of sliding the support standard and its secured product support members assembly forward of the internal cavity as retained by a sliding mechanism; and loading products into said plurality of mounted support members from the back and sides of said support members to provide first-in-first-out vending of such products.

7. The method of claim 1, further including the step of securing a second column of said product support members to a second side of said vertical support
standard, oppositely disposed from said first side thereof, wherein said vertical support standard carries two generally parallel stacked vertical columns of said product support members.

5  8. The method of claim 1, wherein said product support means comprises beverage trays, and wherein said loading step comprises loading said trays with beverage containers.

9. The method of claim 8, wherein said loading step includes the step of loading different ones of said trays respectively with beverage containers of different sizes.

10. The method of claim 8, wherein said loading step includes the step of loading different ones of said trays respectively with beverage containers of different shapes.

15 11. A method of storing products in a vending machine, comprising the steps:
   a. providing a plurality of elongate trays of a type suitable for supporting a plurality of vendable products in an ordered queue thereon;
   b. arranging said plurality of trays in vertical spaced columns within an internal cavity of a vending machine, with the trays extending in the direction from front to back of said internal cavity; and
   c. simultaneously moving a plurality of trays of at least one of said vertical columns of trays in a forward direction at least partially out of said internal cavity; thereby providing access to and along the length of the moved trays of said at least one vertical column.

20 12. The method of claim 11, further including the step of loading said plurality of trays of said at least one vertical column with vendable products in ordered queues of said trays.

30 13. The method of claim 12, wherein the step of loading said trays comprises loading said trays of said at least one vertical column from a side of the respective trays, such that the vendable products being added to the tray are added to the back of the product queue; whereby first-in-first-out vending is enabled.

35 14. The method of claim 12, wherein the vendable products comprise beverage containers.
15. The method of claim 14, wherein at least some of the vendable products comprise glass beverage containers.

16. The method of claim 14, wherein at least some of the vendable products comprise plastic beverage containers.

17. The method of claim 12, wherein the step of loading said trays includes loading different ones of said trays with different sized said vendable products.

18. The method of claim 11, further including the step of varying the vertical spacing between adjacent trays of a said vertical column to accommodate said vendable products of differing sizes.

19. The method of claim 11, wherein said moving step comprises: simultaneously moving a plurality of trays from two adjacent said vertical columns of trays in the forward direction and at least partially out of said internal cavity; thereby providing access to and along the lengths of the plurality of moved trays of the two adjacent vertical columns.

20. A product support structure for a vending machine of the type having: a chassis defining an internal cavity; and means for selectably vending products from said internal cavity in response to customer selections; comprising:
   a. a vertical support standard extending between upper and lower ends and configured for mounting in a generally vertical orientation in a vending machine;
   b. a plurality of product support members mounted in vertically spaced relationship to at least one side of said support standard, said product support members being of a configuration suitable for retainably holding an ordered queue of vendable products; said product support members being spaced in a vertical column of said members, with each of said support members extending in generally horizontal manner from front to back of said support standard; and
   c. means for mounting said support standard to the chassis of a vending machine for operative orientation of the product support members within the internal cavity of the machine.

21. The product support structure of claim 20, wherein said mounting means comprises a slidable mounting mechanism for slidably mounting said vertical support standard to said chassis.
22. The product support structure of claim 21, wherein said slidable mounting mechanisms are mounted to said upper and said lower ends of said vertical support standard.

23. The product support structure of claim 20, wherein said plurality of products support members are mounted in vertically spaced relationship to both sides of said vertical support standard to form a vertical column tray assembly having a pair of adjacent vertical columns of said support members.

24. The product support structure of claim 23, comprising a plurality of said vertical column tray assemblies and means for mounting said plurality of vertical column tray assemblies to said chassis in side-by-side relationship in said internal cavity.

25. The product support structure of claim 23, wherein said mounting means comprises a slidable mounting mechanism for slidably mounting said vertical column tray assembly to said chassis.

26. The product support structure of claim 24, wherein said mounting means for said plurality of said vertical column tray assemblies comprises slidable mounting mechanisms for slidably mounting each of said plurality of vertical column tray assembly to said chassis.

27. The product support structure of claim 20, including means for adjustably mounting said product support members to said vertical support standard, wherein the relative vertical spacing between adjacent said product support members in a vertical column can be varied.

28. The product support structure of claim 27, wherein said adjustable mounting means includes means for adjusting the relative angles of the product support members relative to the horizontal.

29. The product support structure of claim 20, wherein said product support members comprise trays.

30. The product support structure of claim 29, wherein said trays include low friction floor surfaces.
31. The product support structure of claim 29, wherein said trays are configured to hold queues of beverage containers.

32. A vending machine for beverage containers, comprising:
   a. a chassis defining an internal cavity;
   b. a door cooperatively mounted to a front of said chassis and including a transparent panel for viewing into the internal cavity;
   c. at least one vertical support standard mounted to said chassis and extending generally in a front to back direction within said internal cavity; and
   d. a plurality of trays of a type suitable for holding beverage containers in ordered queues, mounted to said vertical support standard in vertically spaced manner to create at least one vertical column of said trays.

33. The vending machine of claim 32, further including slidable mounting apparatus operatively mounting said vertical support standard to said chassis in slidable manner, wherein said vertical support standard and its attached trays can be slidably moved in a forward direction out of said internal cavity to expose the trays carried by the vertical support standard along their lengths.

34. The vending machine of claim 33, further including means for adjustably mounting said plurality of trays to said vertical support standard.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6  G07F11/28

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 6  G07F

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<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>X</td>
<td>US 3 512 679 A (STOLTZ) 19 May 1970</td>
<td>1-6, 11-13, 17-22, 27-29, 31-34</td>
</tr>
<tr>
<td>Y</td>
<td>see column 2, line 10 - column 3, line 7</td>
<td>8-10, 14-16</td>
</tr>
<tr>
<td>A</td>
<td>see column 5, line 17 - column 6, line 43</td>
<td>7,23-26, 30</td>
</tr>
<tr>
<td></td>
<td>see column 11, line 74 - column 12, line 75; figures 1-3,5-9</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>US 2 851 324 A (WELLEKENS) 9 September 1958</td>
<td>8-10, 14-16</td>
</tr>
<tr>
<td>A</td>
<td>see column 1, line 15 - line 45</td>
<td>1,11,20, 32</td>
</tr>
<tr>
<td></td>
<td>see column 1, line 69 - column 4, line 39; figures 1-7</td>
<td></td>
</tr>
</tbody>
</table>

X  Further documents are listed in the continuation of box C.  
X  Patent family members are listed in annex.

* Special categories of cited documents:
* "A" document defining the general state of the art which is not considered to be of particular relevance
* "E" earlier document but published on or after the international filing date
* "L" document which may throw doubt on priority claim(s) or whether it claims to establish the publication date of another citation or other special reason (as specified)
* "O" document referring to an oral disclosure, 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.

"*" document member of the same patent family

Date of the actual completion of the international search: 1 March 1999

Date of mailing of the international search report: 08/03/1999

Name and mailing address of the ISA:
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Fax: 31 651 epx nl

Authorized officer:
Rivero, C

Form PCT/ISA2/210 (second sheet) (July 1992)
<table>
<thead>
<tr>
<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>US 3 893 589 A (MANDELL) 8 July 1975 see column 3, line 1 - column 6, line 63; figures 1-4</td>
<td>1,11,20, 32</td>
</tr>
<tr>
<td>A</td>
<td>PATENT ABSTRACTS OF JAPAN vol. 14, no. 360 (P-1088), 3 August 1990 &amp; JP 02 132592 A (KUBOTA LTD), 22 May 1990 see abstract; figures 1-3</td>
<td>1,11,20, 32</td>
</tr>
<tr>
<td>A</td>
<td>PATENT ABSTRACTS OF JAPAN vol. 96, no. 12, 26 December 1996 &amp; JP 08 212437 A (FUJI ELECTRIC CO LTD), 20 August 1996 see abstract</td>
<td>1,11,20, 32</td>
</tr>
<tr>
<td>Patent document cited in search report</td>
<td>Publication date</td>
<td>Patent family member(s)</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-----------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FR 2010162 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GB 1238734 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 48021913 B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NL 6906347 A</td>
</tr>
<tr>
<td>US 2851324 A</td>
<td>09-09-1958</td>
<td>NONE</td>
</tr>
<tr>
<td>US 3893589 A</td>
<td>08-07-1975</td>
<td>NONE</td>
</tr>
</tbody>
</table>