AUSTRALIA

THE PATENTS ACT 1952

APPLICATION FOR A STANDARD PATENT

We, THE COCA-COLA COMPANY, a corporation organized and existing under and by virtue of the laws of the State of Delaware, of 310 North Avenue, Atlanta, Georgia, United States of America,

hereby apply for the grant of a standard patent for an invention entitled: A CARBONATOR FOR A POST-MIX BEVERAGE DISPENSING SYSTEM,

which is described in the accompanying complete specification.

This application is made under the provisions of Section 51 as a divisional of Australian Patent Application No. 64,992/80 by THE COCA-COLA COMPANY.

Our address for service is care of CLEMENT HACK & CO., Patent Attorneys, of 140 William Street, Melbourne, in the State of Victoria, Australia.

DATED this 4th day of June, 1984.

TO: The Commissioner of Patents.
Declaration in Support of a Convention or Non-Convention Application for a Patent or Patent of Addition

In support of the application made by

THE COCA-COLA COMPANY

for a patent for an invention entitled

A CARBONATOR FOR A POST-MIX BEVERAGE DISPENSING SYSTEM

I/We.

ROBERT A. KELLER,

Senior Vice-President & General Counsel for

THE COCA-COLA COMPANY

do solemnly and sincerely declare as follows:-

1. I am authorized by the abovementioned applicant to make this declaration on its behalf.

2. The basic application(s) as defined by Section 141 of the Act was/were made in the following country or countries on the following date(s), by the following applicant(s) namely:

<table>
<thead>
<tr>
<th>Country</th>
<th>Date</th>
<th>Applicant(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. The said basic application(s) was/were the first application made in a Convention country in respect of the invention the subject of the application.

4. The actual inventor(s) of the said invention is/are

   JASON K. SEDAM, of 1258 Mill Glen Drive, Dunwoody, Georgia, United States of America, and
   WILLIAM R. FUERST, of 51342 North Soledad, Primera, Tucson, Arizona, United States of America.

5. The facts upon which the applicant is/are entitled to make this application are as follows:

   The applicant is the assignee of the actual inventors.

DECLARED at Atlanta, Georgia this 25th day of July 1984

ROBERT A. KELLER
Senior Vice-President &
General Counsel for
THE COCA-COLA COMPANY
1. A carbonator comprising a refillable water reservoir tank with a removable lid to permit manual refilling thereof; a carbonator tank disposed within said reservoir tank; means for pumping water from said reservoir into said carbonator tank; means for introducing carbon dioxide gas into said carbonator tank; first liquid level detector means disposed in said reservoir tank for sensing when the water level therein falls below a predetermined minimum level; second liquid level detector means disposed in said carbonator tank for sensing when said water level therein falls below a predetermined minimum level; and control means responsive to both said first and second liquid level detector means for enabling said means for pumping when said water level in said carbonator tank falls below said predetermined level and disabling said means for pumping when said water level in said reservoir tank falls below said predetermined level.
TO BE COMPLETED BY APPLICANT

Name of Applicant: THE COCA-COLA COMPANY

Address of Applicant: 310 North Avenue, Atlanta, Georgia, United States of America

Actual Inventor: Jason K. SEDAM
William R. FUERST

Address for Service: CLEMENT HACK & CO.,
140 William Street,
Melbourne, Vic. 3000.
Australia.

Complete Specification for the invention entitled: "A CARBONATOR FOR A POST-MIX BEVERAGE DISPENSING SYSTEM"

The following statement is a full description of this invention, including the best method of performing it known to me:

PP/CP1F/2/80
BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a post-mix soft drink dispenser system suitable for use in a refrigerator.

Description of the Prior Art

Hereuntofore, attempts have been made to provide post-mix dispenser systems for use in refrigerators which are compact and easily incorporated into existing refrigerators and which are capable of dispensing post-mix soft drink beverages of suitable quality. However, due to various design features of these prior art systems the above objectives have never been satisfactorily achieved. Examples of such systems can be found in the following U.S. Patents: 2,785,546 to Bauerlein, issued March 19, 1957; 2,894,377 to Shikles, Jr. et al, issued July 14, 1959; 2,823,833 to Bauerlein, issued February 18, 1958; 3,292,822 to Crowder et al, issued December 20, 1966; 3,756,473 to Donahue, issued September 4, 1973; and 3,942,685 to Lidner issued March 9, 1976.

U.S. Patents 2,785,546 and 2,823,833 to Bauerlein, 3,756,473 to Donahue; and 3,942,685 to Lidner disclose post-mix beverage dispenser units designed for use in refrigerators. These dispenser systems will selectively dispense either ice water, or a mixture of syrup concentrate and water. There are no provisions in the system of Bauerlein for dispensing carbonated water or carbonated beverages. In addition, the water for the systems of Bauerlein is provided through a pipe which must pass through the wall of the refrigerator making retro-fitting of the Bauerlein system somewhat complex. One glaring disadvantage of the Bauerlein systems is that the syrup concentrate is contained in a refillable container rather than in a disposable syrup package, which creates cleaning problems and unsanitary conditions.
The dispenser system described in U.S. Patent 2,894,377 to Shikles, Jr. et al has more versatile dispensing capabilities than the dispenser system of Bauerlein, Donahue and Lidner described above, since it can dispense carbonated water and carbonated post-mix beverages in addition to tap water and post-mix combinations of tap water and syrup. However, the Shikles, Jr. et al system still suffers from certain disadvantages. For example, the Shikles, Jr. et al system requires an external water supply which must be piped in through the walls of a refrigerator making retro-fitting of the system more complicated than desirable. In addition, although the syrup packages of Shikles, Jr. et al are removable, they are not as easily inserted into the system as desirable, since several connections are necessary between the syrup package of Shikles, Jr. et al and other components of the system. Furthermore, the syrup package of Shikles, Jr. et al will not provide the necessary controlled rate of flow needed to obtain a high quality of beverage with the same proportions of carbonated water and syrup for every beverage dispensed.

U.S. Patent 3,292,822 to Crowder et al disclosed in Figures 17 and 18 a post-mix carbonated beverage dispenser system contained within the door of a refrigerator including a manually refillable water reservoir for the carbonator and disposable syrup packages. However, the method of inserting the syrup packages into the system is somewhat cumbersome, the valving system has limited capabilities, and the syrup is not dispensed at a satisfactorily controllable rate of flow.

Prior to the present invention the use of a flow rate control tube in the syrup container of a post-mix dispenser for providing an even rate of flow of syrup from the container into a receptacle was generally known. An example of a system of this type is disclosed in U.S. Patent 2,708,533 to Nicholas. Nicholas discloses the broad concept of providing a flow control tube 76 in the syrup tank of a post-mix beverage system.
having its open or bottom end precisely positioned at a predetermined level above the discharge opening of the tank in order to provide a substantially constant rate of flow of the syrup being dispensed from the tank. The Nicholas patent also discloses in Figure 2 that the syrup tank of his invention may be a disposable tin can that is filled at a central distributing plant and delivered in a completely sealed condition to the location of the dispensing system. As illustrated in Figure 2 of Nicholas, the bottom of the tin can is rupturable by puncturing elements associated with the dispenser valve and the top of the can is provided with a knockout 118 into which stopper 74 and flow control tube 76 is inserted just prior to the dispensing operation. The flow control tube 76 is positioned within the container at a predetermined position determined by graduations 124 on the flow control tube which instructs an operator as to the proper position of the tube for preselected different flow rates for syrups of different Brix values.

Although, once the system of Nicholas is assembled, it operates in a very satisfactory manner for controlling flow rate, it does suffer from certain disadvantages. For example, in the Nicholas patent the flow control tube is a completely separate item from the syrup package which is shipped from the distributing plant to the point of use. Thus, the flow control tube 76 in Nicholas system requires special assembly at the point of use and skilled adjustment of its position within the syrup container. While it might be possible for an operator in a commercial establishment to learn how to properly insert the flow control tube, the occasional user of the system, would have difficulty inserting the flow control tube in the correct position for the different Brix values of syrups to be dispensed. In addition, the syrup container of Nicholas could be refilled through the knockout portion 118 which would lead to problems of improper or inadequate sanitation. Still further, if the temperature of the syrup container of Nicholas is elevated,
syrup will rise up tube 76 and spill over through the top thereof.

Other examples of the use of flow control or vent tubes in syrup packages can be found in U.S. Patent 3,258,166 to Kuckens, issued June 28, 1966 and U.S. Patent 3,991,219 to Kuckens, issued November 19, 1976. Each of these patents disclose inverted containers having flow control vent tubes formed therein. However, the vent tubes in each of these patents are completely open to the atmosphere. That is, no means are provided for precluding the flow of liquid up the vent tubes. Thus, at elevated temperatures, the head-space of gas above the liquid in the containers will create a back-pressure forcing the liquid up the vent tubes causing spillage.

An additional U.S. Patent 3,807,607 to Kuckens, issued April 30, 1974 discloses a syrup container 1 having a vent tube 11 therein and a gas responsive check valve 12 in the top of vent tube 11. The check valve 12 of Kuckens is provided to inhibit flow of syrup up tube 11 when container 1 is being refilled in contrast to precluding flow up the tube in response to container 1 being heated to an elevated temperature. Applicant has discovered that the location of valve 12 of Kuckens at the top of tube 11 is unsatisfactory, if fluid flow up the tube 11 were to be caused by an elevated container temperature. In such a case fluid might flow substantially all of the way to valve 12 at the top of vent tube 11 before valve 12 closes. This would result in the accumulation of syrup on the inner walls of tube 11 causing clogging and/or contamination. Moreover, as stated hereinbefore, the Kuckens valve 12 is not disclosed as being provided to preclude flow up tube 11 in response to an elevated container temperature. In short, the Kuckens syrup dispensing apparatus is not designed for use in a refrigerator where the opening and closing of the refrigerator door may cause elevated syrup package temperatures resulting in the tendency of syrup to flow up the vent tube in response to those elevated temperatures.
Check valves have also been used heretofore in vent
tubes of containers for dispensing products other than syrup.
However, these check valves were utilized to preclude spilling
of liquid when the container is inverted to an upright non-
dispensing position. The designers of these prior art devices
were not concerned nor cognizant of the problem of fluid
spillage of liquid due to an elevated container temperature and
a resulting flow of liquid up the vent tube. Examples of such
prior art containers can be found in U.S. Patents 600,327 to
Winters, issued March 8, 1898; 2,283,652 to Schwarzkopf issued
May 19, 1942; 2,336,313 to Swan issued December 7, 1943; and
2,822,962 to Poitras, issued February 11, 1958.

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided
a carbonator comprising: a refillable water reservoir tank with
a removable lid to permit manual refilling thereof; a carbonator
tank disposed within said reservoir tank; means for pumping water
from said reservoir into said carbonator tank; means for
introducing carbon dioxide gas into said carbonator tank; first
liquid level detector means disposed in said reservoir tank
for sensing when the water level therein falls below a pre-
determined minimum level; second liquid level detector means
disposed in said carbonator tank for sensing when said water
level therein falls below a predetermined minimum level; and
control means responsive to both said first and second liquid
level detector means for enabling said means for pumping
when said water level in said carbonator tank falls below said
predetermined level and disabling said means for pumping when
said water level in said reservoir tank falls below said
predetermined level;

BRIEF DESCRIPTION OF THE DRAWINGS

The objects of the present invention and the attendant
advantages thereof will become more readily apparent by
reference to the accompanying drawings wherein:
Figure 1 is a perspective view of a carbonator system of the present invention;
Figure 2 is a diagrammatic view in perspective of the carbonator water supply and reservoir system of the present invention;
Figure 3 is a perspective view of the carbonator pump and power station of the present invention;

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 is a perspective view of the exterior of the carbonator system housing and includes a water reservoir section WR and a carbonator tank section CT. The water reservoir section is provided with a removable water lid RL so that the water reservoir WR may be manually refilled, such as by a pitcher filled with tap water and so cubes or crushed ice may be placed therein. The carbonator tank section includes a removable cover CT which provides access to the carbonator tank CT and the carbonator power section of Figure 3 to be described hereinafter. Electric power is supplied to the carbonator system through an electric power cord PC, this being the only connection with devices outside the refrigerator required by the system of the present invention. However, the power cord may be fed through a hole in the conventional refrigerator door gasket of the refrigerator making retro-fitting of the system very simple. The tubes CW and G passing through the bottom of the carbonator system housing illustrated in Figure 1 are the carbonated water outlet and the CO₂ inlet of the system, respectively.

Referring in detail to Figure 2 there is illustrated a diagrammatic view of how the water reservoir WR and the carbonator tank CT fit within the housing of the carbonator system of Figure 1. As illustrated, the carbonator tank CT is immersed within the water of the water reservoir WR. This assists in cooling the carbonated water formed in carbonator tank CT since the water in reservoir WR is chilled.
by the refrigerator. In addition cubed or crushed ice may be placed in reservoir WR. Therefore, the carbonator system of the present invention provides for maximum chilling of the carbonated water delivered to the valving system VS in the door of the refrigerator. Many of the water lines and carbonated water tube connections are not illustrated in Figure 2 for clarity of explanation. However, the low level water reservoir probe LLP in reservoir tank WR and the carbonator tank liquid level probe TP are illustrated. The details of operation of these probes LLP and TP will be described further hereinafter.

Briefly, as illustrated in Figure 2, the bottom of probe LLP is positioned at a predetermined low water level above the bottom of water reservoir WR. Probe LLP comprises an electrically conductive member of electrode which completes an electrical circuit through the water in tank WR to ground through a connection grounding the walls of tank CT as long as water in tank WR is at least at the level of the bottom of probe LLP. When the water in tank WR falls below the level of the bottom end of probe LLP an electrical signal is generated which indicates that the water in the reservoir WR has fallen below a satisfactory level. An indicator light may be provided to advise one to refill the water reservoir when the water reaches this unsatisfactory level. When this occurs, power to the motor pump arrangement of Figure 3 to be described hereinafter can not be supplied, thus shutting down the operation of the carbonator until the supply of water in reservoir WR is replenished. Probe TP in tank CT is also electrically conductive with its bottom end positioned at a predetermined level above the bottom of tank TP. Thus, as in the case of probe LLP, when the liquid level falls below the level of the bottom end of probe TP, an open circuit results between the probe and a grounded connection of tank CP turning on the pump to be described hereinafter. When water again reaches the bottom of probe TP a signal is generated which
turns the pump off.

Figure 2 also illustrates other elements to be described in connection with Figure 3 including the provision of a power switch PS on the front end of the carbonator system housing so that the system can be manually shut on and off when desired.

Referring in detail to Figure 3 there is illustrated an end view of the carbonator end of the housing of Figure 1 with the carbonator tank cover CTC removed. As illustrated, the carbonator tank CT is provided with a manifold head or lid CL through which various connections to the CO₂ gas, carbonator water outlet and carbonator tank water supply are connected. See for example, the tubes WC, G and WO for transmission of carbonated water, CO₂ gas and water from reservoir WR, respectively. A duck-bill check valve DCV is provided in the tube G for regulating the flow of CO₂ gas to the carbonator tank CT. A flow control valve FCV is provided in the carbonated water outlet line WC at the fitting between line WC and the carbonator tank top CL. Valve FCV may comprise flow restricting buttons with bores of selected sizes for different flow rates. Another duck-bill check valve WCV is provided in water line WO between a motor and pumping system M-P to be described hereinafter. A relief valve RV is provided in the top of carbonator tank CL to limit the pressure in the carbonator tank to a predetermined maximum safe level. A low water level probe LLP is provided in water reservoir WR as described hereinbefore and a water level carbonator tank probe TP is provided in the carbonator tank CT. Both of these liquid level probes are electrically connected to a solid state level control module SLC by suitable wires. The motor and pumping system M-P has a water line WI in communication with water reservoir WR for pumping water out of tank WR in the carbonator tank CT on demand as determined by water level proves LLP and TP, respectively. Carbonator tank probe TP is of a similar nature to the water level LLP in reservoir WR. The bottom end of probe TP is positioned at a predetermined
be described be a power system housing so when desired. Illustrated an Figure 1 illustrated, a head or CO₂ gas, supply are for from valve DCV is CO₂ gas to is provided between tank CT may comprise for valve WCV is the carbonator system reservoir WR is the pressure safe level. Reservoir WR carbonator tank both of these motor and system in the level the level probe TP reservoir WR. determined

level above the bottom of a carbonator tank CT, (see Figure 2) and when the water in tank CT falls below that level an electrical circuit through probe TP, the water, and a grounded wall of tank CT is open circuited. This open circuit is sensed by solid state level control module SLC. Module SLC then generates a signal to motor and pump M-P which causes the motor and pump to draw water out of reservoir WR through tubes WI, WO through check valve WCV and into carbonator tank CT via a hydraulic spray nozzle HSN. Thus, the water in carbonator tank CT is automatically replenished as its level falls below the bottom of probe TP. When water again reaches the bottom of probe TP a signal is generated through module SLC to turn pump M-P off.

Referring now in detail to Figures 1, 2 and 3 the operation of the carbonator system of the present invention will be briefly described. Water reservoir WR is initially filled by removing lid RL and a pitcher of water is poured into the reservoir. Power switch PS on the front wall of the carbonator system housing is then turned ON which enables all of the electrical water level control circuit of the carbonator. Once power is supplied and a proper water level is sensed by probe LLP in reservoir WR, motor and pump M-P is energized drawing water out of the reservoir WR, via tube WI, through pump M-P, tube WO, water check valve WCV, and hydraulic spray nozzle HSN to fill the carbonator tank. Simultaneously, CO₂ gas is being fed through tube G into gas diffuser CD at the bottom of tank CT. When the valving system to be described hereinafter, is actuated, indicating that the dispensing of carbonated water is desired, carbonated water flows up dip tube DV through carbonated water tube WC and out of the carbonator system to the valving system VS mounted on the door of the refrigerator.

Carbonated water sufficient for two six-ounce drinks is stored in the carbonator system in a preferred embodiment of the present invention ready for dispensing on demand. However,
replacement of the carbonated water supply begins immediately by virtue of the water level controls heretofore described as a drink is drawn from the dispensing valve. Therefore, 18 ounces of product can be continuously drawn from a dispensing valve before the carbonator water supply is exhausted. A like quantity of carbonated water can be dispensed after waiting for one minute.

Power is supplied to the carbonator system of Figures 1 to 3 via a conventional three wire power cord PC intended to be plugged into the duplex power receptacle. The power cord PC can be provided with pressure sensitive adhesive on one of its flat surfaces so it can be attached or secured outside and inside of the refrigerator. The power cord PC is very thin and, therefore, entry into the refrigerator may be accomplished through the refrigerator door gasket making retro-fitting of the system of the present invention very simple.
immediately
scribed as
ore, 18
dispensing
ded. "A
after
figures 1 to
ned to be
r.cord PC
one of its
ide and
ery thin
accomplish-
o-fitting
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A carbonator comprising a refillable water reservoir tank with a removable lid to permit manual refilling thereof; a carbonator tank disposed within said reservoir tank; means for pumping water from said reservoir into said carbonator tank; means for introducing carbon dioxide gas into said carbonator tank; first liquid level detector means disposed in said reservoir tank for sensing when the water level therein falls below a predetermined minimum level; second liquid level detector means disposed in said carbonator tank for sensing when said water level therein falls below a predetermined minimum level; and control means responsive to both said first and second liquid level detector means for enabling said means for pumping when said water level in said carbonator tank falls below said predetermined level and disabling said means for pumping when said water level in said reservoir tank falls below said predetermined level.

DATED THIS 4TH DAY OF JUNE, 1984

THE COCA-COLA COMPANY

CLEMENT HACK & CO.