ABSTRACT

Closure for a container for keeping pressurized or carbonated beverage, comprising means for dispensing the beverage from the container so that dispensation of gas not being dissolved in the beverage is prevented or reduced until all beverage has been dispensed, and being provided with means for permitting, preventing and optionally regulating dispensation of the beverage. Set comprising a container for keeping pressurized or carbonated beverage and a closure as disclosed above. Preferably the container is a standardized PET bottle. Preferably the beverage is a carbonated beverage, such as mineral water or soda or beer or sparkling wine or champagne.
Gas Pressure vs Draining

Fig 5
CLOSURE FOR DISPENSING PRESSURIZED OR CARBONATED BEVERAGE FROM A CONTAINER, CONTAINER USING SAID CLOSURE AND A SET COMPRISING SAID CONTAINER AND CLOSURE

FIELD OF THE INVENTION

[0001] The present invention relates to a closure for dispensing pressurized or carbonated beverage from a container so that dispensation of gas not being dissolved in the beverage is prevented or reduced until all the beverage has been dispensed. The closure is especially useful for dispensing carbonated beverages, such as mineral water, soda, beer, sparkling wine or champagne from a standardized bottle, preferably a bottle made from polyethylene terephthalate, commonly called a PET bottle, so that the dispensed beverage keeps sufficient gas pressure as long as there is beverage still to be dispensed. The closure thus provides for preserving fizz in dispersed beverage as well as in beverage still to be dispensed.

BACKGROUND ART

[0002] U.S. Pat. No. 5,610,430 discloses a suction spout for carbonated beverage cans made of metal, but does not disclose any closure similar to the closure of the present invention.

[0003] WO2006/083659 discloses a beverage dispensing system with a specialized sealed container. This is in contrast to the present invention, which pertains to a closure for dispensing pressurized or carbonated beverage from a non-specialized container.

[0004] US 2004/0035869 discloses a resealing arrangement for a beverage container without disclosing any closure similar to the closure of the present invention.

[0005] U.S. Pat. No. 5,289,945 discloses a sealing and dispensing cap for a carbonated drink container using a lever arm arrangement for open and closing a dispensing channel. The present invention is not primarily intended for use with any similar arrangement. Further, there is no proof of concept in ‘945.

[0006] U.S. Pat. No. 5,897,037 discloses a combination cap and dispensing spout for a carbonated beverage bottle. This device is pressed onto the original bottle cap, which may be partly opened using said device. The carbonated beverage is allowed to flow through the threads in the partly opened original cap and further through the combination cap from where it exits via a tubular spout. This is in contrast to the present invention where the claimed closure is used without the original bottle cap. Consequently in the present invention the carbonated beverage does not flow through the threads of the original bottle cap.


[0008] WO 94/29183 discloses a flow-controlling device for a soft-walled bottle comprising a non-return valve, which is opened by squeezing the bottle. The present invention is primarily not intended for use with any means requiring that any bottle or container be squeezed.

[0009] U.S. Pat. No. 4,011,971 discloses a device for dispensing of non-pressurized liquids, such as still wine. Contrary thereto the present invention is only intended for dispensing of pressurized or carbonated beverage.

[0010] DE 4,422,190 discloses a multi-compartment bottle with a dispensing device suited for dispensing champagne or similar beverages. The present invention is primarily not intended for multi-compartment bottles.

[0011] All of the cited prior art references disclose only one means for dispensing. Our invention preferably makes use of at least first and second means for dispensing.

DEFINITIONS

[0012] With “fizz” is here meant gas dissolved in a pressurized or carbonated beverage. This gas is released as bubbles when the pressure outside the beverage becomes lower than the pressure in the beverage. This gas is released as bubbles when the vapor pressure of the beverage is equilibrated to the decreased pressure of the gas outside the beverage when inside a container, or to atmospheric pressure when the beverage is flushed out from the container into e.g. a glass.

[0013] With “slide valve”, also called “flip valve”, is here meant a valve mounted on a closure and having a hollow part with a first opening at the end that faces towards the periphery of the closure and a second opening inclined about 90° relative to the first opening that faces towards the inner side of the closure. This valve slides in a notch in the upper part of the closure. In the valve’s open state the second opening is essentially entirely facing an opening in the closure being exposed to the inside of a container onto which the closure is attended. In the valve’s closed state the second opening does not to any extent face any opening in the closure. By moving the slide the flow of the beverage can be controlled. The slide valve can also be fitted with a thread both on the valve and on the notch thereby providing a more precise control of the flow of the beverage.

[0014] A “needle valve” is a variant of a slide valve.

[0015] With “snap-in valve” is here meant a valve designed as a stopper placed e.g. in an opening through the top of a closure being attached to a container. The stopper is operated via a lever, preferably being controlled by a spring acting on one end of the lever. When no pressure is exercised on the other end of the lever the stopper is in a closed position. When pressure is exercised on said other end of the lever the stopper comes to an open position. By adjusting said pressure the flow of the beverage can be controlled. This type of valve is preferably equipped with a flow guidance that directs the beverage to the periphery of the closure.

[0016] With “slot profiles” is here meant interruptions in a thread being essentially perpendicular to the thread. The function for such slot profiles in the thread of a closure and in the thread of a corresponding container comprising pressurized or carbonated liquid, such as a beverage, is mainly to provide means for releasing excess gas from the container.

[0017] With “radially compressed” is here referred to e.g. the situation when the periphery of a hole is slightly conical for accomplishing a tight grip around an object being inserted in the hole.

[0018] With “excess gas” is here meant the gas in a container comprising pressurized or carbonated beverage that is not dissolved in the beverage and thus exists as free gas outside the liquid.

DESCRIPTION OF THE INVENTION

[0019] Upon decanting pressurized or carbonated beverage such as carbonated water, soda, beer, sparkling wine or cham-
pagne from a container, e.g. from a PET bottle, the fizz is decreased. The fizz is stronger the stronger the pressure of the excess gas, i.e. the free gas outside the liquid. Upon repeated openings of the bottle the gas pressure outside the beverage is thus step-by-step equilibrated to atmospheric pressure. When gas is evaporated from the beverage the fizz will decrease. The longer the time between openings of the bottle the more gas will evaporate from the beverage implying even less fizz. The reduction in fizz is more notable the bigger the bottle. Likewise the smaller the relation between the volume of the beverage and the volume of the excess gas the more notable the reduction in fizz.

[0020] Contrary thereto when a bottle provided with a closure according to the present invention is opened only the excess gas pressure needed to press out beverage from the bottle is consumed. In comparison with the hitherto used opening of a PET bottle with the present invention a higher interior gas pressure is preserved in the dispensed beverage as well as in the beverage remaining in the bottle. Consequently the present invention provides for less decrease in fizz. That the present invention provides for less decrease in fizz is shown e.g. in Example 10.

[0021] Surprisingly the captioned problem with reduced fizz can be solved by controlled use of the excess gas pressure in the container upon dispensing beverage from the container, preferably via one or more control mechanisms, different embodiments of which are described below. Satisfactory dispensation may be achieved as well when holding the bottle top down, top up or in inclined position.

[0022] A standard PET bottle and its corresponding normal closure both have slot profiles, in the bottle neck threads and in the closure threads respectively, for releasing excess gas when the closure is opened. In order to prevent excess gas from being dispensed at least the closure thread need be devoid of slot profiles. The thread on the bottle neck may keep its slot profiles. When there are no slot profiles in the closure thread a leak proof seal is accomplished between the bottle neck and the closure also when the closure is partly opened.

[0023] One way to control the dispensation of beverage and excess gas is to place one or more conduits through the closure periphery from the outside in such a way that the conduit(s) will be exposed to excess gas when opening the closure maximum about one turn with the bottle placed top up, and to beverage with the bottle placed top down. Thereby the gas and the beverage respectively are let out through the conduit(s) via the seal between the closure and the bottle neck top. In order to keep maximum fizz in the dispensed beverage excess gas from the container should not be dispensed until all the beverage has been dispensed. This principle prevails irrespective of what embodiment of the present invention is used.

[0024] The conduit(s) may be combined with a control valve, e.g., a slide valve, a flip valve or a snap valve where a hole is exposed to the volume inside the closure, but outside a sealing between the bottle neck top and the inside of the closure.

[0025] The shelf life or expiration date of the beverage will not be compromised if the seal between the closure and the bottle neck top is made so that a V-shaped gasket of the closure accomplishes a tight joint to the top of the bottle. Also closures with other types of gaskets or simply a well planed top of the closure will function as well.

[0026] A bottle closure, specially designed to retain the contents of a soda bottle, i.e., carbonated beverage and gas therein dissolved, may be sealed using a gasket between the bottle neck top and the closure, for example a closure made to fit a bottle neck according to standard PCO-1810. The closure has a leak proof thread and an outlet on its upper periphery, preferably furnished with a valve to control the release of the beverage. Upon turning the bottle and the closure about half a turn relative to one another and placing the bottle top down the beverage will be pressed out into the compartment between the leak proof threads and the interior of the closure. If no control valve is installed beverage will flow out of said outlet with maximum intensity.

[0027] To avoid said uncontrolled outflow of beverage a control valve might be installed. When this valve is in its closed position no beverage will be dispensed. When the valve is fully or partly open a controlled stream of beverage will be flushed out through the conduit of the control valve. If the closure is instead opened with the bottle top up and the control is opened the gas above the beverage level will be released. This gas would otherwise have been released via the standardized slot profiles on the bottle neck and the closure thread. If there are slot profiles only at the beginning of the closure thread the excess gas pressure is released when the closure and the bottle neck are almost unscrewed from one another.

[0028] The bottle neck may though be furnished with a pressure tight siphon attached to the bottle neck’s inner periphery. When using such a siphon the beverage of the bottle can be dispensed when the bottle is standing top up without excess gas being dispensed. If the siphon is flexible the beverage can be dispensed from any inclined position of the bottle between the horizontal position and the vertical position, which is convenient when the bottle is placed e.g., on a refrigerator shelf.

[0029] The siphon may be made of a material having a higher density than the beverage or be provided with a weight, whereby the siphon will not float up, but remain below the surface of the beverage. Preferably the siphon is flexible, more preferably partly flexible, such as flexible only in about the last third part of its length as measure from the closure, i.e. in the part of the siphon being most distal from the closure. Such a partly flexible siphon has the advantage of not risking being bent in the container, thereby avoiding the risk of the tip of the siphon being placed too close to the closure.

[0030] The outlet from the closure may be a radially extendable tube. The inlet of the tube may be shut or blocked when the tube is in its innermost position thereby preventing beverage from being dispensed. The outlet from the tube may be so formed that the dispensed beverage exits the tube in a direction pointing below the horizontal plane when the container essentially is in a vertical position. Further, the tube may be extendable, preferably by being telescopic, so that the outlet of the tube may be located at a distance of up to three times the largest width of the closure as measured from the edge of the closure. The dispensation capacity may be regulated by moving the tube from its innermost position. Such regulation of the dispensation capacity may take place by moving the tube so that the inlet thereof to a larger or lesser degree coincides with an opening through which the beverage to be dispensed enters the closure.

[0031] Alternatively a sharpened hollow member, e.g., a hollow needle, can be pressed through the closure, preferably for use with the bottle placed top down. Such a hollow member should be designed to withstand the pressure from the pressurised or carbonated beverage in the container.
[0032] For the embodiment with a hollow member is preferably used a stand into which the bottle neck and the closure are pressed down over the hollow member whereby the hollow member is radially compressed to ensure maximal tightening between the hollow member and the closure.

[0033] In useful embodiments the closure is provided with at least two control means, called first and second control means, the first control means providing for safe opening and closing of the flow of beverage or excess gas, the second control means providing for regulating the flow of beverage or excess gas. The first control means may consist in the cooperating threads of the closure and of the bottle neck respectively. The second control means may be a valve, preferably a slide valve, a needle valve, a flip valve or a snap-in valve. Alternatively also the first control means may be a valve.

[0034] In order to prevent unnecessary leakage the present closure may be provided with means for preventing that the closure be too much unscrewed from the bottle neck, i.e. preventing the closure from being unscrewed from the bottle neck more than to a predefined stage, or for making such unscrewing difficult. These means may thus be entirely blocking unscrewing or may account for increased resistance in unscrewing.

[0035] In order to improve recycling by facilitating separation of materials a closure according to the present invention is preferably made from one or more of polyethylene (PE), high density polyethylene (HDPE), polypropylene (PP) and ethylene vinyl acetate (EVA).

[0036] In another useful embodiment dual regulating means and choice of material as per the preceding paragraph are combined. In this embodiment upon turning the closure about half a turn relative to the bottle beverage from the bottle enters the space between a gasket and the upper inside of the closure. This upper inside is provided with a convex valve. Pushing on the upper outside of the closure opens this convex valve. This upper outside and the convex valve are both flexible in the sense that when you stop pushing on the upper outside the convex valve closes. This embodiment inter alia has the advantage that it can be made entirely from one polymeric material—there is no need for any additional springs made from another material. The required flexibility and automatic reversed function are inherent in the convex design of the valve and the flexible upper outside of the closure. The pressure from the beverage enhances thecaptioned double tightening. This embodiment provides for a reliable and resealable tightening, which is further easy to operate.

[0037] A container for keeping pressurized or carbonated beverage under pressure suitable for cooperating with a closure according to the present invention may comprise a smaller percentage of beverage than a standard PET bottle, and/or have a higher gas pressure than a standard PET bottle. The gas pressure can be increased by the addition of a few drops of liquid nitrogen or carbonic acid just before closing the bottle. This liquid nitrogen or carbonic acid will change to gas phase shortly after closing of the bottle. The normal gas pressure in a standard PET bottle is the pressure obtained when liquid nitrogen or carbonic acid is added to the beverage in an amount of between 2 g and 4 g per litre beverage and the beverage thereafter is kept in the container being closed.

[0038] Especially the present closure is applied on a container wherein pressurized or carbonated beverage is kept under a pressure, which is obtained when liquid nitrogen or carbonic acid is added to the beverage in an amount of more than 4 g, preferably more than 6 g, per litre beverage and the beverage thereafter is kept in the container being closed.

[0039] The present invention also encompasses a set comprising a container for keeping pressurized or carbonated beverage under pressure and a closure according to the present invention.

[0040] Although mainly standardized PET bottles have been discussed above as suitable containers for the present invention also other containers for keeping pressurized or carbonated beverages are encompassed by the present invention. Except for PET bottles other plastic bottles, glass bottles, other non-metallic containers and metallic containers are useful in the present invention.

[0041] When embodiments with bottle and closure are discussed above it has been presumed that the bottle neck is threaded on its outside, that the closure is threaded on its inside and that these two pieces may be screwed and unscrewed in relation to one another. This is though not always necessary. In one useful embodiment the capsule and bottle neck are screwed tightly together after filling of the bottle with the required amount of beverage where after they may not be taken apart. This feature may e.g. be achieved by using threads that are such that they may not be unscrewed, by using latches in connection with the threads, and by fastening the threads towards each other using e.g. adhesive or melting by heat or ultrasound.

[0042] A further development of the aforesaid embodiment makes use of a bottle with a bottle neck devoid of threads and a closure also being devoid of threads. These two parts may simply have an even outside surface and an even inside surface respectively. They may also have surfaces provided with guiding means such as longitudinal grooves. The bottle neck and the closure are irreversibly joined, e.g. by using adhesive or melting by heat or ultrasound.

[0043] The captioned embodiments where the closure is irreversibly fastened to the bottle neck have e.g. the advantage that there is no risk of leakage between the closure and the bottle neck.

[0044] In order to make the closure tamperproof and to reduce the risk for leakage all types of valves mounted on the closure may be initially blocked from being used, e.g. by having the movable part/s of the valve glued to, or otherwise adhered to, a suitable non-movable part of the valve. Once said blocking is broken by moving the movable part/s the valve will function in its normal way.

[0045] The captioned problem with reduced fizz in pressurized or carbonated beverage dispensed from a container, such as a Coca-Cola® beverage dispensed from a PET bottle, is known since such containers were introduced, without any remedy having to date been put forward. The present invention thus provides a solution to this long felt need.

LEGEND OF FIGURES

[0046] FIGS. 1A-1D schematically show in cross section a closure according to Example 1.

[0047] FIGS. 2A-2B schematically show in cross section a closure according to Example 2.

[0048] FIGS. 3A-3B are photos showing the embodiment according to Example 4.

[0049] FIGS. 4A-4C schematically show in cross section a closure according to Example 9.

[0050] FIG. 5 shows how the pressure of free gas in a 2 litre Coca Cola bottle provided with a closure according to the
present invention develops when the bottle is emptied in aliquots of 0.2 l. As a comparison is shown how the pressure of free gas in a 2 litre Coca Cola bottle provided with a standard screw cap develops when the bottle is emptied in aliquots of 0.2 l.

[0051] FIGS. 6A-6C schematically show in cross section a closure according to Example 11.

EXAMPLES

[0052] The following Examples are illustrative and non-limiting

Example 1

[0053] The embodiment according to this example is schematically shown in FIGS. 1A-1D. A PET bottle closure (1) fitting on a PCO 1810 bottle neck is provided on its inside with a non-interrupted and tight thread (2), which seals slot profiles (3) on the thread of a bottle neck when screwed thereon. The closure (1) is fitted with a standard gasket seal (4) fitting between the bottle neck's top and the closure (1). The closure (1) if also fitted with a hole (5) above the thread between the outside of the gasket seal (4) and the inner periphery of the closure (1), said hole (5) leading to the outside of the closure (1). Upon opening the bottle when placed in vertical position with the closure (1) towards the bottom beverage (6) will be dispensed through the hole (5). Upon opening the bottle when placed in vertical position with the closure towards the top excess gas (7) will be dispensed through the hole (5). Upon turning the closure (1) backwards the flow of beverage (6) or excess gas (7) is stopped once the gasket seal (4) tightens towards the bottle neck top. When the gasket seal (4) is close to the bottle neck top only a small amount per unit time of beverage (6) or excess gas (7) may be dispensed. In other words the thread of the closure (1) is used to control the rate of dispensation of beverage (6) or excess gas (7). This embodiment may be provided with a siphon.

[0054] Beverage (6) exits when the bottle is held top down if a siphon is not used and when the bottle is held top up if a siphon is used. Excess gas (7) exits when the bottle is held top up if a siphon is not used. The bottle should not be operated top down when a siphon is used, as it is not totally foreseeable whether beverage (6) or excess gas (7) will exit in this situation.

Example 2

[0055] The embodiment according to this example is schematically shown in FIGS. 2A and 2B. This example is similar to Example 1, though with the difference that the hole (5) in Example 2 is fitted with a control valve (8). Beverage (6) or excess gas (7) reaches the inlet of the control valve (8) upon opening the closure (1), whereby the flow of beverage (6) or excess gas (7) is controlled via the control valve (8), which can be designed in many different ways, preferably as a snap valve with spring action. This means that the valve releases beverage (6) or excess gas (7) only when pressed upon. The control valve may also be of other types, such as a slide valve or a flap valve. FIGS. 2A and 2B show the bottle top up, but illustrate mutatis mutandis also the bottle top down. Preferably the outlet from the control valve (8) is sealed, e.g. by ultrasonic partial melting if made of a plastic material, upon delivery so that this seal needs to be broken prior to the first use of the control valve (8). Thereby the risk for leakage is reduced and the shelf life of the contents of the bottle is increased.

Example 3

[0056] This example is similar to Examples 1 and 2, though with the difference that a flexible siphon is placed in the bottle and is connected to the bottle opening, thereby allowing beverage (6) to be pressed out by excess gas (7) when the container is standing up with the closure (1) at the top or when it is placed in any inclined position, between a vertical position with the closure (1) at the top and a horizontal position. The horizontal position is e.g. useful when keeping a PET bottle lying down in a refrigerator and dispensing beverage directly from there.

[0057] The only exit from the bottle is thus through the siphon, which as such may be designed in a number of ways known in the art.

Example 4

[0058] A hollow needle is pressed through the closure and the bottle is placed top down. The needle is designed to withstand the pressure from the gas and the beverage in the container to avoid leakage. Connected to the needle is a control valve through which the beverage is let out. This arrangement may preferably include a stand into which the bottle neck and the closure are pressed down over the needle, whereby the closure is radially compressed to ensure maximal tightness between the needle and the closure. A major benefit with this embodiment is that all known fitting closures may be used.

Example 5

[0059] This example is similar to Example 4, though with the difference that here the bottle is fitted with a siphon and the needle/control valve device is placed on top of the bottle for use with the bottle standing up.

Example 6

[0060] A washer is placed between the bottle neck and the inner top surface of the closure whereby the washer is placed on distancing elements in order to ensure free space between the washer and the inner top surface of the closure. A hole is arranged for at any location on the top of the closure. This hole is preferably equipped with a control valve. Upon holding the bottle upside down beverage will pass out around the washer and further out through the hole upon opening the closure. Preferably a control valve is placed over the hole of the closure. For longer storage after opening, the closure should be tightened to minimize leakage of gas and/or beverage. This embodiment is suitable for use with a siphon as well as without a siphon.

Example 7

[0061] This example is similar to Examples 1, 2 and 6. Here the thread of the closure is designed in such a way that it has slot profiles only towards the open part of the closure. Here excess gas is released as with a standardized PET bottle closure, i.e. downwards from the closure thread when the closure is opened in its normal way, i.e. by simply being unscrewed. This means that the use of the present embodiment of the invention does not affect normal opening of the
closure. When the closure is opened in its normal way the control valve should be in its closed position. This embodiment is preferably used with a bottle not provided with a siphon.

Example 8

[0062] The closure embodiment of this example is a variant of any of the embodiments of Examples 1-7 for use with a bottle, preferably standing up. Here a needle valve is mounted at the periphery of the closure. Upon delivery of the closure the needle valve is shut. The closure is furnished with an elongated hollow key for opening the needle valve. Upon turning the closure about 180 degrees in relation to the bottle beverage reaches the space between the top of the bottle neck and the upper inside of the closure. Then the needle valve is opened using said elongated hollow key, which at the same time functions as an outlet existing at a predefined distance outside the closure. You may operate the key with just one hand thereby adjusting the flow of the beverage.

Example 9

[0063] The embodiment according to this example is schematically shown in FIGS. 4A-4C. This embodiment is a closure for a bottle and has dual regulating means, preferably the closure is made from one or more of polyethylene (PE), high-density polyethylene (HDPE), polypropylene (PP) and ethylene vinyl acetate (EVA). In this embodiment upon turning the closure about half a turn relative to the bottle pressurized or carbonated beverage (6) from the bottle enters a space (9) between a gasket (10) and the upper inside (11) of the closure. This upper inside (11) is provided with a preferably convex valve (12). Pushing on the outer side (13) of the closure opens the valve (12). The upper outside (13) and the valve (12) are both flexible in the sense that when you stop pushing on the upper outer side (13) the valve (12) closes. Once the valve (12) is opened beverage (6) is led out through an outlet (5), which may be designed in any convenient way.

[0064] In order to render the closure less vulnerable for leakage or rupture or other damage during transportation and to make the closure at least somewhat tamperproof the valve (12) may be initially fastened towards the upper inside (1) e.g. use of adhesive or by melting using heat or ultrasound. When you open the valve (12) for the first time you will break this initial fastening. A cap or a shrink film may also be used to make the closure tamperproof.

[0065] This embodiment inter alia has the advantage that it can be made entirely from a polymeric material as above—there is no need for any additional springs. The required flexibility and automatic reversed function are inherent in the convex design of the valve and the flexible upper outside of the closure. The pressure from the beverage enhances the captured double tightening.

[0066] In a modification of the embodiment according to this example the closure may be irreversibly fastened on the bottle neck in any of the ways described earlier.

Example 10

[0067] No prior art reference, such as the ones cited above, discloses any proof of concept for any invention having any similarity with the present invention. In order to show the utility and effectiveness of the present invention the following experiment was carried out. The reduction of the pressure of the free gas in a standard 2 litre PET bottle filled with Coca-Cola provided with its normal screw cap being emptied via 0.2 litre aliquots of Coca-Cola in vertical position with the opening upwards was compared with the reduction of the pressure of the free gas in a standard 2 litre PET bottle filled with Coca-Cola provided with a closure according to the present invention being emptied via 0.2 litre aliquots of Coca-Cola in vertical position with the opening downwards. The original bottle cap was removed from both bottles and was exchanged for a bottle cap fitted with a manometer and closure according to the present invention also provided with a manometer. After 20 minutes the free gas pressure was measured. It is evident that the initial free gas pressure could not be measured as there were no manometers on the original bottle caps.

[0068] The result of the test of Example 10 is illustrated in FIG. 5. The free gas pressure reduction in the standard bottle is shown with the lower and dotted line while the free gas pressure reduction in the bottle with a closure according to the present invention is shown with the upper and uninterrupted line.

[0069] It is evident that the reduction of the pressure of the free gas in the bottle provided with a closure according to the present invention is very much smaller than the reduction of the pressure of the free gas in the bottle provided with a normal screw cap.

[0070] The equation for the lower line in FIG. 5 is approximately $Y=1/(2.43 \times 10^{-3} \times X)$. The equation for the upper line in FIG. 5 is approximately when $0<X<800$ then $Y=-1$ and when $800<X<2000$ then $Y=-0.8 \times 10^{-3} X+1.6$.

[0071] Similar curves prevail for other types of containers. It has been found that for a useful embodiment of the present invention dispensation of gas not being dissolved in the beverage is prevented or reduced in such a way that at least 20% of the gas pressure prevailing in the container prior to start of dispensation remains at least 50% of the beverage has been dispensed. In a preferred embodiment at least 40% of the gas pressure prevailing in the container prior to start of dispensation remains at least 50% of the beverage has been dispensed. In another preferred embodiment at least 40% of the gas pressure prevailing in the container prior to start of dispensation remains at least 50% of the beverage has been dispensed.

[0072] There are other ways of characterizing how well the gas pressure is maintained when using the present invention. For example a useful embodiment of the present invention dispensation of gas not being dissolved in the beverage is prevented or reduced in such a way that when up to 25% of the beverage has been dispensed the gas pressure in the container is at least 40% of the gas pressure prevailing in the container prior to start of dispensation. In a preferred embodiment when up to 50% of the beverage has been dispensed the gas pressure in the container is at least 40% of the gas pressure prevailing in the container prior to start of dispensation.

[0073] The present invention encompasses not only a closure as disclosed above, but also a container for use with such a closure and a set comprising a container for keeping pressurized or carbonated beverage under pressure and such a closure.

Example 11

[0074] The embodiment according to this example is schematically shown in FIGS. 6A-6C. This embodiment is a clo-
Sure (1) for a bottle and has dual regulating means. Preferably the closure is made from one or more of polyethylene (PE), high-density polyethylene (HDPE), polypropylene (PP) and ethylene vinyl acetate (EVA) and is provided on its inside with a non-interrupted and tight thread (2). The embodiment according to this example schematically demonstrates a control valve variant where a washer/gasket (10) is placed between the closure (1) and the opening of the container (14) to ensure tightening and long shelf life. In this embodiment upon turning the closure (1) about half a turn relative to the bottle pressurized or carbonated beverage the washer/gasket (10) will be pressed by the beverage and/or the gas pressure to the closure (1) leaving a space (15) between the containers opening and the washer/gasket and will ensure at least intermittent tightening. By pressing the flexible end (16) of the closure, the washer/gasket (10) will be displaced and beverage (6) or excess gas (7) will be dispensed depending on the vertical position of the container. FIGS. 6A, 6B and 6C show the bottle top up, but illustrate mutatis mutandis also the bottle top down.

1-36. (canceled)

37. A closure for a container for keeping pressurized or carbonated beverage comprising:

an outlet for dispensing therethrough beverage from the container;

at least one dispensation regulator providing at least in part that dispensation of gas not dissolved in the beverage is prevented or reduced such that at least about 20% of the gas pressure prevailing in the container prior to start of dispensation remains at least until about 50% of the beverage has been dispensed.

38. The closure according to claim 37, wherein the dispensation of gas not being dissolved in the beverage is prevented or reduced such that at least about 30% of the gas pressure prevailing in the container prior to start of dispensation remains at least until about 50% of the beverage has been dispensed.

39. The closure according to claim 37, wherein the dispensation of gas not being dissolved in the beverage is prevented or reduced such that at least about 40% of the gas pressure prevailing in the container prior to start of dispensation remains at least until about 50% of the beverage has been dispensed.

40. The closure according to claim 37, wherein the closure is for use with a metallic container, a non-metallic container, a glass container or a plastic container, wherein the plastic container is optionally a PET-bottle.

41. The closure according to claim 37, wherein the closure is for use with a container being so placed during dispensation of the beverage that the outlet is adjacent to that part of the container wherein there is beverage.

42. The closure according to claim 37, wherein the closure is for use with a container being so placed during dispensation of the beverage that the outlet is situated above that part of the container where there is beverage, and further comprising a siphon so placed that during dispensation of the beverage the entry to the siphon remains within the beverage, and so arranged that beverage to be dispensed is flowing only through the siphon to the outlet.

43. The closure according to claim 42, wherein the siphon is a tube and includes a flexible tube, a flexible tube having a density being higher than the density of the beverage, a flexible tube being provided with a weight to keep the entry to the tube within the beverage, or a tube being flexible primarily in that part of its length which is most distal from the closure.

44. The closure according to claim 37, wherein the inside of the closure is provided with a first thread, which fits with a second thread on the outside of the part of the container onto which it is screwed, whereby beverage, non-dissolved gas, or both, is prevented from being dispensed when the threads are screwed tightly together, and whereby beverage, non-dissolved gas, or both, passes into a compartment thereby created within the closure for subsequent dispensation therefrom when the threads are not screwed tightly together, and wherein the dispensation capacity is regulated by adjusting the extent to which the first and second threads are screwed together.

45. The closure according to claim 37, wherein the outlet has the form of a radially extendable tube wherein the inlet of the tube is shut or blocked when the tube is in its innermost position, thereby preventing beverage from being dispensed.

46. The closure according to claim 37, wherein the outlet is hollow and has a sharp end and the sharp end is used for penetrating a seal on a beverage container, such as a screw cap threadably sealed on a bottle top, wherein after penetrating the seal the hollow outlet remains attached to the seal forming fluid and gas communication between the contents of the container and the exterior opening of the hollow outlet.

47. The closure according to claim 37, wherein the closure has at least first and second controls, the first control providing opening and closing of the flow of beverage or excess gas, the second control providing regulating of the flow of beverage or excess gas.

48. The closure according to claim 47, wherein the first control comprises cooperating threads of the closure suitable to threadably engage with the threaded neck of a bottle, and the second control is a valve selected from the group consisting of a slide valve, a flip valve, a needle valve or a snap-in valve.

49. The closure according to claim 37, wherein the closure is for use with a bottle having a threaded bottle neck and the closure comprises increasingly resistant threads such that after the closure is substantially threadably engaged with a bottle having a threaded neck, the closure and bottle may only be unscrewed to a predetermined distance before the increasingly resistant threads prevent further unscrewing, or where the closure comprises threads designed such that after the closure is substantially threadably engaged with a bottle having a threaded neck, the closure and the bottle may only be unscrewed a predetermined distance before the threading of the closure prevents any further unscrewing of the closure from the bottle neck.

50. The closure according to claim 37, wherein the closure is for use with a bottle, and the closure is provided with a gasket tightening towards the top of the bottle neck when the closure is closed, and that upon turning the closure a predetermined angle relative to the bottle, beverage from the bottle enters the space between the gasket and the upper inside of the closure, whereby the upper inside is provided with a valve that is opened by pushing on the upper outside of the closure, and whereby the upper outside and the valve are both flexible in that the valve closes when pushing on the upper outside ceases.

51. The closure according to claim 37, wherein the closure is provided with a valve, and the valve is initially blocked from being used by a movable part thereof adhered to a
non-movable part of the valve, where after the blocking is broken by moving the movable part, the valve will function in its normal way.

52. The closure according to claim 37, wherein the closure is provided with a cap, a shrink film or heat-sealing for rendering the closure tamperproof, less vulnerable for leakage, rupture, or other damage during transportation, or both.

53. The closure according to claim 37, wherein the closure has one of more of the following features: it is not provided with a lever arm arrangement for opening and closing any dispensation feature; it is for use without a closure routinely used with beverage containers with screw tops; it does not comprise a flexible tube on the outside the closure, wherein the outside is defined as the portion of the closure that does not face into or onto a container; it does not require squeezing of the container for being operated; it is not for use with a multi-compartment container.

54. The closure according to claim 37, wherein the closure has at least a first control for providing opening and closing of the flow of beverage or excess gas, comprising cooperating threads of the closure and of the neck of a bottle respectively, and at least a second control for regulating of the flow of beverage or excess gas comprising a valve selected from the group consisting of a slide valve, a flip valve, a needle valve or a snap-in valve.

55. The closure according to claim 37, wherein the closure has at least first and second controls, the first control providing opening and closing of the flow of beverage or excess gas, the second control regulates the flow of beverage or excess gas, in that it is for use with a bottle, in that it is provided with a gasket tightening towards the top of the bottle neck when the closure is closed, and in that upon turning the closure a predefined angle relative to the bottle beverage from the bottle enters the space between the gasket and the upper inside of the closure, whereby the upper inside is provided with a valve that is opened by pushing on the upper outside of the closure, whereby this upper outside and the valve are both flexible in the sense that when you stop pushing on the upper outside the valve closes.

56. A container for keeping pressurized or carbonated beverage, that is for use with a closure according to claim 37, and comprises a smaller percentage of beverage than a standard PET bottle, or has a higher gas pressure than a standard PET bottle, or both.

57. A container according to claim 56, wherein the pressurized beverage in the container is kept under increased pressure, which is obtained by addition of liquid nitrogen or liquid carbonic acid to the beverage, preferably in an amount of more than about 4 g, preferably more than about 6 g, per litre beverage, just before applying the closure on the container, and/or by applying the closure on the container under an increased nitrogen and/or carbon dioxide pressure, preferably being more than about 5 bar.

58. A kit comprising a container for keeping pressurized or carbonated beverage and a closure according to claim 37.

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