Final Assignment

INSTRUCTIONS:

Please include EXAM NUMBERS ONLY on the assignment. The assignment is to be turned in to the Registrars Office by 4 p.m. on Tuesday July 6. You are allowed to refer to any written materials that may help you (e.g., MPEP, course materials, and other reference materials on patent law and practice), except you may NOT conduct ANY patent searching and may NOT refer to any patents other than the patent provided with the assignment. You are NOT allowed to collaborate with or consult with ANYONE including, but not limited to, other students, professors, and teaching assistants! If you have any questions regarding the assignment, you may ask Professor Carroll. Any students who fail to comply with the above will be subject to honor code violations.

The following documents should be attached as part of this assignment:

1. *Patent Application (9 pages of specification and 2 pages of drawings)*
2. *Office Action (3 pages including cover sheet and PTO 1449 form)*
3. *British Patent GB 1,266,351*

As a result of recent client development efforts in Ireland's finest pubs, you have landed a new client – Arthur Guinness. Guinness has asked you to take over prosecution of a patent application and has provided you with a copy of the application as filed, an outstanding Office action, and a prior art reference cited by PTO. The application claimed priority under 35 U.S.C. 119 to British patent application No. 222,222 filed in the UK on August 7, 2001 and a certified copy has already been provided. The sole inventor is Arthur Guinness, a citizen of Ireland, residing at St. James Gate, Dublin, Ireland.

You are instructed as follows:

- Prepare a response that will overcome the objections and rejections in the Office action. The response should include an amendment that will place the pending claims into condition for allowance. The Remarks section should be no more than about 3 pages.
- Add some new method claims that will distinguish over the prior art including the cited British Patent and any prior art mentioned in the specification.
- Do NOT incur any additional PTO fees.
- The response should comply with all applicable sections of the Patent Statute (Title 35 of the United States Code), Patent Office rules (Title 37 of the Code of Federal Regulations), including the new amendment format.

BEVERAGE PACKAGE AND METHOD OF PACKAGING A BEVERAGE CONTAINING GAS IN A SOLUTION

TECHNICAL FIELD

[0001] This invention relates to a beverage package and a method of packaging a beverage containing gas in solution. The invention more particularly concerns beverages containing gas in solution and packaged in a sealed, non-resealable, container which, when opened for dispensing or consumption, permits gas to be evolved or liberated from the beverage to form, or assist in the formation of, a head or froth on the beverage.

BACKGROUND INFORMATION

[0002] It is recognised in the beverage dispensing and packaging art that the characteristics of the head of froth which is provided on the beverage by the liberation of gas from the beverage immediately prior to consumption are an important consideration to the consumers enjoyment of the product and are therefore of commercial importance. Conventionally beverages of the type discussed above containing gas in solution and packaged in a non-resealable container (such as a can, bottle or carton) provide a headspace in the container within which gas is maintained under pressure. Upon opening of the package, the headspace gas is vented to atmosphere and the beverage is usually poured into a drinking vessel. During such dispensing of the beverage it is usual for gas in solution to be liberated to create the froth or head. It is generally recognised that when dispensing a beverage as aforementioned, the gas is liberated as a result of the movement of the beverage over a surface having so-called gas nucleation or active sites which may be the wall of the drinking vessel into which the beverage is poured.

[0003] There is therefore a distinct possibility with conventional beverage packages that upon opening of the container after storage and until the beverage is poured therefrom, the beverage will have little or no froth or head--such a headless beverage is usually regarded by the consumer as somewhat unattractive and unappealing especially where the beverage is to be drunk directly from the container. Admittedly it may be possible to develop a head or froth within the container by agitating or shaking the package (so that the movement of the beverage over the interior surface of the container causes the liberation of the gas in solution) but this is clearly

inconvenient once the container is opened and is inadvisable if the package is shaken immediately prior to opening as the contents tend to spray or spurt on opening.

[0004] There is therefore a need for a beverage package and a method of packaging a beverage containing gas in solution by which the beverage is packaged in a non-resealable container so that when the container is opened gas is liberated from the beverage to form or assist in the formation of a head or froth.

SUMMARY

[0005] Consistent with one aspect of the present invention, there is provided a beverage package including primary and secondary chambers for causing pressurized gas to be ejected from the secondary chamber into the beverage in the primary chamber.

[0006] Consistent with another aspect of the present invention, there is provided a method of packaging a beverage having a gas in solution therewith.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] These and other features and advantages of the present invention will be better understood by reading the following detailed description, taken together with the drawings wherein:

[0008] FIGS. 1 to 4 diagrammatically illustrate the progressive stages in the formation of the beverage package in a canning line, and

[0009] FIG. 5 diagrammatically illustrates the effect on opening the beverage package prior to consumption of the beverage and the development of the head of froth on the beverage.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] The present embodiment will be considered in relation to the preparation of a sealed can containing a fermented beverage, such as stout having in solution a mixture of nitrogen and carbon dioxide gases, the former preferably being present to the extent of at least 1.5% vols/vol and typically in the range 1.5% to 3.5% vols/vol and the carbon dioxide being present at a considerably lower level than the amount of carbon dioxide which would normally be present in conventional, wholly carbonated, bottled or canned stout and typically in the range 0.8 to 1.8 vols/vol (1.46 to 3.29 grams/liter). For the avoidance of doubt, a definition of the term "vols/vol" may be taken as "the number of volumes of gas which are dissolved in a unit volume of the

beverage, the volumes of gas being determined at a pressure of 760 millimeters of mercury and at a temperature of 15.6.degree. C.".

[0011] The stout is to be packaged in a conventional form of cylindrical container or can (typically of aluminum alloy) which, in the present example, will be regarded as having a capacity of 500 milliliters and by use of a conventional form of filling and canning line appropriately modified, as will hereinafter be described. A cylindrical shell for the can 1 having a sealed base 2 and an open top 3 is passed in an upstanding condition along the line to a station shown in FIG. 1 to present its open top beneath a stack of hollow components or pods 4. Each pod 4 is moulded in a food grade plastics material such as polypropylene to have a short (say 5 millimeters) hollow cylindrical housing part 5 and a circumferentially spaced array of radially outwardly extending flexible tabs or lugs 6. The pods 4 are placed in the stack with the chamber formed by the housing part 5 sealed and containing nitrogen gas at atmospheric pressure (or at pressure slightly above atmospheric); conveniently this is achieved by blow moulding the housing part 5 using nitrogen gas. The volume within the housing part 5 is approximately 15 milliliters.

[0012] At the station shown in FIG. 1, the bottom pod 4 of the stack is displaced by suitable means (not shown) into the open topped can 1 as shown. However, immediately prior to the pod 4 being moved into the can 1 a small (restricted) orifice or hole 7 is bored in the cylindrical side wall of the housing part 5. In the present example, the hole 7 has a diameter in the order of 0.6l millimeters and is conveniently bored by a laser beam generated by device 7a (although the hole could be formed by punching or drilling). The hole 7 is located towards the bottom of the cylindrical chamber within the housing part 5. Since the hollow pod 4 contains nitrogen gas at atmospheric pressure (or slightly higher), it is unlikely that air will enter the hollow pod through the hole 7 during the period between boring the hole 7 and charging of the can 1 with stout (thereby alleviating contamination of the stout by an oxygen content within the hollow pod 4).

[0013] The hollow pod 4 is pressed into the can 1 to be seated on the base 2. The hollow component or pod 4 thereby forms an enclosure defining a secondary chamber having a volume less than the primary chamber in the can. Conventional cans 1 have a domed base 2 (shown by the section 2a) which presents a convex internal face so that when the pod 4 abuts this face a clearance is provided between the hole 7 and the underlying bottom of the chamber within the can 1. It will be seen from FIG. 1 that the diameter of the housing part 5 of the pod 4 is less than

the internal diameter of the can 1 while the diameter of the outermost edges of the lugs 6 is greater than the diameter of the can 1 so that as the pod 4 is pressed downwardly into the can, the lugs 6 abut the side wall of the can and flex upwardly as shown to grip the can side wall and thereby restrain the hollow pod from displacement away from the base 2.

[0014] The open topped can with its pod 4 is now displaced along the canning line to the station shown in FIG. 2 where the can is charged with approximately 440 milliliters of stout 8 from an appropriate source 9. The stout 8 is supersaturated with the mixed carbon dioxide and nitrogen gases, typically the carbon dioxide gas being present at 1.5 vols/vol (2.74 grams/liter) and the nitrogen gas being present at 2% vols/vol. The charging of the can 1 with the stout may be achieved in conventional manner, that is under a counterpressure and at a temperature of approximately 0.degree. C. When the can 1 is charged with the appropriate quantity of stout 8, the headspace above the stout is purged of air, for example by use of liquid nitrogen dosing or with nitrogen gas delivered by means indicated at 10 to alleviate contamination of the stout from oxygen in the headspace.

[0015] Following charging of the can 1 with stout and purging of the headspace, the can moves to the station shown in FIG. 3 where it is closed and sealed under atmospheric pressure and in conventional manner by a lid 11 seamed to the cylindrical side wall of the can. The lid 11 has a pull-ring 12 attached to a weakened tear-out region 13 by which the can is intended to be broached in conventional manner for dispensing of the contents.

[0016] Following sealing, the packaged stout is subjected to a pasteurisation process whereby the package is heated to approximately 60.degree. C. for about 15-20 minutes and is thereafter cooled to ambient temperature. Stout flows from the primary chamber of the can into the secondary chamber of the pod so that when the package is at ambient temperature the hole 7 is located below the depth of stout 8a within the hollow pod 4.

[0017] Following the pasteurisation process the contents of the can 1 will stabilise in a condition of equilibrium with a headspace 1a over the stout 8 in the primary chamber of the can and a headspace 4a over the stout 8a in the secondary chamber forced by the hollow pod 4 and in the equilibrium condition. With the sealed can at ambient temperature (or a typical storage or dispensing temperature which may be, say, 8.degree. C.) the pressure of mixed gases carbon dioxide and nitrogen (which largely results from the evolution of such gases from the stout) is

substantially the same in the headspaces 1a and 4a and this pressure will be greater than atmospheric pressure, typically in the order of 25lbs per square inch (1.72 bars).

[0018] Alternatively, the pod 4 may be a hollow component secured directly to the base 2 of the can 1. In another alternative, the hollow pod 4 may be suspended in the beverage in the primary chamber and weighted to locate the restricted orifice below the surface of the beverage.

[0019] The package in the condition shown in FIG. 4 is typically that which would be made available for storage and retail purposes. During handling it is realised that the package may be tipped from its upright condition; in practice however this is unlikely to adversely affect the contents of the hollow pod 4 because of the condition of equilibrium within the can.

[0020] When the stout is to be made available for consumption, the can 1 is opened by ripping out the region 13 with the pull-ring 12. On broaching the lid 11 as indicated at 14 the headspace 1a rapidly depressurises to atmospheric pressure. As a consequence the pressure within the headspace 4a of the secondary chamber in the pod 4 exceeds that in the headspace 1a and causes stout 8a in the hollow pod to be ejected by way of the hole 7 into the stout 8 in the primary chamber of the can. The restrictor hole 7 acts as a very "active site" to the supersaturated stout 8a which passes therethrough to be injected into the stout 8 and that stout is effectively "ripped apart" to generate extremely minute bubbles which themselves act as active sites for the stout 8 into which they are injected. These minute bubbles leave "vapour trails" of larger initiated bubbles which develop within the headspace 1a a head 8b having the previously discussed desirable characteristics.

[0021] It is appreciated that the headspace 1a occupies a larger proportion of the volume of the can 1 than that which would normally be expected in a 500 milliliter capacity can; the reason for this is to ensure that there is adequate volume in the headspace 1a for the head of froth 8b to develop efficiently in the event, for example, that the stout is to be consumed directly from the can when the tear-out region 13 is removed. Normally however the stout 8 will first be poured from the can into an open topped drinking vessel prior to consumption but this pouring should not adversely affect the desirable characteristics of the head of froth which will eventually be presented in the drinking vessel.

[0022] In the aforegoing embodiment the can 1 is charged with stout 8 (from the source 9) having in solution the required respective volumes of the carbon dioxide and the nitrogen gases. In a modification the can 1 is charged with stout (from source 9) having the carbon dioxide gas

only in solution to the required volume; the 2% vols/vol nitrogen gas necessary to achieve the required solution of mixed gas in the packaged stout is derived from the liquid nitrogen dosing of the headspace in the can.

[0023] Further variations in the invention are possible. Thus, while the invention has been shown but in a few forms, it is not so limited but is of a scope defined by the following claim language which may be broadened by an extension of the right to exclude others from making, using or selling the invention as is appropriate under the doctrine of equivalents.

CLAIMS

The invention claimed is:

1. A beverage package comprising:

a sealed, non-resealable, container having a primary chamber containing a beverage having gas in solution therewith;

an enclosure defining a secondary chamber having a volume less than said primary chamber, said enclosure including a restricted orifice, and said secondary chamber communicating with the beverage in said primary chamber through said restricted orifice; and

wherein said secondary chamber contains gas at a pressure greater than atmospheric, and wherein said chamber is arranged so that upon opening of said container a pressure differential caused by a decrease in pressure in said primary chamber causes gas in said secondary chamber to be ejected by way of said restricted orifice into said gas-containing beverage in said primary chamber.

2. A package as claimed in claim 1 wherein said beverage is a fermented beverage having in solution therewith carbon dioxide in a range 0.8% to 1.8% vols/vol and most preferably 1.5% vols/vol and nitrogen in a range 1.5% to 3.5% vols/vol and most preferably 2%vols/vol.

3. A package as claimed in claim 1 wherein said beverage is a fermented beverage or the like.

4. A package as claimed in claim 1 wherein said container has a base on which said enclosure is located.

5. A package as claimed in claim 1 wherein said beverage in said primary chamber forms a primary headspace comprising gas at a pressure greater than atmospheric.

6. A package as claimed in claim 5 wherein said secondary chamber contains beverage supplied thereto from the beverage in said primary chamber and having a secondary headspace therein comprising gas at a pressure greater than atmospheric such that the pressures within said primary and secondary headspaces are substantially at equilibrium, and wherein said secondary chamber is arranged such that upon opening of the container the pressure differential caused by the decrease in pressure at said primary headspace causes beverage in said secondary chamber to be ejected by way of said restricted orifice into the beverage of said primary chamber.

7. A package as claimed in claim 6 wherein said enclosure comprises a hollow moulding with radially extending tabs engaging the side wall of said container.

8. A package as claimed in claim 1 wherein said enclosure comprises a hollow component suspended in the beverage in said primary chamber with said restricted orifice located below the surface of the beverage in said primary chamber.

9. A package as claimed in claim 8 wherein said hollow component is weighted to locate said restricted orifice below said surface of said beverage in said primary chamber.

10. A package as claimed in claim 1 wherein said enclosure comprises a substantially cylindrical hollow moulding with radially extending tabs engaging said side wall of said container, and wherein said restricted orifice comprises a circular aperture having a diameter in the range of 0.02 to 0.25 centimeters.

11. A method of packaging a beverage having gas in solution therewith substantially as shown in the drawings and described in the specification.

ABSTRACT

A beverage package and a method of packaging a beverage having gas in solution has a non-resealable container within which is located a hollow pod having a restricted aperture in a side wall. The container is charged with the beverage and sealed. Beverage from the main chamber of the container enters the pod by way of the aperture to provide headspaces in the container and in the pod. Gas within the headspaces is at greater than atmospheric pressure. Upon opening the container by draw ring/region, the headspace is vented to atmosphere and the pressure differential resulting from the pressure in the pod headspace causes gas/beverage to be ejected from the pod into the beverage. The ejection causes gas to be evolved from solution in the beverage in the main container chamber to form a head of froth on the beverage.

FIG.1.

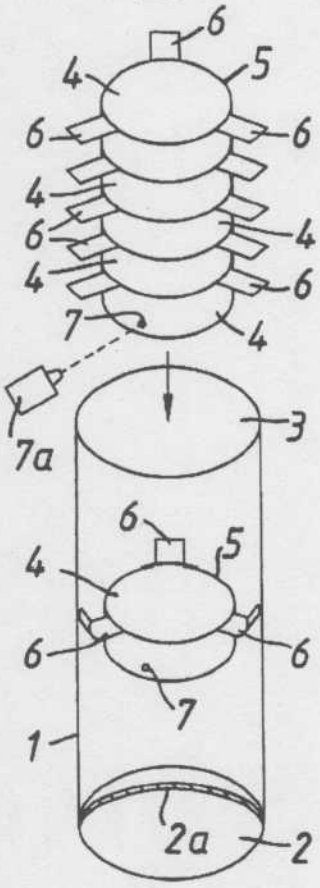


FIG.2.

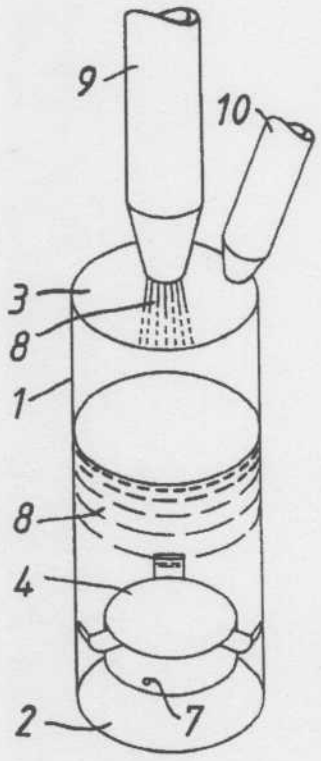


FIG. 3.

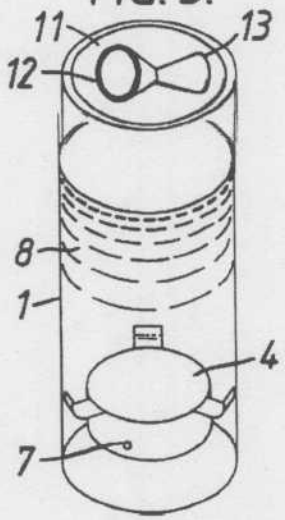


FIG. 4.

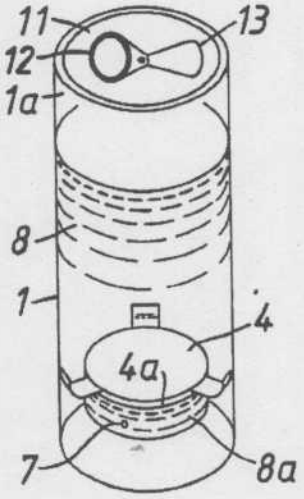
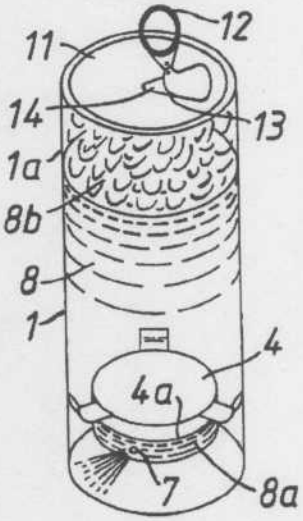


FIG. 5.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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EXAMINER	
Carroll	
ART UNIT	**PAPER NUMBER**
999	

DATE MAILED: 04/06/04

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Objections

1. The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§602.01 and 602.02.

Claim Rejections – 35 USC § 112, 2nd para.

2. Claims 1-11 are rejected under 35 USC § 112, 2nd paragraph as being indefinite for failing to particularly point out and distinctly claim what applicant regards to be the invention. Claims 1-10 are replete with vague and indefinite language. In claim 1, line 8, it is unclear which "said chamber" is arranged. In claim 1, lines 10, "said gas-containing beverage" lacks antecedent basis. Claim 2 includes narrow and broader ranges in the same claim. In claim 3, "or the like" is an indefinite alternative expression. Claim 11 is an omnibus claim and fails to point out what is included or excluded by the claim language.

Claim Rejections – 35 USC § 102

3. Claims 1-5 are rejected under 35 USC 102(b) as being clearly anticipated by British Patent GB 1,266,351. As shown in FIGS. 3 and 4, GB '351 discloses a beverage container having first and second chambers.

Allowable Subject Matter

4. Claims 6-11 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

5. Any inquiry concerning this communication from the examiner should be directed to Examiner Carroll.

K. Carroll 4-6-04
Primary Examiner

FORM PTO-1449 (Modified) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	Atty. Docket No. GUINNESS001	Serial No. 01/111,111
	Applicants Guinness	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use several sheets if necessary) (37 CFR 1.98(b))	Filing Date 08/07/02	Group 999

U.S. PATENT DOCUMENTS

EXAMINERS INITIALS		PATENT NUMBER	ISSUE DATE	PATENTEE	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

FOREIGN PATENT OR PUBLISHED FOREIGN PATENT APPLICATION

		DOCUMENT NUMBER	PUBLICATION DATE	COUNTRY OR PATENT OFFICE	CLASS	SUBCLASS	TRANSLATION yes	TRANSLATION no
KK		1 2 6 6 3 5 1	3-8-72	United Kingdom				

OTHER DOCUMENTS (Including Author, Title, Date**, Relevant Pages, Place of Publication***)

EXAMINER	DATE CONSIDERED
KK Law	4-6-04

EXAMINER: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

PATENT SPECIFICATION (11) 1266351

1266351

DRAWINGS ATTACHED

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(23) Complete Specification filed 21 Jan. 1970

(45) Complete Specification published 8 March 1972

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B8C 15A 15D 21A2 29C
B8D 12 1A3 1B1 7M

(72) Inventors SEWARD HAROLD HILDEBRAND and JOHN ANTHONY CAREY

(54) IMPROVED METHOD OF AND MEANS FOR DISPENSING CARBONATED LIQUIDS FROM CONTAINERS

(71) We, ARTHUR GUINESS SON & COMPANY (DUBLIN) LIMITED, of St. James's Gate Brewery, St James's Gate, Dublin, in the Republic of Ireland, a corporation constituted under the laws of the Irish Republic, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the packaging of beverages in the form of liquids which contain gas in solution. Such beverages (sometimes called "aerated" beverages) may be alcoholic or non-alcoholic.

The invention is concerned with the packaging of such beverages, under pressure, in what are herein termed "non-releasable" containers, by which is meant containers such as cans or bottles, which when broached, totally and irrevocably vent the pressure in the headspace above the liquid contents, so that the gas in solution in the liquid will thereafter evolve when the liquid is dispensed into a drinking vessel. Particularly in the case of alcoholic beverages, there is a tendency for the contents of the container to go "flat", unless they are consumed within a short while after broaching the container. Such containers are normally intended to hold a volume of beverage in the order of two litres or less.

The invention has been developed by the Applicants mainly for use in connection with alcoholic beverages such as beer, (which term shall include stout, ale and lager) which are required to be dispensed in such manner that a "head" of foam shall form in the drinking vessel. It is, however, applicable to other aerated beverages if the requirement for a "head" should exist in the particular consumer market.

Among the qualities normally sought in a head on beverages such as beer, ale and stout, may be listed the following:—

Regularity, by which is meant a consistent bubble size. Fineness, by which is meant a small bubble size, e.g. bubbles up to about 0.010 inches average diameter.

Homogeneity, by which is meant a continuity of bubble structure without the occurrence of large irregularly shaped random gaps.

Endurance, by which is meant the ability of the bubble structure, when it has risen to the surface of the liquor after dispensing into a drinking vessel, to persist during the process of drinking and regardless of whether or not the liquor is quaffed rapidly or sipped slowly.

By the expression "size of head" is meant the volume of froth initially present on the top of the liquor in the drinking vessel, after the beverage has been dispensed and after sufficient time has elapsed for most of the gas in solution to have evolved, and for the majority of the resulting bubbles to have risen to the surface of the liquor.

Considerable research has been carried out by Arthur Guiness Son & Company (Park Royal) Limited, a United Kingdom brewery with which the present Applicants are closely associated, on the provision of a fine and enduring head on beer when dispensed under pressure from a large container such as a cask or keg. In those conditions, the pressure is maintained on the contents of the container during and after dispensing, since the container may normally have a capacity of from 30 to 50 litres. It has been found, as discussed in U.K. Patents Nos. 876,628 and 876,629 that the quality of head may be improved and made more enduring by the use of mixed gases in solution in the beverage, namely an "inert gas" and carbon dioxide and by dispensing the beverage through a tap provided with a restrictor designed to produce a sudden pressure-drop as the beverage is dispensed.

By the term "inert gas" we mean a gas which has the following properties:—

[Price 25p]

SEE ERRATA SLIP ATTACHED

(a) It does not itself react chemically with the liquor and particularly not with beer.

(b) When applied to, or dissolved in the liquor it does not promote or allow, in the liquor after gasification, chemical reactions such as acetification, which in the absence of the inert gas would not tend to take place.

(c) As compared with carbon dioxide:—

(i) It is relatively insoluble in beer, e.g. in the order of less than 5% by volume as compared with 100%.

(ii) It does not have a large effect on the size of head for a given pressure change of the dissolved gases.

(d) It is not harmful to the consumer.

(e) It does not impair the normal taste of the liquor.

The inert gas which clearly satisfies all the above requirements and which we prefer to use, is nitrogen, since this gas is not only "inert" as above defined, but is also inexpensive and non-inflammable. In this latter respect, we believe that hydrogen or methane may be examples of gases which would otherwise satisfy the definition given above but, being inflammable, they would not normally be desirable to use as propellants for draught beer or similar liquor.

In the case of non-releasable containers, the beverage cannot be dispensed under pressure through a restrictor, because the broaching of a bottle or can immediately relieves the original pressure in the container.

The object of the present invention is to provide conditions in a non-releasable container which will enable an aerated beverage to be dispensed into a drinking vessel so as to provide a "head" on the contents of the drinking vessel which is comparable to that which can be obtained when dispensing beer from a large pressurised cask or keg, through a tap provided with a restrictor, as discussed earlier.

According to the present invention there is provided a packaged beverage in the form of a liquid containing gas in solution, sealed into a non-releasable container (as hereinbefore defined) having a main compartment and a smaller subsidiary compartment, and comprising a predetermined volume of the liquid carried in the main compartment under pressure from gas in a headspace above the liquid substantially in equilibrium with the gas in solution in the liquid, and a charge of gas under pressure in the subsidiary compartment; the subsidiary compartment communicating with the main compartment through a fine aperture constituting a restricted flow jet nozzle and located below the surface of the liquid, the arrangement being such that when the container is broached and gas pressure in the headspace above the liquid is suddenly relieved, gas from the charge will vent through the jet nozzle into the liquid, emerging as fine bubbles and acting to "seed" the formation of further fine bubbles in the liquid as the gas evolves out of solution from the liquid.

The invention further includes a method of packaging a beverage in the form of a liquid containing gas in solution, in a sealed non-releasable container (as hereinbefore defined) under pressure from gas in a headspace above the liquid substantially in equilibrium with the gas in solution in the liquid, which comprises providing within the sealed container, an internal charge of gas under pressure, separate from the gas in the headspace, and capable of being vented through fine jet means below the normal liquid level in the filled container; the arrangement being such that when the container is broached and gas pressure in the headspace above the liquid is suddenly relieved, gas from the charge will vent through the jet means into the liquid, emerging as fine bubbles and acting to "seed" the formation of further fine bubbles in the liquid as the gas evolves out of solution from the liquid.

In most instances we prefer that the pressure of the charge of gas in the subsidiary compartment shall also be in equilibrium with that of the gas in the headspace and in solution in the liquid. In the case where there is disequilibrium, valve means may be provided to maintain this disequilibrium so long as the container is sealed, but which opens to release the charge from the subsidiary compartment when the container is broached.

Normally, the volume of the subsidiary compartment will not exceed 10% of the volume of the main compartment.

The invention is applicable to various forms of non-releasable containers, but expected to be chiefly applicable to bottles and cans.

In the case of bottles, the subsidiary gas compartment is conveniently formed as a part of the bottle closure. In the case of cans, the subsidiary gas compartment is conveniently built into the structure of the can.

Three embodiments of the invention will now be described with reference to the accompanying illustrative drawings in which:—

Figure 1 shows a sectional view of a bottle adapted to incorporate the invention.

Figure 2, shows on an enlarged scale, a sectional view of the closure for the bottle of Figure 1, which incorporates a subsidiary gas compartment.

Figure 3, shows a sectional view of one construction of a can incorporating a subsidiary gas compartment.

Figure 4, shows a sectional view of another construction of can incorporating a subsidiary gas compartment.

In Figure 1, a conventional bottle 1, is provided with a closure 2 in the form of a

crimped metal or plastics cap, (commonly termed a "Crown Cap") to the underside of which is attached a tubular compartment 3, which serves to hold the subsidiary charge of gas. The compartment 3 extends below the level of liquid A—A, in the filled bottle.

Referring to Figure 2, the cylindrical gas receptacle 3 is continuous with the cap 2, which is provided with a film of sealing compound 4 to provide a pressure joint with the mouth of the bottle. The end of the receptacle 3 tapers at 5 to a fine nozzle orifice 6, from which the gas will escape in the form of a jet, which will emerge below the surface of the contents of the bottle when the bottle is broached.

One method of charging the bottle 1 and gas receptacle 3, is so arranged for the bottle to be filled and capped in a region of appropriate gas pressure so that, at the end of the operation, the subsidiary gas receptacle 3 is already charged with the appropriate gas, or mixed gases, at the appropriate pressure or partial pressures, in equilibrium with the same gas or mixed gases in solution in the liquid.

Assuming that the bottle is opened in a normal manner, and that the closure is not rapidly lifted away from the bottle, the initial broaching of the bottle will immediately relieve the pressure of gas in the headspace, above the line A—A. As a result of this, the gas (or gases) previously held in solution in the liquid will be free to evolve. At the same time, the charge of gas (or gases) in the subsidiary gas receptacle 3, will escape and be vented, in the form of a jet of fine bubbles, below the level of the liquid. This venting will continue so long as the cap and container are not withdrawn from the bottle. We have found that, in practice, a delay of one or two seconds before removing the cap, is sufficient for the jet of bubbles to initiate the evolution of gas out of the liquid, and to "seed" the formation of further fine bubbles in the liquid. Moreover, once such seeding has begun, it will continue when the contents of the bottle are poured out into a drinking vessel, and an even and fine head of froth will be formed in the drinking vessel, comparable with that obtained when dispensing from the pressurised cask or keg, and considered by most consumers to be superior in texture and quality to that obtainable from a normal bottled aerated beverage.

As an alternative to filling the bottle and charging the gas receptacle 3 in one operation in a region of gas pressure, the receptacle 3 can be sealed, at the nozzle 6, by gelatine or other suitable non-toxic substance intended to dissolve when in contact with the liquid in the bottle. The receptacle can be filled, prior to sealing with an appropriate charge of gas (or gases) at a predetermined pressure (or partial pressures). Conveniently, in such a case, a simple non-return valve may be fitted into the top of the closure cap 2, so that gas can be injected into the receptacle 3 before the closure is applied to the bottle.

The embodiment of the invention illustrated by Figure 3, shows how it may be applied to a conventional can of aerated beverage such as beer.

A canister 10, is constructed to carry, attached to its base 14, a gas receptacle 11. This receptacle has a gas escape tube 12, which is turned over to point downwardly and which terminates in a fine jet orifice 13. This construction is intended to provide a liquid lock for the contents of the gas receptacle in the event that a filled canister is stored in an upside down position. The bottom of the gas receptacle 11, carries a rubber grommet 15, which is self-sealing under internal pressure. Pressurisation of the can may be carried out by hypodermic injection through the grommet 15, or by the use of a conventional non-return valve such as is used, for example, when inflating beach balls.

The canister 10, is filled with beer, containing gas (or mixed gases) in solution, up to a predetermined level indicated by the line B—B. This allows a headspace 16 for gas (or mixed gases) which serve to hold the gas (or mixed gases) in solution in the beer until the canister is broached.

In this embodiment conventional means are provided for broaching the top of a canister, but are not illustrated. For example a tear-off portion may be provided in the top of the canister above the headspace 16.

When the canister is broached, the pressure in the headspace is vented, and as a result the gas in solution in the beer becomes free to evolve. After broaching, gas under pressure will vent through the jet orifice 13 into the beer, in the form of fine bubbles. This has been found to encourage the evolution of gas from the beer, and to provide a fine and even head on the beer when it is dispensed from the canister into a drinking vessel.

The embodiment of the invention illustrated by Figure 4 shows another way of applying it to a conventional can of aerated beverage such as beer.

A canister 20 defines a main compartment 21 and a subsidiary compartment 22, formed by the attachment of a large diameter relatively flat wall 24, to the base 23 of the canister 20. The base 23 carries a rubber grommet 27, which is self-sealing under internal pressure, and the wall 24 of the subsidiary compartment has a downwardly projecting dimple 25, in the base of which is located a fine jet orifice 26.

Under conditions of equilibrium, when the main compartment 21 of the canister 20 has been filled with beverage up to the predetermined level indicated by the line C—C, gas

pressure in the headspace 21A will be in equilibrium with the pressure of gas in solution in the liquid in the main compartment and this pressure, exerted on the upper face of the wall 24, will cause the dimple 25 to be pressed into contact with the upper face of the grommet 27, thus sealing the jet orifice 26.

The subsidiary compartment 22 is pressurised by hypodermic injection through the grommet 27, to a pressure which is fractionally less than the pressure in the main compartment 21. Thus, under packaged conditions, communication between subsidiary compartment 22, and the main compartment 21 is closed because the jet orifice 26 is, as previously explained sealed by contact with the upper face of the grommet 27.

If desired, the wall 24 may initially be given a slight downward spring or bias, in which event it will, of itself, tend to hold the jet orifice 26 in sealing contact with the grommet 27. In such event, the pressure in the subsidiary compartment 22 of an unbroached can may be equal to, or even fractionally greater than that in the main compartment 21.

When the container is broached, by perforating the upper wall 28 of the canister 20, pressure in the headspace 21A is relieved. There is then a pressure differential between the pressure in the subsidiary compartment 22 and that in the main compartment 21 which has now been broached. This will cause the resilient flat wall 24 of the subsidiary compartment 22 to lift slightly, and thus permit escape of the gas from the subsidiary compartment 22 in the form of a fine jet of bubbles into the liquid in the main compartment 21. This jet will act to initiate and encourage evolution of gas out of the liquid, and to "seed" the formation of further fine bubbles in the liquid.

It should be appreciated that this invention is not restricted to the use of mixed gases in solution in the liquid. There may well be circumstances with certain types of beverage, where pressurisation with a single gas (normally carbon dioxide) will be found to be adequate. On the other hand, as earlier mentioned, it has been found, particularly with beverages such as beer, that the use of mixed gases and specially of a mixture of carbon dioxide and an inert gas such as nitrogen, will assist the formation of a fine, regular and enduring head on the beverage when it is dispensed.

The pressures involved are a matter for selection by those responsible for bottling or otherwise packaging the beverage in the containers. The examples which follow, and which relate to the packaging of beer, are merely indicative of pressures which we have found to be satisfactory, particularly when using mixed gases.

In general, for packing beer, we prefer that the gas in solution in the liquor and in the headspace, shall be a mixture of carbon dioxide and an inert gas (as herein defined), and that the partial pressure of carbon dioxide should lie within the range 0.8 to 1.4 kg. per cm. sq. (absolute) and that of the inert gas should lie within the range 0.4 to 2.8 kg. per cm. sq. (absolute). Specifically, when using nitrogen as the inert gas, we have achieved satisfactory results when the partial pressure of carbon dioxide in the mixed gases lies within the range 1.1 to 1.4 kg. per cm. sq. (absolute), and that of the nitrogen lies within the range 2.1 to 2.5 kg. per cm. sq. (absolute).

We normally aim to package the beverage so that the pressure (or partial pressures) of the gas (or mixed gases) in the headspace is substantially in equilibrium with the pressure (or partial pressures) of the same gas (or the same mixed gases) in solution in the beverage. Where a slight difference initially is present, conditions of equilibrium are usually established after the beverage has been packaged for a short time.

In the constructions of Figures 1 to 3, we have also found it preferable, though not essential, that the pressure and nature of the gas or mixed gases in the subsidiary compartment, should be substantially in equilibrium with that or those of the gas or mixed gases in the main compartment. In the construction of Figure 4, as already stated, the pressure in the subsidiary compartment may differ fractionally from that in the main compartment.

There may however, be conditions where it is sufficient to charge the subsidiary compartment with a single gas e.g. carbon dioxide or nitrogen, and if the subsidiary compartment is arranged so that there is a one-way relief valve at the jet nozzle, which will only come into operation to vent the subsidiary compartment after the main compartment has been broached, the pressure in the subsidiary compartment may be less than the pressure (or the sum of the partial pressures) in the main compartment.

WHAT WE CLAIM IS:—

1. A packaged beverage in the form of a liquid containing gas in solution, sealed into a non-releasable container (as herein defined) having a main compartment and a smaller subsidiary compartment, and comprising a predetermined volume of the liquid carried in the main compartment under pressure from gas in a headspace above the liquid substantially in equilibrium with the gas in solution in the liquid, and a charge of gas under pressure in the subsidiary compartment, the subsidiary compartment communicating with the main compartment through a fine aperture constituting a restricted flow jet nozzle, and

located below the surface of the liquid, the arrangement being such that when the container is broached and gas pressure in the headspace above the liquid is suddenly relieved, gas from the charge will vent through the jet nozzle into the liquid, emerging as fine bubbles and acting to "seed" the formation of further fine bubbles in the liquid as the gas evolves out of solution from the liquid.

2. A method of packaging a beverage in the form of a liquid containing gas in solution, in a sealed non-resealable container (as herein defined) under pressure from gas in a headspace above the liquid substantially in equilibrium with the gas in solution in the liquid, which comprises providing, within the sealed container, an internal charge of gas under pressure, separate from the gas in the headspace, and capable of being vented through fine jet means below normal liquid level in the filled container; the arrangement being such that when the container is broached and gas pressure in the headspace above the liquid is suddenly relieved, gas from the charge will vent through the jet means into the liquid, emerging as fine bubbles and acting to "seed" the formation of further fine bubbles in the liquid as the gas evolves out of solution from the liquid.

3. The invention of Claim 1 or Claim 2, wherein the volume of the subsidiary compartment does not exceed 10% of the volume of the main compartment.

4. The invention of Claim 1, 2 or 3, wherein the charge of gas in the subsidiary compartment is not in equilibrium with the gas in the headspace and in solution in the liquid and there is provided valve means which act to maintain the disequilibrium so long as the container is sealed but which opens to release the charge from the subsidiary compartment when the container is broached.

5. The invention of Claim 1, 2 or 3, wherein the pressure of the charge of gas in the subsidiary compartment is substantially in equilibrium with that of the gas in the headspace and in solution in the liquid.

6. The invention of Claim 1 or Claim 2, wherein the beverage is beer.

7. The invention of any of the preceding claims wherein the gas in solution in the liquor and in the head space is a mixture of carbon dioxide and an inert gas (as hereinbefore defined).

8. The invention of Claim 7, wherein the partial pressure of carbon dioxide in the mixed gases lies within the range 0.8 to 1.4 kg. per cm. sq. (absolute) and that of the inert gas lies within the range 0.4 to 2.8 kg. per cm. sq. (absolute).

9. The invention of Claim 7 or Claim 8, wherein the inert gas is nitrogen.

10. The invention of Claim 9, wherein the partial pressure of carbon dioxide in the mixed gases lies within the range 1.1 to 1.4 kg. per cm. sq. (absolute), and that of the nitrogen lies within the range 2.1 to 2.5 kg. per cm. sq. (absolute).

11. A packaged beverage which contains gas in solution, sealed into a non-releasable container, substantially as herein described with reference to Figures 1 and 2, or with reference to Figure 3 or Figure 4, of the accompanying illustrative drawings.

12. A method of packaging a beverage which contains gas in solution in a non-resealable container, substantially as herein described with reference to Figures 1 and 2, or with reference to Figure 3 or Figure 4 of the accompanying illustrative drawings.

URQUHART-DYKES & LORD,
Columbia House,
69, Aldwych,
Strand,
London, W.C.2.
and
11th Floor,
Tower House,
Merrion Way,
Leeds LS2 8PB.
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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*



FIG.1

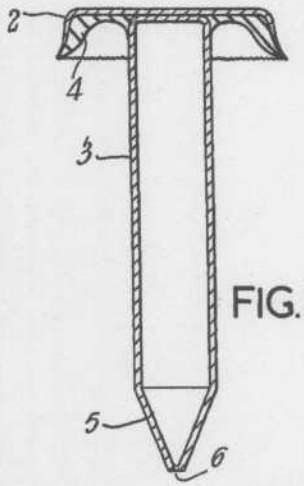


FIG.2

FIG.3

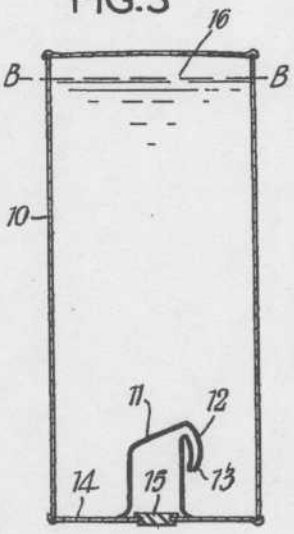


FIG.4

