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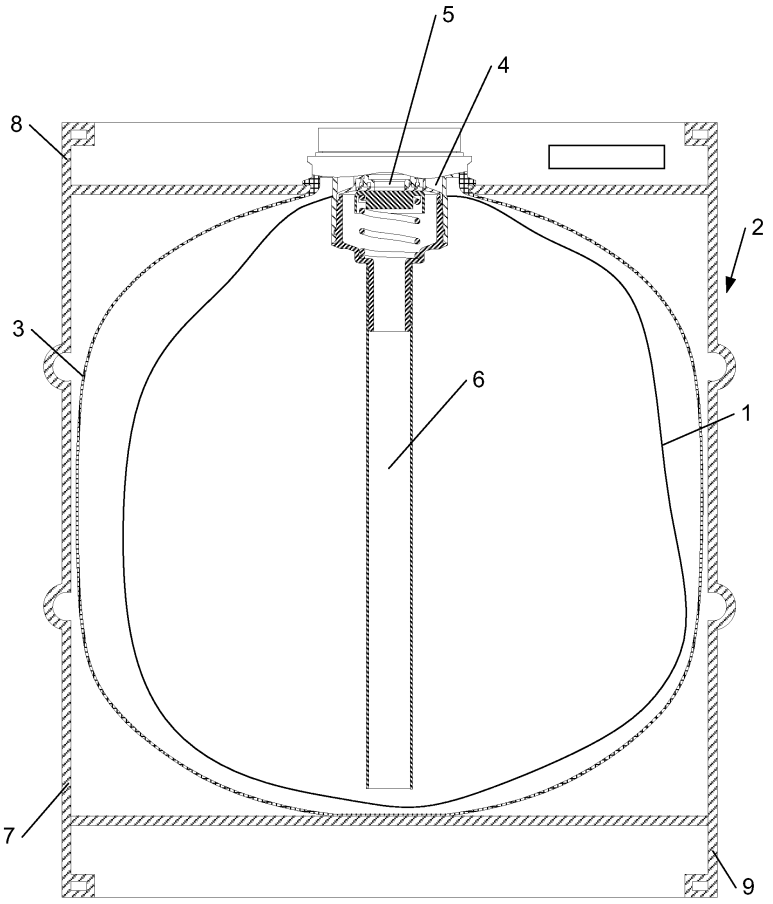
(71) Applicant: **Inbev S.A.**
3000 Leuven (BE)

(72) Inventor: **DEKOCKER, Wim**
3000, LEUVEN (BE)

(74) Representative: **Gevers, François et al**
Gevers & Vander Haeghen S.A.,
Holidaystraat 5
1831 Diegem (BE)

(54) Beer packaging and dispensing

(57) A liner-in-keg beer dispensing package, (as well as a beer dispensing system comprising such packaging in combination with a refrigerated dispensing appliance), includes a vinylidene chloride based polymeric gas barrier liner (1) for containing the beer, and dispensing same upon introduction of pressurized fluid (e.g. air) in between the liner and the keg (3), as for example in the course of the operation of the appliance.



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Description

Field of the Invention:

[0001] The present invention relates to draft beer dispensing systems and related beer packaging, in particular although not necessarily limited to small volume dispense systems such as home draft dispense appliances.

Background of the invention:

[0002] Low volume throughput beverage dispense systems - (for example, but also especially "at home" dispense systems for draft beer), typically employ relatively small kegs with, in general, lower turnover rates than might be expected in installations typical of commercial enterprises, such as bar or restaurant keg dispense systems. Both of these factors leave the beer more predisposed to risks associated with more and more rapid loss of CO2, and to oxidation of the beer through gas infiltration. (Small volume containers almost necessarily have larger packaging surface area to contained volume ratios - increasing the volumetric rate of loss and infiltration respectively - and compounding the keeping quality problem on both fronts).

[0003] Taking it as a given that home draft dispense carries with it both consumer expectations of a premium experience, as well as the collateral system and beer packaging cost premiums necessarily incurred in delivering that experience to a consumer's home: the viability of the value proposition becomes particularly precarious. If the system's packaging integrity fails, the quality of the beer and the draft experience will degrade rapidly. Marketing prospects for sustaining consumer interest in such circumstances is contraindicated. The entire commercial opportunity is susceptible to failure as a direct result of packaging performance.

[0004] From an appliance design and logistical convenience point of view, liner-in-keg dispense systems are particularly suited to this general class of dispense systems. In this context, however, the entire home draft opportunity can be critically dependent on the efficacy of gas barrier liners employed in the liner-in-keg combination.

[0005] Due at least in part to their ability to be fabricated into packaging articles of various sizes and shapes (e.g., their design flexibility), plastic materials based on organic polymers, are becoming increasingly important in the packaging industry. More particularly, the use of organic polymers in films, has become widespread in packaging applications. However, the barrier properties of available organic polymers have not been able to approach the barrier properties of traditional packaging materials, such as glass and metal. In particular, virtually all plastics having oxygen barrier characteristics that might otherwise be suitable for liner-in-keg purposes fail dramatically in that very connection under the high relative humidity that conditions prevail in a liner-in-keg environment.

[0006] Inorganic-organic "alloys" (nanocomposites) have been produced which comprise gas impermeable inorganic fillers dispersed in an organic polymer matrix. This technology has resulted in enhanced gas barrier performance as the result of the "tortuous path effect," however these approaches have had limited commercial acceptance due to the cost associated with the additional fabrication steps involved.

[0007] Another approach to providing packaging for oxygen sensitive products involves inorganic and/or organic oxygen scavengers being used in packaging structures to eliminate or reduce the oxygen inside a package. Oxygen scavengers that can be used include iron powders and unsaturated olefinic polymers. In oxygen scavenging packaging, oxygen within the package or that diffuses through the packaging wall from the outside environment is removed by the irreversible reaction of the oxygen scavenger with the oxygen. In the case of polymeric oxygen scavengers, the oxygen scavenging functionality can be an unsaturated olefinic moiety, which can be incorporated into or grafted onto a polymer. Because these polymers were developed to aid in the removal of headspace oxygen from a package, they typically have relatively high oxygen transmission rates, so that the oxygen within the headspace can easily reach the reactive site (scavenging site) and so that it is reacted at a sufficiently rapid rate. Therefore, most oxygen scavenging polymers used in packaging, such as polyolefins and acrylate polymers, have relatively high oxygen transmission rates and/or relatively low oxygen barrier properties. These advances have therefore not materially addressed the requirements for liner-in-keg applications.

[0008] The overall shortcomings of oxygen barrier performance of polymers in general, has resulted in their being ignored for liner-in-keg applications, in favor of specialty, modified polymer films that are intended to more closely approximate the oxygen barrier performance associated with traditional glass and metal packaging materials.

[0009] Instead, the packaging arts has pursued a materials "hybridization" - which has been demonstrated to deliver improved gas barrier performance. This approach has, for example, included thin-layer surface coating/ deposition of metals, silica or graphite over an organic polymer substrate. Metallized PET is widely employed.

[0010] From a simple barrier perspective, the use of foil or metal coated barrier films as liner materials is unequivocally preferred - their properties are unmatched by the currently available alternative materials in this respect. However, and despite their demonstrable superiority as gas barrier materials, per se, their use remains problematic for liner-in-keg packaging applications. The problem is "two-fold": involving as it does, both the folding that is typically employed in installing the liner in the keg, and the unfolding of the liner within the keg that occurs during or as a preamble to filling. Both such operations can and often do result in an unacceptable physical compromise of the gas barrier integrity of foil and metallized

film packaging. However, un-hybridized polymers to such foil and metallized flexible liners offer little hope of a viable alternative. Virtually all such gas barrier polymer's performance degrades unacceptably in liner-in-keg applications. The problem of such polymeric alternatives is that their gas barrier properties are, virtually without exception, significantly or even radically compromised in the presence of moisture (including elevated relative humidity) that is trapped and/or accumulates in the space between the liner and the keg. This problem is particularly acute in liner-in-keg dispense systems in which unconditioned air, (i.e. with its often high ambient relative humidity), is utilized to pressurize the keg - and so results in condensation forming between the keg and the liner when the keg is refrigerated within the dispense system.

[0011] Heretofore, the industry has continued to use foil or metallized films for this reason, notwithstanding the quality problems that they continue to face, and in spite of the fact that the market for these products and the related dispense appliances is "fragile" in the sense elaborated upon above. These liner materials continue to fail to reliably deliver their essential performance, for the reasons set forth above. Since consumer quality demands high and consistent quality, the superior gas barrier properties of these hybrid materials boarders on being useless when challenged by marketplace expectations.

[0012] Accordingly, there remains an unsatisfied need in the art for a liner which:

- overcomes the shortcomings of foil and metallized films
- is not subject to the general shortcomings of most known gas barrier polymers with regard to moisture, and
- can reliably support consumer expectations and the related value proposition for these dispense systems.

Summary of the Invention:

[0013] The present invention relates to a liner adapted for a "liner-in-keg" packaging wherein the liner comprises a vinylidene chloride based polymeric gas barrier, to be deployed internally of the keg and adapted to provide a gas diffusion barrier between a gas-sensitive liquid to be contained within the liner and the liner-surrounding keg surfaces. The gas barrier performance of the vinylidene chloride moieties is largely indifferent to high relative humidity, at least in comparison to almost all other generally known plastics.

[0014] Of course the use of vinylidene chloride based polymers (PVDC) and copolymers are generally well known, and continue to be among the most widely used "high oxygen barrier" resins. Among the more familiar domestic examples of the vinylidene chloride based polymers that used in packaging, are the Saran® cling film products. Other uses of PVDC are variously described in the prior art, as indicated below.

[0015] US patent 2,713,543 discloses the use of vinylidene chloride in beverage bulbs useful for packaging carbonated beverages.

[0016] US patent 2,721,691 discloses drum liners comprised of multilayer plastic films that can be based on suitable materials such as vinyl resin.

[0017] US 3,248,040 discloses double wall flexible film packaging using vinylidene chloride copolymers - all in connection with the production of bags and pouches.

[0018] Meat packaging also using polyvinylidene chloride is disclosed in US patent 3,574,642.

[0019] US patent 3,620,774 discloses a tubular container for beer, made using vinylidene chloride, and especially copolymers of vinylidene chloride and lesser amounts of acrylonitrile.

[0020] US patent 3,630,759 discloses yet another use of vinylidene chloride pouches, for use in packaging perishable vegetables.

[0021] US patent 4,172,152 discloses a double walled film container structure to provide insulation space there between, in which beer can be sold. The outer wall of this packaging construction can employ vinylidene chloride polymers.

[0022] In accordance with the present invention , the package's keg may be a metal or plastic keg that substantially encloses the liner and provides an opening that extends into the kegs interior through which the liner is adapted to be filled and emptied.

[0023] In a preferred form of the present invention the package is a flexible liner. In particular, the liner is a folded liner adapted to be initially deployed into unfolded relation within the keg, by inflation. The barrier properties of the packaging according to the present invention is particularly well suited (i.e. is particularly resistant to problems associated with folding/folding in other barrier packaging). This can be done by filling the liner with the gas-sensitive liquid content that it is designed to hold and dispense; or, the liner can be inflated by pre-filling with a liner-interior flushing gas. This is an intermediate filling step and is performed to aid in displacing oxygen from the interior and interior surface of the liner, that might otherwise prejudice the shelf-life of the gas-sensitive liquid that is subsequently introduced into the liner.

[0024] The present invention is particularly applicable to packaging wherein the keg is:

- predisposed towards accumulation/retention of exogenous moisture in between said liner's exterior and said keg's interior; and,
- adapted to hold and dispense a gas-in-liquid solution, which is sensitive either to the ingress of oxygen or to release of solubilized gas from said solution or both.

[0025] Moisture can be accumulated within the keg prior to insertion of the liner into the keg during the assembly

of the package, e.g. by way of atmospheric water vapor prior to sealing of the keg. The problem manifests most acutely then, in packages that are adapted to be cooled to temperatures at which the water vapor condenses as liquid water between the keg and the liner.

[0026] Preferably, the liner according to the present invention is a flexible liner and the liquid contents are dispensed from the package in response to the introduction of fluid between the liner and the keg. This too is problematic in that the introduction of fluid can collaterally introduce either or both of liquid water or water vapor between said liner and said keg.

[0027] In accordance with the present invention, the liner functions as a passive gas barrier and preferably it is a gas-barrier vinylidene chloride based polymer comprised of polyvinylidene chloride homopolymer. However, PVDC homopolymer has a narrow melt processing temperature that makes its processing difficult. Alternatively therefore, the gas-barrier vinylidene chloride based polymer comprises one or more polyvinylidene chloride copolymers.. Note however, that various PVDC copolymers that comprise small amounts of a comonomer, such as vinyl chloride, methylacrylate or acrylonitrile have had some commercial success. While these copolymers offer the desired melt process capability due to their reduced melting points, their gas barrier performance is compromised due to their decreased crystallinity and due to dilution of the vinylidene chloride moieties.

[0028] With this in mind, it is preferred in connection with the present invention, to employ a chemically modified PVDC polymer structure that achieves both enhanced oxygen barrier performance and good processability (due to decreased melting point). To this end an oxygen-scavenging vinyl cycloalkenylacrylate monomer can be successfully incorporated into the polymer structure of PVDC by free radical polymerization. The oxygen scavenging vinyl cycloalkenylacrylate monomer has two carbon-carbon double bonds, one in the vinyl moiety of the monomer and the other in the cycloalkenyl moiety of the monomer. The polymerization of vinylidene chloride with the cycloalkenyl acrylate monomer apparently proceeds primarily through reaction of the vinyl double bond of the oxygen scavenging monomer with the carbon-carbon double bond of the vinylidene chloride. Reaction of vinylidene chloride with the double bond of the cycloalkenyl moiety of the oxygen scavenging monomer is believed to be minimal during the polymerization reaction. See in this connection, US patent 6,818,151. Thus, in accordance with this aspect of the present invention, the liner provides both passive and active gas barrier properties, with the latter in particular being related advantages associated with managing to the ingress of oxygen and the problems of oxidation that would otherwise be manifest through the exposure of an oxygen sensitive liquid contained in the liner.

[0029] The packaging according to the present invention is especially well suited for liquids that are sensitive to loss of solubilized gas selected from the group consisting of: carbon dioxide; nitrogen; or mixtures thereof.

[0030] Comestible products that have various sensitivities to gas loss or oxygen ingress include liquids such as edible oils; or a beverage such as beer or wine are particularly notable in this respect.

[0031] In a particularly preferred form of the present invention there is provided a (folded) liner and spear assembly adapted to be deployed in a keg. The liner is folded to facilitate insertion into a keg, and to deploy on inflation thereof during some aspect of the filling process. The assembly in question comprises a spear (or dip tube), an a bung to seal the opening into the keg. The bung includes integral valve means for filing and dispensing operations.

[0032] The present invention also relates to a liner-in-keg package assembly, and especially although not necessarily the one in which the afore-mentioned liner and spear assembly are employed. In this liner in keg assembly the bung is positioned in engaged relation sealing the opening into the keg and holding the liner and spear in relatively fixed relation within the kegs interior.

[0033] In an especially preferred form of the present invention, of course, there is provided a beer-filled liner-in-keg package assembly. As previously indicated, the present invention extends to a beer dispensing system comprising a liner-in-keg package assembly, with an air pump to pressurize space between keg and liner, to thereby facilitate the dispense of said beer from said package. In systems of this type that make provision for refrigeration of the contents (again, preferably a comestible, and in particular a beverage such as wine or especially a carbonated beverages such as beer) of the liner-in-keg packaging, the advantages manifest in the combination when humid air is driven by the pump into the space between the liner and the keg. In accordance with the present invention the high relative humidity that results in the interior of this package in this combination with an appliance does not radically degrade the gas-barrier properties of the liner material.

Introduction to the Drawing:

[0034] The figure of the drawing appended to this specification illustrates a cross-sectional view through a keg enclosing a liner, according to the present invention;

Detailed Description of the Invention:

[0035] In the preferred form of the present invention the packaging described herein is a dispensing keg - and in particular, a keg that is used in combination with a "draft" beverage dispensing appliance.

[0036] "Draft" or draught have been variously used in the beer business to describe beer that is served using taps from a large multi-serving container, or even beer that is not heat pasteurized. In the context of the preferred form of the present invention detailed herein, the term is a reference to dispense from a multi-serving packaging

in a dispense system which is reminiscent of traditional bar taps.

[0037] In any case, under preferred practice in accordance with the present invention, there is provided a combination of a keg and a (e.g. draft beverage) dispensing appliance. The dispensing keg is preferably adapted to dispense a comestible, which could be, for example, an edible oil. In the preferred embodiment, however, the keg is adapted to dispense a beverage, such as wine.

[0038] The invention however, is particularly advantageous in relation to the packaging and dispense of carbonated, oxygen-sensitive beverages such as beer. These latter mentioned comestibles are sensitive to loss of solubilized gas (typically selected from the group consisting of: carbon dioxide; nitrogen; or mixtures thereof). As is also the cases with edible oils and wines, beer for example is also susceptible to exposure to gas infiltration (i.e. oxygen) that occurs through the liner into its interior.

[0039] Accordingly, the liner 1 according to the present invention is adapted for a "liner-in-keg" package 2 as illustrated generally in The figure hereof. More particularly, the liner 1 comprises a vinylidene chloride based polymeric gas barrier, to be deployed internally of a keg 3 and adapted to provide a the diffusion barrier between a gas-sensitive liquid to be contained within the liner 1 and the liner-surrounding interior surfaces of keg 3. The selection of the liner material has a bearing on whether the gas barrier is a passive gas barrier (such as polyvinylidene chloride homopolymers) or an active barrier such as active oxygen scavenging polyvinylidene chloride copolymers.

[0040] As illustrated the liner 1 resides within a (metal or plastic) keg 3 that substantially encloses the liner. The keg 3 circumscribes an opening 4 into its interior through which the liner 1 (and any associated dispensing apparatus such as valve body 5 and spear 6) is adapted to be inserted, and through which the liner 1 is subsequently filled and emptied.

[0041] In operation, of the illustrated packaging, the liner is a folded flexible liner that is adapted to be inserted into keg 3 and then initially deployed into unfolded relation within the keg, by inflation. The pattern in which the liner is folded orders the sequence in which it unfolds during inflation, so as to ensure that it expands properly so that it can receive a full charge of beer without damaging the liner. In a preferred practice, the liner is deployed by inflation by one of the group selected from: filling with said gas-sensitive liquid or, pre-filling with a liner-interior flushing gas. This is done to reduce the carry-over of oxygen from the liner interior into the beer when it is subsequently introduced into the packaging. Note that the liner according to the present invention is less sensitive to folding/unfolding problems associated with prior art liner materials and is also less sensitive to positioning (which if not perfectly accomplished can result in damaging deformation of the liner to which other liner materials are generally more susceptible).

[0042] Note too, that although moisture can be accumulated within the keg prior to insertion of said liner into the keg during the assembly of the package, (as by way of its introduction as atmospheric water vapor prior to sealing of the keg), - it is also through the operation the appliance/package combination that the problem is compounded. When liquid (e.g. beer) is dispensed from the package in response to the introduction of fluid between the liner and the keg introduction of that fluid collaterally introduces either or both of liquid water or water vapor between the liner and the keg. In this way, the keg is predisposed towards accumulation/retention of exogenous moisture in between the liner's exterior and the keg's interior. The problem is further exacerbated in the illustrated appliance wherein the package is adapted to be cooled to temperatures at which the water vapor introduced by way of the fluid (e.g. air) condenses as liquid water between the keg and the liner.

[0043] In the dispensing operation, air is introduced through into the space between the liner 1 and the interior surfaces of keg 3 through an opening in the valve body that is segregated from the opening through which beer is introduced/dispensed. Pressure exerted by the air acts against the exterior of liner 1, and upon selective operation of a dispense tap (not shown), beer is forced from the liner 1 by that applied pressure.

[0044] Optionally, the package 2 includes a supporting shell 7 having upper and lower chimes 8 and 9 respectively, with shell 7 enclosing keg 3 therein.

Claims

1. A liner adapted for a "liner-in-keg" package wherein said liner comprises a vinylidene chloride based polymeric gas barrier, to be deployed internally of said keg and adapted to provide a gas diffusion barrier between a gas-sensitive liquid to be contained within said liner and the liner-surrounding keg surfaces.

2. The liner according to claim 1, wherein said package's keg is a metal or plastic keg substantially enclosing said liner around an opening there through that circumscribes an opening into said liner though which said liner is adapted to be filled and emptied.

3. The package according to claim 1, wherein said liner is a flexible liner.

4. The packaging according to claim 3, wherein said liner is a folded liner adapted to be initially deployed into unfolded relation within the keg, by inflation.

5. The packaging according to claim 4, wherein said liner is adapted to be deployed by inflation by one of the group selected from: filling with said gas-sensitive liquid or, pre-filling with a liner-interior flushing gas.

6. The package according to claim 1, wherein said keg is predisposed towards accumulation/retention of exogenous moisture in between said liner's exterior and said keg's interior.

7. The package according to claim 6, wherein said liquid is a gas-in-liquid solution, which is sensitive to release of solubilized gas from said solution.

8. The package according to claim 6, wherein said liquid is susceptible to exposure to gas infiltration into said liner.

9. The package according to claim 6, wherein moisture is accumulated within said keg prior to insertion of said liner into said keg during the assembly of said package.

10. The package according to claim 6, wherein said moisture is introduced as atmospheric water vapor prior to sealing of said keg.

11. The package according to claim 10, wherein said package is adapted to be cooled to temperatures at which said water vapor condenses as liquid water between said keg and said liner.

12. The package according to claim 6, wherein said liner is a flexible liner.

13. The package according to claim 12, wherein said liquid is dispensed from said package in response to the introduction of fluid between said liner and said keg.

14. The package according to claim 13 wherein said introduction of fluid collaterally introduces either or both of liquid water or water vapor between said liner and said keg.

15. The package according to claim 6 wherein said gas barrier is a passive gas barrier.

16. The package according to claim 15 wherein said gas-barrier vinylidene chloride based polymer comprises polyvinylidene chloride homopolymer.

17. The package according to claim 15 wherein said gas-barrier vinylidene chloride based polymer comprises one or more polyvinylidene chloride copolymers.

18. The package according to claim 17, wherein said copolymer(s) is/are active oxygen scavenging polymers.

19. The package according to claim 7, wherein said liquid is sensitive to loss of solubilized gas selected from the group consisting of: carbon dioxide; nitrogen; or mixtures thereof.

20. The package according to claim 6, wherein said liquid is a comestible.

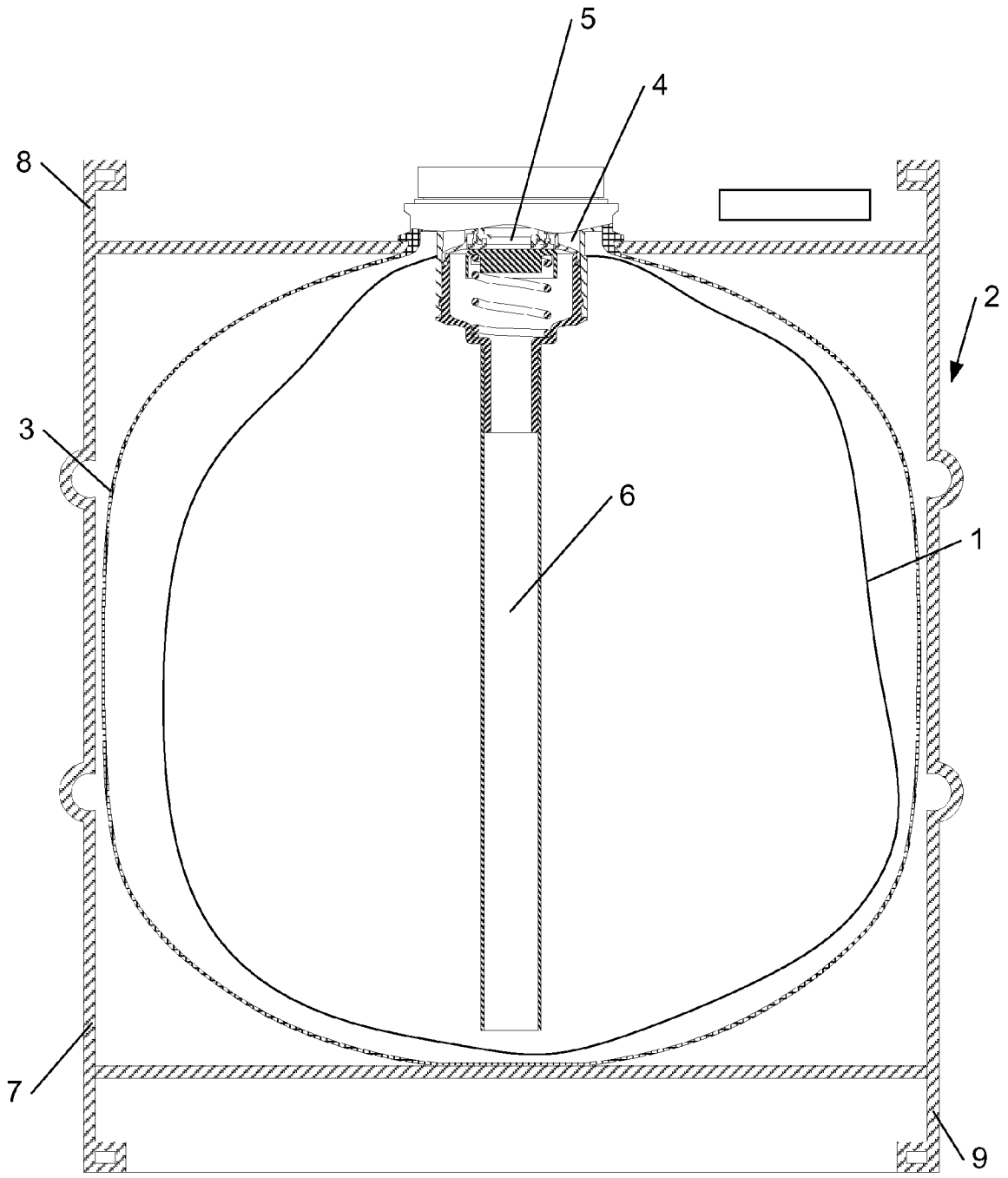
21. The package according to claim 6, wherein said liquid is and edible oil.

22. The package according to claim 6, wherein said liquid is a beverage.

23. The package according to claim 22, wherein said beverage is beer or wine.

24. The package according to claim 6, wherein said package is a dispensing keg.

25. The package according to claim 24, wherein said keg is adapted to be used in combination with a draft beverage dispensing appliance.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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	4 April 2007	Newell, Philip

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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