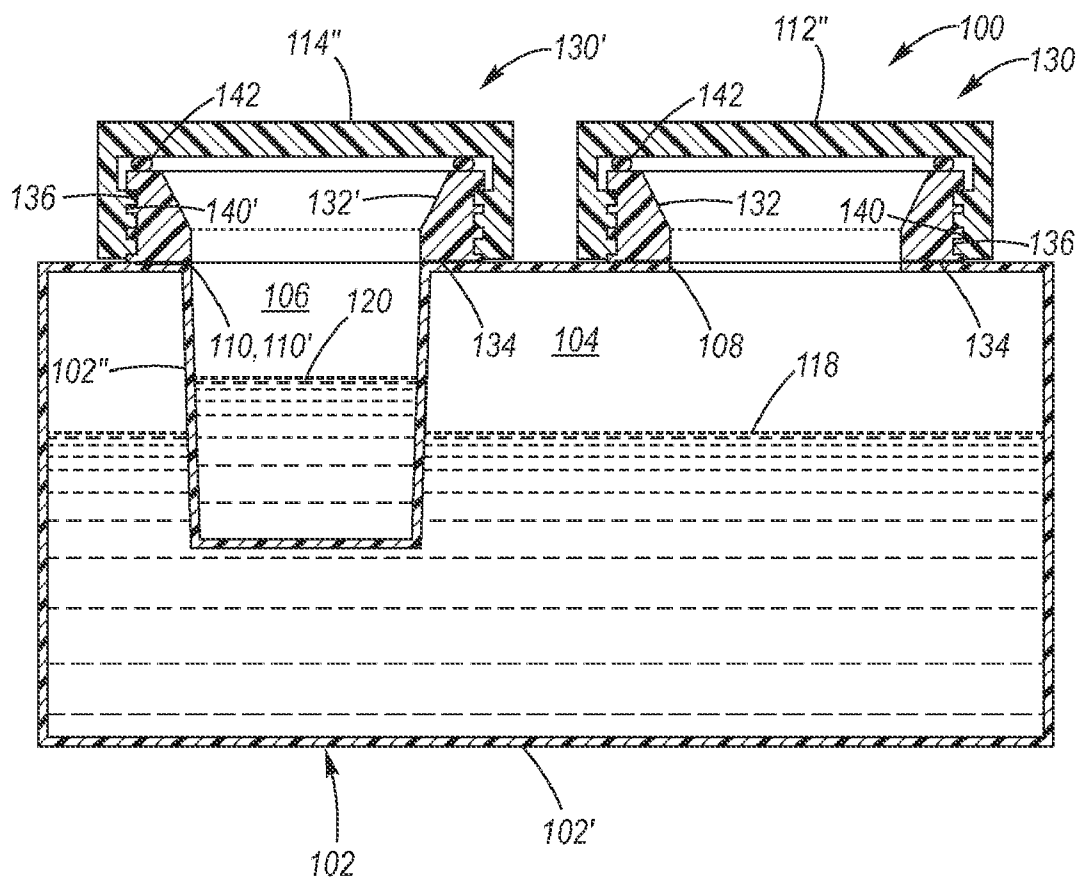




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(19) **United States**(12) **Patent Application Publication**
Gaden et al.(10) **Pub. No.: US 2011/0272414 A1**(43) **Pub. Date: Nov. 10, 2011**(54) **DOUBLE CHAMBER SEALED TANK****Publication Classification**(75) Inventors: **Dale D. Gaden**, Ferndale, MI (US);
Peter J. Soles, Tecumseh (CA)(51) **Int. Cl.**
B65D 6/00 (2006.01)(52) **U.S. Cl.** **220/564**(73) Assignee: **GM GLOBAL TECHNOLOGY
OPERATIONS, INC.**, DETROIT,
MI (US)(57) **ABSTRACT**

A double chamber sealed tank, wherein a singular tank shell is formed so as to provide two separate, yet mutually integral, chambers, each chamber not fluidically communicating with the other. Each chamber has an opening and is provided with its own respective sealing cap. In addition, each chamber has its own respective liquid dispensing system which functions independently of the other.

(21) Appl. No.: **12/775,943**(22) Filed: **May 7, 2010**

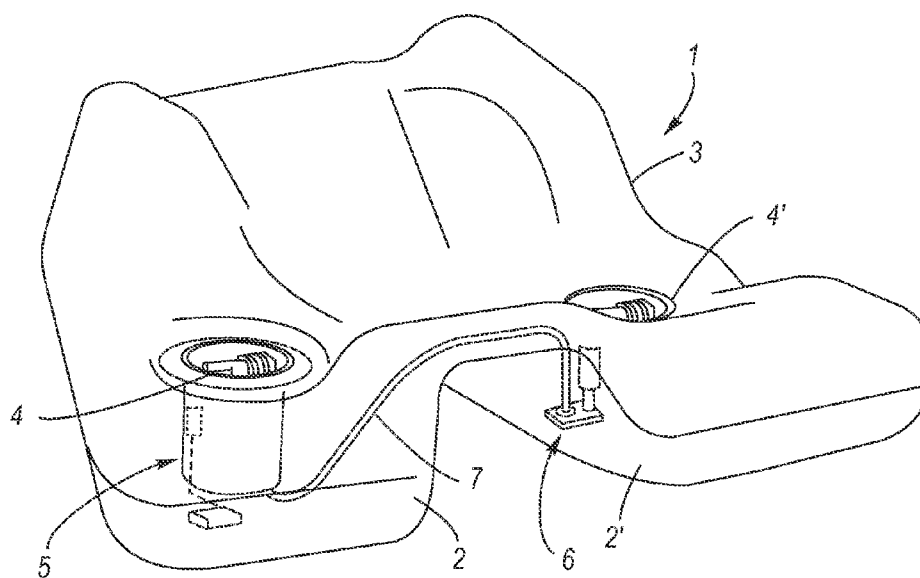


Fig. 1

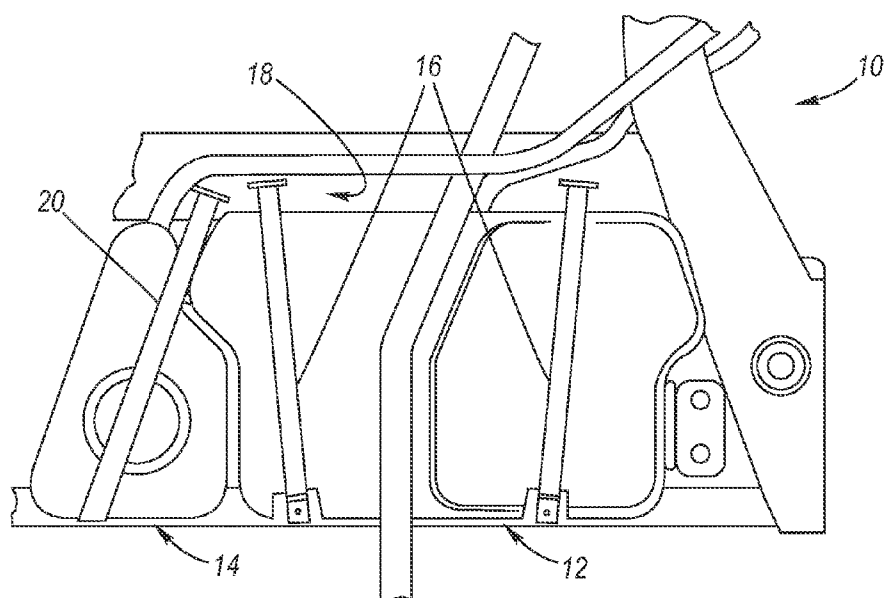


Fig. 2

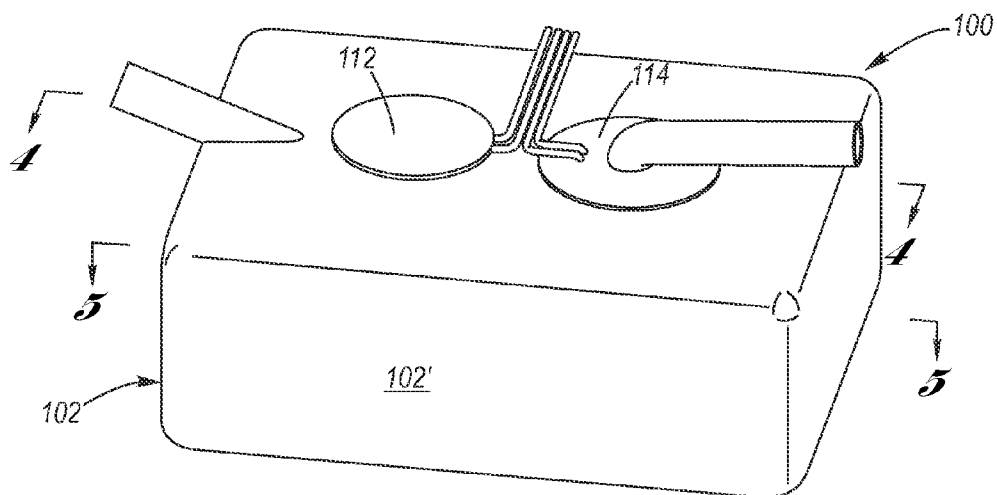


Fig. 3

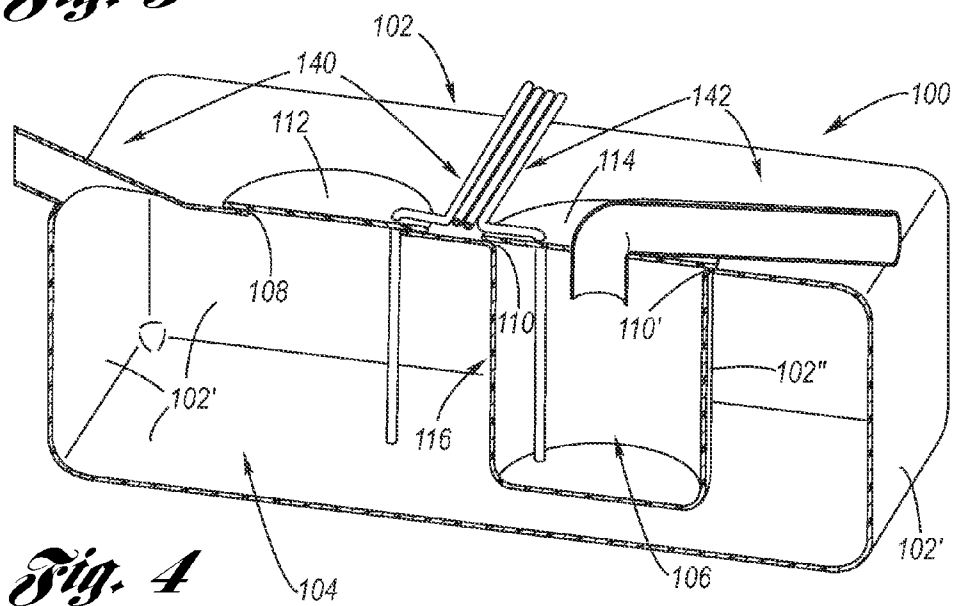


Fig. 4

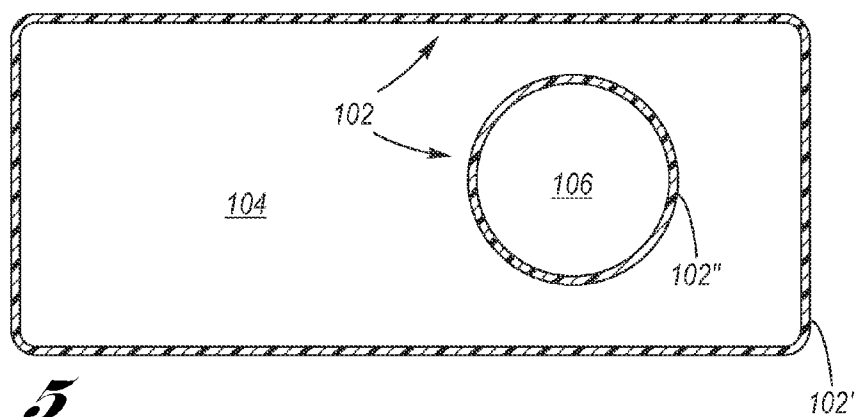
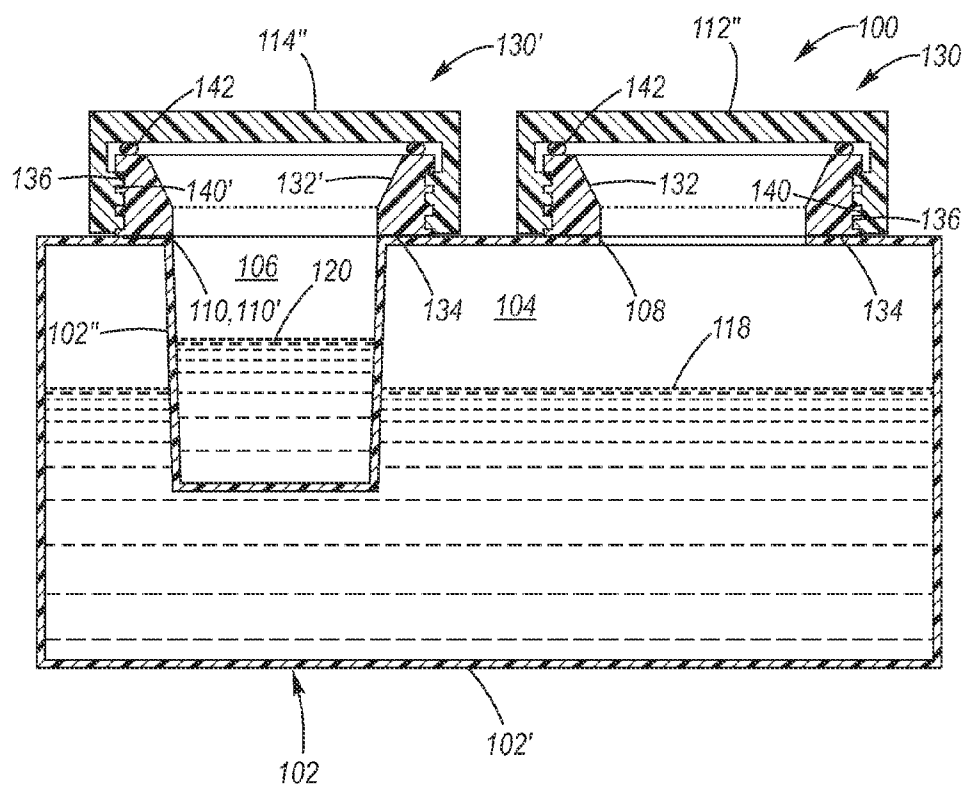
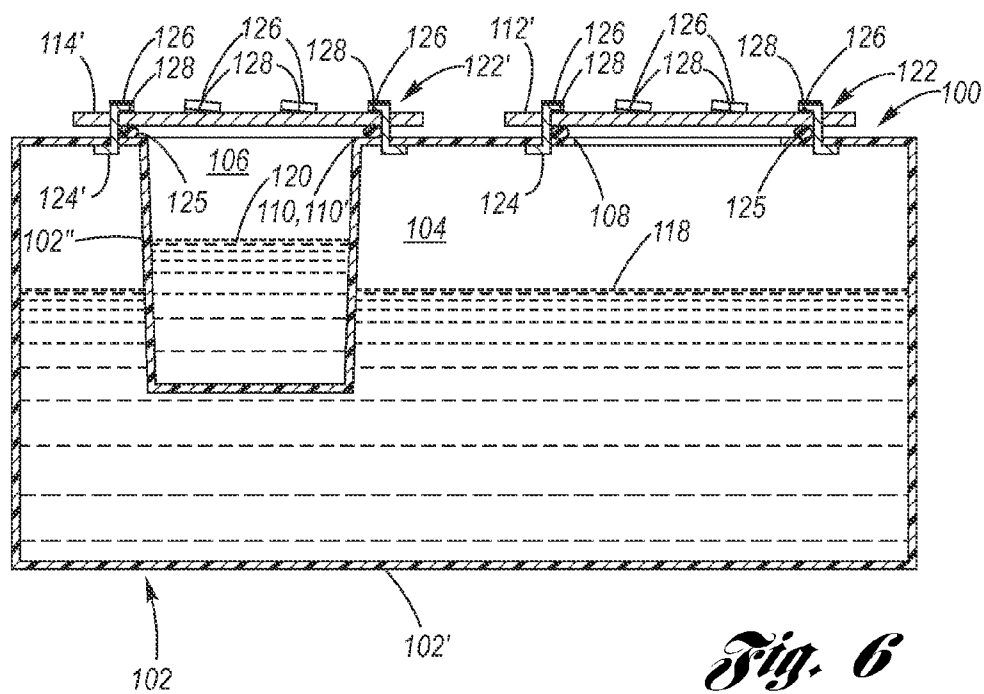


Fig. 5



DOUBLE CHAMBER SEALED TANK

TECHNICAL FIELD

[0001] The present invention relates to tanks used for holding and dispensing of liquids, and more particularly to a double chamber tank for separately holding in each chamber a liquid, whereby each liquid does not fluidically communicate with the other.

BACKGROUND OF THE INVENTION

[0002] Tanks, containers and the like (hereinafter simply referred to as “tanks”) used for the holding of liquids, are ubiquitous. Tanks used for automotive applications are singular constructions, each tank being a stand-alone subassembly, complete and solitary in its own right. These tanks are used, by way of example, for the holding a wide variety of liquids, for example: fuel, washer fluid, oil, coolant, and in the case of diesel engines, urea used in conjunction with the injection of diesel fuel with respect to the diesel engine of the motor vehicle.

[0003] Motor vehicle fuel tanks provide not only a reservoir for fuel but also must have accommodation for adding fuel, delivering fuel (i.e., to the engine) and monitoring the amount of the fuel therein. It has become a common practice to combine the fuel delivery and monitoring functions via a fuel pump module which is removably interfaced with an opening of the fuel tank outershell.

[0004] FIG. 1 depicts an example of a prior art motor vehicle fuel tank 1 having, by way of example, a saddle shape featuring two fuel sumps 2, 2'. The fuel tank outershell 3 is provided with first and second openings 4, 4', each opening being disposed over a respective fuel sump. At the first sump 2, and interfaced sealingly with the first opening 4, is a fuel pump module 5, and at the second sump 2' and interfaced sealingly with the second opening 4' is a secondary fuel transfer source 6 which is fluidically connected to the fuel pump module via a transfer line 7.

[0005] In modern motor vehicles, component packaging space is at a premium, and this premium applies to each tank used on the motor vehicle. In some cases the tank has a sidewall to which is imparted geometrical shapes which allows for placement between surrounding components, as is frequently done for plastic washer fluid and overflow coolant tanks which are generally disposed in the engine compartment. However, in the case of fuel tanks which are disposed at the underbody of the motor vehicle, unique conditions thereat render packaging space at a high premium. For example, suspension and exhaust components crowd the underbody, and exhaust temperatures mandate the need for providing at least a required minimal amount of clearance, and even additional parts may be needed, such as for example heat shields.

[0006] A typical prior art motor vehicle application of multiple tanks is shown at FIG. 2, wherein a motor vehicle 10 (shown in part at the underbody thereof) has a diesel fuel tank 12 for holding therein diesel fuel and an unconnected but generally adjacent urea tank 14 for holding therein urea for mixing with the diesel fuel, typically in conjunction with an injection process of the diesel engine of the motor vehicle. The diesel fuel tank 12 has its respective bracketing 16 for its attachment to the motor vehicle underbody 18, and the urea tank 14 has its respective bracketing 20 for its respective attachment to the underbody. Even though there may be a

potential for shrinking the fuel tank due to mpg improvement, there is still crowding that cannot be overcome by conventional tank modalities.

[0007] Accordingly, there remains in the art the clear need for a fuel tanks underbody packaging efficiency improvement.

SUMMARY OF THE INVENTION

[0008] The present invention is a double chamber sealed tank, wherein a singular tank shell is formed so as to provide two separate, yet mutually integral, chambers. Each chamber is fluidically separate from the other; that is, the chambers have no mutual fluidic communication between them.

[0009] The double chamber sealed tank according to the present invention is formed of a singular tank shell, as for example a plastic which has been formed by a blow molding process. Each chamber has a respective opening formed by the tank shell and is provided with its own respective sealing cap. In addition, each chamber has its own respective liquid dispensing system which functions independently of the other.

[0010] By way of exemplification, the tank shell of the double chamber sealed tank provides a first chamber, and, via a recess (or impression, depression, concavity, crater, etc.) of the tank shell into the space of what would otherwise be the first chamber, the tank shell further provides a separate, second chamber disposed within the first chamber. In this regard, the tank shell defines an outer sidewall which contains therewithin both the first and the second chambers, and further defines an inner sidewall which contains therewithin the second chamber, while serving as a joint sidewall for both the first and second chambers. Each of the first and second chambers serve as fluidically separate tanks for the holding of a respective liquid, as for example diesel fuel in the first chamber and urea in the second chamber.

[0011] Accordingly, it is an object of the present invention to provide a double chamber sealed tank, each chamber respectively holding liquid without fluidic communication therebetween.

[0012] This and additional objects, features and advantages of the present invention will become clearer from the following specification of a preferred embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 is a perspective view of a prior art saddle tank.

[0014] FIG. 2 is a plan view of a motor vehicle underbody, showing a prior art diesel fuel tank and a prior art companion urea tank therefor.

[0015] FIG. 3 is a perspective view of a double chamber sealed tank according to the present invention.

[0016] FIG. 4 is a sectional view, seen along line 4-4 of FIG. 3.

[0017] FIG. 5 is a sectional view, seen along line 5-5 of FIG. 3.

[0018] FIG. 6 is a sectional side view of a double chamber sealed tank according to the present invention, wherein each chamber is shown sealingly capped by a cammed lock ring seal.

[0019] FIG. 7 is a sectional side view of a double chamber sealed tank according to the present invention, wherein each chamber is shown sealingly capped by a threaded ring seal.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0020] Referring now to the Drawings, FIGS. 3 through 7 depict examples of a double chamber sealed tank according to the present invention.

[0021] The double chamber sealed tank 100 according to the present invention is formed of a singular (single piece) tank shell 102, as for example a plastic, such as high density polyethylene (HDPE), which has been formed, preferably, by a blow molding process. The tank shell 102 is formed of a continuous, single piece construction such that a first chamber 104 and a second chamber 106 are both integrally formed of and by the tank shell. Each chamber 104, 106 has its own respective opening, a first opening 108 and a second opening 110. Each of the first and second openings 108, 110 has its own respective sealing cap, a first sealing cap 112 and a second sealing cap 114, wherein each sealing cap is removably connected to the tank shell independently of the other.

[0022] The tank shell 102 of the double chamber sealed tank 100 provides the first chamber 104, and, via a recess (or impression, depression, concavity, crater, etc.) 116 of the tank shell into the space of the first chamber, further provides the second chamber 106 such that the second chamber is disposed within the first chamber and yet is fluidically separated therefrom. The tank shell 102 includes an outer sidewall 102' which contains therewithin both the first and the second chambers 104, 106, and further includes an inner sidewall 102'' which contains therewithin the second chamber and serves as a joint sidewall for both the first and second chambers. In this regard, the tank shell 102 integrally forms both the first chamber 104 and the second chamber 106, preferably such that the second chamber is disposed entirely within the volume of the first chamber. In this sense, therefore, the tank shell 102 appears outwardly to define only a single tank having two openings, yet internally and unseen from an exterior point of view, the second chamber is disposed within the volume defined by the tank shell, and what would otherwise be the volume of first chamber if the second chamber were absent.

[0023] The first opening 108 is formed in the outer sidewall 102' and provides an opening into the first chamber 104. The second opening 110 is formed at a (preferably annular) juncture 110' where the outer sidewall 102' integrally connects to the inner sidewall 102''.

[0024] Each of the first and second chambers 104, 106 are fluidically separate from one another. In other words, each of the first and second chambers 104, 106 serves as a separate tank for the holding of liquid independently of the other. By way of example, as shown best at FIGS. 6 and 7, the first chamber 104 may hold a first liquid 118, and the second chamber 106 may hold a second liquid 120, wherein the first and second liquids are entirely separated from one another, and wherein the second liquid is disposed within space of what would otherwise be the first chamber.

[0025] Preferably, to minimize sloshing of liquids contained in the first and second chambers 104, 106, the shell 102 is composed of a plastic that is thick enough so that the second chamber is rigidly held relative to the first chamber so that the second chamber does not wobble or otherwise oscillate in the first chamber in response to moderate shakes.

[0026] Each of the first and second chambers 104, 106 has its own liquid dispensing system, a first liquid dispensing system 140 and a second liquid dispensing system 142, each of which functioning independently of the other. Thus, the first liquid dispensing system 140 provides dispensing only of the first liquid 118 from the first chamber without dispensing any of the second liquid from the second chamber; and likewise, the second liquid dispensing system 142 provides dispensing only of the second liquid 120 from the second chamber without dispensing any of the first liquid from the first chamber.

[0027] Turning attention now to FIGS. 6 and 7, exemplar sealing caps and their attachment modalities for sealing the first and second chambers 104, 106 will now be detailed.

[0028] At FIG. 6, the first and second openings 108, 110, are each separately sealed by first and second sealing caps 112', 114', respectively utilizing a cam-lock retention system 122, 122' of the type known in the art, as for example described in U.S. Patent Application Publication 2005/0194796 A1, to Powell, published on Sep. 8, 2005. A retention ring 124, 124' is sealingly embedded in the outer sidewall 102' of the tank shell 102 adjacent each respective first and second opening 108, 110. Each retention ring 124, 124' carries a plurality of retention cams 126. Each first and second sealing cap 112', 114' has a plurality of apertures which allow each of the retention cams 126 to pass therethrough when at one relative orientation, but when either of the first and second sealing caps is rotated relative to the retention cams, the retention cams bear down on a cam surface 128 of the sealing cap, causing the sealing cap to seal against an O-ring 125. Each first and second sealing cap 112', 114' of each of the cam-lock retention systems 122, 122' independently seals its respective first or second opening 108, 110 independently of the other.

[0029] At FIG. 7, the first and second openings 108, 110, are each separately sealed by first and second sealing caps 112'', 114'', respectively utilizing a threaded retention system 130, 130' of the type known in the art. A neck 132, 132' is sealingly attached to the outer sidewall 102' of the tank shell 102 adjacent each respective first and second opening 108, 110. By way of example, the necks 132, 132' are composed of HDPE plastic, as is the tank shell 102, and is either integrally formed of the tank shell or is attached thereto, such as for example by a hot plate weld 134. Each neck 132, 132' has external threading 136. Each first and second sealing cap 112'', 114'' has an internal threading 140. When either of the first and second sealing caps 112'', 114'' is threaded onto its respective neck 132, 132', the sealing cap seals on an O-ring 142 with respect to the neck. Each first and second sealing cap 112'', 114'' of each of the threaded retention systems 130, 130' independently seals its respective first or second opening 108, 110 independently of the other.

[0030] As an example of operation, the double chamber sealed tank 100 is formed in which the tank shell 102 integrally forms the first chamber 104 and the second chamber 106. Each first and second sealing cap is individually and independently removed from the tank shell at its respective first or second opening, and a respectively selected liquid is delivered, respectively, into each of the first and second chambers. The first and second sealing caps are then replaced back sealingly relation with the respective first and second openings. Thereafter, each of the first and second liquids is individually extracted from the first and second chambers by the respective first and second liquid dispensing system.

[0031] By way of a vehicular example, as shown best at FIGS. 6 and 7, the first liquid **118** stored in the first chamber **104** is diesel fuel, and the second liquid **120** stored in the second chamber **106** is urea, wherein the diesel fuel and the urea are entirely separated from one another, and each liquid is separately extracted from its respective first or second chamber by operation of its respective first or second liquid dispensing system.

[0032] In an automotive application of the double chamber sealed tank according to the present invention, benefits over a conventional installation utilizing two separate tanks include: a single molding operation which provides two separate liquid chambers within a single outer sidewall, a single tank shell which allows for attachment to the vehicle using less labor and fewer fasteners, a reduction in tank mass, piece cost, and a minimization of the required packaging space.

[0033] To those skilled in the art to which this invention appertains, the above described preferred embodiment may be subject to change or modification. Such change or modification can be carried out without departing from the scope of the invention, which is intended to be limited only by the scope of the appended claims.

1. A double chamber tank, comprising:
a tank shell comprising:
an outer sidewall defining a first chamber, said first chamber having a first opening formed in said outer sidewall; and
an inner sidewall integrally connected to said outer sidewall at a juncture, said inner sidewall defining a second chamber, said second chamber having a second opening formed at said juncture;
wherein said tank shell integrally forms said outer and inner sidewalls as a single piece; and
wherein said first and second chambers are fluidically separate from each other.
2. The double chamber tank of claim 1, wherein said second chamber is disposed entirely within said first chamber.

3. The double chamber tank of claim 1, further comprising:
a first sealing cap connected to said tank shell in sealing relation with respect to said first opening; and
a second sealing cap connected to said tank shell in sealing relation with respect to second opening.
4. The double chamber tank of claim 3, wherein said second chamber is disposed entirely within said first chamber.
5. The double chamber tank of claim 3, wherein:
said first sealing cap is selectively removable from the sealing relation with respect to said first opening; and
said second sealing cap is selectively removable from the sealing relation with respect to said second opening.
6. The double chamber tank of claim 5, wherein said second chamber is disposed entirely within said first chamber.
7. The double chamber tank of claim 1, further comprising:
a first fluid removal system fluidically communicating with said first chamber and free of fluidic communication with said second chamber; and
a second fluid removal system fluidically communicating with said second chamber and free of fluidic communication with said first chamber.
8. The double chamber tank of claim 7, wherein said second chamber is disposed entirely within said first chamber.
9. The double chamber tank of claim 7, further comprising:
a first sealing cap connected to said tank shell in sealing relation with respect to said first opening; and
a second sealing cap connected to said tank shell in sealing relation with respect to second opening.
10. The double chamber tank of claim 9, wherein said second chamber is disposed entirely within said first chamber.
11. The double chamber tank of claim 9, wherein:
said first sealing cap is selectively removable from the sealing relation with respect to said first opening; and
said second sealing cap is selectively removable from the sealing relation with respect to said second opening.
12. The double chamber tank of claim 11, wherein said second chamber is disposed entirely within said first chamber.

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