United States Patent [19]

Murphy

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[54] **NON-SPILLABLE LIQUID DISPENSING SYSTEM**

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[52] **U.S. Cl.** **222/209;** 222/210; 222/211

[51] **Int. Cl.** **B65d 37/00**

[58] **Field of Search** 222/202, 209, 210, 211, 222/213, 383, 464, 468, 400.5, 470–472, 474, 400.8, 401, 424, 386.5, 416

[56] **References Cited**

UNITED STATES PATENTS

762,300	6/1904	Fulton	222/473 X
985,598	2/1911	Jeanson	222/400.8
1,181,783	5/1916	Lyons	222/464
1,189,271	7/1916	McCaslin	222/401
1,328,866	1/1920	Yeatter	222/402.8
1,599,967	9/1926	Johnson	222/471
2,795,245	6/1957	Meehan	222/209 X
2,871,864	2/1959	Stair	222/209
3,105,619	10/1963	Rohrmuller	222/470 X
3,113,698	12/1963	Abplanalp	222/464 X
3,127,068	3/1964	Sutter	222/210 X
3,300,102	1/1967	Budzick	222/386.5

FOREIGN PATENTS OR APPLICATIONS

385,159	11/1923	Germany	222/207
403,183	6/1966	Switzerland	222/471
1,288,381	2/1962	France	222/464

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[57] **ABSTRACT**

A non-spillable fluid dispensing system having an arrangement for placing a fluid in a cavity provided in a container into communication with a medium surrounding the container. The pressure in the cavity is normally substantially the same as the pressure of the medium. A further arrangement is provided for selectively increasing the pressure in the cavity to a value greater than that of the medium for forcing fluid through the placing arrangement and out of the cavity. The placing arrangement may be either a passage formed in the wall of the container or a length of tubing, and a drinking cup having a drinking lip may be connected to an end of the passage or tubing outside of the container cavity. A bellows is arranged so that a compression of the bellows will increase the pressure in the cavity so as to force fluid in the cavity into the drinking cup. Releasing the bellows will return the cavity to its normal pressure and cause any fluid remaining in the drinking cup to be drawn back toward the cavity. In this manner, an accidental overturning of the container and similar unexpected events will not result in a spilling of the fluid, which may be a potable liquid.

6 Claims, 8 Drawing Figures

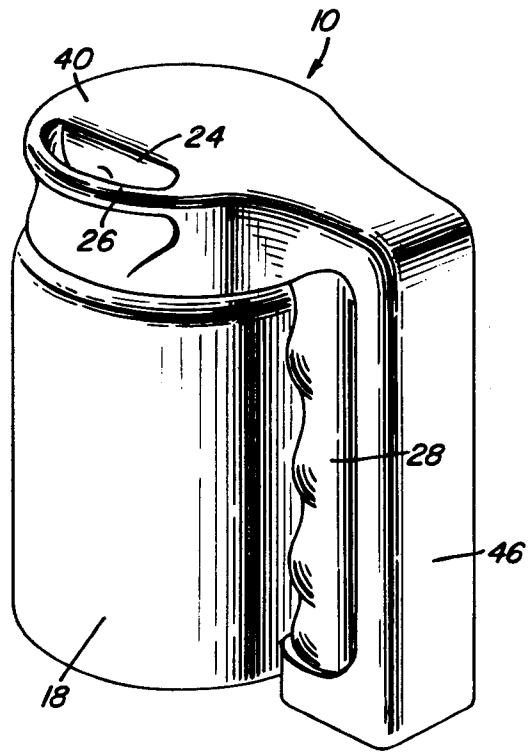


Fig. 1

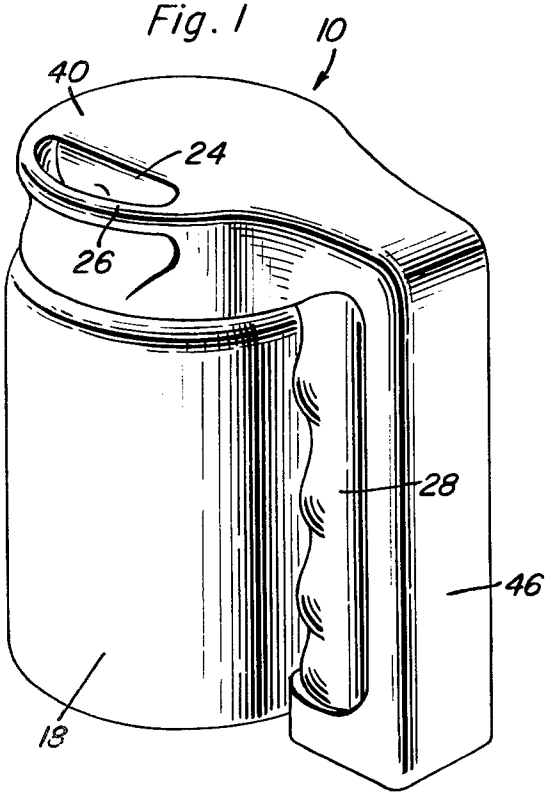


Fig. 2

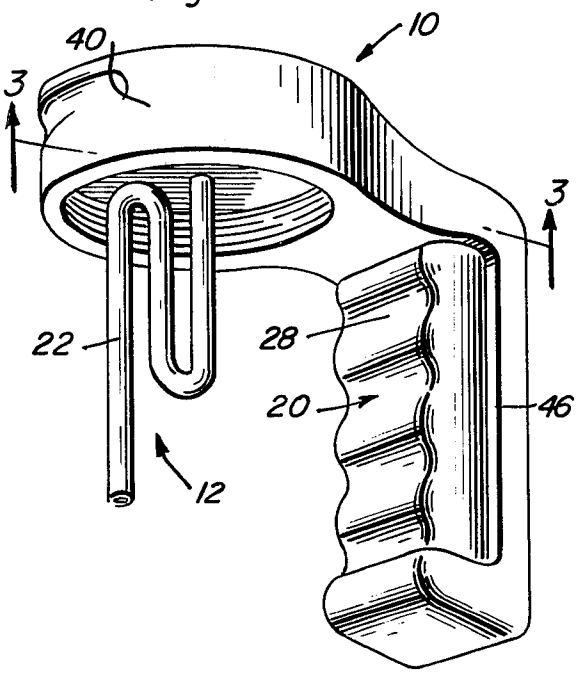


Fig. 6

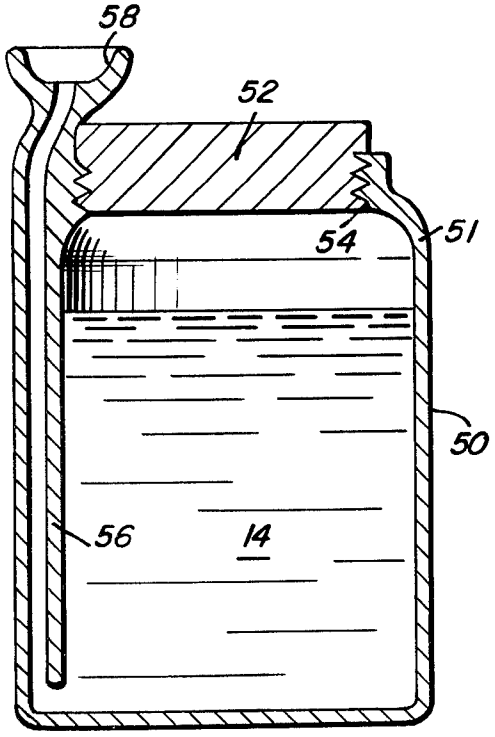


Fig. 7

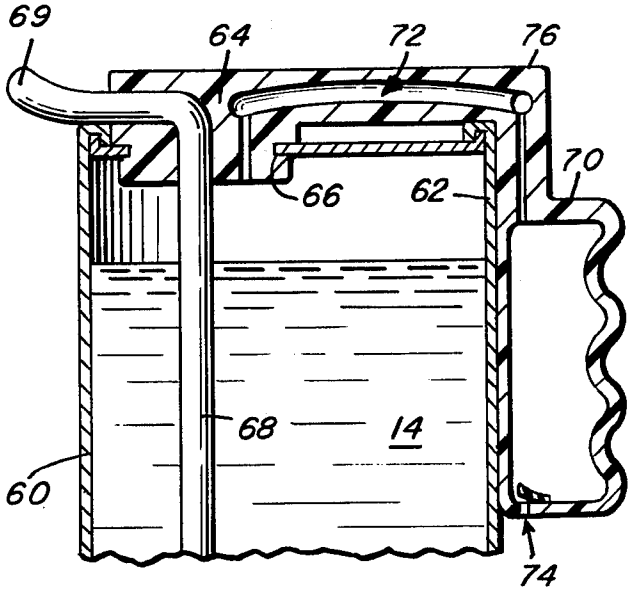


Fig. 3

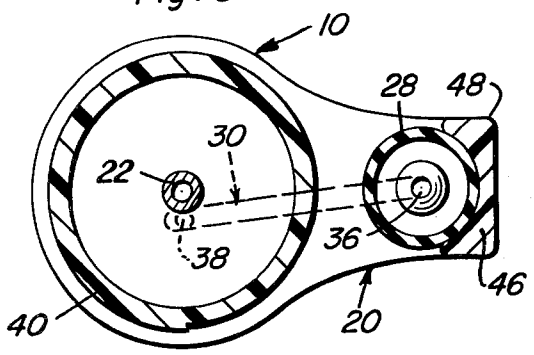


Fig. 4

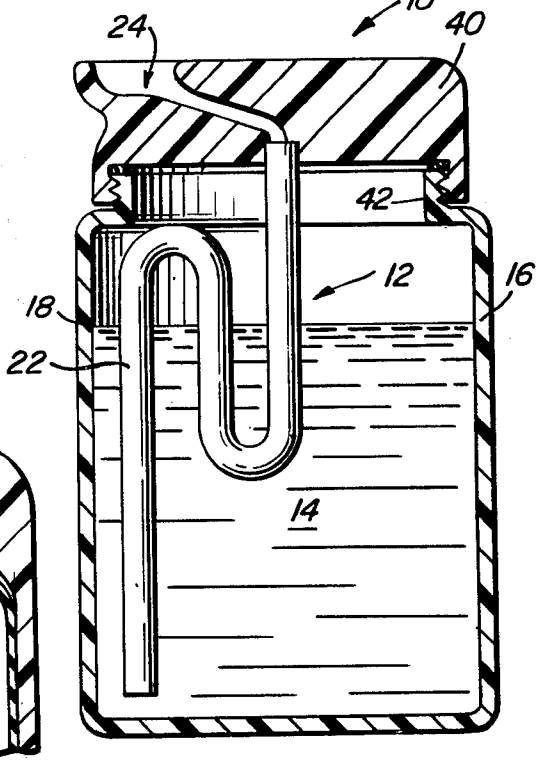


Fig. 8

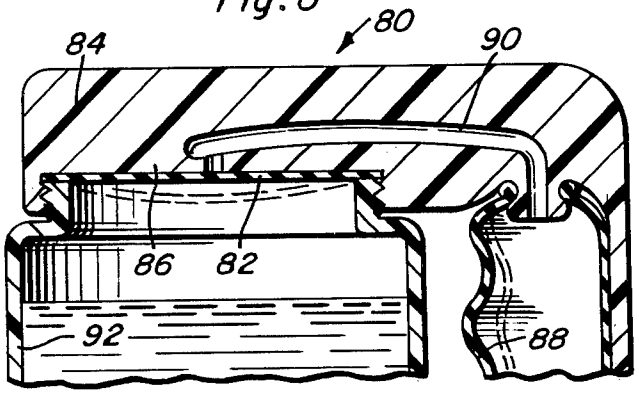
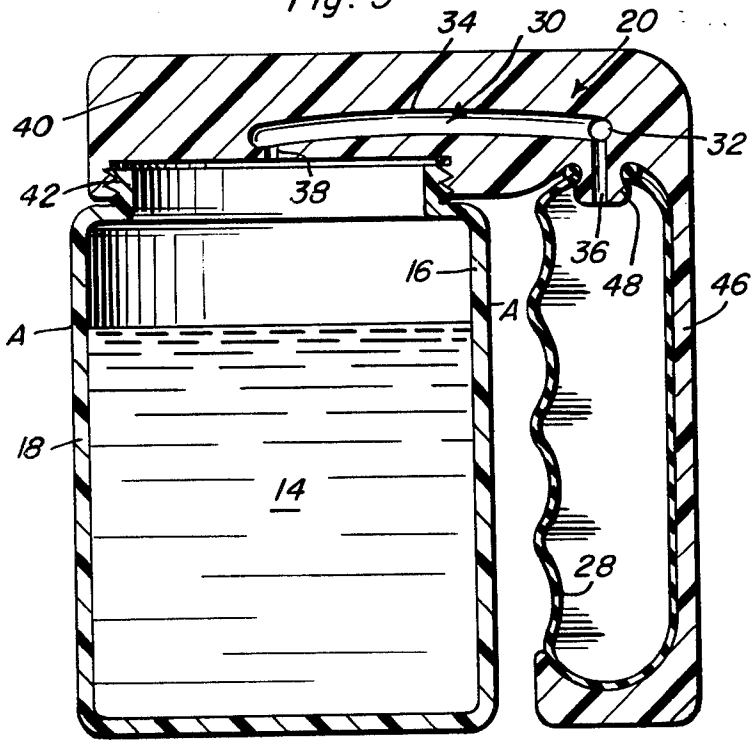


Fig. 5



NON-SPILLABLE LIQUID DISPENSING SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to fluid dispensing systems, and in particular to such a system which prevents fluid from being accidentally spilled.

2. Description of the Prior Art

Millions of Americans spend up to 2 hours a day commuting back and forth to work in such conveyances as private cars, buses, trains, subways, and the like. Many commuters spend even more than 2 hours per day in transit. This time is spent without convenience or joy, and is in general a dull routine.

Americans are also becoming very spectator sport conscious. Football, baseball, basketball, ice hockey, and the like are attracting vast audiences on both the professional and non-professional levels.

Workers of all types are in the habit of taking a "coffee break" to socialize, relax, become informal, or to just "break" the pace of the work day. Often these breaks must be taken under conditions not always commensurate with the consumption of beverages and the like.

These are just a few examples of activities which cause people to demand refreshments such as beverages under conditions which are seldom commensurate with the consumption of such foods. Coffee is consumed by the billions of cups each day. Alternative beverages such as cocoa, orange juice, soft drinks, and the like are also consumed in vast quantities by Americans anxious to relax over a refreshing beverage.

Activities as referred to above, however, make the consumption of beverages difficult. For example, the driver of a motor vehicle may encounter a sudden emergency while drinking from a conventional cup and the like and be forced to drop same spilling the contents and creating a mess. A similar situation may be encountered at a sporting event, where, for example, one is always exposed to the possibility of being jostled unintentionally by excited persons about him. Further, stadiums and arenas are generally not provided with trays and the like for placing unempty beverage containers. Even containers placed on desks, tables, and the like are subject to accidental spillage. Such spillage will, of course, invariably create a mess, often one that damages or ruins important papers, drawings, and the like.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a non-spillable fluid dispensing system which will overcome the problems referred to above.

It is another object of the present invention to provide a nonspillable fluid dispensing system which is convenient, simple, and reliable to use, and inexpensive of manufacture.

It is yet another object of the present invention to provide a non-spillable fluid dispensing system which may be used with existing beverage containers available on the market.

These and other objects are achieved according to the present invention by providing a non-spillable fluid dispensing system having an arrangement for placing a fluid in a cavity provided in a container in communication with a medium surrounding the container — the pressure in the cavity being normally substantially the same as the pressure of the medium — and an arrangement for selectively increasing the pressure in the cavity to a value greater than that of the medium and forcing fluid through the placing arrangement and out of the cavity.

According to a preferred embodiment of the present invention, the pressure increasing arrangement has a bellows, a passage arrangement for placing the bellows in communication with a container cavity, and a valve element arranged in the passage arrangement for permitting a flow from the bellows to the container cavity and blocking a flow from the container cavity to the bellows. The passage arrangement may have a main passage portion and constricted passage portions respectively connecting the main portion to the bellows and cavity. In this arrangement, the valve element is arranged in the main passage portion for movement between the constricted passage portions, and is dimensioned to pass freely through the main passage portion and be blocked from entering the constricted passage portions. The constricted passage portion connecting the bellows to the main passage portion is desirably arranged at an end of the main passage portion so that the valve element will block a flow from the cavity to the bellows. The constricted passage portion connecting the cavity to the main passage portion is advantageously arranged spaced from an end of the main passage portion for permitting a flow from the bellows to the cavity.

An advantageous feature of the present invention incorporates an arrangement such as a cap for selectively sealing a cavity communicating opening of the container. The passage arrangement and valve element may be arranged in the cap, and the bellows suitably connected thereto.

Another advantageous feature of the present invention is the provision of a drinking cup having a drinking lip and connected to the fluid placing arrangement outside of the container cavity. The fluid may be selectively forced into this cup from the container cavity by the pressure increasing arrangement, and from the cup into the container cavity when the pressure in the cavity is less than that of the surrounding medium.

In alternative embodiments of a non-spillable fluid dispensing system according to the present invention, the fluid placing arrangement may be in the form of a tube mounted in a cap and either extending straight to the bottom of the container cavity or extending from the bottom of the container cavity to a high fluid level of the cavity, back toward the bottom of the container cavity, and out of the cavity through the cap, or it may be a passage formed in a wall of the container itself.

Fluid, especially a liquid, may be dispensed by a non-spillable liquid fluid dispensing system according to the present invention by the steps of placing a fluid arranged in a cavity of a container in communication with a medium surrounding the container and having a pressure substantially the same as the normal pressure in the cavity, and increasing the pressure in the cavity to a value greater than that of the surrounding medium and forcing fluid out of the cavity. As a further step, the normal pressure of the cavity is restored so as to draw fluid back thereinto.

Another preferred embodiment of the present invention replaces the valve element with a diaphragm forming a wall of the cavity.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing a non-spillable fluid dispensing system embodying device arranged on a fluid container.

FIG. 2 is a perspective view showing the device of FIG. 1 from another angle.

FIG. 3 is a sectional view taken generally along the line 3—3 of FIG. 2 and drawn to a reduced scale.

FIG. 4 is a vertical, transverse sectional view of the device shown in FIGS. 1 to 3.

FIG. 5 is a vertical, longitudinal sectional view of the device of FIGS. 1 to 4.

FIG. 6 is a vertical sectional view showing a modified embodiment of a device according to the present invention.

FIG. 7 is a fragmentary, vertical sectional view showing yet another embodiment of a device according to the present invention.

FIG. 8 is a fragmentary, vertical longitudinal sectional view showing still another embodiment of a device according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to the embodiment shown in FIGS. 1 to 5 of the drawings, a non-spillable fluid dispensing system 10 according to the present invention has an arrangement 12 for placing a, for example, liquid 14 arranged in a cavity 16 provided in a container 18, in communication with a medium such as air surrounding container 18. The pressure in cavity 16 is arranged to normally be substantially the same as the pressure of the surrounding medium. System 10 is also provided with an arrangement 20 for selectively increasing the pressure in cavity 16 to a value greater than that of the surrounding medium and forcing liquid 14 through arrangement 12 and out of cavity 16.

In the embodiment of FIGS. 1 to 5, arrangement 12 is in the form of a tube 22 extending from the bottom of cavity 16 to a high level A—A of liquid 14 in cavity 16, back toward the bottom of cavity 16, and finally out of cavity 16. A drinking cup 24 having a drinking lip 26 is advantageously connected to tube 22 at a point outside of cavity 16. Liquid 14 is selectively forced into cup 24 from cavity 16 by arrangement 20, and from cup 24 back into cavity 16 when the pressure in cavity 16 is less than that of the surrounding medium. Although tube 22 has been illustrated in FIGS. 1 to 5 as having a "Z" shape, it is to be understood that other configurations such as those to be discussed below may be employed for tube 22. The particular shape of tube 22 shown in FIGS. 1 to 5, however, does add to the length of tube 22, and thereby increases the differential pressure from, for example, atmosphere to the partial pressure present in cavity 16. This could be helpful to overcome a "hot" to "cold" change in volume of a liquid 14.

Arrangement 20 is shown in FIGS. 1 to 5 as having a bellows 28, a passage 30 for placing bellows 28 in communication with cavity 16, and a valve element 32 arranged in passage 30 for permitting a flow from bellows 28 to cavity 16 and blocking a flow from cavity 16 to bellows 28. Passage 30 is made up of a main passage portion 34, and constricted passage portions 36 and 38 connecting portion 34 to bellows 28 and cavity 16, respectively. Valve element 32 is arranged in portion 34 for movement between portions 36, 38, and is dimensioned to pass freely through portion 34 and be blocked from entering portions 36, 38. Constricted passage portion 36 is illustrated as arranged at an end of main passage portion 34 so that valve element 32 will block a flow from cavity 16 to bellows 28. That is, a flow from cavity 16 to bellows 28 will move valve element 32 along main passage portion 34 to the position shown in FIG. 5 of the drawings. Valve element 32 is preferably a spherical member as illustrated, and the end of main passage portion 34 is advantageously hemispherical to seat element 32. Constricted passage portion 38 is arranged spaced from its associated end of main passage portion 34 so that it will not block passage portion 38 when seated at that end and will permit a flow from bellows 28 to cavity 16. Constricted passage portions 36, 38 should be dimensioned as small as possible relative to passage portion 34 for preventing liquid 14 from entering constricted passage portion 38 when container 18 is turned, for example, upside down. Valve element 32 is desirable for preventing liquid 14 from flowing into the squeezable handle or bellows 28. That is, valve element 32 cooperates with passage 30 to keep bellows 28 free from contamination by liquid 14. Main passage portion 34 should be dimensioned so that the displacement of valve element 32 therein is equal to the displacement of liquid 14 in tube 22 plus the height of the liquid 14 in drinking cup 24 while bellows 28 is compressed.

The embodiment according to FIGS. 1 to 5 of the drawings is provided with a container sealing member such as a cap 40 for selectively sealing an opening 42 of container 18 communicating with cavity 16. This cap 40 may be attached in a selective manner to container 18 as by conventional screw threads 44. Container 18 may be, for example, a conventional vacuum bottle and the like. Passage 30 and valve element 32 are arranged in cap 40, and tube 22 is connected to cap 40 in a suitable manner as illustrated. Bellows 28 is arranged in a handle 46 formed as an extension of cap 40, and is connected to cap 40 as by a suitable fitting 48.

Referring now to the embodiment illustrated in FIG. 6 of the drawings, a container 50 having a cavity 51 is provided with a selectively removable cap 52 sealing an opening 54 of container 50. A passage 56 is formed in a side wall of container 50, and a drinking cup is provided at the end of passage 56 outside of cavity 51.

The embodiment illustrated in FIG. 7 of the drawings has a container 60 provided with a cavity 62. This container 60 may be a can such as is conventionally used for packaging beer, soft drinks, and the like. A stopper 64 is sealingly arranged in an opening 66 of container 60. A tube 68 may be passed through stopper 64 as by a suitable bore provided therein, and a mouthpiece 69 is formed on the outside end of this tube 68. Alternatively, a drinking cup 24, 58 could be provided on tube 68 in a manner similar to that for tube 22 and passage 56. Mouthpiece 69 may be inserted directly between a user's lips (not shown) in the manner of a conventional straw. A bellows 70 which differs from bellows 28 in that it is compressed towards container 60, is provided

on stopper **64** and is in communication with cavity **62** by means of a passage and valve arrangement **72** which may be similar to passage **30** and valve element **32.** A spring-loaded valve assembly **74** may be arranged in bellows **70** to allow, for example, air to slowly enter bellows **70** after valve element **76** has blocked flow from cavity **62** to bellows **70.** Tube **68** may be constructed from a flexible material so as to follow fluid **14** to the lowermost corner (not shown) of the bottom of cavity **62** and permit the removal of all of liquid **14** from container **60.**

Upon opening the can or container **60,** stopper **64** may be inserted and the container **60** resealed. Liquid will only pass from mouthpiece **69** of tube **68** by compressing bellows **70** and increasing the pressure in cavity **62.** The embodiment of FIG. **7** may be manufactured inexpensively and treated as a disposable item. Further, it may be considered a sanitary device in that properly cleaned it would eliminate possible health hazards resulting from drinking directly from a can. A non-spillable fluid dispensing system device according to the present invention may be simply and inexpensively constructed as by, for example, molding the various elements from suitable synthetic materials. Design temperature parameters may be, for example, 212° F. and 0° F. All surfaces as well as passages should be easily cleanable as by immersion in a liquid such as water provided with suitable known detergent and the like. The devices may be colored and decorated as desired to suit consumer taste. The use of synthetic materials such as, for example, polyethylene has the added advantage of good impact resistance for preventing shattering in the event the device is dropped.

FIG. **8** of the drawings shows an embodiment **80** of the present invention similar to the embodiment of FIGS. **1–5,** but in which a bellows or diaphragm **82** replaces the ball valve **32.** The diaphragm **82** is arranged in a cap **84,** similar to, for example, cap **40,** so as to lay flat across surface **86** when decompressed. The full lines in FIG. **8** show the uncompressed positions of diaphragm **82** and a bellows **88,** similar to bellows **28** and communicating with diaphragm **82** by passageway **90,** while the broken lines show the compressed or dispensing position. As can be readily appreciated, displacement of diaphragm **82** into a cavity of an associated container **92** similar to container **18** by compressing bellows **88** will decrease the volume of the container with an accompanying increase in the pressure therein. By proper design, the pressure increase will be sufficient to dispense liquid. Release of bellows **88** will return diaphragm **82** to its full line position and decrease the pressure in the container to its normal, non-dispensing state. It is to be understood that although the diaphragm is arranged at the top of the container in FIG. **8,** it could as well be arranged at another suitable location, such as on the side of a container (not shown), if more convenient in, for example, manufacturing the device.

In addition to conventional vacuum bottles and beverage cans, devices according to the present invention may be used with specially constructed containers (not shown) which operate on the Peltier effect to either warm or cool the beverage in the container with an electric current from, for example, a cigarette lighter of an automobile.

Although the cup illustrated in FIG. **1** of the drawings is intended to be gripped by the user's right hand, it is to be understood that left-handed models may also be constructed in a known manner by merely reversing the arrangement of appropriate elements.

A device according to the present invention operates on the principle of displaced volumes in a container. A liquid will not pour though any opening if the pressure created by the loss of the liquid from the container will exceed the hydrostatic pressure required for the liquid to flow out of the opening. This permits a device according to the present invention to dispense a fluid arranged in a cavity of a container by placing the fluid in communication with a medium surrounding the container and having a pressure substantially the same as the normal pressure in the cavity, and increasing the pressure in the cavity to a value greater than that of the surrounding medium and forcing fluid out of the cavity. The pressure in the cavity may be restored to its normal value and draw fluid back into the cavity. The selectively increasing and restoring steps of the method according to the present invention are advantageously carried out by compressing and releasing a bellows **28,** 70 of a device according to the present invention. The release of the bellows **28, 70** acts to cause the gas, such as air, arranged above the fluid in the container to be drawn through the passage and back into the bellows **28, 70.** This reduces the pressure in the cavity associated with the container, and will not only prohibit further fluid from passing out of the cavity, but will by proper design draw fluid in the fluid passing arrangement back toward the cavity. Thus, no appreciable amounts of the fluid will be spilled if the user of the dispensing system is suddenly forced to, for example, drop the container. Once the user releases the container, the normal pressure will be restored in the container cavity due to the release of the associated bellows, and fluid will be drawn back toward the cavity.

As can be readily understood from the above description, a device according to the present invention will prohibit liquid from being spilled if the vessel in which it is contained is tipped over or jolted. Further, accidental spillage resulting from small children and the like dropping a fluid container is eliminated. In addition, spillage of the fluid contents of a container due to the necessity of a person holding the container requiring the container holding hand to meet an emergency. The container may merely be dropped without fear of spillage.

Any suitable, fluid material may be dispensed by a device according to the present invention.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed is as follows:

1. A non-spillable fluid dispensing system, comprising, in combination:

a. means in the form of a tube for placing a fluid in a cavity in a container into communication with a medium surrounding the container, the pressure in the cavity being normally substantially the same as the pressure of the medium;

b. a drinking cup having a drinking lip and connected to the placing means outside of the container cavity;

c. means for selectively increasing the pressure in the cavity to a value greater than that of the medium and forcing fluid through the placing means and out of cavity into the cup, and sequentially decreasing the pressure in the container cavity and drawing fluid into the cavity from the placing means, the fluid being selectively forced into the cup from the container cavity by the pressure increasing means and from the cup into the cavity when the pressure in the cavity is less than that of the medium, the pressure increasing means including a bellows arrangeable adjacent the container for being operatively engaged by one using the container, passage means for placing the bellows in communication with the container cavity and valve means associated with the passage means for permitting a flow of fluid from the bellows to increase pressure of fluid in the container cavity and blocking flow of fluid from the cavity to the bellows, said passage means having a main passage portion and constricted passage portions connecting the main passage portion to the bellows and cavity, and said valve means being a valve element arranged in the main passage portion for moving between the constricted passage portions, said valve element dimensioned to pass freely through the main passage portion and be blocked from entering the constricted passage portions, the constricted passage portion connecting the bellows to the main passage portion being arranged at an end of the main passage portion for the valve element to block a flow from the cavity to the bellows, and the constricted passage portion connecting the cavity to the main passage portion being arranged spaced from an end of the main passage portion for permitting a flow from the bellows to the cavity; and

d. means for selectively sealing an opening of the container communicating with the cavity, the valve means being arranged in the sealing means and the bellows connected to the sealing means, with the sealing means, valve means, and bellows forming an integral unit.

2. A structure as defined in claim **1**, wherein the placing means is a tube extending from the bottom of the container cavity to a high fluid level, back toward the container cavity bottom, and out of the cavity through the sealing means.

3. A structure as defined in claim **1**, wherein the placing means is formed in a wall of the container.

4. A structure as defined in claim **1**, wherein said valve element is spherical.

5. A non-spillable fluid dispensing system, comprising, in combination:

a. means in the form of a tube for placing a fluid in a cavity in a container into communication with a medium surrounding the container, the pressure in the cavity being normally substantially the same as the pressure of the medium;

b. a drinking cup having a drinking lip and connected to the placing means outside of the container cavity; and

c. means for selectively increasing the pressure in the cavity to a value greater than that of the medium and forcing fluid through the placing means and out of cavity into the cup, and sequentially decreasing the pressure in the container cavity and drawing fluid into the cavity from the placing means, the fluid being selectively forced into the cup from the container cavity by the pressure increasing means and from the cup into the cavity when the pressure in the cavity is less than that of the medium, the pressure increasing means including a bellows arranged adjacent the container for being operatively engaged by one using the container, passage means for placing the bellows in communication with the container cavity and means associated with the passage means for permitting a flow of fluid from the bellows to increase pressure of fluid in the container cavity and blocking flow of fluid from the cavity to the bellows, the pressure increasing means including a bellows, a diaphragm arranged forming a wall of the container cavity and passage means for placing the bellows in communication with the diaphragm and permitting a flow from the bellows to expand the diaphragm and reduce the volume of the cavity with an accompanying increase in pressure, the bellows, diaphragm and passage means forming an integral unit arrangeable sealing an opening of the container communicating with the cavity.

6. A structure as defined in claim **5**, wherein the placing means is a tube extending from a bottom of the container cavity to a high fluid level, back toward the container cavity bottom, and out of the cavity.

* * * * *