



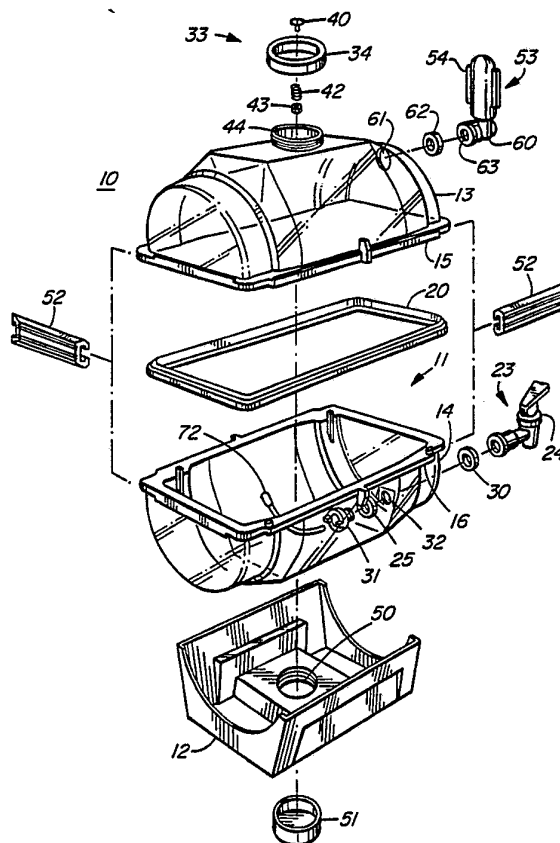
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| <p>(21) International Application Number: PCT/CA92/00151 (22) International Filing Date: 13 April 1992 (13.04.92) (30) Priority data: 685,067 12 April 1991 (12.04.91) US (71)(72) Applicant and Inventor: MACLENNAN, Ian, M. [CA/CA]; 1670 38B Street, White Rock, British Columbia V4A 9J8 (CA). (72) Inventors: HEWSON, C., Bruce ; 2251 Bellevue Avenue, West Vancouver, British Columbia V7V 1C5 (CA). GNATOWSKI, Marek ; 622 Chapman Avenue, Coquitlam, British Columbia V3J 4A3 (CA). KOUTSANDREAS, Andrew ; 3235 West 7th Avenue, Vancouver, British Columbia V6K 2A3 (CA).</p> | | <p>(74) Agent: FORS, Arne, I.; Gowling, Strathy & Henderson, Suite 3800, Commerce Court West, Toronto, Ontario M5L 1J3 (CA). (81) Designated States: AT (European patent), AU, BE (European patent), BR, CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, KR, LU (European patent), MC (European patent), NL (European patent), SE (European patent).</p> <p>Published <i>With international search report.</i></p> |

(54) Title: METHOD AND APPARATUS FOR MAKING A FERMENTED BEVERAGE

(57) Abstract

Apparatus and method for making a fermented beverage. A pressure vessel (11) is made of two separable portions (13, 14) which have a removable seal (20) placed therebetween. A spigot (23) is positioned in the lower one (14) of the two separable portions. An inert gas producing cylinder is mounted on the pressure vessel (11) to maintain the mixture in the vessel under pressure. A pressure relief valve (40) maintains the pressure vessel at the appropriate pressure. A float (70) is maintained at or near the surface of the liquid and a tube (72) extends from the float (70) to the spigot (23) through which the liquid travels. In a preferred embodiment the pressure relief valve is located on the outside of the vessel and is provided with defoaming means (116, 122) between the valve and the interior of the vessel. A defoamer is used which is screened from the liquid in the vessel.



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METHOD AND APPARATUS FOR MAKING A FERMENTED BEVERAGEFIELD OF THE INVENTION

5 This invention relates to a method and apparatus for making a fermented beverage, such as beer. More particularly, the invention relates to making a fermented beverage in a pressurized or closed environment for the homebrewing trade.

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BACKGROUND OF THE INVENTION

 Beer has been made by various techniques and using various apparatuses for many years, as is well
15 known. In general, these techniques can be divided into commercial and homemaking methods. Commercial techniques produce consistent quality beer of various types but the price of such beer is high due to taxes and the like which are placed on the beer.

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 Homemaking beer is far less expensive than buying commercially available beer and has become increasingly popular as the price of commercially available beer continues to rise. Various techniques have
25 been used to produce homemade beer but there are disadvantages with many. In general, homemade beer is made in an "open" system. That is, homemade beer is generally made under ambient or atmospheric conditions where the beer is exposed to the atmosphere. Making beer
30 under these conditions allows oxygen to be absorbed into the beer. This can adversely affect shelf-life expectancy and flavor degradation. In addition, cleanliness is very important in making homemade beer and with the variety of containers, hoses and the like which
35 inherently must be used in the process, the cleanliness requirement is troublesome. Yet a further disadvantage is

that beer produced by homemade techniques is inconsistent in quality between batches. Because of these disadvantages, the homemade beer industry is not growing as robustly as might otherwise be the case.

5

SUMMARY OF THE INVENTION

According to one aspect of the invention, there is disclosed apparatus for producing beer comprising a pressure vessel having separable portions, a spigot mounted in one portion of said pressure vessel, a seal between said separable portions of said pressure vessel, a pressure relief valve mounted to said pressure vessel and an inert gas producer to provide pressure within said pressure vessel.

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According to a further aspect of the invention, there is disclosed a method of producing a beer comprising the steps of combining a premixed malt extract with water, adding a cold fermenting yeast to said mixture of premixed malt extract and water, applying a temperature relatively lower than ambient temperature to said mixture of premixed malt extract, water and cold fermenting yeast and allowing said mixture to ferment.

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According to yet a further aspect of the invention, there is provided float apparatus comprising a float, an entrance port in said float for allowing entry of liquid under pressure and a tube extending from said entrance port to a spigot for transporting said liquid from said float to said spigot.

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According to yet a further aspect of the invention, there is provided a pressure dispenser comprising a housing operable to hold a gas dispenser, a cap operable to be connected to said housing, a first

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chamber in said housing operable to hold pressure at a first pressure and a second chamber downstream of said first chamber operable to hold pressure at a second pressure, said second pressure being lower than said first pressure, a piston to allow communication between said first and second chambers, said second chamber being in communication with a pressure vessel.

Also according to the invention, there is provided apparatus for producing a fermented beverage, comprising a pressure vessel having an interior for receiving fermented-beverage-making ingredients therein, an inlet for introducing said ingredients into the vessel and an outlet for dispensing a resultant fermented beverage from the vessel; pressure relief valve means on said vessel and in communication with the interior of the vessel for relieving pressure resulting from pressure buildup in the interior of the vessel during a fermentation process occurring in the vessel; and defoaming means which is located between said relief valve means and the interior of the vessel to counteract foam produced during said fermentation process from coming into contact with the pressure relief valve means.

Further according to the invention, there is provided apparatus for producing a fermented beverage, comprising a pressure vessel having an inlet for introducing fermented-beverage-making ingredients into the vessel and an outlet for dispensing a resultant fermented beverage from said vessel; pressure relief valve means located on the outside of said vessel and being in communication with the inside of the vessel for relieving pressure resulting from pressure buildup in the vessel during a fermentation process occurring in the vessel, the pressure relief valve means comprising a valve seat on a support member and a spring loaded valve member on said

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5 seat which valve member is adapted to open when the pressure in the vessel exceeds a first predetermined value, the seat being capable of movement relative to said support member to vent the vessel to the atmosphere when the pressure in the vessel exceeds a second predetermined value, which is higher than said first predetermined value.

10 Also according to the invention, there is provided a method of producing a fermented beverage comprising the steps of fermenting beverage producing ingredients in the presence of a yeast and a defoaming agent, which defoaming agent is screened from the fermented beverage produced by the fermentation process.

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BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

20 Specific embodiments of the invention will now be disclosed, by way of example only, with reference to accompanying drawings, in which:

Figure 1A is an isometric exploded view of a beer making apparatus according to the invention;

25 Figure 1B is an enlarged view of a seal of the apparatus of Figure 1A;

30 Figure 2 is a sectional view of a carbon dioxide pressure valve of the apparatus of Figure 1;

Figure 3A is a diagrammatic illustration of a float in the liquid in the bottom portion of the container according to a further aspect of the invention;

35 Figure 3B is a diagrammatic and enlarged view of the float of Figure 3A;

Figure 3C is an end view of the float of Figure 3B;

Figure 4A is an isometric exploded view of a beer making apparatus according to another embodiment of the invention;

Figure 4B is an enlarged view of a seal of the apparatus of Figure 4A;

Figure 5A is an isometric exploded view of a pressure relief valve assembly of the apparatus of Figure 4A;

Figure 5B is a sectional view of the pressure relief valve assembly of Figure 5A, shown located in position on the beer making apparatus;

Figure 6A is a three-dimensional view of a foam counteracting cup of the apparatus of Figure 4A;

Figure 6B is a side view of the cup of Figure 6A;

Figure 6C is a diametrical cross-section through the cup of Figure 6A;

Figure 7A is an isometric exploded view of a carbon dioxide pressure valve assembly of the apparatus of Figure 4A;

Figure 7B is a sectional view of a backflow preventing plug for use with the carbon dioxide pressure valve assembly of Figure 7A;

Figure 7C is an end view of the plug of Figure 7B; and

Figure 8 is an isometric exploded view of a float and dispenser part of the apparatus of Figure 4A.

DESCRIPTION OF SPECIFIC EMBODIMENT

Referring now to the drawings, the beer producing apparatus is illustrated generally at 10 in Figure 1. It comprises a pressure vessel, generally illustrated at 11, and a base member 12.

The pressure vessel 11 comprises two identical and separable case halves, the upper case half 13 and the lower case half 14, made from an PET (polyethylene terephthalate) and being transparent. This is preferable since some plastics such as polyethylene have an affinity for the esters present in beer and which can, therefore, damage beer flavour. It is intended for such a material to have a low oxygen permeation rate in order that the beer to be made in and carried in the vessel 11 has a low flavour degradation.

A main seal 20 made of Monsanto SANTOPRENE or neoprene molded rubber is mounted between the upper and lower case halves 13, 14. As also seen in the enlarged area of Figure 1B, the main seal 20 extends completely around the periphery and between the upper and lower case halves 13, 14. A protuberance 21 on the lower side of the seal 20 allows the seal 20 to be retained in a complementary recess 22 extending about the periphery of the lower case half 14.

Rails 15, 16 extend completely around the periphery of the upper and lower case halves 13, 14, respectively.

5 A spigot generally illustrated at 23 is carried
by the lower case half 14. The spigot 23 comprises the
dispenser part 24, a first rubber washer 30 mounted
between the outside of the lower case half 14 and the
10 spigot 23, a second rubber washer 25 mounted between the
inside of the lower case half 14 and a spigot retainer nut
31 which is threadedly engaged with the spigot 23 through
the lower case half 14. A tube 72 extends from the spigot
23 as will be described in greater detail hereafter. The
dispenser part 24 of the spigot 23 is inserted through a
15 hole 32 positioned in the lower case half 14 with the
washer 30 mounted outside the pressure vessel 11 and the
washer 25 between the spigot retainer nut 31 and the
inside of the lower case half 14. The spigot retainer
then is retained in position in the lower case half 14.

20 A top cap assembly is generally illustrated at
33. It comprises a top cap 34, a pressure safety release
valve 40, a spring 42 adapted to provide the necessary
predetermined tension to the pressure release valve 40 and
25 a nut 43 adapted to retain the spring 42 on the pressure
release valve 40. The top cap 34 is adapted to screw on
to complementary threaded connection 44 on the upper case
half 13.

30 Lower case half 14 has a connection (not shown)
identical to the connection 44 on the upper case half 13.
It extends through a hole 50 in base 12 and is closed and
retained in the base 12 by a bottom cap 51. In an
alternative embodiment shown in Figure 4A and which will
35 be referred to in more detail later, the base 12 simply

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snaps on to the lower case half 14 instead of being retained by means of the bottom cap 51.

5 Six plastic bar clamps 52 (only two of which are illustrated) are used as closure members between the upper and lower case halves 13, 14. The bars 52 are positioned on all four sides of the pressure vessel 11, two on each longitudinal side and one on each end. They are adapted to slide over the rails 15, 16 in a tight fit such that seal 20 is compressed between the upper and lower case halves 13, 14 and such that the upper and lower case halves 13, 14 are held tightly together in a leak proof relationship.

15 A carbon dioxide dispenser is generally illustrated at 53. It comprises an upper removable cartridge housing or cage 54 adapted to hold a carbon dioxide cartridge (not shown) and a lower valve stem housing 60. The carbon dioxide dispenser 53 is removably connected to the upper case half 13 through hole 61 with retaining cap 62.

25 Referring to Figure 2, the lower valve stem housing 60 is shown in more detail. It is provided with a metering orifice 63 extending into the pressure vessel 11 and a compression chamber 64 which feeds gas emitted from the carbon dioxide cartridge to the metering orifice 63 by the action of tapered pin 80 moving out of contact with its seat by valve stem 90. Metering orifice 63 is intended to allow only such quantity of carbon dioxide to pass as can easily be handled by the pressure safety relief valve 40 on the top cap assembly 33. The pressure used within the pressure vessel 11 has been satisfactory when it is of a value of 10-12 p.s.i.

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Reference is now made to Figures 3A, 3B and 3C. A float 70 is diagrammatically illustrated as floating on or near the surface of the liquid 71 held in the pressure vessel 11. The float 70 is made from polypropylene material and has a specific gravity of approximately .996 or slightly less than one so that it floats slightly below the surface of the liquid 71. The tube 72, already referred to above, extends from the float 70 to the spigot 23 where it is inserted within the spigot retaining nut 31. The float 70 has three ribs 73 (Figure 3B) located equidistantly around and within the first diameter 74 of the float 70. They extend from the entrance port 80 to the end of the recess formed by the first diameter 74 and form a retaining ridge 81 which, when the tube 72 is inserted, prevents the tube 72 from contacting the end of the recess to allow the end of the tube 72 to be open to receive the beer 71 from the pressure vessel 11 (Figures 3B and 3C).

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OPERATION

In operation, the top cap 34 will be removed and a predetermined amount of known malt extract of approximately 1 quart is poured into the pressure vessel 11. Thereafter, a predetermined amount of water is added to the malt extract until the desired height of mixture is observed in the upper half 13 just below the CO₂ dispenser 60 in the pressure vessel 11. A cold fermenting yeast is then added to the mixture and the mixture is left to allow the fermentation process to begin.

As the fermentation process begins and continues, the carbon dioxide emitted from the mixture during the fermenting process will create a pressure within the vessel 11. It is intended for this pressure not to exceed 12 p.s.i. since the vessel 11 has been

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designed with this pressure in mind for safety reasons. If the pressure exceeds 12 p.s.i., the pressure release valve 40 is adapted to open under the restraining influence of spring 42 and allow the excess pressure to bleed to atmosphere.

Various durations of fermentation as desired by the operator may be utilised. It has been found, however, that a fermentation duration of three (3) or four (4) days at ordinary room temperature is satisfactory to substantially complete the initial phase of fermentation. Following the initial phase of fermentation, the brewing apparatus 10 is placed within a usual home refrigerator where the fermentation process will continue because of the cold fermentating yeast used although on a reduced scale. It has been found that the fermentation activity, as viewed through the transparent vessel 11, will be substantially completed in a seven day period.

Following the completion of the fermentation process, the beer is ready for consumption and, to that end, the operator will insert a carbon dioxide cartridge into the cartridge housing 54 and screw the cartridge housing 54 down onto the lower valve stem housing 60 until the membrane in the cartridge is pierced by pin 82. This will allow carbon dioxide to be emitted from the cartridge and through the orifice 83 and into chamber 84. The operator will subsequently press the valve stem 90 upwardly as viewed in Figure 2 until the piston 91 is removed from the O-ring 92 which surrounds the piston 91 and seals the compression chamber 64 from chamber 84.

Carbon dioxide will flow from the chamber 84 to chamber 64 and, thence, through orifice 63 and into the pressure vessel 11 at a rate such that no pressure spikes will occur in the pressure vessel and such that the

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pressure safety relief valve 40 is adequate to handle the release of any pressure over approximately 10-12 p.s.i.

5 The beer 71 in the pressure vessel 11, due to the pressure to which it is subject, will flow upwardly within the recess extending from the entrance port 80 of the float 70 and into the open end of tube 72 where it will flow to the spigot 23. The use of the tube 72 having a reduced diameter allows the pressure of the beer 71 to
10 be reduced as it flows through the tube 72 to the spigot 23. Whereas the pressure within the pressure vessel 11 is approximately 10-12 p.s.i., the pressure of the beer 71 at the spigot 23 will preferably be approximately 2 p.s.i.

15 The handle of the spigot 23 will subsequently be operated to allow the beer to exit the vessel 11 to the user under the influence of the pressure in the pressure vessel 11 caused by the carbon dioxide.

20 Following the consumption of the brewed beer, the entire apparatus is easily disassembled. The bottom cap 51 is removed from the lower case half 14 and the top cap assembly 33 is removed from the upper case half 15. The base 12 is removed from the lower case half 14. The
25 plastic slide bars 52 are slidably removed from the rails 15, 16 and the mail seal 20 is removed from the recess 22 in the lower case half 14. The spigot 23, the carbon dioxide dispenser 53 and float 70 are likewise removed and easily disassembled. The beer making apparatus 10 can
30 then be easily cleaned and reassembled for its next use.

Preferably, the pressure vessel 11 is made from PET, although other materials could, of course, be used. Although carbon dioxide has been found to be suitable for
35 use in dispensing the beer, an inert gas such as nitrogen could also be used. Further, although a cartridge of

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carbon dioxide has also been indicated as suitable, an aerosol container appropriately designed could also be used.

5 With reference to Figures 4A and 4B, a beer making apparatus, generally indicated at 89, is shown. The apparatus 89 is basically similar to the apparatus 10, but it has a modified pressure relief valve assembly. Parts of the apparatus 89, which correspond with the parts
10 of the apparatus 10 are indicated by like reference numerals.

 With reference to Figures 5A, 5B and 5C, the pressure relief valve assembly of the apparatus 89 is
15 generally shown at 90. In Figure 5B, the assembly 90 is shown located on the threaded connection 44 of the upper case half 13. It replaces the top cap assembly 33 shown in Figure 1A.

20 The assembly 90 comprises a circular base member 92 having a cylindrical skirt 94 depending therefrom and having a flange 96 extending around the upper part of the skirt 94. The member 92 further has a central screw threaded part 98 for receiving a screw threaded cap 100
25 thereon. The cap 100 is provided with a plurality of circumferentially spaced slots 102 to act as air vents.

 The screw threaded part 98 has a central bore 104 in which is received a bung 106 having a central bore
30 108. The bung 106 is, in addition, provided with a pair of diametrically opposite grooves 110 extending along the lower part thereof (Figure 5A).

 The bung 106 is of a resilient material and it
35 has an outer diameter slightly larger than the inner

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diameter of the bore 104 so that it forms a press fit in the bore 104.

5 A pressure safety relief valve 112 is located in the cap 100 and it rests on the bung 106 which acts as a valve seat. A spring 114, adapted to provide the necessary predetermined tension to the pressure relief valve 112, is provided and the cap 100 retains the spring 114 on the valve 112.

10

The valve has a stem 116 which projects through an opening in the top of the cap 100 and serves as a guide for the valve 112.

15 It will be noted that, in contrast to the top cap assembly 33 shown in Figure 1A, where the spring loaded part of valve 40 and spring 42 are located inside the pressure vessel 11, the valve 112 and the spring 114 are on the outside of the pressure vessel 11 and thus less
20 likely to be exposed to the contents of the vessel 11. Thus, failure of the pressure relief valve 112 due to contact with contamination by the contents of the vessel 11, such as foam and sediment formed during the fermentation process, is counteracted. As a further
25 precaution, the press fit of the bung 106 in the bore 104 is such that the bung 106 will be forced upwards should the pressure exceed a predetermined value which is higher than the normal operating pressure of the pressure relief valve 112. Thus, the bung 106 will be forced upwards to
30 expose the grooves 110 to the outside of the vessel 11 or even, in extreme cases, to force the bung 106 out of the bore 104, thereby to relieve the pressure inside the vessel 11 should the pressure relief valve 112 fail, for example, due to clogging of the bore 108.

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As a further safety measure the upper and lower case halves 13, 14 of the vessel 11 are designed so that they will separate at the four corners of the halves 13, 14 to release pressure in the unlikely event of the pressure relief valve assembly 90 failing altogether. Thus, as the pressure inside the vessel 11 increases, the mutually facing surfaces between which the seal 20 is sandwiched will tend to separate to allow pressure to escape at the corners. This is facilitated by the seal 20 having upper lips 121, as shown in Figure 4B, which can be forced open as the surfaces at the corners are separated during pressure increase to open up the seal 20. The vessel 11 has been designed for this to occur at a pressure of about 30-35 p.s.i.

The relief valve assembly 90 is held in place on the threaded connection 44 by a screw threaded cap 115 having a central opening 117 therein. A rubber seal 119 is located between the flange 96 and the top of the threaded connection 44. The seal 119 is clamped between the flange 96 and the top of the threaded connection 44, forming a passive seal.

In the earlier description, the pressure used in the pressure vessel has been referred to as being of a value of 10-12 p.s.i. However, an even higher pressure of a value of 13-15 p.s.i. has also been found to be satisfactory and is preferred when used with the apparatus 89. Also the pressure relief valve assembly 90 is adapted to relieve the pressure when the pressure exceeds a value of about 17 p.s.i. rather than 12 p.s.i. referred to earlier in connection with the pressure relief valve 40.

For the proper functioning of the pressure relief valve 112, it is desirable to prevent foam from

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coming into contact with the pressure relief valve assembly 90.

5 Foam forms during the fermentation process and the foam tends to rise to the top of the vessel 11. This foam carries with it sediment and other products of the fermentation process which are of a thick consistency and tend to clog up the pressure relief valve assembly 90.

10 To prevent the foam from reaching the valve assembly 90, a cup 116 having a plurality of circumferentially spaced openings 118 is located under the valve assembly 90. It has an inner diameter so that it will frictionally engage around the skirt 94. The
15 openings 118 serve to break up the foam passing therethrough, due to surface tension. Sediment carried by the broken up foam will settle in the bottom of the cup 116 and is periodically cleaned out. The cup 116 may also be used in conjunction with the top cap assembly 33 shown
20 in Figure 1A.

 As can be seen from Figures 6A and 6C, the cup 116 has a central pin 120 on which is received a disk 122. The disc 122 is of a porous material which is impregnated
25 with a chemical defoamer, as a precaution, to break up any foam not broken up during entry through the openings 118. It has been found that a fatty acid, preferably oleic acid, serves as an effective defoamer in this application, but other suitable fatty acids or mixtures thereof can
30 also be used.

 With reference to Figures 7A, 7B and 7C, the carbon dioxide pressure valve 53 is shown with a backflow preventing plug 130 according to a further aspect of the
35 invention. The plug 130 has a flange 132 at one end and a

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groove 134 extending along part of its length, as shown in Figure 7B.

5 A retaining cap 135 is provided which has an external screw thread, as shown at 136. It fits on the inside of the upper case half 13 and screws into a mating thread 138 on the inside of the housing 60 to mount the valve 53 on the upper case half 13. The plug 130 is located in the bore of the cap 62 so that one end of the groove 134 projects from the cap 62 to allow the passage of CO₂ gas from the valve 53 into the vessel 11 (Figure 7B).

15 As shown in Figure 7B, the outer diameter of the flange 132 is greater than the inside diameter of the inside tapered surface of the housing 60. Thus, the flange 132 will be folded backwards (not shown in the drawing) as it presses against the tapered inside surface of the housing 60, to effectively form a one-way valve. It will allow the passage of CO₂ gas from the carbon dioxide cartridge but not the passage of gas or fluid from the inside of the vessel 11. This protects the valve 53 from backflow from the vessel 11 which could interfere with its proper functioning.

25

As will be appreciated from the foregoing description, the pressure vessel 11 serves three purposes. Firstly, it serves as a fermentation vessel where the fermentation process takes place. Secondly, it serves as a conditioning vessel where conditioning of the beverage by the addition of CO₂ gas and/or the lowering of the temperature thereof. Thirdly, the vessel 11 has been designed to serve as a dispenser from which the finished product can be dispensed directly into a drinking vessel for consumption. This is facilitated by the use of the float 70 by means of which the beverage is drawn off from

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the surface of the liquid and not from the bottom. The vessel 11 is further of a size so as to conveniently fit into a household refrigerator for the conditioning of the beverage and to chill the beverage for consumption.

5 During the cooling of the beverage, when conditioning takes place, it accepts CO₂ which results in the beer attaining a desired flavour and encourages removal of turbidity.

10 The final product therefore does not need to be transferred to another vessel for conditioning or for storage prior to consumption.

15 It is a further advantage that the cup 116 prevents the beverage in the vessel 11 from coming into contact with the chemical defoaming agent, as happens with conventional systems. Thus, the beverage being consumed is uncontaminated by the defoaming agent.

20 While the foregoing embodiments have been described with beer making in mind, it will be appreciated that the apparatus can be used for making other fermented beverages, alcoholic or non-alcoholic. It is also contemplated that the apparatus can be used for the
25 production of wine or products using other fruit juice concentrates.

30 Many modifications will readily occur to those skilled in the art to which the invention relates and the specific embodiments described should be considered illustrative of the invention only and not as limiting its scope as construed in accordance with the accompanying claims.

WHAT IS CLAIMED IS:

1. Apparatus for producing a fermented beverage, comprising:

a pressure vessel having an interior for receiving fermented-beverage-making ingredients therein, an inlet for introducing said ingredients into the vessel and an outlet for dispensing a resultant fermented beverage from the vessel;

pressure relief valve means on said vessel and in communication with the interior of the vessel for relieving pressure resulting from pressure buildup in the interior of the vessel during a fermentation process occurring in the vessel; and

defoaming means which is located between said relief valve means and the interior of the vessel to counteract foam produced during said fermentation process from coming into contact with the pressure relief valve means.

2. The apparatus according to claim 1, further comprising screening means for screening the defoaming means from said resultant fermented beverage in the pressure vessel.
3. The apparatus according to claim 1, wherein said defoaming means comprises a housing between the relief valve means and the interior of the vessel to screen the relief valve means from the interior of the vessel, the housing being provided with at least one opening therein of a predetermined size for the breakup of foam passing therethrough.

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4. The apparatus according to claim 3, wherein the housing comprises a cup shaped member having a plurality of said openings spaced around its circumference.
5. The apparatus according to claim 1, wherein said defoaming means comprises a chemical defoaming agent supported on a solid carrier.
6. The apparatus according to claim 5, wherein the defoaming agent comprises a fatty acid.
7. The apparatus according to claim 6, wherein the fatty acid is oleic acid.
8. The apparatus according to claim 6, wherein said solid carrier comprises a porous material.
9. The apparatus according to claim 3, further comprising a chemical defoaming agent supported on a solid carrier inside the housing.
10. The apparatus according to claim 9, wherein said chemical defoaming agent comprises a fatty acid.
11. The apparatus according to claim 10, wherein said fatty acid comprises oleic acid and the solid carrier comprises a porous material.
12. The apparatus according to claim 1, further comprising a float operable to float at or near the surface of a liquid of said fermented beverage, an entrance port in said float for allowing entry of said beverage under a first pressure and a tube extending from said entrance port to said outlet for

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transporting said beverage from said float to said outlet.

13. The apparatus according to claim 12, wherein the pressure of said beverage at said outlet is under a second pressure, said second pressure being lower than said first pressure.
14. The apparatus according to claim 13, wherein said first pressure is approximately 13-15 p.s.i. and said second pressure is approximately 2 p.s.i.
15. The apparatus according to claim 1, further comprising a pressure dispenser comprising a housing operable to hold a gas dispenser, a cap operable to be connected to said housing, a first chamber in said housing operable to hold pressure at a first pressure and a second chamber downstream of said first chamber operable to hold pressure at a second pressure, said second pressure being lower than said first pressure, a piston to allow communication between said first and second chambers, said second chamber having a channel which is in communication with said pressure vessel.
16. The apparatus according to claim 15, further comprising valve means in said channel for preventing fluid flow from said vessel into said second chamber.
17. The apparatus according to claim 16, wherein said channel has a portion which is tapered towards said second chamber and said valve means comprises a plug having a flange which is in contact with said tapered portion and which flange is adapted to flex to allow fluid flow from said second chamber to said vessel

and to seal against said tapered portion to prevent fluid flow in the opposite direction.

18. The apparatus according to claim 16 and further comprising an inert gas cartridge operable to be mounted in said first chamber.

19. Apparatus for producing a fermented beverage, comprising:

a pressure vessel having an inlet for introducing fermented-beverage-making ingredients into the vessel and an outlet for dispensing a resultant fermented beverage from said vessel;

pressure relief valve means located on the outside of said vessel and being in communication with the inside of the vessel for relieving pressure resulting from pressure buildup in the vessel during a fermentation process occurring in the vessel, the pressure relief valve means comprising a valve seat on a support member and a spring loaded valve member on said seat which valve member is adapted to open when the pressure in the vessel exceeds a first predetermined value, the seat being capable of movement relative to said support member to vent the vessel to the atmosphere when the pressure in the vessel exceeds a second predetermined value, which is higher than said first predetermined value.

20. The apparatus according to claim 19, wherein the valve seat comprises a cylindrical bung of a resilient material which is provided with a central bore and the support member has a complimentary opening into which the bung is received with a press fit.

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21. The apparatus according to claim 20, wherein the bung has at least one vent groove extending partially along its length.
22. A safety pressure relief valve assembly for connection to a pressure vessel, comprising a support member for mounting on the pressure vessel, a valve seat on the support member and a spring loaded valve member on said seat, which valve member is adapted to open to vent said pressure vessel to the outside when the pressure in the vessel exceeds a first predetermined value, said valve seat being capable of movement relative to said support member to vent said pressure vessel to the outside when the pressure in the vessel exceeds a second predetermined value which is higher than said first predetermined value.
23. A method of producing a fermented beverage comprising the steps of fermenting beverage producing ingredients in the presence of a yeast and a defoaming agent, which defoaming agent is screened from the fermented beverage produced by the fermentation process.

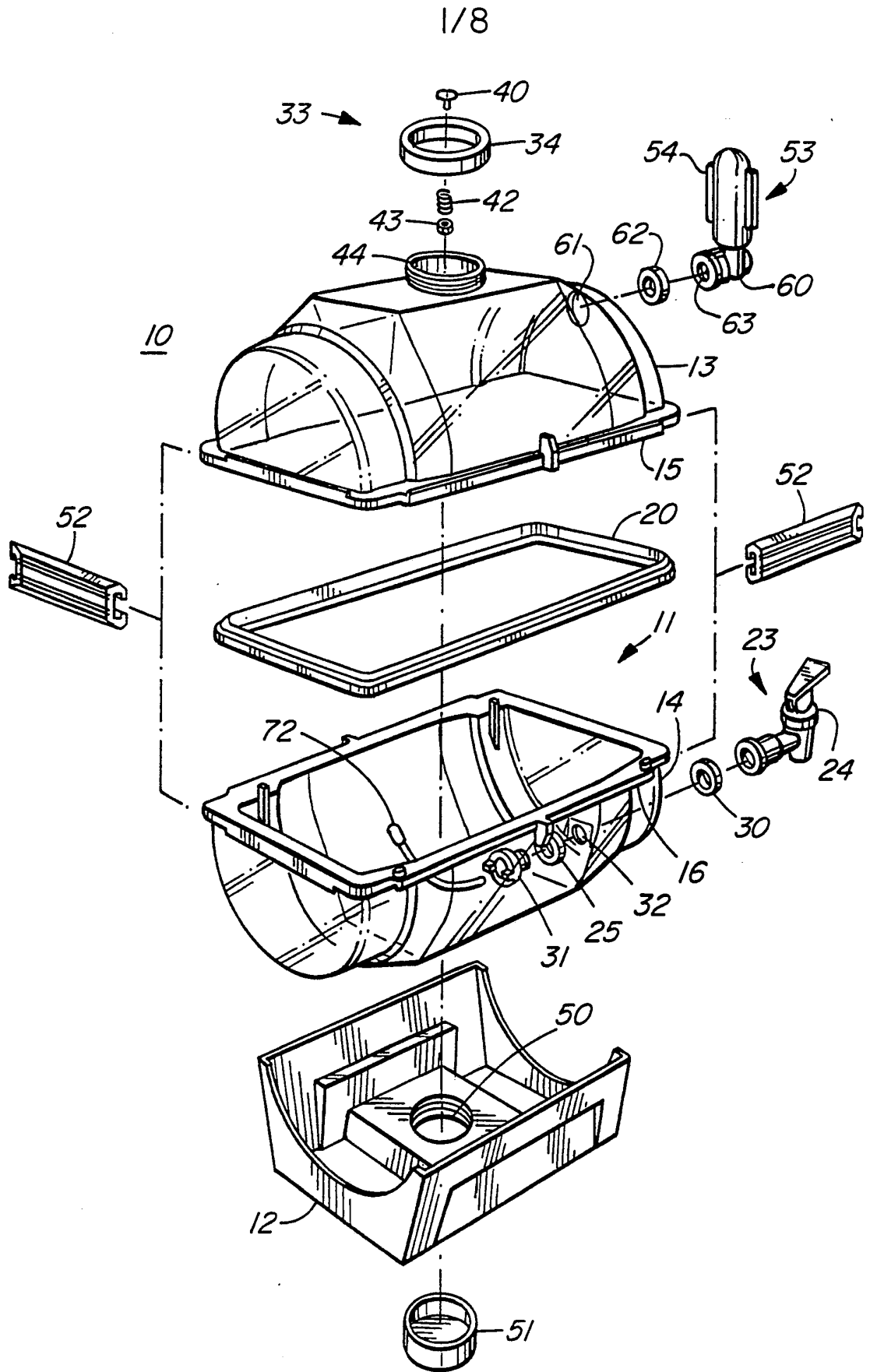


FIG. 1A
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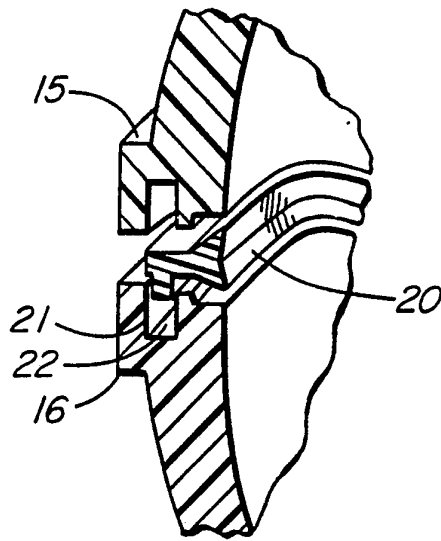


FIG. 1B

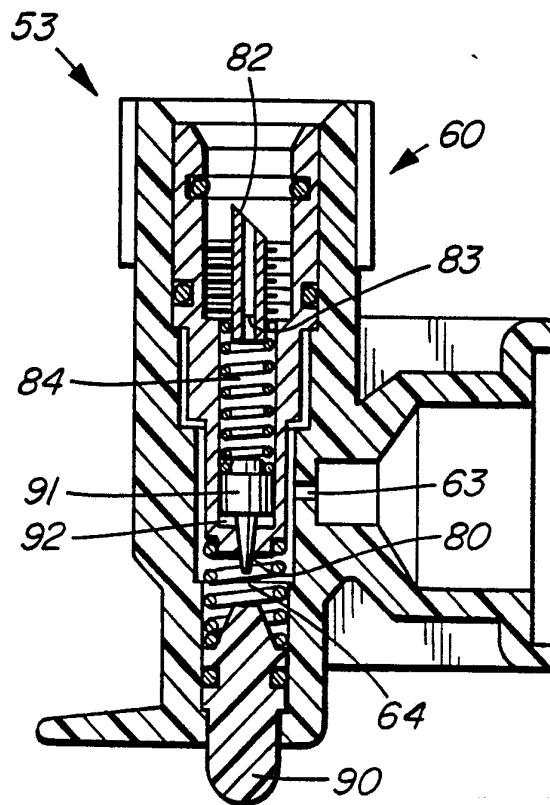


FIG. 2

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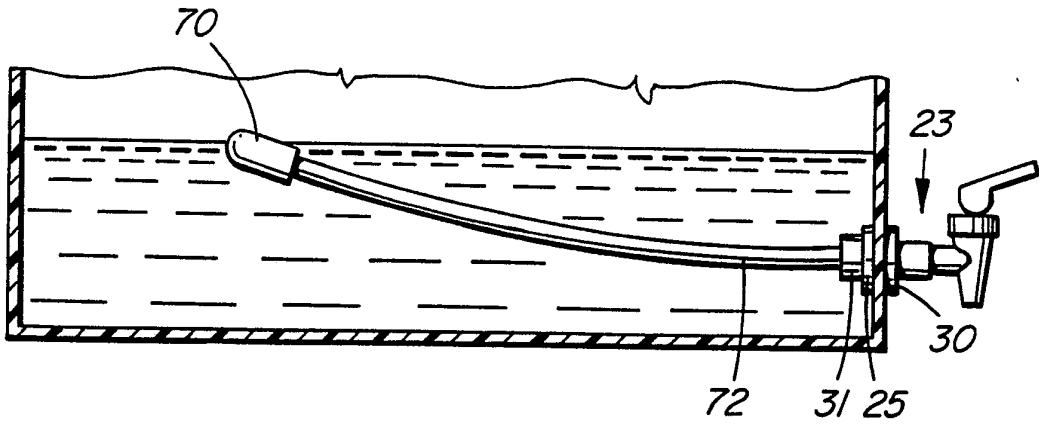


FIG. 3A

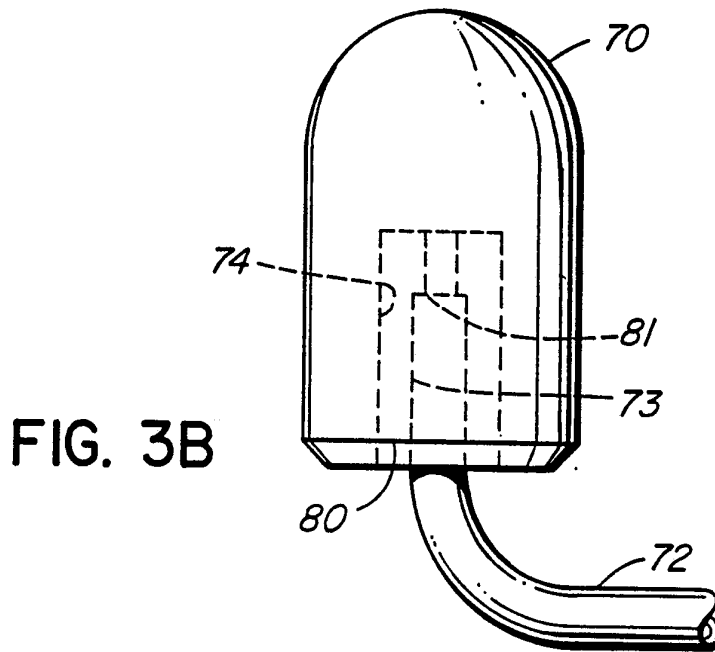


FIG. 3B

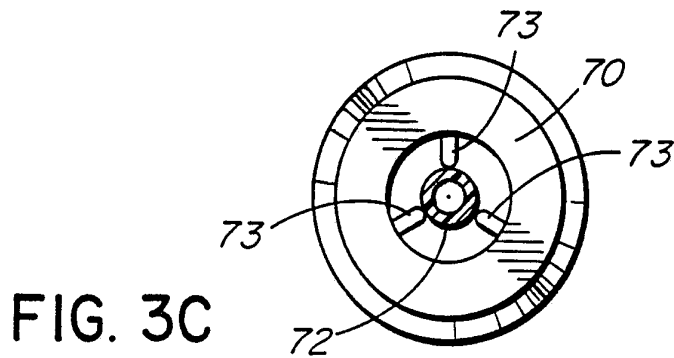


FIG. 3C

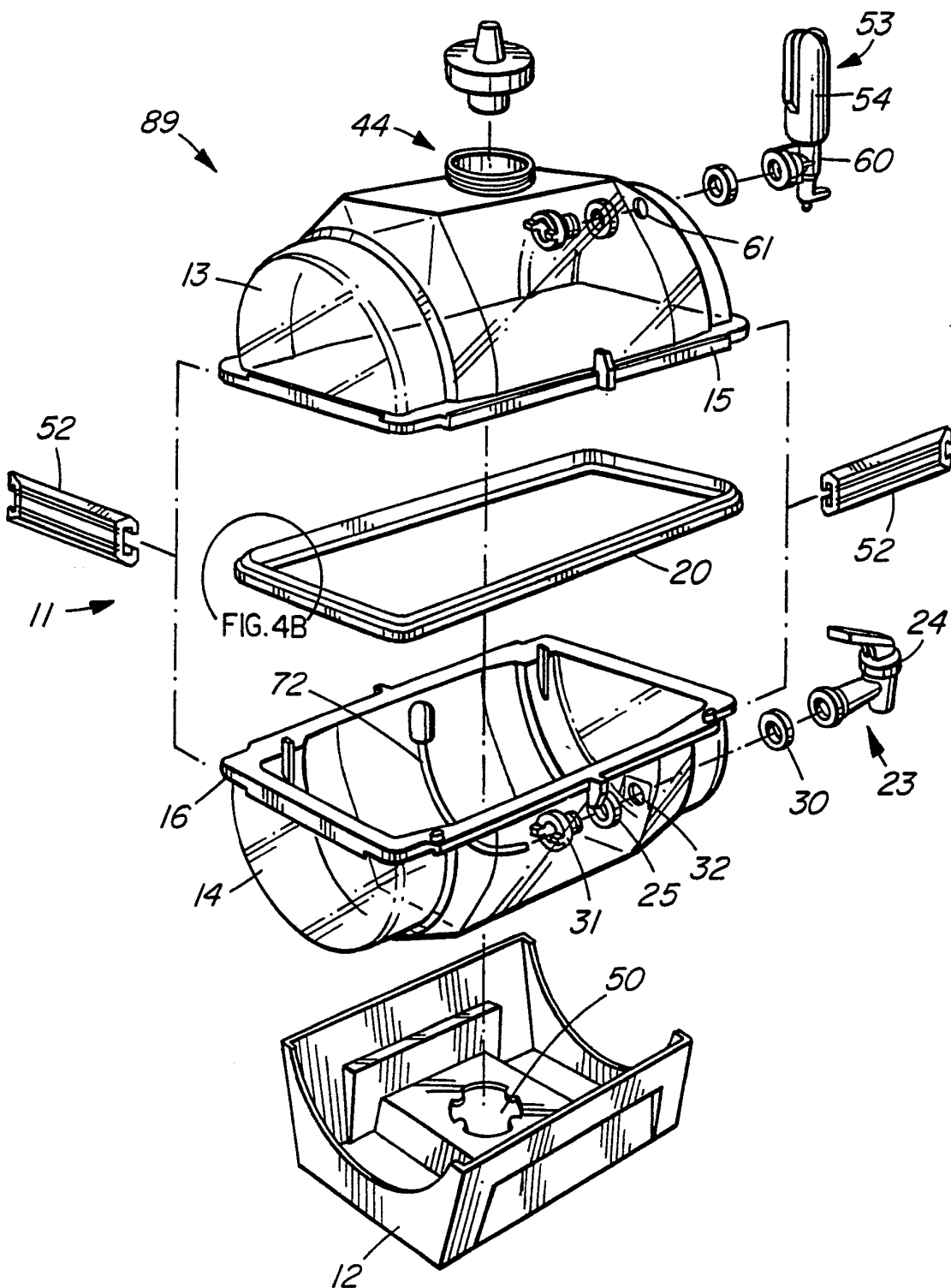


FIG. 4A

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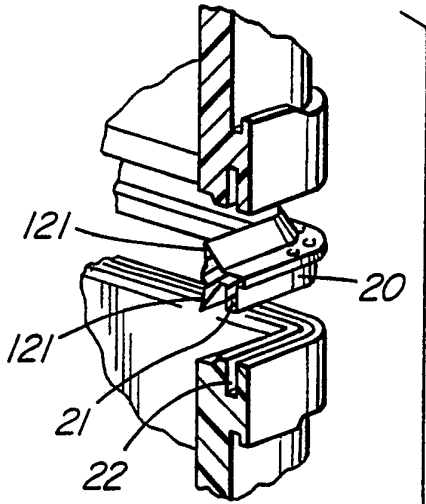


FIG. 4B

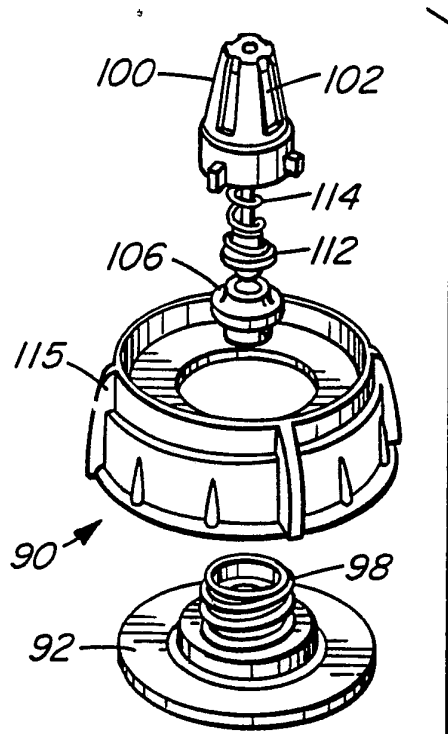


FIG. 5A

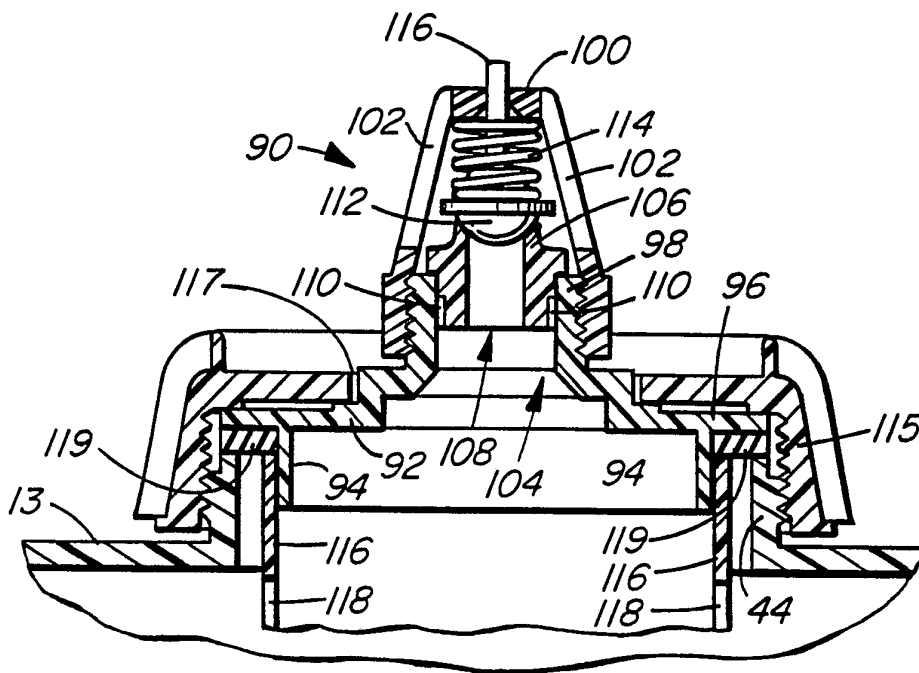


FIG. 5B

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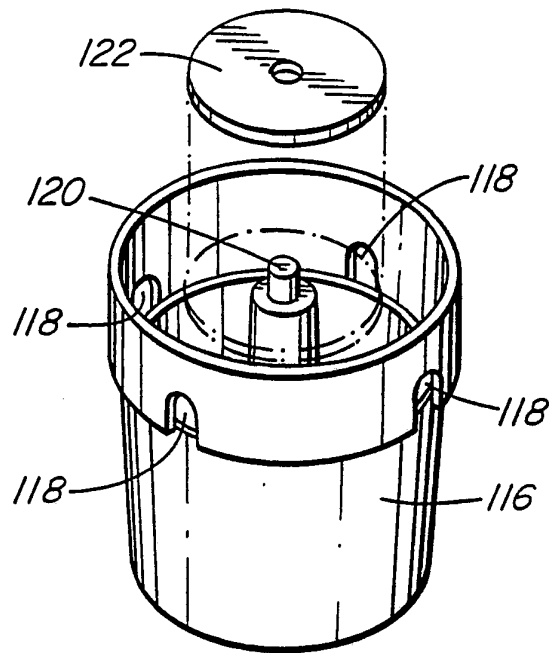


FIG. 6A

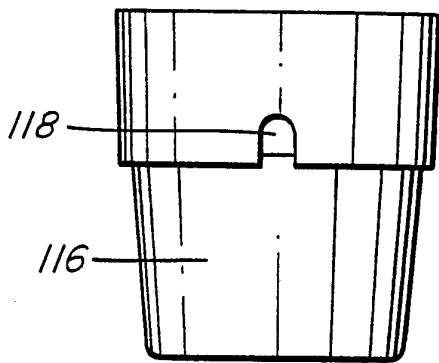


FIG. 6B

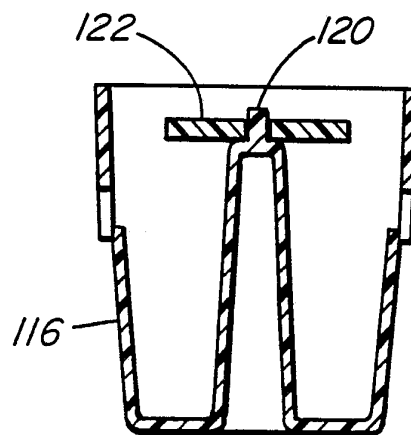


FIG. 6C

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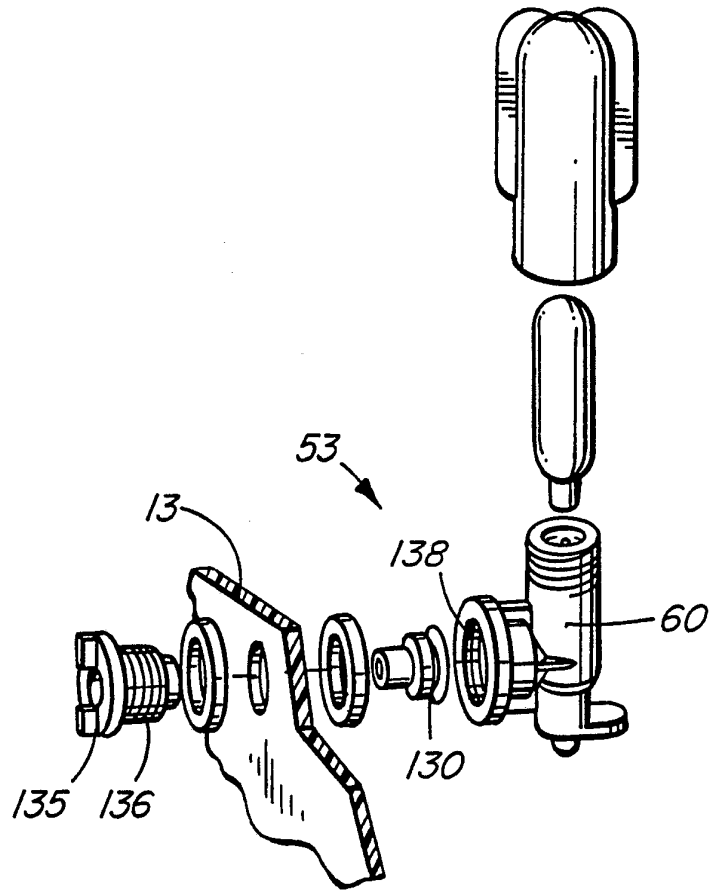


FIG. 7A

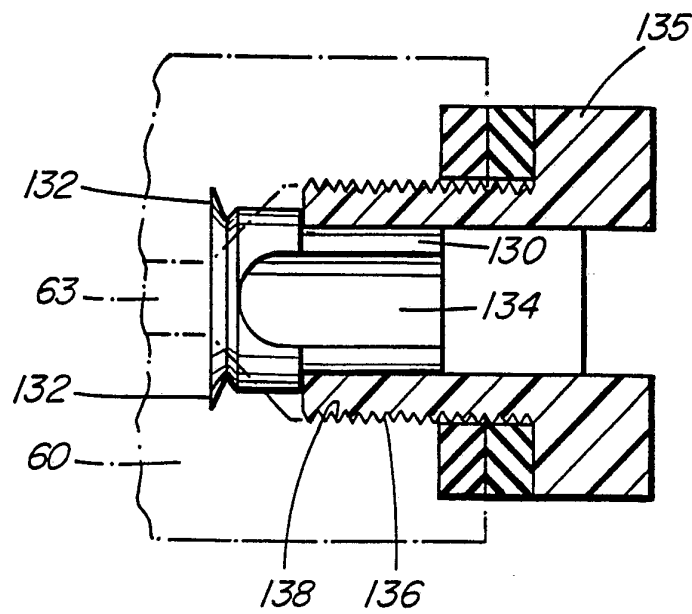


FIG. 7B
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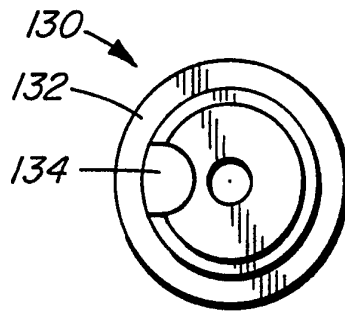


FIG. 7C

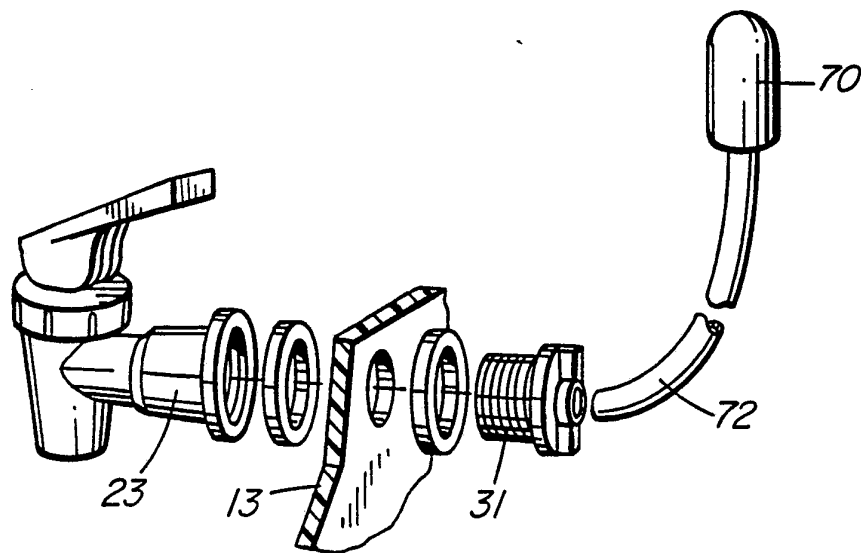


FIG. 8

INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 92/00151

| | | |
|--|--|-------------------------------------|
| I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ | | |
| According to International Patent Classification (IPC) or to both National Classification and IPC Int.Cl. 5 C12C13/00; C12C11/04 | | |
| II. FIELDS SEARCHED | | |
| Minimum Documentation Searched ⁷ | | |
| Classification System | Classification Symbols | |
| Int.Cl. 5 | C12C ; B01F ; F16K ; B01D | |
| Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸ | | |
| III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ | | |
| Category ¹⁰ | Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹² | Relevant to Claim No. ¹³ |
| A | US,A,4 775 482 (THURMAN, W.A.) 4 October 1988 see abstract; claims; figures --- | 1-11 |
| A | JAPANESE PATENTS GAZETTE Section Ch, Week 7916, Derwent Publications Ltd., London, GB; Class D, AN 79-30516B & JP,A,54 032 187 (ASAHI ELECTROCHEM IND. KK.) 9 March 1979 see abstract --- | 1-11 |
| A | GB,A,1 153 348 (ASAHI BREWERIES LTD.) 29 May 1969 see page 2, column 2, line 111 - page 3, column 1, line 42; figure 1 --- -/-- | 1,12-14 |
| <p>¹⁰ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> | | |
| IV. CERTIFICATION | | |
| Date of the Actual Completion of the International Search | Date of Mailing of this International Search Report | |
| 21 JULY 1992 | 29. 07. 92 | |
| International Searching Authority | Signature of Authorized Officer | |
| EUROPEAN PATENT OFFICE | BEVAN S. R. <i>S. Bevan</i> | |

| III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET) | | |
|--|---|-----------------------|
| Category ° | Citation of Document, with indication, where appropriate, of the relevant passages | Relevant to Claim No. |
| A | GB,A,2 112 124 (CLEARLINE HOME AND LEISURE PRODUCTS LIMITED.) 13 July 1983 see page 2, column 1, line 1 - column 2, line 105 | 15-18 |
| | --- | |
| A | US,A,4 016 904 (GORDON, E.A.) 12 April 1977 see column 4, line 35 - column 31; claims; figure 4 | 1,19-22 |
| | --- | |

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. CA 9200151
SA 58362**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information. 21/07/92

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| US-A-4775482 | 04-10-88 | None | |
| ----- | | | |
| GB-A-1153348 | 29-05-69 | BE-A- 686431 | 15-02-67 |
| | | DE-A, C 1517795 | 04-06-70 |
| | | NL-A- 7407784 | 26-08-74 |
| | | NL-A- 6616163 | 08-12-67 |
| ----- | | | |
| GB-A-2112124 | 13-07-83 | None | |
| ----- | | | |
| US-A-4016904 | 12-04-77 | CA-A- 1073318 | 11-03-80 |
| | | GB-A- 1521809 | 16-08-78 |
| | | JP-A- 52081722 | 08-07-77 |
| ----- | | | |