(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 115 166**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **83307790.2**

(22) Date of filing: **21.12.83**

(51) Int. Cl.³: **B 67 D 1/04**
F 04 B 43/10

(30) Priority: **27.12.82 US 453184**

(43) Date of publication of application:
08.08.84 Bulletin 84/32

(84) Designated Contracting States:
AT BE DE FR GB IT NL SE

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(54) **Apparatus and method for storing and dispensing liquids and pumps for same.**

(57) Beverage storing and dispensing apparatus and a method of dispensing a potable beverage in which there is a non-pressurised sanitary storage tank (11) with a fill opening (12) in the top, and a normally non-pressurised pump (25) that is inside of the tank and which is removable through the tank opening while propellant and dispensing lines (68, 67) are connected to the pump; the pump has a tubular body (26), an end cap (40), a collar nut (49), holding the end cap to the body, and an expandable elastomeric bladder (52), mounted upon the end cap; a gas control has an actuator (70) for selective application of compressed propellant gas to the normally non-pressurised pump; the pump has an upward facing receiver for connection to a non-pressurised remote beverage source or to a single usage beverage package. Also a pump for such an apparatus and a method for using such a pump in such an apparatus.

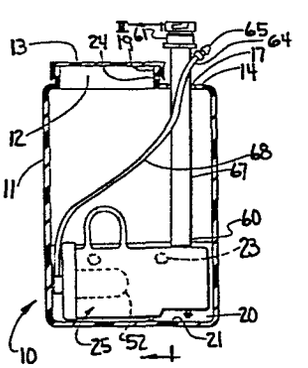

FIG.1

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Apparatus and method for storing and dispensing liquids and pumps for same

This invention relates to methods of dispensing potable beverages or beverage concentrates and has particular, but not exclusive, reference to beverage storage and dispensing apparatus and gas powerable beverage pumps for use in such a method.

By the present invention there is provided a method of dispensing a potable beverage or beverage concentrate which comprises the steps of storing the beverage or beverage concentrate in a container, the container being in fluid communication with a pump, the pump including a body enclosing a chamber having a first portion and a second portion, an inlet to the first portion being in fluid communication with the container, the first portion having an outlet from the first portion for pumped egress of beverage or beverage concentrate from the first portion, the first and second portions being separated by a flexible diaphragm of generally cylindrical form, the second portion having an entry port for the flow of a propellant gas into the second portion, applying pressurised propellant gas to the entry port to

displace the diaphragm to reduce the volume of the first portion and to expel beverage or beverage concentrate from the first portion.

The present invention further provides beverage storing and dispensing apparatus including a sanitary beverage storage tank having a fill opening, a pressurisable fluid powerable beverage pump within the tank, said pump being insertable into the tank and being removable from the tank through the fill opening and a fluid propellant line connected to a propellant port on the pump, and a beverage dispensing line connected to an outlet of the pump, both lines entering into the tank through a wall of the tank.

The fill opening may be so sized as to accept an adult human hand therethrough. The fill opening would normally be closed by a filling cover mounted on the fill opening. The lines may extend through the top wall of the tank. The fill opening may be adjacent a first end of the top wall and the lines may extend through a second end of the top wall.

The pump may have a beverage outlet substantially in line with an aperture in the tank top wall, the beverage delivery line passing through the aperture.

There may be provided a tank breather at the top of the tank. The breather may be in a fill opening lip underneath a rim of the filling cover. The pump may be located in a pump nest in the bottom of the tank. The bottom of the nest may be at the lowest level of the tank. There may be provided tank support pads at a level above the bottom of the nest. The pump body may include a handle. There may be provided pump retainers in the tank to hold the pump on the bottom of the tank. The retainers may be inwardly extending dimples in the tank.

The pump may have a rounded profile resting upon a bottom of the tank, the pump having a flattened section above the rounded profile and a check valve which seals against an inside surface of the flattened section.

The pump may have a flattened intake section, a beverage inlet through the flattened section, a check valve sealingly engageable with the flattened section around the beverage inlet and means for supporting the flattened section adjacent to but above the bottom of the tank.

The pump may have a transparent body and an opaque bladder inside of the body. There may be provided a disconnect fitting on the beverage line, the fitting being outside of the tank.

The present invention further provides apparatus in which the beverage dispensing line enters into the tank through a top wall of the tank, the dispensing line has a disconnect outside of the tank, said disconnect being connectable to a normally closed check valve in a further length of dispensing line, the beverage pump has a filling check valve inside of and adjacent to a bottom of the tank and the beverage tank, pump, delivery line and disconnect are all self-draining when the apparatus is inverted.

Alternatively the apparatus may be characterised in that the pump is on the bottom of the tank and the lines extend into the tank from adjacent the top of the tank with there being a length of each line inside of the tank, each length of line being longer than a distance between the fill opening and the entrance into the tank of the lines, said pump being removable from the tank through the fill opening with both lines intact and connected to the pump, said pump having the diaphragm in

the form of a bladder and means for separating the bladder from a body of the pump while leaving the lines connected, for cleaning of the pump and replacement of the bladder without disconnection of lines.

The present invention yet further provides a gas powerable beverage pump for use in the above method in which there is provided a tubular body having a closed end, an open end, a beverage outlet, and a beverage inlet, an end cap mounted in the open end, said cap having a bladder holder and a propellant port passing through the bladder holder, a seal between the end cap and the body, a fastener secured to the body, said fastener retaining the end cap to the body and an expandable elastomeric bladder mounted upon the end cap.

The pump may include means for supporting the beverage inlet above a lowest level of the pump and there may be provided a handle on the tubular body.

The body end cap and fastener may be formed entirely of a food-grade plastics material, the body having a thickened round throat at the open end, a male thread on the thickened throat and a seal pocket in the throat, the fastener being held to the body by the threads upon the throat.

The end cap and the throat may be of substantially the same diameter. The fastener may be a collar nut having an internally facing thrust flange which has an internal opening substantially smaller than an outside diameter of the seal.

The end cap may include an outwardly extending nose having an outer end substantially beyond the collar nut, in which the propellant port includes a laterally projecting connector which is in between the fastener and the nose outer end.

The connector may be spaced from the fastener and from the nose outer end, by a distance greater than one half the diameter of the beverage tubing which the connector will frictionally retain.

The body may be of generally circular cross-section and the beverage inlet may comprise a flattened section adjacent the closed end of the body, there being an elastomeric check valve sealingly engageable with the flattened inlet section. The flattened inlet section may be recessed within the circular cross-section of the body. The bladder may be cylindrical and may be shorter than the body and be able to conform to the flattened configuration after filling and displacing beverage from the inside of the pump body.

The pump may be further characterised in that the bladder holder has a constant diameter neck extending from an end cap plate, and a head of larger diameter than the neck, said head being inward of and spaced from the end cap plate, in which the bladder closed end is an elongate tube having an open end stretched over the holder head and onto the neck, said open end having a substantially thickened annular collar butted against the end cap, and including an elastomeric ring retaining the bladder to the holder, said ring being between the holder head and the bladder collar, said ring having a greater major diameter than an outer diameter of the holder head and said bladder collar having an outer diameter greater than the head outer diameter.

The holder head may have a diameter at least equal to the mean diameter of the ring and the outer diameter of the collar may be generally equal to or greater than the ring major diameter.

The inlet may comprise an upwardly facing cylindrical connector receiver having the beverage inlet through its bottom, said receiver having an annular seal for engagement with a connector of a beverage source and one way fill valve in the receiver bottom.

The fill may be a normally open check valve. There may be provided a piercing element for opening a seal in the connector, said fill valve being within and below the level of the piercing element.

There may be provided a spillage tray above the pump, the tray being secured by the receiver to the spillage tray. The receiver may have a tray fastener compressively holding the tray to the pump, the pump being supported by the tray.

The tray may be opaque, the pump body and end cap may be transparent and the bladder may be opaque.

The tray may be fastened against the tubular body, the tray including a recess enabling removal of the end cap and bladder from the body by manipulation of the fastener while the body is secured to the tray.

The present invention yet further provides beverage dispensing apparatus for use in the above method and being powerable by compressed gas in which there is provided a normally non-pressurised sanitary beverage pump having a beverage pumping chamber, a beverage inlet to the chamber, a beverage outlet from the chamber, and a propellant chamber for receiving propellant gas, a non-pressurised beverage supply tank having a breather to atmosphere and a normal liquid level which is substantially above a level of the pump beverage chamber, said pump inlet being in fluid communication with the tank so that beverage can flow from the reservoir into

the pumping chamber under the influence of gravity and without pressurisation or suction, an inlet valve in the pump inlet to prevent flow of beverage from the pumping chamber to the tank, a flexible bladder in the pump, said bladder forming one wall of the pumping chamber and dividing the pumping chamber from the propellant chamber, said bladder being expandable under compressed gas propellant pressure for expelling beverage from the pumping chamber to a dispensing nozzle and gas control means to selectively and intermittently supply compressed gas to the pump propellant chamber for expanding the bladder and expelling the beverage to a dispensing nozzle.

The bladder may be in the form of an elongate closed end tube extending into the pump and the pump may include a propellant port into an inside of the tube for admittance of compressed gas into the tube to expand the bladder in the pump. The control means may be a normally closed valve having a manual actuator. The compressed gas may be selected from carbon dioxide and compressed air. The pump and inlet valve may be inside the tank. The pump may be on the bottom of the inside of the tank and beverage and propellant lines may extend into the tank from adjacent the top of the tank with a length of each line inside of the tank, each length of line being longer than a distance between the fill opening and the entrance of the lines into the tank, the pump being removable from the tank through the fill opening with both lines intact and connected to the pump, the pump being operable when so removed from the tank.

The pump may comprise a tubular body having the beverage pumping chamber, beverage inlet and beverage outlet, an end cap sealed to the body, said cap having a

bladder holder upon which the bladder is frictionally retained and a propellant port passing through the bladder holder into the propellant chamber which is inside of the bladder, and a collar nut fastened to the body, said nut retaining the end cap to the body.

Propellant gas may be exhausted to air after expanding the bladder, permitting the bladder to contract to re-fill the beverage chamber.

It will be appreciated that in one embodiment of the invention the pump is located within the tank.

Pumps are usually unattractive and are aesthetically unwanted. Worst of all there is leakage. Sometimes these devices leak and sometimes it's almost impossible to fix the leaks. These devices leak around fittings from seal failure, bad parts, improper assembly, stress cracks and many other reasons. Pump failure is another cause of leakage. In a typical pump failure the beverage is blown out of the pump. The pump must then be removed and rebuilt. In the period between pump failure and discovery of the failure, the beverage in the tank may run into and out of the broken pump. When the pump is energised, the inlet or outlet lines may also be blown off and the beverage squirted onto surrounding structures. Regardless, these failures are an unsightly mess, they are absolutely unacceptable in a household, they cause considerable aggravation, they are expensive, they cause loss of flooring and they are unsanitary. The pumps have been excessively complicated and prone to failure from stress cracking, fitting breakage or leakage, and the use of metallic parts has given metallic off-taste to the beverage. Beverage dispensing apparatus using the previous known pumps has too frequently been

subject to failure, leakage, contamination and has been left in an unsanitary condition and has proven unsatisfactory for widespread use.

Figure 1 is a cross-sectional elevational view of a beverage apparatus having a tank and a beverage pump therein;

Figure 2 is a cross-sectional elevational end view taken through lines II-II of Figure 1;

Figure 3 is a top view of the structure of Figure 1;

Figure 4 is a downward looking sectional view taken through lines IV-IV of Figure 1;

Figure 5 is an elevational cross-sectional view taken through the pump shown in Figure 1;

Figure 6 is a schematic view of the structure of Figure 1 in a beverage dispenser;

Figure 7 is a cross-sectional elevational view of an alternative embodiment of the pump of the present invention; and

Figure 8 is a top plan view of the structure of Figure 7.

Beverage storing and dispensing apparatus acccording to the present invention is shown in Figure 1 and is generally indicated by the numeral 10. The apparatus 10 includes a non-pressurised sanitary beverage storage tank 11 and a normally non-pressurised sanitary beverage pump 25.

The tank 11 has a fill opening 12 sized to receive an adult human hand and the pump 25, the opening 12 is closed by a filling cover 13 mounted upon the opening 12. The tank 11 has a top wall 14 having a first end 15 which the fill opening 12 and cover 13 are adjacent to, and a second end 16 having apertures 17, 18

through which a beverage dispensing line 60 and a fluid propellant line 64 respectively extend. A breather 24 gives fluid communication between ambient and the inside of the tank 11 and keeps the tank 11 non-pressurised and at atmospheric pressure. The breather 24 is in a lip 19 of the fill opening 12 and is under a rim of the filling cover 13. A pump nest 20 is in the bottom of the tank 11, and a bottom 21 of the nest 20 is the lowest level of the inside of the tank 11. The tank 11 has a pair of support pads 22 at a level above the nest bottom 21 for support of the tank 11 by a complemental dispensing machine structure (not shown). The tank 11 has pump retainers 23 in the form of inwardly extending dimples, which frictionally retain the pump 25 on the tank bottom 21.

The pump 25 has a tubular body 26 having a closed end 27, an open end 28, a beverage outlet 29, a beverage inlet 30 and a support 31 for elevating the inlet 30 above a flat surface upon which the pump 25 rests and above a lowest level of the pump 25. The body open end 28 has a thickened round throat 32 which has a male thread 33 and an internal seal pocket 34. The body 26 is of generally circular cross-section and the beverage inlet 30 includes a flattened section 35 adjacent the body closed end 27. The flattened section 35 is recessed within the circular cross-section of the body 26, and an elastomeric check valve 56 is sealingly engageable with the inside of the flattened inlet section 35. A handle 36 is on the body 26 for removal and insertion of the pump 25. An end cap 40 closes the body open end 28 and has a bladder holder 41 and a propellant port 42 which extends through the holder 41 and a nose 43 and a lateral connector 45. The end cap nose 43 has an outer end 44

beyond the lateral connector 45. An elastomeric seal 37 is carried by the end cap 40 and is received in the seal pocket 34, and fluid tightly seals the end cap 40 to the body 26. A collar nut 49 secures the end cap 40 to the body 26. The collar nut 49 is threaded onto the throat threads 33 and has an inward facing thrust flange 50 which has an inside diameter which is less than an inside diameter of the seal 37. The thrust flange 50 engages the end cap 40 and retains the end cap 40 to the body 26. Inside the pump 25 is an elastomeric bladder 52 which is secured by an O-ring 54 to the bladder holder 41. The bladder 52 is shorter than the body 26 and has a length in the form of an elongate cylindrical tube 53. The bladder 52 divides the inside of the pump 25 into a pumping chamber 58 and a propellant chamber 59.

The beverage dispensing line 60 is fluidly connected to the pump outlet 29. The dispensing line 60 extends directly upward and through the top wall aperture 17 and then to an open disconnect fitting 61. The open disconnect fitting 61 is directly connectible to a normally enclosed combination disconnect and check valve 62 in a further dispensing line 63 which is connected to a remotely located dispensing nozzle 69. The fluid propellant line 64 is fluidly connected to the propellant port 42. The propellant line 64 extends through the top wall aperture 18 to an open disconnect 65 normally connected to a further propellant line 66. The further propellant line 66 is connected to a gas control 70 which is a 3-way valve having a vent 71 to atmosphere, a manual actuator 72 and a connection to a gas source 73 which is selected from either compressed air or carbon dioxide. The gas control 70 normally connects the pump propellant chamber 59 to atmosphere via the vent 71 and normally closes the gas source 73.

Inside of the tank 11 is a length 67 of the beverage line 60 and a length 68 of the propellant line 64. Each line length 67, 68 is longer than a distance between the fill opening 12 and the loci of the entrance of the lines 60, 64 into the tank 11, the loci being the apertures 17, 18, through which the lines 60, 64 enter the tank 11. The pump 25 is removable from the inside of the tank 11 by removal through the fill opening 12 with the lines 60, 64 both connected to the pump 25. The pump body 26, end cap 40 and collar nut 49 are all of a transparent food grade plastic enabling visual inspection of the interior of the pump 25, the beverage in the pumping chamber 58, the propellant chamber 59 and the bladder 52 which is opaque. The pump 25 can pass through the fill opening 12, so the pump 25 can be installed or removed from the tank 11 by use of the handle 36.

In operation of the dispensing apparatus 10, the gas source 73 is either compressed air or carbon dioxide gas and is set at a predetermined propellant pressure of about 1.75kg/mm^2. The gas control 70 normally closes the gas source 73 and vents the propellant chamber 59 to atmosphere which causes the pump 25 to be normally non-pressurised. The cover 13 is removed and the tank 11 has beverage or beverage concentrate as it may be, poured in. The cover 13 is then replaced. The tank 11 is never pressurised and is vented to atmosphere through the breather 24 which is under and protected by the cover 13, and/or through the apertures 17, 18 if the apertures are larger than the lines 60, 64 and are not sealed. The normal level of beverage in the tank 11 is substantially above the level of the pump 25 and the beverage inlet 30. The pump 25 requires priming for expulsion of air in

the pumping chamber 58 and the dispensing lines 60, 63. The actuator 72 is repeatedly depressed and released until beverage is delivered to the nozzle 69. When the actuator 72 is depressed the gas control 70 closes the vent and fluidly connects the gas source 73 to the propellant chamber 59 via the propellant lines 64, 66 and the propellant port 42. The tube 53 section of the bladder 52 is expanded by the propellant and the air in the pumping chamber 58 is expelled. When the actuator 72 is released, the gas source 73 is shut off and the propellant chamber 59 is connected to the vent 71 and to atmosphere. The bladder 52 contracts as the used propellant gas is vented to atmosphere and as the bladder 52 collapses beverage fills the pumping chamber 58 through the inlet 30. A first depression of the actuator 72 will usually expel most of the air from the pumping chamber 58 and a second depression of the actuator 72 will expel the remaining air as well as the air in the dispensing lines 60, 63. The apparatus 10 is then ready to dispense beverage. After priming the bladder 52 is collapsed and the pumping chamber 58 and lines 60, 63 are filled with beverage. Neither the pump 25 nor the tank 11 are pressurised.

In a typical dispensing of a serving of beverage, the actuator 72 is depressed and the gas control 70 closes the vent 71 and fluidly connects the gas source 73 to the pumping chamber. The pressure of the gas is applied upon the bladder 52 and the tube 53 expands and expels beverage out of the pump 25 and to the nozzle 69. The cylindrical tube 53 fully expands and then resiliently conforms to the inside contour of the chamber 58 displacing beverage from the inside of the pump body

26. When the actuator 72 is released, the gas source 73 is shut off and the propellant chamber 59 is connected to the vent 71. The propellant gas in the propellant chamber 59 is vented to atmosphere and the bladder 52 collapses and the pumping chamber 58 refills under gravity and without pressurisation or suction. The check valve 62 in the further dispensing line 63 prevents backflow of beverage from the nozzle 69 to the pump chamber 68 and the inlet check valve 56 allows free flow of beverage into the pump 25 from the tank 11 but prevents flow from the pump 25 back to the tank 11 during dispensing.

During dispensing of beverage, if there is a failure, the immediate consequences are minimal. If the pump 25 leaks, the leakage goes back into the tank 11. If the bladder 52 leaks, tears or bursts, there is no leakage outside of the tank 11 and the propellant line 69 can be disconnected from the further propellant line 66 and beverage will not escape from a defective bladder 52. The collar nut 49 stays moist and is easily removable from the pump body 26. There are no apertures in the tank 11 other than in the top wall 14. The beverage line 60 is straight and does not have any kinks or twists and will stay on the pump outlet 29 without clamps. The breather 24 is protected by the cover 13 so dust cannot enter the tank 11. The pump 25 is nested and retained in the lowest and smallest part of the tank 11 and the pump inlet 30 cannot be plugged or come to rest against a surface of the tank 11. The inlet check valve 56 merely rests upon the flattened section by gravity and there are no springs or crevices in the inlet 30.

Cleaning, sanitation and flavour change are functions that must be done and this apparatus 10 offers great advantages for these necessary fuctions. To clean or sanitise or change flavours, the tank 11 is disconnected by pulling the further propellant line 66 off the propellant disconnect 65 and disconnecting the beverage disconnect fittings 61, 62. The upper fitting 62 has a normally closed check valve that prevents backflow from the nozzle 69 and the lower disconnect fitting 61 is always open. The apparatus 10 is then removed and the cover 13 taken off. The tank 11 is then inverted and it completely self-drains. The tank 11 per se just drains out of the fill opening 12, and the pump 25 drains out of the open dispensing line 60 and disconnect fitting 61. The inlet check valve 56 opens by gravity when the tank 11 and pump 25 are inverted. The retainers 23 hold the pump 25 in the bottom of the tank 11 during inversion. The tank 11 can then be turned upright and filled with rinse water. The pump 25 fills as the water level rises as the inlet valve 56 opens and air escapes out the open dispensing line 60. After rinsing, a sanitising solution can be likewise filled in the tank 11 and pump 25 and then swilled around and likewise drained and rinsed. Normally, the tank 11 and pump 25 should be drained and rinsed once each year. To change beverages, water is left in the tank 11 and pump 25 and the lines 60, 64 are reconnected to the further lines 63, 66 and the pump 25 is pressurised and water is pumped into the further dispensing line 63 until the existing beverage is emptied. New beverage may then be placed in the tank 11.

Examination of the pump 25 is very easy. A person reaches through the fill opening and grasps the

pump handle 36 and pulls the pump 25 past the frictional retainers 23 and up and out of the tank 11 with the lines 60, 64 connected. The pump 25 may be pressurised and cycled while out of the tank 11 and if the bladder 52 is defective it can be seen through the transparent pump parts 26, 40, 49. Leakage can also be easily seen. If repair is needed, the pump body 26 and its handle 36 are grasped and the collar nut 49 is screwed off. The end cap 40 and bladder 52 are then pulled from the body 26. The bladder 52 is then easily replaced by rolling the O-ring 54 off the old bladder 52 and then onto a new bladder. The end cap 40 and new bladder 52 are then refitted to the body 26 and the collar nut 49 retightened. All of this is done with the lines 60, 64 connected to the pump 25. The pump 25 is then manually pushed through the fill opening 12 and back into the tank 11 and past the retainers 23 into the nest 20. The end cap nose 43 protects the lateral propellant connector 45 and the propellant line 64 is spaced from contact with either of the collar nut 59 or an end of the tank 11. The pump plastic parts 26, 40, 49 are very resistant to stress cracking and are virtually failure-proof, as a consequence of the thickened throat 32, the end cap nose 43 and the collar nut thrust flange 50.

The pump 25-7 of Figures 7 and 8 has a slightly different body and embodies the identical closed end 27, open end 28, beverage outlet 29, throat 32, threads 33, seal pocket 34, seal 47, end cap 40, collar nut 49, bladder 52, O-ring 54 and inlet check valve 56. The beverage inlet 30 includes an upward facing cylindrical connector receiver 75 for receiving a beverage probe-type connector 76 which can be on a one-way package of

beverage or on a pipe leading from a remote source. The inlet 30-7 has a bottom 77 which supports the check valve 56 and an annular wiping seal 78 which sealingly engages the connector 76 during insertion, removal and resting in place. Within the receiver 75 is a piercing element 79 for opening a tamper-proof seal on the connector 76. The checking fill valve 56 is within the piercing element 79 and below the level of the piercing element 79. The bottom 77 has a flattened section in the body 26-7 from which the check valve 56 hangs in a normally open position, and against which the check valve 56 seats for closing the inlet 30. An opaque spillage tray 80 is above the pump 25-7 and is held in compression against the body 26-7 by a fastener 781 on the receiver 75. The pump 25-7 is supported by the tray 80, and the tray is compressed between the body 26-7 and the fastener 781. The tray 80 has a recess 82 about the collar nut 49 which enables removal of the collar nut 49, end cap 40 and bladder 52 from the body 26-7 by manipulation of the nut 49 while the body 26-7 remains secured to the tray 80. The body 26-7 and end cap 40 are transparent, enabling easy inspection of the pump 26-7 and the bladder 52. Several pumps 25-7 are secured side by side to the tray 80 and the tray 80 is supported by a dispensing machine frame (not shown). The tray 80 and pumps 25-7 may be removed together and washed, inspected and replaced as a unit. The tray 80 collects all spillage.

Reliability of the bladder 52 has been obtained with an ingenious mounting. The end cap 40 has the bladder holder 41 which in turn includes a constant diameter neck 83 extending inward from an end cap plate 84. At the inner end of the neck 83 and spaced from the end plate 84 is a head 85 of larger diameter tha

neck 83. The bladder 52 has a thickened collar 86 butted against the end cap plate 84 and the bladder tube 53 is of constant diameter and is stretched over the holder head 85 and onto the neck 83. The elastomeric ring 54 is in between the holder head 85 and the collar 86. The ring 54 has a major diameter which is greater than the diameter of the holder head 85 and the collar 86 has an outer diameter greater than the head 85 outer diameter. The head 85 diameter is at least equal to the mean diameter of the ring 54 and the outer diameter of the collar 86 is generallly equal to or greater than the major diameter of the ring 54. The bladder 52 is now easily replaced without need for tools. The bladder 52 is securely mounted and does not come off of the holder 41. The pump 25 will not explode because the bladder 52 will merely blow out and fracture at the beverage outlet 30 if over pressurised due to regulator failure.

The advantages of the apparatus 10 are many. There are no holes in the bottom 21 or sides of the tank 11. There are no metallic parts in contact with beverage and beverage flavour is excellent and devoid of any and all traces of metallic off-taste. The exterior finish of the tank 11 is no longer critical as there is no longer a need to seal against the outer surfaces of the tank 11. It is easy to disconnect the tank 11 and pump 25. It is easy to clean and flush the tank 11 and change beverages, and these functions can easily be done by untrained, or unskilled people in their homes. If the bladder 52 ruptures, there is no possibility of beverage leakage. The pump 25 is easily primed and there is no loss of beverage during priming. The tank 11 and pump 25 are very easy to sanitise. When the pump 25 and tank 11 are disconnected, the nozzle 69 does not drain either forward

or backward. The pump 25 and tank 11 are very resistant to mould growth. The tank 11 and pump 25 are extremely clean and sanitary and they do not make or contribute to a mess from beverage spillage or leakage, and all parts of the tank 11 and pump 25 are easily run through a dishwasher. Most importantly, the apparatus is usable in a domestic household because it is simple, it is sanitary and not messy, it is foolproof and extremely reliable, it is leakproof, it is easily cleaned, it cannot explode, and it is easily diagnosed and repaired if not working as intended.

It will be appreciated that the pump unit, such as pump 25, could be mounted above the container for beverage and the pump would then suck the contents from the tank for subsequent passage to a dispensing nozzle. The beverage may be a syrup or a juice or may be a juice concentrate or may be wine, milk or other immediately potable liquid.

It will be appreciated that by using gas, particularly carbon dioxide, for the motive power for the pump there is no contamination of the beverage being dispensed even if the diaphragm or bladder should rupture. Furthermore it is particularly advantageous to use carbon dioxide with soft drinks dispense systems as there is frequently already available a source of compressed carbon dioxide. Furthermore the carbon dioxide, having powered the pump, may be vented to atmosphere without causing any mess or inconvenience.

CLAIMS:

1. A method of dispensing a potable beverage or beverage concentrate which comprises the steps of storing the beverage or beverage concentrate in a container (11), the container (11) being in fluid communication with a pump (25), the pump (25) including a body (26) enclosing a chamber having a first portion (58) and a second portion (59), an inlet (30) to the first portion (58) being in fluid communication with the container (11), the first portion (58) having an outlet (29) from the first portion for pumped egress of beverage or beverage concentrate from the first portion (58), the first (58) and second (59) portions being separated by a flexible diaphragm of generally cylindrical form (52), the second portion (59) having an entry port (42) for the flow of a propellant gas into the second portion (59), applying pressurised propellant gas to the entry port (42) to displace the diaphragm (52) to reduce the volume of the first portion (58) and to expel beverage or beverage concentrate from the first portion (58).

2. Beverage storing and dispensing apparatus for use in the method of Claim 1 and including

a a sanitary beverage storage tank (11) having a fill opening (12);

b a pressurisable fluid powerable beverage pump (25) within the tank (11), said pump (25) being insertable into the tank (11) and being removable from the tank (11) through the fill opening (12); and

c a fluid propellant line (68) connected to a propellant port (42) on the pump (25), and a beverage dispensing line (67) connected to an outlet (29) of the pump (25), both lines (68, 67) entering into the tank (11) through a wall (14) of the tank (11).

3. The apparatus of Claim 2 further characterised in that the fill opening (12) is sized so that the tank will accept an adult human hand through the fill opening (12).

4. The apparatus of any one of Claims 2 or 3 further characterised in that the lines (67, 68) extend through a top wall (14) of the tank.

5. The apparatus of any one of Claims 2 to 4 further characterised in that there is provided a pump nest (20) in the bottom of the tank (11).

6. The apparatus of any one of Claims 2 to 5 further characterised in that

a the beverage dispensing line (67) enters into the tank (11) through a top wall (14) of the tank (11);

b the dispensing line (67) has a disconnect (61) outside of the tank (11), said disconnect being connectable to a normally closed check valve (62) in a further length of dispensing line (63);

c the beverage pump (25) has a filling check valve (56) inside of and adjacent to a bottom of the tank (11); and in which

d the beverage tank (11), pump (25), delivery line (67) and disconnect (61) are all self-draining when the apparatus is inverted.

7. The apparatus of any one of Claims 2 to 6 further characterised in that the pump (25) is on the bottom of the tank (11) and the lines (67, 68) extend into the tank (11) from adjacent the top of the tank with there being a length of each line (67, 68) inside of the tank (11), each length of line being longer than a distance between the fill opening (12) and the entrance (17) into the tank of the lines (67, 68), said pump (25) being removable from the tank (11) through the fill opening (12) with

both lines (67, 68) intact and connected to the pump (25), said pump (25) having the diaphragm (52) in the form of a bladder (52) and means (49) for separating the bladder (52) from a body (26) of the pump (25) while leaving the lines (67, 68) connected, for cleaning of the pump (25) and replacement of the bladder (52) without disconnection of lines (67, 68).

8. A gas powerable beverage pump for use in the method of Claim 1, comprising:

a a tubular body (26) having a closed end (27), an open end (28), a beverage outlet (29), and a beverage inlet (30);

b an end cap (40) mounted in the open end (28), said cap (40) having a bladder holder (41) and a propellant port (42) passing through the bladder holder (41);

c a seal (37) between the end cap (40) and the body (26);

d a fastener (49) secured to the body (26), said fastener retaining the end cap (40) to the body (26); and

e an expandable elastomeric bladder (52) mounted upon the end cap (40).

9. The pump of Claim 8 further characterised in that the body (26), end cap (40) and fastener (49) are formed entirely of a food-grade plastics material, and in which the body (26) has a thickened round throat (32) at the open end (28), a male thread (33) on the thickened throat (32), and a seal pocket (34) in the throat (32), said fastener (49) being held to the body (26) by the threads (33) upon the throat (32).

10. The pump of Claim 8 or Claim 9 further characterised in that the end cap (40) includes an

outwardly extending nose (44) having an outer end substantially beyond the collar nut (48), and in which the propellant port (42) includes a laterally projecting connector which is in between the fastener (41) and the nose outer end (44).

11. The pump of any one of Claims 8 to 10 further characterised in that the bladder holder (41) has a constant diameter neck extending from an end cap plate (40), and a head of larger diameter than the neck, said head being inward of and spaced from the end cap plate (40), in which the bladder closed end (52) is an elongate tube having an open end stretched over the holder head and onto the neck, said open end having a substantially thickened annular collar butted against the end cap, and including an elastomeric ring (54) retaining the bladder (52) to the holder (41), said ring (54) being between the holder head and the bladder collar, said ring having a greater major diameter than an outer diameter of the holder head and said bladder collar having an outer diameter greater than the head outer diameter.

12. Beverage dispensing apparatus for use in the method of Claim 1 and powerable by compressed gas, comprising:

a a normally non-pressurised sanitary beverage pump (25) having a beverage pumping chamber (58), a beverage inlet (30) to the chamber (58), a beverage outlet (29) from the chamber, and a propellant chamber (59) for receiving propellant gas;

b a non-pressurised beverage supply tank (11, 76) having a breather to atmosphere (12, 24) and a normal liquid level which is substantially above a level of the pump beverage chamber (58), said

pump inlet (30) being in fluid communication with the tank (11, 76) so that beverage can flow from the reservoir (11, 76) into the pumping chamber (58) under the influence of gravity and without pressurisation or suction;

c an inlet valve (56) in the pump inlet (30) to prevent flow of beverage from the pumping chamber (58) to the tank (11, 76);

d a flexible bladder (52) in the pump (25), said bladder (52) forming one wall of the pumping chamber (58) and dividing the pumping chamber (58) from the propellant chamber (59), said bladder (52) being expandable under compressed gas propellant pressure for expelling beverage from the pumping chamber (58) to a dispensing nozzle (69); and

e gas control means (70) to selectively and intermittently supply compressed gas to the pump propellant chamber (59) for expanding the bladder (52) and expelling the beverage to a dispensing nozzle (69).

13. The apparatus of Claim 12 further characterised in that the compressed gas is selected from carbon dioxide and compressed air.

14. The apparatus of Claim 12 or Claim 13 further characterised in that the pump (25) and the inlet valve (30) are inside of the tank (11).

15. The apparatus of any one of Claims 12 to 14 further characterised in that the propellant gas is exhausted to air after expanding the bladder (52), permitting the bladder (52) to contract to refill the beverage chamber (58).

16. A method of pneumatically dispensing a potable beverage or beverage concentrate comprising the steps of:

storing a supply of beverage or beverage concentrate at ambient pressure in a container (11) having a normally non-pressurized pneumatic pump (25) therein;

filling the pump (25) in situ within the container (11);

pneumatically pressurizing the pump (25) from outside the container (11), while the pump (25) is in the container (11) and without pressurizing the supply or the container (11);

pneumatically expelling beverage or beverage concentrate which was in the pump (25) from the pump (25) and from the container (11) to a remote dispensing head (69) from which dispensing is completed;

depressurising the pump (25) and terminating dispensing;

evacuating used propellant gas from the pump (25) to outside of the container (11); and

refilling the pump (25) in situ within the container (11), all without pressurization of the container or the supply.

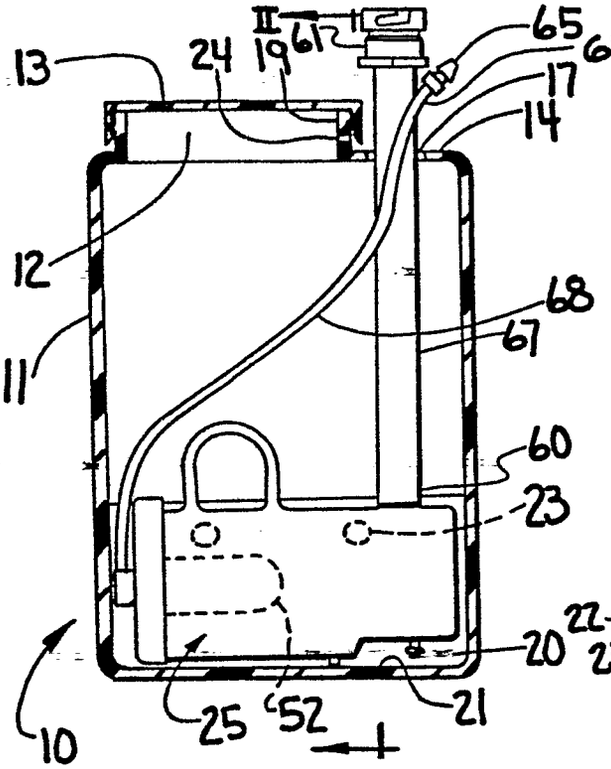


FIG.1

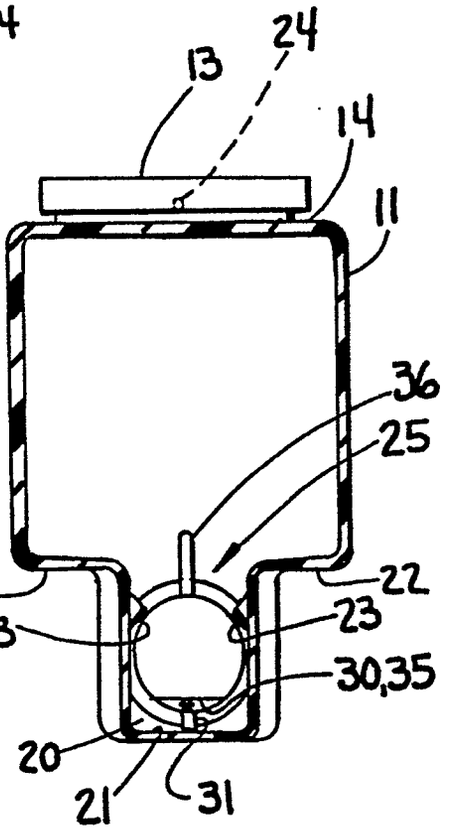


FIG.2

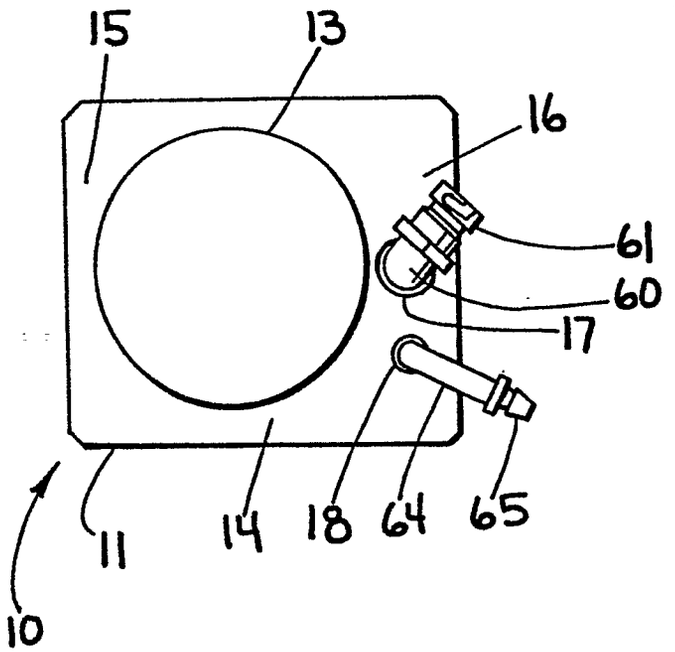


FIG.3

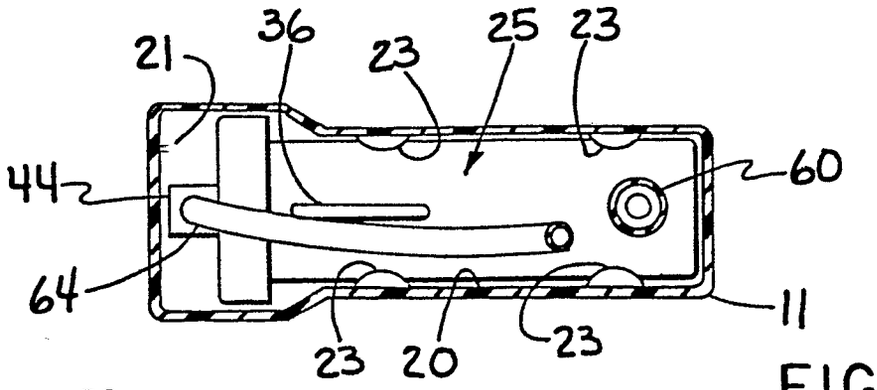


FIG. 4

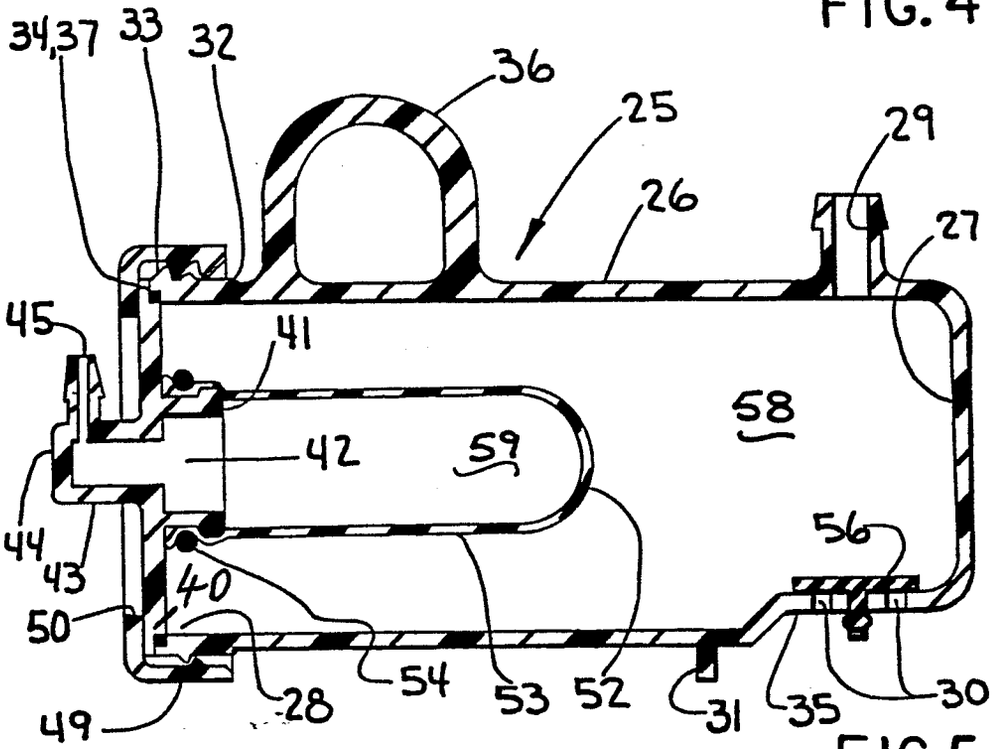


FIG. 5

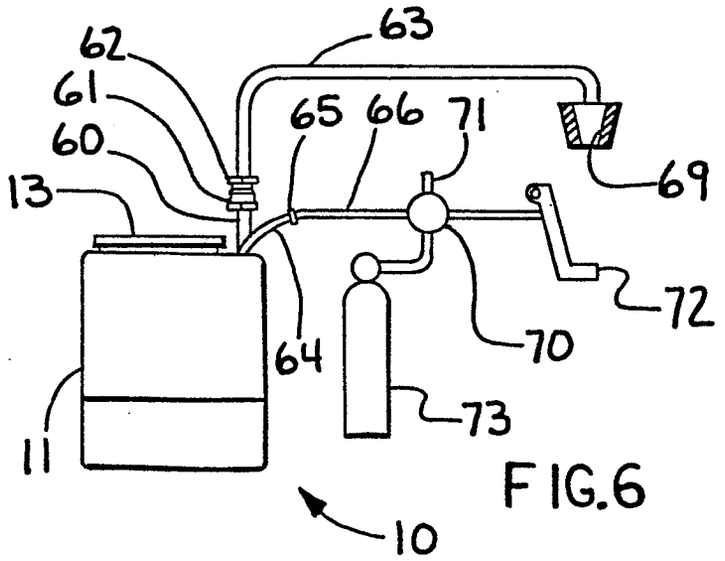
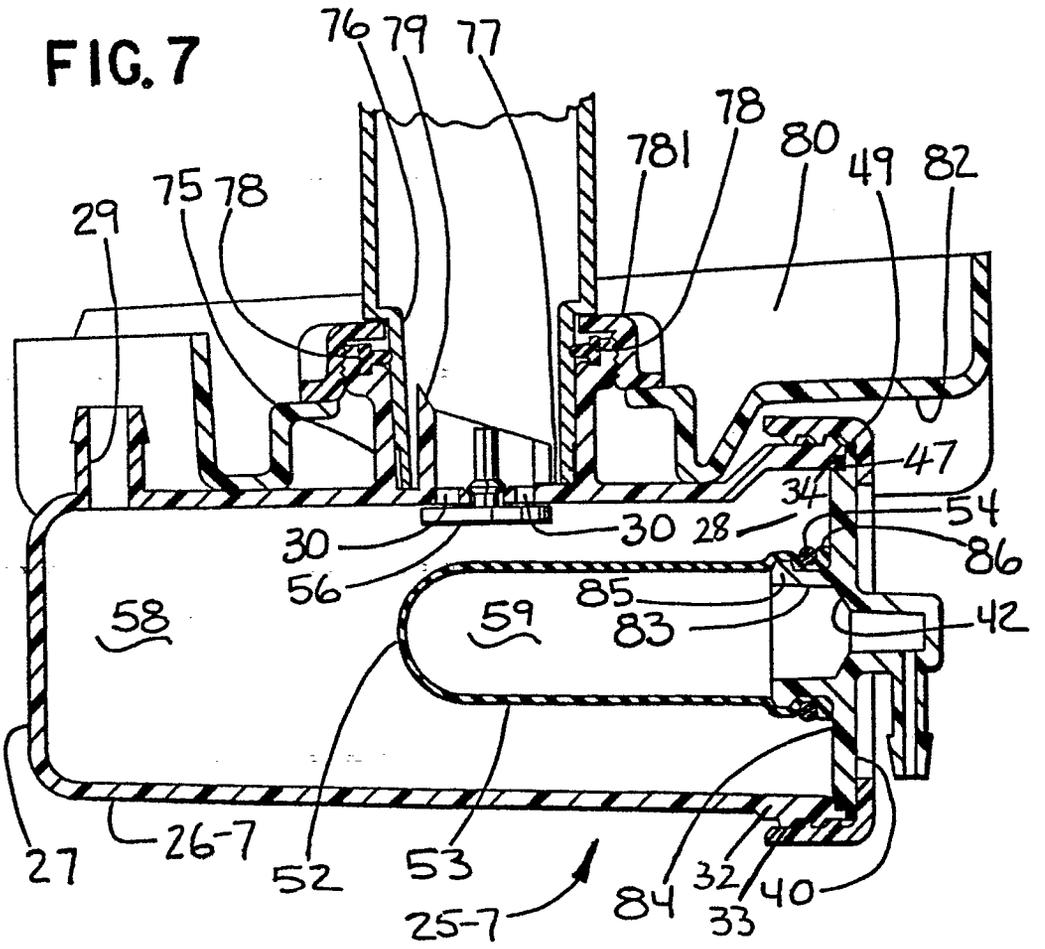


FIG. 6

FIG. 7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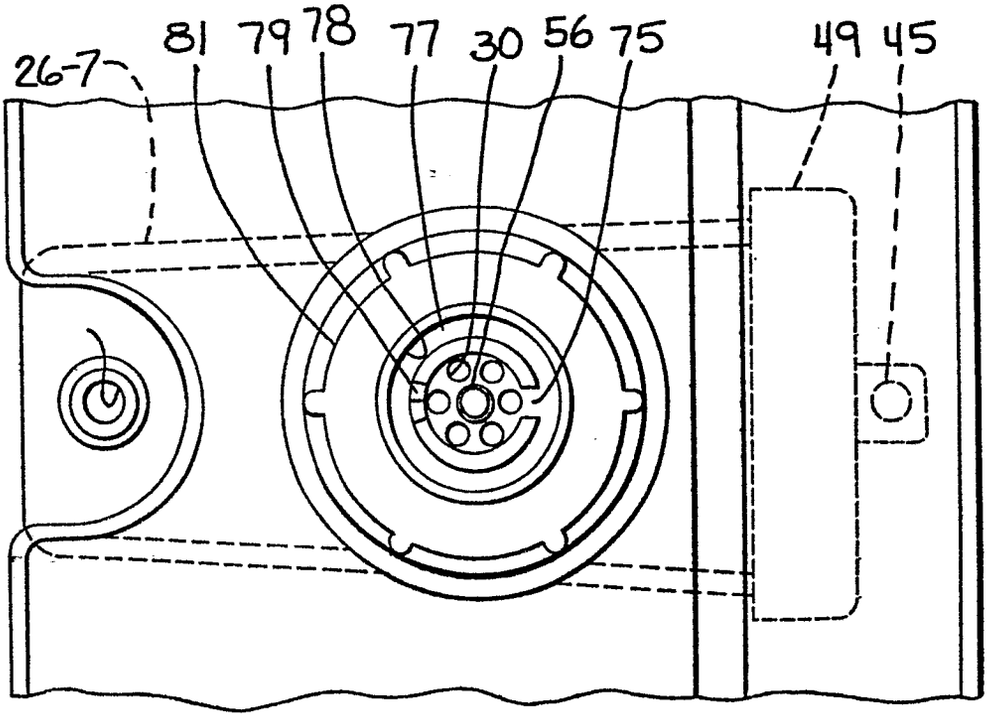
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FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

0115166
Application number

EP 83307790.2

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Y	DE - A1 - 2 715 153 (RÜTHER) * Claims 1-3,5,9,11; fig. 7 * --	1-4,6-9,11,12,14-16	B 67 D 1/04 F 04 B 43/10
Y	US - A - 3 144 177 (COOKSON) * Column 2, line 36; fig. 1-3 * --	1-4,6-9,11,12,14-16	
Y	GB - A - 2 089 902 (NIPPON ZEON CO. LTD.) * Page 2, lines 48,53; fig. 1-4 * --	1-4,6-9,11,12,14-16	
Y	DE - A - 1 911 525 (DE STEFANI) * Pages 2-4; fig. 1 * --	1-4,6-9,11,12,14-16	
A	US - A - 2 837 246 (STEELE) * Fig. 5 * --	5	TECHNICAL FIELDS SEARCHED (Int. Cl. ³) B 65 D 25/00 B 67 D 1/00 B 67 D 5/00 F 04 B 43/00
A	US - A - 3 377 004 (KJELSON) * Fig. 4 * --	10	
A	GB - A - 678 622 (MATHEWS) * Fig. 9 * ----	9,11	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	30-03-1984	TROJAN

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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