

[54] **LIQUID DISPENSING APPARATUS**

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[51] Int. Cl. **B65d 83/14**

[58] Field of Search **137/209, 391; 222/394, 67, 222/68**

[56] **References Cited**

UNITED STATES PATENTS

3,643,678 2/1972 Genrich 137/209

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[57]

ABSTRACT

A liquid dispensing apparatus receives liquid at atmospheric or other reservoir pressure and dispenses the liquid at a higher pressure established by a supplied gas. The apparatus includes an inlet reservoir, a delivery chamber in which liquid is maintained under pressure, and a pressurizing chamber. As liquid is dispensed from the delivery chamber, appropriate valves cooperate repetitively to feed a quantum of liquid from the reservoir to the pressurizing chamber, to pressurize this quantum of liquid, and to provide the pressurized liquid to the delivery chamber to restore the level therein. This cyclic pressure amplification is powered only by the supplied gas pressure; no pump is used.

17 Claims, 15 Drawing Figures

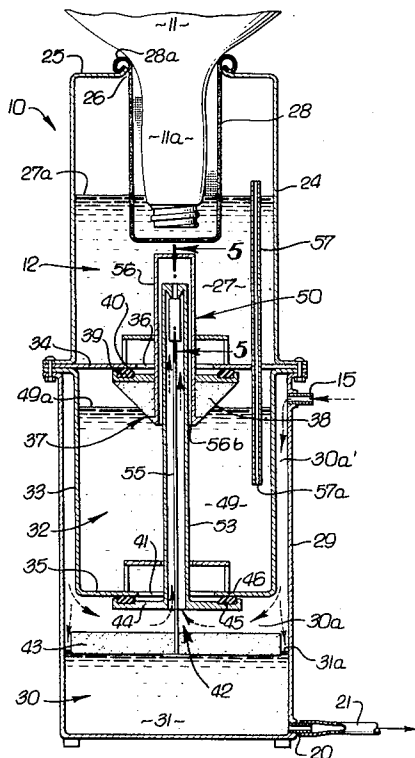


FIG. 1.

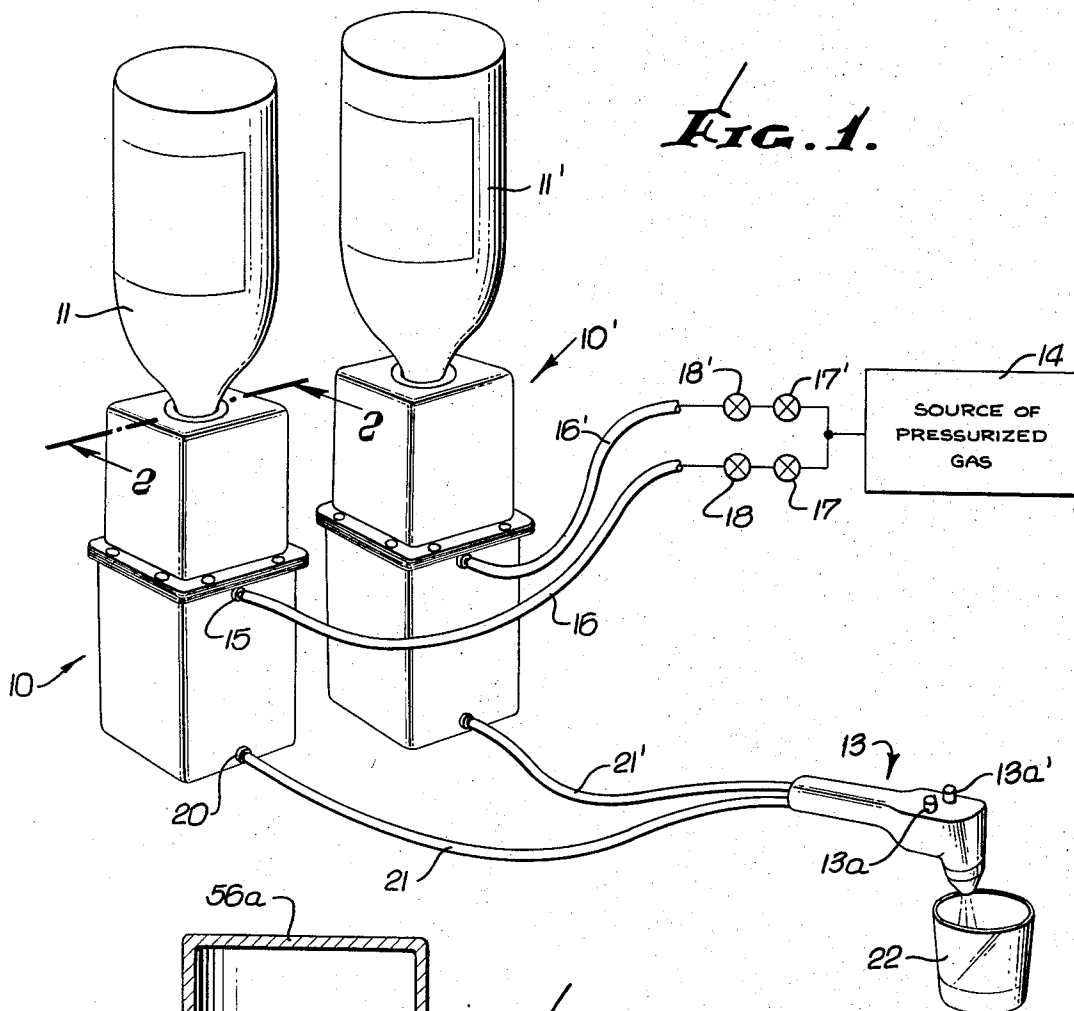
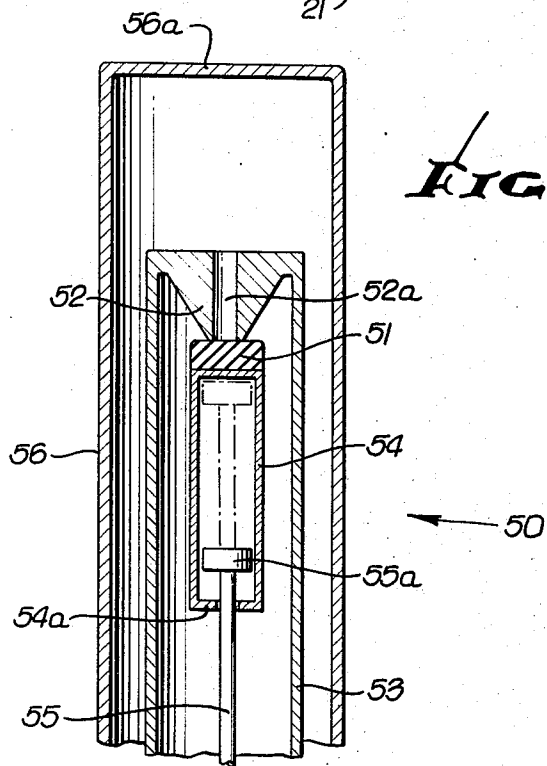


FIG. 5.



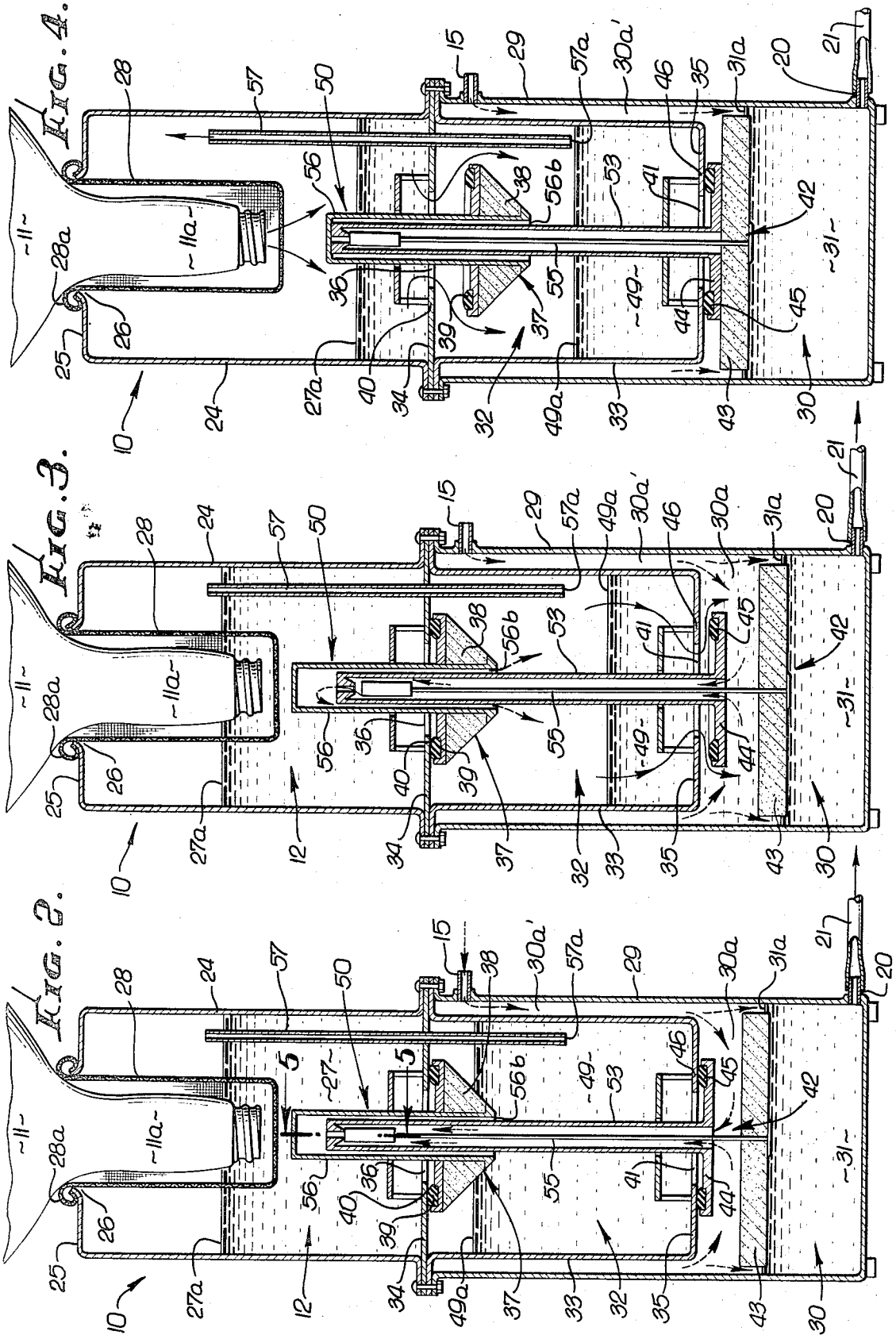


FIG. 6.

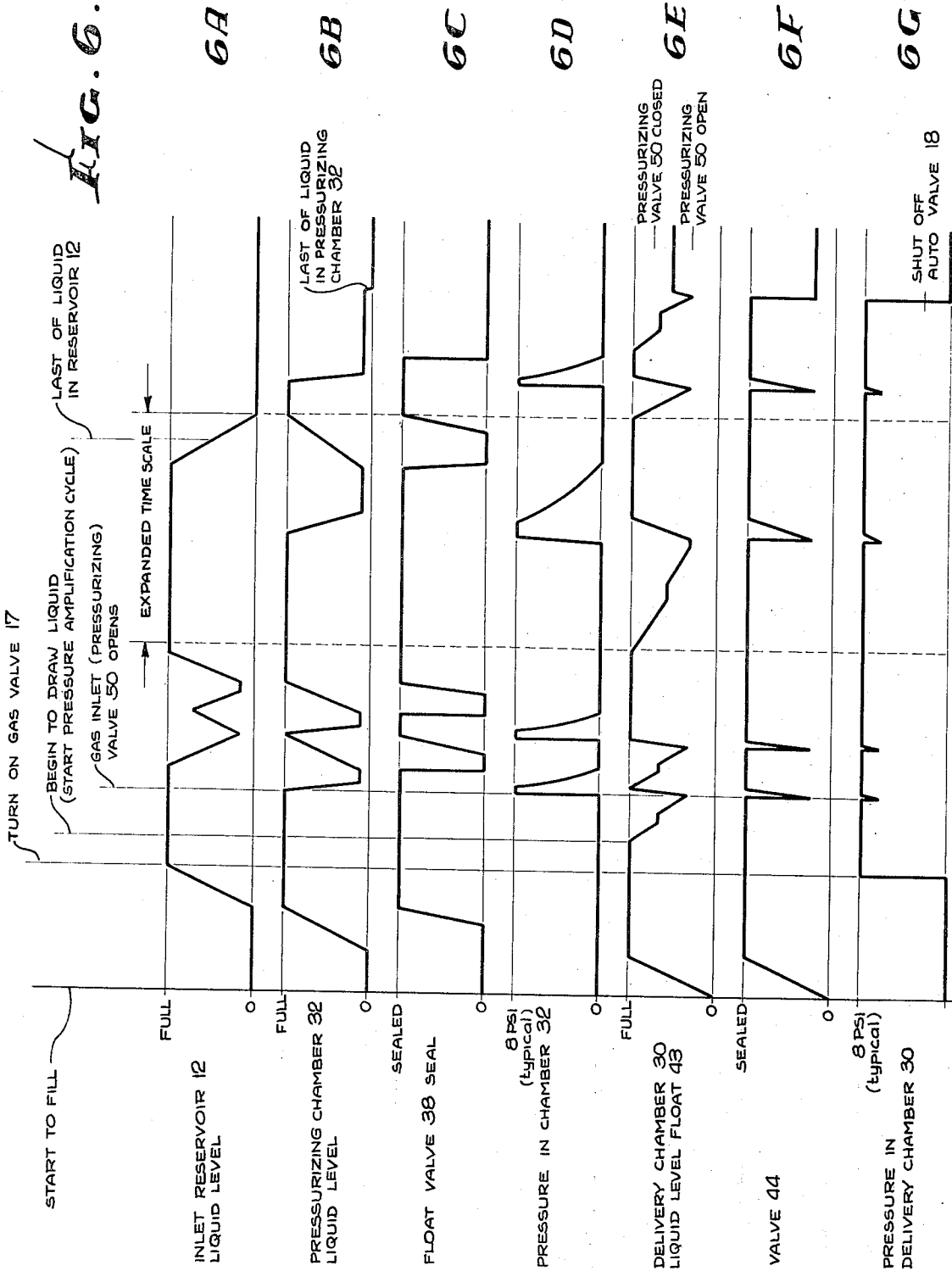


FIG. 7.

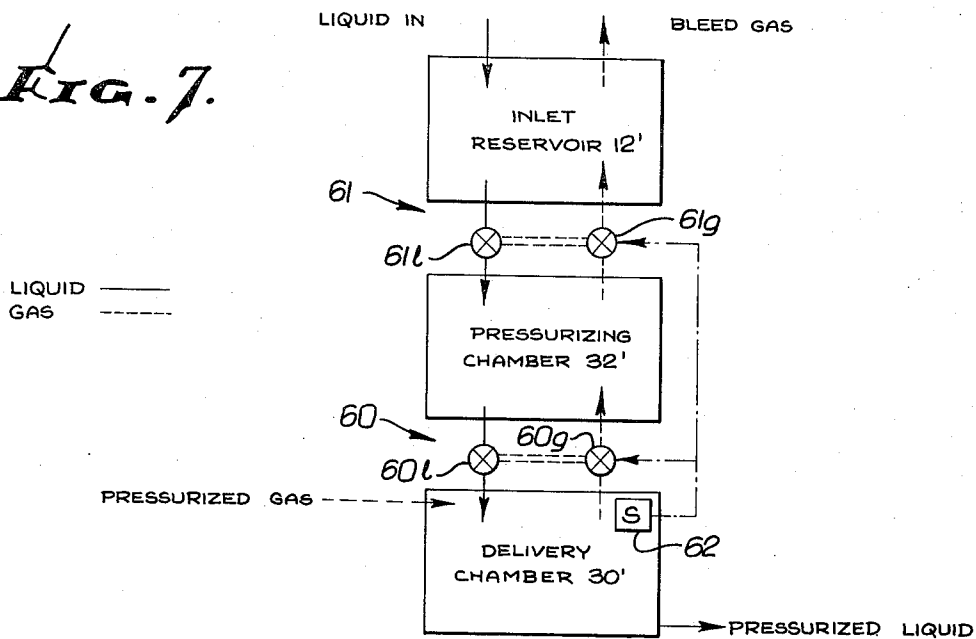
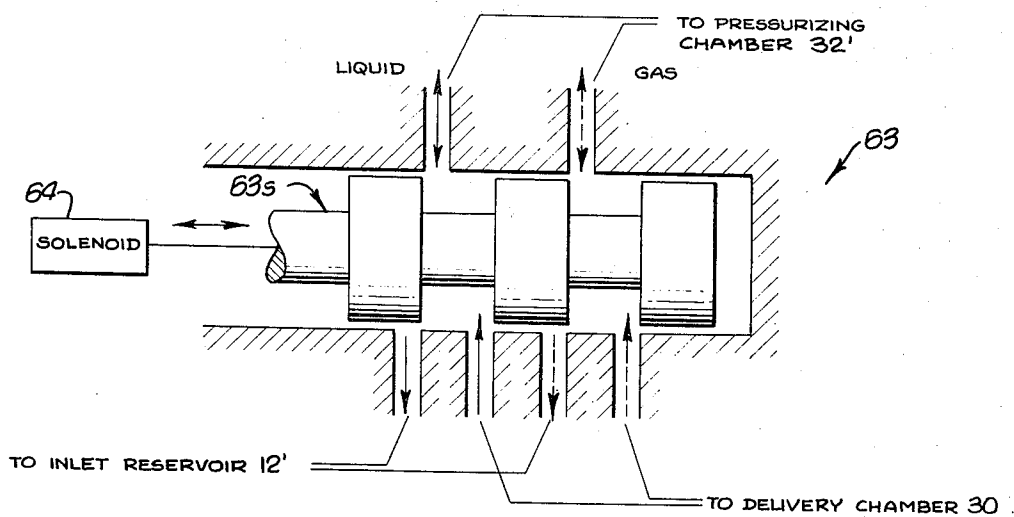


FIG. 8.



LIQUID DISPENSING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a liquid dispensing apparatus wherein a liquid received at one pressure is delivered at a higher pressure established by a supplied gas. The apparatus employs cyclic pressure amplification.

2. Description of the Prior Art

For many applications it is desirable to dispense a liquid at a pressure higher than that at which the liquid is supplied. For example, in commercial bar installations the mixing of drinks would be simplified by providing a multiple channel device through which a variety of bottle-supplied liquors might be dispensed. Such systems are known for dispensing carbonated beverages, which are readily pressurized by the compressed carbon dioxide (CO₂) used for carbonation.

Liquor could be gravity fed to a dispensing nozzle, but this has the impractical requirement that the liquor bottles must be situated above the level of the liquid outlet. Alternatively, a pressure cap may be provided on each bottle and CO₂ or compressed air used directly to pressurize the liquor in the bottle. This approach is functional, but has certain disadvantages. First, as each bottle is emptied the pressure cap must be removed and reinstalled on the new bottle. Secondly, since liquor bottles are not designed intentionally to withstand substantial pressure, the bottles may explode should the pressure accidentally increase.

A pump or turbine could be used for pressurized liquid delivery. However this is impractical for liquor dispensing applications.

If the pump is turned on each time a drink is poured, there is a delay as the pump comes up to speed; this delay complicates accurate control of the dispersed volume of liquor. To maintain the pump running at all times might require recirculation facilities incompatible with a simple bar installation.

An object of the present invention is to provide a dispensing apparatus which accepts a liquid at atmospheric or other reservoir pressure and which dispenses the liquid at a higher pressure established by a gas such as CO₂ or compressed air supplied to the apparatus. For bar applications, the apparatus permits a bottle of liquor to be upended or poured into an inlet reservoir at atmospheric pressure. A supply of the liquid is maintained in a chamber at delivery pressure to be dispensed on demand. As the liquid is dispensed, the delivery chamber is replenished with additional liquid under pressure. The operation is powered only by gravity and the pressure of the supplied gas; no pump or turbine is used.

SUMMARY OF THE INVENTION

The foregoing and other objects of the invention are achieved by providing a liquid dispensing apparatus employing cyclic pressure amplification. The apparatus includes an inlet reservoir, a delivery chamber in which liquid is maintained under pressure, and a pressurizing chamber. As liquid is dispensed from the delivery chamber, appropriate valves cooperate repetitively to feed a quantum of liquid from the reservoir to the pressurizing chamber, to pressurize this quantum of liquid,

and to provide the pressurized quantum of liquid to the delivery chamber to restore the liquid level therein.

In a preferred embodiment, the inlet reservoir, pressurizing chamber and delivery chamber are mounted above one another to permit gravity flow from the inlet reservoir to the pressurizing chamber and thence to the delivery chamber. Liquid in the delivery chamber is maintained under pressure of a supplied gas such as compressed air or CO₂. As liquid is dispensed, a float opens an inlet valve which admits gas into the pressurizing chamber to pressurize the quantum of liquid therein. When this quantum of liquid is at the same pressure as that in the delivery chamber, a valve seal between the chambers opens and the pressurized liquid flows into the delivery chamber. Thereafter the gas inlet is closed, the pressurizing chamber is closed off from the delivery chamber, and the pressure in the pressurizing chamber is reduced via a vent tube. A float valve mechanism between the pressurizing chamber and the inlet reservoir opens to admit the next quantum of liquid at low pressure from the reservoir. Entry of this liquid causes the float valve mechanism to close, completing the pressure amplification cycle. The cycle repeats so long as liquid is dispensed from the delivery chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

A detailed description of the invention will be made with reference to the accompanying drawings wherein like numerals designate corresponding elements in the several figures.

FIG. 1 is a pictorial view of the inventive liquid dispensing apparatus in a typical application.

FIG. 2 is a transverse sectional view of the liquid dispensing apparatus of FIG. 1, as seen along the line 2—2 thereof, at the beginning of a pressure amplification cycle.

FIGS. 3 and 4 are sectional views like FIG. 2, but at different steps in the pressure amplification cycle.

FIG. 5 is a fragmentary sectional view of the gas inlet valve used in the apparatus of FIG. 2, as seen along the line 5—5 thereof.

FIG. 6 includes graphs 6A through 6G illustrating the pressure amplification cycle of the FIG. 2 apparatus.

FIG. 7 is a schematic view of an alternative liquid dispensing apparatus in accordance with the present invention.

FIG. 8 shows a shuttle valve useful with the apparatus of FIG. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following detailed description is of the best presently contemplated modes of carrying out the invention. This description is not to be taken in a limiting sense, but is made merely for the purpose of illustrating the general principles of the invention since the scope of the invention best is defined by the appended claims.

Operational characteristics attributed to forms of the invention first described also shall be attributed to forms later described, unless such characteristics obviously are inapplicable or unless specific exception is made.

FIG. 1 illustrates use of the inventive apparatus 10 in a system for dispensing liquor or other beverage from a bottle 11. Liquid from the upended bottle 11 enters a reservoir 12 within the apparatus 10 at atmospheric

pressure, and is dispensed via a hand-held, valved nozzle 13 at a higher, delivery pressure established by the pressure of a gas supplied to the apparatus 10 from a source 14. Typically the source 14 may comprise an air compressor, tank of CO₂ or the like, connected to the gas inlet 15 of the apparatus 10 via a conduit 16, a manual valve 17 and an automatic shut-off valve 18.

When a valve 13a on the nozzle 13 is opened, liquid is dispensed from the apparatus 10 via an outlet 20, a conduit 21, the valve 13a and the nozzle 13 into a glass 22. The liquid is delivered from the apparatus 10 at higher than atmospheric pressure, so that the nozzle 13 may be situated at a level higher than the apparatus 10. A second, like apparatus 10' also receives pressurized gas from the source 14 via the valves 17', 18' and conduit 16'. The apparatus 10' may be used to dispense a different beverage from a bottle 11' via a hose 21' and another valve 13a' on the nozzle 13. With this arrangement the bartender can mix drinks with fingertip beverage selection and availability.

As shown in FIG. 2, the inlet reservoir 12 comprises the upper portion of the apparatus 10 enclosed by a side wall 24 and a top 25. An opening 26 in the top 25 receives the neck 11a of the upended bottle 11 from which liquid 27 at atmospheric pressure enters the reservoir 12 to a certain liquid level 27a therein. A filter screen 28 depends from a loose seal 28a around the opening 26. At the bottom of the apparatus 10, surrounded by an outer wall 29, is a delivery chamber 30 containing liquid 31 at a delivery pressure higher than that of the reservoir 12 pressure. The liquid 31 is maintained under pressure of gas (indicated by the broken arrows) from the source 14 supplied via the inlet 15 to a delivery chamber region 30a communicating to the surface 31a of the liquid 31.

A pressurizing chamber 32 is situated between the inlet reservoir 12 and the delivery chamber 30. In the embodiment shown, the side wall 33 of the pressurizing chamber 32 is spaced within the outer wall 29, with an annular region 30a' of the delivery chamber 30 extending therebetween. This arrangement is not imperative, and the pressurizing chamber 32 could extend to an outer wall.

A rigid plate 34 separates the inlet reservoir 12 from the pressurizing chamber 32, and a bottom plate 35 separates the pressurizing chamber 32 from the delivery chamber 30. An opening 36 permits liquid flow from the reservoir 12 to the pressurizing chamber 32 under control of an upper valve mechanism 37. The mechanism 37 includes a float valve 38 which closes a seal 39 against an upper valve seat 40 comprising a shoulder of the plate 34 surrounding the opening 36. Fluid flow from the pressurizing chamber 32 to the delivery chamber 30 is via an opening 41 controlled by a lower valve mechanism 42 including a float 43, an annular, disc-shaped valve member 44, a seal 45 and a lower valve seat 46 comprising a shoulder of the plate 35 surrounding the opening 41.

When the valve 13a is opened to dispense liquid 31 under pressure, the liquid level 31a in the delivery chamber 30 drops, lowering the level of the float 43 (FIG. 2). This initiates a pressure amplification cycle during which (a) a quantum 49 of liquid in the chamber 32 is pressurized by gas admitted through a gas inlet valve 50, (b) the pressurized quantum 49 of liquid is provided to the delivery chamber 30 to replenish the liquid 31 therein (FIG. 3), and (c) another quantum of

liquid is admitted from the reservoir 12 to the pressurizing chamber 32 (FIG. 4). At the beginning of each cycle the liquid level 49a within the chamber 32 is sufficiently high so that the float 38 closes the seal 39 across the opening 36, as shown in FIG. 2.

The gas inlet valve 50 is controlled by the lower valve mechanism 42. As shown in FIG. 5, the valve 50 comprises a rubber seal 51 which cooperates with a valve seat 52 formed at the upper end of a tube 53 which extends through the chamber 32 and the opening 41 and joins the annular member 44. The tube 53 communicates to the chamber region 30a. The valve seal 51 is attached to the upper end of a valve member 54 slidably disposed about the flanged upper end 55a of a rod 55 extending upwardly from the float 43 within the tube 53. The upper portion of the tube 53 itself is situated within a tube 56 extending upwardly from the float valve 38. The upper end 56a of the tube 56 is closed, and the lower end 56b is open and communicates to the pressurizing chamber 32.

The pressure in the delivery chamber region 30a at the beginning of a pressure amplification cycle (FIG. 2) is higher than in the pressurizing chamber 32. This pressure differential maintains the annular valve member 44 sealed across the opening 41 as the float 43 level drops. As the float 43 drops the rod 55 moves downward within the sliding valve member 54. When sufficient displacement of the float 43 has occurred, the rod upper end 55a contacts the inwardly flanged lower end 54a of the valve member 54 and pulls the member 54 and the seal 51 away from the valve seat 52 to open the gas inlet valve 50 (FIG. 3). Gas under pressure then flows from the delivery chamber region 30a up the tube 53, past the valve seat 52, through the central opening 52a therein, and thence through the annular space between the tubes 53, 56 into the pressurizing chamber 32. This rapidly pressurizes the quantum 49 of liquid within the chamber 32.

Since the quantum 49 of liquid in the pressurizing chamber 32 now is under the same pressure as the liquid 31 in the delivery chamber 30, there is no pressure differential across the valve member 44. As a result, the member 44 drops toward the float 43, permitting liquid 49 to flow through the opening 41 into the delivery chamber 30, restoring the liquid level therein. While this occurs, the member 44 pulls the tube 53 and the valve seat 52 downward into contact with the valve seal 51. The sliding valve member 54 may be pushed upward at the same time by the rod 55 as the float 43 rides upward atop the replenished liquid in the chamber 30.

The chamber sizes are selected so that when the lower valve mechanism 42 is closed by the float 43, the entire quantum 49 of fluid from the pressurizing chamber 32 will have been transferred to the delivery chamber 30. During this liquid transfer, indicated by the solid arrows in FIG. 3, the upper valve mechanism 37 remains closed. The conical undersurface of the float valve 38 has sufficient area so that the elevated gas pressure within the chamber 32 keeps the float valve 38 sealed across the opening 36.

A vent tube 57 extends from the pressurizing chamber 32 to the inlet reservoir 12 above the liquid level 27a. The bottom 57a of the vent tube 57 is below the liquid level 49a (FIG. 2). Thus when the quantum 49 of liquid first is pressurized, some liquid is driven out through the tube 57. The flow is minimal. After the liquid 49 has been transferred to the delivery chamber 30

and the lower valve mechanism 42 has closed, the pressurized gas in the chamber 32 is vented to reservoir 12 pressure via the tube 57. The diameter of this tube 57 is selected so that the time taken to vent the chamber 32 to reservoir pressure is sufficient to maintain the upper valve mechanism 37 closed during the entire transfer of the liquid quantum 49 to the delivery chamber 30.

Thereafter, when the pressure in the chamber 32 has been vented down to reservoir 12 pressure, the float valve 38 will drop away from the opening 36 (FIG. 4). As a result, sufficient fluid will flow from the inlet reservoir 12 to refill the pressurizing chamber 32 to the level 49a at which the float valve 38 again closes across the opening 36. This new supply of liquid constitutes the quantum 49 of liquid which is pressurized and provided to the delivery chamber 30 during the next pressure amplification cycle.

Pressure amplification cycling of the apparatus 10 continues so long as liquid is dispensed via the outlet 20 or until the supply of liquid from the bottle 11 is exhausted and no more liquid remains in the delivery chamber 30. In the instance, gas flow to the apparatus automatically is shut off.

Since no liquid is supplied from the now empty bottle 11, the float valve 38 will not close. Thus when the last available liquid 31 is dispensed from the chamber 30, the float 43 will open the gas inlet valve 50. Gas from this valve 50 will flow through the pressurizing chamber 32, past the open float valve 38 into the inlet reservoir 12 and thence to the atmosphere. This flow rate will be greater than that accommodated by the manual supply valve 17. As a result, pressure in the delivery chamber 30 will drop sufficiently to cause closure of the automatic shut-off valve 18. The valve 18 may be manually resettable to permit resumption of operation when a new supply of liquid is provided to the apparatus 10.

The graphs 6A through 6G (FIG. 6) summarize operation of the liquid dispensing apparatus 10. At the beginning of a pressure amplification cycle the graph 6E indicates that the delivery chamber 30 is full and that the float 43 is at a height sufficient to shut off the gas inlet (pressurizing) valve 50. The graph 6F indicates that the valve 44 and the seal 45 are closed against the valve seat 46 to cover the opening 41. The graph 6G indicates that the pressure in the delivery chamber 30 is at the value of the gas supplied from the source 14. The graphs 6B and 6C respectively indicate that a quantum 49 of fluid is present in the pressurizing chamber 32 and that the upper valve mechanism 37 is shut.

As the delivery chamber 30 fluid level (graph 6E) drops sufficiently to open the gas inlet valve 50, the pressure in the chamber 32 increases abruptly (graph 6D). Concomitantly, the valve 44 opens (graph 6F) to admit the quantum 49 of liquid to the delivery chamber 30. The level of liquid fluid therein rises (graph 6E) to a level sufficient again to close the valve 44. The pressure in the chamber 32 bleeds off (graph 6D) through the vent tube 57 until the pressure has dropped sufficiently to cause the float valve 38 to open (graph 6C). As a result, the next quantum of fluid is admitted to the pressurizing chamber 32 (graph 6B) to complete the pressure amplification cycle. The next pressure amplification cycle is initiated immediately if liquid still is being delivered via the outlet 15.

In an alternative embodiment shown schematically in FIG. 7, the delivery chamber 30' and the pressurizing chamber 32' are interconnected by a pair of simultaneously operated valves 60l and 60g controlling liquid and gas flow respectively. Similarly, a pair of simultaneously operated valves 61l and 61g control liquid and gas flow respectively between the pressurizing chamber 32' and the inlet reservoir 12'.

A level sensor 62 causes the valve set 60 to open and the valve set 61 to close when the liquid level in the delivery chamber 30' drops below a certain level. This causes the quantum of liquid in the chamber 32' to be pressurized and transferred to the delivery chamber 30' to replenish the level therein. When the delivery chamber 30' is full, the valves 60l, 60g close and the valves 61l, 61g open the vent chamber 32' to reservoir (e.g., atmospheric) pressure and to deliver a new quantum of liquid to the pressurizing chamber 32'.

The shuttle valve 63 of FIG. 8 is useful with the system just described. A solenoid 64 or other device cooperates with the level sensor 62 to shift the shuttle 63s from the position shown (corresponding to having the valve set 60 open and the valve set 61 closed) to the alternate position permitting communication between the reservoir 12' and the pressurizing chamber 32'.

Alternatively, the interchamber valves shown in FIG. 7 may be controlled by separate level sensors (not shown) in the chambers 30' and 32', interconnected so that both valve sets 60, 61 cannot be opened at the same time.

Rather than pour liquid from a bottle 11 directly into the reservoir 12, a fill tank (not shown) may be used with the apparatus 10. The fill tank may receive liquid from several bottles and have a single outlet supplying the liquid to the reservoir 12. Such an arrangement would permit a bartender at one time to arrange the dispensing of several bottles of the same liquor, and eliminate the need to replace the single bottle 11 each time it is emptied.

Intending to claim all novel, useful and unobvious features shown or described we make the following claims:

1. Liquid dispensing apparatus comprising:
 - reservoir means for receiving liquid at reservoir pressure,
 - a delivery chamber containing liquid subjected to the pressure of a gas supplied to said delivery chamber at a delivery pressure higher than said reservoir pressure,
 - a pressurizing chamber receiving a quantum of liquid from said reservoir means at reservoir pressure,
 - a gas inlet controlling the flow of said gas from said delivery chamber to said pressurizing chamber, opening of said valve permitting said gas to pressurize the quantum of liquid in said pressure chamber, said valve being closed when the pressurized quantum of liquid is delivered to the delivery chamber to restore the liquid level therein,
 - liquid level control means for opening said gas inlet valve when the liquid level in said delivery chamber drops below a certain value, and
 - valve seal means for controlling liquid input to said delivery chamber, said valve seal means opening to admit said pressurized quantum of liquid, said valve seal means thereafter being closed by said liquid level control means as said pressurized quan-

tum of liquid restores the liquid level in said delivery chamber.

2. Liquid dispensing apparatus according to claim 1 further comprising:

vent means for venting said pressurizing chamber to reservoir pressure after said pressurized quantum of fluid has been provided to said delivery chamber.

3. Liquid dispensing apparatus comprising:

reservoir means receiving liquid at a reservoir pressure,

a delivery chamber containing liquid subjected to the pressure of a gas supplied to said apparatus at a higher delivery pressure, and

pressure amplification means for accepting a quantum of liquid from said reservoir means at reservoir pressure, and for pressurizing and providing the accepted quantum of liquid to said delivery chamber, including:

a pressurizing chamber receiving said quantum of liquid from said reservoir means,

a gas inlet valve controlling the flow of said gas to said pressurizing chamber, said valve being opened when the liquid in said delivery chamber drops a certain level to permit pressurization of said quantum of liquid by said gas, said valve being closed when the pressurized quantum of liquid is provided to the delivery chamber to restore the liquid level therein,

vent means for venting said pressurizing chamber to reservoir pressure after said pressurized quantum of fluid has been provided to said delivery chamber, and

float valve means controlling fluid flow from said reservoir means to said pressurizing chamber, said float valve means closing when a quantum of liquid has been accepted from said inlet reservoir means and thereafter opening when the pressure in said pressurizing chamber is vented to reservoir pressure.

4. Liquid dispensing apparatus comprising:

reservoir means receiving liquid at a reservoir pressure and

pressurizing means for delivering said received liquid at a higher delivery pressure established by the pressure of a gas supplied to said apparatus, said pressurizing means comprising;

a first chamber for containing pressurized liquid to be dispensed,

a second chamber,

a first valve means controlling fluid flow between said reservoir means and said second chamber, and

a second valve means controlling liquid and gas flow between said first and second chambers, said first and second valve means cooperating to pressurize and deliver a quantity of liquid from said second to said first chamber, and subsequently to transfer a new quantity of liquid at reservoir pressure from said inlet reservoir to said second chamber.

5. Liquid dispensing apparatus according to claim 4 further comprising:

level sensor means for initiating said cooperation when the liquid level in said second chamber drops below a certain level upon dispensing of said pres-

surized liquid, said cooperation continuing repetitively so long as said liquid is being dispensed.

6. Liquid dispensing apparatus according to claim 5 wherein said first and second valve means are implemented by a common shuttle valve actuated in response to said level sensor means.

7. Liquid dispensing apparatus according to claim 4 further comprising means for venting said second chamber to reservoir pressure subsequent to delivery of said pressurized quantity of liquid to said first chamber, to accommodate said transfer of a new quantity.

8. A liquid dispensing apparatus comprising:

a reservoir receiving liquid at atmospheric pressure, a delivery chamber for containing liquid to be dispensed,

means for supplying gas under pressure to said delivery chamber to maintain liquid contained therein at a delivery pressure higher than atmospheric, a pressurizing chamber between said reservoir and said delivery chamber, and

valve means cooperating repetitively to feed a quantity of liquid from said reservoir to said pressurizing chamber, to admit said supplied gas to said pressurizing chamber to pressurize said quantity of liquid to said delivery pressure, and to provide this pressurized quantity of liquid to said delivery chamber to replenish liquid dispensed therefrom, said valve means comprising:

level sensing means for sensing the level of liquid in said delivery chamber,

a gas inlet valve controlling the admission of supplied gas to said pressurizing chamber,

means for opening said gas inlet valve when the liquid level in said delivery chamber drops to below a certain level as liquid is dispensed therefrom, and

means for closing said gas inlet valve as said liquid level rises when said pressurized quantity of liquid is provided to said delivery chamber, said opening and closing means being responsive to said level sensing means.

9. A liquid dispensing apparatus according to claim 8 wherein said reservoir and said chambers are situated to permit gravity liquid flow from said reservoir to said pressurizing chamber and from said pressurizing chamber to said delivery chamber, and wherein said valve means further comprises:

an upper valve mechanism controlling fluid flow between said reservoir and said pressurizing chamber, and

a lower valve assembly controlling fluid flow between said pressurizing chamber and said delivery chamber.

10. A liquid dispensing apparatus according to claim 8 together with a liquid/gas vent tube extending into said pressurizing chamber below liquid level and venting to atmospheric pressure, the diameter of said vent tube presenting a relatively high resistance to the flow of liquid and a relatively lower resistance to the flow of gas, thereby permitting said quantity of liquid to be pressurized, and permitting the pressure in said pressurizing chamber to be reduced by gas outflow through said vent tube after said quantity of liquid has been provided to said delivery chamber.

11. A liquid dispensing apparatus comprising:

a reservoir receiving liquid at atmospheric pressure, a delivery chamber for containing liquid to be dispensed,

means for supplying gas under pressure to said delivery chamber to maintain liquid contained therein at a delivery pressure higher than atmospheric, a pressurizing chamber between said reservoir and said delivery chamber, said reservoir and said chambers being situated to permit gravity liquid flow from reservoir to said pressurizing chamber and from said pressurizing chamber to said delivery chamber, and

valve means cooperating repetitively to feed a quantity of liquid from said reservoir to said pressurizing chamber, to admit said supplied gas to said pressurizing chamber to pressurize said quantity of liquid to said delivery pressure, and to provide this pressurized quantity of liquid to said delivery chamber to replenish liquid dispensed therefrom, said valve means comprising;

an upper valve mechanism controlling fluid flow between said reservoir and said pressurizing chamber, and

a lower valve assembly controlling fluid flow between said pressurizing chamber and said delivery chamber, said lower valve assembly comprising a float and a valve sealing member, said valve assembly opening to permit liquid flow into said delivery chamber when said float is below a certain level and when the pressures in said pressurizing and delivery chambers are substantially equal, said valve assembly closing when the liquid level in said delivery chamber has been restored sufficiently to raise said float into valve closing contact with said sealing member.

12. A liquid dispensing apparatus according to claim 11 wherein said valve means further comprises;

a gas inlet valve controlling the admission of supplied gas to said pressurizing chamber,

means for opening said gas inlet valve when the float in said lower valve assembly drops to below a certain level as liquid is dispensed from said delivery chamber, and

means for closing said gas inlet valve as said float rises toward said valve closing contact.

13. A liquid dispensing apparatus according to claim 12 wherein said gas inlet valve comprises:

a first valve member situated at the end of a first tube extending through said pressurizing chamber from said sealing member, supplied gas reaching said first valve member from said delivery chamber via said first tube,

a linkage within said tube cooperating at one end with said float and at the other end with a second valve member, said first and second valve members coacting to control the flow of gas, and

concentric tube means for conducting gas from said tube to said pressurizing chamber when said first and second valve members separate to open said gas inlet valve.

14. A liquid dispensing apparatus according to claim 13 wherein said upper valve mechanism comprises a conical float mounted for vertical motion between a closed position blocking liquid flow between said reservoir and said pressurizing chamber and an open position permitting such flow, the area of said conical float being sufficient to maintain said float in said closed position when the gas pressure in said pressurizing chamber is greater than atmospheric, while said gravity of liquid is provided to said delivery chamber.

15. A liquid dispensing apparatus according to claim 14 wherein said concentric tube means comprises a second tube extending through and attached to said conical float, one end of said second tube opening into said pressurizing chamber, the other end being closed, said first and second valve members being within said second tube.

16. Liquid dispensing apparatus according to claim 11 further comprising:

vent means for venting said pressurizing chamber to atmospheric pressure after said pressurized quantity of liquid has been provided to said delivery chamber, said vent means being blocked when the next quantity of liquid has been fed to said pressurizing chamber from said reservoir.

17. A liquid dispensing apparatus according to claim 16 wherein said upper valve mechanism comprises:

a float component responsive to the liquid level in said pressurizing chamber and a sealing component for selectively blocking liquid flow between said reservoir and said pressurizing chamber, said float component and said sealing component cooperating to block said liquid flow when the gas pressure in said pressurizing chamber is greater than atmospheric, said sealing component opening to permit liquid flow from said reservoir to said pressurizing chamber after said pressurizing chamber has been vented to atmospheric pressure, and thereafter closing to block liquid flow when the liquid level in said pressurizing chamber reaches a preset level.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3 788 343 Dated January 29, 1974

Inventor(s) SAMUEL W. NEIDORF and HOWARD K. ARNOLD

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 1, Column 6, line 53, after "inlet" and before
"controlling" insert --valve--.

Claim 11, Column 9, line 7, after "from" and before
"reservoir" insert --said--.

Signed and sealed this 9th day of July 1974.

(SEAL)

Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents