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(54) **Beverage dispenser**

(57) A beverage dispense system (1) has a beverage source (2) connected to a supply line (12) that splits into two lines (14a, 14b) upstream of a cooler (5) and the lines (14a, 14b) are re-combined downstream of the cooler (5)

for connection to a dispense tap (7). Splitting the supply line (12) enables flow rate through the system (1) to be increased with reduced velocity and minimal pressure drop so that break-out of CO₂ during dispense is suppressed.

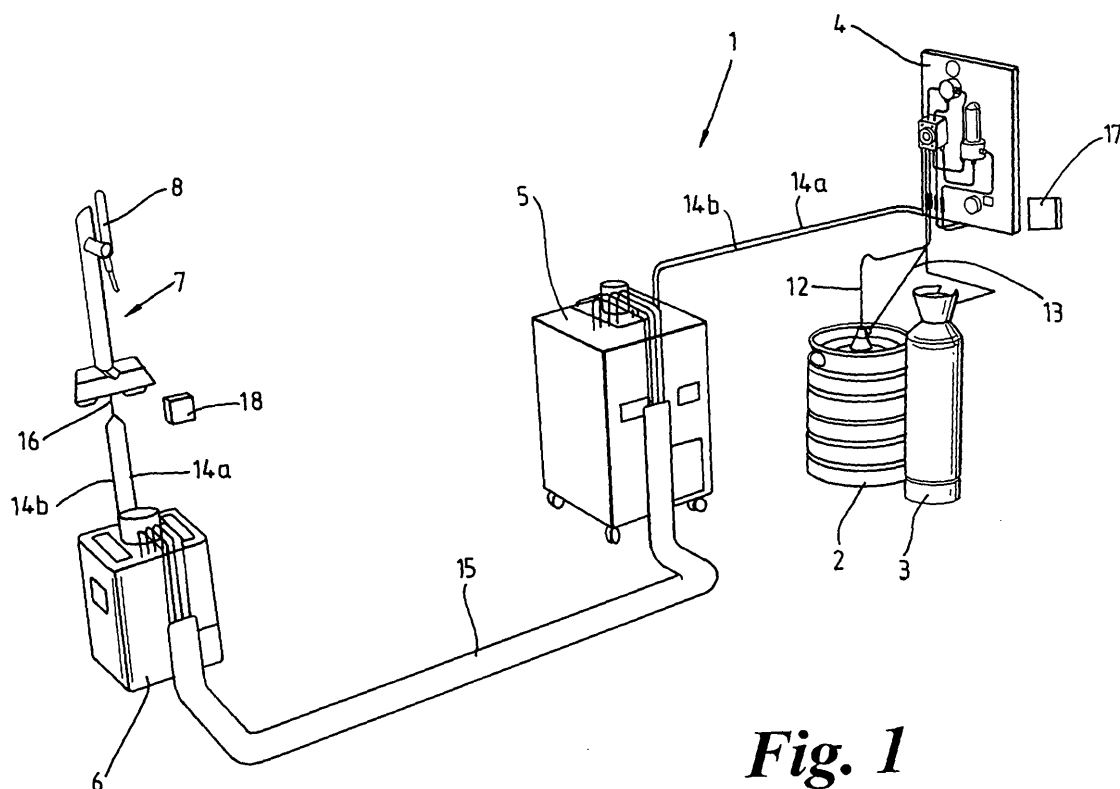


Fig. 1

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Description

[0001] This invention relates to beverage dispense and has particular, but not exclusive, application to the dispense of carbonated beverages, especially carbonated alcoholic beverages such as beer, lager, cider and the like.

[0002] Dispense systems are known in which beer is supplied from a keg located in a cellar room to a remote dispense head positioned at a bar counter for dispense in half pint or pint measures into a glass or similar vessel for consumption by the customer. Typically, the beer is chilled in the cellar by passage through a cooler and then maintained in a cooled condition between the cooler and the dispense head by means of a so-called "python". Essentially a python comprises one or more beer lines in close contact with coolant lines for circulating coolant through the python. For example, the coolant lines may contain chilled water to maintain the beer at the desired temperature.

[0003] For some applications, the beer may be cooled to within a few degrees of the dispense temperature and a further cooler, sometimes referred to as a "trim" or "flash" cooler, provided close to the dispense head to provide accurate control of the dispense temperature. This cooler provides final adjustment of the dispense temperature immediately prior to dispense and may allow beer to be dispensed at very cold temperatures, e.g. down to and below 0°C without freezing in the supply line.

[0004] The known dispense heads commonly include a manually operable valve that controls dispense of the beer. On opening the valve, a pressure drop occurs in the supply line and this can lead to the carbonating gas, usually carbon dioxide or nitrogen, coming out of solution, typically referred to as "break-out". If the pressure drop is not controlled, break-out may lead to excessive frothing of the beer in the tap and/or in the glass. This is undesirable and detracts from the condition/appearance of the dispensed beer. Also the time taken to dispense the beer will be increased while the beer is allowed to settle so that a full measure can be dispensed. Usually, break-out is controlled by regulating the flow of beer with an in-line restrictor for example a length of small bore tubing but this further increases the time to dispense a measured volume of beer.

[0005] In some installations, it is necessary to pump the beer from the cellar to the dispense head to maintain sufficient pressure in the supply to prevent break-out of the carbonating gas in the supply line. However, problems can still arise where the dispense head is located a considerable distance from the cellar and the supply line is several metres long. In this situation, break-out may occur from the beer in the supply line if the pressure drop allows the carbonating gas to come out of solution. Problems can also arise if the rate at which beer is pumped from the keg exceeds the rate at which carbonating gas is introduced to the head space within the keg. In this situation, break-out may occur from the beer in

the keg if the pressure drop in the head space allows the carbonating gas to come out of solution.

[0006] Accordingly, effective management of break-out is a significant factor in the rate at which beer can be dispensed without the beer frothing in an uncontrolled manner in the glass or within the dispense system itself. As a result, existing dispense systems are generally capable of dispensing a full pint of beer without excessive breakout in about 15 to 20 seconds. In periods of peak demand, the beer cannot be dispensed quickly enough to meet the demand. This is inefficient for the retailer and leads to delays in serving the customer.

[0007] The present invention seeks to overcome or at least to mitigate some of the above-discussed disadvantages.

[0008] Thus, according to a first aspect of the invention, there is provided a beverage dispense system comprising a source of carbonated beverage to be dispensed, a remote dispense head connected to the source for dispensing the beverage, at least one cooler between the source and the dispense head for cooling the beverage to a desired temperature, means for pumping beverage from the source to the dispense head, and means for supplying carbonating gas to the beverage source, wherein, downstream of the pumping means, the beverage is contained in at least two supply lines that are combined into one supply line for connection to the dispense head.

[0009] By this invention the pumping means is connected to two or more supply lines whereby flow rate through the system can be increased with reduced velocity and minimal pressure drop. As a result, break-out is suppressed.

[0010] Moreover, the use of two or more supply lines improves cooling efficiency and allows the beverage to be cooled to the desired temperature with higher flow rates compared to existing systems employing a single supply line.

[0011] In this way, the time to dispense a given volume of beverage having a desired temperature, for example a pint or half pint, may be reduced without adversely affecting the presentation and condition of the beverage.

[0012] Preferably, the system includes means for monitoring the beverage source and generating an "out-of-beverage" signal when the beverage source needs to be replaced. Preferably, the signal is used to close a shut-off valve such as a on/off solenoid valve positioned at or near to the dispense head.

[0013] In this way, pressure is maintained in the beverage upstream of the shut-off valve to inhibit break-out of the carbonating gas when the beverage source is changed. As a result, the supply line may not require purging after the new beverage source is connected and the shut-off is opened.

[0014] In a preferred embodiment, the beverage source comprises a container such as a keg connected to an inlet of the pumping means with an outlet of the pumping means connected to said at least two supply

lines. The beverage monitoring means may be arranged to monitor the beverage level in the keg but is more preferably located between the keg and the pumping means. The pumping means may comprise an electric pump, a gas pump or any other suitable pump device.

[0015] Preferably, the means for supplying carbonating gas to the beverage source comprises a gas cylinder connected to the beverage source via a gas flow regulator. The regulator is preferably capable of providing a high flow of gas to a headspace above the beverage remaining in the beverage source so as to maintain sufficient gas pressure in the headspace to inhibit break-out of carbonating gas. The carbonating gas may be carbon dioxide, nitrogen or any other gas suitable for the beverage to be dispensed.

[0016] Preferably, the system includes means for monitoring the gas cylinder and generating an "out-of gas" signal when the gas cylinder needs to be replaced. Preferably, the signal is used to close the shut-off valve positioned at or near to the dispense head to maintain pressure in the beverage upstream of the shut-off valve to inhibit break-out when the gas cylinder is changed.

[0017] Preferably, the "out-of beverage"/"out-of gas" signal(s) is/are transmitted to an indicator panel in the vicinity of the dispense head and the panel may provide a visual and/or audible warning that the beverage source or gas source needs to be changed. For example the indicator panel may be provided with a light and/or buzzer. The signal(s) may be transmitted by a wireless link or by a wired link.

[0018] Preferably, the dispense head comprises a dispense tap connected to the beverage source and having a dispense valve for controlling dispense of beverage. The dispense valve may comprise a valve member movable relative to a valve seat to open and close the dispense valve. The valve member may be operatively connected to a manually operable handle for operating the dispense valve,

[0019] Preferably, the dispense tap is provided with a plurality of apertures upstream of the valve seat through which beverage flows during dispense. The apertures assist in controlling break-out while the beverage is being dispensed and generating a head on the dispensed beverage. Preferably an annular array of circumferentially spaced apertures is provided inset from the marginal edge of an annular disc on the valve member.

[0020] According to a second aspect of the present invention, there is provided a method of dispensing a carbonated beverage comprising providing a source of carbonated beverage, connecting the beverage source to a remote dispense tap, providing a pump and a cooler between the beverage source and the dispense tap, passing beverage through the cooler in at least two lines and combining said at least two lines between the cooler and the dispense tap.

[0021] Preferably, the lines are combined at or near to the dispense tap and means is preferably provided to maintain pressure in the lines when the beverage source

needs to be changed.

[0022] According to a third aspect of the invention there is provided apparatus for dispensing a beverage comprising a source of beverage, a dispense tap remote from the beverage source, a flow line from the beverage source to the dispense tap, valve means remote from the beverage source and arranged to control the flow of beverage to the dispense tap, the valve means having an open position to allow flow of beverage to the dispense tap and a closed position to prevent flow of beverage to the dispense tap, detector means for monitoring the beverage source and generating a wireless signal when the beverage source needs to be replaced, wherein the valve means closes or remains closed in response to the wireless signal to maintain beverage in the supply line when the source is replaced.

[0023] Typically the detector means is provided in a cellar or other suitable storage area for the beverage source and the valve means is provided in the vicinity of the dispense tap. Employing a wireless link simplifies installation, especially for retro-fit to an existing installation. For example the detector means may have an associated transmitter to transmit the wireless signal and the valve means may have any associated receiver to receive the wireless signal.

[0024] The valve means may be operable independently of the dispense tap so as to remain open both during and between dispenses and close when the beverage source needs changing. For example, the valve means may comprise an electrically operable on/off solenoid valve that is held open when connected to a power supply and is closed when the power supply is disconnected.

[0025] Alternatively, the valve means may be operable in response to operation of the dispense tap so as to open during dispense and close between dispenses and when the beverage source needs changing. For example the valve means may comprise an electrically operable on/off solenoid valve that is opened in response to opening of the dispense tap at the start of a dispense and is closed at the end of the dispense. A pressure switch responsive to the fluid pressure may be provided between the dispense tap and the valve such that, when the dispense tap is opened, a pressure drop is detected causing the valve to open. Alternatively, a contact switch may be provided having a pair of contacts on relatively movable parts of the dispense tap, such that, when the dispense tap is opened, the switch changes state causing the valve to open.

[0026] In either arrangement, the solenoid valve is preferably biased to the closed position and is held open using a reduced voltage to conserve power consumption and prevent overheating. In this way the valve fails safe and closes automatically if the power supply is interrupted. Preferably, means is provided to re-set the valve means after a power failure and/or after the beverage source has been changed.

[0027] Where the beverage is a carbonated beverage, either an alcoholic beverage such as beer, lager, cider

or a non-alcoholic beverage such as cola, closing the valve maintains pressure in the supply line to inhibit or prevent break-out of the carbonating gas when the beverage source needs to be changed. The source of carbonated beverage is typically connected to a source of carbonating gas to maintain pressure in a headspace above the beverage to inhibit or prevent break-out of the carbonating gas. In this arrangement, the valve means may also be responsive to a wireless signal generated to close the valve means when the source of carbonating gas needs to be replaced. For example the carbonating gas source may be provided with a pressure switch to generate a wireless signal. The transmitter and receiver for transmitting and receiving the wireless signal generated when the beverage source needs changing may also be used to transmit and receive the wireless signal generated when the gas source needs changing.

[0028] According to a fourth aspect of the present invention, there is provided a dispense valve for dispensing a carbonated beverage comprising a valve member movable relative to a valve seat to open and close the valve and, upstream of the valve seat, a plurality of apertures through which beverage flows during dispense.

[0029] The apertures assist in generating a head on the dispensed beverage. Preferably an array of circumferentially spaced apertures is provided on the valve member. The apertures may be uniformly spaced apart in the circumferential direction and may be the same size and shape. Any one or more of the number, size, shape and spacing of the apertures may be varied to provide any desired flow characteristics.

[0030] Preferably, the valve member is slidably received in a bore for movement between open and closed positions under the control of a manually operable handle. The handle may be biased to close the valve. The valve member preferably engages a valve seat in the bore to prevent flow in the closed position and the apertures are arranged upstream of the valve seat. The valve seat is preferably provided between the ends of the bore.

[0031] Preferably the apertures are provided in an annular part of the valve member that is a close fit in the bore. The annular part may be an integral part or a separate part of the valve member. Preferably, the apertures are inset from the marginal edge of the valve member, for example through holes in the valve member. Alternatively or additionally, the apertures may be provided at the marginal edge of the valve member, for example notches in the edge of the valve member. The bore preferably has an inlet section upstream of the valve seat and an outlet section downstream of the valve seat. The outlet section may be of reduced cross-section relative to the inlet section and preferably opens to a dispense nozzle through which beverage can be dispensed.

[0032] According to a fifth aspect of the present invention, there is provided a method of dispensing a carbonated beverage to control CO₂ breakout by providing a valve member movable between open and closed positions with a plurality of apertures through which fluid can

flow in the open position.

[0033] The apertures are preferably configured to create turbulent flow.

[0034] The invention will now be described in more detail by way of example only with reference to the accompanying drawings, wherein:-

Figure 1 is a schematic view of a beverage dispense system according to the present invention;

Figure 2 shows, to an enlarged scale, the dispense panel of Figure 1 ;

Figure 3 is a perspective view of the dispense tap shown in Figure 1;

Figure 4 is a front view of the tap shown in Figure 3;

Figure 5 is an exploded perspective view of the tap shown in Figure 3; and

Figure 6 is a section on the line 6-6 of Figure 4.

[0035] Referring first to Figure 1 of the drawings, there is shown a beverage dispense system 1 comprising a beverage source which in this embodiment is a keg 2, a pressurising gas source which in this embodiment is a CO₂ cylinder 3, a dispense panel 4, a primary cooler 5, a secondary cooler 6 and a dispense head 7. In this embodiment the beverage is a carbonated beverage such as beer, lager, cider. For convenience in the following description the beverage is beer but it will be understood the invention is not limited thereto.

[0036] The keg 2, CO₂ cylinder 3, dispense panel 4, and primary cooler 5 are typically provided in a location such as a cellar remote from the point of dispense. The dispense head 7 is shown in the form of a counter top fitting such as a font for mounting on a bar counter or other point of dispense and includes a manually operable tap 8 for dispensing beer into a glass or other suitable receptacle. The secondary cooler 6 is provided close to the dispense head 7 and may be mounted under the bar counter on a shelf below the dispense head 7.

[0037] With reference now also to Figure 2, the dispense panel 4 is typically wall mounted and supports an electric pump 9, a one pint beer monitor 10 and a fast flow dual stage CO₂ pressure regulator assembly 11.

[0038] The keg 2 has a coupler (not shown) for connecting a beer line 12 and a CO₂ line 13 to the keg 2. The beer line 12 is connected to an inlet of the electric pump 9 via the one pint beer monitor 10 on the dispense panel 4. The CO₂ line 13 is connected to the CO₂ cylinder 3 via the CO₂ regulator assembly 11 on the dispense panel 4. The CO₂ regulator assembly 11 includes in-line pressure relief valves to prevent excessive pressures being generated in the keg 2.

[0039] The beer line 12 is split into two lines 14a, 14b connected in parallel to the outlet from the electric pump

9. The lines 14a,14b pass through the primary cooler 5 to cool the beer to a desired temperature, for example 6-8°C. The primary cooler 5 may be an ice bank cooler or glycol cooler as will be familiar to those skilled in the art.

[0040] From the primary cooler 5, the lines 14a,14b are bundled in a python 15 in close contact with other lines including coolant lines (not shown) for re-circulating coolant from the primary cooler 5 to prevent the beer warming up to any appreciable extent between the primary cooler 5 and the secondary cooler 6. The coolant can be water, water/glycol, binary ice or any other suitable coolant according to the desired temperature of the beer. Pythons are well known in the art and need not be described further as they form no part of the invention.

[0041] The lines 14a,14b pass through the secondary cooler 6 where the beer is further cooled to the desired dispense temperature, for example 1-2°C. The secondary cooler 6 may be an ice bank cooler, glycol cooler, thermoelectric (Peltier) cooler or any other suitable cooling device as will be familiar to those skilled in the art. Downstream of the secondary cooler 6, the lines 14a, 14b are re-combined into one supply line 16 connected to the dispense tap 8. It will be understood that the line 12 can be split into more than two lines if desired. The beer line(s) may be made of plastic, stainless steel or any other suitable material or combination of materials.

[0042] In a modification (not shown), the secondary cooler 6 may be omitted. Alternatively, a line may be provided by-passing the secondary cooler 6 with a by-pass valve to allow dispense of beverage with or without the additional cooling provided by the secondary cooler 6 to be selected.

[0043] During a dispense when the tap 8 is opened, beer is pumped through the lines 12, 14a,14b, 16 to the dispense tap 8 and beer withdrawn from the keg 2 is replaced by CO₂ from the CO₂ cylinder 3. The regulator assembly 11 maintains a pressure in the headspace above the beer in the keg 2 to prevent CO₂ in the beer coming out of solution and causing foaming/fobbing in the keg 2 and/or the line 12 from the keg 2. The pump 9 boosts the pressure in the lines 14a,14b under the flow conditions during dispense so that pressure drop is minimised to prevent CO₂ coming out of solution and causing foaming/fobbing in the lines 14a,14b.

[0044] The beer monitor 10 is provided with a float operated switch such as a reed switch that generates an "out of beer" signal when the keg 2 needs to be changed. The regulator assembly 11 is provided with a pressure switch that generates an "out of gas" signal when the CO₂ cylinder 3 needs to be changed. When an "out of beer" or "out of gas" signal is generated, it is transmitted wirelessly from a transmitter 17 to a receiver 18 in the bar area, for example on an indicator panel (not shown) for the dispense head 7. In a modification, the signal(s) may be transmitted via a wired link.

[0045] The signal causes a shut-off valve, for example an electrically operable on/off solenoid valve, provided in the re-combined line 16 to close thereby maintaining

pressure in the beer in the lines upstream of the shut-off valve while the keg 2 and/or CO₂ cylinder 3 is changed. In this way, the beer lines may not require purging after a keg change to remove gas pockets and/or fob. As a result, the beer contained in the lines is not wasted when the keg 2 or gas cylinder 3 is changed. This is of particular benefit in installations where the lines upstream of the shut-off valve contain several pints of beer.

[0046] In a modification (not shown), separate shut-off valves may be provided in each of the lines 14a,14b prior to re-combining the lines and the shut-off valves are closed when the beverage source and/or gas source need to be changed.

[0047] Referring now to Figures 3 to 6 of the drawings, the dispense tap 8 is shown in more detail and includes a tap body 19 having an internally threaded inlet at one end of a through bore 20 for releasably connecting an inlet coupler 21 to connect the beer line 16 to the tap 8. The bore 20 houses a dispense valve 22 operable by a handle 23. The dispense valve 22 includes a valve member 24 having a head portion 25, a body portion 26 and a tail portion 27.

[0048] The handle 23 is pivotally mounted at the front end of the body 19 and engages a slot 28 in the head portion 25 whereby the valve member 24 is axially movable within the bore 20 between a closed position shown in Figure 6 and an open position (not shown).

[0049] In the closed position, the handle 23 is upright and a seal member 29 on the tail portion 27 of the valve member 24 engages a tapered valve seat 30 in the bore 20 to prevent flow of beer through the tap 8.

[0050] The handle 23 is pivotal in the direction of arrow A to slide the valve member 24 in the direction of arrow B to move the seal member 29 away from the seat 30.

The body portion 26 is of reduced cross-section relative to the bore 20 and defines therewith a chamber 31 into which beer can flow in the open position of the valve member 24.

[0051] The tap 8 has a dispense nozzle 32 connected to a transverse bore 33 in the body 19 that opens to the chamber 31 in both the open position for dispense of beer when the tap 8 is open and in the closed position to allow beer downstream of the valve seat 30 to drain when the tap 8 is closed. The handle 23 may be biased by a spring (not shown) to close the tap 8 automatically if the handle 23 is released to prevent the tap 8 being left open inadvertently.

[0052] The valve member 24 carries a disc 34 that is slidable in the bore 20 and has a plurality of circumferentially spaced axial through holes 35 inset from the marginal edge of the disc 34. The disc 34 is a close fit in the bore 20 and, when the tap 8 is open, beer flows through the holes 35 past the seal member 29 into the chamber 31 and is dispensed from the nozzle 32. We have found that the holes 35 in the disc 34 cause turbulent flow that controls CO₂ breakout as the beer is dispensed. As a result, the dispensed beer has a consistent head presentation. Moreover, we have found that such controlled

break-out can be achieved with high flow rates and we may dispense a full pint in 5 to 15 seconds.

[0053] The above-described system is capable of dispensing beer, for example pint and half-pint measures, faster than existing systems without causing foaming/fobbing within the system. Thus, we can dispense a pint of beer in 5 to 15 seconds. This is particularly beneficial in periods of peak demand both in terms of improving efficiency for the retailer and reducing waiting time for customers. It will be understood that the benefits of faster dispense without causing foaming/fobbing within the system can be obtained for dispense of different portion sizes such as pint and half pint measures, litre and half-litre measures or any other measure as desired, for example dispense of several pints or litres into a jug or similar container.

[0054] This reduction in dispense time is believed to result from a number of features of the system which may be employed together or separately as follows:-

1) Providing the apertured disc 34 upstream of the valve seat 30 adapts the flow to control break-out and create an acceptable head on the dispensed beer, especially under the high flow conditions required for fast dispense of the beer.

2) Splitting the beer line into parallel lines 14a, 14b fed by the pump 9 provides a greater flow rate at reduced velocity through the system. This enhances heat exchange with coolant in the coolers 5,6 allowing the necessary cooling to be achieved under the high flow conditions required for fast dispense of the beer.

3) Splitting the beer supply line into parallel lines 14a, 14b assists in preventing pressure drop within the supply line so as to inhibit CO₂ break-out and prevent formation of foam/fob in the supply line under the high flow conditions required for fast dispense of the beer.

4) Providing the high flow gas regulator assembly 11 ensures the keg 2 is not starved of CO₂ and the required gas pressure is maintained in the headspace within the keg 2 to inhibit CO₂ break-out and prevent formation of foam/fob in the supply line under the high flow conditions required for fast dispense of the beer.

[0055] In addition to permitting fast dispense of measured volume of beer, the system reduces waste by trapping beer in the supply line when the keg needs to be replaced. As a result, the supply line does not have to be purged to remove fob or gas pockets after the keg has been replaced. This is particularly beneficial in systems where the supply line may contain several pints of beer between the keg and the dispense head.

[0056] It will be understood the invention is not limited

to the embodiment above-described and that any of the features described may be employed separately or in combination with any other feature. For example, the dispense tap may be employed in any system for dispensing a carbonated beverage. The dispense system may also have application for the dispense of non-alcoholic carbonated beverages such as colas.

[0057] Means may be provided to form condensation and/or ice on an external surface of the dispense head. For example, coolant lines may be tapped from the coolant loop in the python to circulate coolant within the dispense head. The beer line may be arranged in close contact with the coolant lines within the dispense head to prevent the beer warming up between dispenses. Means may be provided to illuminate the dispense head. The illumination means may illuminate the external surface on which the condensation and/or ice is to be formed and/or any other part of the dispense head. The illumination and/or condensation/ice may be employed to provide a "theatre of dispense" for the customer and/or to enhance a logo, brand name or other information presented to the customer. The dispense head may comprise a plurality of dispense taps each connected to a separate beverage source. Means may be provided for connecting the system to a source of cleaning fluid to carry out a cleaning cycle. The cleaning cycle may be actuated remotely, for example from the indicator panel in the bar area.

[0058] Other modifications that can be made will be apparent to those skilled in the art.

Claims

1. A beverage dispense system (1) comprising a source (2) of carbonated beverage to be dispensed, a remote dispense head (7) connected to the source (2) for dispensing the beverage, at least one cooler (5,6) between the source (2) and the dispense head (7) for cooling the beverage to a desired temperature, means (9) for pumping beverage from the source (2) to the dispense head (7), and means (3) for supplying carbonating gas to the beverage source (2), wherein, downstream of the pumping means (9), the beverage is contained in at least two supply lines (14a, 14b) that are combined into one supply line (16) for connection to the dispense head (7).

2. A system according to claim 1 further including means (10) for monitoring the beverage source (2) and generating an "out-of beverage" signal when the beverage source (2) needs to be replaced.

3. A system according to claim 2 wherein, the signal is used to close a shut-off valve such as an on/off solenoid valve positioned at or near to the dispense head (7).

4. A system according to claim 2 or claim 3 wherein, the beverage source (2) comprises a container connected to an inlet of the pumping means (9) and an outlet of the pumping means (9) is connected to said at least two supply lines (14a, 14b). 5
5. A system according to any preceding claim wherein the means (3) for supplying carbonating gas comprises a gas cylinder and the system includes means (11) for monitoring the gas cylinder (3) and generating an "out-of gas" signal when the gas cylinder (3) needs to be replaced. 10
6. A system according to claim 5 as dependent on claim 3 wherein the "out-of-gas" signal is used to close the shut-off valve positioned at or near to the dispense head (7). 15
7. A system according to any of claims 2 to 6 wherein, the "out-of beverage"/"out-of gas" signal(s) is/are transmitted by a wireless link (17, 18) or by a wired link to an indicator panel in the vicinity of the dispense head (7) to provide a visual and/or audible warning that the beverage source (2) or gas source (3) needs to be changed. 20 25
8. A system according to any preceding claims wherein, the dispense head (7) has a dispense valve (22) for controlling dispense of beverage, the dispense valve (22) comprising a valve member (24) movable relative to a valve seat (30) to open and close the dispense valve (22) and having a plurality of apertures (35) upstream of the valve seat (30) through which beverage flows during dispense. 30 35
9. A system according to claim 8 an annular array of circumferentially spaced apertures (35) is provided inset from the marginal edge of an annular disc (34) on the valve member (24), wherein one or more of the number, size, shape and spacing of the apertures (35) can be varied to provide any desired flow characteristics. 40
10. A method of dispensing a carbonated beverage comprising the steps of providing a source (2) of carbonated beverage, connecting the beverage source (2) to a remote dispense tap (8), providing a pump (9) and a cooler (5, 6) between the beverage source (2) and the dispense tap (8), passing beverage through the cooler (5, 6) in at least two lines (14a, 14b) and combining said at least two lines (14a, 14b) between the cooler (5, 6) and the dispense tap (8). 45 50

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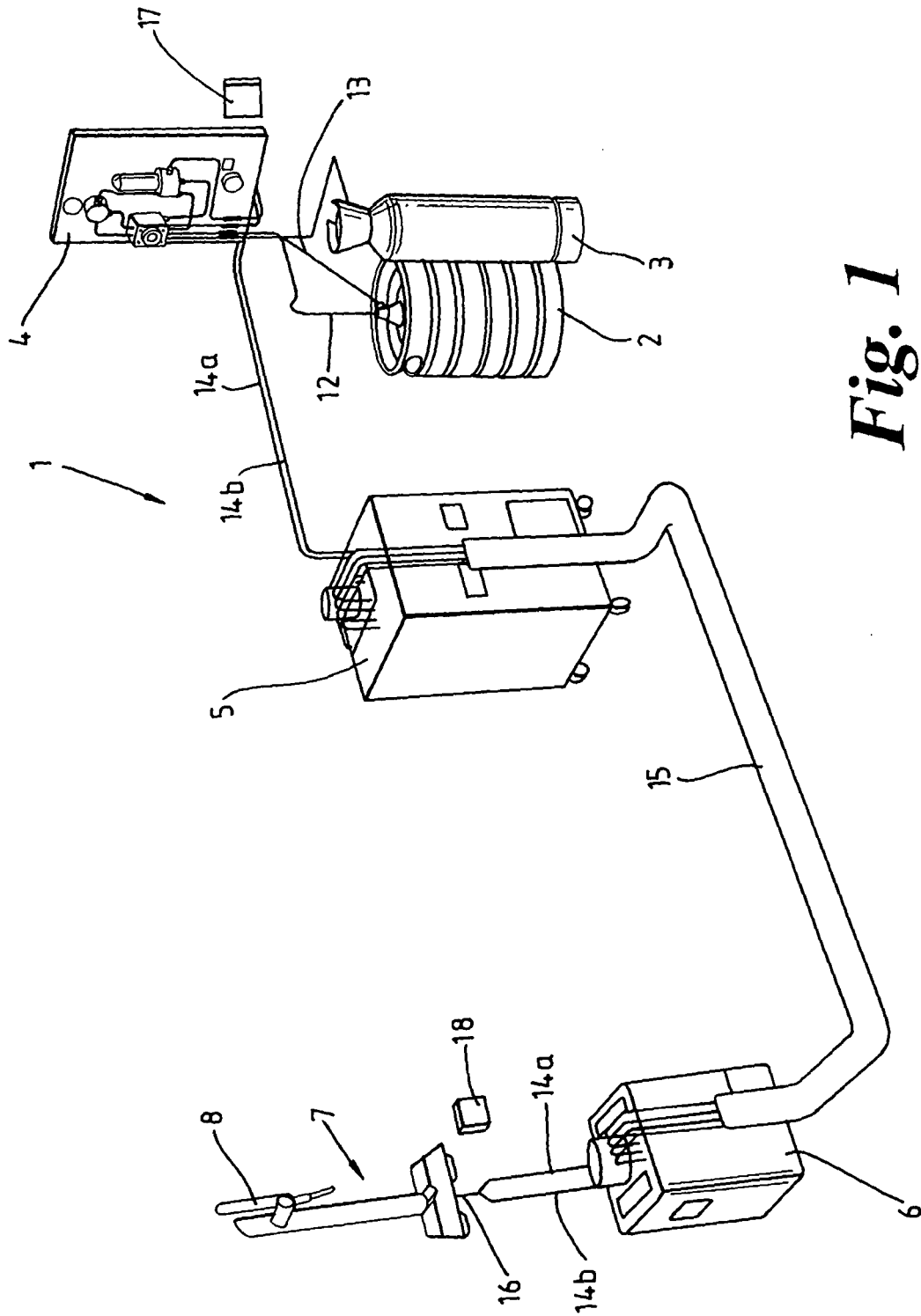


Fig. 1

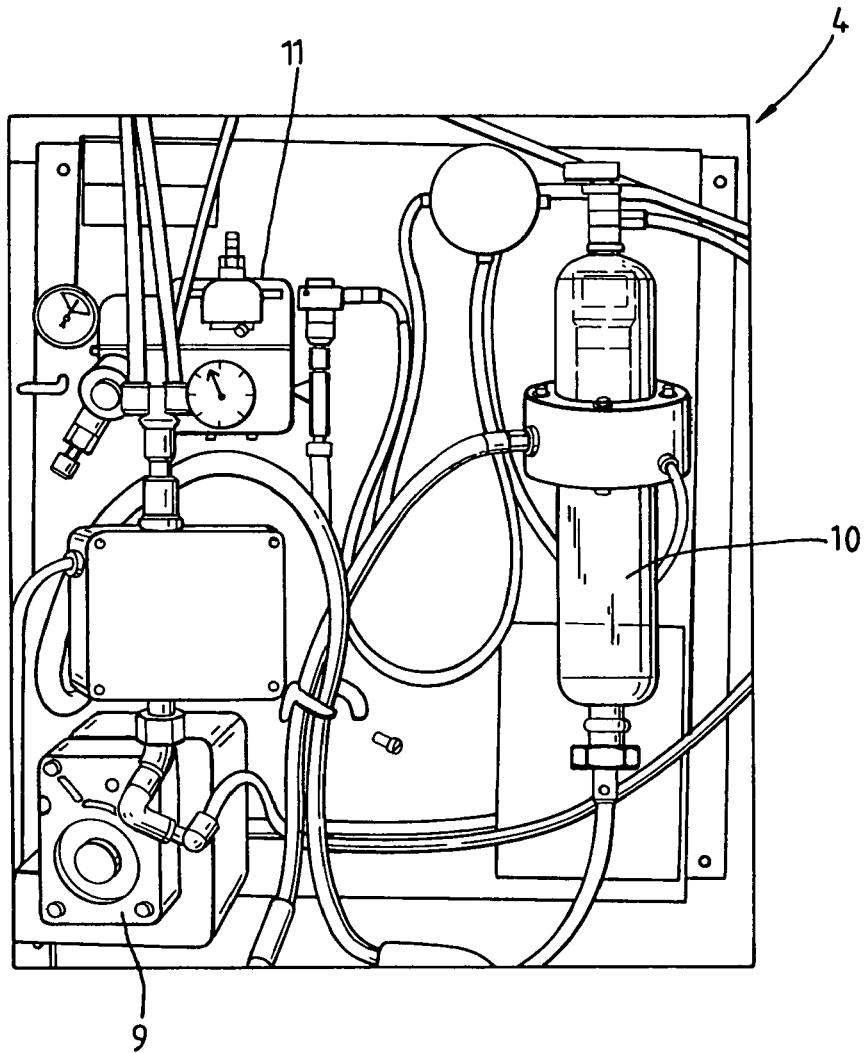
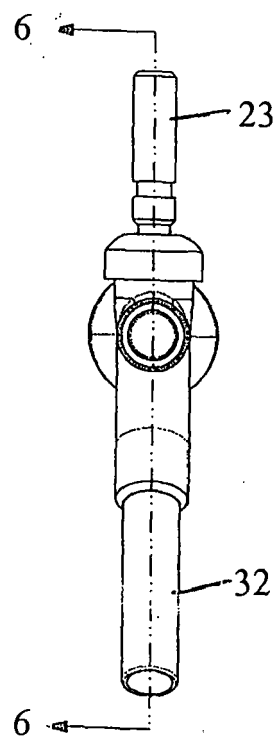
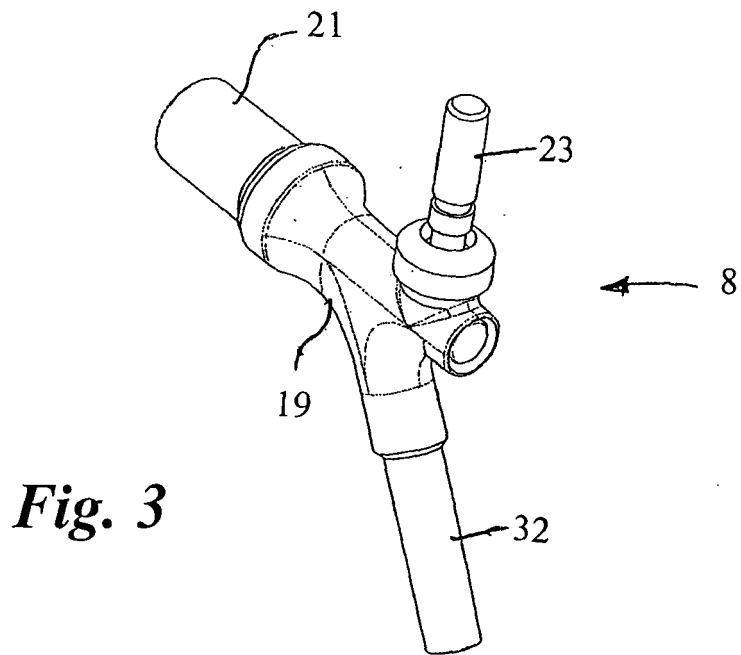


Fig. 2



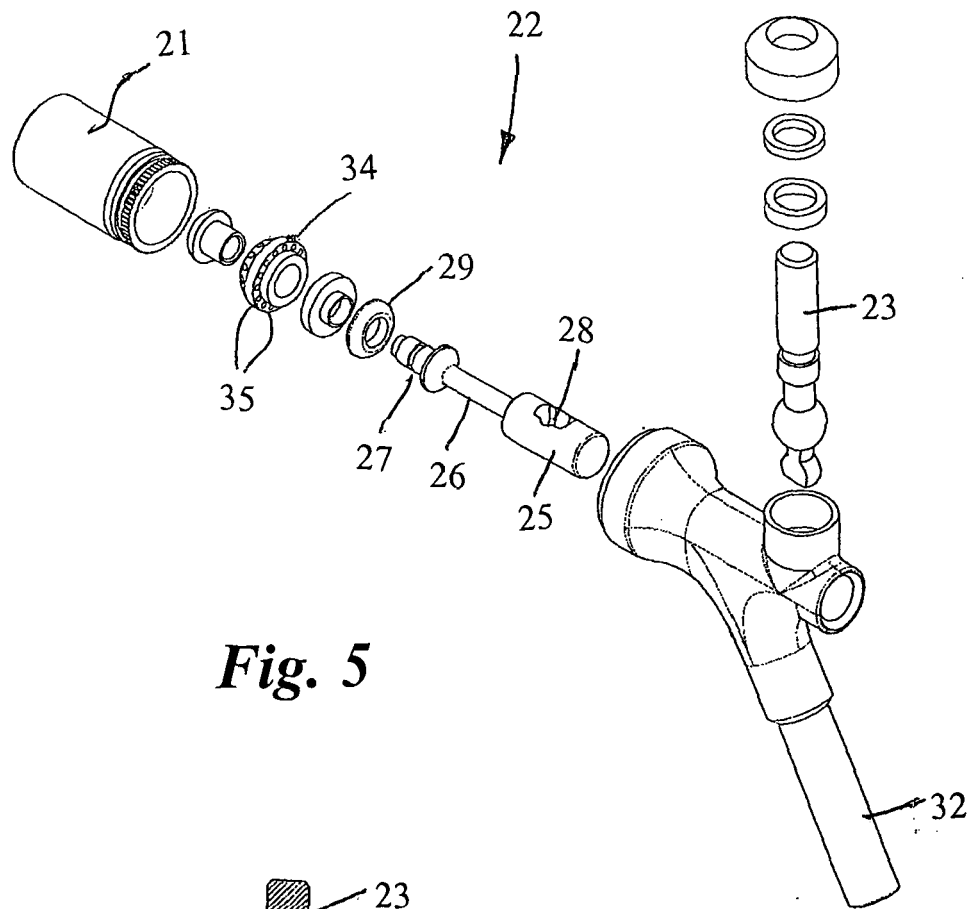


Fig. 5

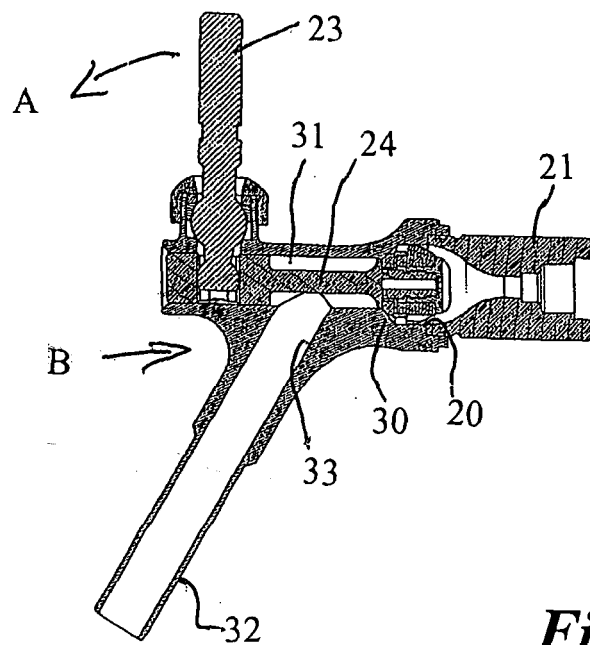


Fig. 6