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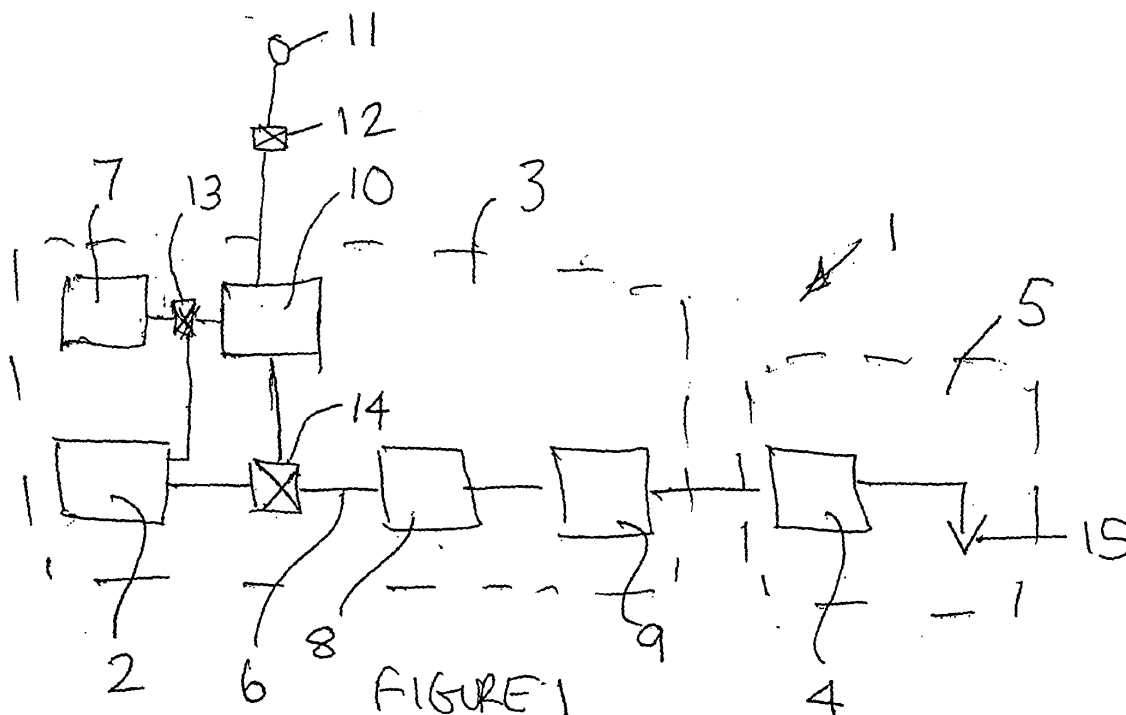
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(54) **I Beverage dispenser with purging means**

(57) A system for dispensing beverages such as beer, lager, cider in which the beverage is transported from a beverage source 2 to a remote dispense point 5 in a flow line 6 and a source 10 of potable liquid such as water is provided that is selectively connectable to the flow line 6 at or close to the beverage source 2 to replace beverage in the flow line 6 as it is dispensed with potable liquid. The potable liquid can be introduced prior to the

end of a serving period so that the flow line 6 does not contain any significant volume of beverage between serving periods. The system is configured to introduce a pre-determined volume of potable liquid that is less than the residual volume of beverage in the flow line 6 to prevent dispense of water with the beverage and that is sufficient to allow a specific number of drinks to be dispensed.



Description

[0001] This invention concerns improvements in or relating to beverage dispense and in particular, but not exclusively, to dispense of alcoholic beverages such as beer, lager, cider and the like although it could have application to dispense of non-alcoholic beverages such as soda, cola and the like. For convenience, the invention will be described below with particular reference to dispense of alcoholic beverages, typically beer.

[0002] Draught beer dispense systems are typically connected to a keg or other source of beer located in a cellar remote from the bar area and the beer is supplied from the keg through a flow line to a counter top fitting mounted on the bar for dispense into a glass or other suitable receptacle. The flow line may contain several pints of beer and this can lead to problems if the beer remains in the flow line for a prolonged period of time. For example, in installations that are not used on a daily basis, beer remaining in the flow line can deteriorate with the result that, when the installation is next used, the beer remaining in the flow line has to be run to waste until fresh beer from the keg is delivered to the counter top fitting for dispense. This is wasteful of beer and the cost of this can be significant, particularly where the flow line from the cellar to the bar is long.

[0003] The known beer dispense systems also require frequent cleaning to maintain the quality of the dispensed product. The cleaning process normally involves disconnecting the flow line from the keg and flushing through to the counter top fitting with a sequence of water and chemicals. Typically, the volume of beer resident in the flow line prior to cleaning is run to waste which again is wasteful of beer and adds to costs. The cleaning frequency can be increased for installations that are not in daily use due to the increased risk of contamination of the flow line due to the deterioration of the beer remaining in the flow line which further adds to costs both in terms of the volume of beer that is wasted and the additional cleaning materials that are used.

[0004] A variety of solutions to the problem of waste during cleaning have been proposed but these mostly focus on 'recovery' of the beer, that is, they extract the beer from the system and re-introduce it after cleaning is complete. This can be accomplished by returning beer to the keg or storing it elsewhere prior to cleaning. Whichever method is adopted, it results in beer from a 'dirty' system being introduced into a 'clean' system with the possibility of contamination and a requirement for more frequent cleaning. This is particularly costly where a keg is spoiled and brewers therefore discourage the practice.

[0005] An alternative method is to purge the system with dispense gas but this can be frustrated by fob detectors and have a negative effect on dispense as the flow rate increases as the residual liquid volume decreases. It is also likely that the last drink will erupt from the glass as gas is jetted into it. Additionally, gas can by-pass beer in vertical pipe runs and interfere with dispense.

[0006] The present invention has been made from a consideration of the foregoing problems and disadvantages of existing dispense systems.

[0007] It is a preferred object of the present invention to provide a dispense system in which wastage caused by deterioration of product in the flow line can be reduced even when the system is not in regular use.

[0008] It is another preferred object of the present invention to provide a dispense system in which wastage during system cleaning can be reduced without resorting to product 'recovery' with its attendant risk of contamination, or gas purging.

[0009] According to a first aspect of the present invention, there is provided a beverage dispense system comprising a source of beverage, a source of potable liquid, a dispense point, a flow line connected to the dispense point, and means for connecting the beverage source to the flow line in a first mode of operation and for connecting the potable liquid source to the flow line in a second mode of operation.

[0010] The first mode of operation preferably corresponds to a "normal" dispense mode in which the beverage, for example beer, can be dispensed into a glass or other suitable vessel at the dispense point, for example a counter top fitting mounted on a bar, by operation of a dispense valve, with the dispensed beverage replaced by beverage from the beverage source. The second mode of operation preferably corresponds to a "saver" dispense mode in which beverage in the flow line is dispensed and replaced by potable liquid, for example water, from the potable liquid source. Preferably, the system is switched from the "normal" dispense mode to the "saver" dispense mode at the end of a serving period or where the bar is to be closed for a significant period of time.

[0011] Thus, when changing from the "normal" dispense mode to the "saver" dispense mode, the flow line contains a known residual volume of beverage upstream of the dispense point and this volume of beverage can be dispensed at the end of the serving period by disconnecting or isolating the beverage source, typically a keg for alcoholic beverages such as beer, lager, cider and the like, from the flow line and connecting the flow line to the source of potable liquid which can then be used to displace (dispense) the residual beverage so that it can be consumed leaving the flow line substantially full of the potable liquid, e.g. water.

[0012] At the start of the next serving period, the potable liquid source can be disconnected or isolated and the beverage source re-connected and the potable liquid in the flow line can be dispensed and run to waste until the flow line is full of beverage and ready for dispense. In this way, the invented system provides a way of reducing wastage of beverage and/or contamination of the flow line resulting from deterioration of beverage remaining in the flow line between periods of dispense when the system is not in use for any extended period of time, for example overnight.

[0013] In operation, the dispense system can be

switched from "normal" dispense mode to the "saver" dispense mode at a point just before it is desired to conclude serving. In the "saver" dispense mode, potable liquid, typically water, is introduced into the beverage line close to the beverage source, for example a beer keg. This may be achieved by a system of solenoid valves and check valves which also prevent any possibility of the potable liquid entering the beverage source or beverage entering the potable liquid source. The potable liquid source may be the mains water supply or a container for storing water to which a top pressure is applied by a suitable source of pressurised gas such as air, nitrogen or carbon dioxide. Alternatively or additionally, a pump could be provided, for example where the flow line is long and/or supplies several dispense points. In each case suitable pressure control means can be provided so that the potable liquid pressure is compatible with the beverage dispense pressure to prevent dispense problems such as 'fobbing' (gas breakout).

[0014] Where the potable liquid source is a container, it may be desirable not to pressurise it until required for use to minimise the absorption of gas into the potable liquid which may break out and result in unwanted termination of dispense where the flow line includes a fob detector or other suitable device to detect when the keg is empty and prevent gas passing along the flow line. For example, the fob detector may generate an out of beverage signal when the keg is empty and operate a valve downstream of the fob detector, preferably at or close to the dispense point to prevent dispense. Switching into the beverage "saver" dispense mode can also pressurise the potable liquid source by opening a solenoid valve to admit the pressurising gas. The introduction of potable liquid into the flow line may be delayed, say for one drink, to allow adequate pressure build up in the potable liquid container.

[0015] Changeover between the "normal" dispense mode and the "saver" dispense mode may be carried out manually. For example, a detachable coupler for connecting the keg to the flow line and to a source of gas pressure in the "normal" dispense mode could be removed from the keg and connected to the potable liquid source in the "saver" dispense mode.

[0016] In one preferred arrangement, the addition of potable liquid to the flow line in the "saver" mode of operation is controlled to introduce a volume of potable liquid less than the volume of the residual beverage in the flow line.

[0017] Thus, the potable liquid source could be of a pre-determined known volume, matched to the system volume, such that it would become exhausted before potable liquid reached the dispense valve. This would then operate the fob detector, where provided, to disable dispense and would have the advantage that the system could operate as a totally manual system, requiring no electrical or electronic equipment, and in conjunction with a conventional manual free flow dispense system. In a modification, the fob detector could generate an "out of

potable liquid" signal when the container is empty and operate a valve downstream of the fob detector, preferably at or close to the dispense point to prevent dispense.

[0018] Alternatively, changeover between the "normal" dispense mode and the "saver" dispense mode may be done through a control system operating valves or other means to changeover the connections of the beverage source and potable liquid source to the flow line and gas source. The control system may be operated manually when it is desired to select the "normal" dispense mode or the "saver" dispense mode. For example the control system may have a user interface with push buttons, rotary knobs, switches or other suitable means for the user to select the desired mode. Alternatively or additionally, the control system may be programmable to select automatically the "normal" dispense mode or the "saver" dispense mode. For example, the control system may include a time switch or other suitable means to select the required mode.

[0019] In one preferred arrangement, the addition of potable liquid to the flow line in the "saver" mode of operation is controlled to introduce a volume of potable liquid less than the volume of the residual beverage in the flow line.

[0020] Thus, in the beverage "saver" dispense mode, the addition of potable liquid may be controlled to allow dispense of no more than a specific number of drinks or volume of beverage, calculated to be just less than the amount of residual beverage in the flow line (typically 70% to 80%). For example, by providing the container with the appropriate pre-determined volume of potable liquid for addition to the flow line or by monitoring the volume of potable liquid introduced to the flow line such as measured by the number of timed portions or pulses of a flowmeter turbine or other suitable sensor. After the final drink has been poured, dispense may be disabled, for example a solenoid valve may be arranged in the flow line at or close to the dispense point that is closed to prevent dispense, and the system switched into a 'shut down' mode either automatically or manually, preventing any further operation. Unauthorised resetting of the system may be prevented by any suitable means, for example, key switch, personal identification number or combination key presses, and the status of the system may be indicated by visual and/or audible means.

[0021] Means may be provided for connecting a source of cleaning fluid to the flow line in a third mode of operation corresponding to a system "cleaning" mode in which the flow line can be filled with cleaning fluid to remove any contaminants. System cleaning is normally carried out at regular intervals during a non-serving period by connecting a source of cleaning fluid to the flow line close to the keg with the keg and potable liquid source disconnected or isolated from the flow line. Preferably, the cleaning fluid is introduced after the flow line has been filled with potable liquid so that the potable liquid is displaced from the flow line and can be run to waste. In this way, wastage of beverage during cleaning is avoided.

The source of cleaning fluid may be a container of sufficient volume to fill the flow line to which a top pressure may be applied by a suitable source of pressurised gas such as air, nitrogen or carbon dioxide. Alternatively or additionally, a pump may be employed. Preferably, the cleaning fluid is displaced from the flow line by flushing through with clean water before the "normal" beverage dispense mode is selected for the next serving period. The system may be left with the flow line filled with clean water or the water may optionally be removed (purged) from the flow line with pressurised gas at the end of the cleaning mode. In this way, when the "normal" beverage dispense mode is selected at the start of the next serving period, contamination of the beverage with cleaning fluid can be prevented.

[0022] In one arrangement, changing the system over to the cleaning mode of operation may be carried out manually. For example, the coupler for detachably connecting the keg to the flow line and to a source of gas pressure in the beverage dispense mode could be removed from the keg and connected to the source of cleaning fluid in the cleaning mode.

[0023] In another arrangement, switching to the cleaning mode of operation may be done through the control system operating means such as valves to introduce cleaning fluid to the flow line at or close to the keg. The control system may be arranged to prevent accidental or unauthorised selection of the cleaning mode of operation during a serving period. For example, the cleaning mode of operation may be selected with a key switch or other coded input to the control system.

[0024] The cleaning mode of operation may be operated after the beverage "saver" dispense mode of operation. For example, when it is desired to clean the flow line between serving periods, for example overnight, the beverage "saver" dispense mode may be selected as normal to fill the flow line with potable liquid, e.g. clean water, at the end of the serving period and then the cleaning mode of operation selected to introduce cleaning fluid followed by clean water to flush the system through followed by optional purging with gas.

[0025] The system may include sensors to identify the presence of beverage, potable liquid or cleaning fluid in the flow line and shut-down dispense and/or provide a visual and/or audible warning if potable liquid or cleaning fluid is detected during a serving period.

[0026] The invention has particular application for use in a beverage dispense system where portion control is employed for dispense and/or logging cumulative throughput and is most valuable where there are multiple dispense points for brands and long pipe runs between the beverage source and the dispense point(s).

[0027] Portion control can be achieved by a variety of means, such as dispense timing or counting pulses from a turbine type flow meter. The latter is preferred as portion size is independent of flow rate. Normally, the dispense valve would be electrically operated but a manual valve can also be employed in combination with a flow meas-

uring device and solenoid as described in our UK patent application published under No. GB 2404651-A.

[0028] According to a second aspect of the present invention, there is provided a method of dispensing a beverage comprising providing a flow line connected to a dispense point, selectively connecting the flow line to a beverage source in a first mode of operation and to a potable liquid source in a second mode of operation, dispensing beverage from the dispense point in the first mode of operation while introducing beverage into the flow line to replace dispensed beverage, and dispensing beverage from the dispense point in the second mode of operation while introducing potable liquid into the flow line to replace dispensed beverage.

[0029] By this method, dispensed beverage is replaced by beverage from the beverage source during the first ("normal" dispense) mode of operation and, in the second ("saver" dispense) mode of operation, dispensed beverage is replaced by potable liquid.

[0030] Preferably, the method includes the step of changing over from the "normal" dispense mode of operation to the "saver" dispense mode of operation towards the end of a serving period so that, between serving periods, the flow line contains potable liquid. In this way, little or no beverage remains in the flow line at the end of the serving period. As a result, deterioration of beverage in the flow line and/or contamination of the flow line between serving periods may be reduced.

[0031] Preferably, the method includes the step of displacing potable liquid remaining in the flow line between serving periods prior to dispensing beverage in the "normal" dispense mode of operation. The potable liquid may be displaced by beverage introduced into the flow line in the "normal" dispense mode of operation to replace potable liquid displaced from the flow line. Alternatively, the potable liquid may be displaced by purging the flow line with pressurised gas.

[0032] Preferably, the method includes the step of introducing cleaning fluid into the flow line in a third ("cleaning") mode of operation between serving periods. The cleaning fluid may replace potable liquid introduced into the flow line in the "saver" dispense mode of operation.

[0033] Preferably, the method includes the step of displacing cleaning fluid prior to dispensing beverage in the "normal" dispense mode operation. The cleaning fluid may be displaced by potable liquid introduced into the flow line before introducing beverage into the flow line.

[0034] According to a third aspect of the present invention there is provided a beverage dispense system in which a flow line to a beverage dispense point is selectively connectable to a beverage source such as beer, lager or cider and to a potable liquid source such as water whereby the flow line can contain potable liquid in place of beverage between serving periods when the system is not in use such as overnight.

[0035] By replacing beverage with potable liquid, deterioration of beverage in the flow line and/or contamination of the flow line between serving periods may be re-

duced. As a result, beverage wastage and/or frequency of cleaning the flow line may be reduced.

[0036] Preferably, the beverage in the flow line is dispensed and replaced by potable liquid introduced into the flow line. For example, the potable liquid may be introduced close to the beverage source such that dispense of beverage can continue as potable liquid is introduced into the flow line to replace beverage already present in the flow line as it is dispensed.

[0037] Alternatively, the beverage in the flow line may be returned to the beverage source and replaced by potable liquid introduced into the flow line. For example, the potable liquid may be introduced close to the dispense point such that beverage already present in the flow line is returned to the beverage source as potable liquid is introduced into the flow line.

[0038] Either arrangement results in a saving of beverage by removing beverage from the flow line during periods of non-use, for example between serving periods when the system is not in use such as overnight.

[0039] According to a fourth aspect of the present invention there is provided a method of replacing beverage in a flow line between a beverage source and a dispense point with potable liquid by connecting the flow line to a source of the potable liquid to displace beverage from the flow line.

[0040] The beverage replaced by the potable liquid may be dispensed or returned to the beverage source. Preferably, the replaced beverage is dispensed for consumption and a volume of potable liquid less than the residual volume of beverage in the flow line is introduced and dispense disabled to prevent dispense of the potable liquid. Preferably, the volume of potable liquid introduced is selected to allow dispense of a specific number of drinks. In this way, full dispense of the final drink to be dispensed can be achieved before dispense is disabled.

[0041] According to a fifth aspect of the present invention there is provided a beverage dispense system having a "normal" beverage dispense mode of operation and a beverage "saver" dispense mode of operation and means for changing over the mode of operation.

[0042] The changeover means may comprise a detachable coupler for releasably connecting a flow line to a beverage source in the "normal" beverage dispense mode of operation and to a potable liquid source in the beverage "saver" dispense mode of operation.

[0043] More preferably, however, the changeover means comprises a control system for operating valve means for selecting connecting a beverage source and a potable liquid source to a flow line. Preferably, a pressurising gas source is provided to propel the beverage and potable liquid through the flow line when the corresponding source is connected to the flow line and the valve means may be configured to connect the gas source to the appropriate source. In this way the beverage pressure and potable liquid pressure may be balanced to reduce break-out when the beverage contains a dissolved gas.

[0044] Preferably, the system includes a "cleaning" mode of operation for introducing a cleaning fluid into the flow line between serving periods. Typically, the beverage "saver" mode of operation is selected at the end of a serving period to displace substantially all the residual beverage from the flow line with potable liquid after which the "cleaning" mode of operation can be selected if line cleaning is required. Alternatively, the "cleaning" mode of operation may be omitted and the potable liquid left in the flow line until the beginning of the next serving period when it is displaced by beverage introduced into the flow line.

[0045] Preferably, separate circuits are provided for introducing potable liquid and cleaning fluid to the flow line during the beverage "saver" and line "cleaning" modes of operation. In this way, the risk of contamination of the potable liquid source with cleaning fluid is reduced. Moreover, separate circuits allow the sequence of "normal" dispense mode, "saver" dispense mode, and "cleaning" mode of operation to be varied as desired. For example, a control system may be provided to select the desired sequence of the various modes of operation. The control system may include an electronic controller, for example a programmable logic controller for inputting a desired sequence. The controller may include over-ride means to enable a selected sequence to be changed if desired.

[0046] According to a sixth aspect of the present invention, there is provided a beverage dispense system comprising a source of beverage, a source of potable liquid, a dispense point remote from the beverage source and potable liquid source, a flow line connected to the dispense point, means for connecting the beverage source to the flow line for delivery of beverage to the dispense point for dispense of beverage in a first mode of operation, means for connecting the potable liquid source to the flow line for delivery of residual beverage in the flow line to the dispense point for dispense of beverage in a second mode of operation, wherein the addition of potable liquid to the flow line in the second mode of operation is controlled to introduce a volume of potable liquid less than the volume of the residual beverage in the flow line.

[0047] According to a seventh aspect of the present invention, there is provided a method of dispensing a beverage comprising providing a flow line connected to a dispense point, connecting the flow line to a beverage source remote from the dispense point and dispensing beverage from the dispense point in a first mode of operation while introducing beverage into the flow line from the beverage source to replace dispensed beverage, connecting the flow line to a source of potable liquid remote from the dispense point and dispensing residual beverage contained in the flow line in a second mode of operation while introducing potable liquid into the flow line to replace dispensed beverage, and controlling the addition of potable liquid to introduce a volume of potable liquid less than the volume of residual beverage in the flow line.

[0048] Embodiments of the invention will now be described in more detail by way of example with reference to the accompanying drawings wherein:-

Figure 1 is a schematic representation of a beer dispense system according to a first embodiment of the invention;

Figure 2 is a schematic representation showing a modification to the beer dispense system of Figure 1;

Figure 3 is a diagrammatic representation of a beer dispense system according to a second embodiment of the invention;

Figure 4 shows, to an enlarged scale, the master control panel of the system shown in Figure 3; and

Figure 5 shows, to an enlarged scale, the status indication panel of the system shown in Figure 3.

[0049] Referring first to Figure 1 of the accompanying drawings, a dispense system 1 for beer is depicted in which a source 2 of beer, typically a keg, located in a cellar 3 is connected to a counter top fitting 4 mounted in a serving area 5 such as a bar remote from the cellar 3 by a flow line 6. The counter top fitting 4 includes a dispense valve (not shown) that may be manually or electrically operable to dispense beer. It will be understood that the dispense system 1 may be employed to dispense other alcoholic beverages such as lager, cider and the like.

[0050] The beer may be stored in the cellar 3 at a low temperature suitable for dispense without additional cooling. Alternatively or additionally, one or more coolers (not shown) such as ice bank coolers, thermoelectric coolers, heat exchangers or other suitable cooling devices may be provided in the cellar and/or bar area to cool the beer to the desired temperature for dispense. Storing the beer at or near the dispense temperature may be advantageous where rapid dispense of high volumes is required.

[0051] Between the cellar 3 and the bar area 5, the flow line 6 may be contained in an insulated sleeve (not shown) in contact with a flow line (not shown) containing a coolant, for example chilled water, to prevent the beer warming up in the flow line 6 to any appreciable extent. The arrangement of beer flow line and coolant flow line in the insulated sleeve is commonly referred to as a "python" and can be several metres long depending on the locations of the cellar 3 and bar area 5.

[0052] The flow line 6 is connected to the keg 2 by a detachable keg coupler (not shown) that also connects the headspace in the keg 2 to a source 7 of pressurising gas, for example a cylinder of carbon dioxide, to propel beer from the keg 2 along the flow line 6. A fob detector 8 is provided in the flow line 6 close to the keg 2 for detecting when the keg 2 is empty and preventing gas

entering the flow line 6 downstream of the fob detector 8. A pump 9 is also provided in the flow line 6 to assist in propelling the beer along the flow line 6 to the counter top fitting 4. In some embodiments, the pump 9 may not be required and can be omitted.

[0053] In accordance with the present invention, the system 1 further includes a source 10 of potable liquid, typically still water. In this embodiment, the source 10 is a container having a pre-determined volume connected to the mains water supply 11 via an on-off solenoid valve 12. The gas cylinder 7 is connected to the headspace of the water container 10 via a three-way solenoid valve 13 that also connects the gas cylinder 7 to the headspace of the keg 2. The water container 10 is connected to the flow line 6 upstream of the fob detector 8 via a three-way solenoid valve 14 that also connects the keg 2 to the flow line 6 upstream of the fob detector 8. The solenoid valves 12,13,14 are connected to a control system (not shown) for switching between a "normal" beer dispense mode and a beer "saver" dispense mode of operation.

[0054] In the "normal" beer dispense mode, the solenoid valve 13 connects the gas cylinder 7 to the keg 2 and the solenoid valve 14 connects the keg 2 to the flow line 6 upstream of the fob detector 8. In this mode, the water container 10 is isolated from the dispense system and the solenoid valve 12 may be opened/closed in response to a sensor (not shown) to fill the container 10 with water up to a pre-determined level corresponding to a known volume of water. Alternatively, the container 10 may be filled manually.

[0055] In the beer "saver" dispense mode, the solenoid valve 13 connects the gas cylinder 7 to the water container 10 and the solenoid valve 14 connects the water container 10 to the flow line 6 upstream of the fob detector 8. In this mode, the keg 2 is isolated from the dispense system and the solenoid valve 12 is closed to isolate the water container 10 from the mains water supply. Check valves (not shown) are also provided to prevent back-flow of water into the keg 2 and back-flow of beer into the water container when switching between the "normal" beer dispense mode and the beer "saver" dispense mode.

[0056] In a modification (not shown), one or both of the solenoid valves 13,14 may be replaced by two separate solenoid valves or any other suitable valve means for selectively controlling the connections to the flow line 6 and gas cylinder 7 in each mode of operation.

[0057] In use, during a serving period, the "normal" beer dispense mode is selected and, with the flow line 6 filled with beer, the dispense valve is operable to dispense beer into a glass or other suitable receptacle placed under an outlet 15 from the valve. Dispensed beer is replaced by beer from the keg 2 to keep the flow line 6 full of beer and the fob detector 8 is operable to detect when the keg 2 is empty and prevent gas entering the flow line 6.

[0058] The beer is dispensed in pint or half-pint measures and the flow line 6 contains a known volume of liquid,

typically equivalent to several pints of beer. Just before the end of the serving period, the system is switched from the "normal" beer dispense mode to the beer "saver" dispense mode either manually or by any other suitable means such as a time switch. In this mode, the flow line 6 contains a known residual volume of beer sufficient to continue dispensing in either pint or half-pint measures and beer that is dispensed is replaced by water from the container 10 so that the flow line 6 gradually fills with water.

[0059] In one arrangement, the water container 10 contains a known volume of water matched to the volume of the flow line 6 so that the container 10 empties and the fob detector 8 operates to disable the system and prevent further dispense before water reaches the dispense valve. The volume of water in the container 10 is preferably selected so that only a small volume of beer remains in the flow line 6 upstream of the dispense valve when the system is disabled at the end of the serving period.

[0060] In another arrangement, the volume of beer dispensed is monitored by any suitable means such as a flowmeter (not shown) arranged in the flow line 6 and, when the beer "saver" dispense mode is selected, the flowmeter is operable to cause the system to shut-down when a pre-determined volume of water has been added to the flow line 6. For example, the flowmeter may provide a signal to the control system to close a solenoid valve (not shown) positioned in the flow line 6 close to the dispense valve to disable the system and prevent further dispense before water reaches the dispense valve. Alternatively, the dispense valve may comprise a solenoid valve.

[0061] In both arrangements, accidental or unintentional dilution of beer dispensed from the counter top fitting 4 is prevented by stopping automatically dispense in the beer "saver" dispense mode before water reaches the dispense valve.

At the start of the next serving period, the "normal" beer dispense mode is again selected to re-connect the keg 2 to the flow line 6 and isolate the water container 10 from the flow line 6. The dispense valve is then opened to run-off to waste the residual volume of water filling the flow line 6 before starting to dispense beer for supply to customers. This may be done manually in the case of a hand operated dispense valve or, in the case of an electrically operated dispense valve, by operating the valve a pre-determined number of times to ensure beer has reached the dispense valve. This may be confirmed by visual recognition of the change from water to beer possibly assisted by giving the water a distinctive colour. Alternatively, the change from water to beer may be detected by monitoring the volume of liquid dispensed with a flowmeter or any other suitable device, for example a sensor capable of distinguishing between beer and water.

[0062] The flow line 6 comprises a tube of relatively small internal diameter, typically of the order of ¼ inch

(6.4mm), such that substantially "plug" flow of liquid occurs along the tube with only insignificant mixing of beer and water at the interface when switching between the "normal" beer dispense mode and the beer "saver" dispense mode.

[0063] As will now be appreciated, the above-described system replaces beer with water at the end of a serving period that remains in the flow line 6 until the start of the next serving period when the water is run-off to waste and replaced by beer from the keg 2. In this way, deterioration of beer remaining in the flow line 6 between dispenses and/or contamination of the flow line 6 caused by deterioration of the beer is substantially eliminated. As a result, there is little or no wastage of beer and the flow line 6 may require less frequent cleaning.

[0064] It will be understood that the flow line 6 may supply more than one dispense valve in the same or different counter top fittings. Where, the flow line is connected to counter top fittings in different parts of the bar area, the control system may disable the dispense valves in sequence so that the dispense valve furthest from the keg 2 is the last to dispense beer during the serving period. In this way, when switching from the "normal" beer dispense mode to the beer "saver" dispense mode, the water substantially fills the flow line 6 leading to all the dispense valves connected to the flow line 6.

[0065] Referring now to Figure 2, there is shown a modification to the dispense system of Figure 1 to include a cleaning mode of operation. For convenience, like reference numerals are used to indicate corresponding parts.

[0066] As shown, a source 16 of cleaning fluid, for example a caustic chlorinated detergent sanitizer solution, in the form of a container is provided with a connector 17 to which the keg coupler can be releasably connected after disconnecting from the keg 2. The gas cylinder 7 is connected to the headspace of the container 16 via a solenoid valve 18. A check valve (not shown) is also provided to prevent backflow of beer or water from the flow line 6 into the cleaning fluid container 16.

[0067] The solenoid valve 18 is connected to the control system and is switched to isolate the cleaning fluid container 16 from the gas cylinder 7 when the "normal" dispense mode and the "saver" dispense mode are selected. The container 16 can be filled with cleaning fluid manually or automatically via an appropriate arrangement of flow control valves and level sensors (not shown) when either the "normal" dispense mode or the "saver" dispense mode is selected.

[0068] In use, the "cleaning" mode of operation can be selected between serving periods when the flow line 6 is filled with water. The keg coupler is disconnected from the keg 2 and attached to the connector 17. The control system operates the solenoid valves 13,14 to isolate the water container 10 from the flow line 6 and the gas cylinder 7 and solenoid valve 18 to connect gas cylinder 7 to the headspace of the cleaning fluid container 16.

[0069] The dispense valve is then opened to run-off to

waste the residual volume of water in the flow line 6 and fill the flow line 6 with cleaning fluid introduced into the flow line 6 from the container 16 under the pressure of gas from the gas cylinder 7. The container 16 contains a volume of cleaning fluid greater than the residual volume of the flow line 6 up to the dispense valve so that, in use, the flow line 6 can be completely filled with cleaning fluid and the cleaning fluid can be run off to waste and replaced by fresh cleaning fluid until the container 16 empties and the fob detector 8 operates to prevent gas entering the flow line 6.

[0070] The flow line 6 is then full of cleaning fluid that is left in the flow line 6 for a pre-determined period of time sufficient to clean and sanitise the flow line 6. During this period, the control system closes the solenoid valve 18. This allows the gas pressure in the container 16 to be released and the container 16 filled with clean water either manually or automatically via a system of flow control and check valves. The container 16 is then re-pressurised and the solenoid valve 18 is opened to displace the cleaning fluid from the flow line 6 with clean water introduced into the flow line 6 from the container 16.

[0071] The container 16 may be re-filled with clean water that is then introduced into the flow line 6 to ensure that the flow line 6 is completely flushed through with clean water to remove the cleaning fluid and leave the flow line 6 filled with clean water before re-connecting the keg coupler to the keg 2 for selection of the "normal" dispense mode at the start of the next serving period.

[0072] Referring now to Figures 3 to 5, there is shown a beer dispense system 20 according to a second embodiment of the invention which employs the "normal" beverage dispense mode, the beverage "saver" dispense mode and the "cleaning" mode of operation previously described with reference to Figures 1 and 2.

[0073] In this embodiment, the system 20 is shown having a beer source 21 in a cellar or cold room 22 remote from a dispense point 23 in a serving area 24 such as a bar. The cellar room 22 is maintained at a low temperature, for example 2°C by any suitable means (not shown) such that the beer is stored in the cellar at a low temperature suitable for dispense without additional cooling. As a result, a separate cooler in the cellar and/or serving area may not be required and faster dispense of beer may be possible. It will be understood, however, that a separate cooler such as an ice-bank cooler, thermoelectric cooler or heat exchanger may be provided in the cellar and/or serving area to cool the beer between the source 21 and dispense point 23 if required, for example for dispense of extra-cold beer. Alternatively or additionally, the temperature in the cellar may be higher and one or more additional coolers provided to cool the beer to the required dispense temperature. In this embodiment, the beer source 21 is shown comprising six kegs 25 each having a detachable keg coupler 26 for connecting a gas inlet line 27 and a beer outlet line 28. It will be understood that the number of kegs 25 may be varied according to the system requirements.

[0074] Each gas inlet line 27 is connected to a common source 29 of pressurised gas, for example carbon dioxide, for pressurising the headspace above the liquid level in the keg via a respective solenoid valve 30 housed in a valve block or manifold 31. Upstream of the manifold 31, a pressure regulator 32 is provided for maintaining a substantially constant gas pressure, for example 30 psi. In this embodiment there are six solenoid valves 30, one for each keg 25.

[0075] The beer outlet line 28 of each keg 21 is connected to a respective solenoid valve 33 housed in a valve block or manifold 34. The kegs 25 are arranged in two groups of three with the solenoid valves 33 of each group connected to a respective one of two flow lines 35,36 from the manifold 34. Each flow line 35,36 includes a fob detector 37 and a pump 38 respectively.

[0076] In this embodiment, each flow line 35,36 splits into two lines at the outlet from the pump 38 to provide a total of four flow lines each connected to a respective one of four dispense valves 39 of a multifill dispense head 40 located in the bar area 24. The dispense valves 39 are on-off solenoid valves with portion control provided by a variety of means, such as dispense timing or counting pulses from a turbine type flow meter. The pump 38 assists in propelling product to the dispense head 40, especially when the bar area 24 is a long way from the cellar room 22.

[0077] Between the cellar room 22 and the bar area 24, the flow lines are contained in an insulated sheath 41 in which coolant, for example a water/glycol mixture or chilled water, is circulated through supply and return lines 42,43 of a recirculation loop connected to a coolant tank 44 to prevent the beer warming up in the flow lines. A pump 45 is provided in the supply line 42 to propel the coolant through the sheath 41 and back to the tank 44. The tank 44 is shown located in the cold room 22 and is provided with a heat exchanger 46 to dump heat to atmosphere outside the cold room 22.

[0078] In a "normal" dispense mode of operation during a serving period, one set of three kegs supplies beer to two of the dispense valves 39 and the other set of three kegs supplies beer to the other two dispense valves 39. Only one keg from each set is connected to each flow line 35,36 and the fob detector 37 detects when the keg is empty and prevents gas entering the flow line downstream of the fob detector 37.

[0079] A control system (not shown) is responsive to an "out of beer" signal from a float (not shown) in the fob detector 37 to close the solenoid valve of the empty keg and open the solenoid valve of another, full keg in the same set to allow dispense of beer to continue. The fob detector 37 includes a valve (not shown) to vent gas and re-set the float to generate an "out of beer" signal when the new keg is empty. By providing three kegs that can be connected in sequence to each flow line, the dispense head 40 can continue to dispense beer while an empty keg is being changed.

[0080] The dispense system further includes a bottle

47 for introducing potable liquid, typically water, into the flow lines to the dispense head 40 during a beer "saver" dispense mode of operation at the end of the serving period when the dispense system will be out of use for a period of time, for example overnight. The bottle 47 has a gas inlet line 48 connected to the source 29 of pressurised gas via a solenoid valve 49 and a water outlet line 50 connected to the flow lines 35,36 via a solenoid valve 52 and the manifold 34. The bottle 47 contains a volume of water sufficient to fill the flow lines to the dispense head 40 with clean water during the beer "saver" dispense mode of operation. During the "normal" dispense mode of operation, the solenoid valves 49,52 are closed to isolate the bottle 47 from the source 29 of pressurised gas and from the flow lines 35,36.

[0081] On switching from the "normal" dispense mode of operation to the beer "saver" dispense mode of operation at the end of a serving period, the solenoid valves 33 of the kegs connected to the flow lines 35,36 are closed and the solenoid valves 49 and 52 opened so that water in the bottle 47 is introduced into the flow lines to the dispense head 40 and gradually replaces residual beer in the flow lines as it is dispensed at the dispense head. The flow line to each dispense valve 39 includes a flowmeter (not shown) to monitor the volume of liquid dispensed from each valve 39 and the control system is operable in response to a signal from the flowmeter to disable dispense from the associated dispense valve 39 just before water reaches the dispense valve 39. For example, by closing the dispense valve 39 or a separate on/off solenoid valve (not shown) provided in the flow line adjacent to the dispense valve 39.

In this way, the dispense head 40 can continue to dispense beer after the system has switched to the beer "saver" dispense mode of operation and the kegs are isolated from the flow lines. The volume of the bottle 47 is chosen to match the combined volume of the flow lines to the dispense valves 39 so that dispense can continue until all the flow lines to the dispense head 40 are filled with water.

[0082] The control system may also respond to an "out of water" signal from the fob detectors 37 if the bottle 47 empties before all the flow lines have filled with water to shut-down the dispense system, for example by closing the dispense valves 39 or where provided, on-off solenoid valves (not shown) in the flow lines close to the dispense valves 39. In this way, dispense is prevented until the dispense valves 39 (or separate on/off solenoid valves in the flow lines) have been opened, for example by selecting the "normal" beer dispense mode, and gas is prevented from entering the flow lines.

[0083] On switching to the "normal" beer dispense mode at the start of the next serving period, one keg from each set is re-connected to the flow lines 35,36 and the bottle 47 is isolated. The residual water remaining in the flow lines is then run-off to waste until beer reaches the dispense head 40 and the system can operate to dispense beer in the normal manner.

[0084] In a modification, the control system may be programmed not to respond to selection of the "normal" beer dispense mode following shut-down until a key switch, code or other means of preventing inadvertent or unauthorised operation has been employed as an added security measure.

[0085] The system also includes a bottle 53 for introducing cleaning fluid, typically a caustic chlorinated detergent sanitizer solution, into the flow lines during a "cleaning" mode of operation between serving periods when the system is not in use, for example overnight. The bottle 53 has a gas inlet line 54 connected to the source of pressurised carbon dioxide and a cleaning fluid outlet line 55 connected to a manifold (not shown) having plug-in sockets 56 for releasable connection to the keg couplers 26. In this embodiment, there are six sockets 56, one for the coupler 26 of each keg 21.

[0086] In use, when the system is to be cleaned between serving periods, the keg couplers 26 are disconnected from the kegs 25 and plugged into the sockets 56. The control system opens the solenoid valves 33 and the dispense valves 39 allowing cleaning fluid to be introduced from the bottle 53 into the flow lines via the keg couplers 26. The bottle 53 has a volume greater than the combined volume of the flow lines 35,36 up to the dispense head 40 allowing the residual water (and beer between the keg couplers 26 and valves 33) in the flow lines to be run-off to waste until the flow lines are filled with cleaning fluid. The cleaning fluid can then be run off to waste and replaced by fresh cleaning fluid until the bottle 53 empties and the fob detectors 37 operate to prevent gas entering the flow lines 35,36.

[0087] The bottle 53 can be re-filled with clean water, either manually or automatically via a suitable arrangement of flow control and check valves (not shown) that is then introduced into the flow lines in similar manner while the cleaning fluid is displaced from the flow lines and run to waste leaving the flow lines filled with clean water. The keg couplers 26 can then be disconnected from the sockets 56 and re-connected to the kegs 25 ready for the next serving period.

[0088] The control system includes a master control panel 57 for user selection of the different modes of operation and a system status indication panel 58 for indicating various conditions of the dispense system. Both panels 57,58 are mounted on a control board 59 in the cellar room 22 that also mounts other parts of the dispense system as shown in Figure 3. This is not essential, however, and one or both panels 57,58 may be provided at other locations such as the serving area. Alternatively or additionally, a second status indication panel (not shown) may be provided in the serving area to alert staff when a keg 25 needs to be changed.

[0089] As best shown in Figure 4, the master control panel 57 includes a power on/off indicator light 60, a control knob 61 for selecting the "normal" beer dispense mode, the beer "saver" dispense mode and the "cleaning" mode of operation, and a green (or other suitable colour)

LED indicator light 62 that is illuminated (continuously or intermittently) when the beer "saver" dispense mode of operation is selected. The control knob 61 may include an over-ride function to allow the user to change the selected operated mode or sequence of operating modes, for example if the "cleaning" mode is not required when the system is shut-down between serving periods. Alternatively, a separate over-ride control may be provided.

[0090] As best shown in Figure 5, the system status indicator panel 58 includes a set of two buttons 63,64 and two indicator lights 65,66 for each keg 25. Button 63 is operated to inform the control system when a new keg has been connected. Button 64 is operated to purge gas from the flow lines when a new keg has been connected. Indicator light 65 is a red (or other suitable colour) LED that is illuminated (continuously or intermittently) to indicate when the keg 25 is empty. Indicator light 66 is a green (or other suitable colour) LED that is illuminated (continuously or intermittently) to indicate when the keg 25 is supplying beer to the dispense head 40.

[0091] The control system may include an electronic controller with programmable memory for controlling operation of the dispense system in the various modes and for storing data relating to the operation of the system. For example, the controller may record the cumulative throughput of the system during the dispense modes of operation, when empty kegs are replaced, frequency of cleaning, servicing and/or data relating to any other function or property of the system that may allow a check on the system to be maintained. The electronic controller may include a communications module for transmission of data to and from the controller for remote monitoring of the system. Alternatively or additionally the master control panel may include a port for connecting a laptop or palmtop computer or other module for transmitting data to and from the controller.

[0092] As will now be appreciated, the invented dispense system can reduce wastage of beer by filling a flow line to a dispense valve with water between serving periods that prevents beer going stale in the flow line and having to be run off to waste at the start of the next serving period or before cleaning. Also contamination of the flow line by deterioration of beer in the flow line can be reduced and hence the frequency at which the flow lines require cleaning may be reduced.

[0093] Furthermore, by employing separate circuits for introducing the potable liquid and cleaning fluid to the flow line, the beverage "saver" mode of operation can be used with or without the "cleaning" mode of operation and vice versa. Additionally, cross-contamination of the potable liquid source with cleaning fluid can be prevented.

[0094] It will also be appreciated that existing dispense systems with a "cleaning" mode of operation can be adapted to include a beverage "saver" mode of operation by adding a circuit including the potable liquid source. Thus, existing systems can be retro-fitted to provide the benefits and advantages of the beverage "saver" mode

of operation.

[0095] It will be understood that the invention is not limited to the above-described embodiments and that the principles and concepts described herein may be applied to beverage dispense systems for both alcoholic beverages such as beer, lager, cider and non-alcoholic beverages such as soda and cola where the beverage is supplied to a dispense point from a remote source and may deteriorate if left in a flow line for any significant length of time and/or contaminate the flow line.

Claims

1. A beverage dispense system comprising a source of beverage, a source of potable liquid, a dispense point remote from the beverage source and potable liquid source, a flow line connected to the dispense point, means for connecting the beverage source to the flow line for delivery of beverage to the dispense point for dispense of beverage in a first mode of operation, means for connecting the potable liquid source to the flow line for delivery of residual beverage in the flow line to the dispense point for dispense of beverage in a second mode of operation, wherein the addition of potable liquid to the flow line in the second mode of operation is controlled to introduce a volume of potable liquid less than the volume of the residual beverage in the flow line.
2. A system according to claim 1 wherein the potable liquid is introduced into the flow line close to the beverage source, and wherein the volume of potable liquid added to the flow line is slightly less than the residual volume of beverage such that substantially all the residual volume of beverage is available for dispense.
3. A system according to claim 1 or claim 2 wherein the addition of potable liquid is controlled to introduce a pre-determined volume of potable liquid to the flow line, and wherein means is provided for detecting when the pre-determined volume of potable liquid has been introduced to the flow line.
4. A system according to claim 3 wherein the pre-determined volume of potable liquid is stored in a container connectable to the flow line, and the detector means is operable to detect when the container is empty.
5. A system according to claim 3 wherein the detector means comprises a sensor operable to detect when the pre-determined volume of potable liquid has been introduced to the flow line.
6. A system according to any of claims 3 to 5 wherein the pre-determined volume of potable liquid corre-

sponds to a volume of beverage for dispensing a specific number of drinks.

7. A system according to any of claims 3 to 7 wherein dispense is disabled when the pre-determined volume of potable liquid has been introduced to the flow line. 5
8. A system according to claim 7 wherein valve means is arranged in the flow line at or close to the dispense point that is closed to prevent dispense in response to introduction of the pre-determined volume of potable liquid to the flow line. 10
9. A system according to any preceding claim wherein means is provided for connecting a source of cleaning fluid to the flow line in a third mode of operation, 15
10. A system according to claim 9 wherein the means for connecting the potable liquid source and the means for connecting the cleaning fluid source are provided by separate circuits. 20
11. A system according to claim 10 wherein the circuit for the potable liquid source is connectable to the flow line when the beverage source is connected to the flow line and the circuit for the cleaning fluid source is connectable to the flow line when the beverage source is disconnected from the flow line. 25
30
12. A system according to claim 10 or claim 11 wherein, a volume of cleaning fluid greater than the residual volume of the flow line is introduced to the flow line after the residual beverage has been displaced from the flow line by introducing potable liquid so that the potable liquid is displaced from the flow line by the cleaning fluid. 35
13. A system according to any preceding claim wherein portion control is employed for dispense and/or logging cumulative throughput. 40
14. A method of dispensing a beverage comprising providing a flow line connected to a dispense point, connecting the flow line to a beverage source remote from the dispense point and dispensing beverage from the dispense point in a first mode of operation while introducing beverage into the flow line from the beverage source to replace dispensed beverage, connecting the flow line to a source of potable liquid remote from the dispense point and dispensing residual beverage contained in the flow line in a second mode of operation while introducing potable liquid into the flow line to replace dispensed beverage, and controlling the addition of potable liquid to introduce a volume of potable liquid less than the volume of residual beverage in the flow line. 45
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15. A method according to claim 14 wherein, the potable liquid is introduced close to the beverage source to replace residual beverage dispensed from the dispense point, and dispense of beverage is terminated before the potable liquid is dispensed from the dispense point.

16. A method according to claim 14 claim 15 further including the step of introducing a pre-determined volume of potable liquid to the flow line to dispense a corresponding volume of beverage sufficient for a specific number of drinks.

17. A method according to any of claims 14 to 16 including disconnecting the flow line from the beverage source and connecting the flow line to a source of cleaning fluid in a third mode of operation.

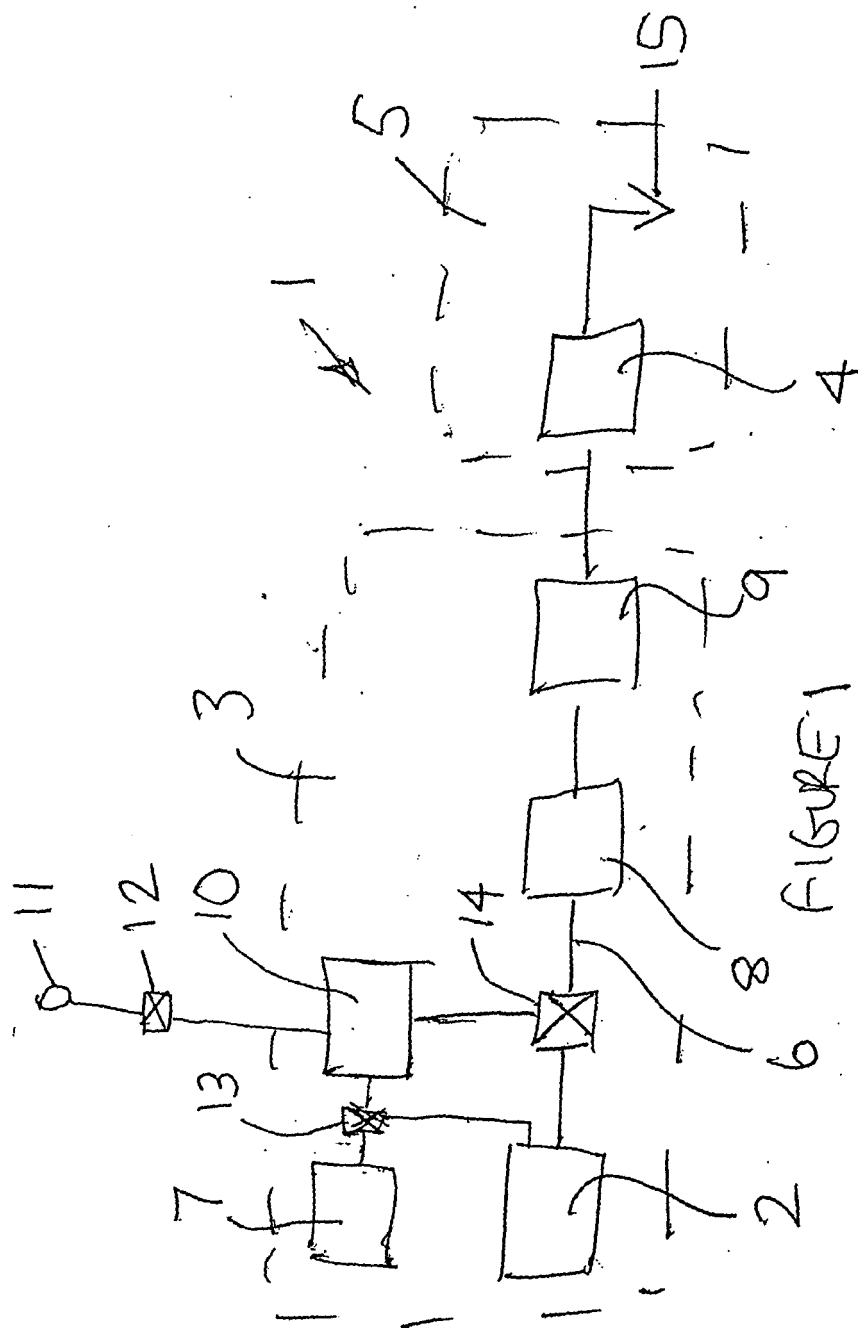
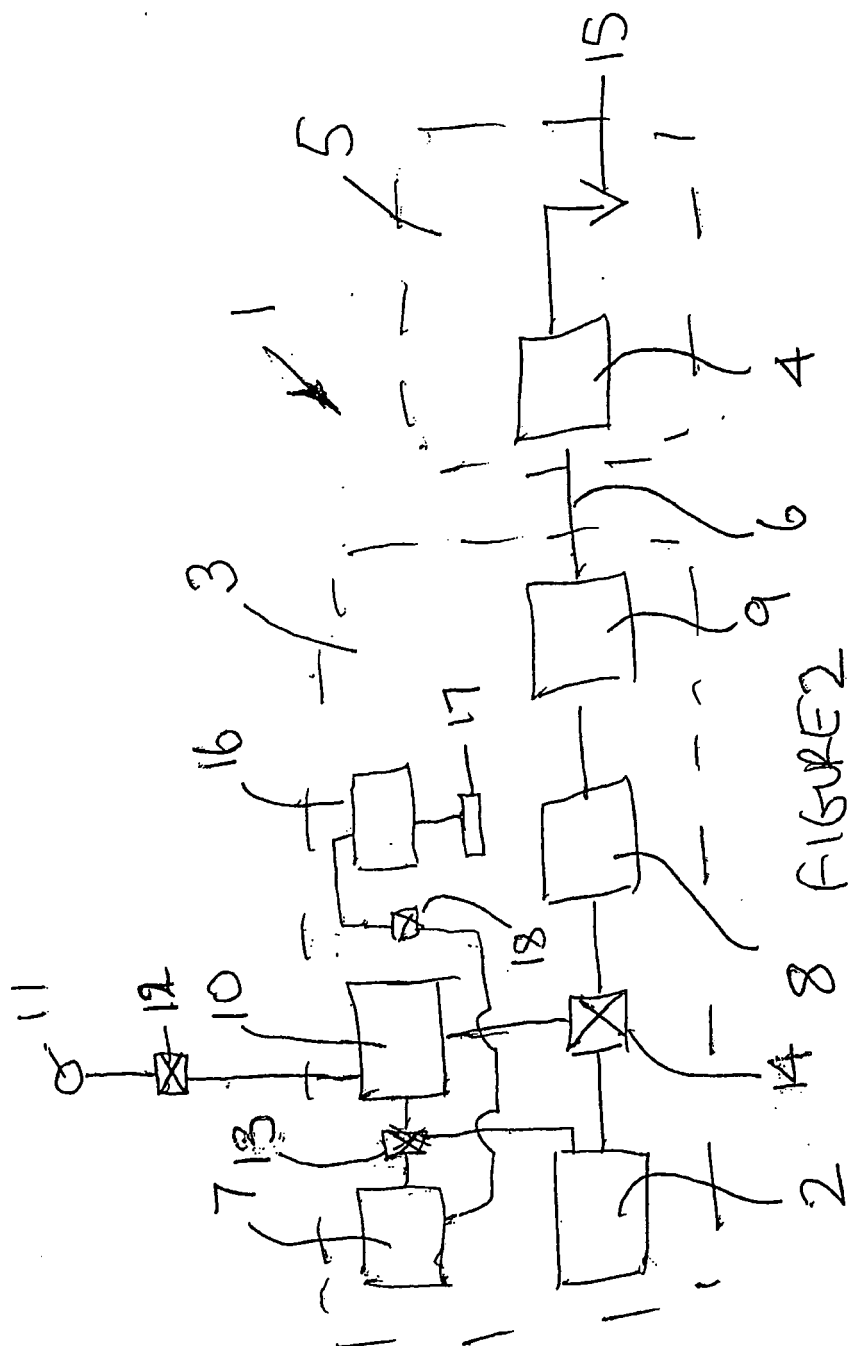


FIGURE 1



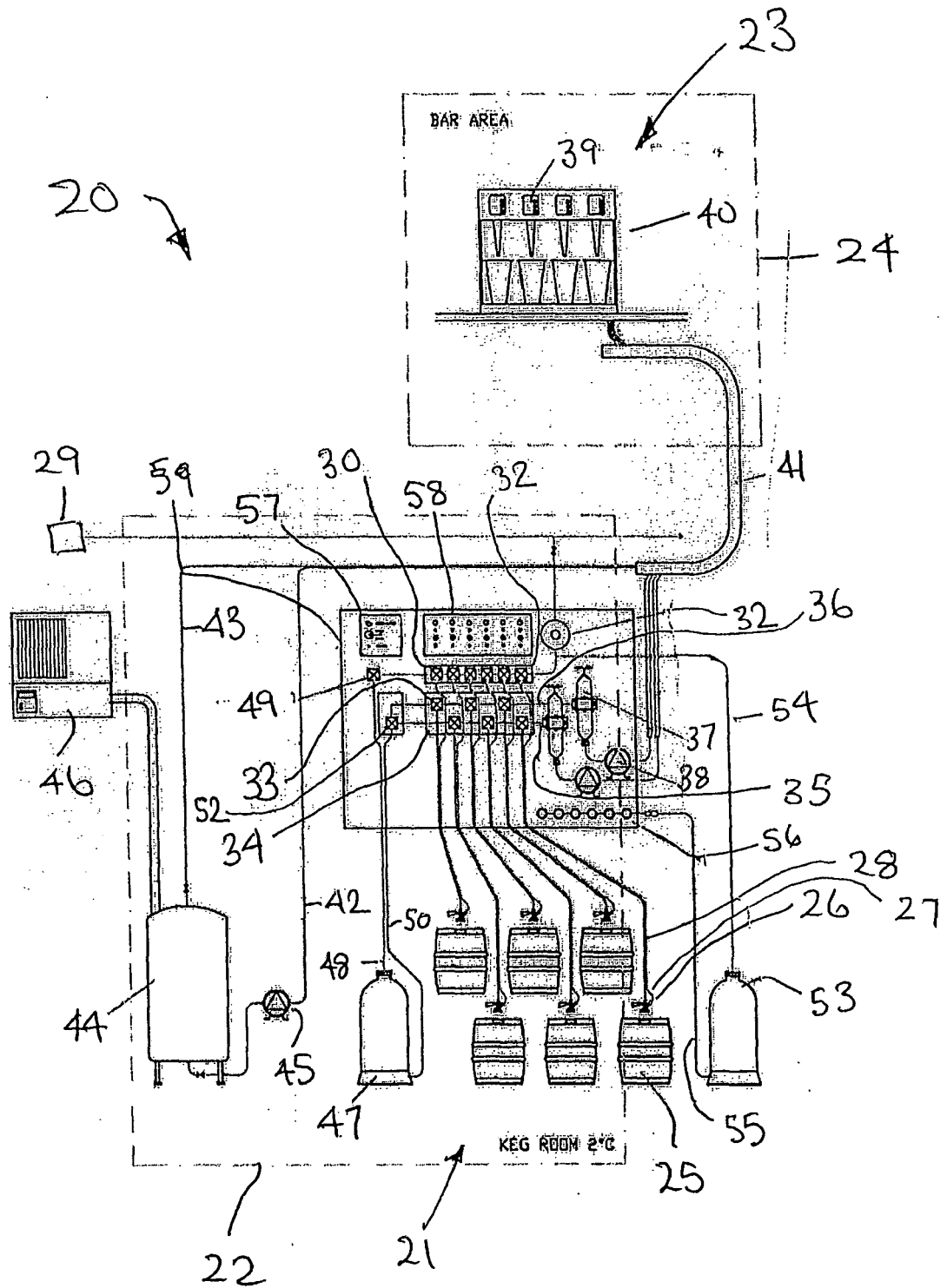


FIGURE 3

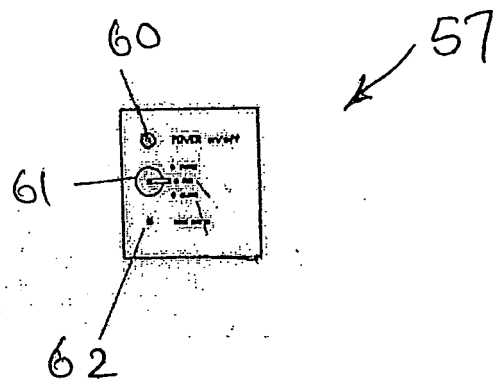
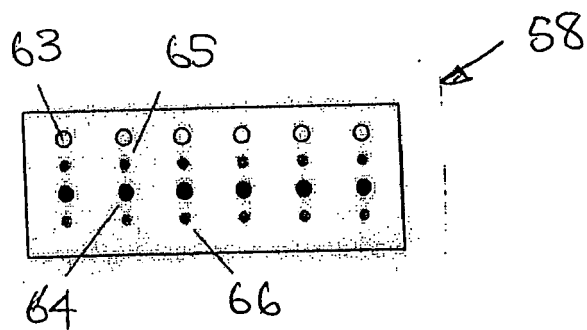


FIGURE 4



FIGURES

REFERENCES CITED IN THE DESCRIPTION

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