

A BEVERAGE DISPENSING SYSTEM

TECHNICAL FIELD

The present invention relates to a beverage dispensing system. In particular, the present invention relates to an automated beverage dispensing system that is configured to automatically dispense one or more types of beverages.

BACKGROUND

The selling of fast food and beverages within the food and beverage or hospitality industry is becoming more and more popular due to changing consumer habits and the increase adoption of the delivery industry. Despite the popularity of this industry as well as the increase in consumer spending, the industry remains costly to operate with increase in labour costs, raw material costs and the usage of modern food preparation equipment to meet new food quality standards.

There have been attempts at using automation in the food and beverage industry via the use of robots or other forms of food vending machines. However, despite the presence of these technologies, the improvements are insufficient and unpopular amongst customers expecting quality products beyond that of basic pre-processed food items. These food items which are prepared with automation or are pre-packaged are generally of a low quality and are rarely desired by consumers wishing to opt for a higher quality product.

In order to improve the quality of the food item, additional labour may be introduced into the vending process and thereby increasing the costs of the service yet again. This in turn has meant that the adoption of automation in the food and beverage industry has not reach its full potential in decreasing costs to the customer and the environment whilst seeing an increase in product quality.

SUMMARY OF THE INVENTION

The present invention relates to a beverage dispensing system. In particular, the present invention relates to an automated beverage dispensing system for dispensing various beverages. The automated beverage dispensing system ameliorates at least one of the drawbacks of current beverage dispensing systems or at least provides the public with a useful alternative.

The automated beverage dispensing system automatically prepares and dispenses a beverage. The system may dispense coffee. The system may dispense other beverages such as tea, juice, soda or alcohol. The beverage dispensing system may be configured to dispense any other beverage.

In one aspect the present invention relates to an automated beverage dispensing system:

at least one tank configured to hold a beverage,

at least one faucet to dispense the beverage,

a fluid pathway between the at least one tank and the at least one faucet and fluidly connecting the tank and the faucet,

a pump positioned within the fluid pathway, between the faucet and the tank,

the pump configured to pump beverage from the tank through the faucet,

at least one beverage quality sensor positioned on or within the tank,

the beverage quality sensor is configured to measure a quality of the beverage within the tank,

a controller in electrically coupled to the pump and electrically coupled to the beverage quality sensor,

the controller is configured to:

activate the pump to dispense beverage from the tank through the faucet,
determine the quality of the beverage within the tank and,
generate an alarm if the measured quality is below a threshold.

The at least one beverage quality sensor is one of: a temperature sensor, a chemical sensor, food safety sensor, a gases composition sensor, a pH sensor, or an optical sensor.

The beverage quality sensor may be a temperature sensor, the temperature sensor is positioned on an inner surface of the tank, or the temperature sensor is located on a coupling between the pump and the fluid pathway, and; the temperature sensor is configured to measure the temperature of the beverage in the tank

the controller is configured to compare the measured temperature of the beverage with a threshold, the controller configured to generate an alarm if the measured temperature is beyond a temperature threshold.

The system may comprise at least a pair of beverage quality sensors associated with each tank. A first beverage quality sensor comprising one of temperature sensor. A second beverage quality sensor comprising one of a pH sensor, chemical sensor, optical sensor or is a chemical sensor, the second beverage quality sensor measuring a quality parameter. The controller may be configured to compare the measured temperature of the beverage with a threshold. The controller may be configured to compare a measured quality parameter with a threshold and the controller configured to generate an alarm if the measured temperature is beyond a temperature threshold and if the measured quality parameter is beyond a threshold.

The tank may comprise a multi walled structure.

In one example the tank comprises a triple walled structure and a metallic lining. The metallic lining is a copper lining.

The tank comprises an inner container formed out of a food grade material e.g., stainless steel or plastics. An intermediate (i.e., second) wall surrounds the inner container. The second wall may comprise a metallic lining. The metallic lining being copper. The tank may comprise an outer wall that surrounds inner container and second wall. The inner container, second wall and outer wall forming a triple walled structure.

The tank may comprise a liquid level sensor positioned on or within the tank, the liquid sensor is configured to determine a level of the beverage within the tank. The controller is configured to generate an alarm if the measured level is below a threshold.

The automated beverage dispensing system may comprise a flushing system, the controller configured to control the flushing system based on a predetermined event to deliver flushing fluid through one or more components of the beverage dispensing system to clean the one or more components of the beverage dispensing system.

The flushing system may comprise a controllable valve fluidly connected between the tank and the pump. The controllable valve is fluidly coupled to a flushing fluid source, and wherein the controllable valve is controlled to deliver the flushing fluid through one or more components of the beverage dispensing system.

The controller may be configured to activate the flushing system during to introduce water through at least the faucet during a flushing cycle and the flushing cycle is initiated after a beverage has been dispensed.

The flushing system may introduce water through at least the faucet when a cleaning mode is initiated. The cleaning mode is automatically initiated at a predefined time or after the dispensing system has not been used for a predetermined period.

The controller is configured to control open the controllable valve and control the pump during the flushing cycle or the cleaning mode to draw flushing fluid through the valve and propel the flushing fluid through one or more components of the beverage dispensing system to clean the one or more components.

In one example during a flushing cycle the flushing system is controlled to introduce between 1 teaspoon and 1 tablespoon of flushing fluid through one or more components of the beverage dispensing system.

In one example in a cleaning mode the flushing system is controlled to introduce between 1 and 3 cups of flushing fluid through one or more components of the beverage dispensing system.

The automated beverage dispensing system may comprise a proximity sensor. The proximity sensor located on the faucet wherein the proximity sensor configured to detect a distance of a cup from the faucet. The controller may be arranged in electronic communication with the proximity sensor. The controller configured to activate the pump to dispense a beverage if a cup is within a threshold distance to the faucet based on the measured distance by the proximity sensor.

In one example the automated beverage dispensing may comprise:

- a plurality of faucets,
- a plurality of pumps,
- each pump arranged in fluid communication with a single faucet,
- a fluid pathway in extending between the pump and its associated faucet and;
- a plurality of tanks each tank associated with a faucet and fluidly coupled with a pump.

In a second aspect the present invention related to an automated beverage dispensing system comprising:

- a faucet
- a tank configured to hold a beverage,
- a pump
- a fluid pathway, the pump positioned upstream of the faucet and in fluid communication with the fluid pathway,
- the faucet in fluid connection with the fluid pathway,
- a controller in electronic communication with the pump and configured to activate the pump to propel a beverage from the tank, through the fluid pathway and through the faucet,
- a flushing system in fluid communication with the one or more of the faucets, fluid pathway and pump,
- the flushing system configured to flush one or more of a faucet, pump and fluid pathway with cleaning fluid based on one or more predetermined events.

In a third aspect the present invention relates to an automated beverage dispensing method comprising the steps of:

- receiving an order for a beverage,
- dispensing the ordered beverage when a cup is detected to be in an operational position, wherein the cup being in an operation position is sensed by a proximity sensor,
- operating a flushing system to flush the beverage dispensing system with a flushing fluid in response to a predetermined event.

In one example the predetermined event is one or more of: a flushing cycle, a cleaning mode, predetermined time.

The controller is configured to detect dispensing of an ordered beverage, initiating a flushing cycle after the beverage is dispensed to flush the faucet and fluid pathway of any residual beverage.

The controller is configured to initiate a cleaning mode in response to an input, wherein the cleaning mode is automatically initiated at a predefined time or after the dispensing system has not been used for a predetermined period.

The method comprising the additional steps of:

- receiving data indicative of a level of beverage in a tank from a liquid level sensor,
- comparing the sensed level with a threshold and;
- generating an alert or alarm or message if the detected liquid in a tank is below a threshold.

The method comprising the additional steps of:

- receiving data indicative of a beverage quality from a beverage quality sensor associated with the tank,
- determining a quality of a beverage based on the received data,
- comparing the quality of the beverage with a threshold, and
- generating an alert or alarm or message if the quality of a beverage is less than a quality parameter,

wherein the controller is configured to determine a quality of a beverage based on a beverage quality sensor input.

BRIEF DESCRIPTION OF THE DRAWINGS

One or more embodiments of a beverage dispensing system will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 illustrates an example embodiment of an automated beverage dispensing system.

Figure 2 illustrates the automated beverage dispensing system of Figure 1 with the type of beverages offered by the system presented on a user interface.

Figure 3 is a schematic diagram of the various components of the beverage dispensing system of Figure 1.

Figure 4 illustrates an example embodiment of a tank of the automated beverage dispensing system.

Figure 5 illustrates an example embodiment of a tank of the automated beverage dispensing system with various sensors disposed on the tank.

Figure 6 is a schematic diagram of a flushing system

used with the automated beverage dispensing system of Figure 1, to flush the dispensing system with flushing fluid to clean out components of the dispensing system.

Figure 7 illustrates a schematic diagram of the inputs and outputs of the controller of the automated beverage dispensing system of Figure 1.

Figure 8 illustrates a commercial application of the beverage dispensing system of Figure 1, where multiple automated beverage dispensing systems are used to dispense various beverages.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to an automated beverage dispensing system that may automatically dispense a beverage in response to trigger. The beverage dispensing system comprises a tank (i.e., a receptacle or flask or tank) to store a beverage, a pump, a faucet (i.e., an outlet or spout or nozzle) and a fluid pathway fluidly connecting the tank, the pump and the faucet. The system further comprises a controller. The controller may be configured to control operation of the pump to push the beverage through the fluid pathway and dispense out of the faucet. The fluid pathway comprises a pathway (i.e., a passageway) may comprise one or more pipes that interconnect the pump, tank and faucet.

The beverage dispensing system may comprise a beverage quality sensor that is configured to sense the quality of the beverage within a tank. The beverage quality sensor may be associated with a tank. In one example, the system may comprise multiple beverage quality sensors, each sensor being associated with a single tank. Optionally, the beverage quality sensor may be mounted inside the tank. The controller may receive signals from the beverage quality sensor (or sensors) and determine the quality of the beverage in each tank. The controller may generate an alarm signal if the measured quality is below a threshold.

The system may optionally comprise multiple beverage quality sensors associated with each tank. The controller may determine the quality of a beverage in the one or more tanks based on the multiple quality sensors. The controller may calculate or measure a quality parameter based on the measurements from the multiple quality sensors. The controller may raise an alarm if the quality is less than a quality threshold.

The beverage dispensing system may further comprise a flushing system. The controller configured to control the flushing system based on a predetermined event to deliver flushing fluid through one or more components of the beverage dispensing system to clean the one or more components of the beverage dispensing system. Alternatively, the flushing system may comprise a flushing system controller that is configured to operate or activate the flushing system. The flushing system controller may be controlled by the controller.

The flushing system may comprise a controllable valve such as for example a solenoid valve or a proportional valve. The valve may be opened when the flushing system is activated in response to a predetermined event e.g., a flushing cycle or a cleaning mode or a predetermined time. In one example the flushing cycle may be initiated after a beverage is dispensed to flush any residual beverage in the faucet or fluid pathway. A cleaning mode may be initiated based on a time of day e.g., at the end of the day or the cleaning mode may be manually initiated. The cleaning mode may flush the components of the beverage dispensing system to clean the components.

The beverage dispensing system may comprise one or more user interfaces e.g., screens to present information to a user. The information presented may be one or more of the types of beverages, the size of the beverage, temperature and/or quality of the beverage. Additionally, information such as the username or user preferences etc. may also be presented on the screen. The beverage dispensing system

may comprise a wireless communication interface to permit wireless communications and various IoT functions such as for example receiving beverage orders remotely or cleaning mode activation remotely etc. The communications interface may also allow for remote payment.

Figure 1 and Figure 2 illustrate an example form of a beverage dispensing system 100. Figure 1 and Figure 2 illustrate an automated beverage dispensing system 100 as it is installed. Figure 3 illustrates a schematic diagram of the beverage dispensing system. The system 100 may be an automated beverage dispensing system that is configured to automatically dispense a beverage in response to a trigger. The trigger may be from a switch or from a remote device such as for example a mobile device. The beverage dispensing system 100 may dispense any suitable type of beverage. The system 100 may dispense hot beverages or cold beverages. For example, the beverage dispensing system 100 may dispense coffee or tea or hot chocolate or other hot beverages. The system 100 may also be configured to dispense soda, beer, wine, juice, pre-mixed drinks, premade cocktails or mocktails or other beverages that may be served cold.

The automated beverage dispensing system 100 may comprise at least one tank 200 configured to hold a beverage, at least one faucet 110 to dispense the beverage and a pump 120. The system 100 may further comprise a fluid pathway 130 extending between the faucet 110 and the tank 200. The pump 120 may be positioned within the fluid pathway 130. The fluid pathway 130 may comprise one or more pipes that extend between the tank 200 and the faucet. The fluid pathway 130 fluidly connects the tank 200, the pump 120 and the faucet 110. The interconnecting pipes 130 may be of any configuration. The pipes are denoted by the thicker lines in Figure 3. A portion of the pipes extends through the elongate faucet to an outlet of the faucet. The beverage is pumped through the fluid pathway 130 and out of the faucet into a cup or container of a user.

The beverage dispensing system 100 may comprise multiple faucets and multiple tanks. Each tank may be adapted to retain a different type of beverage. Alternatively, each tank may be filled with the same beverage.

Referring to the figures, the example configuration of the beverage dispensing system 100 comprises at least two faucets 110, 112. The system 100 further comprises at least two tanks 200, 202. The system 100 further comprises at least two pumps 120, 122. The pumps 120, 122 may comprise any suitable fluid pump such as for example a peristaltic pumps or helical gear pumps or any other suitable pumps to pump beverages.

The beverage dispensing system 100 may comprise at least one beverage quality sensor positioned on or within the tank. In one example configuration illustrated in Figures 1 to 3, a tank is fluidly coupled to a single pump and faucet, such that the contents of the that tank are dispensed through a single faucet. As shown in Figure 3, tank 200 is fluidly coupled to faucet 110 via pump 120 such that the beverage in tank 200 is dispensed through faucet 110. The pump 120 pumps beverage from tank 200 through faucet 110. The beverage in tank 202 is pumped by pump 122 through faucet 112. The system 100 may include separate fluid pathways.

Each pump is couple to a tank by a fastener. The fastener may be a threaded fastener. The fastener may be a push fit or bayonet fitting. In the illustrated example each tank 200, 202 comprises a fastener to fasten the tank to the pump. The tank 200 is fastened to the pump 120 by fastener 210. The tank 202 is

fastened to the pump 122 by a fastener 212. The fasteners 210, 212 each include a conduit to allow beverage to flow from the tank to the faucet as the pump draws beverages from the tank.

The beverage dispensing system 100 may comprise multiple tanks, multiple pumps and multiple faucets. The separate tanks can be for separate beverages. The separate fluid pathways reduce contamination of beverages or mixing of different beverages. Each individual faucet may be adapted to dispense a specific beverage. The faucets may be labelled to indicate the specific beverage that is dispensed through that faucet.

The beverage dispensing system 100 may comprise a controller 140. The controller 140 may be electrically coupled to the pumps 120, 122. The controller 140 is configured to activate each pump to dispense beverage from the tank through the faucet in response to a trigger. The controller 140 may be configured to separately control each pump.

The beverage dispensing system 100 may comprise at least one switch 150. The system 100 comprises a pair of switches 150, 152. Each faucet 110, 112 comprises at least one switch 150, 152, as shown in Figure 3. Figure 1 illustrates the switches, each switch positioned in table and under the faucet. The switch may function as a trigger to dispense a beverage. The switch 150, 152 may be a magnetic switch or a reed switch or another mechanical switch. The switch 150, 152 can be depressed by a user e.g., by a cup or container.

In use, the switch 150, 152 may be depressed or physically interacted with to trigger e.g., by a user placing a cup or container on the switch 150, 152. The controller 140 is configured to receive the trigger (i.e., a trigger signal) from the switch and activate the pump to dispense the beverage via the faucet. The pump associated with the faucet that includes switch 150, 152 is activated. For example, if switch 150 is activated by a user the controller 140 is configured to activate pump 120 to dispense the beverage from tank 200 through faucet 110.

The beverage dispensing system 100 and its components are mounted on a counter. In one example configuration the faucets 110, 112 are mounted on a countertop 160 and extend upwardly from the countertop 160. The system 100 further comprises a drip tray 170 positioned under the faucets 110, 112. The pumps 120, 122, and the tanks 200, 202 are positioned below the counter. The pumps and the tanks are positioned out of sight e.g., under the counter or in a cupboard under the counter. The system 100 also comprises a drainage pipe or multiple drainage paths from the drip tray 170. In the illustrated form, as shown in Figure 1, the system 100 includes a drainage pipe 172 that is connected to the drip tray 170 and coupled to other plumbing to remove excess beverage caught in the drip tray.

The automated beverage dispensing system 100 may comprise one or more proximity sensors. The system 100 may comprise a proximity sensor 180 located on the faucet or adjacent the faucet 110, 112. The proximity sensor 180 configured to detect a cup within range of the faucet. The proximity sensor 180 may be configured to detect if a cup is in an operative position i.e., in a position under the faucet. The controller 140 is arranged in electronic communication with the proximity sensor. The controller 140 is configured to activate the pump 120, 122 to dispense a beverage if a cup is within a threshold distance to the faucet based on the measured distance by the proximity sensor 180. The proximity sensor 180 may be an optical sensor or any other suitable proximity sensor.

Each faucet may comprise a proximity sensor. As shown in the example configuration the system 100 comprises a first proximity sensor 180 associated with the first faucet 110 and a second proximity sensor 182 associated with the second faucet 112.

The proximity sensors 180, 182 are advantageous because the pump is only activated when the cup is close to or below the faucet and the pump is switched off by the controller 140. This reduces spillage and waste of beverages.

Figure 4 illustrates an example of a tank 200, 202. The tank 200, 202 may comprise a multi-walled structure. In one example the tank 200, 202 may comprise a triple walled structure. Alternatively, the tank 200, 202 may comprise at least a double walled structure. The tank 200, 202 may comprise a triple walled structure and a metallic lining.

Referring to Figure 4 each tank 200, 202 may comprise three nested containers defining a triple walled structure. The tank 200, 202 comprises an inner container 204. The inner container is formed from a food grade material and retains the beverage. The inner container may be formed from a food grade metal or a food grade plastics material. In one example the inner container may be formed from a food grade stainless steel.

The tank may comprise an intermediate wall 206 i.e., a second wall. The intermediate wall (i.e., an intermediate container) that surrounds the inner container. The intermediate container 206 may comprise a metallic lining. The metallic lining may be a copper lining to improve temperature regulation of the inner container.

The tank 200, 202 may comprise an outer wall or third wall 208 (i.e., an outer container) that surrounds the intermediate wall. The inner container and intermediate container are nested within the outer container 208, forming a triple walled structure.

The tank 200, 202 may further comprise a vacuum insulated structure. The multi walled structure helps to keep the temperature of the beverage within a suitable range. For example, hot beverages (e.g., coffee, tea) are maintained hot. In another example, cold beverages (e.g., beer, juice, soda) are maintained cold.

The tank 200, 202 may be any suitable size. The system 100 may comprise multiple sized tanks that can be easily removed and replaced. The tank is disconnected by removing the threaded fastener and fastening a new tank. For example, the tanks 200, 202 may be available as 1.5L, 3L or 4.5L tanks. Tanks can be switched to provide different beverages.

The tank may comprise one or more sensors within each tank. Figure 5 illustrates an example form of a tank 200 202, comprising one or more sensors. The tank 200, 202 may comprise multiple sensors to sense one or more parameters of the beverage within the tank.

The tank 200, 202 may comprise a liquid level sensor 220 positioned on or within the tank. The liquid level sensor 220, as shown in Figure 5, is configured to determine a level of the beverage within the tank. The liquid level sensor 220 is positioned on an inner surface of the tank 200, 202. The liquid level sensor 220 may comprise a capacitive sensor or an inductive sensor or an optical sensor. The controller 140 is configured to generate an alarm if the measured level is below a threshold.

The automated beverage dispensing system 100 further comprises a user interface 190. The user interface 190 may be a screen e.g., a touchscreen. The user interface 190 is configured to display one or more of: information regarding a beverage being dispensed, information regarding a flushing cycle or cleaning mode, one or more alarms associated with the beverage dispensing system, information of a user or user preferences, and a payment terminal to allow a user to pay for a beverage.

A user can select the type of beverage from the user interface. The user interface 190 may display the type of beverage that is dispensed from a specific faucet 110. Figure 2 illustrates an example user interface 190. The user interface 190 may be a touchscreen. The screen 190 illustrates that the faucet on the left dispenses hot black coffee and the faucet on the right dispenses cold black coffee. Each faucet would be coupled to an individual tank that holds the respective beverage. A user can select the beverage by touching the icon on the user interface 190. The beverage may be dispensed by a user placing the cup on the switch to depress the switch. Preferably, the beverage is dispensed once a cup is detected to be in an operative position (i.e., correct position) by the proximity sensor

The automated beverage dispensing system 100 comprises a wireless communication interface 192. The wireless communication interface 192 is in electrical communication with the controller to allow data to be transmitted to and from the system. The communication interface 192 allows for various IoT functionality and allows the controller 140 to transmit and receive data from remote devices. As shown in Figure 3, a user can communicate with the controller 140, via their mobile device 10. The wireless communication interface 192 may be a cellular module or a Wi-Fi module or a Bluetooth module or a combination of two or more. In one preferred embodiment, the wireless communication interface 192 comprises a cellular module, a Wi-Fi module and a Bluetooth module.

The automated beverage dispensing system 100 may further comprise at least one beverage quality sensor 230. In one example each tank 200, 202 may comprise one or more beverage quality sensors 230. The beverage quality sensor 230 is positioned on or within the tank, as shown in Figure 5. The beverage quality sensor 230 is configured to measure a quality of the beverage within the tank 200, 202. The beverage quality sensor 230 is in electrical communication with the controller 140. The controller 140 is configured to determine the quality of the beverage within the tank and, generate an alarm if the measured quality is below a threshold.

The at least one beverage quality sensor may comprise one of: a temperature sensor, a chemical sensor, food safety sensor, a gases composition sensor, a pH sensor, or an optical sensor. The quality of a beverage is determined based a measured parameter by the beverage quality sensor.

In one example configuration the beverage quality sensor 230 is a temperature sensor 230. The temperature sensor 230 is positioned on an inner surface of the tank or the temperature sensor is located on a coupling between the pump and the fluid pathway. In one example, each tank 120, 122 comprises a temperature sensor for sensing quality of the beverage in each tank. In one example, as shown in Figure 5 the temperature sensor 230 is positioned on the threaded fastener 210, 212. The temperature sensor 230 is configured to measure the temperature of the beverage in the tank 120, 122. The controller 140 is configured to compare the measured temperature with a threshold. The controller 140 is further configured to generate an alarm if the measured temperature is beyond a temperature threshold.

Temperature may be indicative of a quality of a beverage. The controller 140 is configured to generate an alarm if the measured temperature is beyond a threshold. The alarm may be a visual alarm presented

on the user interface 190. The alarm may be an audible alarm, or a visual and audible alarm presented on the user interface 190. In a further example, the alarm may be transmitted to a mobile device e.g., to the device of an attendant or to the device of a customer or to the device of a service technician.

For hot beverages, the controller is configured to generate an alarm if the measured temperature by the temperature sensor 230 is less than a temperature threshold. For hot beverages e.g., coffee or tea would be considered poor quality if the temperature of these beverages is below a threshold temperature. Coffee and tea having a temperature below a threshold can be indicative of lack of freshness due to the beverages sitting in the tanks for too long. Additionally, if these beverages are below the threshold for too long, they may spoil, or the taste can become less enjoyable. For cold beverages, the temperatures of the cold beverages may rise from their serving temperatures to room temperature and similarly, the increase in temperature may indicate to a consumer that the beverage is now stale or is of a lower quality. Accordingly, the temperature sensor 230 may also generate an alert or alarm if the temperature of the beverage is measured to be above a certain temperature.

In a further example configuration, the beverage dispensing system 100 may comprise at least two beverage quality sensors. A first beverage quality sensor may comprise a temperature sensor 230. The second beverage quality sensor 232 comprising one of a pH sensor, chemical sensor, optical sensor or a chemical sensor. The second beverage quality sensor 232 may be configured to measure a quality parameter. The first and second beverage quality sensors may be mounted in the tank or mounted on the fastener. The second beverage quality sensor 232 may be optional.

The controller 140 may be configured to compare the measured temperature of the beverage with a threshold and compare a measured quality parameter with a threshold. The controller may be further configured to generate an alarm if the measured temperature is beyond a temperature threshold and if the measured quality parameter is beyond a threshold.

The controller 140 is arranged in electrical communication with multiple components e.g., multiple sensors and the controller 140 is configured to transmit control signals to other components e.g., the pumps and user interface. Figure 7 illustrates a schematic diagram of the controller 140 and the electrical connections of sensors and other components. As shown in Figure 7, the controller 140 can receive data from the switch 150, 152, temperature sensor 230, second beverage quality sensor 232, temperature sensor, timer 185, proximity sensors 180, 182 and a liquid level sensor 230. The timer 185 may be an internal clock of the controller or a timer that a user or attendant can use to time various functions.

The controller 140 is configured to transmit signals or data to the user interface for presentation to a user. The controller 140 may further control operation of the pumps based on sensor inputs and/or a beverage selection. The controller 140 may be configured to control a valve of a flushing component. The controller 140 may further be configured to control other components of a flushing system.

The automated beverage dispensing system 100 may optionally comprise a flushing system. In the illustrated embodiment, the system 100 comprises a flushing system 300. Operation i.e., activation of the flushing system 300 may be controlled by the controller 140.

The controller 140 configured to control the flushing system 300 based on a predetermined event to deliver flushing fluid through one or more components of the beverage dispensing system to clean the one or more components of the beverage dispensing system 100.

The flushing system 300 may comprise a flushing fluid source 302. The flushing fluid source 302, may be a reservoir of flushing fluid. The flushing fluid may be water. Flushing fluid may be some other fluid e.g., saline solution. Alternatively, the flushing fluid source may comprise a pipe connected to a water main. In the example configuration shown in Figure 6 the flushing line 306 connects to the valve 304. The flushing fluid may be hot water or boiling water. The flushing fluid source 302 may comprise a heater unit to heat the water to an operative temperature.

Referring to Figure 6, the flushing system 300 may comprise controllable valve 304 fluidly connected between the tank and the pump. The flushing system 300 may comprise multiple controllable valves. A single controllable valve may be positioned between a pump and the associated tank. The flushing system further comprises a flushing line 306 that fluidly couples to the controllable valve 304. The flushing line 306 may be a pipe and fluidly couples the controllable valve 304 and the flushing fluid source 302. The controllable valve 304 is controlled to deliver the flushing fluid through one or more components of the beverage dispensing system.

The controllable valve 304 may be a solenoid valve or a proportional valve. The solenoid valve 304 is controlled between an open position and a closed position by the controller 140. The solenoid valve 304 is configured to allow flushing fluid to move through it when in an open position. The solenoid valve 304 prevents the flushing fluid from flowing when in a closed position.

The controllable valve 304 is opened to flush the components of the beverage dispensing system in response to a predetermined event. The predetermined event may be one of: a flushing cycle, a cleaning mode, predetermined time.

The controller 140 is configured to activate the flushing system 300 during to introduce water through at least the faucet during a flushing cycle. The controller 140 is configured to control the solenoid valve 304 to flush the faucet with water (i.e., flushing fluid) during a flushing cycle. The flushing cycle is initiated after a beverage has been dispensed. The controller 140 may be configured to initiate a flushing cycle after each time a beverage is dispensed.

During a flushing cycle the flushing system is controlled to introduce between 1 teaspoon and 1 tablespoon of flushing fluid (i.e., water) through one or more components of the beverage dispensing system. This water clears any residual beverage within the fluid pathway or faucet or other components of the beverage dispensing system. The flushing cycle reduces any residual beverage from spoiling in the faucet or pipes. Flushing the components of the dispensing system reduces the chances of cross contamination of beverages. Flushing the components of the dispensing system means each pour comprises fresh beverage from the tank. The flushing cycle may operate for between 30 seconds and 90 seconds.

The controller 140 is configured to activate the flushing system 300 to introduce water through at least the faucet when a cleaning mode is initiated. The cleaning mode is automatically initiated at a predefined time or after the dispensing system has not been used for a predetermined period. The cleaning mode may be initiated at the end of the day after the dispensing system 100 has finished being used. The cleaning mode may be initiated by an attendant via the user interface 190. The attendant may be a person that can top up the tanks and generally maintain the system 100 as needed. The cleaning mode may be

initiated by an attendant remotely by sending a message to the controller 140 via the wireless communication interface 192.

The controller 140 may log the number of flushing cycles initiated. The controller 140 may store if a cleaning mode was completed. This data can be transmitted to an attendant's mobile device 10. This allows an attendant to track if the beverage dispensing system has been cleaned.

During a cleaning mode the flushing system 300 is controlled to introduce between 1 and 3 cups of flushing fluid through one or more components of the beverage dispensing system. The cleaning mode is longer than the flushing cycle. The cleaning mode may extend for at least 15 minutes. In one example the cleaning mode may be operated for between 15 mins to 30 mins. The cleaning mode may be long enough to clean the faucet, the pipes and the pump over several minutes. The cleaning mode provides a greater clean than the flushing cycle. During the cleaning mode the controller may control the flushing system i.e., the valve to flush the dispensing system and its components several times.

The controller 140 may be configured to activate the flushing system 300 to introduce water through at least the faucet at one or predetermined times. The controller 140 may be programmed to activate the flushing system to flush water through the components of the dispensing system e.g., the faucet, fluid pathway at predetermined times such as for example every 20 to 30 mins or every hour or every 4 hours etc.

The controller 140 is configured to control open the controllable valve and control the pump 120 during the flushing cycle or the cleaning mode to draw flushing fluid through the valve 304 and propel the flushing fluid through one or more components of the beverage dispensing system to clean the one or more components.

In an alternative configuration the flushing system may comprise a flushing pump in fluid communication with the controllable valve and a source of flushing fluid. The flushing pump may be electrically coupled to the controller, and the controller may be configured to control the flushing pump to propel flushing fluid through one or more components of the beverage dispensing system based on one or more of the predetermined events.

The wireless communication interface 192 allows for various IoT functions. The beverage dispensing system 100 configured to receive one or more beverage orders from a mobile device of a user. The controller 140 may receive the order and prepare the beverage e.g., by preheating the beverage. The controller 140 may be configured to store the one or more orders. The controller may be configured to prepare and dispense the order based on a trigger from the mobile device. The trigger is a wireless message from the mobile device or scanning of a code displayed on a user interface or scanning a wireless tag.

The user interface 190 may be configured to display various information to a user. For example, the user interface 190 may be configured to display one or more of: information regarding a beverage being dispensed, information regarding a flushing cycle or cleaning mode, one or more alarms associated with the beverage dispensing system, information of a user or user preferences, a payment terminal to allow a user to pay for a beverage.

The controller 140 may be configured to track various statistics such as for example the number of sales, the number and types of beverages dispensed, number of flushing cycles, number of cleaning cycles, number of refills of tanks. One or more of the statistics may be displayed on the user interface 190. Alternatively, one or more statistics may be transmitted to a user's remote device.

The controller 140 may also receive automatic notifications about the beverage in the tank for example a low volume notification, low temperature or high temperature, overfill of a tank etc. These notifications may be displayed on the user interface 190 for an attendant or transmitted to an attendant's mobile device. Additional notifications presented on the user interface 190 may be error in cup placement based on the measured proximity of the cup or an error in the cup position in relation to the switch etc. These notifications help a user to correct use the dispensing system.

Figure 8 illustrates a commercial application of the beverage dispensing system 100. The beverage dispensing system may be use in an automated beverage dispensing kiosk that allows a user to self-serve a beverage using the dispensing system 100. As shown in Figure 8 multiple dispensing systems may be deployed in a room or a kiosk. Various signs can be deployed to indicate the various beverages that are available. Each dispensing system may be adapted to serve different beverages. For example, one dispensing system may be for black coffee, one dispensing system may be for tea, one dispensing system may be for milky coffee, one dispensing system may be for soda etc.

The automated dispensing system 100 as described herein allows reduces the need for staff, due to the automated features such as automated flushing cycles, cleaning modes, automated dispensing of beverages. The beverage quality sensors allow for automated monitoring of a beverage quality and automated alerts provided to an attendant. Additionally, the IoT features such as automatic payment and automated dispensing reduce the need for human staff.

It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive.

The term "comprising" (and its grammatical variations) as used herein are used in the inclusive sense of "having" or "including" and not in the sense of "consisting only of".

Any reference to prior art contained herein is not to be taken as an admission that the information is common general knowledge, unless otherwise indicated.

CLAIMS:

1. An automated beverage dispensing system
at least one tank configured to hold a beverage,
at least one faucet to dispense the beverage,
a fluid pathway between the at least one tank and the at least one faucet and fluidly connecting the tank and the faucet,
a pump positioned within the fluid pathway, between the faucet and the tank,
the pump configured to pump beverage from the tank through the faucet,
at least one beverage quality sensor positioned on or within the tank,
the beverage quality sensor is configured to measure a quality of the beverage within the tank,
a controller in electrically coupled to the pump and electrically coupled to the beverage quality sensor,
the controller is configured to:
 - activate the pump to dispense beverage from the tank through the faucet,
 - determine the quality of the beverage within the tank and,
 - generate an alarm if the measured quality is below a threshold.
2. An automated beverage dispensing system in accordance with claim 1 the at least one beverage quality sensor is one of: a temperature sensor, a chemical sensor, food safety sensor, a gases composition sensor, a pH sensor, or an optical sensor.
3. An automated beverage dispensing system in accordance with claim 1 wherein the beverage quality sensor is a temperature sensor,
the temperature sensor is positioned on an inner surface of the tank, or the temperature sensor is located on a coupling between the pump and the fluid pathway, and;
the temperature sensor is configured to measure the temperature of the beverage in the tank
the controller is configured to compare the measured temperature of the beverage with a threshold, the controller configured to generate an alarm if the measured temperature is beyond a temperature threshold.
4. An automated beverage dispensing system in accordance with claim 2; wherein the system comprises at least a pair of beverage quality sensors associated with each tank,
a first beverage quality sensor comprising one of temperature sensor,
a second beverage quality sensor comprising one of a pH sensor, chemical sensor, optical sensor or is a chemical sensor, the second beverage quality sensor measuring a quality parameter
the controller is configured to compare the measured temperature of the beverage with a threshold,
the controller configured to compare a measured quality parameter with a threshold
the controller configured to generate an alarm if the measured temperature is beyond a temperature threshold and if the measured quality parameter is beyond a threshold.
5. An automated beverage dispensing system in accordance with any one of the preceding claims, wherein the tank comprises triple walled structure and a metallic lining.
6. An automated beverage dispensing system in accordance with claim 5 wherein the metallic lining is a copper lining.

7. An automated beverage dispensing system in accordance with any one of the preceding claims, wherein the tank comprises a liquid level sensor positioned on or within the tank, the liquid sensor is configured to determine a level of the beverage within the tank.
8. An automated beverage dispensing system in accordance with claim 7 wherein the controller is configured to generate an alarm if the measured level is below a threshold.
9. An automated beverage dispensing system in accordance with any of the preceding claims, comprising a flushing system, the controller configured to control the flushing system based on a predetermined event to deliver flushing fluid through one or more components of the beverage dispensing system to clean the one or more components of the beverage dispensing system.
10. An automated beverage dispensing system in accordance with claim 9 wherein the flushing fluid is water, and the flushing system is configured to propel water through one or more components of the beverage dispensing system.
11. An automated beverage dispensing system in accordance with claim 9 or 10 wherein:
flushing system comprises a controllable valve fluidly connected between the tank and the pump,
the controllable valve is fluidly coupled to a flushing fluid source, and;
wherein the controllable valve is controlled to deliver the flushing fluid through one or more components of the beverage dispensing system.
12. An automated beverage dispensing system in accordance with claim 11 wherein the controllable valve is a solenoid valve, the solenoid valve is controlled between an open position and a closed position by the controller, and the solenoid valve allowing flushing fluid through it when in an open position and the solenoid valve preventing flushing fluid from flowing when in a closed position.
13. An automated beverage dispensing system in accordance with any one or claims 9 to 12 wherein the predetermined event is one or more of:
a flushing cycle,
a cleaning mode,
predetermined time.
14. An automated beverage dispensing system in accordance with claim 13 wherein the controller is configured to activate the flushing system during to introduce water through at least the faucet during a flushing cycle and the flushing cycle is initiated after a beverage has been dispensed.
15. An automated beverage dispensing system in accordance with any one of claims 9 to 14 wherein the controller is configured to activate the flushing system to introduce water through at least the faucet when a cleaning mode is initiated.
16. An automated beverage dispensing system in accordance with claim 15 wherein the cleaning mode is automatically initiated at a predefined time or after the dispensing system has not been used for a predetermined period.

17. An automated beverage dispensing system in accordance with any one of claims 9 to 16 wherein the controller is configured to activate the flushing system to introduce water through at least the faucet at one or predetermined times.
18. An automated beverage dispensing system in accordance with any one of claims 9 to 17 wherein the flushing system comprises a flushing pump in fluid communication with the controllable valve and a source of flushing fluid, the flushing pump electrically coupled to the controller, and the controller configured to control the flushing pump to propel flushing fluid through one or more components of the beverage dispensing system based on one or more of the predetermined events.
19. An automated beverage dispensing system in accordance with any one of claims 13 to 18 wherein the controller is configured to control open the controllable valve and control the pump during the flushing cycle or the cleaning mode to draw flushing fluid through the valve and propel the flushing fluid through one or more components of the beverage dispensing system to clean the one or more components.
20. An automated beverage dispensing system in accordance with any one of claims 9 to 19 wherein during a flushing cycle the flushing system is controlled to introduce between 1 teaspoon and 1 tablespoon of flushing fluid through one or more components of the beverage dispensing system.
21. An automated beverage dispensing system in accordance with any one of claims 9 to 20 wherein during a cleaning mode the flushing system is controlled to introduce between 1 and 3 cups of flushing fluid through one or more components of the beverage dispensing system.
22. An automated beverage dispensing system in accordance with claim 13 wherein the predetermined time is between 20 to 30 minutes.
23. An automated beverage dispensing system in accordance with any one of the preceding claims comprising a proximity sensor,
 - the proximity sensor located on the faucet, the proximity sensor configured to detect a distance of a cup from the faucet,
 - the controller in electronic communication with the proximity sensor,
 - the controller configured to activate the pump to dispense a beverage if a cup is within a threshold distance to the faucet based on the measured distance by the proximity sensor.
24. An automated beverage dispensing system in accordance with any one or more of the preceding claims comprising a wireless communication interface configured to allow wireless communication with one or more mobile devices,
 - the beverage dispensing system configured to receive one or more beverage orders from a mobile device,
 - the controller configured to store the one or more orders, and the controller is configured to prepare and dispense the order based on a trigger from the mobile device.
25. An automated beverage dispensing system in accordance with claim 24 wherein the trigger is a wireless message from the mobile device or scanning of a code displayed on a user interface or scanning a wireless tag.

26. An automated beverage dispensing system in accordance with any one of the preceding claims comprising a user interface, the user interface displaying one or more of:
information regarding a beverage being dispensed,
information regarding a flushing cycle or cleaning mode,
one or more alarms associated with the beverage dispensing system,
information of a user or user preferences,
a payment terminal to allow a user to pay for a beverage.
27. An automated beverage dispensing system in accordance with any one of the preceding claims wherein the beverage dispensing system comprises:
a plurality of faucets,
a plurality of pumps,
each pump arranged in fluid communication with a single faucet,
a fluid pathway in extending between the pump and its associated faucet and;
a plurality of tanks each tank associated with a faucet and fluidly coupled with a pump.
28. An automated beverage dispensing system comprising:
a faucet
a tank configured to hold a beverage,
a pump
a fluid pathway, the pump positioned upstream of the faucet and in fluid communication with the fluid pathway,
the faucet in fluid connection with the fluid pathway,
a controller in electronic communication with the pump and configured to activate the pump to propel a beverage from the tank, through the fluid pathway and through the faucet,
a flushing system in fluid communication with the one or more of the faucets, fluid pathway and pump,
the flushing system configured to flush one or more of a faucet, pump and fluid pathway with cleaning fluid based on one or more predetermined events.
29. An automated beverage dispensing system in accordance with claims 28 wherein the predetermined event is one of: set time interval, a flushing cycle, a cleaning mode.
30. An automated beverage dispensing system in accordance with any one of claims 28 or 29 wherein:
flushing system comprises a controllable valve fluidly connected between the tank and the pump,
the controllable valve is fluidly coupled to a flushing fluid source, and;
wherein the controllable valve is controlled to deliver the flushing fluid through one or more components of the beverage dispensing system.
31. An automated beverage dispensing system in accordance with claim 28 wherein the system comprises the features of any one or more of statements 14 to 22.
32. An automated beverage dispensing system in accordance with claim 28 the at least one beverage quality sensor is one of: a temperature sensor, a chemical sensor, food safety sensor, a gases composition sensor, a pH sensor, or an optical sensor.

33. An automated beverage dispensing system in accordance with any one of claims 28 to 31; wherein the system comprises at least a pair of beverage quality sensors associated with each tank,
- a first beverage quality sensor comprising one of temperature sensor,
 - a second beverage quality sensor comprising one of a pH sensor, chemical sensor, optical sensor
- or is a chemical sensor, the second beverage quality sensor measuring a quality parameter
- the controller is configured to compare the measured temperature of the beverage with a threshold,
 - the controller configured to compare a measured quality parameter with a threshold
 - the controller configured to generate an alarm if the measured temperature is beyond a temperature threshold and if the measured quality parameter is beyond a threshold.