DISPENSER FOR DISPENSING MIXTURES OF FRESHLY PREPARED BEVERAGES

FIELD OF INVENTION

The present disclosure relates to beverage dispensers for dispensing mixes of liquid beverage constituents. More particularly, the present disclosure relates to beverage dispensers that flush traces of liquid beverage constituents during a dispensation cycle to maintain temperature consistency of dispensed beverages.

BACKGROUND

Coffee shops, known colloquially as ‘kopitiams’, are of considerable cultural significance in Singapore, Malaysia and Brunei. To generations of locals, the neighbourhood coffee shop provides quick and inexpensive meals while serving as a social gathering point that brings residents together.

As the name suggests, a cup of brewed coffee or ‘kopi’ at a coffee shop is considered by many to be an essential aspect of the coffee shop experience. Unlike coffee typically prepared in the West, kopi - specifically the Singapore variant - is typically made from robusta beans instead of arabica beans or sometimes a combination of the two. The robusta beans are roasted with butter or margarine along with sugar which imparts a particularly rich, dark character. The roasted beans are then brewed in a small cloth sack, affectionately known as sock, which also serves as an infuser that is placed within a long-spouted pot. To serve, the relatively concentrated brew is mixed with a canned dairy product, sugar and diluted with water as needed before being served in a cup.

Kopi is prepared without the aid of measuring tools and much of the skill involved in the preparation of a cup of kopi lies in getting the proportions correct for each of the approximately twenty commonly prepared variations which are based on the customer’s individual preference. Variations include stronger or weaker (diluted with more water), choice of canned diary product, the choices being condensed milk, evaporated milk or no milk, less sugar, more sugar or no sugar and with or without ice or any combination of the aforementioned. For example, should a customer ask for a weak iced kopi, the strength of the kopi will need to be balanced by the presence of ice which necessitates a higher strength brew while taking into account the customer’s request for a weaker overall kopi.

Despite the enduring popularity of kopi in the face of challenges from gourmet coffee served at international coffee chains and trendy cafes, the continued existence of kopi culture as we know it is under threat from within. Kopi today is typically prepared by practitioners aged

45and up who lament the high turnover rate of younger staff that, on average, leaves the industry after less than a year on the job. As older practitioners retire, there is a growing concern that continuity of the trade could be adversely affected by the lack of young people staying in the industry long enough to pick up the trade, which may result in a dip in quality of kopi in the near future.

Since there is no easy solution with respect to changing the attitudes of youths towards the profession, there exists an unmet need for a substitute for experienced and skilled practitioners.

While commercial-grade coffee machines exist, they are primarily concerned with the brewing process from bean to cup and typically comprise a grinder for obtaining ground coffee from coffee beans, a brewing chamber having a filter and a piston or similar device for compressing a precise quantity of ground coffee within the brewing chamber, and a pressured water dispenser which forces hot water through the brewing chamber and out through the filter as coffee as exemplified in US Patent Publication US20100080886A1.

US Patent Publication US20020130137A1 discloses a beverage dispenser capable of dispensing a beverage at a desired temperature. The beverage is dispensed from two separate reservoirs, the reservoirs holding the beverage at a minimum and maximum drinking temperature and dispensed simultaneously in a ratio determined by the desired temperature.

SUMMARY OF THE INVENTION

A primary embodiment of the invention is a drink mixing dispenser for dispensing a liquid beverage constituent comprising a housing, a pump, an air intake, a fluid conduit configured to receive the liquid beverage constituent, the fluid conduit having a first valve and an outlet nozzle and an air conduit for transporting air from the air intake to the fluid conduit downstream of the first valve, the air conduit having a second valve where upon activation of the pump, the first valve is in an open position while the second valve is in a closed position to pump the liquid beverage constituent out through the outlet nozzle for a predetermined time, after which the first valve is closed while the second valve is opened to flush out fluid in the first conduit via the outlet nozzle.

Optionally, the pumping means is selected from a group comprising a peristaltic pump, a gear pump and a screw pump. Optionally, the first and second valves are selected from a group comprising a solenoid valve and a motorised valve. Optionally the pump, the air intake, the fluid conduit and the air conduit are incorporated into a fluid circuit. Optionally the

liquid beverage constituent is provided by an on-site fluid reservoir. Optionally the fluid circuit is configured to receive a liquid beverage constituent selected from a group comprising brewed coffee, brewed tea, condensed milk, evaporated milk, water and simple sugar solution. Optionally the fluid circuit is configured to receive water. Optionally the water is supplied by an on-site fluid reservoir or a water main.

Optionally the drink dispenser further comprises a plurality of fluid circuits, the fluid circuits forming a dispensing cluster. Optionally dispensing cluster supplies liquid beverage constituents to one beverage container. Optionally, the drink dispenser comprises a plurality of dispensing clusters.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a front perspective view of the drink dispenser without its housing.

Fig. 2 is a side elevation view of the drink dispenser without its housing.

Fig. 3 depicts a rear elevation view of the drink dispenser without its housing.

Fig. 4 depicts a top elevation view of the drink dispenser without its housing.

DETAILED DESCRIPTION OF THE INVENTION

In the following detailed description, reference is made to the accompanying drawings, which form a part hereof. The illustrative embodiments described in the detailed description, drawings and claims are not meant to be limiting. Other embodiments can be utilized, and other changes can be made, without departing from the spirit or scope of the subject matter presented herein.

Referring to Fig. 1-4, an embodiment of the invention is a drink dispenser for dispensing mixes of liquid beverage constituents comprising a frame **101** which is enclosed by a housing (not depicted). The frame **101** serves as a support structure to which internal components can be attached. The liquid constituent transported by the fluid supply may be a primary constituent, that is a constituent that forms the majority of the beverage by volume such as brewed coffee, brewed tea, or optional constituents which may be added to the primary constituent as preferred by a customer such as condensed milk, evaporated milk and simple sugar solution, and water is provided by an on-site fluid reservoir (not depicted). The coffee and tea stored in their respective onsite reservoirs are stronger relative to a typical finished preparation and is diluted by water as required. For example, if the desired beverage is iced coffee, it will not need to be diluted as much as hot coffee since ice will eventually be added. The on-site reservoirs are preferably insulated and may include a

temperature regulation means which may include a thermostat and a heating element for maintaining the liquid beverage constituent at a desired temperature. The on-site reservoirs can be mounted to the frame **101** and enclosed within the housing, or may be self-contained, standalone units connected to fluid supply connectors **302** via the fluid supply. The frame **101** and housing can be expanded to support internal on-site reservoirs. Alternatively, in instances where the liquid beverage constituent is water, it can also be provided by the fluid supply by way of a water main (not depicted) in place of an on-site fluid reservoir.

With reference to Fig 3, the fluid supply refers to any means of transporting the liquid beverage constituent from the on-site fluid reservoir to the fluid circuit via fluid supply connector **302**.

Disposed within the housing is a fluid circuit. One or more fluid circuits may form a dispensing cluster **116** that is, a group consisting of at least one fluid circuit that dispenses liquid beverage constituents for a single beverage into a single beverage container such as a mug or cup. Additional dispensing clusters can be added to allow the simultaneous dispensation of more than one beverage. Figs 1-4 depict the dispensing cluster **116** as having a total of six fluid circuits. To facilitate the mixing of liquid beverage constituents, a common nozzle that includes a mixing means can be attached to the outlet nozzles of fluid circuits associated with a particular dispensing cluster. The mixing means can be high rpm impeller or any other device known in the art capable of rapidly mixing fluids.

Exemplary fluid circuits for primary constituents coffee and tea comprise a pumping means **102a and b**, an air intake **201a and b,** and a fluid conduit for transporting fluid from the fluid supply for dispensation, the fluid conduit having a first valve **202a and b**, an outlet nozzle **109a and b** and an air conduit for transporting air from the air intake **201a** to the fluid conduit downstream of the first valve **202a and b**, the air conduit having a second valve **203a and b**. While not depicted in the drawings, each fluid circuit may have air conduits that transport air from an air intake to the fluid conduit downstream of the first valve.

The conduits and fluid supply may comprise tubing made of a flexible, food-safe material that prevents sediment accumulation, resists bacterial growth and high temperature of hot beverage constituents. Suitable tubing includes food-grade polyvinylchloride, silicone, nylon, polyurethane. A 3-way connector can be used to connect the air conduit to the fluid conduit.

Referring to Fig. 2 and 4, the fluid supply connector **302** is continuous with fluid inlet valve tube **205a and b** which in turn is connected to the inlet of the first valve **202a and b** which is normally closed. The first valve **202a and b** and the second valve **203a and b** are preferably electromechanical valves such as a solenoid valve or a motorised valve. However it will be

readily understood by a skilled addressee that any valve capable of being controlled by a microprocessor may be used. First valves **202a, b, c and d** and second valves **203a and b** in the embodiment according to the drawings are solenoid valves. The first valve **202a and b** is connected to the pumping means **102a and b** by way of a first valve outlet tube **401a and b** and pump inlet tube **103a and b,** the tube joined by way of connector **402a and 402b**. The pumping means **102a and b** is selected from a group comprising a peristaltic pump, a gear pump and a screw pump. Pumping means **102a, b, c and d** are peristaltic pumps which are used to transport coffee, tea, evaporated milk and sugar solution respectively. Pumping means **102e and f** are gear pumps and are responsible for transporting condensed milk and water respectively. It will be readily appreciated that any mechanism/means capable of moving liquid beverage constituent and air through the air and fluid conduits at a rate consonant with quick dispensation that is required in a commercial setting can be used. This applies to all pumping means employed at each of the fluid circuits. The outlet of the pumping means is connected to an outlet tube **104a and b** which in turn terminates at outlet nozzle **109a and b**. The air intake **201a and b** is directly connected to the second valve **203a and b** which is in turn connected to the pump inlet tube **103a and b** by way of connector **402a and b**. In this manner, the air conduit merges with the fluid conduit downstream from the first valve **202a** the purpose for which will be explained below.

The fluid circuit connected to a fluid supply that provides water is largely similar to the exemplary fluid circuit with a number of notable differences. Referring to Fig. 4, the water fluid circuit has two valve outlet tubes **401c and d** that transport room-temperate water and hot water and are joined by connector tube **404** by way of connectors **402c and d**. Connector **402c** is in turn connected to pumping means **102f** by way of pump inlet tube **103f**. Pumping means **102f** is a gear pump but may be either a peristaltic pump or screw pump. This configuration eliminates the need for separate fluid circuits for room-temperature and hot water in a single dispensing cluster since both fluids are similar and mainly vary in terms of temperature. Referring to Fig. 2, fluid valve inlet tube **205c** which transports hot water is connected to heater **106b** which is in turn connected to inlet of first valve **203c**. The heater **106b** serves as a second stage heater to ensure preheated water originating from the water main is dispensed at a consistent temperature.

Control elements include a microprocessor with memory, an input device (both not depicted) and a relay board **304**. Power to the pumping means, the first valve and second valves is supplied by power supply unit **104**.

An objective of the present invention is the dispensation of beverage at a desired temperature while maximising cost efficiency, particularly in terms energy efficiency. To this

end, on-site reservoirs should keep the temperature of liquid beverage constituents as low as necessary bearing in mind that multiple liquid beverage constituents are required for every bespoke beverage preparation. In other words, the temperature of the dispensed beverage preparation depends on the temperature of individual liquid beverage constituents. Further it has been observed by the inventor of the present invention that traces of liquid beverage constituent that remain in the conduits of the fluid circuit rapidly cool. During a subsequent dispensation cycle, the freshly pumped liquid beverage constituent mixes with the cooled traces of liquid beverage constituent which and are present in quantities high enough to significantly lower the overall temperature of the liquid beverage constituent that is dispensed by that fluid circuit. This is neither apparent nor significant if the liquid beverage constituent is maintained at relatively high temperatures within the on-site reservoir, for example, if the primary constituent is kept at 90°C but leads to higher energy costs associated with maintaining the constituent at a higher temperature. The traces of beverage constituent are relevant when attempting to minimise energy costs by maintaining liquid beverage constituents at a lower temperature. The present invention overcomes this problem by flushing fresh air through the fluid circuit by novel mechanism during each dispensation cycle as described below.

A beverage selection is entered via the input device and the selection is stored in the memory. The microprocessor is configured to activate, via the relay board **304**, the pumping means associated with the appropriate beverage constituents of fluid circuits associated with a single dispensing cluster to pump at full rate for a predetermined time. Referring to Table 1, in order to dispense a cup of kopi, pumping means **102a, e, and f** associated with required liquid beverage constituents coffee, condensed milk and hot water respectively are energised with each pumping means running for a duration of the fluid and air cycle time. First valves **202b** (first valves for condensed milk and hot water fluid circuits are present but not depicted) are normally open while second valves **203a** (second valves for condensed milk and hot water fluid circuits are present but not depicted) are normally closed. The energised pumping means **102a, e and f** pumps the respective liquid beverage constituents for the fluid cycle duration as indicated in Table 1 concurrently before the respective first valves and second valves are energised which closes the first valves while opening the second valves thus leading to air instead of liquid beverage constituent from being pumped for the duration of the air cycle to purge traces of the liquid beverage constituents from their respective fluid conduits.

At the end of the air cycle, power to the first and second valves along with their respective pumping means is halted. Flowmeters are not employed as it has been found that the level of accuracy is not required and in fact serves to replicate traditional techniques of kopi

preparation by a trained practitioner who eschews the use of measuring tools and instead relies on estimation. This has the added benefit of reducing the overall complexity of the present invention hence simplifying construction and maintenance.

TABLE 1

Beverage Constituent	Volume per cup (ml)	Pump flow rate (l/min)	Fluid cycle duration (s)	Air cycle duration (s)	Temperature (°C)
Black Coffee	150	0.95	12	5	70
Condensed Milk	25	0.45	4	5	28
Hot water	50	1.5	3	4	95

As seen from Table 1, it is the liquid beverage constituent of highest volume that serves to limit the overall dispensation time. Accordingly, a higher flow rate relative to lower volume constituents is desirable. The hot water serves two purposes which is to, namely and as explained earlier, dilute the strong black coffee and counterbalance colder constituents such as condensed milk thus raising the overall temperature of the freshly dispensed beverage.

CLAIMS

1. A drink mixing dispenser for dispensing a liquid beverage constituent comprising:

a housing;

a pump;

an air intake;

a fluid conduit configured to receive the liquid beverage constituent, the fluid conduit having a first valve and an outlet nozzle; and

an air conduit for transporting air from the air intake to the fluid conduit downstream of the first valve, the air conduit having a second valve;

wherein, during each beverage dispensing cycle, and upon activation of the pump, the first valve is in an open position while the second valve is in a closed position to pump the liquid beverage constituent out through the outlet nozzle for a predetermined time, after which the first valve is closed while the second valve is opened to flush out fluid in the ~~first~~ fluid conduit via the outlet nozzle.

2. The drink dispenser according claim 1, wherein the pump is selected from a group comprising a peristaltic pump, a gear pump and a screw pump.

3. The drink dispenser according to any one of claims 1-2, wherein the first and second valves are selected from a group comprising a solenoid valve and a motorised valve.

4. The drink dispenser according to any one of claims 1-3, wherein the pump, the air intake, the fluid conduit and the air conduit are incorporated into a fluid circuit.

5. The drink dispenser according to any one of claims 1-4, wherein the liquid beverage constituent is provided by an on-site fluid reservoir.

6. The drink dispenser according ~~any of~~to claim~~s 1-5~~4, wherein the fluid circuit is configured to receive ~~a~~ liquid beverage constituent selected from a group comprising brewed coffee, brewed tea, condensed milk, evaporated milk, water and simple sugar solution.

7. The drink dispenser according to ~~any one of~~ claim~~s 1-5~~4, wherein the fluid circuit is configured to receive ~~liquid beverage constituent is~~ water.

8. The drink dispenser according to claim 7, wherein the water is supplied by an on-site fluid reservoir or a water main.

9. The drink dispenser according to any one of claims 4-8, further comprising a plurality of fluid circuits, the fluid circuits forming a dispensing cluster.

10. The drink dispenser according to claim 9, wherein the dispensing cluster supplies liquid beverage constituents to one beverage container.

11. The drink dispenser according to claim 10, further comprising a plurality of dispensing clusters.

12. The drink dispenser according to claim 7, wherein the water is supplied at a higher temperature than that of the liquid beverage constituent.