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(54) **Title:** POST-MIX DRINK DISPENSING SYSTEM WITH INDEPENDENTLY CONTROLLED SYRUP PUMPS

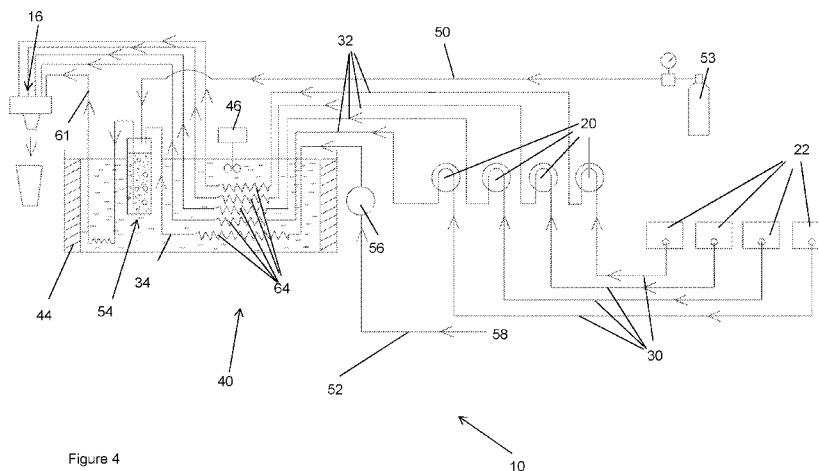


Figure 4

(57) **Abstract:** Drinks dispensing system (10) comprising a first syrup pump (20) being controllable to deliver a predetermined dose of syrup from a first syrup container (22) to a dispensing valve assembly (16), a second syrup pump (20) being controllable to deliver a predetermined dose of syrup from a second syrup container (22) to the dispensing valve assembly (16), a control system (200) configured to control the operation of the first and second syrup pumps (20) by setting a first electrical power parameter of electrical power to be supplied to drive the first syrup pump (20) independently of a second electrical power parameter of electrical power to be supplied to drive the second syrup pump (20); and a water delivery system (14) configured to deliver water to the dispensing valve assembly (16), wherein the dispensing valve assembly (16) is operable to mix and dispense syrup and water.



POST-MIX DRINK DISPENSING SYSTEM WITH INDEPENDENTLY CONTROLLED SYRUP PUMPS5 Description of Invention

Embodiments of the present invention relate to drinks dispensing systems. More particularly embodiments relate to drinks dispensing systems for use on a counter top and may be for supplying carbonated drinks.

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Drinks dispensing systems which dispense soft drinks are well known in the beverage industry. In the context of the present application, references to “soft drinks” are references to drinks made from a mixture of a concentrate, in the form of a syrup, and water. This may include carbonated soft drinks, otherwise variously known as sodas and pops, for example.

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In commercial settings, the most common way to create a carbonated soft drink is to carbonate water, and combine it with a particular syrup flavour in a dispensing system at the point of dispensing the drink. Generally, such dispensing systems are used in venues which serve high volumes of soft drinks (for example, public houses, hotels, restaurants, bars, and sports stadiums).

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Typically, a dispensing system for carbonated soft drinks will include a carbonation system and a syrup system. The carbonation system connects to a water source and a carbon dioxide source, and provides a pressurised container (known as a “carbonator bowl”) in which carbon dioxide from the carbon dioxide source is dissolved into water from the water source.

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The syrup system connects multiple pumps to multiple containers of different flavoured syrups, so that each syrup can be pumped into the carbonated

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water, when required. Typically, the syrup is added to a stream of carbonated water during dispensing – see below.

Both the carbonation system and syrup system are cooled, so that the
5 dispensed soft drink is chilled relative to room temperature. Accordingly, the dispensing system may include a cooling system for this purpose.

Generally, each syrup pump is connected to a respective dispensing tap, which dispenses the soft drink flavoured by the syrup which that syrup pump
10 delivers to the stream of carbonated water. In other words, in many dispensing systems, each dispensing tap dispenses a particular flavour of soft drink (for example, cola or lemonade).

Usually, only the dispensing taps are provided at bar level and the other
15 components (such as the carbonation system and syrup system) are provided elsewhere (for example, in a basement, where there may be more space).

In use, when a dispensing tap is activated, syrup is pumped from its respective container through the cooling system, and water is provided from the water
20 source (e.g. mains water) through the carbonation system and cooling system. Syrup and carbonated water are mixed at an optimal ratio to provide an ideal concentration of soft drink. The optimal ration of syrup and carbonated water may be a balance of a number of factors including the flavour of the resulting soft drink and the volume of syrup used for a particular volume of soft drink
25 (which, of course, influences the cost of providing the soft drink).

Valves are required to regulate the flow rate of the syrup and the water. Typically, the syrup system has a separate valve for each syrup. This valve dictates the flow rate of that syrup and must be set specifically for that
30 particular syrup. Different syrups may require different valve settings due to different optimal ratios and/or different properties of the syrups (e.g. different

viscosities). The valves may be part of the dispensing system which is located remotely with respect to the dispensing taps or may be part of the dispensing taps.

- 5 These valves not only need to be adjusted if a new type of syrup is to be used, but also may drift from a setting over time. This can result in inconsistent flow rates (and as such incorrect syrup to water ratios), high malfunction rates (because valves can break down relatively quickly), and it may be difficult to access parts of the system, since they may be in a basement, for example.
- 10 This leads to high maintenance costs for proprietors in order to maintain a fully operational and consistent dispensing system.

Additionally, not all venues are suitable for such a high capacity system. For example, space in some venues is limited and, in some venues, the volume of soft drink sold is so low that the capital, installation, and/or maintenance cost for a conventional dispensing system means that the conventional system is not economically viable.

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Therefore, there is a need to reduce the size of dispensing systems such as those described above, so that venues with limited space can also provide soft drinks of this kind. There is also a need to reduce maintenance costs.

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Some conventional relatively compact dispensing systems exist. These systems typically connect to an external water source and carbon dioxide source, but the syrups, pumps, cooler and carbonator are included in a single unit. Multiple dispensing taps are provided, each of which connects to a different syrup pump and container, so that each provides a different flavour soft drink. These systems are easier to access, so they are more suitable for small venues. However, maintenance costs are still relatively high because the valves need to be adjusted for each syrup, and similar problems to the larger systems described above can occur.

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US7997448 discloses a multiple beverage dispensing apparatus for selectively dispensing a beverage which is stored in a concentrated form. The apparatus includes a plurality of pumps which are driven by a single motor via a single
5 rotor and a plurality of clutches.

The present invention aims to alleviate one or more problems associated with the prior art.

10 An aspect of the present invention provides a drinks dispensing system for dispensing drinks comprising: a dispensing valve assembly; a syrup delivery system comprising: a first syrup pump for connection to a first syrup container, the first syrup pump being controllable to deliver a predetermined dose of
15 syrup from the first syrup container to the dispensing valve assembly, and a second syrup pump for connection to a second syrup container, the second syrup pump being controllable to deliver a predetermined dose of syrup from the second syrup container to the dispensing valve assembly; a control system configured to control the operation of the first and second syrup pumps by setting a first electrical power parameter of electrical power to be supplied to
20 drive the first syrup pump independently of a second electrical power parameter of electrical power to be supplied to drive the second syrup pump; and a water delivery system configured to deliver water to the dispensing valve assembly, wherein the dispensing valve assembly is operable to mix and dispense syrup and water provided by the syrup delivery system and the water
25 delivery system.

The control system may be configured to set the first and second electrical power parameters to different settings.

30 The electrical power parameter may be a voltage of the electrical power to be supplied to the first and second syrup pumps.

The control system may include a first controller associated with the first syrup pump and a second controller associated with the second syrup pump, each controller being configured to receive operator input to set the respective first
5 and second electrical power parameters.

The control system may be further configured to: receive a command to dispense a drink; control the delivery to the dispensing valve assembly of a syrup using first syrup pump; and control the delivery of water to the
10 dispensing valve assembly using the water delivery system, such that water only is dispensed during a final period of the dispensing of the drink in order to flush the dispensing valve assembly.

The system may further include a third syrup pump for connection to a third
15 syrup container, the third syrup pump being controllable to deliver a predetermined dose of syrup from the third syrup container to the dispensing valve assembly, wherein the control system is further configured to control the operation of the third syrup pump by setting a third electrical power parameter of electrical power to be supplied to drive the third syrup pump independently
20 of the first and second electrical power parameters.

The syrup delivery system, the water delivery system and the dispensing valve assembly may all be housed within or on a single housing.

25 The syrup delivery system may further include a container for housing a replaceable syrup bag.

The first and second syrup pumps may be both peristaltic pumps.

30 The system may further include a cooling system configured to cool at least part of the syrup delivery system and/or the water delivery system.

Parts of both the syrup delivery system and the water delivery system may be cooled using a single cooling system.

- 5 The dispensing valve assembly may be configured to control the flow rate of water from the water delivery system.

The dispensing valve assembly may be configured to pass the syrup from the first and second syrup containers without providing control over the flow rate of
10 the syrup.

The water delivery system may include a carbonation device having a pressurised reservoir of water and carbon dioxide.

- 15 The carbonation device may be configured to refill the reservoir to a predetermined level after a drink has been dispensed.

Embodiments of the invention will now be described with reference to the accompanying figures of which:
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Figure 1 shows a drinks dispensing system in accordance with some embodiments of the invention;

Figure 2 shows a schematic view of a syrup delivery system for use in a drinks
25 delivery system in accordance with some embodiments of the invention;

Figure 3 shows a schematic view of a carbonated water delivery system for use in a drinks dispensing system in accordance with some embodiments of the invention;
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Figure 4 shows a schematic view of a drinks dispensing system in accordance with some embodiments of the invention;

Figure 5 shows a view of a pump for use in a drinks dispensing system in accordance with some embodiments of the invention;

Figure 6 shows a back view of a dispensing valve assembly for use in a drinks dispensing system in accordance with some embodiments of the invention;

Figure 7 shows a partially cut away plan view of a dispensing valve assembly for use in a drinks dispensing system in accordance with some embodiments of the invention; and

Figure 8 shows a control system in accordance with some embodiments of the invention.

With reference to the figures a drinks dispensing system 10 of some embodiments is shown. The drinks dispensing system 10 includes a syrup delivery system 12, a water delivery system 14 and a dispensing valve assembly 16. The syrup delivery system 12 and the water delivery system 14 deliver syrup and water, respectively, to the dispensing valve assembly 16, so that a soft drink can be dispensed. The syrup delivery system 12, the water delivery system 14 and the dispensing valve assembly 16 may all be housed on or within a housing 100, which may be a single housing 100.

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The syrup delivery system 12 includes a syrup pump 20 for connection to a syrup container 22 such that the syrup pump 20 can pump syrup from the syrup container 22 towards the dispensing valve assembly 16. The connection between the syrup pump 20 and the syrup container 22 may be through a conduit 30 which is part of the syrup delivery system 12 or which is connectable to the syrup delivery system 12 (e.g. to an inlet of the syrup pump

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20) – such that syrup is drawn from the syrup container 22 through the conduit 30 by the syrup pump 20 for delivery towards the dispensing valve assembly 16.

- 5 The syrup container 22 is configured to hold and store a volume of syrup for use by the syrup delivery system 12. The syrup container 22 may, therefore, be a bag of syrup which may be connected directly to the conduit 30 (i.e. so that the bag can be replaced when it is empty). In such embodiments, the syrup container 22 may be a bag of syrup provided inside another container
10 such as a box (which may be constructed from cardboard or the like) – e.g. a bag-in-a-box.

In some embodiments, the syrup container 22 may include a housing configured to receive the bag of syrup (or bag-in-a-box) and provide a
15 connection to the conduit 30. In some embodiments, the syrup container 22 may include a housing which provides a reservoir in which syrup may be directly poured and stored, and which also provides a connection to the conduit 30. The syrup container 22 may, therefore, in some embodiments be filled in-situ (i.e. whilst still connected to the syrup delivery system 12).

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In some embodiments, the syrup container 22 may form part of the syrup delivery system 12. The syrup container 22 described herein is an example of a source of syrup which may be connected to the syrup pump 20 (via the conduit 30 or otherwise) and other sources of syrup may be used.

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The syrup pump 20 is configured to deliver a predetermined dose of syrup from the syrup container 22 (or other source of syrup) to the dispensing valve assembly 16.

In some embodiments, the syrup pump 20 may be a peristaltic pump which is configured to deliver the predetermined dose (i.e. a predetermined volume) of syrup to the dispensing valve assembly 16.

- 5 In some embodiments, the syrup pump 20 in the form of a peristaltic pump includes a compressible tube 24 which is compressed and sealed (“occluded”), by a rotating rotor 26 with at least two spaced apart rollers 28. The dimensions of the syrup pump 20 and/or the tube 24 and/or the rotor 26 / rollers 28 may be selected so that the desired dose of syrup is delivered by driving the syrup pump 20. The syrup pump 20, therefore, has a pump volume
10 which is the volume of a single dose of syrup (and, in some embodiments, the minimum volume of syrup the syrup pump 20 is configured to deliver).

- As will be appreciated, for a given syrup pump 20 the number of rotations of the rotor 26 (i.e. pumping actions of the syrup pump 20) in a predetermined
15 period of time determines the volume of syrup delivered by the syrup pump 20 during that period of time (i.e. the total number of doses of syrup 20 delivered in that period of time). The rate of delivery of the syrup by the syrup pump 20 is, therefore, dependent on the rate of the pumping actions of the syrup pump
20 20. The syrup pump 20 may be driven by a motor (which may be a brushed DC motor) which may form part of the syrup pump 20. A mechanical coupling between a rotor of such a motor to the syrup pump 20 may be a constant coupling during normal operation – in other words, without any mechanism to decouple rotation of the rotor of the motor from the operation of the syrup
25 pump 20 (as may otherwise be provided if there were a clutch mechanism between the rotor of the motor and the syrup pump 20, for example). The coupling between the motor and the syrup pump 20 may, therefore, be a clutchless coupling.

- 30 The water delivery system 14 may include a water conduit 52. The water conduit 52 is connectable to a water source 58 (for example, mains water).

The water delivery system 14 may include a water pump 56 which is configured to pump water, through the water conduit 52 (or otherwise) towards the dispensing valve assembly 16. In some embodiments, the water delivery system 14 is a carbonated water delivery system 14, wherein the after pump
5 56 is configured to pump water through the water conduit 52 (or otherwise) into a carbonation device 54 of the carbonated water delivery system 14. Accordingly, for the avoidance of doubt, the carbonated water delivery system 14 may include the carbonation device 54, in some embodiments.

10 The carbonation device 54 may be configured to receive water from the water source 58 (e.g. via the water conduit 52 and water pump 56) and may also be configured to receive carbon dioxide through a carbon dioxide conduit 50 of the carbonated water delivery system 14.

15 The carbon dioxide conduit 50 may be connectable to a source of carbon dioxide such as a pressurised carbon dioxide source 52 (for example, a pressurised gas canister). The carbon dioxide conduit may be configured to feed carbon dioxide from the source of carbon dioxide into the carbonation device 54.

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The carbonated water delivery system 14 may, therefore, be configured to receive water and carbon dioxide, and to dissolve the carbon dioxide in the water to produce carbonated water.

25 The carbonation device 54 may be configured to feed carbonated water to the dispensing valve assembly 16.

In some embodiments, the carbonation device 54 may include a reservoir 59 of water and carbon dioxide. The reservoir 59 may be pressurised, so that a
30 desired amount of carbon dioxide gas dissolves into the water in order to produce carbonated water.

The carbonated water delivery system 14 may be configured to provide a substantially continuous supply of carbonated water on demand for delivery to the dispensing valve assembly 16. Similarly, the water delivery system 14 (for the delivery of uncarbonated water) may be configured to provide a substantially continuous supply of uncarbonated (i.e. still) water on demand for delivery to the dispensing valve assembly 16.

In some embodiments, the drinks dispensing system 10 is configured to provide both carbonated and uncarbonated water via the dispensing valve assembly 16. Accordingly, in some embodiments, the drinks dispensing system 10 may include both a still water delivery system 14 and a carbonated water delivery system 14. Accordingly, the drinks dispensing system 10 may include two water conduits 52 and water pumps 56 – one for each water delivery system 14. These two water delivery systems 14 may operate independently of each other in some embodiments.

In some embodiments (for example, figure 4), multiple syrup pumps 20 may be provided, each of which is connectable to a respective syrup container 22. It should be appreciated that any number of syrup pumps 20 may be provided, as required. Each syrup container 22 may contain a different flavour syrup or otherwise contain a different type of syrup, for example, cola, diet cola or lemonade. In some embodiments, each syrup pump 20 is associated with its own motor. In some embodiments, each motor is configured to drive only a single syrup pump 20. In some embodiments, four brushed DC motor driven peristaltic pumps may be provided as the syrup pumps 20. Each peristaltic pump may include its own motor which is configured to drive operation of that single peristaltic pump 20 (e.g. as described above).

Different syrups may have different viscosities (for example, diet drinks typically have lower viscosities than their “full sugar” equivalents), and as a

result the syrup pump 20 needs to be tuned for a particular syrup, so that the desired dose of syrup is delivered to the dispensing valve assembly 16. In some embodiments, the electrical power provided to operate the syrup pump 20 (or pumps) is controlled in order to control the volume of syrup delivered by the syrup pump 20 over a predetermined period of time (i.e. the rate of syrup delivery by the syrup pump 20). In other words, the electrical power is varied to control the number of pump operations in the predetermined period. In some embodiments, the electrical power is provided to the motor of the syrup pump 20 and the electrical power may be varied to control one or more of the rate of rotation of a rotor of the motor and/or the torque of the rotor of the motor.

In some embodiments, a voltage applied to the syrup pump 20 (e.g. to the motor thereof) is adjustable or otherwise controllable, so that the syrup pump 20 delivers the correct dose of syrup. A higher voltage may, for example, mean a higher number of pump actions in a predetermined period of time and so a faster rate of delivery (i.e. flow rate) of a given syrup. Different syrups may, however, have different properties (e.g. viscosities). Therefore, to obtain a predetermined rate of delivery the voltage applied to the syrup pump 20 (e.g. to the motor thereof) may need to be higher for a high viscosity syrup than for a low viscosity syrup.

In embodiments which use, for example a peristaltic pump as a syrup pump 20, the flow rate may comprise a rate of delivery of a series of individual doses which collectively form the overall dose for the drink, for example.

In some embodiments, the voltage provided to the or each syrup pump 20 (e.g. to the or each motor) may be between around 10 and 30 volts (DC).

In some embodiments, the position of the syrup container 22 with respect to the dispensing valve assembly 16 may also require control of the electrical power supplied to the or each syrup pump 20 (e.g. to the motor(s) thereof).

- 5 For example, if the syrup container 22 is below the dispensing valve assembly 16 then more electrical power may be required to deliver the required dosage to the dispensing valve assembly 16 compared to when the syrup container 22 is above the dispensing valve assembly 16. The electrical power supplied to the syrup pump 20 (e.g. to the motor) may be varied by controlling the voltage
10 applied to the syrup pump 20 (e.g. to the motor) – a higher voltage resulting in more power being supplied.

A control system 200 is configured to control the drinks dispensing system 10. The control system 200 may include one or more controller(s) 202 which are
15 coupled to the or each syrup pump 20. There may be one controller 202 for a plurality of syrup pumps 20 or a single controller 202 for each syrup pump 20. The controller(s) 202 is configured to control the electrical power supplied to the coupled syrup pump or pumps 20. The or each controller 202, therefore, may include an interface 204 configured to receive user input to set an
20 electrical power parameter for the electrical power to be supplied to the coupled syrup pump or pumps 20. The electrical power parameter may be a voltage level, for example.

In some embodiments, the or each controller 202 includes a processor 210
25 (such as a microcontroller or other microprocessor) including a control program which is configured to control the operation of the coupled syrup pump or pumps 20.

The interface 204 may, therefore, include one or more buttons 206 and may
30 also include a display 208 to indicate the present electrical power parameter setting – the buttons 206 and processor 210 being configured to allow a user

to alter the electrical power parameter setting (the alteration being indicated in the display). In some embodiments, which may or may not use a processor 210, the interface 204 is in the form of a dial or other manually operated control which can be moved between a first and second position to vary the electrical parameter setting and which also provides a visual indication of the present electrical parameter setting. In some embodiments, the interface 204 is part of a separate maintenance tool which may be communicatively coupled to the or each controller 202 (e.g. by a wired or wireless connection) during maintenance procedures.

As will be appreciated, each syrup pump 20 in embodiments including a plurality of syrup pumps 20 may be associated with its own electrical power parameter which may be set independently of the other electrical power parameters for the other syrup pumps 20. The electrical power parameter may determine one or more of the rate of rotation of a rotor of the motor of the associated syrup pump 20 and/or the torque of the rotor of the motor of the associated syrup pump 20. Accordingly, different operating conditions can be set for each syrup pump 20 to allow for different syrups and different syrup container 22 locations, for example.

The electrical parameter setting may then be used by the or each controller 202 to control the operation of one or more electrical power delivery systems of the drinks dispensing system 10 – e.g. to vary the voltage applied to the or each motor of the respective syrup pump or pumps 20 coupled to that controller 202.

The one or more electrical power delivery systems may each be coupled to a respective syrup pump 20 – the or each electrical power delivery system being configured to control the electrical power provided to the associated syrup pump 20 (e.g. to the motor thereof). In some embodiments, there is a single electrical power delivery system for a plurality of syrup pumps 20.

In some embodiments, the or each controller 202 may be further configured to receive a command for the dispensing of a drink and to control the duration of the electrical power delivered to the or each syrup pump 20. As will be appreciated, therefore, the or each electrical power delivery system may include one or more electrical switches which are configured to control the delivery of electrical power to the or each syrup pump 20 (e.g. to the or each motor thereof). The command for dispensing of a drink may be provided by an operator interface 66 which may be configured to receive operator indications of the desired drink to be dispensed. The operator interface 66 may be provided such that it is viewable and can be operated from the outside of the housing 100.

In some embodiments, the or each controller 202 is configured to receive the command for dispensing of a drink and to operate the associated syrup pump 20 (using the relevant electrical power delivery system). The controller 202 may operate the syrup pump 20 for a period equal to the length of time the command is received (e.g. whilst the operator is actuating the operator interface) or for a predetermined length of time (e.g. to dispense a predetermined volume of drink).

In some embodiments, the controller(s) 202 include a variable resistor provided as part of a potential divider circuit. The or each syrup pump 20 may be coupled to the one or more electrical power delivery systems via a respective potential divider circuit (each including a variable resistor). The user interface 204 to set the electrical parameter setting may include an interface (such as a dial, knob, or feature for engagement with a tool) through the use of which the resistance of the variable resistor can be set. Such potential dividers may, therefore, be used to set the voltage applied to each syrup pump 20 (e.g. motor) as a proportion of the voltage supplied by the electrical power delivery system.

- In some embodiments, the electrical parameter setting for the or each syrup pump 20 may be set directly by the user/technician according to their own knowledge (or information provided) of the effect of the position of the or each syrup container 22 and the type of syrup to be pumped. For example, a full sugar syrup (i.e. higher viscosity) may require a supply voltage of around 27 volts if the syrup container 22 is substantially level with the dispensing valve assembly 16. A voltage supply of around 30 volts may be required if the syrup container 22 is around 1 to 2 metres below the dispensing valve assembly 16.
- 5 A diet syrup (i.e. lower viscosity), for example, may only require a voltage of around 24 volts if the syrup container 22 is level with the dispensing valve assembly 16. The voltage may not need to be adjusted even if the syrup container 22 is around 1 to 2 metres below the dispensing valve assembly 16.
- 10 As will be appreciated the electrical parameter setting may, in some embodiments, be individually set for each syrup pump 20 and may, in some embodiments, be different for each syrup pump 20.
- 15 As will be appreciated the electrical parameter setting may, in some embodiments, be individually set for each syrup pump 20 and may, in some embodiments, be different for each syrup pump 20.

In some embodiments, the dispensing system 10 may be configured to set the electrical parameter setting (e.g. voltage) required for the syrup pumps 20 automatically. This may be based on input data about the type of syrup in the or each syrup container 22 and/or the system's knowledge of where the syrup container 22 will be or is located in the dispensing system 10.

20 In some embodiments, the dispensing system 10 may be configured to set the electrical parameter setting (e.g. voltage) required for the syrup pumps 20 automatically. This may be based on input data about the type of syrup in the or each syrup container 22 and/or the system's knowledge of where the syrup container 22 will be or is located in the dispensing system 10.

25 In some embodiments, the drinks dispensing system 10 may include a cooling system 40. The cooling system 40 may include a single mechanism which is configured to cool both the syrup travelling towards the dispensing valve assembly 16 and the water travelling to and/or from the carbonation device 54 (or otherwise passing through the water delivery system 14 (be it the carbonated water delivery system 14 or uncarbonated water delivery system 14, or both in some embodiments)).

30 In some embodiments, the drinks dispensing system 10 may include a cooling system 40. The cooling system 40 may include a single mechanism which is configured to cool both the syrup travelling towards the dispensing valve assembly 16 and the water travelling to and/or from the carbonation device 54 (or otherwise passing through the water delivery system 14 (be it the carbonated water delivery system 14 or uncarbonated water delivery system 14, or both in some embodiments)).

The cooling system 40 is configured to reduce the temperature of the syrup and/or the water to a desired chilled temperature (i.e. a temperature lower than room temperature (e.g. lower than about 20°C)). In some embodiments, more
5 than one cooling system 40 may be provided for each of the syrup delivery system 12 and the or each water delivery system 14, as desired.

The cooling system 40 may include a water bath 42 through which syrup and water conduits 32, 34 pass. The water bath 42 may be cooled by an ice bank
10 44. In some embodiments, the ice bank 44 substantially surrounds a perimeter of the water bath 42. The ice bank 44, as will be understood, comprises a coolant conduit which carries a coolant. The coolant is chilled using refrigeration equipment of the cooling system 40 – e.g. using a refrigeration cycle – and the chilled coolant cools the water in the water bath
15 42. The coolant conduit may be configured to build a bank of ice within the water bath 42. The ice bank 44 is, therefore, used to chill and maintain the chilled temperature of the water bath 42.

The water bath 42 may further be insulated to help to maintain low
20 temperature of the water bath 42.

The cooling system 40 may further include a mixing device 46 which is configured to mix or otherwise agitate the water in the water bath 42 in order to maintain a substantially consistent temperature across the water bath 42.

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In some embodiments with multiple syrup pumps 20 multiple syrup conduits 32 are provided. As will be understood, each syrup conduit 32 (be there one or several) couples one of the syrup pumps 20 to the dispensing valve assembly 16 and may pass through the cooling system 40, if provided. The syrup
30 conduit 32 may be a part of the cooling system 40, or a part of the syrup delivery system 12 or may be connected to either system.

In embodiments including multiple syrup conduits 32, the multiple syrup conduits 32 may all pass through the water bath 42 for cooling. The or each syrup conduit 32 may, in some embodiments, take the form of a coil 64 within
5 the water bath 42.

In some embodiments, the or each water delivery system 14 includes a respective water conduit 34 – which may be configured to carry water to the dispensing valve assembly 16 or the carbonation device 54 as the case may
10 be. The water conduit 34 (or conduits) may pass through the water bath 42 (as described above). One of the water conduit(s) 34 may be coupled to the water source 58 (e.g. via the water pump 56) and the carbonation device 54 and configured to deliver water from the water source 58 to the carbonation device
15 54 for carbonation. In some embodiments, one of the water conduit(s) 34 may be coupled to the water source 58 (e.g. via the water pump 56) and configured to deliver water from the water source 58 to the dispensing valve assembly 14. The water conduit(s) 34 may be a part of the cooling system 40, or a part of the water delivery system 14 (which may be the carbonated water delivery system 14 or not) or may be connected to either system

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The or each water conduit 34 may each take the form of a coil 64 within the water bath 42.

At least part of the carbonation device 54 may be configured to be cooled by
25 the cooling system 40 and may be provided within the water bath 42, in some embodiments. In embodiments in which the carbonation device 54 includes a pressurised reservoir 59, the pressurised reservoir 59 may also be cooled by the cooling system 40 (e.g. the reservoir 59 may be positioned at least partially in the water bath 42).

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A further water conduit 61 may be provided to couple the carbonation device 54 to the dispensing valve assembly 16, such that carbonated water can be provided via a further water conduit 61 (or “carbonated water conduit”) to the dispensing valve assembly 16.

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The further water conduit 61 may be chilled by the cooling system 40 (and may, therefore, pass through the water bath 42). The carbonated water conduit 61 may be a part of the cooling system 40, or a part of the carbonated water delivery system 14 or may be connected to either system.

10

In some embodiments in which a water delivery system 14 is provided for still water, there may be a still water reservoir (not shown) configured to be cooled by the cooling system 40 (e.g. may be located at least partially within the water bath 42). Accordingly, the water conduit 34 may deliver water to the still water reservoir and another further water conduit (corresponding with water conduit 61) may be provided to deliver water from the water reservoir to the valve dispensing assembly 16.

15

As will be appreciated, therefore, the cooling system 40 may be used to cool (i.e. chill) the syrup and the water (before and/or after carbonation of the water and/or of still water). As discussed above, each conduit 32,34,61 which passes through the water bath 42 may include a coil 64 to increase the length of conduit 32,34,61 which is in contact with the cooled water.

20

The dispensing valve assembly 16 may be configured to engage the or each of the syrup conduits 32 and the further water conduit 61. The dispensing valve assembly 16 may be configured to engage the other further water conduit (for delivering still water) in some embodiments – in addition to or instead of the further water conduit 61 for carbonated water.

25

30

With reference to figures 6 and 7, the dispensing valve assembly 16 may include a nozzle 60, through which soft drink is dispensed. The dispensing valve assembly 16 may include a mixing chamber (not shown) in or just before the nozzle 60, so that syrup and water (which may or may not be carbonated) may be mixed together as it is dispensed (or just before it is dispensed). The dispensing valve assembly 16 may include one or more operator actuatable control members 66, which correspond to the flavour of drink required.

In use, a operator activates the operator actuatable control member 66 which relates to the desired soft drink, which activates the drinks dispensing system 10 (e.g. the or each operator actuatable control member 66 may be the above described operator interface and may trigger the issuance of the command to dispense the drink).

The relevant syrup pump 20 is then driven to provide the correct dose of syrup to the dispensing valve assembly 16 (and the syrup may travel through the cooling system 40 for chilling as it flows towards the dispensing valve assembly 16). The carbonation device 54 may be pressurised at a pressure greater than that of atmosphere, so that when the dispensing valve assembly 16 is activated (i.e. opened to atmosphere), the carbonated water is automatically forced towards the dispensing valve assembly 16 due to the pressure differential – e.g. if a carbonated soft drink was selected by the operator. In some embodiments, the water is not carbonated (e.g. because the operator selected an uncarbonated drink. In such embodiments, the water pump 56 may deliver water to the dispensing valve assembly 16 (via the still water reservoir or otherwise).

In some embodiments the further water conduit 61, which connects the carbonation device to the dispensing valve assembly 16, is a relatively straight path. If the carbonated water travels along a torturous path (i.e. a twisted further water conduit 61) then the concentration of carbon dioxide in the water

may be reduced, resulting in a soft drink which has reduced carbonation than is ideal.

5 The syrup dose and the water (carbonated or still) will, in use, enter the dispensing valve assembly 16 to be mixed by the dispensing valve assembly 16 (e.g. in the nozzle 60 thereof) and dispensed from the nozzle 60.

10 In some embodiments, the ideal mixing ratio between the syrup and the water is about 1:5 by volume. The dispensing valve assembly 16 may be configured to provide fine control of the water flow rate. This may be achieved by one or more valve members, for example, of the dispensing valve assembly 16.

15 However, since the different syrups have different viscosities no fine tuning of the flow rate / dose of the syrup is performed using the dispensing valve assembly 16 (since the dispensing valve assembly 16 would need to be adjusted every time a different syrup was used) – the flow rate / dose of the syrup may be entirely controlled by the relevant syrup pump 20 (i.e. by the speed of rotation (i.e. rpm) of the syrup pump 20 and/or the electrical power supplied to the syrup pump 20 and/or the configuration of the syrup pump 20 and/or the cross-section of the syrup conduit 32).

25 Once the desired volume of soft drink has been dispensed from the dispensing valve assembly 16 (i.e. once substantially all the syrup has been mixed with water and dispensed), the dispensing system 10 may be configured to flush the dispensing nozzle 16 with water (a “post wash”) which may be carbonated or still water. This may be advantageous to prevent substantial flavour cross-over. For example, if a first soft drink dispensed is cola and a second drink is lemonade, it is advantageous if all of the cola syrup is flushed into the first drink, so that the second, lemonade, drink is not tainted with cola residue. In 30 some embodiments, the dispensing system 10 may flush the dispensing valve assembly 16 with water for between around 0.1 and 1 seconds (for example,

the flush time may be 0.5 seconds). The post wash operation may be controlled by the controller(s).

In some embodiments, the carbonation device 54 may include a pressure
5 regulator to maintain a substantially constant predetermined pressure (for
example, it may be kept at a pressure of between about 760Pa (110psi) and
830Pa (120psi)). When a soft drink is dispensed from the dispensing valve
assembly 16, the pressure in the carbonation device 54 reduces because
10 carbonated water is fed out of the carbonated water delivery system 14 (for
example, the pressure may drop to around 550Pa (80psi)). Once the
dispensing system 10 completes dispensing a soft drink, the carbonation
device 54 may automatically draw additional carbon dioxide from the carbon
dioxide source 53 and additional water may be pumped from the water source
58, so that the pressure is brought back to the predetermined pressure. This
15 may be controlled by the controller(s).

In some embodiments, under operator control, the drinks dispensing system
10 may be configured to output still or carbonated water through the
dispensing valve assembly 16 with or without syrup. As such, an operator
20 may request the dispensing of unflavoured water from the drinks dispensing
system 10 of some embodiments. Equally, of course, in some embodiments,
the drinks dispensing system 10 may be configured to output still and/or
carbonated water flavoured with at least one syrup.

25 In some embodiments in which the dispensing system 10 is configured to
output still and carbonated water, a single water source 58 may be provided.
In some embodiments, a single water pump 56 is provided and the output of
the water pump 56 is split such that a portion of the water from the water
source 58 is provided to the carbonation device 54 and a portion is provided to
30 the dispensing valve assembly 14 without carbonation (i.e. as still water).

In some embodiments, the drinks dispensing system 10 may have multiple modes of operation. The modes may include a dispense mode, a user mode and a technician mode. Dispense mode may be 'normal' operation which allows the end user (i.e. the operator) to activate the dispensing system 10 and dispense a required flavour of soft drink. This mode may set particular details of the use of the system 10. For example, the time taken to fill a 300ml cup may be between about 6 and 7 seconds, so the dispensing system 10 may have a maximum dispense time of 10 seconds to prevent flooding and/or misuse (i.e. filling large containers with soft drink when only a small amount has been purchased). The dispensing system 10 may be set to allow only one type of syrup to flow at a time, even if more than one control member 66 is actuated.

User mode may allow a proprietor (e.g. a coffee shop owner) to perform specific tasks. User mode may be accessed by pressing a specific sequence of control members 66. Once in user mode the dispensing system 10 may allow empty syrup containers 22 to be replaced with new ones and/or prevent further use of the dispensing system 10 (i.e. if there is a fault and the dispensing system 10 cannot be used until a technician has investigated).

20

Technician mode may allow further control of the dispensing system 10. For example, technician mode may allow the or each electrical power for each syrup pump 20 to be adjusted and/or may allow isolation of the carbonation device 54 (or other components of the syrup delivery system 12 and/or the carbonated water delivery system 14), so that it can be fixed if required. It should be appreciated that examples of what may be programmed in each operation mode is not exhaustive.

The controller(s) may be configured to determine the mode of operation.

30

The dispensing system 10 may be conveniently in a compact housing 100, so that it may be placed on a counter top, and does not take up excessive space.

As will be appreciated, embodiments of the present invention may allow
5 operating parameters of the syrup pumps 20 to be controlled independently of each other to allow for different conditions (e.g. different syrups and/or syrup container 22 locations). The operating parameters are, in embodiments, parameters of the electrical power which is used to power a respective motor associated with each syrup pump 20 (or forming a part thereof).

10

In some embodiments, the cooling system 40 is provided as a remote cooling system 40. The remote cooling system 40 may be provided in a separate housing. An umbilical may couple the remote cooling system 40 to the rest of the dispensing system 10. In some embodiments, the dispensing valve
15 assembly 16 is provided in a separate housing and coupled to the rest of the dispensing system 10 by the umbilical. In some embodiments, the cooling system 40 may include a chilled liquid pump which is configured to circulate chilled liquid (e.g. water) from the cooling system 40 (e.g. from the water bath) through at least part of the umbilical and back to the cooling system 40 (e.g.
20 back to the water bath). This chilled liquid pump may be provided in addition to or instead of the mixing device 46. In some embodiments, the chilled liquid pump is configured to deliver the chilled liquid to the dispensing valve assembly 16 for circulation around a part thereof and return to the cooling system. Accordingly, this chilled liquid may cool water and/or syrup which is in
25 the umbilical and/or near the dispensing valve assembly 16. This may help to ensure that the drink is still adequately chilled during periods in which a low volume of drink is dispensed.

In some embodiments, the operator interface 66 is provided as part of the same housing (e.g. on that housing) as the dispensing valve assembly 16
30 which may be a separate housing from the housing for at least part of the rest

of the dispensing system 10 (which may be all of the rest of the dispensing system 10 and/or may be the housing for the cooling system 40).

5 In some embodiments, the umbilical may also include one or more electrical wires which are configured to provide electrical power to the housing as part of which the operator interface 66 is provided and/or to deliver the output from the operator interface 66 to the or each controller 202 (which may be provided in the remote housing).

10 When used in this specification and claims, the terms "comprises" and "comprising" and variations thereof mean that the specified features, steps or integers are included. The terms are not to be interpreted to exclude the presence of other features, steps or components.

15 The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse
20 forms thereof.

CLAIMS

1. A drinks dispensing system for dispensing drinks comprising:
a dispensing valve assembly;
5 a syrup delivery system comprising:
a first syrup pump for connection to a first syrup container,
the first syrup pump being controllable to deliver a predetermined
dose of syrup from the first syrup container to the dispensing
valve assembly, and
10 a second syrup pump for connection to a second syrup
container, the second syrup pump being controllable to deliver a
predetermined dose of syrup from the second syrup container to
the dispensing valve assembly;
a control system configured to control the operation of the first and
15 second syrup pumps by setting a first electrical power parameter of electrical
power to be supplied to drive the first syrup pump independently of a second
electrical power parameter of electrical power to be supplied to drive the
second syrup pump; and
a water delivery system configured to deliver water to the dispensing
20 valve assembly, wherein the dispensing valve assembly is operable to mix and
dispense syrup and water provided by the syrup delivery system and the water
delivery system.
2. A system according to claim 1, wherein the control system is configured
25 to set the first and second electrical power parameters to different settings.
3. A system according to claim 1 or 2, wherein the electrical power
parameter is a voltage of the electrical power to be supplied to the first and
second syrup pumps.

4. A system according to any preceding claim, wherein the control system includes a first controller associated with the first syrup pump and a second controller associated with the second syrup pump, each controller being configured to receive operator input to set the respective first and second
5 electrical power parameters.

5. A system according to any preceding claim, wherein the control system is further configured to:
receive a command to dispense a drink;
10 control the delivery to the dispensing valve assembly of a syrup using first syrup pump; and
control the delivery of water to the dispensing valve assembly using the water delivery system, such that water only is dispensed during a final period of the dispensing of the drink in order to flush the dispensing valve assembly.

15 6. A system according to any preceding claim, further including a third syrup pump for connection to a third syrup container, the third syrup pump being controllable to deliver a predetermined dose of syrup from the third syrup container to the dispensing valve assembly, wherein the control system
20 is further configured to control the operation of the third syrup pump by setting a third electrical power parameter of electrical power to be supplied to drive the third syrup pump independently of the first and second electrical power parameters.

25 7. A system according to any preceding claim, wherein the syrup delivery system, the water delivery system and the dispensing valve assembly are all housed within or on a single housing.

8. A system according to any preceding claim, wherein the syrup delivery
30 system further includes a container for housing a replaceable syrup bag.

9. A system according to any preceding claim, wherein the first and second syrup pumps are both peristaltic pumps.

10. A system according to any preceding claim, further including a cooling system configured to cool at least part of the syrup delivery system and/or the water delivery system.

11. A system according to claim 10, wherein parts of both the syrup delivery system and the water delivery system are cooled using a single cooling system.

12. A system according to any preceding claim, wherein the dispensing valve assembly is configured to control the flow rate of water from the water delivery system.

13. A system according to any preceding claim, wherein the dispensing valve assembly is configured to pass the syrup from the first and second syrup containers without providing control over the flow rate of the syrup.

14. A system according to any preceding claim, wherein the water delivery system includes a carbonation device having a pressurised reservoir of water and carbon dioxide.

15. A system according to claim 14, wherein the carbonation device is configured to refill the reservoir to a predetermined level after a drink has been dispensed.

16. A drink dispensing system substantially as described herein and/or with reference to the accompanying drawings.

17. Any novel feature or novel combination of disclosed herein.

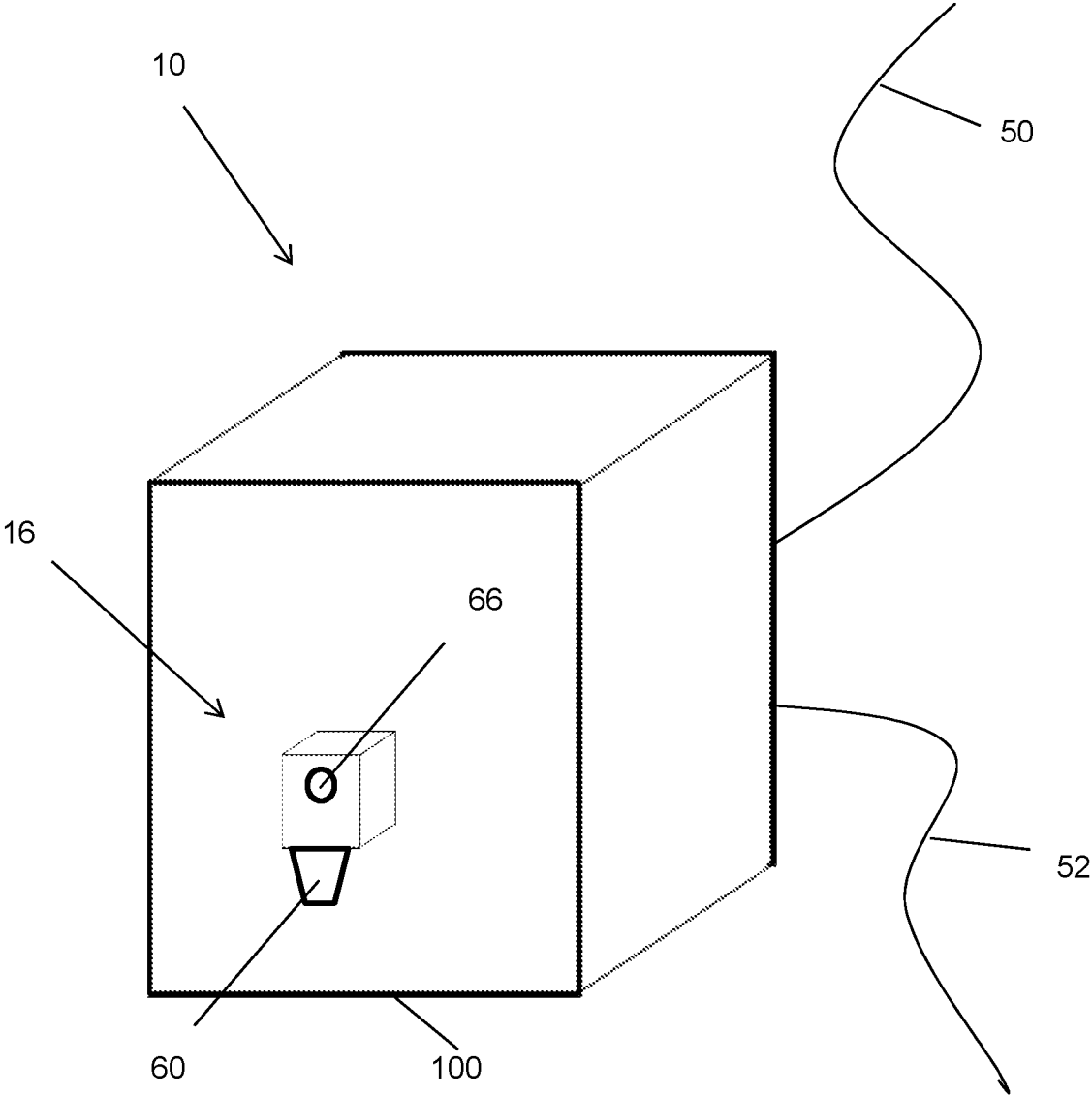


Figure 1

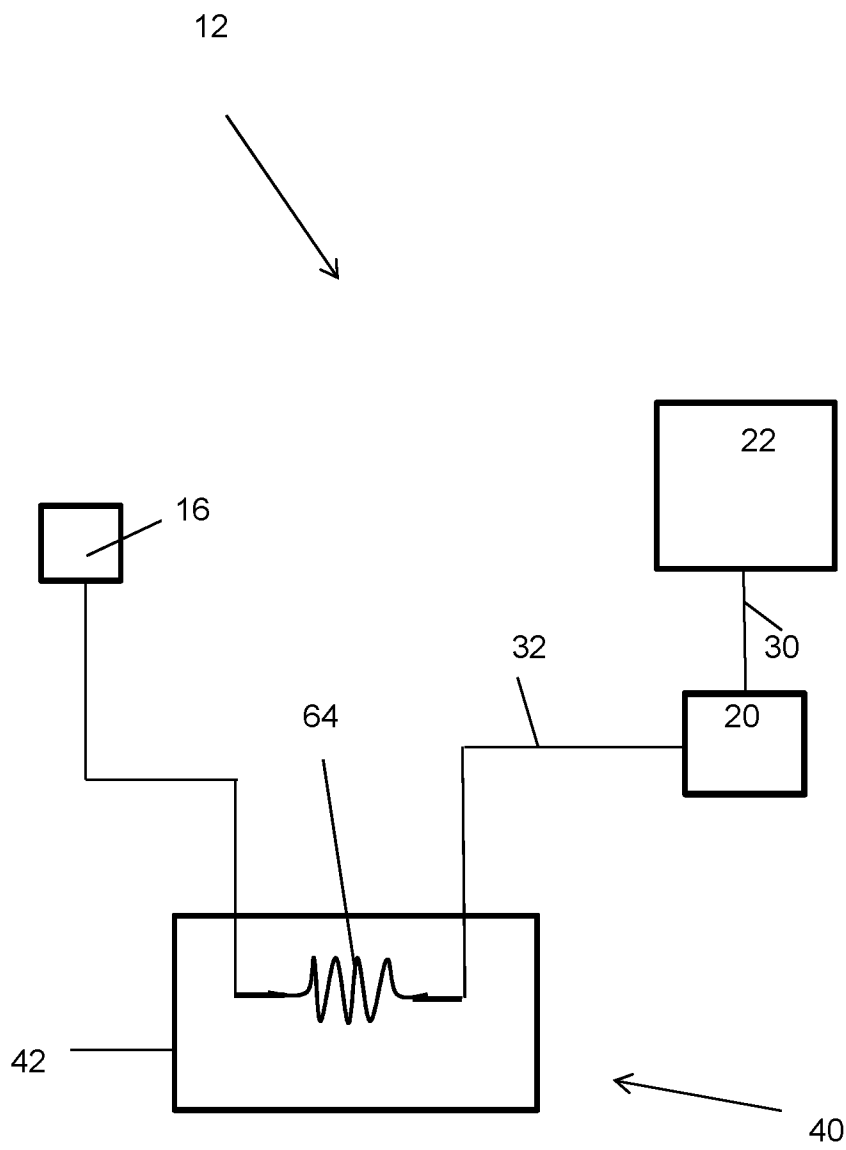


Figure 2

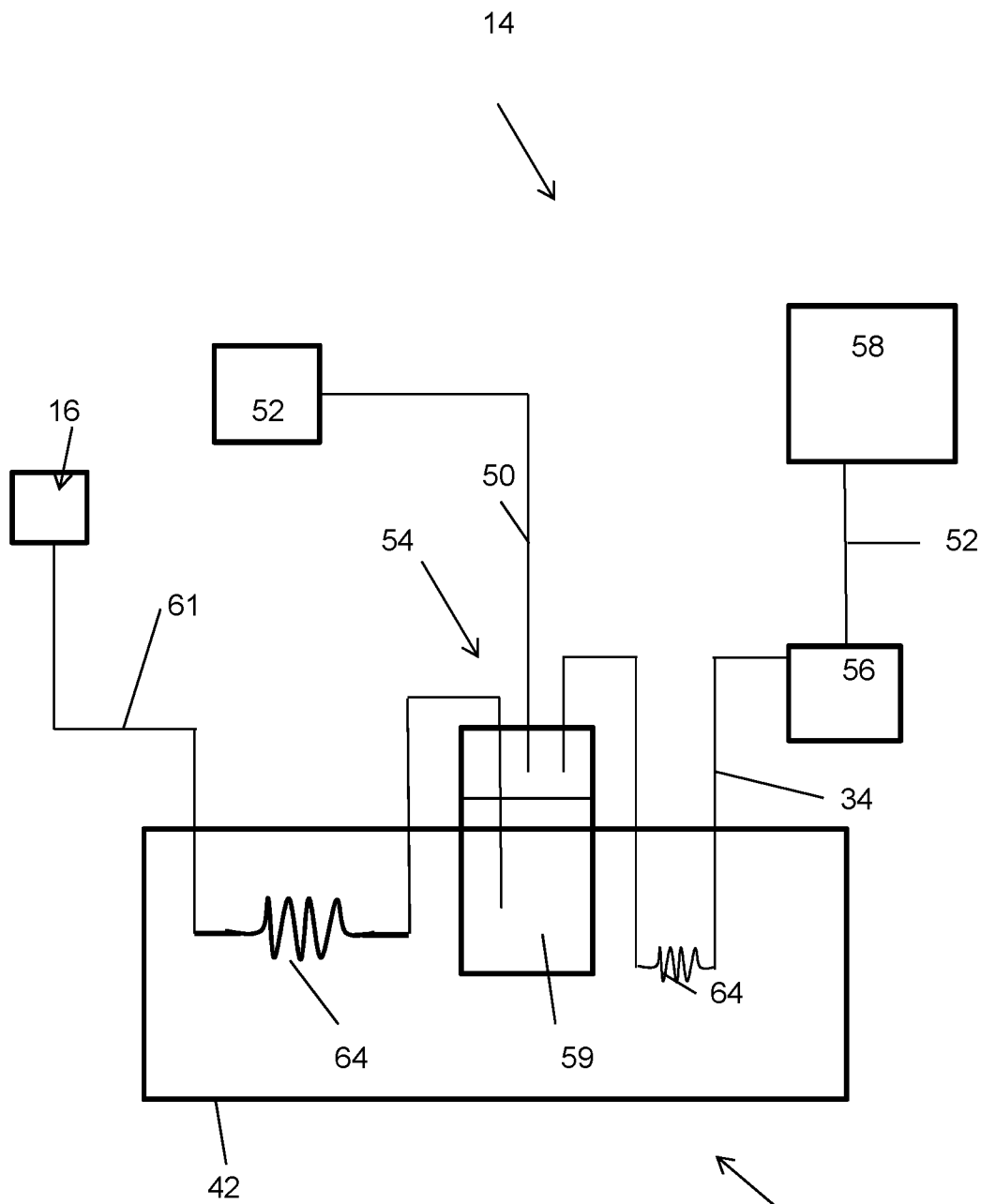


Figure 3

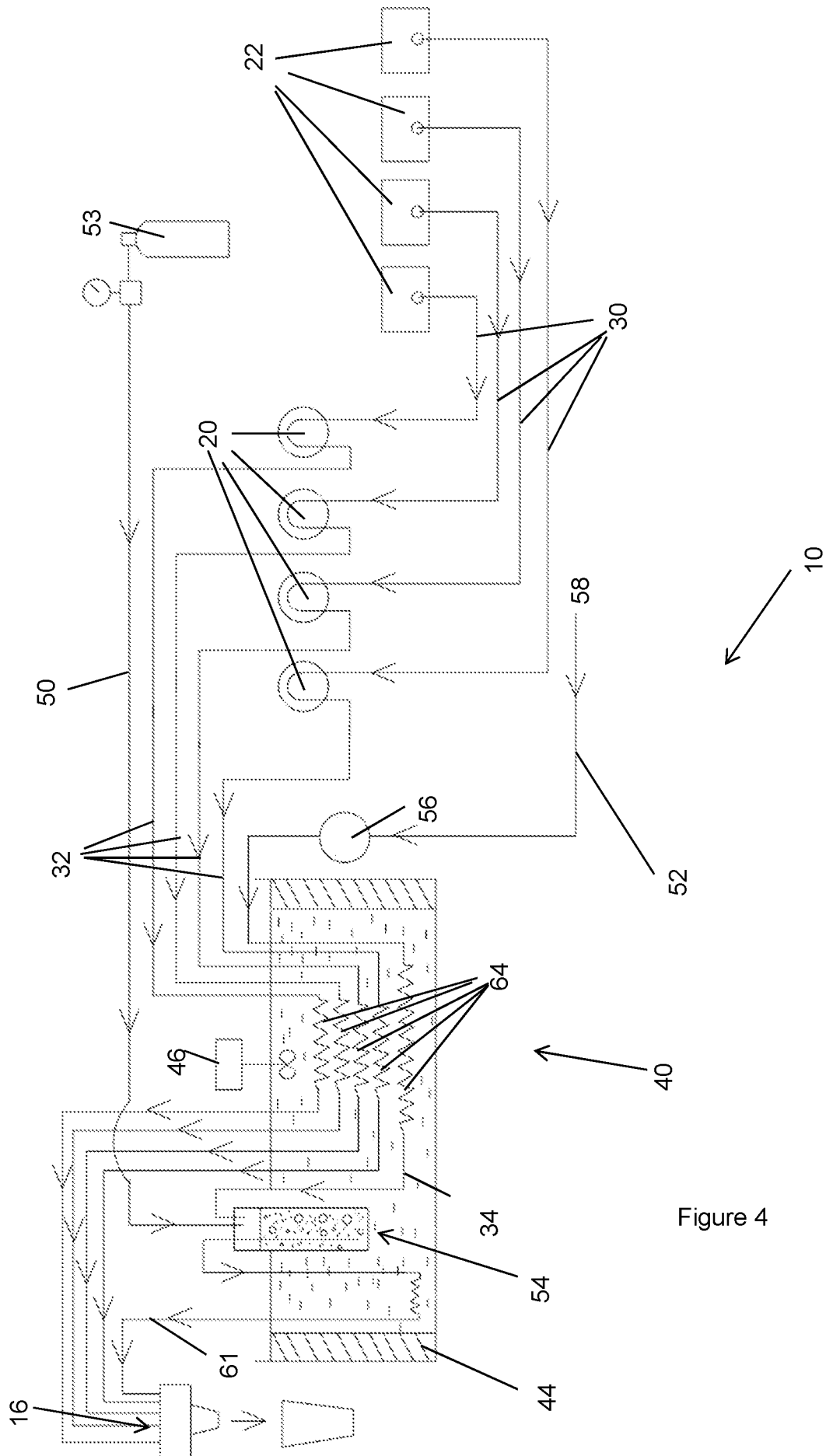


Figure 4

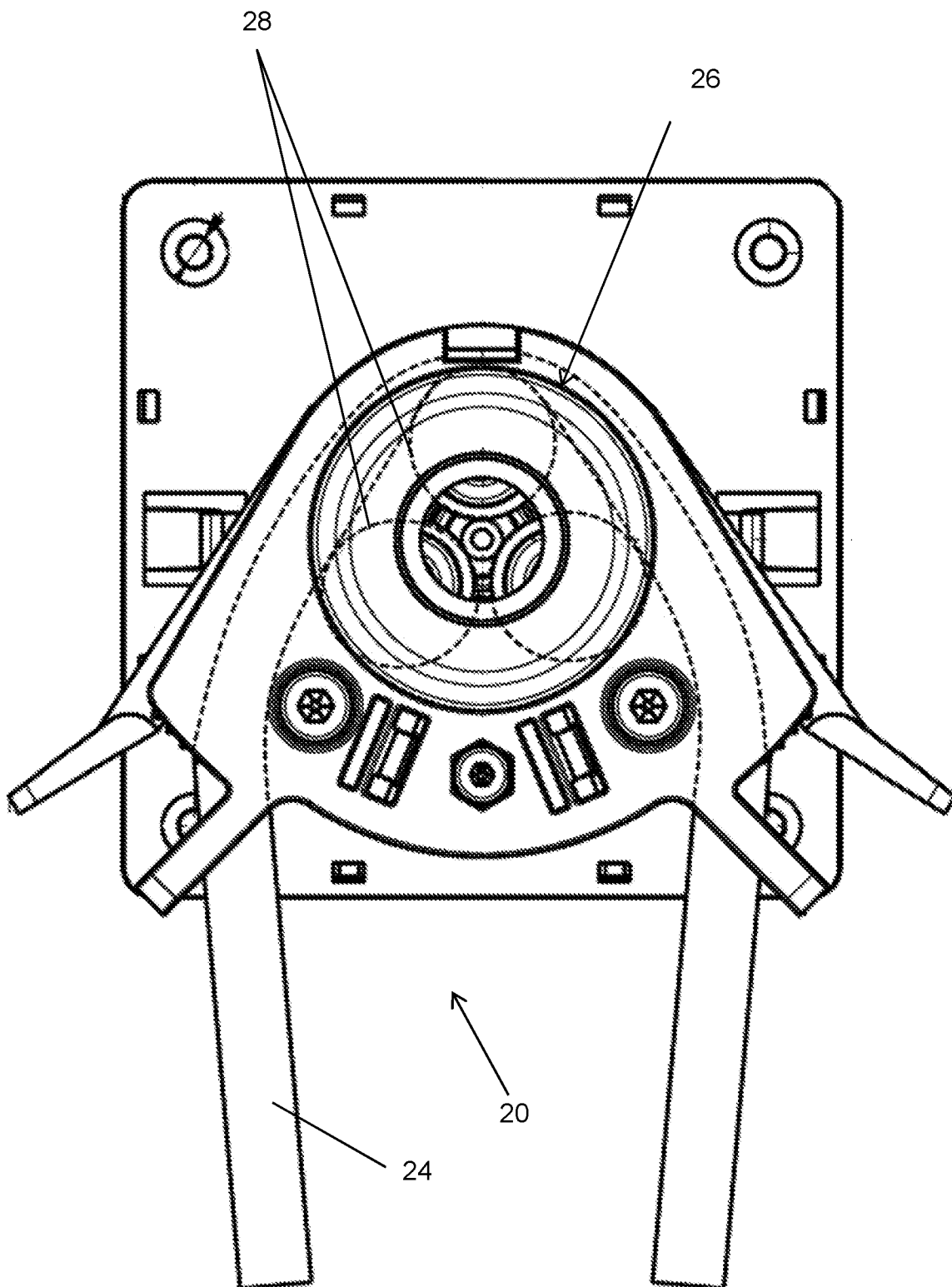
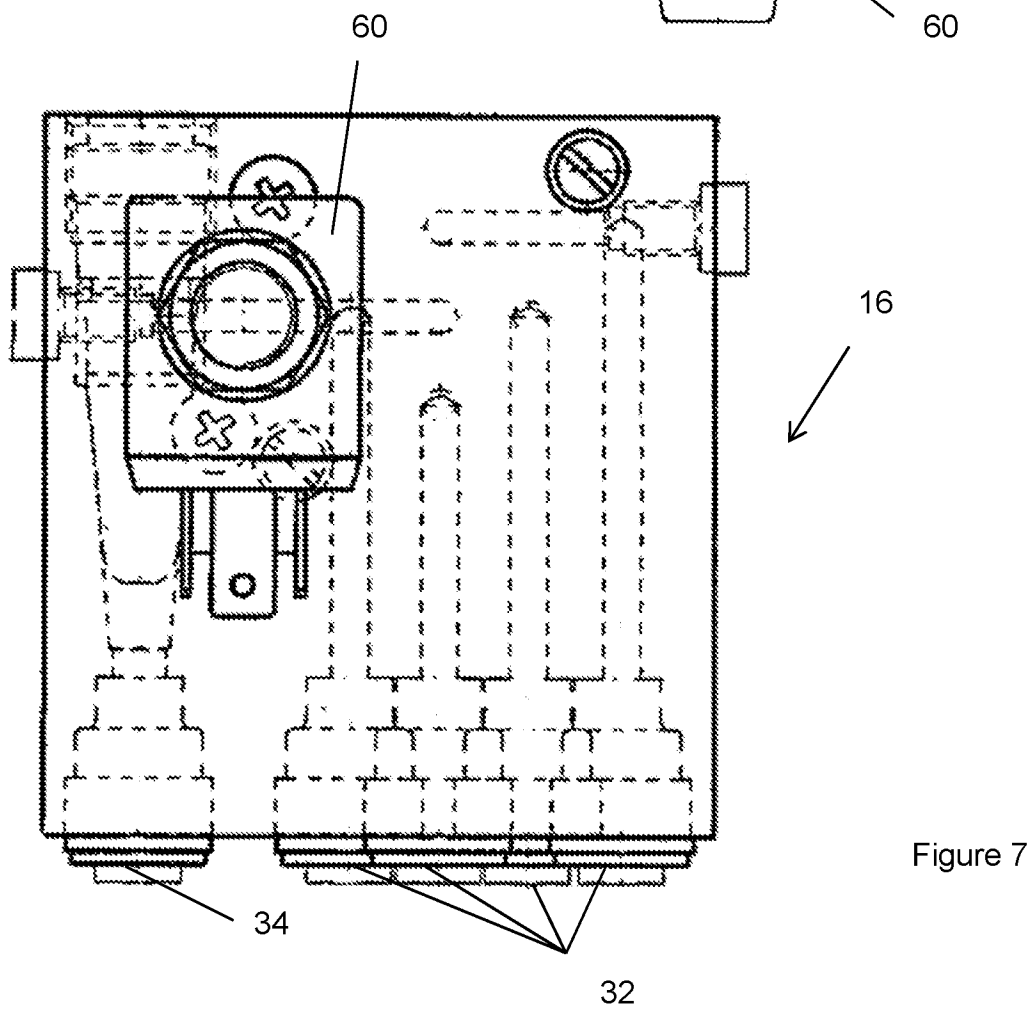
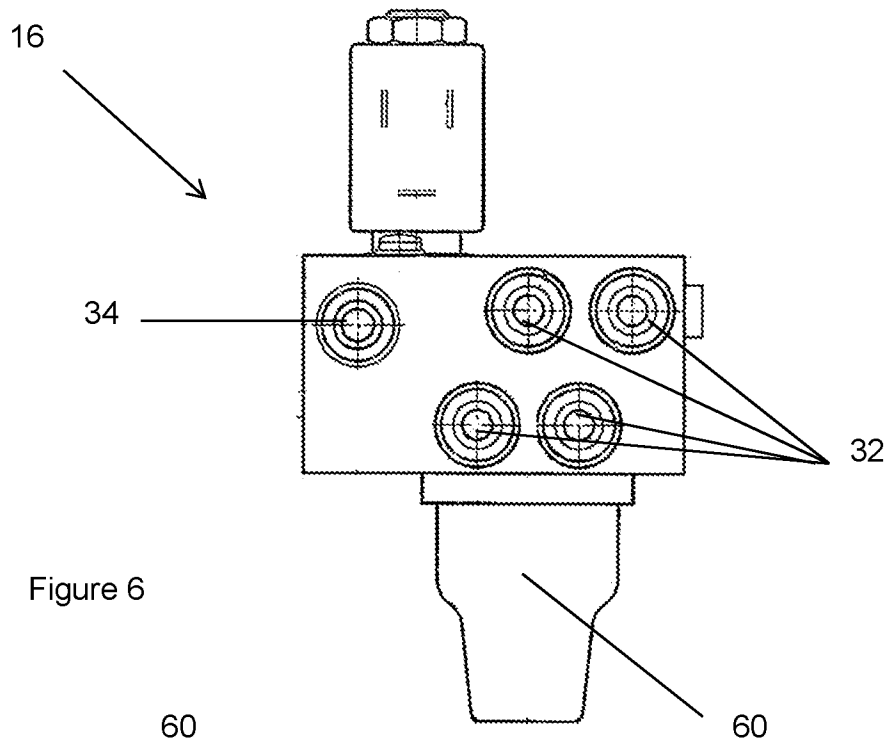


Figure 5



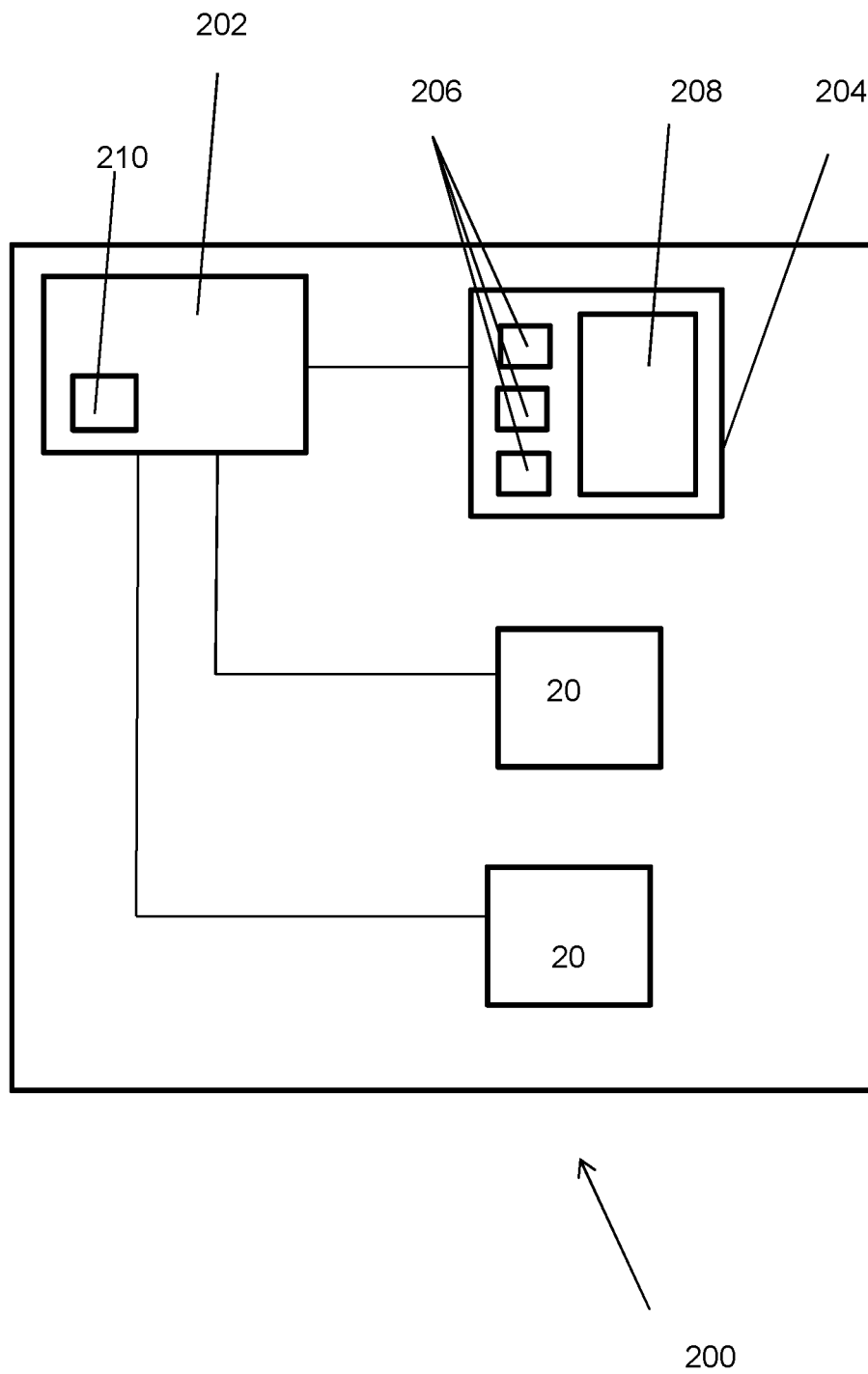


Figure 8

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2016/053401

A. CLASSIFICATION OF SUBJECT MATTER
 INV. B67D1/00 B67D1/12
 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 B67D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 384 649 A1 (COCA COLA CO [US]) 9 November 2011 (2011-11-09)	1,2,4, 6-8,10, 11,13-15
Y	paragraphs [0037], [0043], [0047], [0048], [0059]	3,5,9
Y	----- US 2002/060226 A1 (KAMEYAMA BUNICHIRO [JP]) 23 May 2002 (2002-05-23) column 10, line 59 - line 62	3
Y	----- EP 1 955 977 A1 (IMI CORNELIUS UK LTD [GB]) 13 August 2008 (2008-08-13) paragraph [0038]	5
X	----- EP 1 420 652 A1 (NESTEC SA [CH]) 26 May 2004 (2004-05-26)	1,2,6,7
Y	paragraph [0054] - paragraph [0058] paragraph [0064]	9
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

18 January 2017

Date of mailing of the international search report

22/02/2017

Name and mailing address of the ISA/

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Authorized officer

Desittere, Michiel

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2016/053401

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CA 2 501 127 A1 (A C DISPENSING EQUIPMENT INC [CA]) 23 October 2005 (2005-10-23) page 5, line 23 - page 9, line 4 -----	1,2,6,7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2016/053401

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 16, 17
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 16, 17

Claim 16 vaguely refers to the description in its whole and to the drawings, but does not mention any features. Claim 17 has such a broad scope that a significant search thereof is not possible.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2016/053401

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