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(54) **HOT AND COLD WATER DISPENSING SYSTEM WITH TEMPERATURE CONTROL**

(57) A water dispensing system (1) is provided comprising a boiler module (60) configured to heat water. The system further comprises a dispensing head (14) having a nozzle (18) for dispensing the water heated by the boiler module and a user input device (16) configured to receive an input. The system also has a controller (114) in communication with the user input device and the boiler module. The controller is configured to control the dispensing of the water heated by the boiler module based on the input received by the user input device.

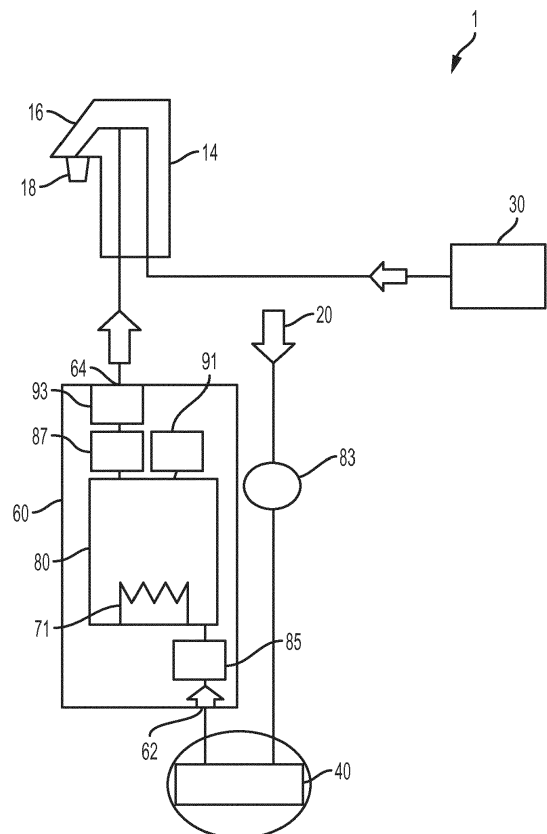


FIG. 7

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application is based on and claims priority to U.S. Provisional Patent Application Serial No. 62/300,325 filed February 26, 2016, the disclosure of which is incorporated herein by reference.

FIELD

[0002] The present disclosure relates to water dispensing apparatuses and systems, specifically water dispensing apparatuses and systems that have water boiler modules, water cooler modules, and dispensing heads for dispensing water.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] Examples of water dispensing apparatuses and systems are described with reference to the following drawing figures.

FIGURE 1 is an image of a sink with a dispensing head and a standard kitchen font.

FIGURE 2 is an image of a cooler module and a boiler module.

FIGURE 3 is a perspective view of an example boiler module with a removable cover in place.

FIGURE 4 is a perspective view of the boiler module of FIGURE 3 without the removable cover.

FIGURE 5 is an image of an example pressure tank.

FIGURE 6 is a schematic drawing of an example pressure tank.

FIGURE 7 is a schematic drawing of an example boiler module.

FIGURE 8 is a schematic drawing of an example boiler module.

FIGURE 9 is an example systems diagram.

FIGURE 10 is an example circuit board.

FIGURE 11 is another example circuit board.

FIGURE 12 is a schematic drawing of an example boiler module with an example cooler module.

FIGURE 13 is an image of the boiler module on top of the cooler module.

FIGURE 14 is a front image of the cooler module.

FIGURE 15 is a back image of the cooler module of FIGURE 14.

FIGURE 16 is an image of the cooler module of FIGURE 14 with a housing cover removed.

DETAILED DESCRIPTION

[0004] The present inventors have endeavored to provide a water dispensing system 1 (FIGURE 7 and 12) that includes a small water boiler module 60 which delivers or dispenses heated or boiling water to an electronic dispensing head 14. The boiler module 60 can be

combined with a cooler module 30 to supply chilled, ambient, and/or carbonated water through the dispensing head 14. The boiler module 60 and/or cooler module can be used for domestic or commercial applications. The present inventors have also endeavored to provide boiler modules 60 that have a high heating performance, have a minimal overall size, and dispense heated water with repeatable temperature consistency. For example, the boiler module 60 can provide one liter of heated water at a minimum average dispense temperature of 90°C (temperature measured in a cup or container).

[0005] Referring to FIGURE 1, the dispensing head 14 is located adjacent to a standard kitchen font 12 at a sink 10. The dispensing head 14 includes a user input device 16 (e.g. touch pad, touch screen, display panel with conventional mechanical push buttons) to control and activate fluid valves and/or solenoid valves in the boiler module 60 and/or cooler module 30 (FIGURES 2, 7, and 12). Chilled, ambient, carbonated, and/or heated water from the boiler module 60 and/or cooler module 30 travel through piping (not shown) to the dispensing head 14 where the water is dispensed through a nozzle 18. Heated water from the boiler module 60 can be used to prepare tea, coffee, and/or food requiring fast preparation (e.g. pasta or vegetables).

[0006] Referring to FIGURES 2-4, the cooler module 30 and the boiler module 60 are placed adjacent to each other below the sink 10. In some examples, the boiler module 60 can be implemented without the cooler module 30. The boiler module 60 includes a housing 66 which surrounds and protects the components of the boiler module 60. The housing 66 includes a baseplate 67, a removable cover 68, and/or a housing display 69 (such as a LCD display, viewing window, touch pad, touch screen, and/or user input device).

[0007] Referring to FIGURES 5-8, the boiler module 60 receives water from a water supply 20. The water supply 20 has a predetermined water supply pressure, and the water enters the boiler module 60 through an inlet 62. A filter unit 40 (FIGURE 7) filters and/or descales the water before the water enters the boiler module 60. Alternatively, the filter unit 40 can be placed downstream of the inlet 62. Heated water exits the boiler module 60 through an outlet 64 and flows through piping to the dispensing head 14 where it is dispensed through the nozzle 18. A temperature sensor 97 senses the temperature of the water in the boiler module 60. A condensate pipe 102 can be included such that condensate collecting in the boiler module 60 can drain out of the boiler module 60. Similarly, cold water from the cooler module 30 flows through piping to the dispensing head 14 where the cold water is dispensed via the nozzle 18.

[0008] The boiler module 60 includes a heating element 71 and an insulated pressure vessel or pressure tank 80. The heating element performance can be 2,000W for fast heat recovery, however heating element performance may vary in the range of 1,500W to 3,000W, depending on the country and the national power supply.

The pressure tank 80 is made from stainless steel and is designed as a pressure tank system. The boiler module 60 and/or pressure tank 80 can be any suitable size or shape. In one example, the pressure tank 80 has a total volume of 1.4L, a diameter of 108mm, and length of 225mm. In another example, the boiler module 60 has minimal dimensions of: 260mm x 195mm x 355mm (width x height x depth). The size and/or dimension of the boiler module 60 and/or any other component can vary. The pressure tank 80 can include insulation 82 to minimize thermal heat loss. In one example, the insulation 82 is 40.0 mm thick.

[0009] Various pressure regulators and/or valves are included with the boiler module 60 such as a water pressure regulator 83 (which can be upstream or downstream of the inlet 62) to reduce the water supply pressure, an inlet valve 85 with an integrated check valve, pressure reducing valve 87, a pressure relief valve 91 (utilized as a safety device), an outlet valve 93 to control the dispense of the water through the dispensing head 14, and/or the like. The pressure reducing valve 87 reduces the water supply pressure to a range of 2.0 bar to 4.0 bar. The water pressure regulator 83 controls the water pressure in the pressure tank 80 such that the operating water pressure in the pressure tank 80 and/or other components of the boiler module 60 are constant. Through research and experimentation the present inventors have found that in order to have an acceptable flow of uniformly heated water at the dispensing head 14, the operating water pressure in the pressure tank 80 is 1.0 bar above the water supply pressure. The pressure relief valve 91 activates in case of uncontrolled pressure (i.e. the operating water pressure in the pressure tank 80 exceeds pressure limits of other components) and is set at a maximum 10.0 bar. When the pressure relief valve 91 activates, the pressure relief valve 91 releases water which is detected by a leak sensor 95 (FIGURE 4) located on the baseplate 67 of the housing 66 which causes a controller (to be discussed further herein) to signal the heating element 71 to stop heating the water and signal the inlet valve 85 to block the inlet 62.

[0010] The boiler module 60 includes a control system 110 having a main controller 114 to control all components and systems of the boiler module 60, a touch pad controller (not shown) to activate and control water dispense from the dispensing head 14, and a boiler controller (not shown) to control the boiler and heating functions. In some examples, the control system 110 can be setup in combination with a control system and controller (not shown) of the cooler module 30 to operate together in a master control system / slave control system relationship. The touch pad controller converts user inputs to input signals and relays the input signals to valves and/or solenoid valves such that water is dispensed through the dispensing head 14. For instance, heated water is dispensed from the nozzle 18 of the dispensing head 14 when a dispense switch signal is activates an outlet valve 93. During the dispense of water, the inlet valve 85 opens

to refill the pressure tank 80 to maintain a constant water level in the pressure tank 80.

[0011] The control system 110 can include several boiler module control features. Examples of boiler module control features are listed below:

Soft Start Function - Full heating element power up to 90°C and heating element pulsing with approximately 25% load from 90°C to the final set point for example 95°C or 98°C. This function prevents the pressure tank 80 from over-heating as the heating element provides energy when it has been switched off due to its thermal energy.

[0012] Heater Load Control - In case of a weak power supply, the heating element performance can be limited to a range of 50% to 80% of the nominal load.

[0013] Sleep Mode Function - At 70°C or lower to reduce the energy consumption over night. Sleep mode is activated if there is no dispense for a certain time (the time can be selected for example 2hrs). To wake up the boiler module 60 the hot water dispense button needs to be selected and the heating element 71 will start to heat the pressure tank 80 until the defined temperature has been reached.

[0014] Heater Jump Start Function - Every time a hot dispense button is selected the heating element 71 is switched on to avoid a delay. After the dispense buttons is released the heating element 71 continues to work in the normal temperature control mode.

[0015] Heater Communication Function - The heating element 71 communicates with the dispensing head 14 and indicate readiness, or failures (e.g. "not ready" means the hot water is not hot enough to dispense (i.e. hot water < 90°C)), out of function, filter full), and option for GPRS communication for submitting the technical performance data.

[0016] Filter Lifetime Control - Filter lifetime control can be selected by operating time or by throughput calculated by the valve opening time. The usual setting is 6 months or 5000 liters throughput whatever appears first. The standard flowrate is 21/min at the nozzle 18 which leads to a filter life time of 2500min or 41.66hrs valve opening time.

[0017] Safety Function maximum dispense - Safety function maximum dispense is only allowed for the max portion size of 11.

[0018] Scale Detection System - Scale detection is used to detect if calcium deposits have settled on the heating element. When heating up from sleep mode, the boiler controller will measure the temperature rise per time interval (dT/dt). The default descaling interval will be 1 year. This default interval will be adjusted based on the described dT/dt measurement in the range of 0.5 to 1.2 years. If the sleep mode is never entered, the default descaling interval of 1 year will be used. The scale detection system is used to give an early warning to the operator to indicate a possible problem with the heating

element 71. To protect the heating element 71 a descaling service needs to be done to secure the heating element useful life.

[0019] Error Codes - All errors will be signaled to the main controller 114 display using the boiler ready signal. The boiler controller will check for errors, such as temperature too high, leakage occurred, descaling required, temperature not reached, and/or the like.

[0020] Sanitation Mode - The boiler module 60 can be set into an automatic sanitation mode where the filter unit 40 is replaced by a sanitation cartridge. The control system activates the sanitation mode, controls the reaction time of the chemicals, and controls the flush time after sanitation. During this process the dispensing head 14 is deactivated.

[0021] Referring to FIGURE 9, the controller 114 is programmable and includes a processor 115 and a memory 116. The controller 114 can be located anywhere in the control system 110 and/or located remote from the control system 110 and can communicate with various components of the dispensing head 14, cooler module 30, and/or boiler module 60, via wired and/or wireless communication links 111, as will be explained further herein below. The controller 114 can have one or more control sections or control units. One having ordinary skill in the art will recognize that the controller 114 can have many different forms and is not limited to the example that is shown and described.

[0022] In some examples, the controller 114 may include a computing system that includes a processing system, storage system, software, and input/output (I/O) interfaces for communicating with devices. The processing system loads and executes software from the storage system, such as software programmed with a display and moving control method. When executed by the computing system, display software directs the processing system to operate as described herein below in further detail to execute image display or notification on the user input device 16 such as light illumination, light colors, and/or audible sounds. In another example, when executed by the computing system movement software directs the processing system to operate the heating element 71 described herein to execute heating of water in the pressure tank 80.

[0023] The computing system may include one or many application modules or control features and one or more processors, which may be communicatively connected. The processing system may comprise a microprocessor (e.g., processor) and other circuitry that retrieves and executes software from the storage system. Processing system can be implemented within a single processing device but can also be distributed across multiple processing devices or sub-systems that cooperate in existing program instructions. Non-limiting examples of the processing system include general purpose central processing units, applications specific processors, and logic devices.

[0024] The storage system (e.g., memory) can com-

prise any storage media readable by the processing system and capable of storing software. The storage system can include volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information, such as computer readable instructions, data structures, program modules, or other data. The storage system can be implemented as a single storage device or across multiple storage devices or sub-systems. The storage system can further include additional elements, such as a controller capable of communicating with the processing system. Non-limiting examples of storage media include random access memory, read only memory, magnetic discs, optical discs, flash memory, virtual memory, and non-virtual memory, magnetic sets, magnetic tape, magnetic disc storage or other magnetic storage devices, or any other medium which can be used to store the desired information and that may be accessed by an instruction execution system. The storage media can be a non-transitory or a transitory storage media.

[0025] In this example, the controller 114 communicates with one or more components of the control system 110 via a communication link 111, which can be a wired or wireless link. The controllers 114 are capable of monitoring and controlling one or more operational characteristics of the control system 110 and its various sub-systems by sending and receiving control signals via the communication link 111. It should be noted that the communication links 11 in fact provide communication between the controller 114 and each of the sensors, devices, valves, and various subsystems described herein, although not every connection is shown in the drawing for purposes of clarity. The control system 110 may include several modules or control features, as described above.

[0026] FIGURES 10 and 11 are example circuit boards which include electronic devices and components described herein, connected to each other by links. Electrical power (e.g. 230V) enters the system from a socket 142 and is received by a transformer 144. The circuit board 140 includes a bidirectional triode thyristor (e.g. TRIAC) 146, relays 148, and the controller 114. The circuit board 140 is coupled to the leak sensor 95, a temperature probe 154, the cooler module 30, the inlet valve 85, the outlet valve 93, an ambient water outlet valve 94, and a heating element 71. A cutout or fuse 156 can be connected to the heating element 71.

[0027] FIGURE 12 is an example of the boiler module 60 with the cooler module 30. The boiler module 60 receives water from the water supply 20 which is filtered by the filter unit 40. Filtered water then enters the boiler module 60 through the inlet 62. The inlet valve 85 regulates water flow into the pressure tank 80 where the water is heated by the heating element 71. Finally, the outlet valve 93 controls the dispense of the heated water through the outlet 64. A cooler filter 131 filters the water from the water supply 20 before the water enters the cooler module 30. The water enters the cooler module 30

through a cooler inlet 132. The water flows through cooling components 133 of the cooler module 30 to a pump 134. The cooler module 30 can include a carbonation system 138 that has carbonator bowl 135 selectively infuses the water with carbonation from a carbonation source 139 based on user selection. A cooler outlet valve 136 opens to allow chilled and/or carbonated water to flow through a cooler outlet 137 to the dispensing head 14.

[0028] FIGURE 13 depicts the boiler module 60 on top of the cooler module 30. FIGURES 14-16 depict the cooler module 30 with the cooler inlet 132, cooler outlet 137, an air outlet 155, and an air inlet 141.

[0029] In certain examples, the water dispensing system 1 includes the boiler module 60 configured to heat water, the cooler module 30 configured to cool water, the dispensing head 14 having a nozzle 18 for dispensing the water heated by the boiler module 60 and the water cooled by the cooler module 30. The dispensing head 14 includes the user input device 16 which is configured to receive an input from a user or operator. The controller 114 is in communication with the user input device 16, the boiler module 60, and the cooler module 30. The controller 114 is configured to control the dispensing of the water heated by the boiler module 60 and the water cooled by the cooler module 30 based on the input received by the user input device 16. The boiler module 60 includes the heating element 71 which is configured to heat the water and the temperature sensor 97 which is configured to sense the temperature of the water in the boiler module 60. The controller 114 is in communication with the heating element 71 and the temperature sensor 97, and the controller 114 controls the heating element 71 based on the temperature sensed by the temperature sensor 97. In certain examples, the controller 114 is configured to determine a length of time required to heat the water to a stored high water temperature and/or the controller 114 can be further configured to determine a remaining useful life of the heating element 71 based on the length of time required to heat the water to the stored high water temperature. The controller 114 can be further configured to prevent dispense of water via the nozzle 18 when the temperature of the water is less than the stored high water temperature. The controller 117 can be further configured to cyclically activate and deactivate the heating element 71 as the temperature of the water approaches the stored high water temperature to thereby prevent overheating of the water and/or configured to activate the heating element 71 when the water heated by the boiler module 60 is dispensed via the nozzle 18.

[0030] In certain examples, the boiler module 60 includes the inlet valve 85 that receives water and the controller 114 is in communication with the inlet valve 85 and configured to open the inlet valve 85 when water heated by the boiler module 60 is dispensed via the nozzle 18 to thereby maintain a constant water level (i.e. stored water level) in the boiler module 60. The boiler module 60 has an outlet 64 for dispensing the water to the dis-

pensing head 14, and the water dispensed via the outlet 64 can have a water pressure greater than the water pressure of the water received via the inlet valve 85 such that temperature of the water dispensing via the outlet 65 is uniform.

[0031] In certain examples, the pressure relief valve 91 is configured to reduce the pressure of the water in the boiler module 60 by releasing water from the boiler module 60 and a leak sensor 95 configured to sense the water released from the boiler module 60. In this example, the controller 114 is in communication with the heating element 71, the leak sensor 95, and the inlet valve 85 and configured to deactivate the heating element 71 and close the inlet valve 85 when the leak sensor 95 senses water released via the pressure relief valve 91. In certain examples, the cooler module 30 includes a carbonation system 138 configured to carbonate the water cooled by the cooler module 30. The controller 114 is in communication with the carbonation system 138 and is configured to control the carbonation system 138 to thereby carbonate the water cooled by the cooler module 30 based on the input received by the user input device 16.

[0032] In certain examples, the controller 114 is configured to deactivate the heating element 71 when no water dispenses via the nozzle 18 during a stored length of time (i.e. the controller 114 deactivates the heating element 71 after a stored length of time elapses, e.g. 1 hour, 2 hours, during which no water dispenses via the nozzle 18). The system 1 can include a filter unit 40 that is configured to filter and/or descale the water, and the controller 114 can be further configured to determine a remaining useful life of filter unit 40 based on a stored filter useful lifespan (e.g. 6 months, 1 year) or a stored dispensed water quantity (e.g. 5000 liters dispensed via the nozzle 18, 7500 liters dispensed via the nozzle). The controller 114 can be further configured to determine a remaining useful life of heating element 71 based on a descaling time interval (e.g. 6 months, 1.5 years) or the length of time required to heat the water (e.g. 20 minutes, 45 minutes). The system 1 can further include a sanitation cartridge (note the sanitation cartridge may replace and/or be included with the filter unit 40) having sanitation chemicals that are configured to sanitize the boiler module 60, the cooler module 30, and/or the dispensing head 14. The controller 114 can be further configured to allow the water to flow through the sanitation cartridge such that the sanitation chemicals sanitize the boiler module 60, the cooler module 30, and/or the dispensing head 14. The controller 114 is also configured to flush the sanitation chemicals from the boiler module 60, the cooler module 30, and/or the dispensing head 14 with the water.

[0033] The water dispensing system 1 includes various methods and/or method steps. For example, the water dispensing system 1 can include the method of heating water in a boiler module 60 having a heating element 71, cooling water in a cooler module 30, receiving a user input with a user input device 16 on a dispensing head

14 through which the water heated by the boiler module 60 and the water cooled by the cooler module 30 can be dispensed, and/or controlling, with a controller 114, the dispensing of the water heated by the boiler module 60 and the water cooled by the cooler module 30 based on a user input received by the user input device 16. The method can further include sensing temperature of the water in the boiler module 60 with a temperature sensor 97, determining, with the controller 114, a length of time required to heat the water to a stored high water temperature, and/or determining, with the controller 114, a remaining useful life of the heating element 71 based on the length of time required to heat the water to the stored high water temperature. The method can further include controlling the dispensing head 14 to dispense the water, preventing the water from dispensing from the boiler module 60 when the temperature of the water is less than the stored high water temperature, cycling activation and deactivation of the heating element 71 as the temperature of the water approaches the stored high water temperature to thereby prevent overheating of the water; and/or activating the heating element 71 when the water heated by the boiler module 60 is dispensed via the dispensing head 14.

[0034] In certain examples, the cooler module includes a refrigeration system which may include a cold plate, an evaporator, a condenser, a compressor, and/or other known refrigeration components. The carbonation system can include a pump that increases the pressure of the water in the cooler module and/or a carbonator bowl that receives carbon dioxide gas from a carbon dioxide gas source to carbonate the water. A water source pressure regulator can include a regulator inlet for receiving water from a water source and a regulator outlet that dispenses the water that is received by the inlet of the boiler module. The water source pressure regulator can be configured to regulate flow of the water to the inlet of the boiler module to thereby maintain a uniform pressure of the water received by the inlet.

[0035] In the present description, certain terms have been used for brevity, clearness and understanding. No unnecessary imitations are to be implied therefrom beyond the requirement of the prior art because such terms are used for descriptive purposes only and are intended to be broadly construed. The different apparatuses and systems described herein may be used alone or in combination with other apparatuses and systems. Various equivalents, alternatives and modifications are possible within the scope of the appended claims. In the present disclosure, certain terms have been used for brevity, clearness and understanding. No unnecessary limitations are to be implied therefrom beyond the requirement of the prior art because such terms are used for descriptive purposes only and are intended to be broadly construed. The different apparatuses and systems described herein may be used alone or in combination with other apparatuses and systems. Various equivalents, alternatives and modifications are possible within the scope of

the appended claims.

Claims

1. A water dispensing system comprising:
 - a boiler module configured to heat water; and
 - a dispensing head having a nozzle for dispensing the water heated by the boiler module and a user input device configured to receive an input; and
 - a controller in communication with the user input device and the boiler module, wherein the controller is configured to control the dispensing of the water heated by the boiler module based on the input received by the user input device.
2. The water dispensing system according to claim 1, further comprising a cooler module configured to cool water; wherein the water cooled by the cooler module dispenses via the nozzle; and wherein the controller is in communication with the cooler module and configured to control the dispense of the water cooled by the cooler module via the nozzle based on the input received by the user input device; and, optionally or preferably, wherein the cooler module includes a carbonation system configured to carbonate the water cooled by the cooler module; and wherein the controller is in communication with the carbonation system and configured to control the carbonation system to thereby carbonate the water cooled by the cooler module based on the input received by the user input device.
3. The water dispensing system according to claim 2, wherein the boiler module has a heating element configured to heat the water and a temperature sensor configured to sense the temperature of the water in the boiler module; wherein the controller is in communication with the heating element and the temperature sensor; and wherein the controller controls the heating element based on the temperature sensed by the temperature sensor.
4. The water dispensing system according to claim 3, wherein the controller is configured to determine a length of time required to heat the water to a stored high water temperature; and wherein the controller is further configured to determine a remaining useful life of the heating element based on (i) the length of time required to heat the water to the stored high water temperature, and/or on (ii) a descaling time interval or the length of time required to heat the water.

5. The water dispensing system according to claim 4, wherein the controller is further configured to prevent dispense of water via the nozzle when the temperature of the water is less than the stored high water temperature. 5
6. The water dispensing system according to claim 4 or 5, wherein the controller is configured to cyclically activate and deactivate the heating element as the temperature of the water approaches the stored high water temperature to thereby prevent overheating of the water. 10
7. The water dispensing system according to claim 6, wherein the controller is further configured to activate the heating element when the water heated by the boiler module is dispensed via the nozzle. 15
8. The water dispensing system according to any of claims 4 to 7, wherein the controller is configured to deactivate the heating element when no water dispenses via the nozzle during a stored length of time. 20
9. The water dispensing system according to any of claims 4 to 7, further comprising a filter unit that is configured to filter the water, and wherein the controller is configured to determine a remaining useful life of filter unit based on a stored filter useful lifespan or a stored dispensed water quantity; and/or further comprising a sanitation cartridge having sanitation chemicals that are configured to sanitize the boiler module and cooler module, wherein the controller is configured to allow the water to flow through the sanitation cartridge such that the sanitation chemicals sanitize the boiler module and the cooler module, and wherein the controller is further configured to flush the sanitation chemicals from the boiler module and the cooler module with the water. 25 30 35
10. The water dispensing system of any of claims 7 to 9, wherein the boiler module comprises an inlet valve that receives water; and wherein the controller is in communication with the inlet valve and configured to open the inlet valve when water heated by the boiler module is dispensed via the nozzle to thereby maintain a stored water level in the boiler module; and, optionally or preferably, wherein the boiler module has an outlet for dispensing the water to the dispensing head; and wherein the water dispensed via the outlet has a water pressure greater than the water pressure of the water received via the inlet valve such that temperature of the water dispensing via the outlet is uniform. 40 45 50
11. The water dispensing system according to any of claims 7 to 10, further comprising: 55
- a pressure relief valve configured to reduce the pressure of the water in the boiler module by releasing water from the boiler module; and a leak sensor configured to sense the water released from the boiler module; wherein the controller is in communication with the heating element, the leak sensor, and the inlet valve and configured to deactivate the heating element and close the inlet valve when the leak sensor senses water released via the pressure relief valve.
12. A method of operating a water dispensing system, the method comprising:
- heating water in a boiler module having a heating element;
cooling water in a cooler module;
receiving a user input with a user input device on a dispensing head through which the water heated by the boiler module and the water cooled by the cooler module can be dispensed; and
controlling, with a controller, the dispensing of the water heated by the boiler module and the water cooled by the cooler module based on a user input received by the user input device.
13. The method according to claim 12, further comprising:
- sensing temperature of the water in the boiler module with a temperature sensor;
determining, with the controller, a length of time required to heat the water to a stored high water temperature; and
determining, with the controller, a remaining useful life of the heating element based on the length of time required to heat the water to the stored high water temperature.
14. The method according to claim 13, further comprising:
- controlling the dispensing head to dispense the water;
preventing the water from dispensing from the boiler module when the temperature of the water is less than the stored high water temperature; and, optionally or preferably,
activating the heating element when the water heated by the boiler module is dispensed via the dispensing head.
15. The method according to claim 13 or 14, further comprising:
- cycling activation and deactivation of the heating element as the temperature of the water ap-

proaches the stored high water temperature to
thereby prevent overheating of the water.

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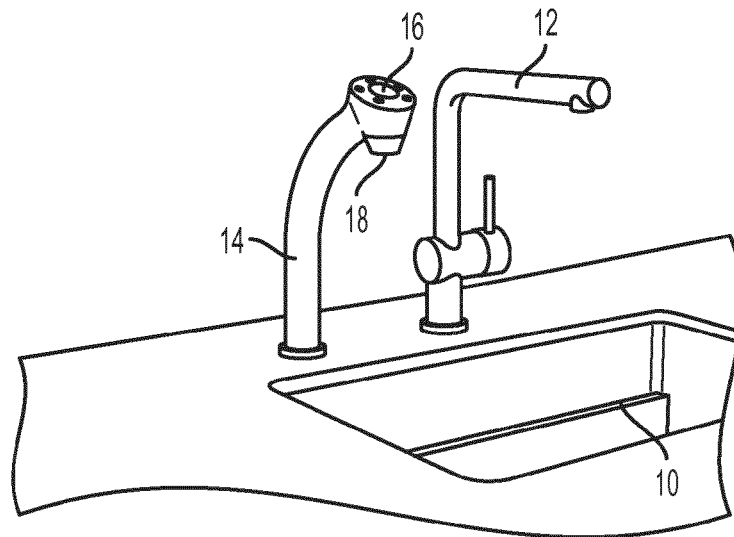


FIG. 1

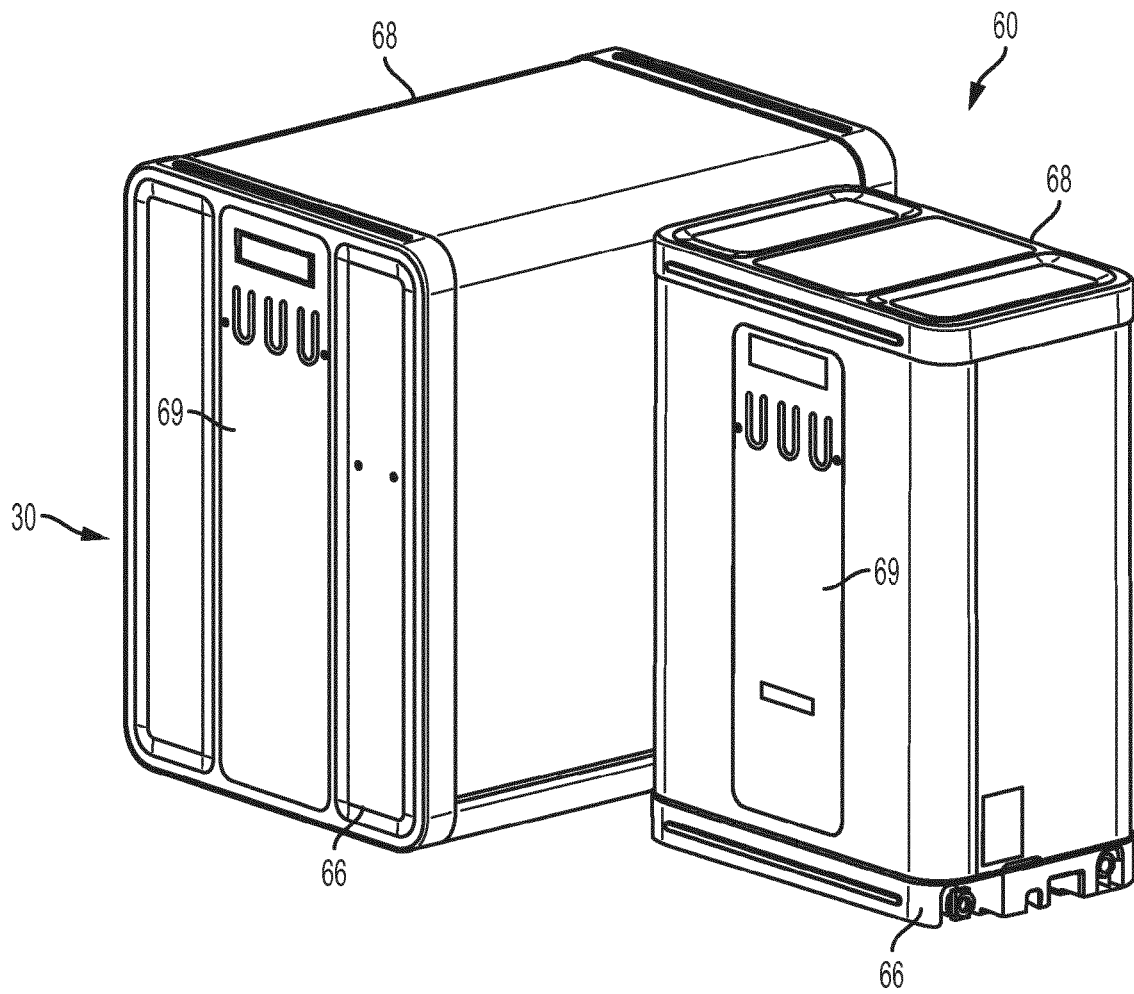


FIG. 2

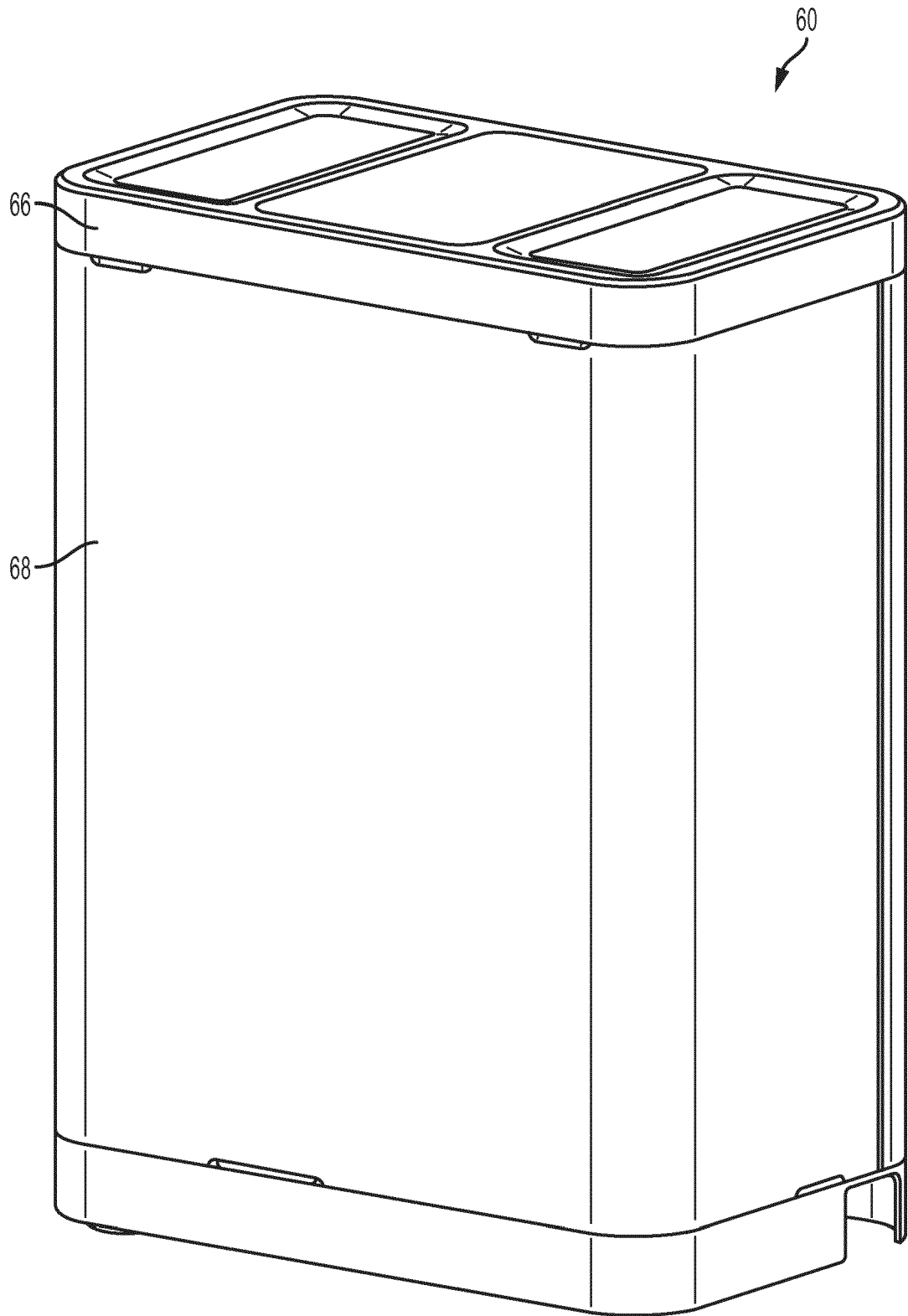


FIG. 3

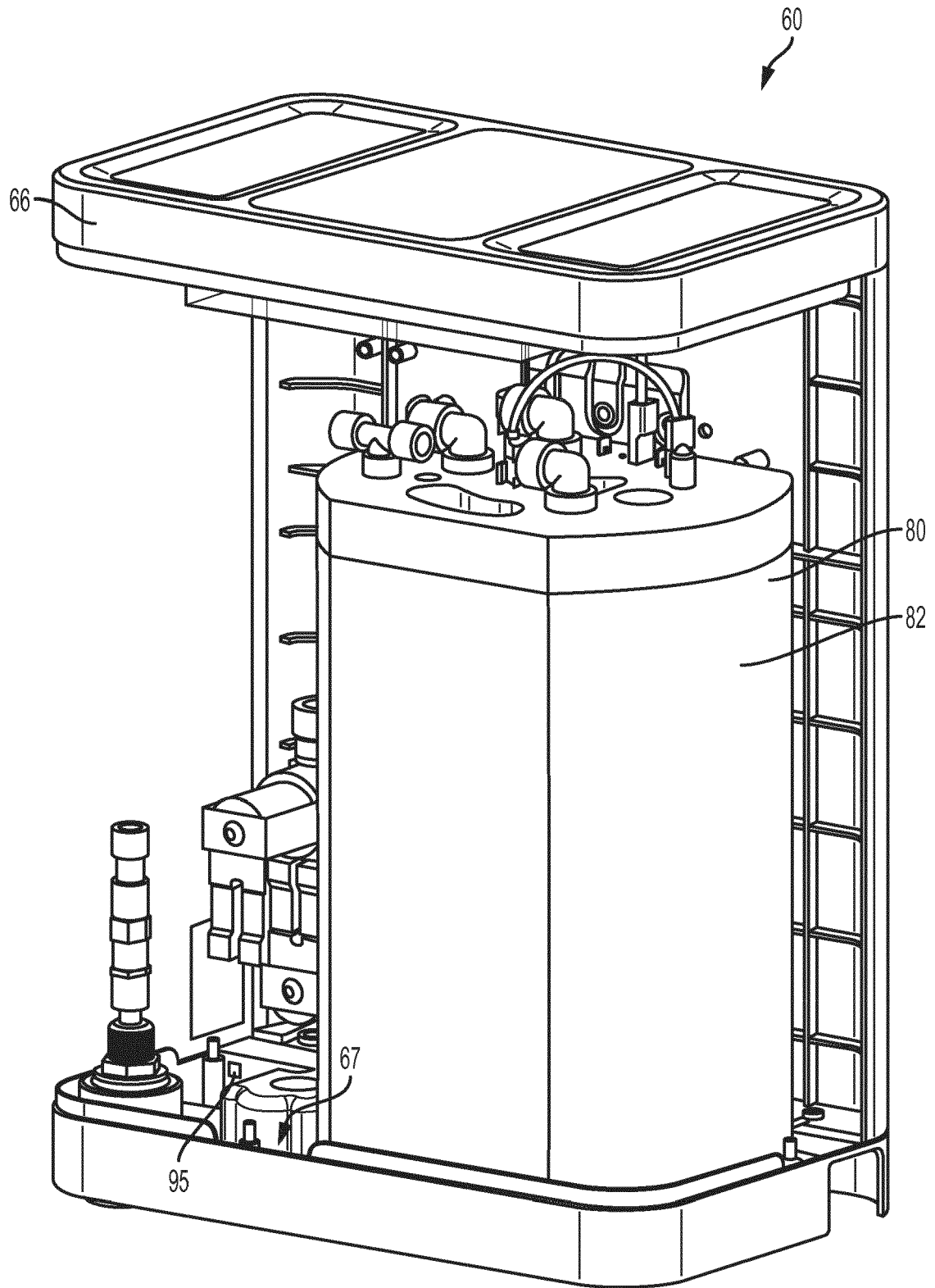


FIG. 4

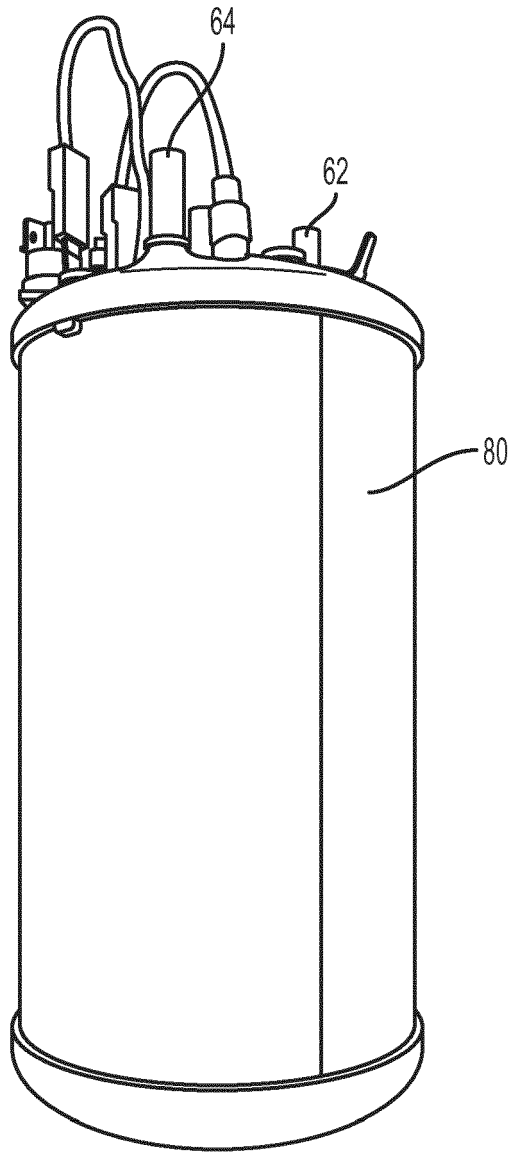


FIG. 5

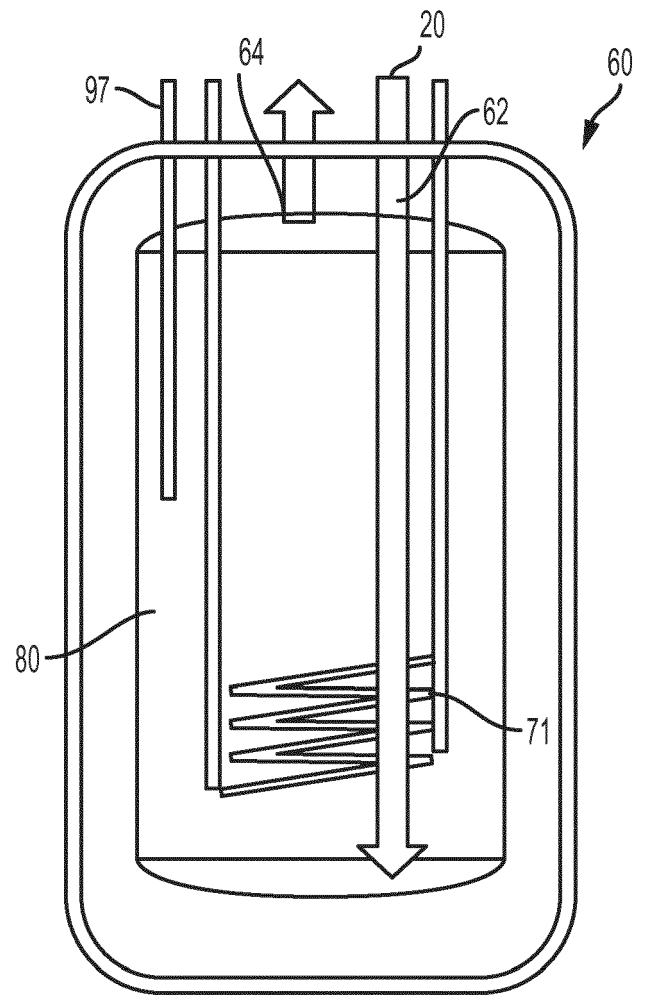


FIG. 6

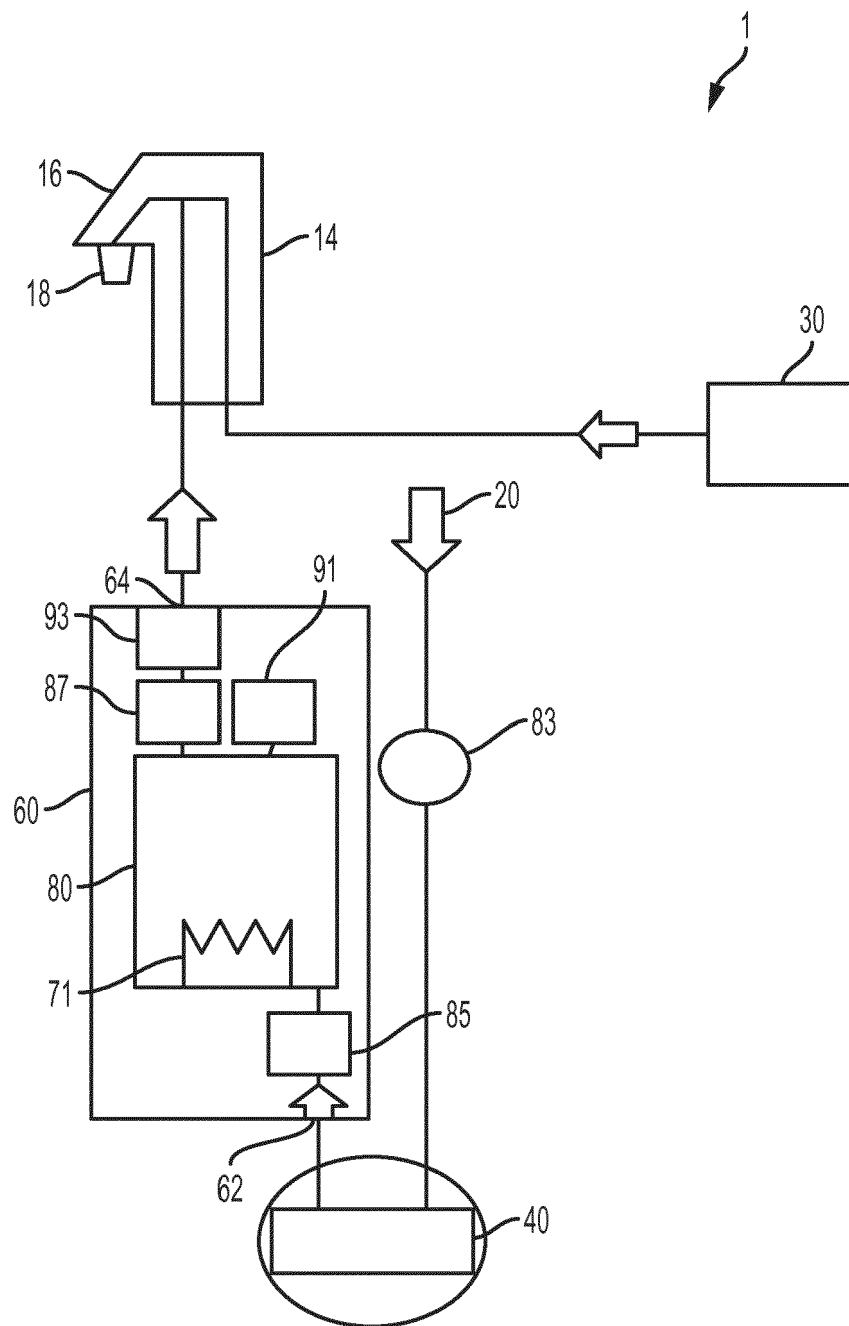


FIG. 7

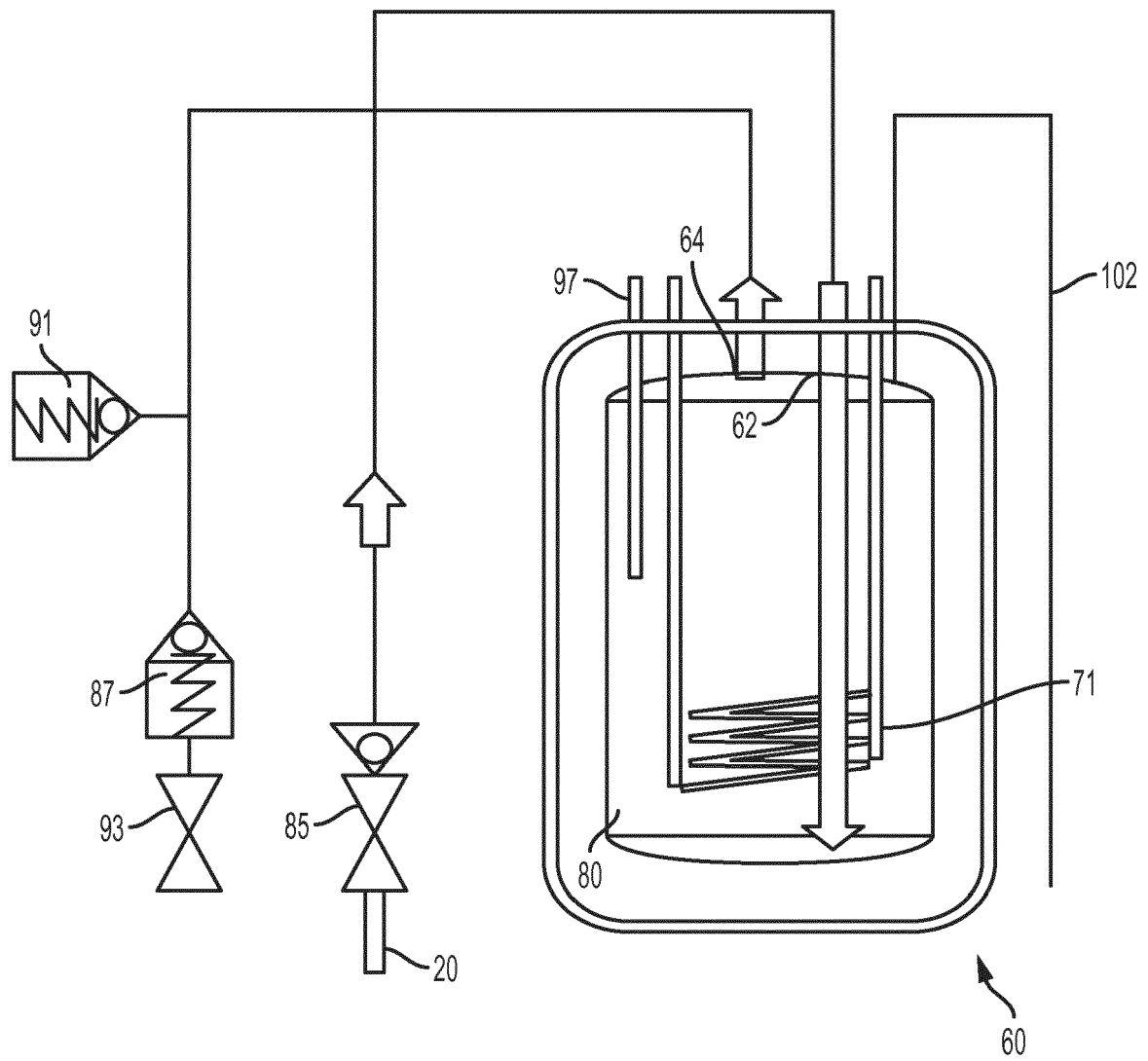


FIG. 8

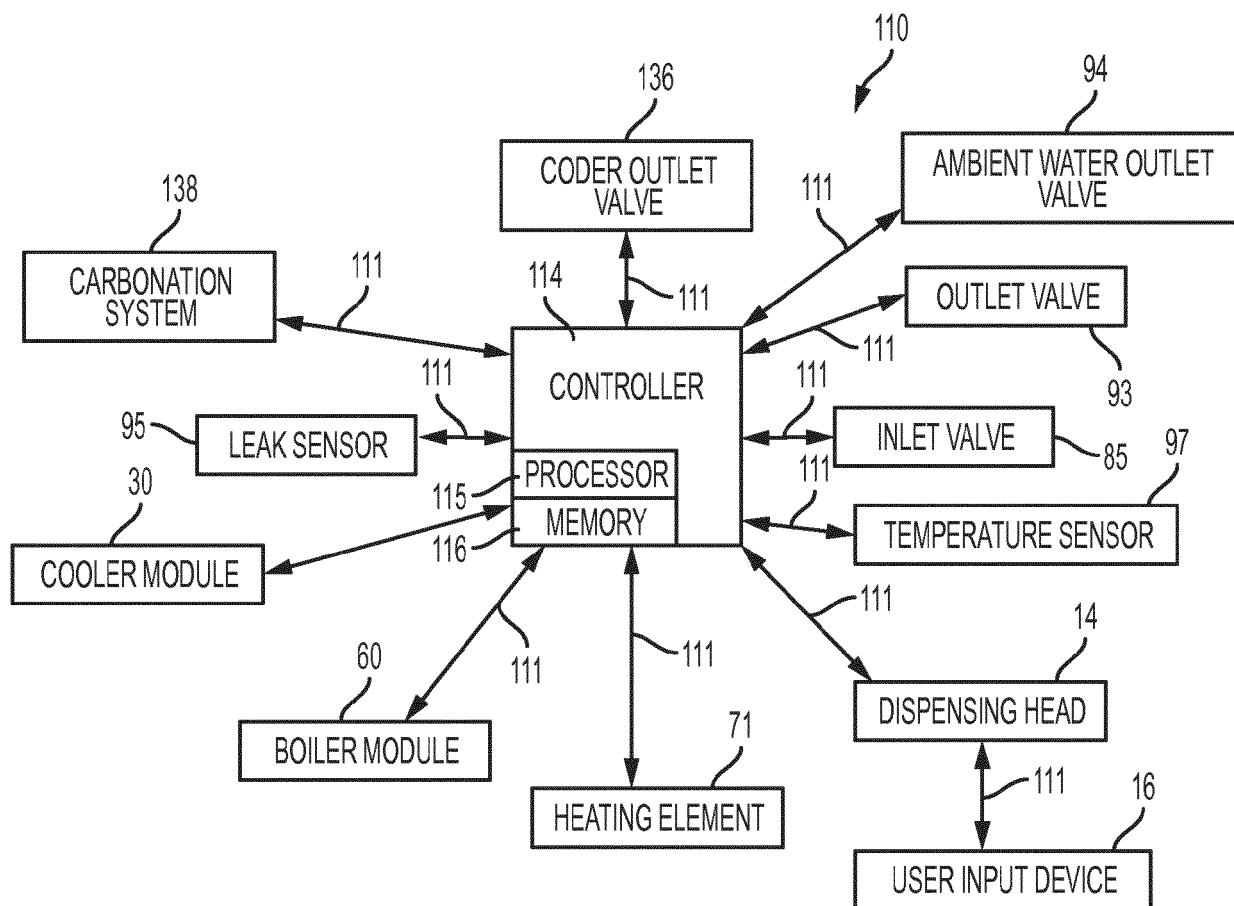


FIG. 9

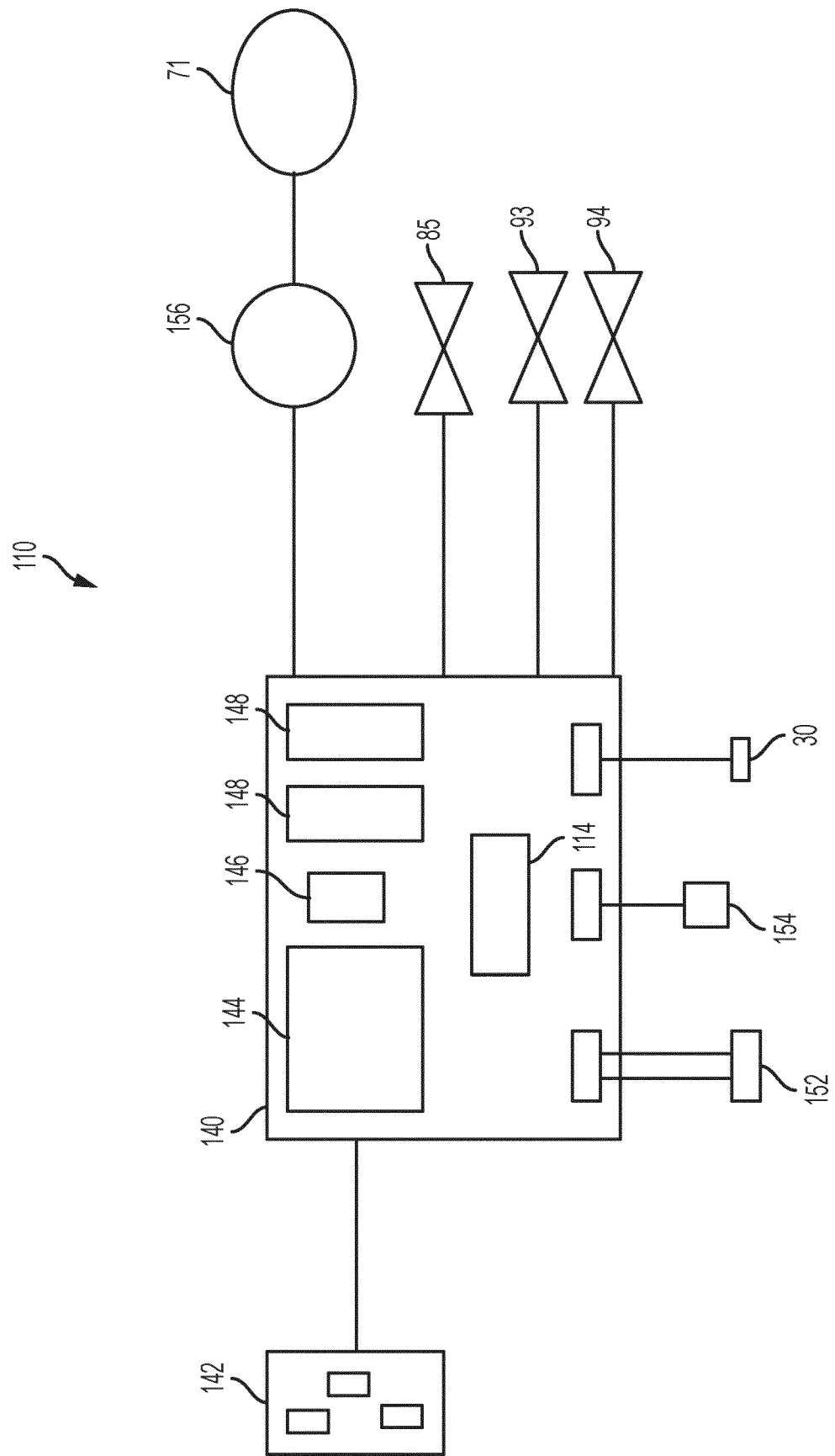


FIG. 10

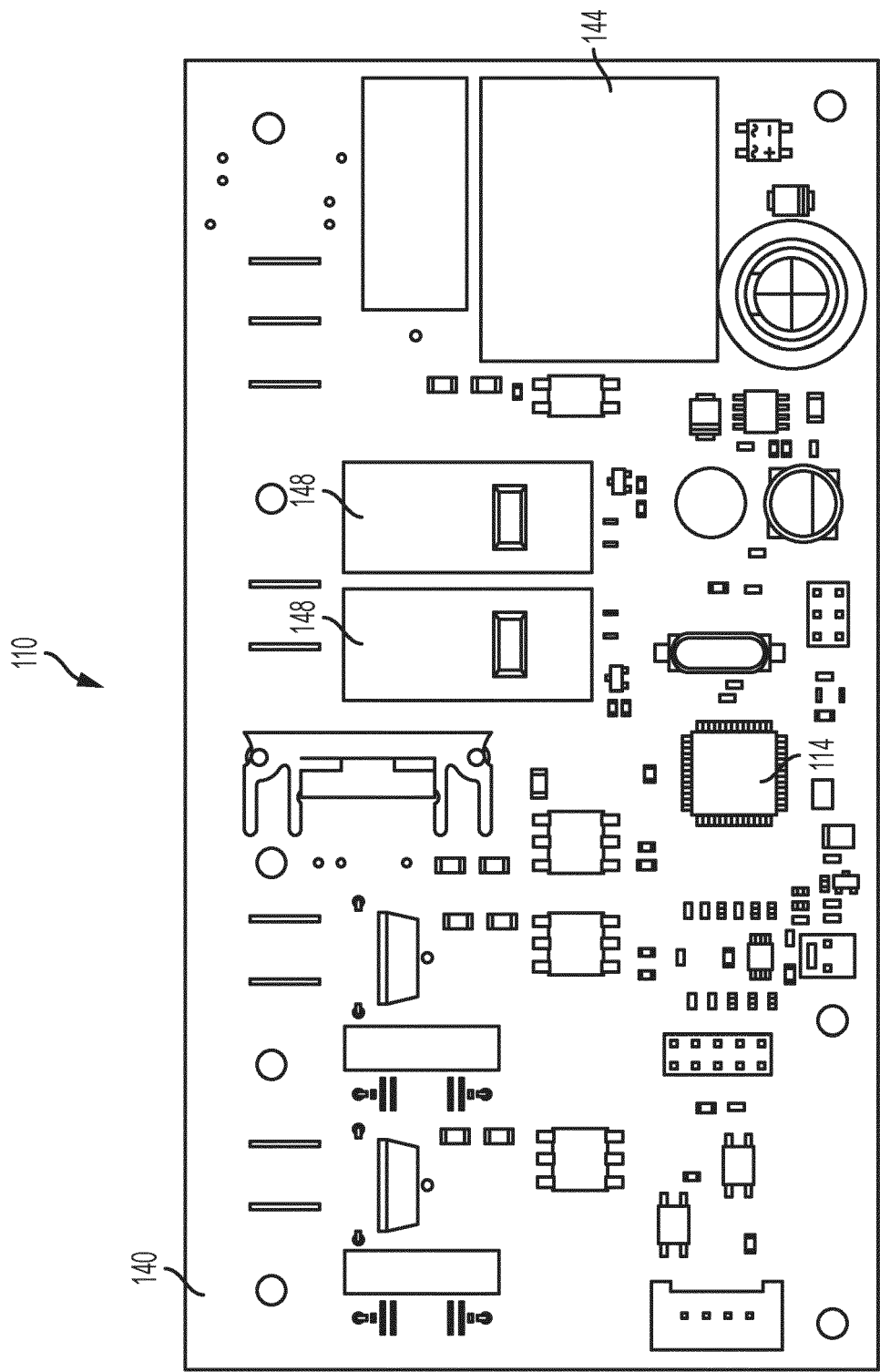


FIG. 11

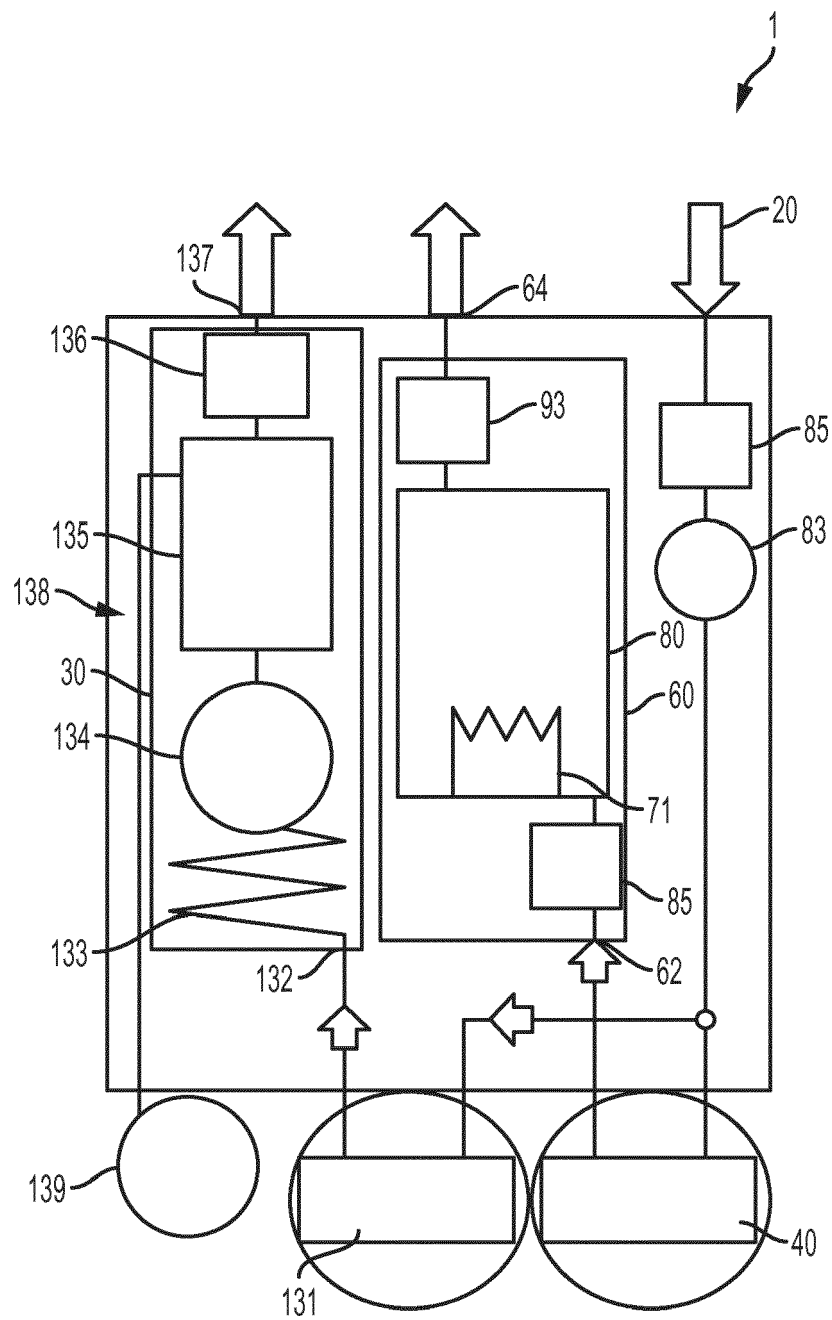


FIG. 12

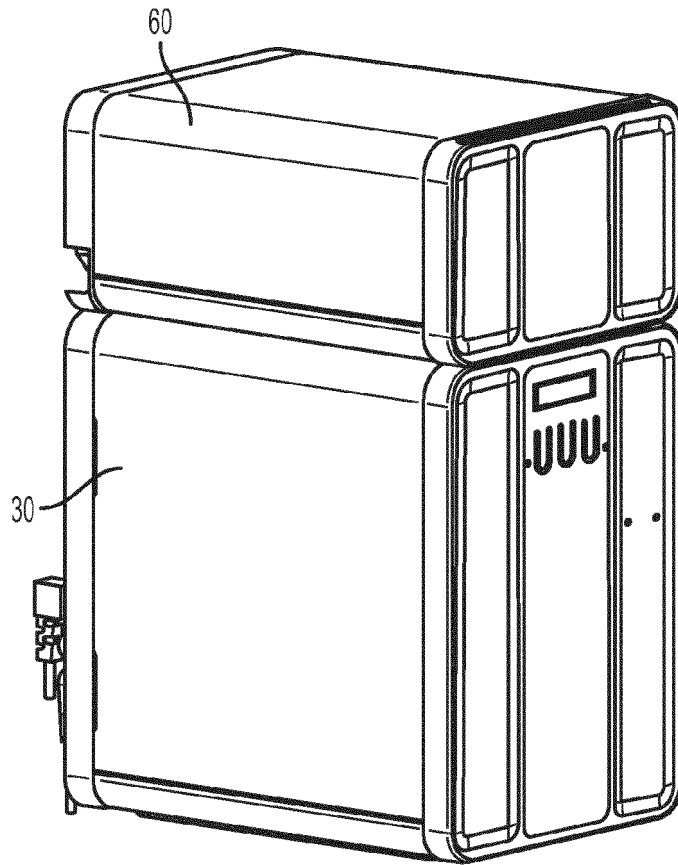


FIG. 13

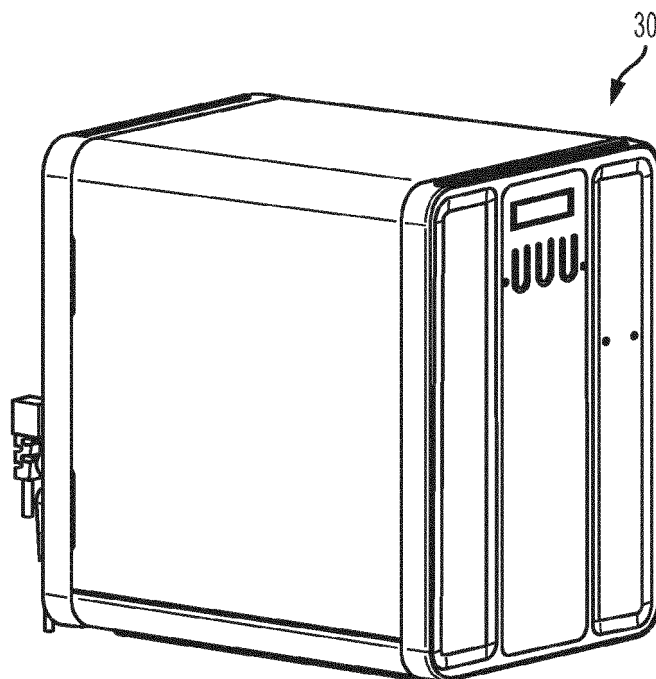


FIG. 14

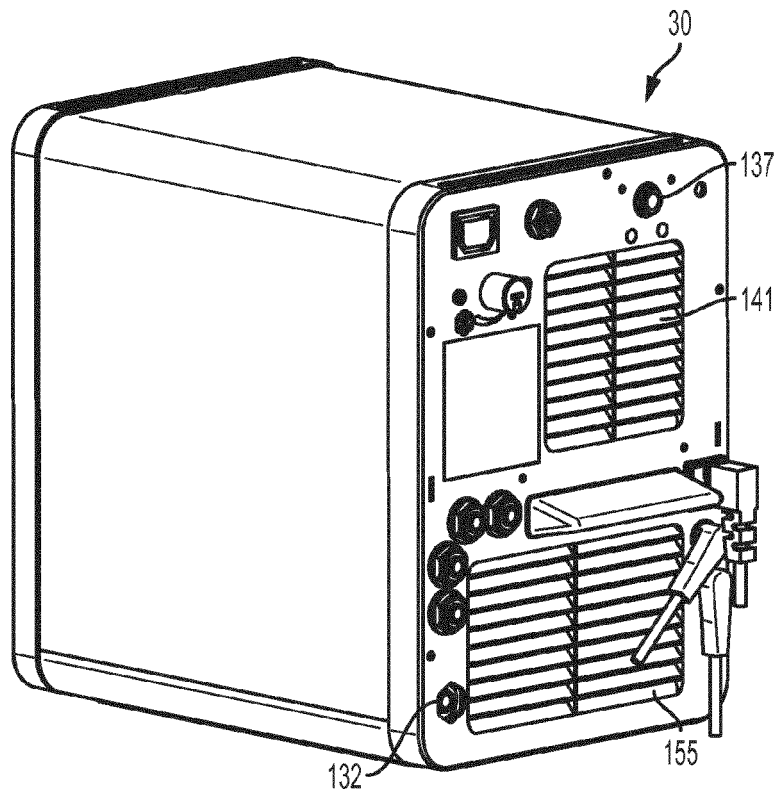


FIG. 15

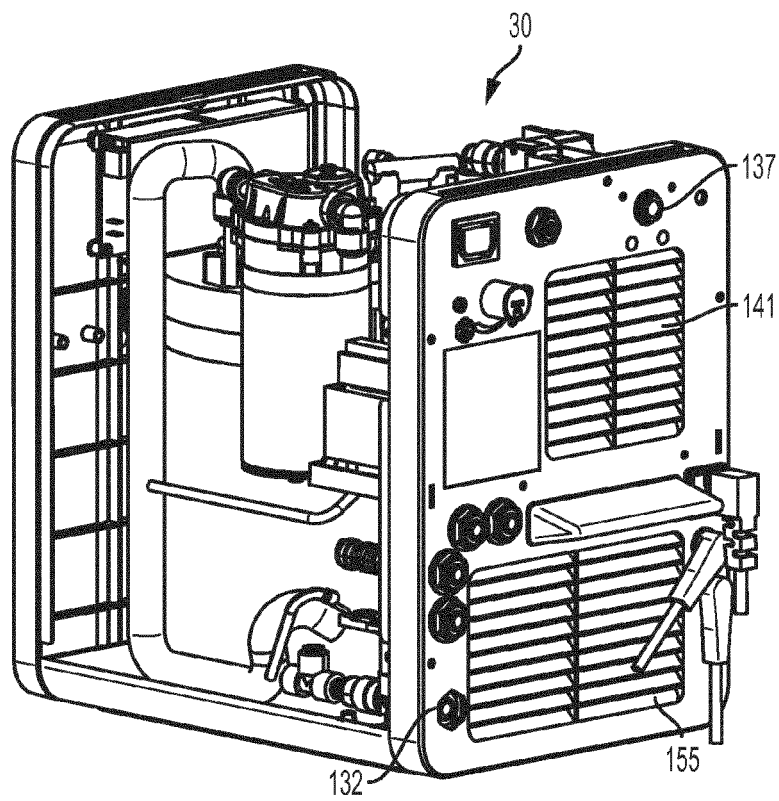


FIG. 16



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Munich		30 June 2017	Desittere, Michiel
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