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(71) Applicant and
(72) Inventor: **BORENSHTEIN, Ilan** [IL/IL]; 29 Jericho Street, 58549 Holon (IL).

(74) Agent: **REINHOLD COHN AND PARTNERS**; P.O. Box 13239, 61131 Tel Aviv (IL).

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(57) Abstract: A water heating system designed to provide hot water at a constant temperature, the system comprising a primary tank connected to a supply pipe and a dispensing pipe, a heating element configured for heating water within the primary tank, an inlet valve configured for controlling flow within the supply pipe, and an air valve configured for selectively bringing the interior of said primary tank into fluid communication with the exterior thereof.

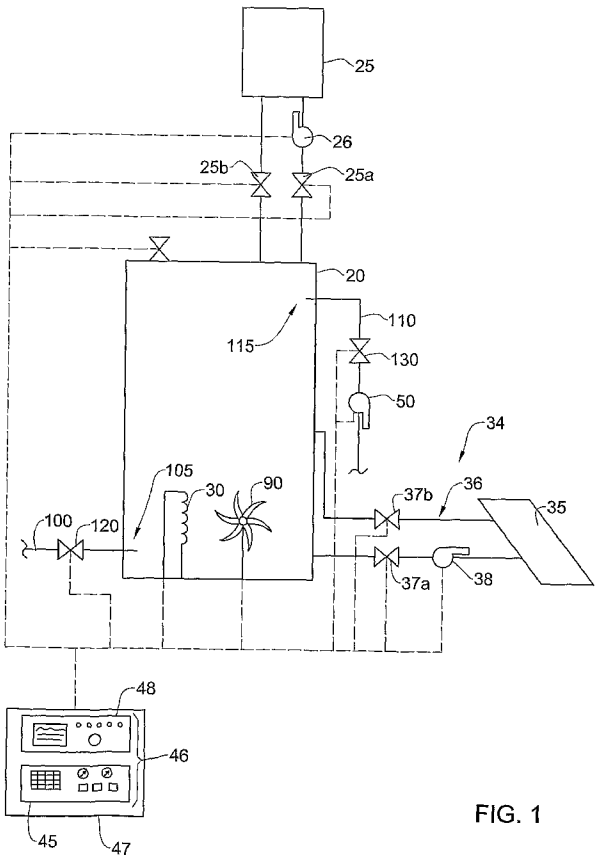

FIG. 1

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WATER HEATING SYSTEM

FIELD OF THE INVENTION

The present invention pertains to a water heating system, and specifically to a water heating system providing hot water of substantially constant temperature.

BACKGROUND OF THE INVENTION

An electric water heater (boiler) is a consumer appliance used for boiling water and possibly maintaining it at constant temperature. It is typically used to provide a source of hot water for household use where hot clean water is required. Electric water heaters are widely used to heat water for baths, washing clothes, cooking and so on.

European Patent EP 0 526 668 discloses a heater for liquid comprising a tank having an inlet for cold liquid and an outlet for hot liquid, an electrically operated valve means to control the flow of liquid into the tank through the inlet, and a heating means to heat the liquid in the tank. The control means is adapted to control (i) water temperature between upper and lower limits, and (ii) the water level between predetermined upper and lower values. The water temperature is controlled by activating/deactivating the heating means, and the water level is controlled by opening/closing the inlet cold water valve respectively.

SUMMARY OF THE INVENTION

According to one aspect of the present invention, there is provided a water heating system designed to provide hot water at a constant temperature, the system comprising:

- a primary tank connected to a supply pipe and a dispensing pipe;
- a heating element configured for heating water within the primary tank;
- an inlet valve configured for controlling flow within the supply pipe; and
- an air valve configured for selectively bringing the interior of the primary tank into fluid communication with the exterior thereof.

The system thus enables a user to dispense hot water from the primary tank without the introduction of unheated water thereto, thus maintaining a substantially constant temperature of dispensed water. In addition, it enables a user to heat a partially filled tank of water and dispense

it, thus saving the energy required to heat a full tank of water when the amount of heated water needed is less than the capacity of the primary tank.

The water heating system may further comprise a dispensing pump configured for supplying sufficient pressure for dispensing water from the primary tank. The pump may be self-activating, i.e., have a means configured to determine when it should be activated.

The water heating system may further comprise an outlet valve configured for controlling flow within the dispensing pipe.

The air valve may be configured to close spontaneously in response to a predetermined level of water within the primary tank.

The water heating system may further comprise a solar heating unit configured for heating water within the primary tank using incident solar radiation.

Solar inlet and outlet valves configured to regulate the flow of water between the primary tank and the solar heating unit may be provided, as well as a secondary pump configured for facilitating circulation of water between the primary tank and the solar heating unit.

The water heating system may further comprise a mixing device disposed within the primary tank and being configured for circulating the water therewithin.

The water heating system may further comprise an auxiliary tank configured to store water drawn from the primary tank. An auxiliary pump, configured to circulate water between water the primary tank and the auxiliary tank, may further be provided. In addition, an auxiliary inlet valve and/or an auxiliary outlet valve may be provided to regulate flow between the auxiliary tank and the primary tank.

The water heating system may further comprise one or more of the following:

- one or more temperature sensors configured to determine the temperature of the water within the primary tank;
- one or more level sensors configured to determine the level or water within the primary tank;
- one or more flow sensors to determine the presence of water flow within one or more areas within the water heating system; and
- one or more valve sensors to determine the state of at least one of the valves.

The water heating system may further comprise means for remote operation of one or more of the elements of the system (i.e., valves, pumps, heating elements, mixing device, etc.).

The water heating system may further comprise a controller configured to direct the operation of the elements of the system.

The controller may comprise a user interface comprising a user input device and a display device.

The user input device may be selected from the group comprising a keypad, one or more knobs, a touch-sensitive screen, and a voice-recognition interface. The display device may be selected from the group comprising LEDs, one or more LCDs, a speaker, a screen, and a touch-sensitive screen.

The controller may be configured to close the inlet valve and open the air valve, for example prior to dispensing of water. It may be further configured to close the air valve when the water level within the primary tank is at or above a predetermined level. It may be further configured to open the inlet valve when the water level in the primary tank is at or below a predetermined level. It may be further configured to activate the dispensing pump.

It will be appreciated that hereafter in the specification and claims, the terms "open" and "close", as well as all other appropriate terms relating to actions taken by the controller *et al.* are to be understood in their broadest meaning, including ensuring that the element is in the required state. For example, the controller can be understood to have "closed" a valve even if the valve was previously closed and no action needs to be taken in that regard, by checking the status of the valve and determining that it is closed.

The controller may be configured to close the inlet valve, open the air valve, and bring the level of water in the primary tank to a predetermined level prior to heating. This may be accomplished, for example, by transferring the excess water to the auxiliary tank. The controller may also be configured to open the inlet and air valves, and bring the level of water in said primary tank to a predetermined level (i.e., by filling) prior to heating. It may also be configured to close the inlet valve and open the air valve when flow is detected within the dispensing pipe. It may be further configured to open the inlet valve when the level of water within the primary tank reaches a predetermined level after commencement of dispensing, and/or after a predetermined amount of time has elapsed since the last dispensing.

The controller may be further configured to permit a user to control one or more elements of the system thereby.

According to another aspect of the present invention, there is provided a method for providing heated water, comprising:

- providing a water heating system as described above;
- heating water within the primary tank ;
- closing inlet valve and opening air valve; and
- dispensing water via the dispensing pipe.

The method may further comprise reducing the level of water within the primary tank prior to heating.

The method may further comprise heating water within the primary tank during dispensing.

The method may further comprise opening the inlet valve when the level of water within the primary tank reaches a predetermined level after commencement of dispensing.

The method may further comprise opening the inlet valve after a predetermined amount of time has elapsed since the last dispensing.

The method may further comprise closing the air valve when the water level within the primary tank is at or above a predetermined level.

The method may further comprise closing the inlet valve and opening the air valve upon commencement of flow within the dispensing pipe.

According to a further aspect of the present invention, there is provided a system for use within a tank of a water heating system for adjusting the height of an inlet to a dispensing pipe, the system comprising a float configured to remain at a fixed position relative to the top surface of water within the tank, an end portion of the dispensing pipe being connected to the float such that it remains below the top surface.

The system may further comprise a vertical guide rod disposed within the tank, and a traveling element configured to move along the rod in tandem with the float. The float may constitute the traveling element.

The traveling element may be formed as a ring.

The end portion of the dispensing pipe may be made of a flexible material.

The system may further comprise a stopper configured to prevent the traveling element from descending below a predetermined level.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to understand the invention and to see how it may be carried out in practice, embodiments will now be described, by way of non-limiting examples only, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic illustration of a liquid heating system according to the present invention;

Fig. 2 illustrates a height-adjusting system for use with the liquid heating system illustrated in Fig. 1; and

Fig. 3 illustrates the temperature of water within a tank of the liquid heating system illustrated in Fig. 1 during use compared to that in a conventional water heating system.

DETAILED DESCRIPTION OF THE INVENTION

As illustrated in Fig. 1, a water heating system **10** comprises a primary tank **20** for accommodating therein water such as water, either heated or for being heated, a heating element **30** disposed within the primary tank for heating the water, an air valve **40**, a cold water supply pipe **100** for carrying fresh water to the primary tank, and a hot water dispensing pipe **110** for carrying heated water therefrom, and an optional dispensing pump **50**. If the primary tank **20** is located at a sufficient height, the dispensing pump **50** may not be necessary.

In addition, the water heating system may comprise an auxiliary tank **25** connected to the primary tank **20**, whose purpose will be described below. Auxiliary inlet and outlet valves **25a**, **25b** are provided to control flow to and from the primary tank **20**, respectively, and an auxiliary pump **26** is provided to circulate the water between the primary tank and the auxiliary tank **25**.

It will be appreciated that while the examples presented herein refer to water, the disclosed water heating system and its constituent parts may be configured for use with any desired liquid.

The heating element **30** may be of any desired type, for example an electric resistance coil, a gas-powered heating element, etc.

An inlet valve **120** is provided to control flow through the supply pipe **100** to the primary tank **20**, and a dispensing device, such as outlet valve **130**, is provided to control flow of water through the dispensing pipe **110** from the primary tank. The outlet **105** of the supply pipe **100** may be disposed at or near the bottom of the primary tank **20**, and the inlet **115** to the dispensing pipe **110** may be disposed at or near the top of the water level within the primary tank **20**. This allows new (cold) water to be introduced into the primary tank **20** near the bottom where cold water tends to accumulate, and heated water to be dispensed from near the top of the primary tank where hot water tends to accumulate. Alternatively, the outlet **105** and/or inlet **115** may be fixed in any desired location.

The water heating system may further comprise a mixing device **90** disposed within the primary tank **20** and being adapted to circulate the water within the primary tank. In this way, the water within the primary tank is maintained at a substantially uniform temperature.

As will be described below, the water heating system **10** allows for a varying level of water within the primary tank **20**. Thus, there is no fixed location therewithin for fixing the inlet **115** of the dispensing pipe **110**. Thus, a height-adjusting mechanism **180**, for example as

illustrated in Fig. 2, may be provided to ensure that the inlet **115** moves with the height of the water within the primary tank **20**.

The height-adjusting mechanism **180** comprises a vertical guide rod **182**, a traveling ring **184** positioned therearound such that is may travel freely along the length of the guide rod without becoming free therefrom, and a float **186**, for example made of a non-dense material, designed to remain at or near the top of the surface of the water when attached to the ring. The height-adjusting mechanism may further comprise a stopper **185** disposed at or near the bottom of the primary tank **20**, configured to prevent the ring **184** from descending below a predetermined level. The purpose of this stopper will be explain below. The ring **184** may be designed such that build-up of scale thereupon and on the guide rod **182** will not negatively impact its performance over the life of the water heating system **10**. An entrance portion **188**, which contains the inlet **115**, of the dispensing pipe **110** within the primary tank **20** is made from a flexible material and is attached to the ring **184** such that the inlet **115** is always submerged in the water and in such a way so as to travel with the ring without encumbering its movement along the rod.

In use, as the water level in the primary tank **20** changes, the float **186** maintains the ring **184** at or near the top of the water. The flexible entrance portion **188** moves with the ring, which ensures that the inlet **115** is always submerged near the top of the water level within the primary tank **20**, which allows heated water to be dispensed from near the top thereof. The stopper **185** prevents the ring **184** from descending to such a level that the inlet **115** will be taking in water from the very bottom of the primary tank **20**, where debris tends to accumulate.

It will be appreciated that which the ring **184** and the float **186** are illustrated in Fig. 2 as constituting two separate elements, they may be embodied by a single element, for example as a ring which is designed to remain at or near the top of the surface of the water.

In addition, it will be further appreciated that the height-adjusting mechanism **180** as described with reference to Fig. 2 is a non-limiting example, and any suitable arrangement to maintain the proper position of the inlet **115** of the dispensing pipe **110** within the primary tank **20** may be provided without departing from the scope of the present invention, *mutatis mutandis*.

The air valve **40**, or a tank-side inlet thereof, is disposed at the top of the primary tank **20** and adapted to selectively allow the interior of the primary tank to be in fluid communication with the surrounding atmosphere during a filling thereof or dispensing therefrom. It may be designed to be activated externally, e.g., by a controller or by a user, and/or designed so as to close spontaneously (i.e., automatically) when the water level approaches it. In this way, when the primary tank **20** is being filled, the user does not have to make certain that the air valve **40** is

closed when the primary tank is filled. It will be appreciated that the air valve **40** may be embodied by two separate valves, a first configured to selectively allow fluids to enter the primary tank **20**, and a second configured to selectively allow fluids to exit the primary tank.

Optionally, the water heating system **10** may comprise or be associated with a solar heating unit **34** configured for exploiting incident solar radiation to heat water within the primary tank **20**. The solar heating unit **34** comprises a solar collector **35** and a fluid path **36** for carrying water between the primary tank **20** and the solar heating unit **34**. Solar inlet and outlet valves **37a**, **37b** are provided to regulate flow of water between the primary tank **20** and the solar heating unit **34**. Circulation of water within the fluid path **36** may be performed passively or by means of an optional pump **38**.

In addition, a controller **45** may be provided to direct the operation of the water heating system. The controller is configured for selectively directing operation of at least some of the inlet valve **120**, outlet valve **130**, air valve **40**, solar inlet and outlet valves **37a**, **37b**, heating element **30**, pumps **26**, **38**, **50**, etc. (It will be appreciated that the broken line in Fig. 1 leading from the controller to various elements of the water heating system **10** is for illustrative purposes only, and does not indicate nor imply physical locations of connections therebetween, nor any connective relationship between elements of the system to one another. In addition, it will be appreciated that the illustrated set of connections is not limiting, and some of the elements illustrated as being controlled by the controller may not be, and others which are not illustrated as being controlled by the controller may be, without deviating from the spirit and the scope of the patent.)

The controller **45** may comprise a user interface **46**, which may include at least a user input device **47** such as a keypad, knobs, or a voice-recognition interface, and a display device **48**, such as a screen or a combination of different display elements, such as LEDs, LCDs, a speaker, etc. The input device **47** and display device **48** may be integrated with one another, for example by providing a touch-sensitive screen which both accepts user input and displays information. In addition, the user interface **46** may be partially or fully accessible remotely, for example via a TCP/IP connection, including over the internet.

A plurality of sensors is further provided in order to facilitate operation of the water heating system **10**. These sensors may be configured to provide input to the controller **45**. For example, one or more temperature sensors (such as thermocouples), level sensors, pressure sensors, flow sensors to determine whether water is flowing with the various pipes, sensors indicating the open/closed states of each of the valves, etc., may be provided as needed for the operation of the system **10**.

The water heating system may be used in any one of several modes of operation. In each mode of operation, the controller **45** may direct one or more elements of the system **10** to operate as necessary, optionally based on input received from one or more of the sensors. It will be appreciated that the mode may be determined by the user, and communicated to the system **10** by the input device **47**, and may be indicated on the display device **48**.

In a first mode of operation, the water is heated to a predetermined temperature, either by the heating element **30**, the solar heating unit **34**, or both. The inlet valve **120** is closed, and the outlet valve **130** and solar inlet and outlet valves **37a**, **37b** remain open (the solar inlet and outlet valves may remain open as long as the water level remains above them, in order to prevent ingress of air into the solar heating unit **34**). The inlet valve **120** may close in response to a user-generated signal. Alternatively, a flow sensor in the dispensing pipe may detect the flow of water therewithin (indicating use of heated water from the system **10**), and the controller may direct that the inlet valve **120** be closed in response. It will be appreciated that any other appropriate system may be in place to determine when the inlet valve **120** is to be closed without departing from the spirit and the scope of the present invention. In addition, if the user beings dispensing water before the predetermined temperature is reaches, the heating element remains active until the temperature is reached. The air valve **40** is opened, i.e., bringing the interior of the primary tank **20** into fluid communication with the surrounding atmosphere. This may be accomplished by a direction from the controller **45**, or by providing an air valve **40** which opens spontaneously when the water level drops. In this way, when hot water is drawn from the primary tank **20**, for example when a hot water tap is opened downstream of the water heating system **10**, no new water flows into the primary tank to replace that which was dispensed, preventing the heated water from being cooled during dispensing thereof. In addition, in order to provide sufficient pressure to dispense heated water, the dispensing pump **50** is activated in order to compensate for the pressure which is no longer being supplied by the supply pipe **100**, thus allowing dispensing of heated water from the primary tank **20**. The inlet valve **120** may be opened when the flow though the dispensing pipe has stopped, a predetermined amount of time thereafter, after the level of water in the primary tank drops to a predetermined level, by a user-generated signal, etc.

In a second mode of operation, the system operates in an economy mode, only heating the amount of water desired by the user. The user sets the amount of water to be heated up, for example based on an expected need. In the event that the primary tank **20** contains more water than the desired amount, the auxiliary pump **26** and auxiliary inlet and outlet valves **25a**, **25b** are activated to draw water from the primary tank to the auxiliary tank **25** so that it is not heated

unnecessarily. The air valve **40** is opened, establishing fluid communication between the interior of the primary tank **20** and the surrounding atmosphere, thus allowing ingress of air to displace the water as it is being drawn to the auxiliary tank **25**. At the same time, the inlet valve **120** is closed to prevent ingress of new water. Thus, only the desired amount of water remains in the primary tank **20**. The heating element **30** heats only the required amount of water from the supply pipe **100**, and the outlet valve **130** may be closed to prevent backflow of water from the dispensing pipe **110**. Upon dispensing, the inlet valve **120** remains closed, so that the heated water in the primary tank **20** is not cooled by incoming unheated water during dispensing, resulting in hot water of a substantially uniform temperature over the course of dispensing. Once the dispensing operation is completed, unheated water is returned to the primary tank **20**, for example from the auxiliary tank **25**, via the supply pipe **100** by opening the inlet valve **120**, or both, either in sequence or in parallel. Once the water level within the primary tank **20** reaches a predetermined level, typically corresponding to the full level thereof, the air valve **40** may be closed.

During the second mode of operation, the water level may fall below either one of the solar inlet and outlet valves **37a**, **37b**. In such a case, the valves are closed, in order to prevent ingress of air into the solar heating unit **34**, which may adversely affect it. The system may be designed such that these valves are be closed by the user, or the controller **45** may determine whether the valves should be opened or closed, for example using a level sensor, and control the opening and closing of the valves accordingly. If, during the second mode of operation, the water level remains above the solar inlet and outlet valves **37a**, **37b**, then the solar heating unit may be used to heat the water in the primary tank **20**, either by itself or as supplemental heating. Alternatively, the system may be designed to prevent the user from lowering the level of water within the primary tank **20** to be below the level of the solar inlet and outlet valves **37a**, **37b**.

During either one of the above modes of operation, the heating element is active until the temperature of the water within the primary tank **20** reaches a predetermined temperature T_2, at which point the heating element is deactivated. When the temperature of the water in the primary tank **20** falls to a second temperature T_1, which may be, for example, a predetermined number of degrees below T_2, the heating element is reactivated until the temperature of the water within the primary tank reaches T_2. In this way, once the temperature of the water within the primary tank **20** reaches the predetermined temperature, it remains in the range between T_1 and T_2.

In addition to the above modes, the controller may allow a user to manually control each element of the system, either directly or via the user interface **46**. Limits for certain functions may be imposed by the controller **45** in order to prevent catastrophic or otherwise undesirable

consequences resulting from improper use of the system **10**. The physical elements of the system **10** may also be designed to protect against some or all of these consequences.

Moreover, the controller **45** may be configured to control the system **10** to operate as a conventional water heating system, i.e., it will ensure that the inlet valve **120** remains open and that the air valve **40** remains closed during dispensing of hot water.

Furthermore, the water heating system **10** may be designed to operate without a controller. In such a case, the valves may be provided with means which enable a user to control them from a convenient location remote from the primary tank **20**. According to one example, there may be provided a switch which ensures that the inlet valve **120** is closed and that the air valve **40** is open, which the user may activate prior to dispensing heated water, in order to maintain a constant temperature thereof. When the user is finished dispensing heated water, he may open the inlet valve **120**, thus filling the primary tank with water. In this case, the air valve **40** should be provided so as to close by itself when the primary tank **20** is full or nearly full.

Reference is now made to Fig. 3, presenting a comparison of the temperature of the water in the water heating system **10**, compared with the temperature of water in a conventional water heating system of one type. Curves **505** and **510** depict, respectively, the temperatures of water within the water heating system **10** and a conventional water heating system. As seen, the temperatures of the water within the two systems are about the same during the time region **520** which corresponds to the heating of the water within the primary tank **20**, while no water is being dispensed. Dispensed hot water is of substantially constant temperature during dispensing of the water, which is indicated in time region **530**. On the contrary, the temperature of the water within the conventional water heating system falls during this period due to refilling the primary tank **20** by cold water. It will be appreciated that if the primary tank **20** is not full, curve **505** will increase at a higher rate within time region **520**.

Those skilled in the art to which this invention pertains will readily appreciate that numerous changes, variations and modifications can be made without departing from the scope of the invention *mutatis mutandis*.

CLAIMS:

1. A water heating system designed to provide hot water at a constant temperature, the system comprising:

- a primary tank connected to a supply pipe and a dispensing pipe;
- a heating element configured for heating water within the primary tank;
- an inlet valve configured for controlling flow within the supply pipe; and
- an air valve configured for selectively bringing the interior of said primary tank into fluid communication with the exterior thereof.

2. The water heating system according to Claim 1, further comprising a dispensing pump configured for supplying sufficient pressure for dispensing water from the primary tank.

3. The water heating system according to Claim 2, wherein said pump is self-activating.

4. The water heating system according to any one of the preceding claims, further comprising an outlet valve configured for controlling flow within the dispensing pipe.

5. The water heating system according to any one of the preceding claims, wherein said air valve is configured to close spontaneously in response to a predetermined level of water within the primary tank.

6. The water heating system according to any one of the preceding claims, further comprising a solar heating unit configured for heating water within the primary tank using incident solar radiation.

7. The water heating system according to Claim 6, further comprising solar inlet and outlet valves configured to regulate the flow of water between the primary tank and the solar heating unit.

8. The water heating system according to any one of Claims 6 and 7, further comprising a secondary pump configured for facilitating circulation of water between the primary tank and the solar heating unit.

9. The water heating system according to any one of the preceding claims, further comprising a mixing device disposed within the primary tank and being configured for circulating the water therewithin.

10. The water heating system according to any one of the preceding claims, further comprising an auxiliary tank configured to store water drawn from the primary tank.

11. The water heating system according to Claim 10, further comprising an auxiliary pump configured to circulate water between water said primary tank and said auxiliary tank.

12. The water heating system according to any one of Claims 10 and 11, further comprising at least one of an auxiliary inlet valve and an auxiliary outlet valve configured for regulating flow between said auxiliary tank and said primary tank.

13. The water heating system according to any one of the preceding claims, further comprising one or more temperature sensors configured to determine the temperature of the water within the primary tank.

14. The water heating system according to any one of the preceding claims, further comprising one or more level sensors configured to determine the level or water within the primary tank.

15. The water heating system according to any one of the preceding claims, further comprising one or more flow sensors to determine the presence of water flow within one or more areas within the water heating system.

16. The water heating system according to any one of the preceding claims, further comprising one or more valve sensors to determine the state of at least one of the valves.

17. The water heating system according to any one of the preceding claims, comprising means for remote operation of one or more elements of the system.

18. The water heating system according to any one of the preceding claims, further comprising a controller configured to direct the operation of at least some of the elements of the system.

19. The water heating system according to Claim 18, wherein said controller comprises a user interface comprises a user input device and a display device.

20. The water heating system according to Claim 19, wherein said user input device is selected from the group comprising a keypad, one or more knobs, a touch-sensitive screen, and a voice-recognition interface.

21. The water heating system according to any one of Claims 19 and 20, wherein said display device is selected from the group comprising LEDs, one or more LCDs, a speaker, a screen, and a touch-sensitive screen.

22. The water heating system according to any one of Claims 18 through 21, wherein said controller is configured to close said inlet valve and open said air valve.

23. The water heating system according to Claim 22, wherein said controller is configured to close said air valve when the water level within the primary tank is at or above a predetermined level.

24. The water heating system according to any one of Claims 22 and 23, wherein said controller is configured to open said inlet valve when the water level in the primary tank is at or below a predetermined level.

25. The water heating system according to any one of Claims 22 through 24, wherein said controller is configured to activate said dispensing pump.

26. The water heating system according to any one of Claims 18 through 25, wherein said controller is configured to close said inlet valve, open said air valve, and bring the level of water in said primary tank to a predetermined level prior to heating.

27. The water heating system according to any one of Claims 18 through 26, wherein said controller is configured to open said inlet valve and said air valve, and bring the level of water in said primary tank to a predetermined level prior to heating.

28. The water heating system according to any one of Claims 18 through 27, wherein said controller is configured to close said inlet valve and open said air valve when flow is detected within the dispensing pipe.

29. The water heating system according to any one of Claims 18 through 28, wherein said controller is configured to open said inlet valve when the level of water within the primary tank reaches a predetermined level after commencement of dispensing.

30. The water heating system according to any one of Claims 18 through 29, wherein said controller is configured to open said inlet valve after a predetermined amount of time has elapsed since the last dispensing.

31. The water heating system according to any one of Claims 18 through 30, wherein said controller is configured to permit a user to control one or more elements of the system thereby.

32. A method for providing heated water, comprising:

- providing a water heating system according to any one of the preceding claims;
- heating water within said primary tank ;
- closing inlet valve and opening air valve; and
- dispensing water via said dispensing pipe.

33. A method according to Claim 32, further comprising reducing the level of water within the primary tank prior to heating.

34. A method according to any one of Claims 32 and 33, further comprising heating water within said primary tank during dispensing.

35. A method according to any one of Claims 32 through 34, further comprising opening said inlet valve when the level of water within the primary tank reaches a predetermined level after commencement of dispensing.

36. A method according to any one of Claims 32 through 35, further comprising opening said inlet valve after a predetermined amount of time has elapsed since the last dispensing.

37. A method according to any one of Claims 32 through 36, further comprising closing said air valve when the water level within the primary tank is at or above a predetermined level.

38. A method according to any one of Claims 32 through 37, wherein said inlet valve is closed and air valve is opened upon commencement of flow within said dispensing pipe.

39. A system for use within a tank of a water heating system for adjusting the height of an inlet to a dispensing pipe, said system comprising a float configured to remain at a fixed position relative to the top surface of water within the tank, an end portion of said dispensing pipe being connected to said float such that it remains below said top surface.

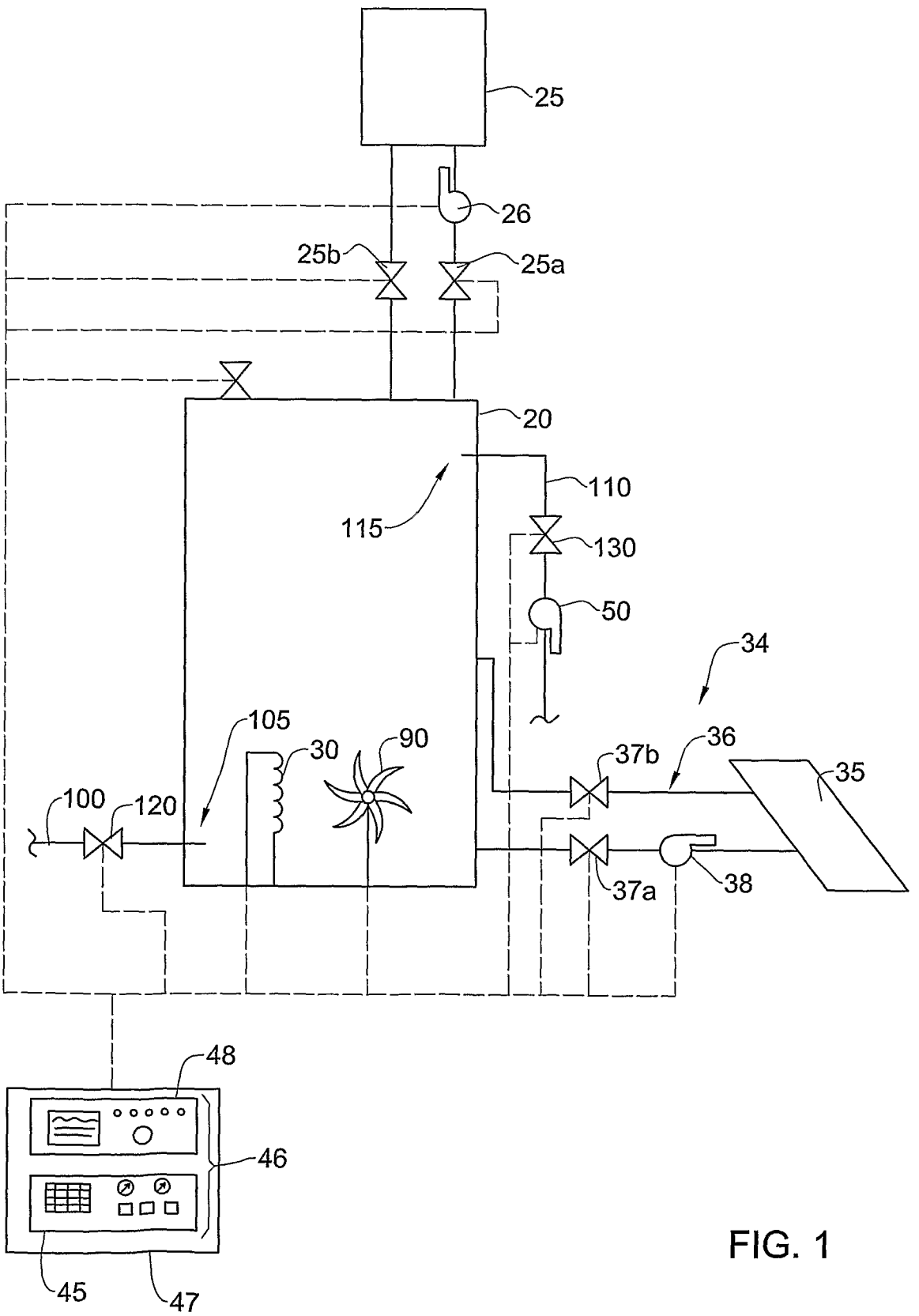
40. A system according to Claim 39, further comprising a vertical guide rod disposed within the tank, and a traveling element configured to move along said rod in tandem with said float.

41. A system according to Claim 40, wherein said float constitutes said traveling element.

42. A system according to any one of Claims 40 and 41, wherein said traveling element is a ring.

43. A system according to any one of Claims 39 through 42, said end portion being made of a flexible material.

44. A system according to any one of Claims 40 through 43, further comprising a stopper configured to prevent said traveling element from descending below a predetermined level.


25
26
25b
25a
20
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47

FIG. 1

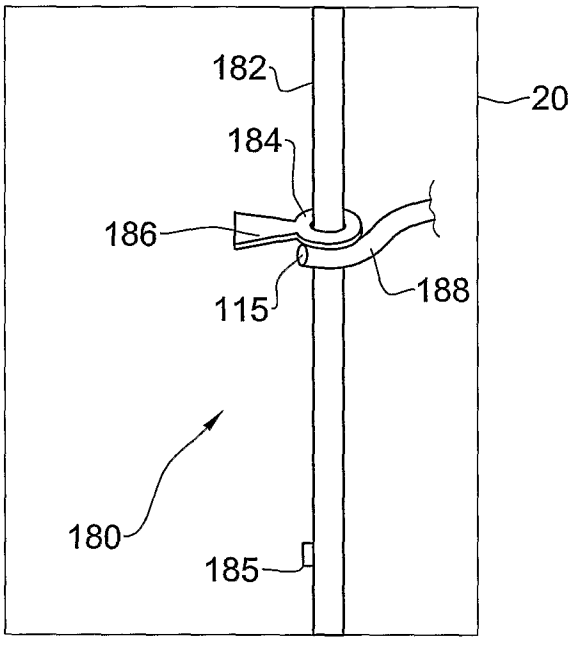

FIG. 2

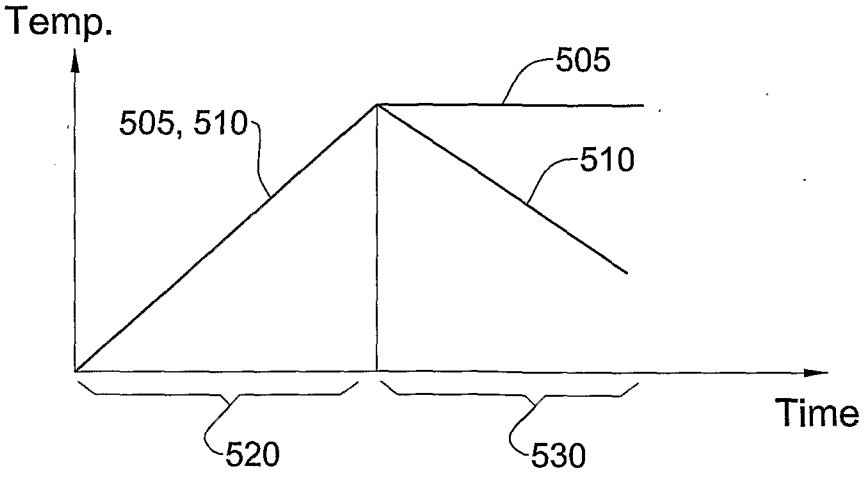

FIG. 3