

A Boiling Water Heater System and Method of Heating Water in Same

TECHNICAL FIELD

[0001] The present invention relates to a boiling water heater system and to a method of heating water in same. The invention has been primarily developed in relation to a boiling water heater and will be described hereinafter with reference to this application. However, it will be appreciated that the invention is not limited to this particular field of use and is also, for example, suitable for use in combined water heater and water chiller units.

[0002] Boiling water heaters are sometimes known as instant boiling water dispensers and, despite the name, deliver water heated to at or just less than boiling temperature.

BACKGROUND OF THE INVENTION

[0003] A known 'instant boiling water' dispenser holds a pre-determined volume of water in a storage tank at a temperature close to boiling point. The hot water can be dispensed instantly from the tank at any time. The greater the capacity of the storage tank, the greater the volume of hot water that can be dispensed in a very short period, for example during office tea breaks when there is a sudden high demand for hot water.

[0004] The performance of such a hot water dispensing system is evaluated partly on its recovery rate, that is the length of time it takes the system to replenish the depleted hot water, and partly on its energy efficiency. The recovery rate is dependent upon the tank size and on the available power to the heating element immersed within the tank. Therefore, a heating element with a high rated power is desirable in order to minimise the recovery time. The energy efficiency of the system can be dependent on heat losses from the surface area of the tank and on the quality of any tank insulation. As such, a disadvantage of a relatively larger tank is that although it can accommodate a sudden high demand for hot water, it also has the potential for greater heat losses and poor energy efficiency.

OBJECT OF THE INVENTION

[0005] It is the object of the present invention to substantially overcome or at least ameliorate the above disadvantage.

SUMMARY OF THE INVENTION

[0006] There is disclosed herein a boiling water heater system for providing hot water at a dispensing outlet, the heater system including:

a first water heater arranged in fluid communication with a water supply for heating water from the water supply to a first elevated temperature; and

a second water heater arranged in fluid communication with the first water heater for heating the water from the first elevated temperature to a dispensing temperature, that is higher than the first elevated temperature, wherein:

the second water heater includes a storage tank arranged in fluid communication with the dispensing outlet.

[0007] Accordingly, the water temperature at the inlet of the second water heater is raised considerably in comparison to the known hot water dispensing system. This means that the flow rate of the water into the second heater can be increased because the water requires less time in the second heater in order to reach its dispensing temperature. This also means that the size of the second water heater tank can be smaller than the tank of a similar single tank system whilst retaining a good recovery rate. The tank surface area is accordingly reduced and the potential for heat losses to the atmosphere is also reduced. Thus, the energy efficiency of the system may be improved.

[0008] In an embodiment, the first and second water heaters are powered independently of one another.

[0009] In an embodiment, the first water heater is an instantaneous water heater. Preferably, the instantaneous water heater includes a fixed element power rating and has a fixed volume.

[0010] In an embodiment, the second water heater includes a boiling water storage tank. Preferably, the boiling water storage tank includes a fixed rated immersed heating element therein.

[0011] Preferably, the boiling water storage tank includes a controller for managing the water temperature inside the tank at just below boiling point, more preferably one to two degrees below boiling point, or at any temperature the user may define.

[0012] In an embodiment, the system further comprises a water conduit providing the fluid communication between the water supply and the first water heater and the first water heater and the second water heater. The system may further comprise a control valve arranged in the water conduit upstream of the first water heater, the control valve being configured for controlling admission of water from the water supply through the first water heater and into the second water heater. The control valve may be configured to admit water from the water supply through the first water heater and the second water heater in response to user actuation of a dispenser at the dispensing outlet.

[0013] The water supply is preferably at ambient temperature and is preferably a mains water supply. In an embodiment, the water dispensing temperature is near boiling point.

[0014] The system preferably includes a water softening device (if required) disposed in the water conduit upstream of the first water heater. The system preferably includes a water filter disposed in the water conduit upstream of the first water heater.

[0015] There is further disclosed a method of heating water in a boiling water heater system, the water heater system including: a first water heater; a second water heater; and a user actuatable dispenser,

the method including the steps of:

heating water from a water supply to a first elevated temperature in the first water heater;
providing the water at the first elevated temperature to the second water heater;
heating the water to a second dispensing temperature, that is higher than the first elevated temperature;
storing the heated water in the second water heater; and
dispensing the heated water from the dispenser upon user actuation thereof.

[0016] In an embodiment, the water at the water supply is supplied at an ambient temperature.

[0017] In an embodiment, the system further comprises a controller and the method comprises controlling admission of water from the water supply through the first water heater and into the second water heater in response to user actuation of the dispenser. Preferably, the water is dispensed at a temperature near boiling point.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] A preferred embodiment of the present invention will now be described, by way of an example only, with reference to the accompanying drawing wherein:

[0019] Fig. 1 is a schematic diagram of an embodiment of a boiling water heater system.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0020] Fig. 1 shows an embodiment of a boiling water heating heater system 10. The boiling water heater system 10 has a first, instantaneous type, water heater 15. The first water heater 15 is fluidly connected to a mains water supply 18 by a supply conduit 25. The first water heater 15 consists of a fixed volume tank 17 of 0.12 litres with a fixed power rated element 30 of 2.4 kW, inside the tank 17. The first water heater 15 is powered by a power source, such as a first mains electrical supply 19.

[0021] The system 10 also has a second water heater 21, in the form of a boiling water storage tank 20 with an electric fixed rate immersed heating element 35 therein. The storage tank 20 has a capacity of 3 litres. The tank 17 of the first water heater 15 is fluidly connected to the storage tank 20 of the second water heater 21 via a link conduit 28. The boiling water storage tank 20 has an upper end 23 and a lower end 24 and the immersed heating element 35 is located at the lower end 24 so as to be immersed by water in the tank 20 during use. The boiling water storage tank 20 is also provided with a thermal jacket (not shown) or other appropriate means of insulation to insulate it against heat losses from its surface area. The second water heater 21 includes an outer casing 37 around the tank 20 and is powered independently of the first water heater 15 by a second power source, such as a second mains electrical supply 22.

[0022] The boiling water storage tank 20 is fluidly connected to a dispensing outlet, in the form of a user actuatable faucet 45. The dispensing outlet 45 is located on a bench for pumped products or at the lower end 24 of the tank, for gravity feed products. A control valve in the form of a solenoid valve 50 is disposed in the supply conduit 25. The control valve 50 communicates electronically with a logic controller 40 that is associated with the boiling water storage tank 20. Both the controller 40 and the valve 50 are situated within the casing 37 and the controller 40 is programmable to manage the temperature of water in the boiling water storage tank 20 at close to boiling point, more specifically within 1 or 2 degrees of boiling point such that the water is ready to be dispensed instantly on demand. The controller 40 is also

programmed to control the opening and closing of the valve 50 so that it can be at least partially opened as required in order to admit water from the mains water supply 18 into the system 10 at a specific flow rate when the water in the boiling water storage 20 tank needs replenishing.

[0023] The system 10 optionally includes a filtration unit 55 disposed in the supply conduit 25 for filtering water from the mains water supply 18 prior to its admission into the system 10. The system 10 also optionally includes a softener cartridge 60 disposed in the supply conduit 25 upstream of the instantaneous water heater 15.

[0024] The operation of the system 10 is as follows. Water from the mains water supply 18 is supplied to the system 10 at an ambient temperature of around 17°C (T1). Upon start up of the system 10, or in response to user actuation of the faucet 45, the controller 40 sends a signal causing the control valve 50 to at least partially open, thereby allowing water to flow from the mains water supply 18 into the supply conduit 25 at a specific flow rate of 0.8 litres per minute. The water in the supply conduit 25 then passes through the filter 55 and/or softener cartridge 60 if these components are present in the system 10. The water then flows through the first water heater 15 where it is instantly heated to an initial elevated temperature (T2) by the element 30. In the present embodiment, in which the first water heater is a 2400 Watt heater and the water flow rate is held at 0.8 litres per minute, the first water heater 15 raises the temperature of the water passing through it by approximately 40°C. Thus the water exits the instantaneous water heater 15 at an initial elevated temperature of around 57°C and is delivered, via the link conduit 28, to the boiling water storage tank 20 of the second water heater 21 at about this temperature.

[0025] In an alternative embodiment, the mass flow rate of water through the first water heater 15 is held at a constant flow of 1.0 litres per minute, resulting in a change in temperature of the water passing through the instantaneous water heater of around 36°C. As such, the water supplied to the instantaneous water heater at 17°C is delivered to the boiling water storage tank 20 at an initial elevated temperature (T2) of about 53°C.

[0026] In either embodiment, the element 35 of the second water heater 21 is required to heat the water only from the initial elevated temperature (T2) of 53°C or 57°C to the dispensing temperature (T3) of 98°C or 99°C (at sea level), meaning that the recovery rate of the system 10 can advantageously be more than doubled relative to the similar known boiling water heating systems. The water can be maintained at the relatively high flow rate of 0.8 litres per minute or

1.0 litre per minute as it flows into the boiling water storage tank 20 and still be heated to near boiling point at a rate fast enough to cope with the sudden high user demand for boiling water at the faucet 45, for example during a scheduled office tea break. Accordingly, the volume capacity of the boiling water storage tank 20 can advantageously be reduced in comparison to known systems, reducing the potential heat losses from the surface area of the boiling water storage tank by up to 35 percent.

[0027] Although the invention has been described with reference to preferred embodiments, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms without departing from the scope of the invention.

CLAIMS:

1. A boiling water heater system for providing near-boiling drinking water at a dispensing outlet, the heater system including:
 - a first water heater arranged in fluid communication with a water supply for heating water from the water supply to a first elevated temperature; and
 - a second water heater arranged in fluid communication with the first water heater for heating the water from the first elevated temperature to a dispensing temperature, that is higher than the first elevated temperature, wherein:
 - the first water heater is an instantaneous water heater configured to heat the water instantly as the water flows through it; and
 - the second water heater includes a storage tank arranged in fluid communication with the dispensing outlet for storing the water heated to the dispensing temperature, wherein the water dispensing temperature is about 98°C or 99°C.
2. The boiling water heater system as claimed in claim 1, wherein the first and second water heaters are powered independently of one another.
3. The boiling water heater system as claimed in claim 1 or 2, wherein the instantaneous water heater includes a fixed element power rating and has a fixed volume.
4. The boiling water heater system as claimed in claim 3, wherein the fixed volume of the instantaneous water heater is about 0.12 litres.
5. The boiling water heater system as claimed in any one of the preceding claims, wherein the storage tank is a boiling water storage tank.
6. The boiling water heater system as claimed in claim 5, wherein the boiling water storage tank includes a fixed rated immersed heating element therein.
7. The boiling water heater system as claimed in claim 5 or 6, wherein the boiling water storage tank has a volume of about 3 litres.
8. The boiling water heater system as claimed in any one of claims 5 to 7, wherein the boiling water storage tank includes a controller for managing the water temperature inside the tank at just below boiling point.
9. The boiling water heater system as claimed in claim 8, wherein the controller manages the water temperature inside the tank to one to two degrees below boiling point.

10. The boiling water heater system as claimed in claim 8, wherein the controller manages the water temperature inside the tank to a temperature defined by a user.
11. The boiling water heater system as claimed in any one of the preceding claims, wherein the system further comprises a water conduit providing the fluid communication between the water supply and the first water heater and the first water heater and the second water heater.
12. The boiling water heater system as claimed in claim 11, wherein a flow rate of the water that flows from the water supply in the water conduit is about 0.8 litre per minute or about 1.0 litre per minute.
13. The boiling water heater system as claimed in claim 11 or 12, wherein the system further comprises a control valve arranged in the water conduit upstream of the first water heater, the control valve being configured for controlling admission of water from the water supply through the first water heater and into the second water heater.
14. The boiling water heater system as claimed in claim 13, wherein the control valve is configured to admit water from the water supply through the first water heater and the second water heater in response to user actuation of a dispenser at the dispensing outlet.
15. The boiling water heater system as claimed in any one of claims 11 to 14, wherein a flow rate of the water through the first water heater is about 0.8 litre per minute or about 1.0 litre per minute.
16. The boiling water heater system as claimed in any one of the preceding claims, wherein the water that is supplied from the water supply is at ambient temperature.
17. The boiling water heater system as claimed in any one of the preceding claims, wherein the first elevated temperature is about 53°C or 57°C.
18. The boiling water heater system as claimed in any one of the preceding claims, wherein the water supply is a mains water supply.
19. The boiling water heater system as claimed in any one of claims 11 to 15 or claims 16 to 18 when dependent on claims 11 to 15, wherein the system includes a water softening device disposed in the water conduit upstream of the first water heater.
20. The boiling water heater system as claimed in any one of claims 11 to 15 or claims 16 to 19 when dependent on claims 11 to 15, wherein the system includes a water filter disposed in the water conduit upstream of the first water heater.
21. A method of heating water in a boiling water heater system, the water heater system including:

a first instantaneous water heater; a second water heater; and a user actuatable dispenser, the method including the steps of:

heating water from a water supply to a first elevated temperature in the first instantaneous water heater as water flows through the first instantaneous water heater;

providing the water at the first elevated temperature to the second water heater;

heating the water to a second dispensing temperature, that is higher than the first elevated temperature;

storing the heated water in the second water heater; and

dispensing the heated water from the dispenser upon user actuation thereof, wherein the water is dispensed at a temperature of about 98°C or 99°C.

22. The method of boiling water as claimed in claim 21, wherein the water at the water supply is supplied at an ambient temperature.

23. The method of boiling water as claimed in claim 21 or 22, wherein the system further comprises a controller and the method comprises controlling admission of water from the water supply through the first water heater and into the second water heater in response to user actuation of the dispenser.