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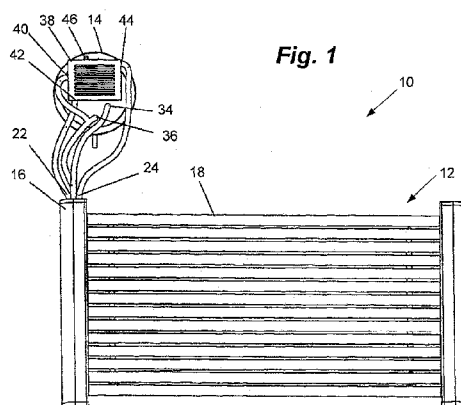
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(54) Title: SOLAR WATER HEATER WITH THE FUNCTIONS OF REFILLING AND DISSIPATION



(57) Abstract: This invention relates to a type of solar water heater, which belongs to the field of solar energy application technology. The water heater consists of a solar heat collector and a thermal storage tank. The aforesaid solar heat collector is equipped with a liquid-refilling port, a backflow port, and a characteristic refill-dissipation tank. The refill-dissipation tank is equipped with a water-refilling port, a liquid-refilling port, a backflow port located higher than the aforesaid liquid-refilling port, and a ventilation-overflow port at the upper part. The aforesaid water-refilling port is connected with the water source with a linking control unit, while the aforesaid liquid-refilling port and the backflow port are connected with the corresponding ports on the solar heat collector, thus forming a circular dissipation loop. This invention cleverly combines refilling and dissipation, to refill water and at the same time solve the problem of overheating.

SOLAR WATER HEATER WITH THE FUNCTIONS OF REFILLING AND DISSIPATION

RELATED APPLICATION

[0001] The present patent application claims the benefit of prior filed co-pending Chinese Patent Application No. 200910025618.2, filed on March 3, 2009; the entire content of which is hereby incorporated by reference.

BACKGROUND

[0002] The invention relates to a type of solar energy device, particularly a solar water heater with the functions of refilling and dissipation, which belongs to the field of solar energy application technology.

[0003] During use of the solar water heater, if water is not drawn for days of clear weather, overheating may occur to the whole circular exchanging system due to the accumulated heat in the system. As a result, leakage and corrosion may easily occur to the thermal storage tank, making overheating one of the most difficult problems in the field of solar water heaters.

SUMMARY

[0004] The aim of this invention is to provide a type of solar water heater with the functions of refilling and dissipation to solve the problems of lack of water and overheat as stated above.

[0005] To this end, the solar water heater with the functions of refilling and dissipation for this invention consists of a solar heat collector and a thermal storage tank; the aforesaid solar heat collector is equipped with a liquid-refilling port, a backflow port, and a characteristic refill-dissipation tank; the refill-dissipation tank is equipped with a water-refilling port, a liquid-refilling port, a backflow port located higher than the aforesaid liquid-refilling port, and a ventilation-overflow port at the upper part; the aforesaid water-refilling port is connected with the water source with a linking control unit, while the aforesaid liquid-refilling port and the backflow port are connected with the corresponding ports on the solar heat collector, thus forming a circular dissipation loop.

[0006] During use, the vacuum tube in the solar heat collector transmits the heat converted from the solar energy it absorbs to the thermal storage tank to heat the water. When water is lacking in the refill-dissipation tank, a linking control unit is used to refill the tank from the water source. As the liquid temperature rises continuously after the collector receives solar energy, the liquid volume expands with a certain ratio, and, as a result, it will flow back to the solar heat collector through the backflow port of the refill-dissipation tank, forming a circular dissipation loop in combination with the existing refilling channel to restrain temperature rise and prevent overheat of the thermal storage tank.

[0007] From this, the present invention, through cleverly combining the function of refilling and dissipation, refills water and effectively solves the problem of overheating, ensuring safe use of the solar water heater and also preventing corrosion due to high temperature of the water tank.

[0008] The present invention provides, in one aspect, a water heater including a solar heat collector, the solar heat collector having a first liquid-refilling port and a first backflow port, a refill-dissipation tank, the refill-dissipation tank having a water-refilling port, a second liquid-refilling port, and a second backflow port positioned above the second liquid-refilling port, and a thermal storage tank, wherein the water-refilling port is selectively connected to a water source by a linking control unit, and wherein a dissipation loop is formed by operatively connecting the second liquid-refilling port to the first liquid-refilling port and operatively connecting the second backflow port to the first backflow port.

[0009] Other features and aspects of the present invention will become apparent by consideration of the following detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Fig. 1 is a schematic view of an embodiment of the water heater.

[0011] Fig. 2 is a cross-sectional view of the water heater of Fig. 1.

[0012] Fig. 3 is an enlarged view of a portion of the water heater of Fig. 1.

DETAILED DESCRIPTION

[0013] Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.

[0014] Figs. 1-3 show an embodiment of a solar water heater 10 with the functions refilling and dissipation. The water heater 10 includes a solar heat collector 12, a thermal storage tank 14, and a refill-dissipation tank 38.

[0015] As shown in Fig. 1, the solar heat collector 12 includes a header 16 connected to a set of vacuum tubes 18 for heat collection. The vacuum tubes 18 are positioned substantially horizontally. The header 16 includes a U-shaped heat exchange tube 20, a liquid-refilling port 22, and a backflow port 24. The U-shaped heat exchange tube 20 includes an inlet 26 and an outlet 28 for circulating water through the U-shaped heat exchange tube 20 (shown in Fig. 2).

[0016] As shown in Fig. 2, the thermal storage tank 14 includes a water source inlet 30, a water supply outlet 32, a water inlet 34 and a return port 36. The water source inlet 30 is connected to a water source. The water supply outlet 32 supplies heated water to a hot water usage location. A circular exchanging loop is formed by connecting the inlet 26 of the U-shaped heat exchange tube 20 to the water inlet 34 of the thermal storage tank 14 and connecting the outlet 28 of the U-shaped heat exchange tube 20 to the return port 36 of the thermal storage tank 14.

[0017] As shown in Fig. 3, the refill-dissipation tank 38 includes a lateral water-refilling port 40, a liquid-refilling port 42 positioned at the bottom of the refill-dissipation tank 38, a backflow port 44 positioned higher than the liquid-refilling port 42, and a ventilation-overflow port 46 positioned at the top of the refill-dissipation tank 38. The water-refilling port 40 is in selective fluid communication with the water inlet 34 of the thermal storage tank 14. A linking control unit 48 selectively connects the water-refilling port 40 to the water

inlet 34, thereby placing the water-refilling port 40 in fluid communication with the water source via the water source inlet 30 and allowing water to flow from the thermal storage tank 14 to the refill-dissipation tank. In the embodiment shown in Fig. 3, the linking control unit 48 is a ball cock. A circular dissipation loop is formed by connecting the liquid-refilling port 42 of the refill-dissipation tank 38 to the liquid-refilling port 22 of the solar heat collector 12 and connecting the backflow port 44 of the refill-dissipation tank 38 to the backflow port 24 of the solar heat collector 12.

[0018] During use, the vacuum tubes 18 of the solar heat collector 12 collect solar energy, thereby heating an unpressurized exchanging media contained in the vacuum tubes 18. The exchanging media then transmits the heat to the water in the U-shaped heat exchange tube 20 of the header 16. The heated water then passes through the outlet 28 to the return port 36 and into the thermal storage tank 14 via a portion of the circular exchanging loop. Connecting the refill-dissipation tank 38 to the header 16 through the water-refilling port 40 ensures that the vacuum tubes 18 will not shatter due to a lack of water in contact with the vacuum tubes 18. When the water level in the refill-dissipation tank 38 is low, the water-refilling port 40 is opened by the linking control unit 48, and water is refilled into the refill-dissipation tank 38. Similarly, when the water level in the refill-dissipation tank 38 reaches a defined level, the linking control unit 48 closes the water-refilling port 40 and the refilling of refill-dissipation tank 38 stops. Furthermore, as the water temperature rises continuously with the heat from the solar energy absorbed by the solar heat collector 12, the water's volume expands with a certain ratio, and, as a result, water will flow back to the solar heat collector 12 through the backflow port 44 of the refill-dissipation tank 38, thereby restraining further temperature rise through the circular dissipation loop formed in combination with the existing refilling channel, thus preventing overheating of the thermal storage tank 14.

[0019] Repeated experiments have shown that the water heater of this embodiment has the functions of automatic refilling, ensuring stable operation of the water circulation system, and solves the problem of overheating due to energy accumulation after days of idling.

[0020] This invention has other embodiments besides the above-said. For example, the water-refilling port 40 may be directly linked to the water source inlet 30 through the linking control unit 48.

[0021] Various features and advantages of the invention are set forth in the following claims.

CLAIMS

What is claimed is:

1. A water heater comprising:
 - a solar heat collector, the solar heat collector having a first liquid-refilling port and a first backflow port;
 - a refill-dissipation tank, the refill-dissipation tank having a water-refilling port, a second liquid-refilling port, and a second backflow port positioned above the second liquid-refilling port; and
 - a thermal storage tank;wherein the water-refilling port is selectively connected to a water source by a linking control unit; and
wherein a dissipation loop is formed by operatively connecting the second liquid-refilling port to the first liquid-refilling port and operatively connecting the second backflow port to the first backflow port.
2. The water heater of claim 1, the solar heat collector comprising:
 - a header including the first liquid-refilling port and the first backflow port;
 - a plurality of vacuum tubes operatively connected to the header; and
 - a U-shaped heat exchange tube positioned in the header.
3. The water heater of claim 2, the thermal storage tank comprising:
 - a water source inlet;
 - a supply outlet;
 - a water inlet; and
 - a return port;wherein a circular exchanging loop is formed by operatively connecting an inlet of the U-shaped heat exchange tube to the water inlet and operatively connecting an outlet of the U-shaped heat exchange tube to the return port.
4. The water heater of claim 3, wherein the linking control unit is a ball cock.
5. The water heater of claim 3, wherein the water-refilling port is selectively connected to the water inlet by the linking control unit, and wherein the water inlet is in fluid communication with the water source via the water source inlet.

6. The water heater of claim 4, wherein the second liquid-refilling port is positioned at the bottom of the refill-dissipation tank.
7. The water heater of claim 5, wherein the second liquid-refilling port is positioned at the bottom of the refill-dissipation tank
8. The water heater of claim 6, wherein the water-refilling port is positioned on a side of the refill-dissipation tank and the second backflow port is positioned on an opposite side of the refill-dissipation tank and is positioned above the water-refilling port.
9. The water heater of claim 7, wherein the water-refilling port is positioned on a side of the refill-dissipation tank and the second backflow port is positioned on an opposite side of the refill-dissipation tank and is positioned above the water-refilling port.
10. The water heater of claim 1 further comprising a ventilation-overflow port positioned at the top of the refill-dissipation tank.

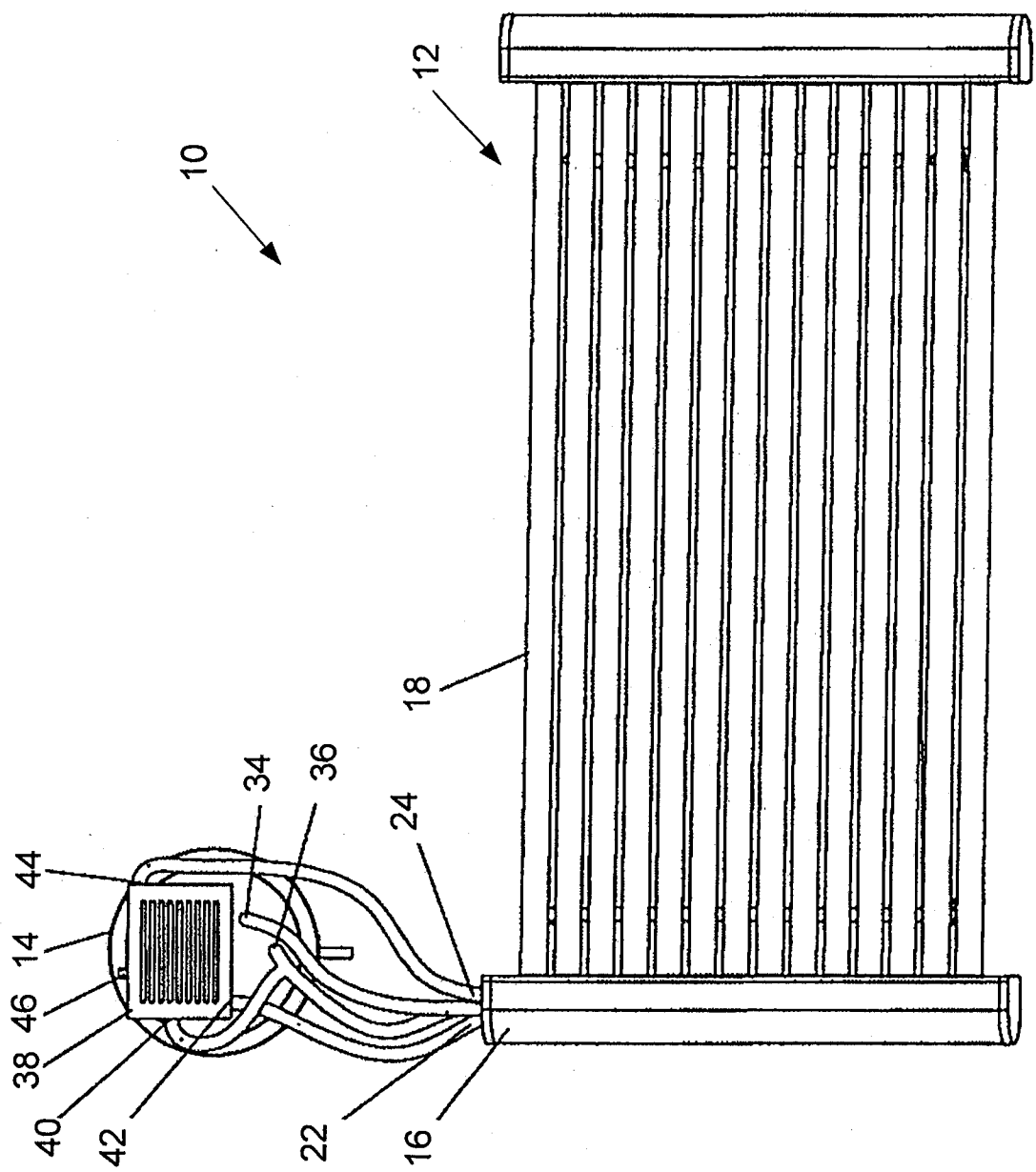
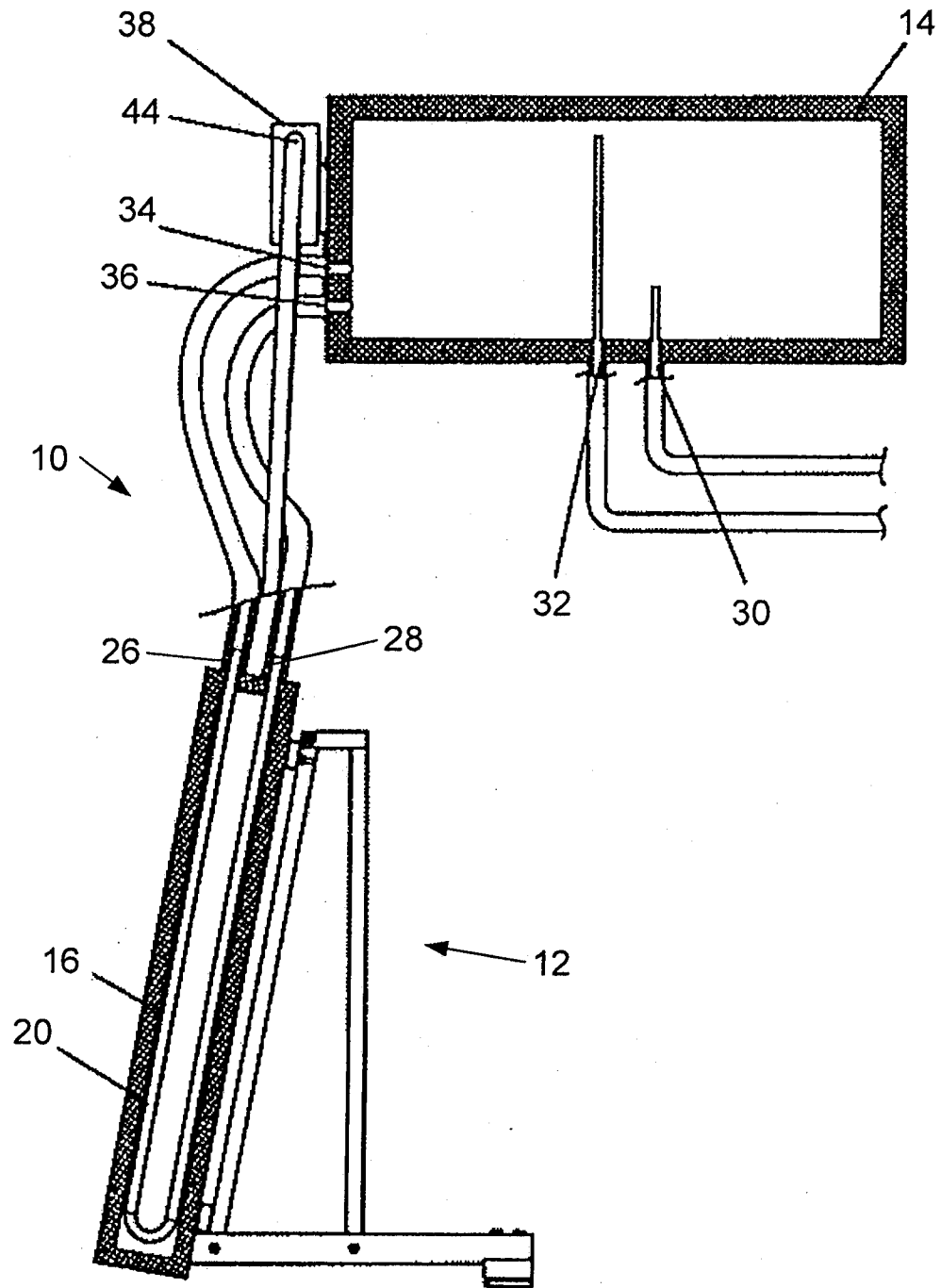


Fig. 1

**Fig. 2**

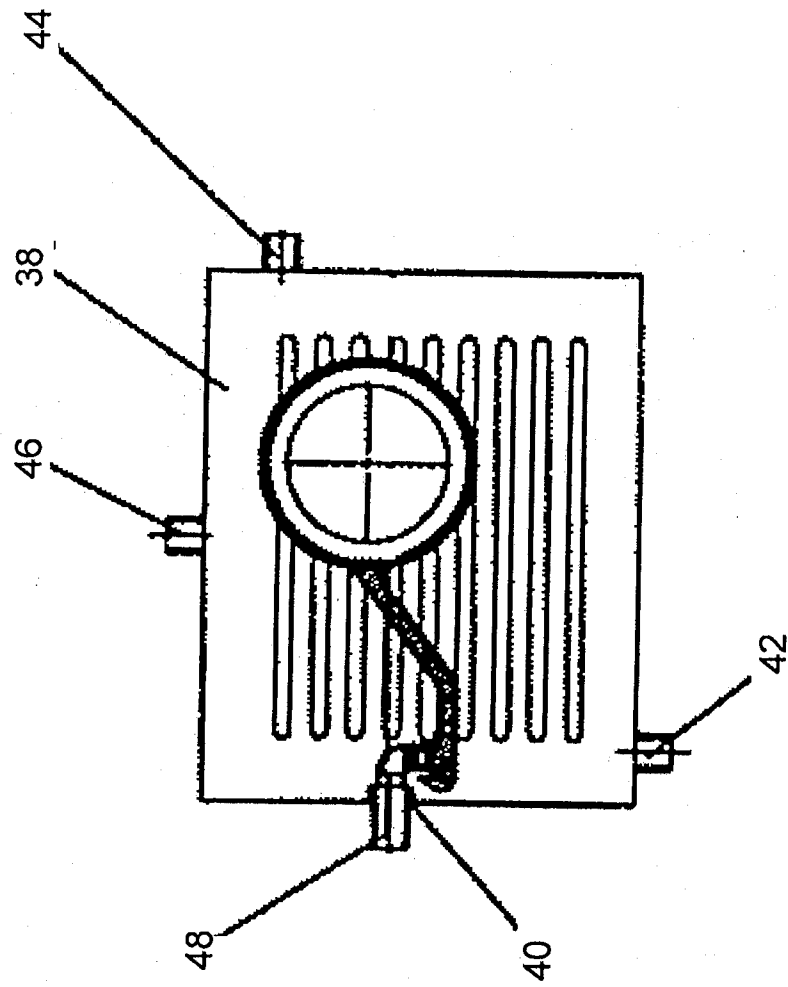


Fig. 3