



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
16.09.2009 Bulletin 2009/38

(51) Int Cl.:
F24H 1/00 (2006.01)

(21) Application number: **09003698.9**

(22) Date of filing: **13.03.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA RS

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(30) Priority: **14.03.2008 TW 97109247**

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(54) **Water heater**

(57) A water heat includes a case having an airtight chamber therein, a water pipe received in the chamber of the case with a first connection end and a second con-

nection end extended out of the case respectively, a thermal medium, which is liquid in a room temperature, received in the chamber of the case, and a heating device for heating the thermal medium directly or indirectly.

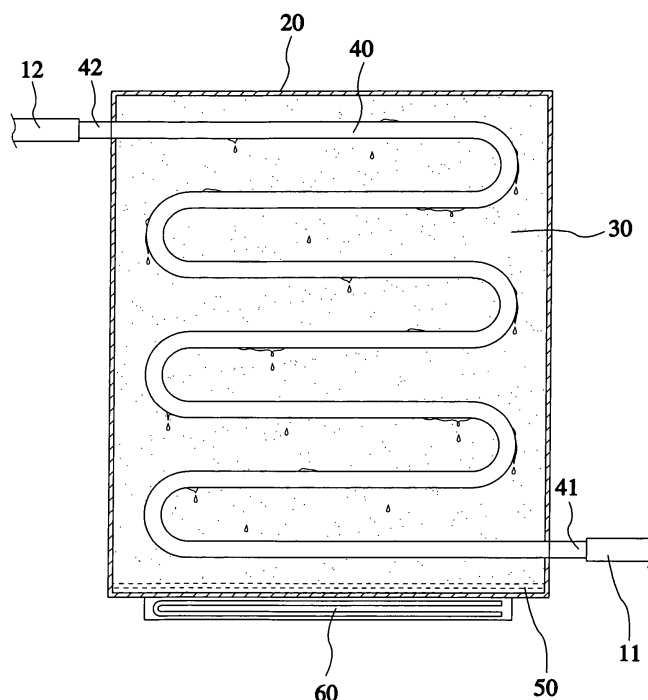


FIG.3

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates generally to a heating device, and more particularly to a water heater.

2. Description of the Related Art

[0002] Typically, conventional water heaters include gas water heaters and electric water heaters. The gas water heater has a continuous S pipe therein and a gas burner heating the pipe directly. The electric water heater has two types. The first type has an electric heater to heat water directly. The second type has electromagnetic heating means, which generates an eddy current to induce a metal block, and then water flows through the metal block to be heated. Typically, the gas water heater has a poorer efficiency than the electric water heater, and it has to consider the air ventilation issue for the place mounting the gas water heater to avoid accident. The other problem of the gas water heater is that it usually has a long distance between the water heater and the hydrant that user has to wait for the cold water in the pipe running out before the water comes out, and the temperature will loss in the long pipe also. Another issue of the gas water heater is temperature control. It is caused by the long pipe also to have the reaction time of temperature change too slow that user usually over adjusts to make the water temperature too hot or too cold when the water temperature had been changed to the designed temperature. Some small electric water heaters have no water tank therein that such water heater may be mounted in the house. The advantage of it is fast reaction in temperature adjustment, and the drawback of it is that it can not supply sufficient hot water. There are large electric water heaters in the present market, which may supply sufficient hot water. However, the mounting place is limited, and it still has the problem of too long distance between the water heater and hydrant.

SUMMARY OF THE INVENTION

[0003] The primary objective of the present invention is to provide a water heater, which has a superior heat efficiency to save power and supply enough hot water.

[0004] According to the objective of the present invention, a water heat includes a case having an airtight chamber therein, a water pipe received in the chamber of the case with a first connection end and a second connection end extended out of the case respectively, a thermal medium, which is liquid in a room temperature, received in the chamber of the case, and a heating device for heating the thermal medium directly or indirectly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005]

- 5 FIG. 1 is a perspective view of a first preferred embodiment of the present invention;
 FIG. 2 is a sectional view along the 2-2 line of FIG. 1;
 FIG. 3 is a sectional view of the first preferred embodiment of the present invention, showing the operation of the water heater;
 10 FIG. 4 is a sectional view of a second preferred embodiment of the present invention;
 FIG. 5 is a sectional view of a third preferred embodiment of the present invention;
 15 FIG. 6 is a sectional view of a fourth preferred embodiment of the present invention;
 FIG. 7 is a sectional view of a fifth preferred embodiment of the present invention; and
 20 FIG. 8 is a sectional view of a sixth preferred embodiment of the present invention

DETAILED DESCRIPTION OF THE INVENTION

[0006] As shown in FIG. 1 and FIG. 2, a water heater 25 10 of the first preferred embodiment of the present invention includes:

[0007] A case 20 has an airtight chamber 30 therein, with a pressure lower than one atmospheric pressure. The chamber 30 is preferred vacuumed. The required pressure in the chamber 30 is less than 10^{-1} Torr, and more preferable is less than 10^{-2} Torr, and further more preferable is less than 10^{-3} Torr.

[0008] A water pipe 40 is a continuous S-shaped pipe mounted in the case 20, which has a first connection end 41 and a second connection end 42 extended out of the case 20 respectively at opposite sides of the case 20, and the second connection is at a higher position and the first connection end is at a lower position, as shown in FIG. 2. In practice, the first and second connection ends 41, 42 of the water pipe 40 are to connectors connected to external pipes to keep the airtight condition of the chamber 30.

[0009] A thermal medium 50, which is a liquid in room temperature with a lower vaporized temperature, is received in the chamber 20 of the case 10. A need of the thermal medium 50 is not much. Typically, sufficient thermal medium 50 only takes 1.5% to 20% of a volume of the chamber 20, preferable is 2% to 15%, and more preferable is 10%. The consideration of the quantity of the thermal medium 50 is cost and heat transfer efficiency. Any quantity of the thermal medium 50 in the chamber 20 should be still in the scope of the present invention. The thermal medium may be a material with a high volatility, such as ether, alcohol, benzene or a mixture of above, or other suitable materials.

[0010] A heating device 60, which is an electric heater, is mounted on a bottom of the case 10.

[0011] As shown in FIG. 3, a cold water pipe 11 is con-

nected to the first connecting end 41 of the water pipe 40, and a hot water pipe 12 is connected to the second connecting end 42 of the water pipe 40. A power line (not shown) is connected to the heating device 60. The heating device 60 may be provided with a controller (not shown) for power control, a temperature sensor (not shown) for temperature control, and a flow sensor (not shown) for turn-on or turn-off water. Aforesaid control devices are common in the conventional water heater, so we do not describe the detail here. When the heating device 60 is energized to heat the thermal medium 50 in the case 20, and then the thermal medium 50 will be vaporized quickly and the vapor of the thermal medium 50 will be full in the chamber 30 to heat the water in the water pipe 40. It is obvious that the heating area of the water pipe 40 is maximized to the entire surface of the water pipe 40 that would provide the maximum heat efficiency. The vacuum condition is related to vaporization of the thermal medium 50. The lower pressure in the chamber 30 will get a faster evaporation the thermal medium 50 and a higher heat efficiency. The present invention provides the vaporized thermal medium to be a medium for heat transfer to water, so that the vaporized thermal medium will reach to the whole chamber for heat transfer. That is why the present invention has a higher heat efficiency to heat water quickly. After heat transfer, the liquidized thermal medium 50 will flow back to a bottom of the chamber 30 along an interior wall of the case 20, and be reheated by the heating device 60 for vaporization again that the water in the pipe may be heated to a desired temperature quickly and flow out the hot water pipe 12 through the second connecting end 42.

[0012] FIG. 4 shows a water heater of the second preferred embodiment of the present invention (all of the elements in the following embodiments have the same reference numerals as the corresponding elements in the first preferred embodiment), which is similar to the first preferred embodiment except that a heating device 60' is mounted on a bottom of the chamber 30, in other words, on a bottom of an interior side of the case 20. The heating efficiency of the heating device 60' will be better.

[0013] FIG. 5 shows a water heater of the third preferred embodiment. Basically, it is as same as the second preferred except that the water heater of the third preferred embodiment further includes an outer case 70 to enclose the case 20 therein. A space between the outer case 70 and the case 20 is vacuumed to form a vacuum thermal isolation layer 80.

[0014] FIG. 6 shows a water heater of the fourth preferred embodiment of the present invention, which is similar to the third preferred embodiment except that the space between the outer case 70 and the case 20 is not vacuumed but is inserted with a thermal isolation material to form a thermal isolation layer 90.

[0015] FIG. 7 shows a water heater of the fifth preferred embodiment of the present invention, which the heating device is a gas burner 100 to replace the electric heater, and an out case 110 is provided to enclose the case 20

therein for wind shield and air guiding.

[0016] The present invention provides the thermal medium to be the heat transfer medium that the heat generated from the heating device is transferred to the entire space in the case. The water heater of the present invention can heat a greater quantity of water very fast. While the water heater of the present invention is equipped with electric heating device, it can be mounted in the shower room or kitchen directly. It is very easy to mount and operate the water heater of the present invention. Some embodiments provide a thermal isolation device to have all the power in heating water. The power loss is minimized

[0017] FIG. 8 is a water heater of the sixth preferred embodiment of the present invention, which is equipped with the gas heating device 100 as same as the fifth preferred embodiment. The water heater of the sixth preferred embodiment has the case 20 provided with a tunnel 25 from a bottom to a top thereof. The tunnel 25 is a ventilation passageway for burning gas. A spiral water pipe 40' surrounds the tunnel 25.

Claims

1. A water heat, comprising:

a case 20 having an airtight chamber 30 therein;
a water pipe 40 received in the chamber 30 of the case 20 with a first connection end 41 and a second connection end 42 extended out of the case 20 respectively;
a thermal medium 50, which is liquid in a room temperature, received in the chamber 30 of the case 20; and
a heating device 60 for heating the thermal medium 50 directly or indirectly.

2. The water heater as defined in claim 1, wherein a pressure in the chamber 30 is lower than one atmospheric pressure.

3. The water heater as defined in claim 2, wherein the chamber 30 of the case 20 is vacuumed.

4. The water heater as defined in claim 2, wherein the pressure in the chamber 30 is less than 10^{-2} Torr.

5. The water heater as defined in claim 1, wherein the water pipe 40 has a continuous S shape, and the second connection end 42 is higher than the first connection end 41.

6. The water heater as defined in claim 1, wherein the heating device 60 is a burner mounted on a bottom of the case 20.

7. The water heater as defined in claim 6, wherein the

heating device 60 is a gas burner.

8. The water heater as defined in claim 1, wherein the heating device 60 is an electric heater mounted on a bottom of the case 20. 5
9. The water heater as defined in claim 1, wherein the heating device 60 is an electric heater mounted on a bottom of the chamber 30. 10
10. The water heater as defined in claim 1, wherein the thermal medium 50 takes 1.5% to 20% of a volume of the chamber 30.
11. The water heater as defined in claim 1, wherein the thermal medium 50 is made of a material with a high volatility selected from a group consisting of ether, alcohol, benzene. 15
12. The water heater as defined in claim 1, further comprising a thermal isolation layer 90 surrounding the case 20. 20
13. The water heater as defined in claim 1, further comprising an outer case 70 enclosing the case 20 therein. 25
14. The water heater as defined in claim 13, wherein a vacuum thermal isolation layer 80 is provided between the out case 70 and the case 20. 30
15. The water heater as defined in claim 13, wherein a thermal isolation layer 90 is provided between the out case 70 and the case 20. 35

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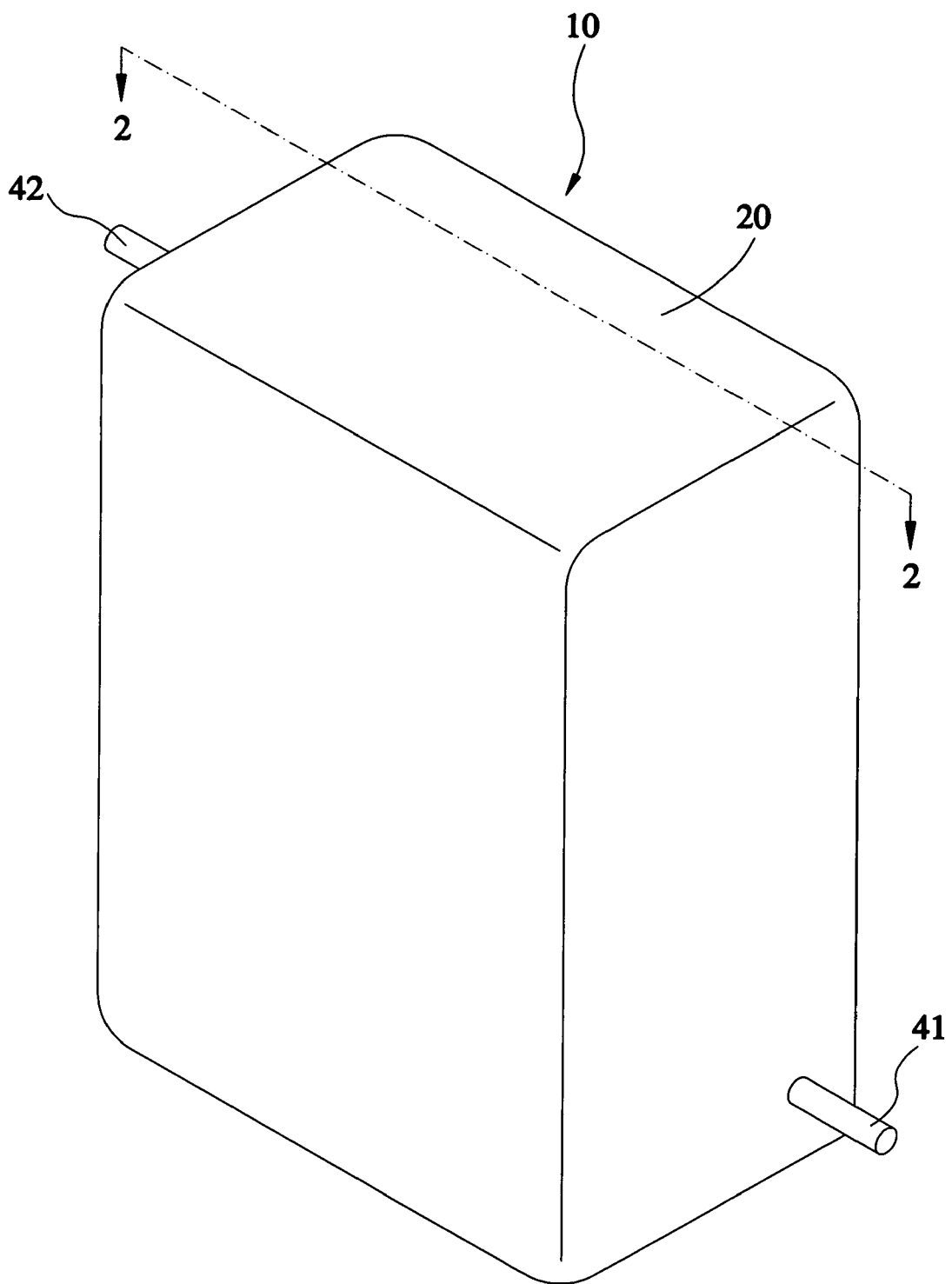


FIG.1

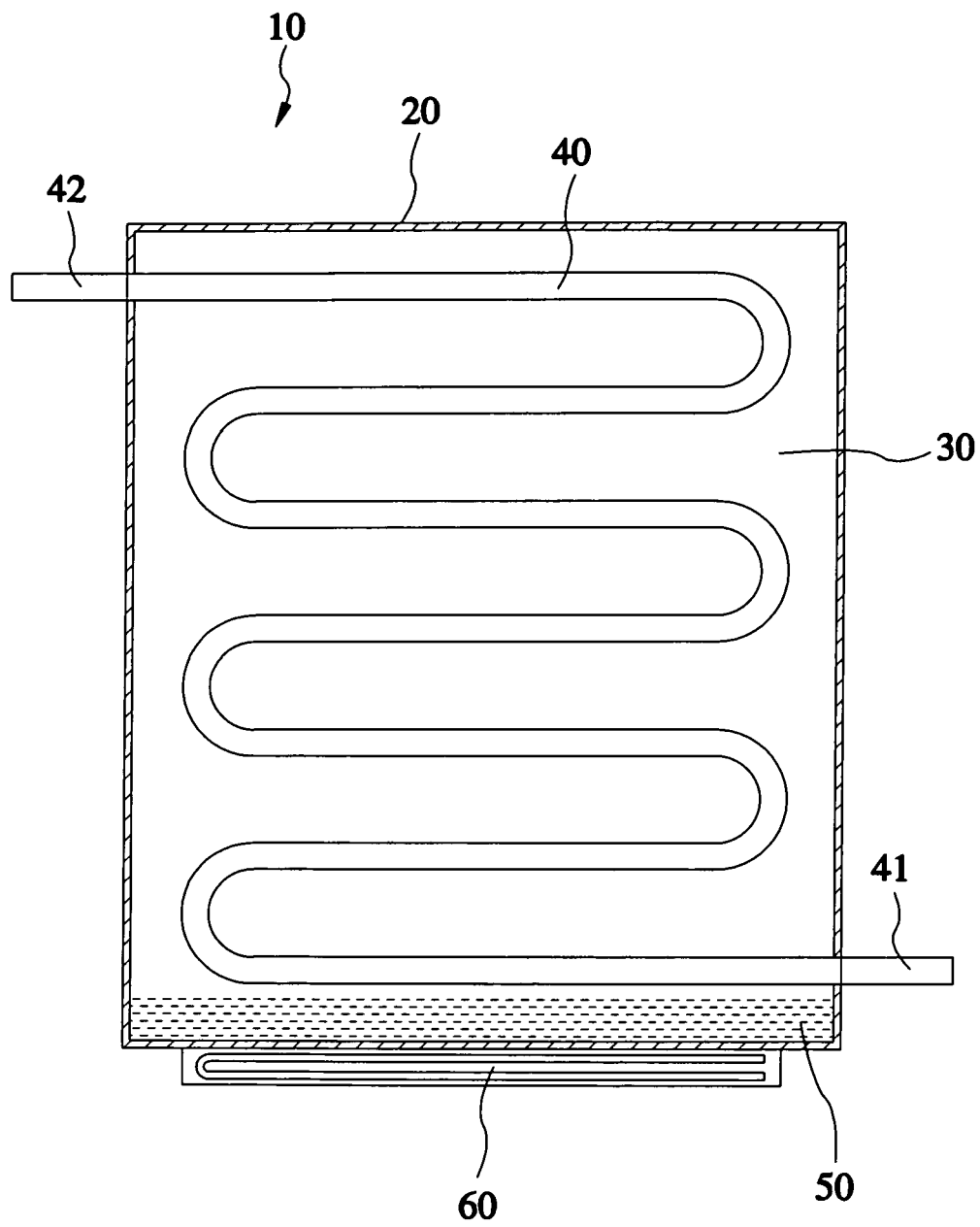


FIG.2

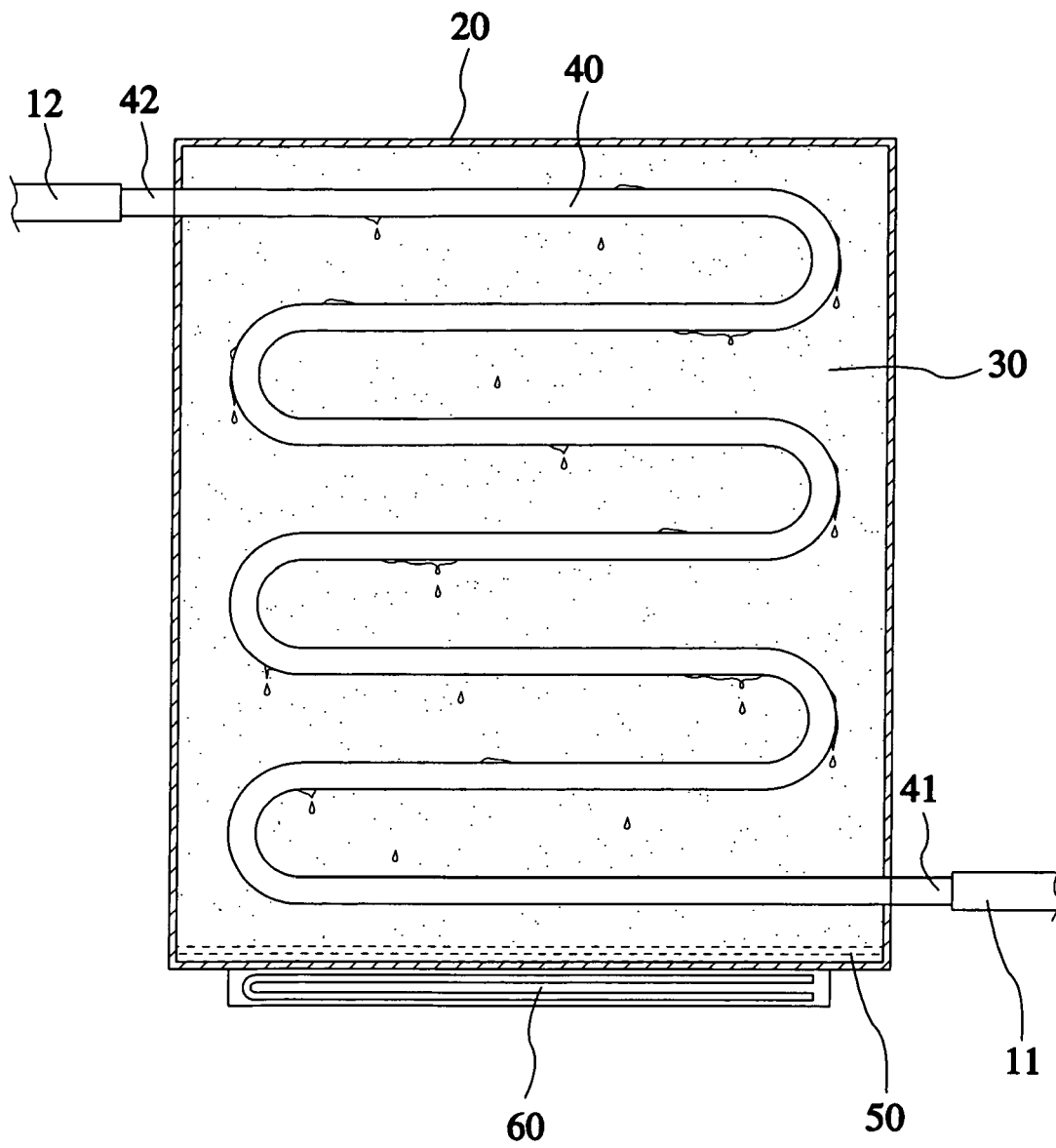


FIG.3

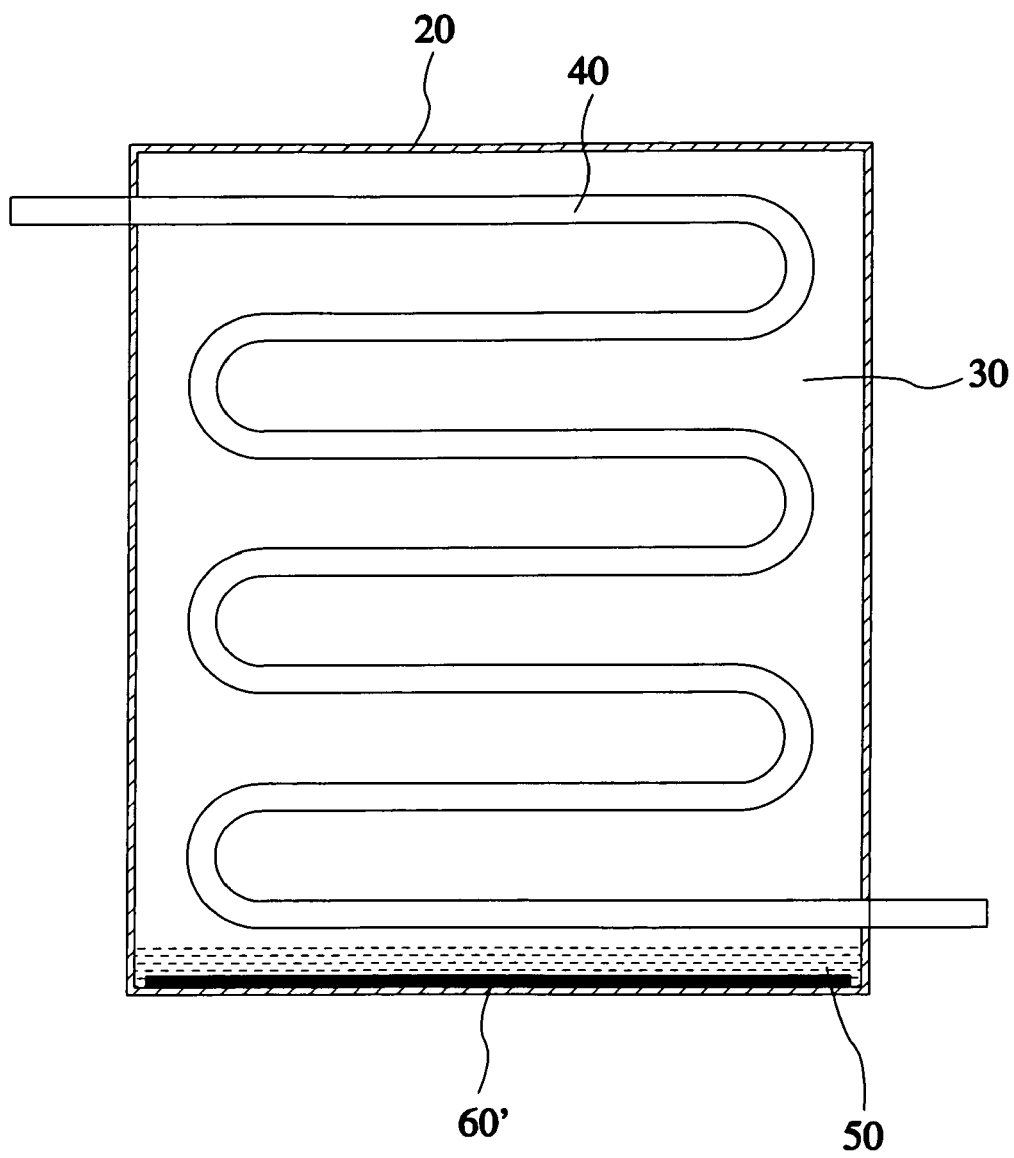


FIG.4

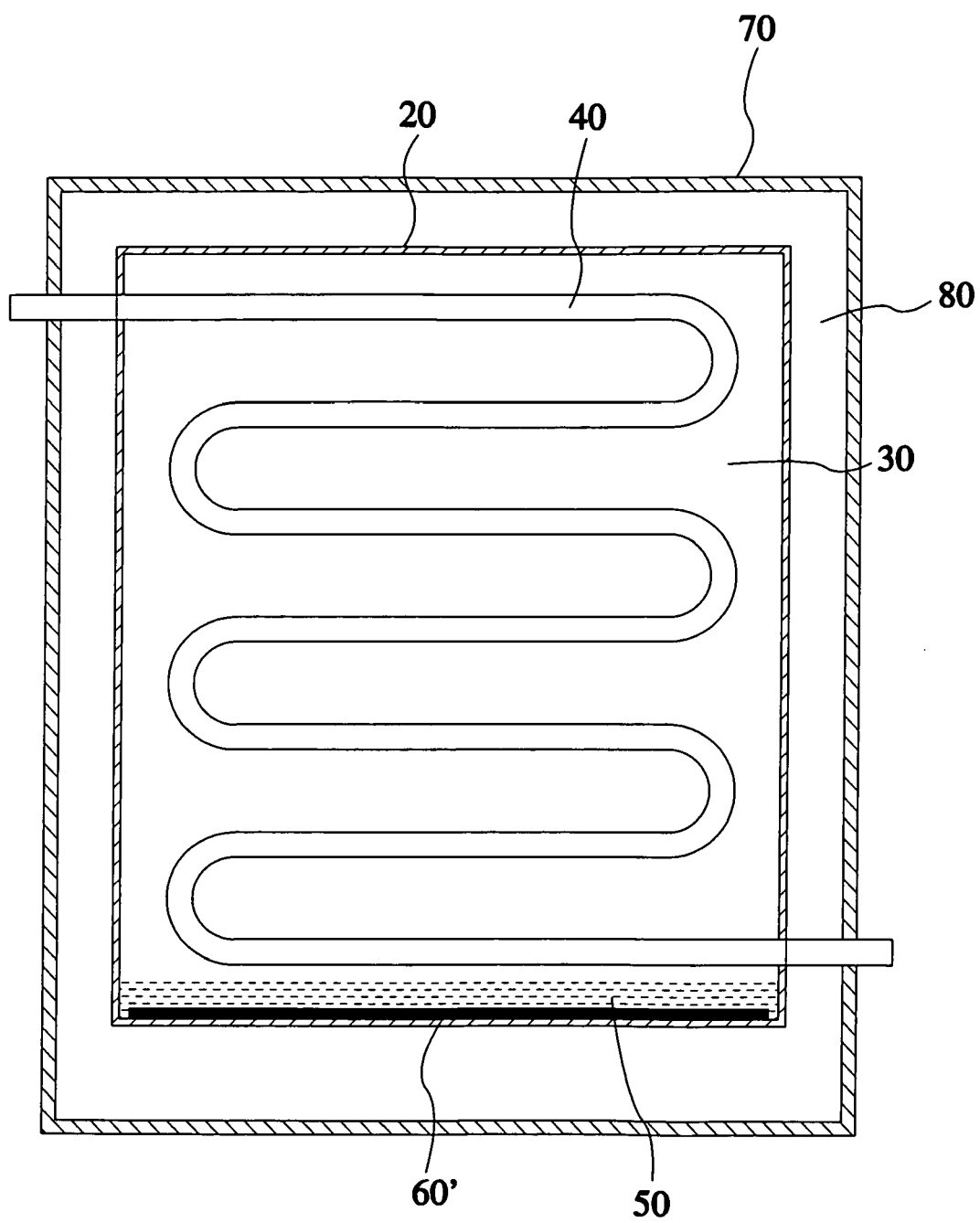


FIG.5

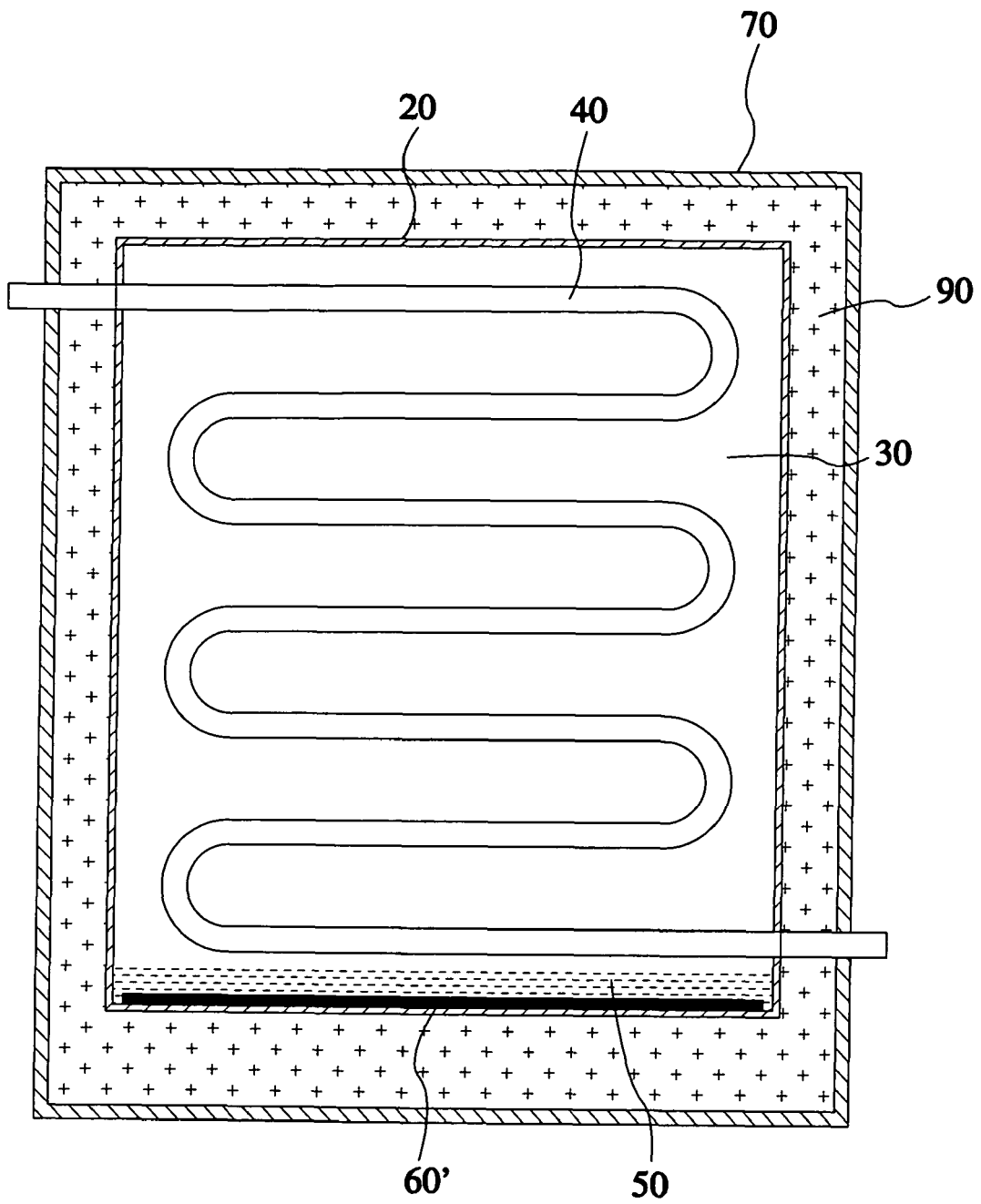


FIG.6

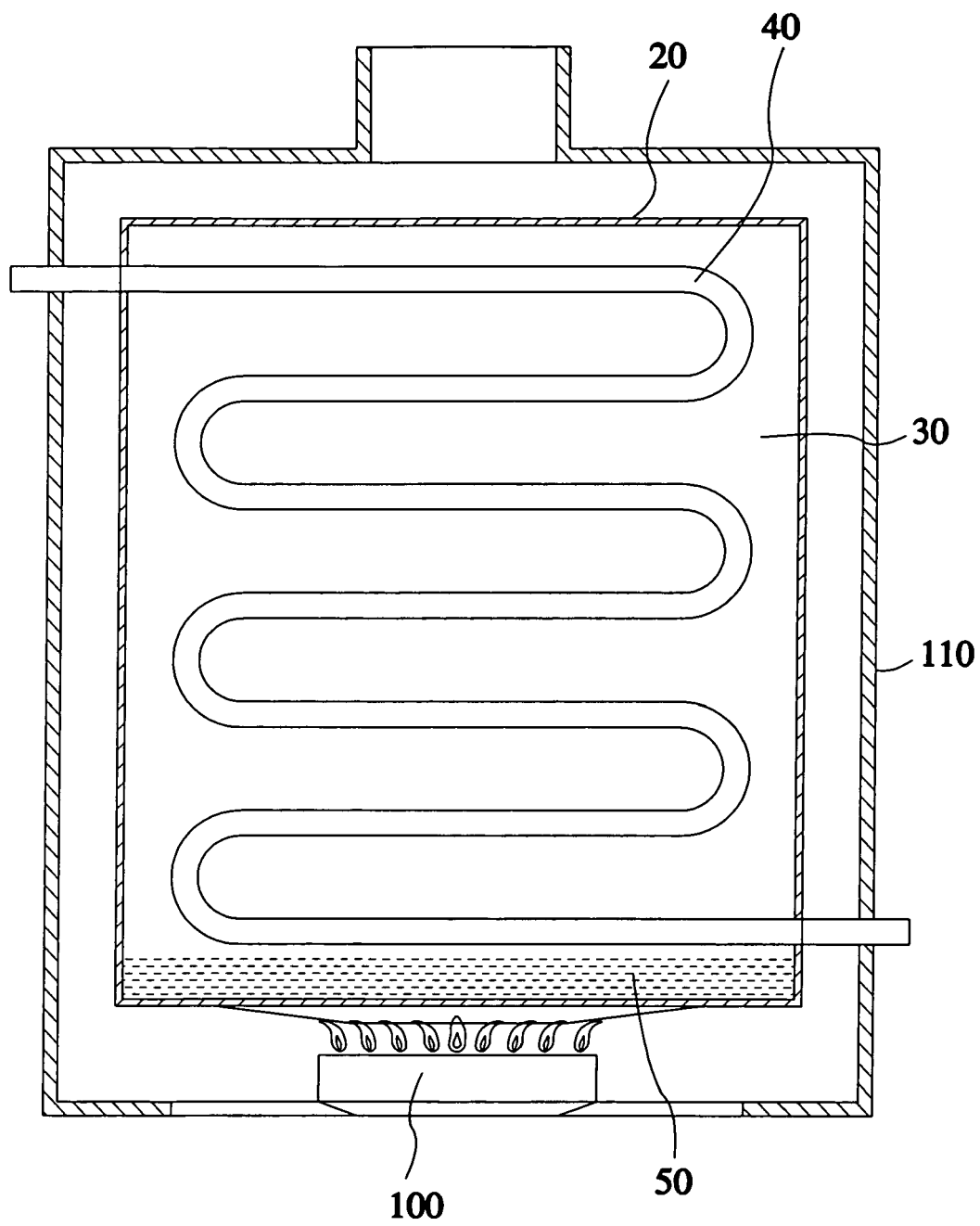


FIG.7

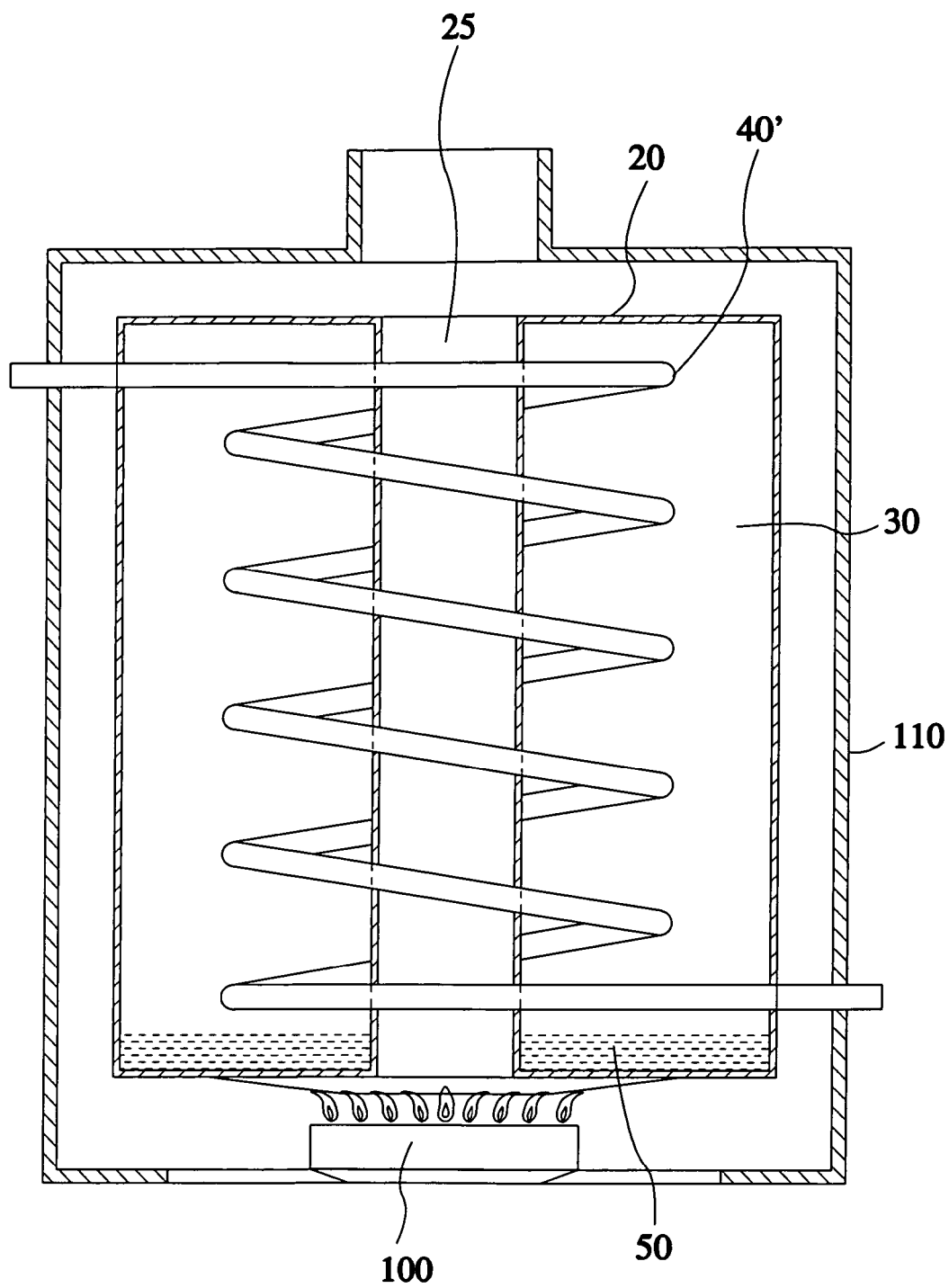


FIG.8