



US 20110067650A1

(19) **United States**

(12) **Patent Application Publication**
Chung-Chin et al.

(10) **Pub. No.: US 2011/0067650 A1**

(43) **Pub. Date: Mar. 24, 2011**

(54) **WATER HEATER MODULE HAVING
DETACHABLE HEAT EXCHANGER**

Publication Classification

(75) Inventors: **Huang Chung-Chin**, Taichung (TW); **Huang Chin-Ying**, Taichung (TW); **Hsin-Ming Huang**, Taichung (TW); **Hsing-Hsiung Huang**, Taichung (TW)

(51) **Int. Cl.**
F24H 1/14 (2006.01)
F28D 7/00 (2006.01)
F28F 1/12 (2006.01)

(52) **U.S. Cl.** **122/18.2; 122/367.3**

(73) Assignee: **GRAND MATE CO., LTD.**, Taichung (TW)

(57) **ABSTRACT**

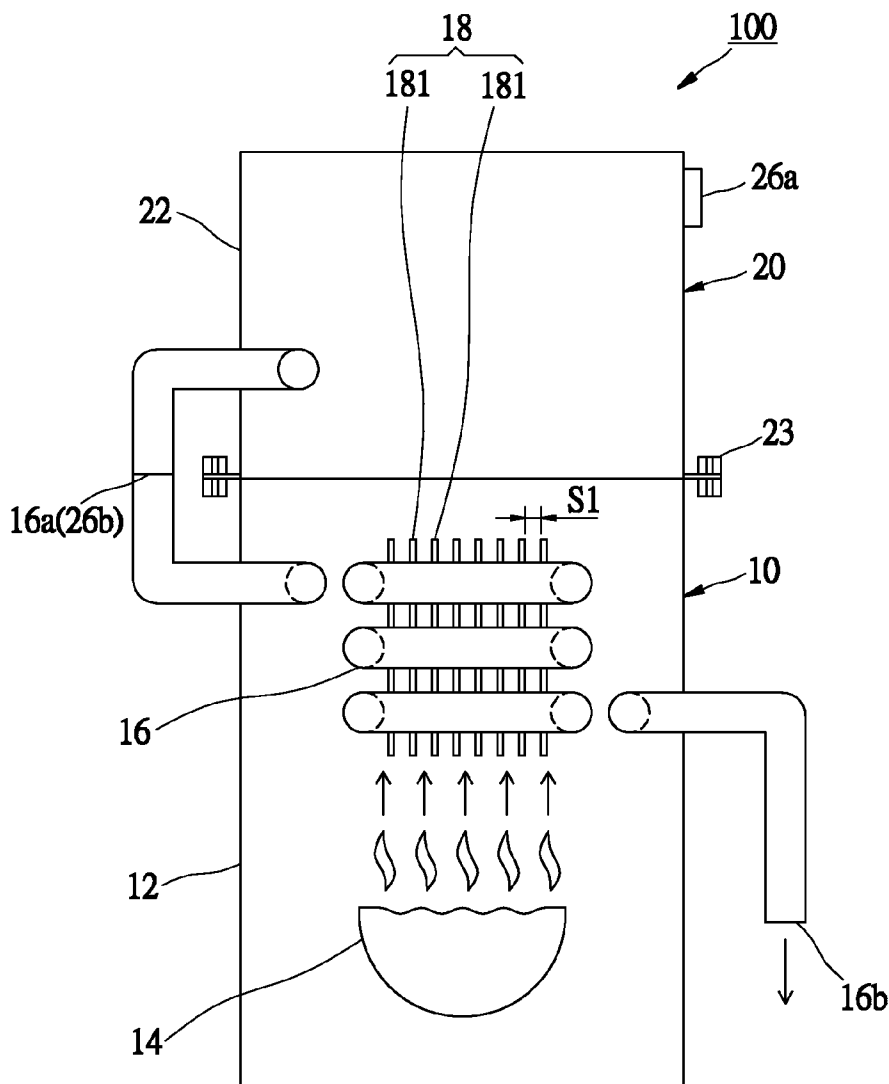
(21) Appl. No.: **12/578,226**

(22) Filed: **Oct. 13, 2009**

(30) **Foreign Application Priority Data**

Sep. 21, 2009 (TW) 98216151

A water heater module of the present invention includes a water heater and an extra heat exchanger. The extra heat exchanger has a spiral pipe and is detachably connected to the water heater. The spiral pipe is heated by high temperature gas from the water heater to pre-heat cold water in the pipe, and then the water is sent to the water heater for further heating that the temperature of the water will be raised within a short time.



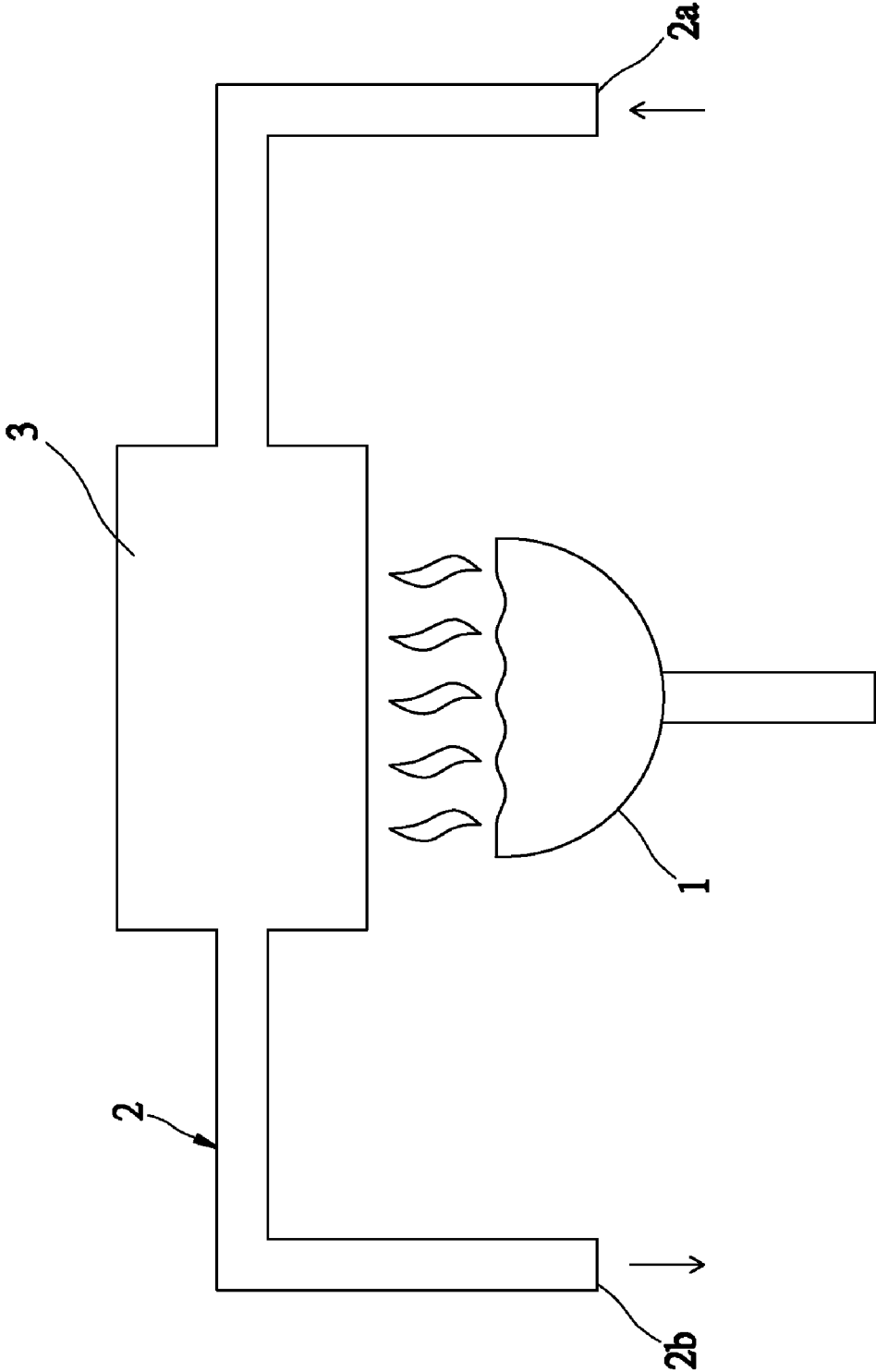


Fig.1

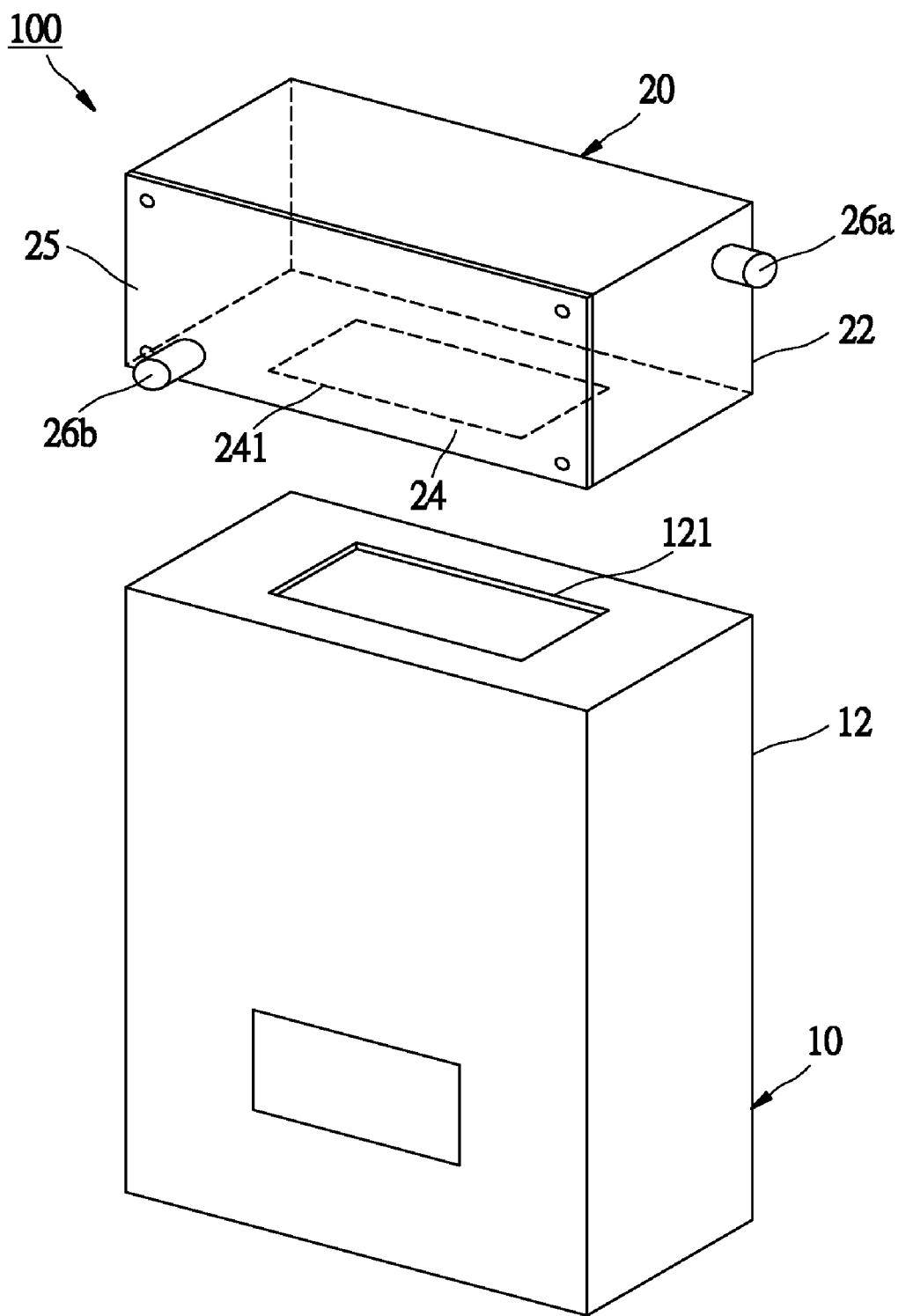


Fig.2

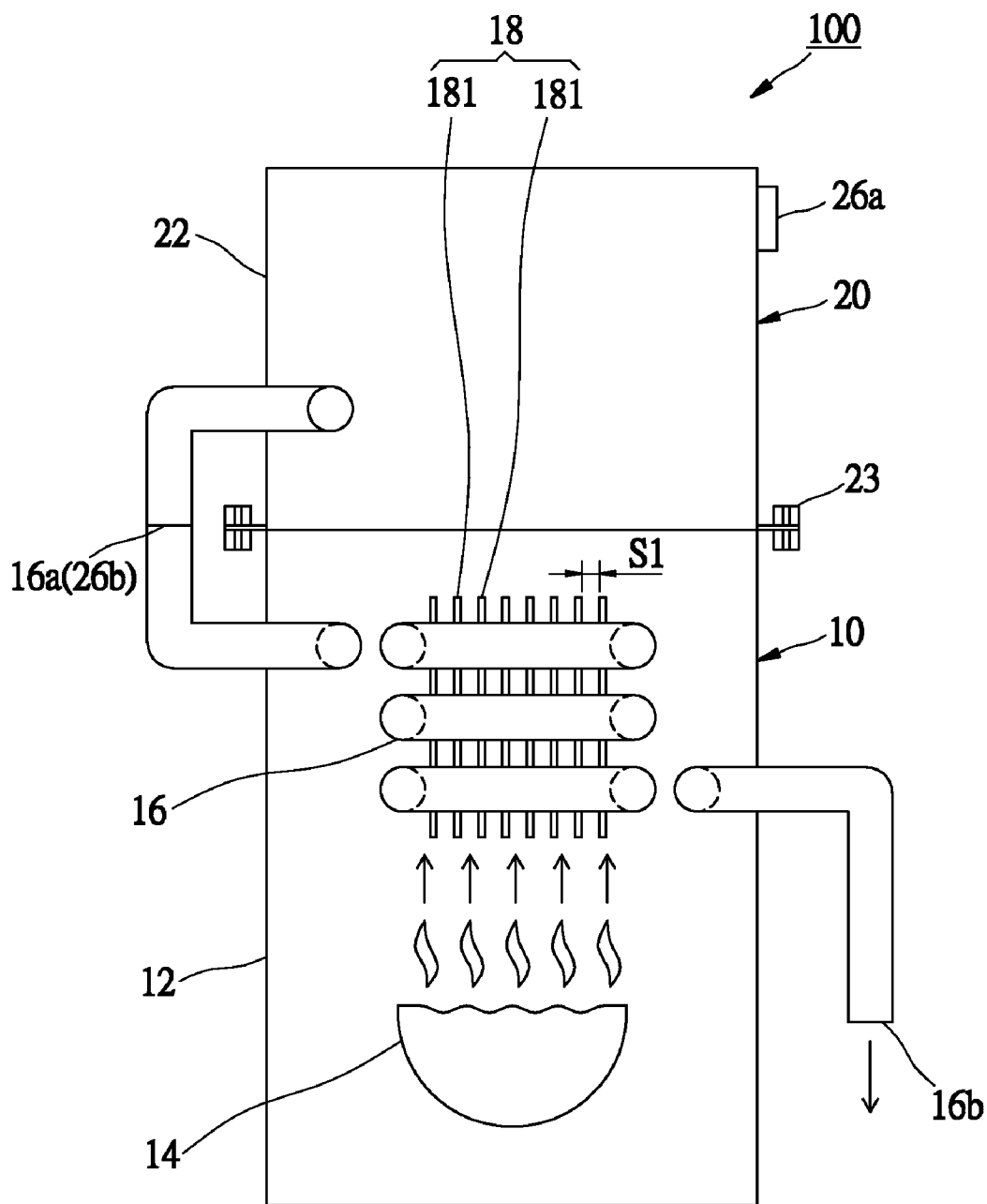


Fig.3

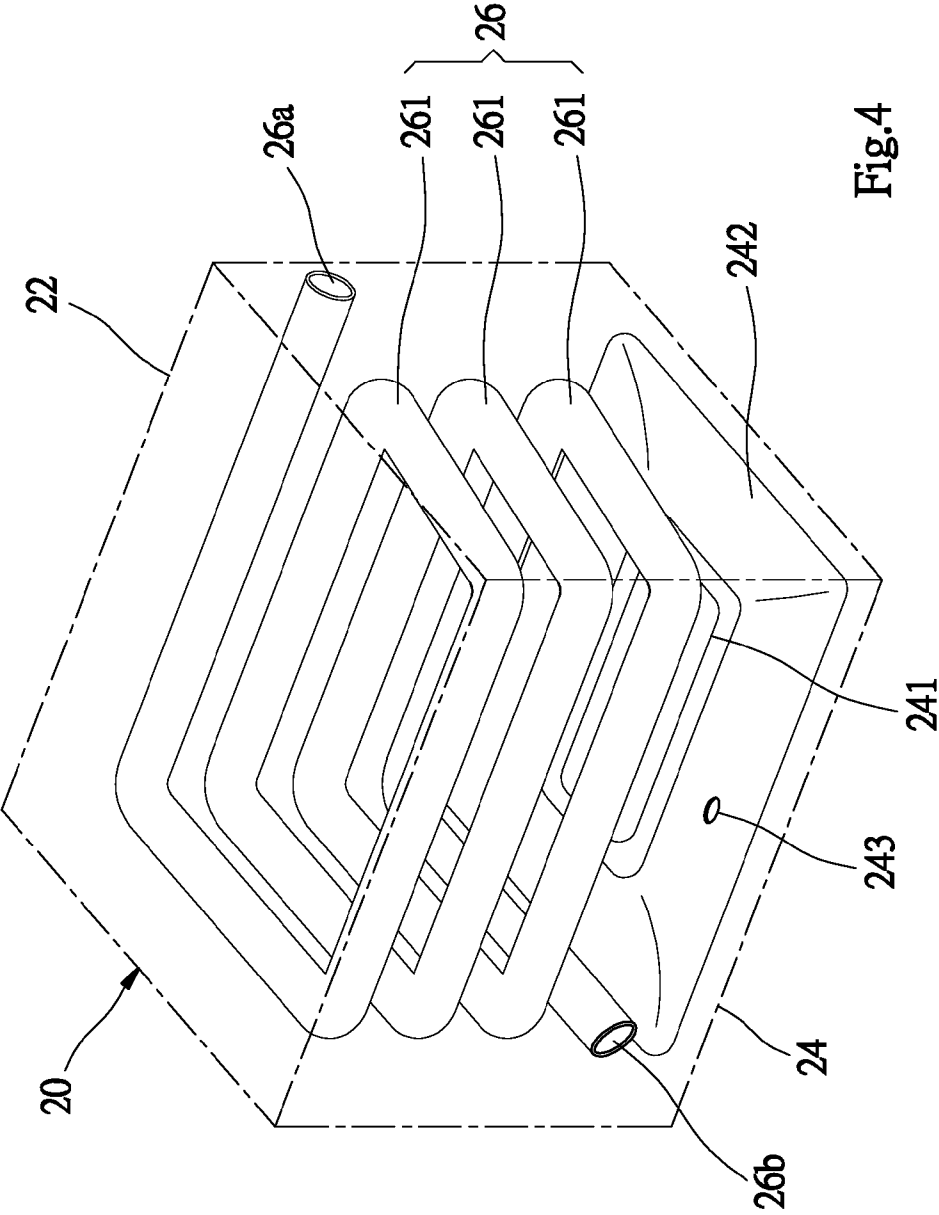


Fig.4

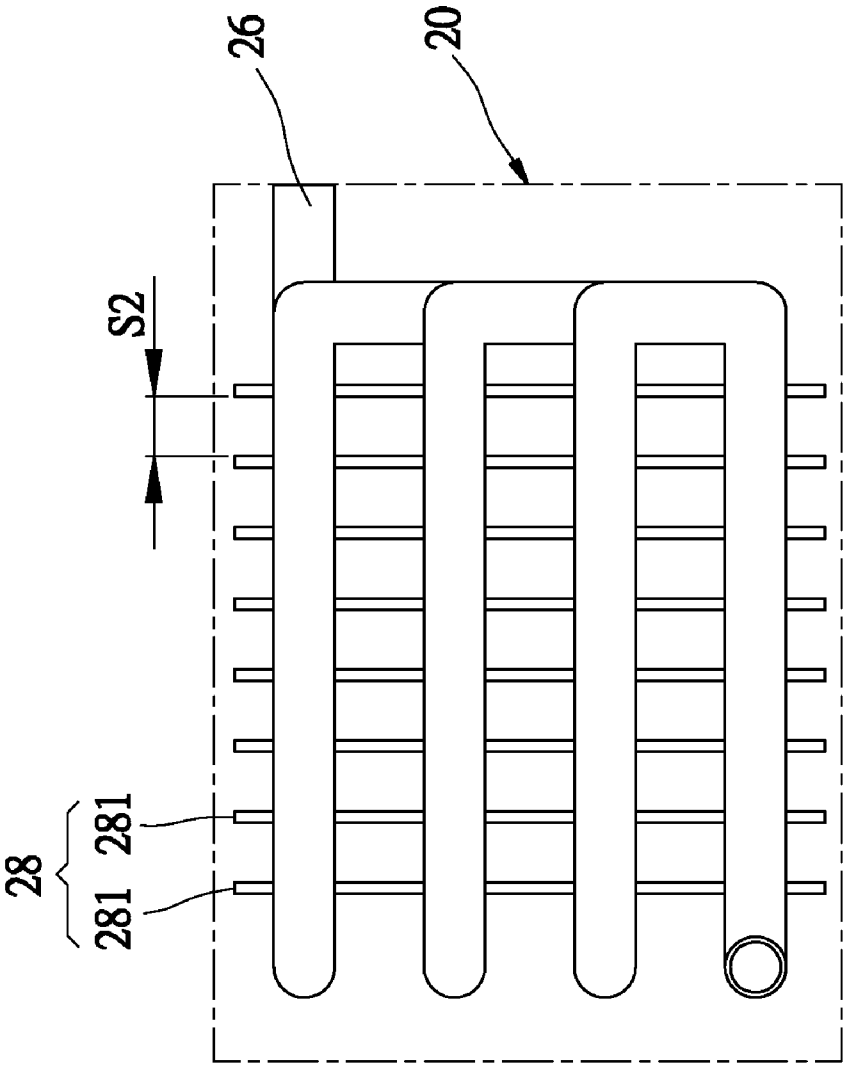


Fig.5

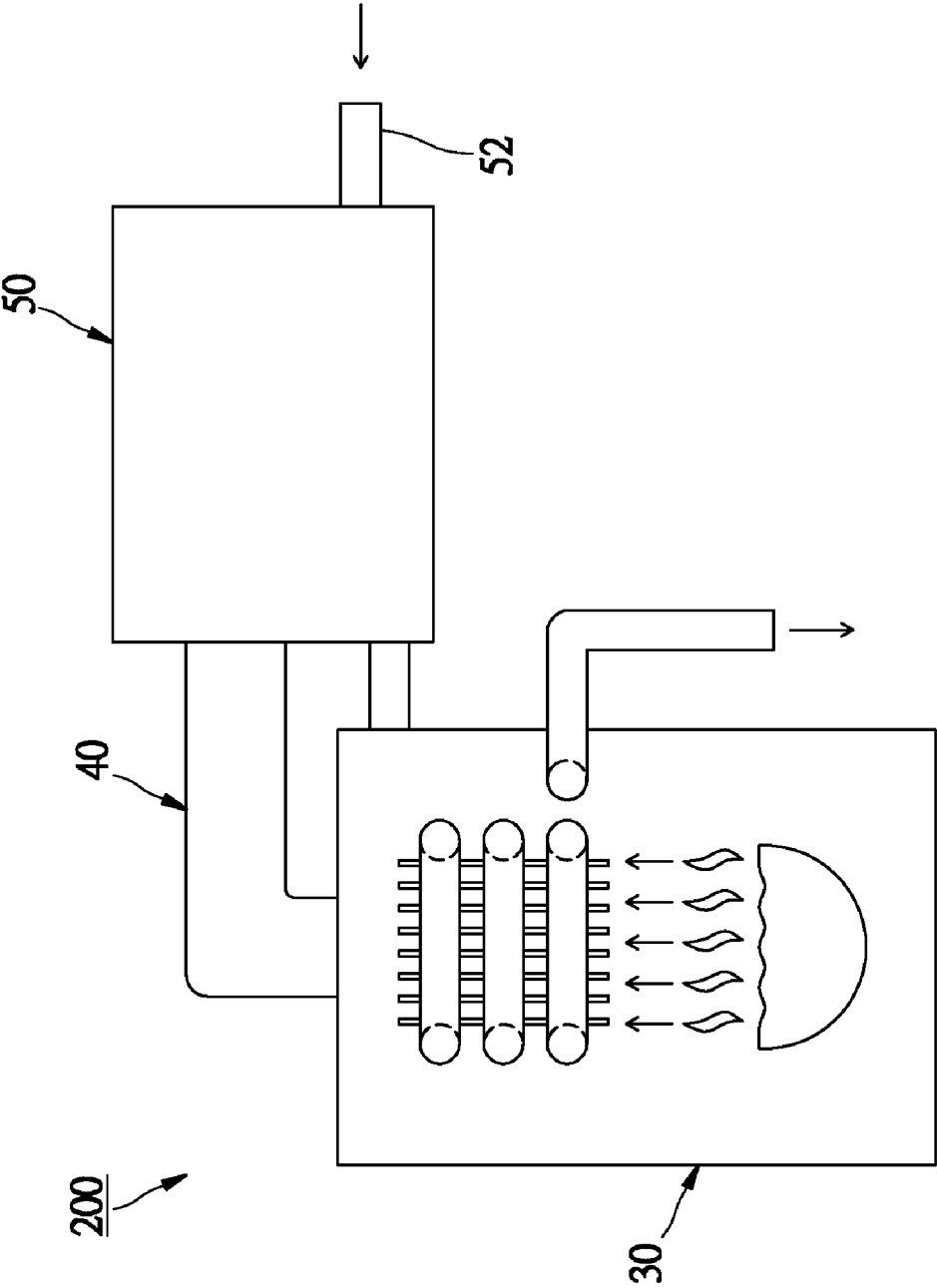


Fig.6

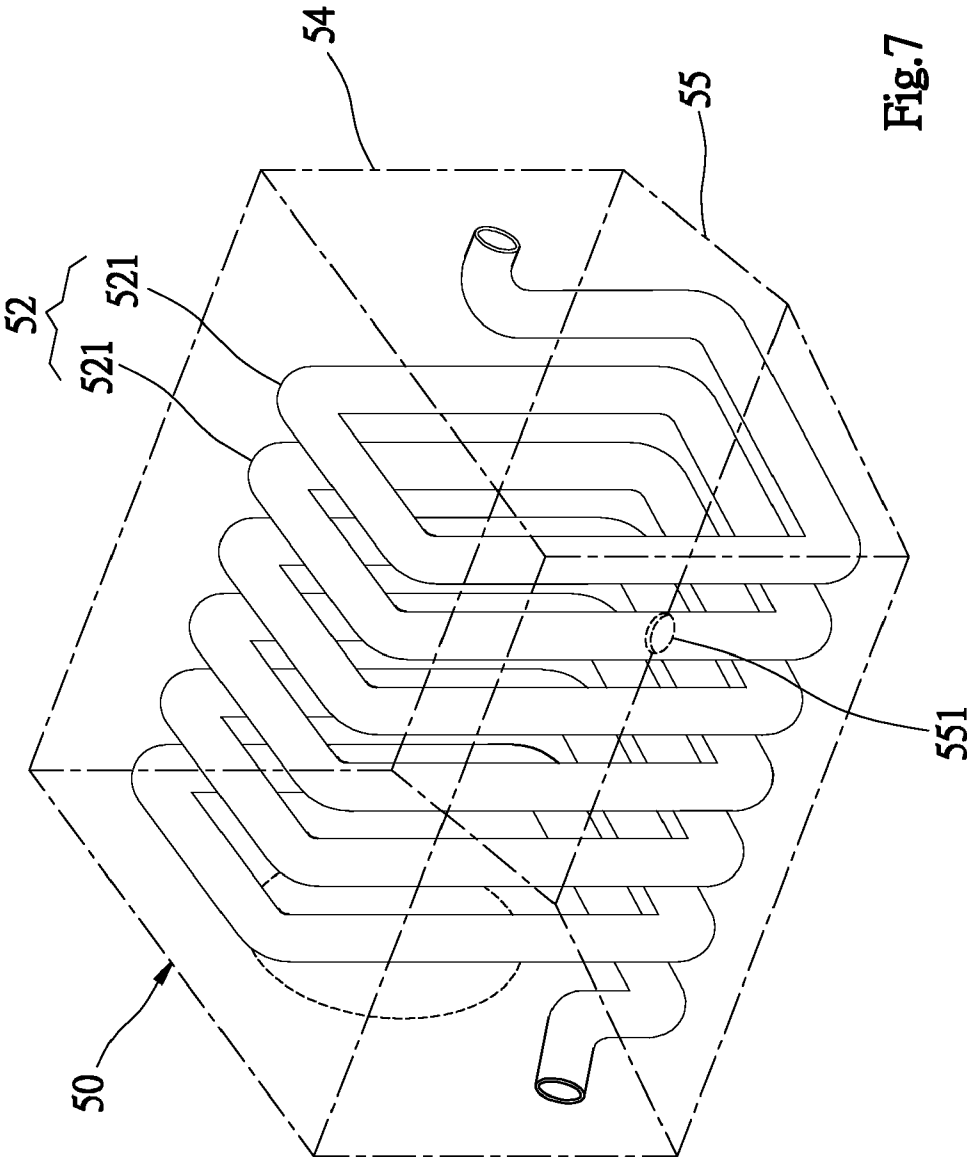


Fig. 7

**WATER HEATER MODULE HAVING
DETACHABLE HEAT EXCHANGER**

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates generally to a water heater, and more particularly to a water heater module equipped with a detachable heat exchanger in order to improve heat transfer efficiency.

[0003] 2. Description of the Related Art

[0004] FIG. 1 shows a conventional water heater including a burning chamber 1, a pipe assembly 2 above the burning chamber 1, and a heat exchanger 3 between an inlet 2a and an outlet 2b of the pipe assembly 2. It may heat cold water in the pipe assembly 2 with high temperature gas in the burning chamber 1 and the heated water flows out of the pipe assembly 2 via the outlet 2b. Such water heater is very common. However, its heat transfer efficiency is only between 72% and 83%. It is because that some thermal will escape along with the gas from the water heater rather than be transferred into water.

[0005] In order to improve heat transfer efficiency, some water heaters are equipped with secondary pipe assembly and heat exchanger therein that there are two sets of pipe assemblies and heat exchangers for pre-heating and heating that may improve the heat transfer efficiency. However, such water heater still has some problems:

[0006] 1. Both sets of pipe assemblies and heat exchangers are mounted in the water heater that such water heater usually has a greater size. It is inconvenient for delivery and assembling.

[0007] 2. Besides, both sets of pipe assemblies and heat exchangers are undetectable that there are two types of water heaters, which are single set of pipe assembly and heat exchanger and double sets of pipe assemblies and heat exchangers in the market for consumers to choose. Although the double sets type water heater has better heat transfer efficiency, its massive size is inconvenient for consumers.

[0008] 3. There are carbon dioxide and vapor in the high temperature gas. It causes the formation of acid water which adhere to surfaces of the pipe assemble. Moreover, most part of the pipe assemble is received in the water heater while the burning chamber is also received in the water heater that it is hard to wash the pipe assemble. Consequentially, acid water will eventually rust pipe assemble in the long run.

[0009] 4. When the high temperature gas heats the pipe assemblies in sequence, it will decrease the heat transfer efficiency because the high temperature gas is gathered in the same space.

SUMMARY OF THE INVENTION

[0010] The primary objective of the present invention is to provide a water heater module, in which a heat exchanger can be detachably mounted in any type of water heater. The water heater of the present invention has a higher compatibility and better heat transfer efficiency when the secondary heat exchanger is mounted.

[0011] The secondary objective of the present invention is to provide a water heater module equipped with a detachable heat exchanger, whose pipe is easy to wash and consequently reduces the rust problem.

[0012] According to the objectives of the present invention, a water heater module of the present invention includes a water heater and an extra heat exchanger. The extra heat exchanger has a spiral pipe and is detachably connected to the water heater. The pipe is heated by high temperature gas from

the water heater to pre-heat cold water in the pipe, and then the water is sent to the water heater for further heating.

[0013] In order to improve the heat transfer efficiency, the present invention further provides a first fin assembly having a plurality of fins and a second fin assembly also having a plurality of fins, wherein the first fin assembly is received in the water heater, and the second fin assembly is received in the extra heat exchanger. Furthermore, the first fin assembly has an exhaust cross section area, which is smaller than an exhaust cross section area of the second fin assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1 is a sketch diagram of the conventional water heater;

[0015] FIG. 2 is a perspective view of a first preferred embodiment of the present invention;

[0016] FIG. 3 is a sketch diagram of the first preferred embodiment of the present invention;

[0017] FIG. 4 is a sketch diagram of the heat exchanger without fins of the first preferred embodiment of the present invention;

[0018] FIG. 5 is a sketch diagram of the heat exchanger with fins of the first preferred embodiment of the present invention;

[0019] FIG. 6 is a sketch diagram of a second preferred embodiment of the present invention; and

[0020] FIG. 7 is a sketch diagram of the heat exchanger of the second preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0021] As shown in FIG. 2 and FIG. 3, a water heater module 100 of the first preferred embodiment of the present invention includes a water heater 10 and an extra heat exchanger 20. In the present embodiment, the water heater 10 is the same as the conventional water heater including a first case 12, in which a burning chamber 14, a first pipe 16 and a first fin assembly 18 are provided. The burning chamber 14 may generate high temperature gas to heat the first pipe 16. The first pipe 16 has a first connecting end 16a and an outlet 16b. The case 12 is provided with a first opening 121 at a top thereof. The first fin assembly 18 includes a plurality of fins 181 arranged in a predetermined pattern. Intervals between the fins 181 are defined as S1. The first pipe 16 extends through the fins 181.

[0022] The extra heat exchanger 20 includes a second case 22 having a plurality of detachable fasteners 23 to secure the first case 12 of the water heater 10. The second case 22 includes a bottom plate 24 having a second opening 241 communicated with the first opening 121 of the first case 12. In other words, the high temperature gas generated by the burning chamber 14 of the water heater 10 flows into the second case 22 through the first opening 121 and the second opening 241 in sequence.

[0023] The extra heat exchanger 20 further includes a second pipe 26 and a second fin assembly 28, as shown in FIG. 4 and FIG. 5. The second pipe 26 is a spiral pipe formed with a plurality of annular sections 261 from top down. The second pipe 26 has an inlet 26a and a connecting end 26b. Cold water flows into the second pipe 26 via the inlet 26a, and the connecting end 26b of the second pipe 26 is connected to the connecting end 16a of the first pipe 16 of the water heater 10. The bottom plate 24 of the second case 22 is provided with a collecting slot 242 with a curved bottom beside the second opening 241 and a weep hole 243 on the bottom of the collecting slot 242. The second case 22 further has a detachable panel 25. The second fin assembly 28 has a plurality of fins

281, and the second pipe 26 extends through the fins 281. Intervals between the fins 281 are defined as S2.

[0024] Above is the structure of the water heater module 100 of the first preferred embodiment of the present invention. In practice, the first case 12 is filled with the high temperature gas generated by the burning chamber 14 of the water heater 10, and the second case 22 is filled with the high temperature gas also to pre-heat water in the second pipe 26 that the water flows into the first pipe 16 from the second pipe 26 is warm. At the same time, the burning chamber 14 will also heat up the water in the first pipe 16 directly that the temperature of the water in the first pipe 16 will be raised within a short time.

[0025] The first fin assembly 18 has an exhaust cross section area which is smaller than that of the second fin assembly 28. The exhaust cross section area is the total cross section area of the high temperature gas generated by the burning chamber 14 of the water heater 10 passing through the fin assembly. Such structure will generate a stack effect with heat convection in the water heater 10 and the extra heat exchanger 20. It may help the high temperature gas going up to improve the heat transfer efficiency.

[0026] Choosing a suitable number of fins 181 and 281 of the first and second fin assemblies 18 and 28 may also help to achieve aforesaid stack effect. A number of the fins 181 of the first fin assembly 18 (shown in FIG. 3) is greater than the fins 281 of the second fin assembly 28 (shown in FIG. 5) that the intervals S1 of the fins 181 of the first fin assembly 18 is smaller than the intervals S2 of the fins 281 of the second fin assembly 28. Such pattern may generate aforesaid stack effect also. Besides the number of the fins, thickness of the fins may affect the stack effect also. For example, when the numbers of the fins 181 and 281 of the first and second fin assemblies 18 and 28 are the same and the fins 181 of the first fin assembly 18 are thicker, it may cause the exhaust cross section area of the first fin assembly 18 to become smaller than the second fin assembly 28.

[0027] The characters and advantages of the present invention are:

[0028] 1. The extra heat exchanger 20 is an independent item which has a high compatibility to be incorporated with any type of water heater. It may improve the heat transfer efficiency, and furthermore, consumers don't need to buy water heater with double pipes of other types to combine their water heater with the extra heat exchanger.

[0029] 2. Acid water on the second pipe 26 will drop into the collecting slot 242 on the bottom plate 24 of the second case 22 and flows out through the weephole 243. It may reduce the rust problem of the second case 22 and the second pipe 26.

[0030] 3. When the panel 25 of the second case 22 is disassembled, the second pipe 26 is exposed for washing and the burning chamber 14 will not interfere with washing.

[0031] 4. A predetermined design of the first and second fin assemblies 18 and 28 may achieve the stack effect. It may improve the heat transfer efficiency and reduce the production of waste gas for safety.

[0032] The water heater and the extra heat exchanger of the water heater of the present invention may be adjusted in its assembling way to become applicable to a different work place. FIG. 6 shows a water heater module 200 of the second preferred embodiment of the present invention, which has a water heater 30 and an extra heat exchanger 50 to be connected with a pipe 40. The extra heat exchanger 50 has a second pipe 52 therein which is a spiral pipe with several

annular sections 521. It may help the acid water dropping when the spiral second pipe 52 is clockwise from a top thereof. A second case 54 of the extra heat exchanger 50 has a bottom plate 55 with a weephole thereon to drain the acid water. The bottom plate 55 may be concave or tilted to collect acid water.

[0033] The description above is a few preferred embodiments of the present invention and the equivalence of the present invention is still in the scope of the claim of the present invention.

What is claimed is:

1. A water heater module, comprising:
 - a water heater including a first case, in which a burning chamber and a first pipe are provided, wherein the first pipe has a first connecting end and an outlet, and the first case has a first opening; and
 - an extra heat exchanger, which is detachably connected to the water heater, including a second case, in which a second pipe is provided, wherein the second case has a second opening communicated with the first opening of the water heater, and the second pipe has an inlet and a second end connected to the first end of the first pipe of the water heater.
2. The water heater module as defined in claim 1, wherein the second pipe of the extra heat exchanger is a spiral pipe having a plurality of annular sections, and the second case has a bottom plate, on which a collecting slot beside the second opening and a weephole communicated with the collecting slot are provided.
3. The water heater module as defined in claim 1, wherein the second pipe of the extra heat exchanger is a spiral pipe, which a spiral direction is clockwise from a top thereof, having a plurality of annular sections, and the second case has a bottom plate under the second pipe, on which a weephole is provided.
4. The water heater module as defined in claim 1, wherein the extra heat exchanger further has a detachable panel.
5. The water heater module as defined in claim 1, further comprising a first fin assembly having a plurality of fins and a second fin assembly having a plurality of fins, wherein the first pipe of the water heater extends through the fins of the first fin assembly, and the second pipe of the extra heat exchanger extends through the fins of the second fin assembly.
6. The water heater module as defined in claim 5, wherein the first fin assembly is proximal to the burning chamber compared to the second fin assembly, and therefore high temperature gas produced by the burning chamber of the water heater will pass through the first fin assembly and then the second fin assembly in sequence, and the first fin assembly has an exhaust cross section area, which is smaller than an exhaust cross section area of the second fin assembly.
7. The water heater module as defined in claim 6, wherein intervals between the fins of the first fin assembly is smaller than intervals between the fins of the second fin assembly.
8. The water heater module as defined in claim 6, wherein the fins of the first fin assembly are thicker than the fins of the second fin assembly.
9. The water heater module as defined in claim 6, wherein a number of the fins of the first fin assembly is greater than a number of the fins of the second fin assembly.

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