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(72) Inventors:
• **Kupka, Thomas**
51467 Bergisch Gladbach (DE)
• **Zhu, Zhongqin**
No.69 Wuxi (CN)

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(74) Representative: **Hocker, Thomas**
Vaillant GmbH
Berghauser Strasse 40
42859 Remscheid (DE)

(71) Applicant: **Vaillant GmbH**
42859 Remscheid (DE)

(54) **Gas water heater attachable with an adapter to realize central heating function**

(57) The present invention discloses an adapter capable of being attached to a gas water heater to achieve a central heating function. The adapter comprises a heat exchanger having a first fluid passageway capable of being intercommunicated to the gas water heater, and a second fluid passageway interchanging heat but physically isolated with said first fluid passageway; a first diverter valve connected to the first fluid passageway and being operable to selectively connect the first fluid passageway to the gas water heater thereby allowing fluid fed from the gas water heater to pass through the first fluid passageway. By employing the adapter as described above, the existing gas water heater can be upgraded to a gas boiler by simple modifications. As a result, the total invest is reduced for users, and cost of development and manufacturing is decreased for manufactures.

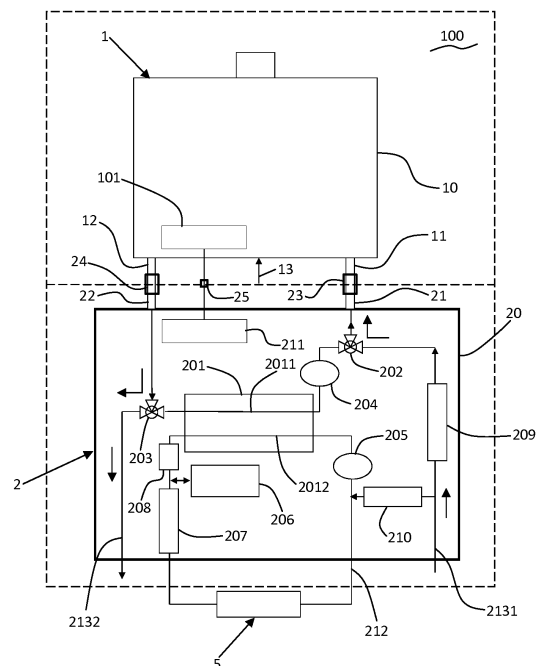


Fig. 1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to an adapter for water heating apparatus, and more particularly to an adapter being attachable to a gas water heater to achieve an additional central heating function.

[0002] The present invention also relates to a gas water heater for engaging with the adapter, and an assembly combining the gas water heater and the adapter.

BACKGROUND OF THE INVENTION

[0003] Gas water heating apparatuses generally include gas water heaters and gas boilers. A typical gas water heater can provide sanitary hot water for domestic usage, such as use in the kitchen, laundry, and bath. The water heater may include a gas burner for combustion of a gas-air mixture, heat exchanger coils for heating water as it flow therethrough, and hydraulic pipes connected with external plumbing for supplying hot water. A typical gas boiler is operable to heat water which is pumped around a boiler circuit. The boiler circuit is typically connected, via suitable valves to space heaters, such as radiators or under floor heating loop, so that the heat output from the boiler can be used for central heating purposes.

[0004] Since a gas boiler has a price much higher than that of a gas water heater, users incline to buy a gas water heater rather than a gas boiler when they have poor economical situation at an earlier stage, and then replace the gas water heater with a gas boiler when their economical situation becomes better. Obviously, the replaced gas water heater has to be scrapped, which will result in a waste of resources, and will no doubt increase the total cost for users.

SUMMARY OF THE INVENTION

[0005] It is an object of present invention to provide an adapter capable of being attached to a gas water heater to achieve an additional central heating function, also, provide a gas water heater adapted for engaging with the adapter and an assembly combining the adapter and the gas water heater.

[0006] According to one aspect of the present invention there is provided an adapter capable of being attached to a gas water heater to achieve a central heating function. The adapter comprises a heat exchanger having a first fluid passageway capable of being intercommunicated to the gas water heater, and a second fluid passageway interchanging heat but physically isolated with said first fluid passageway; a first diverter valve connected to the first fluid passageway and being operable to selectively connect the first fluid passageway to the gas water heater thereby allowing fluid fed from the gas water heater to pass through the first fluid passageway.

[0007] Preferably, the adapter comprises a first circulation pump connected with the first fluid passageway to force fluid to circulate in the first fluid passageway and the gas water heater.

[0008] Preferably, the adapter comprises a third fluid pipelines having an fluid incoming line and an fluid outgoing line. One of the fluid incoming line and the fluid outgoing line is connected to the first diverter valve in such a way that, said one of the fluid incoming line and the fluid outgoing line and the first fluid passageway is permitted to alternatively intercommunicate with the gas water heater.

[0009] Preferably, the adapter comprises a second diverter valve, and the other of the fluid incoming line and the fluid outgoing line is connected to the second diverter valve in such a way that, said the other of the fluid incoming line and the fluid outgoing line and the first fluid passageway is permitted to alternatively intercommunicate with the gas water heater.

[0010] Preferably, the first circulation pump is also operable to force fluid to circulate in the third fluid pipelines and the gas water heater.

[0011] Preferably, the adapter comprises a second fluid pipelines, and said second fluid passageway forms one portion of the second fluid pipelines.

[0012] Preferably, the adapter comprises a second pump connected in the second fluid pipelines to force fluid to circulate in the second fluid pipelines and external radiators.

[0013] According to another aspect of the present invention there is provided a gas water heater capable of being attached with an aforementioned adapter to achieve a central heating function. The gas water heater comprises a first housing, and a first inlet tube and a first outlet tube both extending out of the first housing; a burner contained in the first housing; a main heat exchanger disposed on the burner for absorption of heat and transferring heat to fluid flowing therethrough; a hood disposed on the main heat exchanger for conveying flue gas away from the gas water heater, and a connection interface for connection of the gas water heater with the adapter, said connection interface comprising connection structures disposed at the first inlet and first outlet tubes.

[0014] Preferably, the connection interface further comprises an electrical connector for connecting with a complementary electrical connector of the adapter.

[0015] According to another aspect of the present invention there is provided an assembly comprising a gas water heater for supplying sanitary hot water and the aforementioned adapter. The gas water heater comprises a first housing, and a first inlet tube and a first outlet tube both extending out of the first housing. The adapter is adapter being attachable to the gas water heater and comprising a second housing, and a second inlet tube and a second outlet tube both extending out of the second housing. When the adapter is attached to the gas water heater, the first inlet tube engages with the second outlet tube, and the first outlet tube engages with the second

inlet tube.

[0016] Preferably, the gas water heater comprises a first controller, and the adapter comprises a second controller, wherein the first controller and the second controller establish an electrical connection therebetween via an electrical connector assembly.

[0017] According to another aspect of the present invention there is provided an adapter capable of being attached to a gas water heater and connecting to external radiators to achieve an additional central heating function. The adapter comprises a first fluid pipelines for being in fluid communication with the gas water heater; and a second fluid pipelines and a third fluid pipelines, wherein one of said second and third fluid pipelines is adapted for connecting to external radiators, and the other of said second and third fluid pipelines is adapted for connecting external plumbing to supply hot water for domestic usage.

[0018] Preferably, the adapter comprises a heat exchanger comprising a first fluid passageway and a second fluid passageway, wherein said first fluid passageway forms one portion of the first fluid pipelines, and said second fluid passageway forms one portion of the second fluid pipelines.

[0019] Preferably, the third fluid pipelines comprises a fluid incoming line and a fluid outgoing line; wherein the adapter further comprises a first diverter valve, a second inlet tube and a second outlet tube both connecting to the first fluid pipelines for respectively being input fluid from and outputting fluid to the gas water heater, and said first diverter valve is operable to permit the fluid outgoing line and the first fluid passageway to alternatively intercommunicate with the second inlet tube.

[0020] Preferably, the adapter comprises a second diverter valve when the second fluid pipelines is used for supplying sanitary hot water, wherein said second diverter valve is operable to permit the fluid incoming line and the first fluid passageway to alternatively intercommunicate with the second outlet tube.

[0021] By employing the adapter as described above, the existing gas water heater can be upgraded to a gas boiler by simple modifications. As a result, the total invest is reduced for users, and cost of development and manufacturing is decreased for manufactures.

[0022] The foregoing has outlined rather broadly the features and technical advantages of the present invention in order that the detailed description of the invention that follows may be better understood. Additional features and advantages of the invention will be described hereinafter which form the subject of the claims of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] For a more complete understanding of the present invention, and the advantages thereof, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

[0024] Fig. 1 is a schematic diagram illustrating an assembly combining a gas water heater and an adapter in accordance with a first embodiment of present invention, wherein the assembly is working at a mode in order to supply hot water for domestic usage;

[0025] Fig. 2 is a schematic diagram illustrating the assembly shown in Fig. 1, wherein the assembly is working at a mode for central heating;

[0026] Fig. 3 is a schematic diagram illustrating an assembly combining a gas water heater and an adapter in accordance with a second embodiment of present invention, wherein the assembly is working at a mode to supply hot water for domestic usage;

[0027] Fig. 4 is a schematic diagram illustrating the assembly shown in Fig. 3, wherein the assembly is working at a mode for central heating;

[0028] Fig. 5 is a front view of the gas water heater shown in Figs. 1 and 4 with a cover removed for showing the internal structure thereof.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0029] Reference will now be made to the drawing figures to describe the preferred embodiments of the present invention in detail. However, the embodiments can not be used to restrict the present invention. Changes such as structure, method and function obviously made to those of ordinary skill in the art are also protected by the present invention.

[0030] Gas water heaters and gas boilers could be fired with combustible gas, such as natural gas, city gas, liquefied petroleum gas, methane, etc., thereby supplying hot water and/or heating living space for domestic sanitary usage and heating purpose.

[0031] First referring to Fig. 5, a gas water heater 1 in accordance with one embodiment of present invention, includes a first housing 10, a first controller 101 (as shown in Fig. 1) accommodated in the first housing 10, an exhaust gas device 102, a main heat exchanger 103, a burner 104, an air supply fan 105, a gas valve 1061, a gas distribution device 1062, a flow rate control valve 107, and a first inlet tube 11, a first outlet tube 12, a gas supply pipe 13 extending out of the first housing 10.

[0032] The first controller 101 is capable of controlling combustion of the burner 104, operation of the air supply fan 105, and opening of the gas valve 1061, etc.. The first controller 101 may incorporate a Micro Controller Unit (MCU). Of course, the first controller 101 can also use other types of integrated circuits, such as Application Specific Integrated Circuit (ASIC) and Field Programmable Gate Array (FPGA) etc.. As controlling of electronic components of the gas water heater by means of the first controller 101 is known in the art, a detailed description is omitted for purpose of brevity and simplicity.

[0033] The first housing 10 may be in box-shaped and composed of a number of plates, such as a front plate, a back plate, a top plate, a bottom plate, and a pair of

side plates. The first housing 10 can be mounted to a wall of a building with its back plate facing the wall. The burner 104 may be constituted by a number of burner blades (not shown) arranged side by side. Each burner blade generally defines therein a gas-air mixture passage for mixing fuel gas supplied from the gas supply pipe 13 and combustion air supplied by the air supply fan 105, and delivering the gas-air mixture to top thereof for being ignited and burning.

[0034] The main heat exchanger 103 is placed above the burner 104. The main heat exchanger 103 may include multiple heat absorbing fins and a heat absorbing pipe passing through the multiple heat absorbing fins. The heat absorbing pipe is connected with an upstream water supply channel and a downstream hot water delivering channel. Water passing through the first inlet tube 11 and the upstream water supply channel is then heated in the main heat exchanger 103 by heat interchanging with combustion exhaust gas of the burner 104. Heated hot water is fed to the downstream hot water delivering channel and further passes through the first outlet tube 12 for domestic sanitary use.

[0035] The exhaust gas device 102 is placed upon the main heat exchanger 103, which includes a hood and an discharging duct disposed on top of the hood. The hood collects flue gas generated by the burner 104 passing through the heat exchanger 103, and then the flue gas is discharged to the outdoors through the discharging duct. The air supply Fan 105 is provided in a lower portion of the first housing 10, which is operated to supply outside air to the burner 104 as combustion air, also, force the flue gas to be discharged outdoors.

[0036] The gas valve 1061 is connected with the gas supply pipe 13 and incorporates a main valve operable to turn-on or shutoff the gas flow and a proportional valve operable to control a combustion amount of the burner 103. The fuel gas passing through the gas valve 1061 and the gas distribution device 1062 is ejected into the burner 104, and then mixes with combustion air for being ignited.

[0037] The first inlet tube 11 and the first outlet tube 12 are provided upstream and downstream of the main heat exchanger 103, respectively, for introduction of cold water and output of hot water. The first inlet tube 11 is connected with the flow rate control valve 107 disposed at downstream thereof for adjusting the flow rate. For example, the first controller 101 is able to determine an appropriate flow rate in accordance with detection of cold water temperature value, hot water temperature value, target temperature value set by the user, as well as the amount of gas supply, and then control the flow rate control valve 107 to adjust the flow rate to the desired value. Moreover, when the water pressure is at a low level, the first controller 101 can control the flow rate control valve 107 to adjust the flow rate to output a smaller water flow corresponding to current water pressure level, so as to ensure the gas water heater can be used normally even at a lower water pressure level. Furthermore, in some

cases, the actual water temperature could not reach the preset temperature even opening of the gas valve 1061 reaches the maximum degree when the gas water heater works in winter, in this circumstance, the first controller 101 can control the flow rate control valve 107 to adjust the flow rate to a lower value, thereby allowing the temperature of output hot water can reach the preset value.

[0038] With reference to Figs. 1 and 2, which show an assembly 100 of the gas water heater as described above attached with an adapter 2 in accordance with a first embodiment of present invention. In this embodiment, the adapter 2 includes a second housing 2, a heat exchanger 201 contained in the second housing 2, a first diverter valve 203, a second diverter valve 202, a first circulation pump 204, a second circulation pump 205, a expansion vessel 206, a safety valve 207, an NTC thermistor 208, a flow sensor 209, a fill valve 210, a second controller 211, and a second inlet tube 22 and a second outlet tube 21 both extending out of the second housing 2.

[0039] The second controller 211 is provided for control the operation of electric or electronic components in the adapter 2, such as the first and the second diverter valves, and the first and the second circulation pumps. The second controller 211 may incorporate a Micro Controller Unit (MCU). Of course, the second controller 211 can also use other types of integrated circuits, such as Application Specific Integrated Circuit (ASIC) and Field Programmable Gate Array (FPGA) etc..

[0040] Referring to Figs. 1 and 2, the gas water heater 1 and the adapter 2 define a connection interface therebetween, as the broken line shown between the gas water heater 1 and the adapter 2. As used hereinafter, the term "connection interface" may be defined as any of the structures and electrical connections formed between the gas water heater 1 and the adapter 2. For example, in this embodiment, the first inlet tube 11 of the gas water heater 1 engages with the second outlet tube 21 of the adapter 2, and the first outlet tube 12 of the gas water heater 1 engages with the second inlet tube 22 of the adapter 2. In this case, the first inlet tube 11 and the second outlet tube 21 each is formed with outer threads thereof, and a pipe joint 23 with inner threads can connect these two parts together; similarly, another pipe joint 24 can connect the first outlet tube 12 and the second inlet tube 22 together.

[0041] In addition, the connection interface may include an electrical connector assembly 25 which consists of an electrical connector, e.g. a male connector, disposed in the gas water heater 1 and electrically connected with the first controller 101, and a complementary electrical connector, e.g. a female connector, disposed in the adapter 2 and electrically connected with the second controller 211. Therefore, the first controller 101 and the second controller 211 can establish an electrical communication path therebetween by means of engagement of the two connectors. For example, when the flow sensor 209 detects there is water incoming into the adapter 2, a signal will be generated and fed to the second controller

211, then the second controller 211 determines the incoming water need to be heated and sends a signal to the first controller 101 through the electrical connector assembly 25. After that, the first controller 101 is operable to turn on the gas valve 1061, ignite the burner, and continuously control related electric components to heat the incoming water and maintain the water temperature at a preset value.

[0042] Referring to Fig. 1, the heat exchanger 201 may be a conventional plate heat exchanger typically uses metal plates to transfer heat between two fluids. In this embodiment, the heat exchanger 201 includes a first fluid passageway 2011 and a second fluid passageway 2012, wherein the first fluid passage 2011 and the second fluid passageway 2012 are physically isolated but allowing heat interchanging therebetween. As plate heat exchangers are known in the art, a detailed description of structure and functional operation are omitted for purpose of brevity and simplicity.

[0043] The adapter 2 includes a second housing 20, and a first fluid pipelines, a second fluid pipelines 212, and a third fluid pipelines provided in the second housing 20. In this embodiment, the first fluid pipelines are used to establish a fluid path between the gas water heater 1 and the heat exchanger 201. The first fluid pipelines includes the section between the second inlet tube 22 and the first diverter valve 203, the section between the first diverter valve 203 and the first circulation pump 204, the section between the first circulation pump 204 and the second diverter valve 202, and the section between the second diverter valve 202 and the second outlet tube 21. Therefore, the first fluid passageway 2011 forms one portion of the first fluid pipelines. The second fluid pipelines 212 forms a closed circuit established between the external radiators 5 and the heat exchanger 201, and the second fluid passageway 2012 forms one portion of the second fluid pipelines 212. The third fluid pipelines is used to connect to external plumbing, and includes a fluid incoming line 2131 for introduction of water and a fluid outgoing line 2132 for output of heated water.

[0044] In this embodiment, the first diverter valve 203 and the second diverter valve 202 each employs a three-way valve. The typical three-way valve includes a central port and two side ports, and the central port is able to alternatively intercommunicate with the two side ports. For the first diverter valve 203, the central port thereof receives the incoming water from the gas water heater 1 passing through the second inlet tube 22, and two side ports intercommunicate with the first fluid passageway 2011 and the fluid outgoing line 2132 respectively. In this way, the second controller 211 is operable to control the first diverter valve 203 to alternatively connect to the first fluid passageway 2011 and the fluid outgoing line 2132, in other words, only one of the first fluid passageway 2011 and the fluid outgoing line 2132 is allowed to intercommunicate with the gas water heater 1 at one time. For the second diverter valve 202, the central port outputs water to the gas water heater 1 via the second outlet tube

21, and two side ports intercommunicate with the first fluid passageway 2011 and the fluid incoming line 2131 respectively. In this way, the second controller 211 is operable to control the second diverter valve 202 to alternatively connect to the first fluid passageway 2011 and the fluid incoming line 2131, in other words, only one of the first fluid passageway 2011 and the fluid incoming line 2131 is allowed to fluid communicate with the gas water heater 1 at one time.

[0045] The first circulation pump 204 is disposed associated with the first fluid passageway 2011. In this embodiment, the first fluid pipelines and the hydraulic pipes of the gas water heater 1 form a closed circuit, and the first circulation pump 204 is disposed in the first fluid pipelines for driving fluid to circulate between the gas water heater 1 and the heat exchanger 201. The second circulation pump 205 is disposed in the closed loop formed by the second fluid pipelines 212 for driving fluid to circulate between the external radiators 5 and the heat exchanger 201.

[0046] In this embodiment, the expansion vessel 206 and the safety valve 207 are connected to the second fluid pipelines 212 to absorb excess pressure caused by thermal expansion and release the pressure when the pressure value within the second fluid pipelines exceeds a predetermined threshold, thereby protecting the closed loop from excessive pressure.

[0047] The thermistor 208 is disposed in the second fluid pipelines 212 to monitor the temperature value of the fluid circulating therein. The flow sensor 209 is provided in the fluid incoming line 2131 for sensing the incoming water. The fill valve 210 is provided between fluid incoming line 2131 and the second fluid pipelines 212 to add water in case the closed loop of the second fluid pipelines 212 lacks of water.

[0048] Referring to Fig. 1, which shows an assembly 100 composed by the gas water heater 1 attached with the adapter 2 and equivalent to a conventional gas-fired boiler. As the assembly works at the mode shown in Fig. 1, it supplies hot water for domestic usage. When the flow sensor 209 detects an incoming water flow, a signal is generated and transmitted to the second controller 211, then the second controller 211 controls the first diverter valve 203 to establish a fluid path between the gas water heater 1 and the fluid outgoing line 2132, and controls the second diverter valve 202 to establish a fluid path between the gas water heater 1 and the fluid incoming line 2131. In the meantime, the first fluid passageway 2011 is blocked, thus, the heat exchanger 201 and the radiators 5 are both disabled. As indicated by arrows shown in Fig. 1, the incoming water sequentially passes through the fluid incoming line 2131, the second diverter valve 202, the second outlet tube 21 and enters the gas water heater 1 to be heated; then the heated water sequentially passes through the second inlet tube 22, the first diverter valve 203, and the fluid outgoing line 2132 to supply hot water to users for drinking or bathing.

[0049] As the assembly works at the mode shown in

Fig. 2, it achieves the function of central heating. When the room temperature is detected to drop lower than a predetermined threshold by an appropriate sensor, the second controller 211 controls the first diverter valve 203 and the second diverter valve 202 to connect the first fluid passageway 2011 to the gas water heater 1 to form a closed loop. In the mean time, the fluid incoming line 2131 and the fluid outgoing line 2132 are both blocked, and the second controller 211 controls the operation of the first circulation pump 204 and the second circulation pump 205. The water heated by the gas water heater 1 passes through the first fluid passageway 2011 exchange heat with the fluid passing through the second fluid passageway 2012, then the heated fluid passes through the radiators 5 to dissipate heat into the room, thereby achieving the central heating function.

[0050] Figs. 3 and 4 shows an assembly 200 of the gas water heater 1 attached with an adapter 3 in accordance with a first embodiment of present invention. In this embodiment, the adapter 3 includes a second housing 30, a heat exchanger 301 contained in the second housing 30, a first diverter valve 302, a first circulation pump 303, an expansion vessel 304, a safety valve 305, NTC thermistors 308, 309, a flow sensor 307, a fill valve 306, a second controller 310, and a second inlet tube 32 and a second outlet tube 31 both extending out of the second housing 3. Since most of parts of this embodiment is the same or alike as those of the first embodiment, applicant will mainly describe the modifications of this embodiment with respect to the first embodiment hereinafter.

[0051] In this embodiment, the adapter 3 includes a first fluid pipelines, a second fluid pipelines 312, and a third fluid pipelines. The first fluid pipelines are used to establish a fluid path between the gas water heater 1 and the heat exchanger 301. The first fluid pipelines extend from the second inlet tube 32, and pass through the first diverter valve 302, the first fluid passageway 3011, and the first circulation pump 303, then get to the second outlet tube 31. Therefore, the first fluid passageway 3011 forms one portion of the first fluid pipelines.

[0052] In this embodiment, the second fluid pipelines 312 is used to connect to external plumbing for supplying hot water. The second fluid passageway 3012 forms one portion of the second fluid pipelines 212. The flow sensor 312 and the thermistor 308 are disposed in the second fluid pipelines.

[0053] The third fluid pipelines connect the external radiators 5 and the heat exchanger 301 to form a closed circuit. The third fluid pipelines include a fluid incoming line 3131 for introduction of water and a fluid outgoing line 3132 for output of heated water.

[0054] The first diverter valve 302 employs a three-way valve, and it has a central port for receiving the incoming water from the gas water heater 1 passing through the second inlet tube 32, and two side ports intercommunication with the first fluid passageway 3011 and the fluid outgoing line 3132 respectively. In this way, the second controller 310 is operable to control the first diverter valve

303 to alternatively intercommunicate the first fluid passageway 3011 and the fluid outgoing line 3132, in other words, only one of the first fluid passageway 3011 and the fluid outgoing line 3132 is allowed to intercommunicate with the gas water heater 1 at one time.

[0055] In this embodiment, the expansion vessel 304 and the safety valve 305 are connected to the third fluid pipelines. The thermistor 309 is disposed in the third fluid pipelines. The fill valve 306 is provided between the second fluid pipelines 312 and the third fluid pipelines to add water in case the closed loop composed of the third fluid pipelines and the radiators 5 lacks of water.

[0056] The main difference of present embodiment with respect to the first embodiment is that, the gas water heater 1 is disposed in a closed loop all the time to perform as a heat source either in providing domestic hot water or for central heating purpose, and only one circulation pump, namely the first circulation pump 303 is employed to force the fluid to circulate in the closed loop including the heat exchanger 301 or in another closed loop including the radiators 5.

[0057] As the assembly 200 works at the mode shown in Fig. 3, it supplies hot water for domestic usage. The second controller 310 controls the first diverter valve 302 to establish a fluid path between the gas water heater 1 and the first fluid passageway 3011, thus, a closed circuit is formed. As indicated by arrows shown in Fig. 3, the water heated by the gas water heater 1 passes through the first fluid passageway 3011 with heat interchanging with the fluid passing through the second fluid passageway 3012, and flows back the gas water heater land cycled. The water passing through the second fluid passageway 3012 is heated and distributed to users for domestic usage.

[0058] As the assembly 200 works at the mode shown in Fig. 4, it is performed for central heating purpose. The second controller 310 controls the first diverter valve 302 to intercommunicate with the first fluid passageway 3011 and the gas water heater 1 to form a closed loop. In the mean time, the second controller 310 controls the operation of the first circulation pump 303 to force the fluid heated by the gas water heater 1 to pass through the second inlet tube 32, the first diverter valve 302, the fluid outgoing line 3132, the radiators 5 to dissipate heat into the room space, and enters the gas water heater 1 via the fluid incoming line 3131, thereby achieving the central heating function.

[0059] By employing the adapter as described above, the existing gas water heater can be upgraded to a gas boiler by simple modifications. As a result, the total invest is reduced for users, and cost of development and manufacturing is decreased for manufactures.

[0060] Of course, present invention is not limited to embodiments described above, which may include a number of modifications based on previous embodiments for ordinary person skilled in the art. For example, the adapter can be designed as a backpack, and the connection interface can take plug-in forms, therefore,

when the existing gas water heater need to be modified as a gas boiler, just plug the adapter into the gas water at the connection interface. In addition, the second controller in the adapter can be omitted, and all the operation of the electrical components in the adapter can be controlled by the first controller disposed in the gas water heater.

[0061] It is to be understood, however, that even though numerous, characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosed is illustrative only, and changes may be made in detail, especially in matters of number, shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broadest general meaning of the terms in which the appended claims are expressed.

Claims

1. An adapter (2, 3) capable of being attached to a gas water heater (1) to achieve a central heating function, comprising:

a heat exchanger (201, 301) having a first fluid passageway (2011, 3011) capable of being intercommunicated to the gas water heater, and a second fluid passageway (2012, 3012) interchanging heat but physically isolated with said first fluid passageway;
a first diverter valve (203, 302) connected to the first fluid passageway and being operable to selectively connect the first fluid passageway to the gas water heater thereby allowing fluid fed from the gas water heater to pass through the first fluid passageway.

2. An adapter according to claim 1, further comprising a first circulation pump (204, 303) connected with the first fluid passageway to force fluid to circulate in the first fluid passageway and the gas water heater.
3. An adapter according to claim 1, further comprising a third fluid pipelines having an fluid incoming line (2131, 3131) and an fluid outgoing line (2132, 3132); wherein one of the fluid incoming line and the fluid outgoing line is connected to the first diverter valve in such a way that, said one of the fluid incoming line and the fluid outgoing line and the first fluid passageway is permitted to alternatively intercommunicate with the gas water heater.
4. An adapter according to claim 3, further comprising a second diverter valve (202); wherein the other of the fluid incoming line and the fluid outgoing line is connected to the second diverter valve in such a way

that, said the other of the fluid incoming line and the fluid outgoing line and the first fluid passageway is permitted to alternatively intercommunicate with the gas water heater.

5. An adapter according to claim 3, wherein said first circulation pump (303) is also operable to force fluid to circulate in the third fluid pipelines and the gas water heater.
6. An adapter according to claim 1, further comprising a second fluid pipelines (212, 312), and wherein said second fluid passageway forms one portion of the second fluid pipelines.
7. An adapter according to claim 6, further comprising a second pump (205) connected in the second fluid pipelines (212) to force fluid to circulate in the second fluid pipelines and external radiators (5).
8. A gas water heater (1) capable of being attached with an adapter (2, 3) according to any of the claims 1-7 to achieve a central heating function, comprising:
 - a first housing (10), and a first inlet tube (11) and a first outlet tube (12) both extending out of the first housing;
 - a burner (104) contained in the first housing;
 - a main heat exchanger (103) disposed on the burner for absorption of heat and transferring heat to fluid flowing therethrough;
 - a hood (102) disposed on the main heat exchanger for conveying flue gas away from the gas water heater, and
 - a connection interface for connection of the gas water heater with the adapter, said connection interface comprising connection structures disposed at the first inlet and first outlet tubes.
9. A gas water heater according to claim 8, wherein said connection interface further comprises an electrical connector for connecting with a complementary electrical connector of the adapter.

10. An assembly (100, 200), comprising:

a gas water heater (1) for supplying sanitary hot water, said gas water heater comprising a first housing (10), and a first inlet tube (11) and a first outlet tube (12) both extending out of the first housing;
an adapter (2) according to any of the claims 1-7, said adapter being attachable to said gas water heater and comprising a second housing (20, 30), and a second inlet tube (22, 32) and a second outlet tube (21, 31) both extending out of the second housing; wherein
when the adapter is attached to the gas water

heater, the first inlet tube engages with the second outlet tube, and the first outlet tube engages with the second inlet tube.

11. An assembly according to claim 10, wherein said gas water heater comprises a first controller (101), and said adapter comprises a second controller (211, 310); wherein said first controller and said second controller establish an electrical connection therebetween via an electrical connector assembly (25). 5 10

12. An adapter (2, 3) capable of being attached to a gas water heater (1) and connecting to external radiators (5) to achieve an additional central heating function, comprising: 15
 - a first fluid pipelines, for being in fluid communication with the gas water heater; and
 - a second fluid pipelines and a third fluid pipelines, wherein one of said second and third fluid pipelines is adapted for connecting to external radiators, and the other of said second and third fluid pipelines is adapted for connecting external plumbing to supply hot water for domestic use. 20 25

13. An adapter according to claim 12, further comprising a heat exchanger (201, 301) comprising a first fluid passageway (2011, 3011) and a second fluid passageway (2012, 3012); wherein said first fluid passageway forms one portion of the first fluid pipelines, and said second fluid passageway forms one portion of the second fluid pipelines. 30

14. An adapter according to claim 13, wherein said third fluid pipelines comprises a fluid incoming line (2131, 3131) and a fluid outgoing line (2132, 3132); wherein the adapter further comprises a first diverter valve (203, 302), a second inlet tube (22, 32) and a second outlet tube (21, 31) both connecting to the first fluid pipelines for respectively being input fluid from and outputting fluid to the gas water heater, and said first diverter valve is operable to permit the fluid outgoing line and the first fluid passageway to alternatively intercommunicate with the second inlet tube. 35 40 45

15. An adapter according to claim 14, further comprising a second diverter valve (202) when the second fluid pipelines is used for supplying sanitary hot water; wherein said second diverter valve is operable to permit the fluid incoming line and the first fluid passageway to alternatively intercommunicate with the second outlet tube. 50

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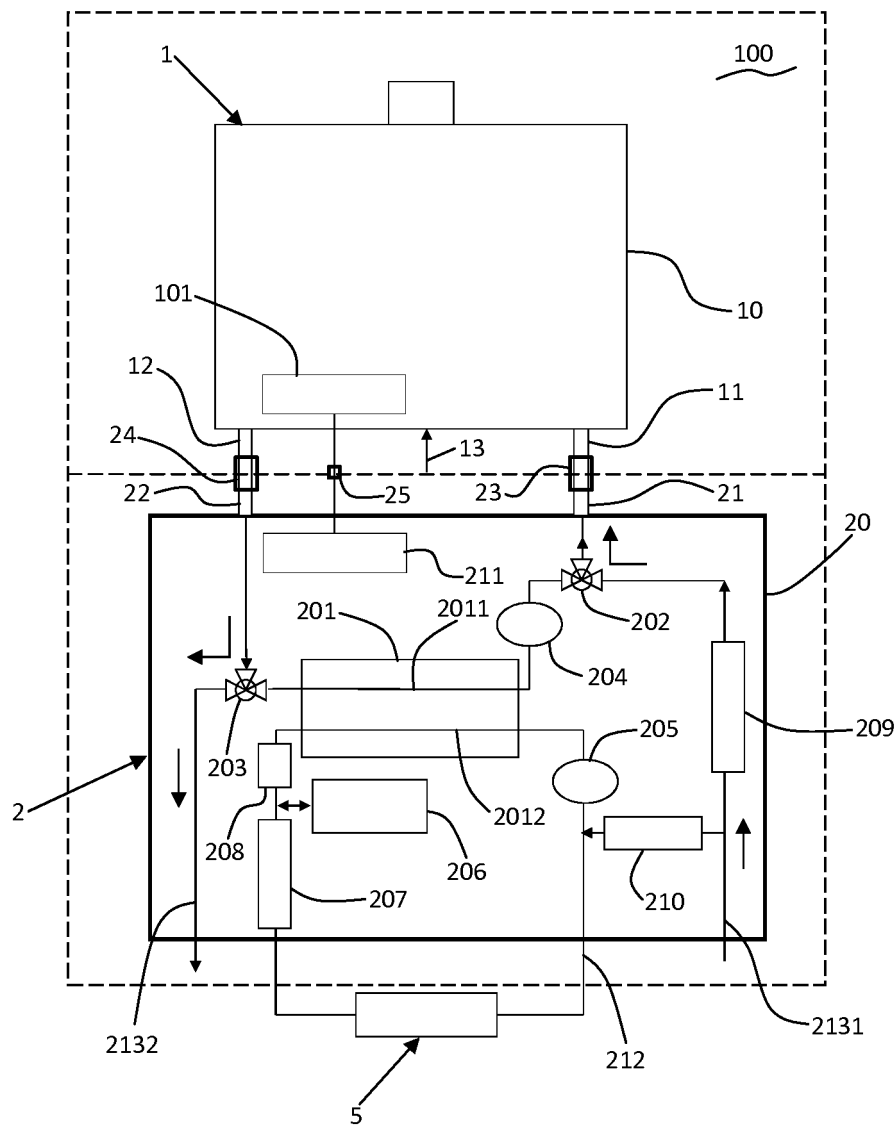


Fig. 1

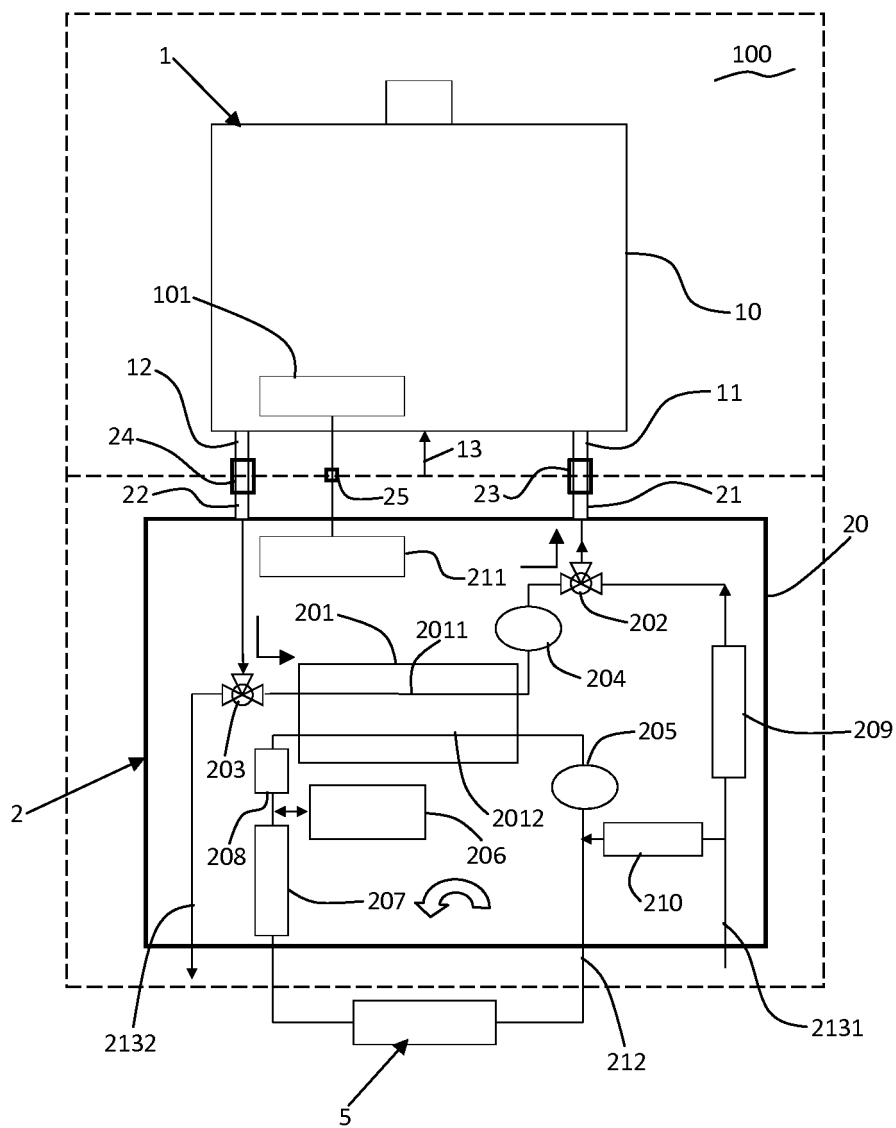


Fig. 2

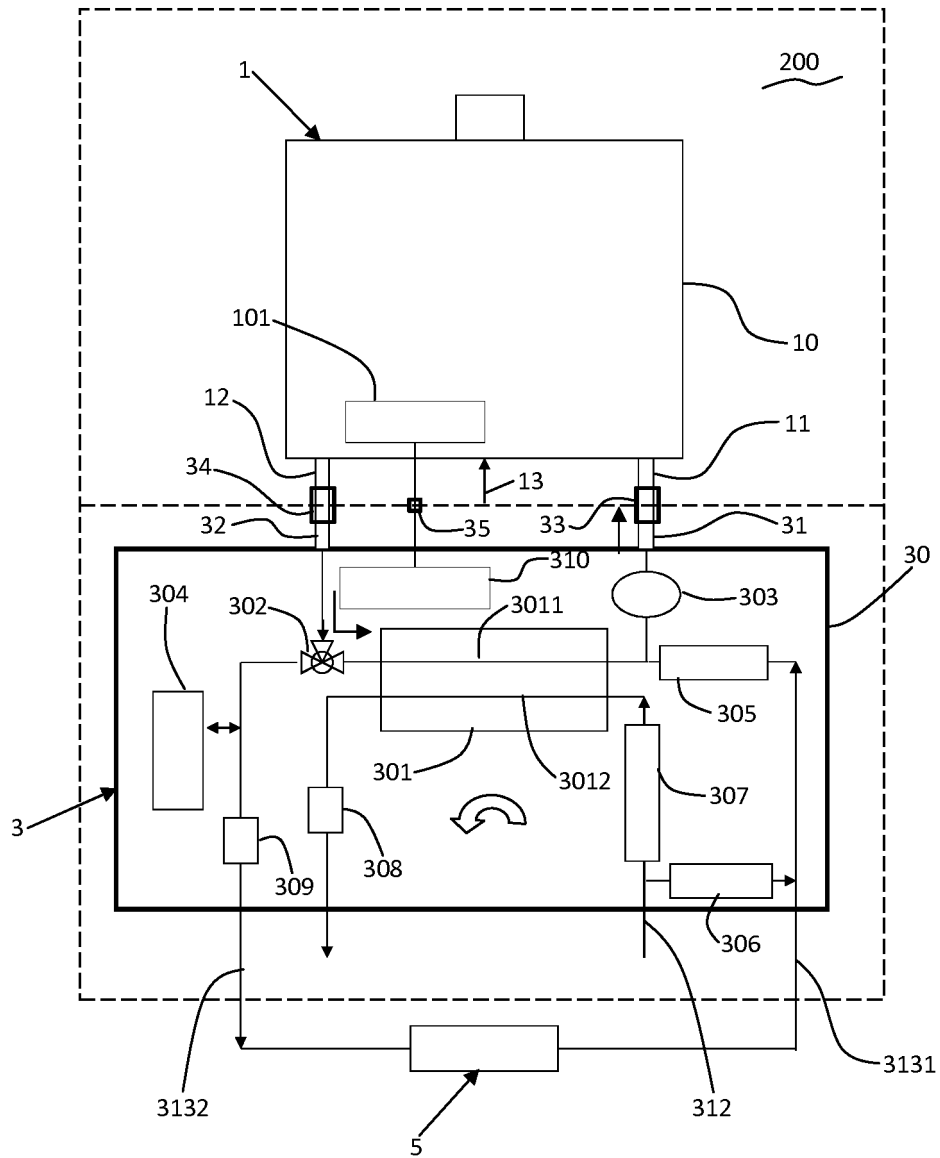


Fig. 3

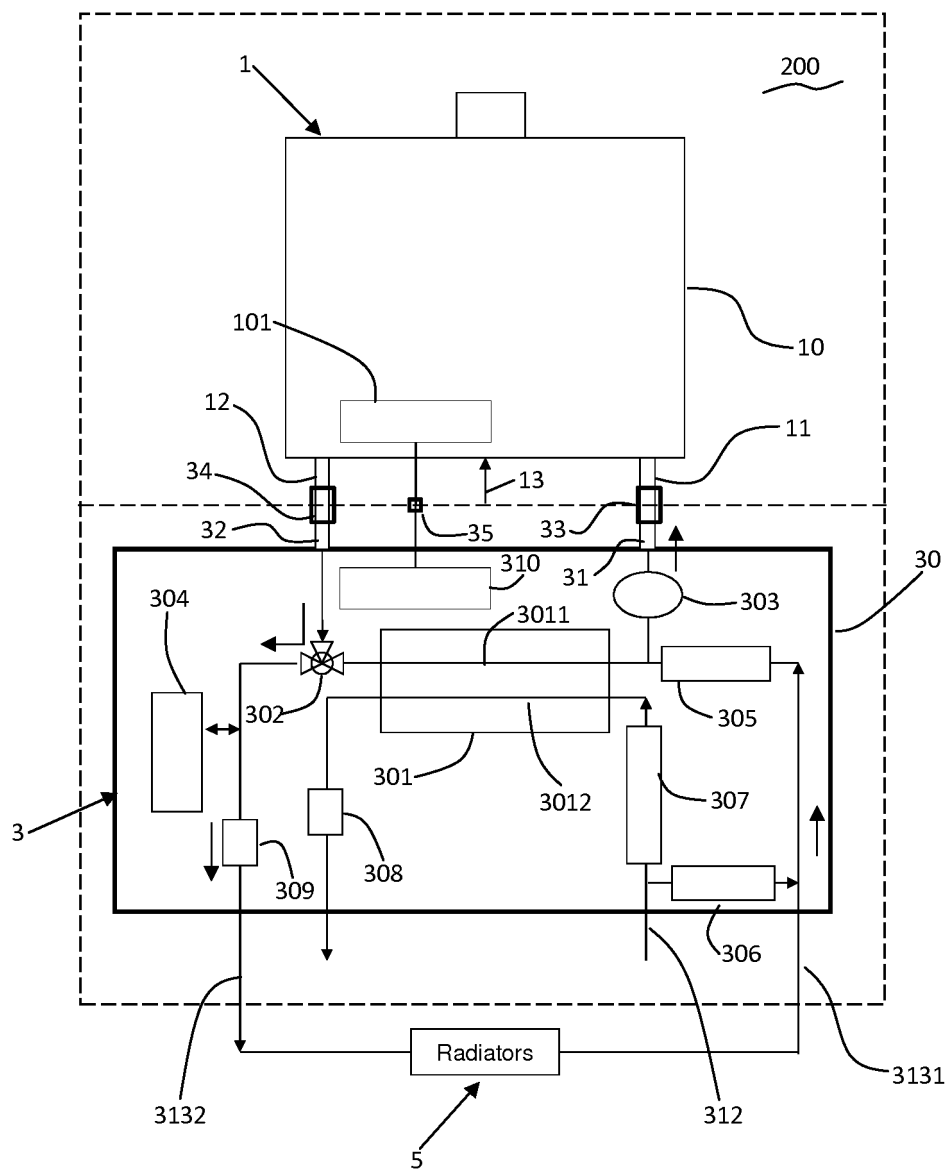


Fig. 4

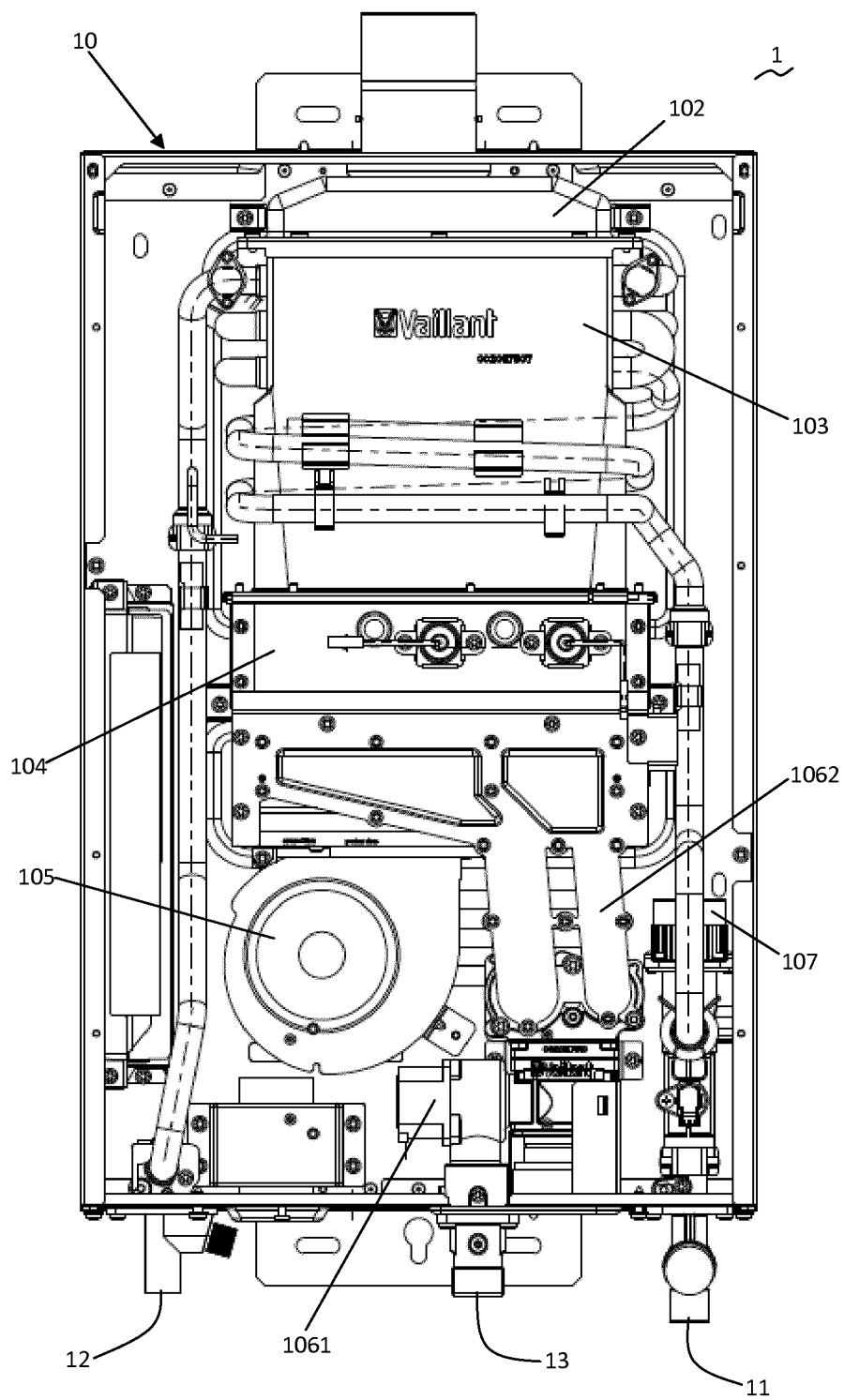


Fig. 5