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(71) Applicants:
• **GD Midea Heating & Ventilating Equipment Co., Ltd.**
Foshan, Guangdong 528311 (CN)

• **Midea Group Co., Ltd.**
Foshan, Guangdong 528311 (CN)

(72) Inventors:
• **RUAN, Tao**
Foshan, Guangdong 528311 (CN)
• **LUO, Bin**
Foshan, Guangdong 528311 (CN)
• **LIU, Shuqing**
Foshan, Guangdong 528311 (CN)
• **LUO, Yuzhao**
Foshan, Guangdong 528311 (CN)
• **ZHAN, Lei**
Foshan, Guangdong 528311 (CN)
• **ZHANG, Yusheng**
Foshan, Guangdong 528311 (CN)

(74) Representative: **Whitlock, Holly Elizabeth Ann et al**
Maucher Jenkins
26 Caxton Street
London SW1H 0RJ (GB)

(54) **STEAM GENERATION DEVICE AND AIR CONDITIONING DEVICE**

(57) Provided are a steam generation device (800) and an air conditioning device (700). The steam generation device (800) is adapted to generate steam so as to provide steam for the air conditioning device (700), and the steam generation device (800) comprises: a machine housing (810) adapted for ceiling mounting, a water tank assembly (820), a heating assembly (830) and a ballcock (870). The water tank assembly (820) is provided with a steam outlet (821) and a water inlet (822) for providing water for the interior of the water tank assembly (820),

and the steam in the water tank assembly (820) flows to the air conditioning device (700) under the driving of air pressure; the steam generated through the heating by the heating assembly (830) is suited to being discharged from the steam outlet (821); and the ballcock (870) is arranged in the water tank assembly (820) for controlling the connection and disconnection of the water inlet (822).

EP 3 904 763 A1

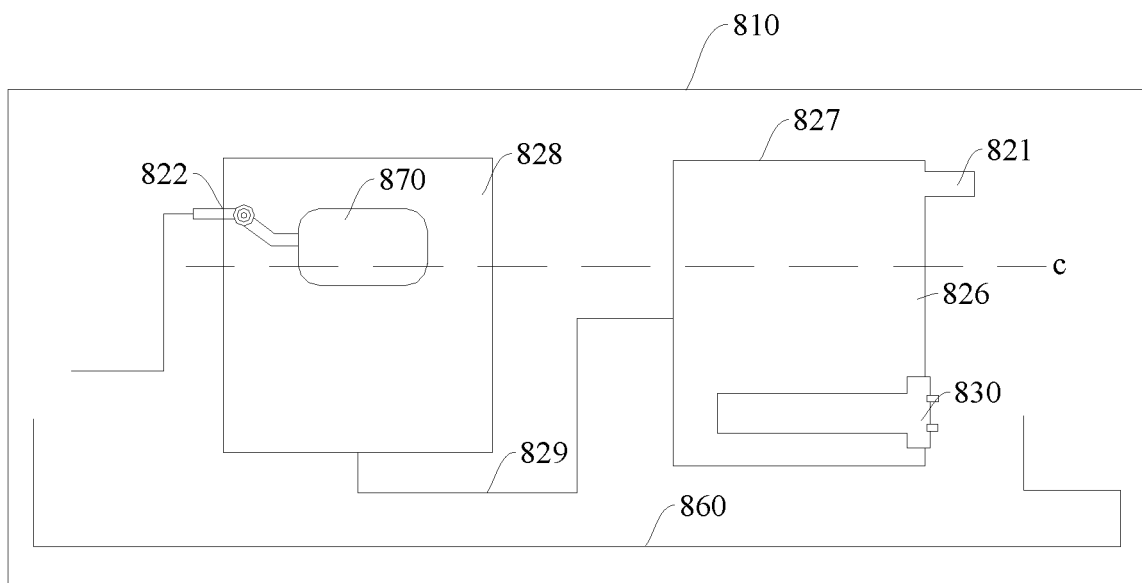


Fig. 14

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to Chinese Patent Application Serial Nos. 201910277395.2, 201920476426.2, 201910277403.3, 201920476507.2, 201910277880.X and 201920476428.1, entitled "Steam Generating Device and Air Conditioning Device", filed by GD MIDEA HEATING & VENTILATING EQUIPMENT CO., LTD. and MIDEA GROUP CO., LTD. on April 8, 2019.

FIELD

[0002] The present application relates to the field of air conditioners, and particularly to a steam generating device and an air conditioning device having the same.

BACKGROUND

[0003] In a related art, in order to supply steam to an air conditioner, a water film structure is required to be used for humidification or a steam generating device is provided in the air conditioner. However, since the steam generating device is far away from a water source, a water tank is generally adopted to supply water to the steam generating device, water is added manually each time, and usage is troublesome. In addition, when the steam is supplied to an air outlet, a driving component is required to be separately provided to enable the steam to flow according to a preset air duct, which requires independently providing the air duct and a component for driving the steam to flow, thereby increasing complexity of the air conditioner. In addition, the steam generating device is disposed in an air conditioning device, and thus is inconvenient to disassemble, and maintenance difficulty may be increased during maintenance of the steam generating device, thereby affecting maintenance efficiency. Further, the steam generating device is inconvenient to assemble, resulting in a decrease in an assembly efficiency of the steam generating device.

SUMMARY

[0004] The present application provides a steam generating device which is provided outside an air conditioning device, thus improving dismounting and mounting convenience of the steam generating device.

[0005] The present application further provides an air conditioning device.

[0006] The steam generating device according to the present application is suitable for generating steam to supply steam to an air conditioning device, and includes: a housing suitable for being mounted on a suspended ceiling; a water tank assembly provided in the housing, the water tank assembly having a steam outlet and a water inlet configured to supply water into an interior of

the water tank assembly, the water inlet being in communication with a water source, and the steam in the water tank assembly flowing to the air conditioning device under the driving action of an air pressure; a heating assembly provided in the water tank assembly, the steam generated by a heating process of the heating assembly being suitable for being discharged from the steam outlet; and a ballcock provided in the water tank assembly and configured to control on-off of the water inlet.

[0007] In the steam generating device according to the present application, with cooperation of the water tank assembly, the heating assembly and the ballcock, water is not required to be manually added into the steam generating device, and the steam generating device is more convenient to use; the steam generating device may be provided outside the air conditioning device, which may improve the dismounting and mounting convenience of the steam generating device, thereby improving a dismounting and mounting efficiency of the steam generating device.

[0008] In some examples of the present application, the ballcock includes: a connecting piece running through the water inlet, a water flowing channel being formed in the connecting piece, and an outer circumferential wall of the connecting piece being sealingly connected with an inner circumferential wall of the water inlet; a baffle pivotally connected with the connecting piece; and a float ball connected with the baffle, the float ball driving the baffle to open or close the water flowing channel under the driving action of buoyancy of water.

[0009] In some examples of the present application, the baffle is connected with the float ball by a connecting rod, the baffle has a central plane, a rotation axis of the baffle is located in the central plane, and an acute included angle is formed between a central axis of the float ball and the central plane.

[0010] In some examples of the present application, the water inlet is provided with a water flowing detection device.

[0011] In some examples of the present application, the water inlet is provided with a normally open water-inlet electromagnetic valve.

[0012] In some examples of the present application, the heating assembly is configured as an electric heating element.

[0013] In some examples of the present application, the electric heating element is configured as a positive-temperature-coefficient (PTC) thermistor.

[0014] In some examples of the present application, a plurality of electric heating elements are provided.

[0015] In some examples of the present application, a plurality of steam outlets are provided at intervals.

[0016] In some examples of the present application, the water tank assembly includes: a working water tank provided with a heating cavity, the steam outlet being provided at the working water tank; and a water supplementing tank in communication with the working water tank through a communicating pipe, the water inlet being

provided at the water supplementing tank.

[0017] In some examples of the present application, the communicating pipe is configured as a U-pipe.

[0018] In some examples of the present application, a one-way valve is provided at the U-pipe to enable fluid to flow only from the water supplementing tank to the working water tank.

[0019] In some examples of the present application, the steam generating device further includes: a steam valve, the water tank assembly being provided with an air pressure adjustment port, and the steam valve being provided at the air pressure adjustment port to control communication or disconnection of the air pressure adjustment port.

[0020] In some examples of the present application, the air pressure adjustment port is provided at the working water tank, and the air pressure adjustment port is in communication with the heating cavity.

[0021] In some examples of the present application: the steam generating device further includes a water supplementing electromagnetic valve provided at the communicating pipe and configured to control communication or disconnection of the communicating pipe; the heating assembly is provided in the working water tank, the steam generated by the heating process of the heating assembly is suitable for being discharged from the steam outlet, and the steam in the working water tank flows to the air conditioning device under the driving action of the air pressure; the ballcock is provided in the water supplementing tank and configured to control the on-off of the water inlet.

[0022] In some examples of the present application, a drain pan is provided below the water tank assembly.

[0023] In some examples of the present application, the drain pan is provided below the water supplementing tank and the working water tank.

[0024] In some examples of the present application, the water tank assembly further has a drainage port, and a drainage valve is provided at the drainage port to control on-off of the drainage port.

[0025] In some examples of the present application, the working water tank is provided with the drainage port.

[0026] In some examples of the present application, a partition plate is provided in the housing, the partition plate divides an interior of the housing into a first cavity and a second cavity, the water tank assembly is provided at the first cavity, and an electric control box of the steam generating device is provided in the second cavity.

[0027] In some examples of the present application, the water supplementing tank and the working water tank are provided at the first cavity.

[0028] In some examples of the present application, a plurality of working water tanks are provided.

[0029] In some examples of the present application, a plurality of water supplementing tanks are provided, and each water supplementing tank is in communication with at least one working water tank.

[0030] In some examples of the present application,

the water tank assembly includes a main water tank, a heating cavity is provided in the main water tank, the water inlet and the steam outlet are both provided in the main water tank, and the heating assembly is provided in the main water tank.

[0031] The air conditioning device according to the present application includes: an indoor unit provided with an air outlet; a steam generating device according to any one of claims 1 to 24; and a steam delivery line having one end in communication with the steam outlet, the steam generating device driving steam to flow to the indoor unit through the steam outlet and the steam delivery line in sequence utilising a pressure of the steam.

[0032] In the air conditioning device according to the present application, the water is not required to be manually added into the steam generating device, and the steam generating device is more convenient to use; the steam generating device may be provided outside the air conditioning device, which may improve the dismounting and mounting convenience of the steam generating device, thereby improving the dismounting and mounting efficiency of the steam generating device.

[0033] Additional aspects and advantages of the present application will be given in part in the following descriptions, become apparent in part from the following descriptions, or be learned from the practice of the embodiments of the present application.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034]

Fig. 1 is a schematic diagram of an air conditioning device and a steam generating device according to the present application;

Fig. 2 is a schematic diagram of the air conditioning device according to the present application;

Fig. 3 is a schematic diagram of one embodiment of the steam generating device according to the present application;

Fig. 4 is a schematic diagram of communication of upper ends of a working water tank and a water supplementing tank of the steam generating device according to the present application;

Fig. 5 is a schematic diagram in which a main water tank is used as a water tank assembly of the steam generating device according to the present application;

Fig. 6 is a schematic connection diagram in which the steam generating device according to the present application has a plurality of working water tanks and a plurality of water supplementing tanks; Fig. 7 is a schematic connection diagram in which a plurality of main water tanks of the steam generating device are provided according to the present application;

Fig. 8 is a schematic diagram of a reed-switch float switch of the steam generating device according to

the present application;

Fig. 9 is a schematic diagram in which the reed-switch float switch is provided at the water supplementing tank of the steam generating device according to the present application;

Fig. 10 is a schematic diagram in which the reed-switch float switch is provided at the main water tank of the steam generating device according to the present application;

Fig. 11 is a schematic diagram of a water level probe assembly of the steam generating device according to the present application;

Fig. 12 is a schematic diagram in which the water level probe assembly is provided at the water supplementing tank of the steam generating device according to the present application;

Fig. 13 is a schematic diagram in which the water level probe assembly is provided at the main water tank of the steam generating device according to the present application;

Fig. 14 is a schematic diagram of another embodiment of the steam generating device according to the present application;

Fig. 15 is a schematic diagram of another embodiment of the steam generating device according to the present application;

Fig. 16 is a schematic diagram of another embodiment of the steam generating device according to the present application;

Fig. 17 is a schematic diagram of another embodiment of the steam generating device according to the present application;

Fig. 18 is a schematic diagram of another embodiment of the steam generating device according to the present application;

Fig. 19 is a schematic diagram of another embodiment of the steam generating device according to the present application;

Fig. 20 is a schematic diagram of another embodiment of the steam generating device according to the present application;

Fig. 21 is a schematic diagram of another embodiment of the steam generating device according to the present application;

Fig. 22 is a schematic diagram of the steam generating device according to the present application;

Fig. 23 is a sectional view of the steam generating device according to the present application;

Fig. 24 is an exploded view of the steam generating device according to the present application;

Fig. 25 is a sectional view of the steam generating device according to the present application from another perspective;

Fig. 26 is an exploded view of the steam generating device according to the present application;

Fig. 27 is an exploded view of the water supplementing tank of the steam generating device according to the present application; and

Fig. 28 is a schematic diagram of a ballcock of the steam generating device according to the present application.

5 DETAILED DESCRIPTION

[0035] Reference will be made in detail to embodiments of the present application, and the examples of the embodiments are illustrated in the drawings, wherein the same or similar elements and the elements having same or similar functions are denoted by like reference numerals throughout the descriptions. The embodiments described herein with reference to drawings are illustrative, and merely used to explain the present application. The embodiments shall not be construed to limit the present application.

[0036] A steam generating device 800 according to an embodiment of the present application will be described below with reference to Figs. 1 to 28.

[0037] As shown in Figs. 1 to 28, the steam generating device 800 according to the embodiment of the present application is suitable for generating steam to supply the steam to an air conditioning device 700, and includes: a housing 810 suitable for being mounted on a suspended ceiling, a water tank assembly 820, a water supplementing electromagnetic valve, a heating assembly 830, a steam valve 8294, a ballcock 870, and a water level detector 840. The water tank assembly 820 is provided in the housing 810, and has a steam outlet 821, an air pressure adjustment port 8293 and a water inlet 822 for supplying water into the water tank assembly 820, and the water inlet 822 is in communication with a water source. The "water source" herein may refer to tap water or tap water provided with a purification device. The heating assembly 830 is provided in the water tank assembly 820, and the steam generated by a heating process of the heating assembly 830 is suitable for being discharged from the steam outlet 821. The steam valve 8294 is provided at the air pressure adjustment port 8293, and may control communication or disconnection of the air pressure adjustment port 8293. It should be noted that the steam valve 8294 may be connected with a controller, and when water is required to be supplemented to the water tank assembly 820, the controller controls the steam valve 8294 to be opened, such that a pressure in the water tank assembly 820 is close to the atmospheric pressure, thereby further ensuring that water quickly flows into the water tank assembly 820. When water is not required to be replenished to the water tank assembly 820, the controller controls the steam valve 8294 to be closed. The ballcock 870 is provided in the water tank assembly 820, and configured to control on-off of the water inlet 822.

[0038] It should be noted that the steam outlet 821 may be provided near a top of the water tank assembly 820, the water inlet 822 may be in communication with the water source through a water inlet pipe, and water in the water source may flow into the water tank assembly 820

through the water inlet 822. The heating assembly 830 is provided in the water tank assembly 820, and may be disposed near a bottom of the water tank assembly 820, and may heat water in the water tank assembly 820 into steam, and the steam in the water tank assembly 820 generated by the heating process of the heating assembly 830 flows to the air conditioning device 700 under the driving action of an air pressure. The water level detector 840 is provided in the water tank assembly 820, and configured to detect a water level in a water tank.

[0039] The steam outlet 821 of the steam generating device 800 may be in communication with an air outlet 900 of the air conditioning device 700 through a pipeline. When the steam is required to be supplied to the air conditioning device 700, the controller controls the steam generating device 800 to operate, the heating assembly 830 heats the water in the water tank assembly 820, the water forms the steam in the heating process, the steam is located above a water surface in the water tank assembly 820, the air pressure above the water surface in the water tank assembly 820 is gradually increased along with an increase of the steam, and the steam flows into the air conditioning device 700 from the steam outlet 821 under the action of the air pressure. Since the water in the steam generating device 800 is gradually reduced in the evaporation process, when detecting that the water in the water tank assembly 820 is reduced to a predetermined value, the water level detector 840 may send a signal to the controller, and the controller may control the water inlet 822 to be opened, such that the water in the water source flows into the water tank assembly 820. Such an arrangement may omit the working step of manually adding water into the steam generating device 800, and the steam generating device 800 is more convenient to use, thus improving a satisfaction degree of a user.

[0040] As shown in Fig. 14, when the steam generating device 800 works, the water in the water tank assembly 820 is gradually converted into the steam, the liquid level of the water in the water tank assembly 820 drops, and when the liquid level of the water in the water tank assembly 820 is lower than the scale line c, the ballcock 870 opens the water inlet 822, such that the water flows into the water tank assembly 820 from the water inlet 822; such an arrangement may omit the working step of manually adding water into the steam generating device 800, and the steam generating device 800 is more convenient to use, thus improving the satisfaction degree of the user. The arrangement of the ballcock 870 may keep the liquid level inside the water tank assembly 820 equal to a height of the scale line c, thereby ensuring that enough water exists in the water tank assembly 820.

[0041] Meanwhile, the steam generating device 800 may be provided outside the air conditioning device 700, and thus convenient to disassemble, and a maintenance difficulty may be decreased during maintenance of the steam generating device 800, thereby increasing maintenance efficiency. Meanwhile, the steam generating device 800 is more convenient to assemble, thus increasing

assembly efficiency.

[0042] Thus, with cooperation of the housing 810, the water tank assembly 820, the heating assembly 830 and the water level detector 840, water is not required to be manually added into the steam generating device 800, and the steam generating device 800 is more convenient to use; the steam generating device 800 may be provided outside the air conditioning device 700, which may improve dismounting and mounting convenience of the steam generating device 800, thereby improving a dismounting and mounting efficiency of the steam generating device 800.

[0043] In some embodiments of the present application, as shown in Figs. 27 and 28, the ballcock 870 may include: a connecting piece 871, a baffle 872 and a float ball 873. The connecting piece 871 runs through the water inlet 822, a water flowing channel is formed in the connecting piece 871, and an outer circumferential wall of the connecting piece 871 is sealingly connected with an inner circumferential wall of the water inlet 822, thus preventing the water in the water tank assembly 820 from flowing out from a position between the connecting piece 871 and the water inlet 822. The baffle 872 is pivotally connected with the connecting piece 871. The float ball 873 is connected with the baffle 872, and drives the baffle 872 to open or close the water flowing channel under the driving action of buoyancy of water. When the liquid level of the water in the water tank assembly 820 is lower than the scale line c, the float ball 873 rotates downwards and drives the baffle 872 to open the water flowing channel, such that the water flows into the water tank assembly 820, and when the liquid level of the water in the water tank assembly 820 is flush with the scale line c, the float ball 873 drives the baffle 872 to close the water flowing channel, such that the water is unable to flow into the water tank assembly 820, and thus, the liquid level in the water tank assembly 820 is flush with the scale line c.

[0044] In some embodiments of the present application, the baffle 872 and the float ball 873 are connected by a connecting rod 874, the baffle 872 has a central plane, a rotation axis of the baffle 872 is located in the central plane, and an acute included angle is formed between a central axis of the float ball 873 and the central plane. Such an arrangement enables the float ball 873 to drive the baffle 872 to open or close the water flow channel more easily, thus guaranteeing a working reliability of the ballcock 870.

[0045] In some embodiments of the present application, as shown in Fig. 17, a water flowing detection device 880 may be provided at the water inlet 822, and may detect whether water flows through the water inlet 822. When the steam generating device 800 operates normally, the water flowing detection device 880 does not operate. When the steam generating device 800 is in a standby non-operation state or an operation state, continuous water flowing signals (determined according to time) of the water flowing detection device 880 indicate that a leakage occurs at a certain position of the steam

generating device 800.

[0046] In some embodiments of the present application, as shown in Fig. 18, a normally open water-inlet electromagnetic valve 890 is provided at the water inlet 822, and the normally open water-inlet electromagnetic valve 890 is normally open when powered off and closed when powered on. When the water flowing detection device 880 detects that a leakage occurs at a certain position of the steam generating device 800, the controller may control the normally open water-inlet electromagnetic valve 890 to be closed, so as to ensure that water is unable to flow into the steam generating device 800 from the water inlet 822, thereby ensuring that water does not continuously leak.

[0047] In some embodiments of the present application, the steam generating device 800 may further include an alarm device, the alarm device may be electrically connected with the controller, and when a leakage occurs at a certain position of the steam generating device 800, the alarm device may send an alarm signal which may be a sound or a light flash, so as to better prompt the user that a leakage occurs at a certain position of the steam generating device 800.

[0048] In some embodiments of the present application, as shown in Figs. 3 to 7, the steam generating device 800 may further include a normally closed water-inlet electromagnetic valve 850, the normally closed water-inlet electromagnetic valve 850 may be connected with the controller, and the controller may control the water-inlet normally closed electromagnetic valve 850 to be opened and closed. Specifically, when the water level detector 840 detects that the water level in the water tank assembly 820 is lower than a water-supplementing water line a, the water level detector 840 sends a signal to the controller, and then, the controller controls the normally closed water-inlet electromagnetic valve 850 to be opened, such that water flows into the water tank assembly 820, and when the water level in the water tank assembly 820 rises to a water-supplementing stopping water line b, the water level detector 840 sends a signal to the controller, and then, the controller controls the normally closed water-inlet electromagnetic valve 850 to be closed, so as to stop replenishing water into the water tank assembly 820. Such an arrangement may achieve the working purpose of automatically controlling water to be supplemented into the water tank assembly 820, and ensure that there exists water stored in the water tank assembly 820 at any time, thereby guaranteeing the working reliability of the steam generating device 800.

[0049] In some embodiments of the present application, as shown in Figs. 3 to 7, the water tank assembly 820 may further have a drainage port 823, the drainage port 823 may be provided with a drainage valve 824, and the drainage valve 824 is configured to control on-off of the drainage port 823. When the water in the water tank assembly 820 is required to be drained out of the water tank assembly 820, the drainage valve 824 may be controlled to be opened, and then, the water in the water

tank assembly 820 is drained out of the water tank assembly 820 from the drainage port 823. When water is required to be stored in the water tank assembly 820, the drainage valve 824 is controlled to be closed, such that the water in the water tank assembly 820 may be prevented from flowing out of the water tank assembly 820, thereby preventing the water in the water tank assembly 820 from flowing out of the water tank assembly 820.

[0050] In some embodiments of the present application, the heating assembly 830 may be configured as an electric heating element which has a high working efficiency and a good reliability, such that the water in the water tank assembly 820 may form steam fast, thus improving the working efficiency of the steam generating device 800, and also further improving the working reliability of the steam generating device 800.

[0051] In some embodiments of the present application, the electric heating element may be configured as a PTC thermistor which has a quick temperature rise, such that during operation of the steam generating device 800, a rate of forming the steam from the water in the water tank assembly 820 may be increased, thereby further increasing a working efficiency of the steam generating device 800. The PTC thermistor may be used in water and is not prone to damage, thus prolonging a service life of the electric heating element.

[0052] In some embodiments of the present application, a plurality of electric heating elements may be provided, and the plurality of electric heating elements may be simultaneously arranged in the water tank assembly 820, so as to further increase the rate of forming the steam from the water in the water tank assembly 820, thereby further improving the working efficiency of the steam generating device 800. When one of the plurality of electric heating elements malfunctions, the other electric heating elements may operate normally, thereby further guaranteeing the working reliability of the steam generating device 800.

[0053] In some embodiments of the present application, as shown in Fig. 5, the water tank assembly 820 may include a main water tank 825 having a heating cavity 826 therein, both the water inlet 822 and the steam outlet 821 may be provided in the main water tank 825, and the heating assembly 830 may be provided in the main water tank 825. It should be noted that the water tank assembly 820 has an integrated structure, the steam outlet 821 may be disposed near a top of the main water tank 825, the heating assembly 830 may be disposed near a bottom of the main water tank 825, and when water is required to be replenished into the main water tank 825, the controller controls the normally closed water-inlet electromagnetic valve 850 to be opened, water may flow into the heating cavity 826 through the water inlet pipe and the water inlet 822, and after completion of the water replenishment of the main water tank 825, the controller controls the normally closed water-inlet electromagnetic valve 850 to be closed. When the steam is required to be supplied to the air conditioning device

700, the controller controls the heating assembly 830 to work, and the heating assembly 830 may rapidly heat the water in the heating cavity 826 into steam.

[0054] In some embodiments of the present application, as shown in Fig. 3, the water tank assembly 820 may include: a working water tank 827 and a water supplementing tank 828. The working water tank 827 has the drainage port 823, and the working water tank 827 and the water supplementing tank 828 do not operate at the same time. The working water tank 827 may have the heating cavity 826 and the steam outlet 821; that is, the steam outlet 821 may be provided in the working water tank 827, the water supplementing tank 828 may be in communication with the working water tank 827 through a communicating pipe 829, and the water supplementing tank 828 may have the water inlet 822; that is, the water inlet 822 is provided in the water supplementing tank 828. Water may flow into the water supplementing tank 828 through the water inlet 822 and stored therein, and when the working water tank 827 is required to be supplemented with water, the water in the water supplementing tank 828 may flow into the working water tank 827 through the communicating pipe 829, thereby ensuring that water is stored in the working water tank 827 at all times. The water inlet 822 is provided with the normally closed water-inlet electromagnetic valve 850, when the water in the water supplementing tank 828 is lower than the water-supplementing water line a, the controller controls the normally closed water-inlet electromagnetic valve 850 to be opened, such that water flows into the water supplementing tank 828 from the water inlet 822, and when the water in the water supplementing tank 828 rises to the water-supplementing stopping water line b, the controller controls the normally closed water-inlet electromagnetic valve 850 to be closed, so as to stop supplementing water into the water supplementing tank 828; such an arrangement may ensure that water is stored in the water supplementing tank 828, and may avoid the condition that no water is stored in the working water tank 827, thereby avoiding a dry heating condition of the heating assembly 830, and then prolonging a service life of the heating assembly 830. The water supplementing electromagnetic valve (i.e., electromagnetic valve 8292) is provided in the communicating pipe 829 and configured to control communication or disconnection thereof.

[0055] It should be noted that the steam outlet 821 may be provided near a top of the working water tank 820, the water inlet 822 may be in communication with the water source through the water inlet pipe, and the water in the water source may flow into the water supplementing tank 820 through the water inlet 822. The heating assembly 830 is provided in the working water tank 827, may be disposed near a bottom of the working water tank 827, and may heat the water in the working water tank 827 into steam, and the steam in the working water tank 827 generated by the heating process of the heating assembly 830 flows to the air conditioning device 700 under

the driving action of the air pressure. The water level detector 840 is provided in the water tank assembly 820, and configured to detect the water level in the water tank.

[0056] In some embodiments of the present application, the communicating pipe 829 may be configured as a U-pipe. After the working water tank 827 is in communication with the water supplementing tank 828 through the U-pipe, a communicating vessel may be formed by the structure of the working water tank 827 and the water supplementing tank 828, and during the operation of the steam generating device 800, the water in the working water tank 827 is reduced gradually, the water level in the water supplementing tank 828 is then higher than the water level in the working water tank 827, and under the action of a pressure difference, the water in the water supplementing tank 828 may be pressed into the working water tank 827, thereby achieving the work purpose of supplementing water into the working water tank 827.

[0057] The heating assembly 830 is provided in the working water tank 827, the steam generated by the heating process of the heating assembly 830 is suitable for being discharged from the steam outlet 821, and the steam in the working water tank 827 flows to the air conditioning device 700 under the driving action of the air pressure. The ballcock 870 is provided in the water supplementing tank 828, and configured to control the on-off of the water inlet 822.

[0058] As shown in Fig. 4, according to another embodiment of the present application, the water tank assembly 820 may include: a working water tank 827 and a water supplementing tank 828. The working water tank 827 may have the heating cavity 826, the steam outlet 821 may be provided in the working water tank 827, and the water supplementing tank 828 may be in communication with the working water tank 827 through a communicating pipe 829, such that a communicating vessel may be formed by the structure of the working water tank 827 and the water supplementing tank 828; the water inlet 822 is provided in the water supplementing tank 828. An upper end of the working water tank 827 is in communication with an upper end of the water supplementing tank 828, thus ensuring that the working water tank 827 and the water supplementing tank 828 have equal pressures, so as to avoid that the excessive pressure in the working water tank 827 presses the water back to the water supplementing tank 828.

[0059] In some embodiments of the present application, as shown in Fig. 16, a one-way valve may be provided at the U-pipe, to enable fluid to flow only from the water supplementing tank 828 to the working water tank 827, such that the fluid in the working water tank 827 may be prevented from flowing to the water supplementing tank 828, and thus, sufficient fluid may be stored in the working water tank 827.

[0060] In some embodiments of the present application, the working water tank 827 may have the air pressure adjustment port 8293 which may be in communication with the heating cavity 826. It should be noted that,

when the working water tank 827 is required to be supplemented with water, the air pressure adjustment port 8293 is opened, the air pressure in the heating cavity 826 is reduced rapidly, such that the pressure in the heating cavity 826 is rapidly close to the atmospheric pressure, thereby ensuring that the water in the water supplementing tank 828 rapidly flows into the working water tank 827, and further completing the water supplementing work of the working water tank 827.

[0061] In some embodiments of the present application, the steam valve 8294 may be provided at the air pressure adjustment port 8293, and connected with the controller, so as to better control opening or closing of the air pressure adjustment port 8293 to be opened or closed, and when the working water tank 827 is required to be supplemented with water, the controller controls the steam valve 8294 to be opened, such that the pressure in the heating cavity 826 is quickly close to the atmospheric pressure, thereby further ensuring that the water in the water supplementing tank 828 quickly flows into the working water tank 827. When the working water tank 827 is not required to be supplemented with water, the controller controls the steam valve 8294 to be closed.

[0062] It should be noted that, when the steam generating device 800 is used for the first time or works for a period of time, and the working water tank 827 is required to be supplemented with water, the water supplementing tank 828 may supplement water into the working water tank 827 through the communicating pipe 829. When the U-pipe is connected between the water supplementing tank 828 and the working water tank 827, the water in the water supplementing tank 828 may be replenished into the working water tank 827 using a communicating vessel principle, and when the water level in the water supplementing tank 828 drops, and the water level detector 840 detects that the water supplementing tank 828 is required to be supplemented with water, the normally closed water-inlet electromagnetic valve 850 is opened to replenish water into the water supplementing tank 828; since the communicating vessel is constructed by the water supplementing tank 828 and the working water tank 827, the two water tanks have flush liquid levels, and when the water level in the water supplementing tank 828 reaches a certain height, the water level detector 840 sends an electric signal to control the normally closed water-inlet electromagnetic valve 850 to be closed, thus stopping supplementing water into the water supplementing tank 828.

[0063] When the water supplementing tank 828 and the working water tank 827 have sufficient water, and steam is required to be generated, the heating assembly 830 may be started to heat the water in the working water tank 827 to generate the steam; in the heating process of the heating assembly 830, the air pressure in the working water tank 827 is increased gradually, and since the communicating pipe 829 is provided with the one-way valve, the fluid is unable to flow to the water supplementing tank 828 from the working water tank 827, and at this

point, under the effect of the air pressure in the working water tank 827, the water supplementing tank 828 does not replenish water to the working water tank 827; that is, a pressure generated by a height difference of liquid columns in the water supplementing tank 828 and the working water tank 827 is equal to the pressure in the working water tank 827, and at this point, the water supplementing tank 828 does not replenish water to the working water tank 827.

[0064] After the heating assembly 830 performs the heating operation for a period of time, and when the amount of water around the heating assembly 830 is not enough, a little amount of steam or no steam is generated inside the working water tank 827, and at this point, if the steam is required to be generated continuously, the working water tank 827 is required to be supplemented with water; that is, only when the air pressure in the working water tank 827 is equal to the air pressure in the water supplementing tank 828, the water supplementing tank 828 may supplement water to the working water tank 827. The air pressure in the working water tank 827 and the water supplementing tank 828 may be balanced using the following two ways: 1) since the heating assembly 830 stops performing the heating operation, a temperature in the working water tank 827 is decreased gradually, and the remaining steam in the working water tank 827 condenses gradually, such that the air pressure in the working water tank 827 is decreased gradually, and when the air pressure in the working water tank 827 is decreased to a certain degree, the water in the water supplementing tank 828 may flow into the working water tank 827 using the communicating vessel principle; 2) in order to quickly balance the pressure in the working water tank 827 and the water supplementing tank 828, the air pressure adjustment port 8293 may be provided in the working water tank 827, the steam valve 8294 may be provided at the air pressure adjustment port 8293, and when the pressure in the working water tank 827 and the water supplementing tank 828 is required to be balanced, the steam valve 8294 is opened to quickly restore the pressure in the working water tank 827 to the atmospheric pressure, and then, the pressure in the working water tank 827 may be balanced with the pressure in the water supplementing tank 828.

[0065] In some embodiments of the present application, as shown in Fig. 6, a plurality of working water tanks 827 may be provided, and the plurality of working water tanks 827 operate together in a unit time, which may increase an amount of the steam generated by the steam generating device 800, thereby increasing the working efficiency of the steam generating device 800.

[0066] In some embodiments of the present application, as shown in Fig. 6, a plurality of water supplementing tanks 828 may be provided, and each water supplementing tank 828 is in communication with at least one working water tank 827. It should be noted that each water supplementing tank 828 may be in communication with one or plural working water tanks 827. When each water sup-

plementing tank 828 may be in communication with one working water tank 827, the water supplementing tanks 828 are in one-to-one correspondence with the working water tanks 827; that is, one water supplementing tank 828 is in communication with only one working water tank 827, or one water supplementing tank 828 replenishes water to only one working water tank 827.

[0067] It should be noted that the steam generating device 800 may be in communication with the water source through a main water inlet pipe, and a plurality of water inlet pipes may be provided at the main water inlet pipe, and in one-to-one correspondence to the water supplementing tanks 828. The water supplementing tank 828 is in communication with the working water tank 827 using the communicating vessel principle, and the upper end of the water supplementing tank 828 is in communication with the upper end of the working water tank 827. Such an arrangement may ensure that the pressure in the water supplementing tank 828 is equal to the pressure in the working water tank 827, and may prevent the water in the working water tank 827 from being pressed into the water supplementing tank 828 when the pressure in the working water tank 827 is too large. The water inlet 822 of each water supplementing tank 828 may be provided with the normally closed water-inlet electromagnetic valve 850, each water supplementing tank 828 is provided therein with the water level detector 840, and when the water level in the water supplementing tank 828 is lower than the water-supplementing water line a, the normally closed water-inlet electromagnetic valve 850 is opened, and water may flow into the water supplementing tank 828 through the main water inlet pipe, the water inlet pipe, and the water inlet 822 in sequence, and when the water level rises to the water-supplementing stopping water line b, the normally closed water-inlet electromagnetic valve 850 is closed to stop supplementing water to the water supplementing tank 828.

[0068] In some embodiments of the present application, the water tank assembly 820 includes the main water tank 825 having the heating cavity 826 therein, both the water inlet 822 and the steam outlet 821 are provided in the main water tank 825, and the heating assembly 830 is provided in the main water tank 825. That is, the water inlet 822 directly supplies water to the main water tank 825, the heating assembly 830 is configured to heat the water in the main water tank 825, and the steam flows out of the main water tank 825.

[0069] In some embodiments of the present application, as shown in Fig. 7, a plurality of main water tanks 825 may be provided; it should be noted that the steam generating device 800 may be in communication with the water source through the main water inlet pipe, and the plurality of water inlet pipes may be provided at the main water inlet pipe, and in one-to-one correspondence with the main water tanks 825. The water inlet 822 of each main water tank 825 may be provided with the normally closed water-inlet electromagnetic valve 850, each main water tank 825 is provided therein with the water level

detector 840, and when the water level in the main water tank 825 is lower than the water-supplementing water line a, the normally closed water-inlet electromagnetic valve 850 is opened, and water may flow into the main water tank 825 through the main water inlet pipe, the water inlet pipe, and the water inlet 822 in sequence, and when the water level rises to the water-supplementing stopping water line b, the normally closed water-inlet electromagnetic valve 850 is closed to stop supplementing water to the main water tank 825.

[0070] In some embodiments of the present application, as shown in Figs. 8 to 10, the water level detector 840 may be configured as a reed-switch float switch 841, and the reed-switch float switch 841 has a good working reliability, such that the water levels in the water supplementing tank 828 and the main water tank 825 may be better detected, thus improving accuracy of water level detection.

[0071] In some embodiments of the present application, as shown in Fig. 8, the reed-switch float switch 841 may have an alarm position 842, the alarm position 842 may include a high water level position 843 and a low water level position 844, and the high water level position 843 is higher than the low water level position 844. When the water supplementing tank 828 and the main water tank 825 are supplemented with water, and when the water levels in the water supplementing tank 828 and the main water tank 825 are located at the high water level position 843, the reed-switch float switch 841 sends an alarm signal to the controller, and the controller controls the normally closed water-inlet electromagnetic valve 850 to be closed, so as to stop supplementing water. When the water levels in the water supplementing tank 828 and the main water tank 825 are located at the low water level position 844, the reed-switch float switch 841 sends an alarm signal to the controller, and the controller controls the normally closed water-inlet electromagnetic valve 850 to be opened, so as to start supplementing water. Such an arrangement may achieve the function of automatically replenishing water into the water supplementing tank 828 and the main water tank 825, thus improving water supplementing accuracy.

[0072] In some embodiments of the present application, as shown in Fig. 8, the reed-switch float switch 841 may further have an early warning position 845, the early warning position 845 may include a secondary high water level position 846 and a secondary low water level position 847, the secondary high water level position 846 is higher than secondary low water level position 847 and lower than the high water level position 843, and the secondary low water level position 847 is higher than the low water level position 844. When the water supplementing tank 828 and the main water tank 825 are supplemented with water, and when the water levels in the water supplementing tank 828 and the main water tank 825 are located at the secondary low water level position 847 and the secondary high water level position 846, the reed-switch float switch 841 sends an alarm signal to the con-

troller, such that the user may learn the water levels in the water supplementing tank 828 and the main water tank 825. During the operation of the working water tank 827, when the water level in the water supplementing tank 828 is located at the high water level position 843 and the low water level position 844, the reed-switch float switch 841 sends an alarm signal to the controller, such that the user may also learn the water levels in the water supplementing tank 828 and the main water tank 825.

[0073] In some embodiments of the present application, as shown in Fig. 9, the reed-switch float switch may be provided in the water supplementing tank 828, and when the water supplementing tank 828 is supplemented with water, and when the water level reaches the low water level position 844, the secondary low water level position 847, the secondary high water level position 846, and the high water level position 843 in sequence, the reed-switch float switch 841 may send alarm signals to the controller, such that the user may accurately learn the water supplementing condition in the water supplementing tank 828; after the water level in the water supplementing tank 828 reaches the high water level position 843, the reed-switch float switch 841 sends an alarm signal, and the controller controls the normally closed water-inlet electromagnetic valve 850 to be closed, so as to stop replenishing water into the water supplementing tank 828. During the operation of the working water tank 827, when the water level in the water supplementing tank 828 reaches the high water level position 843, the secondary high water level position 846, the secondary low water level position 847, and the low water level position 844 in sequence, the reed-switch float switch 841 may send alarm signals to the controller, such that the user may accurately learn the water level in the water supplementing tank 828; after the water level in the water supplementing tank 828 reaches the low water level position 844, the working water tank 827 stops working, and the controller controls the normally closed water-inlet electromagnetic valve 850 to be opened, so as to start replenishing water into the water supplementing tank 828.

[0074] In some embodiments of the present application, as shown in Fig. 10, the reed-switch float switch 841 may be provided in the main water tank 825, and when the main water tank 825 is supplemented with water, and when the water level reaches the low water level position 844, the secondary low water level position 847, the secondary high water level position 846, and the high water level position 843 in sequence, the reed-switch float switch 841 may send alarm signals, such that the user may accurately learn the water supplementing condition in the water supplementing tank 828; after the water level in the main water tank 825 reaches the high water level position 843, the reed-switch float switch 841 sends an alarm signal, and the controller controls the normally closed water-inlet electromagnetic valve 850 to be closed, so as to stop replenishing water into the main water tank 825. During the operation of the main water

tank 825, when the water level in the main water tank 825 reaches the high water level position 843, the secondary high water level position 846, the secondary low water level position 847, and the low water level position 844 in sequence, the reed-switch float switch 841 may send alarm signals, such that the user may accurately learn the water level in the main water tank 825; after the water level in the main water tank 825 reaches the low water level position 844, the main water tank 825 stops working, and the controller controls the normally closed water-inlet electromagnetic valve 850 to be opened, so as to start replenishing water into the main water tank 825.

[0075] In some embodiments of the present application, as shown in Figs. 11 to 13, the water level detector 840 may be configured as a water level probe assembly 848 which works more accurately, such that the water levels in the main water tank 825 and the water supplementing tank 828 may be detected accurately, thus improving working accuracy of the water level detector 840. In addition, the water level probe assembly 848 has a good working reliability and is not prone to damage, thus prolonging the service life of the water level detector 840.

[0076] In some embodiments of the present application, as shown in Fig. 11, the water level probe assembly 848 may include a high water level probe 849, a medium water level probe 8491, and a low water level probe 8492, and in a vertical direction, a free end of the high water level probe 849 is higher than a free end of the medium water level probe 8491, and the free end of the medium water level probe 8491 is higher than a free end of the low water level probe 8492. The low water level probe 8492 serves as a common terminal, and the other probes are connected with the low water level probe 8492 through water. Specifically, the water level probe assembly 848 may be provided in the water supplementing tank 828 and the main water tank 825, and when the water levels in the water supplementing tank 828 and the main water tank 825 are equal to a height of the free end of the medium water level probe 8491, the medium water level probe 8491 is connected with the low water level probe 8492, and the water level probe assembly 848 detects that the water levels in the water supplementing tank 828 and the main water tank 825 are a medium water level; when the water levels in the water supplementing tank 828 and the main water tank 825 are equal to a height of the free end of the high water level probe 849, the high water level probe 849 is connected with the low water level probe 8492, the water level probe assembly 848 detects that the water levels in the water supplementing tank 828 and the main water tank 825 are a high water level, and at this point, the water supplementing tank 828 and the main water tank 825 are not required to be supplemented with water; when the water levels in the water supplementing tank 828 and the main water tank 825 are lower than a height of the free end of the low water level probe 8492, the water level probe assembly 848 detects that the water levels in the water supple-

menting tank 828 and the main water tank 825 are a low water level.

[0077] In some embodiments of the present application, as shown in Fig. 12, the water level probe assembly 848 may be provided in the water supplementing tank 828, and when the water supplementing tank 828 is supplemented with water, and when the water level in the water supplementing tank 828 is equal to the height of the free end of the high water level probe 849, the high water level probe 849 is connected with the low water level probe 8492, and the controller controls the normally closed water-inlet electromagnetic valve 850 to be closed, so as to stop replenishing water into the water supplementing tank 828. During the operation of the working water tank 827, when the water level in the water supplementing tank 828 is lower than the height of the free end of the high water level probe 849 and located between the height of the free end of the high water level probe 849 and the height of the free end of the medium water level probe 8491, the medium water level probe 8491 is connected with the low water level probe 8492, such that the user learns that the water level in the water supplementing tank 828 is the medium water level. During the operation of the working water tank 827, when the water level in the water supplementing tank 828 is lower than the height of the free end of the medium water level probe 8491, the controller controls the normally closed water-inlet electromagnetic valve 850 to be opened, so as to supplement water into the water supplementing tank 828.

[0078] In some embodiments of the present application, as shown in Fig. 13, the water level probe assembly 848 may be provided in the main water tank 825, and when the main water tank 825 is supplemented with water, and when the water level in the main water tank 825 is equal to the height of the free end of the high water level probe 849, the high water level probe 849 is connected with the low water level probe 8492, and the controller controls the normally closed water-inlet electromagnetic valve 850 to be closed, so as to stop replenishing water into the main water tank 825. During the operation of the main water tank 825, when the water level in the main water tank 825 is lower than the height of the free end of the high water level probe 849 and located between the height of the free end of the high water level probe 849 and the height of the free end of the medium water level probe 8491, the medium water level probe 8491 is connected with the low water level probe 8492, such that the user learns that the water level in the main water tank 825 is the medium water level. During the operation of the main water tank 825, when the water level in the main water tank 825 is lower than the height of the free end of the medium water level probe 8491, the controller controls the normally closed water-inlet electromagnetic valve 850 to be opened, so as to supplement water into the main water tank 825.

[0079] In some embodiments of the present application, a plurality of steam outlets 821 may be provided at

intervals, such that the plurality of steam outlets 821 may simultaneously supply steam to the air conditioning device 700, thus increasing humidity of air blown out by the air conditioning device 700.

[0080] In some embodiments of the present application, a drain pan 860 may be provided below the water tank assembly 820; the drain pan 860 is provided below the water supplementing tank 828 and the working water tank 827, and when water leaks from the water tank assembly 820 or the water in the main water tank 825 and the working water tank 827 is required to be drained, the water may be stored in the drain pan 860, thereby preventing a water leakage from the steam generating device 800 to the outside.

[0081] In some embodiments of the present application, as shown in Figs. 24 and 26, a partition plate 811 may be provided in the housing 810, dividing the interior of the housing 810 into a first cavity and a second cavity, the water tank assembly 820 may be provided in the first cavity, and an electric control box 906 of the steam generating device 800 may be provided in the second cavity. The water supplementing tank 828 and the working water tank 827 may be provided in the first cavity, such that the water tank assembly 820 and the electric control box 906 may be provided in two cavities respectively, which may avoid interference between the water tank assembly 820 and the electric control box 906, thereby guaranteeing the working reliability of the water tank assembly 820 and the electric control box 906.

[0082] In some embodiments of the present application, the electric control box 906 and the partition plate are detachably connected together, such that the electric control box 906 may be conveniently detached during maintenance, thus improving the maintenance efficiency.

[0083] In some embodiments of the present application, the housing 810 may be mounted at a roof of a room by means of a suspended ceiling. Further, the housing 810 includes a top plate 812, a surrounding plate 813 and a bottom plate 814; the top plate 812, the surrounding plate 813 and the bottom plate 814 define a mounting space, the water tank assembly 820 is provided in the mounting space, the top plate 812 is connected with the roof, the water tank assembly 820 and the partition plate 811 may be connected with the top plate 812, the surrounding plate 813 is connected with the top plate 812, the drain pan 860 is connected with the water tank assembly 820, and the bottom plate 814 may be connected with the surrounding plate 813. The electric control box 906 of the steam generating device 800 may be repaired by detaching the bottom plate 814. Further, when the water tank assembly 820 is required to be maintained or replaced, the bottom plate 814 may be detached first, and then, the drain pan 860 may be detached, such that the water tank assembly 820 may be exposed, and the drain pan 860 may be maintained or replaced, thus simplifying the maintenance process of the steam generating device 800.

[0084] As shown in Fig. 15, according to an embodiment of the present application, one water supplementing tank 828 and a plurality of the working water tanks 827 are provided, and the plural working water tanks 827 are all in communication with the water supplementing tank 828, thus achieving the working purpose that one water supplementing tank 828 replenishes water to the plural working water tanks 827 at the same time, and reducing a volume of the steam generating device 800.

[0085] As shown in Fig. 18, according to an embodiment of the present application, the one-way valve 8291 may be provided at the communicating pipe 829, and the water flowing detection device 880 and the normally open water-inlet electromagnetic valve 890 are provided at the water inlet 822.

[0086] As shown in Fig. 19, according to an embodiment of the present application, the electromagnetic valve 8292 may be provided at the communicating pipe 829, when the heating assembly 830 is in a non-working state, the electromagnetic valve 8292 is in a normally open state, and at this point, the water supplementing tank 828 is in communication with the working water tank 827, water may flow from the water supplementing tank 828 to the working water tank 827, and finally, the liquid level in the water supplementing tank 828 is equal to the liquid level in the working water tank 827. When the heating assembly 830 is in a working state, the electromagnetic valve 8292 is powered on to isolate the water supplementing tank 828 from the working water tank 827, such that the water in the working water tank 827 does not flow to the water supplementing tank 828. At this point, the steam may only be discharged along the steam outlet 821, and then delivered by a long distance for humidification.

[0087] As shown in Fig. 20, according to an embodiment of the present application, the communicating pipe 829 is provided with the electromagnetic valve 8292, and the water inlet 822 is provided with the water flowing detection device 880.

[0088] As shown in Fig. 21, according to an embodiment of the present application, the electromagnetic valve 8292 is provided at the communicating pipe 829, and the water flowing detection device 880 and the normally open water-inlet electromagnetic valve 890 are provided at the water inlet 822.

[0089] As shown in Figs. 1 and 2, the air conditioning device 700 according to an embodiment of the present application includes: an outdoor unit 905, an indoor unit 901, a steam generating device 800 and a steam delivery line. The outdoor unit 905 is in communication with the indoor unit 901, the indoor unit 901 may have an air outlet 900, the steam generating device 800 is the steam generating device 800 according to the above embodiment, the steam delivery line has one end in communication with the steam outlet 821, and the other end in communication with the indoor unit 901, and the steam generating device 800 drives steam to flow to the indoor unit 901 through the steam outlet 821 and the steam delivery

line in sequence using the pressure of the steam. With such an arrangement, the steam generating device 800 may be provided outside the indoor unit 901, the water is not required to be manually added into the steam generating device 800, and the steam generating device 800 is more convenient to use; the dismounting and mounting convenience of the steam generating device 800 may be improved, thereby improving the dismounting and mounting efficiency of the steam generating device 800.

[0090] In some embodiments of the present application, the indoor unit 901 may have a first air inlet hole 902, a second air inlet hole 903 and a heat exchanger 904, and the heat exchanger 904 is located in the indoor unit 901, as shown in Fig. 2; the first air inlet hole 902 may be located on a left side of the heat exchanger 904, the second air inlet hole 903 may be located on a right side of the heat exchanger 904, and the steam generating device 800 may be in communication with the first air inlet hole 902 of the indoor unit 901, thus ensuring that the steam generating device 800 has a sufficient mounting space and guaranteeing a mounting strength of the steam generating device 800. In addition, the steam generating device 800 may be in communication with the second air inlet hole 903 of the indoor unit 901, such that the air blown out by the indoor unit 901 may be more humid, and the humidity of the air may be increased, thereby increasing an air outlet quality of the air conditioning device 700.

[0091] In the description of the present specification, reference throughout this specification to "an embodiment", "some embodiments", "exemplary embodiment", "example", "specific example" or "some examples" means that a particular feature, structure, material, or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the present application. In the specification, the schematic expressions to the above-mentioned terms are not necessarily referring to the same embodiment or example. Furthermore, the described particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodiments or examples.

[0092] Although embodiments of the present application have been shown and illustrated, it shall be understood by those skilled in the art that various changes, modifications, alternatives and variants without departing from the principle and idea of the present application are acceptable. The scope of the present application is defined by the claims and its equivalents.

[0093] In the description of the present specification, reference throughout this specification to "an embodiment", "some embodiments", "exemplary embodiment", "example", "specific example" or "some examples" means that a particular feature, structure, material, or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the present application. In the specification, the schematic expressions to the above-mentioned

terms are not necessarily referring to the same embodiment or example. Furthermore, the described particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodiments or examples.

[0094] Although embodiments of the present application have been shown and illustrated, it shall be understood by those skilled in the art that various changes, modifications, alternatives and variants without departing from the principle and idea of the present application are acceptable. The scope of the present application is defined by the claims and its equivalents.

Claims

1. A steam generating device suitable for generating steam to supply steam to an air conditioning device, and comprising:

a housing suitable for being mounted on a suspended ceiling;
 a water tank assembly provided in the housing and having a steam outlet and a water inlet configured to supply water into an interior of the water tank assembly, the water inlet being in communication with a water source, and the steam in the water tank assembly flowing to the air conditioning device under driving action of an air pressure;
 a heating assembly provided in the water tank assembly, the steam generated by a heating process of the heating assembly being suitable for being discharged from the steam outlet; and
 a ballcock provided in the water tank assembly and configured to control on-off of the water inlet.

2. The steam generating device according to claim 1, wherein the ballcock comprises:

a connecting piece running through the water inlet, a water flowing channel being formed in the connecting piece, and an outer circumferential wall of the connecting piece being sealingly connected with an inner circumferential wall of the water inlet;
 a baffle pivotally connected with the connecting piece; and
 a float ball connected with the baffle and driving the baffle to open or close the water flowing channel under driving action of buoyancy of water.

3. The steam generating device according to claim 2, wherein the baffle is connected with the float ball by a connecting rod, the baffle has a central plane, a rotation axis of the baffle is located in the central plane, and an acute included angle is formed be-

tween a central axis of the float ball and the central plane.

4. The steam generating device according to any one of claims 1 to 3, wherein the water inlet is provided with a water flowing detection device.
5. The steam generating device according to any one of claims 1 to 4, wherein the water inlet is provided with a normally open water-inlet electromagnetic valve.
6. The steam generating device according to any one of claims 1 to 5, wherein the heating assembly is configured as an electric heating element.
7. The steam generating device according to claim 6, wherein the electric heating element is configured as a PTC thermistor.
8. The steam generating device according to claim 6, wherein a plurality of electric heating elements are provided.
9. The steam generating device according to any one of claims 1 to 8, wherein a plurality of steam outlets are provided at intervals.
10. The steam generating device according to any one of claims 1 to 9, wherein the water tank assembly comprises:
 a working water tank provided with a heating cavity, the steam outlet being provided at the working water tank; and
 a water supplementing tank in communication with the working water tank through a communicating pipe, the water inlet being provided at the water supplementing tank.
11. The steam generating device according to claim 10, wherein the communicating pipe is configured as a U-pipe.
12. The steam generating device according to claim 11, wherein a one-way valve is provided at the U-pipe to enable fluid to flow only from the water supplementing tank to the working water tank.
13. The steam generating device according to claim 10, further comprising: a steam valve, the water tank assembly being provided with an air pressure adjustment port, and the steam valve being provided at the air pressure adjustment port to control communication or disconnection of the air pressure adjustment port.
14. The steam generating device according to claim 13,

wherein the air pressure adjustment port is provided at the working water tank and in communication with the heating cavity.

15. The steam generating device according to claim 10, further comprising: a water supplementing electromagnetic valve provided at the communicating pipe and configured to control communication or disconnection of the communicating pipe; wherein the heating assembly is provided in the working water tank, the steam generated by the heating process of the heating assembly is suitable for being discharged from the steam outlet, and the steam in the working water tank flows to the air conditioning device under the driving action of the air pressure; and the ballcock is provided in the water supplementing tank and configured to control the on-off of the water inlet. 5
16. The steam generating device according to claim 10, wherein a drain pan is provided below the water tank assembly. 10
17. The steam generating device according to claim 16, wherein the drain pan is provided below the water supplementing tank and the working water tank. 15
18. The steam generating device according to claim 10, wherein the water tank assembly further has a drainage port, and a drainage valve is provided at the drainage port to control on-off of the drainage port. 20
19. The steam generating device according to claim 18, wherein the working water tank is provided with the drainage port. 25
20. The steam generating device according to claim 10, wherein a partition plate is provided in the housing, the partition plate divides an interior of the housing into a first cavity and a second cavity, the water tank assembly is provided at the first cavity, and an electric control box of the steam generating device is provided in the second cavity. 30
21. The steam generating device according to claim 20, wherein the water supplementing tank and the working water tank are provided at the first cavity. 35
22. The steam generating device according to claim 13, wherein a plurality of working water tanks are provided. 40
23. The steam generating device according to claim 16, wherein a plurality of water supplementing tanks are provided, and each water supplementing tank is in communication with at least one working water tank. 45

24. The steam generating device according to any one of claims 1 to 9, wherein the water tank assembly comprises a main water tank, a heating cavity is provided in the main water tank, the water inlet and the steam outlet are both provided in the main water tank, and the heating assembly is provided in the main water tank. 5

25. An air conditioning device, comprising: 10

an indoor unit provided with an air outlet; the steam generating device according to any one of claims 1 to 24; and a steam delivery line having one end in communication with the steam outlet, the steam generating device driving steam to flow to the indoor unit through the steam outlet and the steam delivery line in sequence utilizing a pressure of the steam. 15

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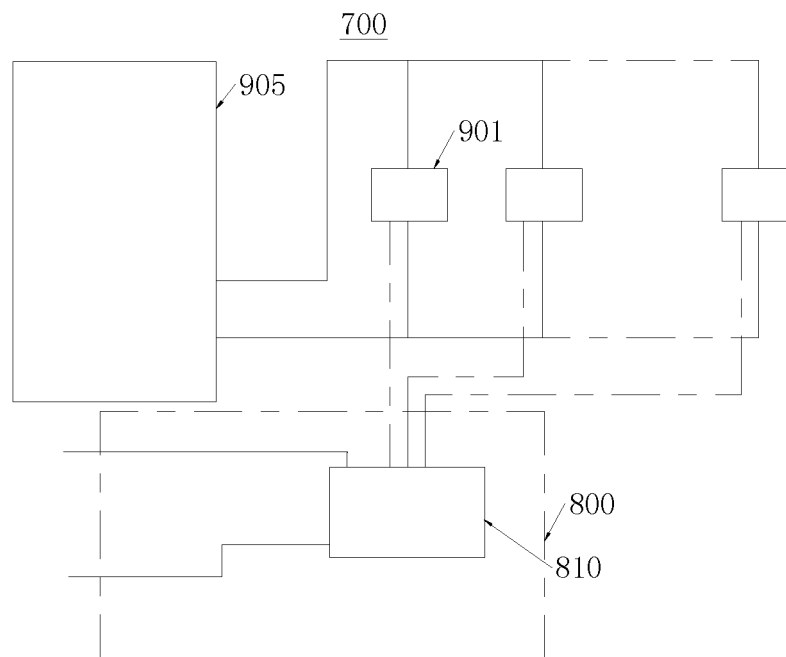


Fig. 1

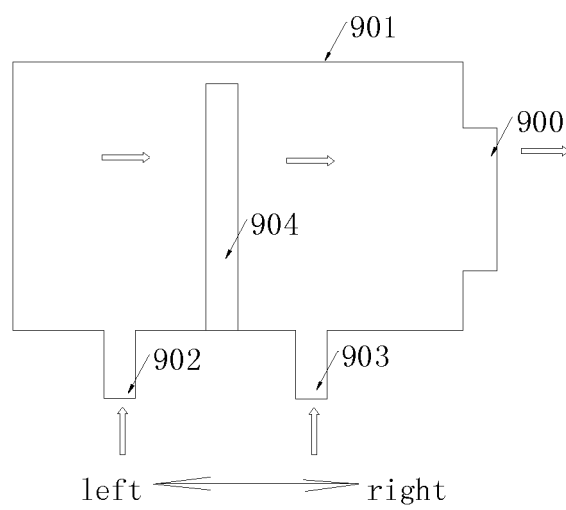


Fig. 2

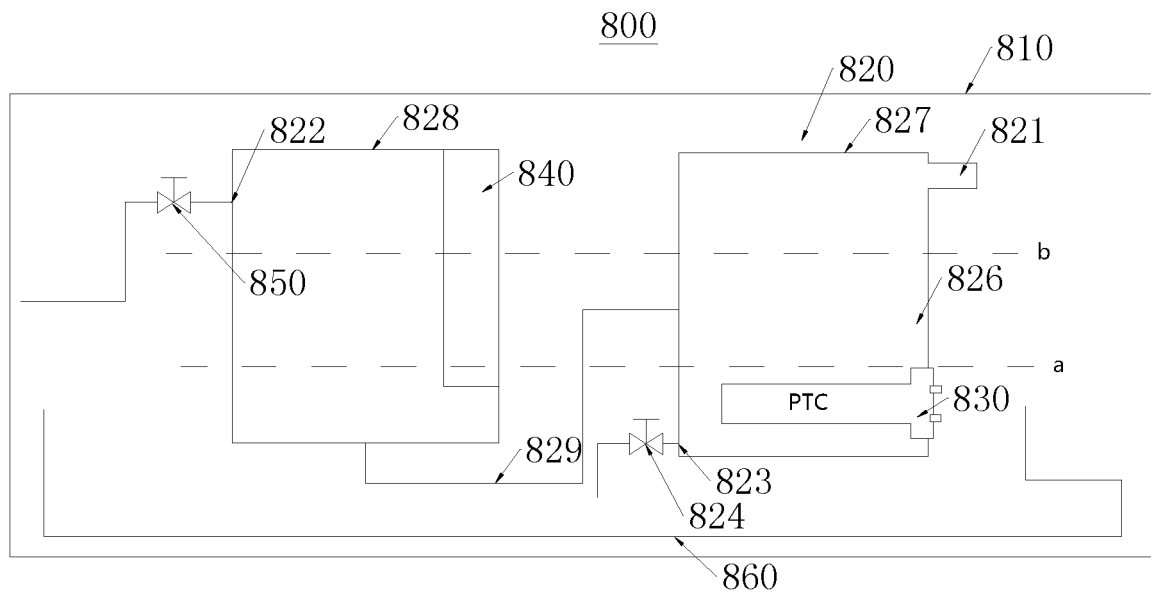


Fig. 3

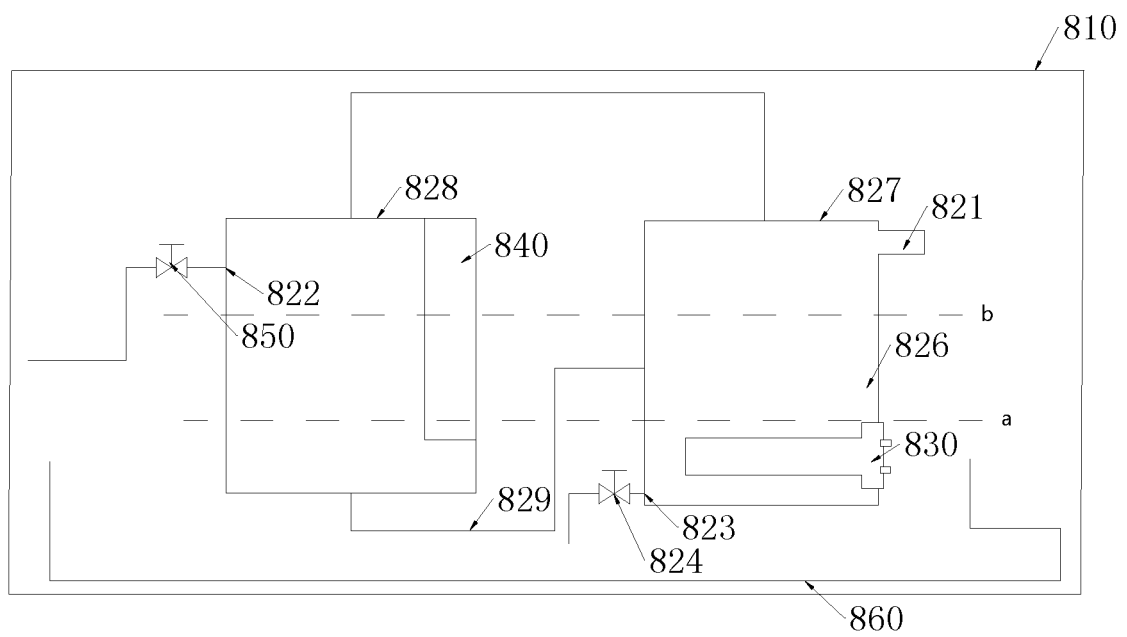


Fig. 4

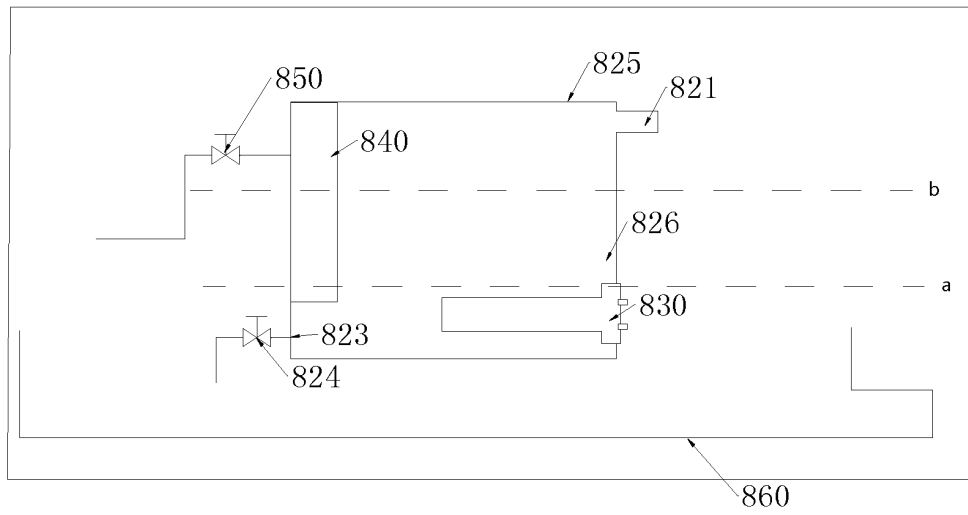


Fig. 5

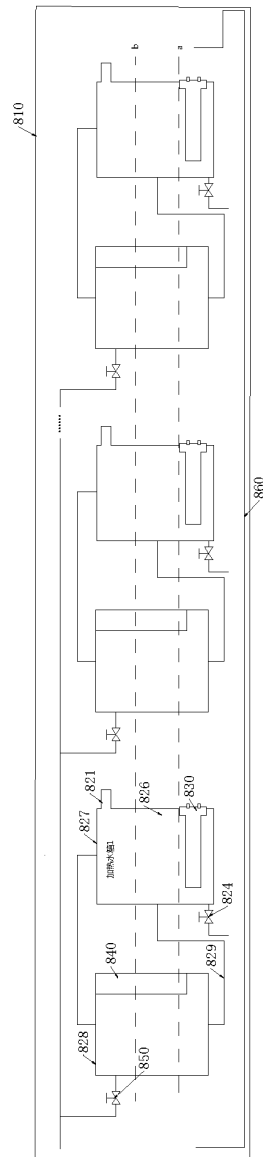


Fig. 6

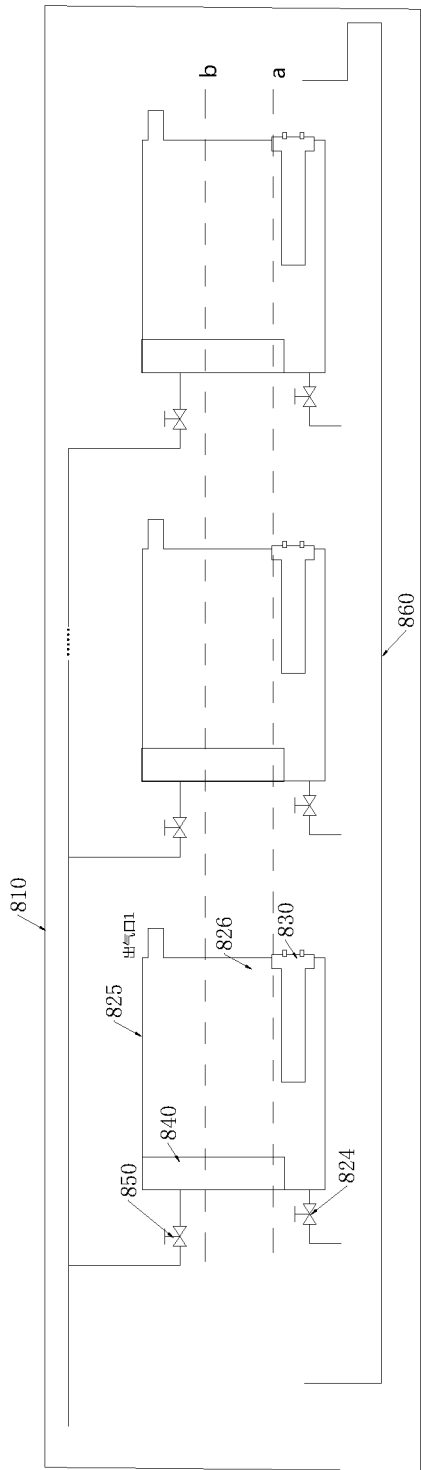


Fig. 7

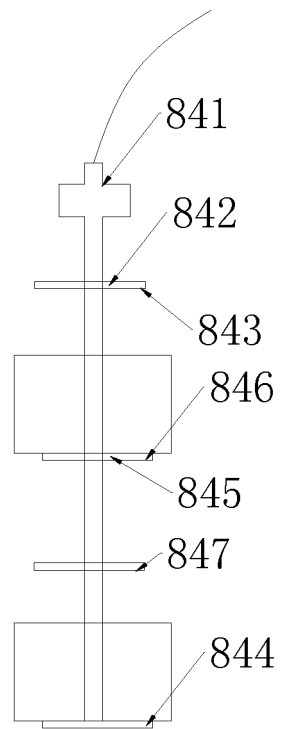


Fig. 8

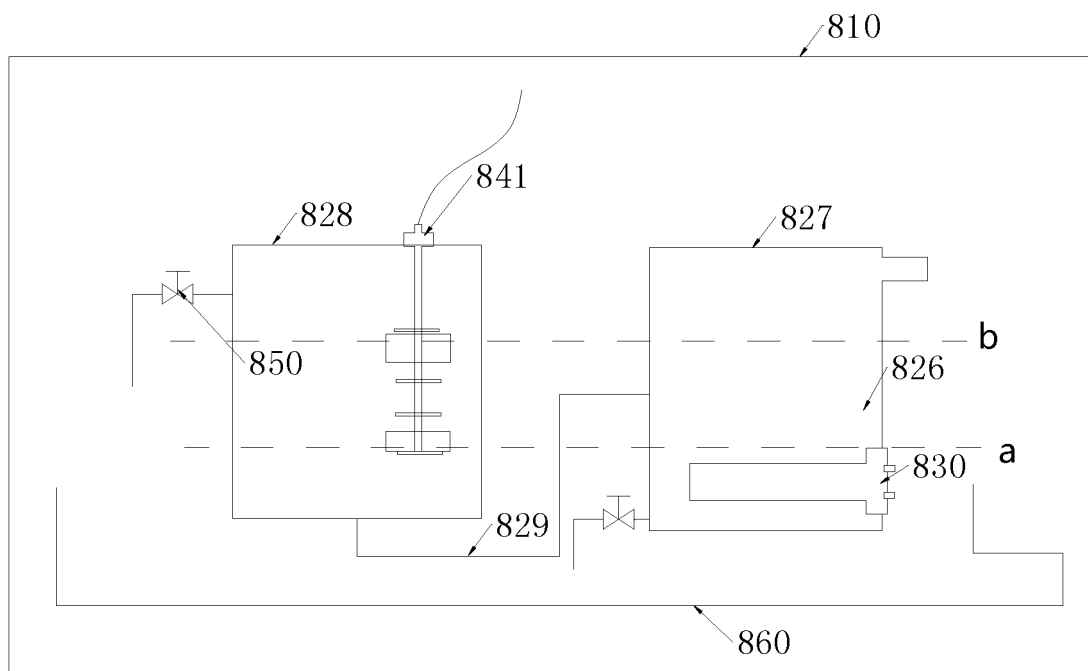


Fig. 9

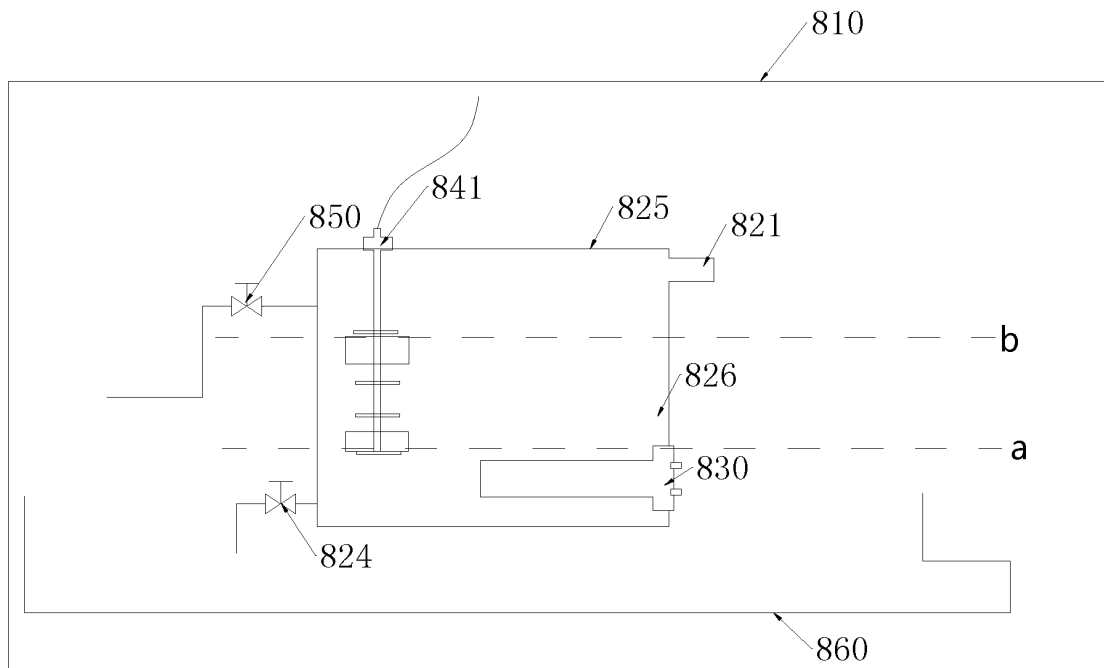


Fig. 10

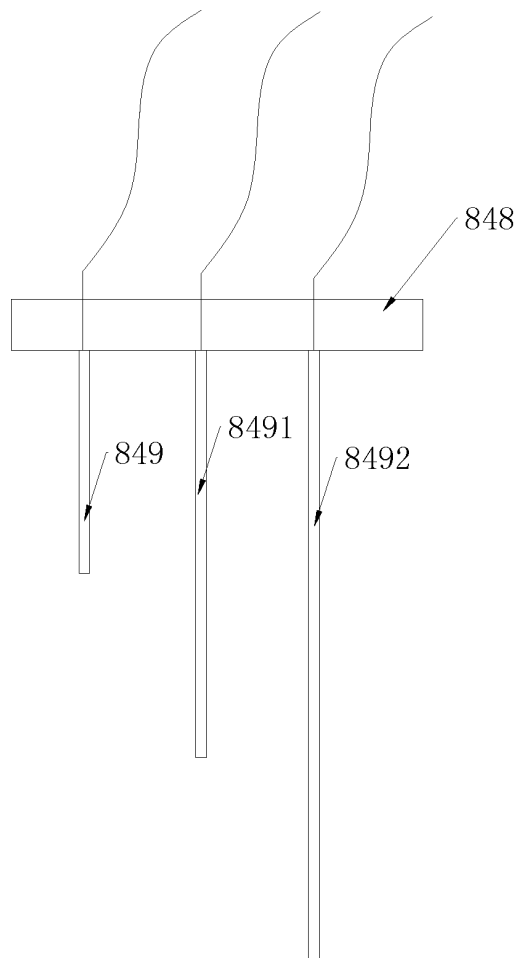


Fig. 11

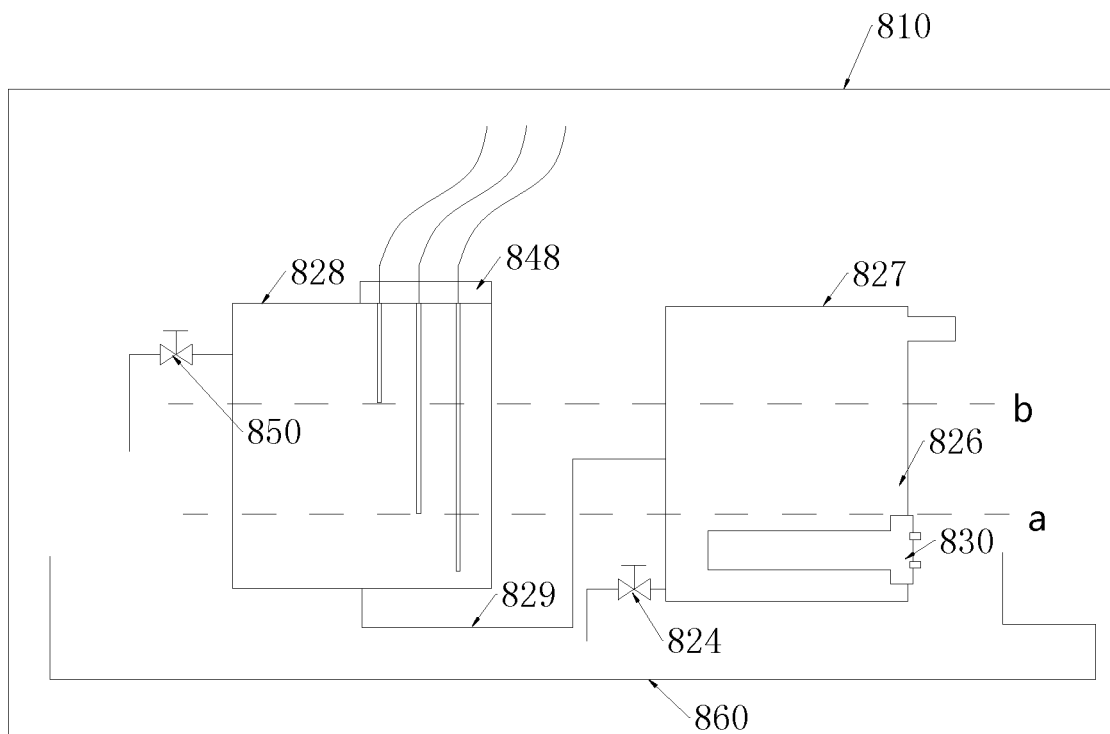


Fig. 12

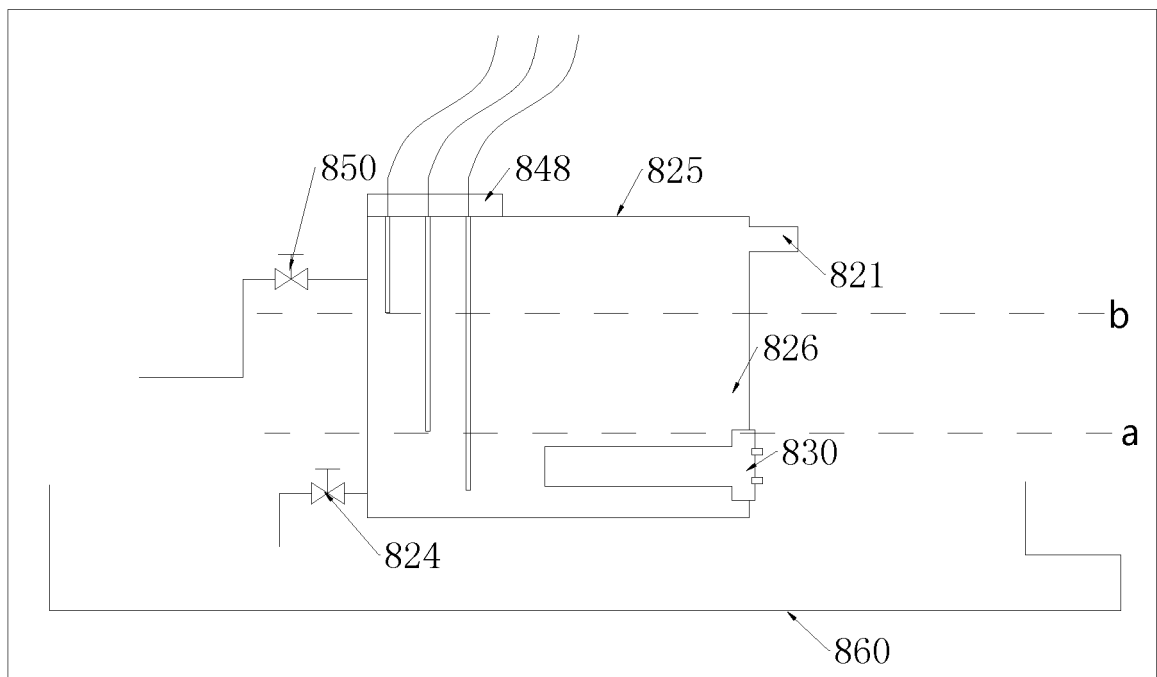


Fig. 13

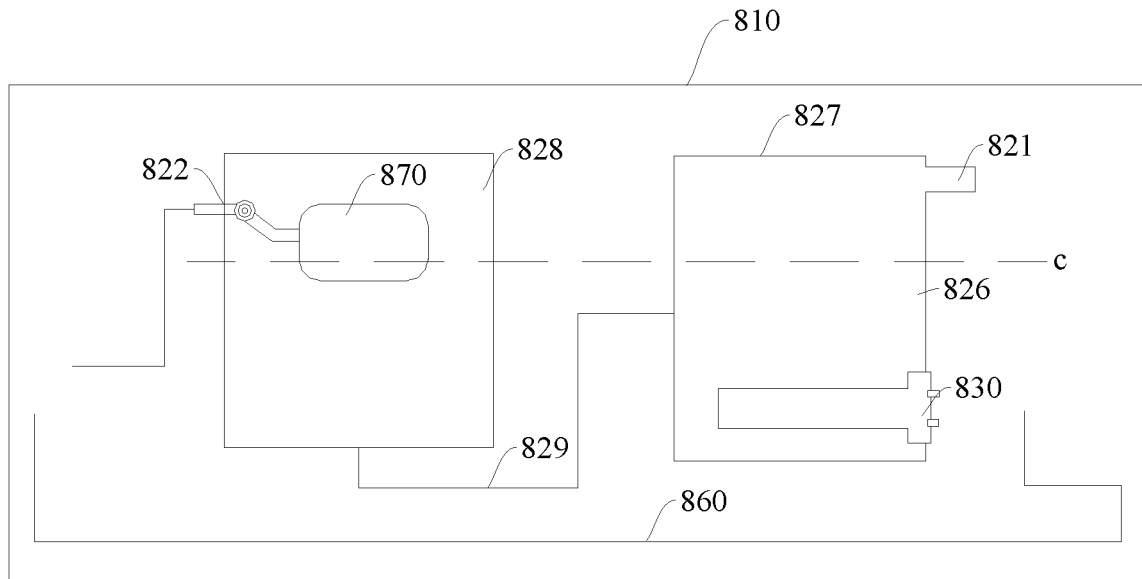


Fig. 14

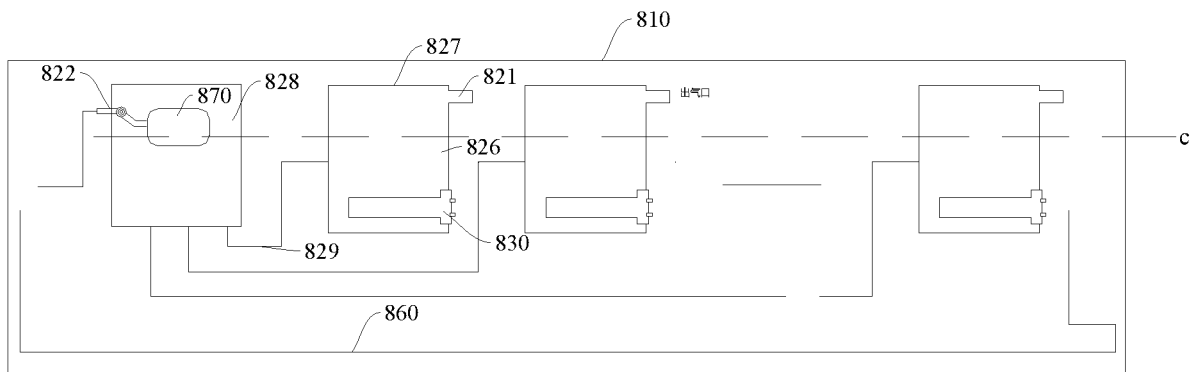


Fig. 15

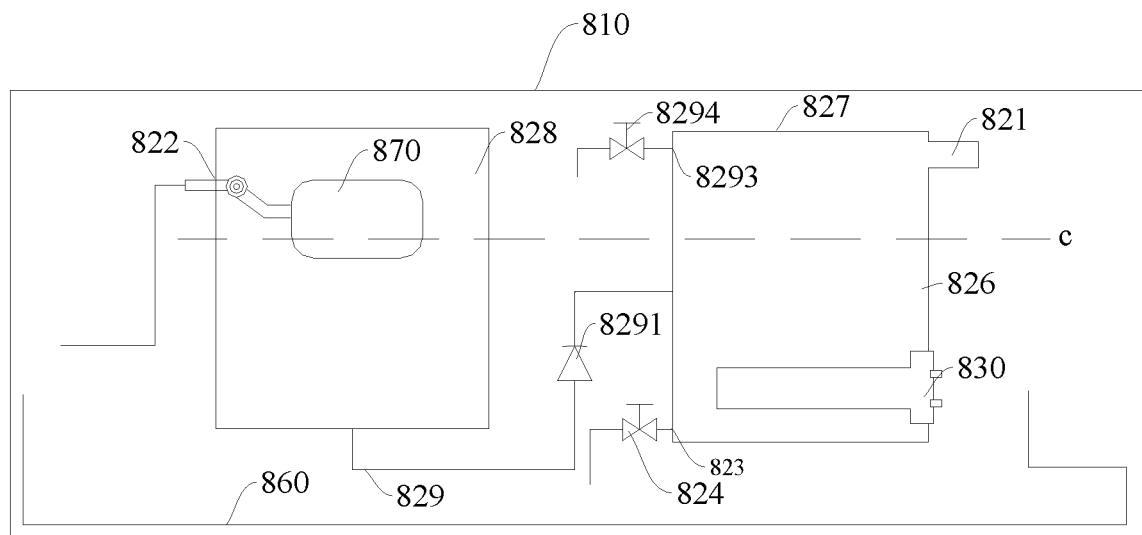


Fig. 16

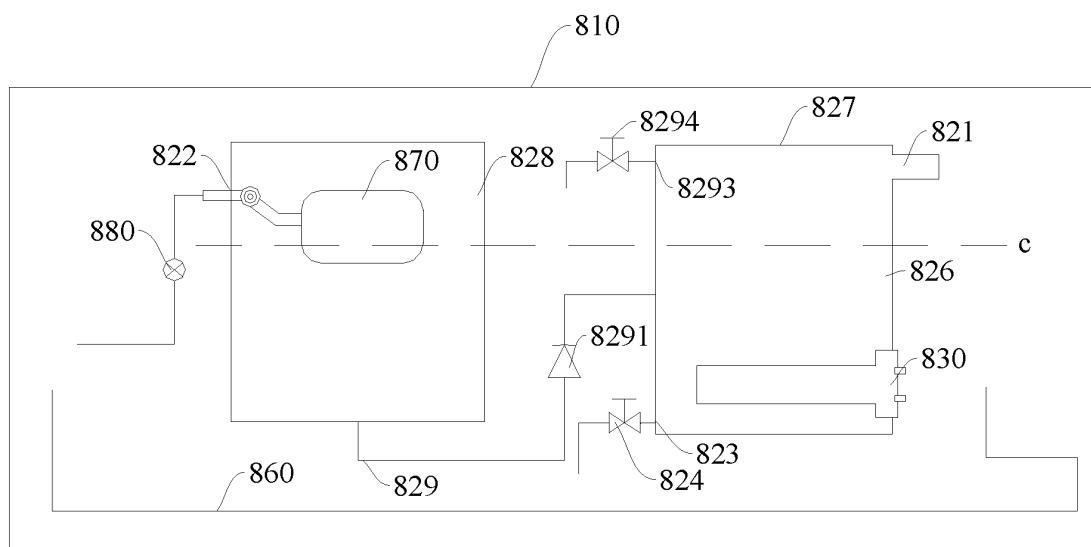


Fig. 17

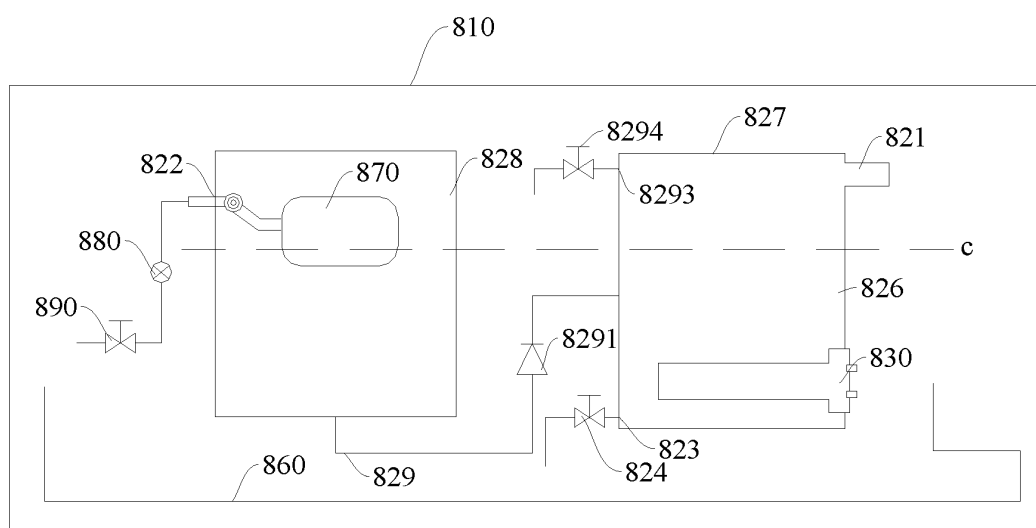


Fig. 18

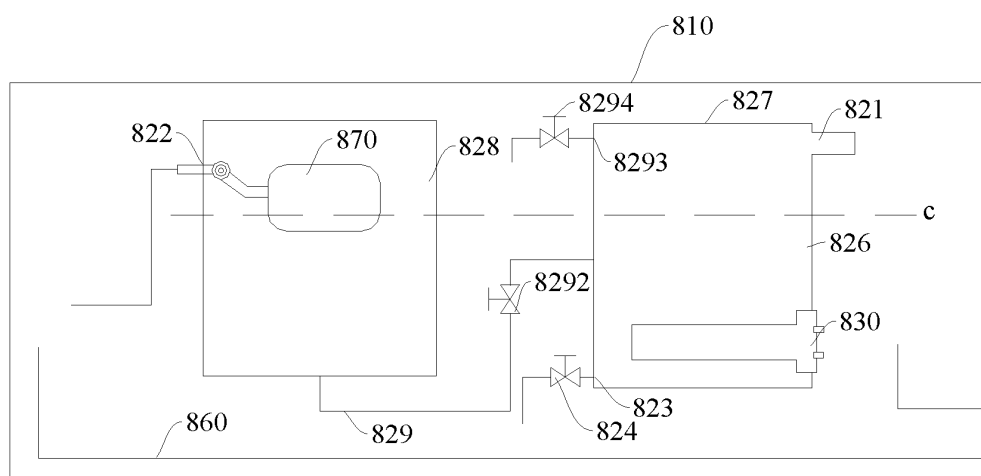


Fig. 19

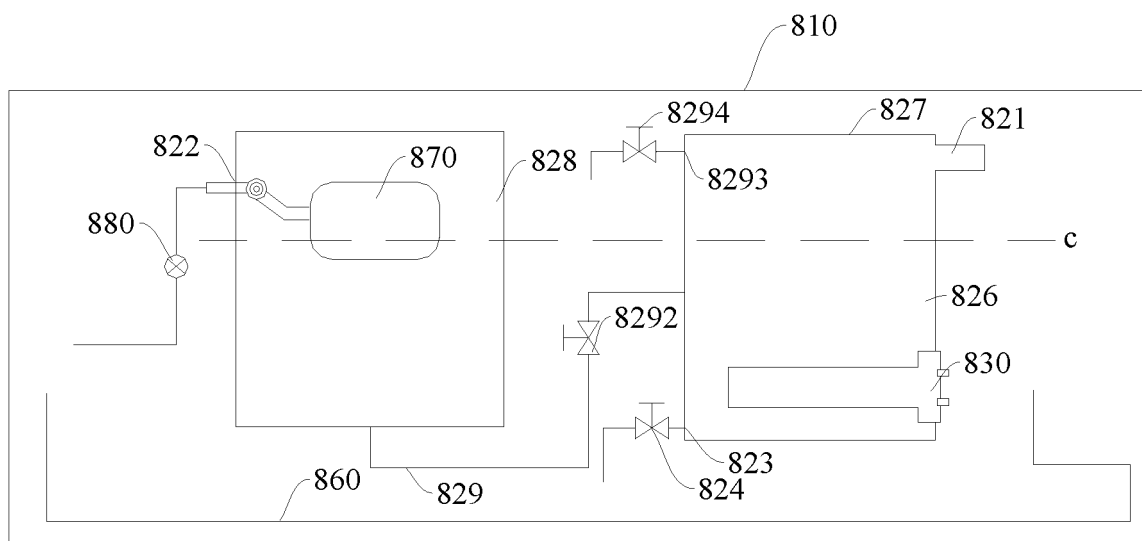


Fig. 20

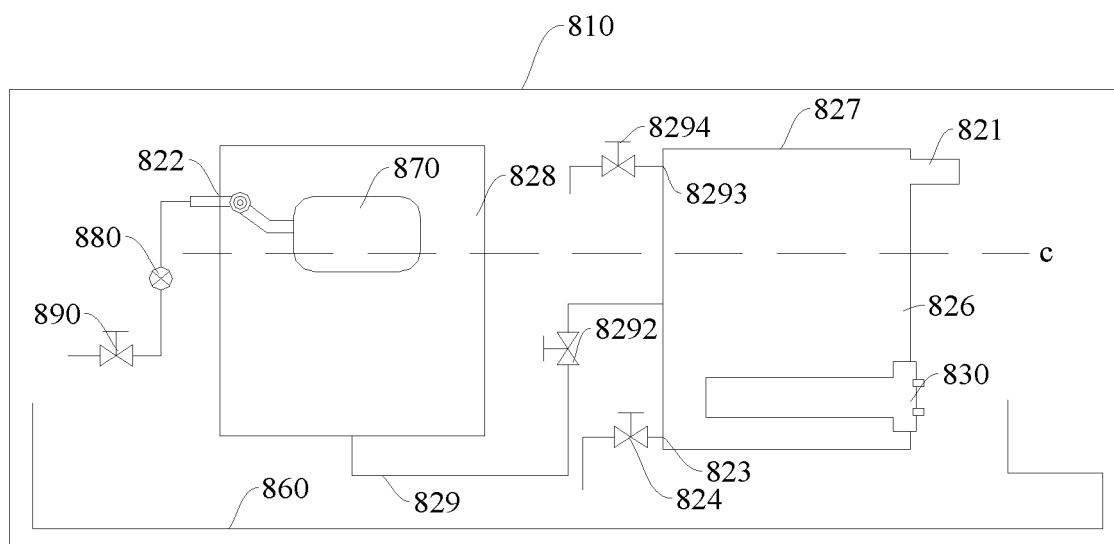


Fig. 21

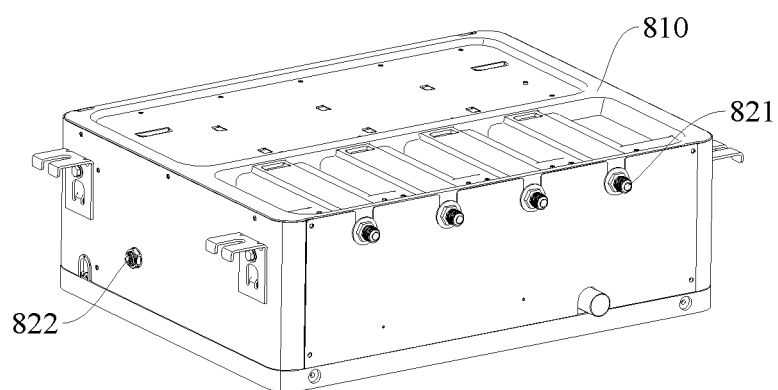


Fig. 22

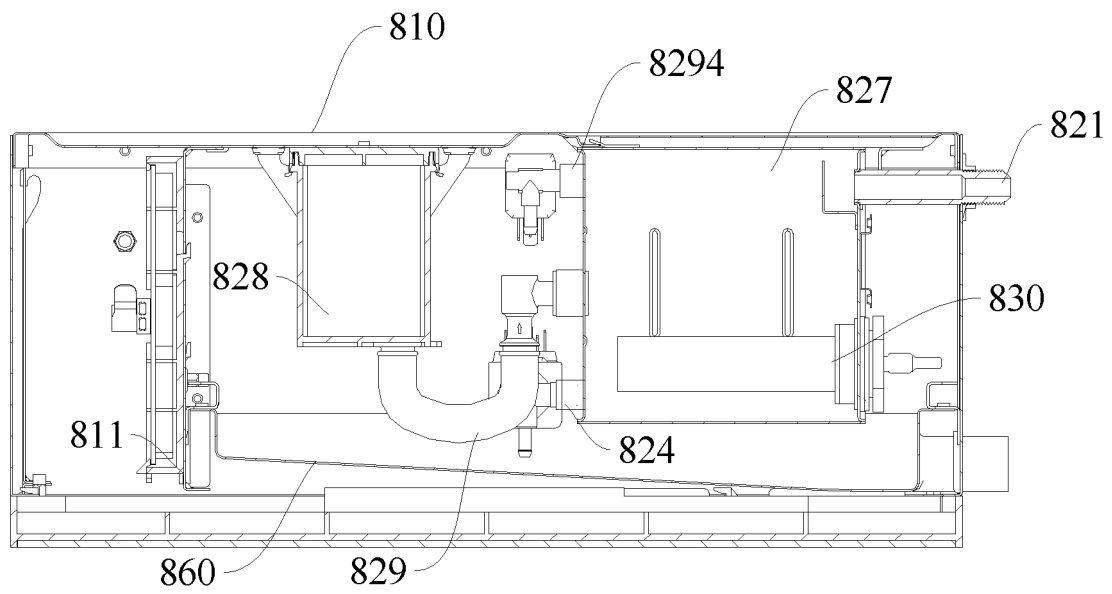


Fig. 23

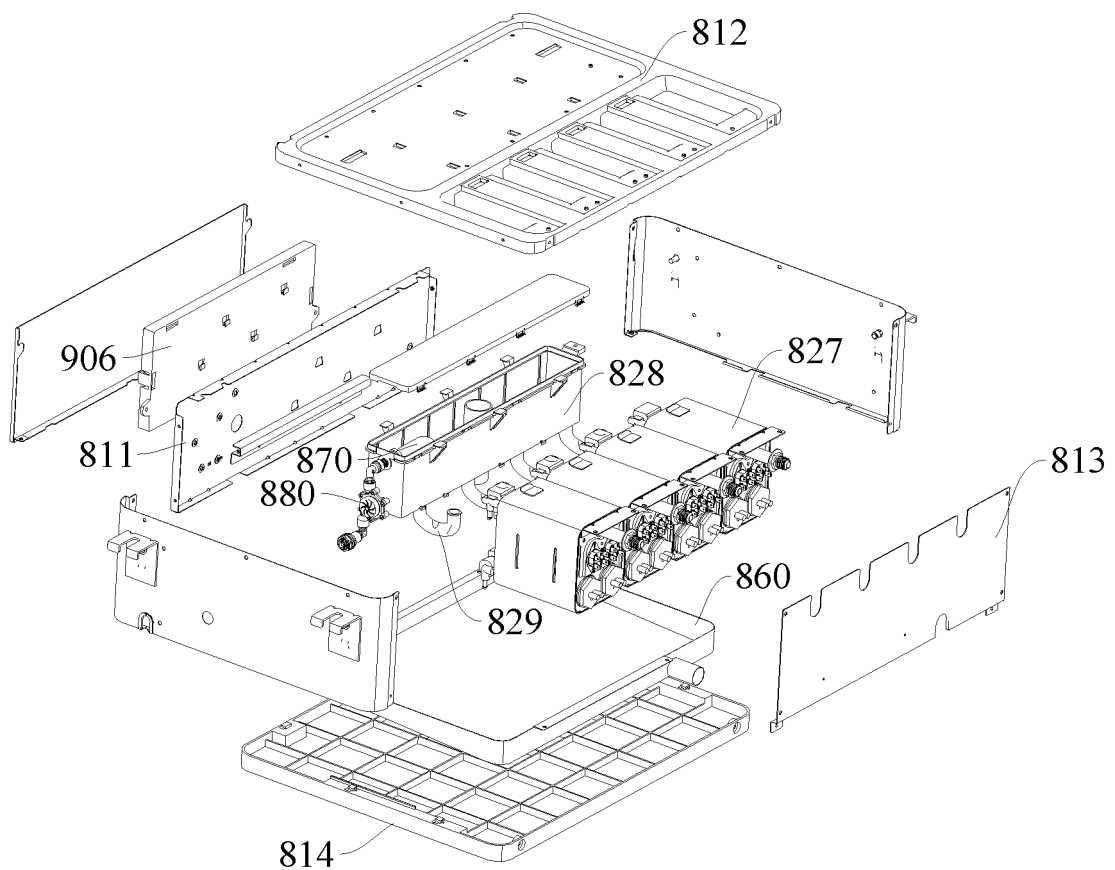


Fig. 24

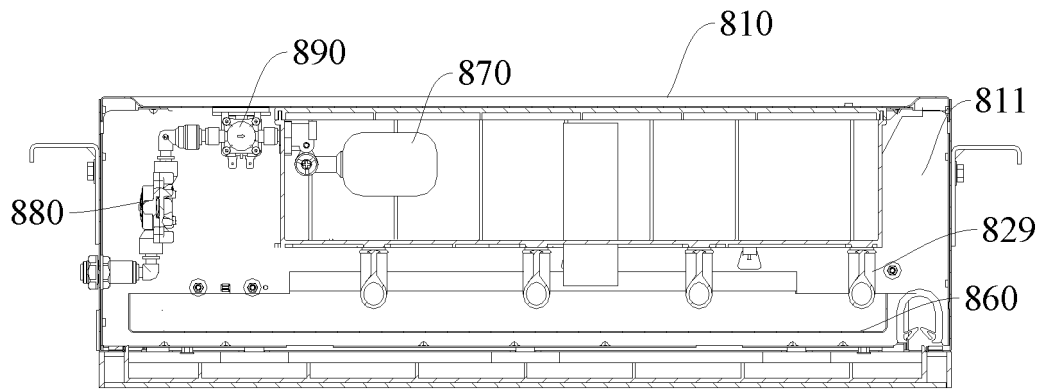


Fig. 25

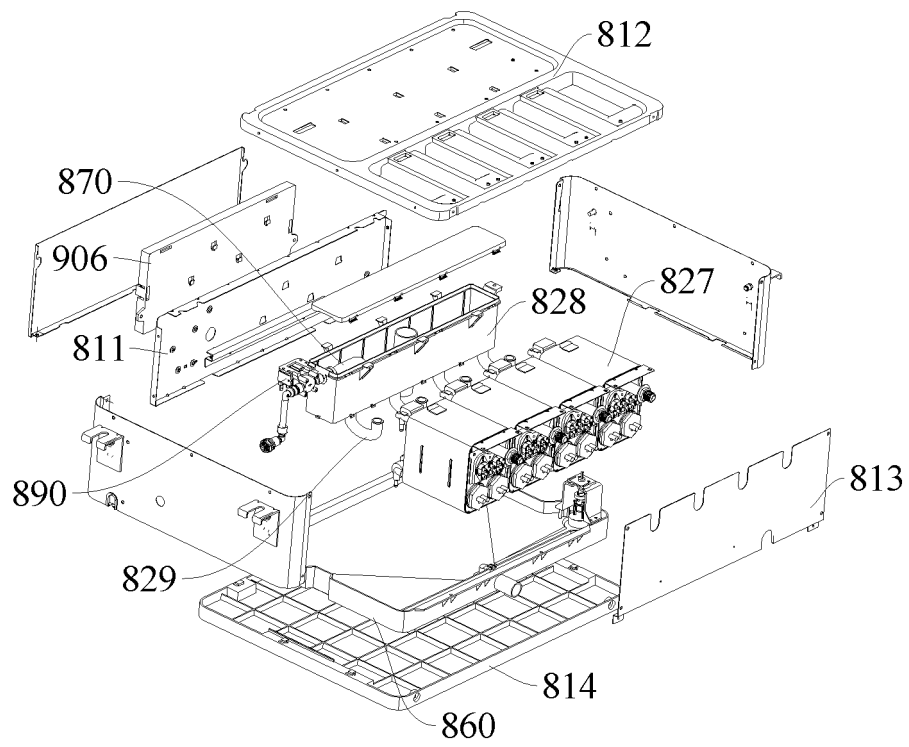


Fig. 26

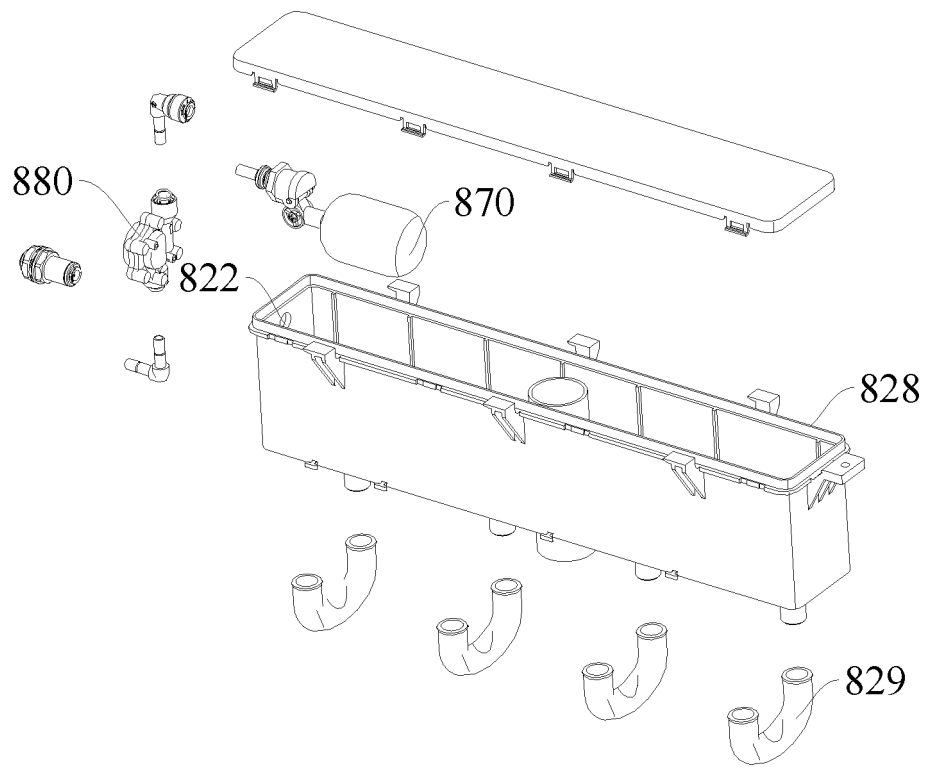


Fig. 27

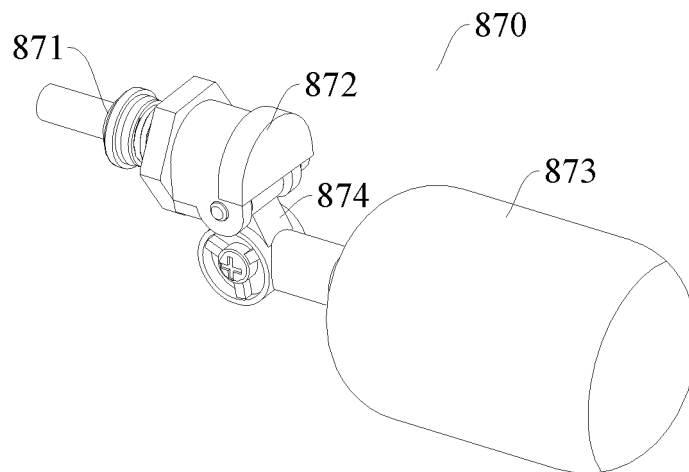


Fig. 28

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/082152

A. CLASSIFICATION OF SUBJECT MATTER F22B 1/28(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) F22B1, F24F1, F24F6		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNKI, CNTXT, CNABS, VEN: 蒸汽, 水箱, 加热, 浮球阀, 空调, 拆卸, 压强, 蒸汽发生器, 压力, 挡板, 连接件, 空调加湿器, steam, tank, valv+, float+, detach+, pressure, air w conditioner, humidifier		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 109973968 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 05 July 2019 (2019-07-05) description, paragraphs 59-119, and figures 1-28	1-25
PX	CN 109973967 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 05 July 2019 (2019-07-05) description, paragraphs 68-119, and figures 1-28	1-25
PX	CN 109973973 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 05 July 2019 (2019-07-05) description, paragraphs 68-119, and figures 1-28	1-25
Y	CN 105135579 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 09 December 2015 (2015-12-09) see description, paragraphs 52-99, and figures 1-3	1-25
Y	CN 103743106 A (HUBEI CHEERO ENVIRONMENTAL PROTECTION TECHNOLOGY CO., LTD.) 14 October 2004 (2004-10-14) see description, paragraphs 4-10, and figure 1	1-25
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “E” earlier application or patent but published on or after the international filing date “L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) “O” document referring to an oral disclosure, use, exhibition or other means “P” document published prior to the international filing date but later than the priority date claimed “T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention “X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone “Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art “&” document member of the same patent family		
Date of the actual completion of the international search 09 May 2020		Date of mailing of the international search report 29 May 2020
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088 China Facsimile No. (86-10)62019451		Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/082152

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	CN 203731615 U (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 23 July 2014 (2014-07-23) see description, paragraphs 26-53, and figure 1	25
A	JP 2002098361 A (DAIKIN IND. LTD.) 05 April 2002 (2002-04-05) entire document	1-25
A	CN 105716057 A (MIDEA GROUP CO., LTD.) 29 June 2016 (2016-06-29) entire document	1-25
A	CN 102878629 (TAIZHOU HAILING DISTRICT ERLING AUTOMATION EQUIPMENT CO., LTD.) 16 January 2013 (2013-01-16) entire document	1-25
A	CN 206669952 U (ZHONGDING HENGTAI TIANJIN TECHNOLOGY CO., LTD.) 24 November 2017 (2017-11-24) entire document	1-25
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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REFERENCES CITED IN THE DESCRIPTION

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