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(54) AIR CONDITIONING DEVICE

(57) An air conditioning device (100), comprising: an indoor unit (1), the indoor unit (1) having an air outlet (11); a steam generation device (2), the steam generation device having a steam outlet (224); a steam delivery conduit (3), one end of the steam delivery conduit (3) is in communication with the steam outlet (224), and the steam generation device (2) drives, by means of the pressure of the steam, the steam to flow and to flow to the indoor unit (1) sequentially through the steam outlet (224) and the steam delivery conduit (3).

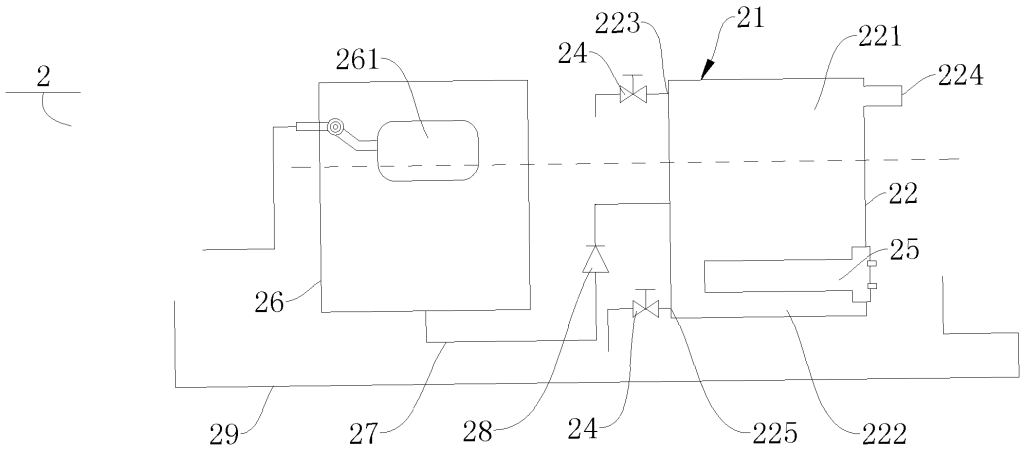

Fig. 6

EP 3 901 527 A1

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application is based on and claims priorities to Chinese Patent Application Serial Nos. 201910277399.0 and 201920468850.2, filed on April 08, 2019, the entire content of which are incorporated herein by reference.

FIELD

[0002] The present application relates to the field of air conditioning technologies, and particularly to an air conditioning device.

BACKGROUND

[0003] In a related art, a humidifier is mounted in an air conditioner to prevent air flow delivered by the air conditioner from being too dry, and a fan is provided at an air outlet end of the humidifier to transport steam generated by the humidifier to an indoor space, but the fan generates a larger noise when working, which affects comfort of a user.

SUMMARY

[0004] The prevent application provides an air conditioning device having the advantages of a low noise and high comfort.

[0005] The air conditioning device according to an embodiment of the present application includes: an indoor unit having an air outlet; a steam generating device having a steam outlet; and a steam delivery line having one end communicated with the steam outlet, the steam generating device driving steam to flow to the indoor unit sequentially through the steam outlet and the steam delivery line utilizing a pressure of the steam.

[0006] In the air conditioning device according to the embodiment of the present application, the steam generating device may generate the steam when working, the pressure of the steam in the steam generating device is increased with an increase in a volume of the generated steam, and when the pressure of the steam in the steam generating device is higher than a pressure at the steam outlet, the steam in the steam generating device may be delivered into the indoor unit sequentially through the steam outlet and the steam delivery line, and delivered to an indoor space along with air flow in the indoor unit, such that the steam may be driven to flow using the pressure thereof, thereby reducing a working noise of the air conditioning device, and then improving the comfort of the user. Further, the whole weight and a manufacturing cost of the air conditioning device may be reduced.

[0007] According to some embodiments of the present application, a plurality of steam chambers are provided in the steam generating device, each steam chamber has at least one steam outlet, and each steam outlet being in communication with at least one steam delivery line.

[0008] In some embodiments of the present application, the steam generating device includes: a working water tank having a heating cavity, the heating cavity being communicated with the steam chamber, and the steam chamber being located inside or outside the heating cavity; and an electric heater provided in the heating cavity.

[0009] In some embodiments of the present application, the electric heater is configured as a positive-temperature-coefficient (PTC) thermistor.

[0010] In some embodiments of the present application, a plurality of electric heaters are provided.

[0011] In some embodiments of the present application, the working water tank has an air pressure adjustment port in communication with the heating cavity.

[0012] In some embodiments of the present application, a steam valve is provided at the air pressure adjustment port.

[0013] In some embodiments of the present application, the working water tank is provided with a drainage port.

[0014] In some embodiments of the present application, the air conditioning device further includes: a water supplementing tank communicated with a water source; and a communicating pipe with one end communicated with the water supplementing tank and the other end communicated with the working water tank.

[0015] In some embodiments of the present application, the communicating pipe is configured as a U-pipe.

[0016] In some embodiments 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.

[0017] In some embodiments of the present application, the water supplementing tank is provided with a ball cock for controlling communication or disconnection between the water supplementing tank and the water source.

[0018] In some embodiments of the present application, the steam outlets are in one-to-one correspondence to the steam delivery lines.

[0019] In some embodiments of the present application, the indoor units are in one-to-one correspondence to the steam delivery lines.

[0020] According to some embodiments of the present application, the other end of the steam delivery line is located at the air outlet.

[0021] According to some embodiments of the present application, the indoor unit is provided with an air duct communicated with the air outlet, the indoor unit further includes a heat exchanger arranged in the air duct, and the other end of the steam delivery line is arranged at the heat exchanger.

[0022] In some embodiments of the present application, the other end of the steam delivery line is located

upstream or downstream of the heat exchanger in a direction of air flow within the air duct.

[0023] In some embodiments of the present application, the other end of the steam delivery line is located between the heat exchanger and the air outlet.

[0024] 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

[0025]

Fig. 1 is a schematic diagram of an air conditioning device according to a first embodiment of the present application;

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

Fig. 3 is a schematic diagram of an air conditioning device according to a third embodiment of the present application;

Fig. 4 is a schematic diagram of an air conditioning device according to a fourth embodiment of the present application;

Fig. 5 is a schematic diagram of an air conditioning device according to a fifth embodiment of the present application;

Fig. 6 is a schematic diagram of a steam generating device of the air conditioning device according to an embodiment of the present application;

Fig. 7 is a schematic diagram of a steam generating device of the air conditioning device according to another embodiment of the present application;

Fig. 8 is a schematic diagram of an indoor unit and a steam delivery line of the air conditioning device according to an embodiment of the present application;

Fig. 9 is a schematic diagram of an indoor unit and a steam delivery line of the air conditioning device according to another embodiment of the present application; and

Fig. 10 is a schematic diagram of an indoor unit and a steam delivery line of the air conditioning device according to still another embodiment of the present application.

REFERENCE NUMERALS

[0026] Air conditioning device 100; indoor unit 1;

air outlet 11; air inlet 12; air duct 13; heat exchanger 14;

steam generating device 2; steam generating module 21; working water tank 22;

steam chamber 221; heating cavity 222; air pressure adjustment port 223;

steam outlet 224; drainage port 225;

drainage valve 23; steam valve 24; electric heater 25; water supplementing tank 26;

ball cock 261; communicating pipe 27; one-way valve 28; drain pan 29;

steam delivery line 3.

DETAILED DESCRIPTION

[0027] 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.

[0028] An air conditioning device 100 according to an embodiment of the present application is described below with reference to the accompanying drawings, and includes: an indoor unit 1, a steam generating device 2 and a steam delivery line 3. The indoor unit 1 may be configured as an air-conditioner indoor unit, a duct type air conditioner, or an indoor part of a central air condi ti oner.

[0029] As shown in Figs. 1 and 2, the indoor unit 1 has an air outlet 11 (referring to Fig. 8), the steam generating device 2 has a steam outlet 224, one end of the steam delivery line 3 is communicated with the steam outlet 224, and the steam generating device 2 drives steam to flow to the indoor unit 1 sequentially through the steam outlet 224 and the steam delivery line 3 using a pressure of the steam.

[0030] It may be understood that the steam generating device 2 may generate the steam when working, the pressure of the steam in the steam generating device 2 is increased with an increase in a volume of the generated steam, and when the pressure of the steam in the steam generating device 2 is higher than a pressure at the steam outlet 224, the steam in the steam generating device 2 may be delivered into the indoor unit 1 sequentially through the steam outlet 224 and the steam delivery line 3, and delivered to an indoor space through the air outlet 11 of the indoor unit 1.

[0031] Thus, the steam may be driven to flow using the pressure thereof, thereby omitting a fan in a related art, then reducing a working noise of the air conditioning device 100, and improving comfort of a user. Further, the whole weight and a manufacturing cost of the air conditioning device 100 may be reduced.

[0032] In addition, in the embodiment of the present application, the steam delivery line 3 is not required to be provided with a control valve, and flow and stop of the steam may be realized by the pressure of the steam in the steam generating device 2, thereby reducing the

manufacturing cost, and simplifying a structure of the steam generating device 2.

[0033] For example, the indoor unit 1 further has an air inlet 12, and indoor air flow enters the indoor unit 1 through the air inlet 12 to exchange heat and then is delivered to the indoor space through the air outlet 11.

[0034] In the air conditioning device 100 according to the embodiment of the present application, the steam generating device 2 may generate the steam when working, the pressure of the steam in the steam generating device 2 is increased with the increase in the volume of the generated steam, and when the pressure of the steam in the steam generating device 2 is higher than the pressure at the steam outlet 224, the steam in the steam generating device 2 may be delivered into the indoor unit 1 sequentially through the steam outlet 224 and the steam delivery line 3, and delivered to an indoor space along with the air flow in the indoor unit 1, such that the steam may be driven to flow using the pressure thereof, thereby reducing the working noise of the air conditioning device 100, and then improving the comfort of the user. Further, the whole weight and the manufacturing cost of the air conditioning device 100 may be reduced.

[0035] For example, in some examples of the present application, three indoor units 1 are provided, three steam generating devices 2 are provided, and three steam delivery lines 3 are provided; the three steam delivery lines 3 are in one-to-one correspondence to the three steam generating devices 2, and the three steam generating devices 2 are in one-to-one correspondence to the three indoor units 1.

[0036] For another example, in some other examples of the present application, as shown in Fig. 3, a plurality of indoor units 1 are provided, a plurality of steam delivery lines 3 are provided correspondingly, one steam generating device 1 is provided, one steam outlet 224 is provided in the steam generating device 2, and all the plurality of steam delivery lines 3 are communicated with the steam outlet 224.

[0037] For another example, in some other examples of the present application, as shown in Figs. 4 and 5, a plurality of indoor units 1 are provided, a plurality of steam delivery lines 3 are provided, the plurality of steam delivery lines 3 are in one-to-one correspondence to the plurality of indoor units 1, one steam generating device 1 is provided, and a plurality of steam outlets 224 are provided in the steam generating device 1, and in one-to-one correspondence to the plurality of steam delivery lines 3.

[0038] According to some embodiments of the present application, as shown in Fig. 2, the steam generating device 2 has a plurality of steam chambers 221 therein, each steam chamber 221 having at least one steam outlet 224, and each steam outlet 224 being in communication with at least one steam delivery line 3.

[0039] It may be appreciated that each steam chamber 221 may have one, two or more steam outlets 224. Each steam outlet 224 may be in communication with one, two or more steam delivery lines 3. Thus, a workload of the single steam chamber 221 may be reduced to improve a working performance thereof, thereby improving a working efficiency of the steam generating device 2.

[0040] For example, three indoor units 1 are provided, three steam chambers 221 are provided, three steam delivery lines 3 are provided, each steam chamber 221 has one steam outlet 224, each steam outlet 224 is communicated with one steam delivery line 3, and the three steam delivery lines 3 are fitted with the three indoor units 1 in one-to-one correspondence.

[0041] For another example, one indoor unit 1 is provided, three steam chambers 221 are provided, three steam delivery lines 3 are provided, each steam chamber 221 has one steam outlet 224, each steam outlet 224 is communicated with one steam delivery line 3, and the three steam delivery lines 3 are fitted with the same indoor unit 1.

[0042] For another example, four indoor units 1 are provided, four steam delivery lines 3 are provided, two steam chambers 221 are provided, each steam chamber 221 has one steam outlet 224, each steam outlet 224 is communicated with two steam delivery lines 3, and the four steam delivery lines 3 are fitted with the four indoor units 1 in one-to-one correspondence.

[0043] For another example, four indoor units 1 are provided, four steam delivery lines 3 are provided, two steam chambers 221 are provided, each steam chamber 221 has two steam outlets 224, each steam outlet 224 is communicated with one steam delivery line 3, and the four steam delivery lines 3 are fitted with the four indoor units 1 in one-to-one correspondence.

[0044] In some embodiments of the present application, the steam generating device 2 is mounted in a kitchen or a toilet. It may be understood that the steam generating device 2 is required to be supplemented with water in time, and a water source is often provided in the kitchen or the toilet; the steam generating device 2 is mounted in the kitchen or the toilet, such that the steam generating device 2 may be closer to the water source, thereby reducing a water supplementing difficulty, and improving a work reliability of the steam generating device 2.

[0045] In some embodiments of the present application, the steam generating device 2 may be hung from a ceiling or a wall, thus reducing an occupied space of the steam generating device 2, and meanwhile lowering a mounting difficulty thereof, so as to be beneficial to improving a mounting efficiency of the steam generating device 2. It should be noted that the steam generating device 2 in the present application may be sold and mounted separately.

[0046] In some embodiments of the present application, as shown in Figs. 6 and 7, the steam generating device 2 includes: a working water tank 22 provided with a heating cavity 222, the heating cavity 222 being communicated with the steam chamber 221, and the steam chamber 221 being located inside or outside the heating cavity 222; and an electric heater 25 provided in the heat-

ing cavity 222.

[0047] The electric heater 25 has the advantage of a stable heating power, thus avoiding a rapid change (rapid increase or rapid decrease) of a quantity of the steam generated by a heating process, and usage of the electric heater 25 has the advantage of gently adjusting a humidity, thereby improving the comfort of the user.

[0048] It may be understood that the electric heater 25 heats the water in the water tank, the water is evaporated at a high temperature to generate steam, the steam may be collected in the steam chamber 221, and when the pressure of the steam collected in the steam chamber 221 is higher than the pressure at the steam outlet 224, under the action of the steam pressure, the steam in the steam chamber 221 may sequentially flow through the steam outlet 224 and the steam delivery line 3, and then is conveyed into the indoor unit 1, and delivered to the indoor space along with air flow in the indoor unit 1.

[0049] The heating cavity 222 serves as not only a place for containing water to be heated, but also a reaction place for heating water by the electric heater 25. The steam chamber 221 serves as not only a place for collecting the steam, but also a place for accumulating the pressure of the steam, and by providing the heating cavity 222 and the steam chamber 221, the steam pressure may be quickly raised to a working pressure, thereby improving the working performance of the air conditioning device 100.

[0050] For example, in some examples of the present application, two working water tanks 22 are provided, and two electric heaters 25 are provided in one-to-one correspondence to the two working water tanks 22.

[0051] Specifically, the steam outlet 224 is provided in the working water tank 22, and communicated with the steam chamber 221 inside the working water tank 22.

[0052] In some embodiments of the present application, the electric heater 25 is configured as a PTC thermistor. The PTC thermistor is a semiconductor resistor typically having a temperature sensitivity, and the arrangement of the PTC thermistor may guarantee heating power of the electric heater 25 to further increase a generation rate of the steam, thereby reducing a response time of the steam generating device 2. Furthermore, compared to other types of electric heaters 25, the PTC thermistor is highly safe and less likely to cause ignition, or the like, even when heated dryly.

[0053] Specifically, the PTC thermistor has adjustable actual power, and during actual operation, the power of the PTC thermistor may be controlled as required. In addition, the PTC thermistor is highly sensitive to temperature, and when the water in the working water tank 22 is insufficient or used up, this condition may be learned in time according to the temperature of the PTC thermistor.

[0054] Specifically, a plurality of PTC thermistors are provided at intervals. The plurality of PTC thermistors may further increase the production rate of the steam to further reduce the response time of the steam generating device 2. The plurality of PTC thermistors may be spaced apart in a height direction of the working water tank 22, and thus, a water level in the working water tank 22 may be judged according to the operating temperatures of the plurality of PTC thermistors.

[0055] In some embodiments of the present application, a plurality of electric heaters 25 are provided. The plurality of electric heaters 25 may further increase the production rate of the steam to further reduce the response time of the steam generating device 2.

[0056] In some embodiments of the present application, as shown in Figs. 6 and 7, the working water tank 22 has a drainage port 225. It may be understood that, during long-term operation of the steam generating device 2, the water inside the working water tank 22 is heated and evaporated into steam by the electric heater 25 for a long time. Since impurities, such as chloride ions, calcium ions, or the like, in the water are hardly taken away by the steam, these impurities may have concentrations higher and higher under long-term accumulation, and thus corrode not only the working water tank 22, but also other detecting elements in the working water tank 22, which influences an operation reliability of the steam generating device 2. The Impurities brought in the water tend to be scaled in the working water tank 22, and the thicker a scale layer, the more difficult the removal. In addition, the steam in the working water tank 22 inevitably carries water mist with impurities during discharge, and when the content of the impurity in the water is too high, the sprayed water mist also influences health of people. Thus, the working water tank 22 is required to be cleaned periodically, and by providing the drainage port 225, cleaned sewage may be drained out of the working water tank 22 through the drainage port 225, thereby improving cleanliness of the working water tank 22.

[0057] Furthermore, when the working water tank 22 is required to be repaired or an emergency occurs and the water in the working water tank 22 is necessary to be drained, the water in the working water tank 22 may be drained through the drainage port 225. Specifically, the drainage port 225 is provided in a bottom of the working water tank 22 and may be connected with a sink or bathroom equipment through a drainage pipe, the water discharged from the working water tank 22 may automatically flow into the sink or a urinal by gravity, and a drainage valve 23 is further provided at the drainage port 225.

[0058] In some embodiments of the present application, as shown in Figs. 6 and 7, the air conditioning device 100 (referring to Fig. 1) further includes: a water supplementing tank 26 communicated with the water source; and a communicating pipe 27 having one end communicated with the water supplementing tank 26 and the other end communicated with the working water tank 22. The water supplementing tank 26 may be configured to timely deliver and supplement water to the working water tank 22, and the problem that the working water tank 22 is unable to be supplemented with water due to temporary water cut may be solved by providing the water supple-

menting tank 26, such that the working water tank 22 may still work continuously during short-time water cut, thereby improving the working reliability and safety of the air conditioning device 100.

[0059] For example, in some examples of the present application, one water supplementing tank 26 is provided, and a plurality of working water tanks 22 are provided and communicated with the water supplementing tank 26 through the communicating pipes 27 respectively.

[0060] For another example, in some examples of the present application, a plurality of water supplementing tanks 26 are provided, a plurality of working water tanks 22 are provided, and the plurality of water supplementing tanks 26 are fitted with the plurality of working water tanks 22 in one-to-one correspondence.

[0061] In some embodiments of the present application, as shown in Figs. 6 and 7, the communicating pipe 27 is configured as a U-pipe. It may be understood that after the water supplementing tank 26 is communicated with the working water tank 22 through the U-pipe, a liquid level in the water supplementing tank 26 is flush with a liquid level in the working water tank 22, when the working water tank 22 has a low liquid level, the water supplementing tank 26 also has a relatively low liquid level, and when the working water tank 22 has a high liquid level, the water supplementing tank 26 also has a relatively high liquid level. Thus, the liquid level in the working water tank 22 may be controlled within an appropriate range by controlling the liquid level in the water supplementing tank 26.

[0062] In some embodiments of the present application, as shown in Figs. 6 and 7, a one-way valve 28 is provided at the U-pipe to enable fluid to flow only from the water supplementing tank 26 to the working water tank 22, thus avoiding that the water in the working water tank 22 flows back into the water supplementing tank 26 under the action of the high-pressure steam, and meanwhile avoiding that the steam in the working water tank 22 flows back into the water supplementing tank 26, so as to guarantee uniqueness of a flowing direction of the steam in the working water tank 22. It should be noted that the one-way valve 28 enables the fluid to flow only from the water supplementing tank 26 to the working water tank 22, and meanwhile may prevent the steam in the working water tank 22 from flowing back into the water supplementing tank 26.

[0063] It should be noted that, in order to guarantee the working safety of the steam generating device 2, the water supplementing tank 26 may be set to deliver and supplement water to the working water tank 22 only when no steam is generated in the working water tank 22. Or, when an air pressure in the working water tank 22 is the same as an air pressure in the water supplementing tank 26, the water supplementing tank 26 delivers and supplements water to the working water tank 22.

[0064] In some embodiments of the present application, as shown in Figs. 6 and 7, the water supplementing tank 26 has a ball cock 261 for controlling communication or disconnection between the water supplementing tank 26 and the water source. It may be appreciated that when the liquid level in the water supplementing tank 26 is below a preset height, the ball cock 261 may control the water source to be communicated with the water supplementing tank 26, thus replenishing the water supplementing tank 26 with water; when the liquid level in the water supplementing tank 26 reaches the preset height, the ball cock 261 controls the water source to be disconnected from the water supplementing tank 26. Thus, by providing the ball cock 261, the water supplementing tank 26 may be communicated with the water source in time under the condition that the water supplementing tank 26 is short of water, and disconnected from the water source in time under the condition that the water supplementing tank 26 is not short of water.

[0065] It may be understood that, during operation of the air conditioning device 100 according to the embodiment of the present application, an electric heating device in the steam generating device 2 may heat the water in the working water tank 22 to generate the steam, and when the pressure of the steam in the working water tank 22 is higher than the pressure at the steam outlet 224, under the action of the steam pressure, the high-pressure steam in the working water tank 22 may sequentially flow through the steam outlet 224 and the steam delivery line 3, and then be conveyed into the indoor unit 1, and delivered to the indoor space along with the air flow in the indoor unit 1.

[0066] When the working water tank 22 has a small amount of water, the water supplementing tank 26 may replenish water into the working water tank 22 through the communicating pipe 27, and when the liquid level in the water supplementing tank 26 is lower than the set height, the ball cock 261 may control the water supplementing tank 26 to be communicated with the water source, thereby replenishing water into the water supplementing tank 26. Specifically, the water supplementing tank 26 may be connected with a faucet through a water inlet pipe, and the faucet is turned on when the water supplementing tank 26 is required to be supplemented with water.

[0067] In some embodiments of the present application, the water supplementing tank 26 is in communication with a water source in the kitchen or toilet, which may be either tap water or purified water, thus lowering a mounting difficulty of the water supplementing tank 26, and meanwhile reducing a distance between the water supplementing tank 26 and the water source, and achieving convenient and practical advantages.

[0068] In some embodiments of the present application, the water supplementing tank 26 may include a water tank body and a water inlet valve, the water tank body has an outer wall integrally provided with a mounting base and is provided with a water inlet, and the water inlet valve is mounted to the mounting base and connected with the water inlet.

[0069] Specifically, when mounted at the water tank

body, the water inlet valve is fitted with the mounting base to reliably fix the water inlet valve, which is beneficial to improving a working reliability of the water inlet valve; meanwhile, the mounting base and the water inlet valve are integrally formed, which is beneficial to guaranteeing a structural strength between the water tank body and the mounting base, realizes convenient formation and simple fabrication, and omits redundant assembling parts and connecting processes, thus facilitating an improvement in an assembling efficiency of the water supplementing tank 26.

[0070] In some embodiments of the present application, the water supplementing tank 26 further includes a detection device provided within the water tank body, the water tank body has a water overflow port, the detection device is configured to send a water overflow signal when the water level within the water tank body is above a preset water level, and the water inlet valve is closed when the detection device sends the water overflow signal. It may be understood that the signal is transmitted between the detection device and the water inlet valve, and when the detection device outputs the water overflow signal, the water inlet valve is closed, so as to ensure that the water overflow amount of the water supplementing tank 26 is not too large, which is beneficial to improving the working reliability of the water supplementing tank 26.

[0071] In some embodiments of the present application, as shown in Figs. 1 and 2, the steam outlets 224 are in one-to-one correspondence to the steam delivery lines 3. It may be understood that, when a plurality of steam outlets 224 are provided, a plurality of steam delivery lines 3 are also provided, thus not only facilitating reduction of connection and mounting difficulties of the plural steam delivery lines 3 and the plural steam outlets 224, but also reducing repairing and later maintenance difficulties, saving mounting and later maintenance time, and improving mounting and repairing efficiencies.

[0072] For example, three steam outlets 224 are provided, three steam delivery lines 3 are provided, and the three steam outlets 224 are in one-to-one correspondence to the three steam delivery lines 3.

[0073] In some embodiments of the present application, as shown in Figs. 6 and 7, the working water tank 22 has an air pressure adjustment port 223 communicated with the heating cavity 222. The steam outlet 224 of the steam generating device 2 is communicated with the steam delivery line 3, the steam delivery line 3 (referring to Figs. 1 and 2) may have some bent sections, and after the steam delivery line 3 works for a long time, the bent sections tend to collect cooling water, which may block the flow of the steam and meanwhile cause an excessive air pressure in the steam delivery line 3 and the working water tank 22. By providing the air pressure adjustment port in the working water tank 22, the steam or the cooling liquid with the excessive air pressure in the steam delivery line 3 may be released periodically or when required, thereby improving steam delivery smoothness. Moreover, the pressure between the working water tank 22 and the water supplementing tank 26 may be balanced to ensure that the water supplementing tank 26 may timely replenish water into the working water tank 22.

[0074] It should be noted that, when the working water tank 22 stops working, the air pressure in the working water tank and the air pressure in the water supplementing tank may be kept balanced, but the steam delivery line 3 (referring to Figs. 1 and 2) may have some bent sections, and after the steam delivery line 3 works for a long time, the bent sections tend to collect cooling water, which may block the flow of the steam and meanwhile cause an excessive air pressure in the steam delivery line 3 and the working water tank 22; the arrangement of the air pressure adjustment port 223 may timely balance the pressure between the working water tank 22 and the water supplementing tank 26, thereby ensuring that the water supplementing tank 26 may timely replenish water into the working water tank 22.

[0075] In some embodiments of the present application, as shown in Figs. 6 and 7, a steam valve 24 is provided at the air pressure adjustment port 223. By providing the steam valve 24, the user may adjust the pressure of the steam in the steam delivery line 3 (referring to Figs. 1 and 2) and the working water tank 22 more conveniently. In addition, the arrangement of the steam valve 24 may further ensure that the steam in the steam chamber 221 does not leak when the steam generating device 2 works, thereby guaranteeing the working reliability and safety of the steam generating device 2.

[0076] Specifically, the steam valve 24 may be configured as a mechanical valve or an electromagnetic valve, and when the steam generating device 2 operates normally, the steam valve 24 is in a closed state.

[0077] In some embodiments of the present application, as shown in Figs. 1 and 2, the indoor units 1 are in one-to-one correspondence to the steam delivery lines 3. It may be understood that, when a plurality of indoor units 1 are provided, a plurality of steam delivery lines 3 are also provided, thus not only facilitating reduction of connection and mounting difficulties of the plural indoor units 1 and the plural steam delivery lines 3, but also reducing repairing and later maintenance difficulties, saving mounting and later maintenance time, and improving mounting and repairing efficiencies. Moreover, accurate air supply to different indoor units 1 may be realized, for example, when part of the indoor units 1 have large working air volumes, steam volumes of the corresponding steam delivery lines 3 may be adjusted to be adapted to the air volumes of the indoor units 1, which achieves the advantage of accurate humidification control.

[0078] According to some embodiments of the present application, as shown in Fig. 8, the other end of the steam delivery line 3 is located at the air outlet 11. It may be understood that, when the pressure of the steam in the working water tank 22 is higher than the pressure at the steam outlet 224, under the action of the steam pressure,

the high-pressure steam in the working water tank 22 may sequentially flow through the steam outlet 224, the steam delivery line 3 and the air outlet 11 of the indoor unit 1 (referring to Figs. 6 and 7), and be mixed with the air flow delivered to the air outlet 11 by the indoor unit 1, so as to be conveyed to the indoor space together.

[0079] The arrangement of the other end of the steam delivery line 3 at the air outlet 11 reduces both connection and assembly difficulties as well as a maintenance difficulty of the steam delivery line 3.

[0080] According to some embodiments of the present application, as shown in Figs. 9 and 10, the indoor unit 1 has an air duct 13, the air duct 13 is communicated with the air outlet 11, the indoor unit 1 further includes a heat exchanger 14, the heat exchanger 14 is provided in the air duct 13, and the other end of the steam delivery line 3 is provided at the heat exchanger 14. It may be understood that the air flow blown out from the indoor unit 1 firstly passes through the heat exchanger 14 and then is discharged into a room from the air outlet 11 (referring to Figs. 6 and 7), and the arrangement of the other end of the steam delivery line 3 at the heat exchanger 14 may prolong a mixing time of the steam and the air flow in the indoor unit 1, such that the steam and the air flow may be mixed fully, thus improving a humidification effect.

[0081] In some embodiments of the present application, as shown in Figs. 9 and 10, the other end of the steam delivery line 3 is located upstream or downstream of the heat exchanger 14 in a direction of the air flow within the air duct 13. It may be understood that the other end of the steam delivery line 3 may be provided upstream or downstream of the heat exchanger 14, specifically according to a specific type of the inner unit 1, an application environment and the manufacturing cost.

[0082] In some embodiments of the present application, as shown in Fig. 10, the other end of the steam delivery line 3 is located between the heat exchanger 14 and the air outlet 11. It may be understood that the arrangement of the other end of the steam delivery line 3 between the heat exchanger 14 and the air outlet 11 may not only prolong the mixing time of the steam and the air flow in the indoor unit 1 to fully mix the steam with the air flow, but also reduce the connection and assembly difficulties of the steam delivery line 3, and meanwhile reduce the maintenance difficulty of the steam delivery line 3.

[0083] According to some embodiments of the present application, as shown in Figs. 3 and 4, the air conditioning device 100 includes: the plurality of indoor units 1 and the steam generating device 2, each indoor unit 1 having one air outlet 11 (referring to Fig. 8), the steam generating device 2 having the plurality of steam outlets 224, the plurality of steam outlets 224 being in one-to-one correspondence to the plurality of indoor units 1, each steam outlet 224 being communicated with the indoor unit 1 through the steam delivery line 3, and the steam generating device 2 driving the steam to flow to the indoor unit 1 sequentially through the steam outlet 224 and the steam delivery line 3 using the pressure of the steam..

[0084] It may be understood that the steam generating device 2 has the plurality of steam outlets 224, and the plurality of steam outlets 224 are in one-to-one correspondence to the plurality of indoor units 1, such that the steam discharged from the plurality of steam outlets 224 may be delivered to the plurality of indoor units 1 through the independent steam delivery lines 3, thereby realizing independent humidification of the plurality of indoor units 1.

[0085] In some embodiments of the present application, as shown in Figs. 3 and 4, the steam generating device 2 includes a plurality of steam generating modules 21, each steam generating module 21 having a steam outlet 224, the steam generating module 21 including a working water tank 22 and an electric heater 25, and the working water tank 22 having a heating cavity 222 and a steam chamber 221. It may be understood that each indoor unit 1 may correspond to one steam chamber 221, and the steam chamber 221 may control heating power of the electric heater 25 according to the amount of the steam required by the indoor unit 1, thereby delivering different volumes of steam of different indoor units 1, then better meeting user requirements and achieving an energy saving advantage.

[0086] Specifically, as shown in Figs. 6 and 7, a drain pan 29 is further provided at a bottom of the steam generating device 2 to prevent the water in the water supplementing tank 26 or the working water tank 22 from leaking into the indoor space.

[0087] It should be noted that the air conditioning device 100 may be configured as a separate component, and is mounted in the kitchen or the toilet by means of a suspended ceiling, and configured to be directly communicated with tap water or purified tap water; that is, the tap water or purified tap water is supplied to the air conditioning device 100; the air conditioning device 100 may also be integrated in and integral with an air conditioner.

[0088] In the description of the present application, "a plurality of' means two or more unless otherwise stated. Furthermore, in the description of the present application, it should be noted that unless specified or limited otherwise, the terms "mounted", "connected", and "coupled" and the like are used broadly, and may be, for example, fixed connections, detachable connections, or integral connections; may also be mechanical or electrical connections; may also be direct connections or indirect connections via intervening structures; may also be inner communications of two elements. The above terms can be understood by those skilled in the art according to specific situations.

[0089] 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.

[0090] 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. An air conditioning device, comprising:

an indoor unit having an air outlet;
a steam generating device having a steam outlet; and
a steam delivery line having one end communicated with the steam outlet, the steam generating device driving steam to flow to the indoor unit sequentially through the steam outlet and the steam delivery line utilizing a pressure of the steam.

2. The air conditioning device according to claim 1, wherein a plurality of steam chambers are provided in the steam generating device, each steam chamber has at least one steam outlet, and each steam outlet is in communication with at least one steam delivery line.

3. The air conditioning device according to claim 2, wherein the steam generating device comprises:

a working water tank having a heating cavity communicated with the steam chamber, and the steam chamber being located inside or outside the heating cavity; and
an electric heater provided in the heating cavity.

4. The air conditioning device according to claim 3, wherein the electric heater is configured as a PTC thermistor.

5. The air conditioning device according to claim 3, wherein a plurality of electric heaters are provided.

6. The air conditioning device according to claim 3, wherein the working water tank has an air pressure adjustment port in communication with the heating cavity.

7. The air conditioning device according to claim 6, wherein a steam valve is provided at the air pressure adjustment port.

8. The air conditioning device according to claim 3, wherein the working water tank is provided with a drainage port.

9. The air conditioning device according to claim 3, further comprising:

a water supplementing tank communicated with a water source; and
a communicating pipe with one end communicated with the water supplementing tank and the other end communicated with the working water tank.

10. The air conditioning device according to claim 9, wherein the communicating pipe is configured as a U-pipe.

11. The air conditioning device according to claim 10, 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.

12. The air conditioning device according to claim 10, wherein the water supplementing tank is provided with a ball cock for controlling communication or disconnection between the water supplementing tank and the water source.

13. The air conditioning device according to claim 2, wherein the steam outlets are in one-to-one correspondence to the steam delivery lines.

14. The air conditioning device according to claim 2, wherein the indoor units are in one-to-one correspondence to the steam delivery lines.

15. The air conditioning device according to any one of claims 1 to 14, wherein the other end of the steam delivery line is located at the air outlet.

16. The air conditioning device according to any one of claims 1 to 15, wherein the indoor unit is provided with an air duct communicated with the air outlet, and the indoor unit further comprises a heat exchanger arranged in the air duct, and the other end of the steam delivery line is arranged at the heat exchanger.

17. The air conditioning device according to claim 16, wherein the other end of the steam delivery line is located upstream or downstream of the heat exchanger in a direction of air flow within the air duct.

18. The air conditioning device according to claim 17, wherein the other end of the steam delivery line is located between the heat exchanger and the air outlet.

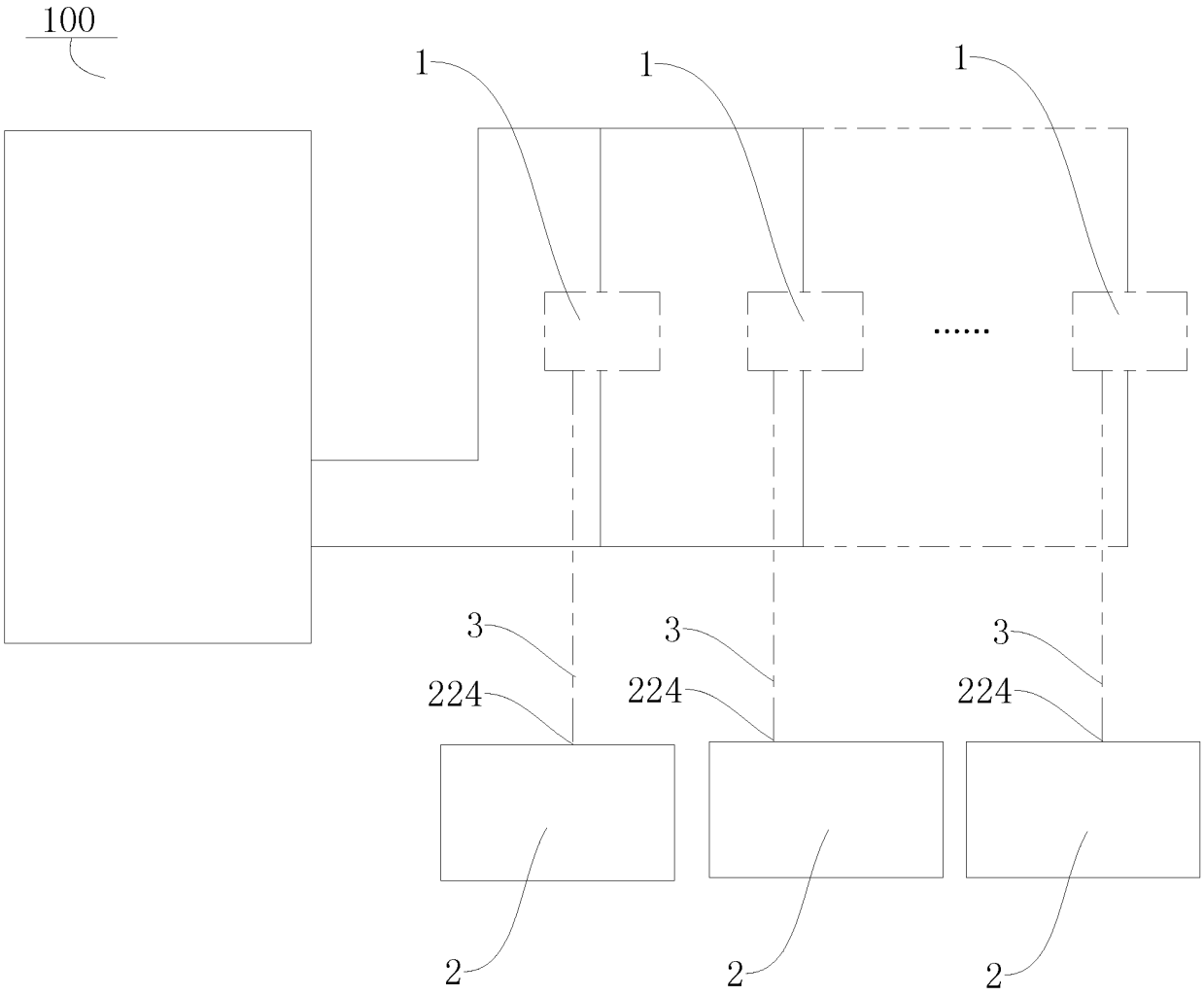

Fig. 1

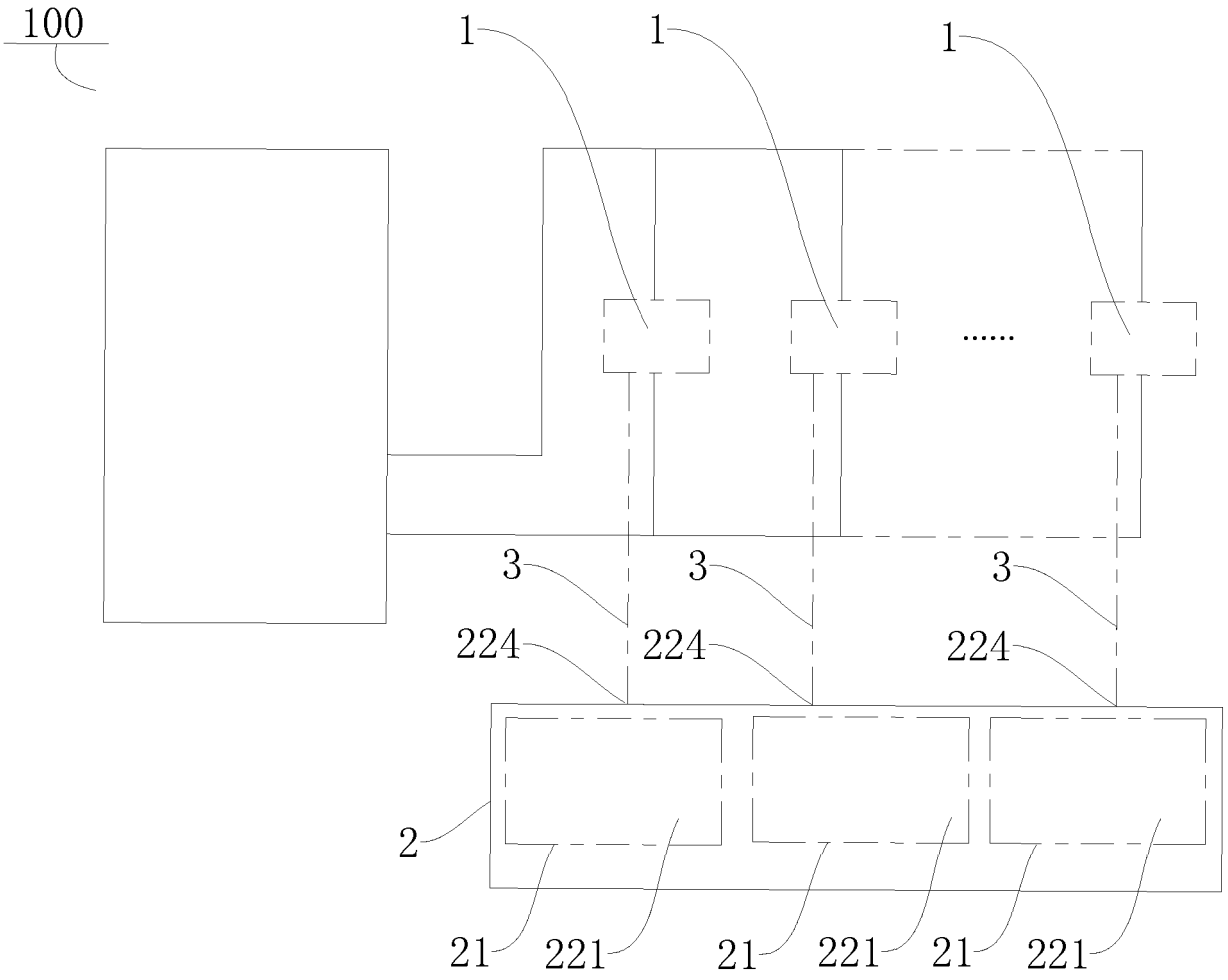

Fig. 2

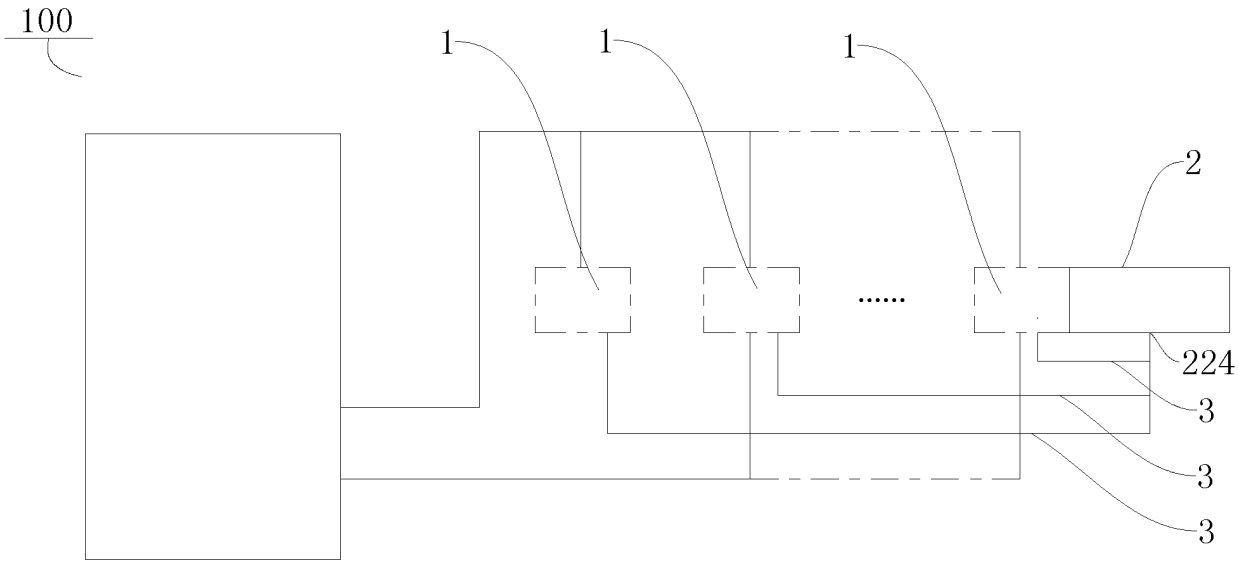

Fig. 3

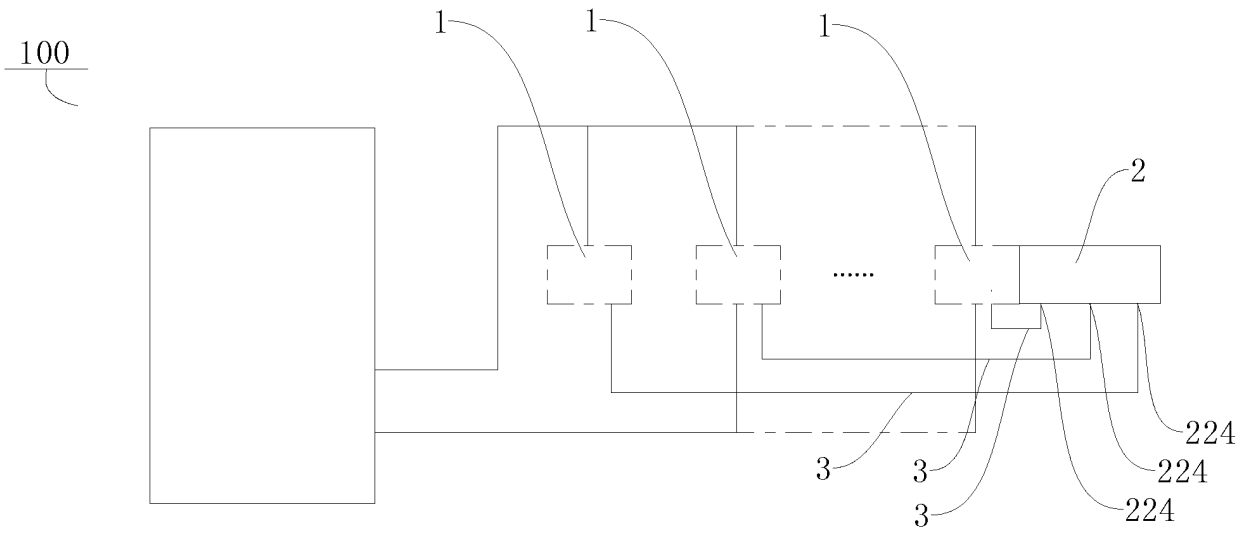

Fig. 4

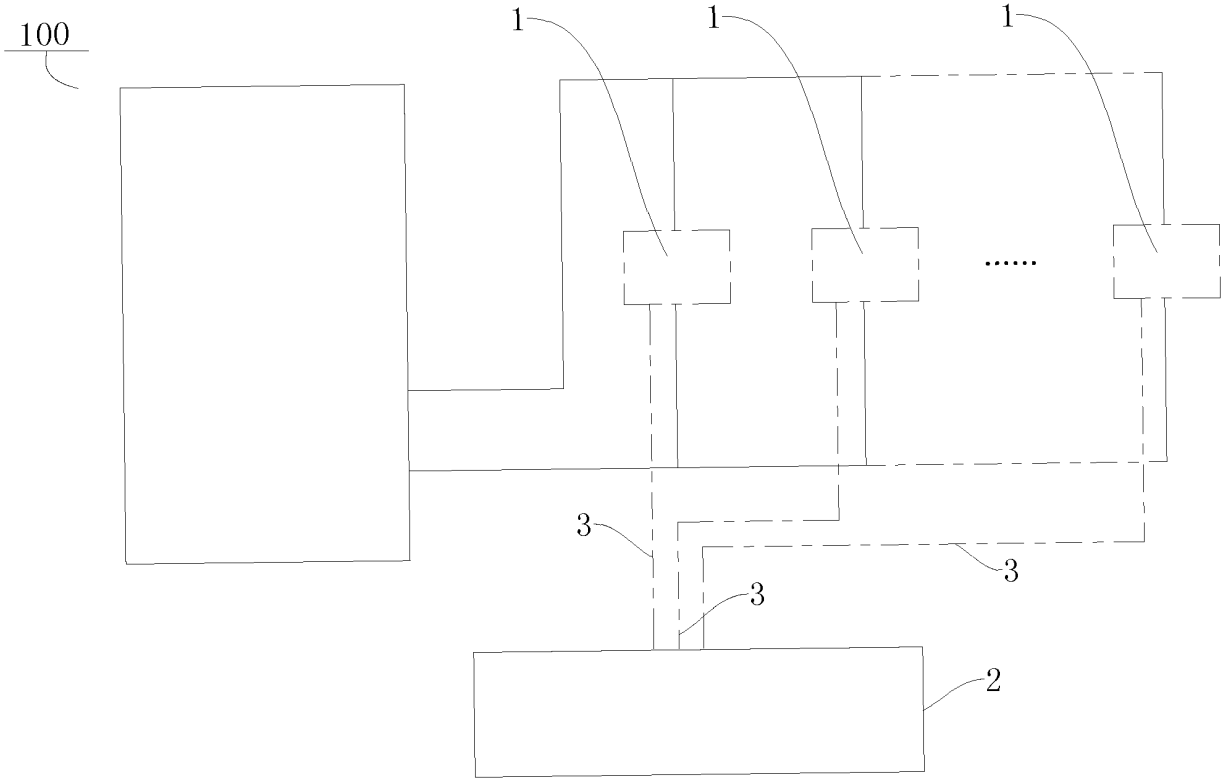

Fig. 5

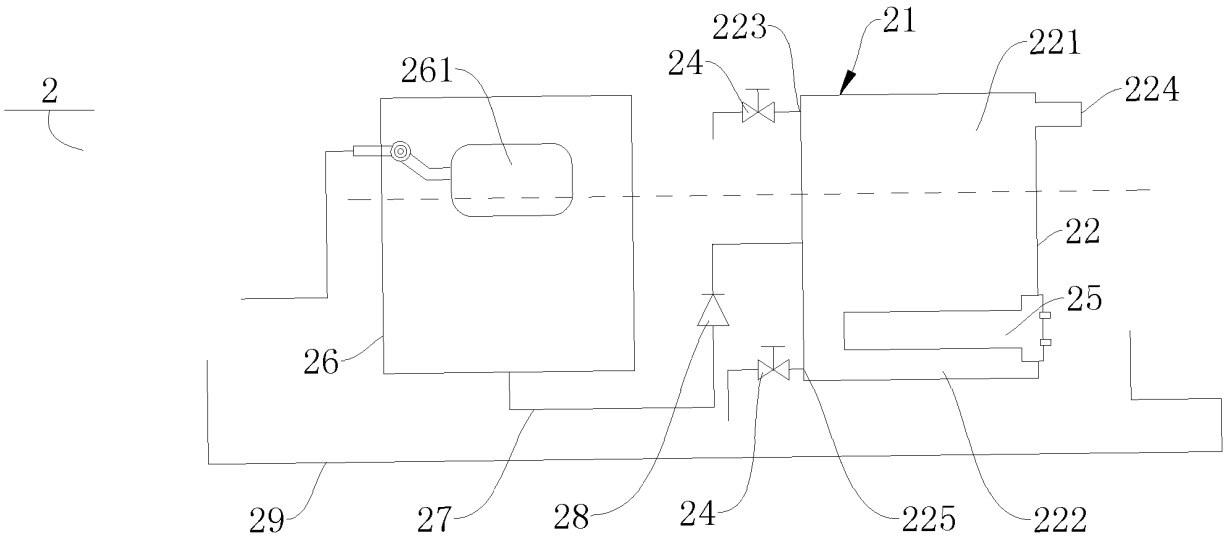

Fig. 6

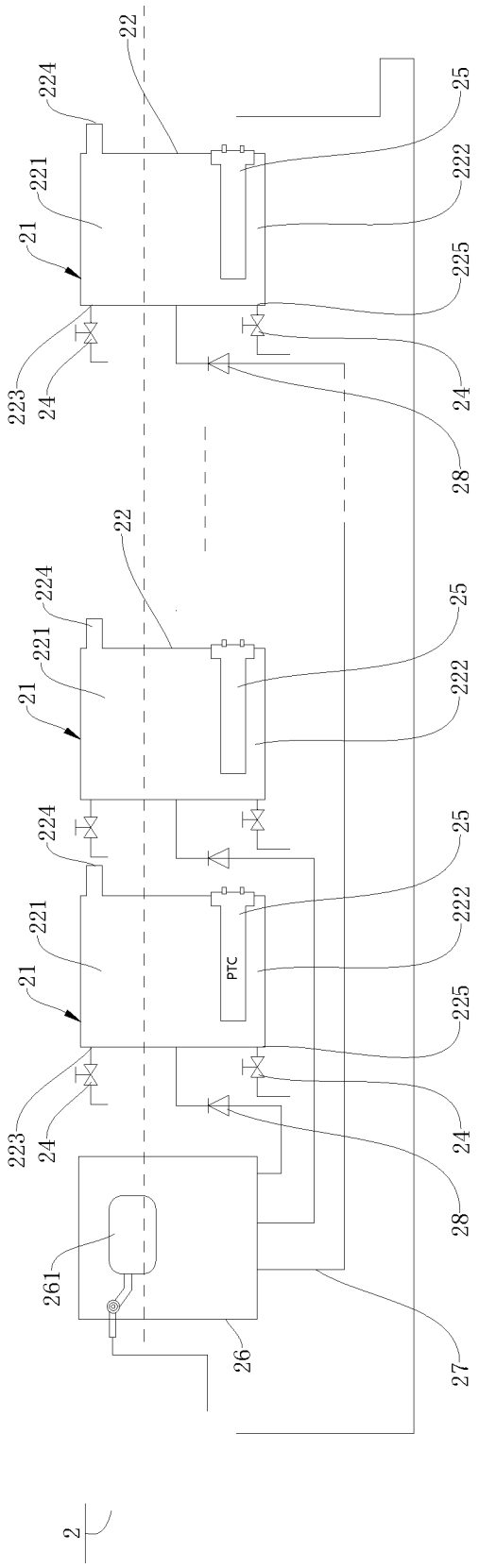

Fig. 7

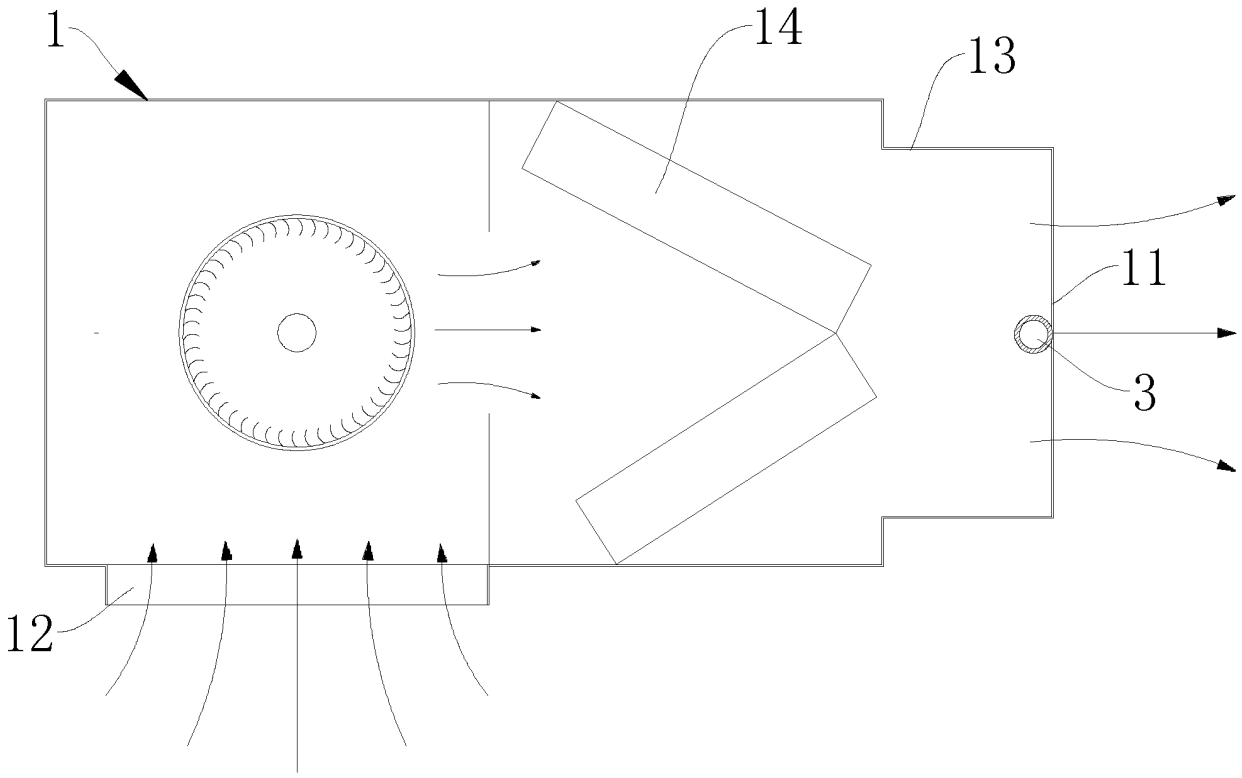

Fig. 8

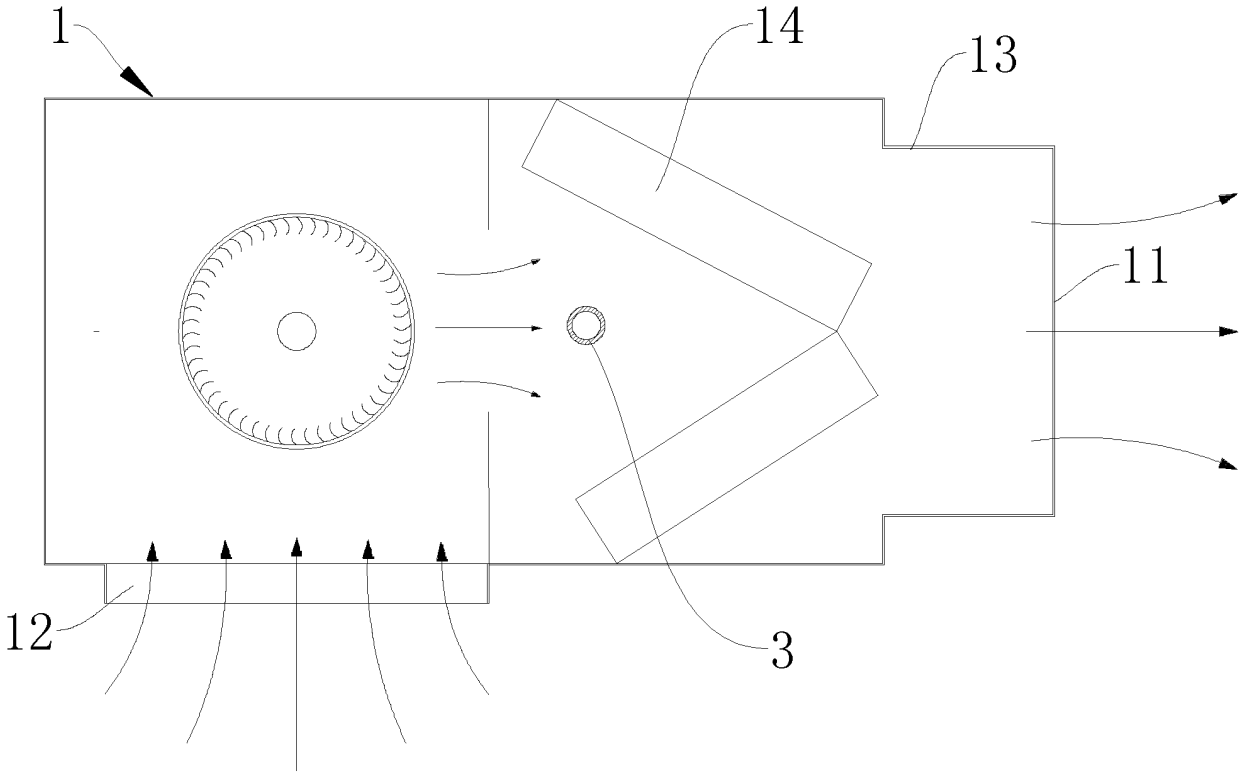

Fig. 9

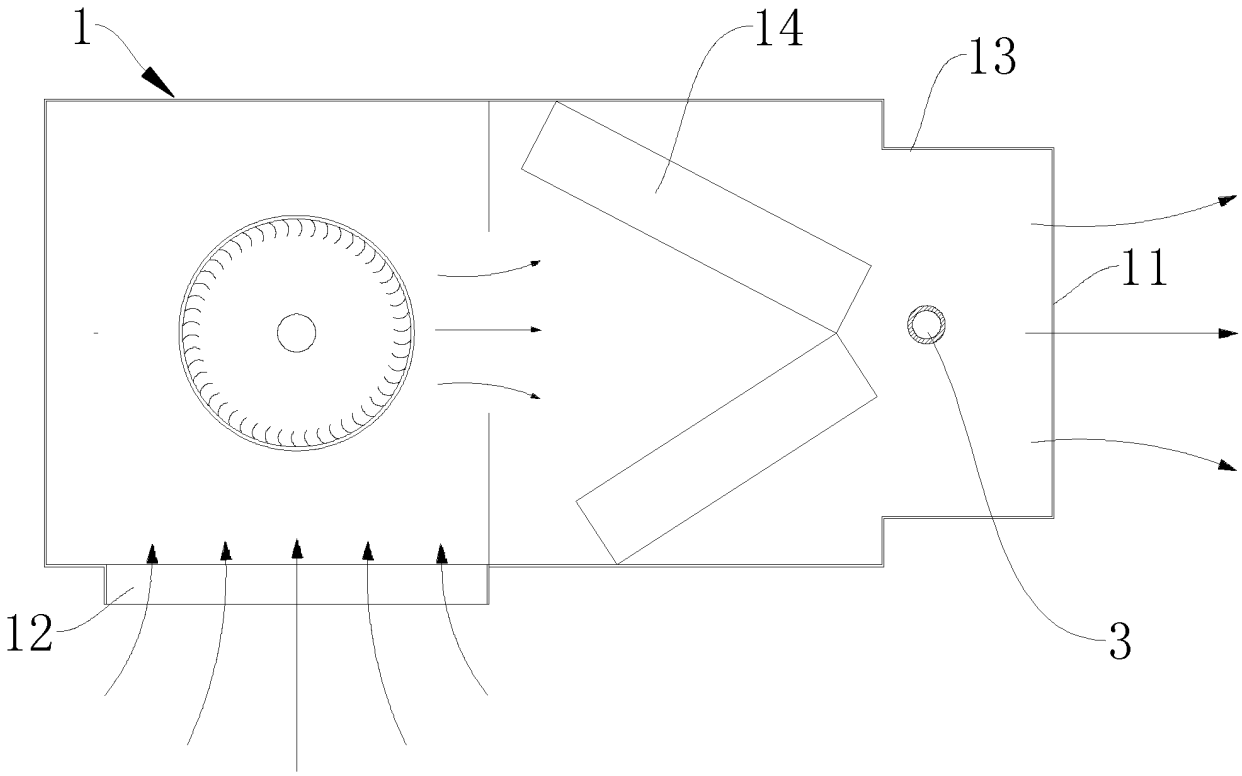

Fig. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/077421

A. CLASSIFICATION OF SUBJECT MATTER

F24F 1/0087(2019.01)i; F24F 6/04(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)

F24F

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)

CNABS, CNTXT, SIPOABS, DWPI, 中国期刊网全文数据库; 阮涛, 罗彬, 罗羽钊, 潘柏江, 广东美的暖通设备有限公司, 美的集团股份有限公司, 蒸气, 蒸汽, 发生, 加热, 室内机, 加湿, 噪音, 噪声, 降噪, 压力, 压强, 气压, 驱动, 输送, 浮子, 浮阀, 浮球, 空调, steam, vapo?r, press+, nois?, noice, water, heat+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 109974113 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 05 July 2019 (2019-07-05) claims 1-18, description, paragraphs 45-104, figures 1-10	1-18,
PX	CN 209857210 U (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 27 December 2019 (2019-12-27) claims 1-18, description, paragraphs 45-104, figures 1-10	1-18,
X	CN 201215358 Y (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 01 April 2009 (2009-04-01) description, page 3, line 1 to page 4, bottom line, figure 1	1-18,
X	CN 203571896 U (GD MIDEA AIR-CONDITIONING EQUIPMENT CO., LTD. et al.) 30 April 2014 (2014-04-30) description, paragraphs 24-46, figures 1-2	1-18,
X	CN 109297103 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 01 February 2019 (2019-02-01) description, paragraphs 32-44, and figures 1-3	1-18,

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"E" earlier application or patent but published on or after the international filing date
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"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	Date of mailing of the international search report
11 May 2020	**27 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**	Authorized officer
Facsimile No. **(86-10)62019451**	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/077421

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	KR 20080059755 A (LG ELECTRONICS INC.) 01 July 2008 (2008-07-01) description paragraphs 27-71, figures 1-3	1-18,

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2020/077421

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CN 109974113 A	05 July 2019	None	
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CN 203571896 U	30 April 2014	None	
CN 109297103 A	01 February 2019	None	
CN 101749823 A	23 June 2010	CN 101749823 B	29 August 2012
KR 20080059755 A	01 July 2008	None	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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