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(54) **AIR CONDITIONER CLEANING DEVICE AND CLEANING METHOD, AND AIR CONDITIONER**

(57) The present application provides an air conditioner cleaning device, including a fresh air device (1). The fresh air device (1) is capable of introducing fresh air into a room, and is capable of supplying air to the heat exchanger. The present application can be used for self-cleaning of an outdoor heat exchanger, with high cleaning efficiency and good cleaning effect. The fresh air device has a dual-passage selective air-introduction, making full use of the temperature difference between the indoor air and the outdoor air, speeding up the frosting and defrosting processes, and improving the self-cleaning efficiency of the air conditioner. The humidification and cooling of the frosting airflow and the heating of the defrosting airflow are realized on the basis of the fresh air device, which can speed up the frosting and defrosting processes and improve the self-cleaning efficiency of the air conditioner. It can be used for self-cleaning of both the indoor heat exchanger and the outdoor heat exchanger, so the functions are completed.

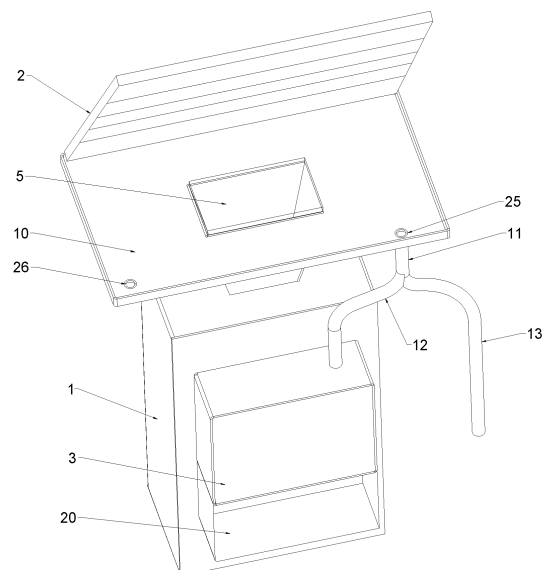


FIG 1

EP 3 879 192 A1

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority of China Patent Application No. 201910233484.7, filed on March 26, 2019, entitled "Air Conditioner Cleaning Device, Cleaning Method, and Air Conditioner", the content of which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The present application belongs to the technical field of air conditioner cleaning, and in particular to an air conditioner cleaning device, a cleaning method, and an air conditioner.

BACKGROUND

[0003] In long-term use of an air conditioner, a large amount of dust pollutants may be accumulated in a component thereof, such as an air-conditioning heat exchanger, leading to a reduction in heat exchange performance, even exacerbating corrosion and aging, and causing permanent damage to the component. In a household air conditioner, the pollutants accumulated in the heat exchange system after a long-term operation may breed a variety of microorganisms, exude odor, or even harmful ingredients, seriously affecting physical and mental health.

[0004] In an existing air conditioner cleaning method, the air conditioner is cleaned through a frosting and defrosting cycle. The frosting mainly depends on condensation of water moisture in the indoor air. However, when the air conditioner is operated in a dry environment, less water exists in the air, which is not possible to meet the water demand for the frosting, resulting in a low frosting rate and limiting the cleaning function of the air conditioner.

[0005] During the cleaning of the indoor unit of the existing air conditioner, in the frosting process, the air conditioner operates in a refrigeration mode, the indoor heat exchanger absorbs heat, and moisture in the air is condensed and frosted on the surface of the indoor heat exchanger. In this process, the air for frosting is directly taken from the circulating airflow in the air conditioner itself, and the circulating airflow is the indoor circulating air. However, in winter, the indoor air temperature is higher than the outdoor air temperature. The direct blowing of the higher temperature air will reduce the frosting rate, or even blow the frost off from the surface of the indoor heat exchanger. In the defrosting process, the air conditioner is switched to a heating mode, and the indoor heat exchanger dissipates heat, melting the frost on the surface thereof. However, in summer, the indoor air temperature is lower than the outdoor air temperature. The blowing of the lower temperature air will reduce the defrosting rate, or even freeze the frost once again.

[0006] Therefore, the existing air conditioner cleaning device has a low cleaning efficiency.

SUMMARY

[0007] Therefore, the present application provides an air conditioner cleaning device, a cleaning method, and an air conditioner to address the technical problem of the low cleaning efficiency of the existing air conditioner cleaning.

[0008] In order to solve the above-described problem, the present application provides an air conditioner cleaning device. The air conditioner includes a heat exchanger. The air conditioner cleaning device includes a fresh air device. The fresh air device is capable of introducing fresh air into a room, and is capable of supplying air to the heat exchanger.

[0009] The objective can be achieved and the technical problem can be solved further by the following implementations.

[0010] In an embodiment, the heat exchanger includes an indoor heat exchanger. The fresh air device is capable of supplying air to the indoor heat exchanger.

[0011] In an embodiment, the fresh air device includes a fresh air passage and an air supply passage. The fresh air device at least has the following operation mode: air enters the fresh air device through the fresh air passage, and then flows through the air supply passage to the indoor heat exchanger.

[0012] In an embodiment, the fresh air passage is connected to an outdoor fresh air duct and/or a first indoor air-return duct. The outdoor fresh air duct is fluid communicated to outdoors and configured to introduce fresh air from the outdoors. The first indoor air-return duct is fluid communicated with inside of the room and configured to introduce indoor air from the room.

[0013] In an embodiment, the air conditioner cleaning device further includes a humidifying assembly, wherein the humidifying assembly is configured to increase humidity of the air supplied by the fresh air device to the indoor heat exchanger.

[0014] In an embodiment, the humidifying assembly includes a humidifier and a water tank. The humidifier is disposed in the fresh air passage. The humidifier is configured to increase the humidity of the air flowing through the fresh air passage. The water tank is configured to provide water to the humidifier.

[0015] In an embodiment, the humidifier includes any one or more of a humidification membrane, a permeable membrane, and an atomizer.

[0016] In an embodiment, the air conditioner further includes a drain pan. The air supply passage penetrates through the drain pan to supply air to the indoor heat exchanger.

[0017] In an embodiment, a waterproof baffle is provided in the drain pan. The waterproof baffle is configured to prevent condensed water from entering the air supply passage.

[0018] In an embodiment, the waterproof baffle is installed over the air supply passage through a support.

[0019] In an embodiment, an edge of the air supply passage is further provided with a water retaining edge protruding from a bottom of the drain pan.

[0020] In an embodiment, the drain pan is provided with a drainage hole and an overflow hole. The drainage hole is connected to the drain pipe.

[0021] In an embodiment, an end of the drain pipe includes a water tank drain pipe. The water tank drain pipe is connected to the water tank. The water tank drain pipe is configured to inject the condensed water from the drain pan into the water tank.

[0022] In an embodiment, the end of the drain pipe further includes an outdoor drain pipe. The outdoor drain pipe is connected to outdoors. The outdoor drain pipe drains the condensed water from the drain pan to the outdoors.

[0023] In an embodiment, the drain pipe is provided with a drainage solenoid valve. The drainage solenoid valve is configured to control whether the condensed water in the drain pan flows into the water tank drain pipe and/or the outdoor drain pipe.

[0024] In an embodiment, a filter purification device is disposed in the water tank drain pipe. The filter purification device is configured to filter the condensed water.

[0025] In an embodiment, the water tank is further provided with a manual water injection port. The manual water injection port is configured for filling water to the water tank.

[0026] In an embodiment, air conditioner cleaning device further includes an auxiliary temperature control assembly. The auxiliary temperature control assembly is disposed in the fresh air passage and configured to control temperature of the air flowing through the fresh air passage.

[0027] In an embodiment, the auxiliary temperature control assembly includes one or both of a semiconductor refrigeration sheet and an electric heating element.

[0028] In an embodiment, the air conditioner further includes an outdoor heat exchanger. The fresh air device further includes an air discharge passage. The air discharge passage is configured to supply air from the fresh air device to the outdoor heat exchanger.

[0029] In an embodiment, the fresh air device further includes a mounting cartridge. The fresh air passage and the air discharge passage are both disposed in the mounting cartridge. The fresh air passage and the air discharge passage are separated by a fixed separator.

[0030] In an embodiment, the semiconductor refrigeration sheet is disposed on the fixed separator. Two ends of the semiconductor refrigeration sheet are respectively disposed in the fresh air passage and the air discharge passage. When the semiconductor refrigeration sheet is energized, one end gets cooler and the other end gets hotter. When the direction of the electric current is changed, the cooling end and the heating end are interchanged.

[0031] In an embodiment, the fresh air device further includes an air discharge passage. The fresh air passage is connected to an outdoor fresh air duct. The outdoor fresh air duct is fluid communicated with outdoors. The air discharge passage is connected to a second indoor air-return duct and an air discharge duct. An inlet of the second indoor air-return duct is fluid communicated with the inside of the room. An outlet of the second indoor air-return duct is fluid communicated with the fresh air passage. The air discharge duct is connected to the outdoor heat exchanger and supplies air to the outdoor heat exchanger.

[0032] In an embodiment, the fresh air passage and the air discharge passage are both disposed in a mounting cartridge and separated by a movable separator. When the movable separator is opened, the fresh air passage is fluid communicated with the air discharge passage, and indoor air enters the fresh air passage through the second indoor air-return duct and the air discharge passage. When the movable separator is closed, the fresh air passage is separated from the air discharge passage, and the indoor air is discharged to the outdoors through the second indoor air-return duct, the air discharge passage, and the air discharge duct.

[0033] A cleaning method adopts the air conditioner cleaning device.

[0034] The objective can be achieved and the technical problem can be solved further by the following implementations.

[0035] In an embodiment, on the condition that the heat exchanger includes the indoor heat exchanger, the method includes:

receiving a cleaning instruction;

frosting process: the air conditioner operating in a refrigeration mode to proceed a frosting process of the indoor heat exchanger; the fresh air device operating to supply air to the indoor heat exchanger, thereby accelerating frosting on the indoor heat exchanger;

defrosting process: the air conditioner operating in a heating mode to proceed a defrosting process of the indoor heat exchanger; the fresh air device operating to supply air to the indoor heat exchanger, thereby accelerating defrosting on the indoor heat exchanger.

[0036] In an embodiment, on the condition that the heat exchanger includes the indoor heat exchanger, the method includes:

receiving a cleaning instruction;

frosting process: the air conditioner operating in a refrigeration mode to proceed a frosting process of the indoor heat exchanger; the fresh air device operating to supply air to the indoor heat exchanger, thereby accelerating frosting on the indoor heat exchanger;

defrosting process: the air conditioner operating in a heating mode to proceed a defrosting process of the indoor heat exchanger.

[0037] In an embodiment, on the condition that the heat exchanger includes the indoor heat exchanger, the method includes:

receiving a cleaning instruction;

frosting process: the air conditioner operating in a refrigeration mode to proceed a frosting process of the indoor heat exchanger;

defrosting process: the air conditioner operating in a heating mode to proceed a defrosting process of the indoor heat exchanger; the fresh air device operating to supply air to the indoor heat exchanger, thereby accelerating defrosting on the indoor heat exchanger.

[0038] In an embodiment, the cleaning method further includes:

a humidifying assembly operating during the frosting process to increase humidity of the air supplied by the fresh air device.

[0039] In an embodiment, during the frosting process, the step of the fresh air device operating to supply air to the indoor heat exchanger includes:

comparing the indoor temperature T_{indoor} with the outdoor temperature T_{outdoor} ;

when $T_{\text{indoor}} > T_{\text{outdoor}}$, the fresh air device introducing fresh air from outdoors through the outdoor fresh air duct;

when $T_{\text{indoor}} \leq T_{\text{outdoor}}$, the fresh air device introducing indoor air from inside of the room through the first indoor air-return duct or the second indoor air-return duct.

[0040] In an embodiment, during the defrosting process, the step of the fresh air device operating to supply air to the indoor heat exchanger includes:

comparing the indoor temperature T_{indoor} with the outdoor temperature T_{outdoor} ;

when $T_{\text{indoor}} \leq T_{\text{outdoor}}$, the fresh air device introducing fresh air from outdoors through the outdoor fresh air duct;

when $T_{\text{indoor}} > T_{\text{outdoor}}$, the fresh air device introducing indoor air from inside of the room through the first indoor air-return duct or the second indoor air-return duct.

[0041] In an embodiment, the cleaning method further includes:

during the frosting process, activating the auxiliary temperature control assembly to reduce the temperature of the air supplied by the fresh air device to the indoor heat exchanger.

[0042] In an embodiment, the cleaning method further includes:

during the defrosting process, activating the auxiliary temperature control assembly to increase the temperature of the air supplied by the fresh air device to the indoor heat exchanger.

[0043] An air conditioner including the air conditioner cleaning device.

[0044] The air conditioner cleaning device, the cleaning method, and the air conditioner provided in the present application have at least the following beneficial effects:

1. The present application can be used for self-cleaning of an outdoor heat exchanger. It adopts the frosting and defrosting manner to remove the dust on the surface of the heat exchanger. The cleaning is automatic with no damage to the equipment, and has a high cleaning efficiency and good cleaning effect.
2. The fresh air device has a dual-passage selective air-introduction, making full use of the temperature difference between the indoor air and the outdoor air. The air with lower temperature is chosen for frosting, and the air with higher temperature is chosen for defrosting, which speeds up the frosting and defrosting processes and improves the self-cleaning efficiency of the air conditioner.
3. The humidification and cooling of the frosting airflow and the heating of the defrosting airflow are realized on the basis of the fresh air device, which can speed up the frosting and defrosting processes and improve the self-cleaning efficiency of the air conditioner.
4. It can be used for self-cleaning of both the indoor heat exchanger and the outdoor heat exchanger, so the functions are completed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0045]

FIG 1 is a schematic structural view of an air conditioner cleaning device according to a first embodiment of the present application.

FIG 2 is a schematic structural, partial view of the air conditioner cleaning device according to the first embodiment of the present application.

FIG. 3 is a schematic structural view of the air conditioner cleaning device according to a second embodiment of the present application.

FIG. 4 is a schematic structural view of an outdoor heat exchanger of the air conditioner cleaning device according to an embodiment of the present application.

FIG. 5 is a schematic structural view of a drain pan of the air conditioner cleaning device according to an embodiment of the present application.

FIG. 6 is a schematic structural view of the drain pan

and an indoor evaporator of the air conditioner cleaning device according to an embodiment of the present application.

[0046] The reference signs are indicated as:

1. fresh air device; 2. indoor heat exchanger; 3. humidifying assembly; 4. fresh air passage; 5. air supply passage; 6. outdoor fresh air duct; 7. first indoor air-return duct; 8. water tank; 9. humidifier; 10. drain pan; 11. drain pipe; 12. water tank drain pipe; 13. outdoor drain pipe; 14. auxiliary temperature control assembly; 15. outdoor heat exchanger; 16. air discharge passage; 17. second indoor air-return duct; 18. air discharge duct; 19. movable separator; 20. mounting cartridge; 21. fixed separator; 22. waterproof baffle; 23. support; 24. water retaining edge; 25. drainage hole; 26. overflow hole; 27. curved indoor heat exchanger; 28. slot-shaped air outlet.

DETAILED DESCRIPTION

[0047] In order to facilitate the understanding of the present application, the present application will be comprehensively described with reference to the drawings. Embodiments of the application are shown in the accompanying drawings. However, the present application can be implemented in many different forms and therefore is not limited to the embodiments described herein. On the contrary, the purpose of providing these embodiments is to make the understanding of the present application more thorough and comprehensive.

First embodiment

[0048] Referring to FIGs. 1, 2, and 4, the first embodiment of the present application provides an air conditioner cleaning device. The air conditioner includes a heat exchanger. The air conditioner cleaning device includes a fresh air device 1. The fresh air device 1 can introduce fresh air into the room, and can supply air to the heat exchanger.

[0049] The air conditioner cleaning device of the present embodiment adopts the frosting and defrosting manner to perform self-cleaning of the air conditioner heat exchanger. The cleaning device of the present embodiment supplies air through the fresh air device during the frosting and defrosting processes of the heat exchanger, not relying on the air circulation of the air conditioner itself. The fresh air device can selectively introduce indoor air or outdoor air to create more favorable conditions for the frosting or defrosting on the heat exchanger, thereby improving the quality and efficiency of the frosting and defrosting on the heat exchanger, and improving the self-cleaning effect and efficiency of the heat exchanger. Moreover, supplying air through the fresh air device is more conducive to humidification and temperature control of the air for frosting and defrosting, further improving the quality and efficiency of the frosting and defrosting.

[0050] In the present embodiment, the heat exchanger includes an indoor heat exchanger 2 (i.e., an evaporator). The fresh air device 1 can supply air to the indoor heat exchanger 2. The air conditioner cleaning device is used for the self-cleaning of the indoor heat exchanger 2.

[0051] The fresh air device 1 includes a fresh air passage 4 and an air supply passage 5. The fresh air passage 4 is configured to introduce air into the fresh air device 1. The air supply passage 5 is configured to supply air to the indoor heat exchanger 2 from the fresh air device 1. The fresh air device 1 has at least the following operation mode: air is introduced into the fresh air device 1 through the fresh air passage 4, and then transported to the indoor heat exchanger 2 through the air supply passage 5. The air passed the indoor heat exchanger 2 is ventilated to the room.

[0052] As a new equipment in the field of air conditioning, the fresh air device is often independent from the air conditioner and used in air purification. It can ventilate indoor air and maximize the replacement of indoor air, which makes up for the inability of ordinary air conditioners to introduce fresh air into the room. In the present embodiment, the fresh air device 1 introduces air through the fresh air passage 4 and then blows the air from the air supply passage 5 to the indoor heat exchanger 2. The air conditioner can further include a drain pan 10, which is configured to collect and store condensed water generated during normal operation of the heat exchanger of the air conditioner. The air supply passage 5 can penetrate through the drain pan 10 to send air to the indoor heat exchanger 2. The edge of the air supply passage 5 is provided with a leak-proof structure to prevent the condensed water in the drain pan 10 from leaking into the fresh air device 1.

[0053] In the present embodiment, the fresh air passage 4 is connected to an outdoor fresh air duct 6 and/or a first indoor air-return duct 7. The outdoor fresh air duct 6 is fluid communicated with the outdoors and configured to introduce fresh air from the outdoors. The first indoor air-return duct 7 is fluid communicated with inside of the room and configured to retract air back from the room. The fresh air passage 4 is the air inlet of the fresh air device 1, and the outdoor fresh air duct 6 and the first indoor air-return duct 7 are directed to the two air introduction sources.

[0054] The frosting on the indoor heat exchanger 2 is not only affected by air humidity, but also by air temperature. A high air temperature is not conducive to frosting. The high-temperature air will delay the frosting process, or even blow off the frost layer from the surface of the heat exchanger. On the contrary, a low air temperature is not conducive to defrosting. Therefore, in the present embodiment, the suitability of the ambient temperature is fully considered. The fresh air device 1 is provided with the indoor and outdoor air inlets, and it can be determined from which side the air is introduced according to the indoor and outdoor environment temperature and air humidity.

[0055] In the present embodiment, the air conditioner cleaning device also includes a humidifying assembly 3 configured to increase the humidity of the air supplied by the fresh air device 1. As the moisture in the air blown to the indoor heat exchanger 2 increases, the condensation on the surface of the indoor heat exchanger 2 escalates, and the frosting on the indoor heat exchanger 2 accelerates. The humidifying assembly 3 includes a humidifier 9 and a water tank 8. The humidifier 9 is disposed in the fresh air passage 4. The humidifier 9 includes any one or more of a humidification membrane, a permeable membrane, and an atomizer. The humidifier 9 is configured to increase the humidity of the air flowing through the fresh air passage 4. The water tank 8 is configured to provide water to the humidifier 9. The water tank 8 can have two water supply modes: the internal circulation water supply mode and the external injection water supply mode.

[0056] The internal circulation water supply mode relies on the condensed water dripped from the heat exchanger. Referring to FIG. 5, in the air conditioner, the drain pan 10 is disposed under the indoor heat exchanger 2, and the air supply passage 5 penetrates through the drain pan 10 to supply air to the indoor heat exchanger 2.

[0057] The drain pan 10 is equipped with a waterproof baffle 22, which is configured to prevent the condensed water from entering the air supply passage 5. Optionally, the waterproof baffle 22 is installed over the air supply passage 5 through supports 23. The condensed water falls from the surface of the indoor heat exchanger 2 onto the waterproof baffle 22. The waterproof baffle 22 can be a slope with a higher side and a lower side to facilitate drainage.

[0058] In an embodiment, the edge of the air supply passage 5 is further provided with a water retaining edge 24 protruding from the bottom of the drain pan 10. The water retaining edge 24 can prevent the water in the drain pan 10 from being poured into the air supply passage 5. The drain pan 10 is also provided with a drainage hole 25 and an overflow hole 26. The drainage hole 25 is connected to the drain pipe 11, recycling the condensed water to the water tank 8 or directly discharging the condensed water outdoors. The overflow hole 26 is configured to drain the condensed water when the drainage hole 25 is blocked. The location of the overflow hole 26 is higher than that of the drainage hole 25, so that the condensed water enters the drainage hole 25 preferentially.

[0059] The end of the drain pipe 11 includes a water tank drain pipe 12, which is connected to the water tank 8. Through the water tank drain pipe 12, the condensed water is injected from the drain pan 10 into the water tank 8. The end of the drain pipe 11 also includes an outdoor drain pipe 13, which is connected to the outdoors. The outdoor drain pipe 13 drains the condensed water from the drain pan 10 to the outdoors. The drain pipe 11 is equipped with a drainage solenoid valve. The drainage solenoid valve controls whether the condensed water in

the drain pan 10 flows into the water tank drain pipe 12 and/or the outdoor drain pipe 13. The drainage solenoid valve preferentially controls the condensed water to be injected into the water tank 8 through the water tank drain pipe 12. When the water tank 8 is full, the drainage solenoid valve controls the condensed water to stop flowing into the water tank drain pipe 12, and to flow outdoors through the outdoor drain pipe 13 instead.

[0060] In the present embodiment, the air supply passage 5 has a rectangular opening. The indoor heat exchanger 2 is a rectangular plate. The air supply passage 5 can have a rectangular shape, circular shape, square shape, slot shape, or the like. Referring to FIG. 6, the indoor heat exchanger 2 can be an arc-shaped indoor heat exchanger 27, and the air supply passage 5 has a slot-shaped air outlet 28. The arc-shaped indoor heat exchanger 27 is installed vertically in the drain pan 10. The air supply passage 5 is not located within the dripping range of the condensed water from the arc-shaped indoor heat exchanger 27. Setting only the water retaining edge 24 around the air supply passage 5 can prevent the condensed water from entering the air supply passage 5.

[0061] In order to avoid cleaning the water tank or blocking the pipelines, a filter purification device is disposed in the water tank drain pipe 12. The filter purification device filters the condensed water. The condensed water injected into the water tank 8 is purified. A reminder can be set through a display module and a program to remind the user to regularly clean the filter purification device.

[0062] In the external injection water supply mode, a manual water injection port is provided on the water tank 8. The manual water injection port is configured for filling water to the water tank 8. The water tank 8 can be a detachable structure, and the water tank 8 can be taken off in water replenishment.

[0063] The water tank 8 can also adopt the above two water supply modes in a comprehensive manner. Further, a water volume sensor can be disposed in the water tank 8 to detect the water volume in the water tank 8, and to send a control signal to control the drainage solenoid valve to replenish water or to send a reminder of the manual water injection according to the water volume result.

[0064] In the present embodiment, in order to adjust the temperature of the air supplied by the fresh air device 1, the cleaning device further includes an auxiliary temperature control assembly 14, which is disposed in the fresh air passage 4 and configured for the temperature of the air flowing through the fresh air passage 4. The auxiliary temperature control assembly 14 includes one or both of a semiconductor refrigeration sheet and an electric heating element.

[0065] Considering that the air conditioner also includes an outdoor heat exchanger 15 (i.e., a condenser), the cleaning device in the present embodiment can also be improved as follows to realize the self-cleaning of the outdoor heat exchanger 15 as well.

[0066] Specifically, the fresh air device 1 is also provided with an air discharge passage 16. The air discharge passage 16 is configured for the fresh air device 1 to supply air to the outdoor heat exchanger 15. The air inlet of the fresh air device 1 is equipped with a mounting cartridge 20. The fresh air passage 4 and the air discharge passage 16 are both located in the mounting cartridge. The fresh air passage 4 and the air discharge passage 16 are separated by a fixed separator 21. The fresh air passage 4 and the air discharge passage 16 are not in fluid communication with each other. Corresponding humidifying assembly 3 and auxiliary temperature control assembly 14 can also be disposed in the air discharge passage 16 to increase the humidity of the air for frosting on the outdoor heat exchanger 15, reduce the temperature of the frosting air, and accelerate the frosting on the outdoor heat exchanger 15; or to increase the temperature of the defrosting air to accelerate the defrosting on the outdoor heat exchanger 15.

[0067] In the present embodiment, the semiconductor refrigeration sheet is disposed on the fixed separator 21, and two ends of the semiconductor refrigeration sheet are respectively placed in the fresh air passage 4 and the air discharge passage 16. According to the characteristics of the semiconductor refrigeration sheet (i.e., the Peltier effect of the semiconductor material), when the semiconductor refrigeration sheet is energized, one end gets cooler and the other end gets hotter; when the direction of the electric current is changed, the cooling end and the heating end are interchanged.

[0068] When the indoor heat exchanger 2 is to be frosted up, the semiconductor refrigeration sheet in the fresh air passage 4 cools, and the temperature of the fresh air decreases. When the indoor heat exchanger 2 is to be defrosted, the direction of the electric current in the semiconductor refrigeration sheet changes, and the semiconductor refrigeration sheet heats. Similarly, when the outdoor heat exchanger 15 is to be frosted up, the semiconductor refrigeration sheet cools; when the outdoor heat exchanger 15 is to be defrosted, the semiconductor refrigeration sheet heats.

[0069] The air conditioner self-cleaning device in the present embodiment adopts the fresh air device to achieve a selective air-introduction, realizes high-efficiency frosting and defrosting with minimal energy consumption, improves the cleaning efficiency of the air conditioner, and has a relatively short cleaning cycle. Relying on the fresh air device, the indoor heat exchanger and the outdoor heat exchanger can both be cleaned. The humidifying assembly increases the air humidity to improve the frosting efficiency, and the condensed water from the indoor unit is recycled for humidification to accelerate frosting.

Second embodiment

[0070] In the existing structure of the fresh air device 1, the indoor air inlet can be located in the air discharge

system. The air discharge system directly discharges the indoor air to the outdoors. The existing structure of the fresh air device 1 can be used to realize that the fresh air device 1 introduces air from inside of the room. Referring to FIG. 3, the fresh air device 1 in the second embodiment of the present application further includes an air discharge passage 16. The fresh air passage 4 is connected to the outdoor fresh air duct 6. The outdoor fresh air duct 6 is fluid communicated with the outdoors. The fresh air device 1 introduces fresh air from the outdoors through the outdoor fresh air duct 6. The air discharge passage 16 is connected to the second indoor air-return duct 17 and the air discharge duct 18. The inlet of the second indoor air-return duct 17 is fluid communicated with the inside of the room, and the outlet of the second indoor air-return duct 17 is fluid communicated with the fresh air passage 4. The second indoor air-return duct 17 can introduce the indoor air into the fresh air device 1. The air discharge duct 18 is connected to the outdoor heat exchanger 15 and supplies air to the outdoor heat exchanger 15. The fresh air passage 4 and the air discharge passage 16 are disposed in the mounting cartridge and separated by a movable separator 19. When the movable separator 19 is opened, the fresh air passage 4 is fluid communicated with the air discharge passage 16, and the indoor air enters the fresh air passage 4 through the second indoor air-return duct 17 and the air discharge passage 16. When the movable separator 19 is closed, the fresh air passage 4 is separated from the air discharge passage 16, and the indoor air is discharged to the outdoors through the second indoor air-return duct 17, the air discharge passage 16, and the air discharge duct 18.

[0071] The outdoor fresh air duct 6, the first indoor air-return duct 7, the second indoor air-return duct 17, and the air discharge duct 18 in the first and second embodiments can all be equipped with solenoid valves to control the on and off.

[0072] The air conditioner cleaning device of the present embodiment adopts the existing structure of the fresh air device to controllably fluid communicate the fresh air passage with the air discharge passage through the movable structure, which can achieve the cleaning of the indoor heat exchanger and the outdoor heat exchanger, but not change the structure of the fresh air device, ensuring the fresh air device to realize its own performance.

[0073] The present application also provides a cleaning method adopting the above-described air conditioner cleaning device.

[0074] In a preferred embodiment, when the heat exchanger includes the indoor heat exchanger 2, the cleaning method includes:

Step 1, receiving a cleaning instruction; the cleaning instruction can be manually sent or can be periodically sent by the air conditioner which autonomously monitors the operation time period. In cleaning of the

indoor unit, the air deflector is adjusted in advance to avoid wind direct blowing on the human body.

Step 2, frosting process: the air conditioner is controlled to operate in the refrigeration mode and proceed the frosting process of the indoor heat exchanger 2. At this time, the surface temperature of the indoor heat exchanger 2 is below 0°C, and the moisture in the air is condensed on the surface of the indoor heat exchanger 2.

[0075] The fresh air device 1 is controlled to operate and supply air to the indoor heat exchanger 2. The indoor temperature T_{indoor} is compared with the outdoor temperature T_{outdoor} .

[0076] When $T_{\text{indoor}} > T_{\text{outdoor}}$, such as in winter, the fresh air device 1 introduces fresh air from the outdoors through the outdoor fresh air duct 6.

[0077] When $T_{\text{indoor}} \leq T_{\text{outdoor}}$, such as in summer, the fresh air device 1 introduces air back from inside of the room through the first indoor air-return duct 7 or the second indoor air-return duct 17.

[0078] At the same time, the humidifying assembly 3 is operated to increase the humidity of the air supplied by the fresh air device 1, and the auxiliary temperature control assembly 14 is activated to reduce the temperature of the air supplied by the fresh air device 1, which accelerate the frosting on the indoor heat exchanger 2.

[0079] Step 3, checking the frosting result. The frosting result can be judged by detecting the temperature of the inner tube of the indoor heat exchanger 2 or monitoring the cooling time period. Specifically, the temperature of the inner tube reaches the lower limit temperature of frosting, such as -18°C~20°C, or the cooling time period reaches the set time period, such as 180s. It can be judged that the frosting is completed when the above conditions are reached.

[0080] Step 4, defrosting process: the air conditioner is operated in the heating mode and proceeds the defrosting process on the indoor heat exchanger 2. In cleaning of the indoor unit, the air deflector is adjusted in advance to avoid wind direct blowing on the human body.

[0081] The fresh air device 1 is operated to supply air to the indoor heat exchanger 2 to speed up the defrosting on the indoor heat exchanger 2. The indoor temperature T_{indoor} is compared with the outdoor temperature T_{outdoor} .

[0082] When $T_{\text{indoor}} \leq T_{\text{outdoor}}$, such as in summer, the fresh air device 1 introduces fresh air from the outdoors through the outdoor fresh air duct 6.

[0083] When $T_{\text{indoor}} > T_{\text{outdoor}}$, such as in winter, the fresh air device 1 introduces air back from inside of the room through the first indoor air-return duct 7 or the second indoor air-return duct 17.

[0084] At the same time, the auxiliary temperature control assembly 14 is activated to increase the temperature of the air supplied by the fresh air device 1. The defrosting process can also be judged by detecting the temperature of the inner tube or monitoring the heating time period. Specifically, the temperature of the inner tube reaches

the upper limit temperature of defrosting, such as 50°C, or the heating time period reaches 360~600s.

[0085] In the cleaning method of the present embodiment, the fresh air device can be operated in only one process of the frosting and the defrosting, or can be operated in both processes of the frosting and the defrosting.

[0086] The cleaning method of the present embodiment adopting the air conditioner cleaning device of the present application can realize the cleaning of the indoor heat exchanger or the indoor heat exchanger, with high cleaning efficiency, low energy consumption, and environmental friendliness.

[0087] An air conditioner adopts the air conditioner cleaning device of the present application.

[0088] The technical features of the above-mentioned embodiments can be combined arbitrarily. In order to make the description concise, not all possible combinations of the technical features are described in the embodiments. However, as long as there is no contradiction in the combination of these technical features, the combinations should be considered as in the scope of the present application.

[0089] The above-described embodiments are only several implementations of the present application, and the descriptions are relatively specific and detailed, but they should not be construed as limiting the scope of the present application. It should be understood by those of ordinary skill in the art that various modifications and improvements can be made without departing from the concept of the present application, and all fall within the protection scope of the present application. Therefore, the patent protection of the present application shall be defined by the appended claims.

Claims

1. A cleaning device for an air conditioner, the air conditioner comprising a heat exchanger, **characterized in that** the cleaning device for the air conditioner comprises:
a fresh air device (1), the fresh air device (1) is capable of introducing fresh air into a room, and is capable of supplying air to the heat exchanger.
2. The cleaning device for the air conditioner according to claim 1, wherein the heat exchanger comprises an indoor heat exchanger (2), and the fresh air device (1) is capable of supplying air to the indoor heat exchanger (2).
3. The cleaning device for the air conditioner according to claim 2, wherein the fresh air device (1) comprises a fresh air passage (4) and an air supply passage (5), and the fresh air device (1) at least has the following operation mode:
air enters the fresh air device (1) through the fresh

air passage (4), then flows through the air supply passage (5) to the indoor heat exchanger (2).

4. The cleaning device for the air conditioner according to claim 3, wherein the fresh air passage (4) is connected to an outdoor fresh air duct (6) and/or a first indoor air-return duct (7); the outdoor fresh air duct (6) is fluid communicated to outdoors and configured to introduce fresh air from the outdoors, and the first indoor air-return duct (7) is fluid communicated with inside of the room and configured to introduce indoor air from the room.
5. The cleaning device for the air conditioner according to claim 2, further comprising a humidifying assembly (3), wherein the humidifying assembly (3) is configured to increase humidity of the air supplied by the fresh air device (1) to the indoor heat exchanger (2).
6. The cleaning device for the air conditioner according to claim 5, wherein the humidifying assembly (3) comprises a humidifier (9) and a water tank (8), and the humidifier (9) is disposed in the fresh air passage (4), the humidifier (9) is configured to increase the humidity of the air flowing through the fresh air passage (4), and the water tank (8) is configured to provide water to the humidifier (9).
7. The cleaning device for the air conditioner according to claim 6, wherein the humidifier (9) comprises any one or more of a humidification membrane, a permeable membrane, and an atomizer.
8. The cleaning device for the air conditioner according to any one of claims 1-7, wherein the air conditioner further comprises a drain pan (10), and the air supply passage (5) penetrates through the drain pan (10) to supply air to the indoor heat exchanger (2).
9. The cleaning device for the air conditioner according to claim 8, wherein a waterproof baffle (22) is provided in the drain pan (10), and the waterproof baffle (22) is configured to prevent condensed water from entering the air supply passage (5).
10. The cleaning device for the air conditioner according to claim 9, wherein the waterproof baffle (22) is installed over the air supply passage (5) through a support (23).
11. The cleaning device for the air conditioner according to claim 9, wherein an edge of the air supply passage (5) is further provided with a water retaining edge (24) protruding from a bottom of the drain pan (10).
12. The cleaning device for the air conditioner according to any one of claims 9-11, wherein the drain pan (10) is provided with a drainage hole (25) and an overflow

hole (26); the drainage hole (25) is connected to a drain pipe (11).

13. The cleaning device for the air conditioner according to any one of claim 12, wherein an end of the drain pipe (11) comprises a water tank drain pipe (12), and the water tank drain pipe (12) is connected to the water tank (8), and the water tank drain pipe (12) is configured to inject the condensed water from the drain pan (10) into the water tank (8).
14. The cleaning device for the air conditioner according to claim 13, wherein the end of the drain pipe (11) further comprises an outdoor drain pipe (13), the outdoor drain pipe (13) is connected to outdoors, the outdoor drain pipe (13) drains the condensed water from the drain pan (10) to the outdoors.
15. The cleaning device for the air conditioner according to claim 14, wherein the drain pipe (11) is provided with a drainage solenoid valve, and the drainage solenoid valve is configured to control whether the condensed water in the drain pan (10) flows into the water tank drain pipe (12) and/or the outdoor drain pipe (13).
16. The cleaning device for the air conditioner according to claim 13, wherein a filter purification device is disposed in the water tank drain pipe (12), and the filter purification device is configured to filter the condensed water.
17. The cleaning device for the air conditioner according to claim 13, wherein the water tank (8) is further provided with a manual water injection port, and the manual water injection port is configured for filling water to the water tank (8).
18. The cleaning device for the air conditioner according to any one of claims 1-7, 9-11, and 13-17, further comprising an auxiliary temperature control assembly (14), and the auxiliary temperature control assembly (14) is disposed in the fresh air passage (4) and configured to control temperature of the air flowing through the fresh air passage (4).
19. The cleaning device for the air conditioner according to claim 18, wherein the auxiliary temperature control assembly (14) comprises one or both of a semiconductor refrigeration sheet and an electric heating element.
20. The cleaning device for the air conditioner according to claim 18, wherein the air conditioner further comprises an outdoor heat exchanger (15), and the fresh air device (1) further comprises an air discharge passage (16), the air discharge passage (16) is configured to supply air from the fresh air device (1) to the

outdoor heat exchanger (15).

21. The cleaning device for the air conditioner according to claim 20, wherein the fresh air device (1) further comprises a mounting cartridge (20), the fresh air passage (4) and the air discharge passage (16) are both disposed in the mounting cartridge (20), and the fresh air passage (4) and the air discharge passage (16) are separated by a fixed separator (21).
22. The cleaning device for the air conditioner according to claim 21, wherein a semiconductor refrigeration sheet is disposed on the fixed separator (21), and two ends of the semiconductor refrigeration sheet are respectively disposed in the fresh air passage (4) and the air discharge passage (16); when the semiconductor refrigeration sheet is energized, one end thereof gets cooler and the other end thereof gets hotter; when the direction of the electric current is changed, the cooling end and the heating end are interchanged.
23. The cleaning device for the air conditioner according to claim 3, wherein the fresh air device (1) further comprises an air discharge passage (16); the fresh air passage (4) is connected to an outdoor fresh air duct (6), the outdoor fresh air duct (6) is fluid communicated with outdoors; the air discharge passage (16) is connected to a second indoor air-return duct (17) and an air discharge duct (18), and an inlet of the second indoor air-return duct (17) is fluid communicated with the inside of the room, an outlet of the second indoor air-return duct (17) is fluid communicated with the fresh air passage (4); the air discharge duct (18) is connected to the outdoor heat exchanger (15) and supplies air to the outdoor heat exchanger (15).
24. The cleaning device for the air conditioner according to claim 23, wherein the fresh air passage (4) and the air discharge passage (16) are both disposed in a mounting cartridge (20) and separated by a movable separator (19); when the movable separator (19) is opened, the fresh air passage (4) is fluid communicated with the air discharge passage (16), and indoor air enters the fresh air passage (4) through the second indoor air-return duct (17) and the air discharge passage (16); when the movable separator (19) is closed, the fresh air passage (4) is separated from the air discharge passage (16), and the indoor air is discharged to the outdoors through the second indoor air-return duct (17), the air discharge passage (16), and the air discharge duct (18).
25. A cleaning method, **characterized in that** the method adopts the cleaning device for the air conditioner of any one of claims 1-24.

26. The cleaning method according to claim 25, wherein on the condition that the heat exchanger comprises the indoor heat exchanger (2), the method comprises:

receiving a cleaning instruction;
frosting process: the air conditioner operating in a refrigeration mode to proceed a frosting process of the indoor heat exchanger (2); the fresh air device (1) operating to supply air to the indoor heat exchanger (2), thereby accelerating frosting on the indoor heat exchanger (2);
defrosting process: the air conditioner operating in a heating mode to proceed a defrosting process of the indoor heat exchanger (2); the fresh air device (1) operating to supply air to the indoor heat exchanger (2), thereby accelerating defrosting on the indoor heat exchanger (2).

27. The cleaning method according to claim 25, wherein on the condition that the heat exchanger comprises the indoor heat exchanger (2), the method comprises:

receiving a cleaning instruction;
frosting process: the air conditioner operating in a refrigeration mode to proceed a frosting process of the indoor heat exchanger (2); the fresh air device (1) operating to supply air to the indoor heat exchanger (2), thereby accelerating frosting on the indoor heat exchanger (2);
defrosting process: the air conditioner operating in a heating mode to proceed a defrosting process of the indoor heat exchanger (2).

28. The cleaning method according to claim 25, wherein on the condition that the heat exchanger comprises the indoor heat exchanger (2), the method comprises:

receiving a cleaning instruction;
frosting process: the air conditioner operating in a refrigeration mode to proceed a frosting process of the indoor heat exchanger (2);
defrosting process: the air conditioner operating in a heating mode to proceed a defrosting process of the indoor heat exchanger (2); the fresh air device (1) operating to supply air to the indoor heat exchanger (2), thereby accelerating defrosting on the indoor heat exchanger (2).

29. The cleaning method according to any one of claims 25-27, further comprising:
a humidifying assembly (3) operating during the frosting process to increase humidity of the air supplied by the fresh air device (1).

30. The cleaning method according to claim 26 or claim

27, wherein during the frosting process, the step of the fresh air device (1) operating to supply air to the indoor heat exchanger (2) comprises:

comparing the indoor temperature T_{indoor} with the outdoor temperature T_{outdoor} ; 5
 when $T_{\text{indoor}} > T_{\text{outdoor}}$, the fresh air device (1) introducing fresh air from outdoors through the outdoor fresh air duct (6);
 when $T_{\text{indoor}} \leq T_{\text{outdoor}}$, the fresh air device (1) 10
 introducing indoor air from inside of the room through the first indoor air-return duct (7) or the second indoor air-return duct (17).

31. The cleaning method according to claim 26 or claim 28, wherein during the defrosting process, the step of the fresh air device (1) operating to supply air to the indoor heat exchanger (2) comprises: 15

comparing the indoor temperature T_{indoor} with the outdoor temperature T_{outdoor} ; 20
 when $T_{\text{indoor}} \leq T_{\text{outdoor}}$, the fresh air device (1) introducing fresh air from outdoors through the outdoor fresh air duct (6);
 when $T_{\text{indoor}} > T_{\text{outdoor}}$, the fresh air device (1) 25
 introducing indoor air from inside of the room through the first indoor air-return duct (7) or the second indoor air-return duct (17).

32. The cleaning method according to any one of claims 25-28, further comprising: 30
 during the frosting process, activating the auxiliary temperature control assembly (14) to reduce the temperature of the air supplied by the fresh air device (1) to the indoor heat exchanger (2). 35

33. The cleaning method according to any one of claims 25-28, further comprising: 40
 during the defrosting process, activating the auxiliary temperature control assembly (14) to increase the temperature of the air supplied by the fresh air device (1) to the indoor heat exchanger (2). 45

34. An air conditioner, **characterized by** comprising the cleaning device for the air conditioner according to any one of claims 1-24. 50

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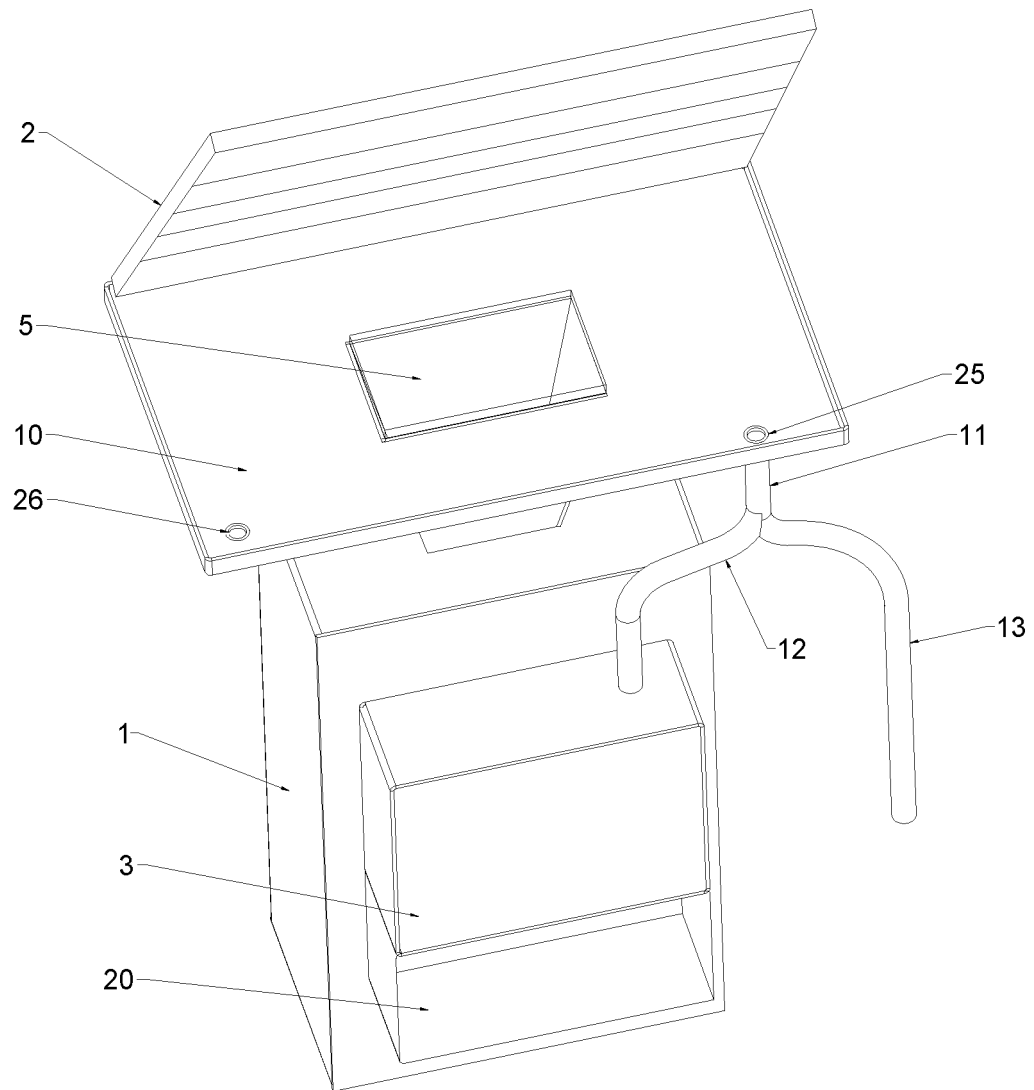


FIG. 1

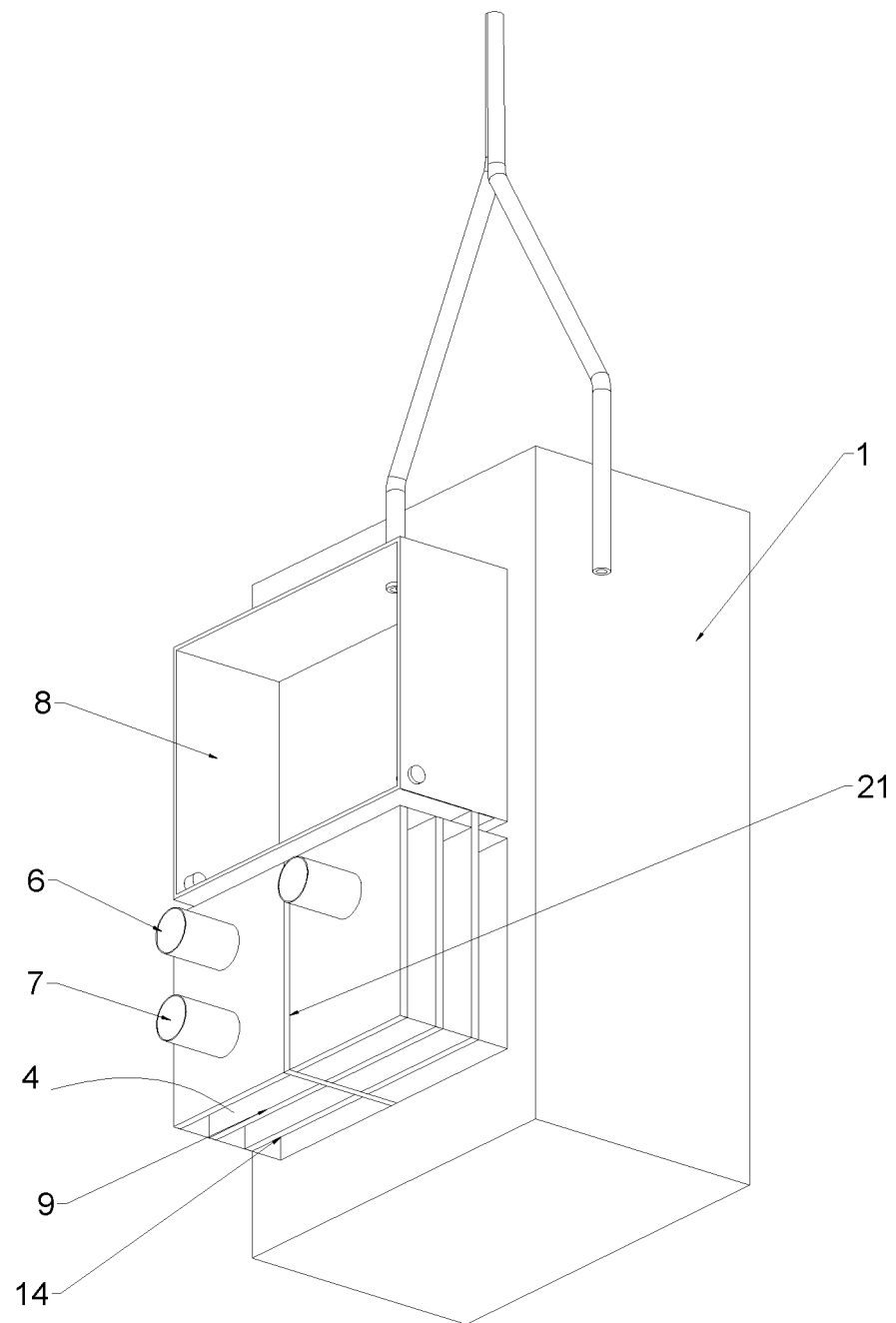


FIG 2

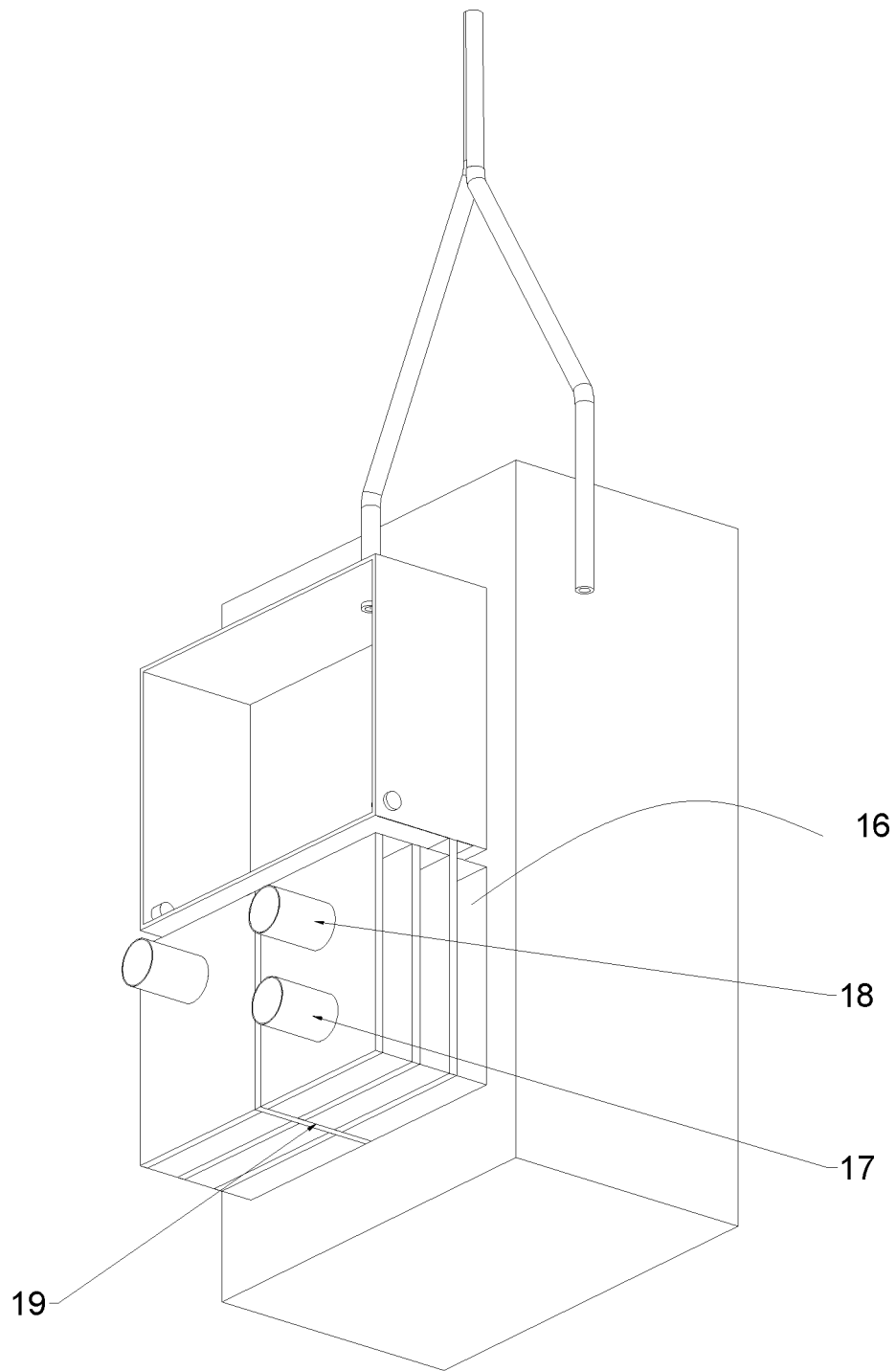


FIG. 3

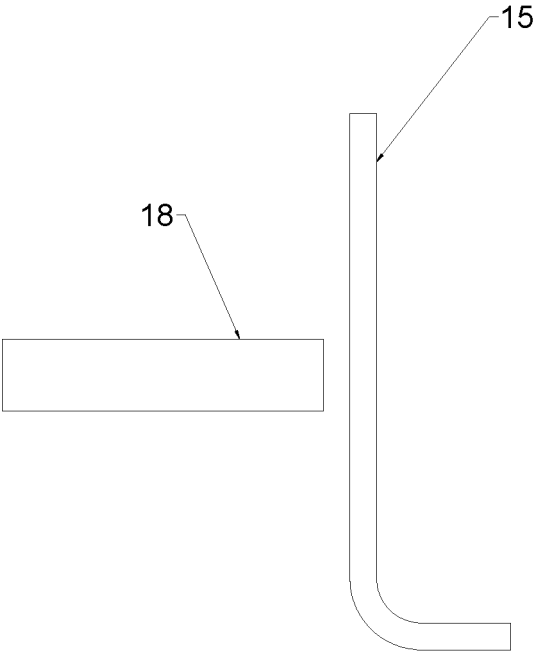


FIG. 4

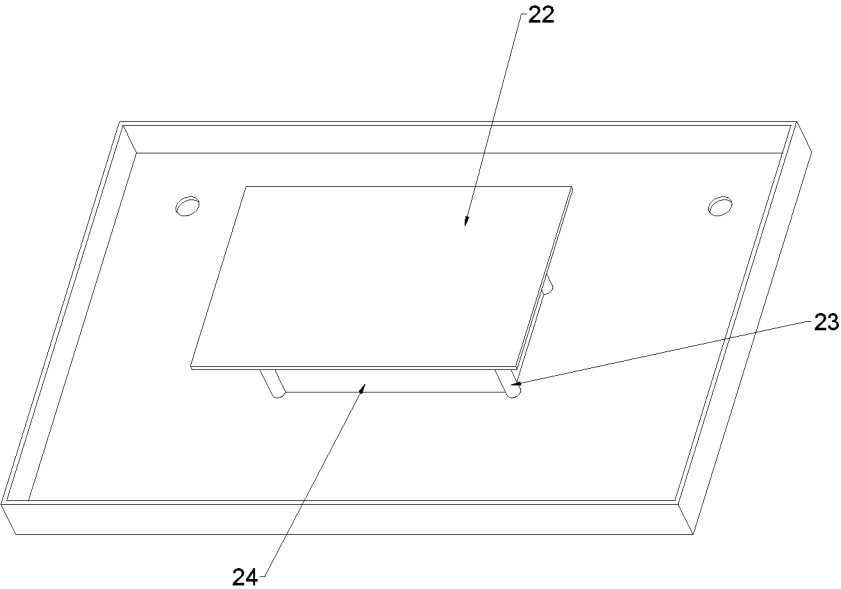


FIG. 5

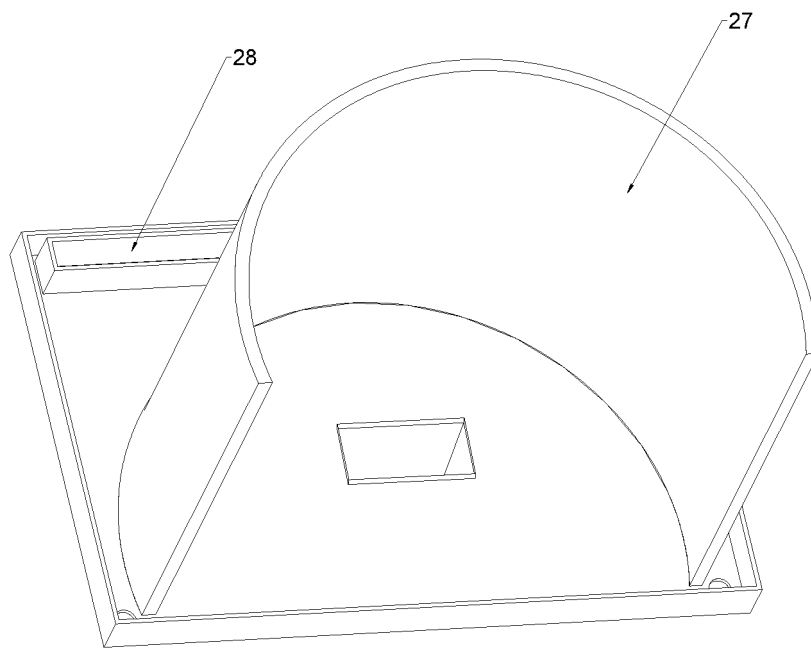


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2019/109433

A. CLASSIFICATION OF SUBJECT MATTER F24F 1/0035(2019.01)i; F24F 13/02(2006.01)i; F24F 1/0087(2019.01)i; F24F 13/22(2006.01)i; F24F 1/42(2011.01)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) F24F1/-;F24F11/-;F24F13/- 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) CNTXT; CNABS; DWPI; SIPOABS; PATENTICS: 格力; 胡宽宏, 王美, 梁义庚, 黄锦伦, 金海元, 王朝新, 陈圣文; 空调, 室内, 室外, 蒸发, 冷凝, 换热, 热交换; 清洗, 清洁, 自洁; 霜, 冰, 冻结; 新风, 室外空气; 调温, 调湿, 温度, 湿度; air condition+, indoor, outdoor; evaporat+, condens+, heat exchang+; clean+, clear+, wash+; frost+, ice, froz+; air																					
C. DOCUMENTS CONSIDERED TO BE RELEVANT																					
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>PX</td> <td>CN 109945313 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 28 June 2019 (2019-06-28) claims 1-34</td> <td>1-34</td> </tr> <tr> <td>PX</td> <td>CN 109945314 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 28 June 2019 (2019-06-28) description, paragraphs 0068-0112, and figures 1-6</td> <td>1-34</td> </tr> <tr> <td>Y</td> <td>CN 109140666 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAD) 04 January 2019 (2019-01-04) description, paragraphs 0084-0139, and figure 1</td> <td>1-3, 25, 34</td> </tr> <tr> <td>Y</td> <td>CN 108224563 A (QINGDAO HAIER AIR CONDITIONER CO., LTD.) 29 June 2018 (2018-06-29) description, paragraphs 0036-0043段, and figures 1-7</td> <td>1-3, 25, 34</td> </tr> <tr> <td>A</td> <td>CN 109469965 A (AUX AIR CONDITIONING CO., LTD.) 15 March 2019 (2019-03-15) entire document</td> <td>1-34</td> </tr> <tr> <td>A</td> <td>CN 105299949 A (LI, Dan) 03 February 2016 (2016-02-03) entire document</td> <td>1-34</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	PX	CN 109945313 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 28 June 2019 (2019-06-28) claims 1-34	1-34	PX	CN 109945314 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 28 June 2019 (2019-06-28) description, paragraphs 0068-0112, and figures 1-6	1-34	Y	CN 109140666 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAD) 04 January 2019 (2019-01-04) description, paragraphs 0084-0139, and figure 1	1-3, 25, 34	Y	CN 108224563 A (QINGDAO HAIER AIR CONDITIONER CO., LTD.) 29 June 2018 (2018-06-29) description, paragraphs 0036-0043段, and figures 1-7	1-3, 25, 34	A	CN 109469965 A (AUX AIR CONDITIONING CO., LTD.) 15 March 2019 (2019-03-15) entire document	1-34	A	CN 105299949 A (LI, Dan) 03 February 2016 (2016-02-03) entire document	1-34
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Date of the actual completion of the international search 12 December 2019	Date of mailing of the international search report 30 December 2019																				
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.

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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CN	109945314	A	28 June 2019	None	
CN	109140666	A	04 January 2019	None	
CN	108224563	A	29 June 2018	None	
CN	109469965	A	15 March 2019	None	
CN	105299949	A	03 February 2016	None	
CN	108489030	A	04 September 2018	None	
CN	109253525	A	22 January 2019	None	
JP	200638362	A	09 February 2006	None	

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