(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 397 918 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
10.07.2024 Bulletin 2024/28

(21) Application number: **22862854.1**

(22) Date of filing: **30.06.2022**

(51) International Patent Classification (IPC):
F24F 11/88 *(2018.01)* ***F24F 11/89*** *(2018.01)*
F24F 11/46 *(2018.01)*

(86) International application number:
PCT/CN2022/102758

(87) International publication number:
WO 2023/029713 (09.03.2023 Gazette 2023/10)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **31.08.2021 CN 202111019328**

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(54) MULTI-SPLIT AIR CONDITIONER CONTROL CIRCUIT, ELECTRICALLY CONTROLLED DEVICE, AND AIR CONDITIONER

(57) A multi-split air conditioner control circuit, an electrically controlled device, and an air conditioner. The multi-split air conditioner control circuit is applied to an outdoor unit (50) of a multi-split air conditioner, and comprises: a power input terminal (10) used for being connected to a first power supply; a wake-up circuit (20) used for providing a second power supply to a controller (30) when a working signal sent by an indoor unit (60) of the multi-split air conditioner is received; and the controller (30) used for controlling, when the working signal and the second power supply are received, a first switch (40) to be switched from an off state to an on state, so as to receive the first power supply. A low power consumption mode is configured for the outdoor unit (50) in the multi-split air conditioner, such that the power consumption of the outdoor unit (50) is reduced.

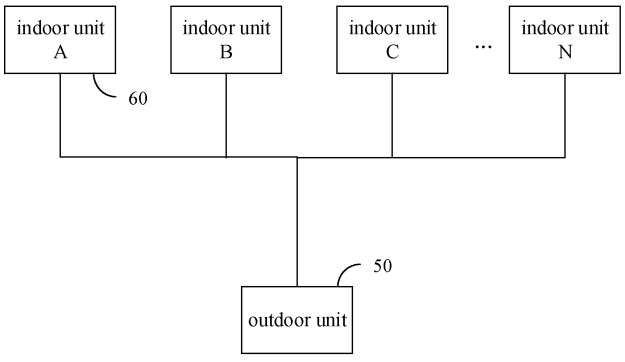

FIG. 2

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority to Chinese Patent Application No. 202111019328.4, filed on August 31, 2021, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present application relates to the technical field of air conditioner, and in particular to a variable refrigerant flow (VRF) air conditioner control circuit, an electronic control device and an air conditioner.

BACKGROUND

[0003] At present, air conditioners are often configured with a low power consumption mode in order to save energy efficiency. When the indoor unit is in standby mode, the outdoor unit loses power and enters standby mode. However, this mode cannot be applied to the variable refrigerant flow (VRF) air conditioner system. When the outdoor unit drives a plurality of indoor units, the power source of the outdoor unit cannot be controlled according to the operating status of a single indoor unit. Therefore, in a VRF system, the outdoor unit is always in a power-on state, resulting in increased energy consumption.

SUMMARY

[0004] The main objective of the present application is to provide a variable refrigerant flow (VRF) air conditioner control circuit, an electronic control device and an air conditioner, aiming to solve the technical problem of high energy consumption in the outdoor unit of the VRF air conditioners in the related art.

[0005] In order to solve the above objective, the present application provides a VRF air conditioner control circuit, which is applied to the outdoor unit of the VRF air conditioner. The VRF air conditioner control circuit includes: a power input terminal, a wake-up circuit, a controller and a first switch.

[0006] In an embodiment, the power input terminal is configured to access a first power source.

[0007] In an embodiment, the wake-up circuit is configured to provide a second power source to the controller in response to receiving a working signal sent by an indoor unit of the VRF air conditioner.

[0008] In an embodiment, the controller is configured to control the first switch to switch from an off state to an on state to receive the first power source in response to receiving the working signal and the second power source.

[0009] In an embodiment, the controller is respectively connected to the power input terminal and the wake-up circuit, and the first switch is provided between the controller and the power input terminal.

[0010] In an embodiment, the wake-up circuit includes a power input circuit and a power output circuit connected to each other, and the power input circuit is connected to a power supply circuit of the indoor unit.

[0011] In an embodiment, the power supply circuit is configured to provide a third power source to power the indoor unit in response to being in a power supply state.

[0012] In an embodiment, the power input circuit is configured to use the third power source as the working signal in response to detecting the third power source provided by the power supply circuit.

[0013] In an embodiment, the power output circuit is configured to convert the third power source into the second power source and transmit the second power source to the controller.

[0014] In an embodiment, the wake-up circuit further includes a second switch provided between the power output circuit and the controller.

[0015] In an embodiment, the controller is further configured to control the second switch to switch from an on state to an off state in response to receiving the first power source.

[0016] In an embodiment, the VRF air conditioner control circuit further includes a sampling circuit, the sampling circuit is respectively connected to the power supply circuit and the controller.

[0017] In an embodiment, the sampling circuit is configured to obtain a voltage signal corresponding to the third power source, and transmit the voltage signal to the controller as the working signal.

[0018] In an embodiment, the VRF air conditioner control circuit further includes a power source circuit provided between the first switch and the controller.

[0019] In an embodiment, the power source circuit is configured to convert the first power source into a fourth power source adapted to the controller, and transmit the fourth power source to the controller.

[0020] In an embodiment, the VRF air conditioner control circuit further includes a load power supply circuit connected to the power source circuit.

[0021] In an embodiment, the power source circuit is further configured to convert the first power source into a fifth power source adapted to a load of the outdoor unit, and transmit the fifth power source to the load power supply circuit.

[0022] In an embodiment, the load power supply circuit is configured to drive the load according to the fifth power source.

[0023] In an embodiment, the controller is further configured to control the first switch from an on state to an off state in response to not receiving the working signal.

[0024] In an embodiment, the first switch is a relay, a control end of the relay is connected to a control end of the controller, a first contact point of the relay is connected to the power input terminal, and a second contact point of the relay is connected to a power supply terminal of the controller.

[0025] In order to achieve the above object, the present application further provides an electronic control device, which includes the above-mentioned VRF air conditioner control circuit.

[0026] In order to achieve the above object, the present application further provides an air conditioner. The air conditioner includes the above-mentioned electronic control device; or includes the above-mentioned VRF air conditioner control circuit.

[0027] In the present application, a VRF air conditioner control circuit is formed by providing a power input terminal, a wake-up circuit, a controller and a first switch on the outdoor unit of the VRF air conditioner. The controller is connected to the power input terminal and the wake-up circuit respectively, and the first switch is provided between the controller and the power input terminal; the power input terminal is used to access the first power source; the wake-up circuit is used to receive the VRF connection When the indoor unit of the air conditioner sends a working signal, the second power source is provided to the controller; the controller is used to control the first switch to switch from an off state to an on state when receiving the working signal and the second power source to receive the second power source. A power source. In the present application, a switch is provided between the controller in the outdoor unit and the first power source as the working power source. The controller determines the required working state of the outdoor unit according to the working signals sent by each indoor unit to control the power-on or power-down of the controller, thereby causing the outdoor unit to switch between the low power consumption mode and the working mode, realizing the low power consumption mode configuration for the outdoor unit in the VRF air conditioner, and reducing the power consumption of the outdoor unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] In order to more clearly illustrate the technical solutions in the embodiments of the present application or in the related art, drawings used in the embodiments or in the related art will be briefly described below. Obviously, the drawings in the following description are only some embodiments of the present application. It will be apparent to those skilled in the art that other figures can be obtained according to the structures shown in the drawings without creative work.

FIG. 1 is a schematic structural diagram of a variable refrigerant flow (VRF) air conditioner control circuit according to a first embodiment of the present application.

FIG. 2 is a schematic structural diagram of a VRF air conditioner according to an embodiment of the present application.

FIG. 3 is a schematic structural diagram of the VRF air conditioner control circuit according to a second embodiment of the present application.

FIG. 4 is a schematic circuit principle diagram of a wake-up circuit according to an embodiment of the present application.

[0029] Description of reference signs:

Reference sign	Name	Reference sign	Name
10	power input terminal	80	power source circuit
20	wake-up circuit	90	load power supply circuit
201	power input circuit	R1~R3	first to third resistors
202	district current (DC) power source	C1~C3	first to third capacitors
203	control signal	L1	first inductor
30	controller	B	rectifier
40	first switch	T	Zener diode
50	outdoor unit	K	electronic switch

(continued)

Reference sign	Name	Reference sign	Name
60	indoor unit	IC	power chip
70	sampling circuit		

[0030] The realization of the objective, functional characteristics, and advantages of the present application are further described with reference to the accompanying drawings.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0031] It should be understood that the embodiments described here are only used to explain the present application and are not intended to limit the present application.

[0032] The technical solutions of the embodiments of the present application will be described in more detail below with reference to the accompanying drawings. It is obvious that the embodiments to be described are only some rather than all of the embodiments of the present application. All other embodiments obtained by persons skilled in the art based on the embodiments of the present application without creative efforts shall fall within the scope of the present application.

[0033] It should be noted that all of the directional instructions in the embodiments of the present application (such as, up, down, left, right, front, rear.....) are only used to explain the relative position relationship and movement of each component under a specific attitude (as shown in the drawings), if the specific attitude changes, the directional instructions will change correspondingly.

[0034] Besides, the descriptions in the present application that refer to "first," "second," etc. are only for descriptive purposes and are not to be interpreted as indicating or implying relative importance or to implicitly indicate the number of technical features indicated. Thus, a feature defined as "first" or "second" may explicitly or implicitly include at least one of the features. In addition, technical solutions between the embodiments can be combined with each other, but must be based on the realization of the technical solutions by those skilled in the art, and when the technical solutions are contradictory to each other or cannot be realized, the technical solutions should be considered that the combination does not exist, and the technical solutions are not fallen within the protection scope claimed in the present application.

[0035] As shown in FIG. 1, FIG. 1 is a schematic structural diagram of a variable refrigerant flow (VRF) air conditioner control circuit according to a first embodiment of the present application. The present application provides a first embodiment of the VRF air conditioner control circuit.

[0036] In the first embodiment, the VRF air conditioner control circuit is applied to the outdoor unit 50 of the VRF air conditioner. The VRF air conditioner control circuit includes: a power input terminal 10, a wake-up circuit 20, a controller 30 and a first switch 40. The controller 30 is respectively connected to the power input terminal 10 and the wake-up circuit 20, and the first switch 40 is provided between the controller 30 and the power input terminal 10.

[0037] The power input terminal 10 is configured to access a first power source.

[0038] The wake-up circuit 20 is configured to provide a second power source to the controller 30 in response to receiving a working signal sent by an indoor unit 60 of the VRF air conditioner.

[0039] The controller 30 is configured to control the first switch 40 to switch from an off state to an on state to receive the first power source in response to receiving the working signal and the second power source.

[0040] As shown in FIG. 2, FIG. 2 is a schematic structural diagram of a VRF air conditioner according to an embodiment of the present application. The VRF air conditioner refers to an air-conditioning system in which one outdoor unit 50 drives the plurality of indoor units 60. The refrigerant output from the outdoor unit 50 is transported to each indoor unit 60 through a diverter element, so that each indoor unit 60 can complete the heat exchange operation. Usually, the outdoor unit 50 and each indoor unit 60 are equipped with independent power sources to provide power for the drivers and loads inside the outdoor unit 50 or each indoor unit 60. When each indoor unit 60 is in the non-working mode, the corresponding independent power source is disconnected, so that each internal load is in a power-down state, and the entire machine is in a low power consumption mode to save energy.

[0041] It should be understood that, the VRF air conditioner control circuit in the embodiment is provided inside the outdoor unit 50. The controller 30 refers to the controller inside the outdoor unit 50. The controller 30 can be combined with a corresponding drive circuit to form a driver for driving the load. The load may include devices such as compressors, fans, electronic expansion valves, etc. The drive circuits corresponding to various types of loads already have mature circuit structures, which will not be described again in the embodiment.

[0042] It should be noted that the first power source refers to an independent power source configured with the outdoor unit 50, which can be the power source provided by a power adapter and other device, or the mains power. When the

outdoor unit 50 is in the working mode, each internal unit is powered by the first power source. In the embodiment, a low power consumption mode is configured on the outdoor unit 50, and a first switch 40 is provided between the controller 30 and the power input terminal 10. When the outdoor unit 50 is in the working mode, the first switch 40 is in an on state, and the controller 30 can receive the first power source. When the outdoor unit 50 is in the low power consumption mode, the first switch 40 is in an off state, and the controller 30 cannot receive the first power source and cannot execute the corresponding control logic, and the outdoor unit 50 is in the low power consumption mode. The state of the first switch 40 can be controlled by the controller 30. The first switch 40 can also be provided with interactive components to facilitate the user to switch the working state of the outdoor unit 50.

[0043] The embodiment mainly takes the automatic control of the outdoor unit 50 as an example for description. During specific implementation, the controller 30 needs to control the state of the first switch 40 according to the working state of the indoor unit 60. In order to ensure the normal operation of the indoor unit 60, when the indoor unit 60 has a demand for cooling capacity or heating capacity, the outdoor unit 50 needs to provide corresponding cooling capacity or heating capacity. Therefore, the outdoor unit 50 can usually enter the low power consumption mode only when there is no demand for cooling capacity or heating capacity from the indoor units 60.

[0044] In the embodiment, the working signal can be configured to determine whether the indoor unit 60 is in the working mode and whether there is a demand for cooling capacity or heating capacity, that is, to determine whether the outdoor unit 50 needs to enter the working mode. If the outdoor unit 50 receives the working signal, it determines that it needs to enter the working mode to provide the indoor unit 60 with corresponding cooling capacity or heating capacity. If the outdoor unit 50 does not receive the working signal, it determines that it does not need to enter the working mode. The outdoor unit 50 entering the working mode means that the compressor and other devices are powered on and operating, and the refrigerant is transmitted to the indoor unit 60 to perform cooling or heating operations.

[0045] In an embodiment, each indoor unit 60 can communicate with the outdoor unit 50 respectively. When entering the working mode, each indoor unit 60 sends a working signal to the outdoor unit 50. When the wake-up circuit 20 receives the working signal sent by any one of indoor units 60, a second power source is provided to the controller 30.

[0046] It should be noted that when the outdoor unit 50 is in the low power consumption mode, the controller 30 cannot receive the first power source. In order to make the controller 30 work normally, the wake-up circuit 20 provides the second power source to the controller 30 as the wake-up power source to power the controller 30. In an embodiment, the wake-up circuit 20 can be provided with a built-in power source, and when receiving a working signal, the built-in power source is converted into a second power source for output. The wake-up circuit 20 can also be connected to an external power source, and when receiving a working signal, the external power source is converted into a second power source for output.

[0047] In addition, in order to facilitate the determination of the working state of the indoor unit 60, the controller 30 also needs to receive the working signal. If the outdoor unit is in the low power consumption mode, the second power source serves as the working power source to enable the controller 30 to operate normally. At this time, if the controller 30 receives the working signal, the first switch 40 is controlled to switch from the off state to the on state, so as to receive the first power source and restore the normal power source, thereby causing the outdoor unit 50 to wake up from the low power consumption mode and enter the working mode.

[0048] In an embodiment, the controller 30 is further configured to control the first switch 40 to switch from the on state to the off state when no working signal is received.

[0049] It should be noted that when the indoor unit 60 is in the working mode, it will continue to send working signals to the outdoor unit 50. The presence or absence of the working signal indicates whether the indoor unit 60 is in the working mode. For example, the working state of the control unit in the indoor unit 60 is detected in real time, and when the control unit is in the working mode, a working signal is generated and sent to the outdoor unit 50. When the working signal is received by the signal receiving unit of the outdoor unit 50, the working signal is transmitted to the wake-up circuit 20 and the controller 30. Therefore, when the outdoor unit 50 is in the working mode, if the controller 30 does not receive the working signal sent by any one of the indoor units 60, it means that all the indoor units 60 are not in the working mode, and the outdoor unit 50 does not need to provide corresponding cooling capacity or heating capacity. At this time, the controller 30 can control the first switch to switch from the on state to the off state, so that the outdoor unit 50 enters the low power consumption mode.

[0050] In an embodiment, the first switch 40 can be a relay, the control end of the relay is connected to the control end of the controller 30, the second contact point of the relay is connected to the power input terminal 10, and the first contact point of the relay is connected to the power supply terminal of the controller 30.

[0051] It can be understood that the control end of the relay can be the connection end of the relay coil, and the first contact point and the second contact point of the relay are closed when the relay coil is energized, and are opened when the relay coil is not energized. The first switch 40 is a normally open switch, and the control end of the controller 30 is configured to output control power source. When the controller 30 receives the working signal and the second power source, the control power source is output to energize the relay coil, thereby conduct a loop between the input terminal 10 and the power supply terminal of the controller 30 to receive the first power source. Of course, the first switch 40 can

also use other types of switching devices, which is not limited in the embodiment.

[0052] In the first embodiment, a VRF air conditioner control circuit is formed by providing the power input terminal 10, the wake-up circuit 20, the controller 30 and the first switch 40 on the outdoor unit 50 of the VRF air conditioner. The power input terminal 10 is configured to access the first power source; the wake-up circuit 20 provides the second power source to the controller 30 when receiving the working signal sent by the indoor unit 60 of the VRF air conditioner. The controller 30 is configured to control the first switch 40 to switch from an off state to an on state to receive the first power source when receiving the working signal and the second power source. In the embodiment, a switch is provided between the controller 30 in the outdoor unit 50 and the first power source as the working power source. The controller 30 determines the required working state of the outdoor unit 50 according to the working signals sent by each indoor unit 60, so as to control the power-on or power-down of the controller 30, thereby switching the outdoor unit 50 between the low power consumption mode and the working mode, realizing the configuration of the low power consumption mode for the outdoor unit 50 in the VRF air conditioner, and reducing power consumption of the outdoor unit 50.

[0053] As shown in FIG. 3, FIG. 3 is a schematic structural diagram of the VRF air conditioner control circuit according to a second embodiment of the present application. Based on the above first embodiment, the present application provides a second embodiment of a VRF air conditioner control circuit.

[0054] In the second embodiment, the wake-up circuit 20 includes a power input circuit 201 and a power output circuit 202 connected to each other. The power input circuit 201 is connected to the power supply circuit of the indoor unit 60.

[0055] The power supply circuit is configured to provide a third power source to power the indoor unit 60 when it is in a power supply state.

[0056] The power input circuit 201 is configured to use the third power source as a working signal when detecting the third power source provided by the power supply circuit.

[0057] The power output circuit 202 is configured to convert the third power source into the second power source and transmit the second power source to the controller 30.

[0058] In order to facilitate detection of the working state of each indoor unit 60 and thereby facilitate control of the working state of the outdoor unit 50, in the embodiment, the third power source as the power source in the indoor unit 60 is configured as the working signal. The power supply circuit is configured to convert the independent power source corresponding to each indoor unit 60 into a power source to drive the load in each indoor unit 60 to operate. The third power source can be the power source.

[0059] It can be understood that if the load in the indoor unit 60 is in the powered-on state, it means that the indoor unit 60 is in the working mode, that is, it has corresponding cooling capacity or heating capacity demands. Therefore, the working state of the indoor unit 60 can be determined by determining whether the power supply circuit of the indoor unit provides power source. The power supply circuit has a mature circuit structure, which will not be described in detail in the embodiment.

[0060] In an embodiment, the power supply circuit of each indoor unit 60 is also connected to the power input circuit 201 in the outdoor unit 50. When the power supply circuit supplies power to the load in the indoor unit 60, it further provides a third power source to the power input circuit 201 at the same time. When the power supply circuit stops supplying power to the load in the indoor unit 60, it also stops supplying the third power source to the power input circuit 201.

[0061] Since the third power source is actually the power source for the load in the indoor unit 60, its amplitude is usually high. In order to avoid damage to the controller 30, the third power source further needs to be performed with process such as step-down, etc. Usually the third power source can be 12V or 24V, and 3V or 5V In addition, the third power source is usually alternating current (AC) power, and the second power source is usually DC power, so the power output circuit 202 also needs to rectify the third power source.

[0062] In an embodiment, the third power source is also converted into the second power source at the same time to serve as the wake-up power source for the controller 30. By multiplexing the power source of the indoor unit 60, the accuracy of detecting the status of the indoor unit is improved, and the wake-up circuit 20 is also simplified, making it easier to implement.

[0063] In an embodiment, the wake-up circuit 20 also includes a second switch 203. The second switch 203 is provided between the power output circuit 202 and the controller 30. The controller 30 is further configured to control the second switch 203 to switch from an on state to an off state when receiving the first power source.

[0064] It can be understood that the controller 30 can operate normally after receiving the first power source. At this time, it is no longer necessary to wake up the power source. The circuit between the power output circuit 202 and the controller 30 can be cut off so that the controller 30 no longer needs to receive a second power source, thereby further saving energy. In an embodiment, the second switch 203 is a normally closed switch, which may be a relay. After receiving the first power source, the controller 30 applies current to the relay coil of the second switch 203, thereby switching the second switch 203 from the on state to the off state. When the controller 30 receives the first power source, the current on the relay coil of the switch 203 disappears, and the second switch 203 returns to the on state. Of course, the second switch 203 can also be other types of switches, which is not limited in the embodiment.

[0065] As shown in FIG. 4, FIG. 4 is a schematic circuit principle diagram of a wake-up circuit according to an embod-

iment of the present application. As an example, the embodiment further provides a circuit principle diagram of the wake-up circuit 20. The power input circuit 201 includes a first resistor R1, a second resistor, a first capacitor C1, a second capacitor C2 and a rectifier B. The first input terminal of the rectifier B is connected to the first terminal of the first resistor R1 and the first terminal of the first capacitor C1 respectively. The second terminal of the first capacitor C1 is connected to the second input terminal of the rectifier B. The first input terminal and the second input terminal of the rectifier B are configured to access the AC power source. The first output terminal of the rectifier B is connected to the first terminal of the second resistor R2 and the first terminal of the second capacitor C2 respectively. The second terminal of the second capacitor C2 is connected to the second output terminal of the rectifier B. The second terminal of the rectifier B is connected to ground, and the second terminal of the second resistor R2 is connected to the power output circuit 202. The power input circuit 201 is configured to access AC current, perform rectification, and transmit DC power to the power output circuit 202.

[0066] The power output circuit 202 includes a power chip IC, a first inductor L1, a third capacitor C3, a third resistor R3 and a Zener diode T. The second switch 203 includes an electronic switch K, the control end of the second switch 203 is connected to the controller 30. The input end of the power chip IC is connected to the second end of the second resistor, the output end of the power chip IC is connected to the first end of the first inductor L1 and the cathode of the Zener diode T respectively. The second end of the first inductor L1 is respectively connected to the first terminal of the third resistor R3, the first terminal of the third capacitor C3 and the first terminal of the electronic switch K. The anode of the Zener diode T, the second terminal of the third resistor R3 and the second terminal of the third capacitor C3 are all grounded. The power chip IC is configured to perform voltage conversion on the input DC power, and output the power through a filter circuit composed of the first inductor L1, a third capacitor C3 and a third resistor R3. Of course, the wake-up circuit 20 is other circuits that realize similar functions, and the embodiment is not limited thereto.

[0067] It should be noted that the power chip IC can further communicate with the controller 30. After receiving the first power source, the controller 30 sends a shutdown signal to the power chip IC. After receiving the shutdown signal, the power chip IC stops outputting power. At this time, the second switch 203 does not need to be provided in the wake-up circuit 20, and automatic cut-off can also be realized.

[0068] In addition, in order to further avoid damage to the controller 30, the VRF air conditioner control circuit further includes a sampling circuit 70. The sampling circuit 70 is respectively connected to the power supply circuit and the controller 30. The sampling circuit 70 is configured to obtain the voltage signal corresponding to the third power source, and transmit the voltage signal to the controller 30 as the working signal.

[0069] It should be noted that since the voltage of the third power source is high and is AC power, directly inputting it into the port of the controller 30 may easily cause damage to the controller 30. Therefore, the sampling circuit 70 may first sample the third power source to obtain the DC power, and then the step-down processing is performed on the DC power, or a lower voltage signal is output to the controller 30. In an embodiment, since the power input circuit 201 rectifies the third power source, the sampling circuit 70 can also obtain the voltage signal from the output end of the power input circuit 201.

[0070] It can be understood that the controller 30 can determine the working state of the indoor unit 60 according to the voltage value of the voltage signal. If the voltage value of the voltage signal is low, it means that the indoor unit 60 is in the standby state. If the voltage value of the voltage signal is not low, it means that the indoor unit 60 is in the working state.

[0071] In an embodiment, in order to conveniently manage the power source of the outdoor unit 50. The VRF air conditioner control circuit further includes a power source circuit 80 provided between the first switch 40 and the controller 30. The power source circuit 80 is configured to convert the first power source into a fourth power source adapted to the controller 30, and transmit the fourth power to the controller 30.

[0072] It can be understood that the first power source can be the power source provided by a power adapter or other device or the mains power, and its voltage is usually 120V or 240V. However, the required power source voltage of the controller is low, so the first power source needs to be adjusted, and then transmitted to the controller 30. The specific voltage of the fourth power source is determined according to the specific parameters of the controller 30. If the rated voltage of the controller 30 is 5V, then the voltage value of the fourth power source is 5V If the rated voltage of the controller 30 is 8V, then the voltage value of the fourth power source is 8V The power source circuit 80 can be composed of a power management chip, and its specific circuit structure technology is mature, which will not be described in the embodiment.

[0073] In addition, the VRF air conditioner control circuit further includes a load power supply circuit 90 connected to the power source circuit 80. The power source circuit 80 is further configured to convert the first power source into a fifth power source adapted to the load of the outdoor unit 50, and transmit the fifth power source to the load power supply circuit 90. The load power supply circuit 90 is configured to drive the load according to the fifth power source.

[0074] It can be understood that the first power source is the power source for the entire outdoor unit 50. After the outdoor unit 50 wakes up from the low power consumption mode, various loads inside the indoor unit 50 need to be powered on for operation. Therefore, in addition to providing power source to the controller 30, the power source circuit

80 also needs to increase the power supply to various loads. In an embodiment, the fifth power source may include a plurality of power sources with different voltages, which are configured to power the load. The specific voltage value is determined according to the rated voltage of the load, for example, the fifth power source may include 12V, 24V, etc. The circuit structure technology of the load power supply circuit 90 is also mature, which will not be described in the embodiment.

[0075] In the second embodiment, the wake-up circuit 20 includes a power input circuit 201 and a power output circuit 202 connected to the power supply circuit of the indoor unit 60. When the power input circuit 201 detects the third power source provided by the power supply circuit, the third power source is used as the working signal. The power output circuit 202 converts the third power into a second power and transmits the second power to the controller 30. In the embodiment, the power supply source of the indoor unit 60 is multiplexed, and the power supply source is used as the working signal. If the power input circuit 201 receives the power source, it means that the indoor unit 60 is in the working mode, and the outdoor unit 50 also needs to enter the working mode. At the same time, the third power source is converted to obtain the second power source, which is configured as the driving power source of the controller 30 so that the controller 30 can operate normally, thereby causing the outdoor unit 50 to wake up from the low-power consumption mode.

[0076] In order to achieve the above objective, the present application further provides an electronic control device, including the above-mentioned VRF air conditioner control circuit. The specific structure of the VRF air conditioner control circuit refers to the above-mentioned embodiments. Since this electronic control device can adopt the technical solutions of all the above-mentioned embodiments, it at least has the beneficial effects brought by the technical solutions of the above-mentioned embodiments, which will not be repeated here.

[0077] In order to achieve the above objective, the present application further provides an air conditioner. The air conditioner includes the above-mentioned electronic control device; or includes the above-mentioned VRF air conditioner control circuit. The specific structure of the electronic control device or the VRF air conditioner control circuit refers to the above-mentioned embodiments. Since the air conditioner can adopt the technical solutions of all the above-mentioned embodiments, it at least has the beneficial effects brought by the technical solutions of the above-mentioned embodiments, which will not be repeated here.

[0078] The above-mentioned embodiments are only some embodiments of the present application, and are not intended to limit the scope of the present application. Any equivalent structure conversion or equivalent process conversion made with reference to the description and the accompanying drawings of the present application, directly or indirectly applied in other related technical fields, should all fall in the scope of the present application.

Claims

1. A variable refrigerant flow, VRF, air conditioner control circuit, applied to an outdoor unit of a VRF air conditioner, comprising:

   a power input terminal;
   a wake-up circuit;
   a controller respectively connected to the power input terminal and the wake-up circuit; and
   a first switch provided between the controller and the power input terminal, wherein:

   the power input terminal is configured to access a first power source;
   the wake-up circuit is configured to provide a second power source to the controller in response to receiving a working signal sent by an indoor unit of the VRF air conditioner; and
   the controller is configured to control the first switch to switch from an off state to an on state to receive the first power source in response to receiving the working signal and the second power source.

2. The VRF air conditioner control circuit according to claim 1, wherein:

   the wake-up circuit comprises a power input circuit and a power output circuit connected to each other, and the power input circuit is connected to a power supply circuit of the indoor unit;
   the power supply circuit is configured to provide a third power source to power the indoor unit in response to being in a power supply state;
   the power input circuit is configured to use the third power source as the working signal in response to detecting the third power source provided by the power supply circuit; and
   the power output circuit is configured to convert the third power source into the second power source and transmit the second power source to the controller.

3. The VRF air conditioner control circuit according to claim 2, wherein:

the wake-up circuit further comprises a second switch provided between the power output circuit and the controller; and
the controller is further configured to control the second switch to switch from an on state to an off state in response to receiving the first power source.

4. The VRF air conditioner control circuit according to claim 2, wherein:

the VRF air conditioner control circuit further comprises a sampling circuit, the sampling circuit is respectively connected to the power supply circuit and the controller; and
the sampling circuit is configured to obtain a voltage signal corresponding to the third power source, and transmit the voltage signal to the controller as the working signal.

5. The VRF air conditioner control circuit according to any one of claims 1 to 4, wherein:

the VRF air conditioner control circuit further comprises a power source circuit provided between the first switch and the controller; and
the power source circuit is configured to convert the first power source into a fourth power source adapted to the controller, and transmit the fourth power source to the controller.

6. The VRF air conditioner control circuit according to claim 5, wherein:

the VRF air conditioner control circuit further comprises a load power supply circuit connected to the power source circuit;
the power source circuit is further configured to convert the first power source into a fifth power source adapted to a load of the outdoor unit, and transmit the fifth power source to the load power supply circuit; and
the load power supply circuit is configured to drive the load according to the fifth power source.

7. The VRF air conditioner control circuit according to any one of claims 1 to 4, wherein the controller is further configured to control the first switch from an on state to an off state in response to not receiving the working signal.

8. The VRF air conditioner control circuit according to any one of claims 1 to 4, wherein the first switch is a relay, a control end of the relay is connected to a control end of the controller, a first contact point of the relay is connected to the power input terminal, and a second contact point of the relay is connected to a power supply terminal of the controller.

9. An electronic control device, comprising:
the variable refrigerant flow, VRF, air conditioner control circuit according to any one of claims 1 to 8.

10. An air conditioner, comprising:

the electronic control device according to claim 9; or
the variable refrigerant flow, VRF, air conditioner control circuit according to any one of claims 1 to 8.

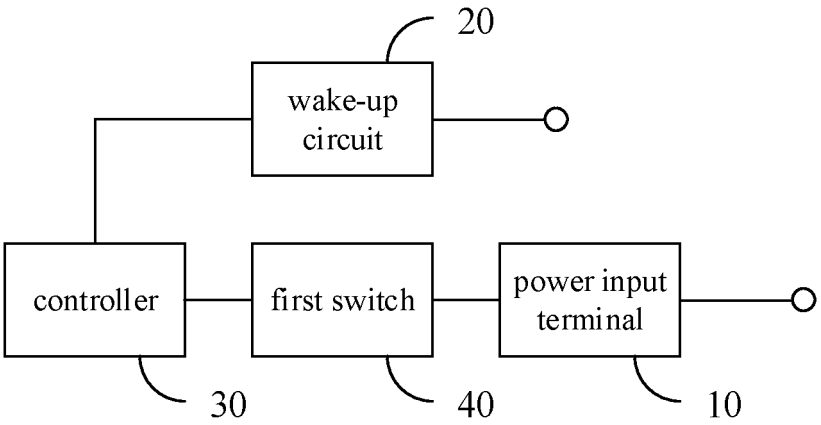
20
wake-up circuit
controller
first switch
power input terminal
30
40
10

FIG. 1

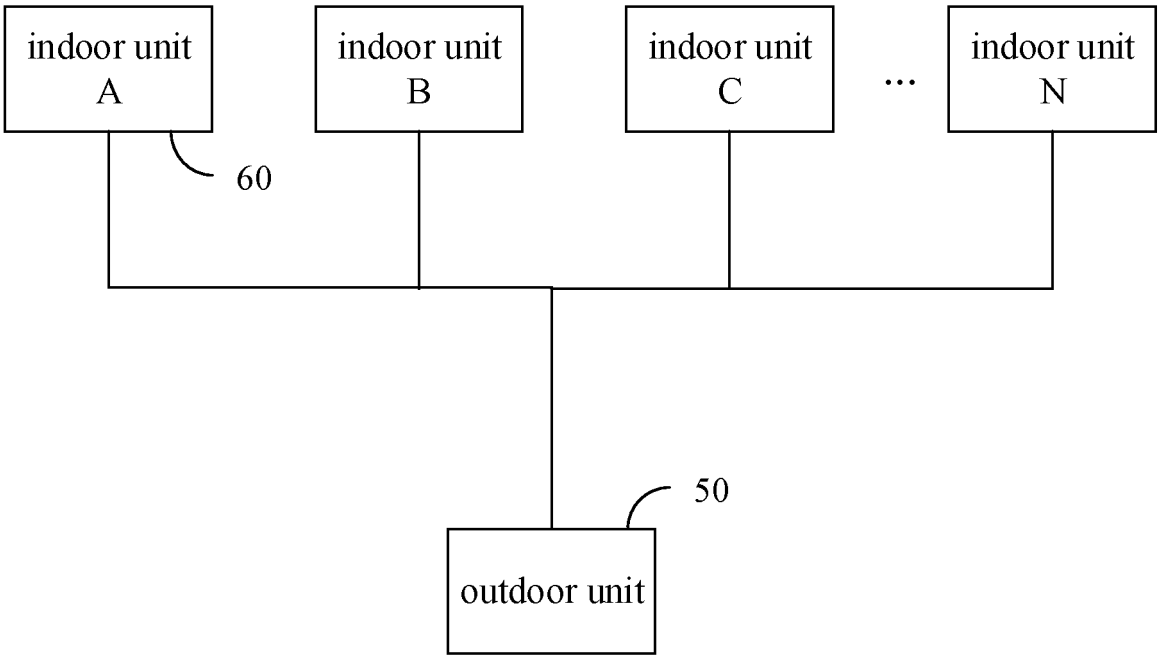
indoor unit A
indoor unit B
indoor unit C
...
indoor unit N
60
50
outdoor unit

FIG. 2

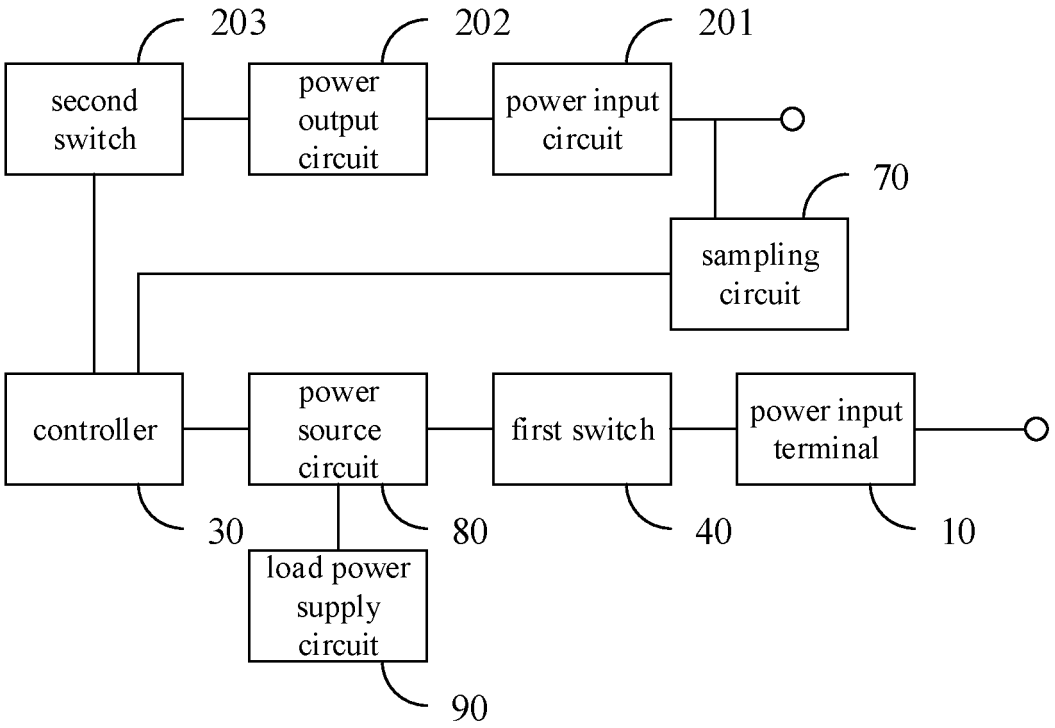
203
202
201
second switch
power output circuit
power input circuit
70
sampling circuit
controller
power source circuit
first switch
power input terminal
30
80
40
10
load power supply circuit
90

FIG. 3

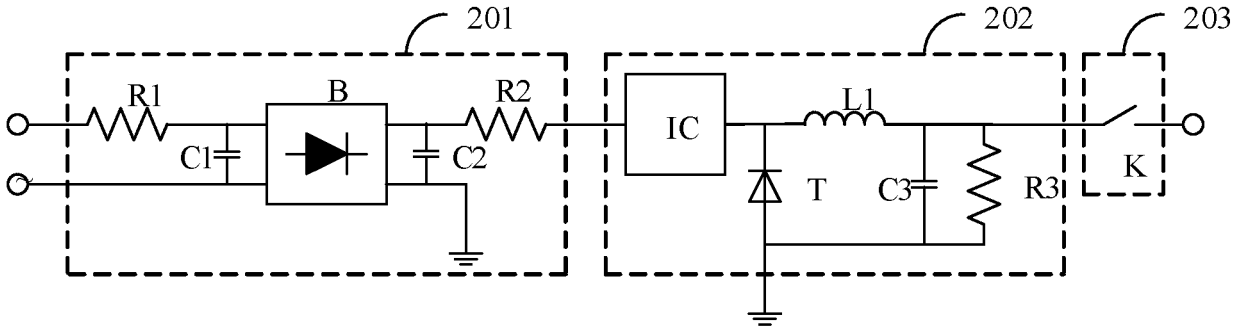
201
202
203
R1
B
R2
C1
C2
IC
L1
T
C3
R3
K

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/102758

A. CLASSIFICATION OF SUBJECT MATTER

F24F 11/88(2018.01)i; F24F 11/89(2018.01)i; F24F 11/46(2018.01)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)

CNTXT, DWPI, WPSABSC, WPSABS, VEN: 多联, 空调, 控制, 电路, 室外, 室内, 功耗, 输入, 输出, 开关, 唤醒, multi connect, air condition???, control???. circuit, outdoor, indoor, electric???, power, input, output, switch, wak???, awak

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 113669879 A (FOSHAN SHUNDE MIDEA ELECTRONIC TECHNOLOGY CO., LTD. et al.) 19 November 2021 (2021-11-19) claims 1-10	1-10
Y	CN 111976415 A (GUANGDONG MIDEA REFRIGERATION EQUIPMENT CO., LTD.) 24 November 2020 (2020-11-24) description, paragraphs 0033-0042, and figure 1	1-10
Y	CN 108800484 A (GUANGDONG MIDEA REFRIGERATION EQUIPMENT CO., LTD. et al.) 13 November 2018 (2018-11-13) description, paragraph [0033]	1-10
Y	CN 112902416 A (ZHUHAI GREE ELECTRIC APPLIANCES INC.) 04 June 2021 (2021-06-04) description, paragraphs 0034-0046	2-4
A	CN 111656104 A (HISENSE (GUANGDONG) AIR-CONDITIONING CO., LTD.) 11 September 2020 (2020-09-11) entire document	1-10

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

* Special categories of cited documents:
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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
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"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
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 September 2022	**26 September 2022**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/102758

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A	KR 102142829 B1 (APCO LTD.) 07 August 2020 (2020-08-07) entire document	1-10

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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CN 112902416 A	04 June 2021	None	
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REFERENCES CITED IN THE DESCRIPTION

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