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(54) **CONTROL METHOD AND APPARATUS FOR OUTDOOR UNIT OF AIR CONDITIONER, AND AIR CONDITIONER**

(57) Disclosed in the present invention are a control method and apparatus for an outdoor unit of an air conditioner, and an air conditioner. The control method for an outdoor unit of an air conditioner comprises the following steps: acquiring a first temperature of an environment in which an outdoor unit in a standby state is located, controlling the outdoor unit to operate for a first preset duration, and then acquiring a second temperature of the environment in which the outdoor unit is currently located; and reading a real-time environment temperature from a cloud according to the range of the temperature difference between the second temperature and the first temperature, so as to control the operation of the outdoor unit according to the temperature difference between the

real-time environment temperature from the cloud and the second temperature. By means of the present invention, the problem of poor heat dissipation in a mounting environment of an outdoor unit can be determined intelligently and accurately, and the determination process does not require manual intervention. By means of the present invention, the problem of the poor heat dissipation in the mounting environment of the outdoor unit can be found in advance, and a user or related personnel can be notified in a timely manner, thereby achieving the aim of finding and clearing a fault in advance before an outdoor unit device of an air conditioner is damaged, effectively protecting an outdoor unit of the air conditioner, and greatly improving the user experience.

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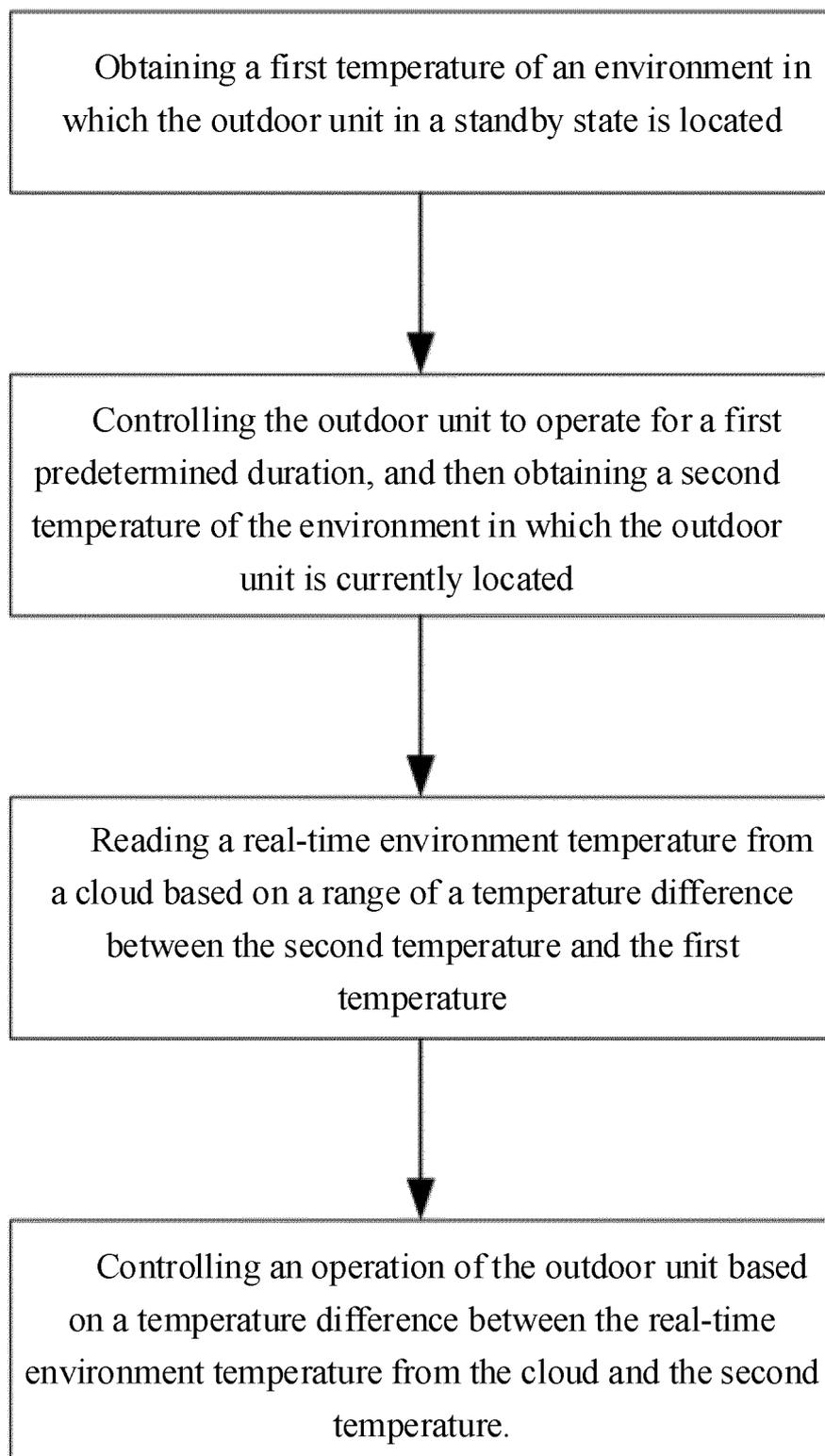


FIG. 1

Description

PRIORITY INFORMATION

[0001] This application claims priority to and benefit of Chinese Patent Application No. 202110374364.6, filed with China National Intellectual Property Administration on April 7, 2021, the entire contents of which are incorporated herein by reference.

FIELD

[0002] The present disclosure relates to the field of intelligent control technologies for air conditioners. More specifically, the present disclosure provides a method and apparatus for controlling an outdoor unit of an air conditioner, and an air conditioner.

BACKGROUND

[0003] At present, due to limitations in building design, an outdoor unit of an air conditioner is often mounted in a semi-closed space or even a closed space. This often causes poor heat dissipation of the outdoor unit of the air conditioner, resulting in a serious impact on cooling and heating performance of an air conditioning system, and even damage to the outdoor unit. In a conventional method, usually a cause is troubleshot only when the cooling and heating performance of the air conditioner is found to be seriously affected. It is likely that a maintenance person needs to go through several checks before discovering that the cause is poor heat dissipation in an installation environment for the outdoor unit. However, in this case, the outdoor unit of the air conditioner may malfunction due to the poor heat dissipation. Therefore, it is an urgent problem to be solved by those skilled in the art and always the focus of research regarding how to better protect the outdoor unit of the air conditioner, ensure the normal operation of the outdoor unit, and realize an early detection for the poor heat dissipation in the installation environment.

SUMMARY

[0004] A main objective of the present disclosure is to provide a method and apparatus for controlling an outdoor unit of an air conditioner, and an air conditioner, to solve at least one technical problem in the related art.

[0005] To achieve the above technical objectives, the present disclosure provides a method for controlling an outdoor unit of an air conditioner. The method includes, but is not limited to, at least one of the following steps of: obtaining a first temperature of an environment in which the outdoor unit in a standby state is located; controlling the outdoor unit to operate for a first predetermined duration, and then obtaining a second temperature of the environment in which the outdoor unit is currently located; reading a real-time environment temperature from the

cloud based on a range of a temperature difference between the second temperature and the first temperature; and controlling an operation of the outdoor unit based on a temperature difference between the real-time environment temperature from the cloud and the second temperature.

[0006] Based on the above technical solution, in the present disclosure, a problem of poor heat dissipation in an installation environment for the outdoor unit can be detected in advance based on an environment temperature of the outdoor unit in the standby state, an environment temperature of the outdoor unit subsequent to a period of time of operation of the outdoor unit, and the real-time environment temperature from the cloud, and a subsequent operation method of the outdoor unit can be controlled in a timely manner to protect the outdoor unit. An entire determination process of the present disclosure no longer requires manual intervention, and thus the solution in the present disclosure has outstanding advantages such as a high degree of automation and intelligence.

[0007] Further, the control method further includes: transmitting installation environment heat dissipation prompt information of the outdoor unit to a terminal based on the temperature difference between the real-time environment temperature from the cloud and the second temperature. The terminal is a user terminal and/or a commissioning person terminal.

[0008] Based on the above improved technical solution, in the present disclosure, a user and a relevant person can be further promptly and quickly informed, to notify the user and the relevant person in advance of heat dissipation of the installation environment for the outdoor unit. Therefore, the technical solution in the present disclosure not only saves a lot of time spent on investigating the cause when cooling and heating performance of the air conditioner is found to be seriously affected, but also effectively avoids damage to the outdoor unit caused by poor heat dissipation in the installation environment, which can provide good protection to the outdoor unit, prolonging a service life of the outdoor unit of the air conditioner, and offering good user experience.

[0009] Further, the obtaining the first temperature of the environment in which the outdoor unit in the standby state is located includes: reading a total energy demand of the outdoor unit; determining, based on that the total energy demand is zero, that the outdoor unit is in the standby state; and obtaining the first temperature of the environment in which the outdoor unit is located.

[0010] Based on the above improved technical solution, in the present disclosure, that the outdoor unit is in the standby state can be further accurately determined to more accurately obtain a real temperature of the environment in which the outdoor unit is located, avoiding misinformation of heat dissipation due to a detection error of the first temperature. Thus, in the present disclosure, high reliability can be provided.

[0011] Further, the obtaining the first temperature of

the environment in which the outdoor unit is located includes: controlling a fan of the outdoor unit to start; controlling the fan to operate for a second predetermined duration; and collecting the first temperature of the environment in which the outdoor unit is currently located.

[0012] Based on the above improved technical solution, in the present disclosure, an air flow speed of the environment in which the outdoor unit is located can be accelerated by means of turning on the fan, to prevent a temperature detection result of the environment in which the outdoor unit is located from being affected by external factors such as solar radiation. Thus, in the present disclosure, a more accurate and reliable collection result of the first temperature can be provided.

[0013] Further, the controlling the outdoor unit to operate for the first predetermined duration includes: controlling, based on that the first temperature is within a second set range, the outdoor unit to operate in a cooling mode for the first predetermined duration. The reading the real-time environment temperature from the cloud based on the range of the temperature difference between the second temperature and the first temperature includes: calculating the temperature difference between the second temperature and the first temperature, and reading the real-time environment temperature from the cloud based on that the temperature difference is greater than a first set value.

[0014] Further, the controlling, based on that the first temperature is within the second set range, the outdoor unit to operate in the cooling mode includes: controlling, based on that the first temperature is greater than a second set value, the outdoor unit to operate in the cooling mode.

[0015] In the present disclosure, the above improved technical solution can be applied in a poor heat dissipation detection for the installation environment for the outdoor unit in summer. By controlling the outdoor unit to operate in the cooling mode, the environment temperature of the outdoor unit subsequent to a period of time of operation of the outdoor unit is determined and compared with the real-time environment temperature from the cloud, to obtain an accurate determination result.

[0016] Further, the controlling the outdoor unit to operate for the first predetermined duration includes: controlling, based on that the first temperature is within a third set range, the outdoor unit to operate in a heating mode for the first predetermined duration. The reading the real-time environment temperature from the cloud based on the range of the temperature difference between the second temperature and the first temperature includes: calculating the temperature difference between the first temperature and the second temperature, and reading the real-time environment temperature from the cloud based on that the temperature difference is greater than a third set value.

[0017] Further, the controlling, based on that the first temperature is within the third set range, the outdoor unit to operate in the heating mode includes: controlling,

based on that the first temperature is smaller than a fourth set value, an indoor unit to operate in the heating mode.

[0018] In the present disclosure, the above improved technical solution can be applied in a poor heat dissipation detection for the installation environment for the outdoor unit in winter. By controlling the outdoor unit to operate in the heating mode, the environment temperature of the outdoor unit subsequent to a period of time of operation of the outdoor unit is determined and compared with the real-time environment temperature from the cloud, to obtain an accurate determination result.

[0019] To achieve the above technical objective, the present disclosure can further provide an apparatus for controlling an outdoor unit of an air conditioner. The apparatus can include, but is not limited to, a first temperature obtaining module, a first device control module, a second temperature obtaining module, the cloud temperature reading module, and a second device control module.

[0020] The first temperature obtaining module is configured to obtain a first temperature of an environment in which the outdoor unit in a standby state is located.

[0021] The first device control module is configured to control the outdoor unit to operate for a first predetermined duration.

[0022] The second temperature obtaining module is configured to obtain, based on the outdoor unit having operated for the first predetermined duration, a second temperature of the environment in which the outdoor unit is currently located.

[0023] The cloud temperature reading module is configured to read a real-time environment temperature from the cloud based on a range of a temperature difference between the second temperature and the first temperature.

[0024] The second device control module is configured to control an operation of the outdoor unit based on a temperature difference between the real-time environment temperature from the cloud and the second temperature.

[0025] In the present disclosure, the above technical solutions, innovatively, can detect in advance the poor heat dissipation in the installation environment for the outdoor unit based on the environment temperature of the outdoor unit in the standby state, the environment temperature of the outdoor unit subsequent to a period of time of operation of the outdoor unit, and the real-time environment temperature from the cloud, and can control the subsequent operation method of the outdoor unit in a timely manner to protect the outdoor unit. An entire determination process of the present disclosure no longer requires manual intervention, and thus the technical solutions in the present disclosure have outstanding advantages such as a high degree of automation and intelligence.

[0026] To realize the above technical objective, the present disclosure can further provide an air conditioner. The air conditioner can include, but is not limited to, the

apparatus for controlling the outdoor unit according to any embodiment of the present disclosure.

[0027] The present disclosure can provide the following advantageous effects. The technical solutions in the present disclosure can realize an intelligent, automatic, and accurate determination of a problem of poor heat dissipation in the installation environment for the outdoor unit, without human intervention. In the present disclosure, the environment temperature of the outdoor unit in the standby state and the real-time environment temperature from the cloud are determined as the basis for the determination, which greatly improves an accuracy and reliability of the determination of the heat dissipation of the installation environment for the outdoor unit. Therefore, in the present disclosure, the problem of poor heat dissipation in the installation environment for the outdoor unit can be detected in advance, and the user or the relevant person of the problem can be notified timely, in such a manner that a purpose of detecting and eliminating a fault in advance before damage caused to the outdoor unit of the air conditioner can be achieved, and a number of technical objectives such as effectively protecting the outdoor unit of the air conditioner can be realized, greatly enhancing user satisfaction and user experience.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] In order to clearly explain technical solutions according to embodiments of the present disclosure or in the related art, drawings used in the description of the embodiments or the related art are briefly described below. The drawings as described below are merely some embodiments of the present disclosure. Based on structures illustrated by these drawings, other drawings can be obtained by those skilled in the art without creative effort.

FIG. 1 illustrates a flowchart of a method for controlling an outdoor unit of an air conditioner according to one or more embodiments of the present disclosure.

FIG. 2 illustrates a schematic diagram of a detailed execution process of a method for controlling an outdoor unit of an air conditioner according to one or more embodiments of the present disclosure.

FIG. 3 illustrates a schematic diagram of a composition of an apparatus for controlling an outdoor unit of an air conditioner according to one or more embodiments of the present disclosure.

[0029] Implementations of the objectives, functional features, and advantages of the present disclosure will be further described in connection with the embodiments and with reference to the accompanying drawings.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0030] Technical solutions according to embodiments of the present disclosure will be described clearly and completely below in combination with accompanying drawings of the embodiments of the present disclosure. The embodiments described below are only a part of the embodiments of the present disclosure, rather than all embodiments of the present disclosure. On a basis of the embodiments of the present disclosure, all other embodiments obtained by those skilled in the art without creative labor shall fall within the protection scope of the present disclosure.

[0031] In view of the fact that, in the related art, only when the user finds that the air conditioner has poor cooling and heating performance can a problem of poor heat dissipation in an installation environment for an outdoor unit be discovered through a number of inspections, the present disclosure innovatively provides a method and apparatus for controlling an outdoor unit of an air conditioner, and an air conditioner, to overcome one or more problems in the related art.

[0032] As illustrated in FIG. 1 and FIG. 2, one or more embodiments of the present disclosure can provide a method for controlling an outdoor unit of an air conditioner. The method may include, but is not limited to, at least one of the following steps.

[0033] A first temperature T1 of an environment in which an outdoor unit of an air conditioner in a standby state is located is obtained. In the present disclosure, whether the outdoor unit is on standby or not can be accurately determined through reading a total energy demand of the outdoor unit. When the total energy demand (a demand quantity of cooling or heating issued by an indoor unit to the outdoor unit) is zero, the outdoor unit is on standby or in a waiting state. When the total energy demand is non-zero, the outdoor unit is in operation or not on standby. In the present disclosure, to make the first temperature T1 show an environment temperature of the outdoor unit more accurately and more realistically, a fan of the outdoor unit is controlled to start prior to a collection of the first temperature T1, and then the first temperature T1 of the environment is collected subsequent to an operation of the fan for a second predetermined duration t2. Such a method can effectively avoid the influence of external factors, such as solar radiation, on the environment temperature of the outdoor unit. The first temperature T1 of the environment in which the outdoor unit is located can be more reliably and accurately obtained in a manner of blowing air by the fan. In addition, in the present disclosure, an operation of collecting the temperature of the environment in which the outdoor unit is located may be performed, in response to detecting that the total energy demand of the outdoor unit is zero and that the total energy demand stays zero for a predetermined duration, further ensuring an accuracy of collecting the temperature of the environment in which the outdoor unit is located.

[0034] In a specific implementation of the present disclosure, a commissioning mode may be set separately for an air-conditioning device. The commissioning mode is activated through performing a selection or other operations by means of a remote control, a button on the device, or a combination thereof. A cooling mode or a heating mode is then automatically selected based on a specific value of the first temperature T 1.

[0035] The outdoor unit is controlled to operate for the first predetermined duration T1, and then a second temperature T2 of the environment in which the outdoor unit is currently located is obtained. In the present disclosure, an operation mode of the outdoor unit may be controlled based on the first temperature T1. In some embodiments, controlling the operation mode of the outdoor unit based on the first temperature T1 may include: controlling, based on that the first temperature T1 is within a second set range, the outdoor unit to operate in a cooling mode; or controlling, based on that the first temperature T1 is within a third set range, the outdoor unit to operate in a heating mode. It should be understood that the second temperatures T2 obtained tend to be different in different operation modes of the outdoor unit.

[0036] In the cooling mode: in some embodiments, the outdoor unit may be controlled, based on that the first temperature T1 is greater than or equal to the second set value S2 (i.e., within the second set range), to operate in the cooling mode.

[0037] For example, the second set value S2 is 17 degrees Celsius. In some embodiments of the present disclosure, the outdoor unit is controlled to operate in the cooling mode, in response to detecting that the first temperature T1 is 30 degrees Celsius, which is greater than 17 degrees Celsius.

[0038] In the heating mode: in some embodiments, the outdoor unit may be controlled, based on that the first temperature T1 is smaller than or equal to a fourth set value S4 (i.e., within the third set range), to operate in the heating mode.

[0039] For example, the fourth set value S4 is 16 degrees Celsius. In some embodiments of the present disclosure, the outdoor unit is controlled to operate in the heating mode, in response to detecting that the first temperature T1 is 9 degrees Celsius, which is smaller than 16 degrees Celsius.

[0040] It should be understood that the predetermined durations for controlling the outdoor unit to operate in the cooling mode and the heating mode may be different or the same. For example, the first predetermined duration t1 in the cooling mode is 40 minutes, and the first predetermined duration t1 in the heating mode is 39 minutes.

[0041] A real-time environment temperature T3 from the cloud is read based on a range of a temperature difference between the second temperature T2 and the first temperature T1. In some embodiments, the real-time environment temperature T3 from the cloud may be read based on a condition that the temperature difference is outside the first set range. That is, the real-time environ-

ment temperature T3 from the cloud is read under a condition that the temperature difference between the second temperature T2 and the first temperature T1 is not in the first set range. The real-time environment temperature T3 from the cloud may be a weather temperature collected in real time for a location of the outdoor unit of the air conditioner. For example, the real-time environment temperature T3 from the cloud may be obtained through obtaining weather information provided by a weather center, or a real-time temperature may be collected separately.

[0042] In the cooling mode: the temperature difference between the second temperature T2 and the first temperature T1 is calculated, and the real-time environment temperature T3 from the cloud may be read based on that the temperature difference is greater than the first set value S1 (i.e., outside the first set range). For example, if the second temperature T2 is 38 degrees Celsius, the first temperature T1 is 30 degrees Celsius, and the first set value S1 is 2 degrees Celsius, the temperature difference between the second temperature T2 and the first temperature T1 is equal to $T2-T1=38-30=8>2$, which indicates that the temperature difference is greater than the first set value S 1. Thus, the real-time environment temperature T3 from the cloud is read.

[0043] In the heating mode: the temperature difference between the first temperature T1 and the second temperature T2 is calculated, and the real-time environment temperature T3 from the cloud is read based on that the temperature difference is greater than a third set value S3 (i.e., outside the first set range). For example, if the second temperature T2 is 3 degrees Celsius, the first temperature T1 is 9 degrees Celsius, and the third set value S3 is 3 degrees Celsius, the temperature difference between the first temperature T1 and the second temperature T2 is equal to $T1-T2 = 9-3 = 6 > 3$, which indicates that the temperature difference is greater than the third set value S3. Thus, the real-time environment temperature T3 from the cloud is read.

[0044] In the present disclosure, an operation of the outdoor unit can be controlled based on a temperature difference between the real-time environment temperature T3 from the cloud and the second temperature T2. On a basis of a condition that the temperature difference between the real-time environment temperature T3 from the cloud and the second temperature T2 is greater than a predetermined value, the outdoor unit may be shut down temporarily, or the outdoor unit may be shut down after operating for a predetermined duration, or a rotational speed of the fan of the outdoor unit may be increased, or an operation frequency of a compressor may be reduced, or other control strategies may be adopted, to avoid as much as possible damage to the outdoor unit that may be caused by poor heat dissipation in the installation environment, serving purposes such as protecting the outdoor unit of the air conditioner and prolonging the life of the outdoor unit.

[0045] In the cooling mode: the temperature difference

between the second temperature T2 and the real-time environment temperature T3 from the cloud is calculated. The operation of the outdoor unit is controlled when the temperature difference is greater than a predetermined value R2 in a cooling operating condition, to reduce a possibility of damage to the outdoor unit of the air conditioner caused by the poor installation environment for the outdoor unit. For example, if the second temperature T2 is 38 degrees Celsius, the real-time environment temperature T3 from the cloud is 31 degrees Celsius, and the predetermined value R2 in the cooling mode is 3 degrees Celsius, the temperature difference between the second temperature T2 and the real-time environment temperature T3 from the cloud is equal to $T2 - T3 = 38 - 31 = 7 > 3$, which indicates that a current temperature difference is greater than the predetermined value R2 in the cooling mode. Thus, it is further determined that the installation environment for the outdoor unit is in a poor heat dissipation condition.

[0046] In the heating mode: the temperature difference between the real-time environment temperature T3 from the cloud and the second temperature T2 is calculated. The operation of the outdoor unit is controlled when the temperature difference is greater than a predetermined value R1 in a heating operating condition, to reduce a possibility of damage to the outdoor unit of the air conditioner caused by the poor installation environment for the outdoor unit. For example, if the second temperature T2 is 3 degrees Celsius, the real-time environment temperature T3 from the cloud is 10 degrees Celsius, and the predetermined value R1 in the heating mode is 2 degrees Celsius, the temperature difference between the real-time environment temperature T3 from the cloud and the second temperature T2 is equal to $T3 - T2 = 10 - 3 = 7 > 2$, which indicates that the current temperature difference is greater than the predetermined value R1 in the heating mode. Thus, it is further determined that the installation environment for the outdoor unit is in a poor heat dissipation condition.

[0047] It should be understood that although some specific example parameter setting values, such as a first set value, a second set value, a third set value, a fourth set value, the first temperature, the second temperature, and the real-time environment temperature from the cloud are provided in the present disclosure, these example parameter setting values can be adjusted or reset in the present disclosure based on an actual operating condition and an actual device, as long as objectives of the present disclosure can be realized. That is, parameter values listed in the present disclosure shall not be construed as limitations on the protection scope of the present disclosure.

[0048] With the present disclosure, the user or a relevant person can be timely informed of a heat dissipation condition in the installation environment for the outdoor unit. In some embodiments, installation environment heat dissipation prompt information of the outdoor unit may be transmitted to a terminal based on the tempera-

ture difference between the real-time environment temperature T3 from the cloud and the second temperature T2. In some embodiments of the present disclosure, the installation environment heat dissipation prompt information includes, but is not limited to, "poor heat dissipation in the installation environment for the outdoor unit", "good heat dissipation of the installation environment for the outdoor unit", or the like. Forms of the prompt information include, but are not limited to, prompt codes, a short message, a picture, a prompt sound, a vibration, or a combination of at least two of these forms. The terminal is a user terminal and/or a commissioning person terminal. In the present disclosure, the installation environment heat dissipation prompt information of the outdoor unit may be transmitted to the user terminal and/or the commissioning person terminal via the cloud, or the installation environment heat dissipation prompt information may be transmitted to the user terminal and/or the commissioning person terminal directly by an intelligent air-conditioning device. When the commissioning person receives the prompt information, a purpose of reminding the commissioning person to pay attention to the outdoor unit can be realized. The commissioning person may remount the outdoor unit of the air conditioner. For example, a mounting position, a mounting method, or the like of the outdoor unit may be adjusted. The method in the present disclosure may be re-executed after the remounting to realize commissioning, until the installation environment for the outdoor unit of the air conditioner can provide good heat dissipation. For a user using an air conditioner in which the present disclosure is applied, the user can notify the relevant person to carry out maintenance of the outdoor unit of the air conditioner as soon as possible after receiving the prompt information. Thus, in the present disclosure, a demand for obtaining an installation environment condition of the outdoor unit of the air conditioner in advance is fully satisfied for the user using the air conditioner, which can effectively improve user satisfaction of the air conditioner, and provide the user using the air conditioner with good use experience.

[0049] In the cooling mode: the temperature difference between the second temperature T2 and the real-time environment temperature T3 from the cloud is calculated. The installation environment heat dissipation prompt information is transmitted to a terminal of the user or the relevant person when the temperature difference is greater than the predetermined value R2 under the cooling operating condition.

[0050] In the heating mode, the temperature difference between the real-time environment temperature T3 from the cloud and the second temperature T2 is calculated. The installation environment heat dissipation prompt information is transmitted to the terminal of the user or the relevant person when the temperature difference is greater than the predetermined value R1 under the heating operating condition.

[0051] With the present disclosure, the cloud-based determination of the heat dissipation condition in the in-

stallation environment for the outdoor unit of the air conditioner can be realized. No manual intervention is required in the whole intelligent determination process, which greatly improves use experience and satisfaction of the user.

[0052] As illustrated in FIG. 3, based on the same concept as the method for controlling the outdoor unit of the air conditioner of the present disclosure, one or more embodiments of the present disclosure can further provide an apparatus for controlling an outdoor unit of an air conditioner. The apparatus for controlling the outdoor unit of the air conditioner may include, but is not limited to, a first temperature T1 obtaining module, a first device control module, a second temperature T2 obtaining module, the cloud temperature reading module, a second device control module, a heat dissipation prompt module, or the like. The first temperature T1 obtaining module may be connected to the first device control module. The first device control module may be connected to the second temperature T2 obtaining module. The second temperature T2 obtaining module may be connected to the cloud temperature reading module. The cloud temperature reading module may be connected to the second device control module. The second device control module may be connected to the heat dissipation prompt module. However, in fact, the present disclosure is not limited in this regard.

[0053] The first temperature T1 obtaining module can be configured to obtain the first temperature T1 of the environment in which the outdoor unit in the standby state is located. The first temperature T1 obtaining module can be configured to read the total energy demand of the outdoor unit, and obtain, based on a condition that the outdoor unit of the air conditioner is in the standby state when the total energy demand is zero, the first temperature T1 of the environment in which the outdoor unit is located. In a further embodiment, the first temperature T1 obtaining module can be configured to control the fan of the outdoor unit to start, control the fan to operate for the second predetermined duration t2, and then collect the first temperature T1 of the environment in which the outdoor unit is located.

[0054] The first device control module can be configured to control the outdoor unit to operate for the first predetermined duration t1, to obtain the temperature of the installation environment in which the outdoor unit is located subsequent to an operation of the outdoor unit for a period of time.

[0055] The second temperature T2 obtaining module can be configured to obtain, based on the outdoor unit having operated for the first predetermined duration t1, the second temperature T2 of the environment in which the outdoor unit is currently located. The second temperature T2 obtaining module can be specifically configured to control the outdoor unit to operate in the cooling mode or the heating mode based on a range in which the first temperature T1 is located. The second temperature T2 obtaining module can be configured to control, based on

that the first temperature T1 is within the second set range, e.g., the first temperature T1 is greater than or equal to the second set value S2, the outdoor unit to operate in the cooling mode for the first predetermined duration t1; or can be configured to control, based on that the first temperature T1 is within the third set range, e.g., the first temperature T1 is smaller than or equal to the fourth set value S4, the outdoor unit to operate in the heating mode for the first predetermined duration t1. It should be understood that operation durations of the outdoor unit of the air conditioner in the cooling mode and the heating mode may be different or the same.

[0056] The cloud temperature reading module can be configured to read the real-time environment temperature T3 from the cloud based on the range of the temperature difference between the second temperature T2 and the first temperature T1. The cloud temperature reading module can be specifically configured to calculate the temperature difference between the second temperature T2 and the first temperature T1, and read the real-time environment temperature T3 from the cloud in the cooling mode based on a condition that the temperature difference is greater than the first set value S1, or read the real-time environment temperature T3 from the cloud in the heating mode based on a condition that the temperature difference is greater than the third set value S3. The real-time environment temperature T3 from the cloud may be, for example, the weather temperature collected in real time for the location of the outdoor unit of the air conditioner.

[0057] The second device control module can be configured to control the operation of the outdoor unit based on the temperature difference between the real-time environment temperature T3 from the cloud and the second temperature T2. The second device control module can be configured to control the outdoor unit to shut down, or increase the rotational speed of the fan, or control the outdoor unit to shut down subsequent to an operation of the outdoor unit for a short period of time, etc., when the temperature difference between the real-time environment temperature T3 from the cloud and the second temperature T2 characterizes poor heat dissipation in the installation environment for the outdoor unit, to effectively avoid occurrences of accidents such as damage to the outdoor unit that may be caused by the poor heat dissipation in the installation environment. In addition, in the present disclosure, the user or the commissioning person can be informed of the poor heat dissipation in the installation environment before the outdoor unit is damaged. A specific implementation process is as follows.

[0058] The heat dissipation prompt module can be configured to transmit the installation environment heat dissipation prompt information of the outdoor unit to a terminal of the commissioning person or a handheld terminal of the user based on the temperature difference between the real-time environment temperature T3 from the cloud and the second temperature T2. The installation environment heat dissipation prompt information

may be transmitted by the cloud server or by an intelligent air conditioner. The user who receives the prompt information can notify, based on an actual situation, an air conditioner maintenance person to come to the door for commissioning and maintenance. The commissioning person who receives the prompt information can remount the outdoor unit of the air conditioner to realize good heat dissipation in the installation environment for the outdoor unit.

[0059] Innovatively, with the environment temperature of the outdoor unit in the standby state, the environment temperature of the outdoor unit subsequent to the operation of the outdoor unit for a period of time, and the real-time environment temperature from the cloud as the basis for determination, in the present disclosure, whether the installation environment for the outdoor unit is in a good heat dissipation condition or not can be determined intelligently and automatically, and the determination result can be notified in time to the user or relevant person, which can solve problems in the related art such as damage to the outdoor unit or the poor cooling and heating performance that are caused by the poor heat dissipation in the installation environment for the outdoor unit of the air conditioner, obviously improving satisfaction and use experience of the user with the air conditioning device.

[0060] The present disclosure can further provide an air conditioner. The air conditioner includes, but is not limited to, the apparatus for controlling the outdoor unit of the air conditioner according to any embodiment of the present disclosure. The air conditioning device of the present disclosure is an air conditioner having an outdoor unit. Other apparatus structures, device hardware, and software that form the air conditioner can be selected as desired, and thus details thereof will be omitted herein.

[0061] Throughout this specification, description with reference to "the embodiment", "an embodiment", "some embodiments", "an example", "a specific example", or "some examples" means that a particular feature, structure, material, or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the present disclosure. The appearances of the above phrases in various places throughout this specification are not necessarily referring to the same embodiment or example of the present disclosure. Furthermore, the particular features, structures, materials, or characteristics described here may be combined in any suitable manner in one or more embodiments or examples. In addition, different embodiments or examples and features of different embodiments or examples described in the specification may be combined by those skilled in the art without mutual contradiction.

[0062] In addition, terms "first" and "second" are only used for descriptive purposes, and cannot be understood as indicating or implying relative importance or implicitly indicating the number of indicated technical features. Therefore, the features associated with "first" and "second" may explicitly or implicitly include at least one of the

features. In the description of the present disclosure, "plurality" means at least two, unless otherwise specifically defined.

[0063] In the description of the present disclosure, it should be understood that the orientation or position indicated by the terms such as "center", "longitudinal", "transverse", "length", "width", "thickness", "upper", "lower", "front", "rear", "left", "right", "vertical", "horizontal", "top", "bottom", "inner", "outer", "clockwise", "counterclockwise", "axial", "radial", and "circumferential" should be construed to refer to the orientation or the position as shown in the drawings in discussion, and is only for the convenience of describing the present disclosure and simplifying the description, rather than indicating or implying that the pointed device or element must have a specific orientation, or be constructed and operated in a specific orientation, and therefore cannot be understood as a limitation of the present disclosure.

[0064] In the present disclosure, unless otherwise clearly specified and limited, terms such as "install", "connect", "connect to", "fix" and the like should be understood in a broad sense. For example, it may be a fixed connection or a detachable connection or connection as one piece; mechanical connection or electrical connection; direct connection or indirect connection through an intermediate; internal communication of two components or the interaction relationship between two components, unless otherwise clearly limited. For those of ordinary skill in the art, the specific meaning of the above-mentioned terms in the present disclosure can be understood according to specific circumstances.

[0065] The logics and/or steps represented in the flowchart or described otherwise herein can be for example considered as a list of ordered executable instructions for implementing logic functions, and can be embodied in any computer-readable storage medium that is to be used by or used with an instruction execution system, apparatus, or device (such as a computer-based system, a system including a processor, or any other system that can retrieve and execute instructions from an instruction execution system, apparatus, or device). For the present disclosure, a "computer-readable storage medium" can be any apparatus that can contain, store, communicate, propagate, or transmit a program to be used by or used with an instruction execution system, apparatus, or device. More specific examples of computer-readable storage mediums include, as a non-exhaustive list: an electrical connector (electronic device) with one or more wirings, a portable computer disk case (magnetic devices), a Random Access Memory (RAM), a Read-Only Memory (ROM), an Erasable Programmable Read-Only Memory (EPROM or flash memory), a fiber optic device, and a portable Compact Disc Read-Only Memory (CDROM). In addition, the computer-readable storage medium may even be paper or other suitable medium on which the program can be printed, as the program can be obtained electronically, e.g., by optically scanning the paper or the other medium, and then editing, interpreting, or otherwise

processing the scanning result when necessary, and then stored in a computer memory.

[0066] It can be appreciated that each part of the present disclosure can be implemented in hardware, software, firmware or any combination thereof. In the above embodiments, a number of steps or methods can be implemented using software or firmware stored in a memory and executed by a suitable instruction execution system. For example, when implemented in hardware, as in another embodiment, it can be implemented by any one or combination of the following technologies known in the art: a discrete logic circuit having logic gate circuits for implementing logic functions on data signals, an application-specific integrated circuit with suitable combined logic gates, a Programmable Gate Array (PGA), a Field Programmable Gate Array (FPGA), etc.

[0067] Although some embodiments of the present disclosure are described above, the scope of the present disclosure is not limited to the embodiments. Within the concept of the present disclosure, any equivalent structure transformation made using the contents of the specification and the accompanying drawings of the present disclosure, or any direct or indirect application of the contents of the specification and the accompanying drawings in other related fields, shall equally fall within the scope of the present disclosure.

Claims

- 1. A method for controlling an outdoor unit of an air conditioner, the method comprising:

- obtaining a first temperature of an environment in which the outdoor unit in a standby state is located;
 - controlling the outdoor unit to operate for a first predetermined duration, and then obtaining a second temperature of the environment in which the outdoor unit is currently located;
 - reading a real-time environment temperature from the cloud based on a range of a temperature difference between the second temperature and the first temperature; and
 - controlling an operation of the outdoor unit based on a temperature difference between the real-time environment temperature from the cloud and the second temperature.

- 2. The method for controlling the outdoor unit of the air conditioner according to claim 1, the method further comprising:

- transmitting installation environment heat dissipation prompt information of the outdoor unit to a terminal based on the temperature difference between the real-time environment temperature from the cloud and the second temperature,

wherein the terminal is a user terminal and/or a commissioning person terminal.

- 3. The method for controlling the outdoor unit of the air conditioner according to claim 1, wherein said obtaining the first temperature of the environment in which the outdoor unit in the standby state is located comprises:

- reading a total energy demand of the outdoor unit;
 - determining, based on that the total energy demand is zero, that the outdoor unit is in the standby state; and
 - obtaining the first temperature of the environment in which the outdoor unit is located.

- 4. The method for controlling the outdoor unit of the air conditioner according to claim 3, wherein said obtaining the first temperature of the environment in which the outdoor unit is located comprises:

- controlling a fan of the outdoor unit to start;
 - controlling the fan to operate for a second predetermined duration; and
 - collecting the first temperature of the environment in which the outdoor unit is currently located.

- 5. The method for controlling the outdoor unit of the air conditioner according to claim 1, wherein:

- said controlling the outdoor unit to operate for the first predetermined duration comprises: controlling, based on that the first temperature is within a second set range, the outdoor unit to operate in a cooling mode for the first predetermined duration; and
 - said reading the real-time environment temperature from the cloud based on the range of the temperature difference between the second temperature and the first temperature comprises: calculating the temperature difference between the second temperature and the first temperature, and reading the real-time environment temperature from the cloud based on that the temperature difference is greater than a first set value.

- 6. The method for controlling the outdoor unit of the air conditioner according to claim 5, wherein said controlling, based on that the first temperature is within the second set range, the outdoor unit to operate in the cooling mode comprises:

- controlling, based on that the first temperature is greater than a second set value, the outdoor unit to operate in the cooling mode.

7. The method for controlling the outdoor unit of the air conditioner according to claim 1, wherein:

said controlling the outdoor unit to operate for the first predetermined duration comprises: controlling, based on that the first temperature is within a third set range, the outdoor unit to operate in a heating mode for the first predetermined duration; and
 said reading the real-time environment temperature from the cloud based on the range of the temperature difference between the second temperature and the first temperature comprises: calculating the temperature difference between the first temperature and the second temperature, and reading the real-time environment temperature from the cloud based on that the temperature difference is greater than a third set value.

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8. The method for controlling the outdoor unit of the air conditioner according to claim 7, wherein said controlling, based on that the first temperature is within the third set range, the outdoor unit to operate in the heating mode comprises:
 controlling, based on that the first temperature is smaller than a fourth set value, an indoor unit to operate in the heating mode.

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9. An apparatus for controlling an outdoor unit of an air conditioner, the apparatus comprising:

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a first temperature obtaining module configured to obtain a first temperature of an environment in which the outdoor unit in a standby state is located;
 a first device control module configured to control the outdoor unit to operate for a first predetermined duration;
 a second temperature obtaining module configured to obtain, based on the outdoor unit having operated for the first predetermined duration, a second temperature of the environment in which the outdoor unit is currently located;
 the cloud temperature reading module configured to read a real-time environment temperature from the cloud based on a range of a temperature difference between the second temperature and the first temperature; and
 a second device control module configured to control an operation of the outdoor unit based on a temperature difference between the real-time environment temperature from the cloud and the second temperature.

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10. An air conditioner, comprising the apparatus for controlling the outdoor unit of the air conditioner according to claim 9.

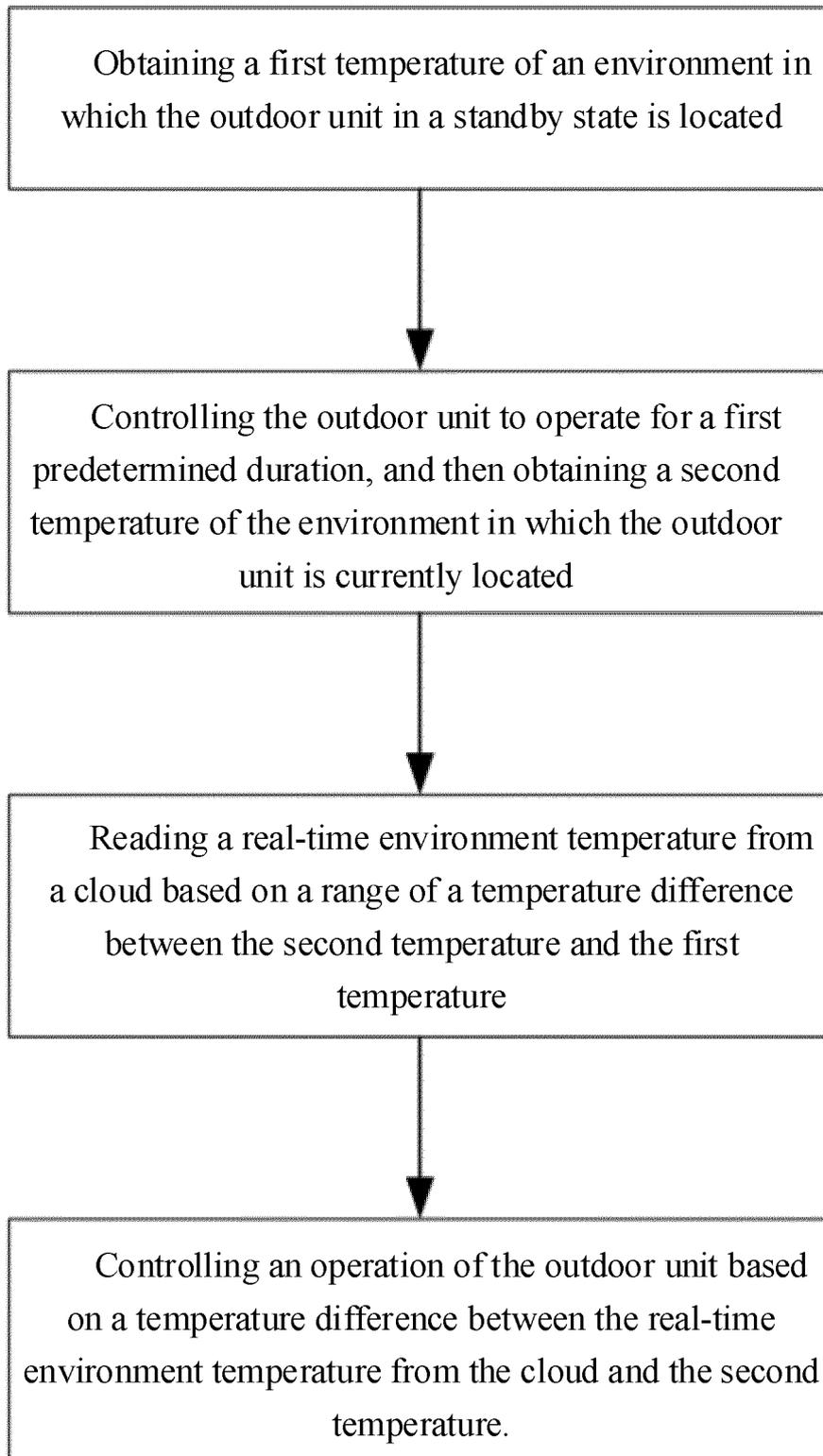


FIG. 1

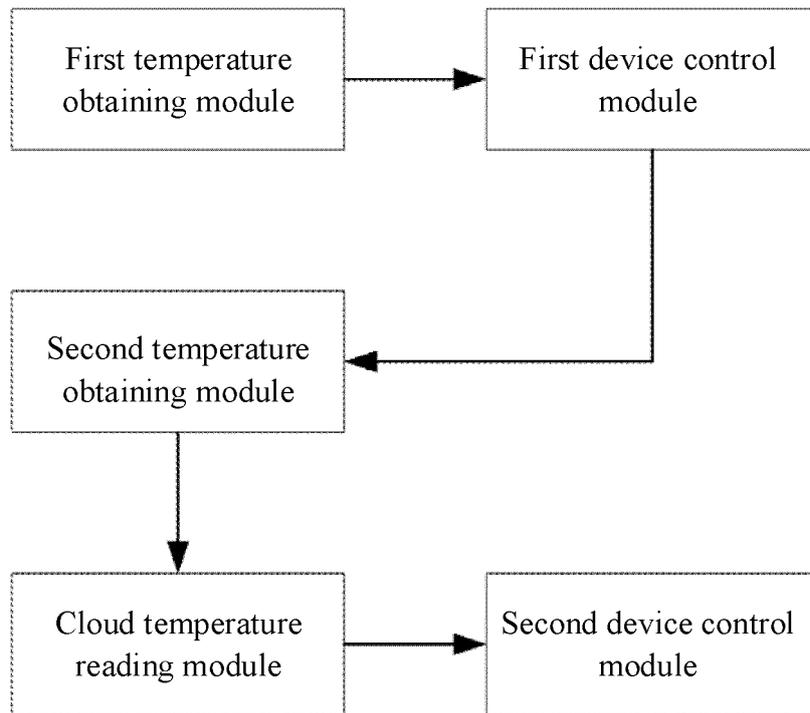


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/076337

5	A. CLASSIFICATION OF SUBJECT MATTER		
	F24F 11/49(2018.01)i; F24F 11/61(2018.01)i; F24F 11/64(2018.01)i; F24F 11/65(2018.01)i; F24F 11/72(2018.01)i; F24F 110/12(2018.01)i		
	According to International Patent Classification (IPC) or to both national classification and IPC		
10	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		
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNTXT, ENTXT, VEN, DWPI: 空调, 空气调节, 空气调和, 室外机, 室外装置, 室外单元, 控制, 方法, 室外温度, 环境温度, 预设时长, air condition+, outdoor unit, outdoor machine, outdoor apparatus, control+, method, outdoor temperature, environment temperature, preset time		
20	C. DOCUMENTS CONSIDERED TO BE RELEVANT		
	Category*	Citation of document, with indication, where appropriate, of the relevant passages	
		Relevant to claim No.	
	Y	CN 105318507 A (GUANGDONG MEDIA REFRIGERATION EQUIPMENT CO., LTD. et al.) 10 February 2016 (2016-02-10) description, pages 4-5, and figure 1	1-10
25	Y	CN 110529994 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 03 December 2019 (2019-12-03) description, pages 8-12, and figures 7-13	1-10
	Y	WO 2017015829 A1 (WU PENG) 02 February 2017 (2017-02-02) description, pages 3 and 4, and figure 1	1, 2, 9, 10
30	PX	CN 113108426 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 13 July 2021 (2021-07-13) claims	1-10
	A	CN 108332352 A (AUX AIR CONDITIONER CO., LTD.) 27 July 2018 (2018-07-27) entire document	1-10
35	A	CN 205980183 U (MITSUBISHI ELECTRIC CORP.) 22 February 2017 (2017-02-22) entire document	1-10
	<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.		<input checked="" type="checkbox"/> See patent family annex.
40	* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	
	"A" document defining the general state of the art which is not considered to be of particular relevance	"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	
	"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	
	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family	
45	"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		
	Date of the actual completion of the international search	Date of mailing of the international search report	
	24 April 2022	05 May 2022	
50	Name and mailing address of the ISA/CN	Authorized officer	
	China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China		
55	Facsimile No. (86-10)62019451	Telephone No.	

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INTERNATIONAL SEARCH REPORT

International application No.

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2016166815 A1 (ALPS ELECTRIC CO., LTD. et al.) 24 August 2017 (2017-08-24) entire document	1-10
A	CN 109539493 A (AUX AIR CONDITIONER CO., LTD.) 29 March 2019 (2019-03-29) entire document	1-10
A	CN 111578467 A (GUANGDONG MIDEA REFRIGERATION EQUIPMENT CO., LTD) 25 August 2020 (2020-08-25) entire document	1-10

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/076337

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Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 105318507 A	10 February 2016	None	
CN 110529994 A	03 December 2019	None	
WO 2017015829 A1	02 February 2017	None	
CN 113108426 A	13 July 2021	None	
CN 108332352 A	27 July 2018	None	
CN 205980183 U	22 February 2017	JP WO2016166895 A1	07 December 2017
		WO 2016166895 A1	20 October 2016
JP 2016166815 A1	24 August 2017	JP WO2016166815 A1	24 August 2017
		WO 2016166815 A1	20 October 2016
CN 109539493 A	29 March 2019	None	
CN 111578467 A	25 August 2020	None	

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 202110374364 [0001]