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

(11) **EP 4 488 595 A1**

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

(43) Date of publication:
08.01.2025 Bulletin 2025/02

(21) Application number: **23763186.6**

(22) Date of filing: **07.02.2023**

(51) International Patent Classification (IPC):
F24F 11/63 *(2018.01)* ***F24F 1/0076*** *(2019.01)*
F24F 8/22 *(2021.01)*

(52) Cooperative Patent Classification (CPC):
F24F 1/0076; F24F 8/22; F24F 11/63

(86) International application number:
PCT/JP2023/003930

(87) International publication number:
WO 2023/166924 (07.09.2023 Gazette 2023/36)

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **02.03.2022 JP 2022031524**

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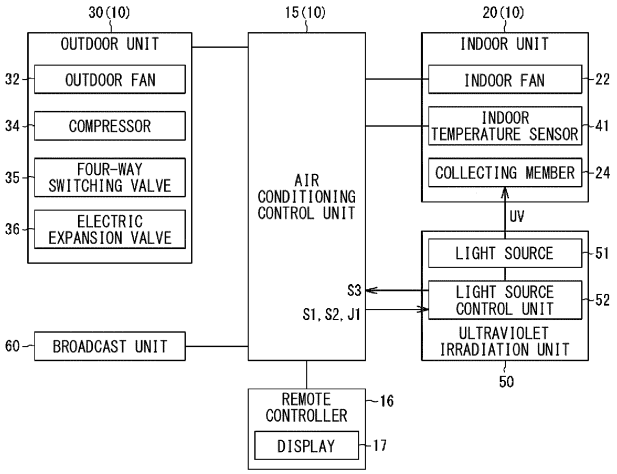
(54) ULTRAVIOLET RADIATION UNIT AND AIR-CONDITIONING DEVICE

(57) An ultraviolet irradiation unit (50) is attachable to an air conditioner (10) including an indoor unit (20) having an indoor fan (22) and an air conditioning control unit (15) that controls an operation of the indoor unit (20), and the ultraviolet irradiation unit (50) includes a light source (51) that irradiates the indoor unit (20) with an ultraviolet ray (UV), and a light source control unit (52) that is capable of communicating with the air conditioning control unit (15) and controls an operation of the light source (51), in which the light source control unit (52) turns on a power source of the light source (51) when receiving a first signal (S1) transmitted from the air conditioning control unit (15).

FIG. 2



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to an ultraviolet irradiation unit and an air conditioner.

BACKGROUND ART

[0002] Conventionally, an air conditioner including an ultraviolet irradiation unit (irradiator) that irradiates an ultraviolet ray is known (see, for example, PATENT LITERATURE 1). The air conditioner includes an air conditioning control unit that controls various operations of the air conditioner, and the air conditioning control unit controls the operation of the ultraviolet irradiation unit.

CITATION LIST

[PATENT LITERATURE]

[0003] PATENT LITERATURE 1: Japanese Laid-Open Patent Publication No. 2021-055892

SUMMARY OF THE INVENTION

[TECHNICAL PROBLEM]

[0004] In the air conditioner, the ultraviolet irradiation unit is an optional item in some cases. That is, the air conditioner is used in a configuration not including the ultraviolet irradiation unit in some cases. However, in the air conditioner, it is necessary to store a control program for controlling the ultraviolet irradiation unit in advance in the air conditioning control unit whether or not the ultraviolet irradiation unit is provided.

[0005] An object of the present disclosure is to provide an ultraviolet irradiation unit that does not need to store a control program for the ultraviolet irradiation unit in an air conditioning control unit of an air conditioner, and an air conditioner including the ultraviolet irradiation unit.

[SOLUTION TO PROBLEM]

[0006]

(1) An ultraviolet irradiation unit of the present disclosure is attachable to an air conditioner including an indoor unit having an indoor fan and an air conditioning control unit that controls an operation of the indoor unit, the ultraviolet irradiation unit including a light source that irradiates the indoor unit with an ultraviolet ray, and a light source control unit that is capable of communicating with the air conditioning control unit and controls an operation of the light source, in which the light source control unit turns on a power source of the light source when receiving a first signal transmitted from the air conditioning control unit.

The ultraviolet irradiation unit of the present disclosure eliminates the need for storing in advance a control program for controlling the ultraviolet irradiation unit in the air conditioning control unit of the air conditioner to which the ultraviolet irradiation unit is attachable. Therefore, the configuration of the air conditioning control unit can be simplified by using the ultraviolet irradiation unit of the present disclosure.

(2) In the ultraviolet irradiation unit of the present disclosure, the light source control unit preferably turns off the power source of the light source when a predetermined period has elapsed after reception of the first signal.

In this case, the light source control unit can easily turn on and off the light source. The configuration of the light source control unit of the ultraviolet irradiation unit can be simplified.

(3) In the ultraviolet irradiation unit of the present disclosure, the light source control unit preferably turns off the power source of the light source upon reception of a second signal transmitted from the air conditioning control unit when the air conditioner stops operating or when the indoor fan stops operating.

In this case, the light source control unit can easily turn on and off the light source in accordance with an operation state of the air conditioner.

(4) An air conditioner of the present disclosure includes an indoor unit including a casing having a suction port through which indoor air is sucked, an indoor fan accommodated in the casing, and a collecting member accommodated in the casing, an air conditioning control unit that controls an operation of the indoor unit, and an ultraviolet irradiation unit including a light source that irradiates the collecting member with an ultraviolet ray and a light source control unit that is capable of communicating with the air conditioning control unit and controls an operation of the light source, in which the light source control unit turns on a power source of the light source when receiving a first signal transmitted from the air conditioning control unit.

The air conditioner of the present disclosure eliminates the need for storing in advance a control program for controlling the ultraviolet irradiation unit in the air conditioning control unit. Therefore, the configuration of the air conditioning control unit can be simplified in the air conditioner of the present disclosure.

(5) In the air conditioner of the present disclosure, when the air conditioner starts operating or when the indoor fan starts operating, the air conditioning control unit preferably transmits the first signal.

In this case, the configuration of the air conditioning control unit can be simplified.

(6) In the air conditioner of the present disclosure, the

light source control unit preferably turns off the power source of the light source after a predetermined period elapses following reception of the first signal. In this case, the light source control unit can easily turn on and off the light source in accordance with the operation state of the air conditioner.

(7) In the air conditioner of the present disclosure, the air conditioning control unit preferably transmits a second signal when the air conditioner stops operating or when the indoor fan stops operating, and the light source control unit preferably turns off the power source of the light source when receiving the second signal.

In this case, the configuration of the light source control unit can be simplified.

(8) The air conditioner of the present disclosure further includes a notification unit, in which the light source control unit preferably transmits a third signal to the air conditioning control unit when detecting an abnormality of the light source, and the air conditioning control unit preferably causes the notification unit to notify when receiving the third signal.

In this case, the notification unit can notify a user that an abnormality has occurred in the light source.

(9) In the air conditioner of the present disclosure, the light source control unit receives first information related to an indoor temperature from the air conditioning control unit, and the light source control unit turns on and off the power source of the light source based on the first information.

[0007] In this case, the light source control unit having a simple configuration can suppress deterioration of the light source due to an influence of an ambient temperature.

BRIEF DESCRIPTION OF DRAWINGS

[0008]

FIG. 1 is a schematic configuration diagram of an air conditioner including an ultraviolet irradiation unit of the present disclosure.

FIG. 2 is a control block diagram of the air conditioner of the present disclosure.

FIG. 3 is a perspective view of an indoor unit in the air conditioner of the present disclosure.

FIG. 4 is a sectional view of the indoor unit with a decorative panel being detached.

FIG. 5 is a perspective view of the indoor unit with the decorative panel and a protecting member being detached.

FIG. 6 is a partially enlarged perspective view of the ultraviolet irradiation unit attached to the air conditioner.

FIG. 7 is a control flowchart of an air conditioning control unit.

FIG. 8 is a control flowchart of a light source control unit according to a first embodiment.

FIG. 9 is a control flowchart of a light source control unit according to a second embodiment.

FIG. 10 is a control flowchart of a light source control unit according to a third embodiment.

FIG. 11 is a control flowchart of a light source control unit according to a fourth embodiment.

DETAILED DESCRIPTION

[0009] Hereinafter, embodiments of an ultraviolet irradiation unit and an air conditioner including the ultraviolet irradiation unit of the present disclosure will be described in detail with reference to the accompanying drawings.

(Outline of air conditioner)

[0010] FIG. 1 is a schematic configuration diagram of the air conditioner including the ultraviolet irradiation unit of the present disclosure. An air conditioner 10 illustrated in FIG. 1 is an embodiment of the air conditioner of the present disclosure, can cool and heat a target space constructed inside a building by performing a vapor compression refrigeration cycle, and adjusts a temperature of air in the target space to a predetermined target temperature. The air conditioner 10 includes an indoor unit 20 and an outdoor unit 30. In the present embodiment, the air conditioner 10 has a configuration in which one indoor unit 20 is connected to one outdoor unit 30. However, the number of the indoor units 20 and the number of the outdoor units 30 are not limited to one. The present embodiment exemplifies the air conditioner 10 configured to circulate a refrigerant in a refrigerant circuit to execute a cooling operation and a heating operation. The air conditioner of the present disclosure should not be limited to such a case, and may alternatively be configured to circulate cold water and warm water supplied from a heat source device to execute the cooling operation and the heating operation, and the indoor unit may be a so-called fan coil unit.

[0011] The indoor unit 20 includes a casing 21, an indoor fan 22, an indoor heat exchanger 23, and a collecting member 24.

[0012] The casing 21 includes a suction port 25 and an air supply port 26. The indoor fan 22 is configured to take indoor air (return air RA) into the casing 21 from the suction port 25, cause the taken air to exchange heat with the refrigerant in the indoor heat exchanger 23, and then blow the air (supply air SA) into a room through the air supply port 26. The indoor fan 22 includes, for example, a motor (not shown) whose number of operating rotations can be adjusted by inverter control. The indoor heat exchanger 23 constitutes a part of a refrigerant circuit 40 to be described later. The indoor heat exchanger 23 is of a cross-fin tube type or a microchannel type, and is used for heat exchange with the indoor air.

[0013] The indoor unit 20 includes the collecting member 24 inside the casing 21. The collecting member 24 is a

member for collecting dust included in the air (return air RA) in an indoor space, and is disposed near the suction port 25 inside the casing 21. In the air conditioner 10, the entire amount of air taken into the casing 21 from the suction port 25 passes through the collecting member 24.

[0014] The air conditioner 10 of the present disclosure further includes an ultraviolet irradiation unit 50. The ultraviolet irradiation unit 50 is disposed inside the casing 21 of the indoor unit 20. The ultraviolet irradiation unit 50 is a unit that irradiates the collecting member 24 with an ultraviolet ray UV, and includes a light source 51. The light source 51 includes an LED device that generates the ultraviolet ray UV when electrified. The light source 51 is equipped with a lens, and the lens diffuses the ultraviolet ray UV emitted from the light source 51 and irradiates the collecting member 24, which is a part of the indoor unit 20, with the ultraviolet ray UV

[0015] The outdoor unit 30 includes a casing 31, an outdoor fan 32, an outdoor heat exchanger 33, a compressor 34, a four-way switching valve 35, an electric expansion valve 36, a liquid shutoff valve 37, and a gas shutoff valve 38. The compressor 34, the four-way switching valve 35, the outdoor heat exchanger 33, the electric expansion valve 36, the liquid shutoff valve 37, and the gas shutoff valve 38 constitute a part of the refrigerant circuit 40 to be described later.

[0016] The air conditioner 10 includes a connection pipe 27. The connection pipe 27 circulates the refrigerant between the indoor unit 20 and the outdoor unit 30. The air conditioner 10 includes the compressor 34, the four-way switching valve 35, the outdoor heat exchanger 33, the electric expansion valve 36, the liquid shutoff valve 37, the indoor heat exchanger 23, the gas shutoff valve 38, and the refrigerant circuit 40 including refrigerant pipes connecting these components. The refrigerant circuit 40 includes a gas refrigerant pipe 40G and a liquid refrigerant pipe 40L.

[0017] The outdoor fan 32 includes a motor (not shown) whose number of operating rotations can be adjusted by inverter control. The outdoor fan 32 is configured to take outdoor air into the casing 31, cause heat exchange between the taken air in the outdoor heat exchanger 33 and the refrigerant, and then blow the air out of the casing 31.

[0018] The outdoor heat exchanger 33 is, for example, a cross-fin tube type or microchannel type heat exchanger, and is used to exchange heat with the refrigerant by using air as a heat source.

[0019] The compressor 34 sucks a low-pressure gas refrigerant and discharges a high-pressure gas refrigerant. The compressor 34 includes a motor (not shown) whose number of operating rotations can be adjusted by inverter control. The compressor 34 is of a variable displacement type (variable capacity type) that can vary capacity (operational capacity) through inverter control of the motor. Although the air conditioner 10 including one compressor 34 in the outdoor unit 30 is exemplified in the present embodiment, the configuration of the air conditioner of the present disclosure is not limited to this configuration.

[0020] The four-way switching valve 35 reverses a flow of refrigerant in the refrigerant pipe and switches and supplies the refrigerant discharged from the compressor 34 to either the outdoor heat exchanger 33 or the indoor heat exchanger 23. As a result, the air conditioner 10 can switch between the cooling operation and the heating operation. The electric expansion valve 36 includes a motor valve that can adjust a refrigerant flow rate or the like.

[0021] The liquid shutoff valve 37 and the gas shutoff valve 38 are manually operated on-off valves. The liquid shutoff valve 37 and the gas shutoff valve 38 are closed to block the flow of the refrigerant in the gas refrigerant pipe 40G and the liquid refrigerant pipe 40L, and are opened to allow the flow of the refrigerant in the gas refrigerant pipe 40G and the liquid refrigerant pipe 40L.

[0022] The indoor unit 20 includes an indoor temperature sensor 41 that detects a temperature of the return air RA. The indoor temperature sensor 41 is connected to an air conditioning control unit 15 to be described later. The outdoor unit 30 includes a refrigerant temperature sensor, an outside air temperature sensor, and the like (not shown). In the air conditioner 10, an evaporation pressure, a condensation pressure, a degree of superheating, and the like of the indoor heat exchanger 23 and the outdoor heat exchanger 33 are obtained by using the detection values of these sensors, and the number of rotations of the compressor 34, an opening degree of the electric expansion valve 36, and the like are controlled so as to adjust these values.

[0023] During the cooling operation by the air conditioner 10 having the above configuration, the four-way switching valve 35 is held in a state indicated by solid lines in FIG. 1. A high-temperature and high-pressure gaseous refrigerant discharged from the compressor 34 flows into the outdoor heat exchanger 33 through the four-way switching valve 35, and exchanges heat with outdoor air by activation of the outdoor fan 32 to be condensed and liquefied. During the cooling operation by the air conditioner 10, the outdoor heat exchanger 33 functions as a condenser. The liquefied refrigerant passes through the electric expansion valve 36 in a fully open state and flows into the indoor unit 20. In the indoor unit 20, the refrigerant is evaporated by heat exchange with the indoor air in the indoor heat exchanger 23. The indoor air cooled by the evaporation of the refrigerant is blown into the room by the indoor fan 22 to cool the room. The refrigerant evaporated in the indoor heat exchanger 23 returns to the outdoor unit 30 through the gas refrigerant pipe 40G, and is sucked into the compressor 34 via the four-way switching valve 35. During the cooling operation by the air conditioner 10, the indoor heat exchanger 23 functions as an evaporator.

[0024] During the heating operation by the air conditioner 10, the four-way switching valve 35 is maintained in a state indicated by broken lines in FIG. 1. A high-tem-

perature and high-pressure gaseous refrigerant discharged from the compressor 34 passes through the four-way switching valve 35 and flows into the indoor heat exchanger 23 of the indoor unit 20. In the indoor heat exchanger 23, the refrigerant exchanges heat with the indoor air to be condensed and liquefied. During the heating operation by the air conditioner 10, the indoor heat exchanger 23 functions as a condenser. The indoor air heated by the condensation of the refrigerant is blown into the room by the indoor fan 22 to heat the room. The refrigerant liquefied in the indoor heat exchanger 23 returns to the outdoor unit 30 through the liquid refrigerant pipe 40L, is decompressed to have predetermined low pressure at the electric expansion valve 36, and further exchanges heat with the outdoor air in the outdoor heat exchanger 33 to be evaporated. The refrigerant evaporated and gasified in the outdoor heat exchanger 33 passes the four-way switching valve 35 to be sucked into the compressor 34. During the heating operation by the air conditioner 10, the outdoor heat exchanger 33 functions as an evaporator.

[Control unit]

[0025] FIG. 2 is a control block diagram of the air conditioner of the present disclosure. As illustrated in FIG. 2, the air conditioner 10 includes the air conditioning control unit 15 that controls the operation of the air conditioner 10. The air conditioning control unit 15 includes an indoor control unit (not shown) disposed in the indoor unit 20 and an outdoor control unit (not shown) disposed in the outdoor unit 30. The indoor control unit and the outdoor control unit are communicably connected to each other via a transmission line. The air conditioning control unit 15 is connected to a remote controller 16 that allows a user to activate and stop the indoor unit 20, change a set temperature, and the like.

[0026] The air conditioning control unit 15 is a device that controls the operation of the indoor unit 20 and the outdoor unit 30, and includes, for example, a microcomputer including a processor such as a CPU, and memory such as RAM and ROM. The air conditioning control unit 15 may be implemented as hardware by using an LSI, an ASIC, an FPGA, or the like. The air conditioning control unit 15 exerts a predetermined function when the processor executes a program installed in the memory. Detection values of the sensors provided in the indoor unit 20 and the outdoor unit 30 are input to the air conditioning control unit 15. The air conditioning control unit 15 controls the operations of the indoor fan 22, the outdoor fan 32, the compressor 34, the four-way switching valve 35, the electric expansion valve 36, and the like based on the detection values of the sensors and the like.

[0027] The air conditioning control unit 15 transmits a first signal S1 and a second signal S2. The first signal S1 is a signal that permits activation of an optional item attached to the air conditioner 10, and the second signal S2 is a signal that stops the optional item. In the air conditioner 10, the first signal S1 and the second signal S2 transmitted by the air conditioning control unit 15 are input to a light source control unit 52 to be described later.

[0028] The air conditioning control unit 15 preferably transmits first information J1 to the light source control unit 52 to be described later. The first information J1 is information related to an indoor temperature detected by the indoor temperature sensor 41. In the air conditioner 10, the first information J1 transmitted by the air conditioning control unit 15 is input to the light source control unit 52. The light source control unit 52 can obtain a temperature around the light source 51 based on the first information J1. The air conditioner 10 of the present disclosure is not required to transmit the first information J1 from the air conditioning control unit 15 to the light source control unit 52.

[0029] The remote controller 16 is an operation unit that allows the user to perform operations such as activation, stop, and change of setting of the air conditioner 10. In the air conditioner 10 of the present disclosure, the remote controller 16 is provided with a display 17. The display 17 is a part that can display an operation state, a set value, and the like of the air conditioner 10. In the air conditioner 10, the user can know the operation state of the air conditioner 10 based on the information presented on the display 17.

[0030] In the air conditioner 10, the ultraviolet irradiation unit 50 is connected to the air conditioning control unit 15. The ultraviolet irradiation unit 50 includes the light source control unit 52 that controls the operation of the ultraviolet irradiation unit 50. The light source control unit 52 is a device that controls the operation of the light source 51 (ON and OFF of a power source of the light source 51), and includes, for example, a microcomputer including a processor such as a CPU and a memory such as a RAM or a ROM. The light source control unit 52 may be implemented as hardware by using an LSI, an ASIC, an FPGA, or the like. The light source control unit 52 exerts a predetermined function when the processor executes a program installed in the memory. The light source control unit 52 can detect an abnormality of the light source 51. When detecting an abnormality of the light source 51, the light source control unit 52 transmits a third signal S3. The third signal S3 is a signal indicating that an abnormality has occurred in the light source 51. In the air conditioner 10, the third signal S3 transmitted by the light source control unit 52 is input to the air conditioning control unit 15.

(Configuration of indoor unit)

[0031] FIG. 3 is a perspective view of the indoor unit in the air conditioner of the present disclosure. FIG. 4 is a sectional view of the indoor unit with a decorative panel being detached. FIG. 5 is a perspective view of the indoor unit with the decorative panel and a protecting member being detached. As illustrated in FIG. 3 to FIG. 5, the indoor unit 20 has a so-called cassette type, and includes

the casing 21 and a decorative panel 28.

[0032] The casing 21 has a substantially rectangular shape in a bottom view, and includes a first casing 21a disposed in an upper portion and a second casing 21b disposed in a lower portion. As illustrated in FIG. 4, the casing 21 is provided therein with a space A accommodating the indoor fan 22, the indoor heat exchanger 23, the collecting member 24, the ultraviolet irradiation unit 50, and the like. The space A also serves as an air flow path in the casing 21. As illustrated in FIG. 4, the casing 21 has a lower end provided with the suction port 25 located at a center of the rectangular shape, and four air supply ports 26 surrounding the suction port 25. The suction port 25 and the air supply ports 26 are openings provided at a lower end of the space A. A protecting member 70 is disposed at a lower end of the suction port 25. The protecting member 70 is a member for preventing entry of fingers into the suction port 25. In the indoor unit 20 in a normal use state, the second casing 21b has a lower end covered with the decorative panel 28 (see FIG. 3).

[0033] As illustrated in FIG. 3, the decorative panel 28 has a substantially rectangular shape in a bottom view, and a suction grill 29 is disposed at a center of the rectangular shape. The decorative panel 28 includes four blow-out ports 28a disposed to surround the suction grill 29. The suction grill 29 is provided with an opening 29a having a slit shape. The opening 29a is in communication with the space A (see FIG. 4) via the suction port 25 (see FIG. 4). The blow-out ports 28a of the decorative panel 28 are in communication with the space A (see FIG. 5) via the air supply ports 26 (see FIG. 3). The indoor unit 20 sucks the indoor air into the casing 21 through the suction port 25 (opening 29a), and supplies the air sucked into the casing 21 into the room through the air supply port 26 and the blow-out port 28a.

[0034] As illustrated in FIG. 4, the indoor unit 20 includes the indoor fan 22 and the indoor heat exchanger 23 in the casing 21 (space A). The indoor fan 22 is a fan for circulating the indoor air. The indoor heat exchanger 23 constitutes a part of the refrigerant circuit 40, and the refrigerant is circulated between the indoor heat exchanger 23 and the outdoor unit 30 through the connection pipe 27. The indoor unit 20 drives the indoor fan 22 to cause the indoor air (return air RA) to be sucked into the casing 21 from the suction port 25 (opening 29a) and pass through the indoor heat exchanger 23, and cause cooled or heated air (supply air SA) to be supplied into the room from the air supply port 26 and the blow-out port 28a.

(Collecting member)

[0035] FIG. 6 is a partially enlarged perspective view of the ultraviolet irradiation unit attached to the air conditioner. As illustrated in FIG. 4 to FIG. 6, the indoor unit 20 includes the collecting member 24 in the casing 21. The collecting member 24 is a member for collecting dust included in the indoor air (return air RA). The collecting member 24 includes a first filter 24a which is the first collecting member 24 and a second filter 24b which is the second collecting member 24. The second filter 24b is configured to collect (finer) dust that cannot be perfectly collected by the first filter 24a, and has finer mesh and higher collection efficiency (about 60% to 95%) than the first filter 24a. In other words, the first filter 24a has coarser mesh than the second filter 24b. The present embodiment exemplifies a case where all the members constituting the collecting member 24 are filters. All the members constituting the collecting member 24 may alternatively be an electric dust collector.

[0036] As illustrated in FIG. 5, the first filter 24a is disposed upstream of the second filter 24b in an air flow direction. The first filter 24a has an upstream surface in the air flow direction, and the upstream surface will be referred to as a lower end surface 24c in the following description. The collecting member 24 according to the present embodiment includes the first filter 24a and the second filter 24b. Alternatively, the collecting member in the indoor unit of the present disclosure may include only one of the first filter or the second filter.

[0037] In the indoor unit 20, the air (return air RA) sucked into the casing 21 from the suction port 25 (opening 29a) passes through the collecting member 24. At this time, the first filter 24a and the second filter 24b collect dust included in the return air RA. In the indoor unit 20, dust generating injurious ingredients and odorous components adheres to the lower end surface 24c of the first filter 24a.

(Ultraviolet irradiation unit)

[0038] As illustrated in FIG. 6, the indoor unit 20 includes the ultraviolet irradiation unit 50. The ultraviolet irradiation unit 50 is a portion that irradiates the lower end surface 24c of the first filter 24a with the ultraviolet ray UV, and includes the light source 51, the light source control unit 52 (see FIG. 2), and a cover 53. The light source 51 includes an LED device that generates the ultraviolet ray UV when electrified. The light source 51 is equipped with a lens (not shown) that diffuses the ultraviolet ray UV generated by the light source 51 substantially entirely on the lower end surface 24c. The light source 51 according to the present embodiment is fixed to the casing 21 and irradiates the lower end surface 24c with the ultraviolet ray UV from a fixed position. Alternatively, the light source 51 may further include a displacement mechanism configured to displace the light source 51 with respect to the casing 21, and may be configured to irradiate the lower end surface 24c with the ultraviolet ray UV while being displaced by the displacement mechanism.

[0039] The ultraviolet irradiation unit 50 is disposed at a position deviated from an air flow from the suction port 25 toward the collecting member 24. In other words, the ultraviolet irradiation unit 50 is located not to be overlapped with the suction port 25 and the collecting member

24 in a bottom view. If the ultraviolet irradiation unit 50 is disposed in the air flow from the suction port 25 toward the collecting member 24, the ultraviolet irradiation unit 50 will increase air flow resistance. In the indoor unit 20 of the present disclosure, the ultraviolet irradiation unit 50 is disposed at a position deviated from the air flow from the suction port 25 toward the collecting member 24 in order to inhibit increase in air flow resistance.

[0040] The ultraviolet irradiation unit 50 includes the cover 53. The cover 53 also serves as a member supporting the light source 51 on the casing 21, and is screwed to the casing 21. The cover 53 includes a body 53a and an opening 53b. The ultraviolet ray UV emitted from the light source 51 passes through the opening 53b and is irradiated to the space A outside the cover 53. The ultraviolet ray UV emitted to the space A outside the cover 53 through the opening 53b is emitted to the lower end surface 24c of the collecting member 24.

(Notification unit)

[0041] As illustrated in FIG. 2, the air conditioner 10 further includes a notification unit 60. In the air conditioner 10, the light source control unit 52 transmits the third signal S3 to the air conditioning control unit 15 when detecting an abnormality of the light source 51. In the air conditioner 10, when the air conditioning control unit 15 receives the third signal S3, the air conditioning control unit 15 causes the notification unit 60 to notify. In the air conditioner 10 having such a configuration, the notification unit 60 can notify the user that an abnormality has occurred in the light source 51. In the air conditioner 10, when the light source control unit 52 detects an abnormality of the light source 51, for example, information for notifing the abnormality may be displayed on the display 17 of the remote controller 16.

[Content of control performed by air conditioning control unit]

[0042] FIG. 7 is a control flowchart of the air conditioning control unit. When the user operates the remote controller 16 (see FIG. 3) to turn on the operation of the air conditioner 10, the air conditioning control unit 15 (see FIG. 3) starts a control operation illustrated in FIG. 7. The control operation illustrated in FIG. 7 is an operation for controlling the operation of an optional item attachable to the air conditioner 10. In the present disclosure, a case will be described as an example where the optional item attachable to the air conditioner 10 is the ultraviolet irradiation unit 50. Examples of optional items other than the ultraviolet irradiation unit 50 include an electric dust collector, a deodorizing unit, and a discharging unit that generates active species.

[0043] As illustrated in FIG. 7, when the control operation for the ultraviolet irradiation unit 50 is started, the air conditioning control unit 15 executes step (S101). In step (S101), the air conditioning control unit 15 determines whether the ultraviolet irradiation unit 50 is connected to the air conditioner 10 (air conditioning control unit 15). When determining in step (S101) that the ultraviolet irradiation unit 50 is connected to the air conditioner 10 (air conditioning control unit 15) (YES), the air conditioning control unit 15 subsequently executes step (S102). On the other hand, when determining in step (S101) that the ultraviolet irradiation unit 50 is not connected to the air conditioner 10 (air conditioning control unit 15) (NO), the air conditioning control unit 15 determines that there is no need to execute the control operation for the ultraviolet irradiation unit 50 and ends the control.

[0044] In step (S102), the air conditioning control unit 15 determines whether there is an abnormality in the indoor unit 20. When determining in step (S102) that there is no abnormality in the indoor unit 20 (YES), the air conditioning control unit 15 subsequently executes step (S103). On the other hand, when determining in step (S102) that there is an abnormality in the indoor unit 20 (NO), the air conditioning control unit 15 determines that the control operation for the ultraviolet irradiation unit 50 cannot be executed and ends the control.

[0045] In step (S 103), the air conditioning control unit 15 determines whether the indoor fan 22 is turned on. When determining in step (S103) that the indoor fan 22 is turned on (YES), the air conditioning control unit 15 subsequently executes step (S104). On the other hand, when determining in step (S103) that the indoor fan 22 is not turned on (NO), the air conditioning control unit 15 repeatedly executes the determination in step (S103) until the indoor fan 22 is turned on.

[0046] In step (S104), the air conditioning control unit 15 transmits the first signal S1. The first signal S1 is a signal that permits activation of an optional item attached to the air conditioner 10, and is a general-purpose signal corresponding to all optional items that can be attached. In other words, in the air conditioner 10 of the present disclosure, the air conditioning control unit 15 transmits the first signal S1 when the following conditions (1) to (3) are satisfied: (1) the ultraviolet irradiation unit 50 is connected to the air conditioner 10 (air conditioning control unit 15); (2) there is no abnormality in the indoor unit 20; and (3) the indoor fan 22 is turned on. In the air conditioner 10 of the present disclosure, the air conditioning control unit 15 transmits the first signal S1 when the conditions (1) to (3) are satisfied. Alternatively, the air conditioning control unit 15 may transmit the first signal S1 when only the conditions (1) and (2) are satisfied. In this case, when the indoor fan 22 is turned off, the air conditioning control unit 15 can still transmit the first signal. In this case, the ultraviolet ray UV can be irradiated by the light source 51 in a state where the indoor fan 22 is turned off.

[0047] The air conditioning control unit 15 transmits the first signal S1 in step (S104), and then executes step (S105). In step (S105), the air conditioning control unit 15 determines whether the remote controller 16 is turned on. When determining in step (S105) that the remote con-

troller 16 is turned on (YES), the air conditioning control unit 15 subsequently executes step (S106). On the other hand, when determining in step (S105) that the remote controller 16 is not turned on (NO) (that is, when the air conditioner 10 is turned off), the air conditioning control unit 15 subsequently executes step (S109).

[0048] In step (S106), the air conditioning control unit 15 determines whether there is an abnormality in the indoor unit 20. When determining in step (S106) that there is no abnormality in the indoor unit 20 (YES), the air conditioning control unit 15 subsequently executes step (S107). On the other hand, when determining in step (S106) that there is an abnormality in the indoor unit 20 (NO), the air conditioning control unit 15 subsequently executes step (S109).

[0049] In step (S107), the air conditioning control unit 15 determines whether the indoor fan 22 is turned on. When determining in step (S107) that the indoor fan 22 is turned on (YES), the air conditioning control unit 15 repeatedly executes steps (S105) to (S107) until the indoor fan 22 is turned off. On the other hand, when determining in step (S107) that the indoor fan 22 is not turned on (NO) (that is, when the air conditioner 10 is in an automatic stopped state by thermo-on or thermo-off), the air conditioning control unit 15 subsequently ends step (S108).

[0050] In step (S108), the air conditioning control unit 15 transmits the second signal S2. The second signal S2 is a signal for stopping an optional item attached to the air conditioner 10, and is a general-purpose signal corresponding to all optional items that can be attached. In other words, in the air conditioner 10 of the present disclosure, after the transmission of the first signal S1, the air conditioning control unit 15 transmits the second signal S2 when (4) the remote controller 16 is turned on, and (5) there is no abnormality in the indoor unit 20, but (6) the indoor fan 22 is no longer turned on.

[0051] In the air conditioner 10, when the air conditioner 10 is turned off by the remote controller 16 after the transmission of the first signal S1 or when an abnormality occurs in the indoor unit 20, the air conditioning control unit 15 transmits the second signal S2 and ends the control operation for the ultraviolet irradiation unit 50 in step (S109).

[0052] As described above, in the air conditioner 10 of the present disclosure, the air conditioning control unit 15 transmits only the first signal S1 that permits the operation of the ultraviolet irradiation unit 50 and the second signal S2 that stops the operation for the ultraviolet irradiation unit 50. In other words, the air conditioning control unit 15 does not control the operation of the ultraviolet irradiation unit 50 (specifically, ON and OFF operation of the light source 51).

[Content of control performed by light source control unit]

[0053] FIG. 8 is a control flowchart of a light source control unit according to a first embodiment. A control operation illustrated in FIG. 8 is a first embodiment of the control operation of controlling the operation of the light source 51 of the ultraviolet irradiation unit 50. When power is supplied to the ultraviolet irradiation unit 50, the light source control unit 52 (see FIG. 3) starts the control operation illustrated in FIG. 8.

[0054] As illustrated in FIG. 8, when starting an operation control of the light source 51, the light source control unit 52 executes step (S201). In step (S201), the light source control unit 52 determines whether the first signal S1 is input. When determining in step (S201) that the first signal S1 is input (YES), the light source control unit 52 subsequently executes step (S202). On the other hand, when determining in step (S201) that the first signal S1 is not input (NO), the light source control unit 52 repeatedly executes step (S201) until the first signal S1 is input.

[0055] In step (S202), the light source control unit 52 turns on the power source of the light source 51. At this time, in the air conditioner 10, the ultraviolet ray UV is irradiated from the light source 51 toward the lower end surface 24c of the collecting member 24.

[0056] After turning on the power source of the light source 51 in step (S202), the light source control unit 52 subsequently executes step (S203). In step (S203), the light source control unit 52 determines whether the second signal S2 is input. When determining in step (S203) that the second signal S2 is input (YES), the light source control unit 52 subsequently executes step (S204). On the other hand, when determining in step (S203) that the second signal S2 is not input (NO), the light source control unit 52 repeatedly executes step (S203) until the second signal S2 is input.

[0057] In step (S204), the light source control unit 52 turns off the power source of the light source 51. At this time, in the air conditioner 10, the irradiation of the ultraviolet ray UV from the light source 51 toward the collecting member 24 is stopped.

[0058] After turning off the power source of the light source 51 in step (S204), the light source control unit 52 returns to step (S201) and executes the control operation in and after step (S201) again.

[0059] As described above, in the air conditioner 10 of the present disclosure, the light source control unit 52 controls ON and OFF of the power source of the light source 51.

[0060] In the air conditioner 10 of the present disclosure, the light source control unit 52 preferably turns on and off the power source of the light source 51 based on the first information J1 transmitted from the air conditioning control unit 15. It is known that the life of the light source 51 decreases when the light source 51 is used in a high-temperature atmosphere (for example, an atmosphere exceeding 40 degrees). In the air conditioner 10 of the present disclosure, the light source control unit 52 turns on and off the power source of the light source 51 based on the first information J1. Specifically, the light source control unit 52 turns off the power source of the

light source 51 when detecting from the first information J1 that an ambient temperature of the light source 51 exceeds 40 degrees, and the light source control unit 52 turns on the power source of the light source 51 when detecting that the ambient temperature of the light source 51 is less than 40 degrees. The air conditioner 10 having such a configuration can suppress a decrease in the life of the light source 51. Furthermore, in the air conditioner 10 having such a configuration, the ultraviolet irradiation unit 50 is not required to be provide with a temperature sensor, and the configuration of the ultraviolet irradiation unit 50 can be simplified. In the air conditioner 10, the first information J1 may be incorporated in the conditions for transmitting the first signal S1, and the air conditioning control unit 15 may be configured to transmit the first signal S1 when determining that the ambient temperature of the light source 51 is less than 40 degrees from the detection value of the indoor temperature sensor 41.

[0061] FIG. 9 is a control flowchart of a light source control unit according to a second embodiment. A control operation illustrated in FIG. 9 is a second embodiment of the control operation of controlling the operation of the light source 51 of the ultraviolet irradiation unit 50. In the air conditioner 10, the light source control unit 52 (see FIG. 3) may control the operation of the light source 51 along the flow illustrated in FIG. 9. The control flow of the light source control unit 52 according to the second embodiment is different from the control flow (see FIG. 8) of the light source control unit 52 according to the first embodiment in that steps (S200) and (S205) are included. Here, configurations different from the flow illustrated in FIG. 8 will be described, and description of common configurations will be omitted.

[0062] As illustrated in FIG. 9, when starting the operation control of the light source 51, the light source control unit 52 executes step (S200). In step (S200), the light source control unit 52 determines whether there is an abnormality in the light source 51. When determining in step (S200) that there is no abnormality in the light source 51 (YES), the light source control unit 52 subsequently executes step (S201). On the other hand, when determining in step (S200) that there is an abnormality in the light source 51 (NO), the light source control unit 52 subsequently executes step (S205).

[0063] In step (S205), the light source control unit 52 transmits the third signal S3. When the third signal S3 is input, the air conditioning control unit 15 causes the notification unit 60 to notify.

[0064] As described above, in the air conditioner 10 of the present disclosure, the light source control unit 52 transmits the third signal S3 when detecting an abnormality of the light source 51, and the air conditioning control unit 15 that has received the third signal S3 causes the notification unit 60 to notify.

[0065] FIG. 10 is a control flowchart of a light source control unit according to a third embodiment. A control operation illustrated in FIG. 10 is a third embodiment of the control operation of controlling the operation of the light source 51 of the ultraviolet irradiation unit 50. In the air conditioner 10, the light source control unit 52 (see FIG. 3) may control the operation of the light source 51 along the flow illustrated in FIG. 10.

[0066] As illustrated in FIG. 10, when starting the operation control of the light source 51, the light source control unit 52 executes step (S211). In step (S211), the light source control unit 52 determines whether the first signal S1 is input. When determining in step (S211) that the first signal S1 is input (YES), the light source control unit 52 subsequently executes step (S212). On the other hand, when determining in step (S211) that the first signal S1 is not input (NO), the light source control unit 52 repeatedly executes step (S211) until the first signal S1 is input.

[0067] In step (S212), the light source control unit 52 turns on the power source of the light source 51. At this time, in the air conditioner 10, the ultraviolet ray UV is irradiated from the light source 51 toward the lower end surface 24c of the collecting member 24.

[0068] After turning on the power source of the light source 51 in step (S212), the light source control unit 52 subsequently executes step (S213). In step (S213), the light source control unit 52 determines whether a first predetermined period X1 has elapsed after the power source of the light source 51 is turned on. When determining in step (S213) that the first predetermined period X1 has elapsed (YES), the light source control unit 52 subsequently executes step (S215). On the other hand, when determining in step (S213) that the first predetermined period X1 has not elapsed (NO), the light source control unit 52 subsequently executes step (S214).

[0069] In step (S214), the light source control unit 52 determines whether the second signal S2 is input. When determining in step (S214) that the second signal S2 is input (YES), the light source control unit 52 subsequently executes step (S215). On the other hand, when determining in step (S214) that the second signal S2 is not input (NO), the light source control unit 52 repeatedly executes steps (S213) and (S214) until the second signal S2 is input.

[0070] In step (S215), the light source control unit 52 turns off the power source of the light source 51. After turning off the power source of the light source 51 in step (S215), the light source control unit 52 subsequently executes step (S216). As described above, in the air conditioner 10, regardless of the presence or absence of input of the second signal S2, the power source of the light source 51 may be turned off when the first predetermined time X1 has elapsed after the power source of the light source 51 is turned on.

[0071] In step (S216), the light source control unit 52 determines whether a second predetermined period X2 has elapsed after the power source of the light source 51 is turned off. When determining in step (S216) that the second predetermined period X2 has elapsed (YES), the light source control unit 52 returns to step (S211). On the other hand, when determining in step (S216) that the

second predetermined period X2 has not elapsed (NO), the light source control unit 52 repeatedly executes step (S216) until the second predetermined period X2 elapses.

[0072] When the control flow illustrated in FIG. 10 is adopted, the air conditioner 10 can perform control such that, for example, the light source 51 is turned on for three hours, then turned off for three hours, and then turned on for three hours to turn on the light source 51 for a total of six hours. This control makes it possible to easily set an upper limit of an irradiation time per day of the light source 51. In this case, ON and OFF control of the power source of the light source 51 can be performed only by a function of the light source control unit 52. In the air conditioner 10, it is preferable to increase the first predetermined period X1 according to an increase in use time in consideration of deterioration of the light source 51 with the increase in use time. This makes it possible to ensure a predetermined irradiation intensity even in a case where the light source 51 whose use time has been increased is used, and to suppress deterioration of sterilization performance.

[0073] As described above, in the air conditioner 10 of the present disclosure, the light source control unit 52 can turn on the power source of the light source 51 for the first predetermined period X1 and then turn off the power source for the second predetermined period X2.

[0074] FIG. 11 is a control flowchart of a light source control unit according to a fourth embodiment. A control operation illustrated in FIG. 11 is a fourth embodiment of the control operation of controlling the operation of the light source 51 of the ultraviolet irradiation unit 50. In the air conditioner 10, the light source control unit 52 (see FIG. 3) may control the operation of the light source 51 along the flow illustrated in FIG. 11.

[0075] As illustrated in FIG. 11, when starting the control operation of the light source 51, the light source control unit 52 first executes step (S220), resets an integrated irradiation time T of the light source 51 to "0", and then executes step (S221).

[0076] In step (S221), the light source control unit 52 determines whether the first signal S1 is input. When determining in step (S211) that the first signal S1 is input (YES), the light source control unit 52 subsequently executes step (S222). On the other hand, when determining in step (S221) that the first signal S1 is not input (NO), the light source control unit 52 repeatedly executes step (S221) until the first signal S1 is input.

[0077] In step (S222), the light source control unit 52 determines whether the integrated irradiation time T of the light source 51 is less than a predetermined threshold value Y When determining in step (S222) that the integrated irradiation time T of the light source 51 is less than the predetermined threshold value Y (YES), the light source control unit 52 subsequently executes step (S223). On the other hand, when determining in step (S222) that the integrated irradiation time T of the light source 51 exceeds the predetermined threshold value Y (NO), the light source control unit 52 subsequently executes step (S229).

[0078] In step (S223), the light source control unit 52 turns on the power source of the light source 51. At this time, in the air conditioner 10, the ultraviolet ray UV is irradiated from the light source 51 toward the lower end surface 24c of the collecting member 24.

[0079] After turning on the power source of the light source 51 in step (S223), the light source control unit 52 executes step (S224). In step (S224), the light source control unit 52 starts integrating the irradiation time of the ultraviolet ray UV by the light source 51, and then executes step (S225).

[0080] In step (S225), the light source control unit 52 determines whether the integrated irradiation time T of the light source 51 is less than the predetermined threshold value Y. When determining in step (S225) that the integrated irradiation time T of the light source 51 is less than the predetermined threshold value Y (YES), the light source control unit 52 subsequently executes step (S226). On the other hand, when determining in step (S225) that the integrated irradiation time T of the light source 51 exceeds the predetermined threshold value Y (NO), the light source control unit 52 subsequently executes step (S227).

[0081] In step (S227), the light source control unit 52 resets the integrated irradiation time T of the light source 51 to "0", and then executes step (S228).

[0082] In step (S226), the light source control unit 52 determines whether the second signal S2 is input. When determining in step (S226) that the second signal S2 is input (YES), the light source control unit 52 subsequently executes step (S228). On the other hand, when determining in step (S226) that the second signal S2 is not input (NO), the light source control unit 52 repeatedly executes steps (S225) and (S226) until the second signal S2 is input.

[0083] In step (S228), the light source control unit 52 turns off the power source of the light source 51. After turning off the light source 51 in step (S228), the light source control unit 52 executes step (S230). In steps (S222) to (S229), similarly, the light source control unit 52 resets the integrated irradiation time T of the light source 51 to "0", and then executes step (S230).

[0084] In step (S230), the light source control unit 52 determines whether a timing has come at which the irradiation of the ultraviolet ray UV by of the light source 51 is possible. When determining in step (S230) that the timing has come at which the irradiation of the ultraviolet ray UV by the light source 51 is possible (YES), the light source control unit 52 returns to step (S221). On the other hand, in step (S230), when determining that the timing has not come at which the irradiation of the ultraviolet ray UV by the light source 51 is possible (NO), the light source control unit 52 repeatedly executes step (S230) until the timing comes at which the irradiation of the ultraviolet ray UV by the light source 51 is possible.

[0085] In the ultraviolet irradiation unit 50, the upper

limit of the irradiation time per day is set in consideration of the life of the light source 51. When the irradiation time of the ultraviolet ray UV by the light source 51 does not reach the upper limit on a certain day corresponds to the timing at which the irradiation of the ultraviolet ray UV by the light source 51 is possible. On the other hand, when the irradiation time of the ultraviolet ray UV by the light source 51 reaches the upper limit on a certain day corresponds to the timing at which the irradiation of the ultraviolet ray UV by the light source 51 is impossible. When the irradiation time per day exceeds the upper limit threshold value Y and the light source is turned off after steps (S227) and (S229), the irradiation by the light source cannot be performed on that day, and thus, in step (S230), standby is performed until the next day.

[0086] As described above, in the air conditioner 10 of the present disclosure, the light source control unit 52 controls ON and OFF of the power source of the light source 51 in accordance with the integrated irradiation time T of the light source 51.

[Functional effects of embodiments]

[0087]

(1) The ultraviolet irradiation unit 50 according to the above embodiment is attachable to the air conditioner 10 including the indoor unit 20 including the indoor fan 22 and the air conditioning control unit 15 that controls the operation of the indoor unit 20. The ultraviolet irradiation unit 50 includes the light source 51 that irradiates the indoor unit 20 with the ultraviolet ray UV, and the light source control unit 52 that is capable of communicating with the air conditioning control unit 15 and controls the operation of the light source 51. In the ultraviolet irradiation unit 50, when receiving the first signal S1 transmitted from the air conditioning control unit 15, the light source control unit 52 turns on the power source of the light source 51.

The ultraviolet irradiation unit 50 having such a configuration eliminates the need for storing in advance a control program for controlling the ultraviolet irradiation unit 50 in the air conditioning control unit 15 of the air conditioner 10 to which the ultraviolet irradiation unit 50 is attachable. Therefore, the configuration of the air conditioning control unit 15 of the air conditioner 10 can be simplified.

(2) In the ultraviolet irradiation unit 50 according to the above embodiment, the light source control unit 52 turns off the power source of the light source 51 when the first predetermined period X1 has elapsed after reception of the first signal S1.

In this case, the light source control unit 52 can easily turn on and off the light source 51. The configuration of the light source control unit 52 of the ultraviolet irradiation unit 50 can be simplified.

(3) In the ultraviolet irradiation unit 50 according to the above embodiment, the light source control unit 52 turns off the power source of the light source 51 upon reception of the second signal S2 transmitted from the air conditioning control unit 15 when the air conditioner 10 stops operating or when the indoor fan 22 stops operating.

In this case, the light source control unit 52 can easily turn on and off the light source 51 in accordance with the operation state of the air conditioner 10.

(4) The air conditioner 10 according to the above embodiment includes the indoor unit 20 including the casing 21 having the suction port 25 through which indoor air is sucked, the indoor fan 22 accommodated in the casing 21, and the collecting member 24 accommodated in the casing 21, the air conditioning control unit 15 that controls the operation of the indoor unit 20, and the ultraviolet irradiation unit 50 including the light source 51 that irradiates the collecting member 24 with an ultraviolet ray and the light source control unit 52 that is capable of communicating with the air conditioning control unit 15 and controls the operation of the light source 51. In the air conditioner 10, when receiving the first signal S1 transmitted from the air conditioning control unit 15, the light source control unit 52 turns on the power source of the light source 51.

The air conditioner 10 of the present disclosure eliminates the need for storing in advance a control program for controlling the ultraviolet irradiation unit 50 in the air conditioning control unit 15. Therefore, the configuration of the air conditioning control unit 15 can be simplified in the air conditioner 10.

(5) In the air conditioner 10 according to the above embodiment, when the air conditioner 10 starts operating or when the indoor fan 22 starts operating, the air conditioning control unit 15 transmits the first signal S1.

In this case, the configuration of the air conditioning control unit 15 can be simplified.

(6) In the air conditioner 10 according to the above embodiment, the light source control unit 52 turns off the power source of the light source 51 after the first predetermined period X1 elapses following reception of the first signal S1.

In this case, the light source control unit 52 can easily turn on and off the light source 51 in accordance with the operation state of the air conditioner 10.

(7) In the air conditioner 10 according to the above embodiment, the air conditioning control unit 15 transmits the second signal S2 when the air conditioner 10 stops operating or when the indoor fan 22 stops operating, and the light source control unit 52 turns off the power source of the light source 51 when receiving the second signal S2.

In this case, the configuration of the light source control unit 52 can be simplified.

(8) The air conditioner 10 according to the above embodiment further includes the notification unit 60.

In the air conditioner 10, the air conditioning control unit 15 transmits the third signal S3 to the air conditioning control unit when detecting an abnormality of the light source 51, and the air conditioning control unit 15 causes the notification unit 60 to notify when receiving the third signal S3.
In this case, the notification unit 60 can notify the user that an abnormality has occurred in the light source 51.
(9) In the air conditioner 10 according to the above embodiment, the light source control unit 52 receives the first information J1 related to an indoor temperature from the air conditioning control unit 15, and the light source control unit turns on and off the power source of the light source 51 based on the first information J1.

[0088] In this case, the light source control unit 52 having a simple configuration can suppress deterioration of the light source 51 due to the influence of the ambient temperature.

[0089] The embodiments have been described above. Various modifications to modes and details will be available without departing from the gist and the scope of the claims.

REFERENCE SIGNS LIST

[0090]

10	air conditioner
15	air conditioning control unit
20	indoor unit
21	casing
22	indoor fan
24	collecting member
25	suction port
50	ultraviolet irradiation unit
51	light source
52	light source control unit
60	notification unit
S1	first signal
S2	second signal
S3	third signal
J1	first information
X1	first predetermined period (predetermined period)

Claims

1. An ultraviolet irradiation unit (50) attachable to an air conditioner (10) including an indoor unit (20) having an indoor fan (22) and an air conditioning control unit (15) that controls an operation of the indoor unit (20), the ultraviolet irradiation unit (50) comprising:

a light source (51) that irradiates the indoor unit (20) with an ultraviolet ray (UV); and
a light source control unit (52) that is capable of communicating with the air conditioning control unit (15) and controls an operation of the light source (51), wherein
the light source control unit (52) turns on a power source of the light source (51) when receiving a first signal (S1) transmitted from the air conditioning control unit (15).

2. The ultraviolet irradiation unit (50) according to claim 1, wherein the light source control unit (52) turns off the power source of the light source (51) when a predetermined period (X1) has elapsed after reception of the first signal (S1).

3. The ultraviolet irradiation unit (50) according to claim 1 or 2, wherein the light source control unit (52) turns off the power source of the light source (51) upon reception of a second signal (S2) transmitted from the air conditioning control unit (15) when the air conditioner (10) stops operating or when the indoor fan (22) stops operating.

4. An air conditioner (10) comprising:

an indoor unit (20) including a casing (21) having a suction port (25) through which indoor air is sucked, an indoor fan (22) accommodated in the casing (21), and a collecting member (24) accommodated in the casing (21);
an air conditioning control unit (15) that controls an operation of the indoor unit (20); and
an ultraviolet irradiation unit (50) including a light source (51) that irradiates the collecting member (24) with an ultraviolet ray (UV) and a light source control unit (52) that is capable of communicating with the air conditioning control unit (15) and controls an operation of the light source (51), wherein
the light source control unit (52) turns on a power source of the light source (51) when receiving a first signal (S1) transmitted from the air conditioning control unit (15).

5. The air conditioner (10) according to claim 4, wherein

when the air conditioner (10) starts operating or when the indoor fan (22) starts operating,
the air conditioning control unit (15) transmits the first signal (S1).

6. The air conditioner (10) according to claim 4 or 5, wherein the light source control unit (52) turns off the power source of the light source (51) after a predetermined period (X1) elapses following reception of the first signal (S1).

7. The air conditioner (10) according to any one of claims 4 to 6, wherein

the air conditioning control unit (15) transmits a second signal (S2) when the air conditioner (10) stops operating or when the indoor fan (22) stops operating, and
the light source control unit (52) turns off the power source of the light source (51) when receiving the second signal (S2).

8. The air conditioner (10) according to any one of claims 4 to 7, further comprising a notification unit (60), wherein

the light source control unit (52) transmits a third signal (S3) to the air conditioning control unit (15) when detecting an abnormality of the light source (51), and
the air conditioning control unit (15) causes the notification unit (60) to notify when receiving the third signal (S3).

9. The air conditioner (10) according to any one of claims 4 to 8, wherein

the light source control unit (52) receives first information (J1) related to an indoor temperature from the air conditioning control unit (15), and
the light source control unit (52) turns on and off the power source of the light source (51) based on the first information (J1).

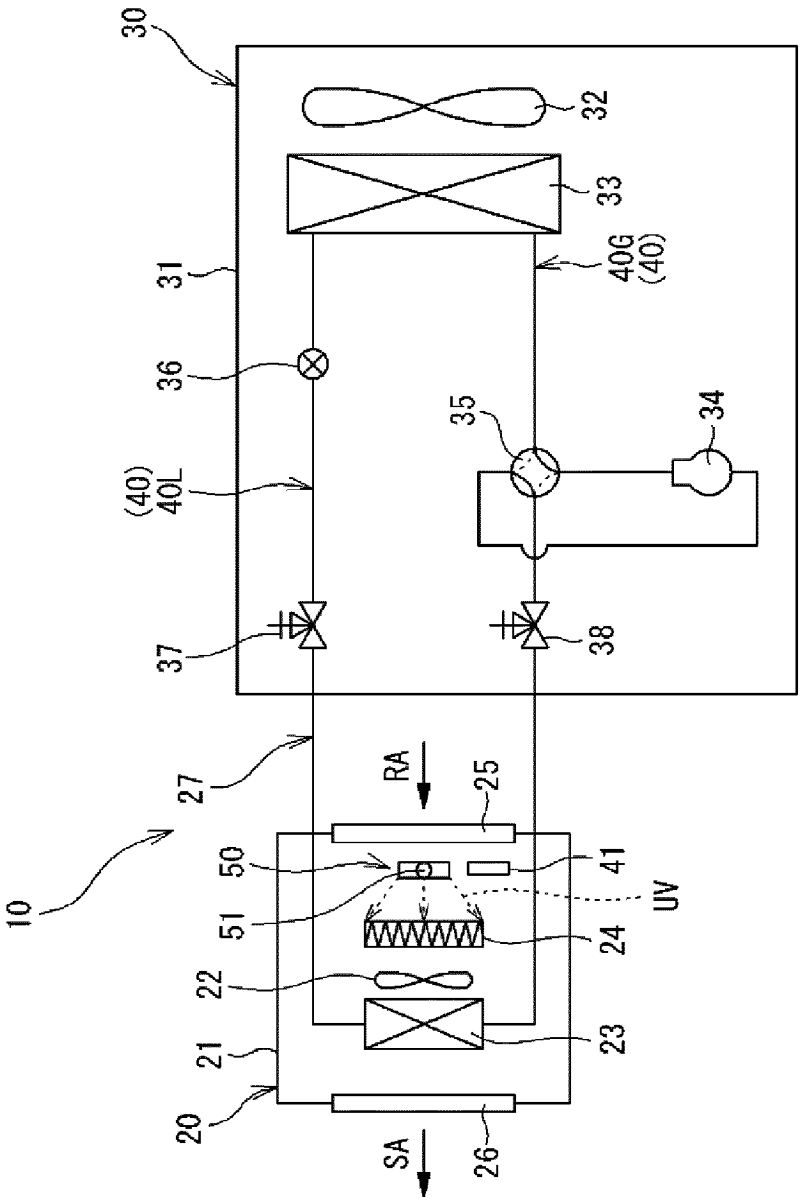

30
32
33
31
40G
(40)
36
35
34
(40)
40L
37
38
27
RA
25
10
50
41
UV
51
24
22
23
21
20
SA
26

FIG. 1

FIG. 2

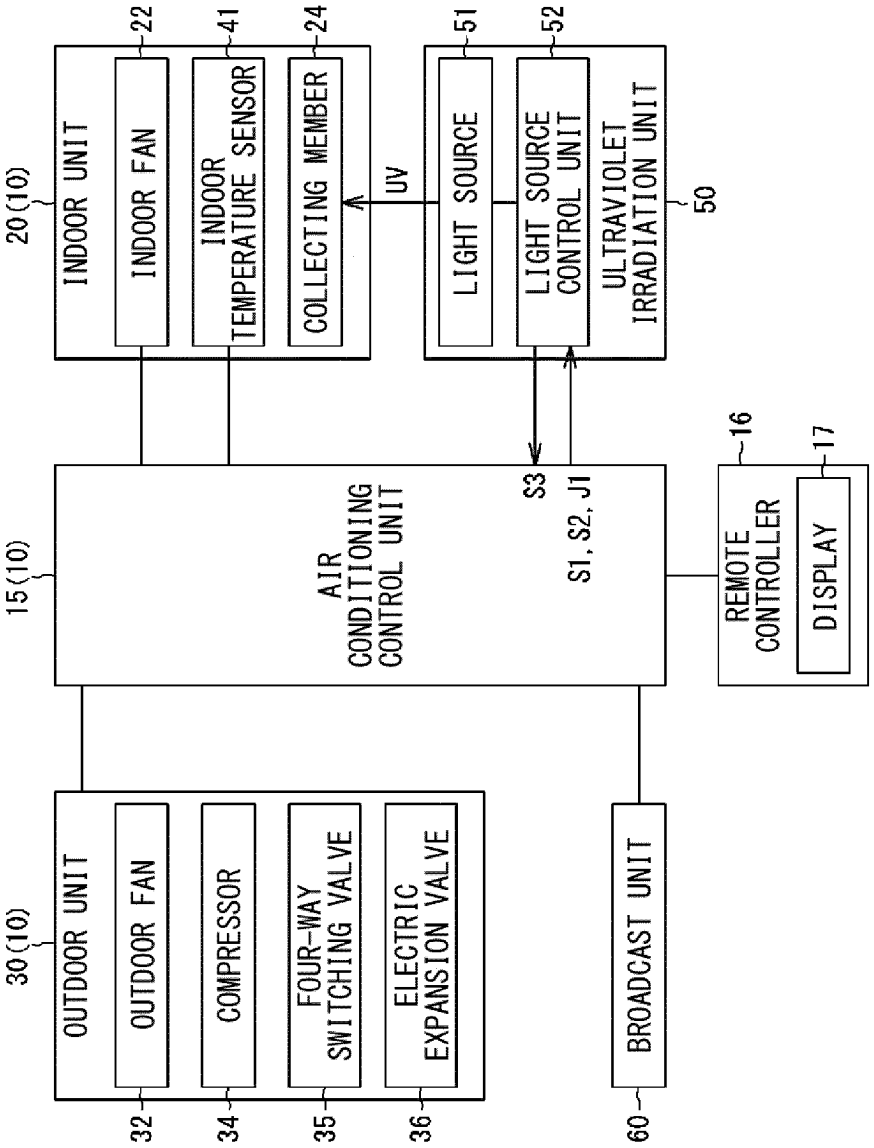

20(10)
INDOOR UNIT
22
INDOOR FAN
41
INDOOR TEMPERATURE SENSOR
24
COLLECTING MEMBER
UV
51
LIGHT SOURCE
52
LIGHT SOURCE CONTROL UNIT
ULTRAVIOLET IRRADIATION UNIT
50
15(10)
AIR CONDITIONING CONTROL UNIT
S3
S1, S2, J1
16
REMOTE CONTROLLER
17
DISPLAY
30(10)
OUTDOOR UNIT
OUTDOOR FAN
COMPRESSOR
FOUR-WAY SWITCHING VALVE
ELECTRIC EXPANSION VALVE
32
34
35
36
BROADCAST UNIT
60

FIG. 3

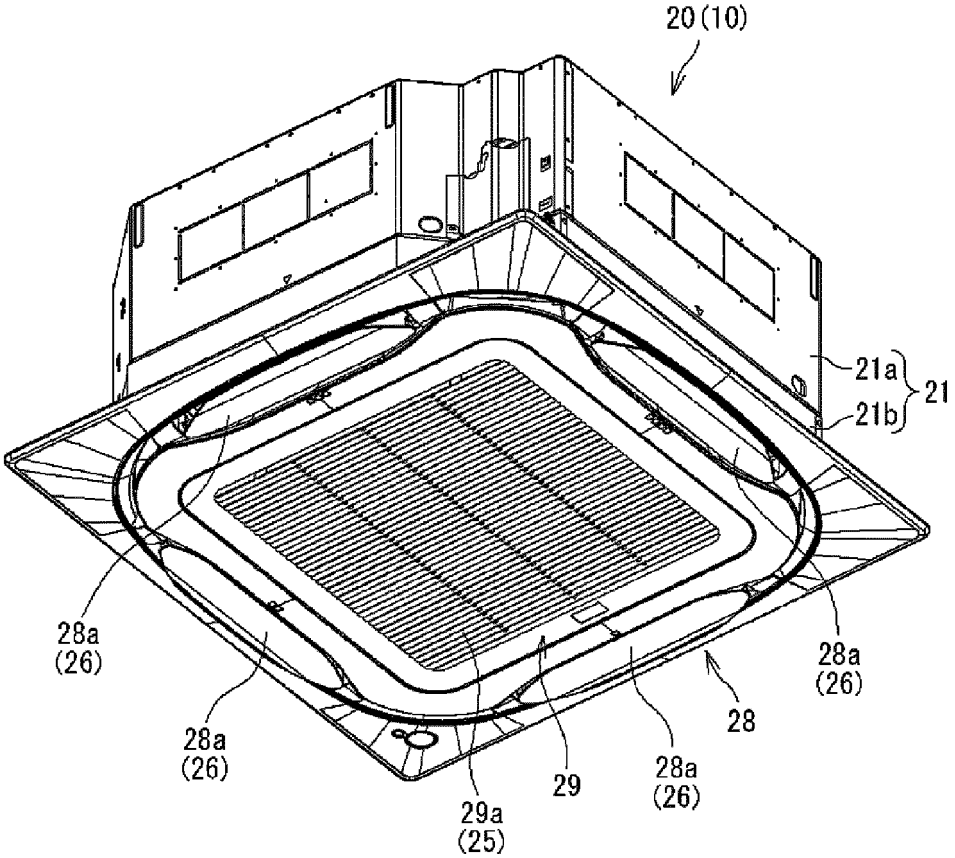


FIG. 4

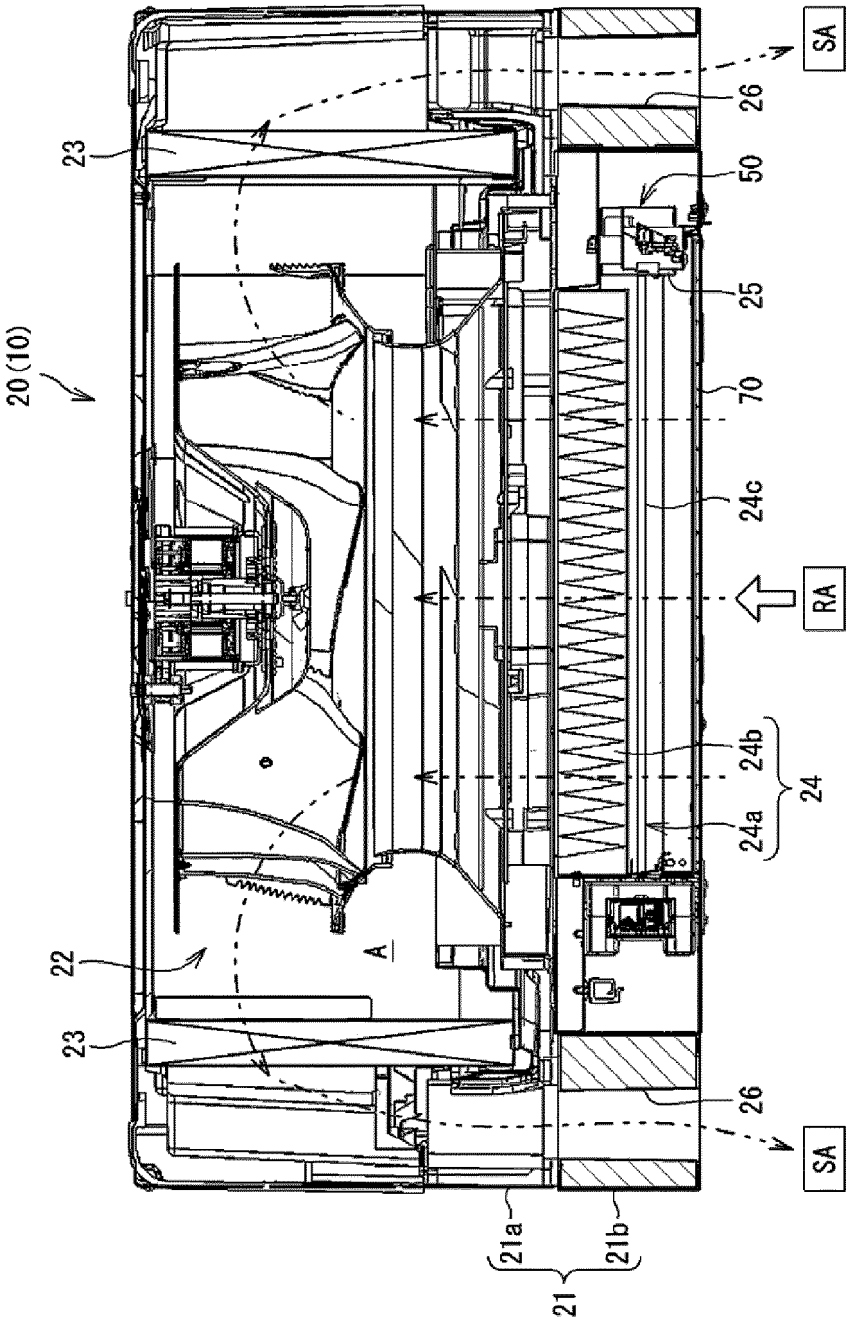


FIG. 5

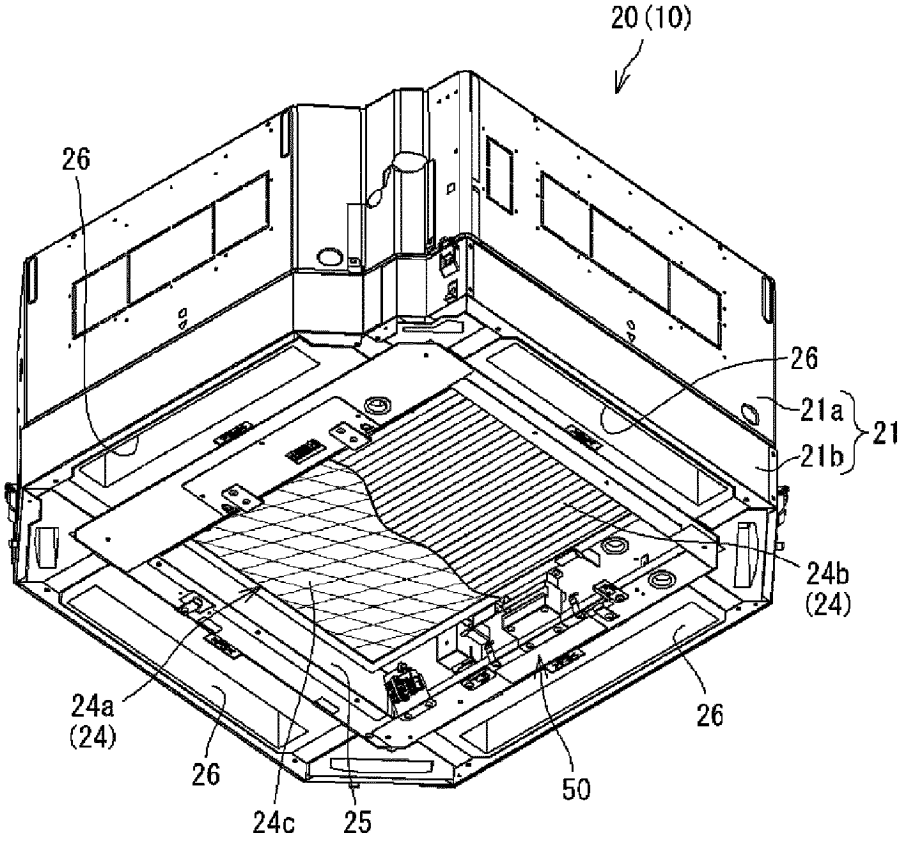


FIG. 6

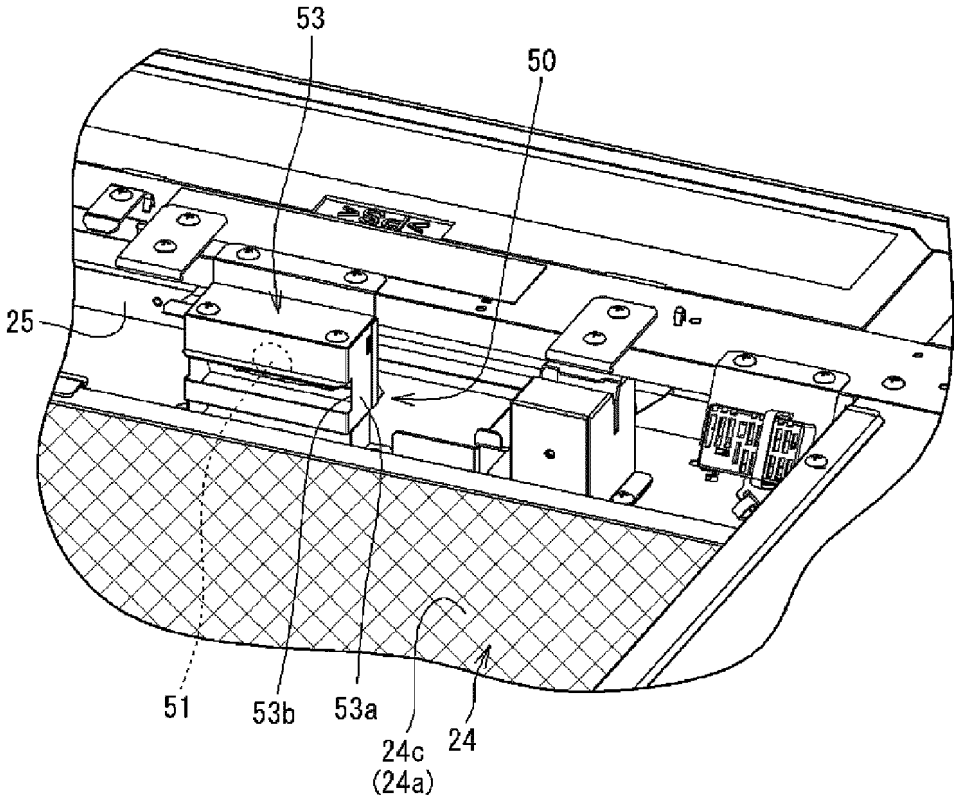


FIG. 7

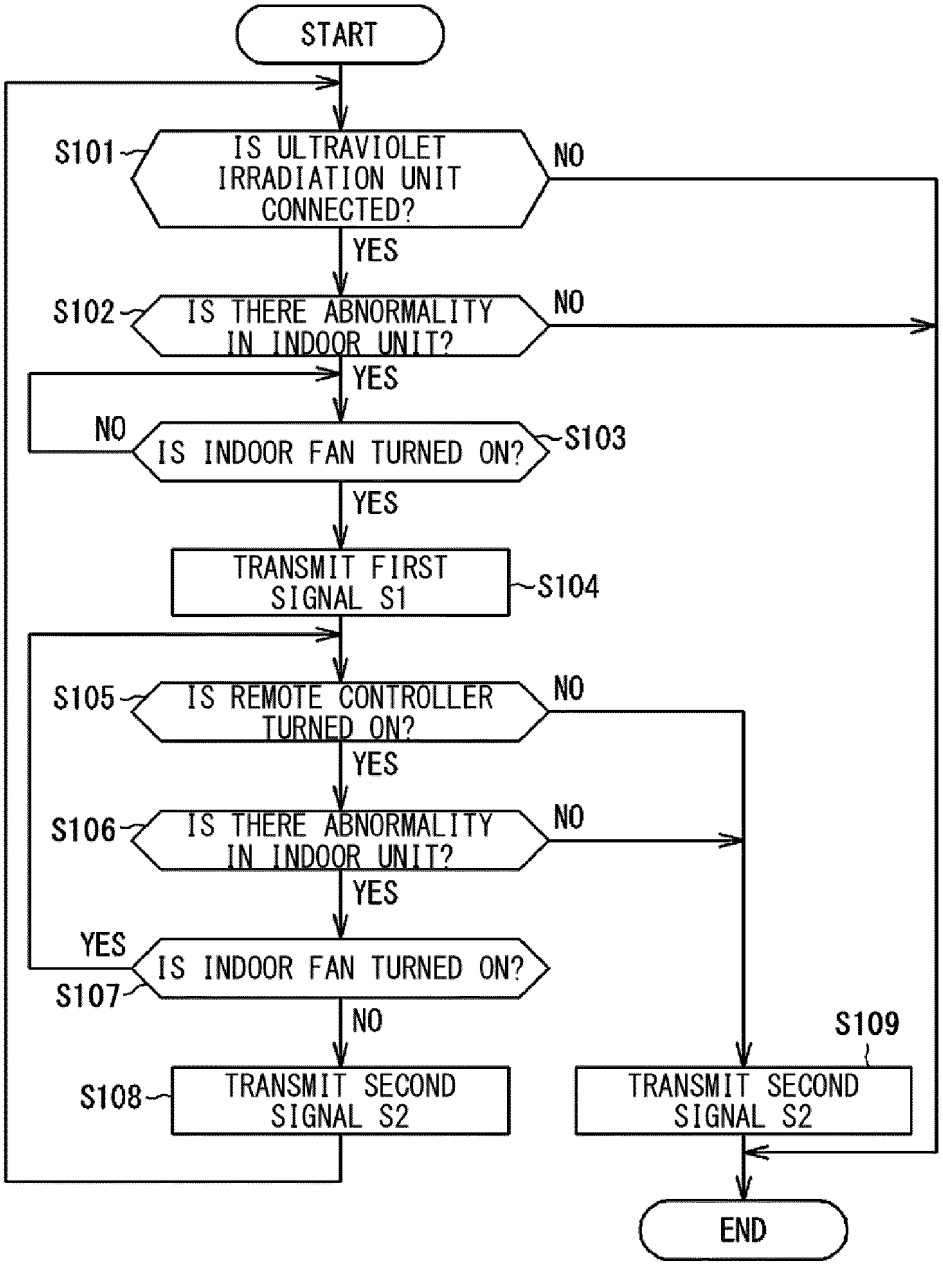

START
S101
IS ULTRAVIOLET IRRADIATION UNIT CONNECTED?
NO
YES
S102
IS THERE ABNORMALITY IN INDOOR UNIT?
NO
YES
NO
IS INDOOR FAN TURNED ON?
S103
YES
TRANSMIT FIRST SIGNAL S1
S104
S105
IS REMOTE CONTROLLER TURNED ON?
NO
YES
S106
IS THERE ABNORMALITY IN INDOOR UNIT?
NO
YES
YES
IS INDOOR FAN TURNED ON?
S107
NO
S108
TRANSMIT SECOND SIGNAL S2
S109
TRANSMIT SECOND SIGNAL S2
END

FIG. 8

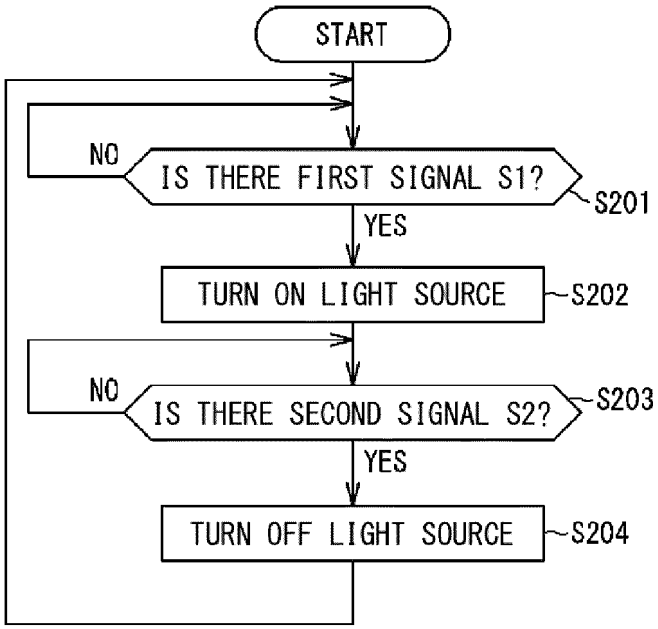

START
NO
IS THERE FIRST SIGNAL S1?
S201
YES
TURN ON LIGHT SOURCE
S202
NO
IS THERE SECOND SIGNAL S2?
S203
YES
TURN OFF LIGHT SOURCE
S204

FIG. 9

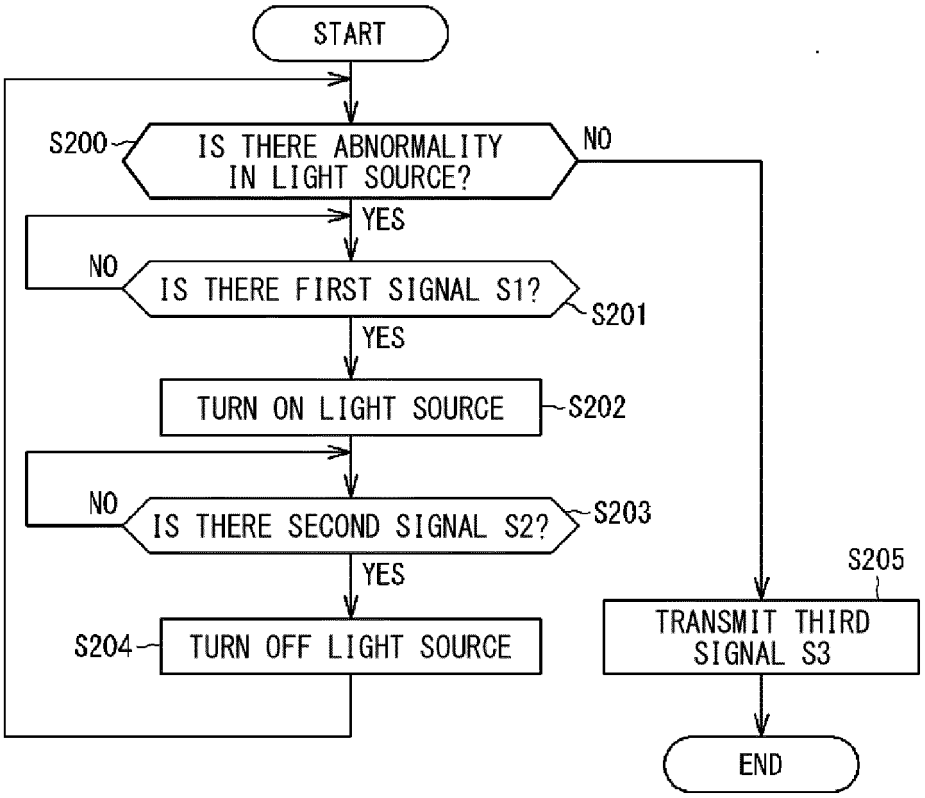

START
S200
IS THERE ABNORMALITY IN LIGHT SOURCE?
NO
YES
NO
IS THERE FIRST SIGNAL S1?
S201
YES
TURN ON LIGHT SOURCE
S202
NO
IS THERE SECOND SIGNAL S2?
S203
YES
S204
TURN OFF LIGHT SOURCE
S205
TRANSMIT THIRD SIGNAL S3
END

FIG. 10

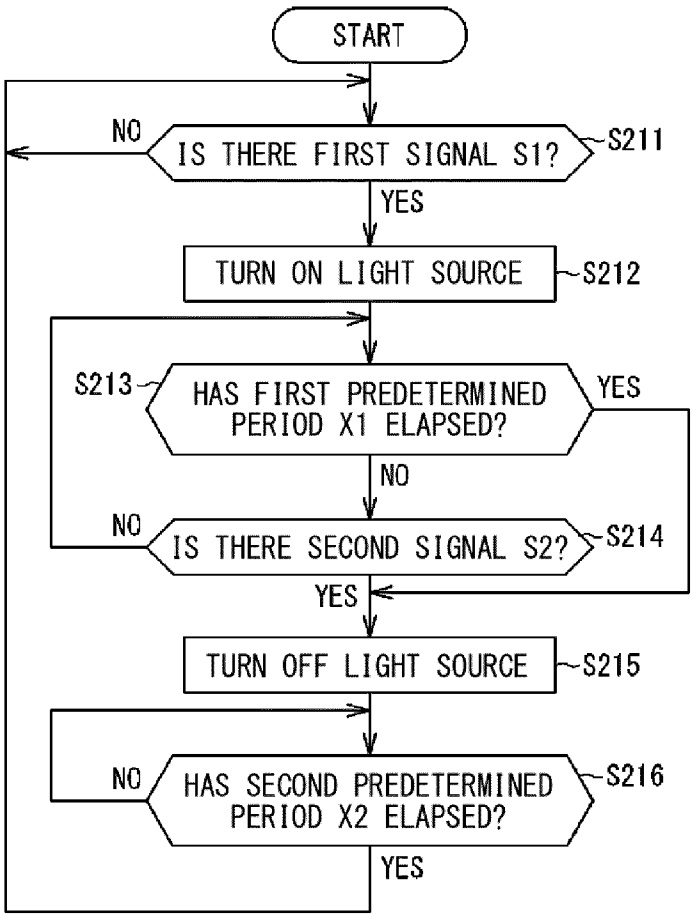
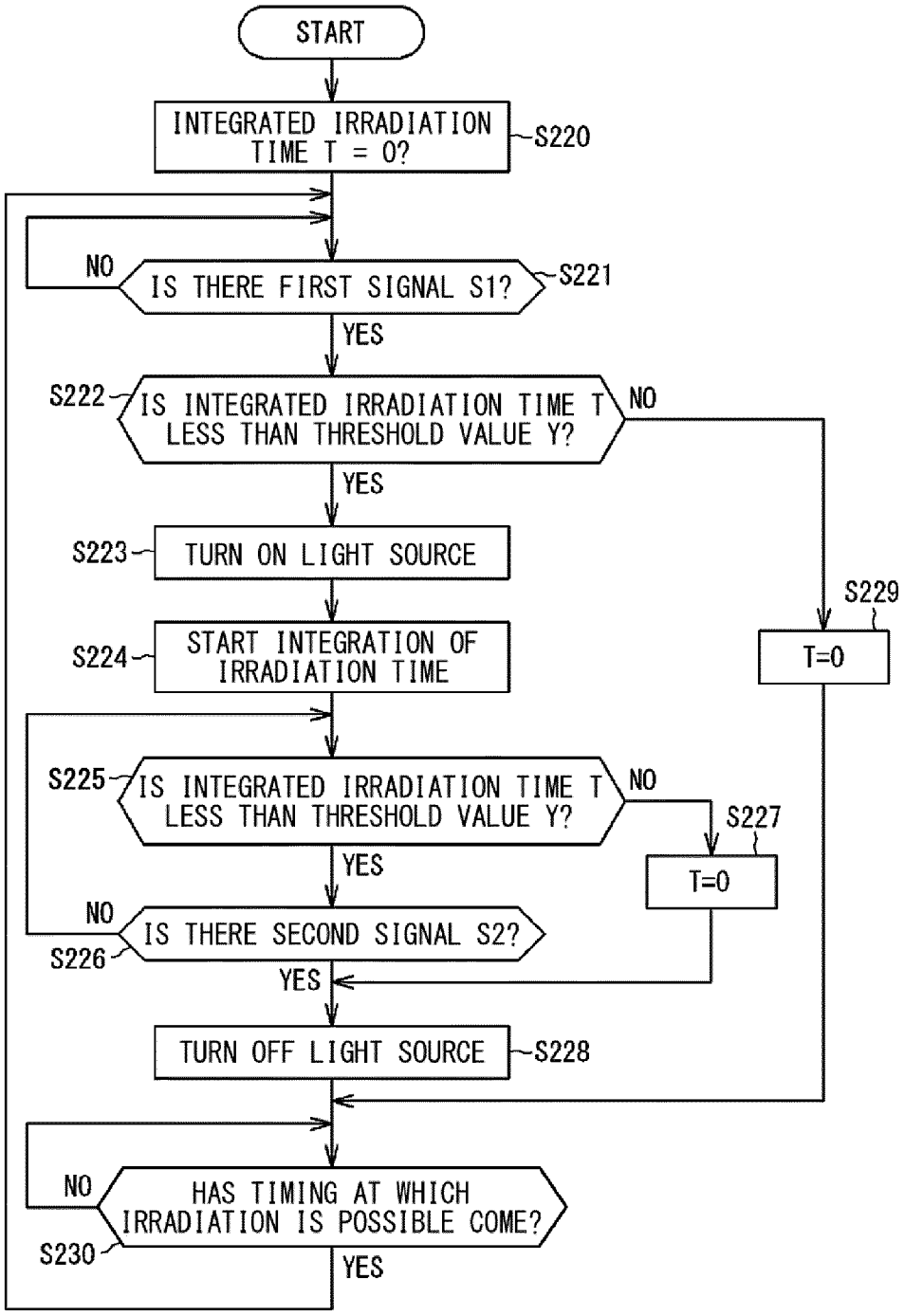

START
NO
IS THERE FIRST SIGNAL S1?
S211
YES
TURN ON LIGHT SOURCE
S212
S213
HAS FIRST PREDETERMINED PERIOD X1 ELAPSED?
YES
NO
NO
IS THERE SECOND SIGNAL S2?
S214
YES
TURN OFF LIGHT SOURCE
S215
NO
HAS SECOND PREDETERMINED PERIOD X2 ELAPSED?
S216
YES

FIG. 11


START
INTEGRATED IRRADIATION TIME T = 0?
S220
NO
IS THERE FIRST SIGNAL S1?
S221
YES
S222
IS INTEGRATED IRRADIATION TIME T LESS THAN THRESHOLD VALUE Y?
NO
YES
S223
TURN ON LIGHT SOURCE
S224
START INTEGRATION OF IRRADIATION TIME
S229
T=0
S225
IS INTEGRATED IRRADIATION TIME T LESS THAN THRESHOLD VALUE Y?
NO
S227
T=0
YES
NO
IS THERE SECOND SIGNAL S2?
S226
YES
TURN OFF LIGHT SOURCE
S228
NO
HAS TIMING AT WHICH IRRADIATION IS POSSIBLE COME?
S230
YES

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2023/003930

A. CLASSIFICATION OF SUBJECT MATTER

F24F 11/63(2018.01)i; ***F24F 1/0076***(2019.01)i; ***F24F 8/22***(2021.01)i
FI: F24F11/63; F24F8/22; F24F1/0076

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)

F24F11/63; F24F1/0076; F24F8/22

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2023
Registered utility model specifications of Japan 1996-2023
Published registered utility model applications of Japan 1994-2023

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2005-207675 A (CORONA CORP) 04 August 2005 (2005-08-04) paragraphs [0008]-[0029], fig. 1-6	1-9
Y	JP 2022-32007 A (DAIKIN IND LTD) 24 February 2022 (2022-02-24) paragraphs [0059]-[0067], fig. 1	1-9
Y	JP 2006-38355 A (MATSUSHITA ELECTRIC IND CO LTD) 09 February 2006 (2006-02-09) paragraphs [0023]-[0030], fig. 1-5	2-3, 6-9
Y	KR 20-0406806 Y1 (LEE, Seung-Il) 24 January 2006 (2006-01-24) p. 5, lines 12-13	8-9
A	JP 2003-207164 A (SANYO ELECTRIC CO LTD) 25 July 2003 (2003-07-25) entire text, all drawings	1-9

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

* Special categories of cited documents:
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"E" earlier application or patent but published on or after the international filing date
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 April 2023	**09 May 2023**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2023/003930

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 2005-207675 A	04 August 2005	(Family: none)	
JP 2022-32007 A	24 February 2022	EP 4155616 A1 paragraphs [0059]-[0067], fig. 1 WO 2022/014144 A1 CN 115777054 A AU 2021307800 A1	
JP 2006-38355 A	09 February 2006	(Family: none)	
KR 20-0406806 Y1	24 January 2006	(Family: none)	
JP 2003-207164 A	25 July 2003	(Family: none)	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2021055892 A **[0003]**