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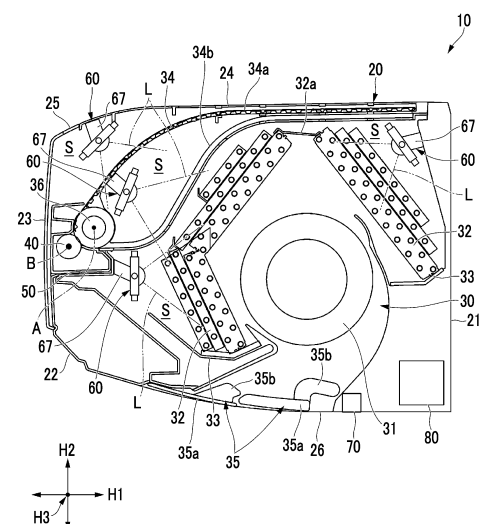
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(54) **AIR CONDITIONER**

(57) An air conditioner comprising a casing that has an intake port and an outlet, a heat exchanger provided in the casing, a fan that is provided in the casing and causes air to flow through the intake port, the heat exchanger, and the outlet in the stated order, and an irradiation part provided in the casing, the irradiation part having a light source that projects directional ultraviolet rays and a drive part that drives so that the orientation of the light source changes.

FIG. 1



Description

Brief Description of Drawings

Technical Field

[0009]

[0001] The present disclosure relates to an air conditioner.

[0002] This application claims the priority of Japanese Patent Application No. 2021-027835 filed in Japan on February 24, 2021, the content of which is incorporated herein by reference.

Background Art

[0003] PTL 1 discloses an air conditioner that sterilizes and disinfects a surface of an air filter included in an indoor unit of the air conditioner by irradiating the surface of the air filter with ultraviolet rays.

Citation List

Patent Literature

[0004] [PTL 1] Japanese Unexamined Patent Application Publication No. 2015-197224

Summary of Invention

Technical Problem

[0005] Incidentally, a portion of the indoor unit which needs to be sterilized is not limited to the air filter. For example, although the portion includes an intake port, an outlet, and a heat exchanger, all of these are less likely to be irradiated with ultraviolet rays while being collectively brought into an irradiation range.

[0006] The present disclosure is made to solve the above-described problem, and an object of the present disclosure is to provide an air conditioner capable of irradiating a wide range inside an indoor unit with ultraviolet rays. Solution to Problem

[0007] According to the present disclosure, in order to solve the above problems, there is provided an air conditioner including a casing having an intake port and an outlet, a heat exchanger provided inside the casing, a fan provided inside the casing to circulate air in order of the intake port, the heat exchanger, and the outlet, and an irradiation part provided inside the casing. The irradiation part has a light source that projects directional ultraviolet rays, and a drive part that drives the light source to change a posture of the light source.

Advantageous Effects of Invention

[0008] According to the present disclosure, it is possible to provide an air conditioner capable of irradiating a wide range inside an indoor unit with ultraviolet rays.

Fig. 1 is a sectional view of an indoor unit of an air conditioner according to an embodiment of the present disclosure.

Fig. 2 is a view for describing a configuration of an irradiation part according to the embodiment of the present disclosure.

Fig. 3 is a functional block diagram illustrating a configuration of a control device according to the embodiment of the present disclosure.

Fig. 4 is a functional block diagram illustrating an operation of the control device according to the embodiment of the present disclosure.

Fig. 5 is a hardware configuration diagram illustrating a configuration of a computer according to the embodiment of the present disclosure.

Description of Embodiments

(Air Conditioner)

[0010] An air conditioner 1 includes an indoor unit 10 provided indoors and an outdoor unit (not illustrated) provided outdoors for the indoor unit 10 via a pipe. The indoor unit 10 suctions indoor air, adjusts a temperature or humidity of the air inside the indoor unit 10, and thereafter, blows out the air to perform air conditioning on the indoor air.

[0011] Hereinafter, the indoor unit 10 according to an embodiment of the present disclosure will be described with reference to Fig. 1.

(Indoor Unit)

[0012] The indoor unit 10 includes a casing 20, a main body part 30, an irradiation part 60, a sensor 70, and a control device 80.

(Casing)

[0013] As panels surrounding the main body part 30 of the indoor unit 10, the casing 20 has an inlet panel 23, a top surface panel 24, a bottom surface panel 22, a rear surface panel 21, and a pair of side surface panels (not illustrated).

[0014] The inlet panel 23 is a panel having an intake port 25 in an upper portion to suction air outside the casing 20 into the casing 20 and disposed to cover a front surface of the main body part 30.

[0015] The rear surface panel 21 is a panel fixed to an indoor wall for installing the indoor unit 10 and disposed to cover a rear surface of the main body part 30 at a position facing the inlet panel 23.

[0016] The top surface panel 24 is a panel disposed so that end portions of the top surface panel 24 respec-

tively engage with upper ends of the inlet panel 23 and the rear surface panel 21 to cover an upper surface of the main body part 30.

[0017] The bottom surface panel 22 is a panel having an outlet 26 for blowing the air inside the casing 20 to the outside of the casing 20, and disposed to cover a bottom surface of the main body part 30 at a position facing the top surface panel 24.

[0018] The side surface panel is a panel disposed so that end portions of the side surface panel respectively engage with end portions of all of the above-described panels in a width direction H3 to cover right and left side portions of the main body part 30 in the width direction H3.

[0019] Therefore, the casing 20 formed by the above-described panels has the intake port 25 and the outlet 26.

[0020] Hereinafter, in the present embodiment, an installation direction H1 means a rightward-leftward direction in Fig. 1. One side in the installation direction H1 means a direction from the rear surface panel 21 toward the inlet panel 23, and the other side in the installation direction H1 means a direction opposite thereto. In addition, an upward-downward direction H2 means an upward-downward direction in Fig. 1, and the width direction H3 means a paper surface depth direction in Fig. 1.

(Main Body Part)

[0021] The main body part 30 has a fan 31, a heat exchanger 32, a drain pan 33, a first accommodating portion 34a, a second accommodating portion 34b, an air filter 34, a transport roller 36, a removing portion 40, and a flap 35. All of these are provided inside the casing 20.

(Fan)

[0022] The fan 31 is a so-called cross-flow fan extending in the width direction H3 of the casing 20. The fan 31 rotates inside the casing 20 to circulate air in order of the intake port 25, the heat exchanger 32, and the outlet 26.

(Heat Exchanger)

[0023] The heat exchanger 32 is provided to surround an upper-half portion of the fan 31 from an outer periphery thereof. The heat exchanger 32 has a first heat exchanger and a second heat exchanger.

[0024] The first heat exchanger is provided on one side in the installation direction H1 with respect to the fan 31. When viewed in the width direction H3, the first heat exchanger is bent in the vicinity of the center, and is in a V-shaped state in a direction toward the rear surface panel 21 in the installation direction H1. The first heat exchanger is divided into an upper portion and a lower portion around a bent portion.

[0025] The second heat exchanger is provided on the other side in the installation direction H1 with respect to the fan 31.

[0026] Upper ends of the first heat exchanger and the second heat exchanger are connected by a bracket 32a. The first heat exchanger and the second heat exchanger include three panel-shaped heat exchangers 32, and the respective panel is disposed to overlap each other in a direction toward the fan 31.

[0027] The air after heat exchange with the heat exchanger 32 is blown outward of the casing 20 through the outlet 26.

(Drain Pan)

[0028] The drain pan 33 is provided below the heat exchanger 32, and extends in the width direction H3. The drain pan 33 has a function of a saucer that collects drain water or slime generated from the heat exchanger 32 and receives the drain water or the slime not to leak outward of the casing 20. The drain water or the slime collected in the drain pan 33 is discharged outdoor by a drain pipe (not illustrated) connected to the drain pan 33.

(First Accommodating Portion)

[0029] The first accommodating portion 34a is an accommodating portion that accommodates the air filter 34 provided above the inside of the casing 20. A portion of the first accommodating portion 34a is located among the inlet panel 23, the top surface panel 24, and the first heat exchanger, and the remaining portion is located between the top surface panel 24 and the second heat exchanger. Therefore, the first accommodating portion 34a extends in the installation direction H1, and the portion of the first accommodating portion 34a extends while being curved downward in the upward-downward direction H2 as the first accommodating portion 34a is directed to one side from the other side in the installation direction H1. Furthermore, one end of a tip extending downward is close to the transport roller 36, and is open upward of the transport roller 36.

[0030] In a state where the air filter 34 is accommodated, the first accommodating portion 34a satisfactorily circulates the air from one side to the other side in the installation direction H1 via the air filter 34, and guides the air to the first heat exchanger and the second heat exchanger.

(Second Accommodating Portion)

[0031] The second accommodating portion 34b is an accommodating portion of the air filter 34 provided inside the casing 20. The second accommodating portion 34b is located among the first accommodating portion 34a, the first heat exchanger, and the second heat exchanger. Therefore, the second accommodating portion 34b extends in the installation direction H1, and the second accommodating portion 34b extends while being curved downward in the upward-downward direction H2 as the second accommodating portion 34b is directed to one

side from the other side in the installation direction H1. One end of a tip extending downward is close to the transport roller 36, and is open downward of the transport roller 36.

[0032] A volume of a space for accommodating the air filter 34 inside the second accommodating portion 34b is substantially the same as a volume of a space for accommodating the air filter 34 inside the first accommodating portion 34a.

[0033] In a state where the air filter 34 is accommodated, the second accommodating portion 34b satisfactorily circulates the air from one side to the other side in the installation direction H1 via the air filter 34, and guides the air to the first heat exchanger and the second heat exchanger.

(Air Filter)

[0034] The air filter 34 is a sheet-shaped filter accommodated in the first accommodating portion 34a and the second accommodating portion 34b. The air filter 34 has a size precisely fitted to a space that accommodates the air filter 34 of the first accommodating portion 34a or a space that accommodates the air filter 34 of the second accommodating portion 34b. The air filter 34 is accommodated in the first accommodating portion 34a as an initial position when the indoor unit 10 starts to be operated.

[0035] In a state of being accommodated in the first accommodating portion 34a, each of the air filters 34 has a plurality of filter gears in end portions in the width direction H3 of a surface of the air filter 34 facing the first heat exchanger side. More specifically, when the air filter 34 is viewed from one side in the installation direction H1, the plurality of filter gears are provided at an equal interval along the installation direction H1 in the end portions of the air filter 34 in the width direction H3.

(Transport Roller)

[0036] The transport roller 36 has a columnar shaft extending in the width direction H3 of the casing 20 and rotating around an axis A extending in the width direction H3, and roller gears. A plurality of the roller gears are provided at an equal interval over a circumferential direction on an outer peripheral surface of an end portion of the shaft in the width direction H3. The roller gear is formed to precisely mesh with the filter gear of the air filter 34. When the shaft portion rotates counterclockwise around the axis A at a predetermined timing in a state where the roller gear and the filter gear mesh with each other, the air filter 34 is guided from the first accommodating portion 34a along the outer peripheral surface of the transport roller 36, and is transported into the second accommodating portion 34b.

[0037] In addition, when the shaft portion rotates clockwise around the axis A at a predetermined timing after being accommodated inside the second accommodating

portion 34b, the air filter 34 is guided from the second accommodating portion 34b along the outer peripheral surface of the transport roller 36, is transported into the first accommodating portion 34a, and returns to an original initial position.

(Removing Portion)

[0038] The removing portion 40 has a columnar shaft portion extending in the width direction H3 of the casing 20 and rotating around a removing portion axis B extending in the width direction H3, and a brush.

[0039] The brush is provided over the circumferential direction to cover the outer peripheral surface of the shaft portion. The brush is formed of a soft material, and has a function of removing fine dust or dirt. A portion of the outer peripheral surface of the brush is in contact with the outer peripheral surface of the transport roller 36 in the width direction H3. When the transport roller 36 rotates, as the air filter 34 is transported, the air filter 34 is pinched between the transport roller 36 and the brush, and the brush comes into contact with one side surface of the air filter 34 where the roller gear is not provided.

[0040] Fine dust or dirt adhering to an entire area of the air filter 34 is removed by rotation of the brush and friction between the brush and the air filter 34 which occur while one side surface of the air filter 34 comes into contact with the brush. The removed fine dust or dirt falls into a dust box 50 existing below the removing portion 40.

[0041] The dust box 50 has a function of a saucer that receives dust or dirt removed from a main body surface of the air filter 34 by the removing portion 40.

(Flap)

[0042] The flap 35 has a panel portion 35a and an adjusting portion 35b. In the present embodiment, the main body part 30 has two flaps 35.

[0043] The panel portion 35a of each flap 35 is provided adjacent to the outlet 26 of the bottom surface panel 22 in the width direction H3. The adjusting portion 35b of each flap 35 adjusts a blowing direction of the air by adjusting an inclination angle of the panel portion 35a with respect to a lower surface of the bottom surface panel 22. In addition, when an operation of the indoor unit 10 is stopped, the adjusting portion 35b is driven to bring the panel portion 35a into a state of being substantially parallel to the bottom surface panel 22. In this manner, the outlet 26 is brought into a closed state by the two panel portions 35a.

[0044] Hereinafter, the irradiation part 60 of the present embodiment will be described with reference to Figs. 1 and 2.

(Configuration of Irradiation Part)

[0045] The irradiation part 60 is provided in a space S inside the casing 20. In the present embodiment, four

irradiation parts 60 are respectively provided inside four spaces S.

[0046] The irradiation part 60 has a light source 61 and a drive part 62.

(Light Source)

[0047] The light source 61 includes a light source body 61a and a light source support portion 61b.

[0048] The light source support portion 61b is a plate-shaped member that supports the light source body 61a.

[0049] The light source body 61a is provided in the center of the light source support portion 61b. The light source body 61a is an LED light bulb capable of projecting directional light L by supplied electric power. The light L is an ultraviolet ray having a sterilizing action by irradiating a bacterium or a virus with the light L. For example, the light L projected from the light source body 61a includes UV-C light. In addition, the reason why the light L which can be projected by the light source body 61a is directional is to secure the amount of energy required for sterilization per unit area of an irradiation range of the light L.

(Drive Part)

[0050] The drive part 62 includes a first frame body 63, a first frame body rotating portion 64, a second frame body 65, a second frame body rotating portion 66, and a support portion 67.

[0051] The first frame body 63 is a frame-shaped member having a predetermined plate thickness, which is substantially square in a front view and has rounded corners. The light source support portion 61b is provided over center portions of a portion corresponding to a pair of facing sides of the first frame body 63. In the center of the portion corresponding to the remaining pair of facing sides of the first frame body 63 where the light source support portion 61b is not provided, the first frame body rotating portion 64, which is a columnar member, is provided to protrude outward.

[0052] The second frame body 65 is a frame-shaped member having a predetermined plate thickness, which is substantially square in a front view and has rounded corners. The second frame body 65 has a shape similar to that of the first frame body 63, and has a size in which the first frame body 63 is fitted into a frame of the second frame body 65. In the second frame body 65, a hole having a diameter through which the first frame body rotating portion 64 can penetrate is formed in the center of the portion corresponding to the pair of facing sides. The first frame body rotating portion 64 protruding outward of the first frame body 63 passes through the hole, and is rotatably held by the second frame body 65 in a state of protruding outward of the second frame body 65.

[0053] The second frame body rotating portions 66, each of which is a columnar member, are provided to protrude outward in the center of the portion correspond-

ing to the remaining pair of facing sides on which the hole is not formed in the second frame body 65. Furthermore, a bracket 90 serving as a support member for the second frame body rotating portion 66 is provided in the space S inside the casing 20, and the second frame body rotating portion 66 is rotatably supported by the bracket 90.

[0054] The pair of first frame body rotating portions 64 can rotate around a lateral drive axis O1 while the lateral drive axis O1 is used as a common center axis. In this manner, the first frame body 63, the light source support portion 61b, and the light source body 61a, which are integrated with the first frame body rotating portion 64, can be rotated around the lateral drive axis O1 inside the second frame body 65.

[0055] In addition, the pair of second frame body rotating portions 66 can rotate around a longitudinal drive axis O2 while the longitudinal drive axis O2 is used as a common center axis. In this manner, the first frame body rotating portion 64, the first frame body 63, the light source support portion 61b, and the light source body 61a, which are integrated with the second frame body rotating portion 66, can be rotated around the longitudinal drive axis O2.

[0056] Therefore, the drive part 62 rotatably holds the light source 61 around two drive axes of the lateral drive axis O1 and the longitudinal drive axis O2.

[0057] The support portion 67 is a member for supporting, driving, and controlling the light source 61, the first frame body 63, the first frame body rotating portion 64, the second frame body 65, and the second frame body rotating portion 66, and is provided at an appropriate place inside the four spaces S. The support portion 67 has a built-in servo motor (not illustrated), and is rotatably provided by using power of the servo motor. The support portion 67 has a substantially cylindrical shape, and a tip of the support portion 67 on the light source 61 side is formed to be cut off by a virtual plane inclined with respect to a rotational axis O3 of the servo motor. That is, the tip of the support portion 67 is formed along the virtual plane inclined with respect to the rotational axis O3 of the servo motor. The support portion 67 has a wire (not illustrated) for supplying operating electric power to the light source 61 and the servo motor inside the support portion 67, and a control unit for driving and controlling the servo motor.

[0058] One surface of the light source support portion 61b on the support portion 67 side is in contact with the tip of the support portion 67 on the light source 61 side. More specifically, the light source support portion 61b is provided so that the surface extends along the virtual plane of the tip. In this manner, the light source support portion 61b is provided to be inclined with respect to the rotational axis O3 of the servo motor built in the support portion 67.

[0059] An optical axis of the light source body 61a is provided to be inclined with respect to the rotational axis O3 of the servo motor built in the support portion 67. An optical axis direction of the light source body 61a coincides with a normal direction of the virtual plane.

[0060] When the servo motor is driven, the support portion 67 rotates around the rotational axis O3. Along with this rotation, the virtual plane three-dimensionally tilts so that the light source support portion 61b also performs three-dimensional tilting in accordance with the rotation of the support portion 67. Here, the second frame body 65 is rotatably held with the indoor unit 10 via the second frame body rotating portion 66. Therefore, the above-described first frame body 63 is further interposed. In this manner, the rotation of the light source support portion 61b is restricted while the three-dimensional tilting is allowed.

[0061] Driving the servo motor is controlled by a control unit provided inside the support portion 67. More specifically, in order to keep the servo motor built in the support portion 67 at any desired position around the rotational axis O3 of the servo motor, the control unit rotates the servo motor by a predetermined amount at a predetermined timing, and thereafter, stops the servo motor. In addition, a cable that supplies electric power for driving and controlling the servo motor is electrically connected via a control unit inside the support portion 67.

[0062] That is, the drive part 62 can be provided at any desired location inside the space S, and the servo motor having the built-in support portion 67 is rotated. In this manner, the light source body 61a in which the optical axis is tilted with respect to the rotational axis O3 of the servo motor is configured to rotate. Therefore, a wide range inside the indoor unit 10 can be irradiated with the light L by a simple mechanism.

[0063] In addition, as the servo motor rotates, the light source 61 held by the drive part 62 rotates around two drive axes of the lateral drive axis O1 and the longitudinal drive axis O2. In this manner, it is possible to enlarge an irradiation range of the light L projected by the light source body 61a provided in the light source support portion 61b.

[0064] In addition, the irradiation part 60 and the support portion 67 have the above-described configuration when the irradiation part 60 is mounted inside the indoor unit 10. Therefore, it is possible to minimize restrictions when the irradiation part 60 and the support portion 67 are installed. That is, the irradiation part can three-dimensionally tilt around the two drive axes by using one servo motor. Therefore, cable wiring can be easily arranged, and it is possible to minimize a volume ratio occupied by the irradiation part 60 inside the space S. In this manner, when it becomes necessary to mount a plurality of the irradiation parts in accordance with locations requiring sterilization inside the indoor unit 10, it is possible to particularly effectively secure mounting ability of the irradiation part 60 on the indoor unit 10.

(Position of Irradiation Part)

[0065] The first irradiation part 60 in the present embodiment is provided inside the space S partitioned into the second heat exchanger, the rear surface panel 21, and the top surface panel 24. More specifically, the sup-

port portion 67 is fixed to a surface of the rear surface panel 21 facing the inside of the casing 20, and the light source 61 is disposed to face the whole second heat exchanger and the drain pan 33 below the second heat exchanger. In this manner, since the drive part 62 is rotationally driven, the whole second heat exchanger and the drain pan 33 below the second heat exchanger can be irradiated with the light L.

[0066] In addition, the light source 61 can face the outlet 26 and the flap 35 by rotating the drive part 62. In this manner, the outlet 26 and the flap 35 can be irradiated with the light L from the inside of the casing 20 via the second heat exchanger, the drain pan 33, and the fan 31.

[0067] The second irradiation part 60 in the present embodiment is provided inside the space S partitioned into the first accommodating portion 34a, the top surface panel 24, and the inlet panel 23. More specifically, the support portion 67 is fixed to a surface of the top surface panel 24 facing the inside of the casing 20, and the light source 61 is disposed to face the first accommodating portion 34a and the air filter 34. In this manner, since the drive part 62 is rotationally driven, the air filter 34 can be irradiated with the light L.

[0068] In addition, the drive part 62 is rotated so that the light source 61 can face the intake port 25. In this manner, the intake port 25 can be irradiated with the light L from the inside of the casing 20.

[0069] The third irradiation part 60 in the present embodiment is provided inside the space S partitioned into the first accommodating portion 34a and the second accommodating portion 34b. More specifically, the support portion 67 is fixed to a surface of the first accommodating portion 34a facing the first heat exchanger, and the light source 61 is disposed to face an entire upper portion of the second accommodating portion 34b and the first heat exchanger. In this manner, since the drive part 62 is rotationally driven, the entire upper portion of the first heat exchanger can be irradiated with the light L.

[0070] In addition, when the air filter 34 is accommodated in the second accommodating portion 34b, a surface provided with the filter gear portion in the air filter 34 can be irradiated with the light L.

[0071] The fourth irradiation part 60 in the present embodiment is provided inside the space S partitioned into the dust box 50, the second accommodating portion 34b, the first heat exchanger, and the bottom surface panel 22. More specifically, the support portion 67 is fixed to a portion of the dust box 50 facing the first heat exchanger, and the light source 61 is disposed to face the entire lower portion of the first heat exchanger and the drain pan 33 below the first heat exchanger. In this manner, since the drive part 62 is rotationally driven, the entire lower portion of the first heat exchanger and the drain pan 33 below the first heat exchanger can be irradiated with the light L.

[0072] In addition, since the drive part 62 rotates, the light source 61 can face the outlet 26. In this manner, the outlet 26 can be irradiated with the light L from the inside

of the casing 20 via the first heat exchanger and the drain pan 33 below the first heat exchanger.

[0073] Therefore, the irradiation part 60 is provided inside the casing 20 so that at least one of the intake port 25, the heat exchanger 32, and the outlet 26 can be irradiated with the light L projected from the light source 61.

(Sensor)

[0074] The sensor 70 is provided in the vicinity of the flap 35 on the bottom surface of the indoor unit 10.

[0075] For example, the sensor 70 is a pyroelectric sensor that can detect that a person is present around the indoor unit 10, or a solar radiation sensor that detects brightness in a room in which the indoor unit 10 is installed.

[0076] When the sensor 70 is the pyroelectric sensor, the pyroelectric sensor transmits a person detection signal to the control device 80 after detecting that the person is present in the room.

[0077] When the sensor 70 is the solar radiation sensor, and when detecting that illuminance in the room is lower (darker) than a predetermined illuminance threshold value, the solar radiation sensor transmits an illuminance detection signal to the control device 80.

(Control Device)

[0078] The control device 80 is provided in the vicinity of a wall surface of a main body lower portion of the indoor unit 10. The control device 80 receives a detection signal transmitted from the sensor 70, specifies an irradiation range of the light L emitted by the irradiation part 60, transmits a drive control signal to the control unit inside the support portion 67, and controls driving of the drive part 62.

[0079] The control device 80 includes a signal receiving portion 81, an irradiation range specifying portion 82, and a drive control unit 83. The control device 80 is connected to the sensor 70 by wire or wirelessly.

[0080] The signal receiving portion 81 receives the detection signal transmitted from the sensor 70. The signal receiving portion 81 transmits the received detection signal to the irradiation range specifying portion 82.

[0081] The irradiation range specifying portion 82 specifies the irradiation range of the light L of the irradiation part 60, based on detection data included in the received detection signal.

[0082] The irradiation range specified by the irradiation range specifying portion 82 includes a first irradiation range and a second irradiation range. The first irradiation range is a range in which the irradiation part 60 irradiates a wide range inside the casing 20 with the light L. The second irradiation range is an irradiation range of the light L which is narrower than the first irradiation range, and is a range in which the light L projected by the irradiation part 60 does not leak outward of the indoor unit 10.

[0083] When the detection data received by the irradiation range specifying portion 82 is person detection data

transmitted from a person detection sensor, the irradiation range specifying portion 82 specifies the irradiation range as a second irradiation range.

[0084] When the detection data received by the irradiation range specifying portion 82 is illuminance data transmitted from an illuminance sensor, the irradiation range specifying portion 82 compares a value of the illuminance data with a predetermined threshold value, and when the value of the illuminance data is lower than the threshold value, the irradiation range specifying portion 82 determines that the room is dark, and specifies the irradiation range as a second irradiation range. In addition, the irradiation range specifying portion 82 compares the value of the illuminance data with the predetermined threshold value, and when the value of the illuminance data is higher than the threshold value, the irradiation range specifying portion 82 determines that the room is bright, and specifies the irradiation range as the first irradiation range.

[0085] After the irradiation range specifying portion 82 specifies the irradiation range, the drive control unit 83 transmits a control signal based on the specified irradiation range to the control unit inside the support portion 67.

[0086] When the irradiation range specifying portion 82 specifies the irradiation range as the first irradiation range, the drive control unit 83 transmits a signal for normal-time driving to the control units inside all of the support portions 67 provided inside the casing 20. In addition, when the irradiation range specifying portion 82 specifies the irradiation range as the second irradiation range, the drive control unit 83 transmits a signal for bringing the irradiation part 60 into a state of facing the top surface panel 24 side to the control units inside all of the support portions 67 provided inside the casing 20.

(Operation of Control Device)

[0087] Hereinafter, an operation of the control device 80 will be described. Fig. 4 is a flowchart illustrating the operation of the control device 80.

[0088] The signal receiving portion 81 receives the detection data transmitted from the sensor 70 (Step S1).

[0089] The irradiation range specifying portion 82 specifies the irradiation range of the light L of the irradiation part 60, based on the detection data received by the signal receiving portion 81 (Step S2).

[0090] The drive control unit 83 transmits a signal for instructing the driving to the control unit inside the support portion 67, based on the irradiation range specified by the irradiation range specifying portion 82, and controls the driving of the drive part 62 (Step S3).

(Operational Effect)

[0091] According to the above-described configuration, the drive part 62 can change a posture of the light

source 61. In this manner, the posture of the light source 61 that projects the light L having a sterilizing action can be changed by the drive part 62. Therefore, a wide range inside the casing 20 can be irradiated with the light L, and bacteria or viruses can be sterilized.

[0092] In addition, the irradiation part 60 rotates around the lateral drive axis O1 and the longitudinal drive axis O2. In this manner, since the drive part 62 rotates around the two axes, the posture of the light source 61 can be changed by the two axes. Therefore, a direction in which the light L is projected by the light source 61 can be three-dimensionally changed in any desired way. Therefore, a wide range can be irradiated with the light L.

[0093] In addition, the servo motor built in the support portion 67 can be kept at a predetermined position at any desired timing. That is, the control unit controls the postures of the plurality of irradiation parts 60 so that the same location can be intensively irradiated with the light L projected by the plurality of irradiation parts 60. Accordingly, partial sterilizing ability can be improved. In this manner, even when bacteria or viruses locally appear inside the indoor unit 10, bacteria or viruses can be effectively sterilized.

[0094] In addition, the irradiation part 60 is provided so that the intake port 25, the heat exchanger 32, and the outlet 26 are irradiated with the light L projected from the light source 61. In this manner, bacteria or viruses contained in the air introduced into the casing 20, or in the air blown out of the heat exchanger 32 and the casing 20 can be sterilized. Therefore, clean air can be provided indoors.

[0095] In addition, the irradiation part 60 is provided so that the drain pan 33 can be irradiated with the light L projected from the light source 61. In this manner, the drain pan 33 in which bacteria or viruses are likely to appear can be sterilized, and the inside of the casing 20 can be kept in a cleaner state with less bacteria and viruses. Therefore, cleaner air can be provided indoors.

[0096] In addition, the irradiation part 60 is provided so that the air filter 34 can be irradiated with the light L projected from the light source 61. In this manner, the inside of the casing 20 can be kept in a cleaner state with less bacteria and viruses. Therefore, cleaner air can be provided indoors.

[0097] In addition, since bacteria or viruses adhering to the air filter 34 are sterilized, even during maintenance such as cleaning the air filter 34, when a user of the indoor unit 10 accidentally suctions fine dust or dirt, an adverse effect on a human body is reduced.

[0098] In addition, the transport roller 36 rotates so that the air filter 34 is transported from the first accommodating portion to the second accommodating portion or from the second accommodating portion to the first accommodating portion. In this manner, a location which is not irradiated with the light L before the air filter 34 is transported due to intermediate transport stopping can be irradiated with the light L. Therefore, the air filter 34 can be evenly irradiated with the light L.

[0099] In addition, the control device 80 drives and controls the drive part 62, based on the detection signal of the sensor 70. In this manner, when a person is present in the vicinity of the indoor unit 10 or when the room is dark while a user of the indoor unit 10 sleeps, the light L of the irradiation part 60 does not leak outward of the casing 20. Therefore, the indoor unit 10 can be safely used.

[0100] In addition, the light L that can be projected by the light source body 61a is directional, and the control unit can rotate the light source 61. In this manner, the irradiation range of the light L can be continuously enlarged while the amount of energy required for sterilization per unit area of the irradiation range of the light L is secured. Therefore, effective sterilization inside the indoor unit 10 can be realized.

(Other Embodiments)

[0101] Hitherto, the embodiments of the present disclosure have been described in detail with reference to the drawings. However, specific configurations are not limited to the configurations of each embodiment, and additions, omissions, and substitutions of configurations and other modifications can be made within the scope not departing from the concept of the present disclosure. In addition, the present disclosure is not limited by the embodiments, and is limited only by the appended claims.

[0102] Fig. 5 is a hardware configuration diagram illustrating a configuration of a computer 1100 according to the above-described embodiment.

[0103] A computer 1100 includes a processor 1110, a main memory 1120, a storage 1130, and an interface 1140.

[0104] The above-described control device 80 is mounted on the computer 1100. Then, the operation of each of the processing units described above is stored in the storage 1130 in a form of a program. The processor 1110 reads the program from the storage 1130, develops the read program in the main memory 1120, and executes the above-described process in accordance with the program. In addition, the processor 1110 secures a storage area corresponding to each storage unit described above in the main memory 1120 in accordance with the program.

[0105] The program may be intended to realize some of functions fulfilled by the computer 1100. For example, the program may fulfill a function in combination with another program previously stored in the storage 1130, or in combination with another program installed in another device. In addition, the computer 1100 may include a custom large scale integrated circuit (LSI) such as a programmable logic device (PLD) in addition to or in place of the above-described configuration. Examples of the PLD include a programmable array logic (PAL), a generic array logic (GAL), a complex programmable logic device (CPLD), and a field programmable gate array (FPGA).

In this case, functions that are realized by the processor 1110 may be partially or entirely realized by the integrated circuit.

[0106] As an example of the storage 1130, a magnetic disk, a magneto-optical disk, or a semiconductor memory can be used. The storage 1130 may be an internal medium directly connected to a bus of the computer 1100, or may be an external medium connected to the computer 1100 via the interface 1140 or a communication line. In addition, when this program is distributed to the computer 1100 via the communication line, the computer 1100 receiving the distributed program may develop the program in the main memory 1120 to execute the above-described process. In the above-described embodiment, the storage 1130 is a tangible storage medium that is not temporary.

[0107] In addition, the program may be used to partially realize the above-described functions. In addition, the program may be a so-called difference file (difference program) that realizes the above-described functions in combination with another program previously stored in the storage 1130.

[0108] In addition, in the above-described embodiment, an example in which every irradiation part 60 is provided in each of the four spaces S inside the casing 20 has been described. However, the number of the irradiation parts 60 is not limited, and a plurality of the irradiation parts 60 may be provided inside the space S. In this manner, the postures of the plurality of irradiation parts 60 are separately controlled so that the inside of the indoor unit 10 can be more efficiently sterilized.

[0109] In addition, in the above-described embodiment, the irradiation part 60 is provided to be rotatable around the two axes by the rotation of the first frame body rotating portion and the second frame body rotating portion. However, the rotational axes of the irradiation part 60 are not limited to the two axes, and a configuration of the rotation around three or more axes may be adopted.

[0110] In addition, in the above-described embodiment, the irradiation part 60 is configured to directly irradiate each member, but may be configured to indirectly irradiate the member by using a light guide plate to reflect the light L. In this manner, a blind spot portion or a narrow portion of the member can be irradiated with the light L, and a wider range can be irradiated with the light L.

[0111] In addition, in the above-described embodiment, the sensor 70 is provided in the vicinity of the flap 35 on the bottom surface of the indoor unit 10, and the control device 80 is provided in the vicinity of the lower portion of the rear surface panel 21. However, a place for providing the sensor 70 and the control device 80 is not limited. The sensor 70 and the control device 80 may be provided at an appropriate place inside or outside the casing.

[0112] In addition, the sensor 70 may be an infrared sensor. A configuration in which a person detection signal is transmitted to the control device 80 may be adopted, when the infrared sensor detects that a person is present

by using temperature information in the vicinity of the indoor unit 10 which is obtained from the infrared sensor.

[0113] In addition, a member such as a rail extending in the width direction H3 may be provided inside the space S, and the support portion 67 for supporting the irradiation part 60 may be provided on the rail. In this manner, a configuration may be adopted so that the irradiation part 60 can move in the width direction H3. In this manner, a wider range can be more effectively irradiated with the light L.

[0114] In addition, the signal receiving portion 81 may receive an input of information related to specifying the irradiation range by using a remote controller (not illustrated) of the indoor unit 10.

[0115] In addition, an operation for setting a timer may be performed on the control device 80 by using the remote controller of the indoor unit 10, and the irradiation range specifying portion 82 may specify the irradiation range at a time of the set timer.

<Additional Notes>

[0116] For example, the air conditioner 1 according to the above-described embodiment is understood as follows.

[0117]

(1) According to a first aspect, there is provided the air conditioner 1 including the casing 20 having the intake port 25 and the outlet 26, the heat exchanger 32 provided inside the casing 20, the fan 31 provided inside the casing 20 to circulate the air in order of the intake port 25, the heat exchanger 32, and the outlet 26; and the irradiation part 60 provided inside the casing 20. The irradiation part 60 has the light source 61 that projects the directional ultraviolet rays, and the drive part 62 that drives the light source 61 to change a posture of the light source 61.

In this manner, the posture of the light source 61 that projects the light L having a sterilizing action can be changed by the drive part 62. Therefore, a wide range inside the casing 20 can be irradiated with the light L.

(2) According to a second aspect of the air conditioner 1, in the air conditioner 1 of (1), the drive part 62 may drive the irradiation part 60 to rotate around at least two drive axes.

In this manner, a direction in which the light L is projected by the light source 61 can be three-dimensionally changed. Therefore, a wide range can be irradiated with the light L.

(3) According to a third aspect of the air conditioner 1, in the air conditioner 1 of (1) or (2), the irradiation part 60 may be provided so that at least one of the intake port 25, the heat exchanger 32, and the outlet 26 is irradiated with the ultraviolet rays projected from the light source 61.

In this manner, bacteria or viruses contained in the

air introduced into the casing 20, or in the air blown out of the heat exchanger 32 and the casing 20 can be sterilized.

(4) According to a fourth aspect of the air conditioner 1, the air conditioner 1 of any one of (1) to (3) may further include the drain pan 33 below the heat exchanger 32 inside the casing 20. The irradiation part 60 may be provided so that the drain pan 33 is irradiated with the ultraviolet rays projected from the light source 61.

In this manner, the drain pan 33 in which bacteria or viruses are likely to appear can be sterilized, and the inside of the casing 20 can be kept in a cleaner state with less bacteria and viruses.

(5) According to a fifth aspect of the air conditioner 1, the air conditioner 1 of any one of (1) to (4) may further include the air filter 34 provided between the intake port 25 and the heat exchanger 32 inside the casing 20. The irradiation part 60 may be provided so that the air filter 34 is irradiated with the ultraviolet rays projected from the light source 61.

In this manner, the inside of the casing 20 can be kept in a cleaner state with less bacteria and viruses. In addition, during maintenance such as cleaning the air filter 34, when a person accidentally suctions fine dust or dirt, an adverse effect on a human body is reduced.

(6) According to a sixth aspect of the air conditioner 1, the air conditioner 1 of (5) may further include the transport roller 36 that transports the air filter 34 by rotating around the axis extending in the width direction H3 of the casing 20, and the removing portion 40 that removes a substance adhering to the air filter 34 by coming into contact with the air filter 34 transported by the transport roller 36.

In this manner, the air filter 34 can be evenly irradiated with the light L.

(7) According to a seventh aspect of the air conditioner 1, the air conditioner 1 of any one of (1) to (6) may further include the control device 80 that adjusts the irradiation range of the light source 61 by controlling the drive part 62. In accordance with a signal from the outside, the control device 80 may control the drive part 62 to set the irradiation range to any one of the first irradiation range and the second irradiation range narrower than the first irradiation range.

[0118] In this manner, when a person is present in the vicinity of the indoor unit 10 or when the room is dark while a user of the indoor unit 10 sleeps, the light L of the irradiation part 60 does not leak outward of the casing 20, and the user of the indoor unit 10 can safely use the indoor unit 10.

Industrial Applicability

[0119] According to the present disclosure, it is possi-

ble to provide an air conditioner capable of irradiating a wide range inside an indoor unit with ultraviolet rays.

Reference Signs List

[0120]

1: Air conditioner
 10: Indoor unit
 20: Casing
 21: Rear surface panel
 22: Bottom surface panel
 23: Inlet panel
 24: Top surface panel
 25: Intake port
 26: Outlet
 30: Main body part
 31: Fan
 32: Heat exchanger
 32a: Bracket
 33: Drain pan
 34: Air filter
 34a: First accommodating portion
 34b: Second accommodating portion
 35: Flap
 35a: Panel portion
 35b: Adjusting portion
 36: Transport roller
 40: Removing portion
 50: Dust box
 60: Irradiation part
 61: Light source
 61a: Light source body
 61b: Light source support portion
 62: Drive part
 63: First frame body
 64: First frame body rotating portion
 65: Second frame body
 66: Second frame body rotating portion
 67: Support portion
 70: Sensor
 80: Control device
 81: Signal receiving portion
 82: Irradiation range specifying portion
 83: Drive control unit
 90: Bracket
 1100: Computer
 1110: Processor
 1120: Main memory
 1130: Storage
 1140: Interface
 A: Axis
 B: Removing portion axis
 H1: Installation direction
 H2: Upward-downward direction
 H3: Width direction
 L: Light
 O1: Lateral drive axis

O2: Longitudinal drive axis
 O3: Rotational axis
 S: Space

with the air filter transported by the transport roller.

Claims

1. An air conditioner comprising:
 - a casing having an intake port and an outlet; 10
 - a heat exchanger provided inside the casing;
 - a fan provided inside the casing to circulate air in order of the intake port, the heat exchanger, and the outlet; and
 - an irradiation part provided inside the casing, 15 wherein the irradiation part has
 - a light source that projects directional ultra-violet rays, and
 - a drive part that drives the light source to 20 change a posture of the light source.
2. The air conditioner according to Claim 1, wherein the drive part drives the irradiation part to rotate around at least two drive axes. 25
3. The air conditioner according to Claim 1 or 2, wherein the irradiation part is provided so that at least one of the intake port, the heat exchanger, and the outlet is irradiated with the ultraviolet rays projected from the light source. 30
4. The air conditioner according to any one of Claims 1 to 3, further comprising: 35
 - a drain pan provided below the heat exchanger inside the casing, wherein the irradiation part is provided so that the drain pan is irradiated with the ultraviolet rays projected from the light source. 40
5. The air conditioner according to any one of Claims 1 to 4, further comprising:
 - an air filter provided between the intake port and the heat exchanger inside the casing, 45 wherein the irradiation part is provided so that the air filter is irradiated with the ultraviolet rays projected from the light source. 50
6. The air conditioner according to Claim 5, further comprising:
 - a transport roller that transports the air filter by rotating around an axis extending in a width direction of the casing; and 55
 - a removing portion that removes a substance adhering to the air filter by coming into contact
7. The air conditioner according to any one of Claims 1 to 6, further comprising:
 - a control device that adjusts an irradiation range of the light source by controlling the drive part, wherein in accordance with a signal from an outside, the control device controls the drive part to set the irradiation range to any one of a first irradiation range and a second irradiation range narrower than the first irradiation range.

FIG. 1

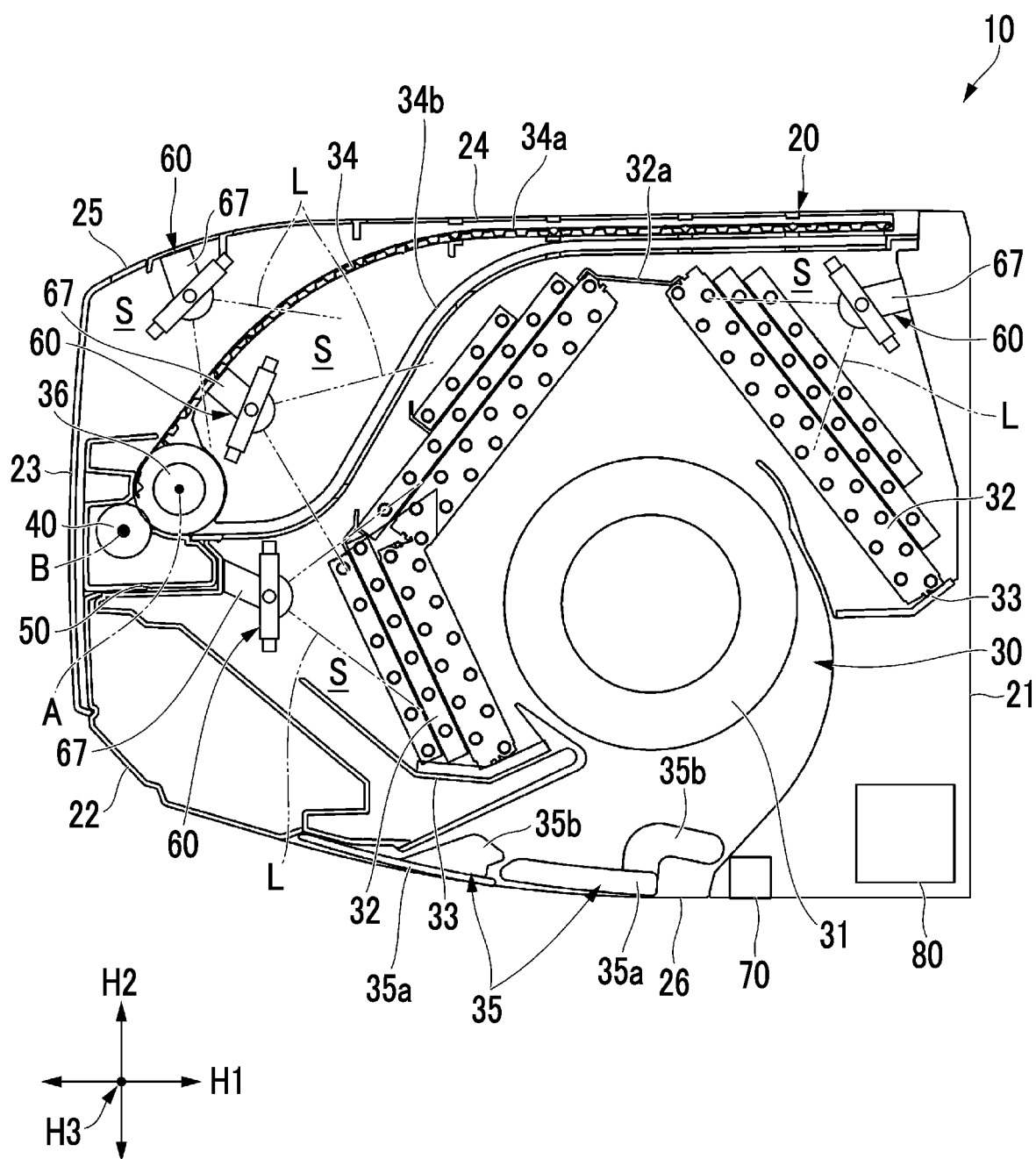


FIG. 2

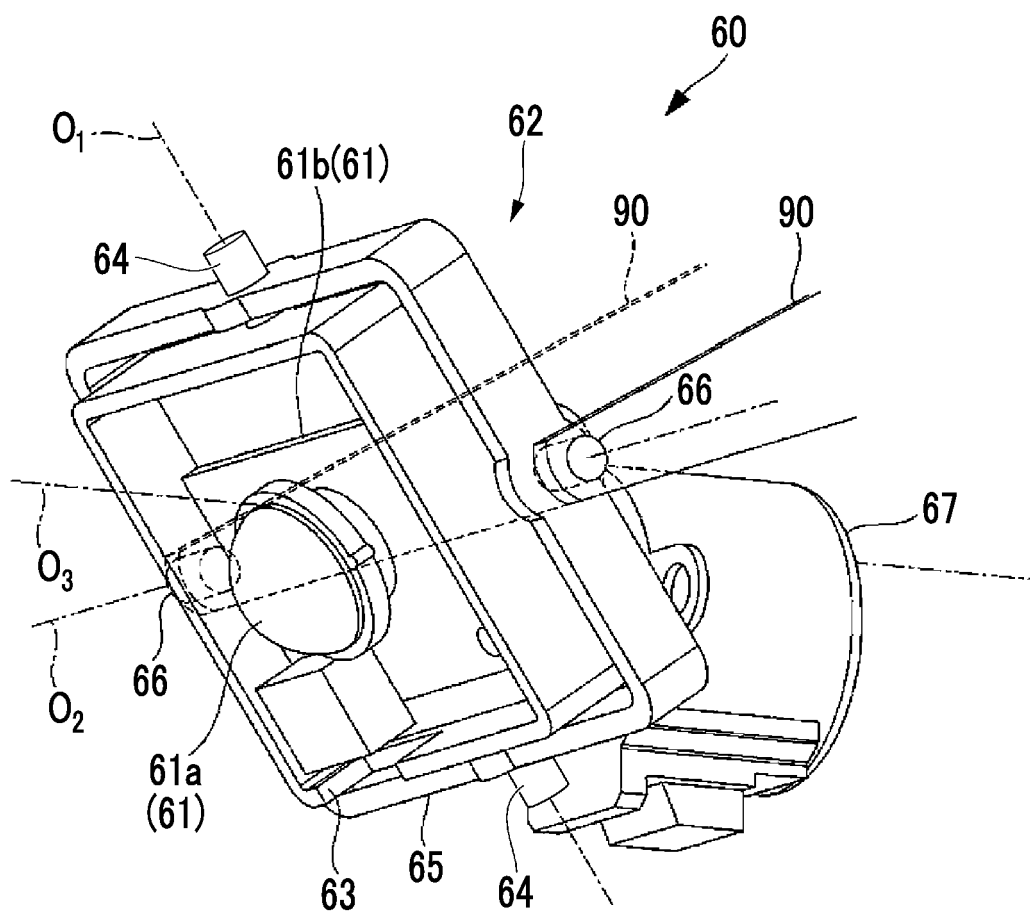


FIG. 3

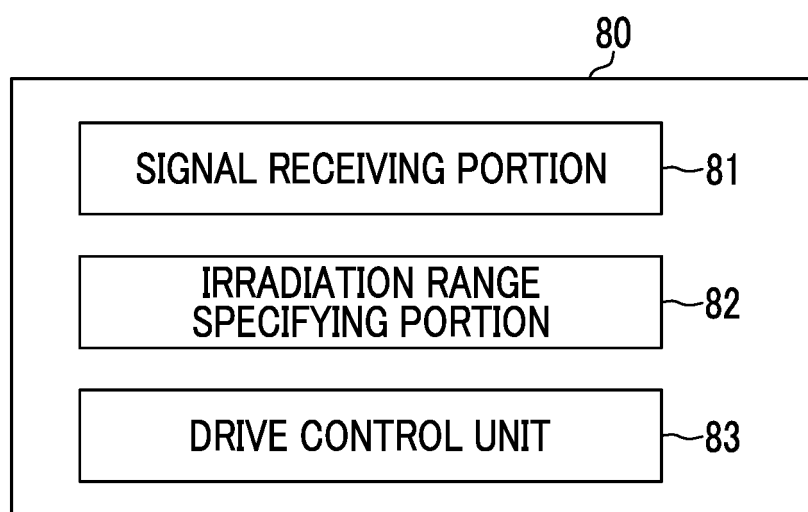


FIG. 4

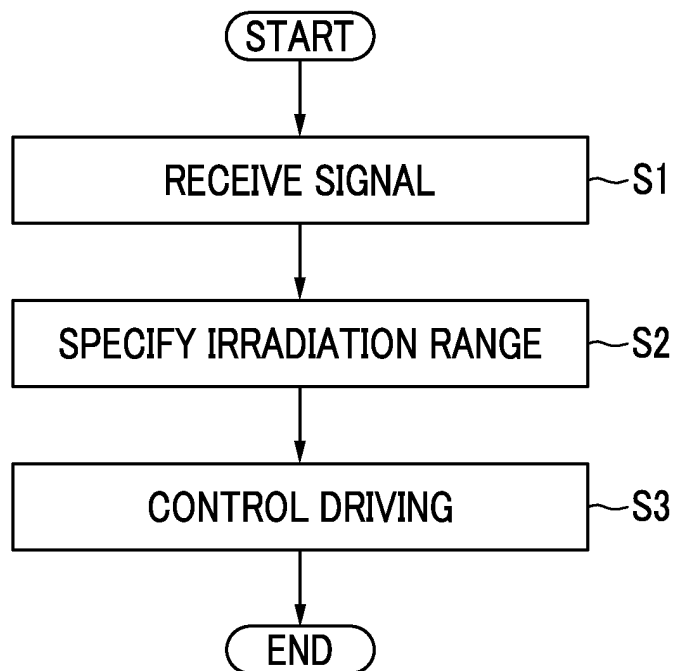
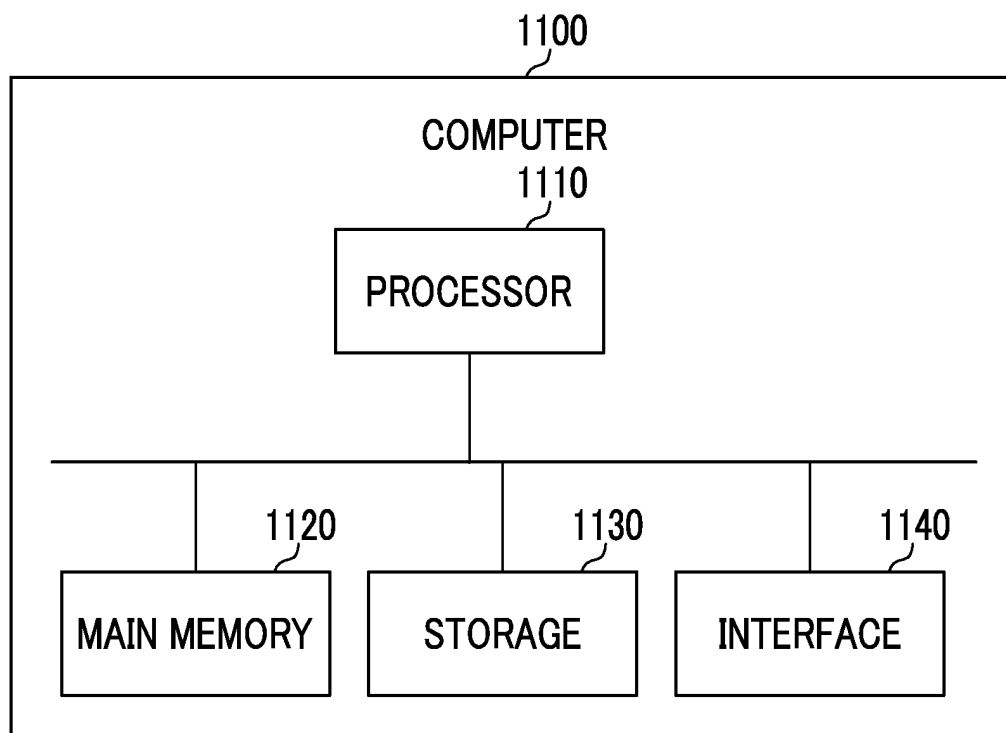


FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2021/039702

A. CLASSIFICATION OF SUBJECT MATTER**F24F 1/0071**(2019.01)i

FI: F24F1/0071

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F1/0071-1/008,F24F1/0328-1/0355,A61L2/00-2/18,A61L11/00-12/14

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 1971-2021
 Registered utility model specifications of Japan 1996-2021
 Published registered utility model applications of Japan 1994-2021

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.
X	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 106863/1991 (Laid-open No. 64014/1992) (MITSUBISHI HEAVY INDUSTRIES, LTD.) 01 June 1992 (1992-06-01), specification, p. 3, line 1 to p. 5, line 5, fig. 1-5	1, 3
Y		2-7
Y	JP 2019-026072 A (YAZAKI CORP.) 21 February 2019 (2019-02-21) paragraph [0017], fig. 3	2-7
Y	JP 2016-200290 A (JOHNSON CONTROLS HITACHI AIR CONDITIONING TECH (HONGKONG) LTD.) 01 December 2016 (2016-12-01) paragraphs [0014]-[0054], fig. 1-6	4-7
Y	JP 2015-197224 A (PANASONIC INTELLECTUAL PROPERTY MANAGEMENT CO., LTD.) 09 November 2015 (2015-11-09) paragraphs [0060]-[0073], fig. 17-19	5-7

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

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INTERNATIONAL SEARCH REPORT

International application No. PCT/JP2021/039702

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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.
X	JP 2009-014259 A (MITSUBISHI ELECTRIC CORP.) 22 January 2009 (2009-01-22) paragraphs [0008]-[0026], [0043]-[0050], fig. 1-4, 8, 9	1-3, 7
Y		7

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/JP2021/039702

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 4-64014 U1	01 June 1992	(Family: none)	
JP 2019-026072 A	21 February 2019	US 2019/0031092 A1 paragraph [0026], fig. 3 DE 102018211324 A1 CN 109318794 A	
JP 2016-200290 A	01 December 2016	(Family: none)	
JP 2015-197224 A	09 November 2015	(Family: none)	
JP 2009-014259 A	22 January 2009	(Family: 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

- JP 2021027835 A [0002]
- JP 2015197224 A [0004]