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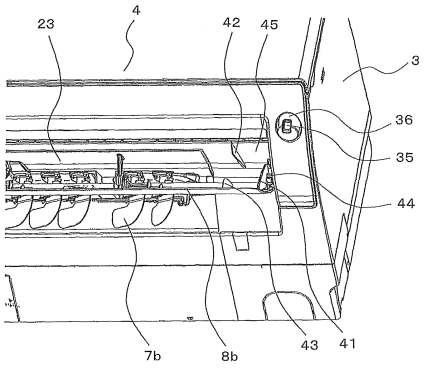
(54) INDOOR UNIT FOR AIR CONDITIONER

(57) An air-conditioning-apparatus indoor unit 1 eliminates or reduces the application of conditioned air to an area in the vicinity of an infrared sensor 35. The air-conditioning-apparatus indoor unit 1 includes a main body 2 that has an air inlet 22 disposed in an upper part of the main body 2 and an air outlet 23 disposed in a lower part of a front surface of the main body 2 and that accommodates a heat exchanger and a fan, left-right deflectors 7a and 7b that are arranged in the air outlet 23 and are configured to change the direction of an air flow from the air outlet 23 in a left-right direction, up-down deflectors 8a and 8b that are arranged in the air outlet 23 and are configured to change the direction of the air flow from the air outlet 23 in an up-down direction, the infrared sensor 35 disposed at one end in the left-right direction of the front surface of the main body 2 so that the infrared sensor 35 is next to one end in the left-right direction of the air outlet 23 of the main body 2, and an large air flow control plate 41, a small air flow control plate 43, and an upper air flow control plate 42 that are arranged between the infrared sensor 35 and one end of the left-right deflector 7b close to the infrared sensor 35 and that control the air flow from the air outlet 23.

FIG. 4



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Description

Technical Field

[0001] The present invention relates to an air-conditioning-apparatus indoor unit that eliminates or reduces incorrect determination of an infrared sensor.

Background Art

[0002] An air-conditioning-apparatus indoor unit including a sensor for detecting, for example, a condition of a human body is known in the art. In such a unit, the sensor is disposed at any one of left and right ends of a front portion of a housing of the unit (refer to Patent Literature 1, for example).

Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2010-270956

Summary of Invention

Technical Problem

[0004] In the related-art air-conditioning-apparatus indoor unit, conditioned air flowing from an air outlet may be applied to an area in the vicinity of the sensor. Disadvantageously, if the conditioned air is applied to the sensor or a casing accommodating the sensor and the sensor detects the temperature of a target object or the position of a human body, the sensor may incorrectly determine the temperature of the target object or the position of the human body.

[0005] The present invention aims to overcome the above-described disadvantage and to provide an air-conditioning-apparatus indoor unit that eliminates or reduces the application of conditioned air to an area in the vicinity of an infrared sensor. Solution to Problem

[0006] The present invention provides an air-conditioning-apparatus indoor unit including a housing that has an air inlet disposed in an upper part of the housing and an air outlet disposed in a lower part of a front surface of the housing and that accommodates a heat exchanger and a fan, a left-right deflector that is provided to the air outlet and that is configured to change a direction of an air flow from the air outlet in a left-right direction, an up-down deflector that is provided to the air outlet and that is configured to change the direction of the air flow from the air outlet in an up-down direction, an infrared sensor disposed at one end in the left-right direction of the front surface of the housing so that the infrared sensor is next to one end in the left-right direction of the air outlet of the housing, and at least one air flow control member that is disposed between the infrared sensor and one end of the left-right deflector close to the infrared sensor and that controls the air flow from the air outlet. Advantageous Effects of Invention

[0007] Since the air-conditioning-apparatus indoor unit according to the present invention includes the air flow control member disposed between the infrared sensor and the end of the left-right deflector close to the infrared sensor, conditioned air from the air outlet is blown in a direction away from the infrared sensor. This configuration eliminates or reduces the application of the conditioned air to an area in the vicinity of the infrared sensor.

Brief Description of Drawings

[0008]

[Fig. 1] Fig. 1 is a perspective view of an air-conditioning-apparatus indoor unit according to Embodiment 1 of the present invention.
[Fig. 2] Fig. 2 is an external view illustrating a nozzle of the air-conditioning-apparatus indoor unit according to Embodiment 1 of the present invention.
[Fig. 3] Fig. 3 is a block diagram illustrating the configuration of a controller of the air-conditioning-apparatus indoor unit according to Embodiment 1 of the present invention.
[Fig. 4] Fig. 4 is an enlarged view illustrating an infrared sensor and its surrounding part of the air-conditioning-apparatus indoor unit according to Embodiment 1 of the present invention.
[Fig. 5] Fig. 5 is a side view of the air-conditioning-apparatus indoor unit according to Embodiment 1 of the present invention in an operation stop mode.
[Fig. 6] Fig. 6 is a side view of the air-conditioning-apparatus indoor unit according to Embodiment 1 of the present invention in a horizontal blowing operation mode.
[Fig. 7] Fig. 7 is a schematic diagram illustrating air flows in an air outlet and its vicinity in the horizontal blowing operation mode of the air-conditioning-apparatus indoor unit according to Embodiment 1 of the present invention.
[Fig. 8] Fig. 8 is an enlarged view illustrating air flows in the vicinity of the infrared sensor in the horizontal blowing operation mode of the air-conditioning-apparatus indoor unit according to Embodiment 1 of the present invention.
[Fig. 9] Fig. 9 is a side view of the air-conditioning-apparatus indoor unit according to Embodiment 1 of the present invention in a downward blowing operation mode.
[Fig. 10] Fig. 10 is a schematic diagram illustrating an air flow in the air outlet and its vicinity in the downward blowing operation mode of the air-conditioning-apparatus indoor unit according to Embodiment 1 of the present invention.
[Fig. 11] Fig. 11 is an enlarged view illustrating air flows in the vicinity of the infrared sensor in the hor-

izontal blowing operation mode of an air-conditioning-apparatus indoor unit according to Embodiment 2 of the present invention.

[Fig. 12] Fig. 12 is an enlarged view illustrating air flows in the vicinity of the infrared sensor in the horizontal blowing operation mode of an air-conditioning-apparatus indoor unit according to Embodiment 3 of the present invention.

[Fig. 13] Fig. 13 is an enlarged view illustrating air flows in the vicinity of the infrared sensor in the horizontal blowing operation mode of an air-conditioning-apparatus indoor unit according to Embodiment 4 of the present invention. Description of Embodiments

[0009] Embodiments of the present invention will be described below with reference to the drawings.

[0010] Note that components designated by the same reference signs in the drawings are the same components or equivalents. This applies to the entire description of the specification.

[0011] Furthermore, note that the forms of components described in the specification are intended to be illustrative only and are not intended to be limited to their descriptions.

Embodiment 1

[0012] Fig. 1 is a perspective view of an air-conditioning-apparatus indoor unit 1 according to Embodiment 1 of the present invention.

[0013] The air-conditioning-apparatus indoor unit 1 includes an inverter-driven compressor whose rotation speed is controllable, a four-way valve, a condensing-side heat exchanger, a pressure reducing device, and an evaporating-side heat exchanger so that these components are connected. The indoor unit 1 is of a wall-mounted type and is capable of performing a cooling cycle operation and a heating cycle operation by switching of the four-way valve.

[0014] As illustrated in Fig. 1, the air-conditioning-apparatus indoor unit 1 includes a main body 2 that serves as a housing included in the indoor unit 1, a panel 3 included in the indoor unit 1, and a grille 4 that is included in the indoor unit 1 and serves as a design surface.

[0015] The air-conditioning-apparatus indoor unit 1 further includes an air inlet 22 disposed in an upper part of the main body 2 and an air outlet 23 disposed in a lower part of a front surface of the main body 2. Air is suctioned into the air inlet 22, passes through the heat exchanger (not illustrated) in the indoor unit, and is blown from the air outlet 23 by a cross flow fan (not illustrated).

[0016] The air-conditioning-apparatus indoor unit 1 further includes left-right deflectors 7a and 7b that are arranged in the air outlet 23 and are capable of changing the direction of air blown from the air outlet 23 in a left-right direction of a living space, up-down deflectors 8a and 8b that are arranged in the air outlet 23 and are capable of changing the direction of air blown from the air outlet 23 in a height direction (up-down direction) of the living space, a nozzle 28 constituting the air outlet 23, and an infrared sensor 35 for determining the temperature of an indoor floor, the temperature of a wall surface, the position of a human body, and an activity condition of the human body.

[0017] The infrared sensor 35 is disposed at one end, which is on the right hand side in Fig. 1, in the left-right direction of the front surface of the main body 2 so that the infrared sensor 35 is next to the air outlet 23 of the main body 2 in the left-right direction.

[0018] Although the configuration of the indoor unit including the cross flow fan disposed downstream of the heat exchanger is described herein, the indoor unit may include another type of fan, for example, a propeller fan. Furthermore, the indoor unit may include another type of fan, for example, a propeller fan, disposed upstream of the heat exchanger.

[0019] Fig. 2 is an external view illustrating the nozzle 28 of the air-conditioning-apparatus indoor unit 1 according to Embodiment 1 of the present invention.

[0020] As illustrated in Fig. 2, the nozzle 28, which constitutes the air outlet 23, includes the left-right deflectors 7a and 7b capable of changing the direction of air blown from the air outlet 23 to the living space in the left-right direction, a left-right deflector driving motor 25a to be driven to change the orientation of the left-right deflector 7a, a left-right deflector driving motor 25b to be driven to change the orientation of the left-right deflector 7b, an up-down deflector driving motor 24a to be driven to change the orientation of the up-down deflector 8a, and an up-down deflector driving motor 24b to be driven to change the orientation of the up-down deflector 8b.

[0021] The left-right deflectors 7a and 7b and the up-down deflectors 8a and 8b are provided with the independent driving motors 25a, 25b, 24a, and 24b, respectively. When there are persons at two positions in an indoor space, the left-right deflectors 7a and 7b and the up-down deflectors 8a and 8b arranged side by side send air flows blown from the air outlet 23 in different directions, thus achieving air-conditioning at the two positions based on the floor temperature, the wall surface temperature, the positions of human bodies, and activity conditions of the human bodies determined by the infrared sensor 35.

[0022] Although the up-down deflectors 8a and 8b driven independently of each other are arranged side by side in Embodiment 1, a single up-down deflector may be used. In addition, although the left-right deflectors 7a and 7b driven independently of each other are arranged side by side in Embodiment 1, the left-right deflectors 7a and 7b may be connected by a link mechanism and be driven by a single left-right deflector driving motor. Furthermore, the left-right deflectors 7a and 7b may be configured so that the orientation of each deflector is changed manually instead of by motor.

[0023] Fig. 3 is a block diagram illustrating the configuration of a controller 12 in the air-conditioning-apparatus

indoor unit 1 according to Embodiment 1 of the present invention.

[0024] The controller 12 in Fig. 3 including, for example, a microcomputer is accommodated in the indoor unit 1. The controller 12 includes an input unit 12a, a central processing unit (CPU) 12b that performs, for example, a calculating process and a determining process, a memory 12c in which various control set values and a control program for operation modes, such as a cooling operation and a heating operation, and an output unit 12d that outputs driving signals, based on information indicating calculation results and determination results output from the CPU 12b, to the motors 25a, 25b, 24a, and 24b.

[0025] The input unit 12a receives operation information (for example, an operation mode, a set temperature, a set humidity, a set air flow rate, and a set air flow direction) from a remote control 11, and inputs the information to the CPU 12b. In addition, the input unit 12a receives temperature information about the temperature of an indoor space detected by the infrared sensor 35, which turns from side to side, and information about a temperature (indoor temperature) detected by an indoor temperature thermistor (not illustrated) accommodated in the main body 2, and inputs the received information to the CPU 12b. In this case, the CPU 12b checks the temperature information (temperature distribution of the indoor space) against the control set values stored in the memory 12c on the basis of the indoor temperature, thus obtaining information about the floor temperature, the wall surface temperature, the position of a human body, and an activity condition of the human body in the indoor space.

[0026] In response to the driving signals output from the output unit 12d, the rotation speed (air flow rate) of a fan motor 6a is controlled, and the rotation angle of each of left-right deflector driving motors 25a and 25b on the left and right sides is controlled. Additionally, in response to the driving signals output from the output unit 12d, the rotation angle of each of up-down deflector driving motors 24a and 24b on the left and right sides is controlled.

[0027] Fig. 4 is an enlarged view illustrating the infrared sensor 35 and its surrounding part of the air-conditioning-apparatus indoor unit 1 according to Embodiment 1 of the present invention.

[0028] The infrared sensor 35 is covered with a casing 36 included in the main body 2. The infrared sensor 35 and the casing 36 protrude from the design surface of the main body 2. The infrared sensor 35 is disposed next to the air outlet 23 in the left-right direction (horizontal direction). The infrared sensor 35, which is turned by a motor (not illustrated), can obtain temperature information in a wide range of the indoor space.

[0029] The up-down deflector 8b includes a large air flow control plate 41 and a small air flow control plate 43 arranged on an upper surface of the up-down deflector 8b facing the infrared sensor 35 when the up-down deflector 8b is located in an open position during operation. The air flow control plates each serve as an air flow control member.

[0030] The large air flow control plate 41 and the small air flow control plate 43 are arranged between the infrared sensor 35 and one end of the left-right deflector 7b close to the infrared sensor 35. The large air flow control plate 41 and the small air flow control plate 43 extend upwardly from the upper surface of the up-down deflector 8b so that the surfaces of these plates face in the left-right direction of the air outlet 23.

[0031] The large air flow control plate 41 is disposed at one end (in Fig. 4, right end) of the up-down deflector 8b closer to the infrared sensor 35 than the small air flow control plate 43.

[0032] A part of the large air flow control plate 41 is a bearing 44 that receives an output shaft for the up-down deflector 8b and the up-down deflector driving motor 24b. The strength of the bearing 44 can be increased by forming the large air flow control plate 41 so that the part of the plate is the bearing 44. In addition, the large air folw control plate 41 in this form can be made with a smaller amount of resin used than that in a case where the large air flow control plate 41 is formed as a member separate from the bearing 44.

[0033] Furthermore, the large air flow control plate 41 has a larger area than the small air flow control plate 43 so that the large air flow control plate 41 appears to protrude from the indoor unit 1 when the indoor unit 1 is viewed from a side during operation.

[0034] Fig. 5 is a side view of the air-conditioning-apparatus indoor unit 1 according to Embodiment 1 of the present invention in an operation stop mode. As illustrated in Fig. 5, the large air flow control plate 41 has a size so that this plate is accommodated in the indoor unit 1, or does not protrude from the indoor unit 1 when the indoor unit 1 is viewed from the side in the operation stop mode.

[0035] As illustrated in Fig. 4, the air outlet 23 includes an upper air flow control plate 42, serving as an air flow control member, disposed on an upper surface of the air outlet 23. The upper air flow control plate 42 is disposed between the infrared sensor 35 and the end of the left-right deflector 7b close to the infrared sensor 35. The upper air flow control plate 42 extends downwardly from the upper surface of the air outlet 23 so that the surfaces of the plate face in the left-right direction of the air outlet 23.

[0036] In Embodiment 1, the large air flow control plate 41 and the small air flow control plate 43, or the two air flow control plates are arranged on the up-down deflector 8b, and the upper air flow control plate 42, or the single air flow control plate is disposed on the upper surface of the air outlet 23.

[0037] The upper air flow control plate 42 is disposed between the large air flow control plate 41 and the small air flow control plate 43, or the two air flow control plates arranged on the up-down deflector 8b.

[0038] In other words, each of the large air flow control

plate 41, the small air flow control plate 43, and the upper air flow control plate 42 is located between the infrared sensor 35 and the and of the left-right deflector 7b close to the infrared sensor 35. The large air flow control plate 41, the small air flow control plate 43, and the upper air flow control plate 42 are arranged from the infrared sensor 35 in this order of the large air flow control plate 41, the upper air flow control plate 42, and the small air flow control plate 43.

[0039] The air outlet 23 includes a pseudo air passage 45 disposed between the infrared sensor 35 and the end of the left-right deflector 7b close to the infrared sensor 35. The up-down deflector 8b is disposed in the pseudo air passage 45, but conditioned air is not blown through the pseudo air passage 45. The pseudo air passage 45 is formed by partly closing an opening of the air outlet 23 with an internal cover.

[0040] At the back of the pseudo air passage 45, for example, the left-right deflector driving motor 25b and a drain port (not illustrated) for connection to a drain hose for discharging water generated during cooling to an outdoor space are arranged. There is no side wall close to the pseudo air passage 45, through which conditioned air is not blown. When the left-right deflector 7b is turned to the right in Fig. 4, an air flow can be sent farther to the right than that in a case where an air passage side wall is placed close to the pseudo air passage 45.

[0041] Fig. 6 is a side view of the air-conditioning-apparatus indoor unit 1 according to Embodiment 1 of the present invention in a horizontal blowing operation mode. Fig. 7 is a schematic diagram illustrating air flows in the air outlet 23 and its vicinity in the horizontal blowing operation mode of the air-conditioning-apparatus indoor unit 1 according to Embodiment 1 of the present invention. Fig. 8 is an enlarged view illustrating air flows in the vicinity of the infrared sensor 35 in the horizontal blowing operation mode of the air-conditioning-apparatus indoor unit 1 according to Embodiment 1 of the present invention.

[0042] In the horizontal blowing operation mode illustrated in Figs. 6 to 8, the up-down deflector 8b is substantially located in a horizontal blowing position and the left-right deflector 7b is turned to the right (to the infrared sensor 35) in Figs. 7 and 8.

[0043] Conditioned air blown from the air outlet 23 is directed to the right in Figs. 7 and 8 by the left-right deflector 7b. The conditioned air is then divided into two air flows so that one air flow flows on a lower surface of the up-down deflector 8b facing away from the infrared sensor 35 and the other air flow flows on the upper surface thereof facing the infrared sensor 35.

[0044] The conditioned air flowing on the lower surface of the up-down deflector 8b facing away from the infrared sensor 35 flows at an angle defined by the left-right deflector 7b and is sent to the indoor space.

[0045] On the other hand, the conditioned air flowing on the upper surface of the up-down deflector 8b facing the infrared sensor 35 is partly deflected to a front side of the indoor unit by the small air flow control plate 43 disposed on the up-down deflector 8b. The conditioned air flowing over the small air flow control plate 43 flows toward the infrared sensor 35.

[0046] The conditioned air flowing over the small air flow control plate 43 toward the infrared sensor 35 is partly deflected to the front side by the upper air flow control plate 42 disposed on the upper surface of the air inlet 22 (the nozzle 28). The conditioned air flowing under the upper air flow control plate 42 flows toward the infrared sensor 35.

[0047] The conditioned air flowing under the upper air flow control plate 42 toward the infrared sensor 35 is deflected to the front side by the large air flow control plate 41 that blocks an air passage on the upper surface of the up-down deflector 8b.

[0048] In particular, the conditioned air flowing toward the infrared sensor 35 through the small air flow control plate 43, the upper air flow control plate 42, and the large air flow control plate 41 in that order experiences higher flow resistance, as the conditioned air approaches the infrared sensor 35 wihile passing through a zigzag path defined by these three plates extending in the up-down direction. Consequently, the conditioned air is gradually deflected to the front side, and is completely deflected to the front side by the large air flow control plate 41.

[0049] An increase in area of the small air flow control plate 43, which has an air flow controlling effect, may cause condensation on the suction surface of the plate in the cooling operation. For this reason, this plate is reduced in size to produce a leakage air flow to the infrared sensor 35. This configuration reduces the difference in temperature between the suction surface and the pressure surface of the small air flow control plate 43, thus eliminating or reducing condensation. The same applies to the upper air flow control plate 42. In addition, arranging the upper air flow control plate 42 and the large air flow control plate 41 closer to the infrared sensor 35 than the small air flow control plate 43 produces a leakage air flow at the small air flow control plate 43 and the upper air flow control plate 42. As the leakage air flow approaches the infrared sensor 35, the amount of leakage air flow decreases. Thus, the leakage air flow reaching the infrared sensor 35 can be eliminated or reduced.

[0050] The conditioned air flowing from the air outlet 23 in the vicinity of the infrared sensor 35 is deflected to the front side by the above-described three air flow control plates, or the small air flow control plate 43, the upper air flow control plate 42, and the large air flow control plate 41. Consequently, the conditioned air can be prevented from being directly applied to the infrared sensor 35 and the casing 36 covering the infrared sensor 35.

[0051] If the above-described three air flow control plates are not arranged, conditioned air blown from the air outlet 23 would contact the casing 36 covering the infrared sensor 35. Unlike an indoor temperature, the temperature in the casing 36 would vary with fluctuations of the conditioned air blown from the air outlet 23. The

temperature in the casing 36 would disturb the amount of infrared radiation to be detected by the infrared sensor 35, resulting in an incorrect amount of infrared radiation. Unfortunately the infrared sensor 35 could not correctly obtain information about the temperature of a floor, the temperature of a wall surface, the position of a human body, and an activity condition of the human body. Thus, it would be necessary to restrict the orientations of the up-down deflectors 8a and 8b so that conditioned air is not applied to the casing 36. Disadvantageously, conditioned air could not be blown horizontally. It would be difficult to perform a moderate cooling operation.

[0052] According to Embodiment 1, conditioned air flowing from the air outlet 23 in the vicinity of the infrared sensor 35 is deflected to the front side by the small air flow control plate 43, the upper air flow control plate 42, and the large air flow control plate 41, thus preventing the conditioned air from directly contacting the casing 36 that covers the infrared sensor 35. The temperature in the casing 36 can be maintained at the same level as that of the indoor temperature, resulting in a correct amount of infrared radiation to be detected by the infrared sensor 35. Consequently, the infrared sensor 35 can correctly obtain information about the temperature of a floor, the temperature of a wall surface, the position of a human body, and an activity condition of the human body.

[0053] According to Embodiment 1, it is unnecessary to restrict the orientations of the up-down deflectors 8a and 8b so that conditioned air is not applied to the casing 36. The conditioned air can be blown to a human body in the horizontal direction close to the infrared sensor 35. For example, the moderate cooling operation can also be performed.

[0054] Fig. 9 is a side view of the air-conditioning-apparatus indoor unit 1 according to Embodiment 1 of the present invention in a downward blowing operation mode. Fig. 10 is a schematic diagram illustrating an air flow in the air outlet and its vicinity in the downward blowing operation mode of the air-conditioning-apparatus indoor unit 1 according to Embodiment 1 of the present invention.

[0055] In the downward blowing operation mode illustrated in Figs. 9 and 10, the up-down deflector 8b is in a downward blowing position and the left-right deflector 7b is turned to the right (to the infrared sensor 35) in Fig. 10.

[0056] Conditioned air blown from the air outlet 23 is sent to the right in Fig. 10 by the left-right deflector 7b.

[0057] An air flow flows on the lower surface of the up-down deflector 8b facing away from the infrared sensor 35 and is sent to the indoor space at an angle defined by the left-right deflector 7b.

[0058] The conditioned air barely flows on the upper surface of the up-down deflector 8b facing the infrared sensor 35. The conditioned air does not reach an area in the vicinity of the infrared sensor 35. This results in a correct amount of infrared radiation to be detected by the infrared sensor 35. The infrared sensor 35 can correctly obtain information about the temperature of a floor, the temperature of a wall surface, the position of a human body, and an activity condition of the human body.

[0059] In particular, in the heating operation in which the up-down air flow direction is set to downward blowing to directly heat the floor surface of an indoor space, wide-angle air blowing in the left-right direction is critical to improving comfort in the indoor space. Because the small air flow control plate 43, the upper air flow control plate 42, and the large air flow control plate 41 do not provide the air flow controlling effect in the downward blowing operation mode in Embodiment 1, the wide-angle air blowing in the left-right direction is not reduced.

[0060] In Embodiment 1 described above, the three air flow control plates, or the small air flow control plate 43, the upper air flow control plate 42, and the large air flow control plate 41 are arranged. The number of air flow control plates may be increased or reduced. When the number of air flow control plates is reduced, conditioned air can be prevented from reaching the area in the vicinity of the infrared sensor 35 by controlling the size of each air flow control plate and a movable range of the left-right deflector.

[0061] In Embodiment 1 described above, the pseudo air passage 45 is provided. When the pseudo air passage 45 is not provided, the air flow control plates can also prevent conditioned air from reaching the area in the vicinity of the infrared sensor 35.

Embodiment 2

[0062] Fig. 11 is an enlarged view illustrating air flows in the vicinity of the infrared sensor 35 in the horizontal blowing operation mode of an air-conditioning-apparatus indoor unit 1 according to Embodiment 2 of the present invention.

[0063] As illustrated in Fig. 11, the indoor unit 1 according to Embodiment 2 includes the upper air flow control plate 42 alone as an air flow control plate.

[0064] At the end, where the large air flow control plate 41 is disposed in Embodiment 1, of the up-down deflector 8b close to the infrared sensor 35, the bearing 44 alone is provided.

[0065] In the horizontal blowing operation mode in Fig. 11, the up-down air flow direction is set to horizontal blowing and the left-right air flow direction is set to rightward blowing for the heating operation of the indoor unit 1 including only the upper air flow control plate 42.

[0066] In the heating operation, heated air blown from the air outlet 23 has a low air density in the vicinity of the pseudo air passage 45, and a main stream of the heated air flows through an upper air passage part that is over the upper surface of the up-down deflector 8b. Consequently, the heated air blown from the air outlet 23 is deflected to the front side by the upper air flow control plate 42. The heated air does not reach the area in the vicinity of the infrared sensor 35.

Embodiment 3

[0067] Fig. 12 is an enlarged view illustrating air flows in the vicinity of the infrared sensor 35 in the horizontal bowing operation mode of an air-conditioning-apparatus indoor unit 1 according to Embodiment 3 of the present invention.

[0068] As illustrated in Fig. 12, the indoor unit according to Embodiment 3 includes the small air flow control plate 43 alone as an air flow control plate.

[0069] At the end, where the large air flow control plate 41 is disposed in Embodiment 1, of the up-down deflector 8b close to the infrared sensor 35, the bearing 44 alone is provided.

[0070] In the horizontal blowing operation mode in Fig. 12, the up-down air flow direction is set to horizontal blowing and the left-right air flow direction is set to rightward blowing for the cooling operation of the indoor unit 1 including the small air flow control plate 43 disposed on the up-down deflector 8b.

[0071] In the cooling operation, cooled air blown from the air outlet 23 has a high air density in the vicinity of the pseudo air passage 45, and a main stream of the cooled air flows on the upper surface of the up-down deflector 8b. Consequently, the cooled air blown from the air outlet 23 is deflected to the front side by the small air flow control plate 43. The cooled air does not reach the area in the vicinity of the infrared sensor 35.

Embodiment 4

[0072] Fig. 13 is an enlarged view illustrating air flows in the vicinity of the infrared sensor 25 in the horizontal blowing operation mode of an air-conditioning-apparatus indoor unit 1 according to Embodiment 4 of the present invention.

[0073] As illustrated in Fig. 13, the indoor unit according to Embodiment 4 includes, as air flow control plates, the small air flow control plate 43 disposed on the up-down deflector 8b and the upper air flow control plate 42 disposed on the upper surface of the air outlet 23.

[0074] At the end, where the large air flow control plate 41 is disposed in Embodiment 1, of the up-down deflector 8b close to the infrared sensor 35, the bearing 44 alone is provided.

[0075] In the horizontal blowing operation mode in Fig. 13, the up-down air flow direction is set to horizontal blowing and the left-right air flow direction is set to rightward blowing for the cooling operation or the heating operation of the indoor unit 1 including the small air flow control plate 43 and the upper air flow control plate 42.

[0076] In the cooling operation, cooled air blown from the air outlet 23 has a high air density in the vicinity of the pseudo air passage 45, and a main stream of the cooled air flows on the upper surface of the up-down deflector 8b. Consequently, the cooled air blown from the air outlet 23 is deflected to the front side by the small air flow control plate 43. The cooled air does not reach the area in the vicinity of the infrared sensor 35.

[0077] On the other hand, in the heating operation, heated air blown from the air outlet 23 has a low air density in the vicinity of the pseudo air passage 45, and a main stream of the heated air flows through the upper air passage part that is over the upper surface of the up-down deflector 8b. Consequently, the heated air blown from the air outlet 23 is deflected to the front side by the upper air flow control plate 42. The heated air does not reach the area in the vicinity of the infrared sensor 35.

[0078] In Embodiment 4, a likelihood that an air flow may reach the area in the vicinity of the infrared sensor 35 can be eliminated or reduced in both the cooling operation and the heating operation.

[0079] In Embodiments 1 to 4 described above, the large air flow control plate 41, the small air flow control plate 43, and the upper air flow control plate 42 are arranged between the infrared sensor 35 and the end of the left-right deflector 7b close to the infrared sensor 35. This arrangement enables the large air flow control plate 41, the small air flow control plate 43, and the upper air flow control plate 42 to deflect an air flow flowing in the left-right direction from the air outlet 23 to the front side before the air flow reaches the area in the vicinity of the infrared sensor 35, thus eliminating or reducing false detection caused by the application of the air flow to the area in the vicinity of the infrared sensor 35. In other words, the casing 36 covering the infrared sensor 35 has substantially the same temperature as that in an indoor space, the amount of infrared radiation to be detected by the infrared sensor 35 is correct without being disturbed by the temperature of the casing 36, and the infrared sensor 35 can correctly obtain information about the temperature of a floor, the temperature of a wall surface, the position of a human body, and an activity condition of the human body.

[0080] The large air flow control plate 41 and the small air flow control plate 43 are arranged on the up-down deflector 8b. This arrangement enables the large air flow control plate 41 and the small air flow control plate 43 to deflect the air flow flowing in the left-right direction from the air outlet 23 to the front side before the air flow reaches the infrared sensor 35, thus eliminating or reducing false detection caused by the application of the air flow to the area in the vicinity of the infrared sensor 35.

[0081] The upper air flow control plate 42 is disposed on the upper surface of the air outlet 23. This arrangement enables the upper air flow control plate 42 to deflect the air flow flowing in the left-right direction from the air outlet 23 to the front side before the air flow reaches the infrared sensor 35, thus eliminating or reducing false detection caused by the application of the air flow to the area in the vicinity of the infrared sensor 35.

[0082] The upper air flow control plate 42 is disposed between the large air flow control plate 41 and the small air flow control plate 43. This arrangement allows the large air flow control plate 41, the small air flow control plate 43, and the upper air flow control plate 42 disposed

between these two plates to define a zigzag path. This zigzag path increases flow resistance in the passage to the infrared sensor 35, so that an air flow flowing in the left-right direction from the air outlet 23 can be deflected to the front side before the air flow reaches the infrared sensor 35. This eliminates or reduces false detection caused by the application of the air flow to the area in the vicinity of the infrared sensor 35.

[0083] The large air flow control plate 41 is included in the bearing 44 of the up-down deflector 8b. This arrangement enhances the strength of the bearing 44 of the up-down deflector 8b.

[0084] The large air flow control plate 41 disposed close to the infrared sensor 35 has a larger area than the small air flow control plate 43. This increases flow resistance in the passage to the infrared sensor 35 and also results in a reduction in amount of material used. Since an increase in area of the small air flow control plate 43, which has the air flow controlling effect, may cause condensation on the suction surface of this plate in the cooling operation, the small air flow control plate 43 is allowed to produce a leakage air flow to reduce the difference in temperature between the suction surface and the pressure surface of the small air flow control plate 43. This eliminates or reduces condensation. Although the leakage air flow is produced at the small air flow control plate 43, the large air flow control plate disposed close to the infrared sensor 35 can eliminate or reduce the leakage air flow reaching the infrared sensor 35.

Reference Signs List

[0085] 1: indoor unit; 2: main body; 3: panel; 4: grille; 6a: fan motor; 7a: left-right deflector; 7b: left-right deflector; 8a: up-down deflector; 8b: up-down deflector; 11: remote control; 12: controller; 12a: input unit; 12b: CPU; 12c: memory; 12d: output unit; 22: air inlet; 23: air outlet; 24a: up-down deflector driving motor; 24b: up-down deflector driving motor; 25a: left-right deflector driving motor; 25b: left-right deflector driving motor; 28: nozzle; 35: infrared sensor; 36: casing; 41: large air flow control plate; 42: upper air flow control plate; 43: small air flow control plate; 44: bearing; and 45: pseudo air passage

Claims

1. An air-conditioning-apparatus indoor unit comprising:

   a housing having an air inlet disposed in an upper part of the housing and an air outlet disposed in a lower part of a front surface of the housing, the housing accommodating a heat exchanger and a fan;
   a left-right deflector provided to the air outlet, the left-right deflector being configured to change a direction of an air flow from the air outlet in a left-right direction;
   an up-down deflector provided to the air outlet, the up-down deflector being configured to change the direction of the air flow from the air outlet in an up-down direction;
   an infrared sensor disposed at one end in the left-right direction of the front surface of the housing so that the infrared sensor is next to one end in the left-right direction of the air outlet of the housing; and
   at least one air flow control member disposed between the infrared sensor and one end of the left-right deflector close to the infrared sensor, the at least one air flow control member controlling the air flow from the air outlet.

2. The air-conditioning-apparatus indoor unit of claim 1, wherein the at least one air flow control member is disposed on the up-down deflector.

3. The air-conditioning-apparatus indoor unit of claim 1 or 2, wherein the at least one air flow control member is disposed on an upper surface of the air outlet.

4. The air-conditioning-apparatus indoor unit of claim 3, wherein the at least one air flow control member includes two air flow control members arranged on the up-down deflector and one air flow control member disposed on the upper surface of the air outlet, and wherein the one air flow control member on the upper surface of the air outlet is disposed between the two air flow control members on the up-down deflector.

5. The air-conditioning-apparatus indoor unit of any one of claims 2 to 4, wherein a part of the at least one air flow control member on the up-down deflector is a bearing of the up-down deflector.

6. The air-conditioning-apparatus indoor unit of claim 4 or 5, wherein one of the two air flow control members, arranged on the up-down deflector, close to the infrared sensor has a larger area than an other one of the two air flow control members.

FIG. 1

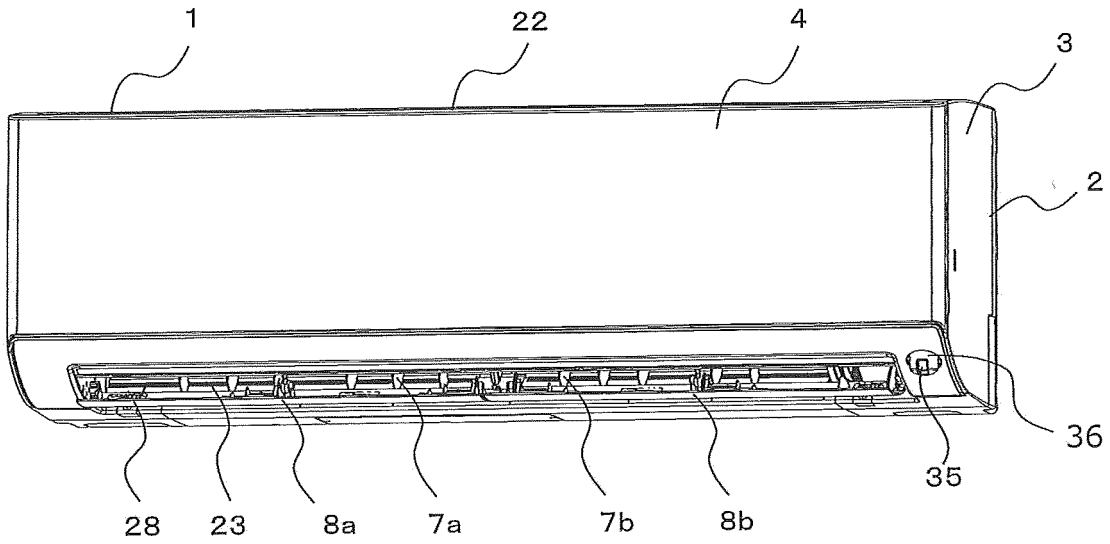


FIG. 2

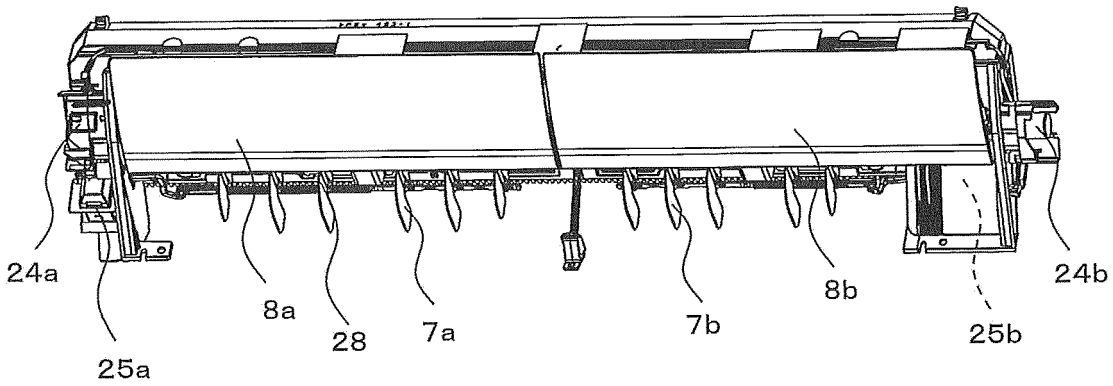


FIG. 3

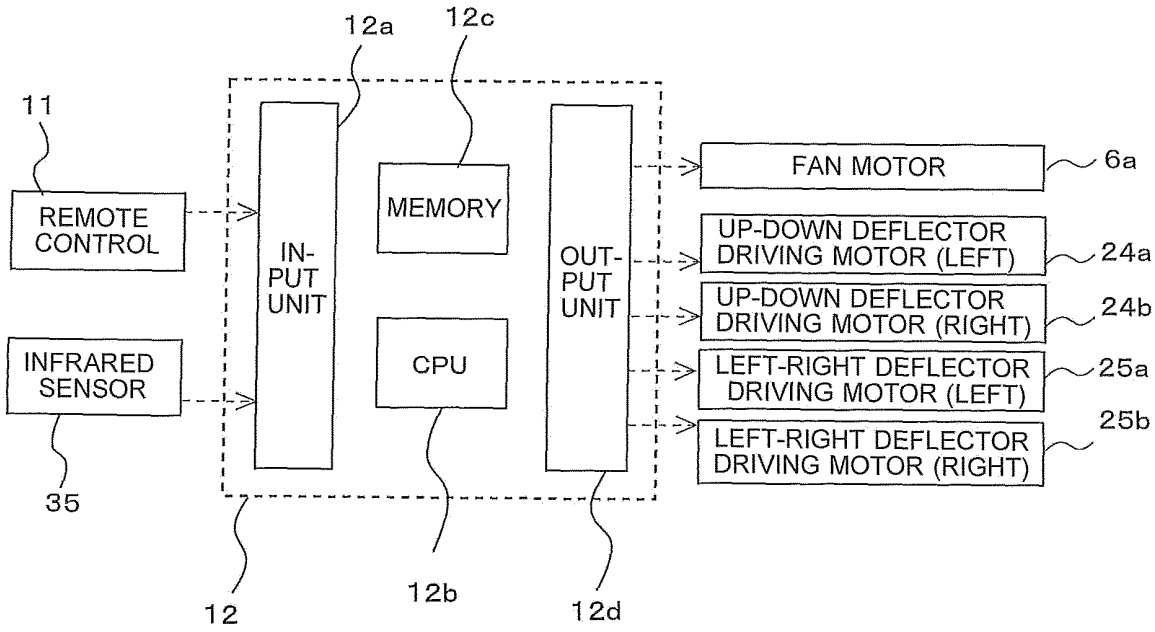

12a
12c
11
REMOTE CONTROL
INFRARED SENSOR
35
IN-PUT UNIT
MEMORY
CPU
OUT-PUT UNIT
12
12b
12d
FAN MOTOR
6a
UP-DOWN DEFLECTOR DRIVING MOTOR (LEFT)
24a
UP-DOWN DEFLECTOR DRIVING MOTOR (RIGHT)
24b
LEFT-RIGHT DEFLECTOR DRIVING MOTOR (LEFT)
25a
LEFT-RIGHT DEFLECTOR DRIVING MOTOR (RIGHT)
25b

FIG. 4

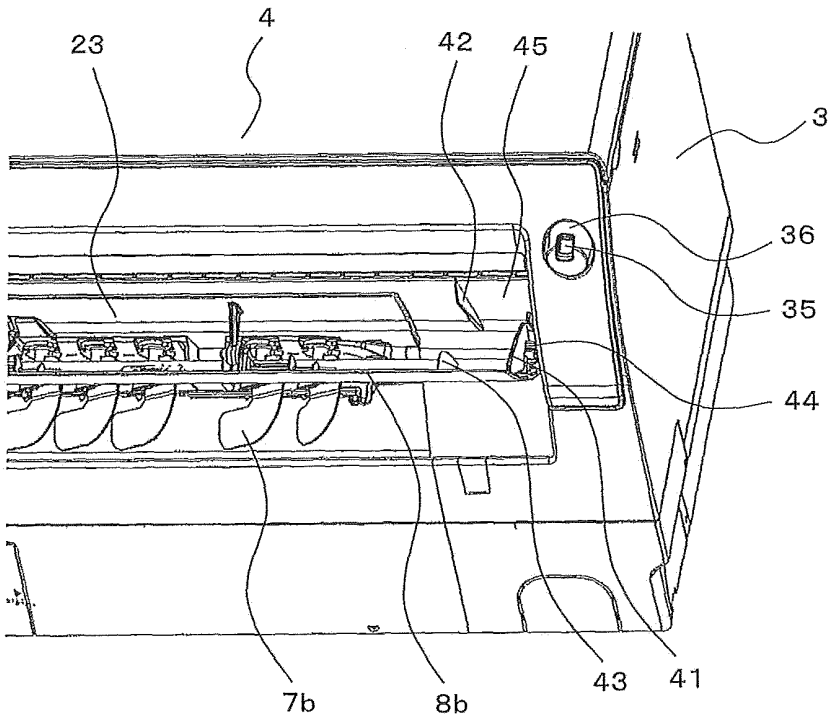

4
23
42
45
3
36
35
44
7b
8b
43
41

FIG. 5

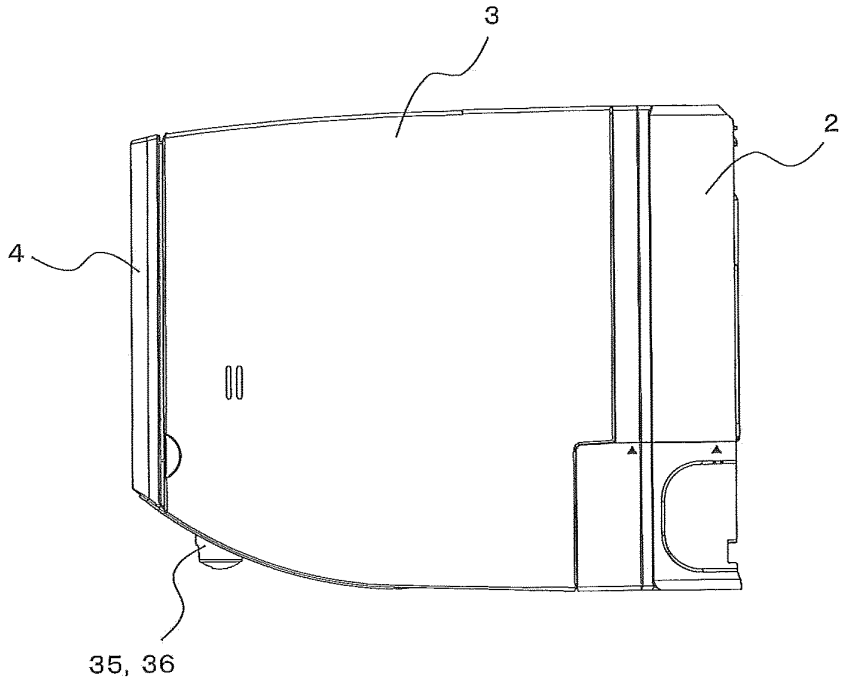


FIG. 6

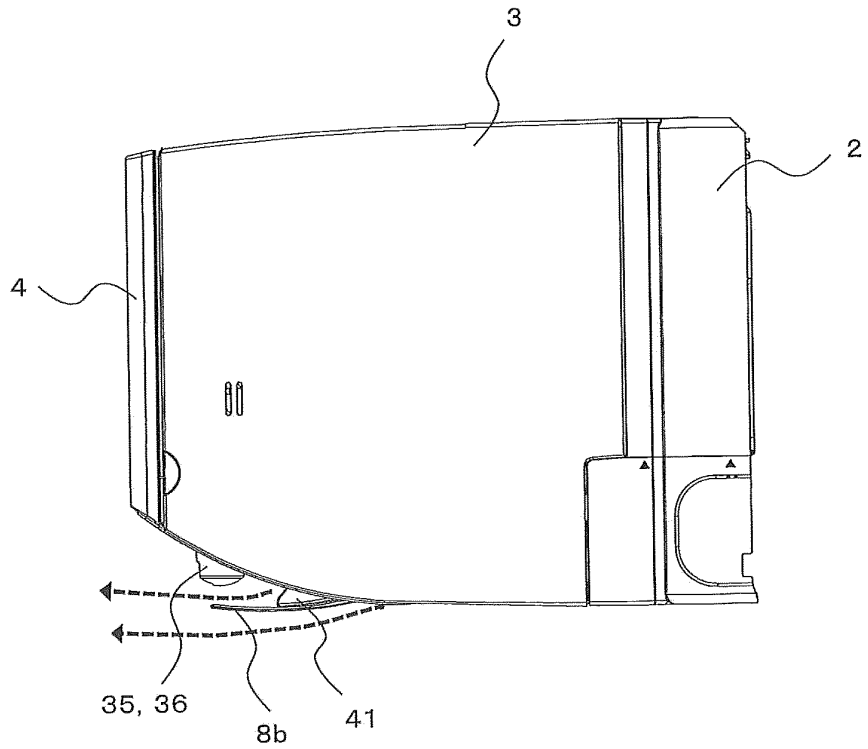


FIG. 7

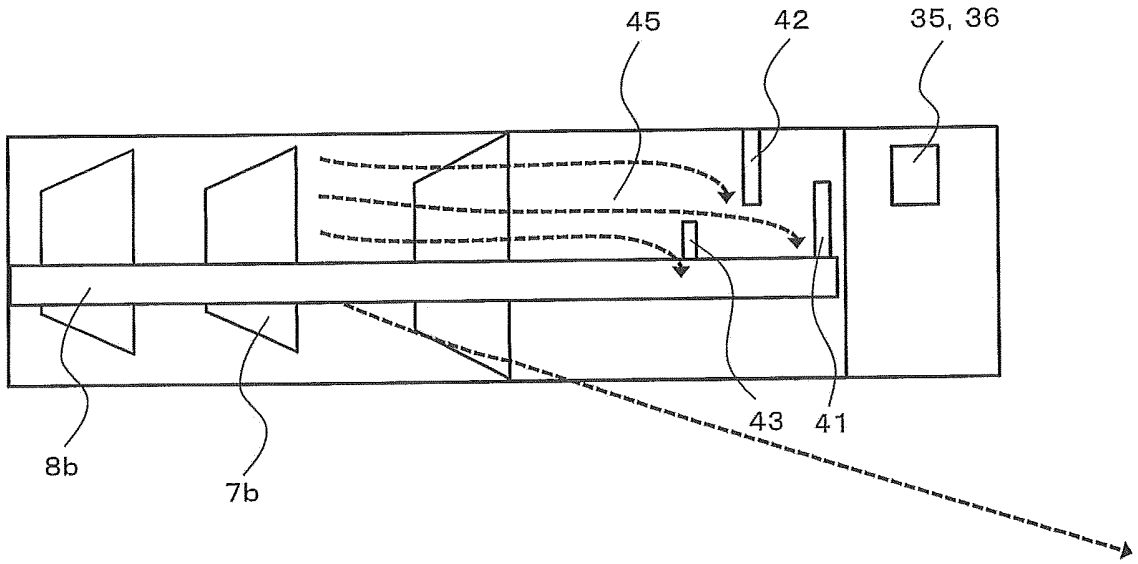


FIG. 8

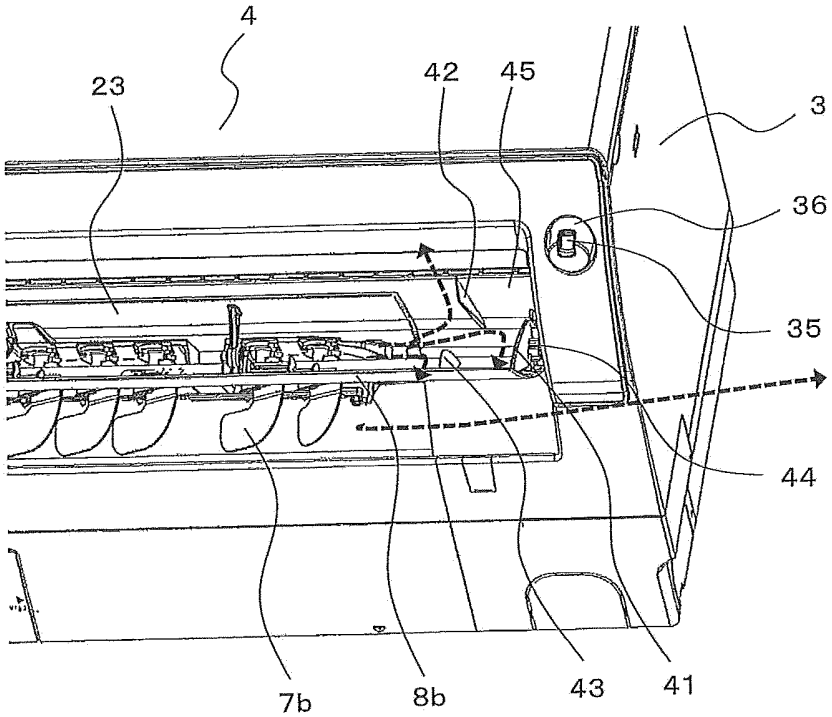


FIG. 9

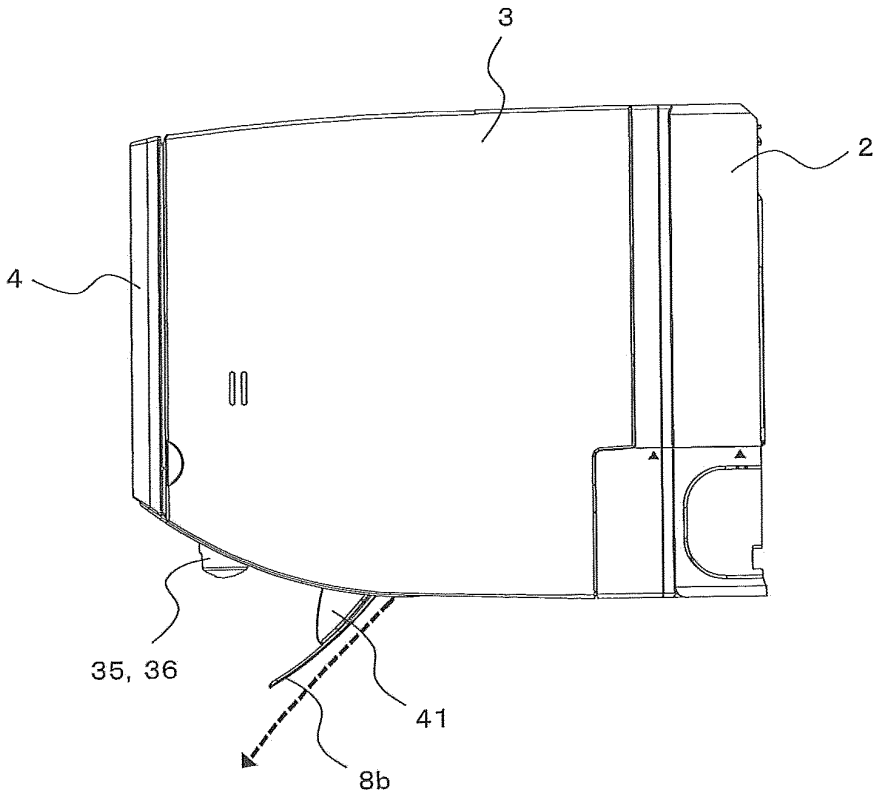


FIG. 10

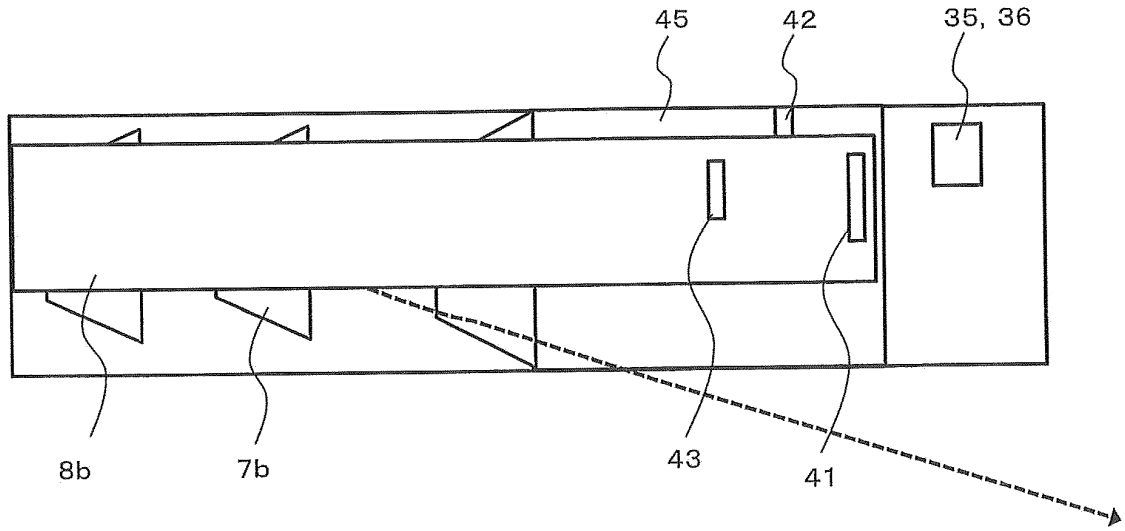


FIG. 11

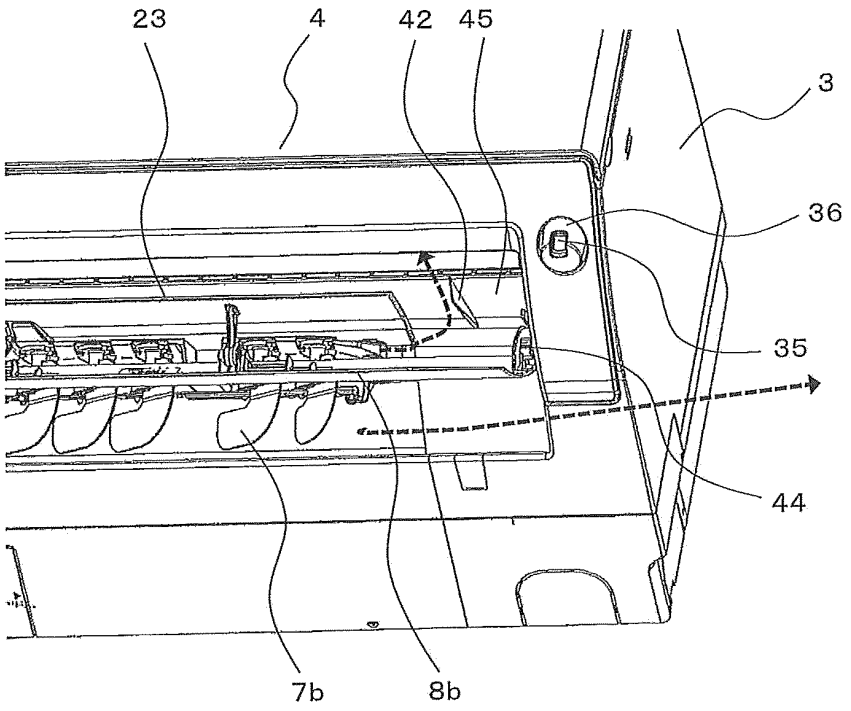


FIG. 12

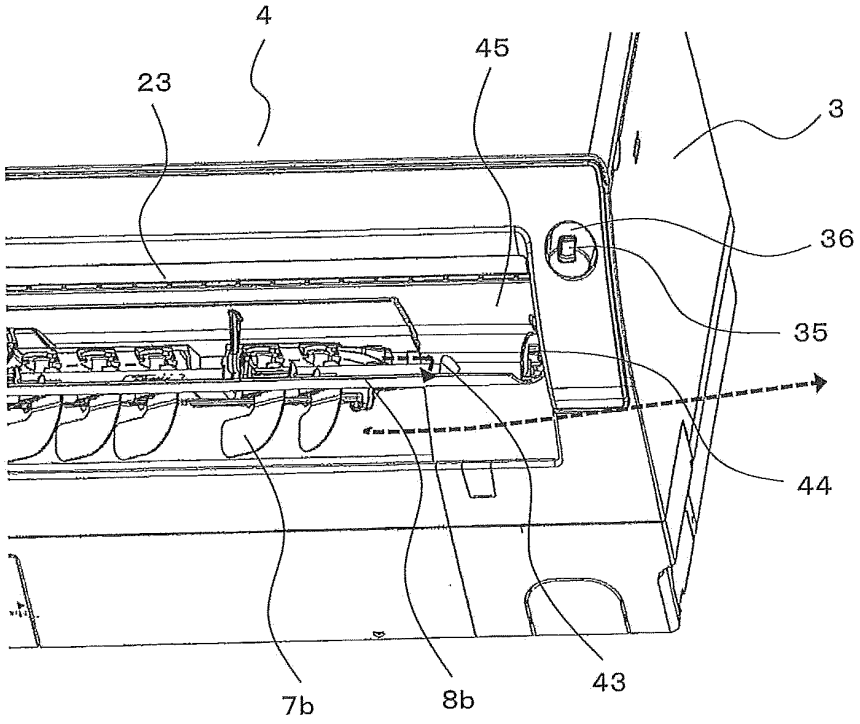
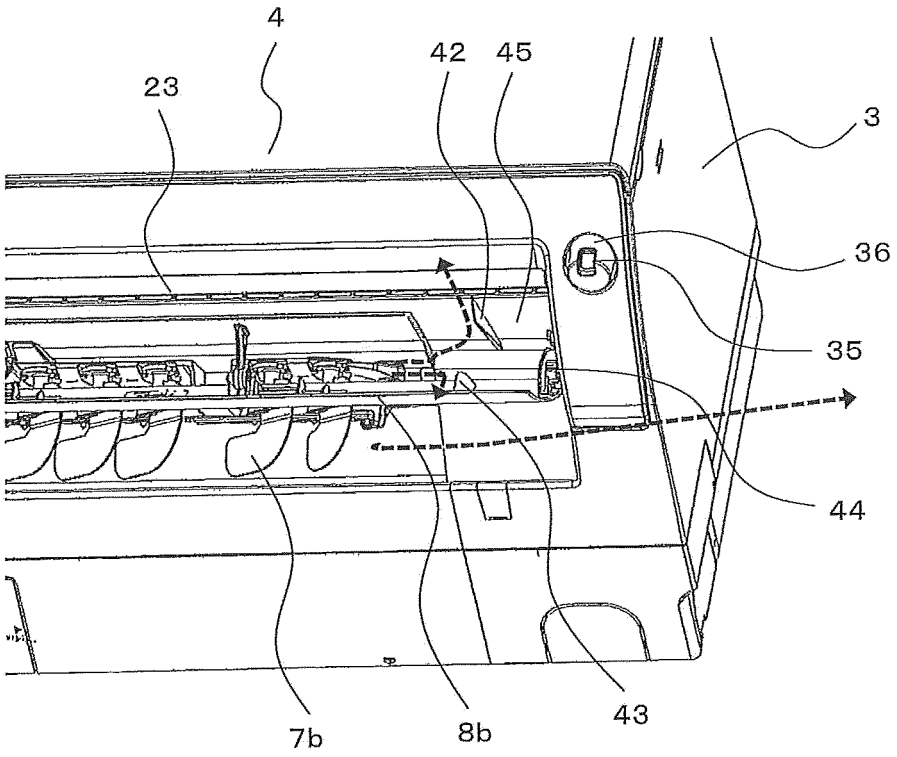


FIG. 13



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/056114

A. CLASSIFICATION OF SUBJECT MATTER
F24F11/02(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F24F11/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2015
Kokai Jitsuyo Shinan Koho 1971-2015 Toroku Jitsuyo Shinan Koho 1994-2015

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.
A	JP 2002-310488 A (Sharp Corp.), 23 October 2002 (23.10.2002), paragraphs [0014] to [0024]; fig. 1 to 4 & EP 1326055 A1 & WO 2002/029332 A1 & DE 60143534 D & AU 9417701 A & TW 550364 B & HK 1061063 A & CN 1478188 A & AU 2001294177 B	1-6
A	JP 2005-265258 A (Tiger Corp.), 29 September 2005 (29.09.2005), paragraphs [0043] to [0045]; fig. 2 to 3 (Family: none)	1-6
A	JP 11-294807 A (Toshiba Corp.), 29 October 1999 (29.10.1999), paragraphs [0031] to [0032]; fig. 5 (Family: none)	1-6

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

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Date of the actual completion of the international search	Date of mailing of the international search report
25 May 2015 (25.05.15)	02 June 2015 (02.06.15)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/056114

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 15538/1991(Laid-open No. 113849/1992) (Kubota Trane Kabushiki Kaisha), 06 October 1992 (06.10.1992), paragraphs [0008] to [0014]; fig. 1 to 8 (Family: none)	1-6

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Patent documents cited in the description

- JP 2010270956 A **[0003]**