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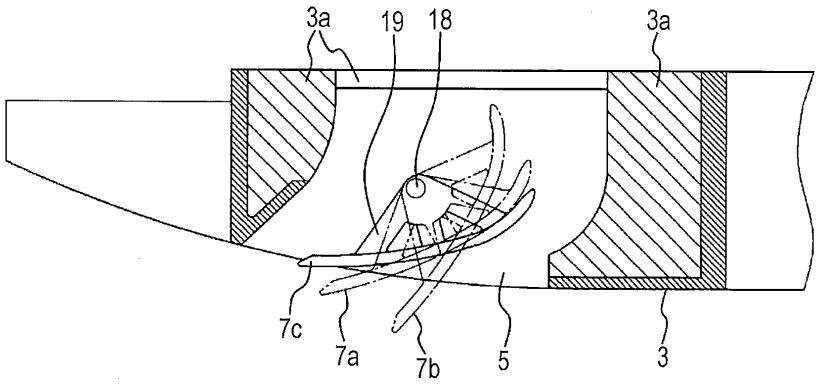
(54) INDOOR UNIT FOR AIR CONDITIONER

(57) An indoor unit of an air conditioner includes multiple blow ports and multiple louvers each provided at the blow ports and configured to adjust a blowing direction. Each louver is, upon stop of the indoor unit, rotated in the direction of closing the blow port, the angle of the louver upon stop of the indoor unit being a fully-closed angle. A remote controller configured to set operation of each louver upon operation of the indoor unit is provided. When the minimum angle among louver angles settable by the remote controller is taken as a first angle and the maximum angle is taken as a second angle, the louver angles of a part of the multiple blow ports are, under a preset predetermined operation condition, set to a third angle greater than the fully-closed angle as the louver angle upon stop of the indoor unit and smaller than the first angle, and the louvers of the other blow ports perform louver operation settable from the remote controller. With this configuration, high-speed blowing from a part of the multiple blow ports is allowed, and bending of the louver provided at each blow port can be reduced.

FIG. 5



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Description

TECHNICAL FIELD

[0001] The present invention relates to an indoor unit of an air conditioner, and specifically relates to an indoor unit having multiple blow ports and including louvers each configured to control a wind direction for the blow ports.

BACKGROUND ART

[0002] An indoor unit of an air conditioner including multiple blow ports (e.g., four) has been known as a typical air conditioner. In this indoor unit, the blowing direction of heated air blown from the multiple blow ports is, in heating operation, differentiated for improving unevenness in the inner temperature of a room targeted for heating, and in this manner, air stirring movement is performed.

[0003] Moreover, there is an indoor unit configured such that the louver angles of a part of multiple blow ports are set to an angle not used in normal operation to narrow an opening area and a wind volume is concentrated on the remaining blow ports to increase a wind velocity.

[0004] The typical technique of this type includes a technique described in Japanese Patent No. 6135734 (Patent Document 1). In the technique of Patent Document 1, in a case where an indoor load is high in heating operation, louvers are controlled to an air flow block position at which the louvers are rotated to an angle more greater than that at the maximum downward blowing position such that the opening areas of a part of blow ports of an indoor unit are decreased. Louvers of the remaining blow ports are controlled to a horizontal blowing position.

[0005] The air flow block position is a position at which the louver is further opened from the normally-used maximum angle (downward blowing) and a blade of the louver enters deeper into the blow port. With this configuration, an air flow path is closed by the blade of the louver. The volume of blown wind is significantly decreased at the blow ports at which the louvers are at the air flow block position, and therefore, a wind velocity at the remaining blow ports is increased. Thus, blown air can reach a farther spot than that of a normal case.

PRIOR ART LITERATURE

PATENT LITERATURE

[0006] PATENT LITERATURE 1: Japanese Patent No. 6135734

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0007] However, when an attempt is made to rotate the louver to the air flow block position described in Patent Document 1, the louver contacts a wall surface of the blow port made of, e.g., a heat insulating material in the typical indoor unit. Thus, an internal structure of the blow port in the vicinity of the louver needs to be changed for allowing rotation of the louver to the air flow block position.

[0008] Moreover, the louvers of a part of blow ports may be set to a fully-closed position (a position upon stop of operation) to increase the wind velocity at the remaining blow ports. However, there is a problem that the louvers bend due to a wind pressure when the louvers are at the fully-closed position.

[0009] An object of the present invention is to provide an indoor unit of an air conditioner configured so that high-speed blowing from a part of multiple blow ports is allowed and bending of a louver provided at each blow port can be reduced.

SOLUTIONS TO THE PROBLEMS

[0010] For accomplishing the above-described object, the present invention is an indoor unit of an air conditioner including multiple blow ports and multiple louvers each provided at the blow ports and configured to adjust a blowing direction. Each louver is, upon stop of the indoor unit, rotated in the direction of closing the blow port, the angle of the each louver rotated in the direction of closing the blow port upon stop of the indoor unit being a fully-closed angle. A remote controller configured to set operation of each louver upon operation of the indoor unit is provided. When the minimum angle among louver angles settable by the remote controller is taken as a first angle and the maximum angle is taken as a second angle, the louver angles of a part of the multiple blow ports are, under a preset predetermined operation condition, set to a third angle greater than the fully-closed angle as the louver angle upon stop of the indoor unit and smaller than the first angle, and the louvers of the other blow ports perform louver operation settable from the remote controller.

[0011] Another feature of the present invention is an indoor unit of an air conditioner including multiple blow ports and multiple louvers each provided at the blow ports and configured to adjust a blowing direction. Each louver is, upon stop of the indoor unit, rotated in the direction of closing the blow port, the angle of the each louver rotated in the direction of closing the blow port upon stop of the indoor unit being a fully-closed angle. The function of automatically swinging each louver upon operation of the indoor unit is provided. When the minimum angle of each louver upon automatic swing is taken as a first angle and the maximum angle is taken as a second angle, the louver angles of a part of the multiple blow ports are, under a preset predetermined operation condition, set to a third angle greater than the fully-closed angle as the louver angle upon stop of the indoor unit and smaller than the first angle, and the louvers of the other blow ports are set to auto swing or an optional angle.

ADVANTAGEOUS EFFECTS OF THE INVENTION

[0012] According to the present invention, there is an advantageous effect that the indoor unit of the air conditioner configured so that high-speed blowing from a part of the multiple blow ports is allowed and bending of the louver provided at each blow port can be reduced can be provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Fig. 1 is a perspective view of a first embodiment of an indoor unit of an air conditioner of the present invention.

Fig. 2 is a longitudinal sectional view of the indoor unit illustrated in Fig. 1.

Fig. 3 is a sectional view of a main portion of one blow port illustrated in Figs. 1 and 2 in a fully-closed state of a louver.

Fig. 4 is a sectional view of a main portion of one blow port illustrated in Figs. 1 and 2, Fig. 4 being a view of the minimum angle (a first angle) and the maximum angle (a second angle) of the louver during operation of the indoor unit.

Fig. 5 is a sectional view of a main portion of one blow port illustrated in Figs. 1 and 2, Fig. 5 being a view for describing a third louver angle in the first embodiment.

Fig. 6 is a view for describing action when the louver illustrated in Fig. 5 is in a third angle state.

Fig. 7 is a sectional view of a main portion for describing a typical indoor unit configured such that a louver has been rotated to an air flow block position.

DESCRIPTION OF EMBODIMENTS

[0014] Hereinafter, a specific embodiment of the present invention will be described with reference to the drawings. In each figure, the same reference numerals are used to represent the same or equivalent elements.

First Embodiment

[0015] A first embodiment of an indoor unit of an air conditioner of the present invention will be described with reference to Figs. 1 to 7.

[0016] First, an entire configuration of the indoor unit of the air conditioner in the first embodiment will be described with reference to Fig. 1. Fig. 1 is a perspective view of the indoor unit of the air conditioner of the first embodiment.

[0017] As illustrated in Fig. 1, the indoor unit 1 of the air conditioner is configured such that the indoor unit 1 and a not-shown outdoor unit are connected to each other via a refrigerant pipe to form a refrigerant circuit and refrigerant circulates to form a refrigeration cycle. The indoor unit 1 is a so-called ceiling cassette type, and includes, for example, a housing 2 embedded in, e.g., a ceiling of a room and a decorative panel 3 provided to close a lower opening of the housing 2. The decorative panel 3 includes a suction port 4 provided at the center to suck indoor air, and air blow ports 5 provided at four spots to surround the suction port 4.

[0018] A suction grille 6 is provided at the suction port 4, and a louver 7 configured to adjust the blow direction of air blown from each blow port 5 is rotatably provided at the blow port 5. Note that the louvers 7 illustrated in Fig. 1 indicate a state in which the indoor unit 1 is stopped and the louvers 7 are fully closed, i.e., a state in which a louver angle is a fully-closed angle (0 degree). A fully-closed state includes not only a state in which the blow port 5 is fully closed, but also a state in which the louver is substantially horizontal to substantially close the blow port and an opening area is minimum.

[0019] Fig. 2 is a longitudinal sectional view of the indoor unit 1 illustrated in Fig. 1. As illustrated in Fig. 2, a motor 8 and a centrifugal fan 9 connected to a rotary shaft of the motor 8 are placed at a center portion in the housing 2. The motor 8 is fixed to the center of a top plate of the housing 2.

[0020] Moreover, a heat exchanger 10 in a hollow square shape as viewed in plane is placed at the periphery of the centrifugal fan 9 to surround the centrifugal fan 9. The heat exchanger 10 is a cross fin type fin-and-tube heat exchanger. Moreover, a drain pan 11 configured to receive dew condensation water generated at the heat exchanger 10 is placed below the heat exchanger 10. Generally, a heat insulating material made of foamed styrol is used as the drain pan 11. A water receiving groove is formed along a lower end of the heat exchanger 10, and a lower end portion of the heat exchanger 10 enters the water receiving groove. Moreover, although not shown in the figure, the blow port 5 is formed integrally with the heat insulating material forming the drain pan 11, or is formed from a separate heat insulating material.

[0021] 20 is the ceiling of the room, and the indoor unit 1 is placed such that a housing 2 portion is embedded in the ceiling 20. The decorative panel 3 is formed in a square shape slightly larger than the housing 2. Moreover, the decorative panel 3 is arranged along the ceiling 20 to cover a lower surface of the housing 2, and is exposed to an indoor space.

[0022] The louver 7 provided at the blow port 5 of the decorative panel 3 is at a fully-closed position (the louver angle is 0 degree) in Fig. 2, and indicates a state in which operation of the indoor unit 1 is stopped. When the indoor unit 1 starts operating, the louver 7 is rotated to open the blow port 5, and then, is fixed at a predetermined angle set from a remote controller (not shown) by a user, such as downward blowing or lateral blowing. Alternatively, when the user sets operation of the louver 7 to automatic swing from the remote controller, the louver 7 performs automatic swing operation within a range from the minimum angle to the maximum angle.

[0023] Moreover, when operation of the indoor unit 1 begins, the indoor air is sucked into a suction portion 12 of the centrifugal fan 9 through the suction port 4 and the suction grille 6, and then, is discharged in an outer peripheral direction from a discharge portion 13 of the centrifugal fan 9. The air discharged from the centrifugal fan 9 is cooled or heated through the heat exchanger 10. Thereafter, the resultant conditioned air is blown into the room through the blow ports 5 formed at the decorative panel 3 by way of a wind path 14 formed by an outer peripheral surface of the heat exchanger 10 and an inner peripheral surface of the housing 2.

[0024] At this point, when the louver 7 is set to an angle for downward blowing, the conditioned air is blown downward. When the louver 7 is set to an angle for lateral blowing, the conditioned air is blown in a lateral direction (the horizontal direction). Further, in the case of setting to automatic swing as described above, the louver 7 performs the automatic swing operation within the range from the minimum angle to the maximum angle. Thus, the conditioned air is blown within a range from a direction close to the horizontal direction to a direction close to the vertical direction according to motion of the louver 7.

[0025] Note that in Fig. 2, 15 is a bell mouth arranged below the centrifugal fan 9 and having, at a center portion, an opening whose diameter gradually decreases while standing toward the suction portion 12 of the centrifugal fan 9. The bell mouth 15 is configured to guide air sucked through the suction port 4 to the centrifugal fan 9. Moreover, the bell mouth 15 is configured to divide, together with the drain pan 11, an internal space of the housing 2 into a suction side and a discharge side of the centrifugal fan 9.

[0026] 16 is an electric component box configured to house, e.g., a control board for controlling operation of the indoor unit 1, and the electric component box 16 is placed on a lower surface of the bell mouth 15. 17 is a suction filter placed above the suction grille 6.

[0027] Next, a configuration of the vicinity of the louver 7 in the fully-closed state of the louver 7, i.e., the state in which the louver 7 is at the fully-closed angle (0 degree), will be described with reference to Fig. 3. Fig. 3 is a sectional view of a main portion of one blow port illustrated in Figs. 1 and 2 when the louver is in a fully-closed angle state. When operation of the indoor unit 1 is stopped, the louver 7 is brought into the fully-closed angle state illustrated in Fig. 3 to prevent a foreign substance from entering the indoor unit during stop of the indoor unit 1 and improve designability upon stop of the indoor unit.

[0028] As illustrated in Fig. 3, the fully-closed angle (0 degree) of the louver 7 is not generally a state in which the blow port 5 is fully closed, but a state in which a slight clearance is formed between each of right and left ends of the louver 7 and a wall surface of the decorative panel 3 forming the blow ports 5. It is configured such that the louver 7 and a wall surface of the blow port 5 do not contact each other.

[0029] Note that in Fig. 3, 3a is a heat insulating material forming the blow port 5, such as foamed styrol.

[0030] As illustrated in Fig. 1, the louver 7 is formed in an elongated plate shape or a blade shape extending from one end to the other end of the blow port 5 in a longitudinal direction thereof, and is fixed to a center shaft 18 extending in a longitudinal direction of the louver 7 via an attachment member 19. The center shaft 18 is rotatably supported by support members (not shown) arranged on both end sides of the center shaft 18, and rotation of the center shaft 18 is controlled by, e.g., a stepping motor.

[0031] Fig. 4 is a sectional view of a main portion of one blow port illustrated in Figs. 1 and 2, Fig. 4 being a view of the minimum and maximum angles of the louver during operation of the indoor unit. That is, Fig. 4 illustrates an operation range of the louver 7 in a state in which the indoor unit 1 is in operation. A louver 7a indicated by a solid line indicates the minimum angle (a first angle) of the louver 7 settable by the user by means of the remote controller (not shown), and a louver 7b indicated by a chain line indicates the maximum angle (a second angle) of the louver 7 settable by the user by means of the remote controller.

[0032] When the louver 7 is set to a position 7a at the minimum angle (the first angle), lateral blowing operation for blowing the conditioned air substantially in the horizontal direction from the blow port 5 is performed. On the other hand, when the louver 7 is set to a position 7b at the maximum angle (the second angle), downward blowing operation for blowing the conditioned air substantially in the vertical direction from the blow port 5 is performed.

[0033] Note that in the present embodiment, when the fully-closed angle as the louver angle upon stop of the indoor unit 1 as illustrated in Fig. 3 is 0 degree, the minimum angle (the first angle) is 28 degrees, and the maximum angle (the second angle) is 64 degrees, for example. Note that the minimum angle (the first angle) may be set to any value within a range of about 27 to 30 degrees, for example. Moreover, the maximum angle (the second angle) may be set to any value within a range of about 60 to 70 degrees, for example.

[0034] The angle of the louver 7 during operation of the indoor unit 1 is not only settable within the range between the minimum angle and the maximum angle from the remote controller, but also is settable from the remote controller at multiple steps in increments of several degrees between the minimum angle and the maximum angle. For example, when the minimum angle is taken as a first step and the maximum angle is taken as a seventh step, five steps (second to sixth steps) of the angle are settable between the first and seventh levels. Note that the angle of the louver 7 is not limited to the seven steps, and more or less steps may be provided. Alternatively, the louver angle may be steplessly settable to an optional angle.

[0035] When operation of the louver 7 is set to automatic swing from the remote controller, the louver 7 repeats reciprocation operation for increasing the angle

from the angle at the start of automatic swing setting such as the first step as the minimum angle to the seventh step as the maximum angle in the order of the second step, the third step, ... and subsequently decreasing the angle to the first step as the minimum angle in the opposite direction in the order of the sixth step, the fifth step, ...

[0036] Note that automatic swing is not limited to the reciprocation operation between the first to seventh steps, and for example, may be reciprocation operation between the third to seventh steps. Moreover, it may be configured such that upon automatic swing, the louver angle smoothly and steplessly changes.

[0037] In the indoor unit of the air conditioner as described above, in high-load operation in which a temperature difference between an external air temperature and a room temperature is extremely great in, e.g., heating operation, a wind direction is set to downward blowing such that warm air is supplied downward. However, in some cases, sufficient blown air cannot reach a floor surface.

[0038] In this case, it has been known that the louver 7 is set at an air flow block position. Fig. 7 is a sectional view of a main portion for describing a typical indoor unit configured such that a louver 7 has been rotated to the air flow block position. The air flow block position is a position at which the louvers 7 of a part of the blow ports 5 of the indoor unit 1 are, as shown in Fig. 7, rotated to an angle more greater than that at the maximum downward blowing position (the position at the maximum angle indicated by the chain line in Fig. 4) such that the opening areas of the blow ports are decreased.

[0039] For example, the louvers of one or two of four blow ports 5 illustrated in Fig. 1 are set to the air flow block position, so that the wind velocity of air blown from the other blow ports 5 can be increased. Thus, the blown air can reach the floor surface.

[0040] However, at the air flow block position, the angle of the louver 7 is further increased as compared to the normally-used maximum angle. Thus, the louver 7 enters deeper into the blow port 5 of the decorative panel 3 or the blow port 5 at a drain pan 11 (see Fig. 2) portion, and contacts the heat insulating material 3a forming the blow port or the heat insulating material forming the blow port 5 at the drain pan 11 portion.

[0041] For this reason, in the normal indoor unit 1, an internal structure of the blow port in the vicinity of the louver needs to be, for preventing contact of the louver 7 with the wall surface of the blow port 5 made of, e.g., the heat insulating material 3a, changed such that the louver 7 does not contact the wall surface of the blow port 5 even when the louver 7 is rotated to the air flow block position.

[0042] Moreover, another technique for decreasing the opening area of the blow port 5 of the indoor unit 1 is conceivable, in which the louvers of a part of four blow ports 5 are set to the fully-closed position (the position upon stop of operation) as illustrated in Fig. 3 such that the wind velocity at the remaining blow ports is increased. According to such a technique, the louver 7 does not contact the wall surface of the blow port 5 made of, e.g., the heat insulating material, and therefore, the internal structure of the blow port 5 in the vicinity of the louver 7 does not need to be changed.

[0043] However, when the indoor unit is operated with the louvers 7 of a part of blow port 5 being at the fully-closed position, there are problems that the louvers at the fully-closed position greatly bend due to the wind pressure of blown air and plastic deformation of the resin louvers easily occurs due to the high temperature of the blown air when operation is performed for a long period of time.

[0044] The configuration of the indoor unit of the air conditioner of the present embodiment for solving the above-described problems will be described with reference to Figs. 5 and 6. Fig. 5 is a sectional view of a main portion of one blow port illustrated in Figs. 1 and 2, Fig. 5 being a view for describing a third louver angle in the first embodiment. Fig. 6 is a view for describing action in a state in which the louver illustrated in Fig. 5 is at the third angle.

[0045] In Fig. 5, the position 7a of the louver 7 indicated by a chain line indicates a case where the louver 7 is set to the position at the minimum angle (the first angle), and the position 7b of the louver 7 similarly indicated by a chain line indicates a case where the louver 7 is set to the position at the maximum angle (the second angle). These positions 7a, 7b of the louver 7 are the angles of the louver 7 settable from the remote controller (not shown), and are functions generally provided to the typical indoor unit. Moreover, the function of automatically swinging the louver 7 within the range between the first angle position 7a and the second angle position is also generally provided, and is settable from the remote controller.

[0046] The present embodiment is configured such that the angle of the louver 7 of each of four blow ports 5 illustrated in Fig. 1 is, as illustrated in Fig. 5, settable to a position 7c at the third angle greater than the fully-closed angle (a louver angle of 0 degree) as the louver angle upon stop of the indoor unit as illustrated in Fig. 3 and smaller than the first angle as the minimum opening degree of the louver 7 settable from the remote controller.

[0047] The position 7c at the third angle of the louver 7 is not an angle settable by the user from the remote controller, but the angle position of the louver 7 automatically set from a control device included in, e.g., the indoor unit 1 of the air conditioner in the case of a preset predetermined operation condition such as the start of the heating operation.

[0048] For example, in a case where the first angle is 28 degrees, the third angle is set to an angle, such as 14 degrees, greater than 0 degree as the fully-closed angle upon stop of the indoor unit and smaller than the first angle (28 degrees) as the minimum angle settable by the user from the remote controller. The third angle is not limited to 14 degrees, and may be set to any value within

a range of 5 to 25 degrees.

[0049] That is, in the present embodiment, in a case where the minimum angle (the first angle) as the angle of the louver 7 settable from the remote controller is the first step and the maximum angle (the second angle) is the seventh step, the third angle corresponds to an angle of a 0.5 step. The angle of the 0.5 step is not a louver angle settable by the user from the remote controller, but is an angle automatically set from the control device provided at, e.g., the indoor unit 1 in the case of the predetermined operation condition.

[0050] In the present embodiment, it is configured such that each louver 7 is settable to the position 7c at the third angle (the angle of the 0.5 step) as described above. In a case where the air conditioner is under the preset predetermined operation condition, the louvers 7 of a part of blow port 5 among the louvers 7 of the multiple blow ports 5 are set to the position 7c at the third angle.

[0051] The louvers 7 of a part of blow port 5 are set to the position at the third angle (the angle greater than the fully-closed angle of the louver and smaller than the first angle), so that a small clearance 21 can be formed between the wall surface of the blow port 5 and an end portion of the louver 7 as indicated by a hatched circle in Fig. 6. Thus, an air flow can be blown from the clearance 21, and therefore, bending of the louver due to the wind pressure can be reduced. Thus, bending of the louver 7 can be suppressed small, and therefore, plastic deformation of the louver can be reduced even in a case where high-temperature air is blown into the room.

[0052] Note that the louvers 7 set to the third angle may be configured switchable sequentially in every predetermined time. Moreover, for the louvers 7 of the other blow ports 5, louver operation settable from the remote controller is performed. That is, the other louvers 7 are set to automatic swing, or are set to an optional louver angle.

[0053] The preset predetermined operation condition of the air conditioner includes, for example, operation conditions as follows, and it may be configured such that the louvers of a part of blow port among the louvers of the multiple blow ports are automatically set to the third angle from the control device (not shown) provided at, e.g., the indoor unit 1 in a case where the following operation is performed:

(1) a case where the heating operation has been set;
(2) a case where operation is, in the heating operation or cooling operation, performed under a high-load operation condition where the temperature difference between the external air temperature and the room temperature is equal to or greater than a preset predetermined temperature difference;
(3) a case where a high-speed blowing setting for causing blown air to reach a farther spot than a normal case, such as the vicinity of the floor surface, has been made in the heating operation or the cooling operation; and
(4) a case where stirring operation for increasing the blown wind velocity to decrease a temperature difference between upper and lower portions in the room in, e.g., the heating operation has been set or a case where the stirring operation is automatically executed by the control device of the air conditioner.

[0054] Note that for the third angle described above, the user cannot set an optional louver to the third angle from the remote controller, but the third angle is the angle automatically set from the control device of the air conditioner in a case where, e.g., the high-speed blowing setting has been made. For example, in a case where any of the operations (1), (3), and (4) has been set, a case where operation is performed under the condition (2), or a case where the stirring operation of (4) is automatically executed, the angle of the louver 7 of any of the blow ports 5 is automatically set to the third angle position from the control device.

[0055] With this configuration, the opening area of the blow port 5 of the louver portion set to the third angle is small. Thus, the volume of wind blown from the blow port 5 can be significantly reduced, and the velocity of wind blown from the other blow ports 5 can be sufficiently increased. Consequently, blown air can reach a position far enough such as the floor surface.

[0056] Moreover, at the blow port 5 of the louver portion set to the third angle, the small clearance 21 can be formed between the wall surface of the blow port 5 and the end portion of the louver 7, and therefore, the air flow can be blown from the clearance 21. Thus, bending of the louver 7 due to the wind pressure can be reduced. Thus, the rotation speed of the centrifugal fan 9 is increased, and therefore, bending of the louver 7 can be reduced even in a case where a great volume of high-temperature air is blown into the room. Consequently, plastic deformation of the louver 7 can be also reduced.

[0057] Note that in the above-described embodiment, it is configured such that under the preset predetermined operation condition, the angles of the louvers of a part of the multiple blow ports are set to the third angle. However, the following configuration may be employed instead of this configuration.

[0058] That is, under the predetermined operation condition, the angles of the louvers 7 of a part of the multiple blow ports 5 are not promptly controlled to the third angle, but may be first held at the fully-closed angle for such a predetermined time that plastic deformation of the louvers 7 does not occur and be subsequently controlled to the third angle after a lapse of the predetermined time.

[0059] With this configuration, the velocity of wind blown from the other blow ports 5 can be further increased as compared to the case of control to the third angle when the louvers 7 are held at the fully-closed angle, and therefore, a high-speed blowing effect can be further improved. In addition, the louvers 7 controlled to the fully-closed angle are controlled to the third angle before plastic deformation of the louvers 7 occurs, and

therefore, the effect of preventing plastic deformation of the louvers 7 can be also provided.

[0060] Moreover, in the above-described embodiment, the minimum angle settable by the remote controller is taken as the first angle, and the louver angle greater than the fully-closed angle as the louver angle upon stop of the indoor unit and smaller than the first angle is taken as the third angle. Instead, the following configuration may be employed.

[0061] That is, in the configuration with the function of automatically swinging the louver, the minimum angle of the louver upon automatic swing may be taken as the first angle, and the louver angle greater than the fully-closed angle as the louver angle upon stop of the indoor unit and smaller than the first angle may be set as the third angle. In this case, the louvers of the blow ports 5 other than the louvers set to the third angle are set to automatic swing or an optional angle.

[0062] As described above, in the present embodiment, it is configured such that under the preset predetermined operation condition such as the case where the high-speed blowing setting has been made, the angles of the louvers 7 of a part of the multiple blow ports 5 are set to the third angle greater than the fully-closed angle (0 degree) as the louver angle upon stop of the indoor unit and smaller than the first angle as the minimum angle settable from the remote controller or the minimum angle upon auto swing and the louvers 7 of the other blow ports perform the louver operation settable from the remote controller. Thus, an advantageous effect can be provided, which provides the indoor unit of the air conditioner configured so that high-speed blowing from a part of the multiple blow ports 5 is allowed and bending of the louver 7 provided at each blow port 5 can be reduced.

[0063] Note that the present invention is not limited to the above-described embodiment, and includes variations. Moreover, the above-described embodiment has been described in detail for clearly describing the present invention, and is not limited to one with all configurations described above.

DESCRIPTION OF REFERENCE SIGNS

[0064]

1 Indoor unit
2 Housing
3 Decorative panel
3a Heat insulating material
4 Suction port
5 Blow port
6 Suction grille
7 Louver
7a Position at minimum angle (first angle)
7b Position at maximum angle (second angle)
8 Motor
9 Centrifugal fan
10 Heat exchanger
11 Drain pan
12 Suction portion
13 Discharge portion
14 Wind path
15 Bell mouth
16 Electric component box
17 Suction filter
18 Center shaft
19 Attachment member
20 Ceiling
21 Clearance

Claims

1. An indoor unit of an air conditioner, comprising:

multiple blow ports; and
multiple louvers each provided at each of the blow ports and configured to adjust a blowing direction,
wherein each louver is, upon stop of the indoor unit, rotated in a direction of closing the blow port, an angle of the each louver rotated in the direction of closing the blow port upon stop of the indoor unit being a fully-closed angle,
a remote controller configured to set operation of each louver upon operation of the indoor unit is provided, and
when a minimum angle among louver angles settable by the remote controller is taken as a first angle and a maximum angle is taken as a second angle,
louver angles of a part of the multiple blow ports are, under a preset predetermined operation condition, set to a third angle greater than the fully-closed angle as the louver angle upon stop of the indoor unit and smaller than the first angle, and the louvers of the other blow ports perform louver operation settable from the remote controller.

2. The indoor unit of the air conditioner according to claim 1, wherein
under the predetermined operation condition, the louver angles of a part of the multiple louvers are held at the fully-closed angle for a predetermined time, and are subsequently controlled to the third angle.

3. The indoor unit of the air conditioner according to claim 1, wherein
when the fully-closed angle as the louver angle upon stop of the indoor unit is 0 degree, the first angle is set to an optional angle within a range of 27 to 30 degrees, the second angle is set to an optional angle within a range of 60 to 70 degrees, and the third angle is further set to an optional angle within a range

of 5 to 25 degrees.

4. The indoor unit of the air conditioner according to claim 1, wherein
the blow ports are provided at four spots to surround a suction port at a center of the indoor unit, and
the louvers set to the third angle are sequentially switched in every predetermined time.

5. The indoor unit of the air conditioner according to claim 1, wherein
the predetermined operation condition is heating operation.

6. The indoor unit of the air conditioner according to claim 1, wherein
the predetermined operation condition is a case where operation is performed under a high-load operation condition where a temperature difference between an external air temperature and a room temperature is equal to or greater than a preset predetermined temperature difference.

7. The indoor unit of the air conditioner according to claim 1, wherein
the predetermined operation condition is a case where high-speed blowing has been set.

8. The indoor unit of the air conditioner according to claim 1, wherein
the predetermined operation condition is a case where stirring operation for increasing a blown wind velocity to decrease a temperature difference between upper and lower portions in a room is performed.

9. An indoor unit of an air conditioner, comprising:

multiple blow ports; and
multiple louvers each provided at each of the blow ports and configured to adjust a blowing direction,
wherein each louver is, upon stop of the indoor unit, rotated in a direction of closing the blow port, an angle of the each louver rotated in the direction of closing the blow port upon stop of the indoor unit being a fully-closed angle,
a function of automatically swinging each louver upon operation of the indoor unit is provided, and
when a minimum angle of each louver upon automatic swing is taken as a first angle and a maximum angle is taken as a second angle,
louver angles of a part of the multiple blow ports are, under a preset predetermined operation condition, set to a third angle greater than the fully-closed angle as the louver angle upon stop of the indoor unit and smaller than the first angle, and the louvers of the other blow ports are set to the auto swing or an optional angle.

10. The indoor unit of the air conditioner according to claim 9, wherein
a remote controller configured to set operation of each louver upon operation of the indoor unit is provided, and
the first angle is a minimum angle among louver angles settable by the remote controller.

FIG. 1

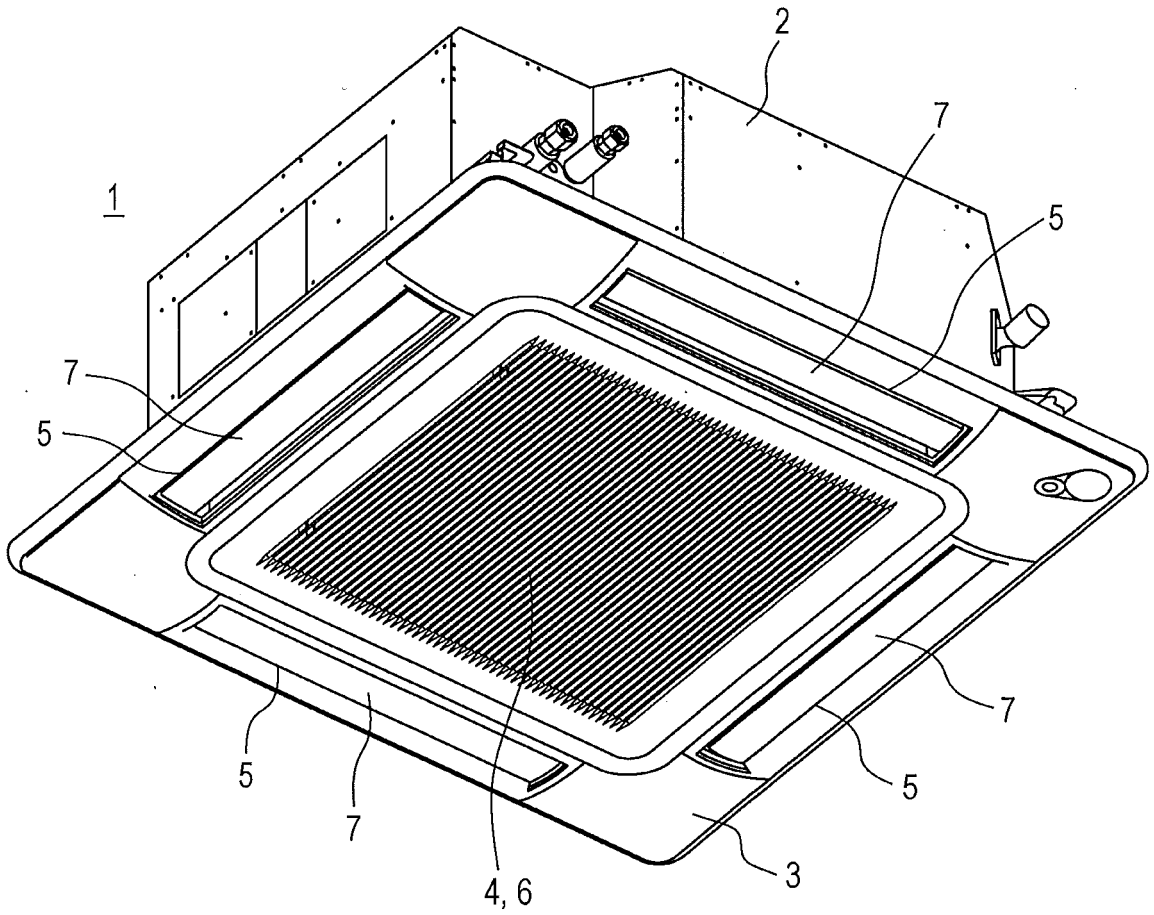

FIG. 2

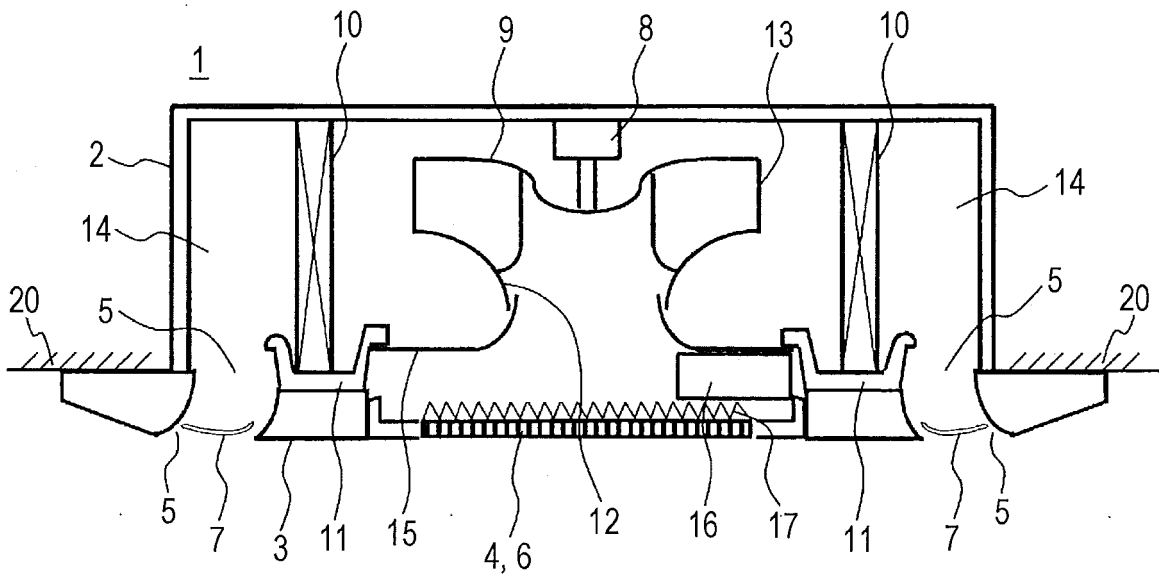
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FIG. 3

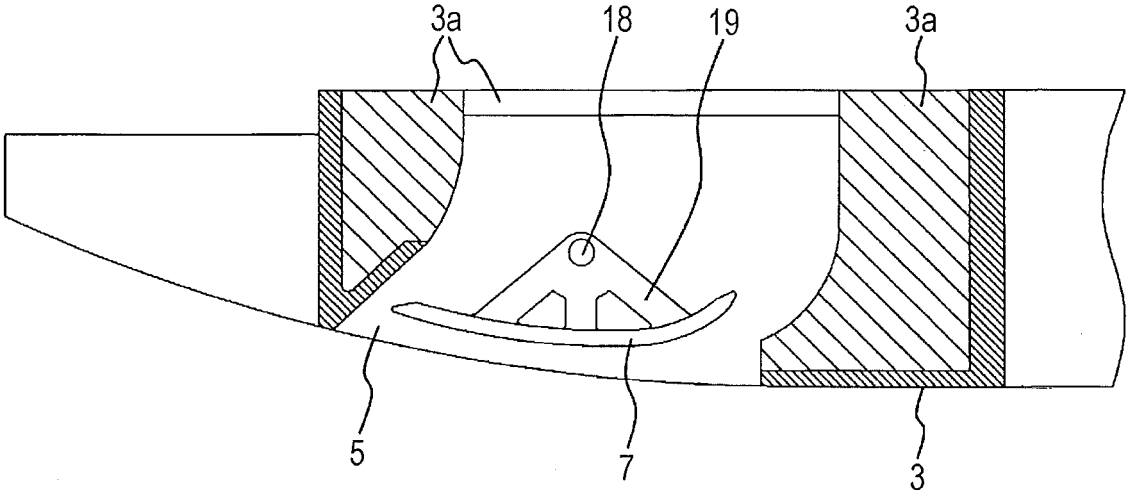
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FIG. 4

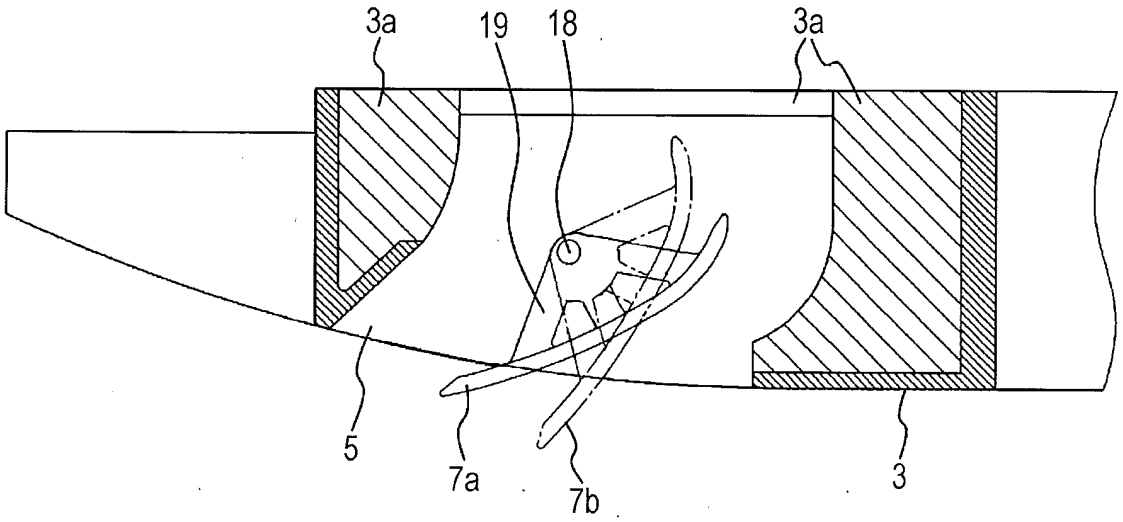


FIG. 5

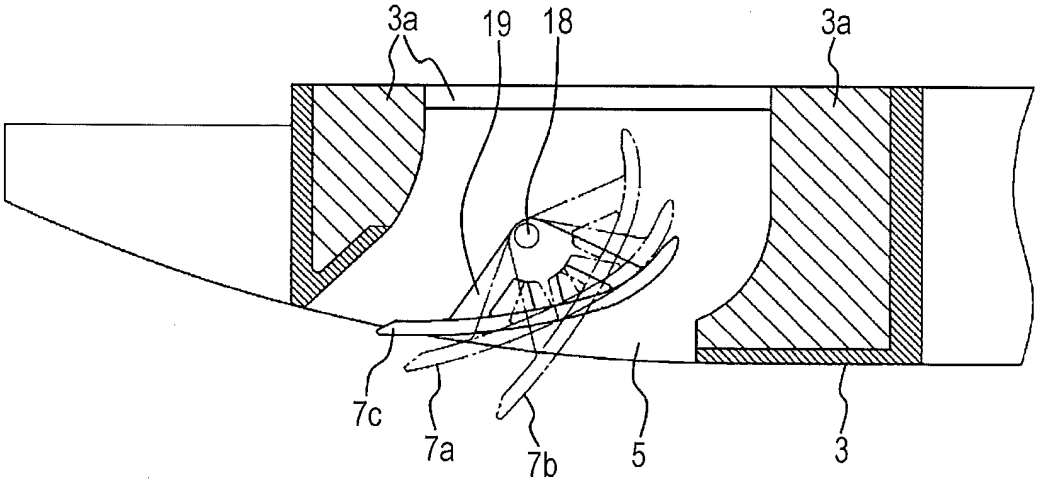


FIG. 6

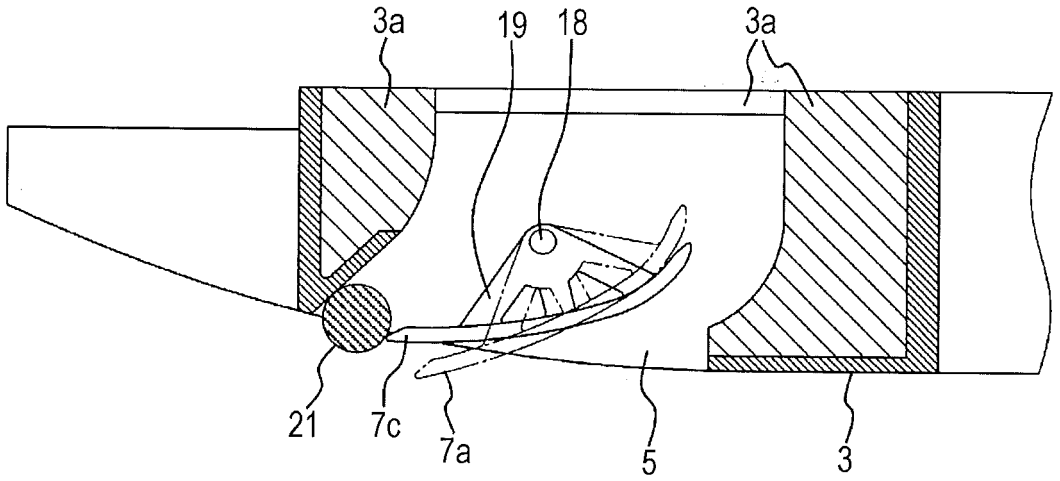
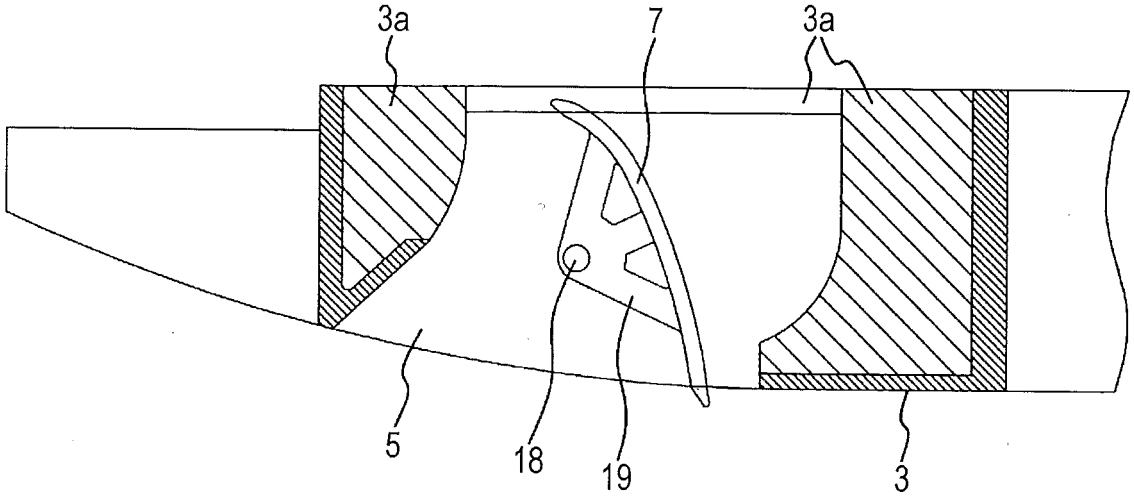


FIG. 7



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/043574

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. F24F13/20(2006.01)i, F24F11/56(2018.01)i, F24F11/79(2018.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl. F24F13/20, F24F11/56, F24F11/79

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	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

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 2011-69592 A (DAIKIN INDUSTRIES, LTD.) 07 April 2011, paragraphs [0047]-[0131], fig. 1-17 (Family: none)	1-10
A	JP 2017-36899 A (MITSUBISHI HEAVY INDUSTRIES, LTD.) 16 February 2017, paragraphs [0016]-[0052], fig. 1-13 & EP 3130861 A1, paragraphs [0020]-[0077]	1-10
A	JP 2015-135201 A (MITSUBISHI ELECTRIC CORPORATION) 27 July 2015, paragraphs [0010]-[0028], fig. 1-8 & CN 204373066 U	1-10

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:
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"O" document referring to an oral disclosure, use, exhibition or other means
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23.02.2018	06.03.2018

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 6135734 B **[0004] [0006]**