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(54) INDOOR MACHINE OF AIR CONDITIONER

(57) An airstream direction guide device (F) including a discharge port (6) includes an up/down airstream direction louver (7A), which controls an up/down discharge direction of heat-exchanged air, and right/left airstream direction louvers (7B), which are attached to the up/down airstream direction louver (7A) and control a right/left discharge direction of the heat-exchanged air, wherein the right/left airstream direction louvers (7B) are formed to have a length in a depth direction longer than that in a vertical direction and the same as or longer than a length of the up/down airstream direction louver (7A) in the depth direction, the up/down airstream direction louver (7A) is caused to take an approximately horizontal attitude and the right/left airstream direction louvers (7B) are positioned on an upper surface side of the up/down airstream direction louver (7B) and perform a horizontal discharge guide, and the up/down airstream direction louver (7A) is caused to take an approximately vertical attitude, and the right/left airstream direction louvers (7B) are positioned on a back surface side of the up/down airstream direction louver (7A) and perform a downward discharge guide so that a horizontal discharge guide in the cooling operation and a downward discharge guide in the warming operation can be securely and efficiently switched, airstream direction guide characteristics can be improved, and the heat-exchanged air can be smoothly distributed.

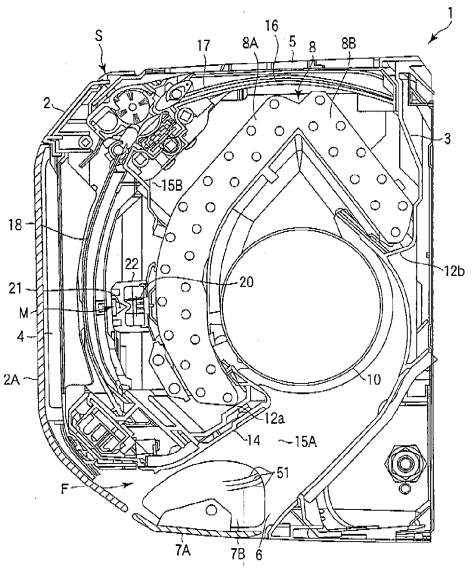

FIG. 1

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Description

Technical Field

[0001] The invention relates to an indoor unit of an air conditioner, and more particularly to an improvement of an airstream direction guide device which is disposed in a discharge port and discharges and guides heat-exchanged air into a room.

Background Art

[0002] In an air conditioner including an indoor unit and an outdoor unit, the indoor unit comprises an airstream direction guide device which discharges and guides obtained heat-exchanged air such as cool air and the like into a room. This type of airstream direction guide device includes a right/left airstream direction louver, which is disposed in a discharge port of an indoor unit main body, an up/down airstream direction louver, and a drive source and a drive mechanism which drive the right/left and up/down airstream direction louvers.

[0003] In general, as disclosed in Jpn. Pat. Appln. KOKAI Publication No. 5-523B6, right/left airstream direction louvers are disposed in a discharge ventilation path formed downstream of a blower, and an up/down airstream direction louver is disposed in a discharge port as a leading end of the discharge ventilation path. In addition to the above configuration, a feature of the invention resides in that the up/down airstream direction louver is divided to a main airstream direction plate and a sub airstream direction plate so that they function in a warming operation.

[0004] In the technology described above, provision of the up/down airstream direction louver in the discharge port of the leading end of the ventilation path permits an airstream direction of the heat-exchanged air discharged from the discharge port to be controlled in a width having a relatively wide angle in an up/down direction. In contrast, since the right/left airstream direction louver is disposed halfway of the discharge ventilation path in the indoor unit main body, the airstream direction of the heat-exchanged air is controlled in a very narrow control width in a right/left direction.

[0005] In recent houses, since a lounge, a dining room, a kitchen, and the like are continuously configured as a large room. Although an improvement of airstream direction characteristics is required not only in the up/down direction but also in the right/left direction, in the technology described above, since an airstream direction adjustment width is narrow in the right/left direction, the airstream direction cannot be guided at a wide angle. Further, since an up/down airstream direction is changed after a right/left airstream direction is changed, a loss occurs twice when the airstream direction changes and thus an airstream amount loss cannot be ignored.

[0006] Jpn. Pat. Appln. KOKAI Publication No. 2006-300460 discloses an air conditioner configured such that an up/down airstream direction louver (up/down airstream direction plate) is turnably disposed in a discharge port, right/left airstream direction louvers (right/left airstream direction plates) are turnably disposed in the up/down direction louver, and a drive unit, which drives the right/left airstream direction plate, includes a drive motor which is disposed in a side portion of the discharge port and an interconnection unit which interconnects the drive motor with the right/left airstream direction louvers.

Disclosure of Invention

[0007] According to the technology of Jpn. Pat. Appln. KOKAI Publication No. 2006-300460, since an airstream direction adjustment width can be widely set not only in an up/down direction but also in a right/left direction, airstream can be guided in a direction having a wide angle. Since the airstream can be guided in the right/left direction and in the up/down airstream direction at the same time, a loss occurs only once when the airstream direction is changed and thus deterioration of the airstream amount loss can be prevented.

[0008] However, Jpn. Pat. Appln. KOKAI Publication No. 2006-300460 does not explain how to discharge and guide cool air in a cooling operation and how to discharge and guide warm air in a warming operation. However, since FIG. 1 of the patent document illustrates the up/down airstream direction louver obliquely forward, it can be presumed that FIG. 1 explains how cool air is discharged and guided in the cooling operation.

[0009] In the drawing, the up/down airstream direction louver is disposed on an upper surface of the right/left airstream direction louvers, in other words, the right/left airstream direction louvers are positioned on a lower portion side of the up/down airstream direction louver. Moreover, in this state, the up/down airstream direction louver is formed concave on the lower portion side and formed convex on an upper portion side. Accordingly, most of the cool air guided by the up/down airstream direction louver does not travel in a horizontal direction but travels to a downward floor surface.

[0010] Since this type of indoor unit is of a wall-hanging type and attached to a high location in a room, in a cooling operation, it is preferable to guide cool air in a horizontal direction as far as possible so as not to supply the cool air to the feet of an occupant. As to this point, since the technology of Jpn. Pat. Appln. KOKAI Publication No. 2006-300460 is liable to supply cool air to the feet of the occupant, the technology fails to provide comfort.

[0011] Further, the patent document describes that plural right/left airstream direction louvers are coupled with a coupling rod via couple pins, and the coupling rod is disposed in front ends of the right/left airstream direction louvers acting as a front side of a discharge port. That is, since a position where the coupling rod is disposed is also an front end portion of the up/down airstream direction louver, the coupling rod acts as a resist-

ance when heat-exchanged air passes and thus a turbulent flow is generated by the coupling rod and prevents a smooth distribution of air.

[0012] An object of the invention, which has been made in view of the circumstances, is to provide an indoor unit of an air conditioner that comprises an airstream direction guide device which can improve airstream direction guide characteristics by securely and efficiently switching a horizontal discharge guide in a cooling operation and a downward discharge guide in a warming operation as well as permit a smooth air distribution.

[0013] In order to achieve the above object, the invention provides an indoor unit of an air conditioner in which an intake port and a discharge port are opened and which comprises a ventilation path disposed in the indoor unit to communicate the intake port with the discharge port, a heat exchanger and a blower disposed in the ventilation path, an airstream direction guide device installed in the discharge port, wherein the airstream direction guide device comprises: an up/down airstream direction louver which comprises a laterally long flat plate having a length in a right/left width direction longer than a length in a depth direction and controls an up/down direction of heat-exchanged air discharged from the discharge port by being driven to turn; and a plurality of right/left airstream direction louvers which are attached to the up/down airstream direction louver and control a right/left direction of the heat-exchanged air discharged from the discharge port by being driven to turn, the right/left airstream direction louvers are formed to have a length in a depth direction longer than a length in a vertical direction orthogonal to the depth direction as well as formed to have a length which is the same as or longer than a length of the up/dowh airstream direction louver in the depth direction, the up/down airstream direction louver is caused to take an approximately horizontal attitude and the right/left airstream direction louvers are positioned on an upper surface side of the up/down airstream direction louver and perform a horizontal discharge guide, and the up/down airstream direction louver is caused to take an approximately vertical attitude and the right/left airstream direction louvers are positioned on a back surface side of the up/down airstream direction louver and perform a downward discharge guide.

Brief Description of Drawings

[0014]

FIG. 1 is a schematic longitudinal sectional view of an indoor unit of an air conditioner according to an embodiment of the Invention.

FIG. 2 is an outer appearance perspective view of the indoor unit according to the embodiment.

FIG. 3 is an outer appearance perspective view of the indoor unit according to the embodiment in a refrigeration cycle operation.

FIG. 4 is a plan view of an airstream direction guide device according to the embodiment with a part thereof omitted.

FIG. 5 is a perspective view, partly in enlargement, of the airstream direction guide device according to the embodiment.

FIG. 6 is a view explaining an operation of the airstream direction guide device according to the embodiment by partly more enlarging the airstream direction guide device according to the embodiment.

FIG. 7 is a perspective view of the airstream direction guide device according to the embodiment with a part thereof exploded.

FIG. 8 is a view explaining a drive unit of the airstream direction guide device according to the embodiment.

FIG. 9A is a perspective view explaining an offset prevention structure of the airstream direction guide device according to the embodiment.

FIG. 9B is a sectional view explaining the offset prevention structure of the airstream direction guide device according to the embodiment.

FIG. 10A is a sectional view showing a part of the indoor unit according to the embodiment in a cooling operation.

FIG. 10B is a view explaining an attitude of the airstream direction guide device according to the embodiment in the cooling operation.

FIG. 11A is a sectional view showing a part of the indoor unit according to the embodiment in a warming operation.

FIG. 11B is a view explaining an attitude of the airstream direction guide device according to the embodiment in the warming operation.

FIG. 12A is a view explaining an operation of an airstream direction guide device according to another embodiment of the invention.

FIG. 12B is a view explaining an operation of an airstream direction guide device according to another embodiment of the invention.

FIG. 12C is a view explaining an operation of an airstream direction guide device according to another embodiment of the invention.

FIG. 13 is a view explaining a structure of an up/down airstream direction louver of an airstream direction guide device according to still another embodiment.

[0015] Best Mode for Carrying Out the Invention Embodiments of the invention will be explained based on the drawings.

[0016] FIG- 1 is a longitudinal sectional view schematically showing an indoor unit of an air conditioner when a refrigeration cycle operation stops, FIG. 2 is a perspective view showing an outer appearance of the indoor unit when the refrigeration cycle operation stops, and FIG. 3 is a perspective view showing the outer appearance of the indoor unit when a refrigeration cycle operation is performed. (Note that, parts to which reference numerals are not attached in the description are not illustrated, and

reference numerals may not be attached to illustrated parts. This is the same in the following description.)

[0017] An indoor unit main body 1 includes a front surface panel 2 that configures a front-side cabinet and a rear main body 3 that configures a rear-side cabinet and is formed in a laterally long state in a right/left width direction with respect to an up/down direction. A front surface intake port 4 is opened to a part of a front surface side of the indoor unit main body 1, and a movable panel 2A supported by an open/close drive mechanism is fitted to the front surface panel 2 that confronts the front surface intake port 4.

[0018] FIG. 1 shows a time at which the refrigeration cycle operation is stopped, the movable panel 2A is flush with the front surface panel 2, closes the front surface intake port 4, and configures a part of an outer appearance of the indoor unit main body 1. When the refrigeration cycle operation is started, the panel open/close mechanism is operated, and the movable panel 2A is away from the front surface intake port 4 and projects and moves to the front surface side.

[0019] Accordingly, a space communicating with a room is formed around the movable panel 2A, and the front surface intake port 4 can be opened into the room. An upper surface intake port 5 is opened to an upper portion of the indoor unit main body 1 and is attached with a rod-like sash which partitions the upper surface intake port 5 to plural space portions.

[0020] A discharge port 6 is opened to a lower portion of a front surface of the indoor unit main body 1 and is provided with an airstream direction guide device F which will be described later. The airstream direction guide device F is configured such that it can open and close the discharge port 6 depending on a turning attitude and set a discharge direction of heat-exchanged air according to a refrigeration cycle operation condition.

[0021] A heat exchanger 8, which is formed in an approximately inverted V shape by a front-side heat exchanger portion 8A and a rear-side heat exchanger portion 8B, is disposed in the indoor unit main body 1. The front-side heat exchanger portion 8A is formed in a curved shape so as to confront the overall front surface intake port 4 and a part of the upper surface intake port 5, and the rear-side heat exchanger portion 8B linearly obliquely tilts and confronts a part of the upper surface intake port 5.

[0022] An indoor blower 10 is interposed between the front- and rear-side heat exchanger portions 8A, 8B of the heat exchanger 8. The indoor blower 10 includes a fan motor, which is disposed in a space of a side end of the indoor unit main body 1, and a lateral flow fan coupled with a rotating shaft of the fan motor. An axial direction length of the lateral flow fan is set to approximately the same length as a width direction length of the heat exchanger 8, and the lateral flow fan and the heat exchanger 8 are disposed to properly confront each other.

[0023] A lower end portion of the front-side heat exchanger portion 8A is mounted on a front drain pan 12a, and a lower end portion of the rear-side heat exchanger portion 8B is mounted on a rear drain pan 12b. The front and rear drain pans 12a, 12b are molded integrally with the rear main body 3 which configures the indoor unit main body 1, can receive drain water dropped from the heat exchanger portions 8A, 8B, and discharge the drain water outdoors via a discharge hose (not shown).

[0024] Sidewall outer surfaces of the front and rear drain pans 12a, 12b are partly disposed near the indoor blower 10 and form a nose to the lateral flow fan of the indoor blower 10. The sidewall portions of the front and rear drain pans 12a, 12b acting as the nose are coupled with respective sides of the discharge port 6 via a partition wall 14.

[0025] A space surrounded by the partition wall 14 becomes a discharge ventilation path 15A which communicates the nose with the discharge port 6 by driving the indoor blower 10. On the other hand, an intake ventilation path 15B is formed in a portion from the front surface intake port 4 and the upper surface intake port 5 to the heat exchanger 8.

[0026] In contrast, an upper portion frame member assembly 16 is interposed between the upper surface intake port 5 disposed on an upper surface of the front surface panel 2 and an upper end portion of the heat exchanger B. An air filter cleaning unit S is attached along an upper end portion of the upper portion frame member assembly 16, and an upper surface air filter 17 is movably supported throughout the overall portion excluding the front end portion.

[0027] The air filter cleaning unit S performs such an operation that it causes dusts to alternately pass through the upper surface air filter 17 and a front surface air filter 18 and remove and clean the dusts which come into contact with and attached to the filters. The removed dusts are introduced once to an exhaust unit disposed in a side portion of the indoor unit main body 1 and discharged outdoors.

[0028] An ion generator M is disposed in the intake ventilation path 15B between the front surface air filter 18 and the front-side heat exchanger portion 8A. The ion generator M is configured such that it includes an ion generation electrode 20 and a confronting electrode 21 as a ground electrode, and the ion generation electrode 20 and the confronting electrode 21 are attached to a case member 22.

[0029] The ion generator M generates negative ions to parts, which configure the indoor unit, and to the indoor air guided to the intake ventilation path 15B, and cleans components which configure the indoor unit and the indoor air by sterilizing germs deposited on the components and germs container in the indoor air. A deodorizing action can be also obtained by the cleaning.

[0030] Next, the airstream direction guide device F will be described in detail. FIG. 4 is a plan view showing only a configuration of both the side portions of the airstream direction guide device F omitting a part (central portion) thereof, FIG. 5 is a perspective view of a side portion of

the airstream direction guide device F in enlargement, FIG. 6 a perspective view explaining an assembly structure of the side portion of the airstream direction guide device F, FIG. 7 is a perspective view of the airstream direction guide device F with the side portion exploded, and FIG. 8 is a view explaining a drive structure of the airstream direction guide device F.

[0031] The airstream direction guide device F includes an up/down airstream direction louver 7A, plural right/left airstream direction louvers 7B, a drive source 30A and a drive mechanism 31A which drive the up/down airstream direction louver 7A, and drive sources 30B and drive mechanisms 31B which drive the right/left airstream direction louvers 7B.

[0032] Although not particularly shown, plural right/left airstream direction louvers 7B are disposed in bilateral symmetry on both the sides of an intermediate portion of the up/down airstream direction louver 7A. That is, two sets of right/left airstream direction louvers 7B, in which each set includes the plural louvers, are separately disposed on right and left sides of the intermediate portion with respect to the up/down airstream direction louver 7A.

[0033] Note that the right/left airstream direction louvers 7B are not necessarily limited to the configuration, and a set of a right/left airstream direction louver 7B including plural louvers may be attached to the up/down airstream direction louver 7A throughout its overall length. However, the drive sources 30B need to have a larger driving force and moreover a reduction in size of the indoor unit main body 1 is prevented to secure an installation space of the drive sources.

[0034] As shown in FIG. 4, the drive sources 30B which drive the respective sets of the right/left airstream direction louvers 7B (hereinafter, called "right/left airstream direction louver drive motors") and the drive mechanisms (hereinafter, called "right/left airstream direction louver drive mechanism") 31B are disposed on both the right- and left-side portions of the up/down airstream direction louver 7A.

[0035] Further, the drive source 30A for driving the up/down airstream direction louver 7A (hereinafter, called "up/down airstream direction louver drive motor") and the drive mechanism (hereinafter, called "up/down airstream direction louver drive mechanism") 31A are disposed only in a left-side portion of the up/down airstream direction louver 7A.

[0036] That is, the up/down airstream direction louver drive motor 30A and the up/down airstream direction louver drive mechanism 31A, and parts of the right/left airstream direction louver drive motors 30B and the right/left airstream direction louver drive mechanisms 31B are disposed in the left-side portion of the up/down airstream direction louver 7A at positions close to each other. Portions to which the louver drive motors 30A, 30B are attached are located on a left-side portion of the discharge port 6.

[0037] Only the right/left airstream direction louver drive motor 30B and the right/left airstream direction louver drive mechanism 31B are attached to a right-side portion of the up/down airstream direction louver 7A. Portions where the louver drive motors 30B are attached are right-side portions of the discharge port 6.

[0038] Any of the louver drive motors 30A, 30B is electrically connected to a controller R and controlled so as to be driven in rotation in a forward direction or in a reverse direction upon reception of a signal transmitted from the controller R or to receive a drive stop signal.

[0039] Further, although not particularly shown, the controller R receives signals from temperature sensors and humidity sensors attached to the front surface intake port 4, the upper surface intake port 5, the heat exchanger 8, the intake ventilation path 15B, the discharge ventilation path 15A, and the like, performs arithmetic operations, and transmits control signals to a compressor and an outdoor blower disposed in an outdoor unit, the indoor blower 10, the ion generator M, the air filter cleaning unit S, and the like.

[0040] Next, the up/down airstream direction louver drive mechanism 31A coupled with the up/down airstream direction louver drive motor 30A and the right/left airstream direction louver drive mechanism 31B coupled with the right/left airstream direction louver drive motors 306 which are shown in the left-side portion of FIG. 4 will be explained in detail.

[0041] A rotating shaft of the up/down airstream direction louver drive motor 30A is fitted with an up/down airstream direction louver drive gear 32. Further, a rotating shaft of the right/left airstream direction louver drive motors 30B is fitted with a right/left airstream direction louver drive gear 33.

[0042] As shown in FIGS. 5 and 8 in enlargement, the right/left airstream direction louver drive gear 33 is meshed with a rack portion 35 disposed in an end of a drive rod 34. That is, the right/left airstream direction louver drive gear 33 configures a pinion gear and is meshed with the rack portion 35 and can move the drive rod 34 forward and rearward along an axial direction according to a drive direction of the drive motor 30B.

[0043] The drive rod 34 is provided with a collar portion 36, which has a diameter larger than that of the rack portion 35, adjacent to a side end of the rack portion 35, and a slide shaft portion 37 is disposed along an axial direction of the collar portion 36. Plural projections 38 are disposed in portions near the collar portion 36 of the slide shaft portion 37 in a circumferential direction at predetermined intervals along the axial direction.

[0044] Further, an angular shaft portion 40 and a hook shaft portion 41 are continuously connected to the slide shaft portion 37 integrally therewith. The angular shaft portion 40 has a non-circular cross section and has, for example, a hexagonal shape. The hook shaft portion 41 is a shaft portion which has a diameter smaller than that of the angular shaft portion 40, a circular cross section, a groove portion 42 along a part of a peripheral surface of the shaft portion, and a leading end formed in a taper shape.

[0045] The slide shaft portion 37 of the drive rod 34 is fitted with a drive shaft 43. The drive shaft 43 includes a hole portion which has a hexagonal cross section and is fitted over the angular shaft portion 40 of the slide shaft portion 37 in the drive rod 34. Accordingly, the drive shaft 43 and the drive rod 34 are slidable to each other along the axial direction as well as rotatable integrally with each other.

[0046] A gear portion 44, which is meshed with the up/down airstream direction louver drive gear 32, is disposed in a part of an outer peripheral surface of the drive shaft 43. The up/down airstream direction louver drive motor 30A is attached and fixed to the portion, and an axial direction position of the up/down airstream direction louver drive gear 32, which is fitted to the rotating shaft, is also fixed. Accordingly, an axial direction position of the drive shaft 43, which includes the gear portion 44 meshed with the up/down airstream direction louver drive gear 32, is also fixed.

[0047] When the up/down airstream direction louver drive motor 30A is driven, the drive shaft 43 is driven in rotation via the up/down airstream direction louver drive gear 32 and the gear portion 44, and the drive rod 34 fitted to the drive shaft 43 is also driven in rotation. However, unless the right/left airstream direction louver drive motor 30B is driven, the drive rod 34 only rotates while keeping its position.

[0048] The drive shaft 43 includes a shaft portion 45 having a precisely circular outer cross section and an outer angular shaft 46 having a hexagonal outer cross section along an axial direction of the gear portion 44. That is, a hole portions is disposed along an inner diameter of the drive shaft 43, and the gear portion 44 along an outer shape and the shaft portion 45 and the outer angular shaft 46 along the axial direction are continuously disposed.

[0049] As shown in FIG. 4 again, a right/left airstream direction louver drive gear 33 is fitted to a rotating shaft of the right/left airstream direction louver drive motor 30B, which is disposed in the right-side portion of the up/down airstream direction louver 7A and meshed with a rack portion 35 of a drive rod 34 having the same configuration as that explained above.

[0050] The rack portion 35 and a slide shaft portion 37 are continuously disposed in the drive rod 34, and although the slide shaft portion 37 may be simply a round rod-shaped shaft, the slide shaft portion 37 needs to have a leading end formed in a taper shape and a groove portion similar to the groove portion 42.

[0051] In particular, as shown in FIG. 7, the up/down airstream direction louver 7A includes a laterally-long-shaped flat plate which is long in a right/left width direction (hereinafter, called "X-direction") and short in a depth direction (hereinafter, called "Y-direction"). A length of the up/down airstream direction louver 7A in the X-direction agrees with a length of the discharge port 6 in the right/left width direction, and a length of the louver 7A in the Y-direction agrees with a length of the discharge port 6 in a longitudinal direction. Accordingly, the up/down airstream direction louver 7A has a size and a shape which can open and close the discharge port 6.

[0052] The up/down airstream direction louver 7A is formed by being curved along the Y-direction so that an upper surface has a concave shape and a lower surface has a convex shape in a state that a refrigeration cycle operation shown in FIG- 1 is stopped. Approximately triangular support ribs 48 integrally stand on an intermediate portion in the Y-direction on an upper surface of the up/down airstream direction louver 7A on both the side ends in the X-direction.

[0053] Support holes 49 formed of hexagonal holes are disposed in apexes of the support ribs 48, and hole portions are disposed in base end portions of the support ribs 48. The support holes 49 have a shape and a size which approximately agree with a shape and a size of an outer shape of the outer angular shafts 46 disposed in the drive shafts 43. Accordingly, the outer angular shafts 46 of the drive shafts 43 can be fitted to the support holes 49 of the support ribs 48.

[0054] Although shown only in FIG. 4, a support rib 48 is also disposed on the upper surface of the right-side end of the up/down airstream direction louver 7A and formed with a support hole having a hole diameter slightly larger than a diameter size of the slide shaft portion 37 of the drive rod 34. That is, the slide shaft portion 37 of the drive rod 34 is slidably inserted into the support hole of the support rib 48.

[0055] Plural positioning projections 50 are disposed on the upper surface of the up/down airstream direction louver 7A at positions parted to a front side and a rear side from an intermediate position of the louver 7A in the Y-direction at predetermined intervals in the X-direction integrally with the louver 7A. The positioning projections 50 are disposed by being parted in the Y-direction on both the sides of the support holes 49 of the support ribs 48.

[0056] The right/left airstream direction louvers 7B are formed to have a length in the Y-direction larger than a length in a vertical direction orthogonal to both the portions along the Y-direction (hereinafter, called "z-direction"). Then, the length of the right/left airstream direction louvers 7B in the Y-direction is formed equal to or larger than the length of the up/down airstream direction louver 7A in the Y-direction.

[0057] The right/left airstream direction louvers 7B are formed in an R-shape at an upper end along the Y-direction as well as on both the side portions. Plural (here, three) guide projections 51 are integrally disposed in one side portion of the R-shaped portions at predetermined intervals in the Z-direction from an end edge in the Y-direction to an approximately intermediate portion in the Y-direction. The respective guide projections 51 are formed in a streamline shape.

[0058] Lower ends of the right/left airstream direction louvers 7B are formed in a concave shape in approximately intermediate portions, and hooking projections 53

and adjusting projections 54 are integrally disposed in the concave-shaped portions at positions away from each other.

[0059] The hooking projections 53 are hooked to hole portions 56 disposed in coupling rods 55, which will be described later, at predetermined intervals. The coupling rods 55 are rod-shaped members disposed in confrontation with each other throughout the plural right/left airstream direction louvers 7B, and a coupling rod 55 is turnably coupled with plural right/left airstream direction louvers 7B via the hooking projections 53 and hole portions 56.

[0060] As described above, since two sets of the right/left airstream direction louvers 7B are disposed on a right side and a left side of an approximately intermediate portion of the up/down airstream direction louver 7A in the X-direction, the two coupling rods 55 are also disposed in the up/down airstream direction louver 7A on the right side and on the left side.

[0061] Hole portions 59 formed in a right/left airstream direction louver adjuster 58, which will be described later, at predetermined intervals are hooked to the adjusting projections 54 in the right/left airstream direction louvers 7B. Accordingly, the right/left airstream direction louvers 7B are turnably coupled with the right/left airstream direction louver adjuster 58 via the adjusting projections 54 and the hole portions 59.

[0062] The right/left airstream direction louver adjuster 58 includes a plate member and has a length in the X-direction which agrees with a size between the support ribs 48 disposed on both the right- and left-side ends of the up/down airstream direction louver 7A. Projections 60 are disposed in both the side portions of the right/left airstream direction louver adjuster 58 integrally therewith and are free to be hooked to and unhooked from the hole portions of the support ribs 48.

[0063] Plural cutouts 61 are disposed in side-end portions of the right/left airstream direction louver adjuster 58 along the X-direction at predetermined intervals. Intervals of the cutouts 61 in the Y-direction approximately agree with the intervals of the positioning projections 50 in the up/down airstream direction louver 7A in the Y-direction, and the cutouts 61 have a position and a length via which the cutouts 61 are fitted to the positioning projections 50.

[0064] In an actual assembly, the respective hooking projections 53 of the plural sheets of the right/left airstream direction louvers 7B are hooked to the hole portions 56 of the coupling rods 55 so that the right/left airstream direction louvers 7B are coupled with the coupling rods 55. Further, the respective adjusting projections 54 of the right/left airstream direction louvers 7B are hooked to the hole portions 59 of the right/left airstream direction louver adjuster 58 so that the right/left airstream direction louver adjuster 58, the plural sheets of the right/left airstream direction louvers 7B, and the coupling rods 55 are integrated.

[0065] A member configured by integrating the right/left airstream direction louver adjuster 58, the right/left airstream direction louvers 7B, and the coupling rods 55 is caused to confront between the support ribs 48 on both the side ends of the up/down airstream direction louver 7A, and the projections 60 on both the side ends of the right/left airstream direction louver adjuster 58 are hooked to the hole portions of the support ribs 48.

[0066] In this state, the cutouts 61 of the right/left airstream direction louver adjuster 58 are hooked to the positioning projections 50 of the up/down airstream direction louver 7A. Accordingly, a member, in which the up/down airstream direction louver 7A is attached with the right/left airstream direction louvers 7B, the right/left airstream direction louver adjuster 58, and the coupling rods 55, is configured.

[0067] Coupling fixtures 63, which will be described later, are fitted to both the side portions of the right/left airstream direction louver adjuster 58 in the X-direction so as to be movable in the X-direction. The coupling fixtures 63 include rod portions a extending in the X-direction on a lower surface of the right/left airstream direction louver adjuster 58. That is, since the rod portions a of the coupling fixtures 63 are shielded by the right/left airstream direction louver adjuster 58, they are not exposed in assembly states shown in FIGS. 4 and 5.

[0068] Drive rod coupling portions 64 are disposed in one-side ends of the rod portions a which configure the coupling fixtures 63, coupling rod hook portions 65 are disposed in the other-side ends of the rod portions a, and the drive rod coupling portions 64 and the coupling rod hook portions 65 are exposed on an upper surface of the right/left airstream direction louver adjuster 58.

[0069] The drive rod coupling portions 64 include receiving portions 66 including semicircular receiving holes b and presser portions 67 turnably attached to the receiving portions 66 via hinges. The presser portions 67 are provided with hook portions which can be hooked to and unhooked from the receiving portions 66 as well as provided with semicircular presser holes c having the same radius of curvature as the receiving holes b.

[0070] In a state that the presser portions 67 are hooked and fixed to the receiving portions 66 via the hook portions, the presser holes c and the receiving holes b are made to have a precisely circular shape and become holes having the same diameter as that of the hook shaft portions 41 formed in leading ends of the drive rods 34. Further, lock claws d project from the presser holes c of the presser portions 67, and the lock claws d are formed to have a projection amount and a projection width via which the lock claws d can be hooked to and unhooked from the groove portions 42 of the hook shaft portions 41.

[0071] The coupling rod hook portions 65 are provided with long holes e which are long in the Y-direction, and coupling projections 68, which are disposed in lower surfaces of one-side portions of the coupling rods 55 are hooked to the long holes e.

[0072] Further, in the actual assembly, the right/left airstream direction louver drive motor 30B on the left-side

portion is driven, and the drive rod 34 is moved backward via the right/left airstream direction louver drive gear 33 and the rack portion 35 of the drive rod 34. The drive rod 34 is stopped when a leading end of the hook shaft portion 41 of the drive rod 34 reaches approximately the same position as a leading end of the outer angular shaft 46 of the drive shaft 43.

[0073] In the right/left airstream direction louver drive motor 30B on the right-side portion, the drive rod 34 is stopped after it is moved backward at a maximum to a degree that it is not extracted from the support rib 48. Next, the up/down airstream direction louver 7A, in which the right/left airstream direction louvers 78 and the like are integrated, are held, the support rib 48 disposed on the left-side portion is caused to confront the drive rod 34 and the drive shaft 43, and the support hole 49 is fitted over the outer angular shaft 46 of the drive shaft 43.

[0074] Then, the intermediate portion of the up/down airstream direction louver 7A is flexed to a certain degree, and the support hole of the support rib 48 disposed on the right-side portion is inserted over a leading end of the slide shaft portion 37 of the drive rod 34. At any event, the presser portions 67 in the respective coupling fixtures 63 on both the right-/left-side portions of the right/left airstream direction louver adjuster 58 are opened to the receiving portions 66.

[0075] The right/left airstream direction louver drive motors 30B on both the right/left sides are driven in rotation in a reverse direction from the state, and the hook shaft portions 41 at the leading ends of the drive rods 34 are slidably urged in a direction in which the hook shaft portions 41 project from the support ribs 48. As shown in FIG. 6, when the leading ends of the hook shaft portions 41 are inserted into the receiving holes c disposed in the receiving portions 66 of the coupling fixtures 63, the right/left airstream direction louver drive motors 30B are stopped.

[0076] After the hook shaft portions 41 on both the right-/left-side portions are inserted into the receiving portions 66 of the coupling fixtures 63, the presser portions 67 of the respective coupling fixtures 63 are turned and positioned to the receiving portions 66 and fixed by hook portions. The lock claws d disposed in the presser portions 67 are inserted into the groove portions 42 of the hook shaft portions 41 and placed in a hook state. Accordingly, the drive rods 34 are slidably coupled with the coupling fixtures 63 in the x-direction as the axial direction, and the drive rods 34 are free to rotate idly with respect to the coupling fixtures 63.

[0077] Since the drive rods 34 are coupled with and fixed to the coupling fixtures 63 on both the side portions as described above, a member, in which the up/down airstream direction louver 7A is integrated with the right/left airstream direction louvers 7B, can be coupled with the up/down airstream direction louver drive motor 30 on the one side portion and with the right/left airstream direction louver drive motors 30B on both the right-/left-side portions via the drive mechanisms 31A, 31B.

[0078] That is, the up/down airstream direction louver drive mechanism 31A includes the drive shaft 43 including the gear portion 44. The right/left airstream direction louver drive mechanisms 31B include the drive rods 34, the coupling fixtures 63, the coupling rods 55, and the right/left airstream direction louver adjuster 58.

[0079] In particular, almost all the parts such as the coupling fixtures 63, the coupling rods 55, the right/left airstream direction louver adjuster 58, and the like, which configure the right/left airstream direction louver drive mechanisms 31B, are attached to an intermediate portion of the up/down airstream direction louver 7A in the Y-direction.

[0080] FIG. 9A is a perspective view showing the intermediate portion of the parts in the X-direction in a state that the right/left airstream direction louvers 7B are attached to the up/down airstream direction louver 7A, and FIG. 9B is a sectional view of the intermediate portion.

[0081] An intermediate support rib 70 including a support shaft f is disposed in the intermediate portion of the up/down airstream direction louver 7A in the X-direction, and a cutout is formed in the right/left airstream direction louver adjuster 58 to project the intermediate support rib 7D. The support shaft f of the intermediate support rib 70 is inserted into a hole portion g of a support piece portion 71 projecting from an upper surface portion of the partition wall 14 of the indoor unit main body 1 integrally therewith.

[0082] Further, an offset prevention claw portion 72 is disposed in the intermediate portion of the up/down airstream direction louver 7A integrally therewith, and a cutout, via which the offset prevention claw portion 72 projects, is disposed in the right/left airstream direction louver adjuster 58. The offset prevention claw portion 72 is elastically abutted against a lower end edge of the support piece portion 71 and urges the support piece portion 71 so that no play is generated the support shaft portion f of the intermediate support rib 70 hooked to the hole portion g of the support piece portion 71.

[0083] That is, the intermediate portion of the up/down airstream direction louver 7A is supported by the indoor unit main body 1 via the support piece portion 71 in a state that the right/left airstream direction louvers 7B and the like are integrally assembled. The up/down airstream direction louver 7A is formed in a laterally long flat plate shape which is short in the Y-direction and long in the X-direction and further is attached integrally with the right/left airstream direction louvers 7B with which the right/left airstream direction louver adjuster 58, the coupling rods 55, and the like are coupled.

[0084] Both the right-/left-side portions of the up/down airstream direction louver 7A are supported by the drive rods 34 via the support ribs 48, and the drive rods 34 are supported by the indoor unit main body 1 via the right/left airstream direction louver drive gears 33 and the right/left airstream direction louver drive motors 30B- Accordingly, in the above state, there is a possibility that the intermediate portion of the up/down airstream direction

louver 7A in the longitudinal direction (X-direction) is curved and deformed because a load is applied to the intermediate portion.

[0085] The intermediate portion of the up/down airstream direction louver 7A can be prevented from being curved and deformed by disposing the intermediate support rib 70 in the intermediate portion of the up/down airstream direction louver 7A and supporting the intermediate portion by the support piece portion 71 of the indoor unit main body 1. Moreover, since the offset prevention claw portion 72 is disposed in the up/down airstream direction louver 7A and elastically abutted against the support piece portion 71, a play between the intermediate support rib 70 and the support piece portion 71 can be prevented.

[0086] Further, as described later, when the airstream direction guide device F discharges and guides the heat-exchanged air from the discharge port 6, the plural right/left airstream direction louvers 73 are simultaneously driven to turn on the up/down airstream direction louver 7A. With the operation, although the up/down airstream direction louver 7A is liable to be positionally offset in the X-direction, employment of the position offset regulation structure described above can regulate the positional offset of the up/down airstream direction louver 7A.

[0087] Next, an operation of the indoor unit of the air conditioner configured as described above will be explained.

[0088] When a user operates a remote controller (remote control panel) by depressing an operation button, the indoor blower 10 is driven as well as the ion generator M is energized. Further, the compressor is driven in the outdoor unit which communicates with the indoor unit via a refrigerant pipe, and the refrigeration cycle operation is started.

[0089] Indoor air is drawn into the indoor unit main body 1 from the front surface intake port 4 and the upper surface intake port 5, guided along the intake ventilation path 15B, and passes through the front surface air filter 18 and the upper surface air filter 17. At this time, the dusts contained in the indoor air are captured by the front surface air filter 18 and the upper surface air filter 17.

[0090] The indoor air, from which the dusts have been removed by the front surface air filter 18 and the upper surface air filter 17, is sterilized and deodorized by an operation of the ion generator M. At the same time, the ion generator M also sterilizes the components of the indoor unit. The cleaned indoor air flows in the heat exchanger 8 and becomes heat-exchanged air by a heat exchange operation by which the heat of the indoor air is exchanged with a refrigerant introduced into the heat exchanger 8.

[0091] Thereafter, the heat-exchanged air is guided along the discharge ventilation path 15A and discharged into a room from the discharge port 6. At this time, as described later, the heat-exchanged air is discharged and guided to the airstream direction guide device F and continues an efficient air conditioning operation.

[0092] When the refrigeration cycle operation is continued for a long time, an amount of the dusts, which are captured by and deposited on the front surface air filter 18 and the upper surface air filter 17, is increased and the dusts act as a resistance to an air distribution- To cope with the problem, the air filter cleaning unit S is periodically operated and the dusts deposited on the respective air filters 18, 17 are removed and discharged outdoors.

[0093] Note that, as described later, the airstream direction guide device F is!adjusted so as to change its attitude in a cooling operation and in a warming operation.

[0094] FIG. 10A is a sectional view of a part of the indoor unit in the cooling operation, and FIG. 10B is a view explaining an attitude of the airstream direction guide device F in the cooling operation. FIG. 11A is a sectional view of a part of the indoor unit in the warming operation, and FIG. 11B is a view explaining an attitude of the airstream direction guide device F in the warming operation.

[0095] First, the attitude of the airstream direction guide device F in the cooling operation will be explained.

[0096] When a cooling operation start signal is input to the controller R, the controller R transmits a drive signal to the up/down airstream direction louver drive motor 30A at once. The up/down airstream direction louver drive gear 32 is driven in rotation, and the drive shaft 43 including the gear portion 44 meshed with the drive gear 32 is driven in rotation.

[0097] Since the support hole 149 of the support rib 48 on the left-side portion of the up/down airstream direction louver 7A is hooked to the outer angular shaft 46 of the drive shaft 43, the up/down airstream direction louver 7A is driven to turn using the support hole 49 of the support rib 48 as a center of turn.

[0098] As described above, the drive rods 34, which configure the right/left airstream direction louver drive mechanisms 31B, pass through the support holes 49 of the support ribs 48 acting as a center of turn of the up/down airstream direction louver 7A. Although the drive rods 34 are driven in rotation together with the drive shafts 43, the groove portions 42 disposed in the drive rods 34 idly rotate with respect to the lock claws d disposed in the coupling fixtures 63.

[0099] Accordingly, the drive rods 34 and the coupling fixtures 63 do not slidably move. Since the coupling rod 55 coupled with the coupling fixture 63 on the left-side portion does not move, attitudes of all the right/left airstream direction louvers 7B coupled with the coupling rod 55 are fixed.

[0100] In contrast, in the support rib 48 on the right-side portion of the up/down airstream direction louver 7A, the support hole formed of a round hole turns with respect to the slide shaft portion 37 of the drive rod 34. The drive rod 34, which configures the right/left airstream direction louver drive mechanism 31B, passes through a center of the support hole of the support rib 48 which acts as a center of turn of the up/down airstream direction louver

7A.

[0101] However, the right/left airstream direction louver drive motor 30B on the right-side portion is stopped, the drive rod 34 and the coupling fixture 63 do not slidably move, and the groove portion 42 of the drive rod 34 and the lock claw d of the coupling fixture 63 only rotate idly. Since the coupling rod 55 coupled with the coupling fixture 63 on the right-side portion does not move, attitudes of all the right/left airstream direction louvers 7B on the right-side portion are fixed.

[0102] As shown in FIGS. 10A and 10B, when the up/down airstream direction louver 7A has an oblique attitude along the discharge ventilation path 15A, the controller R controls the up/down airstream direction louver drive motor 30A to stop its rotation. The support ribs 48 are positioned on an upper surface side of the up/down airstream direction louver 7A as well as the right/left airstream direction louvers 7B, which are supported via the drive shafts 43 and the like, are also positioned on the upper surface side of the up/down airstream direction louver 7A.

[0103] The controller R starts a cooling refrigeration cycle operation as well as controls the right/left airstream direction louver drive motors 30B to rotate forward and backward. While the refrigeration cycle operation is performed, the right/left airstream direction louver drive gears 33 are driven in rotation, and the drive rods 34 including the rack portions 35 are slidably urged in the axial direction.

[0104] The coupling fixtures 63 integrally coupled with the drive rods 34 are slidably urged, and the coupling rods 55 having the coupling projections 68 hooked to the coupling rod hook portions 65 of the coupling fixtures 63 are slidably urged in the same direction.

[0105] The right/left airstream direction louvers 7B are turnably urged integrally as the coupling rods 55 moves using the adjusting projections 54 hooked to the hole portions 59 of the right/left airstream direction louver adjuster 58 as fulcrums and using the hooking projections 53 hooked to the hole portions 56 of the coupling rods 55 as points of operation.

[0106] That is, as the coupling fixtures 63 move, the plural right/left airstream direction louvers 7B are simultaneously turned in the same direction via the coupling rods 55. The right/left airstream direction louver drive motors 30B are controlled such that after they are driven in rotation for a predetermined time in a predetermined direction, they are driven in rotation in a counter-predetermined direction for a predetermined time.

[0107] As the coupling fixtures 63 and the coupling rods 55 are reciprocatingly driven for each predetermined time, the plural right/left airstream direction louvers 7B are simultaneously driven to turn in the predetermined direction and in the counter-predetermined direction. That is, the plural right/left airstream direction louvers 7B perform a so-called oscillating motion. The cool air, which is discharged from the discharge port 6 in the refrigeration cycle operation, is guided in right and left directions and reaches every corner of the room.

[0108] Since the plural guide projections 51 disposed in side-end portions of the right/left airstream direction louvers 7B are formed in the streamline shape, the cool air is smoothly guided along the guide projections 51 of the right/left airstream direction louvers 7B and thus an airstream blowing efficiency can be improved.

[0109] Moreover, the up/down airstream direction louver 7A is formed in the concave shape toward the right/left airstream direction louvers 7B. The cool air, which is discharged from the discharge port 6, is guided obliquely forward by the up/down airstream direction louver 7A as well as guided along the concave attitude of the up/down airstream direction louver 7A. As shown by an arrow in the drawing, the cool air is lifted obliquely upward by the up/down airstream direction louver 7A.

[0110] As a result, since the up/down airstream direction louver 7A formed in the curved shape is positioned below a center of a discharge airflow, airstream is not separated and the airflow can be efficiently curved in the horizontal direction. Since the cool air is guided further and more upward, it is away from a floor surface of the room and does not directly cool the feet of an occupant. Comfortable cool air conditioning can be obtained by providing the airstream direction guide device F.

[0111] At this time, the up/down airstream direction louver drive motor 30A may be stopped, and the drive shaft 43, which is meshed via the up/down airstream direction louver drive gear 32, may be held in a fixed state without being influenced by the sliding movement of the drive rod 34. Alternatively, the up/down airstream direction louver drive motor 30A may be driven in rotation forward and backward, and the up/down airstream direction louver 7A may be swung up and down within a predetermined angle range.

[0112] The drive shaft 43, which configures the up/down airstream direction louver drive mechanism 31A, is fitted to the support hole 49 of the support rib 48 disposed in the up/down airstream direction louver 7A, and the support rib 48 and the up/down airstream direction louver are driven to turn and displaced by driving the up/down airstream direction louver drive motor 30A.

[0113] The drive rod 34 having the angular shaft portion 40, which includes the hole portion having the hexagonal cross section and whose outer cross section is formed in the hexagon shape, is fitted to a center shaft of the drive shaft 43 so as to move forward and backward along the axial direction- Since the drive rod 34 is rotated in synchronization with the drive shaft 43, even if the up/down airstream direction louver 7A is driven to turn, power can be transmitted to the right/left airstream direction louvers 7B without loss.

[0114] When a warm operation mode is selected, the controller R rotates the up/down airstream direction louver drive gear 32 by controlling the up/down airstream direction louver drive motor 30A and causes the up/down airstream direction louver 7A to take an approximately vertical attitude via the drive shaft 43 as shown in FIGS.

11A and 11B. Accordingly, the right/left airstream direction louvers 7B are positioned on a back surface side of the up/down airstream direction louver 7A.

[0115] A warm refrigeration cycle operation is performed while keeping the attitude as well as the right/left airstream direction louver drive motors 30B are controlled so as to rotate forward and backward. At this time, the up/down airstream direction louver drive motor 30A may be also energized and cause the up/down airstream direction louver 7A to perform the oscillating motion within a predetermined angle range.

[0116] As the right/left airstream direction louver drive motors 30 are driven, the right/left airstream direction louvers 7B perform the so-called oscillating motion as described above so as to guide the warm air discharged from the discharge port 6 to every corner of the room. The guide projections 51 disposed in the right/left airstream direction louvers 7B smoothly guide the warm air so that the airstream blowing efficiency can be improved.

[0117] Moreover, the up/down airstream direction louver 7A is formed in the concave shape toward the right/left airstream direction louvers 7B. The warm air discharged from the discharge port 6 is discharged and guided downward by the up/down airstream direction louver 7A as shown by arrows in the drawing as well as guided downward along the concave attitude of the up/down airstream direction louver 7A.

[0118] As a result, since the up/down airstream direction louver 7A is positioned above a center of a discharge airflow, airstream is not separated and the airflow can be efficiently curved downward. Warm air is guided from the indoor unit to the floor surface of the room and warms the feet of the occupant. Comfortable warm air conditioning of so-called cool head and warm feet can be obtained by providing the airstream direction guide device F.

[0119] As described above, in the cooling operation and in the warming operation, since the up/down airstream direction louver 7A and the right/left airstream direction louvers 7B are positioned approximately oppositely, an inclining attitude of the right/left airstream direction louvers 7B is changed to an opposite side by switching the operations.

[0120] Thus, it is preferable to perform a control for automatically inverting an airstream direction angle of the right/left airstream direction louvers 7B with respect to a right/left airstream direction guide which is necessary according to a selected operation mode. Since it is not necessary to reset a right/left airstream direction each time the operation mode is changed, an operation can be simplified.

[0121] In an actual airstream direction guide device F, since the up/down airstream direction louver 7A and the right/left airstream direction louvers 7B are configured in the same color and the right/left airstream direction louver adjuster 58 and the coupling rods 55, which configure the right/left airstream direction louver drive mechanisms 31B, are also configured in the same color, the airstream direction guide device F has a good outer appearance and the right/left airstream direction louvers 7B are emphasized so that an airstream direction can be easily adjusted by a remote controller and the like.

[0122] In any of the cooling operation and the warming operation, the right/left airstream direction louver adjuster 58 is attached to an approximately intermediate portion of the up/down airstream direction louver 7A in the Y-direction, and the right/left airstream direction louvers 7B, the coupling rods 55, and the coupling fixtures 63 are disposed in the approximately intermediate portion for the convenience of configuration of the airstream direction guide device F.

[0123] That is, when the heat-exchanged air, which is the cool air and the warm air, is discharged and guided along the up/down airstream direction louver 7A that configures the airstream direction guide device F, almost all the portions of the right/left airstream direction louvers 7B and the right/left airstream direction louver drive mechanisms 31B are disposed in the approximately intermediate portion of the up/down airstream direction louver 7A in the Y-direction.

[0124] Accordingly, regardless of the cooling operation and the warming operation, since the right/left airstream direction louver drive mechanisms 31B are less likely to act as an airflow resistance to the heat-exchanged air, a smooth air distribution can be permitted by suppressing a factor for generating a turbulent flow.

[0125] In maintenance, to remove the up/down airstream direction louver 7A and the right/left airstream direction louvers 7B from the discharge port 6, the drive rods 34 are slidably moved by previously driving the right/left airstream direction louver drive motors 30B on both the side portions in rotation in a predetermined direction, and the drive motors 30B are stopped in a state that the right/left coupling fixtures 63 are caused to be in intimate contact with the right/left support ribs 48 as shown by two-dot-dash lines in FIG. 4.

[0126] Thereafter, when the right/left airstream direction louver adjuster 58 is pulled upward and flexed by holding an approximately intermediate portion thereof in the longitudinal direction (X-direction), the right/left airstream direction louvers 7B, the coupling rods 55, and the coupling fixtures 63 can be easily removed integrally from the up/down airstream direction louver 7A together with the right/left airstream direction louver adjuster 58 and thus a necessary maintenance can performed easily.

[0127] Further, in the support rib 48 on the left-side portion, when the leading end of the drive rod 34 is drawn from the leading end of the outer angular shaft 46 of the drive shaft 43 at a maximum and, in the support rib 48 on the right-side portion, when the leading end of the drive rod 34 is drawn from a side surface portion of the support rib 48 at a maximum, the support ribs 48 of the up/down airstream direction louver 7A can be easily removed from the leading ends of the drive rods 34.

[0128] Accordingly, a necessary maintenance can be performed also to the up/down airstream direction louver 7A. When a maintenance to the right/left airstream direc-

tion louvers 7B and to the up/down airstream direction louver 7A is finished and they are attached to predetermined portions again, it is sufficient to attach them as described above.

[0129] When the right/left airstream direction louvers 7B are initialized (an initial operation is set) and when the refrigeration cycle operation is stopped, right/left airstream direction louvers 7B of a left-side group connected to the left-side coupling rod 55 are inclined in a left direction and the coupling fixture 63 is caused to come into contact with the left-side support rib 48 as shown by the two-dot-dash lines in FIG. 4.

[0130] Likewise, right/left airstream direction louvers 7B of a right-side group connected to the right-side coupling rod 55 are inclined in a right direction and the coupling fixture 63 is caused to come into contact with the right-side support rib 48. With the operation, when an operation is started, since the right/left airstream direction louvers 7B are moved from a determined position at all times, a numerical value of the number of drive pulses supplied to the right/left airstream direction louver drive motors 30B can be set to a determined numerical value, and thus, when an operation is started, an initial operation for driving the right/left airstream direction louver drive motors 30B after they are returned to the determined position can be omitted.

[0131] In the invention, since the up/down airstream direction louver 7A is integrally configured with the right/left airstream direction louvers 7B, a depth size of the indoor unit main body 1 can be made shorter than an ordinary configuration in which an up/down airstream direction louver and right/left airstream direction louvers are individually disposed in front of and behind a ventilation path so that a thickness of the indoor unit main body 1 can be reduced.

[0132] Since the heat-exchanged air, which is introduced from the indoor blower 10 along the discharge ventilation path 15A, can be sent straight up to the discharge port 6, a reduction of an airstream velocity can be suppressed. That is, since the blower 10 having the same blowing capacity can discharge and guide heat-exchanged air further in the room, comfortable air conditioning can be obtained.

[0133] Since the airstream direction guide device F as an airstream direction deflecting portion can be disposed in the discharge port 6, a deflection width of the air, which is sent straight from the discharge ventilation path 15A, in a right and left direction of the room can be increased so that an airflow can be securely bent in the right/left direction. Accordingly, since an amount of air in the right/left direction can be increased, a range of angle in which air is sent right and left can be greatly increased.

[0134] The right/left airstream direction louvers 7B are mounted on the up/down airstream direction louver 7A, the right/left airstream direction louvers 7B are driven by actuators, and the up/down airstream direction louver 7A is driven by an actuator. An up/down positional relationship can be establishes between the right/left airstream direction louver 7B and the right/left airstream direction louvers 7B in a vertical direction.

[0135] As described above, when the up/down relationship between the up/down airstream direction louver 7A and the right/left airstream direction louvers 7B is reversed in the vertical direction, the right/left airstream direction louvers 7B are controlled so that the position thereof is reversed in the right/left direction. Accordingly, when the up/down direction is reversed, since an airstream direction in the right/left direction is automatically corrected, a desired airstream direction can be set without the need for the user to particularly care about an airstream direction.

[0136] FIGS. 12A, 12B and 12C show an airstream direction guide device Fa of a modification.

[0137] Although FIG. 12A shows that a movable panel 2A opens a front surface intake) port 4, this is a time at which a refrigeration cycle operation is stopped in which the airstream direction guide device Fa closes a discharge port 6. At this time, it is an up/down airstream direction louver 7A that actually closes the discharge port 6, and right/left airstream direction louvers 78 integrated with the up/down airstream direction louver 7A are positioned on a back side of the up/down airstream direction louver 7A and shielded from a room.

[0138] FIG. 12B shows the airstream direction guide device Fa in a cooling operation. The up/down airstream direction louver 7A and the right/left airstream direction louvers 7B are turned a predetermined angle counterclockwise from the time at which a refrigeration cycle operation is stopped, the up/down airstream direction louver 7A is caused to take an approximately horizontal attitude, and the right/left airstream direction louvers 7B are positioned on an upper surface side of the up/down airstream direction louver 7A.

[0139] With the configuration, since a depth-side end portion of the up/down airstream direction louver 7A is positioned near a lower surface wall that constitutes a discharge ventilation path 15A, almost no space remains therebetween. Since the right/left airstream direction louvers 7B are positioned on the upper surface side of the up/down airstream direction louver 7A, the cool air introduced to the discharge ventilation path 15A is efficiently discharged and guided horizontally depending on an attitude position and a mode of the up/down airstream direction louver 7A and a position and a mode of the right/left airstream direction louvers 7B.

[0140] As described above, the airstream direction guide device Fa horizontally discharges and guides the cool air discharged from the discharge port 6 and introduces the cool air further and smoothly so that comfortable cool air conditioning can be obtained.

[0141] FIG. 12C shows the airstream direction guide device Fa in a warming operation. The airstream direction guide device Fa is driven to turn counterclockwise from a position in which the refrigeration cycle operation is stopped. The airstream direction guide device Fa is continuously turned in the same direction after it passes

through a state in the cooling operation explained previously once and stopped at a position just before an end portion of the up/down airstream direction louver 7A is abutted against an upper surface wall of the discharge ventilation path 15A.

[0142] The up/down airstream direction louver 7A is reversed using the depth-side end portion in a horizontal discharge guide in the cooling operation as a leading end and using the leading end as a depth-side end portion. Moreover, since the depth-side end portion is positioned near the upper surface wall of the discharge ventilation path 15A has almost no space, there is no space via which warm air passes.

[0143] Since the right/left airstream direction louvers 7B are positioned on the back surface side of the up/down airstream direction louver 7A, the warm air, which is introduced to the discharge ventilation path 15A, is efficiently discharged and guided downward depending on the attitude position and the mode of the up/down airstream direction louver 7A and the position and the mode of the right/left airstream direction louvers 7B.

[0144] Accordingly, it is only necessary that an up/down airstream direction louver drive motor 30A, which drives the up/down airstream direction louver 7A in rotation via an up/down airstream direction louver drive mechanism 31A, is driven in rotation in a predetermined direction from an operation stop state in any of the cooling operation and the warming operation.

[0145] When these operations are stopped, in any of the cooling operation and warming operation, it is only necessary to drive the up/down airstream direction louver drive motor 30A in rotation in a reverse direction and to close the discharge port 6 by the up/down airstream direction louver 7A so that a control can be made easy.

[0146] FIG. 13 is a schematic plan view showing a modification of an up/down airstream direction louver 7A1 that configures the airstream direction guide device F.

[0147] The up/down airstream direction louver 7A1 is configured in a laterally long shape in which a right/left width direction is longer than a depth direction and further a depth direction size of both the side portions h of the up/down airstream direction louver 7A1 is made gradually short only on one side edge. When it is assumed that a portion shown by an arrow in the drawing is a front of the airstream direction guide device F, a rear (back surface side) end edge of the device F is short only on both the side portions in a right/left width direction.

[0148] Further, two sets of right/left airstream direction louvers 7B, which are attached integrally with the up/down airstream direction louver 7A1, are disposed on a right side and on a left side on both the sides of an approximately intermediate portion of the up/down airstream direction louver 7A1 in the right/left width direction as described above. Innermost right/left airstream direction louvers 7Ba are formed short in a depth direction in a plan view as shown by two-dot-dash lines in FIG. 4 so that end portions thereof are not abutted against each other when the innermost right/left airstream direction louvers 7Ba are faced in a state of two bars which inclinedly stand so as to be narrowed downward or in a state of two bars which inclinedly stand so as to be narrowed upward.

[0149] Further, one end portions of the right/left airstream direction louvers 7B (of each two sets here) positioned on both the outer-side portions h project from the up/down airstream direction louver 7A1 depending on a mode of the up/down airstream direction louver 7A1.

[0150] That is, since a central portion of the up/down airstream direction louver 7Al is more extended in the depth direction, although downward discharge characteristics can be more improved in a warming operation, an amount of air in a right/left peripheral portion of the discharge port 6 is lowered than the central portion.

[0151] However, since right/left portions of the up/down airstream direction louver 7A1 are shorter than the central portion, a space between an upper portion and a lower portion of the discharge port 6 and the louver 7A1 can be made large and an air distribution is not blocked by the space, and thus dew condensation due to a temperature drop in a periphery of the discharge port 6 caused by cool air staying in the periphery can be suppressed.

[0152] Further, the invention is not limited to the embodiments as they are and can be specifically embodied by modifying the components within a scope which does not depart from the spirit of the invention in an embodying stage. Various inventions can be formed by appropriately combining the components disclosed in the embodiments.

Industrial Applicability

[0153] According to the invention, since a horizontal discharge guide in a cooling operation and a downward discharge guide in a warming operation can be securely and efficiently switched, airstream direction guide characteristics can be improved.

Claims

1. An indoor unit of an air conditioner in which an intake port and a discharge port are opened and which comprises a ventilation path disposed in the indoor unit to communicate the intake port with the discharge port, a heat exchanger and a blower disposed in the ventilation path, an airstream direction guide device installed in the discharge port, **characterized in that** the airstream direction guide device comprises:

   an up/down airstream direction louver which comprises a laterally long flat plate having a length in a right/left width direction longer than a length in a depth direction and controls an up/down direction of heat-exchanged air dis-

charged from the discharge port by being driven to turn; and
a plurality of right/left airstream direction louvers which are attached to the up/down airstream direction louver and control a right/left direction of the heat-exchanged air discharged from the discharge port by being driven to turn,
the right/left airstream direction louvers are formed to have a length in a depth direction longer than a length in a vertical direction orthogonal to the depth direction as well as formed to have a length which is the same as or longer than a length of the up/down airstream direction louver in the depth direction,
the up/down airstream direction louver is caused to take an approximately horizontal attitude and the right/left airstream direction louvers are positioned on an upper surface side of the up/down airstream direction louver and perform a horizontal discharge guide, and
the up/down airstream direction louver is caused to take an approximately vertical attitude and the right/left airstream direction louvers are positioned on a back surface side of the up/down airstream direction louver and perform a downward discharge guide.

2. An indoor unit of an air conditioner in which an intake port and a discharge port are opened and which comprises a ventilation path disposed in the indoor unit to communicate the intake port with the discharge port, a heat exchanger and a blower disposed in the ventilation path, an airstream direction guide device installed in the discharge port, **characterized in that** the airstream direction guide device comprises:

an up/down airstream direction louver which comprises a laterally long flat plate having a length in a right/left width direction longer than a length in a depth direction, controls an up/down direction of heat-exchanged air discharged from the discharge port by being driven to turn, and is curvedly formed on a center of turn side; and
a plurality of right/left airstream direction louvers which are attached to the center of turn side of the up/down airstream direction louver as well as coupled with each other via coupling rods, and control a right/left direction of the heat-exchanged air discharged from the discharge port by being simultaneously driven to turn,
the right/left airstream direction louvers are formed to have respective lengths in a depth direction longer than a length in a vertical direction orthogonal to the depth direction as well as formed to have a length which is the same as or longer than a length of the up/down airstream direction louver in the depth direction,
the up/down airstream direction louver is caused to take an approximately horizontal attitude and the right/left airstream direction louvers are positioned on an upper surface side of the up/down airstream direction louver and perform a horizontal discharge guide, and
the up/down airstream direction louver is caused to take an approximately vertical attitude and the right/left airstream direction louvers are positioned on a back surface side of the up/down airstream direction louver and perform a downward discharge guide.

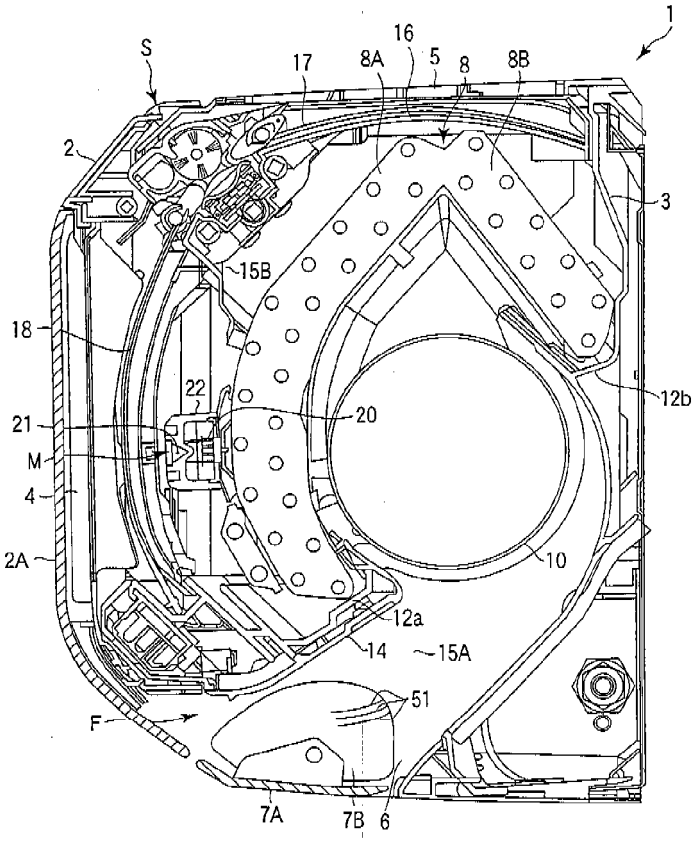
3. The indoor unit of an air conditioner according to claim 1 or 2, **characterized in that**
a drive source coupled with the up/down airstream direction louver is disposed on one side portion of the discharge port, and
coupling rods coupled with the right/left airstream direction louvers are disposed along an approximately intermediate portion of the up/down airstream direction louver in a depth direction, and further the coupling rods are coupled with a drive source disposed in one side portion and/or the other side portion of the discharge port.

4. An indoor unit of an air conditioner in which an intake port and a discharge port are opened and which comprises a ventilation path disposed in the indoor unit to communicate the intake port with the discharge port, a heat exchanger and a blower disposed in the ventilation path, an airstream direction guide device installed in the discharge port, **characterized in that** the airstream direction guide device comprises:

an up/down airstream direction louver which opens and closes the discharge port as well as controls an up/down direction of heat-exchanged air discharged from the discharge port; and
a plurality of right/left airstream direction louvers which are attached to a side surface of the up/down airstream direction louver and control a right/left direction of the heat-exchanged air discharged from the discharge port,
in a cooling operation, the up/down airstream direction louver is driven to turn from a position at which the discharge port is closed in a predetermined direction and caused to take an approximately horizontal attitude and the right/left airstream direction louvers are positioned on an upper surface of the up/down airstream direction louver and perform a horizontal discharge guide, and
in a warming operation, the up/down airstream direction louver is further driven to turn from the horizontal discharge attitude in the cooling operation in a predetermined direction, and the up/

down airstream direction louver is reversed so that the depth-side end portion in the horizontal discharge attitude becomes a leading end and the leading end becomes a depth-side end portion to perform a downward discharge guide.

5. The indoor unit of an air conditioner according to any of claims 1 to 4, **characterized in that** the right/left airstream direction plate comprises a plurality of streamline-shaped guide projections disposed in a front edge portion or a rear edge portion of the right/left airstream direction plate.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S
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8A
5
8
8B
2
3
15B
18
22
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M
4
2A
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12a
14
15A
51
F
7A
7B
6

FIG. 1

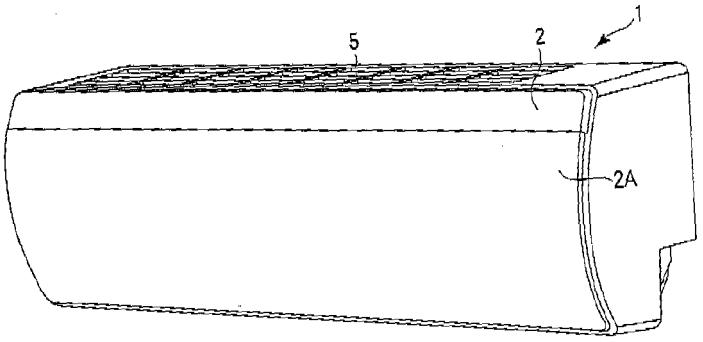


FIG. 2

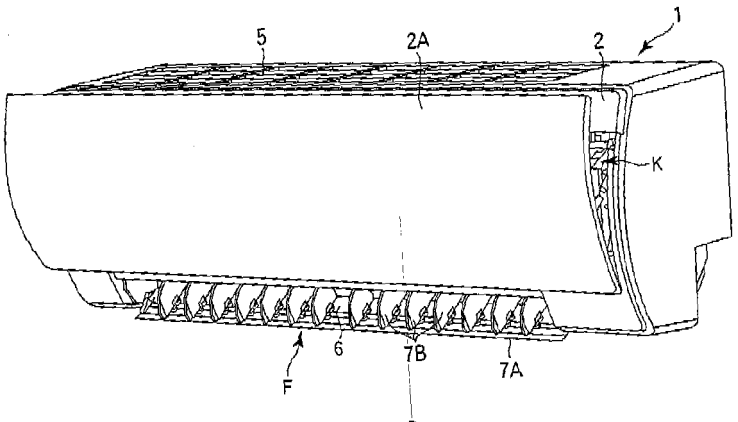
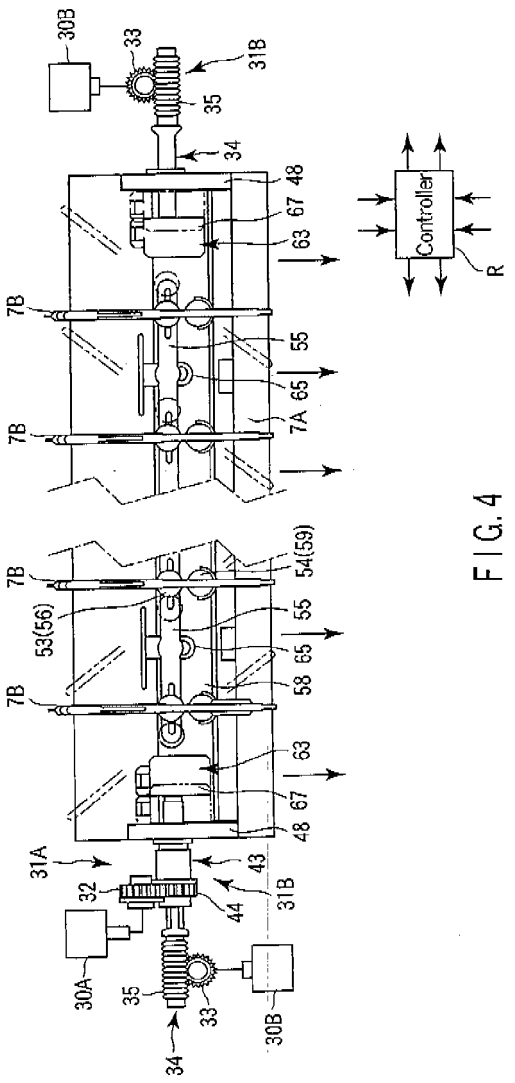


FIG. 3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33
31B
35
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48
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7B
55
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7A
7B
54(59)
7B
53(56)
55
65
58
7B
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67
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31A
43
32
44
31B
30A
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30B
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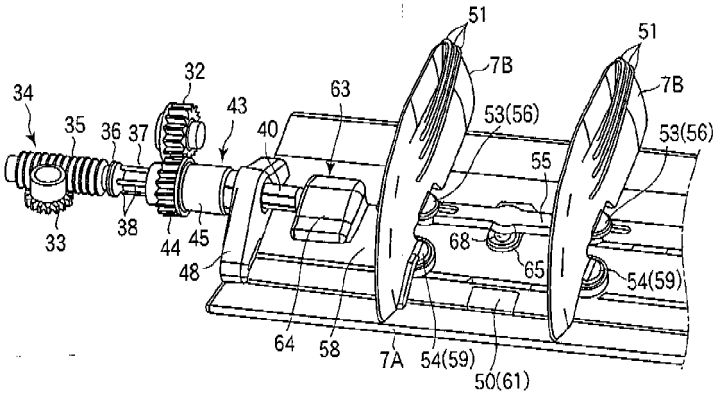
Controller
R

FIG. 4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7B
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53(56)
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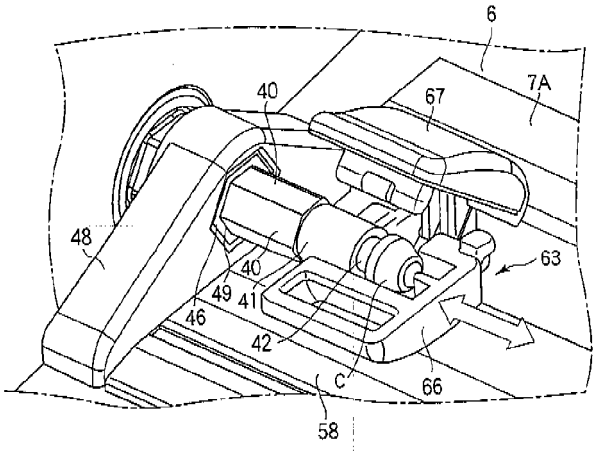
7A
54(59)
50(61)

FIG. 5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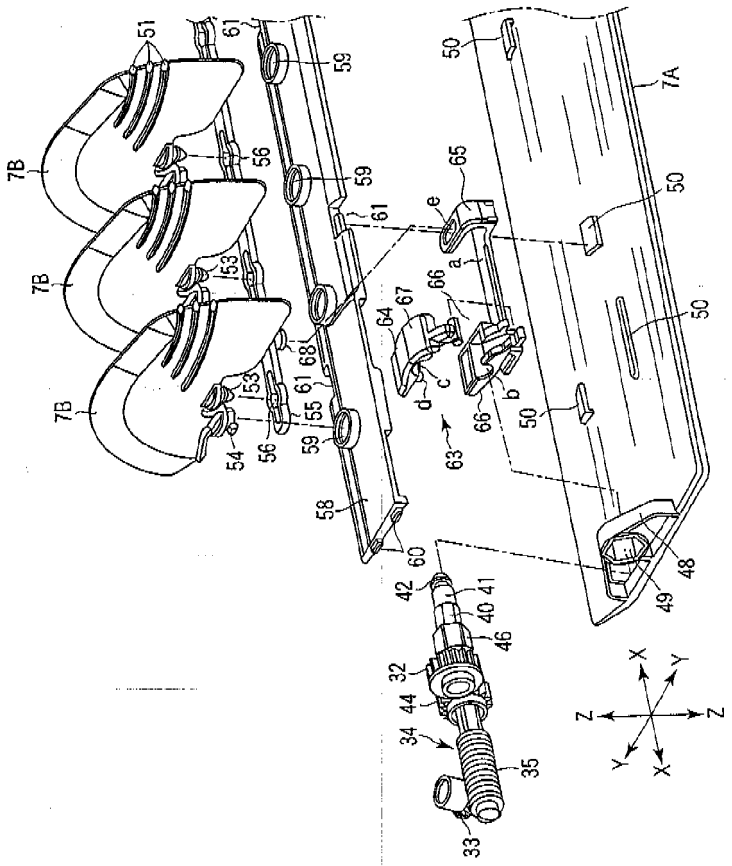
58

FIG. 6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35
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7A
65
e
a
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67
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d
b
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50
50
50
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49
X
Y
Z
Z
Y
X

FIG.7

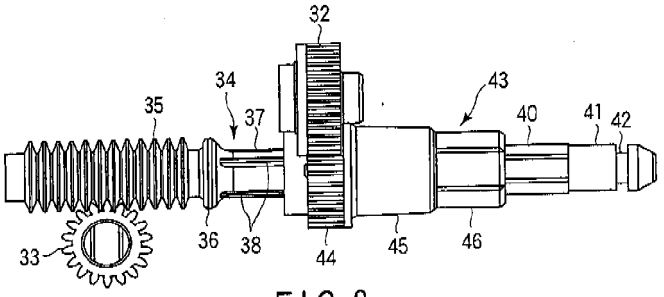


FIG. 8

FIG. 9A

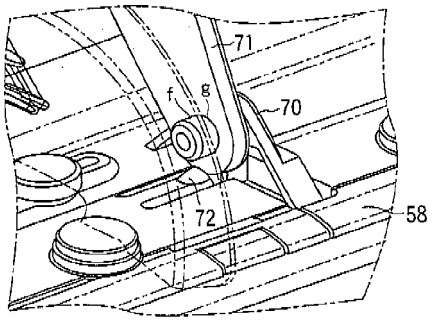
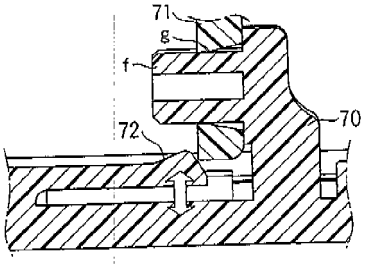


FIG. 9B



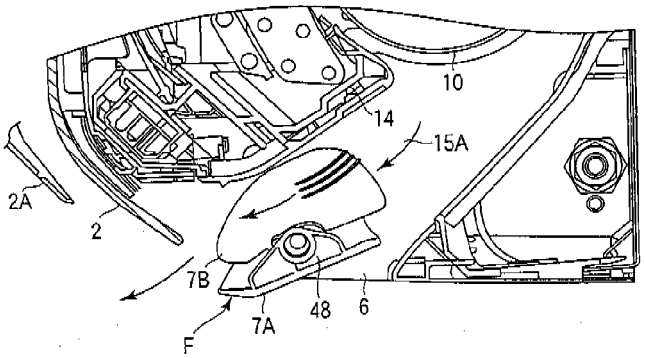


FIG. 10A

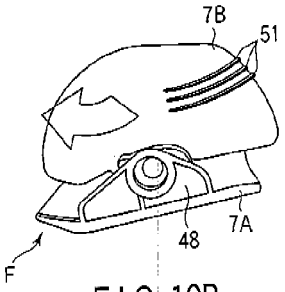


FIG. 10B

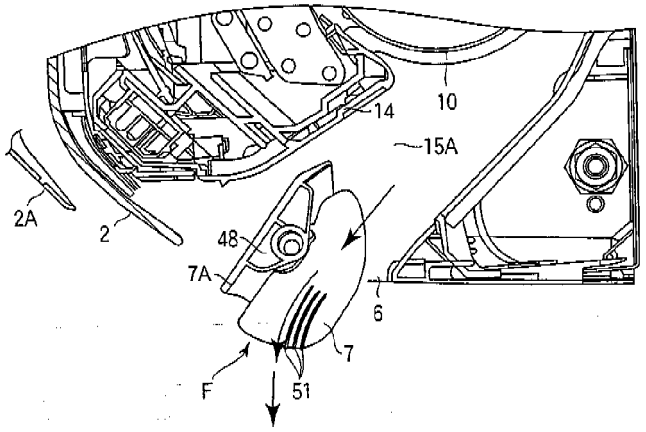


FIG. 11A

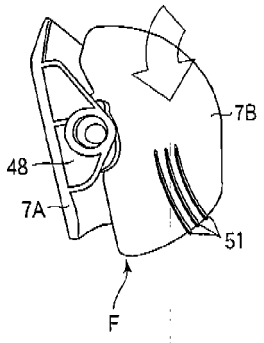


FIG. 11B

FIG. 12A

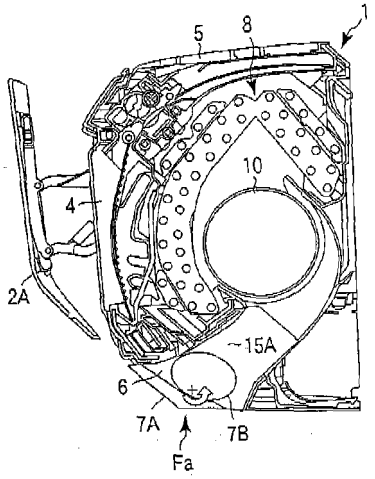
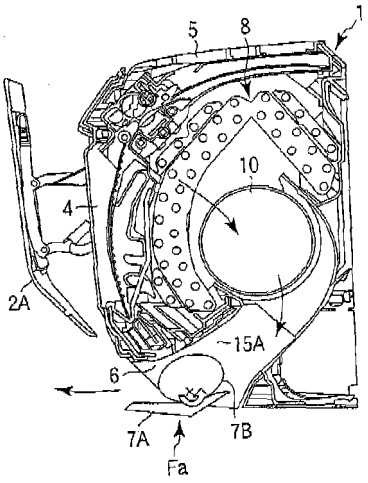


FIG. 12B



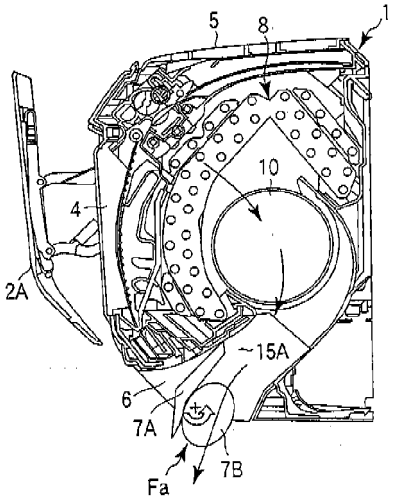


FIG. 12C

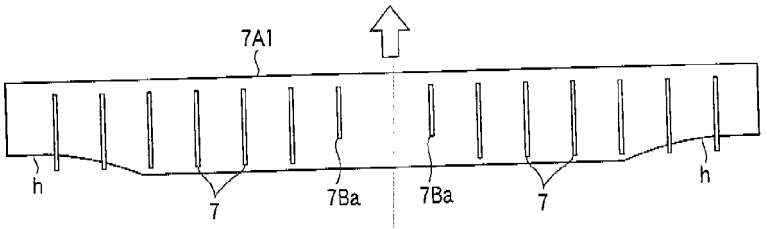


FIG. 13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/064667

A. CLASSIFICATION OF SUBJECT MATTER
F24F13/15(2006.01)i, F24F13/20(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)
F24F13/15, F24F13/20

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 1996-2009
Kokai Jitsuyo Shinan Koho 1971-2009 Toroku Jitsuyo Shinan Koho 1994-2009

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 2007-120890 A (Mitsubishi Electric Corp.), 17 May, 2007 (17.05.07), Par. Nos. [0009] to [0012]; Figs. 2, 3, 5 (Family: none)	1-4
A	JP 2006-275391 A (Matsushita Electric Industrial Co., Ltd.), 12 October, 2006 (12.10.06), Par. Nos. [0015] to [0021]; Figs. 2, 4, 6 (Family: none)	1-4
A	JP 2008-175431 A (Matsushita Electric Industrial Co., Ltd.), 31 July, 2008 (31.07.08), Par. Nos. [0031] to [0033]; Fig. 5 (Family: none)	1-4

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

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"P" document published prior to the international filing date but later than the priority date claimed
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"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
07 September, 2009 (07.09.09)	29 September, 2009 (29.09.09)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/064667

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. 138992/1984(Laid-open No. 54120/1986) (Mitsubishi Heavy Industries, Ltd.), 11 April, 1986 (11.04.86), Page 2, line 4 to page 3, line 11; Figs. 5 to 7 (Family: none)	1-4
A	JP 6-288605 A (Daikin Industries, Ltd.), 18 October, 1994 (18.10.94), Par. No. [0017]; Fig. 1 (Family: none)	5
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 133165/1981(Laid-open No. 39448/1983) (Suzuki Motor Co., Ltd.), 15 March, 1983 (15.03.83), Page 3, line 19 to page 4, line 3; Fig. 4 (Family: none)	5
A	JP 10-267382 A (Fujitsu General Ltd.), 09 October, 1998 (09.10.98), Par. Nos. [0009] to [0011]; Fig. 3 (Family: none)	5

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 5000523 B **[0003]**
- JP 2006300460 A **[0006] [0007] [0008] [0010]**