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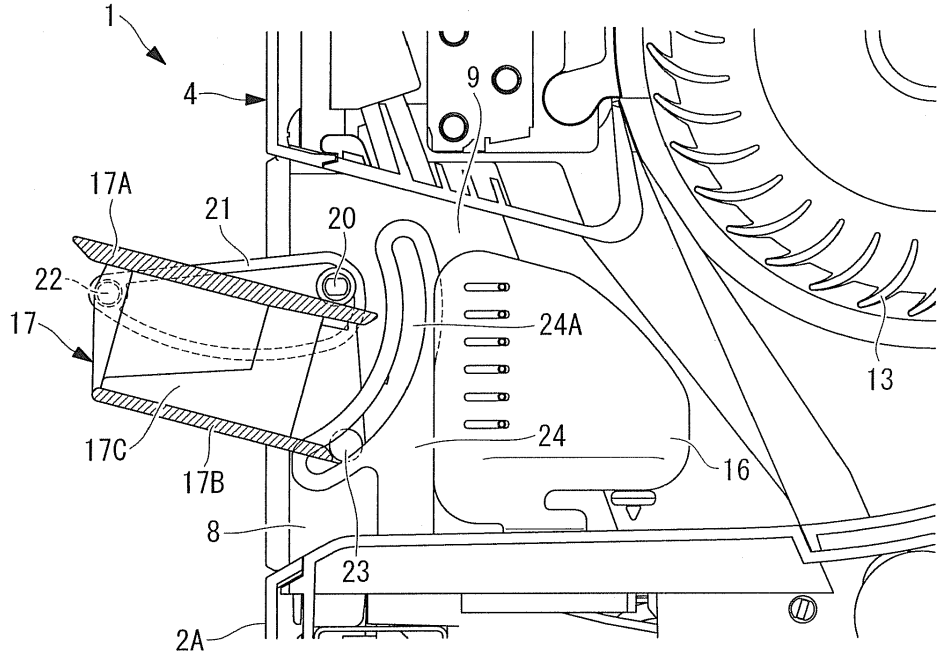
(54) Air conditioner

(57) In this air conditioner, a flap (17) that adjusts an air direction is provided at a blow-out opening (8) for temperature conditioned air, a widthwise front edge of the flap (17) is supported at both ends in a length direction thereof in a freely pivotable manner via first spindles (22) at second ends of linkages (21) whose first ends are coupled with rotation shafts (20) that are driven by a motor, and a widthwise rear edge of the flap (17) is supported in a freely slidable manner by a guiding pathway (24), which is provided so as to extend in a top-to-bottom direction of the blow-out opening (8), via a second spindle (23).

FIG. 3



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Description

{Technical Field}

[0001] The present invention relates to an air conditioner in which a flap that adjusts air direction is provided at a blow-out opening for temperature conditioned air.

{Background Art}

[0002] In general, a blow-out opening of an air conditioner is provided with louvers that adjust the air direction of temperature conditioned air in the left-to-right direction and flaps that adjust the air direction in the top-to-bottom direction. Regarding these louvers and flaps, the louvers are provided on the upstream side in an air duct at the blow-out opening, and the flaps are provided on the downstream side thereof, and rotation shafts thereof are fixed at one point in the air duct at the blow-out opening, thus making it possible to close the blow-out opening with the flaps when the operation of the air conditioner is stopped. In this configuration, in the case in which the blow-out opening extends in the horizontal direction, corresponding to the width of the flaps, it is difficult to set the flap positions in the air duct at optimum positions when blowing downward or blowing upward, and there is a problem in which optimizing the flap position for blowing upward causes the flaps to make the air duct narrower when blowing downward, which prevents the air direction from being optimized, decreases the airflow level, and so forth.

[0003] In response, the disclosures of Patent Literatures 1 to 3 make a rotation shaft of a flap movable. Patent Literature 1 discloses an invention in which a first linkage is rotatably provided at a side plate, a second linkage is rotatably provided at the other end of the first linkage, and a flap is rotatably supported at the distal end of the second linkage, thus making it possible to move a rotation shaft of the flap outside the air duct at the blow-out opening via a multi-joint linkage mechanism. In addition, Patent Literature 2 discloses an invention in which cam gears are driven by a motor via motor gears and drive gears, and a flap is rotatably supported at two points, that is, the front and rear, via two sets of linkage mechanisms that are made movable by cam grooves provided in the cam gears, thus making it possible to move a rotation shaft of the flap outside the air duct at the blow-out opening.

[0004] Furthermore, Patent Literature 3 discloses an invention in which, on a first flap of two flaps, namely, top and bottom flaps, a second pivoting shaft that serves as a pivoting center of the other flap, that is, a second flap, is pivotably supported via a gear box, the second flap is pivotable, together with the first flap, about a first pivoting shaft that serves as a pivoting center of the first flap, and the second flap is also independently pivotable about the second pivoting shaft, thus making it possible to move the second pivoting shaft of the second flap outside the air duct at the blow-out opening.

{Citation List}

{Patent Literature}

[0005]

{PTL 1} Japanese Unexamined Patent Application, Publication No. S63-254343
{PTL 2} Japanese Unexamined Patent Application, Publication No. H9-210442
{PTL 3} Japanese Unexamined Patent Application, Publication No. 2009-19831

{Summary of Invention}

{Technical Problem}

[0006] However, the invention disclosed in Patent Literature 1 does not describe specific means for pivoting the rotation shaft and the second linkage of the flap. The flap and first and second linkages are manually moved, and the invention does not make it possible for an operator to remotely operate the flap via a remote controller or the like so as to allow the operator to perform air direction adjustment.

[0007] In addition, the inventions disclosed in Patent Literatures 2 and 3 make it possible to move the rotation shaft of the flap outside the air duct at the blow-out opening by driving a motor, and the flap is made pivotable about the rotation shaft. However, a linkage mechanism formed of a plurality of linkages and a gear train formed of a plurality of gears are required, a complex moving mechanism is required in order to move the flap to the optimum upward-blow-out position or downward-blow-out position, the number of parts is increased, and the configuration becomes complicated, thus increasing costs. In addition, in the case in which gear trains are employed, it is necessary to install the gear trains at both ends of the flap, synchronizing their timing with each other, and there is a problem in which the production process required for the assembly increases, and so forth.

[0008] The present invention has been made in light of the above-described circumstances, and an object thereof is to provide an air conditioner with which air direction controllability can be increased by adjusting a pivoting angle of a flap to an optimum position, both when blowing upward and blowing downward, by moving a rotation shaft of the flap outside an air duct at the blow-out opening, without the need to employ a gear train which increases the number of parts and production process required in assembly.

{Solution to Problem}

[0009] In order to solve the above-described problems, an air conditioner of the present invention employs the

following solutions.

[0010] Specifically, an air conditioner according to a first aspect of the present invention is an air conditioner including a flap that adjusts an air direction and that is provided at a blow-out opening for temperature conditioned air, wherein a widthwise front edge of the flap is pivotably supported at both ends in a length direction thereof via first spindles and by second ends of linkages whose first ends are connected to a rotation shaft driven by a motor, and a widthwise rear edge of the flap is slidably supported via a second spindle and by a guiding pathway which is provided to extend in a top-to-bottom direction of the blow-out opening.

[0011] With the first aspect of the present invention, in the air-direction-adjusting flap provided at the blow-out opening, the widthwise front edge is pivotable supported at both ends in the length direction thereof via the first spindles and by the second ends of the linkages whose first ends are coupled with the rotation shaft driven by the motor, and the widthwise rear edge of the flap is slidably supported via the second spindle and by the blow-out opening guiding pathway which is provided to extend in the top-to-bottom direction. Because of this, when adjusting the blowing direction of the temperature conditioned air, by rotationally driving the rotation shaft by means of the motor and by pivoting the linkages whose first ends are coupled with the rotation shaft toward the outside of the air duct at the blow-out opening, the first spindles, which pivotably support the widthwise front edge of the flap at the second ends of the linkages, are made to be positioned outward from the air duct at the blow-out opening. At that position, by supporting the flap with the first spindles and the second spindle that slides along the guiding pathway and by restricting the pivoting angle of the flap between an upward-blow-out position and a downward-blow-out position in accordance with the pivoting range of the linkages that are pivoted by means of the motor, it is possible to adjust the blowing direction of the temperature conditioned air to an arbitrary direction. Therefore, both when blowing upward and blowing downward, the pivoting shafts of the flap can be made to be positioned outside the air duct at the blow-out opening, and, at that position, the pivoting angle of the flap can be adjusted to an optimum position. Accordingly, it is possible to prevent a decrease in the airflow level and leakage of the temperature conditioned air and so forth due to narrowing of the air duct, and thus, it is possible to enhance the air-direction controllability.

[0012] Furthermore, with an air conditioner according to a second aspect of the present invention, the flap in the above-described air conditioner is a flap in which two flaps including a wide upper flap and a narrow lower flap are coupled to form a single flap unit with a predetermined spacing between the two flaps so that the two flaps are parallel to each other, and a front edge of the upper flap is pivotably supported by the second ends of the linkages via the first spindles, and a rear edge of the lower flap is slidably supported by the guiding pathway via the second spindle.

[0013] With the second aspect of the present invention, the flap is a flap in which the two flaps, namely, the wide upper flap and the narrow lower flap, are coupled to form a single flap unit with a predetermined spacing therebetween so that the two flaps become parallel to each other. Also, the front edge of the upper flap is pivotably supported by the second ends of the linkages via the first spindles. And also the rear edge of the lower flap is slidably supported by the guiding pathway via the second spindle. Because of this, by supporting the two flaps including the upper flap and the lower flap by the linkages and the guiding pathway via the first spindles and the second spindle while keeping the flaps in the parallel state and by pivoting the flaps between the upward-blow-out position and the downward-blow-out position in accordance with the pivoting angle of the linkages, the air direction of the temperature conditioned air can be adjusted by using the two, namely, upper and lower, flaps. Therefore, the temperature conditioned air can reliably be blown in a target direction, and the adjustment precision of the air direction can be further enhanced.

[0014] Furthermore, with an air conditioner according to a third aspect of the present invention, the upper flap is made flat with a front panel of the air conditioner to close the blow-out opening when the upper flap is pivoted to a vertically downward position via the linkages.

[0015] With the third aspect of the present invention, when the upper flap is pivoted to the vertically downward position via the linkages, the upper flap is made flat with the front panel of the air conditioner, thus making it possible to close the blow-out opening. Accordingly, when the operation of the air conditioner is stopped, the blow-out opening can be closed by pivoting the upper flap to the vertically downward position by pivoting the linkages and the flap into the air duct at the blow-out opening via the rotation shafts by means of the motor. Therefore, the blow-out opening can be closed by using the flap when the operation of the air conditioner is stopped, which makes it possible to enhance the design range and also to prevent dust or the like from entering through the blow-out opening.

[0016] Furthermore, with an air conditioner according to a fourth aspect of the present invention, the guiding pathway in any one of the air conditioners described above is a smoothly curved guiding pathway that extends in a top-to-bottom direction.

[0017] With the fourth aspect of the present invention, the guiding pathway is configured as the smoothly curved guiding pathway that extends in the top-to-bottom direction. Accordingly, when adjusting the air direction, the first spindles, which pivotably support the widthwise front edge of the flap at the second ends of the linkages, move over circular paths whose radii correspond to the lengths of the linkages, and, in association with this movement, by sliding the second spindle, which slidably supports the widthwise rear edge of the flap, in the smoothly curved guiding pathway that extends in the top-to-bottom direc-

tion, the flap can smoothly be pivoted by keeping pivoting thereof to required angles by using both spindles. Therefore, even though the spindles that pivotably support the flap can be made to move, complex linkages, gear trains, cams, and so forth are not required, and thus, it is possible to provide an air-direction adjusting device that can be made to move in a smooth manner and that has a simple configuration.

[0018] Furthermore, with an air conditioner according to a fifth aspect of the present invention, the guiding pathway in any one of the air conditioners described above is configured so that the second spindle is positioned at a bottom end position of the guiding pathway when the flap is at a maximum upward-blow-out position, and that the second spindle is positioned at a top end position of the guiding pathway when the flap is at a position at which the flap closes the blow-out opening.

[0019] With the fifth aspect of the present invention, the guiding pathway is configured so that the second spindle is positioned at the bottom end position thereof when the flap is at the maximum upward-blow-out position and that the second spindle is positioned at the top end position thereof when the flap is at the position at which the flap closes the blow-out opening. Accordingly, when the linkages are pivoted via the rotation shaft by means of the motor, thus pivoting the flap between the maximum upward-blow-out position and the position at which the flap closes the blow-out opening, by sliding the second spindle between the bottom end position and the top end position along the guiding pathway, the flap can be pivoted by restricting pivoting thereof to required angles by using the first spindles and the second spindle. Therefore, it is possible to always keep the angle of the flap to optimum angles, to prevent a decrease in the airflow level and leakage of the temperature conditioned air, and to adjust the air direction to a target direction.

[0020] Furthermore, with an air conditioner according to a sixth aspect of the present invention, in any one of the air conditioners described above, an anti-warping guiding pathway having the same configuration as the guiding pathway is provided at one or more locations at an intermediate position in a length direction of the flap so that the guiding pathway supports a spindle that has a configuration corresponding to the second spindle.

[0021] With the sixth aspect of the present invention, the anti-warping guiding pathway having the same configuration as the guiding pathway is provided at one or more locations at an intermediate position in the length direction of the flap in order to support the spindle that has a configuration corresponding to the second spindle. Accordingly, even in the case in which the dimension of the blow-out opening in the width direction is large, thus increasing the length of the flap, it is possible to prevent warping of the flap by supporting the intermediate position of the flap by providing the anti-warping guiding pathway at one or more locations at the intermediate position in the length direction of the flap in accordance with the length thereof. Therefore, the air direction can be adjusted by smoothly pivoting the flap without allowing warping of the flap to impede pivoting thereof.

{Advantageous Effects of Invention}

[0022] With the present invention, when adjusting the air direction of the temperature conditioned air, by rotationally driving the rotation shaft by means of the motor and by pivoting the linkages whose first ends are coupled with the rotation shafts toward the outside of the air duct at the blow-out opening, the first spindles, which pivotably support the widthwise front edge of the flap at the second ends of the linkages, are made to be positioned outward from the air duct at the blow-out opening. At that position, by supporting the flap with the first spindles and the second spindle that slides along the guiding pathway and by restricting the pivoting angle of the flap between an upward-blow-out position and a downward-blow-out position in accordance with the pivoting range of the linkages that are pivoted by means of the motor, it is possible to adjust the blowing direction of the temperature conditioned air to an arbitrary direction. Accordingly, both when blowing upward and blowing downward, the pivoting shafts of the flap can be made to be positioned outside the air duct at the blow-out opening. At that position, the pivoting angle of the flap can be adjusted to an optimum position. Thus, it is possible to prevent a decrease in the airflow level and leakage of the temperature conditioned air and so forth due to narrowing of the air duct, which makes it possible to enhance the air-direction controllability.

{Brief Description of Drawings}

[0023]

{Fig. 1} Fig. 1 is a longitudinal sectional view of an air conditioner according to an embodiment of the present invention.

{Fig. 2} Fig. 2 is a perspective view of the air conditioner shown in Fig. 1 viewed diagonally from the front.

{Fig. 3} Fig. 3 is an enlarged view of the air conditioner shown in Fig. 1 when a flap is at a maximum-airflow-level blow-out position.

{Fig. 4} Fig. 4 is an enlarged view of the air conditioner shown in Fig. 1 when the flap is at an upward-blow-out position.

{Fig. 5} Fig. 5 is an enlarged view of the air conditioner shown in Fig. 1 when the flap is at a downward-blow-out position.

{Fig. 6} Fig. 6 is an enlarged view of the air conditioner shown in Fig. 1 when the flap is at a blow-out opening closing position.

{Description of Embodiment}

[0024] An embodiment of the present invention will be

described below with reference to Figs. 1 to 6.

[0025] Fig. 1 shows a longitudinal sectional view of an air conditioner according to the embodiment of the present invention, Fig. 2 shows a perspective view thereof, and Figs. 3 to 6 show enlarged views thereof when a flap is at each blow-out position.

[0026] An air conditioner 1 is provided with a unit main body 2, which is a housing that takes a three-dimensional shape whose depth is smaller relative to the height and width of the rectangular shape thereof. The interior of this unit main body 2 is partitioned into an upper portion and a lower portion by a partitioning wall 3; the upper portion serves as an indoor unit 4, and the lower portion serves as an outdoor unit 5.

[0027] At the top surface of the unit main body 2 that constitutes a part of the indoor unit 4, an air intake port 7 that is provided with an intake grill 6 that takes indoor air is provided over substantially the entire surface thereof, and, in addition, an air blow-out opening (blow-out vent) 8 is provided across substantially the entire length in the horizontal direction at a position of a front surface which is slightly higher than the center of the front surface. An air duct 9 that guides the indoor air taken in from the air intake port 7 to the air blow-out opening 8 is formed at the interior of the indoor unit 4, and a prefilter 10, an air-cleaning filter 11, an indoor heat exchanger 12, and an indoor fan (cross flow fan) 13 are disposed in the air duct 9 sequentially from the upstream side thereof.

[0028] The indoor heat exchanger 12 is divided into multiple sections, is disposed by being bent so as to form a substantially inverted V-shape in a cross section, and is disposed so as to face the indoor fan (cross flow fan) 13 that is disposed in a space of the interior. Drain pans 14 and 15 are disposed at respective bottom ends of the substantially inverted V-shaped indoor heat exchanger 12. In addition, at the air blow-out opening 8, a plurality of louvers 16 that adjust the blow-out air direction in the left-to-right direction and a flap 17 that includes two flaps, namely, upper and lower flaps, and that adjusts the blow-out air direction in the top-to-bottom direction are sequentially disposed in the blowing direction. The louvers 16 are disposed on the upstream side, the flap 17 is disposed on the downstream side, and both are disposed in a pivotable manner.

[0029] Although in many cases, spindles at both the left and right ends of the flap 17 are generally provided in a freely rotatable manner inside the air duct 9 at the air blow-out opening 8, in this embodiment, the spindles of the flap 17 can be moved outward from the air duct 9 at the air blow-out opening 8 via linkages, as described below. Specifically, in this embodiment, as shown in Figs. 3 to 6, rotation shafts 20 that are rotationally driven by an unillustrated stepper motor (hereinafter, it will simply be referred to as a motor) are provided at both the left and right ends of the air duct 9 at the air blow-out opening 8, first ends of a left-right pair of linkages 21 are coupled with these rotation shafts 20, and first spindles 22 that are provided at both left and right ends of the flap 17 are pivotably supported by the second ends of the linkages 21.

[0030] The flap 17 has two flaps, namely, a wide upper flap 17A and a slightly narrower lower flap 17B, that extend in the length direction of the air blow-out opening 8 provided in the horizontal direction and that are coupled to form a single unit by the joining pieces 17C with a predetermined spacing therebetween so as to be parallel to each other. A widthwise front edge of this upper flap 17A is pivotably supported by the second ends of the left-right pair of linkages 21 via the first spindles 22. By doing so, the first spindles 22 and the widthwise front edge of the flap 17A are moved outward from the air duct 9 at the air blow-out opening 8 in association with pivoting of the linkages 21 and can be pivoted at that outward position.

[0031] On the other hand, second spindles 23 are provided at both the left and right ends of the lower flap 17B of the above-described flap 17 at a widthwise rear edge thereof, and these second spindles 23 are slidably supported by guiding pathways 24 that are provided at both the left and right ends of the air duct 9 at the air blow-out opening 8 so as to extend in the top-to-bottom direction of the air blow-out opening 8. The guiding pathways 24 are provided with smoothly curved guiding pathways 24A that extend in the top-to-bottom direction, and the second spindles 23 of the flap 17 are supported so as to be slidable between bottom end positions and top end positions of the curved guiding pathways 24A.

[0032] As described above, in the flap 17, the widthwise front edge of the upper flap 17A is pivotably supported at the second ends of the linkages 21 via the first spindles 22, and also the widthwise rear edge of the lower flap 17B is supported via the second spindles 23 so as to be slidable along the smoothly curved guiding pathways 24A of the guiding pathways 24. Thus, the first spindles 22 are pivoted outward from the air duct 9 at the air blow-out opening 8 when the first spindles 22 move along circular paths whose radii correspond to the lengths of the linkages 21 that pivot about the rotation shafts 20, and pivoting angles thereof are restricted by the second spindles 23 that slide along the smoothly curved guiding pathways 24A of the guiding pathways 24.

[0033] Regarding the pivoting range of the flap 17, the flap 17 is at a maximum upward-blow-out position when the second spindles 23 are at the bottom end positions of the curved guiding pathways 24A, as shown in Fig. 4, and, while the linkages 21 are pivoting downward from the above described position, the flap 17 passes through a maximum-airflow-level blow-out position shown in Fig. 3 and a downward-blow-out position shown in Fig. 5. Furthermore, when the second spindles 23 are at the top end positions of the curved guiding pathways 24A, as shown in Fig. 6, the flap 17 is at a position at which the flap 17 closes the air blow-out opening 8, and therefore the flap 17 is made pivotable within the range described above.

[0034] Also, when the second spindles 23 are at the

top end positions of the curved guiding pathways 24A and when the upper flap 17A is pivoted by the linkages 21, which are pivoted by the motor, to the vertically downward position at which the air blow-out opening 8 is closed, as shown in Fig. 6, the flap 17 is made substantially flat with a front panel 2A of the unit main body 2, thus closing the air blow-out opening 8.

[0035] In addition, because the length of the flap 17 corresponds to the dimension of the blow-out opening 8 in the width direction, an intermediate portion of the flap 17 would be warped if the flap 17 were supported only at the left and right ends thereof, and there would be a risk of impeding smooth pivoting of the flap 17. Therefore, in this embodiment, an anti-warping guiding pathway 25 (see Fig. 2) having the same configuration as the guiding pathways 24 is provided at one or more locations at an intermediate position in the length direction of the flap 17, and spindles (not shown) that are provided on the flap 17 and that correspond to the second spindles 23 are supported by the anti-warping guiding pathway 25. Note that, naturally, it is permissible to provide the anti-warping guiding pathway 25 at intermediate positions at two or more locations depending on the length of the flap 17.

[0036] By employing the above-described configuration, this embodiment affords the following operational advantages.

[0037] When the above-described air conditioner 1 is operated and the indoor fan 13 is rotated, indoor air is taken in from the air intake port 7 via the intake grill 6 and the filters 10 and 11, the air is subjected to temperature conditioning by undergoing heat exchange with refrigerant in the indoor heat exchanger 12, the air is subsequently blown into the room from the air blow-out opening 8 via the air duct 9 in the direction adjusted by the louvers 16 and the flap 17, and thus, the air is used for temperature conditioning of the room.

[0038] At this time, with respect to the left-to-right direction, the air direction of the temperature conditioned air that is blown into the room can be adjusted by changing angles of the plurality of the louvers 16, which are arranged side-by-side in the longitudinal direction of the air blow-out opening 8, toward an arbitrary direction by means of a stepper motor (not shown) or the like. In addition, with respect to the top-to-bottom direction, the air direction can be adjusted by pivoting the flap 17, which has the two, namely, upper and lower, flaps 17A and 17B provided so as to extend in the longitudinal direction of the air blow-out opening 8, to an arbitrary position between the maximum upward-blow-out position shown in Fig. 4 and the position shown in Fig. 6, at which the air blow-out opening 8 is closed, by pivoting the linkages 21 about the rotation shafts 20 by rotating the rotation shafts 20 by means of the motor (not shown).

[0039] When adjusting the air direction described above, the first spindles 22, which are pivoting spindles of the flap 17, are moved to positions at which the first spindles 22 are made to be positioned outward from the air duct 9 at the air blow-out opening 8 by pivoting of the linkages 21, and the flap 17 is pivoted at the position. Specifically, when the rotation shafts 20 are rotated by means of the motor and the linkages 21 are pivoted to upper positions close to a substantially horizontal state, the second spindles 23 are at the bottom end positions of the curved guiding pathways 24A as shown in Fig. 4, and thus, by being pivoted to the maximum upward-blow-out position, the flap 17 functions so that the air direction of temperature conditioned air that is blown into the room from the air blow-out opening 8 is changed and the air is blown upward.

[0040] Fig. 3 shows a position at which the linkage 21 is pivoted slightly downward from the maximum upward-blow-out position. This position is a position at which the flap 17 is in a substantially horizontal state, and because the temperature conditioned air that is blown from the indoor fan 13 is blown toward the room along the air duct 9 without making the air direction thereof changed by the flap 17, which is the maximum-airflow-level blow-out position. At this position, the second spindle 23 slides upward along the curved guiding pathway 24A from the bottom end position and keeps the angle of the flap 17 at the substantially horizontal state described above. Note that it is needless to say that the flap 17 is capable of adjusting the air direction to an arbitrary direction between this maximum-airflow-level blow-out position and the above-described maximum upward-blow-out position.

[0041] When the linkage 21 is pivoted further downward from the maximum-airflow-level blow-out position shown in Fig. 3, the flap 17 reaches a downward-blow-out position shown in Fig. 5. At this position, the second spindle 23 is at a substantially intermediate position between the bottom end position and the top end position of the curved guiding pathway 24A, keeps the angle of the flap 17 at a downward position, and functions so that the temperature conditioned air is blown into the room with the air direction changed downward. This downward angle of the flap 17 can be adjusted to an arbitrary angle by appropriately pivoting the linkage 21 upward or downward from the position shown in Fig. 5.

[0042] In this way, both when blowing upward and blowing downward, by making the first spindles 22, which are the pivoting spindles of the flap 17, positioned outside the air duct 9 at the blow-out opening 8, and by adjusting, at this position, the pivoting angle of the flap 17 to an optimum position, the air direction can be changed to an arbitrary direction. Therefore, it is possible to prevent a decrease in the airflow level and leakage of the temperature conditioned air and so forth all due to narrowing of the air duct 9, and thus, it is possible to enhance the air-direction controllability.

[0043] In addition, as shown in Fig. 6, by moving the second spindle 23 to the top end position of the curved guiding pathway 24A by pivoting the linkage 21 to a vertically downward position by means of the motor, the flap 17 is accommodated in the air duct 9 at the air blow-out

opening 8 so that the upper flap 17A is substantially flat with the front panel 2A of the unit main body 2. This position is a position at which the air blow-out opening 8 is closed by the flap 17. By doing so, the air blow-out opening 8 can be closed by the flap 17 when the operation of the air conditioner 1 is stopped, and thus, dust or the like can be prevented from entering through the blow-out opening 8.

[0044] In this way, with this embodiment, in the air-direction-adjusting flap 17 provided at the air blow-out opening 8, the widthwise front edge thereof is pivotably supported at both ends in the length direction via the first spindles 22 by the second ends of the linkages 21 whose first ends are coupled with the rotation shafts 20 that are driven by the motor. The widthwise rear edge of the flap 17 is supported in a slidable manner by the guiding pathways 24, which are provided so as to extend in the top-to-bottom direction of the blow-out opening 8, via the second spindles 23.

[0045] Because of this, when adjusting the blowing direction of the temperature conditioned air, by rotating the rotation shafts 20 by means of the motor and by pivoting outward the linkages 21, whose first ends are coupled with the rotation shafts 20, from the air duct 9 at the blow-out opening 8, the first spindles 22, which pivotably support the widthwise front edge of the flap 17 at the second ends of the linkages 21, are made to be positioned outside the air duct 9 at the blow-out opening 8. At that position, by supporting the flap 17 by the first spindles 22 and the second spindles 23 that slide along the guiding pathways 24 and by restricting the pivoting angle of the flap 17 between the upward-blow-out position and the downward-blow-out position in accordance with the pivoting range of the linkages 21 that are pivoted by means of the motor, it is possible to adjust the blowing direction of the temperature conditioned air to an arbitrary direction.

[0046] By doing so, both when blowing upward and blowing downward, the first spindles 22, which are pivoting spindles of the flap 17, can be made to be positioned outside the air duct 9 at the blow-out opening 8, and, at that position, the pivoting angle of the flap 17 can be adjusted to an optimum position. Accordingly, it is possible to prevent a decrease in the airflow level and leakage of the temperature conditioned air and so forth due to narrowing of the air duct 9, and thus, it is possible to enhance the air-direction controllability.

[0047] In addition, the flap 17 is a flap in which the two flaps, namely, the wide upper flap 17A and the narrow lower flap 17B, are coupled to form a single unit with a predetermined spacing therebetween so as to be parallel to each other. The front edge of the upper flap 17A is pivotably supported by the second ends of the linkages 21 via the first spindles 22, and the rear edge of the lower flap 17B is also slidably supported by the guiding pathways 24 via the second spindles 23.

[0048] Because of this, by supporting the two flaps, namely, the upper flap 17A and the lower flap 17B, by the linkages 21 and the guiding pathways 24 via the first spindles 22 and the second spindles 23 while keeping the flaps in the parallel state and by pivoting the flaps between the upward-blow-out position and the downward-blow-out position in accordance with the pivoting angle of the linkages 21, the air direction of the temperature conditioned air can be adjusted by using the two, namely, upper and lower, flaps 17A and 17B. Therefore, the temperature conditioned air can reliably be blown in a target direction, and the adjustment precision of the air direction can be further enhanced.

[0049] In addition, when the upper flap 17A is pivoted to the vertically downward position via the linkages 21, the upper flap 17A is made flat with the front panel 2A, thus making it possible to close the air blow-out opening 8. Accordingly, when the operation of the air conditioner 1 is stopped, the air blow-out opening 8 can be closed by pivoting the upper flap 17A to the vertically downward position by pivoting the linkages 21 and the flap 17 into the air duct 9 at the air blow-out opening 8 via the rotation shafts 20 by means of the motor. Therefore, the air blow-out opening 8 can be closed by using the flap 17 when the operation of the air conditioner 1 is stopped, which makes it possible to enhance the design range and also to block dust or the like from entering through the air blow-out opening 8.

[0050] Furthermore, the guiding pathways 24 that support the second spindles 23 are configured as the smoothly curved guiding pathways 24A that extend in the top-to-bottom direction. Accordingly, when adjusting the air direction, the first spindles 22, which pivotably support the widthwise front edge of the flap 17 at the second ends of the linkages 21, move over circular paths whose radii correspond to the lengths of the linkages 21, and, in association with this movement, by sliding the second spindles 23, which slidably support the widthwise rear edge of the flap 17, in the smoothly curved guiding pathways 24A that extend in the top-to-bottom direction, the flap 17 can smoothly be pivoted by keeping pivoting thereof to a required angle by using both of the spindles 22 and 23. Therefore, even though the spindles 22 and 23 that pivotably support the flap 17 are made movable, complex linkages, gear trains, cams, and so forth are not required, and thus, it is possible to provide an air-direction adjusting device that can be made to move in a smooth manner and that also has a simple configuration.

[0051] In addition, the guiding pathways 24 are configured so that the second spindles 23 are at the bottom end positions when the flap 17 is at the maximum upward-blow-out position and the second spindles 23 are at the top end positions when the flap 17 is at the position at which the flap 17 closes the blow-out opening 8. When the linkages 21 are pivoted via the rotation shafts 20 by means of the motor, thus pivoting the flap 17 between the maximum upward-blow-out position and the position at which the flap 17 closes the blow-out opening 8, by sliding the second spindles 23 between the bottom end position and the top end position along the guiding path-

ways 24, the flap 17 can be pivoted while keeping pivoting thereof at required angles by using the first spindles 22 and the second spindles 23. Therefore, it is possible to always keep the angle of the flap 17 to optimum angles, in order to prevent a decrease in the airflow level and leakage of the temperature conditioned air, and to adjust the air direction to a target direction.

[0052] Furthermore, in this embodiment, the anti-warping guiding pathway 25 having the same configuration as the guiding pathways 24 is provided at one or more locations at an intermediate position in the length direction of the flap 17 in order to support spindles (not shown) that correspond to the second spindles 23. Accordingly, even in the case in which the dimension of the blow-out opening 8 in the width direction is large, thus increasing the length of the flap 17, it is possible to prevent warping of the flap 17 by supporting the intermediate position of the flap 17 by providing the anti-warping guiding pathway 25 at one or more locations at the intermediate position in the length direction of the flap 17 in accordance with the length thereof. Therefore, the air direction can be adjusted by smoothly pivoting the flap 17 without allowing warping of the flap 17 to impede pivoting thereof.

[0053] Note that the present invention is not limited to the invention according to the above-described embodiment, and appropriate modifications are possible within the range that does not depart from the scope thereof. For example, although an example in which the present invention is employed in a floor-standing-type integrated air conditioner 1 has been described in the embodiment described above, the present invention is not necessarily limited to air conditioners having such a configuration, and it is needless to say that the present invention can be employed in the same way in separated-type air conditioners, or air conditioners of the wall-mounted type, ceiling-installed type, and so forth.

{Reference Signs List}

[0054]

1	air conditioner
2A	front panel
8	air blow-out opening (blow-out opening)
9	air duct
17	flap
17A	upper flap
17B	lower flap
20	rotation shaft
21	linkage
22	first spindle
23	second spindle
24	guiding pathway
24A	curved guiding pathway
25	anti-warping guiding pathway

Claims

1. An air conditioner (1) comprising:

a flap (17) that adjusts an air direction and that is provided at a blow-out opening (8) for temperature conditioned air,
characterized in that a widthwise front edge of the flap is pivotably supported at both ends in a length direction thereof via first spindles (22) and by second ends of linkages (21) whose first ends are connected to a rotation shaft (20) driven by a motor, and
a widthwise rear edge of the flap is slidably supported via a second spindle (23) and by a guiding pathway (24, 24A) which is provided to extend in a top-to-bottom direction of the blow-out opening (8).

2. The air conditioner according to Claim 1, wherein the flap (17) is a flap in which two flaps including a wide upper flap (17A) and a narrow lower flap (17B) are coupled to form a single flap unit with a predetermined spacing between the two flaps so that the two flaps are parallel to each other, and
a front edge of the upper flap (17A) is pivotably supported by the second ends of the linkages (21) via the first spindles (22), and a rear edge of the lower flap is slidably supported by the guiding pathway (24) via the second spindle (23).

3. The air conditioner according to Claim 2, wherein the upper flap (17A) is made flat with a front panel of the air conditioner to close the blow-out opening (8) when the upper flap is pivoted to a vertically downward position via the linkages (21).

4. The air conditioner according to any one of Claims 1 to 3, wherein the guiding pathway (24) is a smoothly curved guiding pathway (24A) that extends in a top-to-bottom direction.

5. The air conditioner according to any one of Claims 1 to 4, wherein the guiding pathway (24, 24A) is configured so that the second spindle (23) is positioned at a bottom end position of the guiding pathway (24A) when the flap (17) is at a maximum upward-blow-out position, and that the second spindle (23) is positioned at a top end position of the guiding pathway (24A) when the flap is at a position at which the flap closes the blow-out opening (8).

6. The air conditioner according to any one of Claims 1 to 5, wherein an anti-warping guiding pathway (25) having the same configuration as the guiding pathway is provided at one or more locations at an intermediate position in a length direction of the flap (17) so that the anti-warping guiding pathway supports a

spindle that has a configuration corresponding to the second spindle (23).

FIG. 1

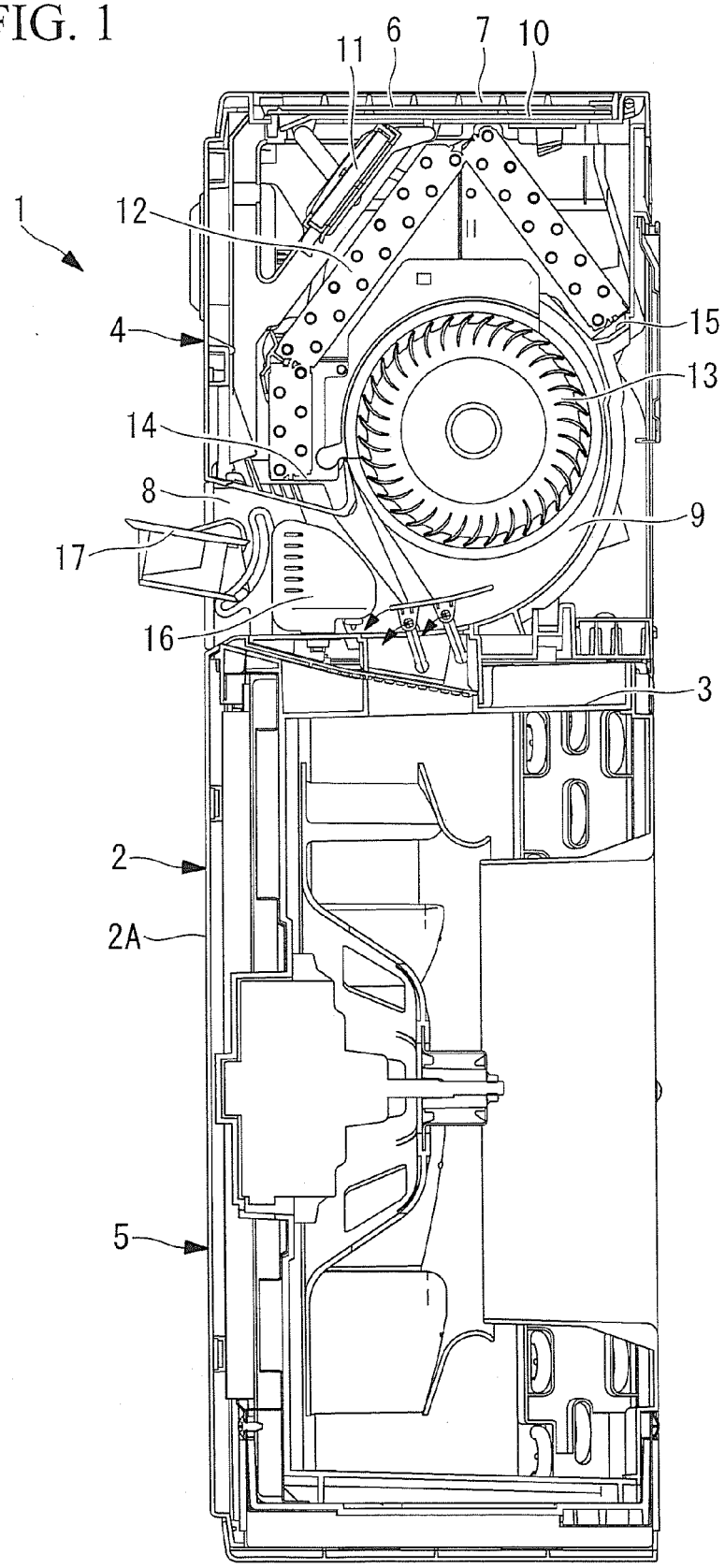


FIG. 2

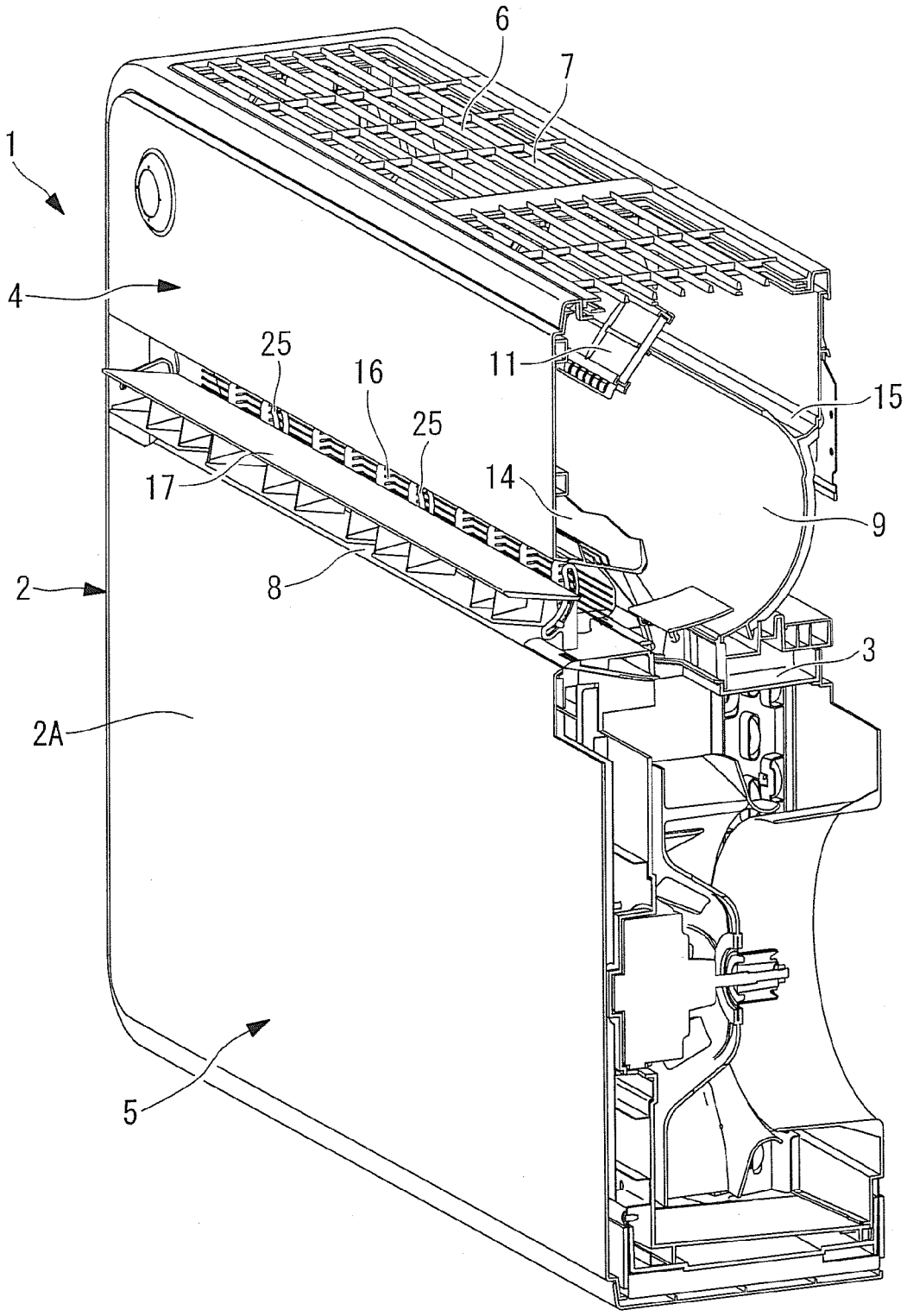


FIG. 3

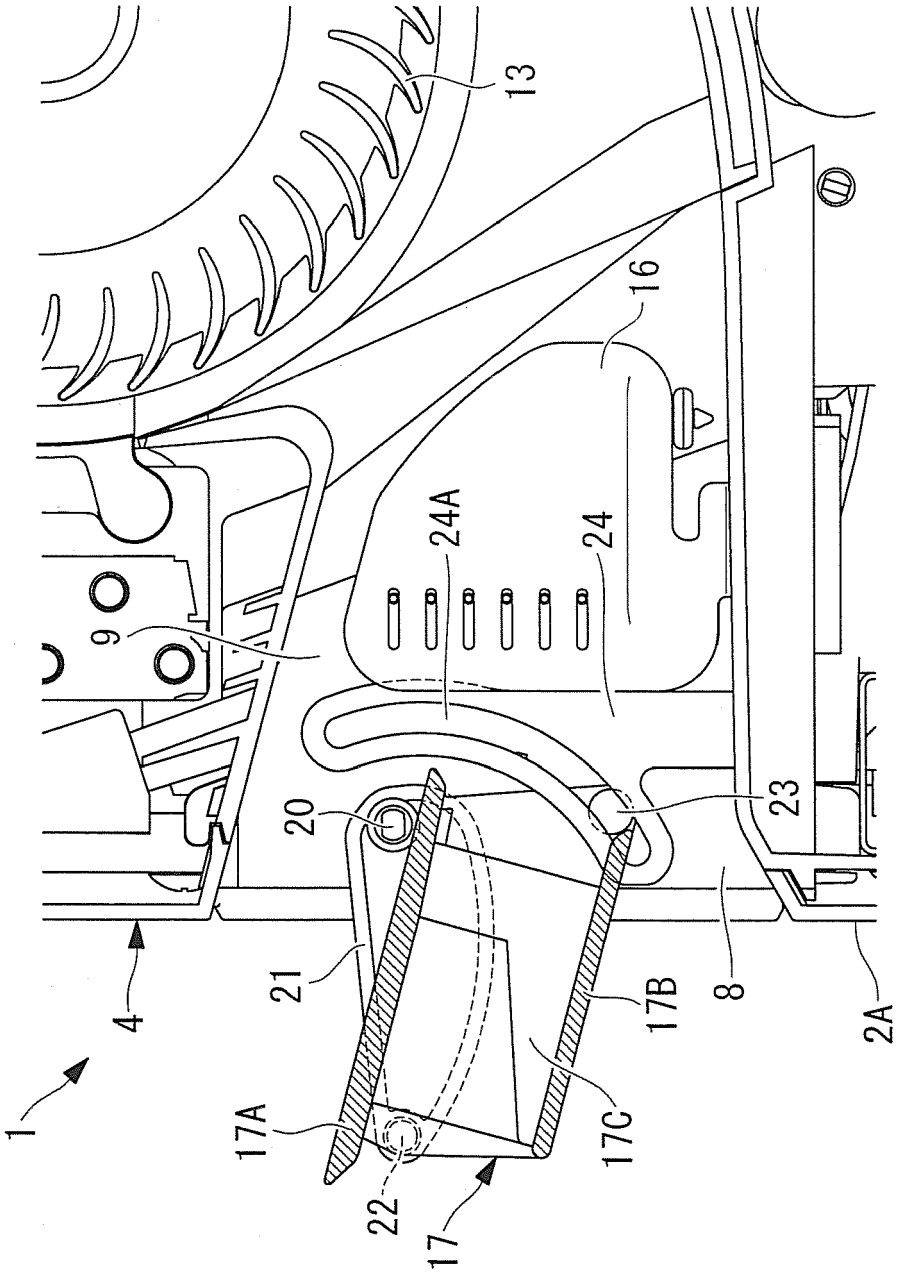


FIG. 4

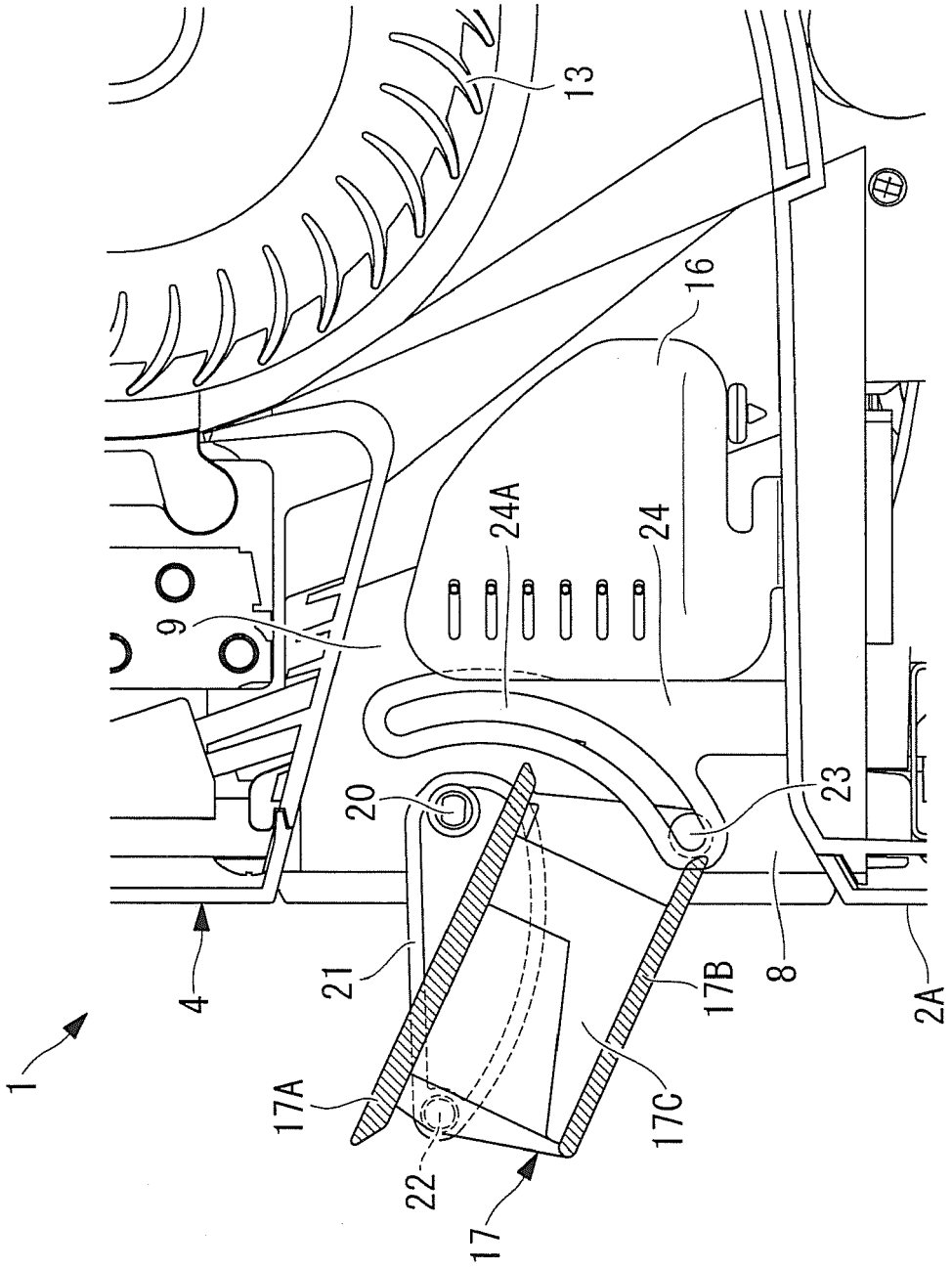


FIG. 5

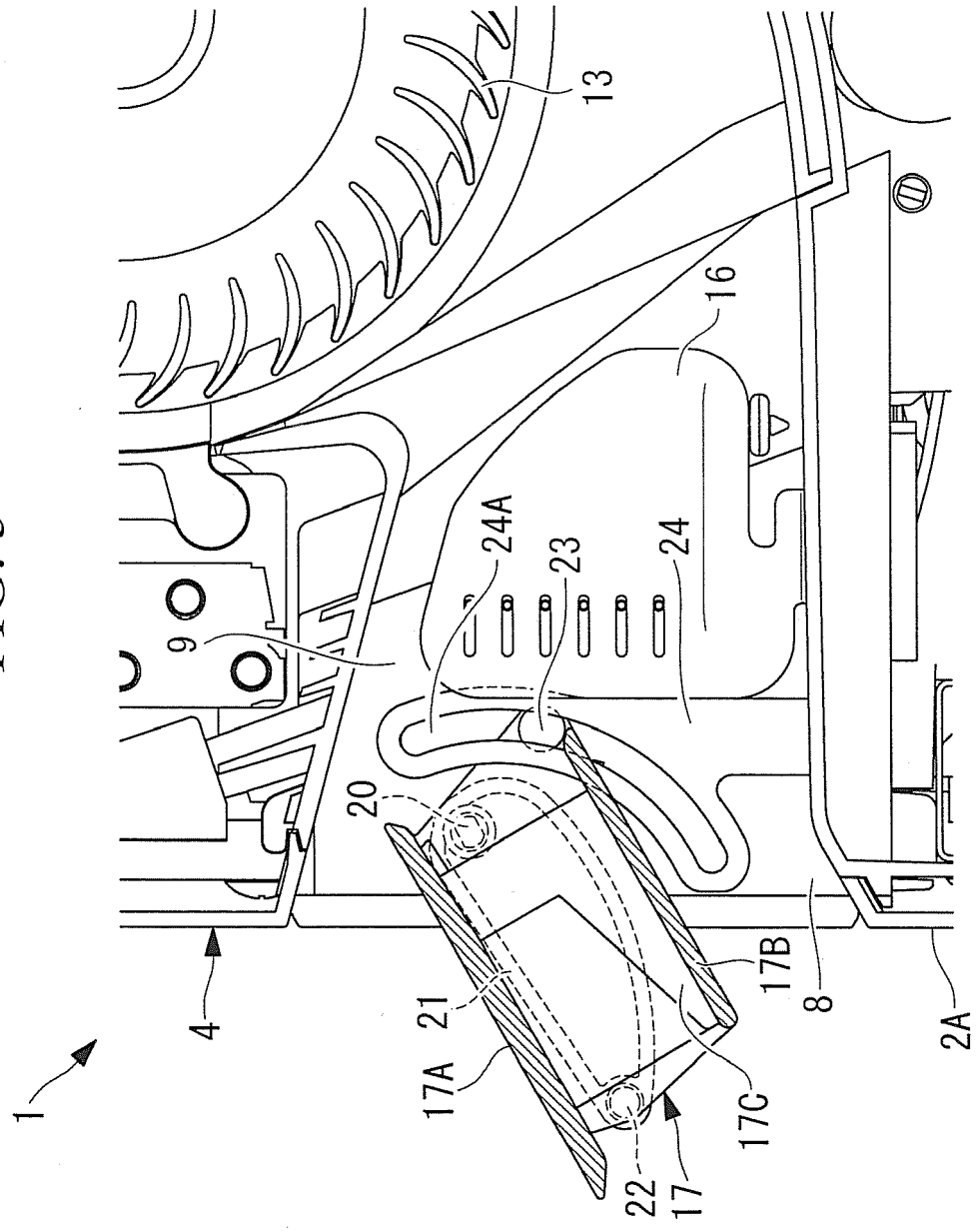
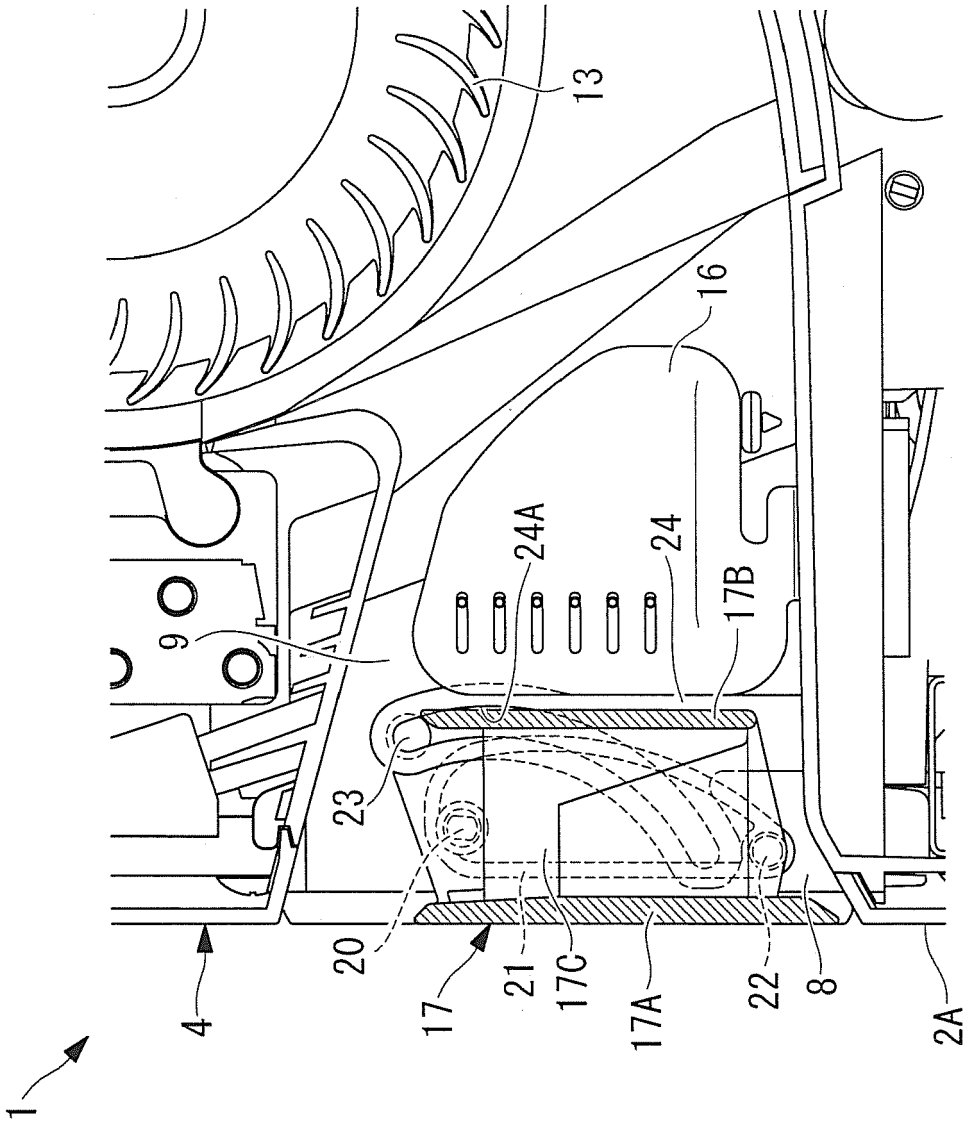


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 14 17 8151

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X	EP 2 096 364 A1 (GIORDANO RIELLO INTERNAT GROUP [IT]) 2 September 2009 (2009-09-02) * paragraph [0014] - paragraph [0031]; figures 1-4 *	1-6	INV. F24F13/14
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TECHNICAL FIELDS SEARCHED (IPC)

F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 December 2014	Vuc, Arianda

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