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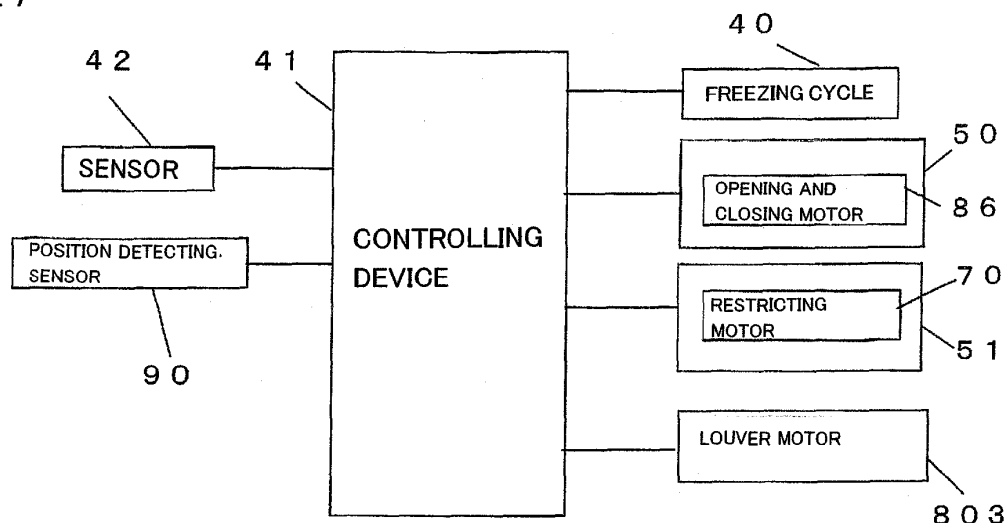
(54) **AIR CONDITIONER**

(57) [PROBLEM] A panel structure where a wind guide panel is easily attachable/detachable and the wind guide panel does not drop during attachment/detachment is realized.

[SOLUTION] An engagement portion 300 for engaging a support material 31 is provided on the rear side of a wind guide panel 20. The front side of the wind guide panel 20 is held by a rotary shaft 330 of the support material 31. When the wind guide panel 20 is in a closed posture, an operational button 304 of the engagement portion 300 is operated to release engagement of the support material 31. Although the wind guide panel 20 is detached from the support material 31, the support material 31 is supported by the cabinet 3. The front side of the wind guide panel 20 is hung on the rotary shaft 330 so that the wind guide panel 20 is suspended and does not drop.

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FIG. 7



Description

AIR CONDITIONER

TECHNICAL FIELD

[0001] The present invention relates to an air conditioner whose inner unit has a panel which opens and closes according to a cooling or heating operation.

BACKGROUND OF THE INVENTION

[0002] In an indoor unit of an air conditioner, a blow out port is formed on a front surface of a cabinet and warm air or cool air is blown out from the blow out port. A panel which switches the direction of the blown out air according to a cooling or heating operation is provided.

[0003] For example, in patent document 1, a vertical air direction changing blade is attached to a tip end of an arm portion as a panel. By rotating the vertical air direction changing blade, the blow out direction is changed. Patent document 1: Japanese Patent Laid-Open No. 2006-138629

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0004] There is provided in the above a structure where the panel is directly connected to the arm portion. In other words, the panel is directly attached through a shaft to a driving means for driving the panel. Accordingly, the panel is not easily detached from the shaft easily.

[0005] Meanwhile, the panel is preferably detachable for cleaning and maintenance. However, when the panel is directly attached to the driving means, attachment/detachment of the panel becomes difficult. In the case where the panel is easily detached, fitting to the shaft is insufficient when the panel is mounted and opening and closing of the panel may not be performed smoothly.

[0006] That is, as long as there is provided a structure where the panel is directly attached to the driving means, the problem as described above is inevitable. Thus, in view of the above, the present invention aims to provide an air conditioner allowing easy attachment/detachment of the panel and capable of maintaining reliability of an opening and closing operation of the panel.

MEANS FOR SOLVING THE PROBLEMS

[0007] In the present invention, a cabinet has a curved surface from its front surface to its bottom surface, a blow out port is formed on the curved surface, a part of the cabinet is served as a wind guide panel for guiding air from the blow out port to an indoor space, the wind guide panel is provided capable of opening both upwardly and downwardly, a support material is provided for supporting the wind guide panel so as to be attached/detached free-

ly, the support material is coupled to an opening and closing mechanism for opening and closing the wind guide panel, and the wind guide panel is opened and closed with the movement of the support material by the opening and closing mechanism.

[0008] The wind guide panel is connected to the opening and closing mechanism through the support material. When the wind guide panel opens and closes, the opening and closing is performed with the support material. In addition, the wind guide panel is attached/detached to/from the support material and is therefore not attached/detached directly to/from the opening and closing mechanism.

[0009] The wind guide panel is supported at least at two points by the support material in a vertical direction. Even if support at one point is released, the wind guide panel is preferably supported at the other point. Since the wind guide panel is in the state of being supported at least at one point by the support material in attachment/detachment, it is possible to prevent the wind guide panel from dropping during attachment/detachment work.

[0010] It is preferable that an engagement portion is provided in one of the wind guide panel and the support material to engage the other and a holding portion is provided for holding the wind guide panel so as to rotate freely with respect to the support material. When engagement by the engagement portion is released, the wind guide panel is suspended from the support material by the holding portion. In this way, the wind guide panel is detached from the support material, but is supported at one point by the holding portion and therefore does not drop.

[0011] The holding portion is preferably positioned above the engagement portion in the wind guide panel. When engagement by the engagement portion on the lower side is released, the lower side of the wind guide panel is detached from the support material. However, since the upper side of the wind guide panel is supported by the support material, the wind guide panel is suspended from the support material. At this time, since the cabinet has the curved surface, the blow out port is exposed to the outside and it is possible to perform cleaning of the blow out port and the like even without detaching the wind guide panel from the support material completely.

[0012] The engagement portion is provided in the wind guide panel and the engagement portion includes a movable member which presses the support material and moves freely. It is preferable that a part of the movable member is exposed to an outer surface of the wind guide panel and the movable member moves by an operation from outside to release engagement of the support material. This makes it possible to move the movable member from outside of the wind guide panel. Even if the wind guide panel is closed in the closed posture, it is possible to detach the wind guide panel from the support material easily by releasing engagement with an operation from outside.

[0013] It is preferable that the movable member is sup-

ported by the wind guide panel so as to move freely and movement of the movable member is restricted so that the movable member does not come off the wind guide panel. When an operation is performed from outside, it is possible to prevent the movable member from moving too much and prevent the movable member from coming off the wind guide panel.

[0014] The holding portion is comprised of a rotary shaft which is provided in one of the wind guide panel and the support material and a bearing which is provided in the other. It is preferable that the wind guide panel is supported by the support material by fitting the rotary shaft into the bearing even if engagement is released. When the rotary shaft comes off the bearing, the wind guide panel is detachable from the support material completely.

EFFECT OF THE INVENTION

[0015] According to the present invention, since the wind guide panel may not be attached/detached to/from the opening and closing mechanism directly and the support material is not removed from the cabinet, coupling of the opening and closing mechanism and the support material is not released, thus making it possible to maintain reliability of an opening and closing operation.

BRIEF DESCRIPTION OF DRAWINGS

[0016]

[FIG. 1] FIG. 1 is a perspective view of an indoor unit of an air conditioner of the present invention.

[FIG. 2] FIG. 2 is a schematic cross-sectional view of the indoor unit when a wind guide panel is closed.

[FIG. 3] FIG. 3 is a perspective view of the indoor unit when the wind guide panel opens upwardly.

[FIG. 4] FIG. 4 is a schematic cross-sectional view of the indoor unit when the wind guide panel opens upwardly.

[FIG. 5] FIG. 5 is a perspective view of the indoor unit when the wind guide panel opens downwardly.

[FIG. 6] FIG. 6 is a schematic cross-sectional view of the indoor unit when the wind guide panel opens downwardly.

[FIG. 7] FIG. 7 is a control block diagram of the air conditioner.

[FIG. 8] FIG. 8 is a view showing the main part of the wind guide panel which engages a support material.

[FIG. 9] FIG. 9 is a view showing an engagement portion in engaging.

[FIG. 10] FIG. 10 is a view showing the engagement portion when engagement is released.

[FIG. 11] FIG. 11 is a cross-sectional view of the engagement portion in engaging.

[FIG. 12] FIG. 12 is a cross-sectional view of the engagement portion when engagement is released.

[FIG. 13] FIG. 13 is a plan view of the wind guide

panel when viewed from the inner surface side.

[FIG. 14] FIG. 14 is a view taken in the direction of arrows A-A in FIG. 13.

[FIG. 15] FIG. 15 is a plan view of the support material.

[FIG. 16] FIG. 16 is a side view of the support material.

[FIG. 17] FIG. 17 is a schematic cross-sectional view of the indoor unit before and after the back side of the wind guide panel is detached from the support material.

[FIG. 18] FIG. 18 is a schematic cross-sectional view of the indoor unit when the wind guide panel opens upwardly to blow out air just below a blow out port.

[FIG. 19] FIG. 19 is a schematic cross-sectional view of the indoor unit when the wind guide panel opens upwardly to blow out air in the slightly oblique direction than the direction just below the blow out port.

[FIG. 20] FIG. 20 is a schematic cross-sectional view of the indoor unit when the wind guide panel opens upwardly to blow out air in the obliquely downwardly direction.

[FIG. 21] FIG. 21 is a schematic cross-sectional view of the indoor unit showing an opening and closing mechanism of the wind guide panel.

[FIG. 22] FIG. 22 is a view for describing movement of a switching portion in a restricting portion, where (a) shows an initial state, (b) shows the case of upwardly opening, and (c) shows the case of downwardly opening.

[FIG. 23] FIG. 23 is a view for describing movement of the restricting portion, where (a) shows an initial state, (b) shows the case of upwardly opening, and (c) shows the case of downwardly opening.

[FIG. 24] FIG. 24 is a schematic cross-sectional view of the indoor unit showing a moving portion when the wind guide panel is closed.

[FIG. 25] FIG. 25 is a schematic cross-sectional view of the indoor unit showing the moving portion when the wind guide panel opens upwardly.

[FIG. 26] FIG. 26 is a schematic cross-sectional view of the indoor unit showing the moving portion when the wind guide panel opens downwardly.

[FIG. 27] FIG. 27 is an exploded perspective view of the restricting portion.

[FIG. 28] FIG. 28 is an exploded perspective view of the moving portion.

EXPLANATIONS OF REFERENCE NUMERALS

[0017]

3	cabinet
5	blow out port
20	wind guide panel
22	lower shaft
23	upper shaft
31	support material

32 rod
 300 engagement portion
 301 holding portion
 302 movable member
 303 claw
 304 operational button
 310 spring
 330 rotary shaft
 331 bearing

PREFERRED EMBODIMENTS OF THE INVENTION

[0018] FIGS. 1 and 2 show an indoor unit of an air conditioner of the present embodiment. The indoor unit includes a heat exchanger 1 and an indoor fan 2, which are housed in a cabinet 3. The cabinet 3 is formed into a box shape having a depth longer than a height and has a curved surface extending from the front surface to the bottom surface. A suction port 4 is formed on the top surface of the cabinet 3 and a blow out port 5 is formed on the curved surface.

[0019] Inside the cabinet 3, an air passage 6 is formed extending from the suction port 4 to the blow out port 5 and the heat exchanger 1 and the indoor fan 2 are arranged in the air passage 6. A filter 7 is arranged between the suction port 4 and the heat exchanger 1, so as to remove dust from indoor air sucked from the suction port 4. A cleaning apparatus 8 is provided for cleaning the filter 7.

[0020] The filter 7 is moved by the cleaning apparatus 8 in the cabinet 3 so as to pass through a dust removing section 9. Thereby, the dust adhering to the filter 7 is removed in the dust removing section 9. A guide passage 10 curved in a U-shape in side view is formed on the front side in the cabinet 3, and a moving section made of a motor and a gear reciprocates the filter 7 along the guide passage 10. In the dust removing section 9, the dust is scraped by a rotating brush from the filter 7 passing through the dust removing section 9. By a suction fan, air is made to flow in the direction substantially in parallel with the filter 7 (in the left and right direction), so that the scraped dust is sucked and discharged.

[0021] A wind guide panel 20 which opens and closes the blow-out port 5 is provided on the curved surface of the cabinet 3. As shown in Figure 3 to Figure 6, the wind guide panel 20 is configured to be able to be upwardly and downwardly opened, and there is provided an opening and closing mechanism which opens and closes the wind guide panel 20.

[0022] In the air conditioner, a not-shown outdoor unit in association with the indoor unit is installed outdoors. A compressor, a heat exchanger, a four-way valve, an outdoor fan and the like are mounted in the outdoor unit, which form a freezing cycle 40 with the heat exchanger 1 on the indoor side. In addition, as shown in FIG. 7, a controlling device 41 for controlling the freezing cycle 40 is provided in the indoor unit. The controlling device 41 comprised of a microcomputer controls the freezing cycle

40 based on an instruction from a user and detection signals from various sensors 42 such as a temperature sensor for detecting room temperature and outdoor temperature, to perform a cooling or heating operation. At this time, the controlling device 41 controls the opening and closing mechanism according to a cooling or heating operation to open and close the wind guide panel 20. In addition, the controlling device 41 controls the cleaning device 8 regularly or by an instruction from a user to clean the filter 7.

[0023] The wind guide panel 20 is formed by one curved panel, so as to have a width which is the same as the width of the cabinet 3 and which is larger than the width of the blow-out port 5. Further, in the front surface of the cabinet 3, a front panel 21 is formed from the middle stage portion of the front surface to the bottom surface so as to be one stage lower than the front surface. Thereby, a recessed section is formed over the whole width direction so that the wind guide panel 20 can be fit into the recessed section. An opening is formed in the front panel 21 which forms the recessed section, and the opening serves as the blow-out port 5. Therefore, the wind guide panel 20 is located in front of the blow-out port 5, so as to cover the blow-out port 5 and the front panel 21 around the blow-out port 5. At this time, the wind guide panel 20 is held in a closed posture as shown in Figure 2.

[0024] When the wind guide panel 20 is held in the closed posture, there are formed gaps between the cabinet and the front and rear ends of the wind guide panel 20. As shown in Figures 4 and 6, when the wind guide panel 20 is opened or closed, the end section of the wind guide panel 20 is made to enter the gap. Thus, the wind guide panel 20 can be smoothly rotated without being brought into contact with the cabinet 3. Further, it is possible to prevent the leaking of the blown-out wind by forming the front and rear end sections of the wind guide panel 20 in such a manner that the wind guide panel 20 is brought into contact with the cabinet 3 at the time when the wind guide panel 20 is fully opened upwardly or downwardly. In particular, in the case of cool air, it is possible to prevent dew condensation on the bottom surface side of the cabinet 3.

[0025] In this way, the outer surface of the wind guide panel 20 forms a smooth curved surface extending from the front surface to the bottom surface of the cabinet 3. That is, the wind guide panel 20 is formed as a member, which configures a part of the front surface of the cabinet 3. In other words, a part of the panel of the cabinet 3 is used as the wind guide panel 20. Thereby, the wind guide panel 20 is formed into a long panel having a total length greater than that of the louver adopted in a conventional air conditioner.

[0026] The wind guide panel 20 is rotated about an upper or lower shaft in the different directions so as to thereby be upwardly or downwardly opened. The upper shaft 23 and the lower shaft 22 are formed in parallel with the left and right direction of the cabinet 3. As shown in Figures 5 and 6, at the time of the cooling operation, the

wind guide panel 20 is downwardly opened about the lower shaft 22. When held in the downwardly opened posture, the wind guide panel 20 is connected to the low wall of the blow-out port 5, so that a long nozzle is formed by the wind guide panel 20 and the upper wall of the blow-out port 5. The wind guide panel 20 guides cool air to the obliquely upwardly direction and the cool air is blown out along a ceiling.

[0027] As shown in Figures 3 and 4, at the time of the heating operation, the wind guide panel 20 is upwardly opened about the upper shaft 23. When held in the upwardly opened posture, the wind guide panel 20 covers the front of the blow-out port 5 and suppresses the flow of warm air blown out toward the front so as to guide the warm air toward the floor surface. Note that at the initial stage of the cooling operation, the wind guide panel 20 is held in the upwardly opened posture to allow the cool air to be blown out toward the floor surface, so that the rapid cooling is performed. As shown in Figure 2, at the non-operation time, the wind guide panel 20 is held in the closed posture and covers the blow-out port 5 so as to be integrated with the cabinet 3.

[0028] In the wind guide panel 20 enlarged as described above, the sway and deflection can be easily caused. Thus, a peripheral wall for reinforcement is formed at both side edges on the inner surface of the wind guide panel 20 in the front and rear direction (short side direction). The peripheral wall is formed over the whole length in the left and right direction (long side direction). The peripheral wall is formed to have a hollow structure and can be thick. With such peripheral wall, the strength of the wind guide panel 20 can be increased, and the deflection of the wind guide panel 20 can be prevented. Further, the same peripheral wall for reinforcement is also formed at both side edges in the left and right direction. Therefore, the sway of the wind guide panel 20 can be prevented.

[0029] When the four-side edges of the wind guide panel 20 are reinforced by being thickened, the strength against deformation of the wind guide panel 20 can be increased, so that the size of the wind guide panel 20 can be increased. Further, the wind guide panel 20 is configured to be hardly deformed, and hence the curving degree of the wind guide panel 20 in the front and rear direction can be increased. Thereby, it is possible to easily perform the control of the air blowing direction at the time when the wind guide panel 20 is opened. That is, at the time of cooling operation, cool air can be guided toward the ceiling, so as to increase the reaching distance of the cool air. At the time of heating operation, warm air is guided toward the wall so as to reach the floor surface.

[0030] Further, an inclined surface is formed on the tip side of the peripheral wall. The inner side surface of the peripheral wall is formed as the inclined surface. The outer side surface of the peripheral wall is formed into a vertical surface. When the wind guide panel 20 is held in the downwardly opened posture, the blown-out cool air hits the peripheral wall positioned in the left and right

direction, which may cause dew condensation on the peripheral wall. Thus, when the inner side surface of the peripheral wall is formed into the inclined surface, the cool air is made to flow along the inclined surface. The cool air is made to flow without staying at the peripheral wall, which makes it possible to prevent the dew condensation from being caused on the peripheral wall.

[0031] A heat insulating material 30 is provided on the inner surface of the wind guide panel 20 surrounded by the peripheral wall. The heat insulating material 30 is provided over the whole surface except for both the end sides in the left and right direction. The width of the heat insulating material 30 in the left and right direction is set larger than the width of the blow-out port 5. The surface of the heat insulating material 30 is formed into one surface. Therefore, there is no projection on the side of the inner surface of the wind guide panel 20, which inner surface faces the blow-out port 5, and hence the air flow cannot be hindered.

[0032] As shown in FIG. 5, on both sides in the horizontal direction of the inner surface of the wind guide panel 20, a support material 31 is provided. The wind guide panel 20 is supported by the support material 31 so as to be attached/detached freely. The support material 31 is attached to the cabinet 3 through a rod 32. That is, the wind guide panel 20 is attached to the cabinet 3 through the rod 32 constituting the opening and closing mechanism and is attachable/detachable to/from the cabinet 3.

[0033] The upper shaft 23 of the wind guide panel 20 is provided on the front side of the support 31, while the lower shaft 22 is provided on the rear side of the support 31. The lower and upper shafts 22 and 23 are arranged along the left and right direction, and both ends of the lower and upper shafts 22 and 23 are supported so as to be separated from the support 31. The lower and upper shafts 22 and 23 are located on the outside of the blow-out port 5 in the front-and-rear and right-and-left directions, and are located in front of the blow-out port 5. Therefore, the lower and upper shafts 22 and 23 do not impede the flow of the wind blown out from the blow-out port 5.

[0034] On both the left and right sides of the wind guide panel 20, an engagement portion for engaging the support material 31 is provided. As the engagement portion, there are provided claws 33 which can be freely slid in the left and right direction. The claw 33 faces the peripheral wall formed in the front and rear direction, and is energized by an urging member, such as a spring, toward the peripheral wall. The wind guide panel 20 is attached to the support material 31 in such a manner that the support material 31 is sandwiched between the claw 33 and the peripheral wall. The wind guide panel 20 can be removed from the support material 31 by sliding the claw 33 in the direction away from the peripheral wall.

[0035] Note that, the claw 33 may be provided at least on one side of the front side and the back side in the front-back direction. In this case, on the other side, a

holding portion for holding the wind guide panel 20 so as to rotate freely is provided. As the holding portion, a pin is engaged with a hole so that the wind guide panel 20 is held so as to rotate freely. The pin is provided in either the wind guide panel 20 or the support material 31 and the hole for receiving the pin is formed in the other. By fitting the pin into the hole, the support material 31 holds the wind guide panel 20 so as to rotate freely. In this way, the wind guide panel 20 is supported at two points by the support material 31 in the front-back direction.

[0036] The claw 33, when being provided on one side, may be provided on the front side in view of operability. In this case, a user is able to attach or detach the wind guide panel 20, while looking at the claw 33 in the state where the wind guide panel 20 is held in the downwardly opened posture. Accordingly, it is possible to perform attachment/detachment work easily and reliably. Moreover, since the pin remains being fitted into the hole even if engagement of the claw 33 is released, the wind guide panel 20 is supported by the support material 31 so as to rotate freely and the wind guide panel 20 is in the state of being suspended from the support material 31. Thus, the wind guide panel 20 does not drop. Thereafter, by removing the pin from the hole, it is possible to detach the wind guide panel 20 from the support material 31 completely.

[0037] Since the claw 33 is provided on the inner surface side of the wind guide panel 20 in the panel structure described above, it is necessary to detach the wind guide panel 20 after bringing the wind guide panel 20 into the downwardly opened posture or the upwardly opened posture. Thus, there is provided a panel structure where the wind guide panel 20 is attachable/detachable even in the closed posture without bringing the wind guide panel 20 in to the downwardly opened posture and the upwardly opened posture necessarily. The panel structure will be described below.

[0038] In the present panel structure, as shown in FIG. 8, an engagement portion 300 for engaging the support material 31 is provided on both sides in the horizontal direction of the wind guide panel 20. Moreover, a holding portion 301 is provided for holding the wind guide panel 20 so as to rotate freely with respect to the support material 31. The back side of the wind guide panel 20 is supported by the engagement portion 300, the front side of the wind guide panel 20 is supported by the holding portion 301, and the wind guide panel 20 is supported at two points by the support material 31. That is, when the wind guide panel 20 is in the closed posture, the holding portion 301 is positioned above the engagement portion 300. Note that, in FIG. 8, the upper side in the figure is the front side of the wind guide panel 20 and the lower side is the back side of the wind guide panel 20.

[0039] The engagement portion 300 includes a movable member 302 for pressing the support material 31. The movable member 302 is provided so as to slide freely in the horizontal direction on the inner surface side of the wind guide panel 20 as shown in FIGS. 9 to 12. The

movable member 302 has a claw 303 on the inner end side, that is, on the end part side being closer to the center of the wind guide panel 20, and has an operational button 304 on the outer end side, that is, on the end part side being closer to the outside of the wind guide panel 20. The claw 303 and the operational button 304 are integrally coupled by a coupling plate 305. The coupling plate 305 is positioned on the back surface side of the support material 31.

[0040] The claw 303 is engaged with the support material 31 so as to sandwich the front and back surfaces of the support material 31. An engagement piece 306 is protrusively provided on the inner end side of the support material 31, that is, on the end part side being closer to the center of the wind guide panel 20 and the claw 303 is engaged with the engagement piece 306. A pin 307 is protrusively provided on the inner end side of the claw 303 and the pin 307 is inserted into a holding hole 309 which is formed on a vertical wall 308 vertically disposed on the wind guide panel 20. A spring 310 is inserted around the pin 307 and the spring 310 is interposed between the vertical wall 308 and the claw 303. The spring 310 is covered by a covering piece 311 so as not to be touched from outside.

[0041] Moreover, the spring 310 urges the claw 303 toward the outer end side. By providing an urging member like the spring 310, the claw 303 is pressed against the support material 31 and the claw 303 is engaged with the support material 31. Accordingly, when the wind guide panel 20 is opened and closed, it is possible to keep engagement of the support material 31 and to prevent the wind guide panel 20 from being detached from the support material 31. As the urging member, a member having elasticity may be used and an elastic rubber may be used. Note that, the support material 31 is positioned so as not to move in the horizontal direction on the inner surface of the wind guide panel 20. Thus, even if the claw 303 is urged by the spring 310 and abuts against the support material 31, the support material 31 is not displaced outward.

[0042] The operational button 304 is inserted into a through hole 321 formed on a peripheral wall 320 on the horizontal direction side of the wind guide panel 20 as shown in FIGS. 13 and 14. With an urging force of the spring 310, as shown in FIG. 11, the operational button 304 is exposed to the outer surface of the wind guide panel 20 from the through hole 321. This makes it possible to operate the movable member 302 from outside.

[0043] As shown in FIGS. 10 and 12, when a user performs an operation of pressing the operational button 304, the movable member 302 moves to the center side in the long-length direction of the wind guide panel 20 resisting the urging force of the spring 310. The claw 303 therefore moves and engagement of the support material 31 is released.

[0044] When the wind guide panel 20 is detached from the support material 31, the movable member 302 is moved to the outer end side by the spring 310. A step

322 is formed on the circumference of the operational button 304, and when the operational button 304 moves outward, the step 322 abuts against the periphery on the inner surface side of the through hole 321. This makes it possible to prevent that the operational button 304 is projected largely from the outer surface of the wind guide panel 20 even if the movable member 302 is urged and pressed by the spring 310 as shown in FIG. 11.

[0045] The moveable member 302 is held by the wind guide panel 20 so as to move freely in the horizontal direction (long-length direction of the wind guide panel 20). That is, the operational button 304 is fitted into the through hole 321 on the outer end side, while the pin 307 is fitted into the holding hole 309 on the inner end side. Thereby, the movable member 302 has both sides in the horizontal direction held by the wind guide panel 20 and does not come off the wind guide panel 20.

[0046] Although the movable member 302 moves inward when the operational button 304 is pressed, the movement is restricted. A rib 323 is protrusively provided on the wind guide panel 20 and the movable member 302 abuts against the rib 323 to restrict the movement. A slit 324 is formed on the coupling plate 305 of the movable member 302 and a slice 325 is protrusively formed in the slit 324. The thickness of the slice 325 is thinner than the coupling plate 305. When the slice 325 abuts against the rib 323, the movement of the movable member 302 is stopped. At this time, as shown in FIG. 12, the operational button 304 is not removed out from the through hole 321. Since the pin 307 is fitted into the holding hole 309, the movable member 302 does not come off the wind guide panel 20.

[0047] Here, in order to mount the movable member 302 in the wind guide panel 20, a hole wall of the holding hole 309 is formed into a tapered shape and the pin 307 of the movable member 302 is able to be inserted obliquely from above into the holding hole 309. After the pin 307 is inserted into the holding hole 309, the movable member 302 is pressed down and the movable member 302 is shifted toward the inner end side so that the operational button 304 does not touch the peripheral wall 320. At this time, the slice 325 abuts against the rib 323. Since the slice 325 is thin, the slice 325 is flexible and is flexed by touching the rib 323, thus making it possible to press down until the coupling plate 305 touches the wind guide panel 20. Then, with the urging force of the spring 310, the movable member 302 moves to the outer end side and the operational button 304 is fitted into the through hole 321.

[0048] As shown in FIG. 8, the wind guide panel 20 and the support material 31 are engaged so as to be able to rotate by the holding portion 301 comprised of a rotary shaft 330 and a bearing 331. As shown in FIGS. 15 and 16, the rotary shaft 330 is protrusively provided on the front side of the support material 31. A pair of right and left rotary shafts 330 is provided. Note that, in the figures, 80 denotes a support shaft for attaching the rod 32 so as to rotate freely. In FIGS. 15 and 16, the upper side in the

figures is the front side of the support material 31.

[0049] As shown in FIGS. 13 and 14, a pair of right and left bearings 331 is provided on the front side of the wind guide panel 20. The bearing 331 receives the rotary shaft 330 so that the rotary shaft 330 comes off. In FIGS. 13 and 14, the upper side in the figures is the front side of the wind guide panel 20 and the lower side is the back side of the wind guide panel 20.

[0050] When the wind guide panel 20 is in the closed posture, as described below, the upper shaft 23 and the lower shaft 22 of the support material 31 are locked by the opening and closing mechanism and the support material 31 is held in the state close to the cabinet 3. When a user presses the operational button 304 while the wind guide panel 20 is in the closed posture, the movable member 302 slides and the claw 303 is separated from the support material 31. Engagement of the wind guide panel 20 and the support material 31 is released and the back side of the wind guide panel 20 is separated from the support material 31. Since the bearing 331 of the wind guide panel 20 is engaged with the rotary shaft 330 of the support material 31 on the front side of the wind guide panel 20, the wind guide panel 20 is in the state of being suspended from the support material 31 as shown in FIG. 17. Accordingly, the wind guide panel 20 does not drop during attachment/detachment work. In this state, since the blow out port 5 of the cabinet 3 is exposed to the outside, it is possible to perform cleaning and maintenance of the inner part of the blow out port 5. Moreover, when the bearing 331 comes off the rotary shaft 330 by lifting the wind guide panel 20, it is possible to detach the wind guide panel 20 completely from the support material 31 held by the cabinet 3.

[0051] In this way, when the engagement portion 300 is at the back side, that is, the lower side than the holding portion 301, the operational button 304 is close to a floor. Accordingly, a user is able to perform an operation for attachment/detachment easily. Because of being in the state of being suspended, the wind guide panel 20 is not obstructive in simple work.

[0052] When the wind guide panel 20 is attached, the bearing 331 of the wind guide panel 20 is firstly hung on the rotary shaft 330 of the support material 31. As shown in FIG. 17, the front side of the wind guide panel 20 is supported by the support material 31. The wind guide panel 20 becomes able to rotate with the rotary shaft 330 as a center. By lifting the back side of the wind guide panel 20 while pressing the operational button 304, the wind guide panel 20 rotates in a counterclockwise manner.

[0053] When the wind guide panel 20 abuts against the support material 31, the operational button 304 is released. With the urging force of the spring 310, the movable member 302 moves and the claw 303 sandwiches the support material 31. The back side of the wind guide panel 20 is supported by the support material 31 and the wind guide panel 20 is attached to the support material 31. In this way, when the wind guide panel 20

is in the closed posture, the wind guide panel 20 is attachable/detachable. Note that, even if the wind guide panel 20 is in the upwardly opened posture or the downwardly opened posture, the wind guide panel 20 is attachable/detachable to/from the support material 31 similarly.

[0054] As shown in FIGS. 11 and 12, the upper surface of the claw 303 is formed into an inclined surface. The lower corner on the inner end side of the support material 31 is rounded. This makes it possible to attach the wind guide panel 20 to the support material 31 even without pressing the operational button 304.

[0055] When the wind guide panel is not attached to the support material 31, the movable member 302 is pressed toward outside of the wind guide panel 20 with the urging force of the spring 310 and the step 322 abuts against the circumference of the through hole 321 to be at a position capable of engaging the support material 31 as shown in FIG. 11. When the back side of the wind guide panel 20 rotates in a counterclockwise manner with the rotary shaft 330 as a center, the claw 303 touches the lower corner of the support material 31. When the rotation is continued as it is, the movable member 302 is pressed by the support material 31 and moves toward the center side. The lower corner of the support material 31 gets over the inclined surface of the claw 303. With the urging force of the spring 310, the movable member 302 moves outward and the claw 303 is engaged with the support material 31. In this way, it is possible to attach the wind guide panel 20 to the support material 31 without pressing the operational button 304 and to mount the wind guide panel 20 more easily.

[0056] In this attachment/detachment work of the wind guide panel 20, a user is able to perform work without touching the support material 31. That is, the user may operate the operational button 304 as required while holding only the outside in the horizontal direction of the wind guide panel 20 and is able to attach/detach the wind guide panel 20 easily. Moreover, the wind guide panel 20 does not have a structure of being attached directly to the opening and closing mechanism but a structure of being attached through the support material 31. Accordingly, there is no effect on the opening and closing mechanism in attachment/detachment of the wind guide panel 20 and it is possible to reduce the possibility that the wind guide panel 20 opening and closing operation failures occur due to an attachment error or the like in mounting.

[0057] As shown in FIGS. 18 to 21, the blow out port 5 is provided with an air direction plate 24 and an auxiliary louver 800. The air direction plate 24 changes an angle of the horizontal direction to change the air direction of the horizontal direction. The auxiliary louver 800 is provided in an outlet part of the blow out port 5 in front of the air direction plate 24 and changes an angle of the vertical direction according to the posture of the wind guide panel 20 to change the air direction of the vertical direction while rectifying the blown out air.

[0058] The auxiliary louver 800 is formed in a plate

shape which is long in the horizontal direction and front and rear end parts thereof are formed in a tapered shape. On the rear end part side, a revolving shaft 801 whose axial direction is the horizontal direction is fixed to a shaft coupling portion formed in the right and left end parts. The revolving shaft 801 is disposed on an upper wall side of upper and lower walls forming the air passage 6 which extends to the blow out port 5, and penetrates through the right and left side walls of the blow out port 5 to be borne so as to revolve freely. In addition, a louver motor 803 is coupled to the shaft end of the revolving shaft 801 through a not-shown speed reduction mechanism (see FIG. 7) and the louver motor 803 is drive-controlled by the controlling device 41.

[0059] In the state where the wind guide panel 20 is held in the upwardly opened posture in which the lower end of the wind guide panel 20 is opened toward the front side by being rotated about the upper shaft 23, the control device 41 drives and control the louver motor 803 so that the auxiliary louver 800 is held in an inclined posture oriented at an angle with respect to the flow of the wind so as to change the wind direction. Further, in the state where the wind guide panel 20 is held in the downwardly opened posture in which the upper end of the wind guide panel 20 is downwardly opened by being rotated about the lower shaft 22, the control device 41 drives and control the louver motor 803 so that the auxiliary louver 800 is controlled so as to be oriented in parallel with the wind flow.

[0060] Further, the controlling device 41 controls the posture of the auxiliary louver 800 so that the front of the blow out port 5 is blocked off by the auxiliary louver 800 and the air blown out frontward is pressed to be guided downwardly in the upwardly opened posture of the wind guide panel 20. Moreover, an angle of the auxiliary louver 800 is controlled so that the air blown out from the blow out port 5 hits two members of the auxiliary louver 800 and the wind guide panel 20 to change the air direction in two stages when the wind guide panel 20 is held in the upwardly opened posture. The posture of the wind guide panel 20 and the auxiliary louver 800 will be described below.

[0061] FIG. 4 shows an example where while the wind guide panel takes the upwardly opened posture, the auxiliary louver 800 is arranged having an angle to the air flow. In this example, since the auxiliary louver 800 has an angle to the air flow, the air blown out from the blow out port 5 is rectified by the auxiliary louver 800 and a part thereof passes the lower side of the auxiliary louver 800 and flows directly in the obliquely downwardly direction without being interfered by the wind guide panel 20. In addition, the rest of the air is rectified by the auxiliary louver 800 and then hits the inner surface of the wind guide panel 20 to be guided in the obliquely downwardly direction along an inner curved surface thereof.

[0062] FIG. 6 shows an example where while the wind guide panel takes the downwardly opened posture, the auxiliary louver 800 is arranged in parallel to the air flow.

In this example, the wind guide panel 20 rotates downwardly around the lower shaft 22 to take a substantially horizontal posture. That is, the wind guide panel 20 in the downwardly opened posture is connected to the lower wall of the blow out port 5 to form a long nozzle by the wind guide panel 20 and the upper wall of the blow out port 5. Accordingly, it is possible that air is guided to the obliquely upwardly direction by the wind guide panel 20 and is blown out to a distance along a ceiling. At this time, being arranged in parallel to the air flow, the auxiliary louver 800 does not block off the air flow forcibly and works to guide the air blown out from the blow out port 5 to a distance.

[0063] FIG. 18 shows an example where while the wind guide panel takes the upwardly opened posture, an opening angle of the wind guide panel 20 is suppressed to take a substantially vertical posture and the auxiliary louver 800 is caused to have an angle to the air flow for rectification. In this example, the air blown out from the blow out port 5 is rectified by the auxiliary louver 800 and hits the wind guide panel 20 so that the air direction is changed and air flows straight downwardly from the blow out port 5.

Accordingly, in this example, with changing of the air direction in two stages of changing of the air direction by the auxiliary louver 800 and the changing of the air direction by the wind guide panel 20 positioned on the downstream side of the air, air blows straight downwardly from the blow out port 5. Moreover, since the air direction is changed in a stepwise manner by the auxiliary louver 800 and the wind guide panel 20, it is possible to reduce wind noise compared to extreme changing of the air direction.

[0064] FIG. 19 shows an example where while the wind guide panel takes the upwardly opened posture, although a substantially vertical posture is taken with the opening angle of the wind guide panel 20 suppressed, the auxiliary louver 800 is arranged in the vertical direction so that the auxiliary louver 800 bears the main air direction changing function and the air flow is blocked off to press the air downwardly. In this example, the air direction changing function is mainly exerted by the auxiliary louver 800 and the air flows a little obliquely downwardly compared to the case where the air flows vertically straight downwardly as shown in FIG. 18.

[0065] FIG. 20 shows an example where, similarly to the posture shown in FIG. 4, while the wind guide panel takes the upwardly opened posture, the wind guide panel 20 opens to the maximum and the auxiliary louver 800 is arranged having an angle to the air flow. In this example, since the auxiliary louver 800 is provided so as to rotate freely around the shaft 801 near the outlet of the blow out port 5 to change the air direction, a space 804 is generated between the auxiliary louver 800 and the upper wall of the blow out port 5 and the air flow is generated along the upper wall through the space 804, and there is a possibility that the air leaks and a part thereof hits the wind guide panel 20 and passes through in the

horizontal direction.

[0066] Thus, in order to eliminate such leakage of air, as shown in FIG. 20, on the upper wall on the front side of the shaft 801 of the auxiliary louver 800, a projection 901 is formed so that the air from the air passage 6 flows, away from the upper wall, along the auxiliary louver 800. The projection 901 is illustrated as having a triangular cross section but may have other shapes such as a semicircle-shaped cross section. The projection 901 allows the air along the upper wall to jump by the projection 901 and flow along the side of the auxiliary louver 800.

[0067] As shown in FIG. 21, the opening and closing mechanism of the wind guide panel 20 is comprised of a moving portion 50 for bringing the wind guide panel 20 close to/away from the cabinet 3 and a restricting portion 51 for restricting the opening direction of the wind guide panel 20 when the wind guide panel 20 moves.

[0068] When the wind guide panel 20 is opened, the moving portion 50 moves the wind guide panel 20 in the direction away from the cabinet 3. At this time, the restricting portion 51 allows either one opening of upwardly opening or downwardly opening and restricts the other opening to thereby change the opening direction of the wind guide panel 20. When the downwardly opening is restricted, the wind guide panel 20 opens upwardly. In contrast, when the upwardly opening is restricted, the wind guide panel 20 opens downwardly. When the wind guide panel 20 closes, the moving portion 50 moves the wind guide panel 20 in the direction close to the cabinet 3.

[0069] That is, the restricting portion 51 restricts the opening direction by locking the upper shaft 23 or the lower shaft 22 not to move. In the case of downwardly opening, the lower shaft 22 is locked. In the case of upwardly opening, the upper shaft 23 is locked.

[0070] In addition, the restricting portion 51 has a function of holding the wind guide panel 20 in the closed posture. The wind guide panel 20 in the closed posture is brought close to the front panel 21 of the cabinet 3. At this time, the restricting portion 51 locks the upper shaft 23 and the lower shaft 22. Even if an external force is applied to separate the wind guide panel 20, since both the shafts 22 and 23 are locked, the wind guide panel 20 does not move.

[0071] In this way, as a driving source for opening and closing the wind guide panel 20, a driving source only for moving the wind guide panel 20 may be provided. Additionally, the driving source may be one which causes the wind guide panel 20 to perform a simple operation such as reciprocation. Accordingly, the moving portion 50 for reciprocating the wind guide panel 20 is able to have a simple mechanism. This makes it possible to simplify the opening and closing mechanism and to try to reduce a size of the opening and closing mechanism.

[0072] As shown in FIGS. 22 and 23, the restricting portion 51 includes a pair of upper and lower hooks 52 and 53 for holding the upper and lower shafts 22 and 23, a switching portion 54 for switching the opening direction by restricting the operation of each of the hooks 52 and

53, an interlocking portion 55 for causing each of the hooks 52 and 53 to operate interlockingly, and a driving portion 56 for driving the interlocking portion 55. As shown in FIGS. 24 to 26, the moving portion 50 includes the rod 32 for holding the wind guide panel 20, a moving mechanism portion 57 for taking the rod 32 in/out from the cabinet 3, and a driving portion 58 for driving the moving mechanism portion 57. Note that, in order that the mechanism of the moving portion and the restricting portion of the wind guide panel is easily understood, the auxiliary louver is omitted in the illustration of FIGS. 21 and 24 to 26.

[0073] A pair of right and left restricting portions 51 is provided inside the cabinet 3 and are arranged outside of the blow out port 5 in the horizontal direction. As shown in FIG. 27, the restricting portion 51 is configured on a base plate 60 to be unitized. The base plate 60 is fixed inside the cabinet 3.

[0074] The upper hook 52 and the lower hook 53 are respectively rotatably supported by fixed shafts 61 fixed to the base plate 60. Suction/outlet ports 21a which respectively allow the hooks 52 and 53 to be projected or retracted are formed in the upper and lower portions of the front panel 21, respectively. The upper hook 52 is projected from the suction/outlet port 21a, so as to hook the upper shaft 23 from the lower side. The upper shaft 23 is held by being sandwiched between a receiving base 62 formed in the front panel 21 and the upper hook 52. Similarly, the lower hook 53 is also projected from the suction/outlet port, so as to hook the lower shaft 22 from the lower side, so that the lower shaft 22 is held by being sandwiched between a receiving base 63 and the lower hook 53.

[0075] The linkage section 55 enables each of the hooks 52 and 53 to be operated by using a link mechanism. Specifically, the linkage section 55 is configured by a pair of upper and lower links 64 and 65, and a linkage plate 66. The upper and lower links 64 and 65 connect the upper and lower hooks 52 and 53 to the linkage plate 66, respectively. That is, a shaft 64a is formed at one end of the upper link 64, so as to be fitted into a shaft hole of the upper hook 52. The upper hook 52 is rotatably supported at the one end of the upper link 64. The lower link 65 and the lower hook 53 are also similarly configured.

[0076] The other end of the upper link 64 is rotatably attached to the linkage plate 66. The linkage plate 66 is formed into a fan-shaped gear, and gear teeth are formed on the circular arc surface of the linkage plate 66. The linkage plate 66 is rotatably supported by a fixed shaft 67 which is projectingly provided on the base plate 60. A pair of long grooves 68 are formed in the linkage plate 66, and other end shafts 64b and 65b of the upper and lower links 64 and 65 are fitted into the long grooves 68, respectively. Each of the long grooves 68 is extended in the radial direction from the fixed shaft 67 serving as the center. The other end shafts 64b and 65b of the links 64 and 65 are respectively made movable in the radial direction, so that a play is provided by each of the long

grooves 68.

[0077] By the rotation of the linkage plate 66, the links 64 and 65 are respectively moved in linkage with each other between the fixed shafts 61 of the hooks 52 and 53 and the fixed shaft 67 of the linkage plate 66. Thereby, the hooks 52 and 53 can be rotated about the fixed shafts 61, respectively.

[0078] The driving section 56 is configured by a plurality of gears 69 and a regulating motor 70. The regulating motor 70 is provided on a mounting base 71 attached to the base plate 60. The motor shaft of the regulating motor 70 is fitted into the gear 69, so that the driving force of the regulating motor 70 is transmitted to the linkage plate 66 via the plurality of gears 69. When the regulating motor 70 is driven, the linkage plate 66 is rotated about the fixed shaft 67.

[0079] As shown in Figure 23, the changing section 54 respectively guides the movement of the other end shafts 64b and 65b of the links 64 and 65. A regulating groove 72 is formed in the mounting base 71, and both the other end shafts 64b and 65b are fitted in the regulating groove 72. The movement of each of the hooks 52 and 53 is defined in such a manner that the links 64 and 65 are moved differently from each other by the regulating groove 72. That is, when one of the hooks 52 and 53 is moved, the other of the hooks 52 and 53 is regulated so as not to be moved. The changing section 54 defines the movement of the hooks 52 and 53 according to the opening direction.

[0080] The regulating groove 72 is formed substantially in a U-shape. The regulating groove 72 is configured by three grooves of an upper locking groove 72a, a neutral groove 72b, and a lower locking groove 72c, and the three grooves are continuously connected. The upper locking groove 72a is formed along a circular arc centering on one end shaft 64a of the upper link 64. The lower locking groove 72c is formed along a circular arc centering on one end shaft 65a of the lower link 65. The neutral groove 72b is formed along a circular arc centering on the fixed shaft 67 of the linkage plate 66.

[0081] As shown in FIGS. 22(a) and 23(a), when both the other-end shafts 64b and 65b are in the neutral groove 72b, the hooks 52 and 53 hold the upper and lower shafts 22 and 23, respectively, and both the shafts 22 and 23 are locked. The state at this time is an initial state. As shown in FIGS. 22(b) and 23(b), when the other-end shaft 64b of the upper link material 64 is in the upper lock groove 72a, the upper hook 52 holds the upper shaft 23 and the upper shaft 23 is locked. The lower hook 53 comes off the lower shaft 22. As shown in FIGS. 22(c) and 23(c), when the other-end shaft 65b of the lower link material 65 is in the lower lock groove 72c, the lower hook 53 holds the lower shaft 22 and the lower shaft 22 is locked. The upper hook 52 comes off the upper shaft 23.

[0082] In the initial state, when the interlocking plate 66 rotates in a clockwise manner, the other-end shaft 64b of the upper link material 64 moves along the upper

lock groove 72a. The other-end shaft 64b of the upper link material 64 moves in the circumferential direction with the one-end shaft 64a as a center. Since the upper link material 64 does not move in the radial direction, neither does the one-end shaft 64a move. Therefore, the upper hook 53 does not rotate. On the other hand, the other-end shaft 65b of the lower link material 65 moves along the neutral groove 72b. The one-end shaft 65a is drawn to move. The lower hook 53 rotates in a clockwise manner. Thereby, as shown in FIGS. 22(b) and 23(b), the locking of the lower shaft 22 is released. In the initial state, when the interlocking plate 66 rotates in a counterclockwise manner, as shown in FIGS. 22(c) and 23(c), similarly, the locking of the upper shaft 23 is released. Note that, in the above-described operation, the controlling device 41 drives the right and left restricting motors 70 so as to synchronize in the right and left restricting portions 51. Note that, the restricting motor 70 is normally or reversely rotated according to the opening direction using a stepping motor.

[0083] A pair of the moving sections 50 are provided on the left and right sides in the cabinet 3, so as to be arranged outside the regulating sections 51 in the left and right direction, respectively. As shown in Figures 11 to 13, the rod 32 is made to project to the outside from a vertically long hole 21b (see Figure 3) formed in the front panel 21. A support shaft 80 for attaching the rod 32 is provided on the support 31. The front end of the rod 32 is rotatably supported by the support shaft 80. The support shaft 80 is positioned so as to be shifted to the front side from the center in the front and rear direction. The rod 32 is formed to have a circular cross section. When the wind hits the rod 32, the wind is allowed to easily flow along the surface of the rod 32. Thus, even when the cool air is blown at the rod 32, dew condensation hardly occurs. Further, the rod 32 is formed to have a hollow structure. Thereby, the weight of the rod 32 can be reduced while the strength of the rod 32 is maintained. As a result, the load of the motor to move the rod 32 is reduced.

[0084] When opening the wind guide panel 20, the moving mechanism section 57 moves the front end of the rod 32 to the front side. When closing the wind guide panel 20, the moving mechanism section 57 moves the front end of the rod 32 to the rear side. The moving mechanism section 57 is formed as a moving plate 81 which is reciprocated while holding the rod 32. As shown in Figure 28, the moving plate 81 is formed into a fan-shape, and is rotatably supported by a fixed shaft 83 which is fixed to a base plate 82. The base plate 82 is fixed to the cabinet 3.

[0085] The moving section 50 is also configured as a unit similarly to the regulating section 51. Here, the regulating section 51 and the moving section 50 are arranged side by side in each of the spaces respectively provided on the left and right sides of the cabinet 3. When both the regulating section 51 and the moving section 50 are configured as one unit, they can be handled as an

opening and closing mechanism unit, so as to be easily attached. Further, the moving section 50 can be configured by a small number of components, so that the size and the thickness of the unit can be reduced. Thereby, the opening and closing mechanism can be housed in a limited space, so that the width of the blow-out port 5 can be increased. When the width of the blow-out port 5 is increased, the blowing range of the wind in the width direction can be increased, and thereby it is possible to supply the wind to all corners of a room.

[0086] The rear end of the rod 32 is rotatably attached to the vicinity of the front end of the moving plate 81 via a rotary shaft 84. A circular arc groove 85 is formed in the moving plate 81. The circular arc groove 85 is formed on a circular arc centering on the fixed shaft 83. A rack is formed in the circular arc groove 85. The driving section 58 is configured by an opening and closing motor 86 and a gear 87 attached to the motor shaft of the opening and closing motor 86. The gear 87 is inserted into the circular arc groove 85, so as to mesh with the rack.

[0087] When the opening and closing motor 86 is driven, the moving plate 81 is rotated about the fixed shaft 83 in association with the rotation of the gear 87, so that the rod 32 is moved into and out of the front panel 21. When the wind guide panel 20 is held in the closed posture as shown in Figure 22, the moving plate 81 is located in the rear side. Only the front end of the rod 32 is made to project from the front panel 21. This state is the initial state.

[0088] When the lock of the lower shaft 22 is released, and when the opening and closing motor 86 is driven, the moving plate 81 is rotated counter clockwise as shown in Figure 25. The rod 32 is pushed out so as to be moved to the front side. The wind guide panel 20 is rotated about the upper shaft 23, so as to be upwardly opened. Note that the opening and closing motor 86 is controlled so that the moving plate 81 is rotated by a fixed angle of, for example, 50 degrees.

[0089] When the lock of the upper shaft 23 is released, and when the opening and closing motor 86 is driven, the moving plate 81 is rotated counter clockwise as shown in Figure 26. The rod 32 is pushed out, so that the front end of the rod 32 is moved to the front side. The wind guide panel 20 is rotated about the lower shaft 22, so as to be downwardly opened. At this time, the wind guide panel 20 is opened so as to be moved downwardly, and hence the front end of the rod 32 is also moved to the front side while being gradually moved downwardly. Also in this case, the moving plate 81 is rotated by a fixed angle.

[0090] When the wind guide panel 20 is opened, and when the opening and closing motor 86 is driven to cause the moving plate 81 to rotate clockwise, the wind guide panel 20 is closed. By the rotation of the moving plate 81, the rear end of the rod 32 is moved to the rear side. The rod 32 is drawn into the cabinet 3. Thereby, the wind guide panel 20 is rotated about the upper shaft 23 or the lower shaft 22. The wind guide panel 20 is made to ap-

proach the cabinet 3, so as to be held in the closed posture.

[0091] Note that the control device 41 drives the opening and closing motors 86 on the left and right sides so that the above described operations are synchronized with each other in the left and right side moving sections 50. A stepping motor is used as the opening and closing motor 86 and is normally and reversely rotated according to the opening and closing operations.

[0092] When the wind guide panel 20 is opened during the cooling or heating operation, one of the lower and upper shafts 22 and 23 of the wind guide panel 20 is locked. Here, when the wind guide panel 20 is pulled and the external force is applied to the wind guide panel 20, one of the shafts is pushed (here, it is assumed that the upper shaft 23 is pushed). When the upper shaft 23 is pushed, the upper hook 52 is made to rotate counter clockwise. The upper link 64 is pushed in the shaft direction. The shaft direction is the direction which connects the one end and the other end of the upper link 64. The other end of the upper link 64 pushes the mounting base 71 through the regulating groove 72. At this time, the direction of the upper locking groove 72a, at which the other end of the upper link 64 is located, is substantially orthogonal to the shaft direction of the upper link 64. Since the mounting base 71 is fixed, the upper link 64 is not moved in the shaft direction. Further, the acting direction of the force from the upper link 64 is substantially orthogonal to the direction of the upper locking groove 72a. No force acts on the other end of the upper link 64 in the direction in parallel with the direction of the upper locking groove 72a. As a result, the upper link 64 is not moved along the upper locking groove 72a, so that the rotation of the upper hook 52 is prevented.

[0093] Therefore, in the state where the wind guide panel 20 is opened, even when external force is applied, it is possible to prevent the lock from being released because the direction of one of the links 64 and 65 is made orthogonal to the direction of the regulating groove 72. Thereby, it is possible to prevent the occurrence of the state in which the opened wind guide panel 20 is hung down by being supported by the rod 32.

[0094] Meanwhile, when the wind guide panel 20 is fully opened, the moving amount of the rod 32 is fixed regardless of the opening direction. However, the front end of the rod 32 is positioned to be eccentric with respect to the wind guide panel 20. Thus, as shown in Figures 4 and 6, the opening angle at the time when the wind guide panel 20 is upwardly opened is different from the opening angle at the time when the wind guide panel 20 is downwardly opened. The upwardly opening angle is set larger than the downwardly opening angle. That is, the opening angle is increased as the distance from the center to the fulcrum is reduced at the time when the wind guide panel 20 is opened. The center is the upper shaft 23 or the lower shaft 22, while the fulcrum is the position of the front end of the rod 32. Since the rod 32 is attached near the upper shaft 23, the upwardly opening angle is set

large, and the downwardly opening angle is set small.

[0095] The wind guide panel 20 is downwardly opened at the time of cooling operation. However, when the downwardly opening angle is large, the wind guide panel 20 is set below the horizontal line. This causes the cool air to flow in the horizontal direction, and does not cause the air to flow toward the ceiling. The reaching distance of the cool air is reduced, and the cool air directly hits a person. Therefore, in the case where the wind guide panel 20 is downwardly opened, it is preferred to reduce the opening angle. The wind guide panel 20 is upwardly opened at the time of heating operation. However, when the opening angle is small, the outlet of the warm air is narrowed. The warm air, which is returned after hitting the wind guide panel 20, has no place to escape, and hence collides with the blown-out warm air, so as to thereby disturb the flow of the air. As a result, the velocity of the air blown out toward the floor surface is reduced, so as to prevent the warm air from reaching the floor surface.

[0096] In this way, efficient air delivery cannot be performed at the time of cooling or heating operation, so that the cooling and heating performance cannot be maximally exhibited. However, as described above, when the upwardly opening angle is set large, and when the downwardly opening angle is set small, the cool air can be blown out toward the ceiling at the time of cooling operation, and the outlet of the warm air is increased at the time of heating operation so that a smooth flow of the warm air can be formed. Therefore, the maximum capacity of the air conditioner can be fully exhibited.

[0097] In the air conditioner, the cooling or heating operation is performed on the basis of an instruction generated when the user operates the remote controller or when the set time of the timer is reached. The control device 41 controls the refrigerating cycle 40, and also controls the opening and closing of the wind guide panel 20 and the auxiliary louver 800. At this time, the control device 41 operates the moving section 50 and the regulating section 51 in association with each other.

[0098] When performing the cooling or heating operation, the control device 41 turns on and off the driving of the regulating motor 70 and the opening and closing motor 86 according to a predetermined timing. Further, the control device 41 turns on and off the driving of the louver motor 803 of the auxiliary louver 800. That is, the motors 70, 86 and 803 are sequence-controlled, respectively.

[0099] The operation timing of the auxiliary louver 800 is set such that the auxiliary louver 800 is rotated to be opened after the wind guide panel 20 is opened, and that the auxiliary louver 800 is rotated to be closed before the wind guide panel 20 is closed. At the time of rapid cooling, the posture of the wind guide panel 20 is changed in such a manner that the wind guide panel 20 is once held in the upwardly opened posture by being rotated about the upper shaft, and that the wind guide panel 20 is then held in the closed posture and then held in the downwardly opened posture by being rotated about the lower shaft.

At this time, however, the auxiliary louver 800 is sequence-controlled so as to be opened after the opening operation of the wind guide panel 20, and to be rotationally closed before the closing operation of the wind guide panel 20.

[0100] Further, the control device 41 performs an initializing operation before the start of operation. That is, the control device 41 determines the position of the wind guide panel 20 at the time when the operation is stopped. When the wind guide panel 20 is not set in the initial state, the control device 41 operates, as the initializing operation, the moving section 50 and the regulating section 51 so that the wind guide panel 20 is set in the initial state. When the operation is started, and when the wind guide panel 20 is set in the initial state, the control device 41 starts the operation without performing the initializing operation. Note that the state where the wind guide panel 20 is held in the closed posture is the initial state, and the opening angle of the wind guide panel 20 is associated with the states of the respective members of the moving section 50 and the regulating section 51.

[0101] As shown in Figure 24, position detecting sensors 90 for detecting the position of the wind guide panel 20 are provided in the moving section 50. Note that the position detecting sensors 90 are provided in the left and right moving sections 50, respectively. A limit switch is used as the position detecting sensor 90. The position detecting sensor 90 is attached to the base plate 82 of the moving section 50 in the cabinet 3. The position detecting sensor 90 is arranged so as to be positioned close to the moving plate 81 which is set in the initial state. When the moving plate 81 is set in the initial state, the rod 32 attached to the moving plate 81 is brought into contact with the position detecting sensor 90. Therefore, the position detecting sensor 90 detects that the wind guide panel 20 is set in the initial state, that is, in the closed posture.

[0102] Note that the position detecting sensor 90 may also be configured to directly detect the position of the wind guide panel 20. The position detecting sensor is not limited to the contact type sensor, such as the limit switch, and non-contact type sensors, such as an optical sensor and a camera, may also be used as the position detecting sensor.

[0103] On the basis of a detection signal of the position detecting sensor 90, the control device 41 determines whether or not the wind guide panel 20 is set in the initial state. Usually, when the operation is stopped, the wind guide panel 20 is held in the closed posture, and hence the moving section 50 and the regulating section 51 are set in the initial state. However, when the wind guide panel 20 is not set in the initial state due to a certain reason, the control device 41 determines, on the basis of the detection signal from the position detecting sensor 90, that the wind guide panel 20 is not set in the initial state. Then, the control device 41 performs the initializing operation so as to forcibly set the wind guide panel 20 in the initial state.

[0104] Conventionally, it is configured such that the time period during which the wind guide panel 20 is changed from the fully opened state to the closed state (initial state) is stored as the initialization time period, and that when the cooling or heating operation is started, the initializing operation of closing the wind guide panel 20 is necessarily performed during the initialization time period, and then the normal operation, such as the cooling or heating operation, is performed. However, in the conventional initializing operation, even when the wind guide panel 20 is set in the initial state at the time of starting an operation, such as the cooling or heating operation, the initializing operation is necessarily performed during the initialization time period, and hence it takes a time until the operation is shifted to the normal operation of the cooling or heating operation.

[0105] As in the present embodiment, when the position detecting sensor 90 is provided, it is possible to detect, at the time of starting the operation, whether or not the wind guide panel 20 is set in the initial state. Thus, when the wind guide panel 20 is set in the initial state at the time of starting the operation, it is possible to perform the cooling operation or heating operation without performing the initializing operation.

[0106] Further, when the wind guide panel 20 is not set in the initial state at the time of starting the operation, the initializing operation is performed. When the position detecting sensor 90 detects that the wind guide panel 20 is set in the initial state, the initializing operation is ended, so that the operation can be shifted to the cooling or heating operation. Further, even when the wind guide panel 20 is not set in the fully opened state, but in a slightly opened state or in a substantially half opened state, the initializing operation is performed. However, the initializing operation is ended when the position detecting sensor 90 detects that the wind guide panel 20 is set in the initial state. Thus, the initializing operation is shifted to the cooling or heating operation without being performed during the initialization time period.

[0107] As described above, the time required for the initializing operation can be reduced by using the detection result from the position detecting sensor 90, so that the operation can be rapidly shifted to the normal operation. Note that it is configured such that when it is not detected by the position detecting sensor 90 that the wind guide panel 20 is set in the initial state, the opening operation of the wind guide panel 20 is not performed and only the closing operation of the wind guide panel 20 is performed.

[0108] When the wind guide panel 20 is not brought into the initial state even after the initial operation has been performed for a predetermined time, the opening operation is performed only for a required time to temporarily bring the wind guide panel 20 into the fully opened state, that is, from the closed state to the fully opened state to bring into the fully opened state. Then, the auxiliary louver 800 may be brought into the closed state and thereafter the wind guide panel 20 may be

brought into the closed state. Even after performing the operation, when the position detecting sensor 90 can not detect that the wind guide panel 20 is brought into the initial state, an error display is performed as a malfunction.

[0109] In such cases where a receptacle of an air conditioner is first connected to an AC power source, and where the power supply to the air conditioner is once interrupted due to power failure, it is necessary to set the auxiliary louver 800 in the closed state. Thus, first, the wind guide panel 20 is opened to the extent in which the auxiliary louver 800 can be rotated (for example, the wind guide panel 20 is fully opened). After the auxiliary louver 800 is closed, the wind guide panel 20 is set in the initial state.

[0110] In the initial state, the moving plate 81 is positioned on the rear side in the moving section 50 as shown in Figure 24. In the regulating section 51, the other end shafts 64b and 65b of the upper and lower links 64 and 65 are located in the neutral groove 72b as shown in Figure 21 and Figure 23(a).

[0111] When the heating operation is started, the control device 41 first drives the regulating motor 70 of the regulating section 51. By the driving, the linkage plate 66 is rotated clockwise. The upper link 64 is rotated about the one end. The other end shaft 65b of the lower link 65 is moved along the neutral groove 72b, and thereby the lower link 65 is pulled up. The lower hook 53 is rotated clockwise, so that the lock of the lower shaft 22 is released.

[0112] The control device 41 drives the opening and closing motor 86 of the moving section 50 with a slight delay from the timing of starting the regulating motor 70. The timing of starting the opening and closing motor 86 is set after the lower hook 53 is separated from the lower shaft 22. That is, the control device 41 stops the regulating motor 70, when a predetermined first timing is reached. The first timing is a timing which is determined according to the time period until the other end shaft 64b of the upper link 64 reaches the end of the upper locking groove 72a as shown in Figure 23(b). After stopping the regulating motor 70, the control device 41 drives the opening and closing motor 86.

[0113] When the opening and closing motor 86 is driven, the moving plate 81 is rotated counterclockwise. The rod 32 is pushed out to the front side, so that the wind guide panel 20 is moved in the direction away from the cabinet 3. The wind guide panel 20 is opened about the upper shaft 23. When the wind guide panel 20 is opened at a set opening angle, the control device 41 stops the opening and closing motor 86. Note that the opening angle is calculated from the number of steps of the opening and closing motor 86.

[0114] The control device 41 drives the opening and closing motor 86 for a fixed time period, and stops the opening and closing motor 86 when a second timing is reached. At this time, the opening angle reaches the maximum opening angle as shown in Figure 25. The wind

guide panel 20 is held in the upwardly opened posture, so that the warm air is blown out toward the floor surface.

[0115] Thereafter, the control device 41 controls the operation of the louver motor 803 so that the auxiliary louver 800 is operated to be opened at a predetermined angle. Thereby, the warm air is blown out toward the floor surface.

[0116] Also, in the case of the cooling operation, the control device 41 controls the regulating motor 70 and the opening and closing motor 86 at the same timing. However, the regulating motor 70 is rotated in the direction opposite to the direction at the time of the heating operation. The opening and closing motor 86 is rotated in the same direction as the direction at the time of the heating operation.

[0117] When the opening and closing motor 86 is driven for a fixed time period, and when the second timing is reached, the opening and closing motor 86 is stopped. At this time, the opening angle reaches the maximum opening angle as shown in Figure 26. The wind guide panel 20 is held in the downwardly opened posture, so that the cool air is blown out toward the ceiling. Thereafter, the control device 41 controls the operation of the louver motor 803 so that the auxiliary louver 800 is operated to be oriented in parallel with the flow of the wind. Thereby, the cool air is blown out toward the ceiling.

[0118] When the cooling or heating operation is ended, the control device 41 first operates the louver motor 803 so that the auxiliary louver 800 is operated to be closed. Next, the control device 41 drives the opening and closing motor 86. The rod 32 is pulled back, so that the wind guide panel 20 is made to approach the cabinet 3. The control device 41 stops the opening and closing motor 86 when a predetermined third timing is reached. At this time, as shown in Figure 24, the wind guide panel 20 is held in the closed posture, and the moving plate 81 is positioned on the rear side. That is, the third timing is a timing which is determined according to the time period during which the moving plate 81 is returned to the initial state. Note that the position detecting sensor 90 detects that the moving plate 81 is returned to the initial state. The third timing may also be set according to the detection timing.

[0119] Then, the control device 41 drives the regulating motor 70. For example, when the heating operation is performed, the state shown in Figure 23(b) is changed to the state shown in Figure 23 (a). The lower hook 53 is rotated, so that the lower shaft 22 is locked. The control device 41 stops the regulating motor 70 when a predetermined fourth timing is reached. The fourth timing is a timing determined according to the time period during which the other end shaft 65b of the lower link 65 is moved from the connecting position between the upper locking groove 72a and the neutral groove 72b, to reach the connecting position between the neutral groove 72b and the lower locking groove 72c.

[0120] Note that, the present invention will not be limited to above described embodiments and many modifi-

cations and alterations can certainly be made to the above described embodiments within the scope of the present invention. The engagement portion may be provided in the support material to catch and engage the wind guide panel. As the holding portion, a rotary shaft may be provided in the wind guide panel and a bearing may be provided in the support material.

[0121] Moreover, support at three points may be provided by providing the engagement portion in the middle of the wind guide panel and the holding portions on the front side and the back side. In this case, the rotary shaft of the holding portion is allowed to slide in the horizontal direction and the rotary shaft is pressed so as to be detached from the bearing, thus making it possible to perform attachment/detachment easily.

[0122] The panel structure described above is also applicable to an air conditioner having a structure where a support material for supporting a wind guide panel which opens and closes a blow out port is attached in a vicinity of a tip end of an arm portion so as to rotate freely (or revolve freely), which is different from the air conditioner of the present embodiment. In this case, it is not necessary to provide an upper shaft and a lower shaft like in the present embodiment. That is, the rod is replaced as the arm portion and a driving component such as a gear is stored in the arm portion. The driving component is driven by a motor and the support material attached to the tip end of the arm portion rotates (or revolves). Accordingly, the wind guide panel attached to the support material also rotates (or revolves).

[0123] In order to rotate (or revolve) the wind guide panel, the arm portion is moved frontward from the blow out port using a motor or the like so that the tip end of the arm portion is away from a cabinet and the wind guide panel is rotated (or revolved) and controlled at a position not contacting the cabinet. Then, movement of the arm portion and rotation (or revolving) of the wind guide panel are controlled so that the wind guide panel is moved to a position where air blown out from the blow out port is able to be blown out in the horizontal direction and along a ceiling, that is, the wind guide panel is brought into the downwardly opened posture. Alternatively, air blown out frontward from the blow out port is pushed and the wind guide panel is moved to a position where air is able to be guided to the floor surface direction, that is, the wind guide panel is brought into the upwardly opened posture. By controlling opening and closing of the wind guide panel, it is possible to blow out air to the desired direction.

Claims

1. An air conditioner, wherein
a cabinet has a curved surface extending from a front surface to a bottom surface, a blow out port is formed on the curved surface, a part of the cabinet is a wind guide panel for guiding air from the blow out port to an indoor space, the wind guide panel is provided

capable of opening both upwardly and downwardly, a support material is provided for supporting the wind guide panel so as to be attached/detached freely, the support material is coupled to an opening and closing mechanism for opening and closing the wind guide panel, and the wind guide panel is opened and closed with movement of the support material by the opening and closing mechanism.

2. The air conditioner according to claim 1, wherein the wind guide panel is supported at least at two points by the support material in a vertical direction, and even if support at one point is released, the wind guide panel is supported at the other point.
3. The air conditioner according to claim 2, wherein an engagement portion is provided in one of the wind guide panel and the support material to engage the other, a holding portion is provided for holding the wind guide panel so as to rotate freely with respect to the support material, and when engagement by the engagement portion is released, the wind guide panel is suspended from the support material by the holding portion.
4. The air conditioner according to claim 3, wherein the holding portion is positioned above the engagement portion in the wind guide panel.
5. The air conditioner according to claim 3 or 4, wherein the engagement portion is provided in the wind guide panel, the engagement portion includes a movable member which presses the support material and moves freely, a part of the movable member is exposed to an outer surface of the wind guide panel, and the movable member moves by an operation from outside to release engagement of the support material.
6. The air conditioner according to claim 5, wherein the movable member is supported by the wind guide panel so as to move freely and movement of the movable member is restricted so that the movable member does not come off the wind guide panel.
7. The air conditioner according to claim 3, wherein the holding portion is comprised of a rotary shaft provided in one of the wind guide panel and the support material and a bearing provided in the other.

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FIG. 1

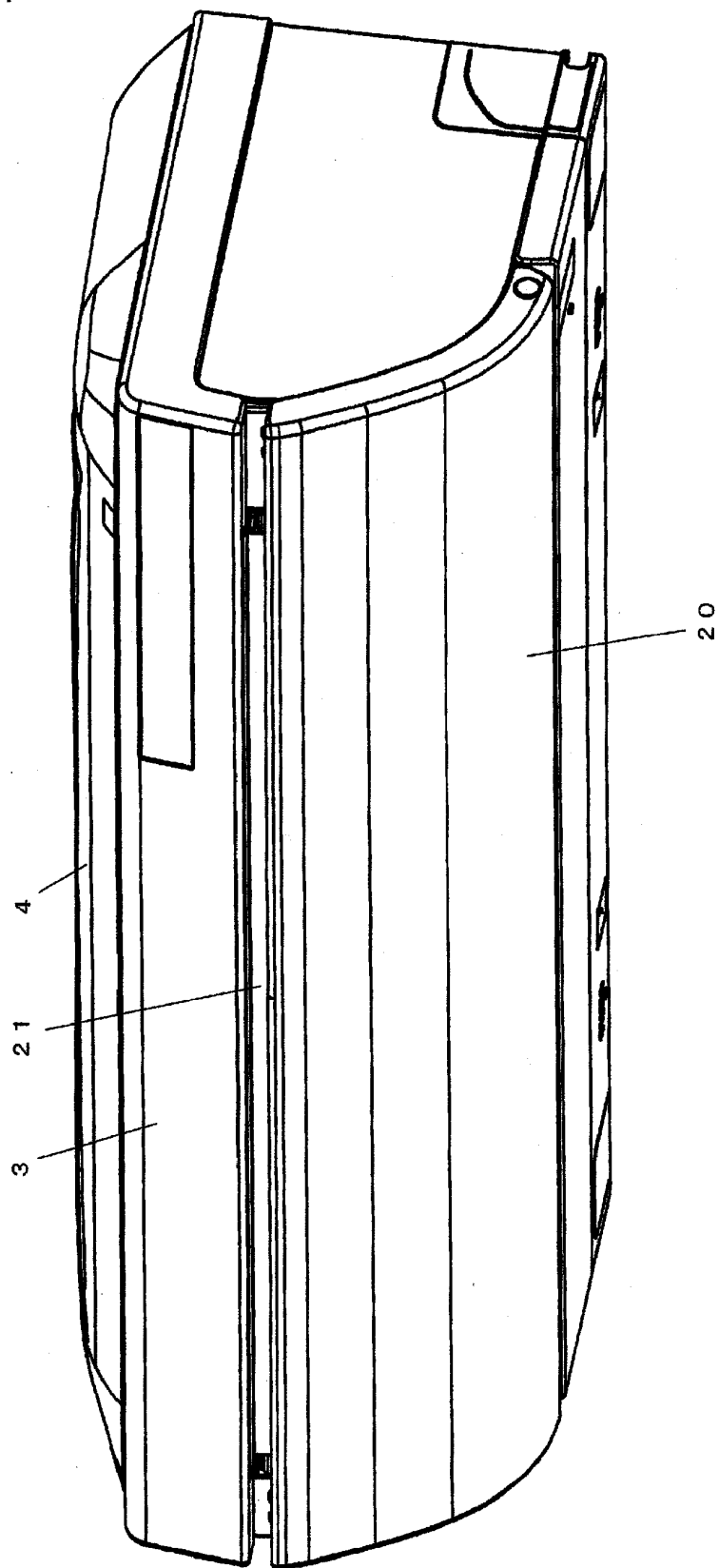


FIG. 2

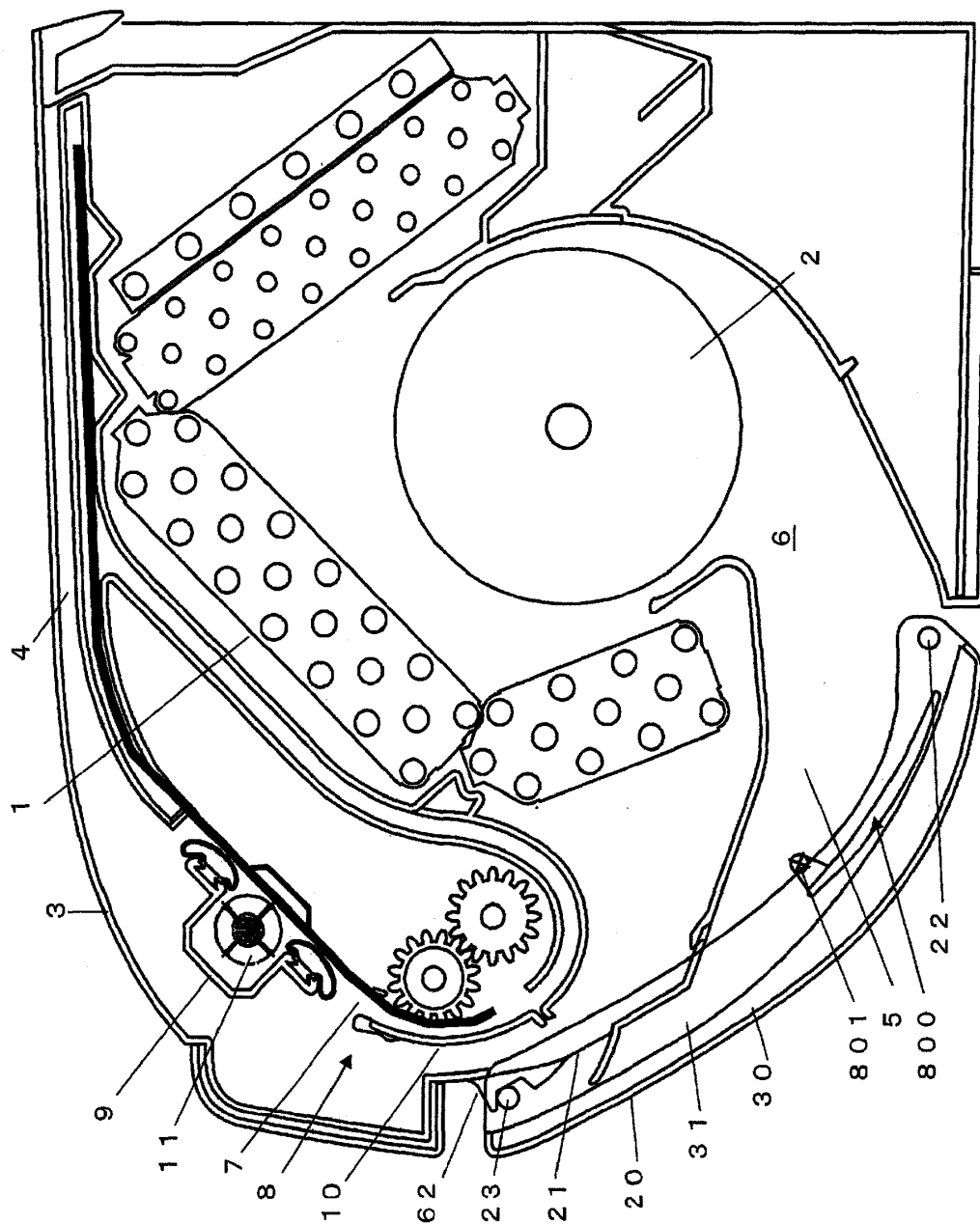


FIG. 3

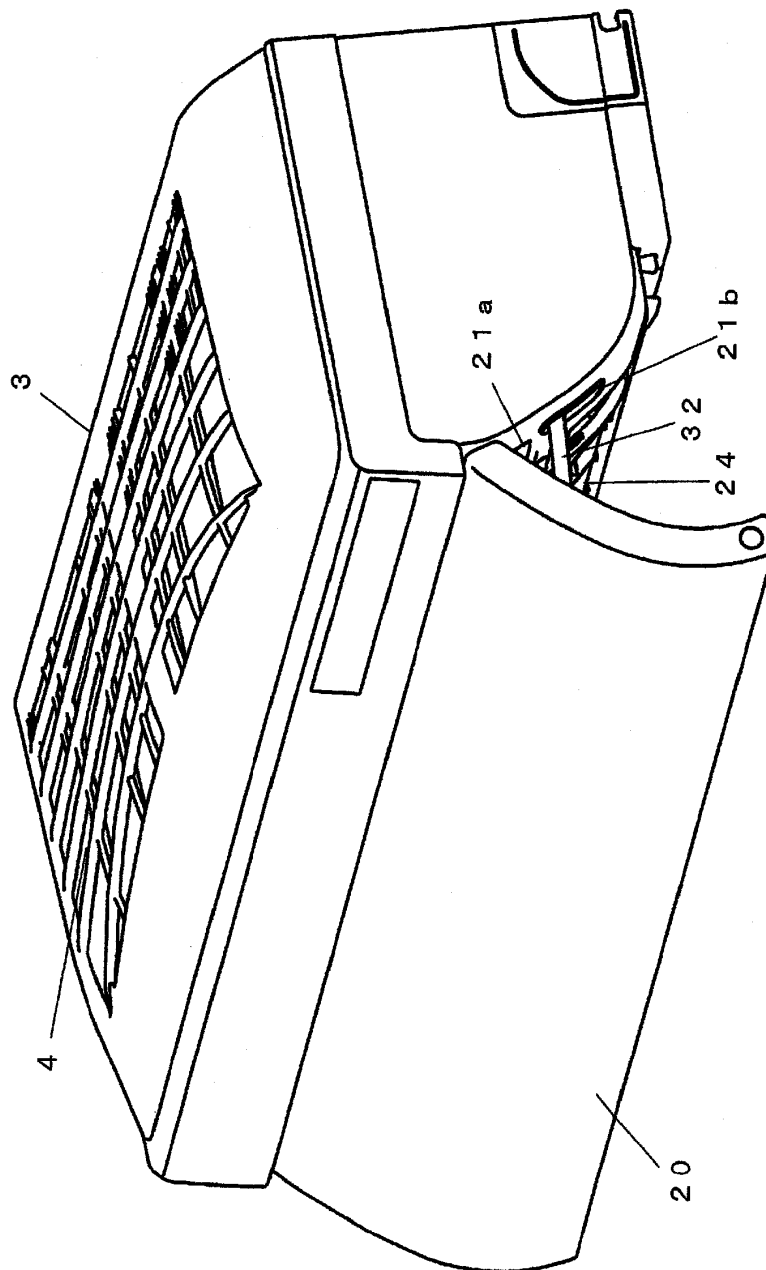


FIG. 4

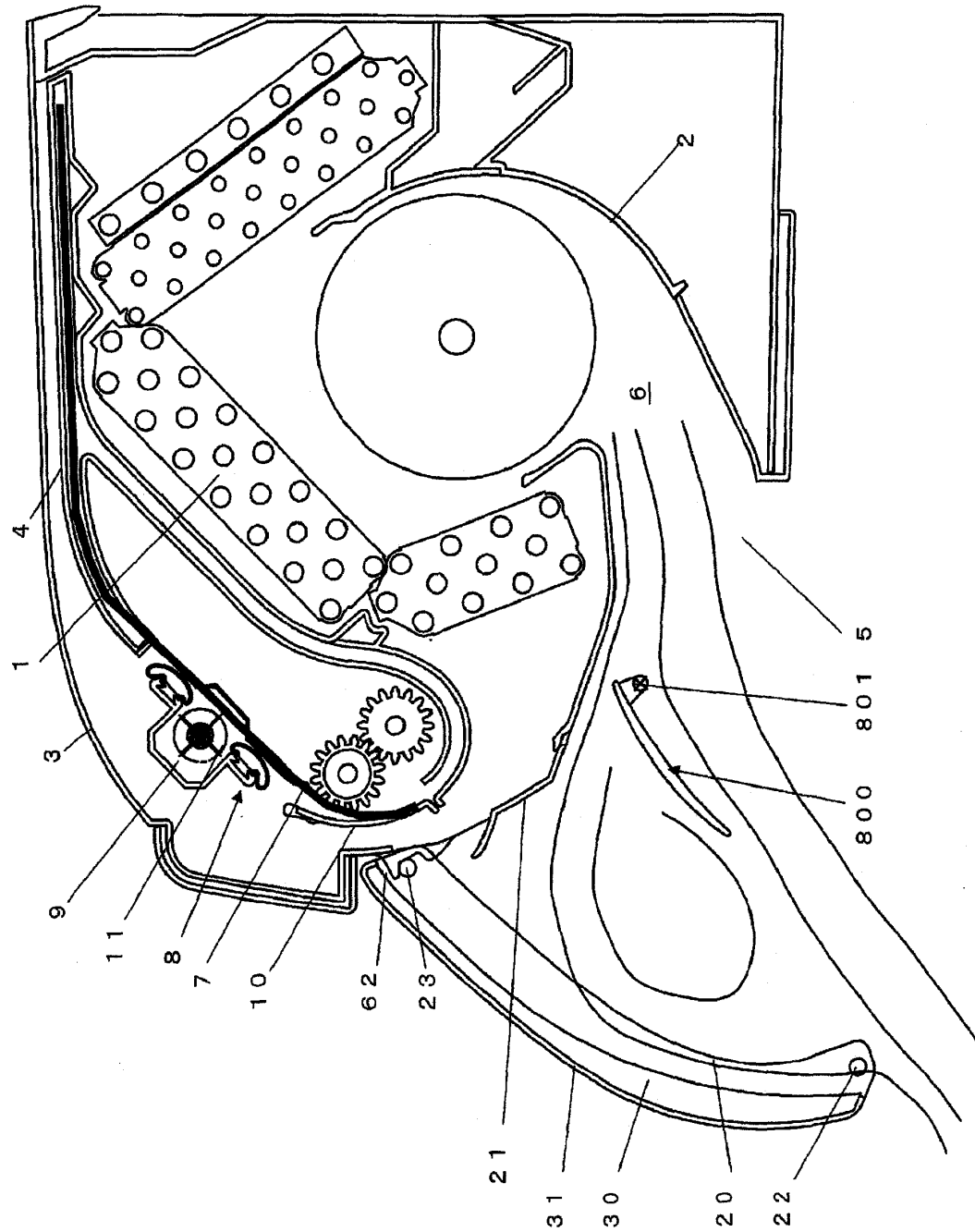


FIG. 5

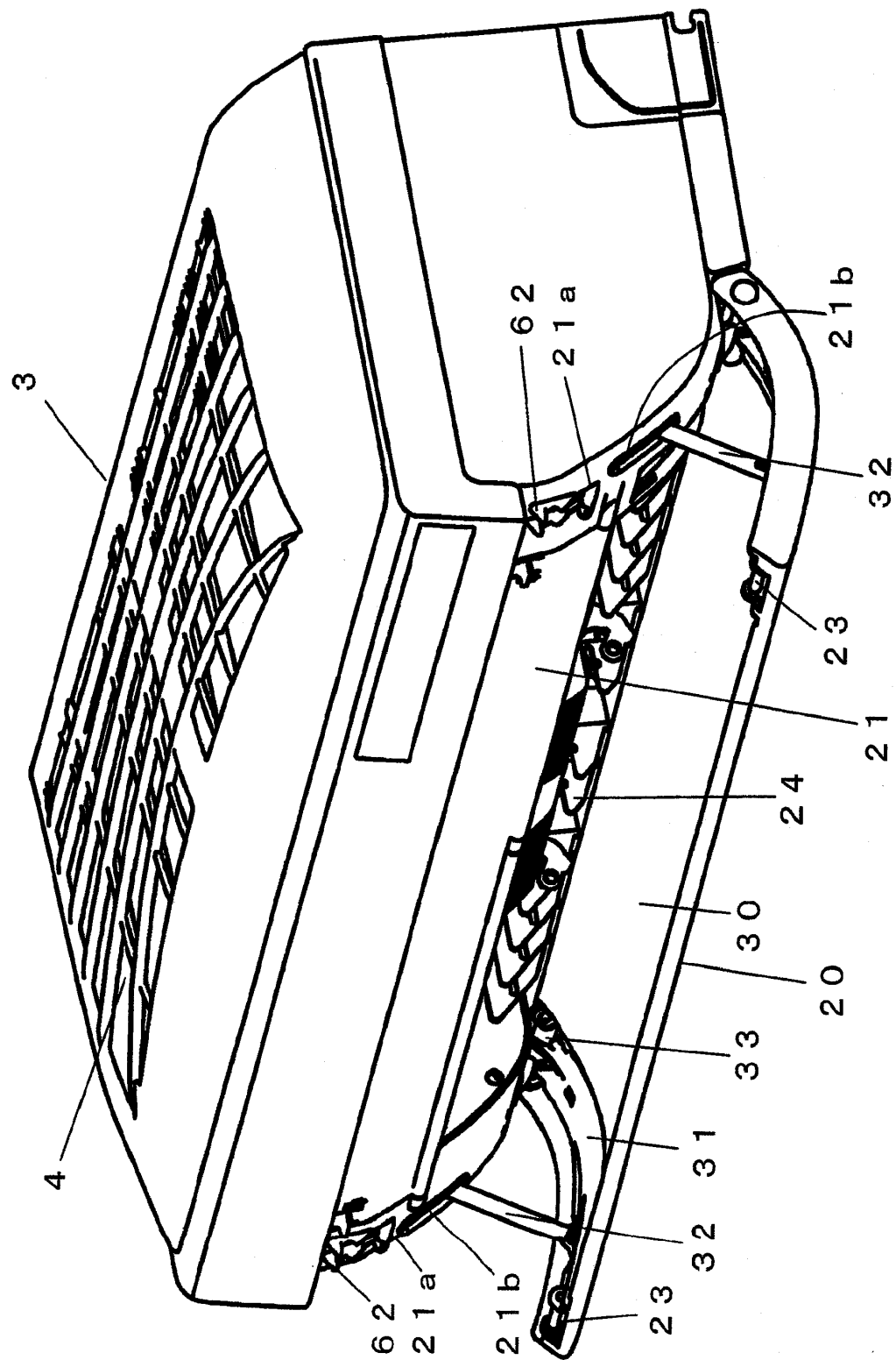


FIG. 6

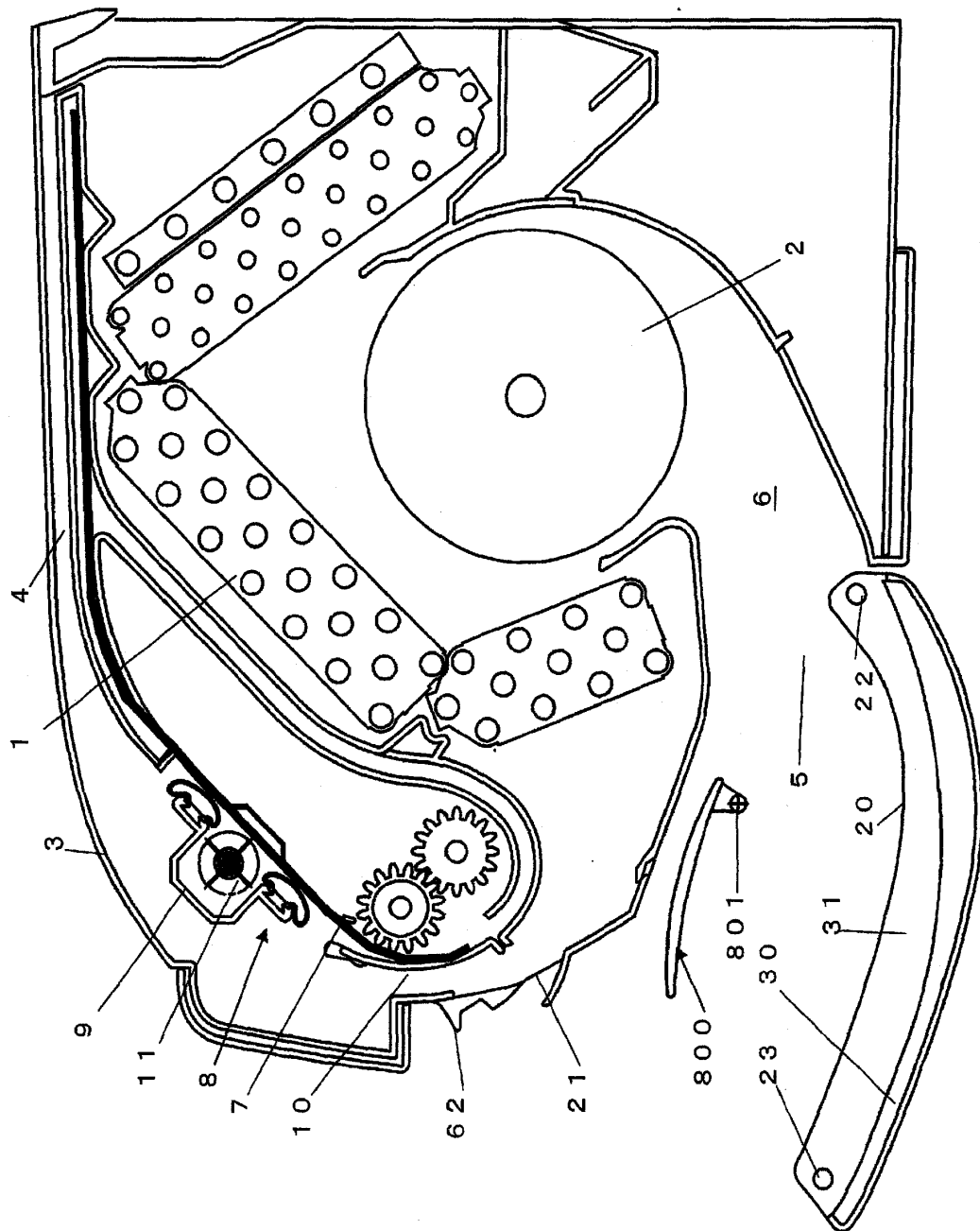


FIG. 7

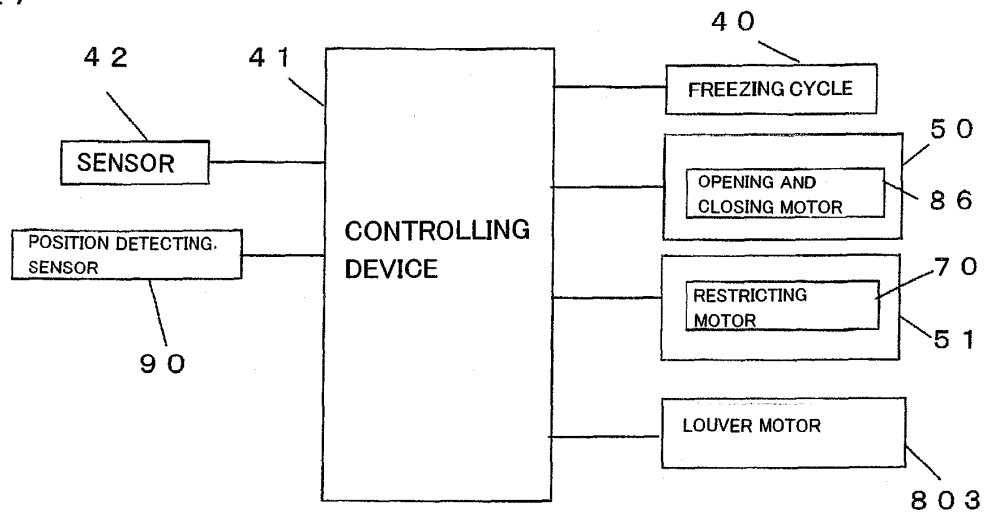


FIG. 8

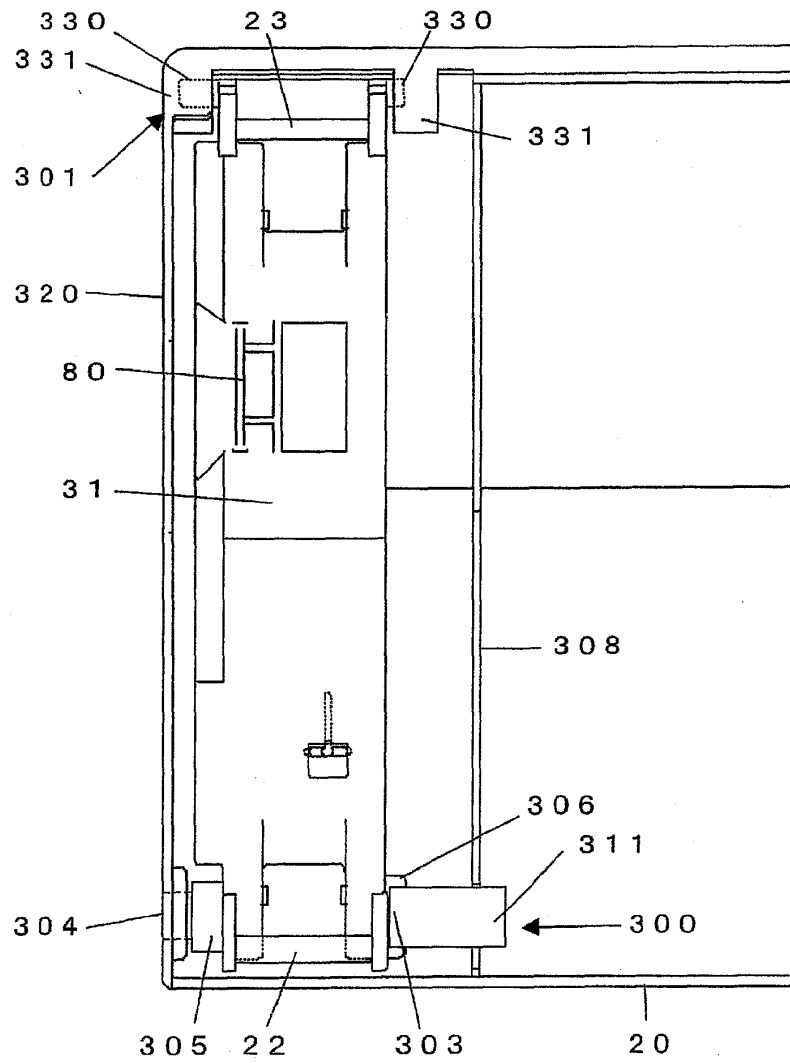


FIG. 9

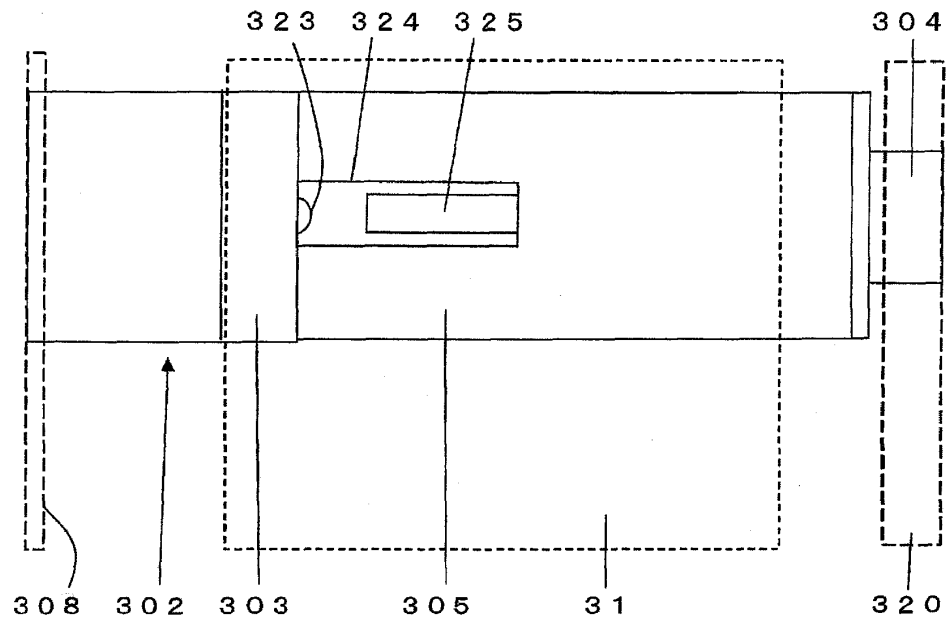


FIG. 10

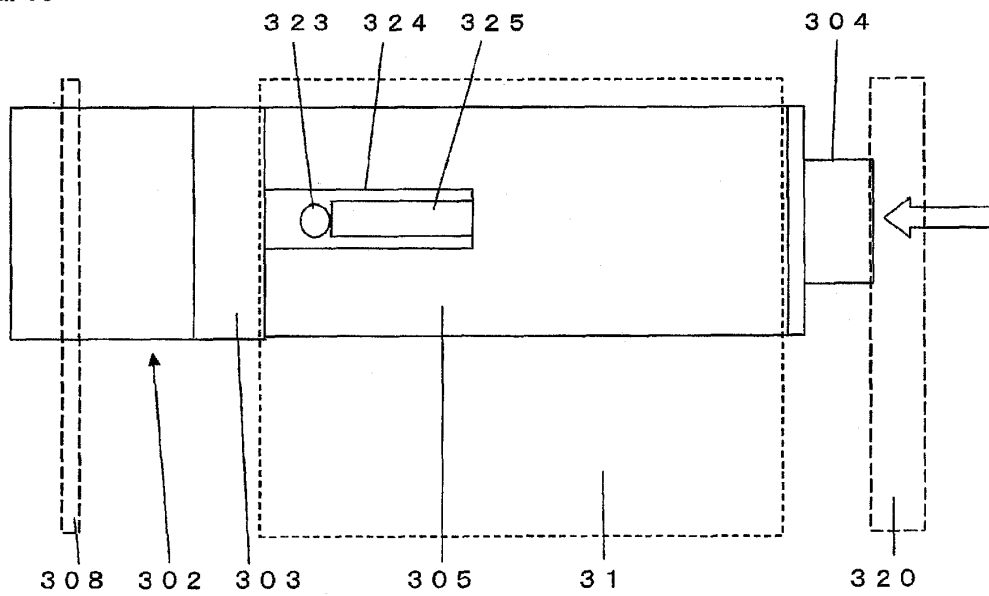


FIG. 11

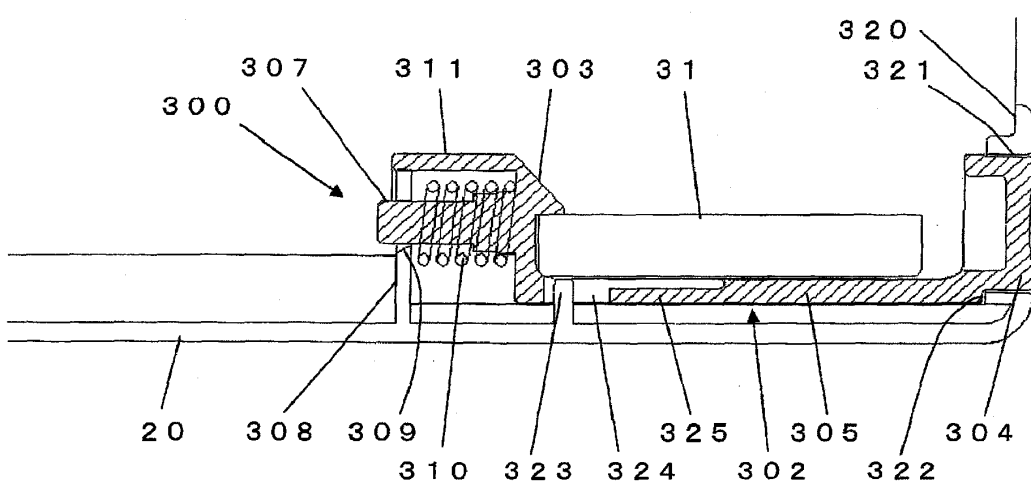


FIG. 12

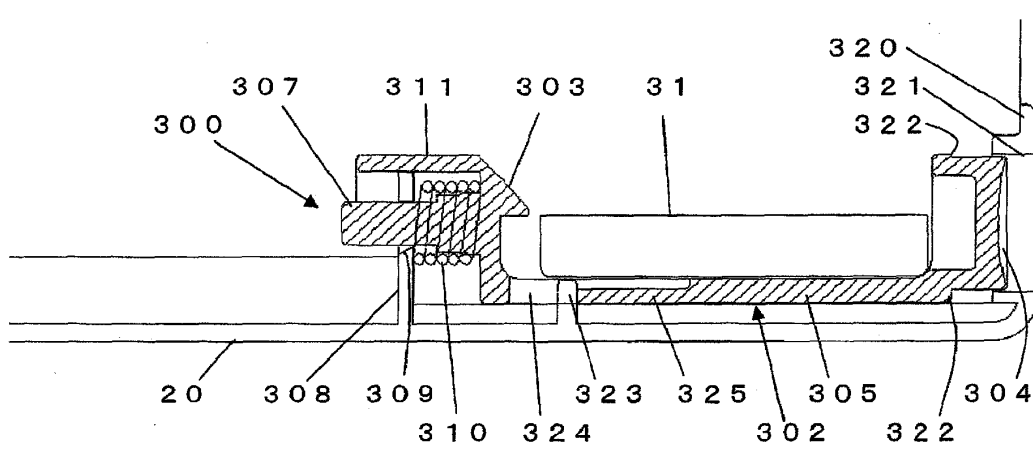


FIG. 13

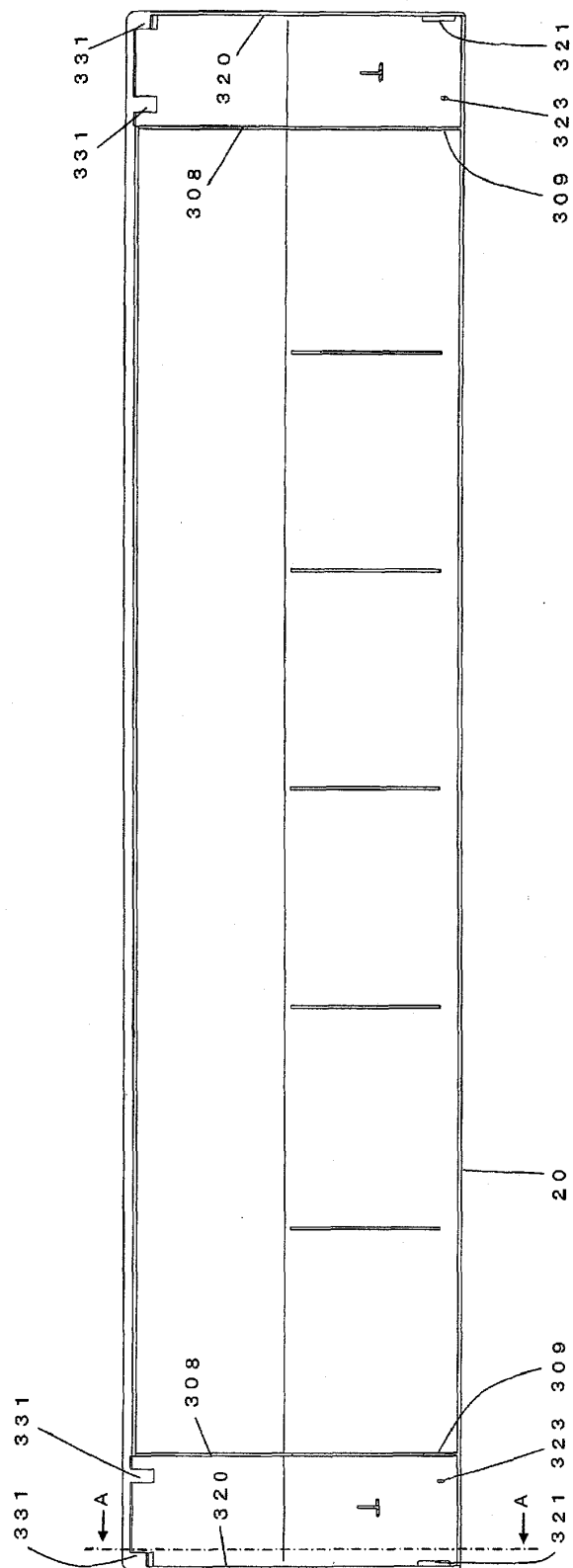


FIG. 14

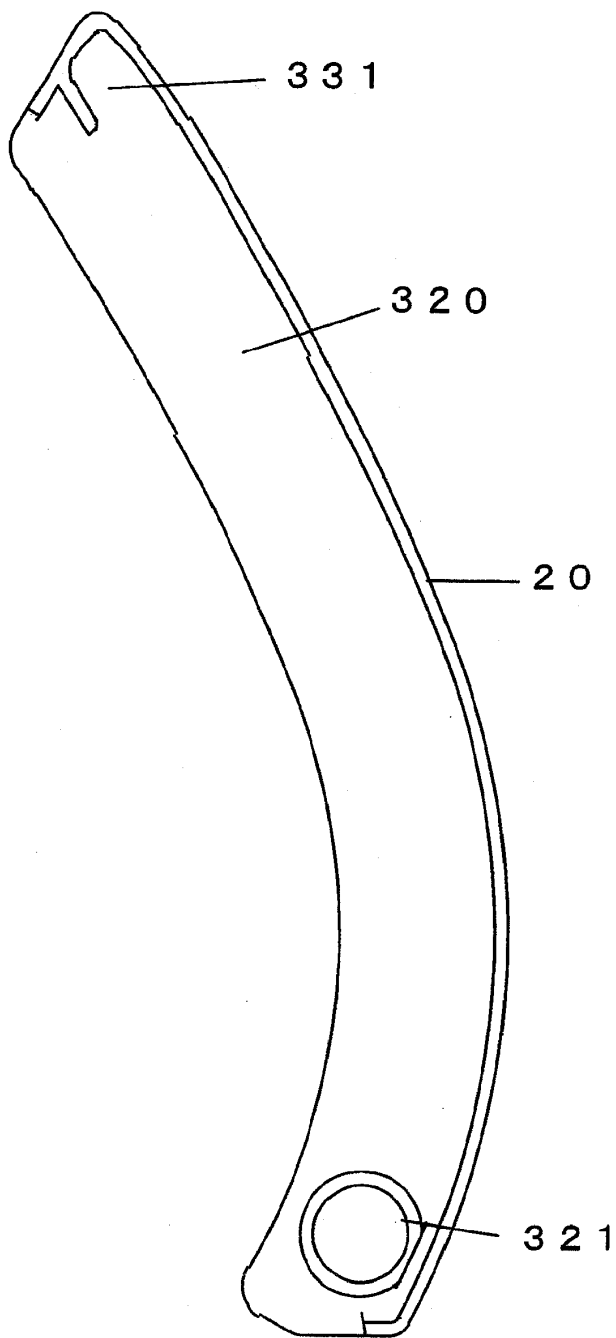


FIG. 15

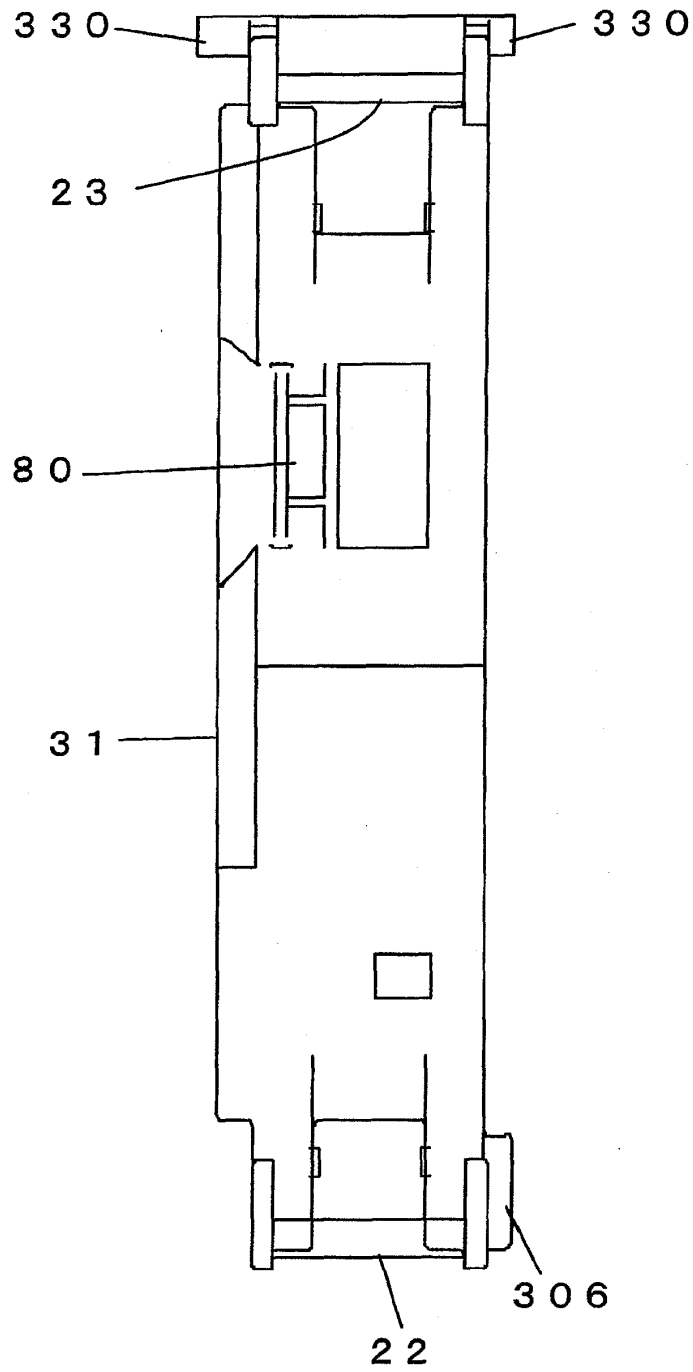


FIG. 16

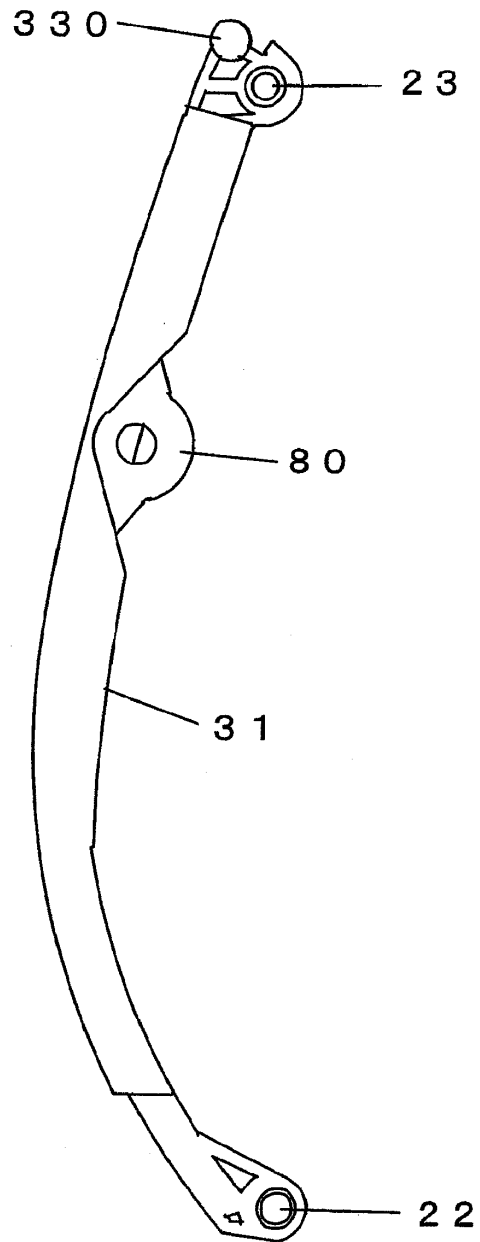


FIG. 17

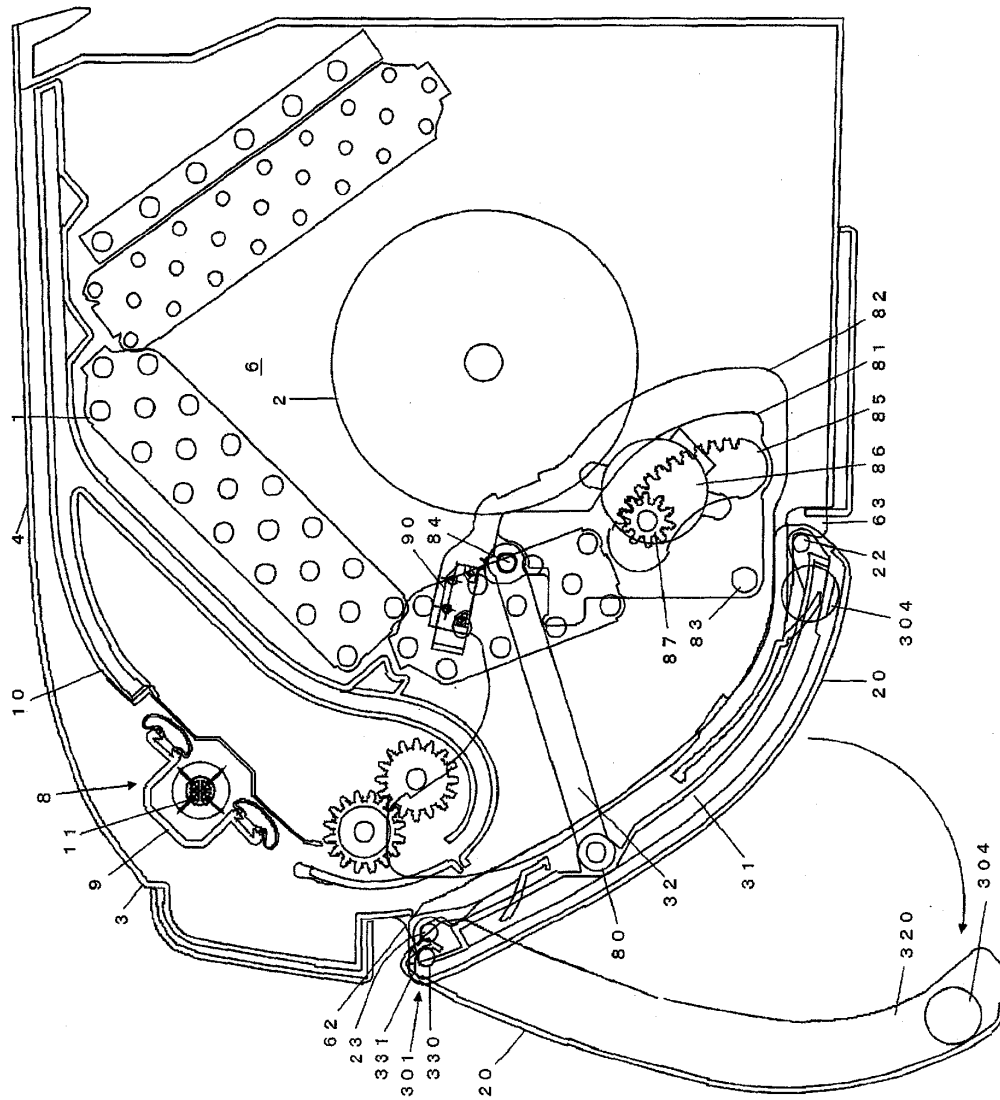


FIG. 18

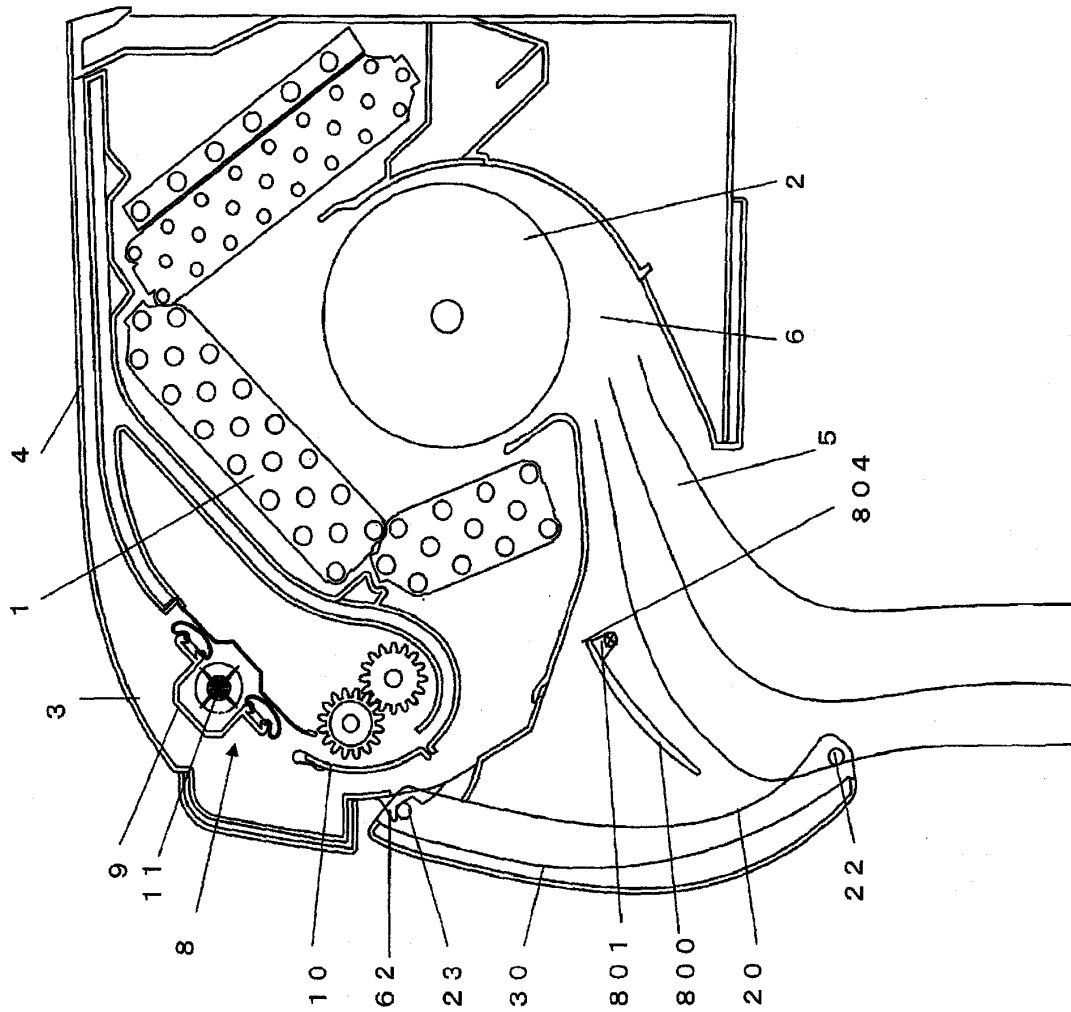


FIG. 19

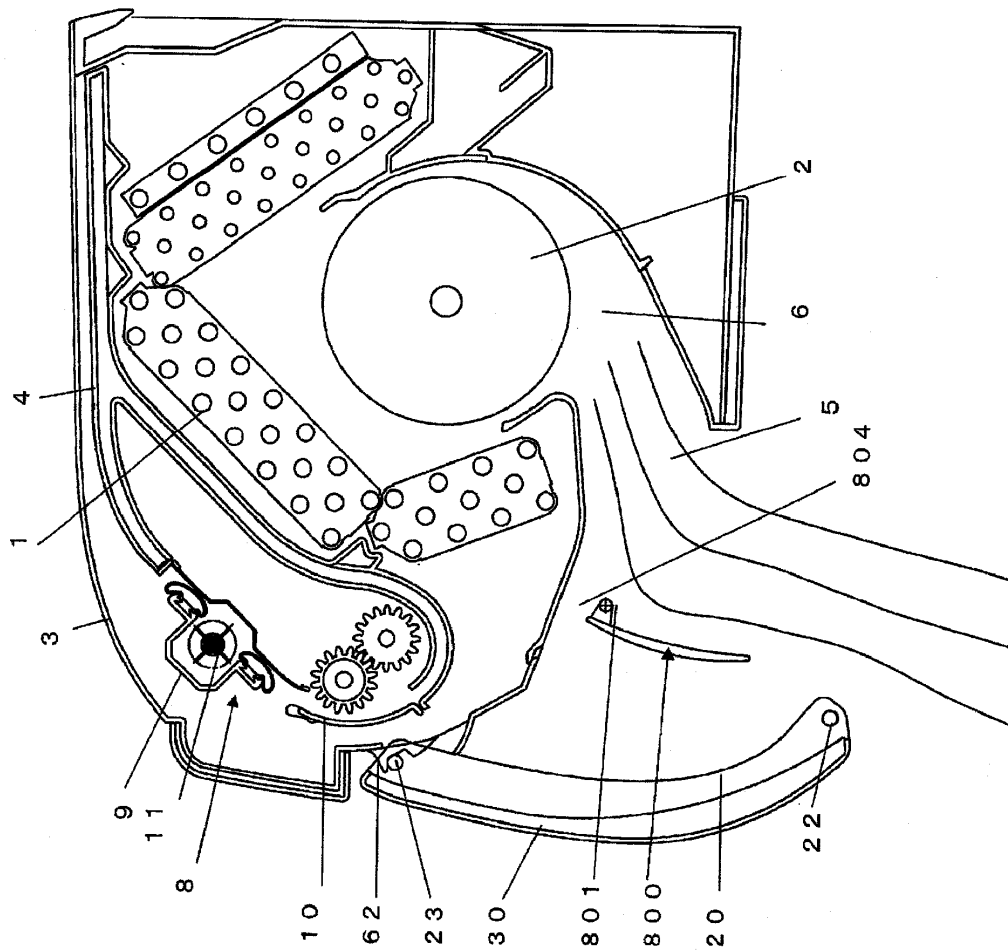


FIG. 20

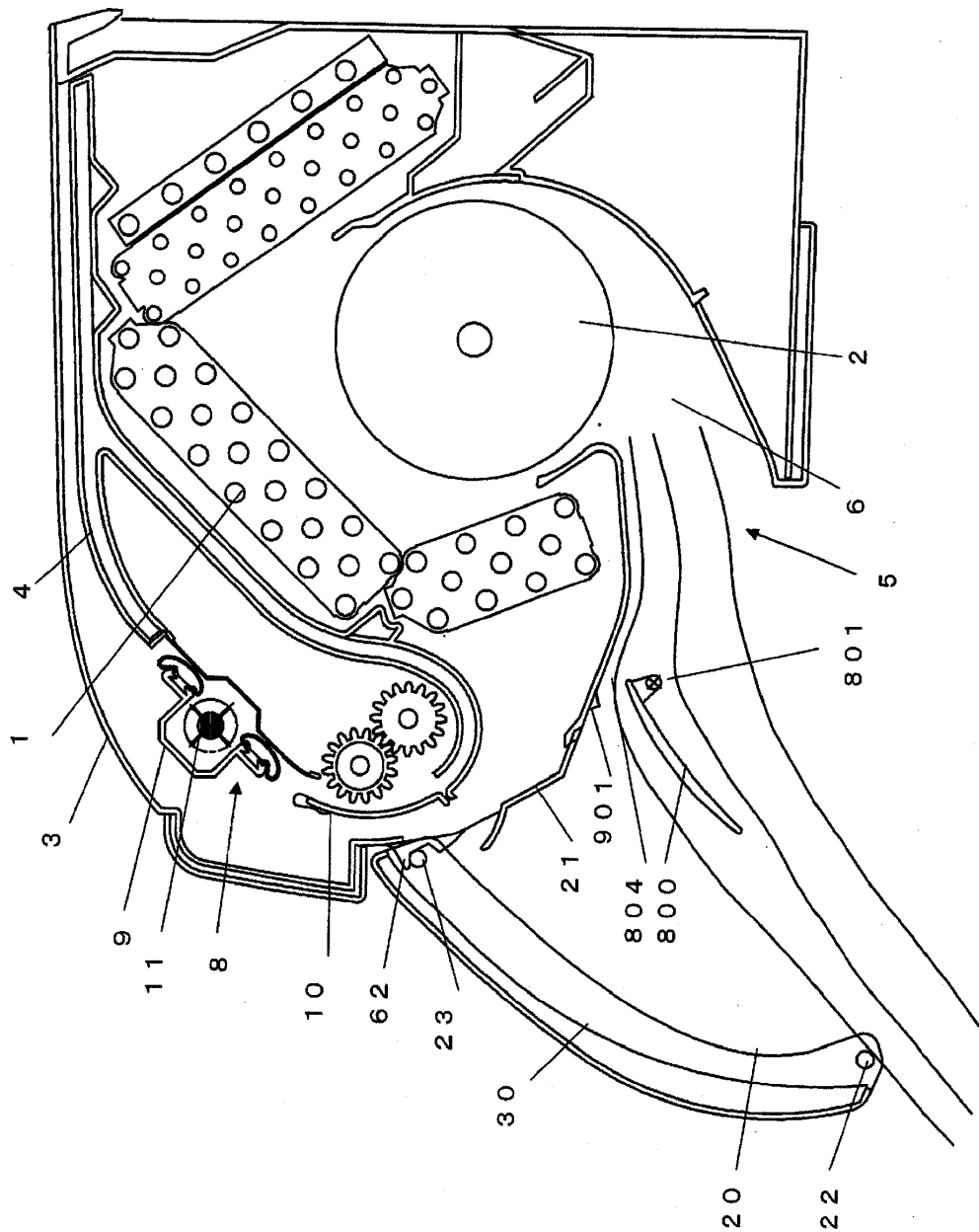


FIG. 21

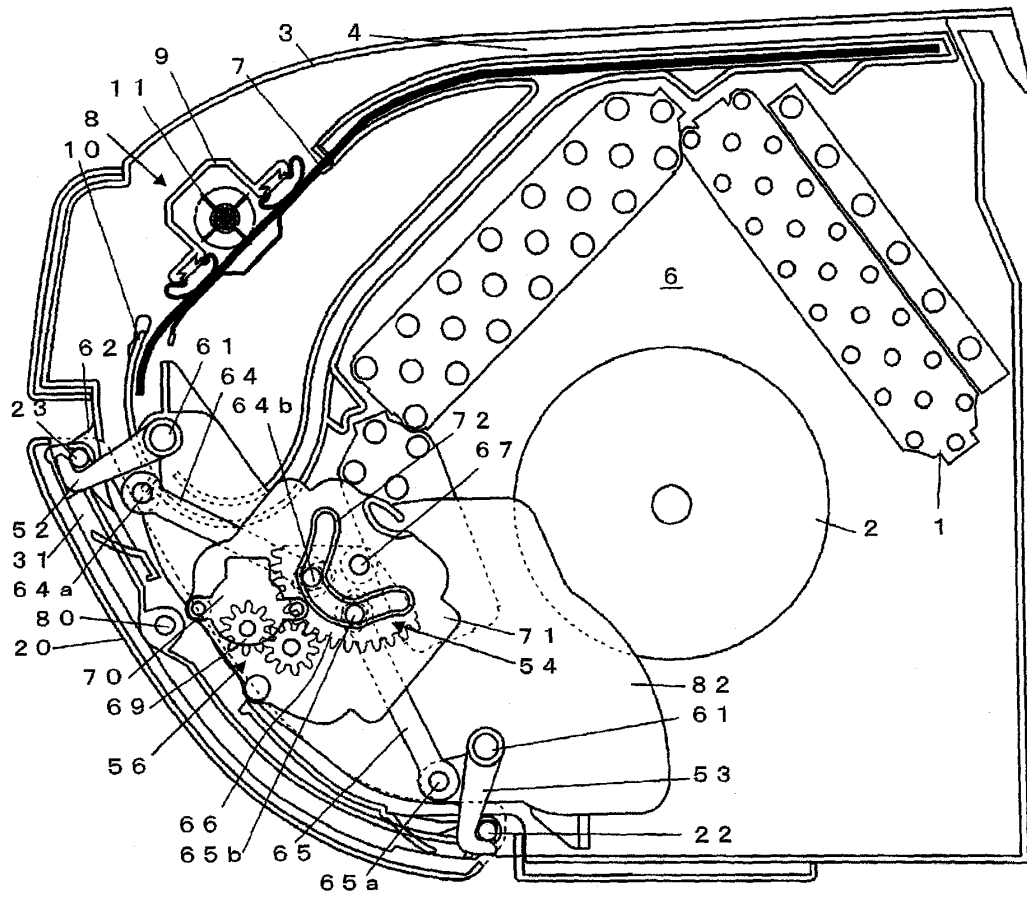


FIG. 22

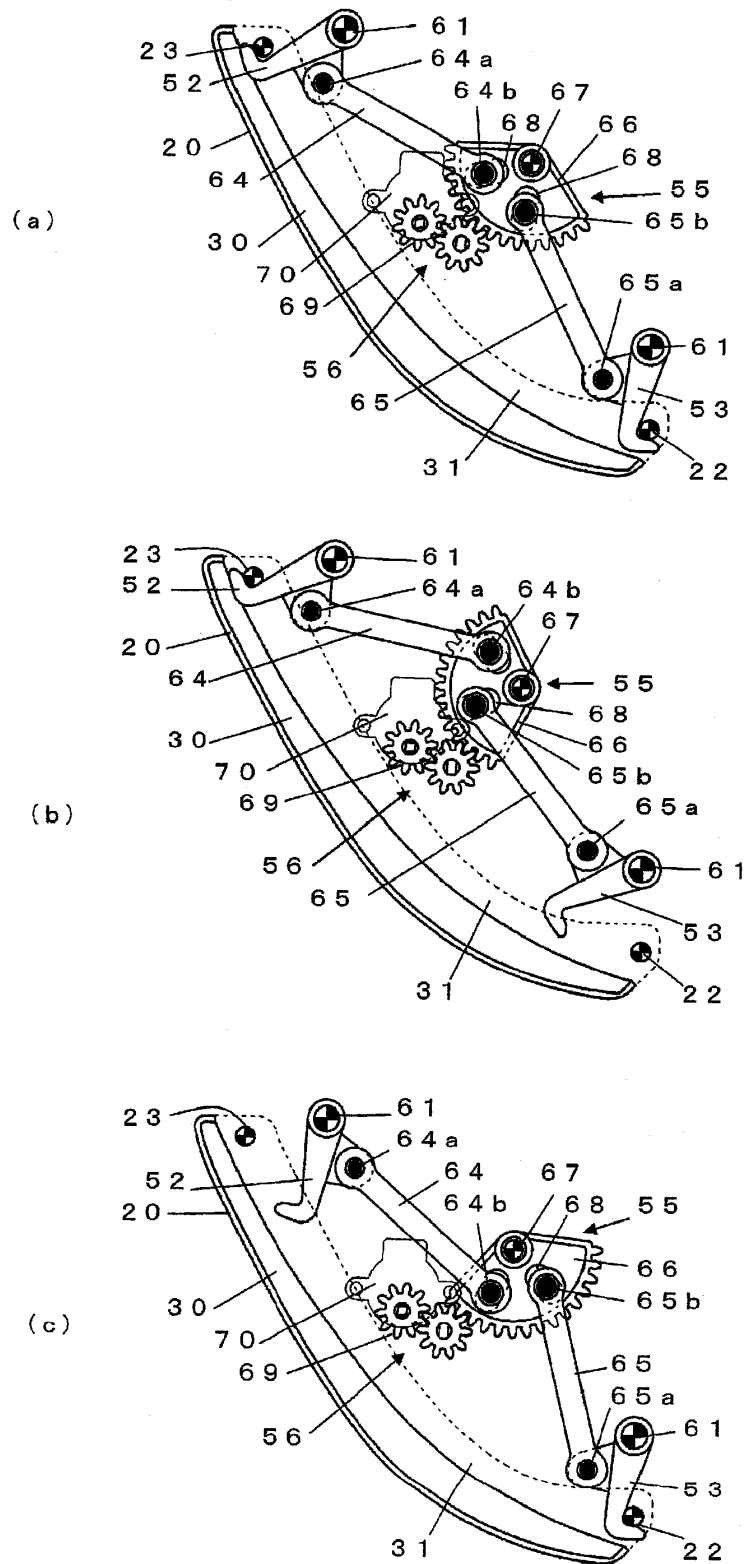


FIG. 23

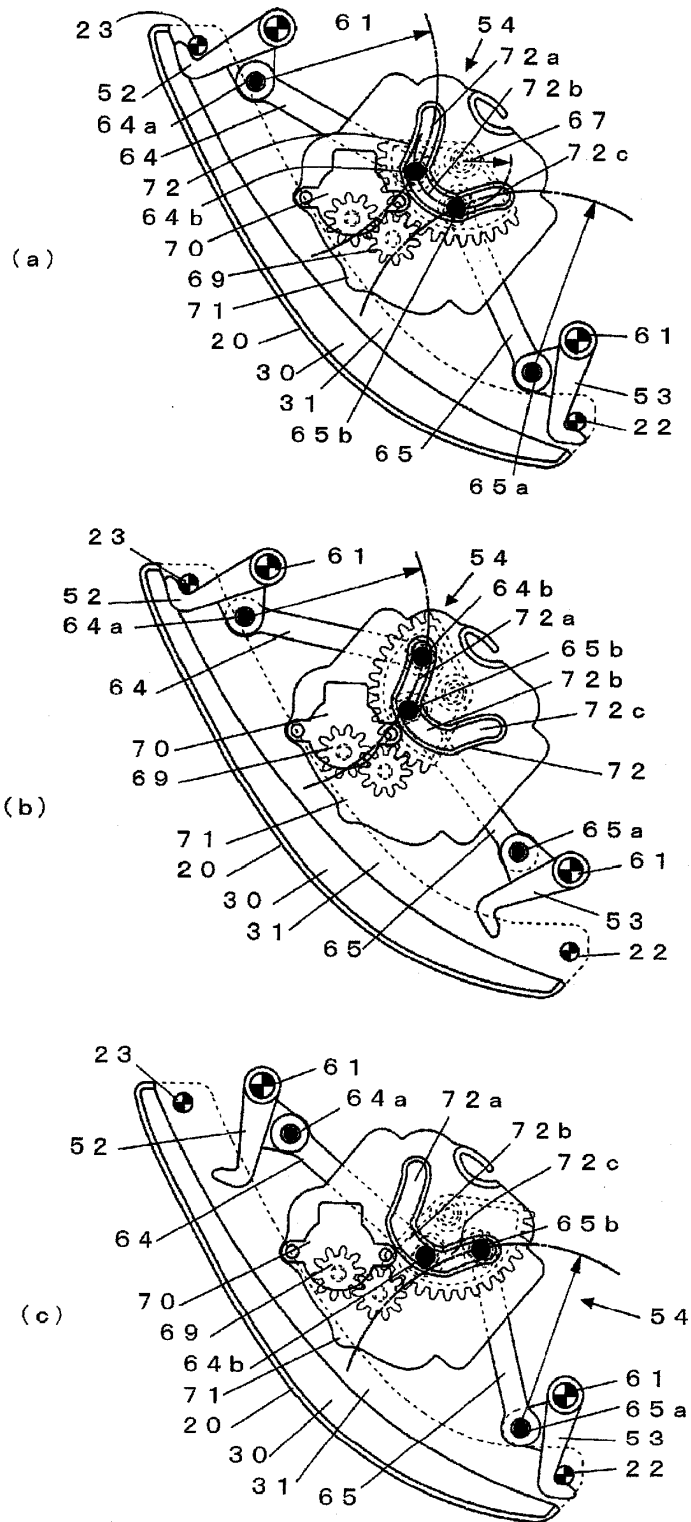


FIG. 24

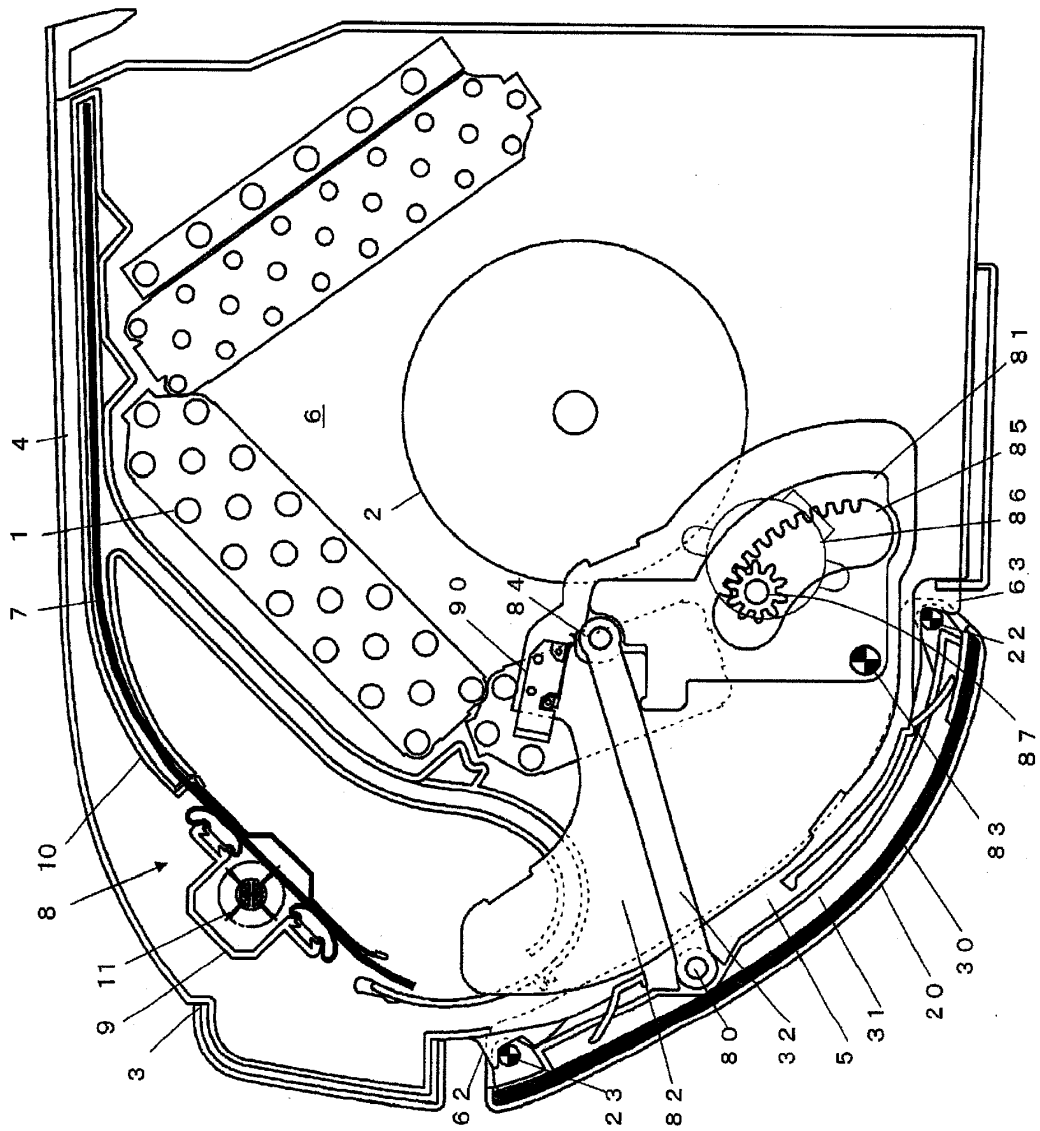


FIG. 25

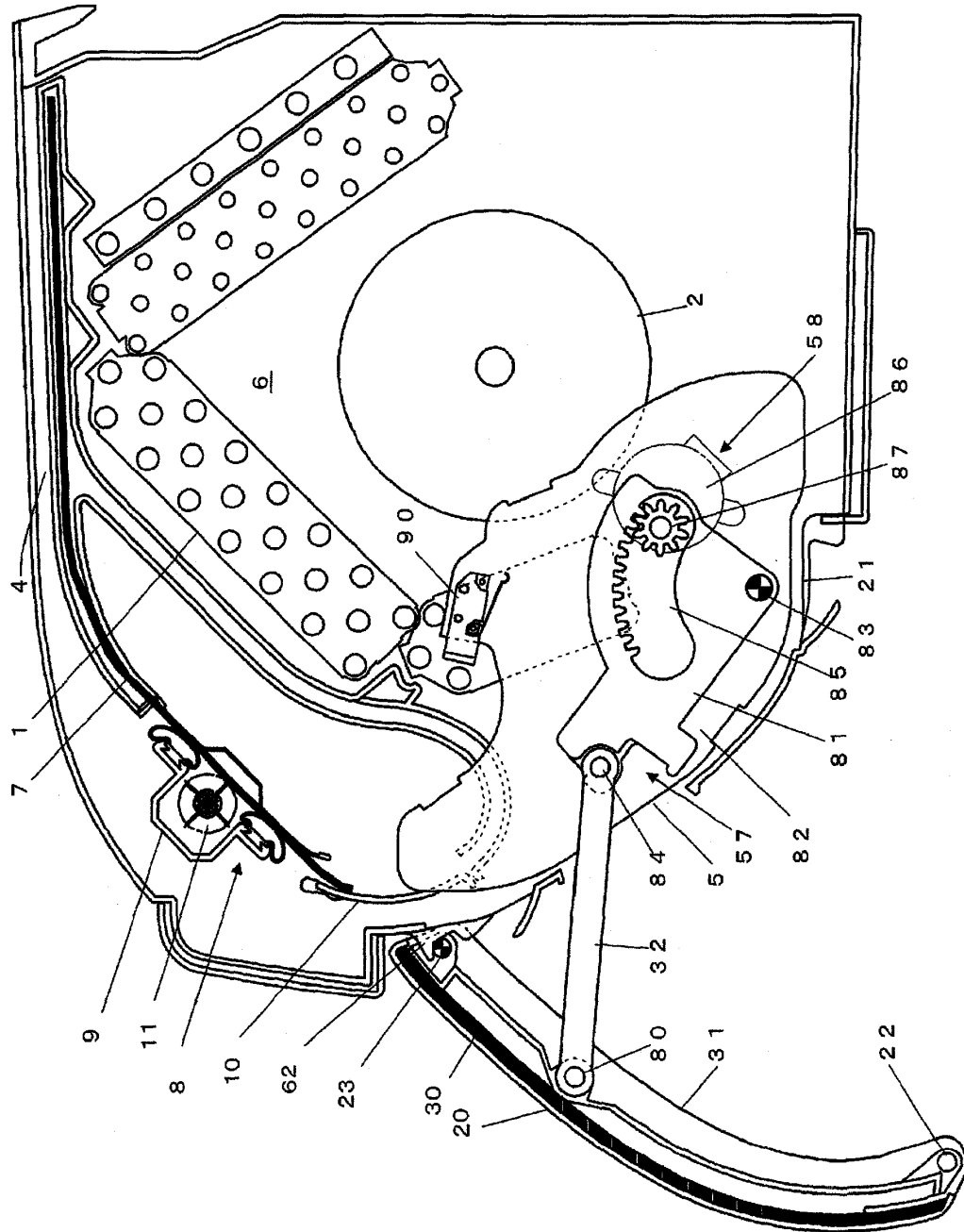


FIG. 26

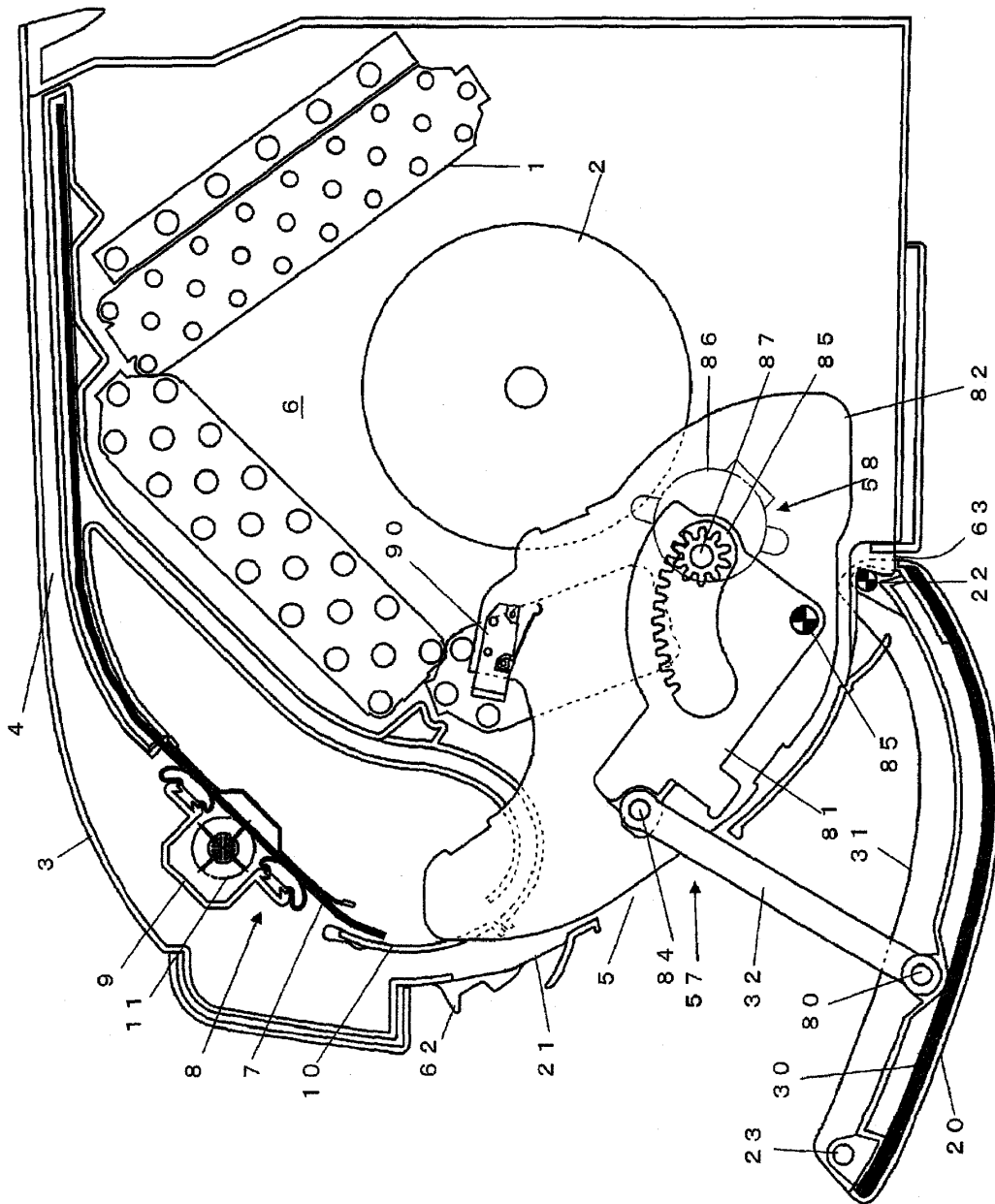


FIG. 27

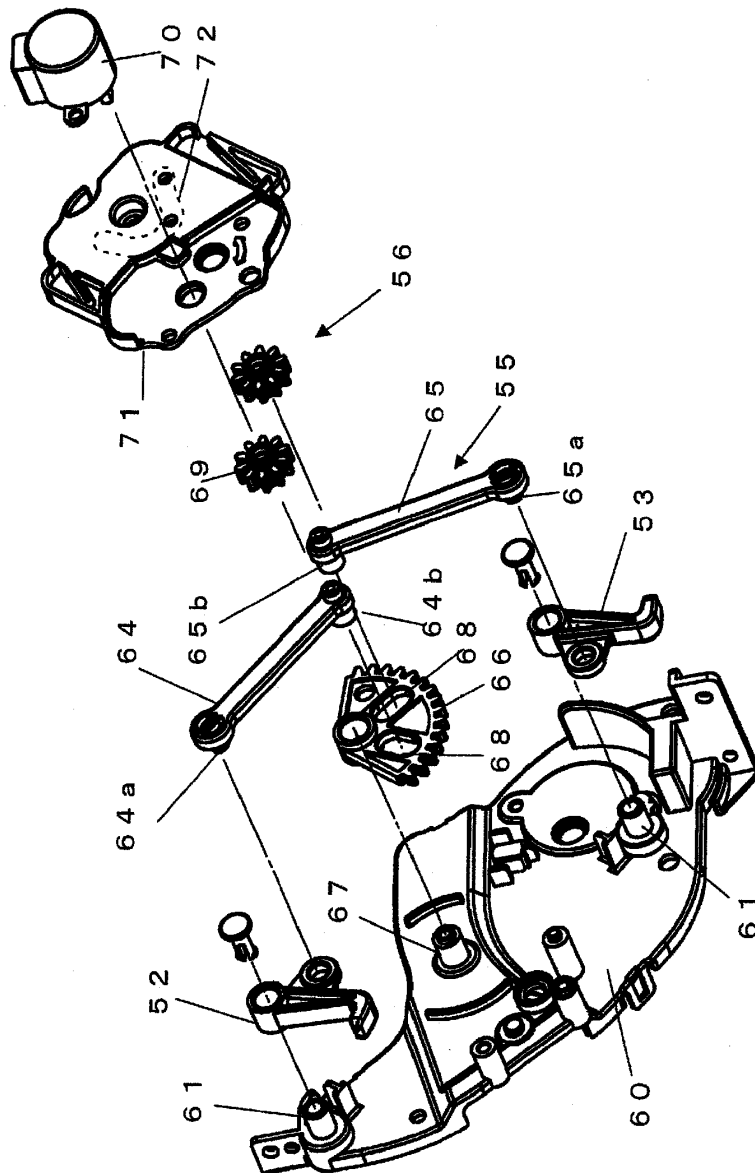
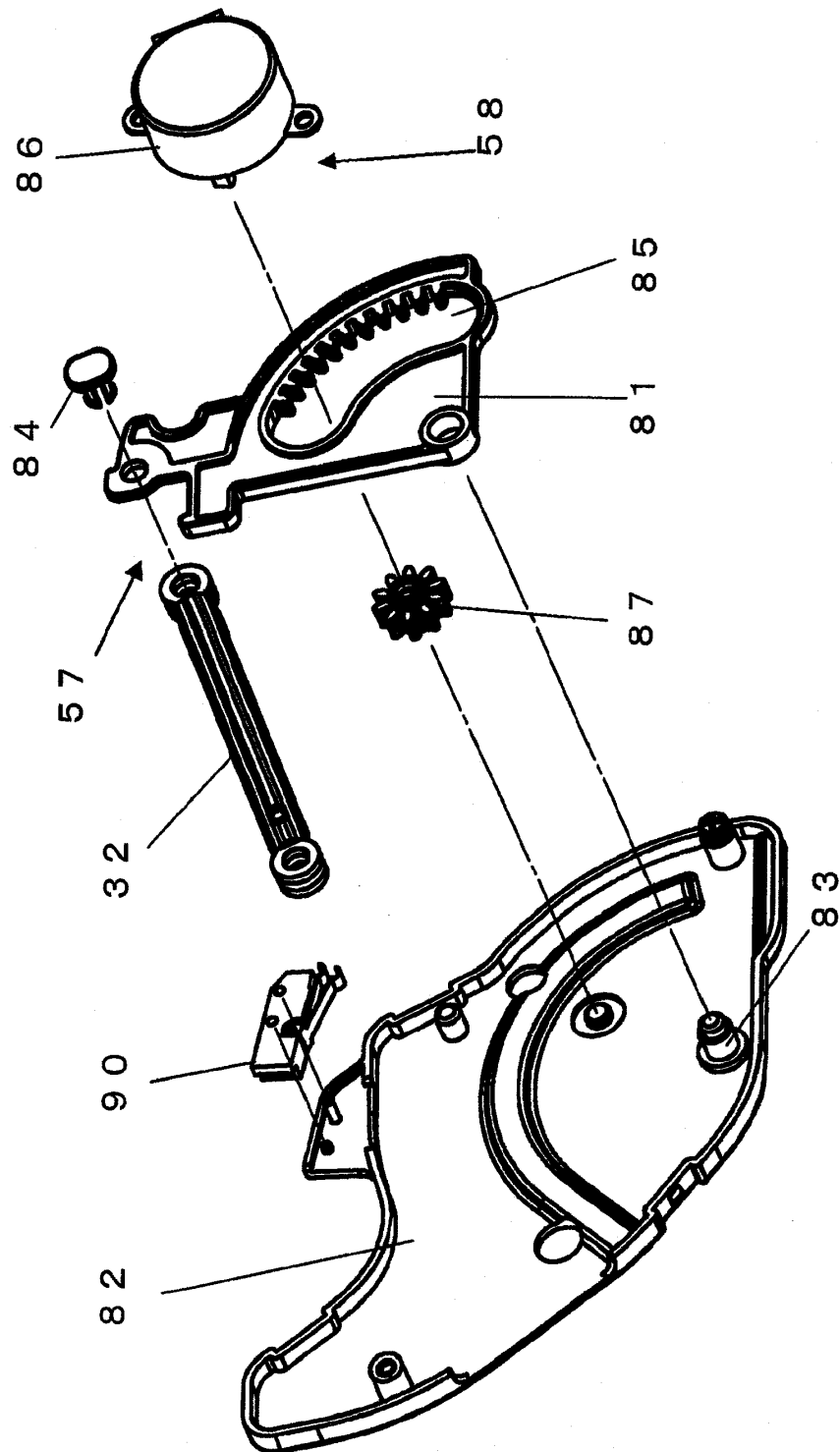


FIG. 28



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2008/064921

A. CLASSIFICATION OF SUBJECT MATTER

F24F13/14 (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)

F24F13/14, 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	1996-2008
Kokai Jitsuyo Shinan Koho	1971-2008	Toroku Jitsuyo Shinan Koho	1994-2008

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.
Y	JP 2004-263924 A (Mitsubishi Electric Corp.), 24 September, 2004 (24.09.04), Claims; Par. Nos. [0001] to [0021]; Figs. 1 to 5 (Family: none)	1-7
Y	JP 8-240338 A (DAISUE CONSTRUCTION CO., LTD.), 17 September, 1996 (17.09.96), Claims; Par. Nos. [0001] to [0070]; Figs. 1 to 14 (Family: none)	1-7
A	JP 2006-138629 A (Matsushita Electric Industrial Co., Ltd.), 01 June, 2006 (01.06.06), Full text; all drawings (Family: none)	1-7

☐ 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

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"&" document member of the same patent family

Date of the actual completion of the international search
24 September, 2008 (24.09.08)Date of mailing of the international search report
07 October, 2008 (07.10.08)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006138629 A [0003]