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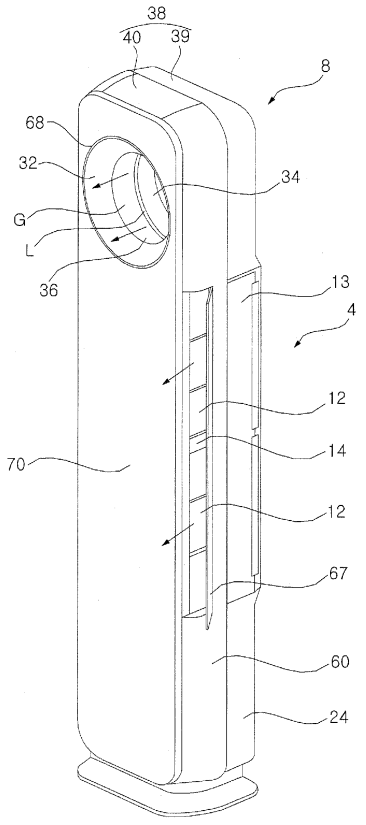
(54) Air conditioner

(57) An air conditioner includes: a main body (4) having air intake ports (2); a heat exchanger (6) installed in the main body (4); an air discharge unit (8) installed in the main body (4) and allowing air passing through the heat exchanger (6) to be discharged; and a blowing unit (10) sucking air through the air intake ports (2) and blowing the air to the air discharge unit (8) through the heat exchanger (6), in which the air discharge unit (8) has a space (G) and a ring-shaped air discharge port (L) allowing air to be discharged to the space (G). Therefore, the present invention has the advantage that it is possible to discharge air through a wide discharge area and to minimize damage to the ring-shaped air discharge port (L) or inflow of foreign substances to the ring-shaped air discharge port (L).

FIG. 2



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Description

[0001] The present invention relates to an air conditioner, and more particularly, to an air conditioner with an air discharge port.

[0002] In general, air conditioners can change a room into a pleasant condition by sucking air through an air intake port, changing the temperature, humidity, cleanliness or the like, and then discharging the air into the room through an air discharge port.

[0003] A heat exchanger where a refrigerant and air exchange heat, and a blower that sucks air and blows the air to be discharged outside through the heat exchanger may be installed in air conditioners.

[0004] Air conditioners can form various air flows in a room, depending on the shapes of the air intake port and the air discharge port or the direction of the number of the openings.

[0005] Recently, it is the tendency to discharge air through as large area as possible while exposing the air intake port and the air discharge port to the outside as less as possible for safety and quality enhancement.

[Prior Art Document]

[Patent Document]

[0006] 10-2008-0013396 A (2008.02.13)

[0007] Air conditioners of the related art have a problem in that the structure is complicated, because an air discharge port is formed through the outer side of a head above a cabinet and exposed to the outside and thus foreign substances easily flow inside through the air discharge port and air is dispersed by a discharge louver. Accordingly, this problem of the prior art needs to be addressed.

[0008] The above objects of the present invention are achieved by the inventions defined in the claims.

[0009] The present invention provides an air conditioner comprising: an air intake port for introducing outside air; a heat exchanger for exchanging heat with the introduced outside air; an air discharge unit for discharging the heat exchanged air; and a blowing unit for introducing outside air through the air intake port and transmitting the air toward the air discharge unit via the heat exchanger, wherein the air discharge unit has a space through which the heat exchanged air is discharged and an air discharge port formed along the periphery of the space to allow air to be discharged to the space.

[0010] Preferably, the air conditioner further comprises an air discharge port for discharging the heat exchanged air in a direction/from a position different from that of the air discharge unit.

[0011] Further, the air discharge port may be positioned at the same vertical level with the blowing unit and the air discharge unit may be disposed above the blowing unit.

[0012] Furthermore, the blowing unit may include at least two units disposed at different vertical levels. The upper blowing unit may transmit the heat exchanged air mainly toward the air discharge unit. The lower blowing unit may transmit the heat exchanged air mainly toward the air discharge port.

[0013] The blowing unit may be a centrifugal blower that blows air in a circumferential direction. Further, the blowing unit may be positioned at the same vertical level with the heat exchanger.

[0014] Preferably, a central axis of the space along which the air is discharged and a rotational axis of the blowing unit are both arranged in a horizontal direction.

[0015] Further, wherein the air discharge unit includes a generally ring-shaped air passage through which the air supplied by the air blowing unit is dispersed into the air discharge port.

[0016] Furthermore, the air discharge unit has a through-hole that forms the space. The through-hole may be surrounded by the air passage. Moreover, at least a part of the air discharge port may be configured to be inserted into the space.

[0017] The air discharge unit may be rotatable so as to change the direction of discharged air.

[0018] Preferably, the air discharge port has an air guide portion which is configured to change a flow direction of the air passing through the air discharge port.

[0019] Further, the air guide portion may be a protrusion inside the air discharge port, formed at the portion of the discharge port which is inserted into the space.

[0020] Furthermore, the air guide portion may protrude to make an acute angle with a surface of the air discharge port.

[0021] Moreover, the air guide portion may protrude perpendicular to a central axis of the space along which the air is discharged.

[0022] The air discharge unit may further include an air guide surface that guides the air passing through the ring-shaped air discharge port to the center of the space.

[0023] Preferably, the inner diameter of the space is smaller than the inner diameter of the air discharge port.

[0024] The present invention has the advantage that it is possible to discharge air through a wide discharge area and to minimize damage to the ring-shaped air discharge port or inflow of foreign substances to the ring-shaped air discharge port.

[0025] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

FIG. 1 is a longitudinal cross-sectional view of an air conditioner according to a first exemplary embodiment of the present invention;

FIG. 2 is a perspective view of the air conditioner according to the first exemplary embodiment of the present invention;

FIG. 3 is a front view of the air conditioner according to the first exemplary embodiment of the present invention;

FIG. 4 is an exploded perspective view of the air conditioner according to the first exemplary embodiment of the present invention;

FIG. 5 is a transverse cross-sectional view of the air conditioner according to the first exemplary embodiment of the present invention;

FIG. 6 is a perspective view of the air discharge unit shown in FIG. 1;

FIG. 7 is an exploded perspective view of the air discharge unit shown in FIG. 6;

FIG. 8 is a longitudinal cross-sectional view of the air discharge unit shown in FIG. 6;

FIG. 9 is a partial-cut perspective view of the air discharge unit shown in FIG. 6;

FIG. 10 is a perspective view showing an air discharge unit of an air conditioner according to a second exemplary embodiment of the present invention;

FIG. 11 is an exploded perspective view of the air discharge unit shown in FIG. 10;

FIG. 12 is a longitudinal cross-sectional view of the air discharge unit shown in FIG. 10;

FIG. 13 is a partial-cut perspective view of the air discharge unit shown in FIG. 10;

FIG. 14 is a bottom view of the air discharge unit shown in FIG. 10; and

FIG. 15 is a longitudinal cross-sectional view showing an air discharge unit of an air conditioner according to a third exemplary embodiment of the present invention.

[0026] Exemplary embodiments of the present invention will be described hereafter in detail with reference to the accompanying drawings.

[0027] FIG. 1 is a longitudinal cross-sectional view of an air conditioner according to a first exemplary embodiment of the present invention, FIG. 2 is a perspective view of the air conditioner according to the first exemplary embodiment of the present invention, FIG. 3 is a front view of the air conditioner according to the first exemplary embodiment of the present invention, FIG. 4 is an exploded perspective view of the air conditioner according to the first exemplary embodiment of the present invention, and FIG. 5 is a transverse cross-sectional view of the air conditioner according to the first exemplary embodiment of the present invention.

[0028] Referring to FIGS. 1 to 5, an air conditioner includes a main body 4 with air intake ports 2, a heat exchanger 6 that is installed in the main body 4, an air discharge unit 8 that is installed on the main body 4 and through which air passing through the heat exchanger 6 is discharged, and a blowing unit 10 that sucks air through the air intake ports 2 and blows the air to the air discharge unit 8 through the heat exchanger 6. The air discharge unit 8 has a space G. The air discharge unit 8 has a ring-shaped air discharge port L through which air is discharged to the space G.

[0029] Air outside the main body 4 may be sucked into the main body 4 through the air intake ports 2. The air intake ports 2 may be formed at the rear portion of the main body 4. The air outside the main body 4 may be sucked into the main body 4 through the air intake ports 2 from the area behind the main body 4. The main body 4 may have air discharge ports 12 through which the air in the main body 4 can be discharged separately from the ring-shaped air discharge port L. Some of the air sucked through the air intake ports 2 may be discharged forward from the space G of the air discharge unit 8 after flowing into the air discharge unit 8 from the inside of the main body 4. The other of the air sucked through the air intake ports 2 may be discharged outside the main body 4 through the air discharge ports 12 from the inside of the main body 4.

[0030] The main body 4 may include an intake panel 13 where the air intake ports 2 are formed and a discharge panel 14 that is disposed ahead of the intake panel 13 and where the air discharge ports 12 are formed. The tops of the intake panel 13 and the discharge panel 14 may be open.

[0031] The intake panel 13 may have a rear plate 15, a left plate 16 formed at the left of the rear plate 15, and a right plate 17 formed at the right of the rear plate 15. Air intake ports 2 may be formed to be open in the front-rear direction through the rear plate 15 of the intake panel 13. The intake panel 15 may have a heat exchanger-receiving space where the heat exchanger 6 is received, between the left plate 16 and the right plate 17. The intake panel 13 may further have a bottom plate 18 where the heat exchanger 6 is placed. A refining unit that refines the air sucked through the air intake ports 2 may be installed at the intake panel 13. The refining unit may include an intake grill 19 installed on the rear side of the intake panel 13 and at least one filter 20 installed in the intake grill 19. The refining unit may include an intake grill 19 disposed on the rear side of the intake panel 13 and at least one filter 20 disposed in the intake grill 19.

[0032] The discharge panel 14 may have a front plate 21, a left plate 22 formed at the left of the front plate 21, and a right plate 23 formed at the right of the front plate 21. The bottom of the discharge plate 14 may be closed. Air discharge ports 12 may be formed through at least one of the left plate 22 and the right plate 23. It is preferable that the air discharge ports 12 are formed at both of the left plate 22 and the right plate 23. The air discharge ports 12 may be formed to be long in the up-down direction at the discharge panel 14.

[0033] The air conditioner may be a stand type air conditioner. The main body 4 may further include a base 24 where the intake panel 13 and the discharge panel 14 are placed. In the air conditioner, the intake panel 13 may be installed above the rear portion of the base 24 and the discharge panel 14 may be installed above the front portion of the base 24. The front of the base 24 may be open.

[0034] The heat exchanger 6 may be installed ahead of the air intake ports 2. The heat exchanger 6 may be placed on the bottom plate 18 of the intake panel 13 and may be vertically positioned between the left plate 16 and the right plate 17 of the intake panel 13.

[0035] The air discharge unit 8 may be installed above the intake panel 13 and the discharge panel 14. An opening 30 through which the air blown upward from the blowing unit 10 flows into the air discharge unit 8 may be formed through the bottom of the air discharge unit 8. The space G may be formed in the air discharge unit 8. The central axis of the space G may be horizontally arranged. The space G may be open in the front-rear direction through the air discharge unit 8. The air discharge unit 8 may include a front inner body 32 in which the space G is formed and a rear inner body 34 having the front end inserted in the space G and forming the ring-shaped air discharge port L together with the front inner body 32. The air discharge unit 8 may further include an outer case 38 installed above the main body 4 and receiving the front inner body 32 and the rear inner body 34. The air discharge unit 8 may further have an outer case 38 disposed at the upper portion of the main body 4 and receiving the front inner body 32 and the rear inner body 34.

[0036] The front end of the rear inner body 34 is positioned in the space G of the front inner body 32, so that it can form the ring-shaped air discharge port L together with the front inner body 32.

[0037] The outer case 38 can form the external appearance of the air discharge unit 8. The outer case 38 can protect the rear inner body 32 and the front inner body 34. The outer case 38 may be formed in a hexahedral shape. The outer case 38 may be installed above the main body 4. An opening 30 may be formed through the bottom of the outer case 38. The air blown from the main body 4 may flow into the outer case 38 through the opening 30 formed through the bottom of the outer case 38. The outer case 38 may be installed above the intake panel 13 and the discharge panel 14. The opening 30 may be formed to communicate with the portion between intake panel 13 and the discharge panel 14. The outer case 38 may include a rear outer case 39 and a front outer case 39 disposed ahead of the rear outer case 39. The rear outer case 39 may form the rear portion of the outer case 38. The rear outer case 39 may be installed above the intake panel 13. The rear outer case 39 may be placed on the intake panel 13 and fastened to the upper portion of the intake panel 13 by fasteners, such as screws. The front outer case 40 may form the front portion of the outer case 38. The front outer case 40 may be installed above the discharge panel 14. The front outer case 40 may be placed on the discharge panel 14 and fastened to the upper portion of the discharge panel 14 by fasteners, such as screws.

[0038] The blowing unit 10 may be installed ahead of the heat exchanger 6. The blowing unit 10 may be a centrifugal blowing unit that sucks air at the rear area and circumferentially blows the air. The blowing unit 10 is installed at the discharge panel 14 and may blow air to the air discharge port 12 and the air discharge unit 8. The blowing unit 10 may include a motor and a blowing fan and the blowing fan may be a turbofan, which is a centrifugal fan. The rotary shaft of the blowing fan may be horizontally arranged. The blowing unit 10 may include an upper blowing unit 41 sucking air through the air intake ports 2 and blowing the air to the air discharge ports 12 and the air discharge unit 8 and a lower blowing unit 42 sucking air through the air intake ports 2 and blowing the air to the air discharge ports 12. The upper blowing unit 41 may include an upper motor 43 installed on the discharge panel 14 to be positioned ahead of the upper portion of the heat exchanger 6 and an upper turbofan 44 having a rotary shaft connected to the motor 43 and sucking and circumferentially blowing air at the rear area. The lower blowing unit 42 may include a lower motor 45 installed on the discharge panel 14 to be positioned ahead of the lower portion of the heat exchanger 6 and a lower turbofan 46 having a rotary shaft connected to the motor 45 and sucking and circumferentially blowing air at the rear area. A separating guide 47 that separates a flow path of the upper blowing unit 41 and a flow path of the lower blowing unit 42 and guides air may be disposed in the main body 4. The separating guide 47 has the top that guides air allowed to flow by the upper blowing unit 41 and the bottom that guides air allowed to flow by the lower blowing unit 42. The separating guide 47 may be formed between the left plate 22 and the right plate 23 of the discharge panel 14. The blowing unit 10 may include an orifice 48 that guides the air passing through the heat exchanger 6 to the blowing unit 10. The orifice 48 may have an upper guide hole 49 that guides the air passing through the upper portion of the heat exchanger 6 to the upper blowing unit 41. The orifice 48 may have a lower guide hole 50 that guides the air passing through the lower portion of the heat exchanger 6 to the upper blowing unit 42.

[0039] The air conditioner may include a side cover 60 that has air discharge holes 58 communicating with the air discharge ports 12 and covers both of a side of the discharge panel 14 and the front side of the air discharge unit 8. The side cover 60 may cover the interface between the side of the discharge panel 14 and the front side of the air discharge unit 8. The side cover 60 may be formed to be long in the up-down direction and may cover the front side of the base 24 in addition to the side of the discharge panel 14 and the front side of the air discharge unit 8. The side cover 60 may include a vertical plate 62 formed to be long in the up-down direction and a horizontal portion 64 bending from the upper portion of the vertical plate 62. The vertical plate 62 may cover all the front side of the base 24, the side of the discharge panel 14, and the front side of the air discharge unit 8. The horizontal portion 64 may partially cover the top of the air discharge unit 8. The side cover 60 may have the air discharge holes 58 at the positions corresponding to the

air discharge ports 12. A wind direction control member 67 and a wind direction control motor (not shown) may be installed at one of the discharge panel 14 and the side cover 60. The wind direction control member 67 can control the direction of air discharged to the air discharge ports 12. The wind direction control member 67 can open/close the air discharge ports 12. The wind direction control motor can control the direction of air by rotating the wind direction control member 67 and can open/close the air discharge ports 12.

[0040] The air conditioner may include a front cover 70 that has a hole 68 larger than the ring-shaped air discharge port L and covers both of the front of the discharge panel 14 and the front of the air discharge unit 8. The front cover 70 may cover the interface between the front of the discharge panel 14 and the front of the air discharge unit 8. The front cover 70 may be formed to be long in the up-down direction and may cover the front of the base 24 in addition to the front of the discharge panel 14 and the front of the air discharge unit 8. The hole 68 may be formed larger than the front end of the front inner body 32. The front cover 70 may be installed to cover portion other than the front end of the front inner body 32, in the air discharge unit 8.

[0041] FIG. 6 is a longitudinal cross-sectional view of the air discharge unit shown in FIG. 1, FIG. 7 is a perspective view of the air discharge unit shown in FIG. 6, FIG. 8 is an exploded perspective view of the air discharge unit shown in FIG. 6, and FIG. 9 is a partial-cut perspective view of the air discharge unit shown in FIG. 6.

[0042] The air discharge unit 8 may have an air passage P through which the air blown upward from the main body 4 is dispersed. The air discharge unit 8 may be formed such that the ring-shaped air discharge port L makes the air passage P and the space G communicate with each other. The air discharge unit 8 may have a discharge passage through which the air blown upward from the main body 4 is discharged to the front portion of the air discharge unit 8. The discharge passage may be formed by the air passage P, the ring-shaped air discharge port L, and the space G.

[0043] In the air discharge unit 8, the front inner body 32 may be connected to the front portion of the outer case 38 and the rear inner body 34 may be connected to the rear portion of the outer case 38. The front inner body 32 may be connected to the front inner case 40 while being received in the front inner case 40. The rear inner body 34 may be connected to the rear inner case 39 while being received in the rear inner case 39.

[0044] The outer case 38 can form the air passage P together with the rear inner body 34. The air passage P may function as a dispersion passage through which the air sucked into the outer case 38 through the opening 30 can be dispersed.

[0045] The outer case 38 may have a receiving portion 80 where the front inner body 32 is partially inserted and received. The receiving portion 80 may extend rearward from the front plate of the outer case 38. The receiving portion 80 may have cylindrical portion 82 extending rearward from the front plate of the outer case 38 and a circular plate portion 84 formed at the rear end of the cylindrical portion 82. The circular plate portion 84 may be formed perpendicular to the rear end of the cylindrical portion 82. The receiving portion 80 may have a front hole 86 formed at the circular plate portion 84. The front hole 86 may be open in the front-rear direction. The front hole 86 may be formed larger than the front end 131 of the rear inner body 34.

[0046] The front inner body 32 is described hereafter.

[0047] The front inner body 32 may be inserted in the receiving portion 80 formed at the outer case 38. The front inner body 32 may be connected to the receiving portion 80. The rear end of the front inner body 32 may be connected to the receiving portion 80. The front end of the front inner body 32 may protrude forward further than the front of the outer case 110.

[0048] The front inner body 32 may have a front extending portion 36 formed ahead of the ring-shaped air discharge port L. The front extending portion 36 may have a straight surface that is circumferentially rounded and formed straight in the front-rear direction. The inner diameter D1 of the front extending portion 36 may be larger than the diameter D2 of the front end 131 of the rear inner body 34. Since the inner diameter D1 of the front extending portion 36 is larger than the diameter D2 of the front end of the rear inner body 34, the air passing through the ring-shaped air discharge portion L can be discharged forward.

[0049] The front inner body 32 may include a front discharge body 103 forming the ring-shaped air discharge port L together with the rear inner body 34 and a front cover 104 connected to the front discharge body 103 and having the front extending portion 36.

[0050] The front discharge body 103 may have a front cylindrical portion 105 smaller than the cylindrical portion 82 of the receiving portion 80 and a front circular plate portion 106 formed at the rear end of the front cylindrical portion 105 and smaller than the circular plate portion 84 of the receiving portion 80. The front circular plate portion 106 may be formed perpendicular to the rear end of the front cylindrical portion 105.

[0051] The front discharge body 103 may have a rear expanding portion that increases in open area toward the rear portion. The rear expanding portion 107 may be a hollow cylindrical portion with the rear end formed larger than the front end. The rear expanding portion 107 may be formed to decrease in diameter toward the front portion and increase in diameter toward the rear portion. The rear end of the rear expanding portion 107 may be connected to the circular plate portion 84 of the receiving portion 80. The front end of the rear expanding portion 107 may be connected to the front extending portion 36. The inner side of the rear expanding portion 107 may form the ring-shaped air discharge portion L together with the rear inner body 34. The rear expanding portion 107 may be connected with the front extending portion 36 to

make an obtuse angle θ with the front extending portion 36. The front end of the rear expanding portion 107 can be in contact with the rear end of the front extending portion 36. The front end of the rear expanding portion 107 may be fitted or bonded by an adhesive to the rear end of the front extending portion 36

[0052] The front cover 104 may have a front expanding portion 108, which increases in open area toward the front portion, at the front end of the front extending portion 36. The front expanding portion 108 may be a hollow cylindrical portion with the front end formed larger than the rear end. The front expanding portion 108 may be formed to increase in diameter toward the front portion and decrease in diameter toward the rear portion. The rear end of the front expanding portion 108 may bend from the front end of the front extending portion 36. The front of the front expanding portion 108 may be implemented by a curved surface 109. The front end of the front expanding portion 108 may be formed smaller than the hole 68 of the front cover 70 shown in FIG. 1.

[0053] Front inner body fastening portions 110A and 110B that allow the front inner body 32 to be fastened to the outer case 38 by fasteners, such as screws, are formed at the front inner body 32 and the outer case 38, respectively. The fasteners, such as screws, are inserted through the front inner body fastening portions 110A formed at at least one of the front discharge body 103 and the front cover 104 and then fitted into the front inner body fastening portions 110B formed at the front outer case 121, such that the front inner body 32 can be fastened to the outer case 38.

[0054] Front inner body coupling portions 111A and 111B that allow the front discharge body 103 and the front cover 104 to be fastened to the front discharge body 103 and the front cover 104 by fasteners, such as screws, are formed at the front discharge body 103 and the front cover 104, respectively. Fasteners, such as screws, are inserted through the front inner body coupling portions 111A formed at the front cover 104 and then fitted into the front inner body coupling portions 111B formed at the front discharge body 103, such that the front cover 104 and the front discharge body 103 can be coupled.

[0055] Meanwhile, the front inner body 100 may have a front internal space V between the front discharge body 103 and the front cover 104. The front cover 104 may be formed to be transparent or translucent to transmit light from a lighting mechanism 112, which is described below. The air discharge unit 4 is installed at the front discharge body 103 and may include the lighting mechanism 112 that emits light toward the front cover 104. The lighting mechanism 112 may be positioned in the front internal space V formed by the front discharge body 103 and the front cover 104. The lighting mechanism 112 can be protected by the front discharge body 103 and the front cover 104. The lighting mechanism 112 may include a substrate and an LED installed on the substrate. The substrate may be disposed in a ring shape in the front internal space V. A plurality of LEDs may be installed to be circumferentially spaced from each other on the front of the substrate.

[0056] The rear inner body 34 is described hereafter.

[0057] The outer circumference of the rear inner body 34 can form the air passage P together with the outer case 38. A rear space S that communicates with the space G of the front inner body 32 in the front-rear direction may be formed inside the rear inner body 34. The front end 131 of the rear inner body 34 may be inserted in the space G of the front inner body 32. The rear end 132 of the rear inner body 34 may be connected to the outer case 38.

[0058] The rear inner body 34 may include rear air guides 133 and 134 that form the ring-shaped air discharge port L together with the front inner body 32 and guide air in the air passage P to the ring-shaped air discharge port L, and a rear inner cover 135 where the rear air guides 133 and 134 are installed and that is connected to the outer case 38.

[0059] The rear air guides 133 and 134 can form the ring-shaped air discharge port L together with the front inner body 32, with the front portions opposite the front inner body 32. The rear air guides 133 and 134 may be installed with the front ends positioned in the space G of the front inner body 32. The rear portions of the rear air guides 133 and 134 can form the air passage P together with the rear outer case 39. The rear air guides 133 and 134 may include a left rear air guide 133 disposed on the left outer circumference of the rear inner cover 135 and a right rear air guide 134 disposed on the right circumference of the rear inner cover 135. In the rear air guides 133 and 134, when the left rear air guide 133 and the right rear air guide 134 are installed on the rear inner cover 135, the outer circumferences may face the outer case 38 and the inner circumferences may face the rear inner cover 135.

[0060] The rear end of the rear inner cover 135 may be connected to the rear outer case 39. The rear space S may be formed inside the rear inner cover 135. The rear inner cover 135 may be formed in a cylindrical shape.

[0061] In the rear inner body 34, the inner circumference of the rear inner cover 135 may be seen through the rear space S of the rear inner cover 135 when seen from the outside. The rear inner cover 135 may function as an inner cover that prevents the rear air guides 133 and 134 from being seen from the outside. The rear inner cover 135 may function as a sealing member that prevents the air in the air passage P from leaking through the gap between the rear air guides 133 and 134 and the outer case 38. Since the rear air guides 133 and 134 guide the air in the air passage P, the shapes may be complicated in consideration of the air flow. On the contrary, since the rear inner cover 135 does not directly guide the air in the air passage P, the shape can be simplified more than those of the rear air guides 133 and 134. The rear inner body 34 may be enhanced in quality more than when the rear air guides 133 and 134 are exposed to the outside when seen from the outside.

[0062] Rear inner body fastening portions 136A and 136B that allow the rear inner body 34 to be fastened to the outer case 38 by fasteners, such as screws, may be formed at the rear inner body 34 and the outer case 38, respectively. The fasteners, such as screws, are inserted through the rear inner body fastening portions 136A formed at at least one of the rear air guides 133 and 134 and the rear inner cover 135 and then fitted into the rear inner body fastening portions 136B formed at the rear outer case 39, such that the rear inner body 34 can be fastened to the rear outer case 39.

[0063] The rear air guides 133 and 134 may have rear air guide coupling portions 137A and 137B that allow the left rear air guide 133 and the right rear air guide 134 to be fastened by fasteners, such as screws. The fasteners, such as crews, are inserted through the rear air guide coupling portions 137A formed at the left rear air guide 133 and then fitted into the rear air guide coupling portions 137B formed at the right rear air guide 134, such that the left rear air guide 133 and the right rear air guide 134 can be coupled.

[0064] Rear inner body coupling portions 138A and 138B that allow the rear air guides 133 and 134 and the rear inner cover 135 to be fastened by fasteners, such as screws, may be formed at the rear air guides 133 and 134 and the rear inner cover 135. The fasteners, such as screws, are inserted through the rear inner body coupling portions 138A formed at the rear air guides 133 and 134 and fitted into the rear inner body coupling portions 138B formed at the rear inner cover 135, such that the rear air guides 133 and 134 and the rear inner cover 135 can be coupled.

[0065] The outer case 38 is described hereafter.

[0066] In the outer case 38, a rear receiving space that receives the rear inner body 34 may be formed at the rear outer case 39 and a front receiving space that receives the front inner body 32 may be formed at the front outer case 40.

[0067] The rear outer case 39 may have a left plate 141, a right plate 142, an upper plate 143, and a rear plate 144. The front of the rear outer case 39 may be open. An opening 30 may be formed through the bottom of the rear outer case 39. In the rear outer case 39, the air passage P may be formed respectively between the left plate 141 and the rear inner body 34, between the right plate 122 and the rear inner body 34, between the upper plate 123 and the rear inner body 34, and between the opening 30 and the rear inner body 34. A rear hole 145 may be formed through the rear plate 144 of the rear outer case 39. The rear hole 145 may be open in the front-rear direction. The rear hole 145 may be formed to communicate with the rear space S of the rear inner body 34 in the front-rear direction.

[0068] The front outer case 40 may have a left plate 151, a right plate 152, an upper plate 153, and a front plate 154. The rear of the front outer case 40 may be open. An opening 30 may be formed through the bottom of the front outer case 40. In the front outer case 40, the air passage P may be formed respectively between the left plate 151 and the receiving portion 80, between the right plate 152 and the receiving portion 80, between the upper plate 153 and the receiving portion 80, and between the opening 30 and the receiving portion 80. In the front outer case 40, the receiving portion 80 may protrude rearward from the front plate 154. The receiving portion 80 may be formed larger than the front inner body 32. The front inner body 32 may be protected by the receiving portion 80.

[0069] The operation of the air conditioner having the configuration described above is described hereafter.

[0070] First, when the blowing unit 10 is driven, air in a room is sucked into the air intake ports 2 from the rear area of the air intake ports 2 and then the air is sucked into the main body 4 through the air intake ports 2. The air sucked into the main body 4 exchanges heat with a refrigerant while passing through the heat exchanger 6 in the front-rear direction, and is sucked into the blowing unit 10. The air sucked in the blowing unit 10 is circumferentially blown by the blowing unit 10. Some of the air blown in the circumferential direction of the blowing unit 10 is blown upward between the intake panel 13 and the discharge panel 14 and sucked into the air discharge unit 8 through the opening 30. The air sucked into the air discharge unit 8 is dispersed into the air passages P while widely spreading between the outer case 38 and the rear inner body 34, and then is discharged into the space G through the ring-shaped air discharge port L. The air discharged in the space G may be discharged forward through the space G. The other of the air blown in the circumferential direction of the blowing unit 10 is blown to a side of the blowing unit 10 to flow into the air discharge ports 12 and is discharged outside the main body 4 through the air discharge ports 12.

[0071] FIG. 10 is a perspective view showing an air discharge unit of an air conditioner according to a second exemplary embodiment of the present invention, FIG. 11 is an exploded perspective view of the air discharge unit shown in FIG. 10, FIG. 12 is a longitudinal cross-sectional view of the air discharge unit shown in FIG. 10, FIG. 13 is a partial-cut perspective view of the air discharge unit shown in FIG. 10, and FIG. 14 is a bottom view of the air discharge unit shown in FIG. 10.

[0072] The air conditioner according to the present exemplary embodiment is different in the air discharge unit 8 from the first exemplary embodiment of the present invention and other configurations and operations except for the air discharge unit 8 are the same as those of the first exemplary embodiment of the present invention; therefore the detailed description is not provided.

[0073] The air discharge unit 8 may include the front inner body 32 and the rear inner body 34 of the first embodiment of the present invention.

[0074] The air discharge unit 8, unlike the first exemplary embodiment of the present invention, may include an outer body 200 that receives the front inner body 32 and the rear inner body 34. The outer body 200 may

rotate with the front inner body 32 and the rear inner body 34. The outer body 200 may implement a rotary discharge unit together with the front inner body 32 and the rear inner body 34. The rotary discharge unit may rotate left and right about a vertical axis O.

[0075] The front inner body 32 may be connected to the front portion of the outer body 200. The front end of the front inner body 32 may protrude forward further than the outer body 200.

[0076] The front inner body 32, similar to the first exemplary embodiment of the present invention, may include a front discharge body 103 and a front cover 104. The detailed description of the front discharge body 103 and the front cover 104 is not provided.

[0077] The front inner body 32 and the outer body 200 may be combined by fitting any one of them into fitting grooves formed at the other, and may be fastened by fasteners, such as screws.

[0078] The rear inner body 34 may be connected to the rear portion of the outer body 200. The rear inner body 34 can form an internal air passage P together with the outer body 200. The rear inner body 34 can form the ring-shaped air discharge port L together with the front inner body 32. The outer circumference of the rear inner body 34 can form an internal air passage P2 together with the outer body 200. A rear space S may be formed inside the rear inner body 34. The front end 131 of the rear inner body 34 may be inserted in the front inner body 32. The rear end 132 of the rear inner body 34 may be connected to the outer body 200.

[0079] The rear inner body 30, similar to the first exemplary embodiment of the present invention, may further include rear air guides 133 and 134 and a rear inner cover 135, and the detailed description of the rear air guides 133 and 134 is not provided.

[0080] The rear air guides 133 and 134 may be installed with the front ends positioned inside the front inner body 32. The rear portions of the rear air guides 133 and 134 can form the internal air passage Ps together with the outer body 200. When the rear air guides 133 and 134 are installed at the rear inner cover 135, the outer circumferences may face the outer body 200 and the inner circumferences may face the rear inner cover 135.

[0081] The rear inner body 34 and the outer body 200 may be combined by fitting any one of them into fitting grooves formed at the other, and may be fastened by fasteners, such as screws.

[0082] The outer body 200 may form the external appearance of the rotary discharge unit. The outer body 200 can protect the rear inner body 32 and the front inner body 34. The outer body 200 may have air intake ports 202 and 204 that allow air to flow into the outer body 200. A plurality of air intake ports 202 and 204 may be formed at the outer body 200 to be space from each other. The air intake ports 202 and 204 may include an upper air intake port 202 formed at the upper portion of the outer body 200 such that air passes downward and a lower air intake port 202 formed at the lower portion of the outer body 200 such that air passes upward. The outer body 200 can protect the rear inner body 32 and the front inner body 34 by being disposed to surround the circumferences of the rear inner body 32 and the front inner body 34. The outer body 200 may be formed generally in a ball shape with the front and the rear open. The outer body 200 may include air guides 206 and 208 where air intake ports through which the air in the outer case 220 flows inside are formed. The air guides 206 and 208 may include an upper air guide 206 where the upper air intake port 202 is formed and a lower air guide 208 where the lower air intake port 204 is formed. The upper air guide 206 and the lower air guide 208 may be implemented by hollow cylinders that are open in the up-down direction to form air intake ports. Dispersion ribs 210 and 212 that disperse air may be formed in the upper air guide 206 and the lower air guide 208, respectively. The outer body 200 may include a left outer body 214 that surrounds the left of the rear inner body 32 and the left of the front inner body 34 and a right outer body 126 that surrounds the right of the rear inner body 32 and the right of the front inner body 34. The left outer body 214 may be formed to be convex left while connecting the left of the upper air guide 206 with the left of the lower air guide 208. The left outer body 214 may be rounded in the up-down direction and the front-rear direction. The right outer body 216 may be formed to be convex right while connecting the right of the upper air guide 206 with the right of the lower air guide 208. The right outer body 216 may be rounded in the up-down direction and the front-rear direction. In the outer body 200, the left outer body 214, the upper air guide 206, the right outer body 216, and the lower air guide 208 may be sequentially and circumferentially disposed.

[0083] The air discharge unit 8 may include an outer case 220 that receives the outer body 200.

[0084] The outer case 220 may be installed above the main body 4. The outer case 220 may support the outer body 200. The outer case 220 may support the outer body 200 to be rotatable.

[0085] The outer case 220 can form the external appearance of the air discharge unit 8. The outer case 220 may protect the outer body 200. Guide surfaces 222 and 224 that can guide the outer surface of the outer body 200 to be rotatable may be formed in the outer case 220. An opening 226 through which air can pass to be sucked into the outer case 200 may be formed through the bottom of the outer case 220. The outer case 220 may be installed above the main body 4. The outer case 220 may be installed above the main body and may have the opening 226 at the bottom. The outer case 220 may protect the left, upper, and right sides of the outer body 200. The air blown from the main body 4 may flow into the outer case 220 through the opening 226 formed through the bottom of the outer case 220. The outer case 220 may be formed in a hexahedral shape. A receiving space where the outer body 200 is rotatably received may be formed in the outer case 220.

[0086] The outer case 220 may include a rear outer case 230 and a front outer case 240 disposed ahead of the rear outer case 39.

[0087] The rear outer case 230 may form the rear portion of the outer case 220. The front of the rear outer case 230 may be open. An opening 226 may be formed through the bottom of the rear outer case 230. The rear outer case 230 may have a left plate 231, a right plate 232, an upper plate 233, and a rear plate 234. A rear opening 235 may be formed through the rear plate 234 of the rear outer case 230. The rear opening 235 may be open in the front-rear direction. The rear opening 235 may be formed to communicate with the rear space S of the rear inner body 34 in the front-rear direction. The rear opening 235 may prevent the rear portion of the rotary discharge unit from being restricted by the rear outer case 230 when the rotary discharge unit rotates. When the rotary discharge unit rotates left or right, the rear portion may protrude rearward from the rear opening 235.

[0088] The front outer case 240 may form the front portion of the outer case 220. The front outer case 240 may be coupled to the front portion of the rear outer case 230 and the rear may be open. The front outer case 240 may have a front guide 222 that guides the outer surface of the outer body 200 and a front supporter 242 at the lower portion which supports the lower air guide 208 to be rotatable. A front opening 245 may be formed through the front of the front outer case 240. The front opening 245 may be open in the front-rear direction. The front opening 245 may prevent the front portion of the rotary discharge unit from being restricted by the front outer case 240 when the rotary discharge unit rotates. When the rotary discharge unit rotates left or right, the front portion may protrude forward from the front opening 245.

[0089] The outer case 220 may further include an outer guide 250 that supports the outer body 200 to be rotatable. The outer guide 250 may be installed inside the rear outer case 230. The outer guide 250 may support the outer body 200 to be rotatable, together with the front outer case 240.

[0090] The outer guide 250 may have a rear guide surface 224 that guides the outer surface of the outer body 200. The outer guide 250 may have a rear upper supporter 252 at the upper portion which supports the upper air guide 206 to be rotatable. The outer guide 250 may have a rear lower supporter 254 at the lower portion which supports the lower air guide 208 to be rotatable.

[0091] The outer guide 250 may have an inner opening at the rear portion which communicates with the area opening 235 of the rear outer case 230 in the front-rear direction. The inner opening 255 may prevent the rear portion of the rotary discharge unit from being restricted by the outer guide 250 when the rotary discharge unit rotates. When the rotary discharge unit rotates left or right, the rear portion may protrude rearward from the inner opening 255.

[0092] The outer case 220 may have an external air passage P1 that guides air flowing in the outer case 220 through the opening 226 of the outer case 220. The external air passage P1 of the outer case 220 may allow the air flowing through the opening 226 to flow into the internal air passage P2 through the air intake ports 202 and 204. The external air passage P1 of the outer case 220 may be formed between the rear outer case 230 and the outer guide 250.

[0093] The outer case 220 may have a blocking portion 258 that prevents the air flowing in the external air passage P1 from leaking through a gap between the front outer case 240 and the outer body 200. The blocking portion 258 may protrude from the outer guide 250.

[0094] The air discharge unit 8 may further include rotating mechanisms 260 and 262 that are installed at the outer case 220 and rotate the outer body 200.

[0095] The rotating mechanisms 260 and 262 may include an upper rotating mechanism 260 that rotates the upper portion of the outer body 200 and a lower rotating mechanism 262 that rotates the lower portion of the outer body 200. In the outer body 200, the upper portion is rotated by the upper rotating mechanism 260 and the lower portion is rotated by the lower rotating mechanism, such that the upper and lower portions can be generally and stably rotated.

[0096] The rotating mechanisms 260 and 262 may include a motor 264 that is installed at the outer case 220, a pinion 266 that is installed at the motor 264, and a rack 268 that is engaged with the pinion 266.

[0097] The rack 268 may be rounded at the outer body 200. The rack 268 may be rounded on the outer circumferences of the air guides 206 and 208 of the outer body 200.

[0098] The rack 268 of the upper rotating mechanism 260 may be formed on the outer circumference of the upper air guide 206 and the rack 268 of the lower rotating mechanism 262 may be formed on the outer circumference of the lower air guide 208.

[0099] The operation of the air conditioner having the configuration described above is described hereafter.

[0100] First, when air is blown from the main body 4 to the air discharge unit 8, the air can flow into the air discharge unit 8 through the opening 226. Some of the air passing through the opening flows into the lower portion of the internal air passage P2 through the lower air intake port 204 of the lower air guide 208 and the other is dispersed to the left and right of the external air passage P1 and then flows into the upper portion of the internal air passage P2 through the upper air intake port 202 of the upper air guide 206.

[0101] The air flowing into the lower portion of the internal air passage P2 passes through the lower portion of the ring-shaped air discharge port L while being dispersed left and right, while the air flowing into the upper portion of the internal air passage P2 passes through the upper portion of the ring-shaped air discharge port L while being dispersed left and right. The air passing through the ring-shaped air discharge port may be discharged forward through the space G.

[0102] Meanwhile, the rotating mechanism 260 and 262 may rotate the outer body 200 to any one direction of the left and the right and then stop the outer body 200. The rotating mechanism 260 and 262 may swing the outer body 200 to the left and right.

[0103] When the motors 264 of the rotating mechanisms 260 and 262 are driven, the pinion 266 is rotated, and the upper air guide 206 with the rack 268 and the lower air guide 208 with the rack 268 rotate together. When the upper air guide 206 and the lower air guide 208 rotate, the left outer body 214 and the right outer body 216 rotate with the upper air guide 206 and the lower air guide 208. Further, the front inner body 32 and the rear inner body 34 rotate with the outer body 200. In the ring-shaped discharge unit 10, while the front inner body 32, the rear inner body 34, and the outer body 200 rotate together, the air flows into the internal air passage P2 of the ring-shaped discharge unit 8 through the upper air intake port 202 formed at the upper air guide 206 and the lower air intake port 204 formed at the lower air guide 208, and then the air is discharge through the ring-shaped air discharge port L in the direction in which the ring-shaped air discharge port L is arranged.

[0104] FIG. 15 is a longitudinal cross-sectional view showing an air discharge unit of an air conditioner according to a third exemplary embodiment of the present invention.

[0105] The rear inner body 34, as shown in FIG. 15, may have an air guide portion 136 that protrudes to guide the air passing through the ring-shaped air discharge port L to the front inner body 32. The other configurations and operations, except for the air guide portion 136, of the air conditioner according to the present exemplary embodiment may be similar to or different from those according to the second exemplary embodiment of the present invention or those according to the first exemplary embodiment of the present invention, and the detailed description of the configurations and operations are not provided.

[0106] The air guide portion 136 may be formed inside the ring-shaped air discharge port L. The air, which is guided by the rear inner body 34, in the air passing through the ring-shaped air discharge port L may be changed in the flow direction by the air guide portion 136 toward the front inner body 32.

[0107] The air guide portion 136 may protrude toward the front inner body 32, at the portion, which is inserted in the space G of the front inner body 32, of the rear inner body 34. The air guide portion 136 may be implemented by a rib of which the entire shape is a circular ring shape. The air guide portion 136 may protrude from the rear inner body 34, that is, may protrude from the rear air guide 134 in the rear air guide 134 and the rear inner cover 135. The air guide portion 136 may be formed to have a height such that a gap T through which air can pass is formed between the air guide portion 136 and the front inner body 32.

[0108] The air guide portion 136 may protrude to make an acute angle with a surface 34', which forms the air discharge port L, of the rear inner body 34. The surface 34', which forms the ring-shaped air discharge port L, of the rear inner body 34 may be formed to incline toward the central axis C of the rear inner body 34 while extending forward. When the guide portion 136 makes an obtuse angle with the surface 34', which forms the ring-shaped air discharge portion L, of the rear inner body 34, the degree of changing the flow direction of the air may be small, such that it is preferable that the air guide portion 136 makes an acute angle with the surface 34', which forms the ring-shaped air discharge portion L, of the rear inner body 34. The air guide portion 136 may protrude perpendicular to the central axis C of the space G. The front inner body 32 and the rear inner body 34 may have a horizontal central axis C and the air guide portion 136 may be formed perpendicular to the horizontal central axis C. When the angle of the guide portion 136 inclined with respect to the surface 34', which forms the ring-shaped air discharge portion L, of the rear inner body 34, is too small, a vortex may be generated between the air guide portion 136 and the surface 34', which forms the ring-shaped air discharge portion L, of the rear inner body 34. When the air guide portion 136 protrudes perpendicular to the central axis C of the rear inner body 34, it is possible to minimize a vortex and change the flow direction of the air to the front inner body 32.

[0109] When the air conditioner operates, air can pass through the ring-shaped air discharge port L, in which the air flowing to the air guide portion 136, of the air passing through the ring-shaped air discharge port L, can be guided to the front inner body 32 by the air guide portion 136, and the air guided to the front inner body 32 can be guided to the portion, which forms the ring-shaped air discharge port L, of the front inner body 32 and then can flow toward the center of the space G. That is, when the air guide portion 136 is not formed in the air conditioner, the air passing through the ring-shaped air discharge port L may concentrate on the edge in the edge and the center of the space G while passing through between the front end of the rear inner body 34 and the front inner body 32, but when the air guide portion 136 is formed, the air passing through the ring-shaped air discharge port L may concentrate on the center in the center and the edge of the space G. That is, the air that is discharged from the air conditioner may be intensively discharged forward through the center of the space G.

[0110] The front inner body 32 may have an air guide surface 32' that guides the air passing through the ring-shaped air discharge port L to the center of the space G.

[0111] The air guide surface 32' may be formed perpendicular to the central axis C of the rear inner body 34. The air guide surface 32' may be formed between ring-shaped air discharge port L and the front extending portion 36 in the flow direction of the air.

[0112] When the air conditioner operates, the air passing through the ring-shaped air discharge port L may be

discharged through the front inner body 32, in which the air may be guided to the center of the space G by the air guide surface 32' and the air passing through the ring-shaped air discharge port L may be concentrated on the center in the center and the edge of the space G and then discharge forward through the center of the space G.

[0113] Other aspects, features, and advantages will be apparent from the summary above, as well as from the description that follows, including the figures and the claims.

[0114] While the invention has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary and not restrictive. It will be understood that changes and modifications may be made by those of ordinary skill within the scope of the following claims. In particular, the present invention covers further embodiments with any combination of features from different embodiments described above and below.

[0115] Furthermore, in the claims the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. A single unit may fulfil the functions of several features recited in the claims. The terms "essentially", "about", "approximately" and the like in connection with an attribute or a value particularly also define exactly the attribute or exactly the value, respectively. Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. An air conditioner comprising:

   an air intake port (2);
   a heat exchanger (6) configured for exchanging heat with the introduced outside air;
   an air discharge unit (8) configured for discharging the heat exchanged air; and
   a blowing unit (10) configured for introducing outside air through the air intake port (2) and via the heat exchanger (6) and transmitting the air toward the air discharge unit (8),
   wherein the air discharge unit (8) has a space (G) through which the heat exchanged air is discharged and an air discharge port (L) formed along the periphery of the space (G) to allow air to be discharged to the space (G).

2. The air conditioner of claim 1, further comprising an air discharge port (12) for discharging the heat exchanged air in a direction/from a position different from that of the air discharge unit (8).

3. The air conditioner of claim 2, wherein the air discharge port (12) is positioned at the same vertical level with the blowing unit (10) and the air discharge unit (8) is disposed above the blowing unit (10).

4. The air conditioner of claim 2 or 3, wherein the blowing unit (10) includes at least two units (41, 42) disposed at different vertical levels of the air conditioner.

5. The air conditioner of any one of the preceding claims, wherein the blowing unit (10), being a centrifugal blower that blows air in a circumferential direction, is positioned at the same vertical level with the heat exchanger (6).

6. The air conditioner of any one of the preceding claims, wherein a central axis of the space (G) along which the air is discharged and a rotational axis of the blowing unit (10) are both arranged in a horizontal direction.

7. The air conditioner of any one of the preceding claims, wherein the air discharge unit (8) includes a generally ring-shaped air passage (P) through which the air supplied by the air blowing unit (10) is dispersed into the air discharge port (L).

8. The air conditioner of claim 7,
   wherein the air discharge unit (8) has a through-hole that forms the space (G), the through-hole being surrounded by the air passage (P), and
   wherein at least a part of the air discharge port (L) is configured to be inserted into the space (G).

9. The air conditioner of any one of the preceding claims, wherein the air discharge unit (8) is rotatable so as to change the direction of discharged air.

10. The air conditioner of any of preceding claims, wherein the air discharge port (L) has an air guide portion (136) which is configured to change a flow direction of the air passing through the air discharge port (L).

11. The air conditioner of claim 10, wherein the air guide portion (136) is a protrusion inside the air discharge port (L), formed at the portion of the discharge port (L) which is inserted into the space (G).

12. The air conditioner of claim 10 or 11, wherein the air guide portion (136) protrudes to make an acute angle with a surface of the air discharge port (L).

13. The air conditioner of any one of claims 10 to 12, wherein the air guide portion (136) protrudes perpendicular to a central axis of the space (G) along which the air is discharged.

14. The air conditioner of any of preceding claims, wherein the air discharge unit (8) further includes an air guide surface (32') that guides the air passing

through the ring-shaped air discharge port (L) to the center of the space (G).

15. The air conditioner of any one of the preceding claims, wherein the inner diameter (D1) of the space (G) is smaller than the inner diameter (D2) of the air discharge port (L).

FIG. 1

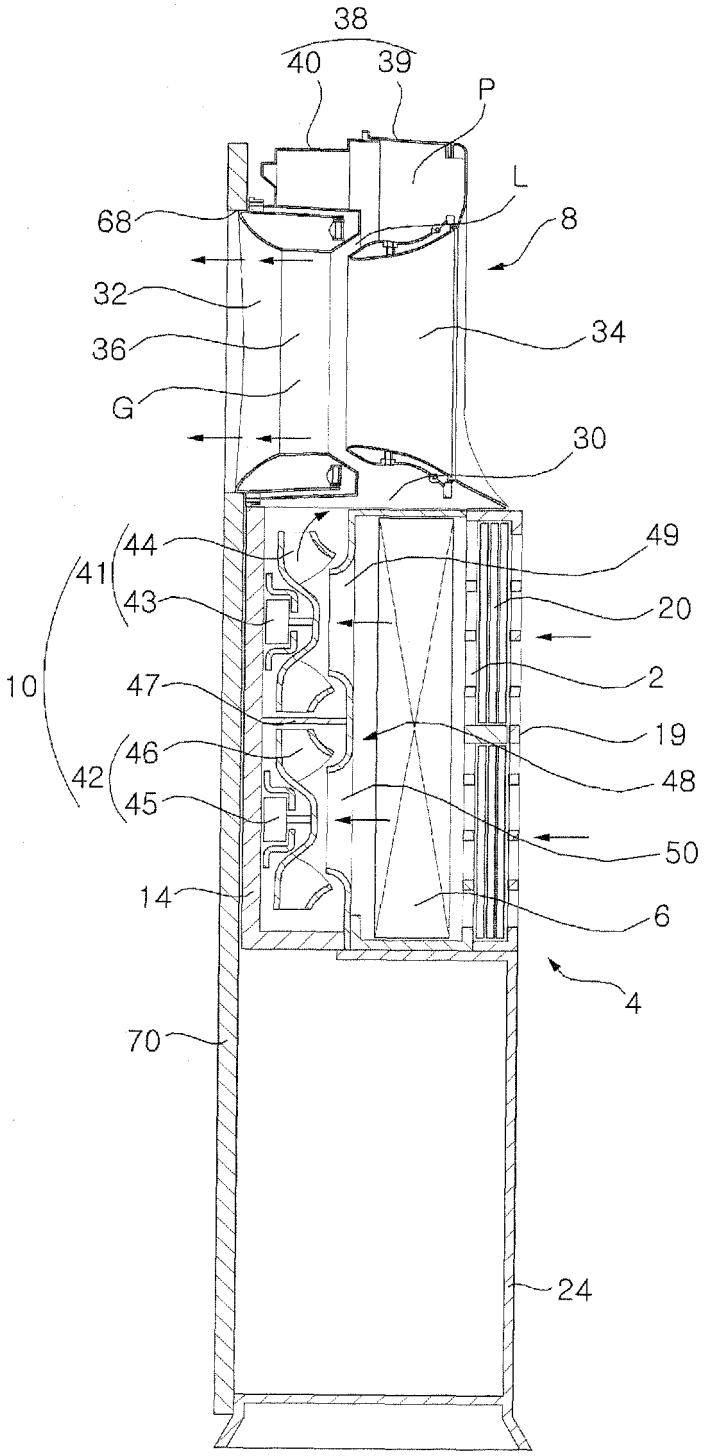
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FIG. 2

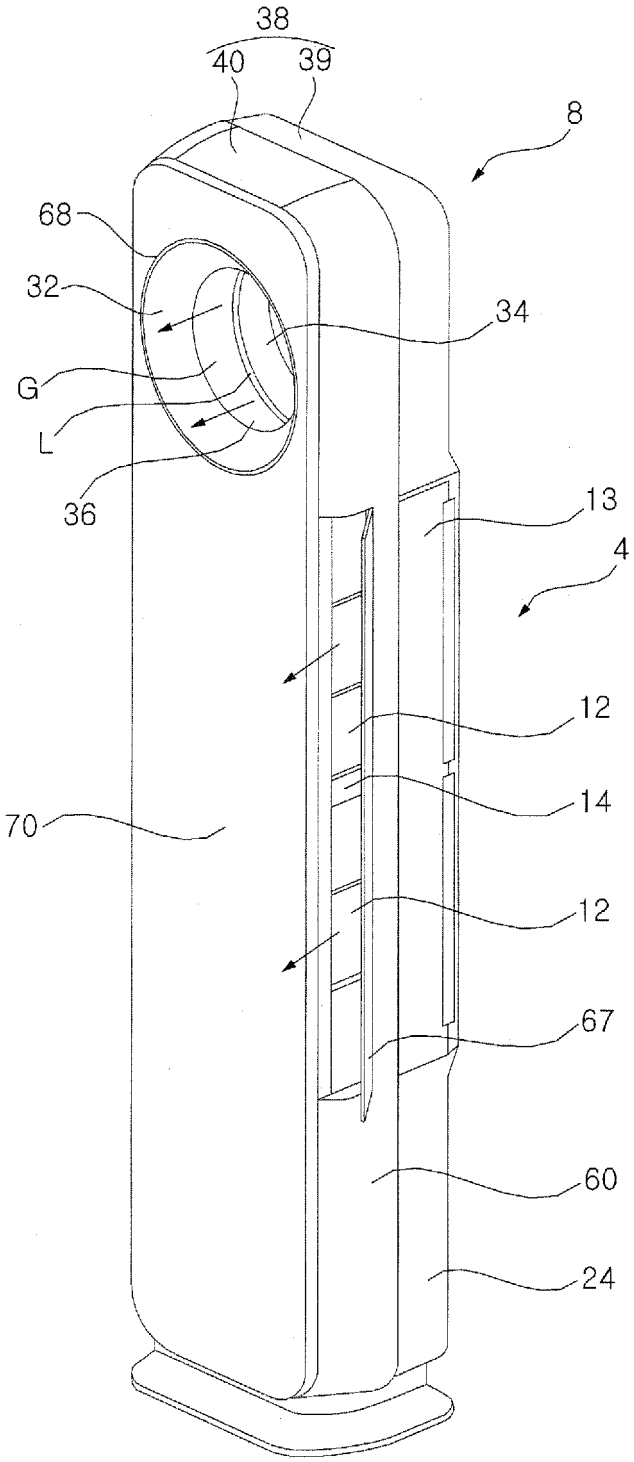

FIG. 3

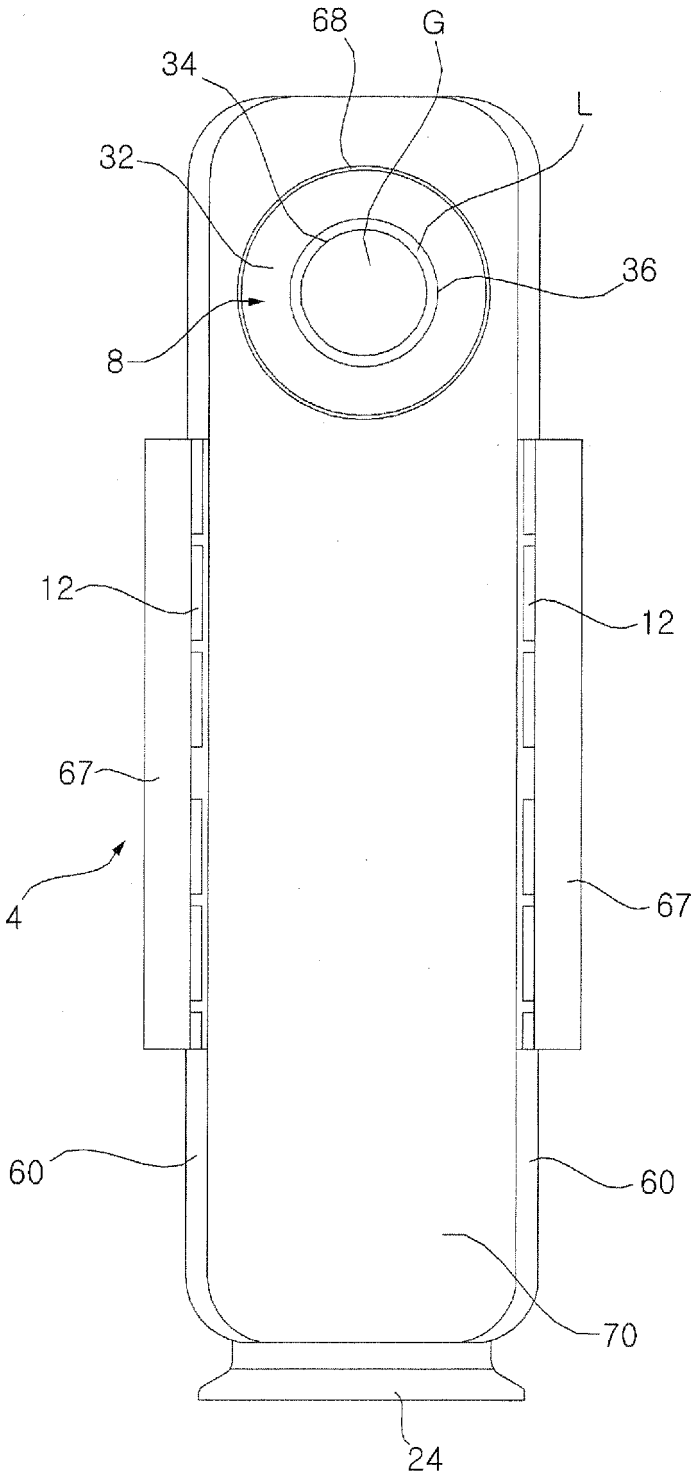

FIG. 4

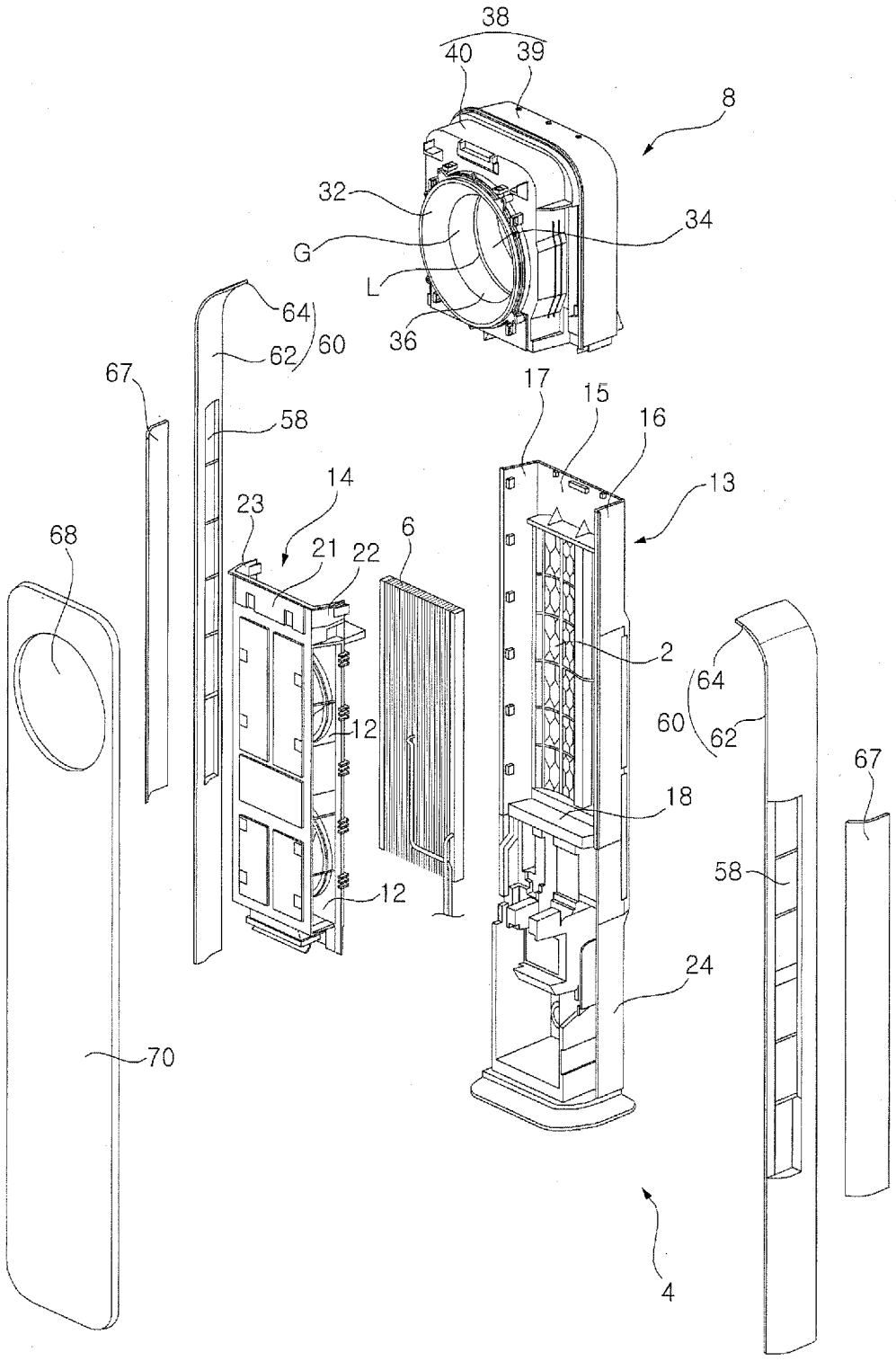
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FIG. 5

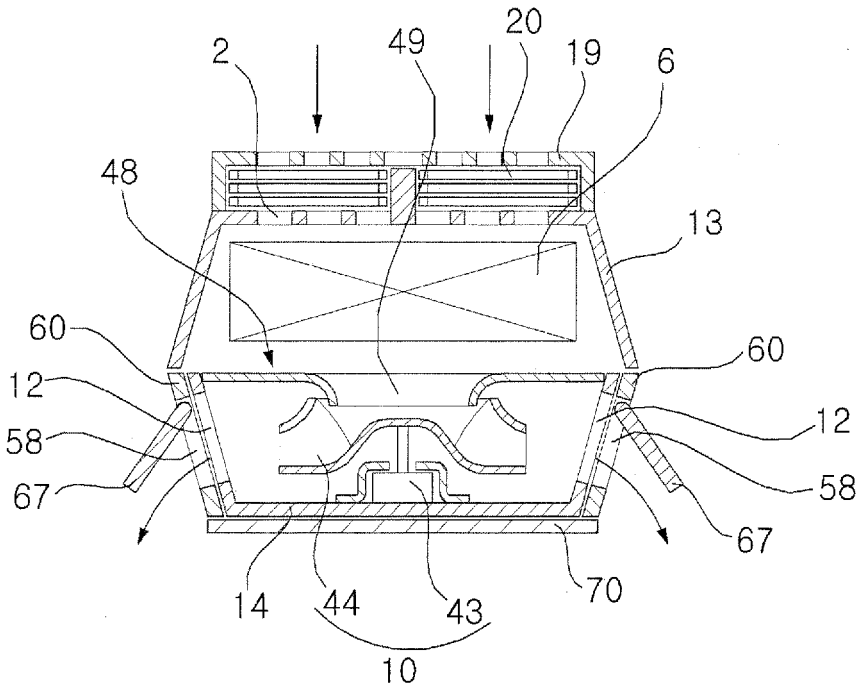

FIG. 6

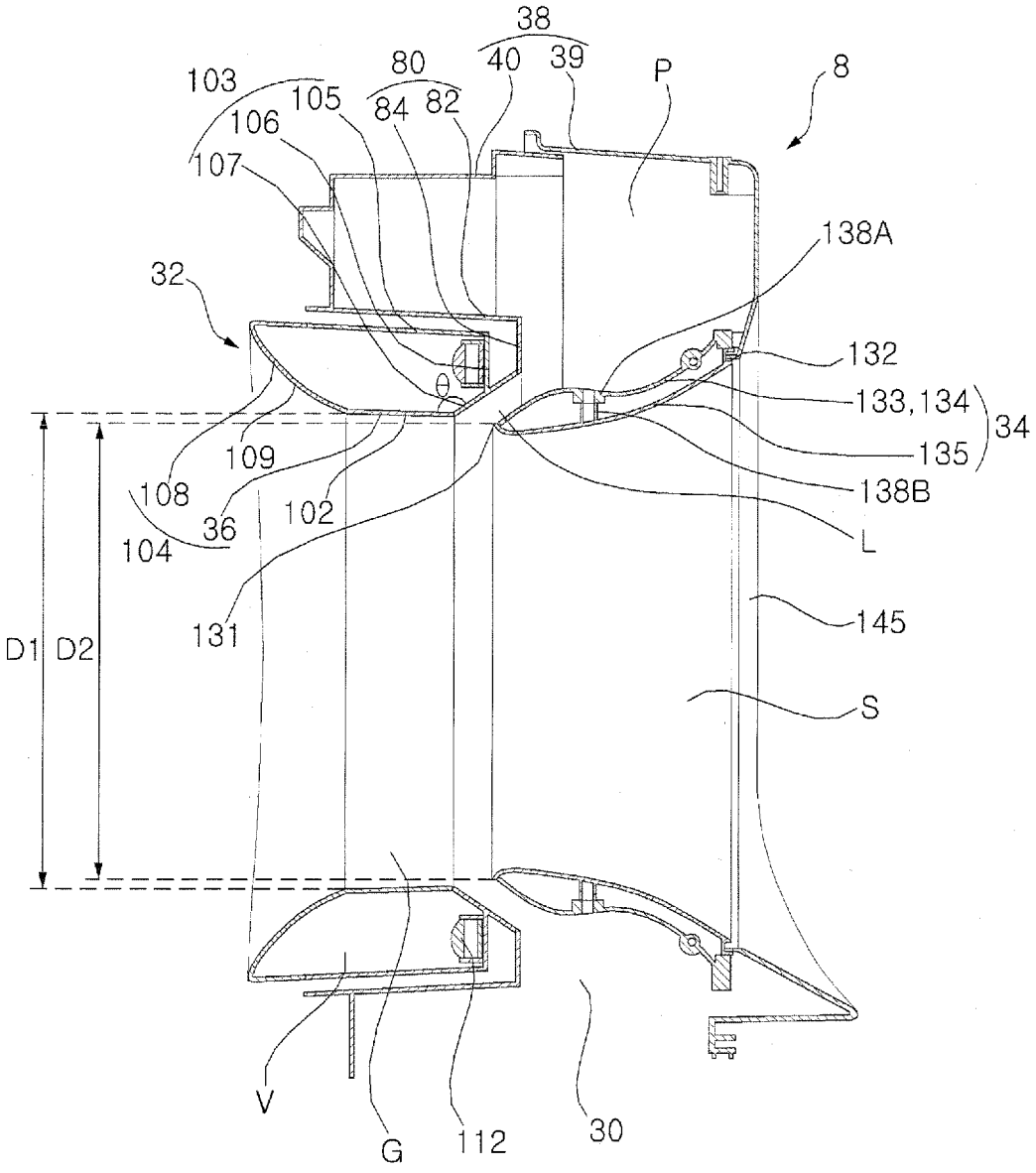
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FIG. 7

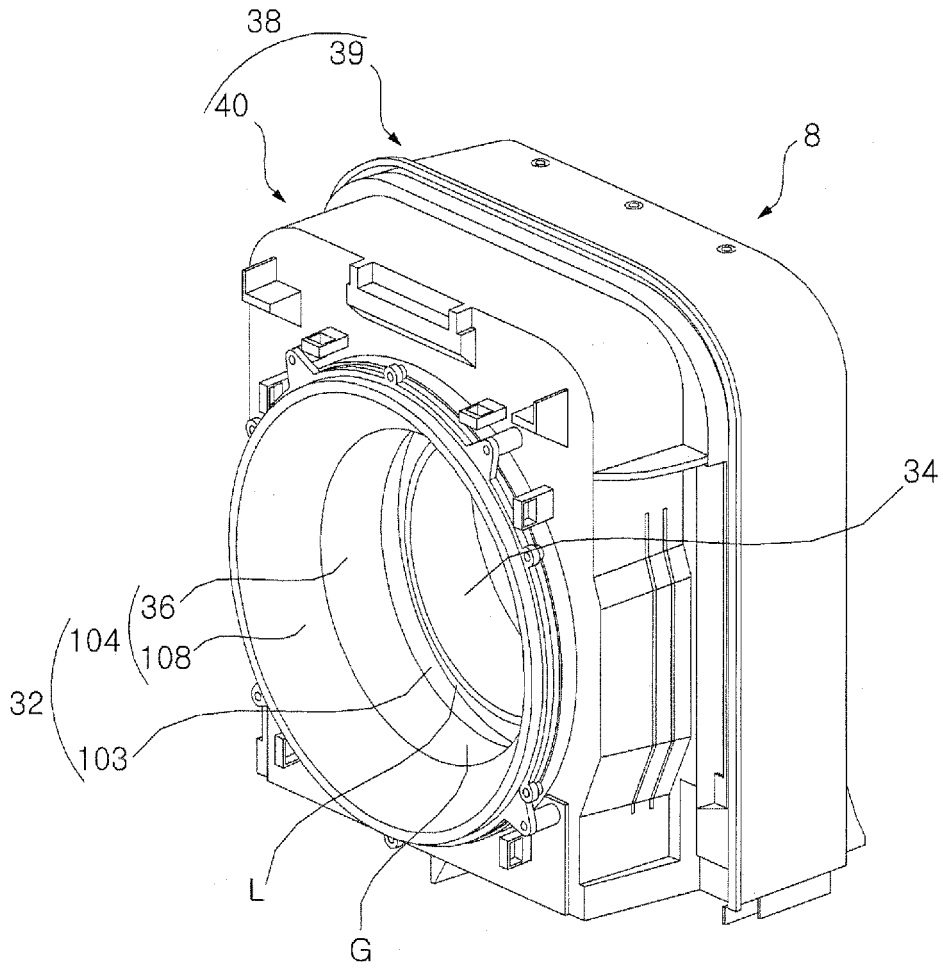

FIG. 8

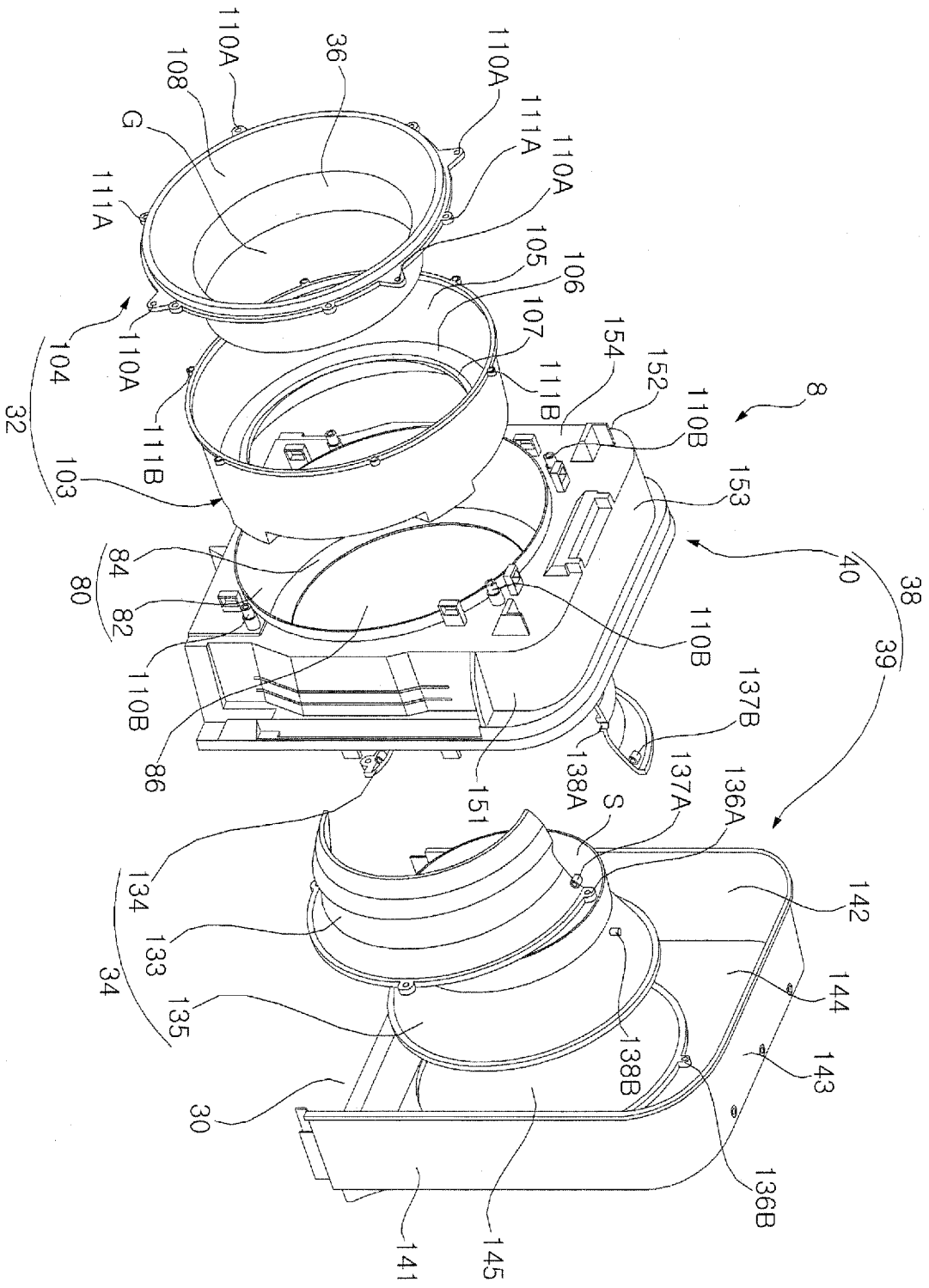
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FIG. 9

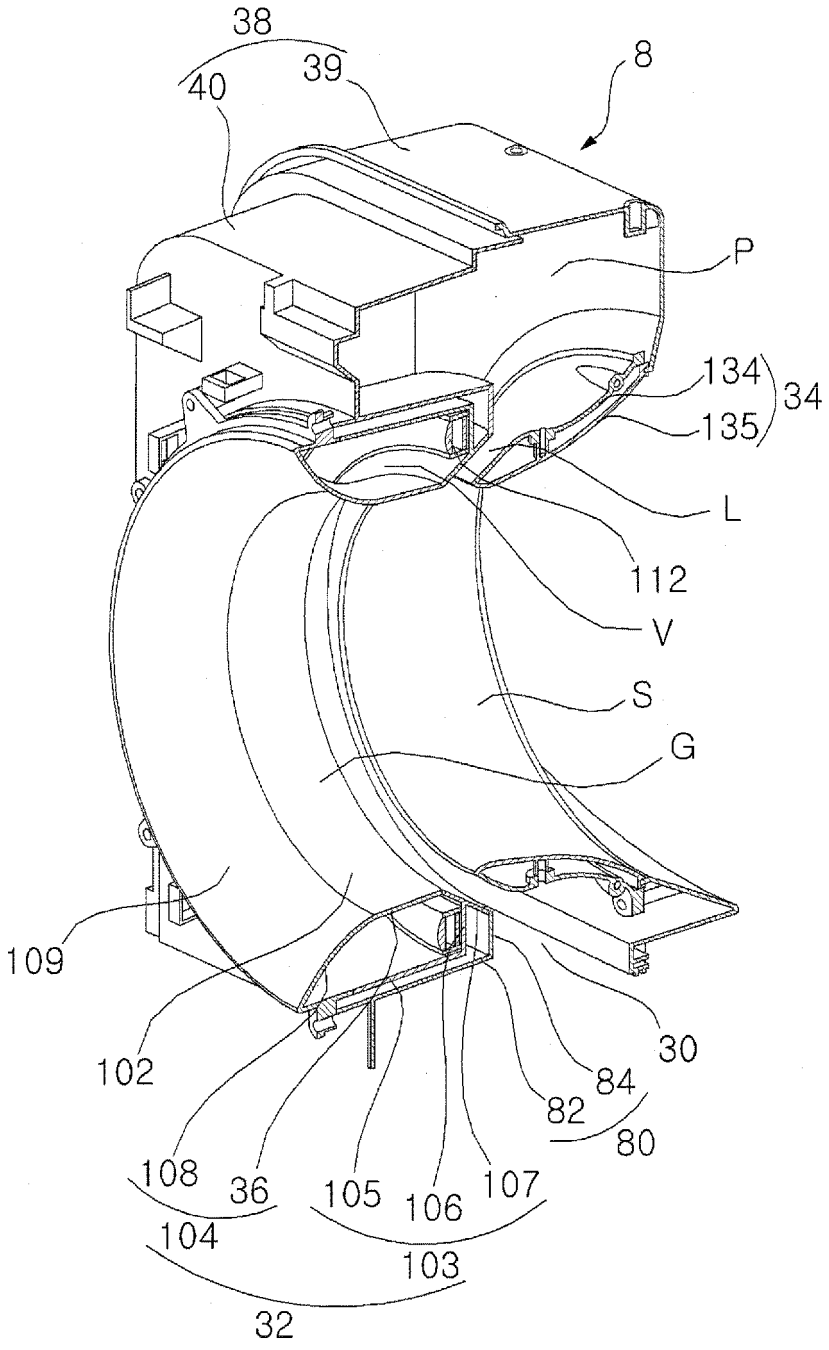
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FIG. 10

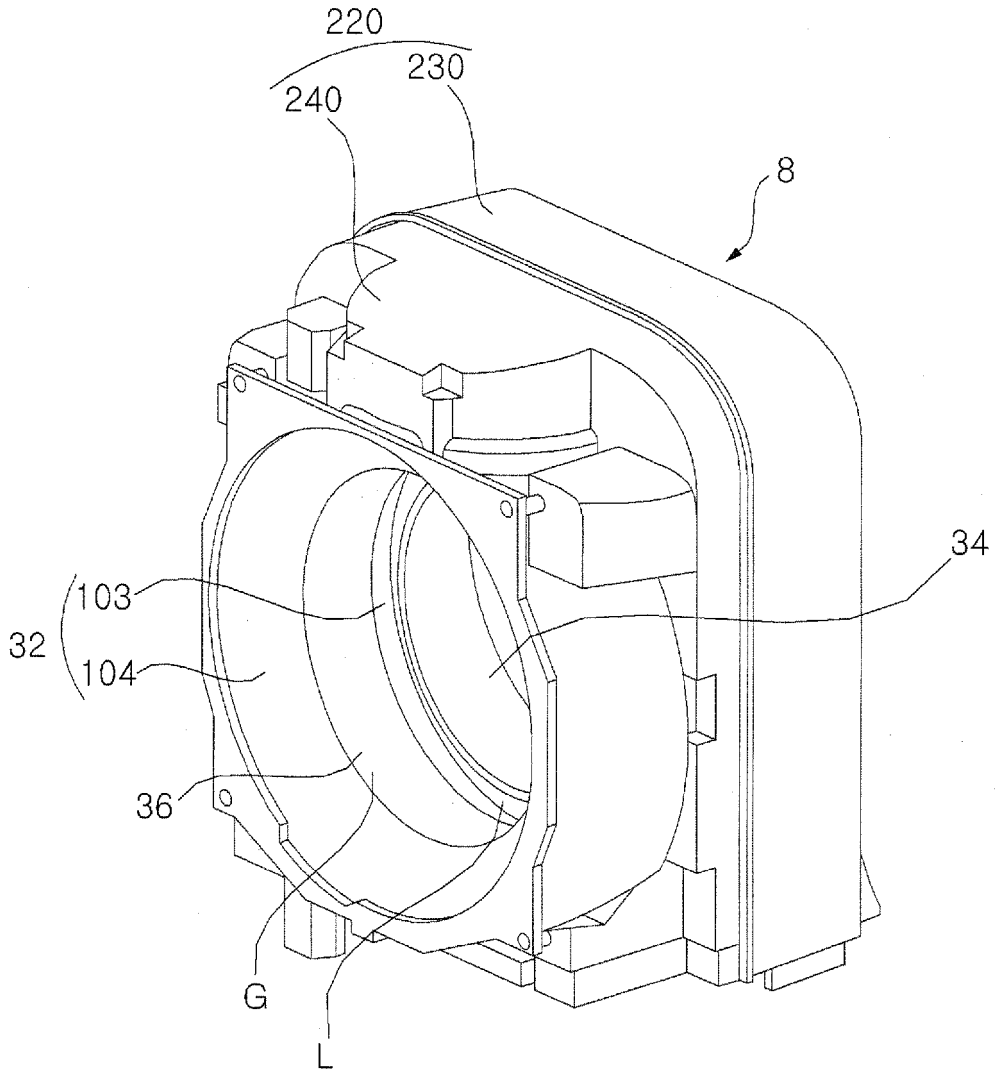

FIG. 11

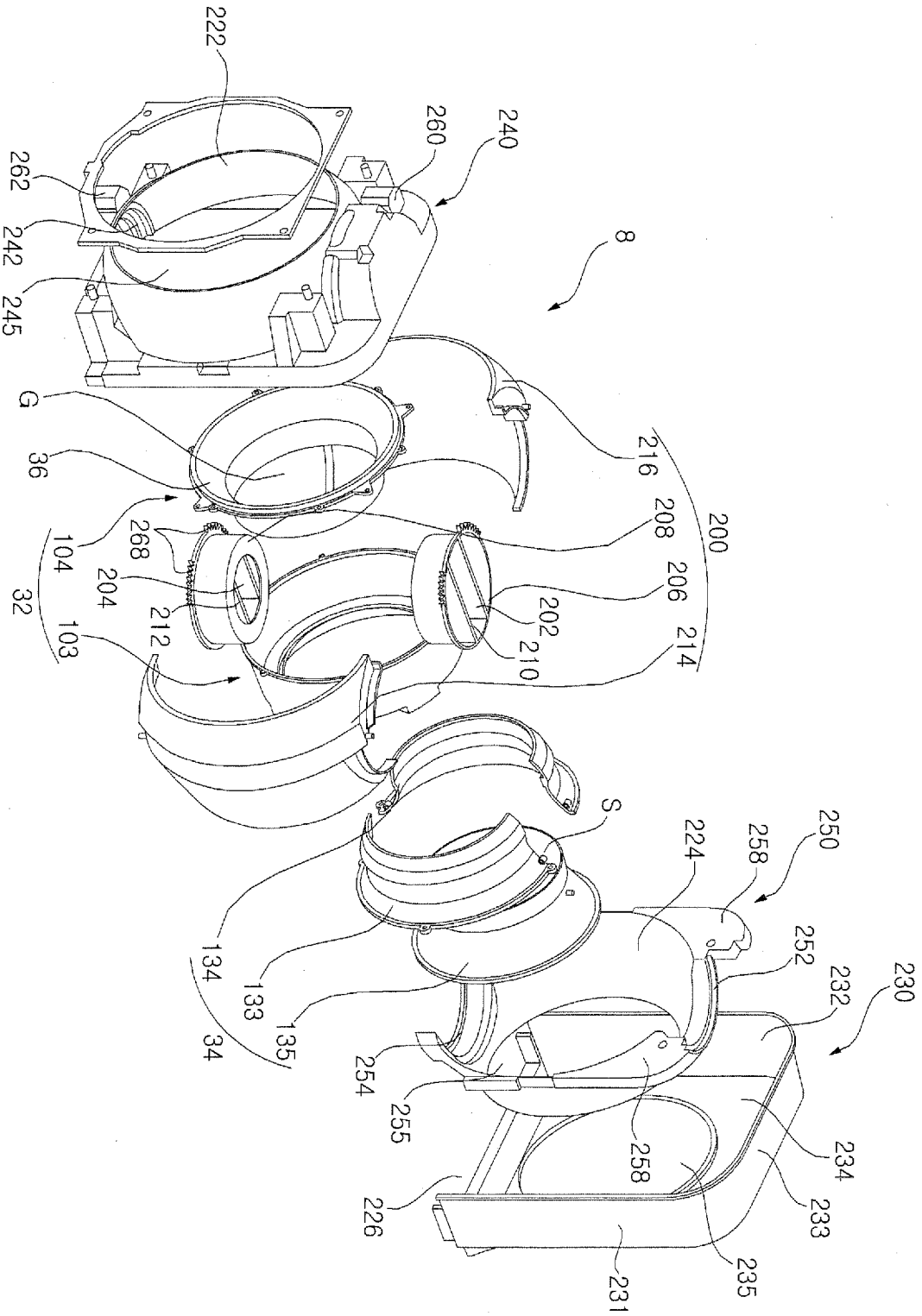
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FIG. 12

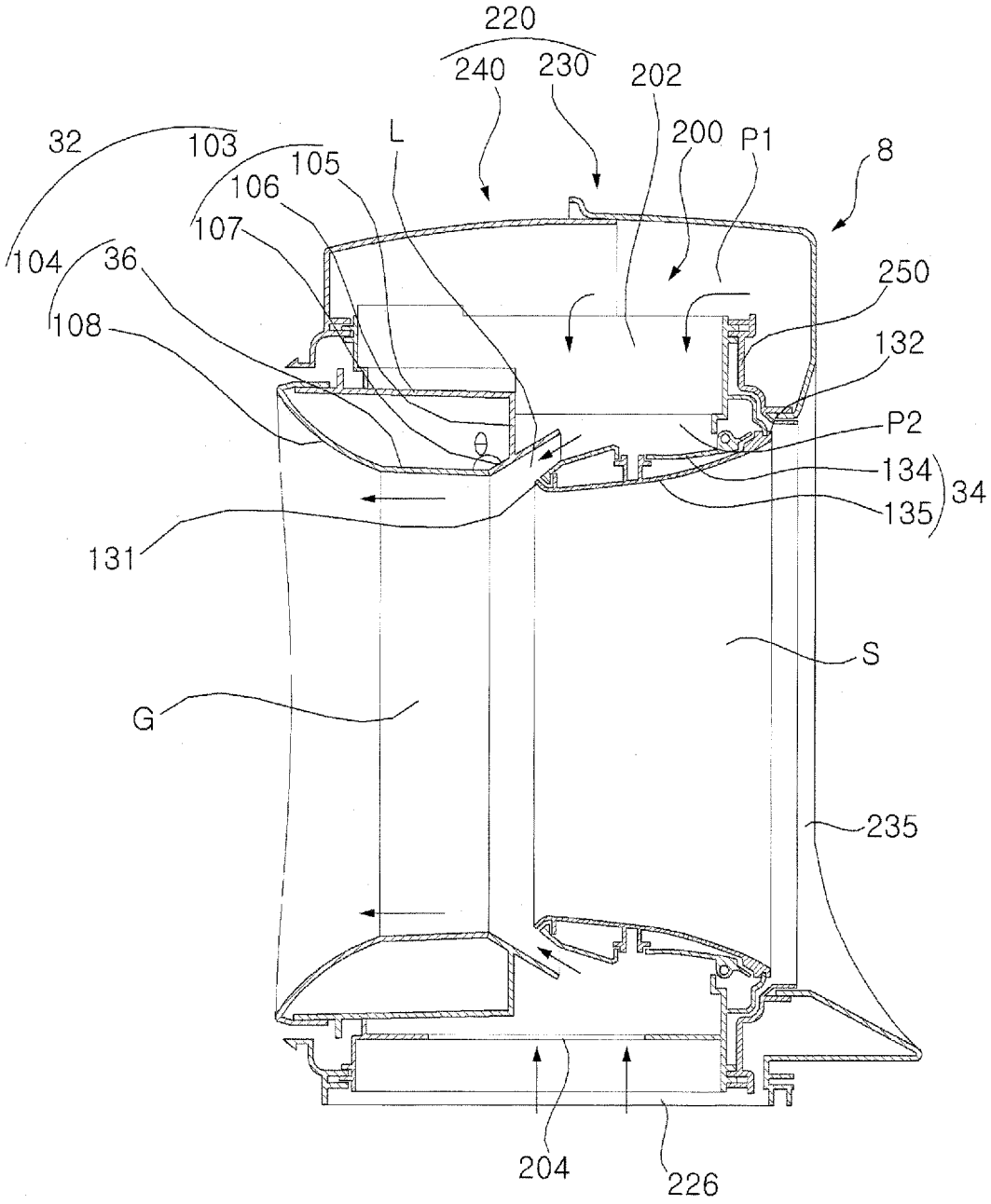
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FIG. 13

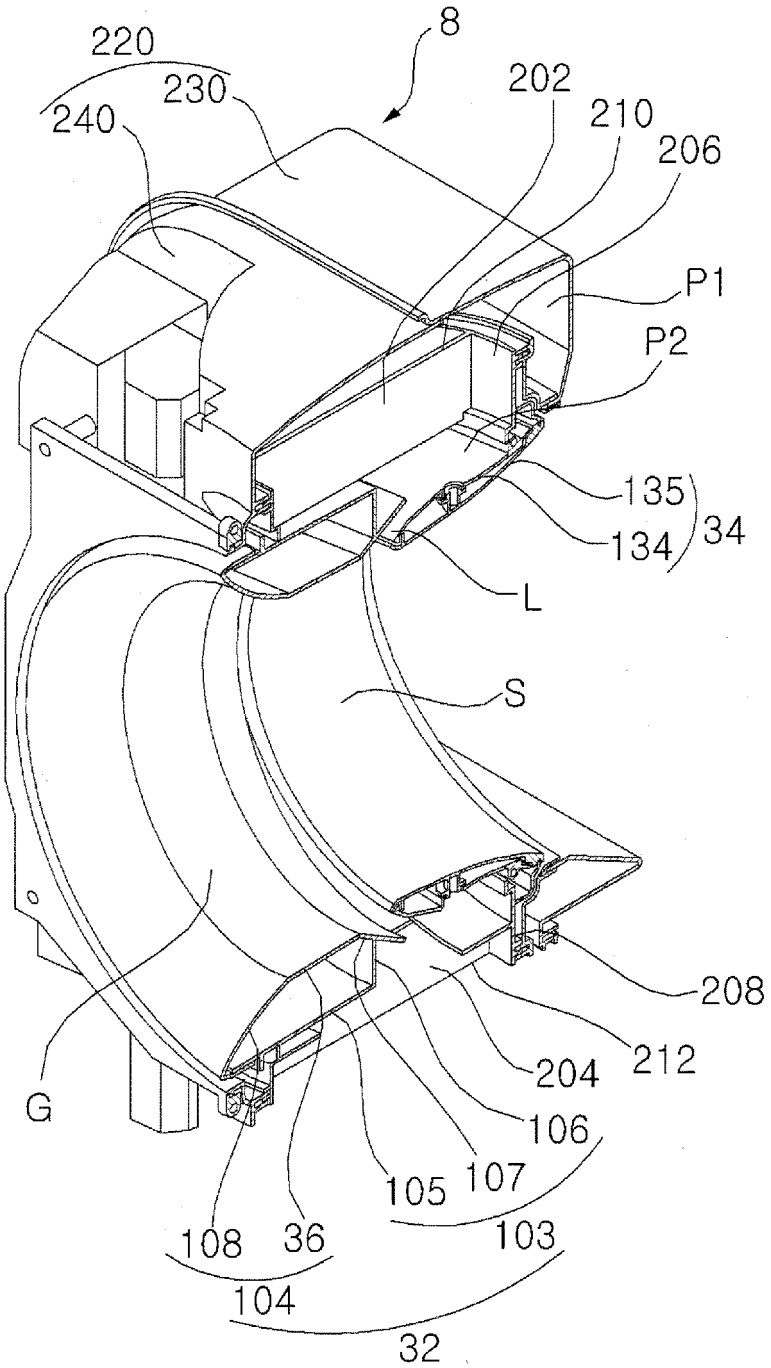
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FIG. 14

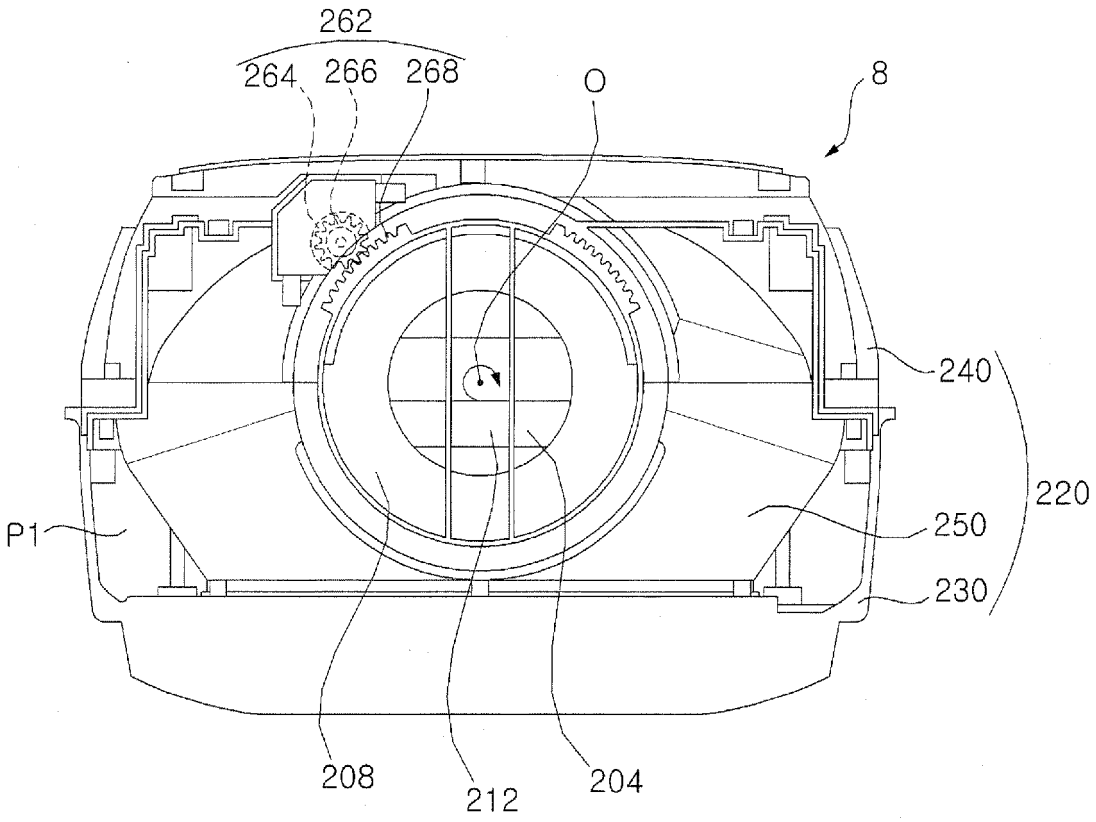
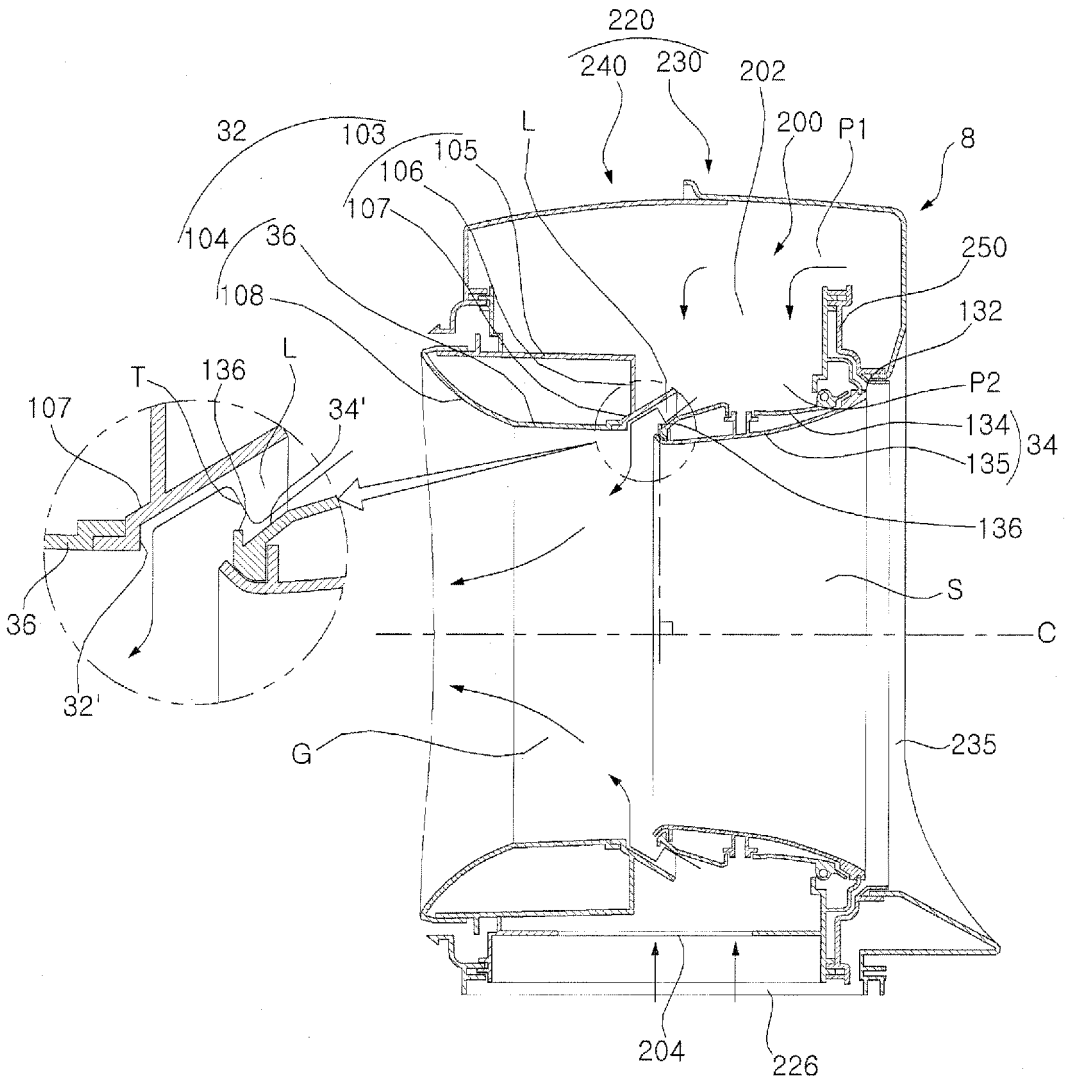


FIG. 15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EUROPEAN SEARCH REPORT

Application Number
EP 12 19 4253

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 029 451 A (IMAIIDA TSUYOSHI [JP] ET AL) 9 July 1991 (1991-07-09) * line 64 - column 10, line 38; figures 17,9 * -----	1,2,7,9	INV. F24F13/26 F24F1/00

TECHNICAL FIELDS SEARCHED (IPC)

F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 February 2013	Decking, Oliver

CATEGORY OF CITED DOCUMENTS

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20-02-2013

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		US 5097674 A	24-03-1992

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