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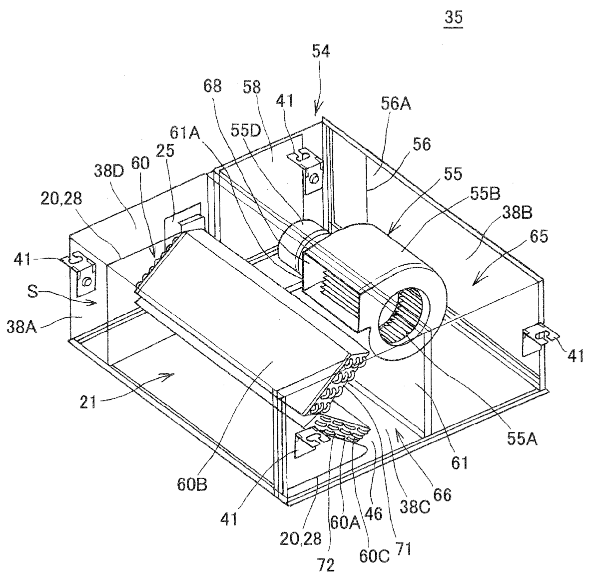
(54) Built-in type air conditioner

(57) A built-in type air conditioner (30,40) having a unit body (35, 135) in which a heat exchanger (60)and an air blowing fan (55) are mounted, characterized in that the heat exchanger (60) comprises a planar upper heat exchanger (71) and a planar lower heat exchanger (72) that are joined to each other to have a V-shape in side view, and the air blowing fan (55) has an air blow-out port (68) that is disposed so as to confront the apex of the V-shape of the V-shaped heat exchanger.

FIG.4



EP 2 402 669 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a built-in type air conditioner installed on a ceiling portion of a building or the like.

2. Description of the Related Art

[0002] There is known a built-in type air conditioner which is installed on a ceiling portion of a building and in which an air blow-out duct is provided to an unit body containing a heat exchanger and a fan so as to extend from the unit body (for example, see JP-A-2000-274724). In the built-in type air conditioner disclosed in JP-A-2000-274724, the heat exchanger is designed like a flat plate, and it is disposed substantially vertically so as to be orthogonal to an air blow-out direction of the fan.

[0003] In the built-in type air conditioner described above, the flat-plate type heat exchanger is vertically mounted, and thus when the capacity of the heat exchanger is increased, the size of the air conditioner increases in the vertical direction. Particularly, with respect to the built-in type air conditioner installed on the ceiling portion, the installation space for the air conditioner is restricted, and thus it is required to suppress the height of the built-in air conditioner. When the flat-plate type heat exchanger is mounted to tilt obliquely, it would be possible to suppress the height of the built-in type air conditioner. However, when only the heat exchanger is merely tilted, the distance between the fan and the heat exchanger (and the amount of air flow to be supplied from the fan to the heat exchanger) is greatly uneven, and this causes a problem that the efficiency of the heat exchange is lowered.

SUMMARY OF THE INVENTION

[0004] The present invention has been implemented in view of the foregoing situation, and has an object to provide a built-in type air conditioner installed on a ceiling portion of a building with which the amount of air flow to be supplied to the indoor heat exchanger can be made substantially even over the indoor heat exchanger and heat exchange efficiency can be enhanced with suppressing the height of the air conditioner concerned.

[0005] In order to attain the above obj ect, according to the present invention, a built-in type air conditioner (30,40) having a unit body (35, 135) in which a heat exchanger (60)and an air blowing fan (55) are mounted, is characterized in that the heat exchanger (60) comprises a planar upper heat exchanger (71) and a planar lower heat exchanger (72) that are joined to each other to have a V-shape in side view, and the air blowing fan (55) has an air blow-out port (68) that is disposed so as to confront the apex of the V-shape of the V-shaped heat exchanger.

[0006] In the above built-in type air conditioner, the V-shaped heat exchanger (60) may be disposed so as to be tilted by a predetermined angle.

[0007] In the above built-in type air conditioner, the predetermined angle may be set to 90°.

[0008] In the above built-in type air conditioner, the air blow-out port (68) may be set so that an intermediate point M thereof is located at a position upwardly-displaced from an horizontal line passing through the apex of the V-shape of the V-shaped heat exchanger in side view and faces the apex of the V-shape of the V-shaped heat exchanger, whereby air flow from the air blow-out port of the air blowing fan prevails fully over the upper heat exchanger and the lower heat exchanger.

[0009] In the above built-in type air conditioner, the V-shaped heat exchanger may be disposed so that an unfolded side (75) of the V-shape thereof faces the air blow-out port of the air blowing fan.

[0010] In the above built-in type air conditioner, the V-shaped heat exchanger may be disposed so that an unfolded side (75) of the V-shape thereof faces a downstream side of the V-shaped heat exchanger.

[0011] The built-in type air conditioner may further comprise a drain pump (63) disposed in a space formed between the air blowing fan (55)and the heat exchanger (60), wherein the unit body has side plates (38A, 38B, 38C, 38D), the drain pump is located to be near to one side plate (38D) of two confronting side plates (38C, 38D) in the unit body, the heat exchanger is located to be near to the other side plate (38C) in the longitudinal direction thereof.

[0012] The built-in type air conditioner may further comprises a refrigerant pipe which is provided at the one side plate (38D) side in the unit body so as to penetrate through the one side plate (38D).

[0013] In the above built-in type air conditioner, the air blowing fan is a centrifugal air blower.

[0014] According to the presents invention, eth heat-exchange efficiency can be enhanced with suppressing the height of the built-in type air conditioner.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Figs. 1A and 1B are side views showing a first embodiment of a built-in type air conditioner to which an air conditioner of the present invention is applied;
Fig. 2 is a perspective view showing a duct-based built-it type air conditioner;
Fig. 3 is a perspective view showing a panel-based built-in type air conditioner;
Fig. 4 is a perspective view showing the construction of the inside of a unit body;
Fig. 5 is a plan view showing the unit body;
Fig. 6 is a side view showing the construction of the inside of the unit body; and

Fig. 7 is a side view showing the construction of the inside of the unit body according to a second embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] Preferred embodiments according to the present invention will be described hereunder with reference to the accompanying drawings.

[First Embodiment]

[0017] Figs. 1A and 1B are diagrams showing a first embodiment of a built-in type air conditioner to which an air conditioner according to the present invention is applied. Particularly, Fig. 1A is a side view showing a duct-based built-in type air conditioner, and Fig. 1B is a side view showing a panel-based built-in type air conditioner.

[0018] Each of the duct-based built-in type air conditioner 40 (built-in type air conditioner) shown in Fig. 1A and the panel-based built-in type air conditioner 30 (built-in type air conditioner) shown in Fig. 1B is disposed to be suspended in a ceiling space 34 between the ceiling 32 and the ceiling board 33 of a building 31, and has a unit body 35 in which an indoor heat exchanger 60 (heat exchanger) and a fan 55 (air blowing fan) for blowing air to the indoor heat exchanger 60 are mounted, and an air blow-out duct 36 extending from the unit body 35 to the ceiling board 33.

[0019] Fig. 2 is a perspective view showing the duct-basedbuilt-in type air conditioner 40. Fig. 3 is a perspective view showing the panel-based built-in type air conditioner 30.

[0020] The body case 54 of the unit body 35 comprises four side plates 38A, 38B, 38C and 38D which are provided in a rectangular frame shape so as to confront each other, a top plate 39 fixed to the upper edge portions of the four side plates 38A, 38B, 38C and 38D and a bottom plate 46 fixed to the lower edge portions of the four side plates 38A, 38B, 38C and 38D.

[0021] Plural hanging rings 41 are fixed to the side plates 38C and 38D in the width direction of the body case 54 of the unit body 35. The hanging rings 41 are fixedly fitted to hanging bolts 42 hanging from the ceiling 32 of the building 31, whereby the duct-based built-in type air conditioner 40 and the panel-based built-in type air conditioner 30 are hung to the ceiling 32 of the building 31.

[0022] The indoor heat exchanger 60 mounted in the body case 54 is connected to an outdoor unit (not shown) through a refrigerant pipe 44 (see Fig. 5).

[0023] The indoor heat exchanger 60 cools or heats air sucked into the unit body 35 by evaporation or condensation of refrigerant introduced from the outdoor unit.

[0024] With respect to the air blow-out duct 36 shown in Fig. 1, plural air blow-out ducts 36 are normally provided so as to extend from the unit body 35. One end of each of the air blow-out ducts 36 is engagedly fitted to an air blow-out port 47 (see Figs. 2 and 3) which is integrally mounted on the side plate 38A facing the air flow direction of the fan 5.5 in the main body case 54, and the other end thereof is secured to an air blow-out grille. The air blow-out grille 48 is disposed at a proper position of the ceiling board 33 so as to be exposed to the indoor side.

[0025] A fan 55 of the unit body 35 sucks indoor air in the unit body 35, and blows this air to the indoor heat exchanger 60. Air heat-exchanged in the indoor heat exchanger 60 is passed through the air-blowout duct 36 and blown out from the air blow-out grille 48 into a room.

[0026] The panel-based built-in type air conditioner 30 shown in Fig. 1B and Fig. 3 is configured so that the ceiling panel 49 is engagedly fitted in a lower opening of the unit body 35. The ceiling panel 49 has a suction plate 50 at the center position, and indoor air sucked from the suction port of the suction plate 50 is introduced into the unit body 35.

[0027] Furthermore, in the duct-based built-in type air conditioner 40 shown in Fig. 1A and Fig. 2, a suction opening 56 (see Fig. 4) is formed in a side plate (that is, the side plate 38B at the back side of the duct-based built-in type air conditioner 40) confronting the side plate 38A in which air blow-out ports 47 are formed, and normally one suction duct 52 is continuously connected to the side plate 38B through a filter box 51, for example. A suction grille 53 is engagedly fitted to an end portion of the suction duct 52 at the ceiling plate 33 side, and the suction grille 53 is disposed at a proper position of the ceiling plate 33. Indoor air is sucked from the suction grille 53, passed through the suction duct 52 and introduced into the unit body 35. The lower opening of the unit body 35 of the duct-based built-in type air conditioner 40 is closed by a wind shielding plate 57.

[0028] Fig. 4 is a perspective view showing the internal construction of the unit body 35. Fig. 5 is a plan view showing the unit body 35, and shows a state that the top plate 39 is detached. Fig. 6 is a side view showing the internal construction of the unit body 35.

[0029] As shown in Figs. 4 to 6, the inside of the body case 54 is partitioned into a fan chamber 65 containing a fan 55 mounted therein and a heat exchanger chamber 66 containing an indoor heat exchanger 60 mounted therein by a partition plate 61 which is substantially parallel to the side plate 38B.

[0030] As shown in Fig. 4, a partition wall 20 for partitioning the upstream side and lower stream side of the indoor heat exchanger 60 in the heat exchanger chamber 66 is provided between each of one end 59A and the other end 59B of the indoor heat exchanger 60 and the inner surface of the side plate 38A. A space at the lower stream side of the indoor heat exchanger 60 in the heat exchanger chamber 66 serves as an air-conditioned air chamber 21 through which air heat-exchanged in the indoor heat exchanger 60 is passed. Aheat-insulating member 28 is adhesively attached to each of the partition wall 20 for partitioning the air-conditioned air chamber 21 and the upper surface 21A of the air-conditioned air chamber 21.

[0031] An electrical component box 67 (see Fig. 5) in which electrical components such as the fan 55, a controller for controlling the air conditioner, etc. are mounted is disposed in the fan chamber 65.

[0032] The heat exchanger chamber 66 is provided with a drain pan 62 (see Fig. 6) for receiving drain water of the indoor heat-exchanger 60 and a drain pump 63 for discharging drain water stocked in the drain pan 62 to the outside of the unit body 35. In Figs. 4 and 5, the drain pan 62 is omitted from the illustration.

[0033] The fan 55 has a cylindrical fan body 55A having many vanes, a fan case 55B in which the fan body 55A is mounted, and a fan motor 55D for rotating the fan body 55A through a motor shaft 55C extending in the axial direction of the fan body 55A. Here, a sirocco fan as a centrifugal air blower is used as the fan 55.

[0034] The partition plate 61 is provided with a rectangular opening 61A, and the rectangular air blow-out port 68 of the fan 55 is connected to the opening 61A and exposed to the heat exchanger chamber 66 side. The fan 55 is disposed at the intermediate portion between the side plates 38C and 38D, and the air blow-out port 68 of the fan 55 is disposed substantially at the intermediate portion in the longitudinal direction of the partition plate 61, so that the position of the air blow-out port 68 is substantially coincident with the intermediate portion in the longitudinal direction of the indoor heat exchanger 60 in the width direction of the heat exchanger chamber 66.

[0035] Furthermore, as shown in Fig. 6, the air blow-out port 68 is disposed so as to confront the upper portion of the heat exchanger chamber 66, and the lower wall 68A of the air blow-out port 68 is located at a higher position than the intermediate position in the vertical direction of the heat exchanger chamber 66.

[0036] As shown in Fig. 4, a closing plate 56A for closing the suction opening 56 when the filter box 51 is not connected is detachably provided to the side plate 38B of the fan chamber 65. Furthermore, the side plate 38D of the fan chamber 65 is provide with a lid plate 58 for closing an opening which is opened during maintenance of the electrical component box 67 or the fan 55.

[0037] As shown in Fig. 6, the drain pan 62 is supported on the bottom plate 46, and located at the lower portion of the heat exchanger chamber 66. The drain pan 62 is configured to extend substantially fully in the depth direction of the unit body 35 between the side plate 38A and the partition plate 61, and an upwardly projecting heat exchanger support portion 69 is formed at the intermediate portion of the drain pan 62. Furthermore, the heat-insulating member 28 is also provided on the lower surface of the drain pan 62.

[0038] The indoor heat exchanger 60 is supported at the lower end thereof by the heat exchanger support portion 69 extending in the width direction of the unit body 35. A water path through which the heat exchanger chamber 66 side and the air-conditioned air chamber 21 intercommunicate with each other is formed at the heat exchanger support portion 69.

[0039] The indoor heat exchanger 60 is a fin-and-tube type heat exchanger, and has a pair of tube plates 60A extending in the air flowing direction, plural fin plates 60B disposed between the tube plates 60A so as to be spaced from one another, and plural tubes 60C penetrating through the fin plates 60B. The tubes 60C are joined to one another as one refrigerant pipe through U-shaped portions each of which is provided to the end of each tube 60C.

[0040] The indoor heat exchanger 60 extends in the longitudinal direction thereof between the side plates 38C and 38D, and a space S located at one side 35A in the width direction of the unit body 35 is formed between one end 59A in the longitudinal direction of the indoor heat exchanger 60 and the side plate 38D as shown in Fig. 5. The indoor heat exchanger 60 is disposed so that the other end 59B side in the longitudinal direction thereof is close to the other side 35B of the inside of the unit body 35.

[0041] The indoor heat exchanger 60 is connected to the outdoor unit (not shown) through a pair of refrigerant pipes comprising a gas pipe and a liquid pipe, and one refrigerant pipe 44 is shown in Fig. 5. The refrigerant pipe 44 is connected to one end 59A in the longitudinal direction of the indoor heat exchanger 60, and extends to penetrate through the side plate 38D. The other refrigerant pipe (not shown) is also connected to one end 59A and extends to penetrate through the side plate 38D. That is, the pair of refrigerant pipes containing the refrigerant pipe 44 are collectively disposed in the space S. Therefore, the unit body 35 can be designed to have a simple structure.

[0042] The indoor heat exchanger 60 is constructed by combining two planar heat exchangers, and it has an upper heat exchanger 71 (upper heat exchange unit) disposed at the upper portion of the heat exchanger chamber 66, and a lower heat exchanger 72 (lower heat exchange unit) disposed at the lower portion of the heat exchanger chamber 66.

[0043] The upper heat exchanger 71 and the lower heat exchanger 72 are joined to each other by a joint member 73 (the apex of V-shape) provided between the lower end of the upper heat exchanger 71 and the upper end of the lower heat exchanger 72. The indoor heat exchanger 60 is designed in clockwise-tilted V-shape (that is, V-shape which is clockwise rotated around the apex thereof by a predetermined angle, preferably 90°) in side view taken from the side plate 38C so that both the ends 74 of the indoor heat exchanger 60 extend in the up-and-down direction in Fig. 6. As described above, the indoor heat exchanger 60 is designed in a clockwise-tilted V-shape which unfolds (expands) in the up-and-down direction. Therefore, as compared with a case where the plantar heat exchanger is disposed upright, the height of the heat exchanger in the unit body 35 can be reduced.

[0044] The indoor heat exchanger 60 is configured so that the upper heat exchanger 71 and the lower heat exchanger 72 are substantially symmetrical with each other with reference to a horizontal plane H passing through the joint member 73 as shown in Fig. 6, and the upper heat exchanger 71 and the lower heat exchanger 72 have substantially the same size in the height direction and the depth direction of the unit body 35.

[0045] In the heat exchanger chamber 66, the air blow-out port 68 of the fan 55 and the indoor heat exchanger 60 are disposed to be spaced from each other as shown in Fig. 6, whereby a space P is provided between the partition plate 61 and the indoor heat exchanger 60, and the drain pump 63 is disposed at one side 35A of the inside of the unit body 35 in the space P. The space P is continuous with the space S at the corner portion of the heat exchanger chamber 66, and the drain pump 63 is disposed to be adjacent to the pair of refrigerant pipes containing the refrigerant pipe 44.

[0046] A lid 25 for closing an opening which is formed in the side plate 38D and opened during maintenance of the drain pump 63, the refrigerant pipes, etc. is provided in the neighborhood of the drain pump 63 on the plane of the side plate 38D.

[0047] As shown in Fig. 6, the indoor heat exchanger 60 is disposed so that the open side (unfolded side) 75 of the V-shape confronts the air blow-out, port 68 of the fan 55. That is, the indoor heat exchanger 60 is disposed so that bath the ends 74 of the V-shape confronts the fan 55 side and the joint member 73 corresponding to the apex of the V-shape confronts the air-conditioned air chamber 21 side. A gap G is secured in the depth direction between both the ends 74 of the V-shape and the air blow-out ports 68 of the fan 55 so that the drain pump 63 can be disposed in the gap G. As described above, the gap G is secured, and air stream flowing from the air blow-out port 68 expands in the up-and-down direction and the width direction as it is far away from the air blow-out port 68, so that air stream can be made to prevail all over the upper heat exchanger 71 and the lower heat exchanger 72.

[0048] The air blow-out port 68 of the fan 55 is located at a height position corresponding to the upper portion of the indoor heat exchanger 60 so as to be downwardly tilted toward the joint member 73 side so that air can be fully blown to the whole area of the indoor heat exchanger 60. Specifically, a lower wall 68A and an upper wall 68B constituting the lower surface and upper surface of an air blow-out passage defining the air blow-out port 68 are provided to be downwardly inclined to the joint member 73 side. The intermediate point M in the up-and-down direction of the air blow-out port 68 is located to be upwardly displaced from an extension line of the horizontal plane H passing through the joint member 73 as shown in Fig. 6, so that air streams from the fan 55 are blown out along the lower wall 68A and the upper wall 68B, and an air stream from the intermediate point M reaches the periphery of the joint member 73.

[0049] Here, the air streams blown out from the fan 55 will be described with reference to Figs. 5 and 6. In Figs. 5 and 6, the directions of the air streams blown out from the fan 55 are represented, by arrows, and the length of each arrow corresponds the amount of air flow.

[0050] The fan 55 comprises a sirocco fan. The amount of air flow from the center portion of the air blow-out port 68 is largest and the amount of air flow from a position which is outwardly displaced from the center is smaller. Accordingly, in Figs. 5 and 6, the amount of air flow (air stream) X1, Z1 from the center portion is large, and the amounts of air flow (air stream) X2, Z2 and air flow (air stream) X3, Z3 from the outer positions are smaller than the amount of the air stream X1, Z1.

[0051] As shown in Fig. 5, the air blow-out port 68 is located at the position corresponding to the intermediate portion in the longitudinal direction of the indoor heat exchanger 60, so that air can be fully blown all over in the longitudinal direction of the indoor heat exchanger 60, and thus the efficiency of heat exchange can be enhanced. Furthermore, the gap G is provided between the air blow-out port 68 and the indoor heat exchanger 60, and the air flow sufficiently spreads and reaches both the ends 59A and 59B in the longitudinal direction of the indoor heat exchanger 60 like air streams X2 and X3, so that air can be fully blown out all over in the longitudinal direction.

[0052] As shown in Fig. 6, the indoor heat exchanger 60 is disposed so that the open side (unfolded side) 75 of the V-shape thereof confronts the air blow-out port 68 of the fan 55. The upper heat exchanger 71 and the lower heat exchange 72 are farther away from the air blow-out port 68 as the body positions thereof are closer to the joint member 73 side, and the upper and lower heat exchangers 71 and 72 are closer to the air blow-out port as the body positions thereof are closer to both the ends 74 thereof. The air stream Z1 blown out from the intermediate point M in the up-and-down direction of the air blow-out port 68 has a larger amount of air flow than the air streams Z2, z3 at the outside of the intermediate point M. Therefore, a sufficient amount of air flow can be also supplied to the area around the joint member 73 which is far away from the air blow-out port 68. Furthermore, the areas around both the ends 74 of the indoor heat exchanger 60 are located to be near to the air blow-out port 68, and thus a sufficient amount of air flow can be supplied to the areas around both the ends 74 although the air streams Z2, z3 have a smaller amount of air flow than the air stream Z1.

[0053] As describedabove, the indoor heat exchanger 60 is disposed so that the open (unfolded) side 75 of the V-shape thereof confronts the air blow-out port 68 of the fan 55 in accordance with the air flow distribution of the fan 55 with which the air flow amount of the air stream Z1 from the intermediate point Z1 is largest, and also the air blow-out port 68 is located and oriented so that the air stream Z1 reaches the joint member 73. Therefore, air flow can be made to fully prevail all over in the up-and-down direction of the indoor heat exchanger 60, and thus the heat-exchange efficiency can be enhanced.

[0054] Furthermore, a gap G is provided between the air blow-out port 68 and the indoor heat exchanger 60, and air streams sufficiently spread and reach both the ends 74 corresponding to the ends in the height direction like air streams Z2 and Z3, so that air can be made to fully flow in the height direction.

[0055] As described above, according to the first embodiment to which the present invention is applied, the indoor heat exchanger 60 is provided so that the upper heat exchanger 71 and the lower heat exchanger 72 are joined to each other so as to form a clockwise-tilted V-shape in side view, and the air blow-out port 68 of the fan 55 is provided so as to confront the joint member 73 corresponding to the apex (bottom point) of the V-shape. Therefore, the height of the indoor heat exchanger 60 can be reduced, and the distance between the fan 55 and the indoor heat exchanger 60 can be prevented from being greatly uneven. Accordingly, the heat-exchange efficiency can be enhanced and also the height of the unit body 35 can be suppressed.

[0056] Furthermore, the air stream Z1 from the intermediate point M of the air blow-out port 68 is blown to the joint member 73. Therefore, even when the intermediate point M of the air blow-out port 68 of the fan 55 is upwardly displaced from the extension line of the horizontal plane H passing through the joint member 73 of the indoor heat exchanger 60, air flow can be made to fully prevail over the upper heat exchanger 71 and the lower heat exchanger 72, and thus the heat-exchange efficiency can be enhanced.

[0057] Furthermore, the open side (unfolded side) 75 of the V-shaped indoor heat exchanger 60 is oriented to face the air blow-out port 68 of the fan 55, and the shape of the air inlet side of the indoor heat exchanger 60 is set in conformity with the air flow distribution of the fan 55, so that the heat-exchange efficiency can be further enhanced.

[0058] The air blow-out port 68 of the fan 55 and the indoor heat exchanger 60 are disposed so as to form the gap therebetween. Therefore, the range of air flow from the air blow-out port 68 expands, and thus air flow can be made to prevail to the end portions of the indoor heat exchanger 60, so that the heat-exchange efficiency can be enhanced. Furthermore, the pair of refrigerant pipes containing the drain pump 63 and the refrigerant pipe 44 are collectively provided at one side 35A in the width direction in the unit body 35, and thus the unit body 35 can be simply constructed.

[0059] Furthermore, the fan 55 is a sirocco fan as a centrifugal air blower. Therefore, large static pressure can be achieved, and a large amount of air flow can be obtained even in the construction in which a relatively large air blow-out duct 36 extending to the indoor heat exchanger 60 and the ceiling board 33 is provided at the downstream side of the fan 55.

[0060] The first embodiment is an example to which the present invention is applied, and the present invention is not limited to the first embodiment describedabove. In the first embodiment, the apex of the V-shape corresponds to the joint member 73, however, the present invention is not limited to this style. The apex concerned may be the apex of a V-shaped heat exchanger in which the upper heat exchanger 71 and the lower heat exchanger 72 are integrally formed.

[Second Embodiment]

[0061] A second embodiment to which the present invention is applied will be described with reference to Fig. 7. In the second embodiment, the same constituent elements as the first element are represented by the same reference numerals, and the description thereof is omitted.

[0062] The second embodiment is structurally different from the first embodiment in that the V-shaped indoor heat exchanger 60 is disposed in counterclockwise-tilted V-shape (that is, V-shape which is counterclockwise rotated around the apex thereof by a predetermined angle, preferably 90°) in side view taken from the side plate 38C side) in a unit body 135 of the second embodiment.

[0063] Fig. 7 is a side view showing the internal construction of the unit body 135 of the second embodiment.

[0064] As shown in Fig. 7, the indoor heat exchanger 60 is disposed so that the open side (unfolded side) 75 of the V-shaped indoor heat exchanger 60 faces the downstream side of the indoor heat exchanger 60 in the heat exchanger chamber 66, and the joint member 73 faces the air blow-out port 68 of the fan 55. That is, the indoor heat exchanger 60 is oriented in a counterclockwise tilted V-shape in side view taken from the side plate 38C side so that both the ends 74 of the V-shape faces the air-conditioned air chamber 121 side located at the downstream side of the indoor heat exchanger 60 and the joint member 73 as the apex of the V-shape faces the fan 55. The gap G is secured in the depth direction between the joint member 73 at the apex of the V-shape and the air blow-out port 68 of the fan 55 so that the drain pump 63 can be disposed in the gap G.

[0065] The air stream Z1 blown out from the intermediate point M in the up-and-down direction of the air blow-out port 68 is blown out along the lower wall 68A and the upper wall 68B, and flows to the area around the joint member 73.

[0066] In the second embodiment, both the ends 74 of the V-shaped indoor heat exchanger 60 extend to the air-conditioned air chamber 121 side, and the distance between the side plate 38A and both the ends of the V-shape is short. Therefore, the length in the depth direction of the upper surface 121A of the air-conditioned air chamber 121 is short. Therefore, the length in the depth direction of the heat-insulating member 128 covering the upper-surface 121A of the air-conditioned air chamber 121 can be reduced as compared with the first embodiment, and the use amount of the heat-insulating member 128 can be reduced. Furthermore, the heat exchanger support unit 169 mounted on the drain pan 62 is formed to be shifted to the side plate 38A.

[0067] The foregoing description of the embodiments of the present invention has been provided for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Obviously, many modifications and variations will be apparent to practitioners skilled in the art. The embodiments were chosen and described in order to best explain the principles of he invention and its practical applications, thereby enabling others skilled in the art to understand the invention for various embodiments and with the various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the following claims and their equivalents.

Claims

1. A built-in type air conditioner (30,40) having a unit body (35, 135) in which a heat exchanger (60) and an air blowing fan (55) are mounted, **characterized in that** the heat exchanger (60) comprises a planar upper heat exchanger (71) and a planar lower heat exchanger (72) that are joined to each other to have a V-shape in side view, and the air blowing fan (55) has an air blow-out port (68) that is disposed so as to confront the apex of the V-shape of the V-shaped heat exchanger.

2. The built-in type air conditioner according to claim 1, wherein the V-shaped heat exchanger (60) is disposed so as to be tilted by a predetermined angle.

3. The built-in type air conditioner according to claim 2, wherein the predetermined angle is set to 90°.

4. The built-in type air conditioner according to claim 1, 2 or 3, wherein the air blow-out port (68) is set so that an intermediate point M thereof is located at a position upwardly-displaced from an horizontal line passing through the apex of the V-shape of the V-shaped heat exchanger in side view and faces the apex of the V-shape of the V-shaped heat exchanger, whereby air flow from the air blow-out port of the air blowing fan prevails fully over the upper heat exchanger and the lower heat exchanger.

5. The built-in type air conditioner according to any one of claims 1 to 4, wherein the V-shaped heat exchanger is disposed so that an unfolded side (75) of the V-shape thereof faces the air blow-out port of the air blowing fan.

6. The built-in type air conditioner according to any one of claims 1 to 4, wherein the V-shaped heat exchanger is disposed so that an unfolded side (75) of the V-shape thereof faces a downstream side of the V-shaped heat exchanger.

7. The built-in type air conditioner according to any one of claims 1 to 6, further comprising a drain pump (63) disposed in a space formed between the air blowing fan (55) and the heat exchanger (60), wherein the unit body has side plates (38A, 38B, 38C, 38D), the drain pump is located to be near to one side plate (38D) of two confronting side plates (38C, 38D) in the unit body, the heat exchanger is located to be near to the other side plate (38C) in the longitudinal direction thereof.

8. The built-in type air conditioner according to claim 7, further comprising a refrigerant pipe which is provide at the one side plate (38D) side in the unit body so as to penetrate through the one side plate (38D).

9. The built-in type air conditioner according to any one of claims 1 to 8, wherein the air blowing fan is a centrifugal air blower.

FIG.1A

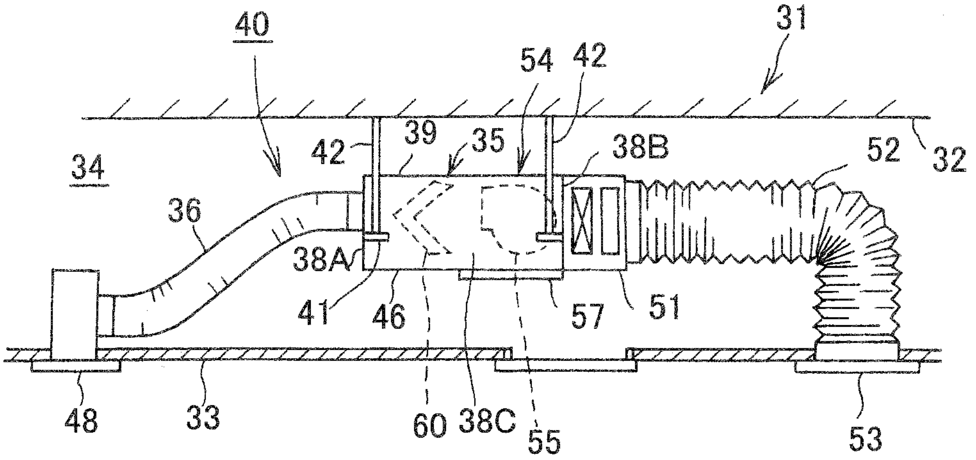
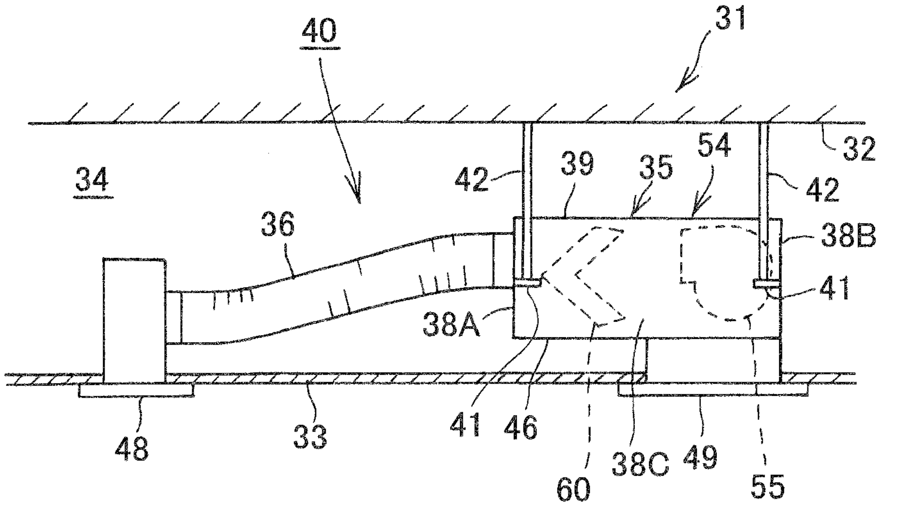

40
31
54
42
42
39
35
38B
52
32
34
36
38A
41
46
57
51
48
33
60
38C
55
53

FIG.1B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36
38B
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38A
48
33
41
46
60
38C
49
55

FIG.2

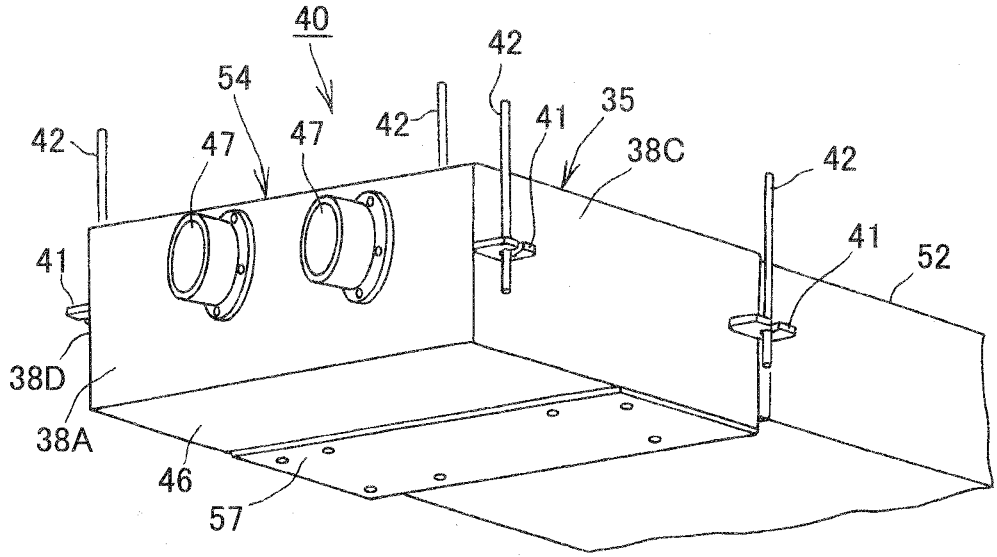


FIG.3

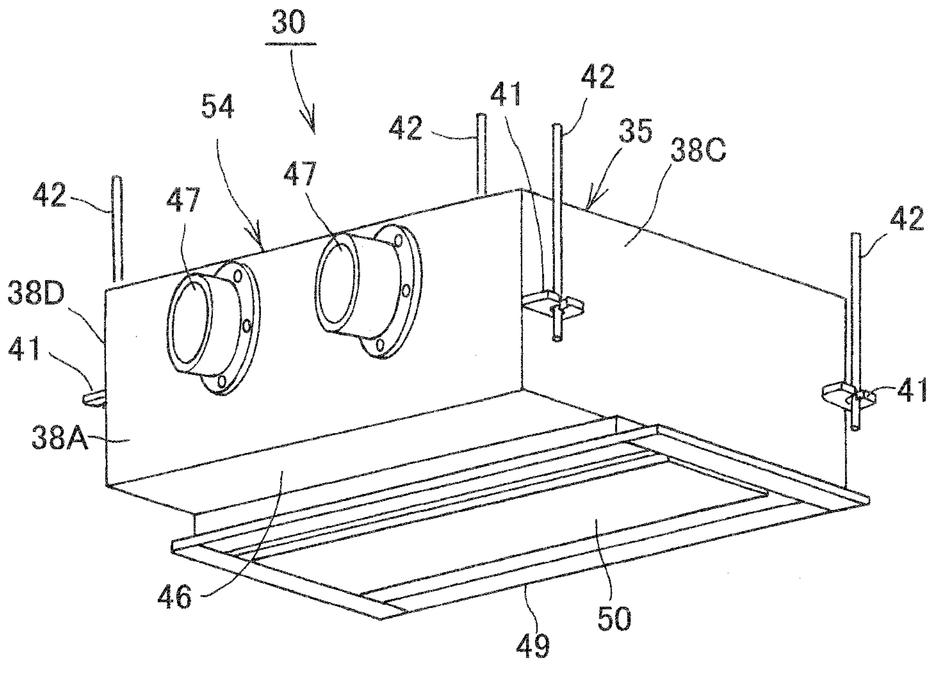
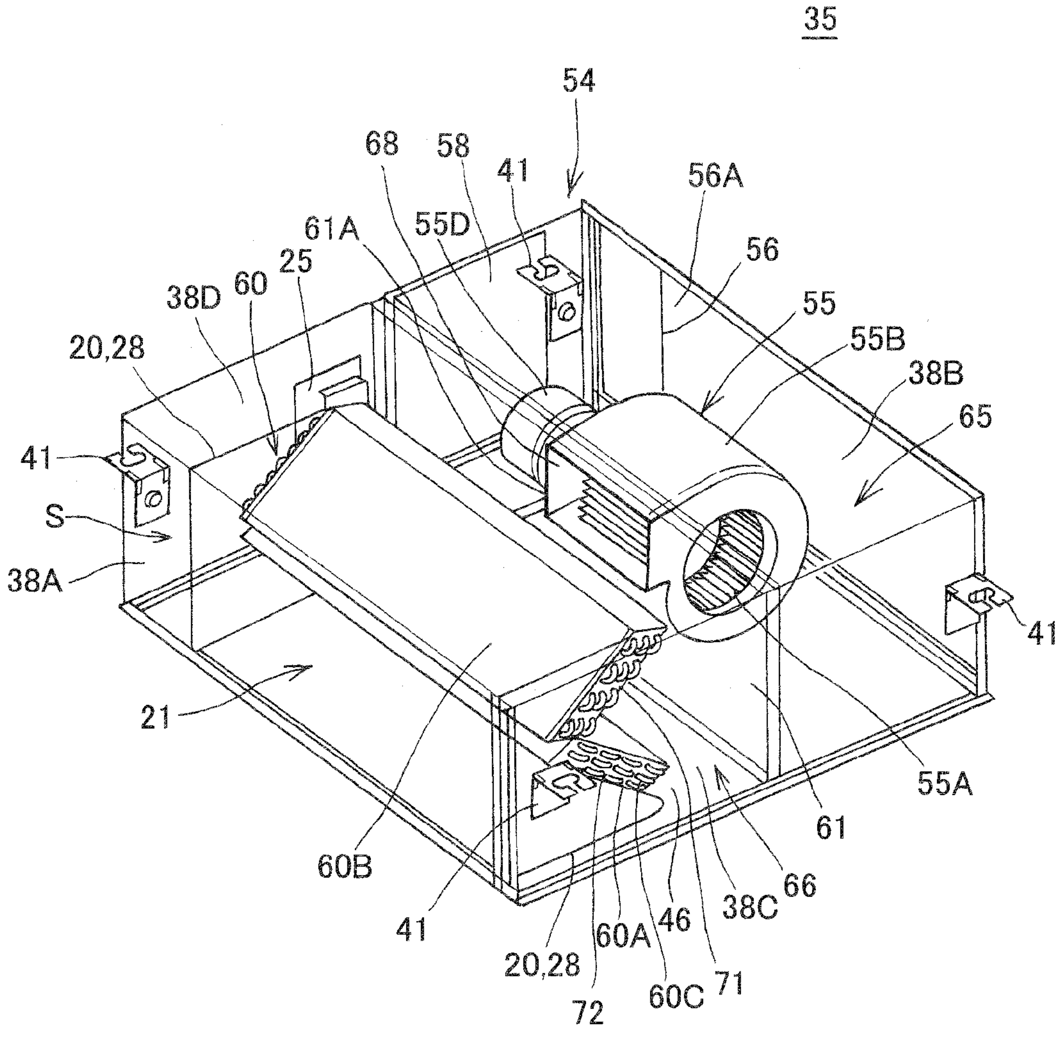


FIG.4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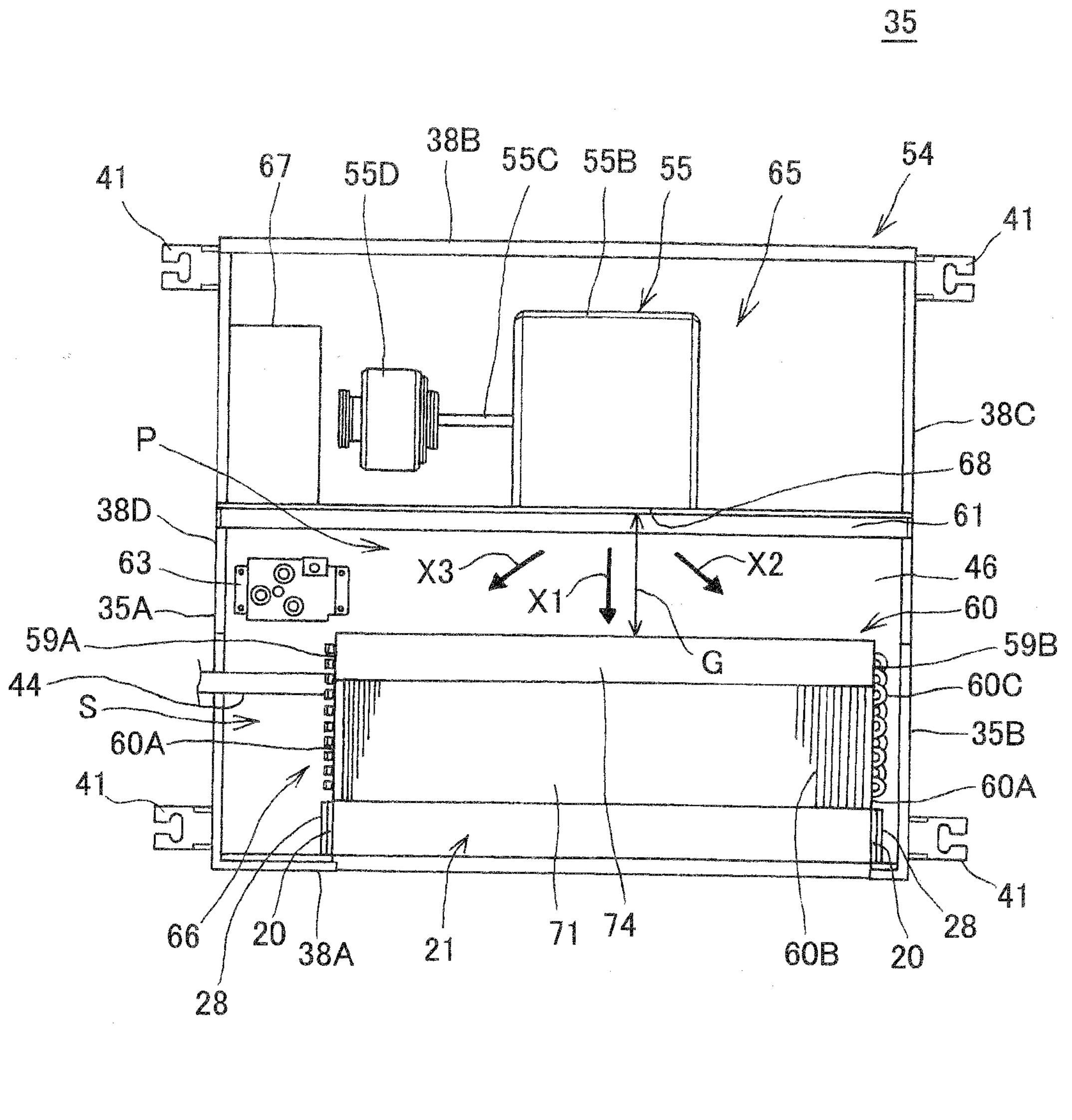
54
68
58
41
56A
61A
55D
56
25
55
38D
60
55B
20,28
38B
65
41
S
38A
41
21
55A
61
60B
66
38C
41
46
60A
20,28
71
60C
72

FIG.5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41
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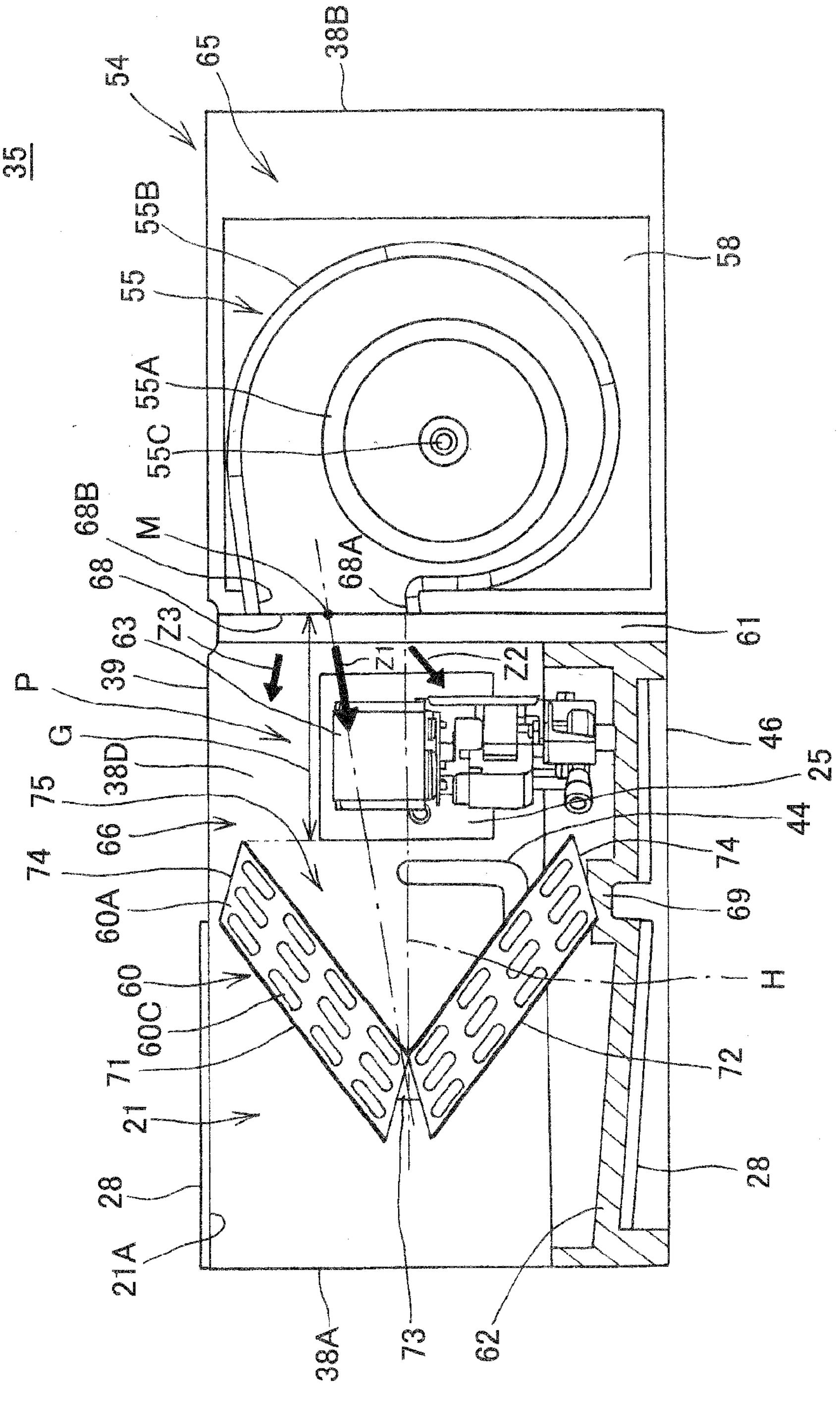
55D
38B
55C
55B
55
65
54
41
38C
P
68
38D
61
63
X3
X1
X2
46
35A
60
59A
G
59B
44
60C
S
35B
60A
41
60A
41
66
20
38A
21
71
74
60B
20
28
28

FIG.6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38B
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55C
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68A
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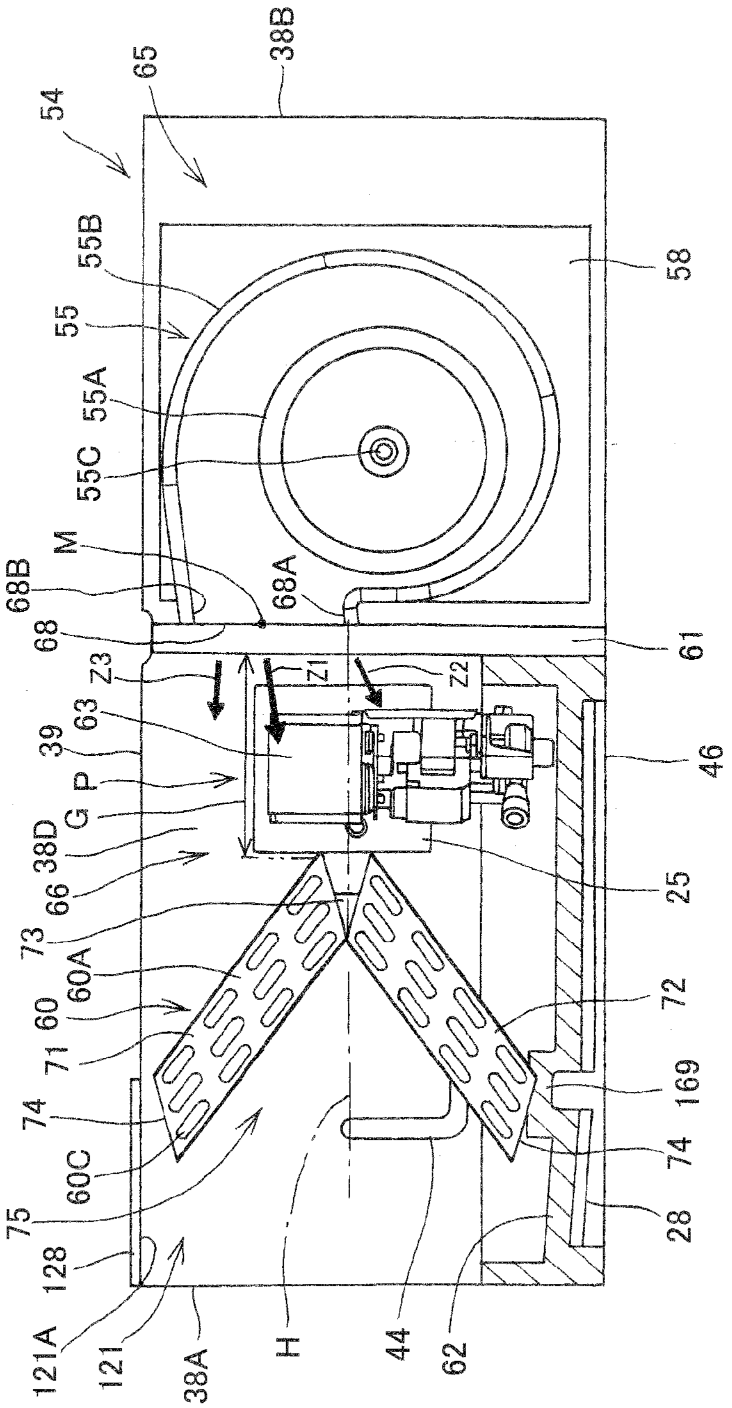
63
Z3
Z1
Z2
61
39
P
G
38D
75
66
74
60A
60
60C
71
21
28
21A
38A
73
62
28
72
H
69
74
44
25
46

FIG. 7

135


38B
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65
55B
58
55
55A
55C
M
68B
68A
68
61
Z3
Z1
Z2
39
63
P
G
46
38D
66
25
73
60A
60
72
71
169
74
60C
74
75
28
128
121A
121
38A
H
44
62

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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