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(54) HEAT SOURCE UNIT FOR A HEAT PUMP

(57) Heat source unit for a heat pump having a refrigerant circuit, the heat source unit comprising a casing (2) having walls defining an interior space, the interior space being separated by a partition (12) into an air chamber (A) and a machine chamber (M); a plurality of components (50, 60, 61, 62, 63) configured to control a refrigerant flow through the refrigerant circuit, the components being accommodated in the machine chamber (M), wherein the walls comprise a maintenance plate (23), the maintenance plate having a first portion (24) delimiting the interior space at a front (7) of the heat source unit in a position corresponding to the machine chamber (M) and a second portion (25) delimiting the interior space at a side (9) of the heat source unit corresponding to the machine chamber (M), the maintenance plate (23) being removable for giving access to the components (50, 60, 61, 62, 63) in the machine chamber (M), wherein the second portion (25) of the maintenance plate (23) covers at least half of the side (9) of the heat source unit in a direction of depth, the depth being the dimension of the heat source unit between the front (7) and a back (8).

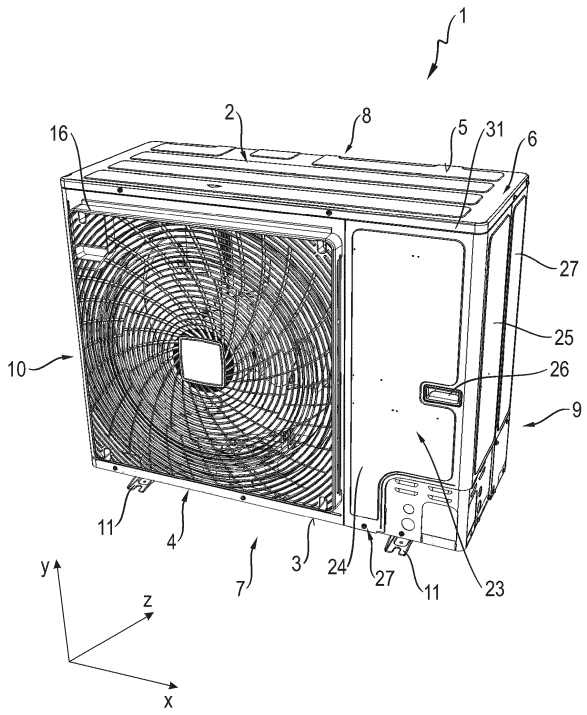

Fig. 1

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Description

Technical Field

[0001] The present disclosure relates to heat pumps for cooling and/or heating purposes having a refrigerant circuit. In particular, the disclosure relates to split-type heat pumps comprising a heat source unit, such as an outdoor unit, and at least one heat consumer unit, such as an indoor unit. Even more particular, the disclosure relates to a heat pump using air as heat source.

Background

[0002] Particularly with respect to domestic appliances, heat source units are often configured as so-called front blowers, wherein the heat source unit has a casing with walls defining an interior space. The space is separated by a vertical partition into an air chamber and machine chamber. A fan is provided in the air chamber for inducing an air flow through the front of the casing and through a heat source heat exchanger. The machine chamber contains a plurality of components of the refrigerant circuit including components controlling the refrigerant flow through the refrigerant circuit.

[0003] Under some circumstances, it is desired to arrange the heat source unit in front of a wall below a window. For this purpose, it is required that the heat source unit does not exceed a certain height of for example 87 mm. Yet, when reducing the height of the casing only, the available space in the machine chamber is reduced. Accordingly, the components contained in the machine chamber need to be arranged more compact. This in turn, however, leads to the problem that some of said components may not be accessed for maintenance purposes without having to dismount others of said components. Therefore, maintenance of the heat source unit is more cumbersome and requires more time.

Summary

[0004] The present disclosure aims at providing a heat source unit enabling ease of maintenance even when the casing is relatively low in height.

[0005] According to an aspect, a heat source unit for a heat pump having a refrigerant circuit is suggested. The refrigerant circuit of a heat pump in its simplest configuration comprises a heat source heat exchanger (outdoor heat exchanger), a heat consumer heat exchanger (indoor heat exchanger), an expansion valve and a compressor connected by refrigerant pipes. In addition, the refrigerant circuit may comprise a 4-way switching valve for switching between heating operation and cooling/defrosting operation (reverse cycle operation).

[0006] The heat source unit comprises a casing (outer casing) having walls defining an interior space. The interior space is separated by a partition into an air chamber and a machine chamber. The air chamber may accommodate a fan for inducing an air flow through the air chamber and through the heat source heat exchanger. The heat source heat exchanger may form one of the walls of the casing of the heat source unit, e.g. at a back of the heat source unit, and delimit the interior space. The machine chamber accommodates a plurality of components configured to control a refrigerant flow through the refrigerant circuit. In this context, "a component configured to control a refrigerant flow through the refrigerant circuit" is any component, be it electrical, electronical and/or mechanical, that is used for the control of the refrigerant circuit including but not limited to a control board or control box, a valve, a sensor, the compressor of the refrigerant circuit, an inverter used for altering the capacity of the compressor and the like. To put it differently, the component may be any electrical/electronical and/or mechanically movable component that requires maintenance.

[0007] The casing may comprise a bottom plate and a top plate. The heat source unit may be mounted to a horizontal surface or brackets fixed to a vertical wall with the bottom plate being oriented horizontally. For this purpose, the feet may be provided at a lower side of the bottom plate, the feet being configured for mounting on the horizontal surface or the brackets. The top plate is arranged opposite to the bottom plate and delimits the height of the heat source unit at an upper end. In one example, the casing further has a front, an opposite back, and opposite sides respectively extending between the front and the back. The walls of the casing comprise a maintenance plate, wherein the maintenance plate has a first portion delimiting the interior space at a front of the heat source unit in a position corresponding to the machine chamber and a second portion delimiting the interior space at a side of the heat source unit corresponding to the machine chamber. In one example, the maintenance plate is, in a top view of the heat source unit, "L" shaped. Moreover, the maintenance plate is removable for giving access to the components in the machine chamber to allow maintenance of the components.

[0008] Additionally, the walls may comprise a bell mouth delimiting the interior space at the front of the heat source unit in a position corresponding to the air chamber. The bell mouth may be covered at its front side by a grille. Further, the walls may comprise the heat source heat exchanger delimiting the interior space at a side of the heat source unit and at the back of the heat source unit corresponding to the air chamber. Thus, in one example, the heat source heat exchanger may, in a top view of the heat source unit, be "L" shaped. An additional rear plate may be provided as one of the walls, the rear plate having a first portion delimiting the interior space at the back of the heat source unit in a position corresponding to the machine chamber and a second portion delimiting the interior space at a side (the same side as the second portion of the maintenance plate) of the heat source unit corresponding to the machine chamber. Hence, in one example, the rear plate is, in a top view of

the heat source unit, "L" shaped.

[0009] According to this aspect the second portion of the maintenance plate, which is arranged to delimit the interior space at the side of the heat source unit covers at least half of that side in a direction of depth. The "depth" is the dimension of the heat source unit between the front and a back. The first portion of the maintenance plate may on the other hand delimit a major portion (more than 50%, according to an example more than 75%) of the front of the machine chamber.

[0010] Whereas in prior art devices the maintenance plate primarily covered the front of the machine chamber giving access only or at least primarily to the components which are accessible from the front, the heat source unit of the above aspect suggests a maintenance plate which also covers at least half of the side of the machine chamber, thereby allowing access to the components from both the front and the side. Accordingly, most of the components may still be accessed for maintenance, even though the components are arranged more compact in the machine chamber without the need to first disassemble some of the components to allow access. Thus, ease of maintenance is realized.

[0011] According to a second aspect, the components comprise a switchboard (also switchbox, control board or control box) having a board and electrical and/or electronical components mounted on a main surface of the board, wherein the main surface faces an inner side of the first portion of the maintenance plate.

[0012] Thus, once the maintenance plate is removed, the switchboard is easily accessible from the front and all of the electrical and/or electronical components mounted on the main surface face the front, whereby they may easily be accessed. In addition, the switchboard may remain fixed in the heat source unit during maintenance. This is particularly advantageous if refrigerant piping of the refrigerant circuit of the heat pump is attached to and in surface contact with the switchboard to provide for a cooling effect of the electrical and/or electronical components. Disassembling the refrigerant piping, which is fragile, bears the risk of damages and is cumbersome. Thus, this aspect further enhances ease of maintenance.

[0013] According to a third aspect, the board is attached to a support extending perpendicularly to the main surface of the board away from the first portion of the maintenance plate. In other words, the support frame extends from the board towards the back of the heat source unit and/or faces an inner side of the second portion of the maintenance plate. The support frame may be a plate or a frame. The support may be fixed to the casing of the heat source unit, particularly to one of the walls of the heat source unit such as the back wall.

[0014] Due to the support, the switchboard can securely be mounted to the casing without impairing the maintenance access. Thus, higher stress on for example refrigerant piping attached to and in surface contact with the switchboard, as explained above, may be avoided.

[0015] According to a fourth aspect the support is mounted to the rear plate of the walls.

[0016] Thus, any forces and stress applied to the switchboard may be spread to the rear plate. Accordingly, the switchboard is securely mounted to the casing.

[0017] According to a fifth aspect, the support has at least one, particularly two or more, maintenance opening/-s.

[0018] Accordingly, it is upon removal of the maintenance plate possible to even reach components in the machine chamber located at a position behind the support through the maintenance opening/-s. Consequently, no dismounting of the support is required, and ease of maintenance is obtained. According to a sixth aspect, the support is a rectangular frame having two first legs parallel to the board and two second legs perpendicular to the first legs, the support further having an intermediate rib extending between the two first legs. In this context, "rectangular" defines a frame having a substantially rectangular base shape, wherein rounded or chamfered edges or corners are still within the scope of the term "rectangular".

[0019] Accordingly, a good balance may be obtained between forming maintenance openings in the support to allow access to the components arranged at positions behind the support and provide rigidity and stability to support the switchboard in the casing.

[0020] According to a seventh aspect, the intermediate rib extends perpendicular to the two first legs. As compared to e.g. a "V" shaped intermediate rib, two generally rectangular maintenance openings having a relatively large size are achieved according to the seventh aspect.

[0021] Consequently, the access to any components hidden behind the support through the maintenance openings is simplified.

[0022] According to an eighth aspect, the board is attached to the top plate of the casing and/or the partition alternatively or additionally to the attachment to the support.

[0023] Consequently, the forces and stress applied to the board of the switchboard may be spread to the top plate and/or the partition. Accordingly, the switchboard is securely mounted to the casing.

[0024] According to a ninth aspect and alternatively to the above-described support, the board may also be attached to a support column supported on a bottom plate of the walls. In one example, the support column may be attached to the bottom plate and to a lower portion, such as a lower edge of the board of the switchboard.

[0025] As a result, any stresses and forces applied to the board of the switchboard may be spread to the bottom plate. Hence, the switchboard will be securely mounted to the casing of the heat source unit.

[0026] According to a tenth aspect, the components configured to control the refrigerant flow in the refrigerant circuit further comprise a switch, a sensor and/or a valve, the switch, the sensor and/or the valve being, in a front view of the heat source unit, located behind the board of the switchboard.

[0027] Consequently, these components are not accessible via the front of the heat source unit upon detachment of the maintenance plate. Yet, due to the configuration of the maintenance plate, these components are accessible via the side of the heat source unit corresponding to the second portion of the maintenance plate. In one example, at least one of these components is accessible through one of the maintenance openings in the support.

[0028] According to an eleventh aspect, the maintenance plate is hooked to the casing and fixed in position at one location by a releasable fastening member. The releasable fastening member may be a screw.

[0029] In one example according to the twelfth aspect, the maintenance plate is hooked to the rear plate of the walls and/or the partition.

[0030] According to a thirteenth aspect, the maintenance plate is fixed in position at only one location by the releasable fastening member.

[0031] Due to this configuration, the maintenance plate may easily be attached and detached for maintenance further enhancing ease of maintenance.

[0032] According to a fourteenth aspect, at least one edge of the maintenance plate comprises one or more engaging member/-s having an upwardly or downwardly extending hook, the engaging member being engaged with a slit-like opening in the casing.

[0033] Thus, the respective edge may easily be hooked to the casing and attachment/detachment of the maintenance plate is simplified.

[0034] According to a fifteenth aspect, at least the engaging member/-s of one edge additionally has/have a downwardly or upwardly extending hook, respectively.

[0035] According to this aspect, the edge having the engagement member with the upwardly and downwardly extending hook may resemble a hinge. Thus, during attachment of the maintenance plate, the edge may for example with the downwardly extending hook be hooked to the casing and temporarily held until the engagement member of another edge is inserted into the respective slit-like opening of the casing and the maintenance plate is moved upward so that the upwardly extending hooks of the engagement member/-s of the one edge and the upwardly extending hooks of the engagement member/-s of the other edge engage behind the respective parts of the casing.

[0036] In one example, one of the edges of the maintenance plate comprises one or more "L" shaped engaging member/-s having an upwardly or downwardly extending hook, the "L" shaped engaging member being engaged with a slit-like opening in the casing, for example the partition or the rear plate. The other of the edges of the maintenance plate comprises one or more "T" shaped engaging member/-s having an upwardly extending hook and a downwardly extending hook, the "T" shaped engaging member being engaged with a slit-like opening in the casing, such as the rear plate or the partition.

Brief Description of the Drawings

[0037] A more complete appreciation of the present disclosure and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings.

[0038] In the drawings,

Figure 1 shows a perspective view on the front of a heat source unit according to an embodiment;

Figure 2 shows a top view of the heat source unit of figure 1 with the top plate being removed;

Figure 3A shows a perspective front view of the maintenance plate of the heat source unit of figure 1;

Figure 3B shows a perspective right side view of the maintenance plate of figure 3A;

Figure 3C shows a perspective left side view of the maintenance plate of figure 3A;

Figure 4A shows a perspective front view of the heat source unit of figure 1 with a maintenance plate being removed;

Figure 4B shows a perspective right side view of the heat source unit of figure 4A;

Figure 4C shows a perspective view of the heat source unit of figure 4A from the right;

Figure 5 shows an alternative shape of the support; and

Figures 6A and B schematically show the use of a support column instead of the support.

Detailed Description

[0039] Embodiments will now be explained with reference to the drawings. It will be apparent to those skilled in the field of heat pumps from this disclosure that the following description of the embodiments is provided for illustration only and not for limiting the invention as defined by the appended claims.

[0040] Figure 1 shows a heat source unit 1 of a heat pump. The heat source unit 1 comprises a casing 2. The casing 2 has a bottom 3 formed by a bottom plate 4 and a top 5 formed by a top plate 6.

[0041] The casing 2 further has a front 7 and an opposite back 8 and opposite sides 9, 10.

[0042] In the present example, the heat source unit 1 is mounted to a horizontal surface or to a bracket mounted to a vertical wall via feet 11. Thus, the height of the

heat source unit 1 is defined between the bottom 3 and the top 5 (Y direction). The width or lengths of the heat source unit 1 is defined between the opposite sides 9 and 10 (X direction). The depth of the heat source unit 1 is defined between the front 7 and the back 8 (Z direction).

[0043] The casing 2 or more particularly the walls of the casing, as explained later, define an interior space visible in the top view of figure 2. The interior space is separated or divided into an air chamber A and machine chamber M by a partition 12.

[0044] In the present example the walls delimiting the interior space comprise a bell mouth 13 arranged at the front 7 of the heat source unit 1 and delimiting the interior space at the front 7 of the heat source unit 1 corresponding to the air chamber A. The air chamber A accommodates a fan 15. The bell mouth 13 comprises a circumferential flange 14 defining an opening and partly accommodating the fan 15. The opening formed by the flange 14 is covered at the front 7 of the heat source unit 1 by a grille 16.

[0045] The walls further comprise a heat source heat exchanger 17 being part of the refrigerant circuit of the heat pump. The heat source heat exchanger 17 comprises a first portion 18 delimiting the interior space at the side 10 of the heat source unit 1 corresponding to the air chamber A. The heat source heat exchanger 17 further comprises a second portion 19 delimiting the interior space at the back 8 of the heat source unit 1 corresponding to the air chamber A. Accordingly, the heat source heat exchanger 17 has in the top view of figure 2 an "L" shape.

[0046] The air chamber A is, thus, defined by the bell mouth 13, the heat source heat exchanger 17 and the partition 12.

[0047] Upon operation of the fan 15 air is sucked in through the heat source heat exchanger 17 at the side 10 and the back 8 and flown through the opening defined by the flange 14 and exhausted at the front 7 of the heat source unit 1. Thereby, refrigerant flowing through the heat source heat exchanger 17 exchanges heat with the air flowing through the heat exchanger 17.

[0048] The walls further comprise a rear plate 20. The rear plate 20 has a first portion 21 delimiting the interior space at the back 8 of the heat source unit 1 corresponding to the machine chamber M. The rear plate 20 further has a second portion 22 delimiting the interior space at the side 9 of the heat source unit 1 corresponding to the machine chamber M.

[0049] Moreover, the walls comprise a maintenance plate 23. The maintenance plate 23 comprises a first portion delimiting the interior space at the front 7 of the heat source unit 1 corresponding to the machine chamber M and a second portion 25 delimiting the interior space at the side 9 of the heat source unit 1 corresponding to the machine chamber M. As best visible in the top view of figure 2 and the perspective side view in figure 4B, the second portion 25 covers at least half of the side 9 of the heat source unit 1 in the depth direction (Z direction). In the example, the second portion 25 even covers more than half of the side 9 of the heat source unit 1 in the depth direction.

[0050] For easy attachment and detachment of the maintenance plate 23 to and from the casing 2 of the heat source unit 1, the maintenance plate is hooked to the casing 2 and fixed in position at one location by a releasable fastening member 27, such as a screw (see figure 1). In the shown example, only one releasable fastening member 27 is used to fix the maintenance plate 23 in position.

[0051] More particularly, the maintenance plate 23 in the shown embodiment is hooked to the partition 12 and to the rear plate 20. In another example, the maintenance plate 23 may also be hooked to the bell mouth 13.

[0052] For this purpose, the free edge of the first portion 24 of the maintenance plate 23 facing the partition 12 has a plurality of engaging members 28a (two in the present example). The engaging members 28a are "L" shaped forming a hook extending upward in the present example, even though a downwardly extending hook is conceivable as well.

[0053] A front edge of the partition 12 comprises a respective number of slit-like openings 29a (see figure 4A). The engaging members 28a are respectively inserted in the slit-like openings 29a formed in the front edge of the partition 12. Thereby the engaging members 28a hook behind the front edge of the partition 12 creating a form fit in a forward direction and fixing the free edge of the first portion 24 of the maintenance plate 23 to the front edge of the partition 12.

[0054] A further ("L" shaped) engaging member 28c may be provided at the first portion 24 of the maintenance plate 23 to be inserted in the same manner into a slit-like opening 29c formed in an auxiliary front plate 30 of the walls of the casing 2.

[0055] As previously mentioned, the maintenance plate 23 is in the shown embodiment also hooked to the rear plate 20, particularly the second portion 22 of the rear plate 20 or even more particular to a front edge of the second portion 22 of the rear plate 20. For this purpose, a rear edge of the second portion 25 of the maintenance plate 23 has a plurality of engaging members 28b (three in the present example). The engaging members 28b are respectively inserted in slit-like openings 29b formed in the front edge of the second portion 22 of the rear plate 20 (see figure 4C).

[0056] The engaging members 28b have at least one hook which extends either upward or downward, which, upon insertion into the slit-like opening 29b hooks behind the front edge of the second portion 22 of the rear plate 22, creates a form fit in a forward direction and fixes the rear edge of the second portion of the maintenance plate 23 to the front edge of the second portion 22 of the rear plate 20. If simple hooks ("L" shaped engaging members) are used, the hooks at the rear edge of the second portion 25 of the maintenance plate 23 and the hooks at the first portion 24 of the maintenance plate 23 should extend in

the same direction (upward or downward).

[0057] Yet, in the present example, the engaging members 28b formed at the rear edge of the second portion 25 of the maintenance plate 23 are "T" shaped (see figures 3B and 3C). Thus, the engaging members 28b have two hooks, one extending upward and the other extending downward. Thus, the engaging members 28b at the rear edge of the second portion 25 of the maintenance plate 23 may serve as a hinge when mounting the maintenance plate 23.

[0058] All the engaging members 28 a-c are respectively formed at an inner side of the maintenance plate 23.

[0059] Moreover, the maintenance plate 23 comprises a handle 26 integrated in the first portion 24 of the maintenance plate 23.

[0060] The machine chamber M is, as explained above, defined by the partition 12, the rear plate 20 and the maintenance plate 23.

[0061] The heat source heat exchanger 17 at one end extends into the machine chamber M to connect the heat source heat exchanger 17 to the refrigerant circuit of the heat pump. The machine chamber M accommodates a plurality of components of the refrigerant circuit of the heat pump including refrigerant piping and components configured to control the flow of refrigerant through the refrigerant circuit particularly through the refrigerant piping.

[0062] The components configured to control the flow of refrigerant through the refrigerant circuit comprise the main expansion valve 60 of the refrigerant circuit, the 4-way valve 61 used for switching between a cooling and heating operation, a high-pressure switch 62, a low-pressure switch, a liquid injection valve 63 and the like.

[0063] Additionally, the components configured to the control the flow of refrigerant through the refrigerant circuit comprise a switchboard 50. The switchboard 50 comprises a board 51 having a main surface 52. A plurality of electronical and/or electrical components 53 are mounted on the main surface 52 of the board 51. A cooling bypass 54 may be branched off the refrigerant circuit and be connected to the main surface 52 of the board 51 for cooling the electrical/electronical components 53 mounted on the main surface 52.

[0064] The switchboard 50 is at one side edge of the board 51 attached to the partition 12 and at an opposite side of the board 51 attached to the rear plate 20 via a support 30. Additionally, the switchboard 50 may also be attached to an inner side (lower side) of the top plate 6.

[0065] The support 40 may be a plate but is, in the shown example, a frame. The support 40 has a substantially rectangular base shape as best visible from figure 4B. Consequently, the support 40 has two first legs 41 extending parallel to the board 51 and two second legs 42 extending substantially perpendicular to the board 51 and to the first legs 41. The first legs 41 and the second legs 42 basically form the rectangular base shape of the support 40. In the present example, the left upper corner of the support 40 is chamfered. In addition, it is apparent that the first legs 41 and the second legs 42 define a plane which extends substantially perpendicular to the main surface 52 of the board 51. Consequently, the support 40 extends away from the board 51 towards the rear plate 20, more particularly towards the first portion 21 of the rear plate 20.

[0066] An intermediate rib 43 is formed at a position intermediate the two second legs 42. The intermediate rib 43 may be centered between the two second legs 42. However, it is also conceivable that the intermediate rib 43 is closer to one of the second legs 42 than to the other. It is also possible to provide more than one intermediate rib 43 if higher rigidity is required. Alternatively, the support 140 may be configured as shown in figure 5 having a "V" shaped intermediate rib 143. In this support 140 three maintenance openings 144 are formed, which are smaller in size than the maintenance openings 44. The support 140 has the advantage of a higher rigidity as compared to the support 40 but due to the smaller size of the maintenance openings 144, it is more difficult to access the components in the machine chamber M through the maintenance openings 144 as compared to the maintenance openings 44.

[0067] As previously mentioned, the support 40 defines two maintenance openings 44. The maintenance openings 44 are respectively defined by one of the second legs 42, portions of the first legs 41 and the intermediate rib 43.

[0068] The support 40 is mounted to the rear plate 20, particularly the second portion 22 of the rear plate 20 at its first legs 41 adjacent to a front edge of the second portion 22 of the rear plate 20.

[0069] In one example, it is conceivable to attach the board 51 to the partition 12 and an inner side of the top plate 16 only. Yet, according to the shown embodiment, the board 51 is attached to the support 40, particularly to the first legs 41 of the support 40 adjacent to the board 51. For this purpose, the switchboard may have slit-like openings 55 and the support 40 may have hooks 45 (see figure 4A). In the present example, the hooks 45 extend downward towards the bottom 3. To fix the switchboard 50 to the support 40 the hooks 45 are inserted into the slit-like openings 55 and the switchboard 50 is moved upward to engage the hooks 45 with the switchboard 50 and realize a form fit.

[0070] Additionally, the switchboard 50 is, in the present example, attached to the partition 12 at the edge opposite to the edge at which the switchboard 50 is attached to the support 40.

[0071] Thus, the switchboard 50 is securely fixed to the casing 2 of the heat source unit 1 and any forces and/or stress applied to the switchboard 50 are spread to the partition 12 and, via the support 42, to the rear plate 20.

[0072] If maintenance of some components in the machine chamber M is required, the maintenance plate 23 must be detached.

[0073] For this purpose, the releasable fastening mem-

ber 27 must be removed. Subsequently, the maintenance plate 23 may be slid downward so that the engaging members 28a-c move downward in the respective slit-like opening 29a-c. If the engaging members have moved down to a lower border of the slit like openings 29a-c, the engaging members 28a and 28c may be withdrawn from the slit-like openings 29a and 29c. On the other hand, the downwardly extending hook of the engaging members 28b hooks behind the front edge of the second portion 22 of the rear plate 20 so that another form fit in a forward direction is created. Subsequently, the maintenance plate 23 may be rotated about the engaging members 28b serving as a hinge giving access particularly to the front of the machine chamber M such as the electrical/electronical components 53 of the switchboard 50 or other components accessible from the front such as the main expansion valve 60 (see figure 4A).

[0074] If necessary, the maintenance plate 23 may also be completely removed by again sliding the maintenance plate 23 upward to some extent to enable disengagement of the engaging members 28b from the slit-like openings 29b.

[0075] Upon removal of the maintenance plate 23 some of the components in the machine chamber M which require maintenance are accessible through the side 9 of the heat source unit 1 (figure 4B). For example, the main expansion valve 60 may be more easily accessible from the side 9. Additionally, some components are accessible through the maintenance openings 44 in the support 40 such as the 4-way valve 61, the high pressure switch 62 and the liquid injection valve 63.

[0076] Accordingly, ease of maintenance is achieved in that the components are easily accessible without having to dismantle some of the components in the machine chamber M and due to the easy detachment of the maintenance plate 23.

[0077] After maintenance, the maintenance plate 23 will again be attached. For this purpose, the engaging members 28b are again inserted into the slit-like openings 29b at the front edge of the second portion 22 of the rear plate 20. Subsequently, the maintenance plate 23 is slid downward to engage the downwardly extending hooks of the engaging members 28b with the front edge of the second portion 22 of the rear plate 20. Subsequently, the maintenance plate 23 may be rotated about the engaging members 28b serving as a hinge to also insert the engaging members 28a and 28c into the slit like openings 29a and 29c. Subsequently, the maintenance plate 23 is again moved upward so that an upper edge 31 (see figure 3A to C) of the maintenance plate 23 engages behind a circumferential rim 32 of the top plate 6 and the engaging members 28a-c or more particularly their upwardly directed hooks, respectively engaged with the front edge of the second portion 22 of the rear plate 20 and of the partition 12 as well as the auxiliary front plate 30, create a form fit in a forward direction. To fix the maintenance plate 23 in this position the releasable fastening member 27 is again fastened.

[0078] It is to be understood that the present description of an embodiment is not considered to be limiting. Rather several modifications may be realized by the skilled person. Instead of using the support 40, the switchboard 50 may also be exclusively attached to the partition 12 and/or an inner side (lower side) of the top plate 6. In a further alternative, the switchboard 50 may be supported by a support column 1140 as shown schematically in figures 6A and B and optionally to the partition 12.

List of References

[0079]

1	heat source unit
2	casing
3	bottom
4	bottom plate
5	top
6	top plate
7	front
8	back
9	side
10	side
11	foot
12	partition
13	bell mouth
14	flange
15	fan
16	grille
17	heat source heat exchanger
18	first portion of the heat source heat exchanger
19	second portion of the heat source heat exchanger
20	rear plate
21	first portion of rear plate
22	second portion of rear plate
23	maintenance plate
24	first portion of maintenance plate
25	second portion of maintenance plate
26	handle
27	fastening member
28	engaging member
29	slit-like opening
30	auxiliary front plate
31	upper edge
32	rim
40	support
140	support
1140	support column
41	first leg
141	first leg
42	second leg
142	second leg
43	intermediate rib
143	intermediate rib
44	maintenance opening

144 maintenance opening
45 hook

50 switchboard
51 board
52 main surface
53 electrical/electronic component
54 cooling bypass
55 slit-like opening

60 main expansion valve
61 4-Way valve
62 high-pressure switch
63 liquid injection valve

A air chamber
M machine chamber

Claims

1. Heat source unit for a heat pump having a refrigerant circuit, the heat source unit comprising:

   a casing (2) having walls defining an interior space, the interior space being separated by a partition (12) into an air chamber (A) and a machine chamber (M);
   a plurality of components (50, 60, 61, 62, 63) configured to control a refrigerant flow through the refrigerant circuit, the components being accommodated in the machine chamber (M),
   wherein the walls comprise a maintenance plate (23), the maintenance plate having a first portion (24) delimiting the interior space at a front (7) of the heat source unit in a position corresponding to the machine chamber (M) and a second portion (25) delimiting the interior space at a side (9) of the heat source unit corresponding to the machine chamber (M), the maintenance plate (23) being removable for giving access to the components (50, 60, 61, 62, 63) in the machine chamber (M),
   wherein the second portion (25) of the maintenance plate (23) covers at least half of the side (9) of the heat source unit in a direction of depth, the depth being the dimension of the heat source unit between the front (7) and a back (8).

2. Heat source unit according to claim 1, wherein the components comprise a switch board (50) having a board (51) and electrical and/or electronical components (53) mounted on a main surface (52) of the board, wherein the main surface (52) faces an inner side of the first portion (24) of the maintenance plate (23).

3. Heat source unit according to claim 2, wherein the board (51) is attached to a support frame (40; 140) extending perpendicularly to the main surface (52) of the board (51) away from the first portion (24) of the maintenance plate (23) .

4. Heat source unit according to claim 3, wherein the support frame (40; 140) is mounted to a rear plate (20) of the walls.

5. Heat source unit according to claim 3 or 4, wherein the support frame (40; 140) has at least one, particularly two or more, maintenance opening/-s (44; 144).

6. Heat source unit according to claim 3, 4 or 5, wherein the support frame is rectangular having two first legs parallel to the board (51) and two second legs (42; 142) perpendicular to the first legs, the support frame (40; 140) further having an intermediate rib (43; 143) extending between the two first legs (41; 141).

7. Heat source unit according to claim 6, wherein the intermediate rib (43) extends perpendicular to the two first legs (41).

8. Heat source unit according to any one of claims 2 to 6, wherein the board (50) is attached to a top plate (6) of the casing (2).

9. Heat source unit according to claim 2, wherein the board (50) is attached to a support column (1140) supported on a bottom plate (4) of the walls.

10. Heat source unit according to any one of claims 2 to 9, wherein the components comprise a switch, a sensor and/or a valve, the switch, the sensor and/or the valve being, in a front view, located behind the board (51).

11. Heat source unit according to any one of the preceding claims, wherein the maintenance plate (23) is hooked to the casing (2) and fixed in position at one location by a releasable fastening member (27).

12. Heat source unit according to claim 11, wherein the maintenance plate (23) is hooked to a rear plate (22) of the walls and/or to the partition (12).

13. Heat source unit according to claim 11 or 12, wherein the maintenance plate (23) is fixed in position at only one location, by the releasable fastening member (27).

14. Heat source unit according to any one of claims 11 to 13, wherein at least one edge of the maintenance plate (23) comprises one or more engaging member/-s (28a, 28b) having an upwardly extending hook, the engaging member (28a) being engaged

with a slit-like opening (29a, 29b) in the casing (2).

15. Heat source unit according to claim 14, wherein at least the engaging member/-s (28b) of one edge additionally has/have a downwardly or upwardly extending hook.

Amended claims in accordance with Rule 137(2) EPC.

1. Heat source unit for a heat pump having a refrigerant circuit, the heat source unit comprising:

a casing (2) having walls defining an interior space, the interior space being separated by a partition (12) into an air chamber (A) and a machine chamber (M);
a plurality of components (50, 60, 61, 62, 63) configured to control a refrigerant flow through the refrigerant circuit, the components being accommodated in the machine chamber (M),
wherein the walls comprise a maintenance plate (23), the maintenance plate having a first portion (24) delimiting the interior space at a front (7) of the heat source unit in a position corresponding to the machine chamber (M) and a second portion (25) delimiting the interior space at a side (9) of the heat source unit corresponding to the machine chamber (M), the maintenance plate (23) being removable for giving access to the components (50, 60, 61, 62, 63) in the machine chamber (M),
wherein the second portion (25) of the maintenance plate (23) covers at least half of the side (9) of the heat source unit in a direction of depth, the depth being the dimension of the heat source unit between the front (7) and a back (8); and
wherein the components comprise a switch board (50) having a board (51) and electrical and/or electronical components (53) mounted on a main surface (52) of the board, wherein the main surface (52) faces an inner side of the first portion (24) of the maintenance plate (23), **characterized in that**
the board (51) is attached to a support frame (40; 140) extending perpendicularly to the main surface (52) of the board (51) away from the first portion (24) of the maintenance plate (23).

2. Heat source unit according to claim 1, wherein the support frame (40; 140) is mounted to a rear plate (20) of the walls.

3. Heat source unit according to claim 1 or 2, wherein the support frame (40; 140) has at least one, particularly two or more, maintenance opening/-s (44; 144).

4. Heat source unit according to any one of the preceding claims, wherein the support frame is rectangular having two first legs parallel to the board (51) and two second legs (42; 142) perpendicular to the first legs, the support frame (40; 140) further having an intermediate rib (43; 143) extending between the two first legs (41; 141).

5. Heat source unit according to claim 4, wherein the intermediate rib (43) extends perpendicular to the two first legs (41).

6. Heat source unit according to any one of the preceding claims, wherein the board (51) is attached to a top plate (6) of the casing (2).

7. Heat source unit for a heat pump having a refrigerant circuit, the heat source unit comprising:

a casing (2) having walls defining an interior space, the interior space being separated by a partition (12) into an air chamber (A) and a machine chamber (M);
a plurality of components (50, 60, 61, 62, 63) configured to control a refrigerant flow through the refrigerant circuit, the components being accommodated in the machine chamber (M),
wherein the walls comprise a maintenance plate (23), the maintenance plate having a first portion (24) delimiting the interior space at a front (7) of the heat source unit in a position corresponding to the machine chamber (M) and a second portion (25) delimiting the interior space at a side (9) of the heat source unit corresponding to the machine chamber (M), the maintenance plate (23) being removable for giving access to the components (50, 60, 61, 62, 63) in the machine chamber (M),
wherein the second portion (25) of the maintenance plate (23) covers at least half of the side (9) of the heat source unit in a direction of depth, the depth being the dimension of the heat source unit between the front (7) and a back (8); and
wherein the components comprise a switch board (50) having a board (51) and electrical and/or electronical components (53) mounted on a main surface (52) of the board, wherein the main surface (52) faces an inner side of the first portion (24) of the maintenance plate (23), **characterized in that**
the board (51) is attached to a top plate (6) of the casing (2).

8. Heat source unit for a heat pump having a refrigerant circuit, the heat source unit comprising:

a casing (2) having walls defining an interior space, the interior space being separated by a

partition (12) into an air chamber (A) and a machine chamber (M);
a plurality of components (50, 60, 61, 62, 63) configured to control a refrigerant flow through the refrigerant circuit, the components being accommodated in the machine chamber (M),
wherein the walls comprise a maintenance plate (23), the maintenance plate having a first portion (24) delimiting the interior space at a front (7) of the heat source unit in a position corresponding to the machine chamber (M) and a second portion (25) delimiting the interior space at a side (9) of the heat source unit corresponding to the machine chamber (M), the maintenance plate (23) being removable for giving access to the components (50, 60, 61, 62, 63) in the machine chamber (M),
wherein the second portion (25) of the maintenance plate (23) covers at least half of the side (9) of the heat source unit in a direction of depth, the depth being the dimension of the heat source unit between the front (7) and a back (8); and
wherein the components comprise a switch board (50) having a board (51) and electrical and/or electronical components (53) mounted on a main surface (52) of the board, wherein the main surface (52) faces an inner side of the first portion (24) of the maintenance plate (23), **characterized in that**
the board (51) is attached to a support column (1140) supported on a bottom plate (4) of the walls.

9. Heat source unit according to any one of the preceding claims, wherein the components comprise a switch, a sensor and/or a valve, the switch, the sensor and/or the valve being, in a front view, located behind the board (51).

10. Heat source unit according to any one of the preceding claims, wherein the maintenance plate (23) is hooked to the casing (2) and fixed in position at one location by a releasable fastening member (27).

11. Heat source unit according to claim 10, wherein the maintenance plate (23) is hooked to a rear plate (22) of the walls and/or to the partition (12).

12. Heat source unit according to claim 10 or 11, wherein the maintenance plate (23) is fixed in position at only one location, by the releasable fastening member (27).

13. Heat source unit according to any one of claims 10 to 12, wherein at least one edge of the maintenance plate (23) comprises one or more engaging member/-s (28a, 28b) having an upwardly extending hook, the engaging member (28a) being engaged with a slit-like opening (29a, 29b) in the casing (2).

14. Heat source unit according to claim 13, wherein at least the engaging member/-s (28b) of one edge additionally has/have a downwardly or upwardly extending hook.

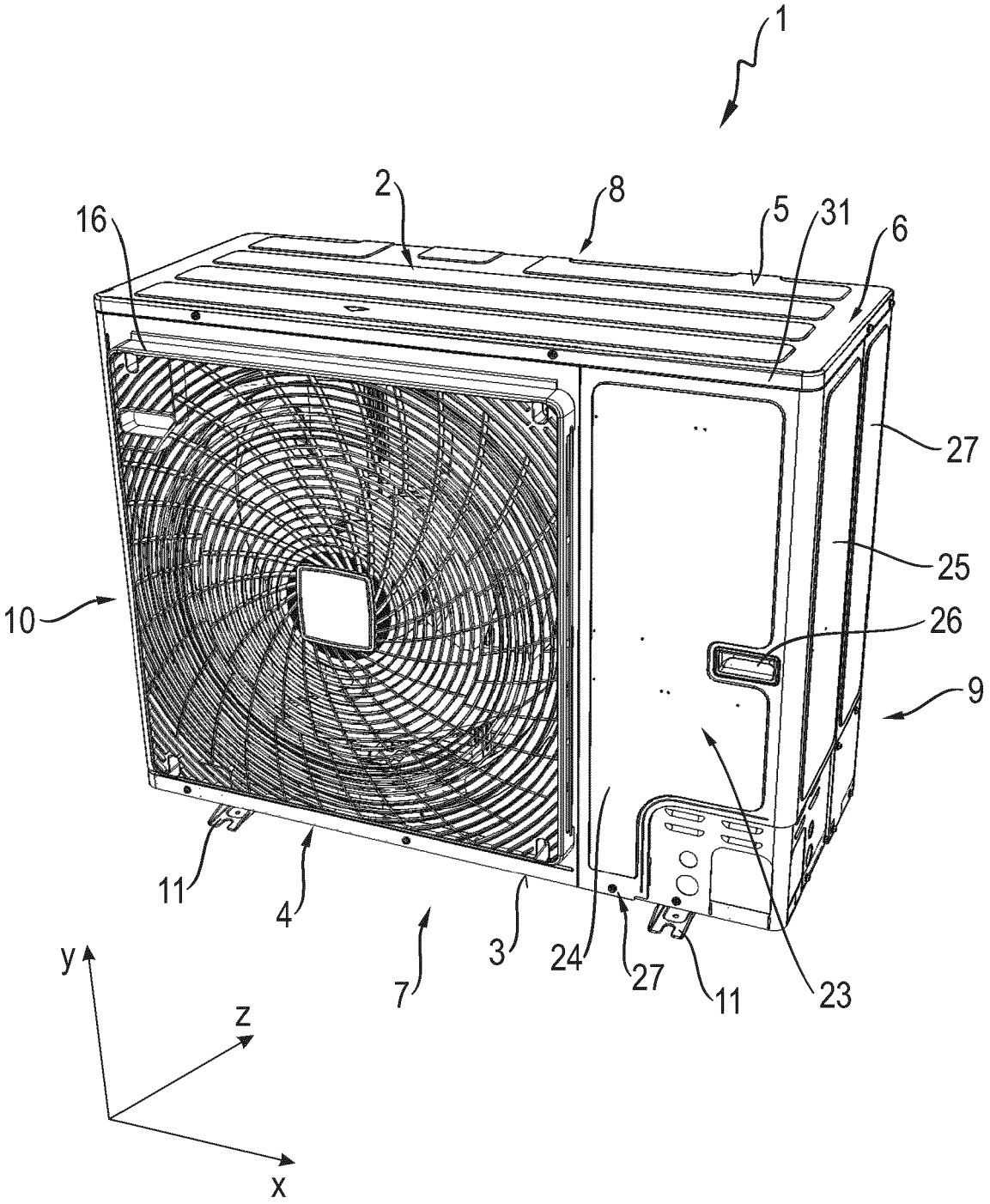

Fig. 1

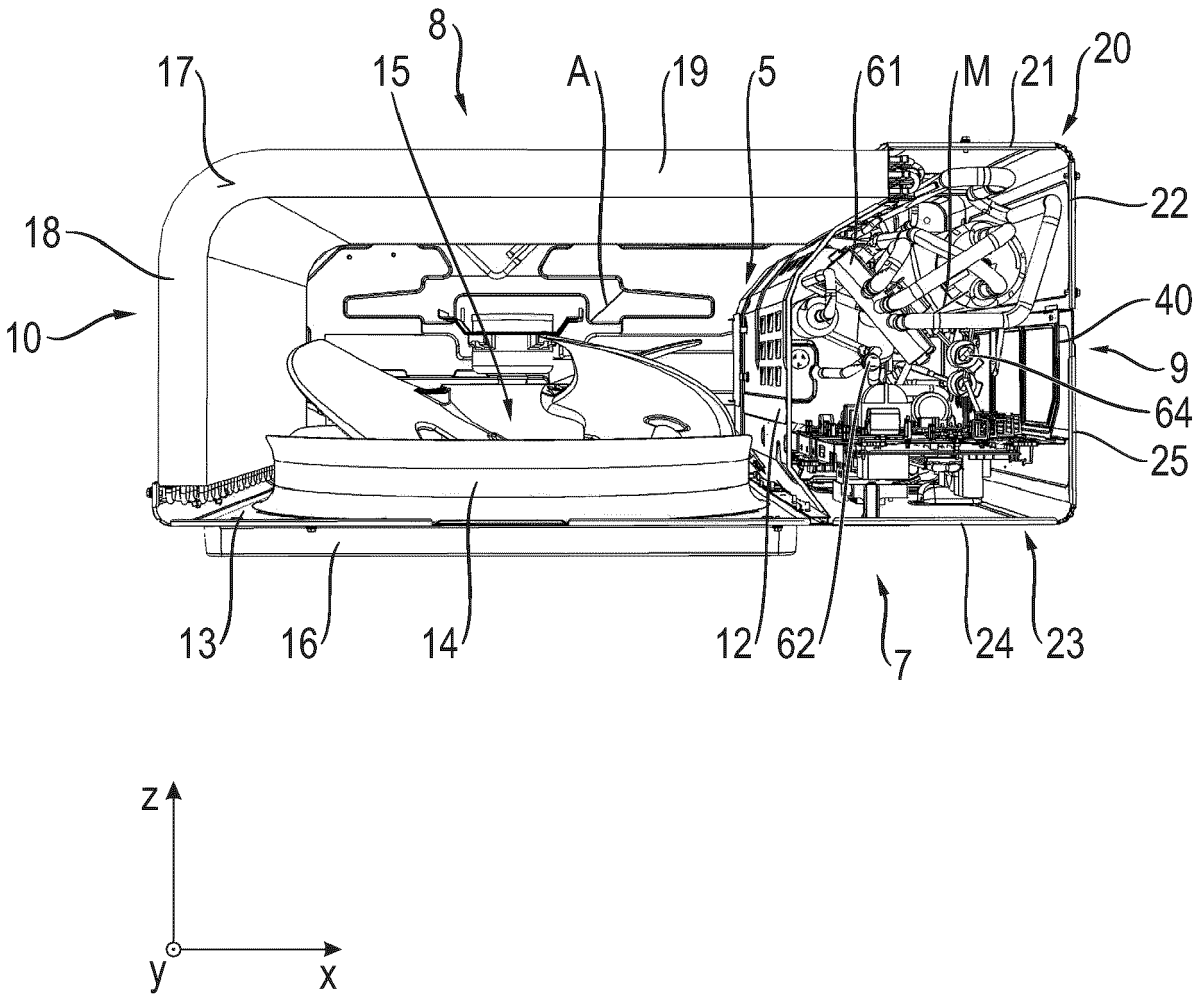

Fig. 2

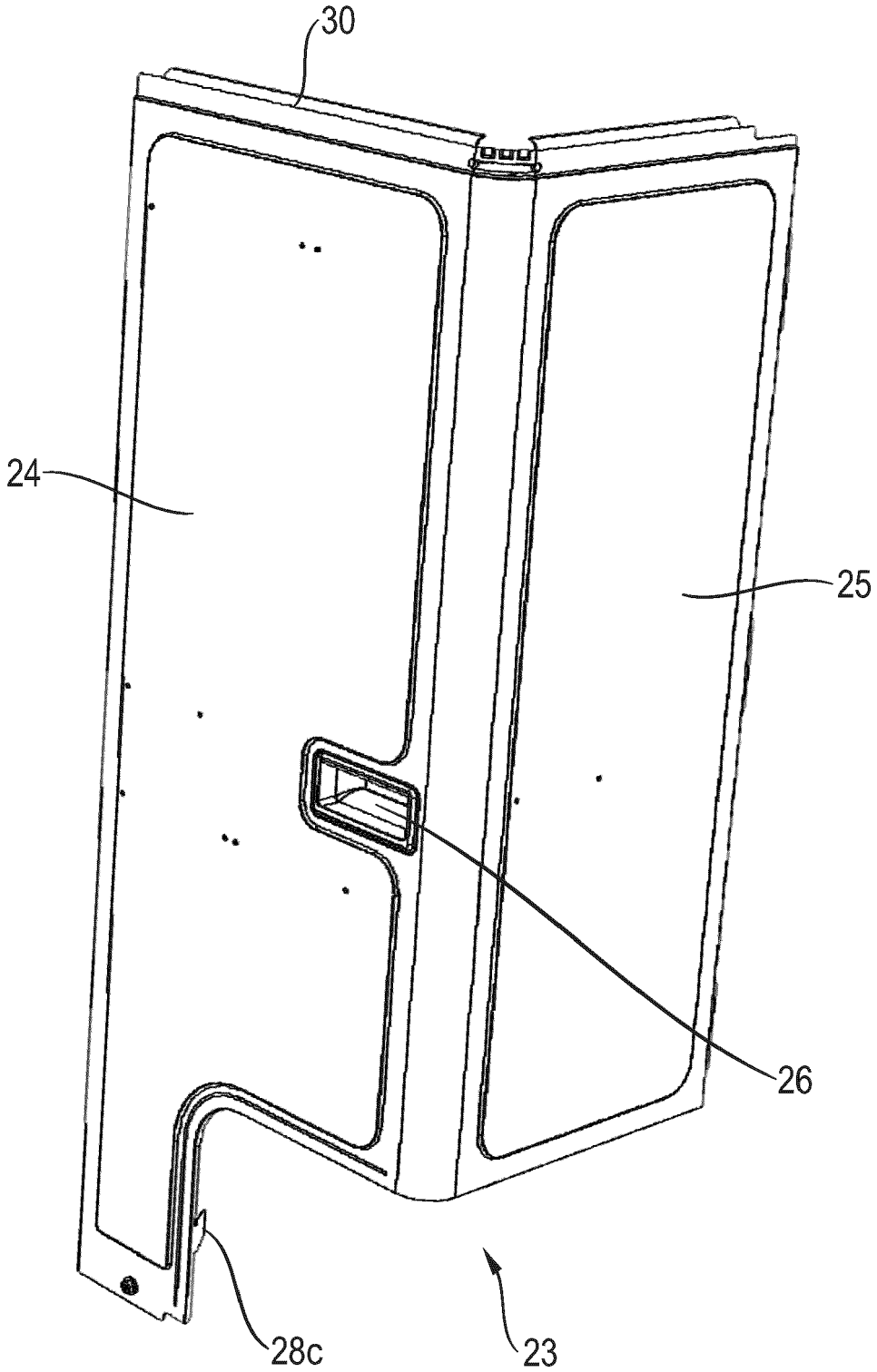

Fig. 3A

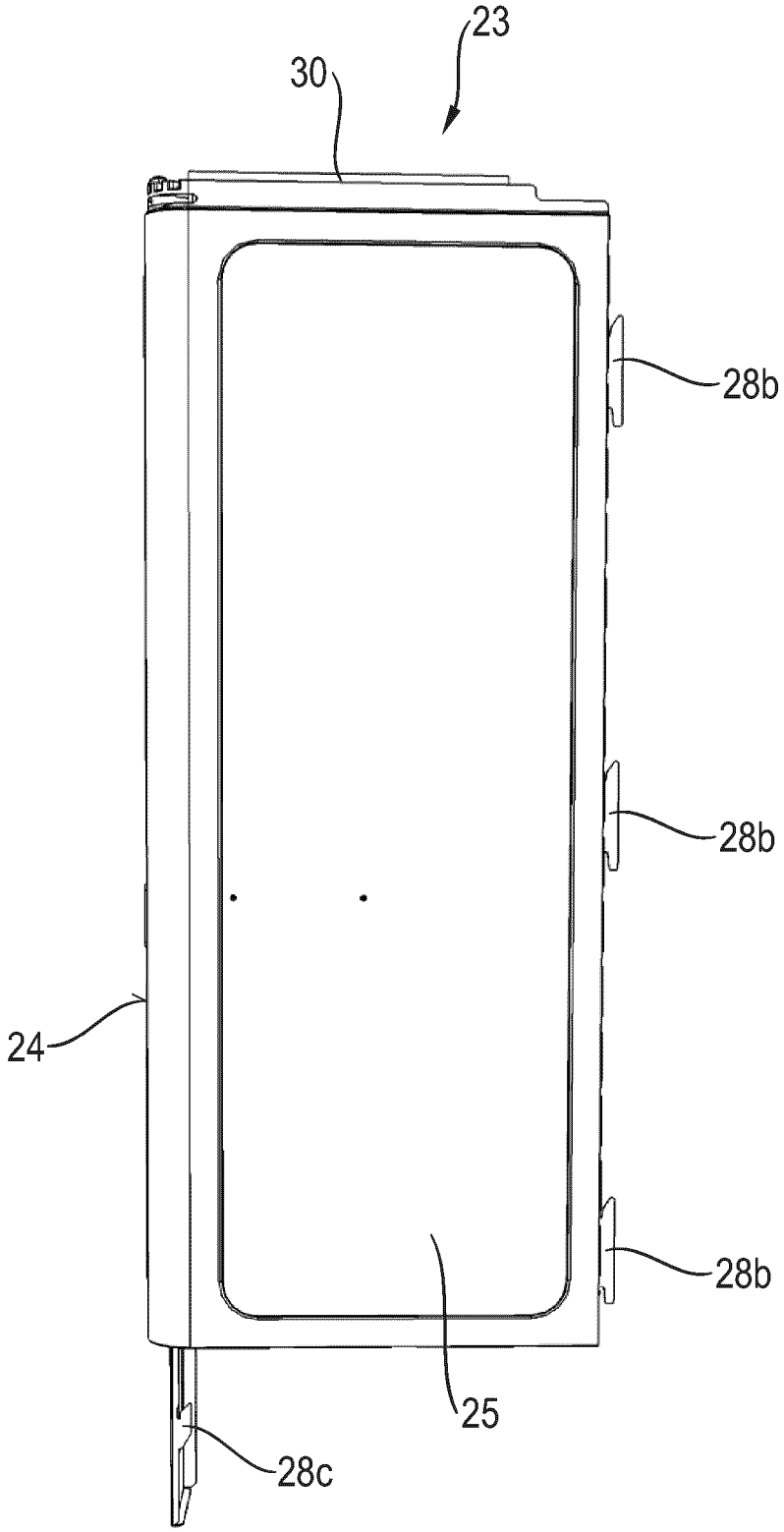

Fig. 3B

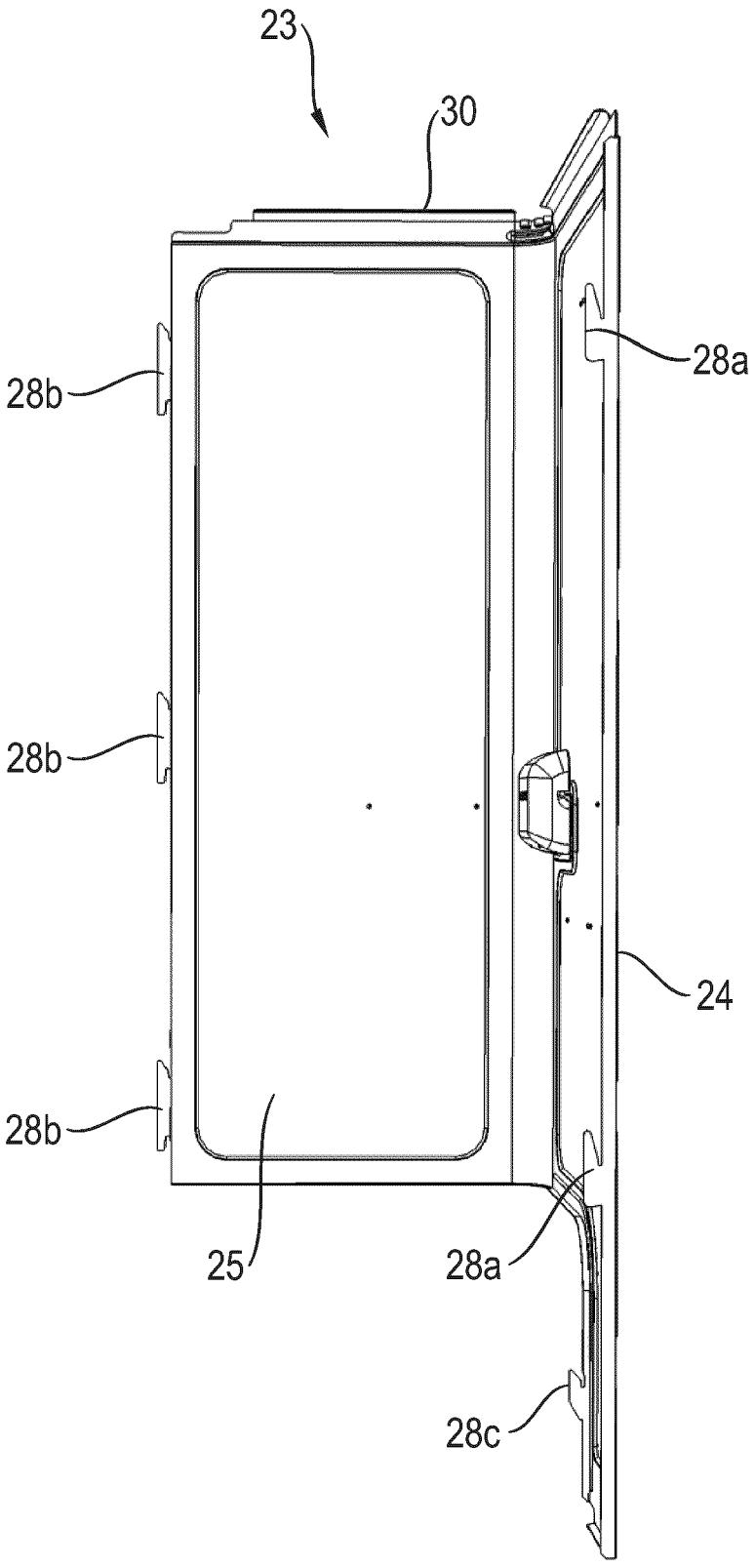

Fig. 3C

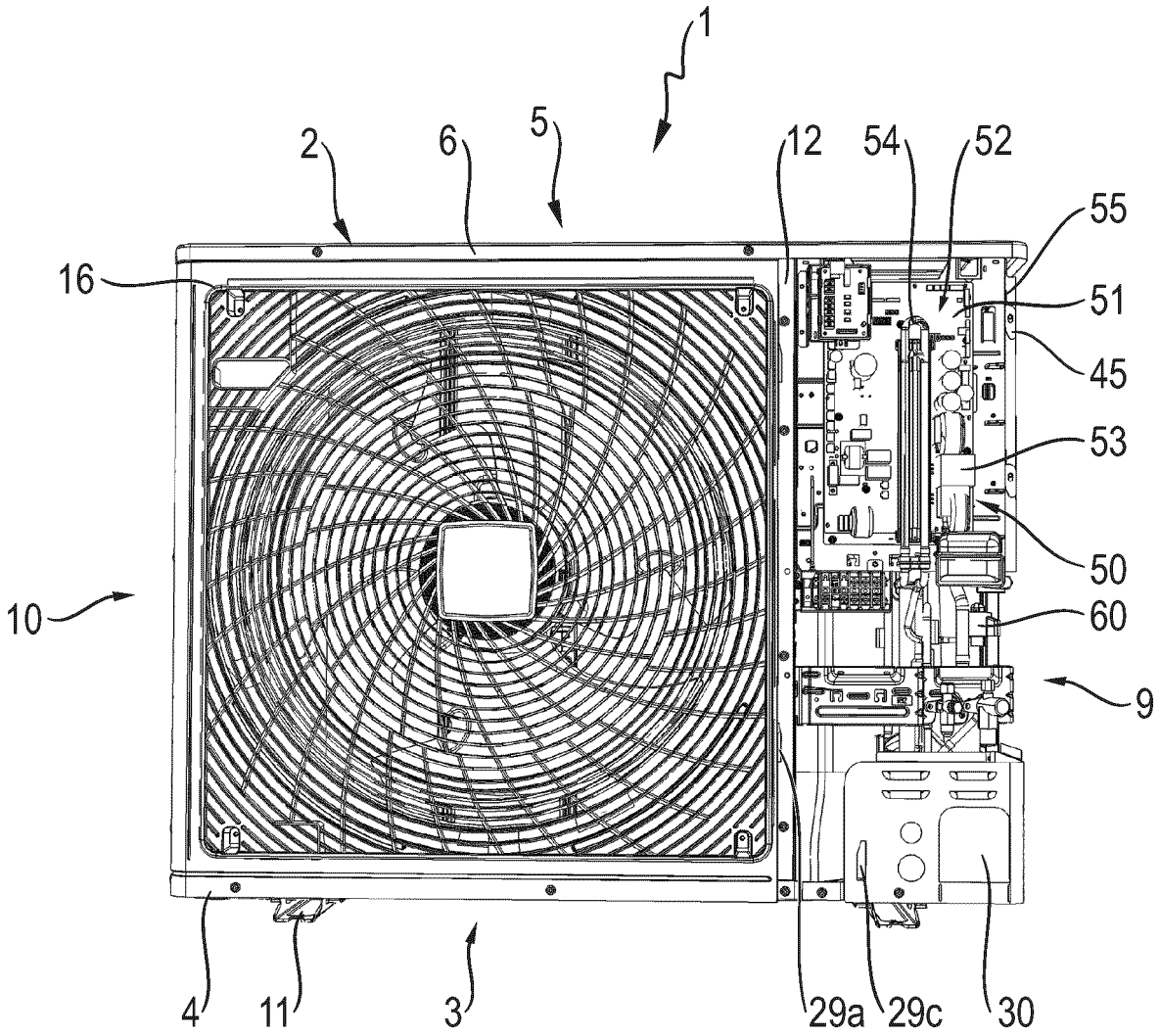

Fig. 4A

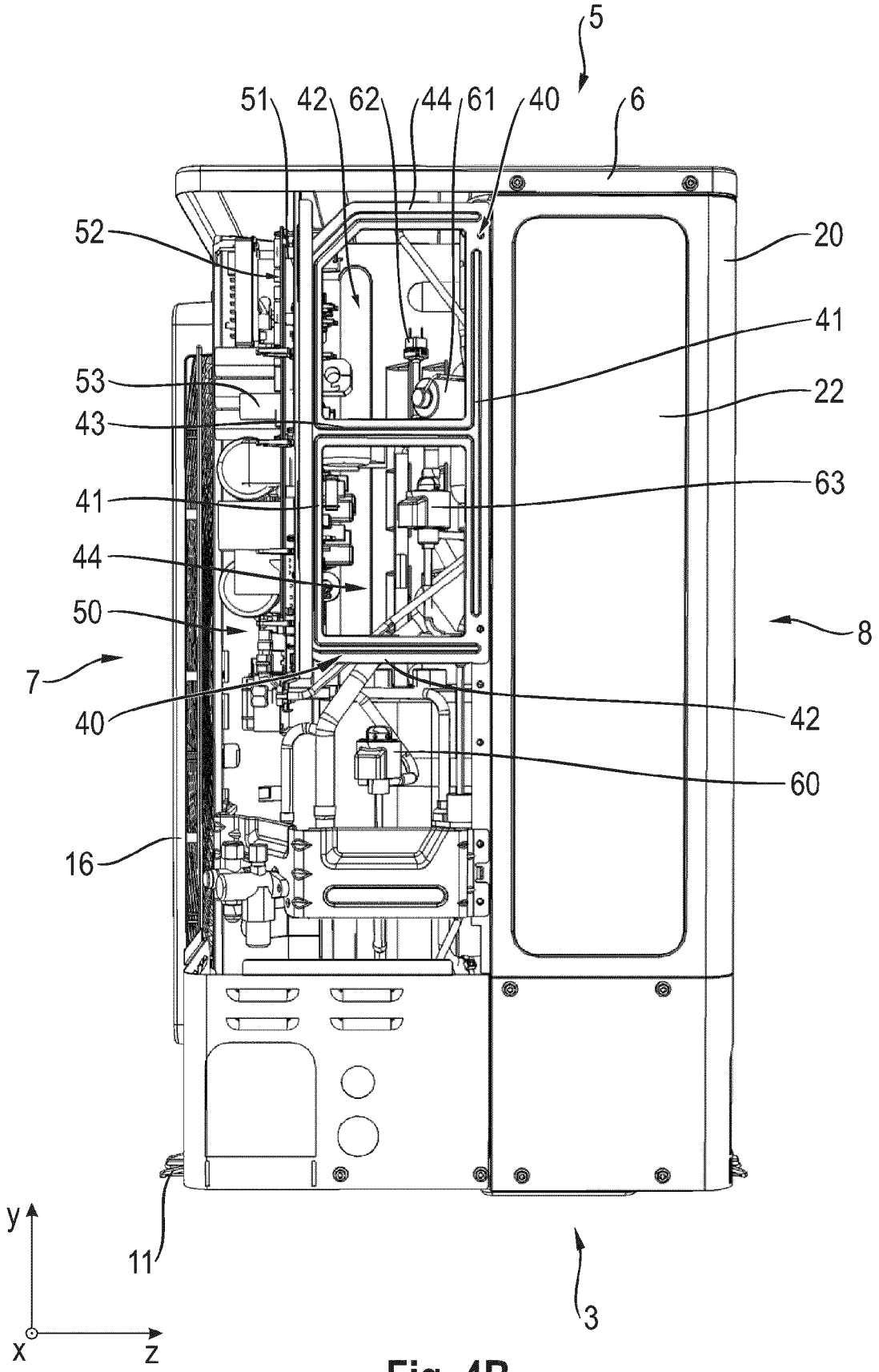
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Fig. 4B

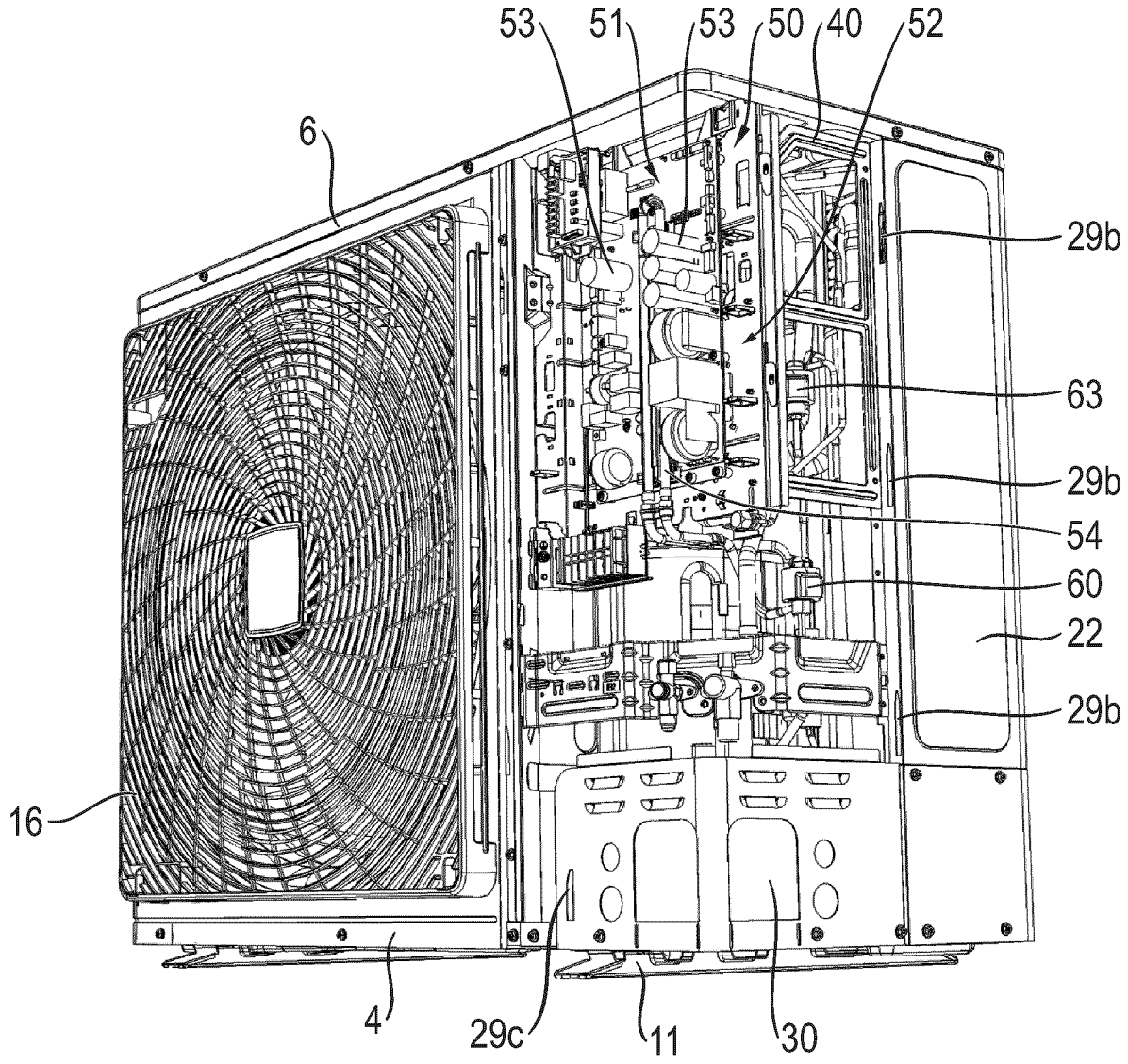

Fig. 4C

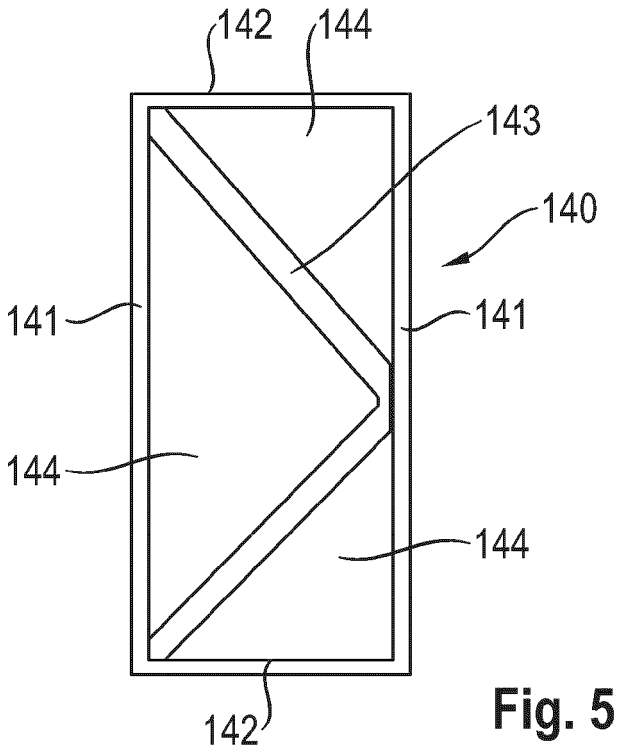

Fig. 5

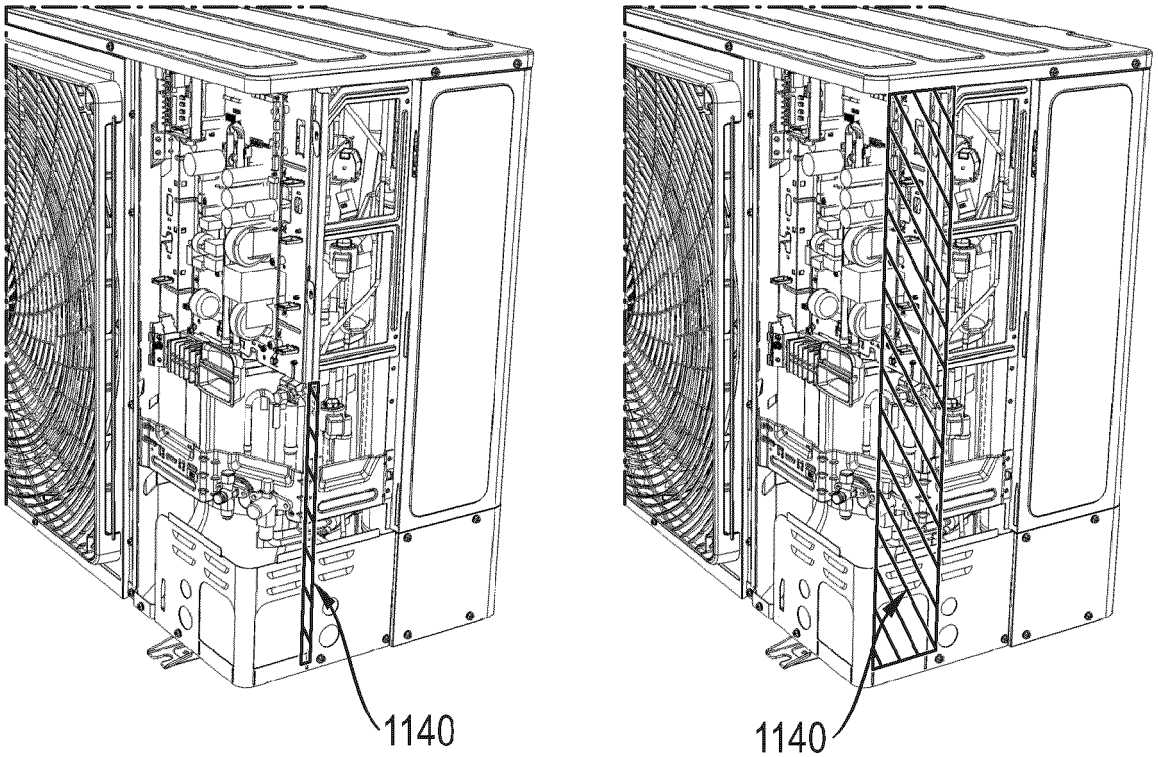

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 19 17 5649

DOCUMENTS CONSIDERED TO BE RELEVANT

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F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	22 October 2019	Valenza, Davide

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