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(54) **HEAT SOURCE UNIT FOR A HEAT PUMP**

(57) Heat source unit (10) for a heat pump having a refrigerant circuit, the heat source unit (10) comprising components of the refrigerant circuit of the heat pump; an outer casing (11) having a bottom wall (17), a back wall (13), a front wall (12) opposite to the back wall (13), and side walls (14, 15), wherein a drawer plate (37) supporting the at least one component of the refrigerant circuit and being slidable relative to the bottom wall (17) of the outer casing (11), whereby the at least one component of the refrigerant circuit is together with the drawer plate (37) withdrawable from the outer casing (11).

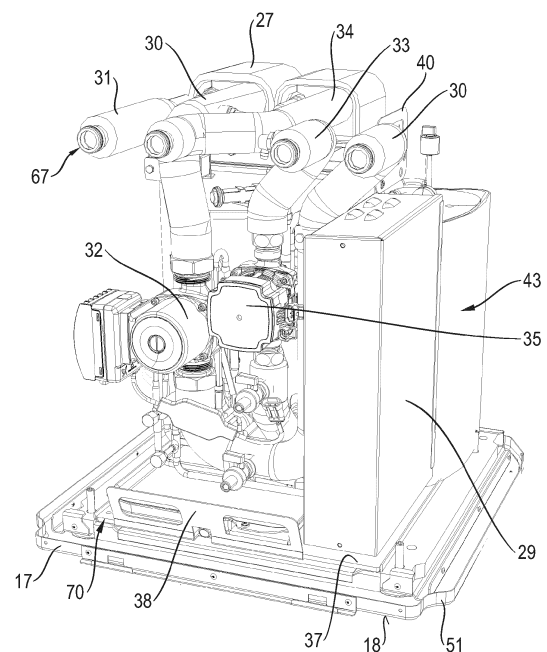


Fig. 3

Description

Technical Field

[0001] The present disclosure relates to heat pumps for heating and/or cooling purposes. In particular, the disclosure relates to heat pumps using the ground as heat source. Those heat pumps are often also referred to as geothermal heat pumps or ground source heat pumps.

Background

[0002] Depending on the type of heat pump, the heat source units are nowadays very often positioned indoors. This particularly applies for example to ground source heat pumps.

[0003] On the one hand, the heat source units, therefore, need to be relatively silent emitting only little noises. Thus, it is known to provide dampers for those components which tend to produce a lot of noises and vibrations.

[0004] On the other hand, the heat source units should be relatively compact in size in order not to occupy too much space indoors.

[0005] Particularly with respect to ground source heat pumps, it is well-known to integrate the heat pump into larger casings also comprising additional components such as for example a domestic hot water tank containing water to be heated by the heat pump. Thus, the heat source units become relatively heavy weighting even more than 100kg. As a consequence, handling and installation of those units becomes cumbersome.

[0006] In addition and due to the compact structure, the different components of the heat pump, such as components of the refrigerant circuit, sensors and the controller (such as the inverter PCB for controlling the capacity of the compressor), are difficult to access for maintenance. Thus, a lot of parts have to be disassembled for accessing the relevant parts making maintenance time-consuming and expensive.

Summary

[0007] In view of the aforesaid, it is an aim of the present disclosure to provide a heat source unit that may alleviate the above problems improving handleability and installation as well as maintenance still providing a compact and relatively low noise unit.

[0008] This aim may be achieved by a heat source unit as defined in claim 1. Embodiments may be found in the dependent claims, the following description and the accompanying drawings.

[0009] According to a first aspect, a heat source unit for a heat pump, particularly a ground source heat pump is suggested. The heat pump comprises a refrigerant circuit. In its simplest form, the refrigerant circuit comprises a heat source heat exchanger, a compressor, a heat consumer heat exchanger and an expansion valve. If implemented as a ground source heat pump, the heat source

heat exchanger changes heat between a ground source and the refrigerant flowing in the refrigerant circuit. In one example, the heat consumer may be domestic hot water, hence, the heat consumer heat exchanger may exchange heat between the water or any intermediate heating medium to heat the water and the refrigerant flowing in the refrigerant circuit.

[0010] The heat source unit comprises components of the refrigerant circuit of the heat pump. In addition, the heat source unit comprises an outer casing. The outer casing may be an outer casing of a larger unit even containing the heat consumer, such as a domestic hot water tank. The outer casing has a bottom wall, a back wall, a front wall opposite to the back wall, and side walls. Particularly, the bottom wall is configured to support the outer casing relative to or on a horizontal surface. For this purpose, a lower side of the bottom wall may comprise feet via which the bottom wall rests on the horizontal surface. The side walls may be parallel to each other and be arranged on opposite sides. Also the front wall may extend substantially parallel to the back wall. Yet, the front wall may be slightly curved towards the outside so that no strict parallelism is present. Even further, the front wall may be removable.

[0011] The heat source unit of the first aspect further comprises a drawer plate supporting the at least one component of the refrigerant circuit. The drawer plate is slidable relative to the bottom wall of the outer casing, whereby the at least one component of the refrigerant circuit is together with the drawer plate withdrawable from the outer casing. To put it differently, the drawer plate may be drawn out of the outer casing to reach the at least one component of the refrigerant circuit for maintenance. The drawer plate may even be completely removed from the outer casing. In both cases, it may be foreseen to remove the front wall. Alternatively, the front wall may as well be attached to the drawer plate and be withdrawn together with the drawer plate.

[0012] If the drawer plate including the component of the refrigerant circuit may be completely removed from the outer casing handleability and installation is simplified because the drawer plate including the component of the refrigerant circuit and the outer casing may be separately handled (carried to the installation site) and installed. In addition the serviceability is improved as the access to the at least one component of the refrigerant circuit on the drawer plate is simplified. Finally and due to the positioning of the at least one component of the refrigerant circuit on the drawer plate, dampers may be provided to dampen the components relative to the outer casing thereby reducing vibrations being transmitted to the outer casing and, hence, noises.

[0013] According to a second aspect, the components of the refrigerant circuit comprise the compressor. To put it differently, the at least one component of the first aspect is the compressor. Yet, also other components of the refrigerant circuit, such as the expansion valve, the heat source heat exchanger, the heat consumer heat ex-

changer, the refrigerant pipes, valves, sensors, the controller of the refrigerant circuit, pumps, etc. may be provided on the drawer plate in addition to the compressor.

[0014] As the compressor is one of the components which is perceived to produce most of the noises and vibrations, it is preferred to have the compressor being mounted on the drawer plate as this enables easy access to the compressor at the same time maintaining the possibility to provide dampers for damping the vibrations of the compressor relative to the outer casing.

[0015] According to a third aspect the compressor is mounted on the drawer plate via a damping mechanism.

[0016] Consequently, any vibrations generated by the compressor may be dampened relative to the drawer plate so that fewer vibrations are transmitted to the drawer plate and handed to the outer casing. Accordingly noises reaching the outside of the outer casing can be reduced.

[0017] According to a fourth aspect, the damping mechanism comprises a compressor plate supporting the compressor via a set of compressor plate dampers, the compressor plate being supported on the drawer plate via a set of drawer plate dampers. In one example, the compressor may comprise a compressor housing containing the compression mechanism wherein the compressor housing has fixation preparations for fixing the compressor. The compressor is mounted to the compressor plate at these fixation preparations with the compressor plate dampers being interposed between the compressor housing particularly the fixation preparations and the compressor plate.

[0018] The compressor plate is in turn mounted to the drawer plate via the drawer plate dampers.

[0019] Additionally, the compressor housing may be contained in a compressor enclosure (such as a compressor casing) for sound insulation, wherein the compressor enclosure (e.g. the compressor casing) may be mounted to the compressor plate or the drawer plate.

[0020] According to the above aspect, a double damping effect may be achieved, wherein the damping properties of the compressor plate dampers and the drawer plate dampers are selected differently. Yet, standard dampers are preferably used in order to reduce the costs. However, such standard dampers are usually available in a complete range of stiffness. Thus, the compressor plate dampers may be selected and configured to dampen frequency in a first frequency range, whereas the drawer plate dampers may be selected and configured to dampen frequencies and a second frequency range. In this context, the first frequency range and the second frequency range do at most overlap (i.e. the frequency ranges may also be entirely different without overlap). In an example, the first frequency range contains higher frequencies than the second frequency range. Thus, the drawer plate dampers may be less stiff than the compressor plate dampers.

[0021] According to a fifth aspect, the heat source unit further comprises a drawer support plate supported on

the bottom wall and supporting the drawer plate.

[0022] The drawer support plate enables easy installing as well as inserting and withdrawing of the drawer plate. In this context, bottom plates of outer casings are often pan shaped having an outer circumferential upright rim. The provision of the drawer support plate enables to overcome the rim so that the drawer plate may be slid onto the drawer support plate directly from the front.

[0023] According to a sixth aspect, the drawer support plate is supported on the bottom wall via a set of bottom plate dampers. To put it differently, additional dampers are positioned between an upper side of the bottom plate and a lower side of the drawer support plate.

[0024] Accordingly, even further damping is provided so that also other components on the drawer plate except for the compressor are damped relative to the bottom plate and, hence, the outer casing. Consequently, noises are even further reduced.

[0025] As described above, a plurality of dampers may be provided between the compressor and the compressor plate, the compressor plate and the drawer plate and/or between the drawer plate and the drawer support plate. According to an example all these dampers are fixed to the respective parts so as to be exchangeable that is, using a form fit and/or a force fit. In one example, mechanical fasteners are used for this purpose. Accordingly, all dampers may be readily be replaced when necessary over the lifetime of the heat source unit. The use of glue or adhesive is to be avoided in this regard.

[0026] According to a seventh aspect, the drawer support plate comprises upright flanges for limiting the movement of the drawer plate in at least two directions, preferably three directions, within the plane of the drawer plate. In one example, the two opposite flanges are located at opposite side edges of the drawer support plate along the side walls of the outer casing. These flanges may limit the movement of the drawer plate in a direction between the side walls of the outer casing that is in opposite directions perpendicular to the side walls. Another flange may be located at a rear edge of the drawer support plate adjacent the back wall of the outer casing. This flange may be a limit stop when inserting the drawer plate onto the drawer support plate indicating that the drawer plate has been fully inserted. Thus, it limits a movement of the drawer plate in a direction towards the back wall of the outer casing.

[0027] Consequently, the sliding of the drawer plate onto the drawer support plate is guided and the movement thereof is limited so that easy insertion and withdrawal of the drawer plate may be achieved.

[0028] According to an eighth aspect, the drawer support plate is provided with at least one lug for limiting the movement of the drawer plate in a direction perpendicular to the plane of the drawer plate. In an example, a plurality of lugs is provided. In particular, the drawer plate may be slid onto the drawer support plate and enters below the lug/-s. Thus, a form fit is realized between an upper side of the drawer plate and a lower side of the lug/-s limiting

a vertical movement of the drawer plate.

[0029] This further assists the guidance and correct arrangement of the drawer plate on the drawer support plate and, hence, in the outer casing.

[0030] According to a ninth aspect, the drawer plate comprises a handle adjacent a front edge of the drawer plate for withdrawing the drawer plate. Another handle may be positioned adjacent a rear edge. Thus, the handles may as well be used for carrying the drawer plate with two hands.

[0031] The provision of the handle/-s improves the handleability.

[0032] According to a tenth aspect a carrying handle is mounted to the drawer plate at a distance to the drawer plate for carrying the drawer plate with the components of the refrigerant circuit.

[0033] This carrying handle is particularly useful for lifting the drawer plate including the components of the refrigerant circuit and carrying it to another location if required.

[0034] According to an eleventh aspect, the components of the refrigerant circuit comprise a first heat exchanger, the first heat exchanger being configured for exchanging heat between the refrigerant and a liquid wherein first liquid pipes are connected to the first heat exchanger and second liquid pipes are connectable to a heat consumer, the first and second liquid pipes are respectively connected by a quick - release-fastener. In this context the term "quick - release-fastener" it is to be understood as a connection that is releasable without unscrewing of nuts and particularly without the need of tools.

[0035] Consequently, it is easy and quick to disconnect the first and second liquid pipes, respectively, for subsequent withdrawal of the drawer plate from the outer casing for maintenance.

[0036] According to a twelfth aspect, the heat consumer is a domestic hot water tank accommodated in the outer casing and the liquid pipes are water pipes. Alternatively to the domestic hot water tank, the heat consumer may as well be a heat emitter arranged in a space to be heated, such as a room of a residential building. Examples of the heat emitter are an underfloor heating, a radiator, etc..

[0037] As previously mentioned, it is relatively common to integrate further components into the heat source unit. Particularly the domestic hot water tank may be accommodated in the outer casing to provide a neat unit to be arranged indoors.

[0038] According to a thirteenth aspect, the components of the refrigerant circuit comprise a second heat exchanger, the second heat exchanger being configured for exchanging heat between the refrigerant and a heat source, wherein first heat source pipes are connected to the second heat exchanger and second heat source pipes are in fluid communication with the heat source, the first and second heat source pipes are respectively connected by a quick - release-fastener.

[0039] It is also preferred that the pipes leading to the heat source such as the ground source, are connected to the respective heat source heat exchanger via first and second heat source pipes respectively connected by a quick - release fastener. Accordingly, it is easy and quick to disconnect the first and second heat source pipes, respectively, for subsequent withdrawal of the drawer plate from the outer casing for maintenance.

[0040] According to a fourteenth aspect, all components of the refrigerant circuit are supported on the drawer plate. These components comprise at least the compressor, the expansion valve, the heat source heat exchanger and the heat consumer heat exchanger as well as the refrigerant pipes connecting these components. Other components that may as well be supported on the drawer plate are a 4-way valve, a receiver, an accumulator, additional expansion valves and/or other valves.

[0041] Hence, by withdrawing the drawer plate from the outer casing the entire refrigerant circuit may be serviced. Also additional components such as pumps, sensors, etc. may be supported on the drawer plate. Particular examples are a brine water pump communicating with the above-mentioned heat source pipes (brine water pipes) and a heating circuit pump communicating with the above-mentioned (liquid pipes) water pipes).

[0042] According to a fifteenth aspect at least a portion of a controller for controlling the operation of the refrigerant circuit is supported on the drawer plate. In an example, the compressor comprises an inverter to alter the capacity of the compressor and the controller is configured to control the inverter, i.e. The controller comprises the inverter or an inverter PCB.

[0043] Accordingly, also the controller may be serviced when withdrawing the drawer plate.

Brief Description of the Drawings

[0044] 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.

[0045] In the drawings,

Figure 1 shows a perspective view of a heat source unit in accordance with the present disclosure;

Figure 2 shows the perspective view of figure 1, wherein the front plate has been removed;

Figure 3 shows an enlarged partial view of figure 2 with the bottom plate and the drawer plate supported thereon being isolated from the remainder of the heat source unit;

Figure 4 shows a perspective front view of the drawer plate being removed from the outer casing;

Figure 5 shows a right side view of the drawer plate being removed from the outer casing;

Figure 6 shows a perspective view of the bottom plate, including the drawer support plate shown in transparent, being isolated from the remainder of the heat source unit; and

Figure 7 shows the perspective view of figure 6 with the drawer plate (without the components supported thereon) being supported on the drawer support plate.

Detailed Description

[0046] An embodiment 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 embodiment is provided for illustration only and not for the purpose of limiting the invention as defined by the appended claims.

[0047] Figure 1 shows a heat source unit 10 according to an example of the present disclosure. In the present example, the heat source unit 10 is a ground heat source unit. The heat source unit 10 comprises an outer casing 11.

[0048] The outer casing 11 comprises a front wall 12 and an opposite back wall 13. The front wall 12 and the back wall 13 are basically arranged in a parallel relationship at the back and the front of the heat source unit 10. In addition, the front wall 12 comprises an upper part 12a and lower part 12b.

[0049] Moreover, the casing has a first side wall 14 and a second side wall 15. The side walls 14 and 15 are as well opposite to each other and basically arranged in a parallel relationship on a left side and a right side of the heat source unit 10, respectively.

[0050] An upper end of the outer casing 11 is closed by a top wall 16. A bottom wall 17 is located at a lower end of the outer casing 11 opposite to the top wall 16.

[0051] In the present example, the heat source unit 10 is configured for being a standalone unit and for installing on a horizontal surface such as the floor of an indoor space in a residential building. For this purpose, a lower side 18 (see figure 3) of the bottom plate 17 may be provided with feet (not visible in the drawings). The feet may be adjustable in height so that the outer casing 11 may be placed in level on the horizontal surface.

[0052] In figure 2, the lower part 12a of the front wall 12 has been removed. It is to be understood that additional casing parts may be provided between the walls of the casing 11 and the components accommodated in the casing 11. Accordingly, the outer casing may have a layered structure including an outer cover and additional inner layers between the outer cover and the components accommodated in the casing 11 to provide for a sound insulated cabinet.

[0053] A heat pump module 19 (in the present example

a hydro module) is accommodated in a lower portion of the outer casing 11. A heat pump module casing 69 is mounted to the bottom plate 17 entirely enclosing the heat pump module 19 with the purpose of sound insulation and to maintain any sweat is generated by the heat pump within the heat pump module casing 69. The heat pump module casing 69 is independent from the later described drawer plate 37 and not withdrawn together with the drawer plate 37.

[0054] An upper portion of the outer casing 11 may contain other components, such as a domestic hot water tank 20 as well as connections 21 to the ground source and/or a heating circuit for heating a residential building (for example embodying radiators and/or a floor heating).

[0055] Figures 3 to 5 show the heat pump module 19 in isolation, wherein figure 3 still depicts the bottom wall 17.

[0056] The heat pump module 19 comprises components of the refrigerant circuit of the heat pump. In the present example, the refrigerant circuit comprises a compressor 22 (see figure 5), a 4-way valve assembly 25, an expansion valve 26, a heat source heat exchanger 27 and a heat consumer heat exchanger 28 all connected by refrigerant pipes 24. Additionally, an accumulator 23, a muffler and other components such as sensors and valves may be present in the refrigerant circuit. In addition, a control box 29 is provided, in which an inverter (inverter PCB) for controlling the capacity of the compressor 22 may be housed.

[0057] The heat source heat exchanger 27 comprises a first heat source pipe 30 being connected to a heat source medium inlet of the heat source heat exchanger 27. Further, a second heat source pipe 31 is provided and connected to a heat source medium outlet of the heat source heat exchanger 27. In the present example, the heat source unit 10 is a ground source heat source unit so that the heat source medium is a brine solution. The first and second heat source pipe 30, 31 (first heat source pipes) are in the particular example brine solution pipes). The heat source heat exchanger 27 is configured for exchanging heat between the refrigerant flowing through the heat source heat exchanger 27 and the heat source medium flowing through the heat source heat exchanger 27. A pump 32 (in the present example a brine solution pump) is disposed in the first heat source pipe for flowing the brine solution through the heat source heat exchanger 27.

[0058] The heat consumer heat exchanger 28 comprises a first liquid pipe 33 connected to a liquid inlet of the heat consumer heat exchanger 28. Moreover, a second liquid pipe 34 is connected to a liquid outlet of the heat consumer heat exchanger 28. The first liquid pipe 33 and the second liquid pipe 34 (first liquid pipes) may in the present example be water pipes. The heat consumer heat exchanger 28 is configured to exchange heat between the refrigerant flowing through the heat consumer heat exchanger 28 and the liquid flowing through the heat consumer heat exchanger 28. A pump 35 (in the

present example a water pump) is disposed in the first liquid pipe for flowing the liquid (water) through the heat consumer heat exchanger 28.

[0059] A drain pan 36 is disposed underneath the piping including the refrigerant pipes 24, the heat source pipe 30, 31 and the liquid pipe 30, 34 to collect any condensation water (sweat) that may be formed on these components and drops or flows downward.

[0060] All the aforementioned components are mounted either directly or indirectly on a drawer plate 37. Moreover, a handle 38 (first handle) is arranged at a front edge 39a of the drawer plate 37. Another handle 42 (second handle) is arranged at the rear edge 39b of the drawer plate 37. A carrying handle 40 is mounted via a mounting structure 41 to the drawer plate 37 but in a distance from the drawer plate 37 in a vertical direction.

[0061] In the present example, the drawer plate 37 is a relatively rigid and thick rectangular plate made of metal, particularly light metal. In one example, the material is aluminum or an aluminum alloy.

[0062] In the following, reference is particularly made to the mounting of the compressor 22 on the drawer plate 37 (see figure 5). In figure 3, the compressor 22 is not visible being housed in a compressor enclosure 43 (such as a compressor casing) of sound insulating material providing for sound insulation of any noises originating from the compressor 22. Also the accumulator 23 is accommodated in the compressor enclosure 43. In figure 5, the compressor enclosure 43 has been removed to show the mounting of the compressor 22.

[0063] The compressor 22 comprises a compressor housing 44 housing the compression mechanism. The compressor housing 44 comprises fixation preparations 45 (mounting preparations) in order to mount the compressor 22. In particular, the compressor housing 44 and, hence, the compressor 22 is mounted to a compressor plate 46. The compressor plate 46 is a rigid plate for example made of metal. More particularly, a plurality of compressor dampers 47 (first set of dampers) is disposed between the compressor housing 44 or more particularly the fixation preparations 45 and, hence, the compressor 22, and the compressor plate 46. In the present example three of the compressor dampers 47 are provided. The compressor dampers 47 may be standard rubber dampers. The compressor dampers 47 may have a first stiffness for damping frequencies in a first frequency range.

[0064] The compressor plate 46 is again mounted to an upper side 48 of the drawer plate 37, wherein a plurality of drawer plate dampers 49 (second set of dampers) is interposed between the compressor plate 46 and the drawer plate 37. In the present example, three of the drawer plate dampers 49 are provided. The drawer plate dampers 49 may be standard rubber dampers. The drawer plate dampers 49 may have a second stiffness for damping frequencies in a second frequency range.

[0065] The first stiffness of the compressor plate dampers 47 may be higher than the second stiffness of the drawer plate dampers 49. Thus, the first frequency range

may contain frequencies higher than the frequencies contained in the second frequency range. In this context, it is to be emphasized that the first frequency range and the second frequency range may overlap, that is some frequencies are contained in both the first frequency range and the second frequency range, or be entirely different.

[0066] As will be apparent from the above, the compressor plate 46, the compressor plate dampers 47 and the drawer plate dampers 49 form a damping mechanism 50. Due to the provision of the damping mechanism, any vibrations generated by the compressor 22 are damped relative to the drawer plate 37 in order to minimize vibrations being transferred to the drawer plate 37.

[0067] In the following, reference is made to the configuration of the bottom wall 17 with respect to figure 6.

[0068] The bottom wall 17 comprises an outer circumferential rim 51 so that the bottom wall 17 is substantially pan shaped. An upper side 52 of the bottom wall 17 may, hence, also be referred to as the bottom.

[0069] As will be apparent from figure 6, a drawer support plate 53 is mounted to the upper side 52 of the bottom wall 17. The drawer support plate 53 has been shown in transparent in figure 6 in order to explain the mounting thereof to the bottom wall 17.

[0070] In particular, the drawer support plate 53 is mounted to the bottom wall 17 using a plurality of bottom plate dampers 54. In the present example, four of the bottom plate dampers 54 are used. The bottom plate dampers 54 are as well rubber dampers, preferably standard rubber dampers. Thus, any vibrations transmitted to the drawer support plate 53 are damped relative to the bottom wall 17 and are therefore not transferred or at least transferred to a lesser extent from the bottom wall 17 to the ground. This further assists the noise reduction of the entire heat source unit 10.

[0071] All dampers 47, 49 and 54 may be attached to the respective parts using mechanical fasteners avoiding the use of adhesive or glue. In an example, the screws 55 are used to fix the dampers 47, 49 and 54 in place. Additionally annular rims 56 may be provided for example on a lower side of the compressor plate 46 and an upper side of the drawer plate 37 as well as a lower side of the drawer support plate 53 and an upper side 52 of the bottom wall 17. The cylindrical dampers 49 and 54 are accommodated in the annular rims 56 so as to avoid movement of the dampers 49 and 54 in a direction perpendicular to their cylinder axis. However, also other mechanical fasteners to force fittingly and/or form fittingly attached the dampers 47, 49 and 54 to the respective parts are conceivable. Due to the use of mechanical fasteners as compared to adhesive or glue, the dampers 47, 49 and 54 may be easily replaced if necessary.

[0072] The drawer support plate 53 further comprises a plurality of upright flanges 57. In the particular example, a flange 57a is arranged on a first side edge (left edge) of the drawer support plate 53 adjacent the left sidewall 15. A further flange 57b is arranged on a second side

edge (right edge) of the drawer support plate 53 adjacent the right side wall 14. Additionally, a flange 57c is located at a rear edge of the drawer support plate 53 adjacent the back wall 13.

[0073] The drawer support plate 53 is shaped so as to have on its upper side a bottom portion 59 and opposite support portions extending along respective side edges of the bottom portion 59 and being elevated relative to the bottom portion 59. To put it differently, the support portions 60 have a support surface 61 which is located further away from an upper side 52 of the bottom wall 17 than the bottom portion 59. Thus, the contact area of the drawer plate 37 on the drawer support plate 53 is reduced simplifying installing and withdrawing/removing of the drawer plate 37.

[0074] Furthermore, a plurality of lugs 58 is provided as part of the drawer support plate 53. In the present example, two lugs 58 are provided and arranged towards or adjacent the rear edge of the drawer support plate 53. The lugs 58 consist of a left lug 58a located at the left side edge and a right lug 58b located at the right side edge. The lugs 58a, b each have a portion extending in parallel to the support surface 61 of the support portion 60, thus defining a U - shape in cross section together with the flanges 57a,b and the support surface 61.

[0075] In figure 7, the drawer plate 37 is mounted on the drawer support plate 53. For clarity reasons, the components mounted on the drawer plate 37 have been omitted.

[0076] It will be apparent from figure 7, that the left and right side flanges 57a,b inhibit movement of the drawer plate 37 in a direction from the left to the right and vice versa, that is in a direction between the side walls 14 and 15 of the outer casing 11. The flange 57c located at the back inhibits a further movement of the drawer plate 37 towards the back wall 13 of the outer casing 11 and therefore represents a limit stop when installing the drawer plate 37.

[0077] Additionally, the drawer plate 37 is caught between lower surface of the lugs 58a, b and the support surface 61 so that a movement of the drawer plate 37 in a vertical direction, that is away from the bottom wall 17 is inhibited.

[0078] When being installed, there is in the region of the bottom portion 59 of the drawer support plate 53 and a lower side 62 of the drawer plate 37 an air space so that the contact region between the lower side 62 and the drawer support plate 53 is limited to the region of the support portion 60.

[0079] Again referring to figure 2, a third and fourth heat source pipe 63, 64 (second heat source pipes and in the particular example brine solution pipes) are provided in an upper portion of the outer casing 11 and lead to the heat source (in the present example to the ground).

[0080] A third and a fourth liquid pipe 65 and 66 (second liquid pipes and in the particular example water pipes) are as well provided in the upper portion of the outer casing 11 and lead to the heat consumer, such as

the domestic hot water tank 20 and/or a heating circuit as mentioned above.

[0081] The first and second heat source pipe 30, 31 are respectively connected to the third and fourth heat source pipe 64, 65 by the use of quick-release-fasteners 67. Also the first and second liquid pipes 33, 34 are respectively connected to the third and fourth liquid pipes 65, 66 by the use of quick-release-fasteners 67.

[0082] When installing the above-described heat source unit 10, the outer casing 11 and the heat pump module 19 may be separately carried to the installation site. Thus, the parts to be carried to the installation site are easier to carry (less heavy) than the complete heat source unit 10. Once the outer casing 11 is installed and the front wall 12 removed, the installer may install the heat pump module 19.

[0083] For this purpose, the drawer plate 37, with all the components mounted thereon and as described above, is placed on a forward end of the support surfaces 61 of the drawer support plate 53. Subsequently, the drawer plate 37 is slid along the support surfaces 61 towards the back wall 13 whereby it is guided by the flanges 57a,b on the left and right side of the drawer support plate 53. The flange 57c on the backside indicates to the installer that the drawer plate 37 has been fully inserted in that it abuts on the flange 57c and cannot be moved further towards the back wall 13. In order to fix the drawer plate 37 in place, one single screw is screwed into a fixing hole 70 adjacent the front edge 39a of the drawer plate 37 (see figure 3). Consequently it is very easy to fix and also loosen the drawer plate.

[0084] Subsequently, a front plate 68 is attached with front end portions of the heat source pipes 30, 31 and the liquid pipes 33, 34 protruding from the front plate 68. Thus, the heat source pipes 63, 64 and the liquid pipes 65, 66 may be connected to the heat source pipes 30, 31 of the liquid pipes 30, 34, respectively, by the use of the quick-release-fasteners 37. No tools are required to connect the pipes. For example, the pipes 63 to 66 may be slid onto the front ends of the pipes 30, 31, 33 and 34, wherein for example a spring biased catching member on the pipes 63 to 66 catches into an annular ring on the front ends of the pipes 30, 31, 33 and 34. In addition, electrical cables may be connected and the front wall 12 be installed.

[0085] For maintenance, the above process is reversed. Accordingly and after disconnecting the electrical cables, separating the pipes 63 to 66 from the pipes 30, 31, 33 and 34 and removing the front plate 68, as well as loosening the screw from the fixing hole 70, the drawer plate 37 including all the components mounted thereon may be drawn out of the outer casing 11 and maintenance on the components be performed. If required, the drawer plate 37 may even be completely removed from the outer casing 11 for maintenance.

[0086] 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. For example, it may be conceivable to implement the described features into a heat source unit using another heat source than the ground. Additionally, the present disclosure is mainly based on heating, but does not exclude cooling. Thus, the heat source unit may also be part of an air conditioning or of the system providing heating and cooling. Even further the refrigerant circuit may comprise less components or other components than those described above. In this context, in its most general form, the refrigerant circuit merely comprises the heat source heat exchanger, the compressor, the heat consumer heat exchanger and the expansion valve. Moreover, only one of the heat exchangers may be disposed on the drawer plate, particularly when the heat source unit is considered as an outdoor unit of an air conditioner.

Reference list

[0087]

10 heat source unit
11 outer casing
12 front wall
13 back wall
14 right side wall
15 left side wall
16 top wall
17 bottom wall
18 lower side
19 heat pump module
20 domestic hot water tank
21 connections to ground source/heating circuit
22 compressor
23 accumulator
24 refrigerant pipe
25 4-way valve assembly
26 expansion valve
27 heat source heat exchanger
28 heat consumer heat exchanger
29 control box
30 first heat source pipe
31 second heat source pipe
32 brine solution pump
33 first liquid pipe
34 second liquid pipe
35 water pump
36 drain pan
37 drawer plate
38 handle
39a front edge
39b rear edge
40 carrying handle
41 mounting structure
42 handle
43 compressor enclosure
44 compressor housing
45 fixation preparation

46 compressor plate
47 compressor plate damper
48 upper side
49 drawer plate damper
5 50 damping mechanism
51 outer rim
52 upper beside
53 drawer support plate
54 bottom plate damper
10 55 screw
56 annular rim
57a-c upright flange
58a,b lug
59 bottom portion
15 60 support portion
61 support surface
62 lower side
63 third heat source pipe
64 fourth heat source pipe
20 65 third liquid pipe
66 fourth liquid pipe
67 quick-release-fastener
68 front plate
69 heat pump module casing
25 70 fixing hole

Claims

- 30 1. Heat source unit (10) for a heat pump having a refrigerant circuit, the heat source unit (10) comprising:
- 35 components of the refrigerant circuit of the heat pump;
an outer casing (11) having a bottom wall (17), a back wall (13), a front wall (12) opposite to the back wall (13), and side walls (14, 15), **characterized by**
40 a drawer plate (37) supporting the at least one component of the refrigerant circuit and being slidable relative to the bottom wall (17) of the outer casing (11), whereby the at least one component of the refrigerant circuit is together with the drawer plate (37) withdrawable from the outer casing (11).
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2. Heat source unit according to claim 1, wherein the components of the refrigerant circuit comprise a compressor (22).
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3. Heat source unit according to claim 2, wherein the compressor (22) is mounted on the drawer plate (37) via a damping mechanism (50).
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4. Heat source unit according to claim 3, wherein the damping mechanism (50) comprises a compressor plate (46) supporting the compressor via a set of compressor plate dampers (47), the compressor

plate (46) being supported on the drawer plate (37) via a set of drawer plate dampers (49).

5. Heat source unit according to anyone of the preceding claims, further comprising a drawer support plate (53) supported on the bottom wall (17) and supporting the drawer plate (37). 5
6. Heat source unit according to claim 5, wherein the drawer support plate (53) is supported on the bottom wall (17) via a set of bottom plate dampers (54). 10
7. Heat source unit according to claim 5 or 6, wherein the drawer support plate (53) comprises upright flanges (57) for limiting the movement of the drawer plate (37) in at least two directions, preferably three directions, within the plane of the drawer plate (37). 15
8. Heat source unit according to claim 5, 6 or 7, wherein the drawer support plate (53) is provided with at least one lug (58) for limiting the movement of the drawer plate in a direction perpendicular to the plane of the drawer plate (37). 20
9. Heat source unit according to anyone of the preceding claims, wherein the drawer plate (37) comprises a handle (38) adjacent a front edge (39a) of the drawer plate (37) for withdrawing the drawer plate (37). 25
10. Heat source unit according to anyone of the preceding claims, wherein a carrying handle (40) is mounted to the drawer plate (37) at a distance to the drawer plate (37) for carrying the drawer plate (37) with the components of the refrigerant circuit. 30
11. Heat source unit according to anyone of the preceding claims, wherein the components of the refrigerant circuit comprise a first heat exchanger (28), the first heat exchanger (28) being configured for exchanging heat between the refrigerant and a liquid wherein first liquid pipes (33, 34) are connected to the first heat exchanger (28) and second liquid pipes (65, 66) are connectable to a heat consumer, the first and second liquid pipes (33, 34, 65, 66) are respectively connected by a quick - release-fastener (67). 35
40
12. Heat source unit according to claim 11, wherein the heat consumer is a domestic hot water tank (22) accommodated in the outer casing (11) and the liquid pipes (33, 34, 65, 66) are water pipes. 45
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13. Heat source unit according to anyone of the preceding claims, wherein the components of the refrigerant circuit comprise a second heat exchanger (27), the second heat exchanger (27) being configured for exchanging heat between the refrigerant and a heat source, wherein first heat source pipes (30, 31) are connected to the second heat exchanger (27) and

second heat source pipes (63, 64) are in fluid communication with the heat source, the first and second heat source pipes (30, 31, 63, 64) are respectively connected by a quick - release fastener (67).

14. Heat source unit according to anyone of the preceding claims, wherein all components of the refrigerant circuit are supported on the drawer plate (37).
15. Heat source unit according to anyone of the preceding claims, wherein at least a portion of a controller (29) for controlling the operation of the refrigerant circuit is supported on the drawer plate (37).

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

1. Heat source unit (10) for a heat pump having a refrigerant circuit, the heat source unit (10) comprising:
 - components of the refrigerant circuit of the heat pump;
 - an outer casing (11) having a bottom wall (17), a back wall (13), a front wall (12) opposite to the back wall (13), and side walls (14, 15), **characterized by**
 - a drawer plate (37) supporting the at least one component of the refrigerant circuit and being slidable relative to the bottom wall (17) of the outer casing (11), whereby the at least one component of the refrigerant circuit is together with the drawer plate (37) withdrawable from the outer casing (11); **characterized by**
 - a drawer support plate (53) supported on the bottom wall (17) and supporting the drawer plate (37), wherein the drawer support plate (53) is supported on the bottom wall (17) via a set of bottom plate dampers (54).
2. Heat source unit according to claim 1, wherein the components of the refrigerant circuit comprise a compressor (22) .
3. Heat source unit according to claim 2, wherein the compressor (22) is mounted on the drawer plate (37) via a damping mechanism (50).
4. Heat source unit according to claim 3, wherein the damping mechanism (50) comprises a compressor plate (46) supporting the compressor via a set of compressor plate dampers (47), the compressor plate (46) being supported on the drawer plate (37) via a set of drawer plate dampers (49).
5. Heat source unit according to any one of the preceding claims, wherein the drawer support plate (53) comprises upright flanges (57) for limiting the move-

ment of the drawer plate (37) in at least two directions, preferably three directions, within the plane of the drawer plate (37).

6. Heat source unit according to any one of the preceding claims, wherein the drawer support plate (53) is provided with at least one lug (58) for limiting the movement of the drawer plate in a direction perpendicular to the plane of the drawer plate (37). 5
10
7. Heat source unit according to anyone of the preceding claims, wherein the drawer plate (37) comprises a handle (38) adjacent a front edge (39a) of the drawer plate (37) for withdrawing the drawer plate (37). 15
8. Heat source unit according to anyone of the preceding claims, wherein a carrying handle (40) is mounted to the drawer plate (37) at a distance to the drawer plate (37) for carrying the drawer plate (37) with the components of the refrigerant circuit. 20
9. Heat source unit according to anyone of the preceding claims, wherein the components of the refrigerant circuit comprise a first heat exchanger (28), the first heat exchanger (28) being configured for exchanging heat between the refrigerant and a liquid wherein first liquid pipes (33, 34) are connected to the first heat exchanger (28) and second liquid pipes (65, 66) are connectable to a heat consumer, the first and second liquid pipes (33, 34, 65, 66) are respectively connected by a quick - release-fastener (67). 25
30
10. Heat source unit according to claim 9, wherein the heat consumer is a domestic hot water tank (22) accommodated in the outer casing (11) and the liquid pipes (33, 34, 65, 66) are water pipes. 35
11. Heat source unit according to anyone of the preceding claims, wherein the components of the refrigerant circuit comprise a second heat exchanger (27), the second heat exchanger (27) being configured for exchanging heat between the refrigerant and a heat source, wherein first heat source pipes (30, 31) are connected to the second heat exchanger (27) and second heat source pipes (63, 64) are in fluid communication with the heat source, the first and second heat source pipes (30, 31, 63, 64) are respectively connected by a quick - release fastener (67). 40
45
12. Heat source unit according to anyone of the preceding claims, wherein all components of the refrigerant circuit are supported on the drawer plate (37). 50
13. Heat source unit according to anyone of the preceding claims, wherein at least a portion of a controller (29) for controlling the operation of the refrigerant circuit is supported on the drawer plate (37). 55

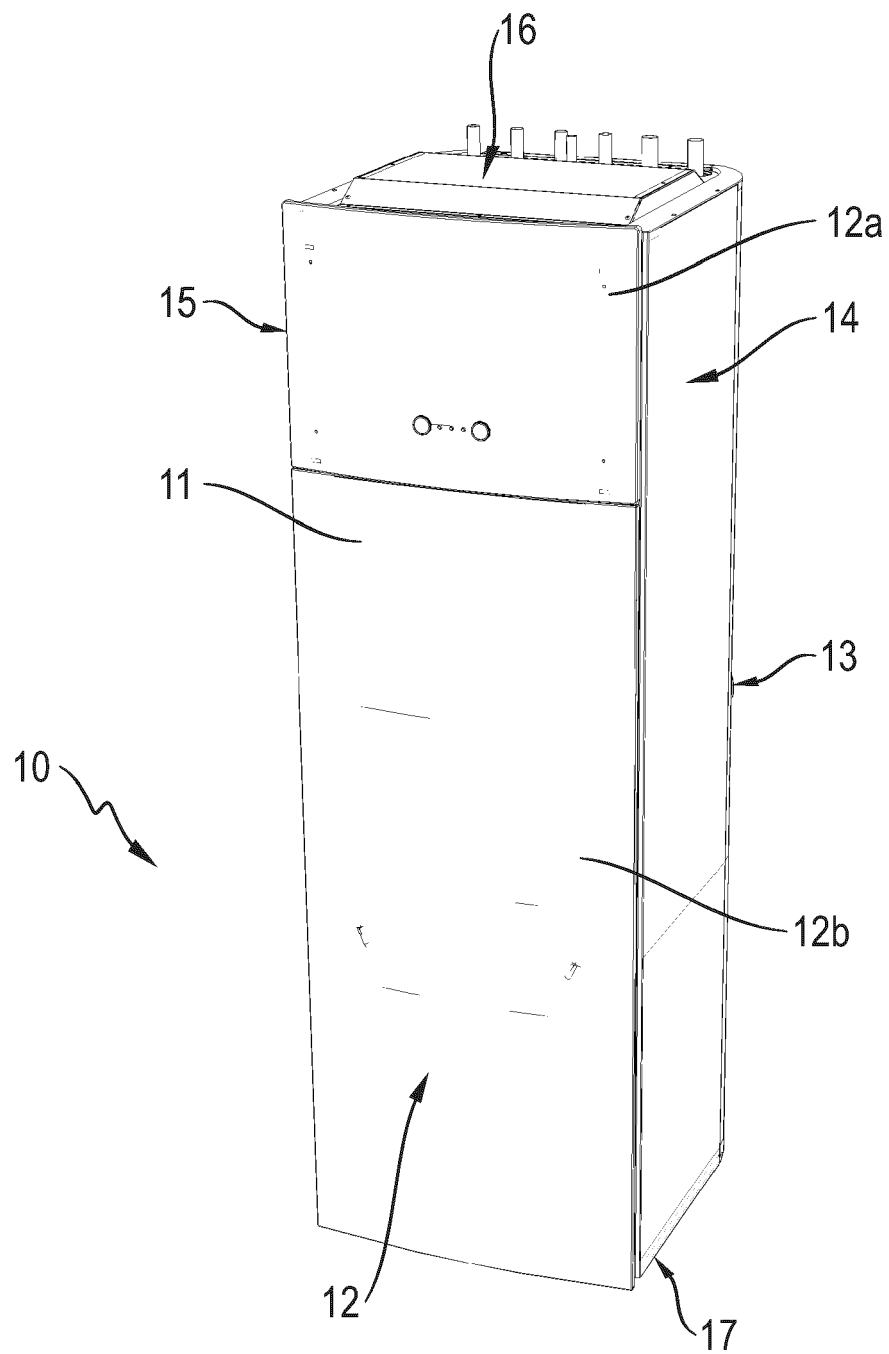


Fig. 1

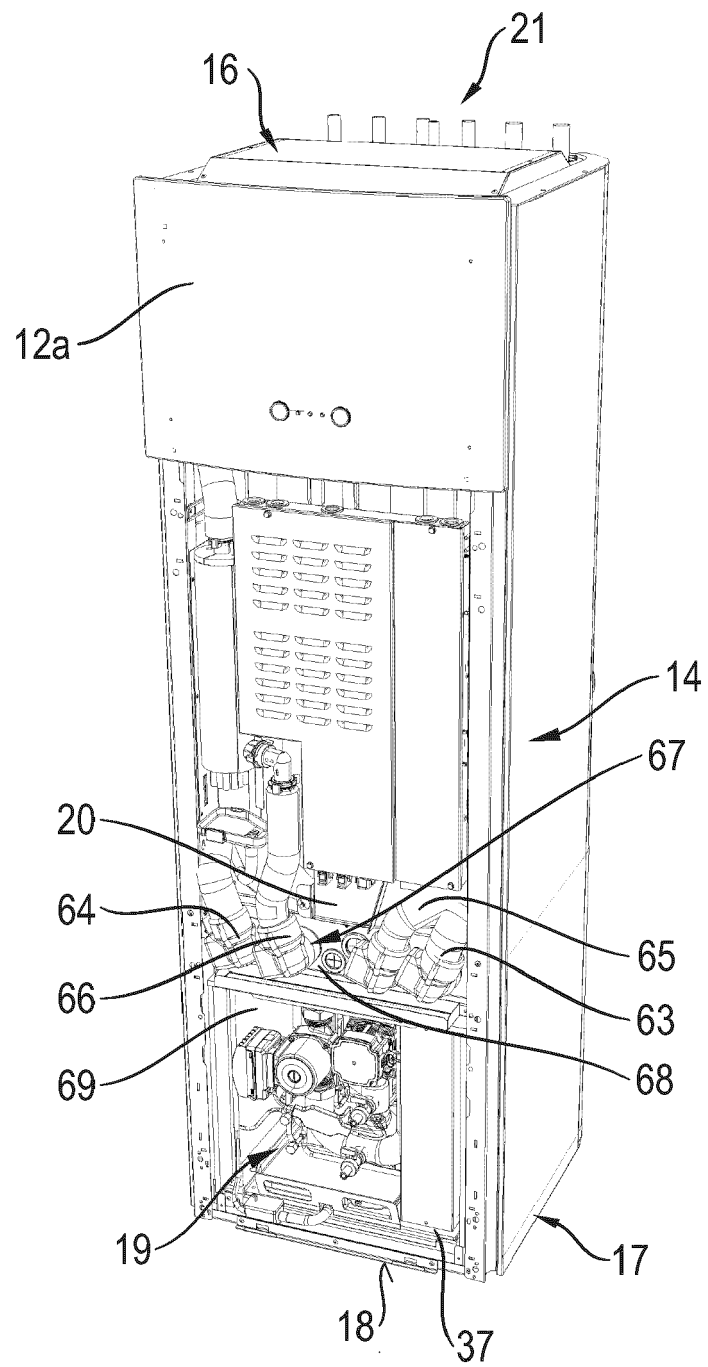


Fig. 2

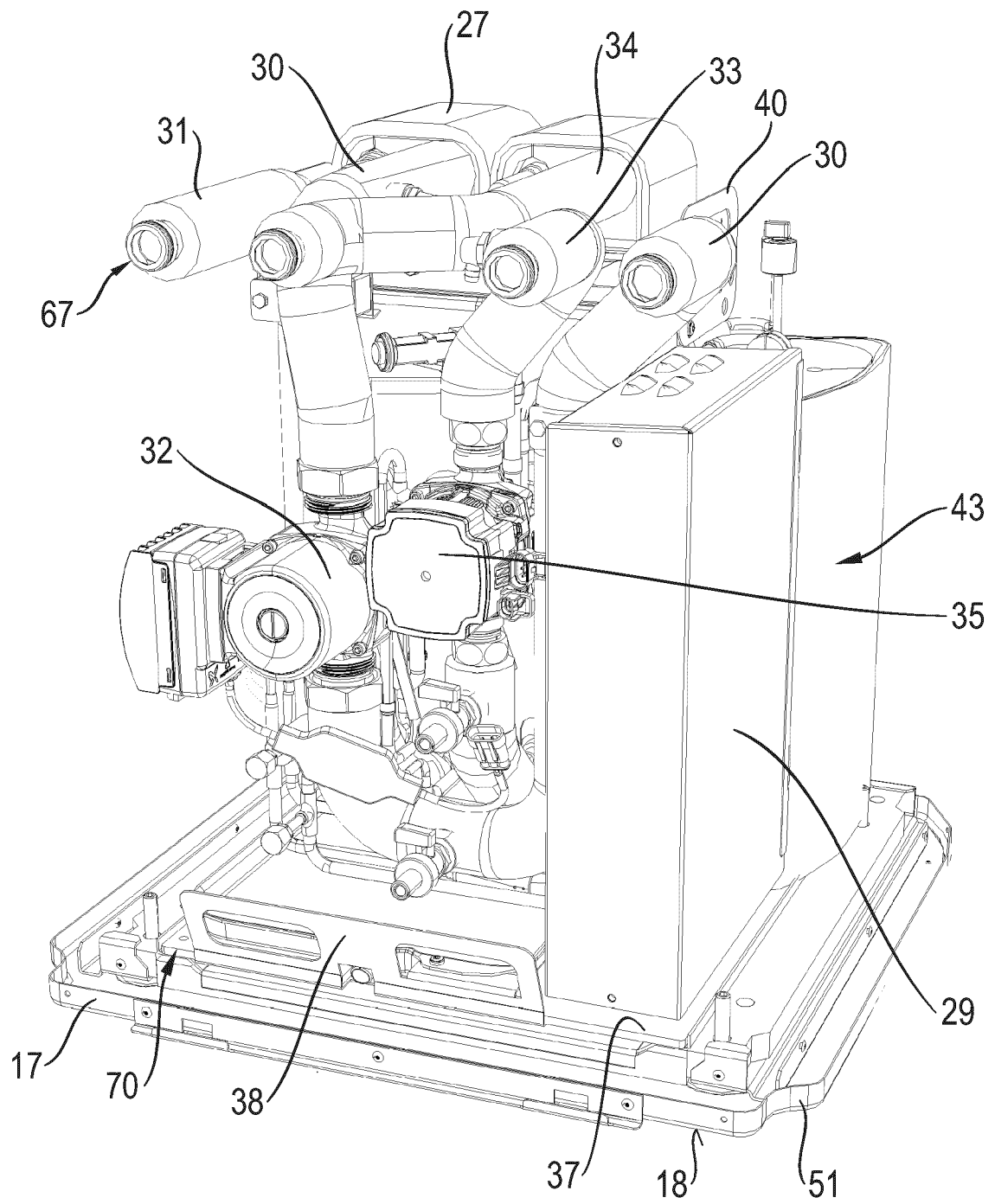


Fig. 3

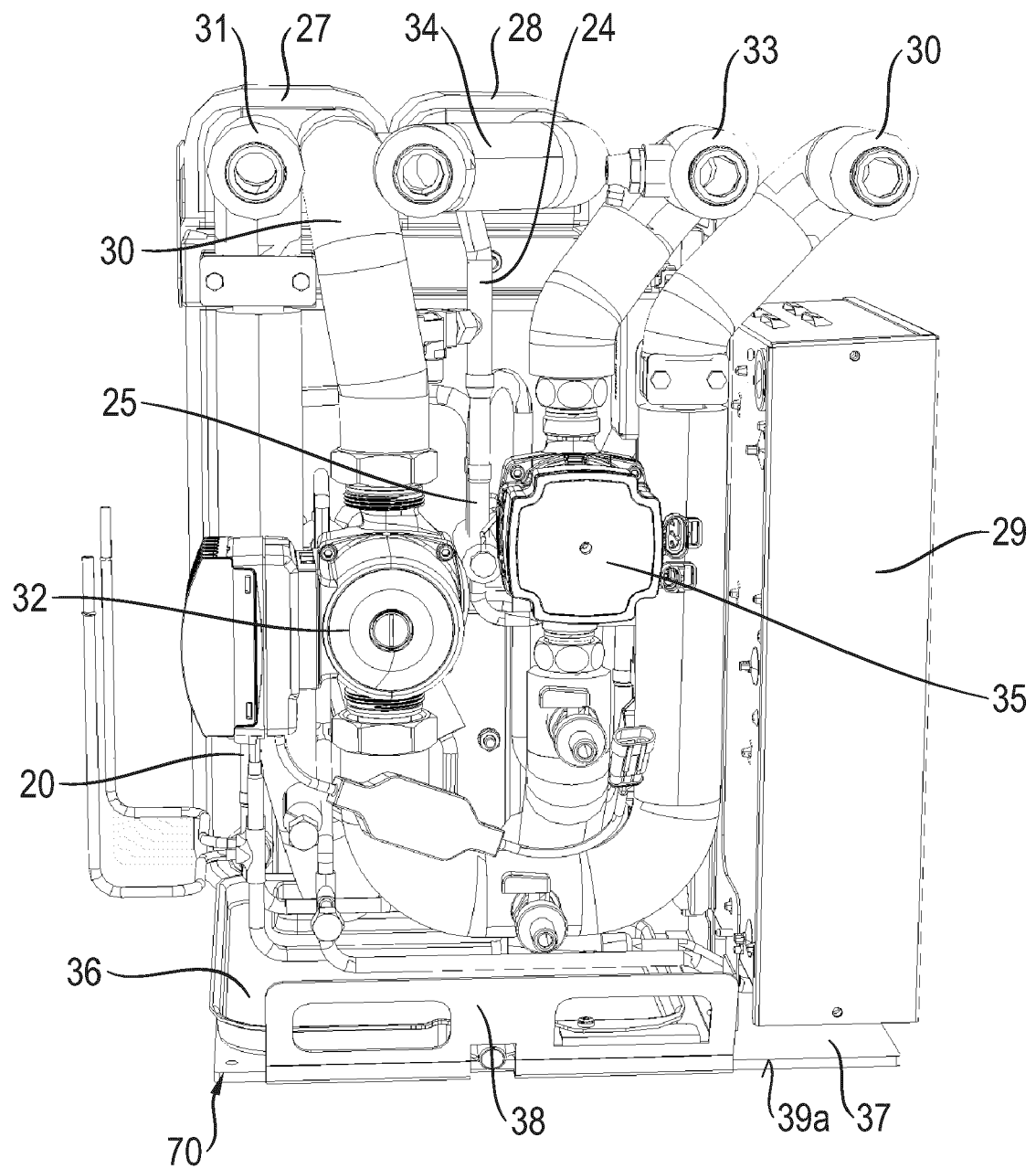


Fig. 4

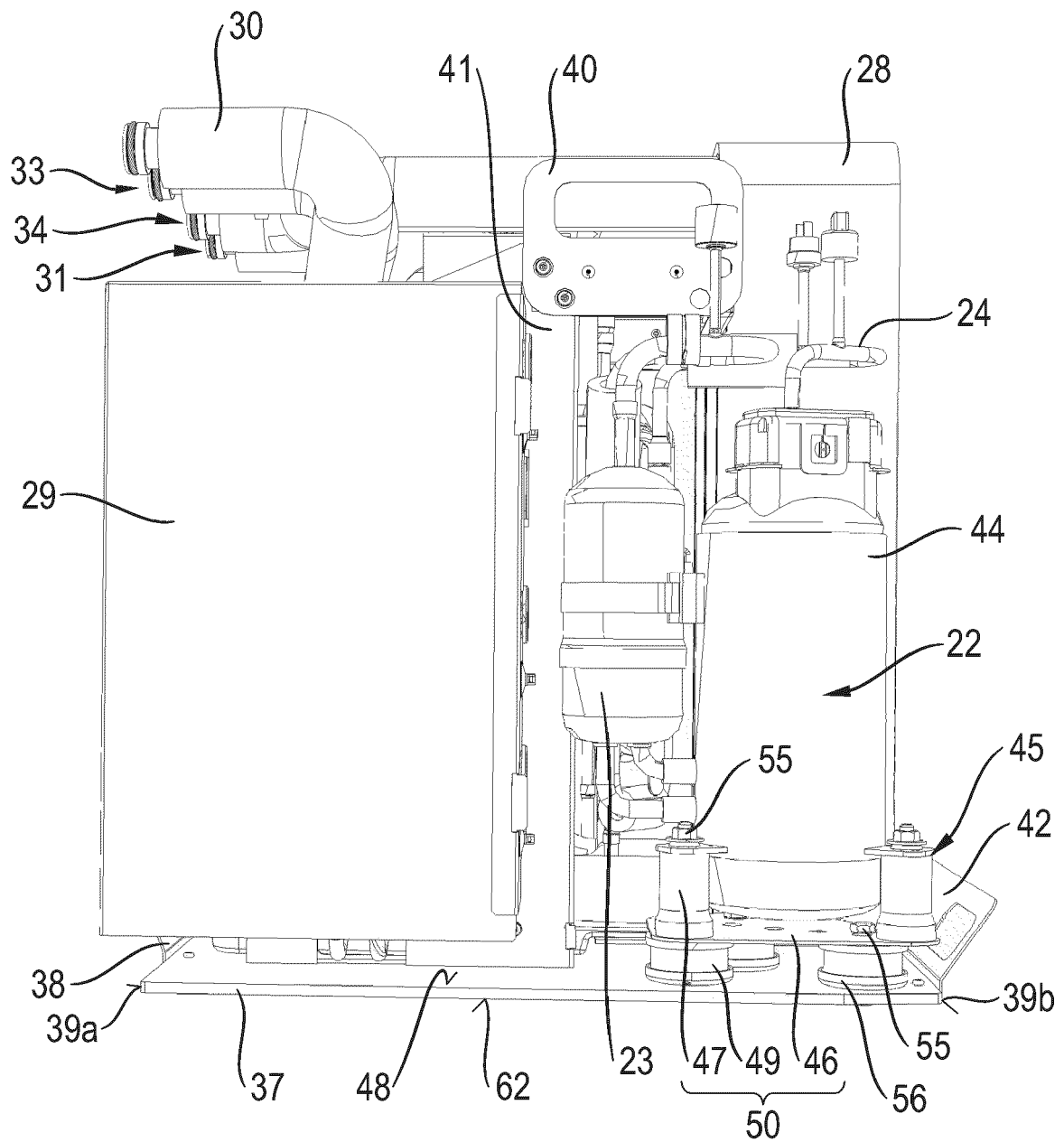


Fig. 5

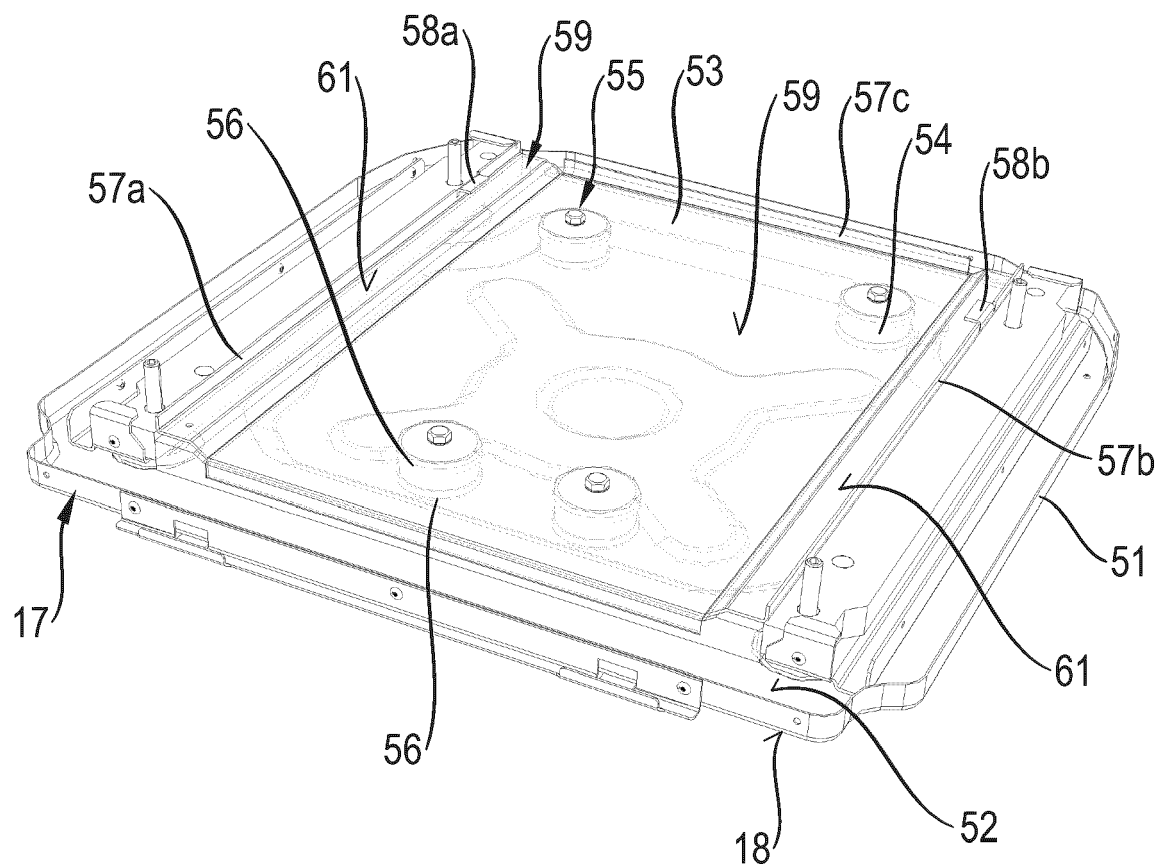


Fig. 6

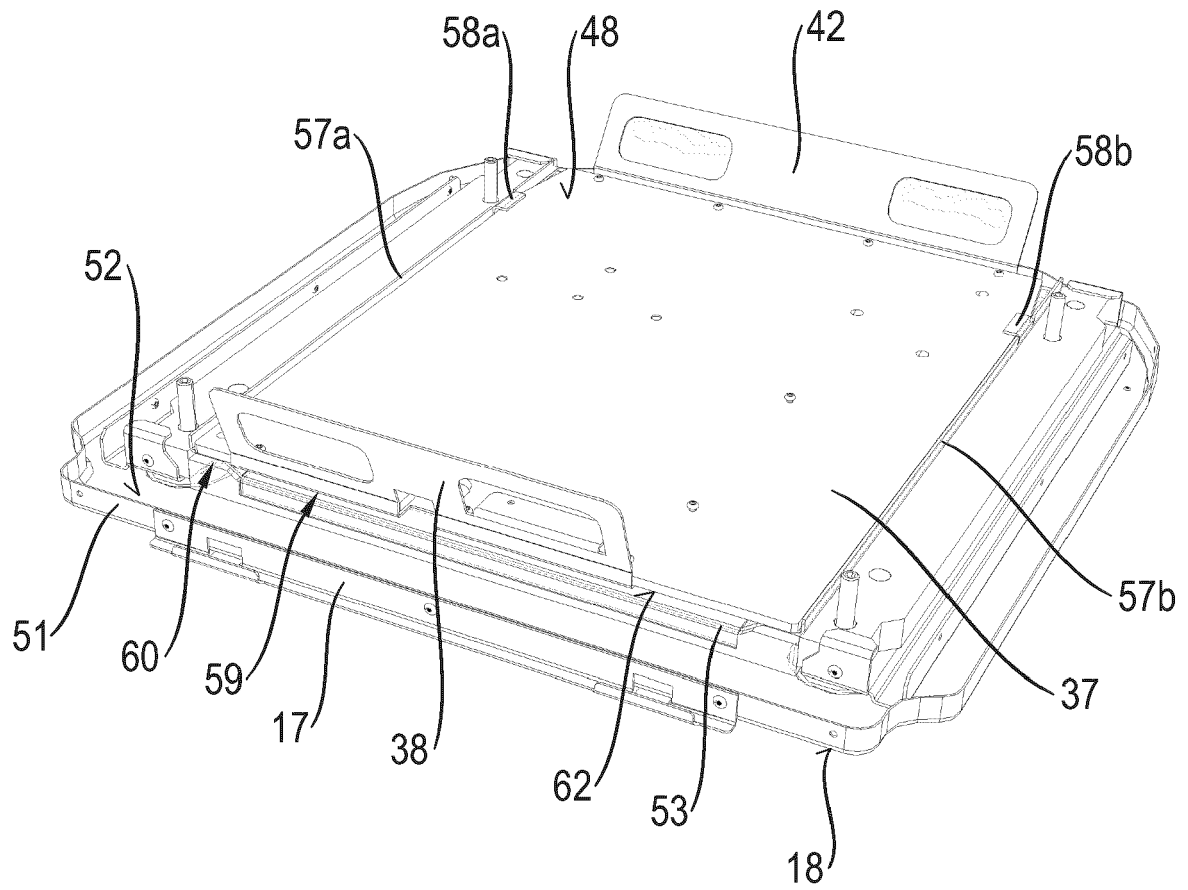


Fig. 7



EUROPEAN SEARCH REPORT

Application Number
EP 19 16 1596

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A	CN 207 065 741 U (TIANJIN YINUO REFRIGERATION EQUIPMENT MAINTENANCE CO LTD) 2 March 2018 (2018-03-02) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			F25D F24F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 6 September 2019	Examiner de Graaf, Jan Douwe
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 19 16 1596

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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