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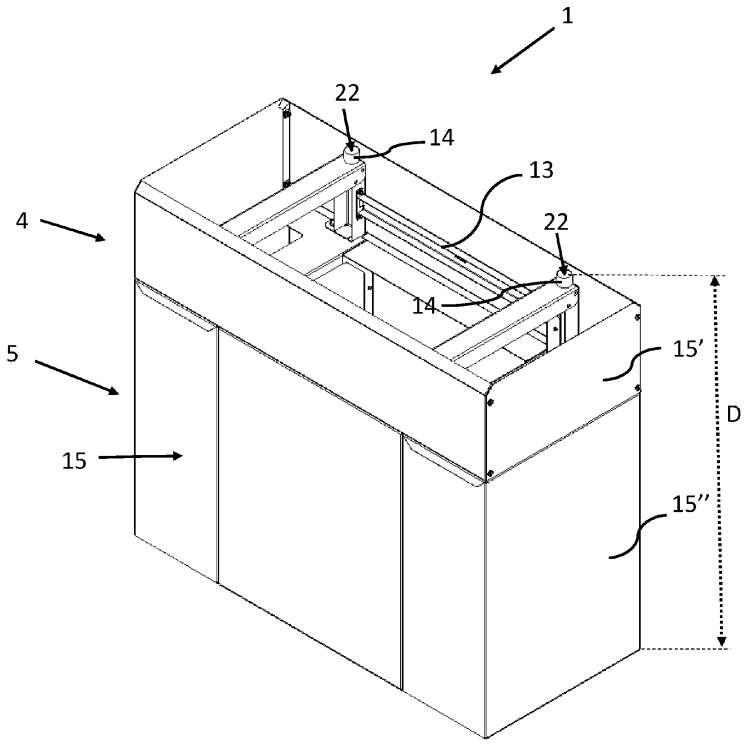
(54) HEAT PUMP SUPPORT DEVICE

(57) The invention relates to a heat pump support device (1) for an outdoor heat pump unit (2), in particular air-source heat pump unit, the heat pump support device (1) comprising a first portion (4) comprising at least one support (14) for supporting a heat pump unit (2),
wherein the heat pump support device (1) comprises a second portion (5) comprising at least one external opening (12) for at least one refrigerant and/or hydraulic and/or electrical connection to run in and out of the heat pump support device (1),
wherein the at least one external opening (12) is 50 cm or more below the at least at least one support (14).

Fig. 1



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Description

[0001] The invention relates to a heat pump support device and an assembly of such a heat pump support device and a heat pump unit. The method further relates to a method of installing an outdoor heat pump unit for cooling or warming a building, using a heat pump support device.

[0002] Heat pump units comprise multiple components that require the heat pump unit to be placed on a stable and horizontal support.

[0003] Heat pump units, including outdoor heat pump units, are vibrating machines (compressor, fan motor, pump etc.). To work properly, they need to be placed on a stable, horizontal support. The compressor needs to be horizontal because it has a rotating part around a vertical axis. If the product is not on a steady horizontal support, the compressor axis may be off-axis, increasing friction and vibration and reducing its lifetime. In addition, the vibrations generated by this misalignment have an impact on the entire circuit and cause noise and premature ageing of the heat pump components.

[0004] This also applies to heat pump units that are configured to be outside. Such outdoor heat pump units need to be placed on a stable base, typically detached from the building that is cooled and/or warmed by the heat pump unit. Outdoor heat pump units may for instance be placed in the vicinity of the building (e.g. in the garden) of the building, on the ground.

[0005] Outdoor heat pump units are connected to the building with electrical and fluid connections, leading from the heat pump unit to the inside of the building. The fluid connections may be hydraulic connections and/or refrigerant connections.

[0006] These connections have to be both accessible for maintenance and repair, as well as being properly protected, for instance against frost or from forming a hot spot or being an active area under electrical tension. In particular, it shall be ensured that an average person cannot get burned by touching the water or refrigerant circuit, or electrocute themselves by accidentally cutting the electrical cable connecting the heat pump.

[0007] The hydraulic and/or refrigerant and/or electrical connections must therefore not be accessible during the standard operating phase. However, it must be accessible during the installation and maintenance phase for a professional who needs this access for his tasks.

[0008] To protect hydraulic connections against frost, it is necessary that the connections are in a frost-free zone. In the north of France, for example, it is advisable to bury the hydraulic connections at least 80 cm deep to avoid frost.

[0009] Protection and ease of access are often contradicting measures, as protection may be achieved by putting the connections deeper in the ground, making maintenance and repair more difficult.

[0010] In addition, heat pump units require a drain point for condensate and for fluids that may have entered the heat pump unit volume otherwise. Due to the condensate and the outdoor conditions, the soil around the heat pump unit is likely to get moist. The heat pump unit is to be protected against moist to prevent the heat pump unit from receiving water.

[0011] Due to the weight of the product itself, the heat pump unit must be placed on stable, rigid, flat and horizontal surface that is suitable for supporting the weight of the heat pump unit and its vibrations and is not subject to deformation. To prevent transmission of sound and vibrations, the heat pump unit is preferably remote from the building. In particular, the heat pump unit and its support have to be decoupled from the house structure to avoid propagation of vibrations.

[0012] Often an extensive concrete construction is made to provide such a stable surface. A cavity is created in the ground, in which a formwork is built to facilitate construction of a concrete or brick wall or underground block. The underground block has a stable surface on which the heat pump unit can be placed directly or in a raised or disassociated manner using interface parts like anti-vibration feet or supports.

[0013] This solution is time consuming to make and doesn't provide for easily accessible connections underground.

[0014] The object of the invention is to provide a way to make installation of outdoor heat pump units more efficient, while at the same time allowing for easy maintenance and repairs. The object is solved by a heat pump support device for an outdoor heat pump unit, in particular air-source heat pump unit, the heat pump support device comprising a first portion comprising at least one support for supporting a heat pump unit,

wherein the heat pump support device comprises a second portion comprising at least one external opening for at least one refrigerant and/or hydraulic and/or electrical connection to run in and out of the heat pump support device,

wherein the at least one external opening is 50 cm or more below the at least at least one support.

[0015] The external opening may be in the range of 50 - 130 cm below the at least one support.

[0016] The one or more supports define a support plane which is, in particular substantially, horizontal when the heat pump support device is installed. Terms like upper, lower, higher, below and the like are used with reference to this support plane. These terms are used with respect to the normal installation orientation of the heat pump support device, i.e. such that the one or more supports form a horizontal support plane.

[0017] The support has a support surface on which the heat pump unit is directly or indirectly attached via an intermediate part which is attached to heat pump. The external opening is arranged 50cm or more below said support surface. Said support surface can be part of the aforementioned support plane. In a particular embodi-

ment fixing means, like screws and/or pins, can be used to the heat pump, in particular a foot of the heat pump, to the at least one support.

[0018] The distance between the at least one support and the at least one external opening is measured between, in particular a support surface of, the lowest support and the highest external opening. Where reference is made to a depth with respect to the ground or ground level, the depth is measured from the ground/-ground level to the highest part of the edge of the external opening.

[0019] For an opening orientated horizontally, e.g. an external opening in a panel parallel to the support plane, such as a bottom panel, the entire edge of the opening is at the same distance. However, for an external opening orientated differently, e.g. an external opening in a panel not parallel to the support plane, such as a side panel, the distance is taken to the part of the edge of the opening closest to the ground/ground level or closest to the support on which the heat pump unit is arranged.

[0020] It is noted that the external opening does not need to be directly below support plane. The distance between the at least one support and the at least one external opening is measured in a direction perpendicular to the support plane, i.e. in a direction parallel to the normal vector of the support plane, ignoring the relative position of the openings in a direction parallel to the support plane.

[0021] The heat pump support device creates an inner space through which the connections can run and which creates a clear working space when the heat pump support device is partially buried underground.

[0022] The heat pump support device has an inner space that facilitates for guiding the refrigerant and/or hydraulic and/or electrical connections from the at least one external opening to the heat pump unit when installed on the at least one support. The heat pump support device creates sufficient inner space to accommodate the refrigerant, and/or hydraulic and/or electrical connections, creating sufficient volume for bending thee connections (tubes, cables) with a bending radius that is needed for such connections. The bending radius can be larger than the diameter of the connection. The inner space can have a height of at least of 400mm. For the case that the inner space is a cylinder, the cylinder could have a diameter of at least 200mm.

[0023] In a preferred embodiment, the heat pump support device can have a height of 800mm, a length of 1270mm and a thickness of 560mm.

[0024] Such a heat pump support device facilitates and accelerates the installation of the heat pump unit as there is no mandatory need for civil engineering work to be carried out, like creating a brick wall, with associated drying time, no specific equipment for transporting and building walls (concrete mixer, transport equipment etc.). The heat pump support device can be a ready to use product, which is manufactured to be a long-lasting solution, not subject to breakage due to vibrations.

[0025] The at least one external opening can be provided at the bottom of the heat pump support device for guiding and connecting the refrigerant and/or hydraulic and/or electrical connections to the place to be heated. The external opening can also be provided in a side panel, in particular near the bottom.

[0026] The heat pump support device ensures that the connections between the heat pump unit and the building to be heated/cooled can be installed in a reliable manner. When the heat pump support device is installed outdoors and partially buried it is ensured that the connections are buried at a predetermined depth where it is protected against frost. By providing the right heat pump support device, the chances of errors during installation are minimized and correct fulfilment of the installation requirements is guaranteed, such as preferred depth to bury the connections, in particular the hydraulic connections, decoupling of the heat pump support from the building frame, rigidity of the support, stability and horizontal alignment of the heat pump unit. Further guaranteed is the correct alignment of the connection points with the building to be serviced by the heat pump unit.

[0027] The at least one external opening is positioned such that, when buried, the depth/distance between the ground level and the at least one external opening ensures that the open area created by the heat pump support device is not subject to frost. This distance is 50cm or more, preferably between 50 cm and 100 cm.

[0028] The heat pump support device provided allows for a clean and durable solution over time (no erosion of the base, mud, etc.) while ensuring connections with standard parts, especially with underground connection pipes between the heat pump unit and the building to be serviced by the heat pump unit.

[0029] According to an embodiment the first portion and the second portion are formed as one piece or the first portion and the second portion are releasably connected to each other. The second portion can be arranged below the first portion.

[0030] The first portion can have a length of at least 110mm, in particular between 100 and 400, mm and the second portion can have a length of 800 mm, in particular between 700mm to 1000mm. The height of the first portion is chosen such to ensure that the fan and evaporator of the heat pump will not be under snow during an operation of the heat pump and/or to avoid the blocking or penetration of the heat pump on the ground due to leaves, water or other objects.

[0031] For the connections running between the external openings and the heat pump unit it is ensured that the angle and bending radius of the connections are not exceeding the specifications of the connections.

[0032] According to an embodiment the heat pump support device comprises an internal frame, the internal frame comprising the one or supports.

[0033] An internal frame may be provided to provide the heat pump support device with sufficient strength to carry the heat pump unit and, when buried, the pressure

of the surrounding soil. The at least one support can be arranged on the internal frame. In an alternative embodiment, the at least one support can be a part of the internal frame itself.

[0034] According to an embodiment the heat pump support device comprises side panels to form an inner space. In said embodiment, the first portion and the second portion have preferably both side panels. However, in a less preferred embodiment, it can be possible to have the first portion without side panels. In said embodiment the first portion only comprises the support and/or the internal frame. The support and/or the internal frame can be connected to the second portion and/or arranged above the ground and thus be visible from outside. The second portion can comprise the side panels.

[0035] According to a preferred embodiment the heat pump support device comprises side panels to form an inner space at least between the at least one external opening and the one or more supports.

[0036] The heat pump support device may comprise a bottom panel, comprising one or more external openings. Alternatively, the heat pump support device may not comprise a bottom panel and thus having an open bottom end, forming the at least one external opening.

[0037] The panels may form a housing to accommodate the connections running through the heat pump support device. When buried, the panels create an open workspace for personnel to access the connections and keep the connections free of mud and the like.

[0038] The heat pump support device may comprise at least one internal opening between the first portion and the second portion. Said internal opening can be arranged in a plate arranged in an inner space of the heat pump support device. The plate can be arranged in a position that separates the first portion from the second portion.

[0039] The heat pump support device may comprise a top panel covering the inner space from the top. In said case the top panel comprises holes used for receiving a part of the support or of the heat pump unit, in particular a foot of the heat pump unit. Thus in said case, the heat pump unit is also supported by the at least one support.

[0040] In an alternative embodiment the at least one hole used for receiving a part of the support or of the heat pump unit can be a side opening orientated horizontally or orientated vertically in a side panel from the second portion of the heat pump support device.

[0041] Alternatively, the heat pump support device may not comprise a top panel and thus having an open top end. In a preferred embodiment the inner space from the first portion of the heat pump support device is closed after the heat pump unit is placed on the heat pump support device, in particular on the at least one support.

[0042] The heat pump support device may comprise an internal structure or frame, which is covered with such side panels. The heat pump support device may also comprise side panels, without internal frame. The side panels are made of sufficiently rigid material, preferably steel, to ensure that the heat pump unit can be carried without deformation, to preserve the integrity of the volume and the components inside, and to prevent penetration into the unit and or the device by external elements of the environment (earth, various objects, animals, climatic events etc.).

[0043] According to an embodiment at least one side panel is divided in an upper side panel covering part of the first portion and a lower side panel covering part of the second portion, the upper side panel being removable or openable to provide access to the inner space. As mentioned above, in a case in which no top panel is present, the heat pump unit can close an open top end of the heat pump support device. Thus, a person can have access to the interior of the heat pump support device by removing the heat pump unit. Additionally or alternatively, the upper side panel can have an opening. Said opening can be large so that a person has access to the interior of the heat pump support device.

[0044] Such a removable or openable upper side panel provides easy access to the inner space and to the connections running through the heat pump support device and the connecting points of such connections with the heat pump unit. When buried, the upper side panels can be positioned above the ground, while the lower side panel can be (at least partially) buried.

[0045] According to an embodiment the lower part is suitable to be at least partially buried below ground level.

[0046] The heat pump supporting device, i.e. at least the second portion, is preferably suitable to be buried below ground level. This means that the heat pump supporting device, or at least the second portion, is sufficiently strong to resist the pressure of surrounding soil, withstand the influence of water and mud and underground animals, while carrying the weight of the heat pump unit.

[0047] According to an embodiment the heat pump support device is partially buried with the first portion being above ground level and the second portion being at least partially below ground level.

[0048] According to an embodiment the at least one external opening is orientated vertically in a side panel of the heat pump support device.

[0049] According to an embodiment the at least one external opening is orientated horizontally in the bottom of the heat pump support device. Such an external opening has the advantage that the installation of the heat pump is easy as the external opening can be large and cover the almost the entire bottom.

[0050] When the at least one external opening is within the indicated range, it is ensured that the refrigerant and/or hydraulic and/or electrical connections are sufficiently deep to be prevented from frost, while not too deep to be accessible by staff.

[0051] According to an embodiment the heat pump support device is partially buried underground with the at least one external opening being at a depth of 50 - 100cm below ground level.

[0052] Preferably, the one or more supports form a support plane which is substantially horizontal. The respective support surface of the support are part of the support plane.

[0053] According to an embodiment the heat pump support device, or at least the internal frame, is substantially made of steel. Steel is a strong, durable material which is suited to be buried.

[0054] According to an aspect there is provided an assembly of a heat pump support device according to any one of the preceding claims and a heat pump unit positioned on the one or more supports of the heat pump support device.

[0055] The heat pump unit may be an outdoor heat pump unit. Outdoor units are units that have constraints, like size, noise, dangerous refrigerants and/or great air flows, so that they shall not be installed inside a housing.

[0056] According to an embodiment at least one intermediate part is positioned in between the at least one support and the heat pump unit. The intermediate part can be a foot and/or a raiser and/or an antivibration pad and/or rubber that is attached below and/or at the bottom the heat pump unit.

[0057] Anti-vibration pads may be used to minimize vibrations. Risers may be provided to elevate the heat pump unit, for instance to ensure that snow or other external elements do not accumulate to a level in front of the heat pump unit such to obstruct the air flow generated by the fan of the heat pump unit and/or to ensure access for connections.

[0058] According to a further aspect there is provided a method of installing an outdoor heat pump unit for cooling or warming a building, using a heat pump support device comprising at least one support for supporting a heat pump unit, wherein the heat pump support device comprises at least one external opening for refrigerant and/or hydraulic and/or electrical connections to run in and out of the heat pump support device, the method comprising

a) digging a hole in the ground,

b) positioning the heat pump support device in the hole, wherein the at least one external opening is 50cm or more below the at least one support, in particular and

c) positioning the at least one refrigerant and/or hydraulic and/or electrical connection connected to a building through the at least one external opening and

d) positioning the heat pump unit on the one or more supports and connecting the heat pump unit to the at least one refrigerant and/or hydraulic and/or electrical connection.

[0059] The refrigerant and/or hydraulic and/or electrical connection connect the heat pump with e.g. a corresponding building circuit.

[0060] In b) the heat pump support device is preferably positioned with the one or more supports forming a substantially horizontal support plane. The support plane is preferably at or above ground level.

[0061] In the figures, the subject-matter of the invention is schematically shown, wherein identical or similarly acting elements are usually provided with the same reference signs.

Figure 1	schematically shows a perspective view of a heat pump supporting device according to an embodiment,
Figure 2	schematically shows a perspective view of an assembly of a heat pump supporting device and a heat pump unit according to an embodiment,
Figures 3a-d	schematically show a top, front, side and bottom view of a heat pump supporting device according to an embodiment,
Figures 4a-b	schematically show an assembly of a heat pump supporting device and a heat pump unit partially buried in the ground according to an embodiment,
Figure 5	schematically shows a side view of an assembly of a heat pump supporting device buried in the ground and a heat pump unit according to an embodiment,
Figure 6	schematically shows two alternative embodiments of the heat pump supporting device.
Figures 7a	schematically shows a further alternative of a heat pump supporting device in a front view.
Figure 7b	schematically shows the further alternative of the heat pump supporting device shown in fig. 7a in a perspective view.

[0062] Figure 1 schematically shows a perspective view of a heat pump support device 1 according to an embodiment. The heat pump support device 1 comprises an internal frame 13 and a plurality of side panels 15. This creates an inner space. Near the top of the heat pump supporting device 1 are a number of supports 14 suitable for supporting a heat pump unit.

[0063] The heat pump support device 1 comprises a second portion 5 connected to a first portion 4, the second portion 5 comprising at least one external opening for refrigerant and/or hydraulic and/or electrical connections to run in and out of the heat pump support device. The side panels 15 are arranged such that there is an inner space for refrigerant and/or hydraulic and/or electrical connections to run between the first portion 4 and the second portion 5.

[0064] Fig. 2 schematically shows a perspective view from another angle, showing external openings 12 being provided at the bottom part of the heat pump support device 1. Fig. 2 also shows the heat pump unit 2 being positioned on the supports 14.

[0065] The at least one external opening 12 is at least 50 cm below the supports 14 that are shown in fig. 1. This is indicated in Fig. 1 and other Figures with arrow D. The distance is measured in a vertical direction from the support 14 to the top edge of the external openings 12. In particular, the distance is measured from a support surface 22 on which the heat pump unit 2 is arranged to the top edge of the external openings 12. A non shown support plane comprises the support surfaces 22 of the supports 14. The support plane can horizontally be arranged such that it comprises the upper edge of the side panels 15. However, it is also possible that the support plane is arranged lower than the upper edge of the respective side panel.

[0066] The at least one external opening 12 is configured for refrigerant and/or hydraulic and/or electrical connections to run in and out of the heat pump support device 1. These connections also run through the inner space of the heat pump support device 1 to the heat pump unit 2 (once installed).

[0067] The heat pump support device 1 is suitable to be partially buried below ground level. The heat pump support device is preferably made or partially made of steel, to make it suitable to be buried.

[0068] Fig. 3a shows a top view on the heat pump support device 1, fig. 3b shows a front view on the heat pump support device 1, fig. 3c shows a side view on the heat pump support device 1 and fig. 3d shows a bottom view on the heat pump support device 1. From the top view it is evident that a plate 23 is arranged in the inner space. Said plate 23 comprises internal openings 11 through which components, like the refrigerant and/or hydraulic and/or electrical connection, of the heat pump can protrude. The plate 24 is arranged at a position in which the first portion 4 and the second portion 5 are connected to each other.

[0069] Fig. 4a and 4b show an assembly of a heat pump support device 1 and a heat pump unit 2, wherein the heat pump support device is partially buried. In Fig.'s 4a and 4b the ground 20 is schematically represented by a cube shape. Part of the heat pump support device 1 is above ground level, the other part is below ground level and not visible in Fig.'s 4a-b.

[0070] As shown in Fig. 2 one of the side panels 15 may be divided in an upper side panel 15' and a lower side panel 15". When buried, the upper side panel 15' may be above the ground and the lower side panel 15" may be at least partially underground, as shown in Fig.'s 4a and 4b. The upper side panel 15' is removable or openable allowing a person access to the inner space of the heat pump support device 1 and/or to the bottom of the heat pump unit.

[0071] Fig. 5 schematically shows a cross sectional side view of an assembly of a heat pump support device 1 and a heat pump unit 2, schematically showing the connections 3, e.g. refrigerant and/or hydraulic and/or electrical connections (shown by dashed lines) running through the heat pump support device 1 from the heat pump unit 2, through the inner space of the heat pump support device 1 through the internal openings 11 and through the external opening 12.

[0072] Fig. 5 shows also large flexible pipe 10 that is installed between the non-shown building and the location of the heat pump unit. The pipe 10 goes below or crosses a wall of the building. The aforementioned refrigerant and/or hydraulic and/or electrical connections 3 are arranged within the flexible pipe 10.

[0073] In the embodiments described above the at least one external opening 12 is orientated horizontally in the bottom (e.g. bottom panel 16) of the heat pump support device 1.

[0074] According to alternative embodiments, shown in Fig. 6a and 6b, the at least one external opening 12 is orientated vertically in a lower side panel 15"of the heat pump support device 1. Providing external openings 12 in a vertically orientated side lower side panel 15"facilitates placement of the refrigerant and/or hydraulic and/or electrical connections.

[0075] In Fig. 6a and 6b the distance D is indicated from the interface between the support 14, in particular support surface 22, and the upper edge of the external opening 12.

[0076] In Fig. 6b the feet from the heat pump are positioned on risers 21. The risers 21 elevate the heat pump unit 1. In particular, a foot 24 of the heat pump unit 1 is directly arranged on the riser 21. The riser 21 is arranged on the non-shown support 14.

[0077] Fig. 6a shows an embodiment with three round external openings 12. One opening is used for electric power supply, another opening is used for sensor or low-voltage connection and a further opening is used for hydraulic or refrigerant connection. The openings are round as this is the shape of a wire and/or a pipe. So there is less free space through which mud, earth or whatever can enter into the inner space of the heat pump support device 1.

[0078] Fig. 6b shows an embodiment with two oval shaped external openings 12. The oval shape is better than a rectangular shape from process point of view. Additionally, two pipes can pass through the oval shape resulting in less openings than the embodiment shown in fig. 6a. The oval shape also creates more tolerance for the installation or connection of the pipe by the installer if the tubes and openings are not right side up.

[0079] Figures 7a schematically shows a further alternative of a heat pump supporting device in a front view and Figure 7b schematically shows the further alternative of the heat pump supporting device shown in fig. 7a in a perspective view. The foot 24 of the heat pump unit 2 is directly arranged on the support 14. A fixing means, in particular a screw, is used to fix the heat pump unit 2, in particular the foot 24, to the support 14.

Reference Signs

[0080]

1. Heat pump support device
2. Heat pump unit
3. Refrigerant and/or hydraulic and/or electrical connections
4. First portion
5. Second portion
10 Pipe
11. Internal opening
12. External opening
13. Internal frame
14. Supports
15. Side panels
16. Bottom panel
20. Ground
21 Riser
22 Support surface
23 Plate
24 Foot

Claims

1. Heat pump support device (1) for an outdoor heat pump unit (2), in particular air-source heat pump unit, the heat pump support device (1) comprising a first portion (4) comprising at least one support (14) for supporting a heat pump unit (2),

wherein the heat pump support device (1) comprises a second portion (5) comprising at least one external opening (12) for at least one refrigerant and/or hydraulic and/or electrical connection to run in and out of the heat pump support device (1),
wherein the at least one external opening (12) is 50 cm or more below the at least at least one support (14).

2. Heat pump support device (1) according to claim 1, wherein

a. the first portion (4) and the second portion (5) are formed as one piece or the first portion (4) and the second portion (5) are releasably connected to each other and/or
b. the second portion (5) is arranged below the first portion (4).

3. Heat pump support device (1) according to any one of the preceding claims, wherein the heat pump support device (1) comprises an internal frame (13), the internal frame (13) comprising the at least one support (14).

4. Heat pump support device (1) according to any one of the preceding claims, comprising side panels (15) to form an inner space at least between the at least one external opening (12) and the at least one support (14).

5. Heat pump support device (1) according to claim 4, wherein at least one first side panel (15) is divided in an upper side panel (15') covering part of the first portion (4) and a lower side panel (15") covering part of the second portion (5), the first side panel (15') being removable or openable to provide access to the inner space.

6. Heat pump support device (1) according to any one of the preceding claims, wherein the second portion (5) is suitable to be at least partially buried below ground level.

7. Heat pump support device (1) according to any one of the preceding claims, wherein the heat pump support device (1) is suitable to be partially buried with the first portion (4) being at least above ground level and the second portion (5) being at least partially below ground level.

8. Heat pump support device (1) according to any one of the preceding claims, wherein the at least one external opening (12) is orientated vertically in a side panel (15) of the heat pump support device (1)

9. Heat pump support device (1) according to any one of the preceding claims, wherein the at least one external opening (12) is orientated horizontally in the bottom of the heat pump support device (1).

10. Heat pump support device (1) according to any one of the preceding claims, wherein the at least one external opening (12) is in the range of 65 - 130 cm, more preferably 85 - 110cm, and even more preferably 95 - 105cm, below the at least one support (14).

11. Heat pump support device (1) according to any one of the preceding claims, wherein the heat pump support device (1) is configured to be partially buried underground with the at least one external opening being at a depth of 50 100cm below ground level.

12. Heat pump support device (1) according to any one of the preceding claims, wherein the heat pump support device (1) or at least the internal frame (13) is made of steel.

13. Assembly of a heat pump support device (1) according to any one of the preceding claims and a heat pump unit (2) positioned on the one or more supports (14) of the heat pump support device (1).

14. Assembly according to claim 13, wherein at least one intermediate part is positioned in between the at least one support (14) and the heat pump unit (2), in particular the intermediate part being an anti-vibration pad and/or a riser and/or foot.

15. Method of installing an outdoor heat pump unit for cooling or warming a building, using a heat pump support device (1) comprising at least one support (14) for supporting a heat pump unit (2), wherein the heat pump support device (1) comprises at least one external opening (12) for refrigerant connections and/or hydraulic connections and/or electrical connections to run in and out of the heat pump support device (1), the method comprising

a) digging a hole in the ground,
b) positioning the heat pump support device (1) in the hole, wherein the at least one external opening (12) is 50 cm or more below the at least one support (14), in particular and
c) positioning at least one refrigerant connection and/or at least one hydraulic connection and/or at least one electrical connection connected to a building connection through the at least one external opening (12) and
d) positioning the heat pump unit (2) on the one or more supports (14) and connecting the heat pump unit (2) to the at least one refrigerant connection and/or at least one hydraulic connection and/or at least one electrical connection.

Fig. 1

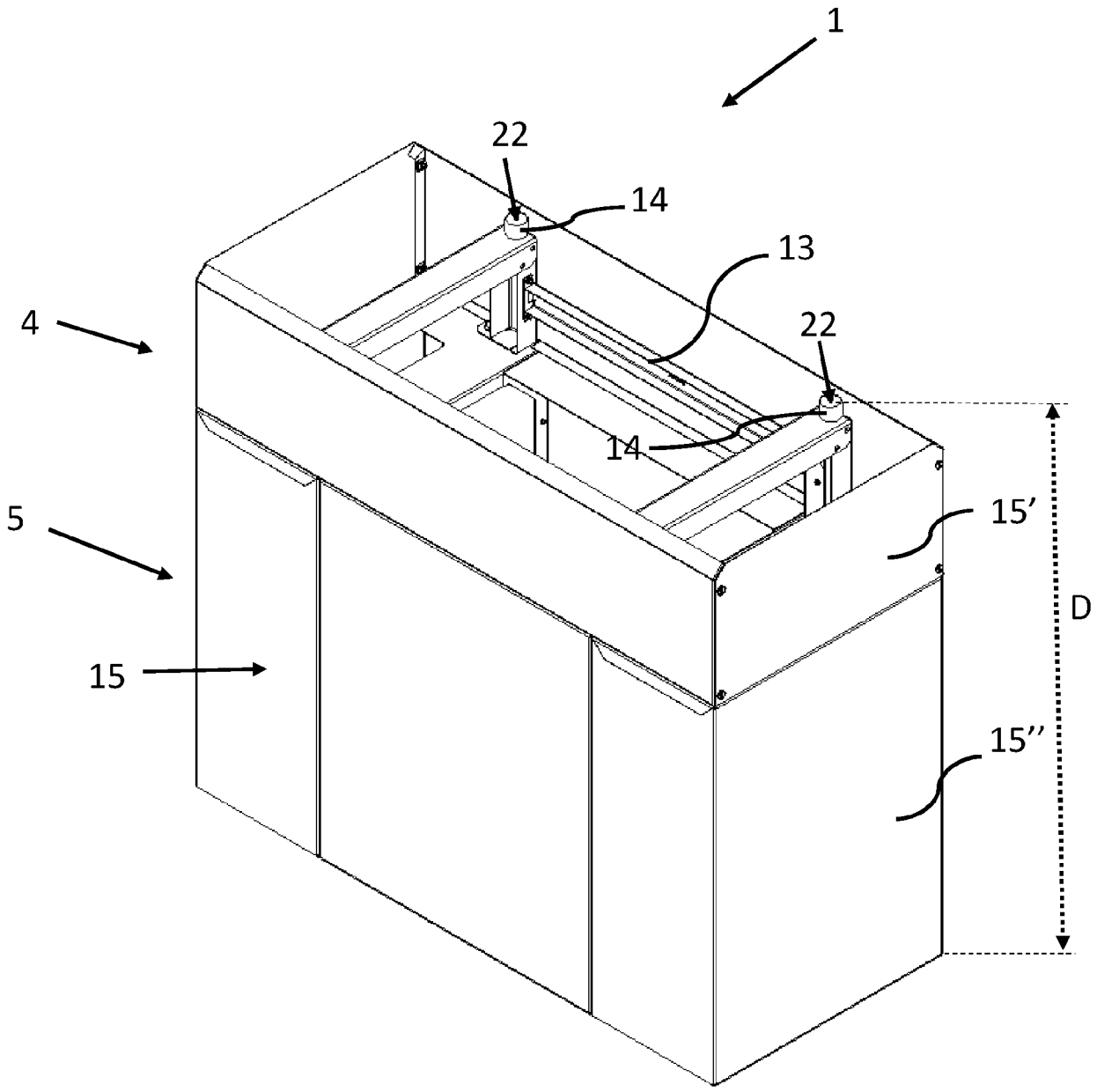


Fig. 2

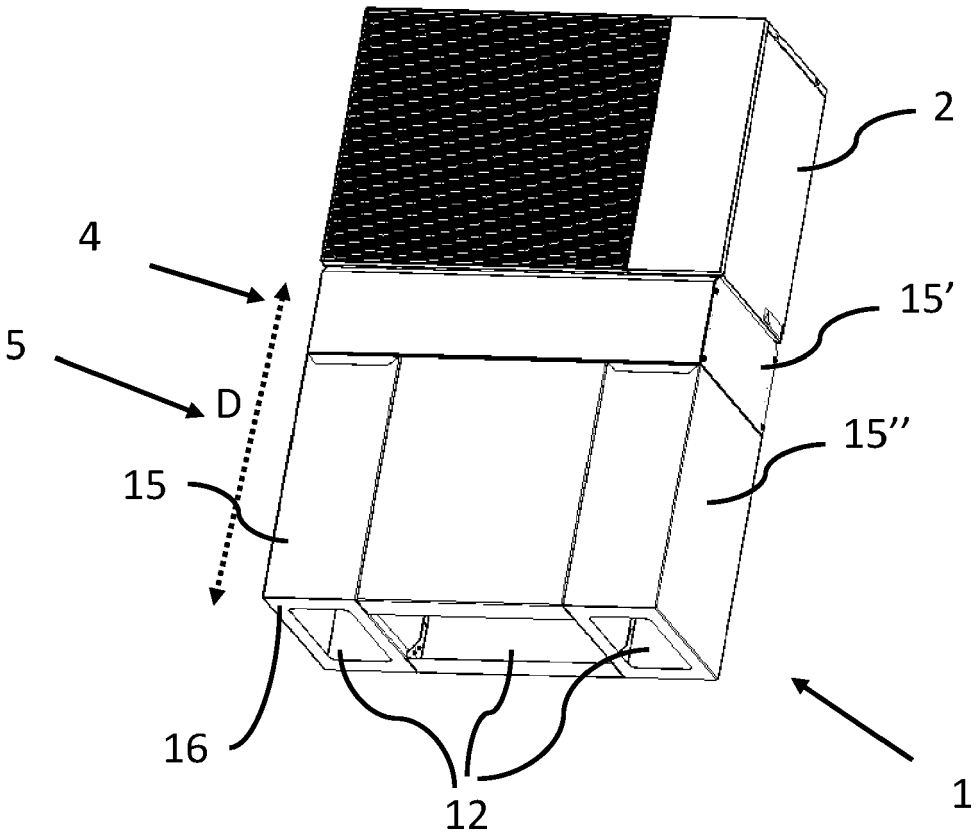


Fig. 3a

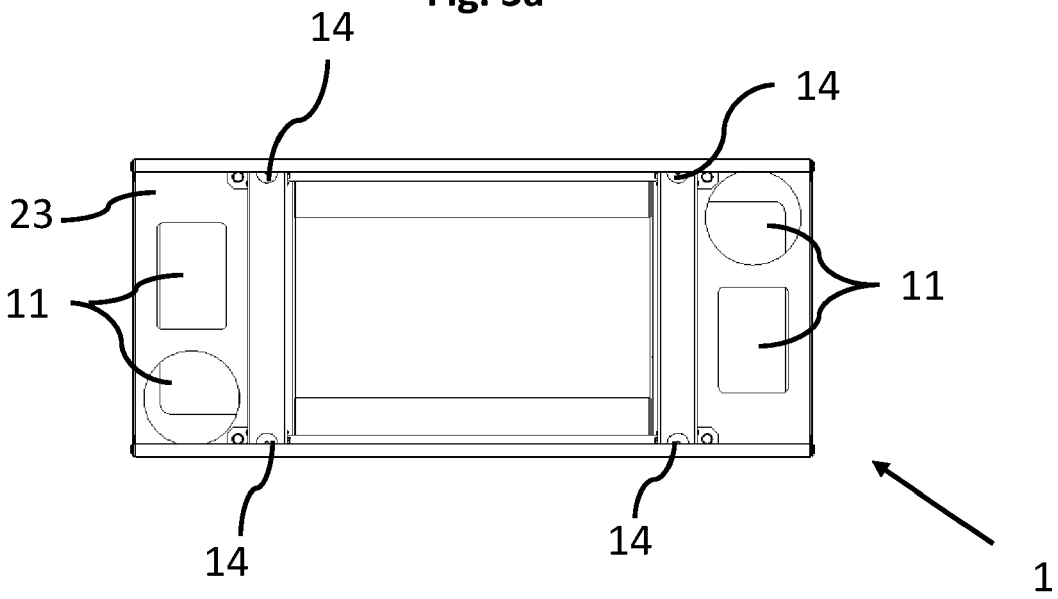


Fig. 3b

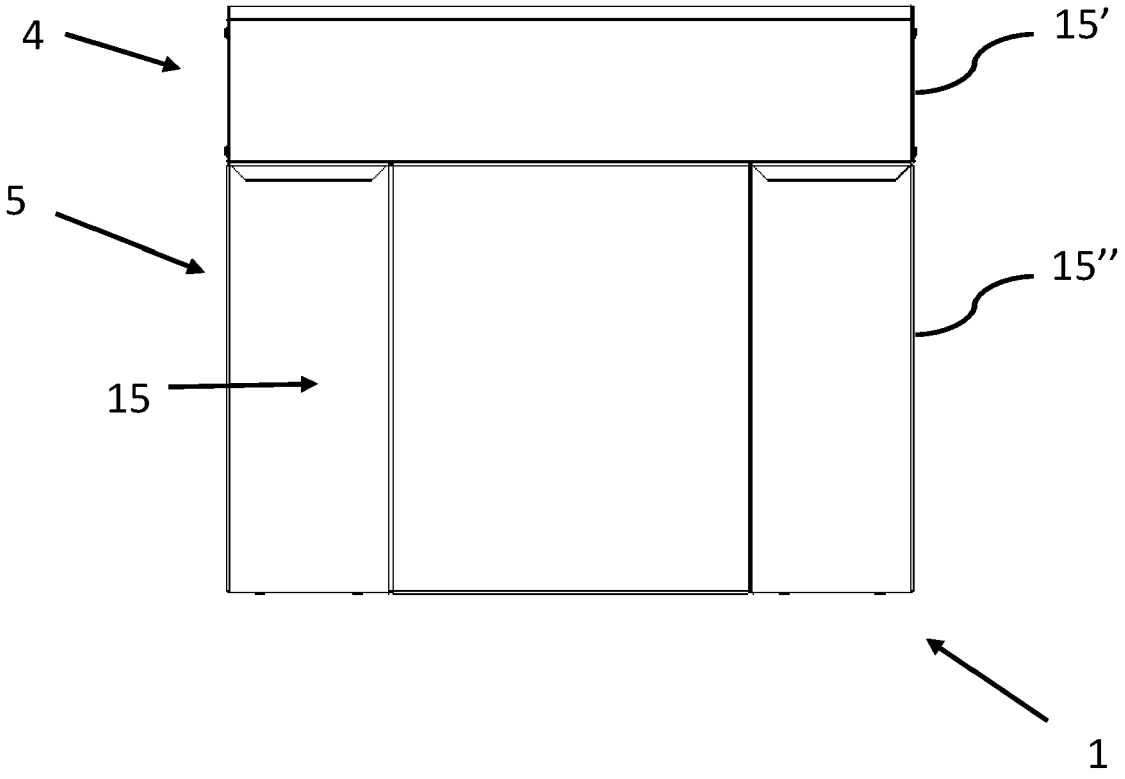


Fig. 3c

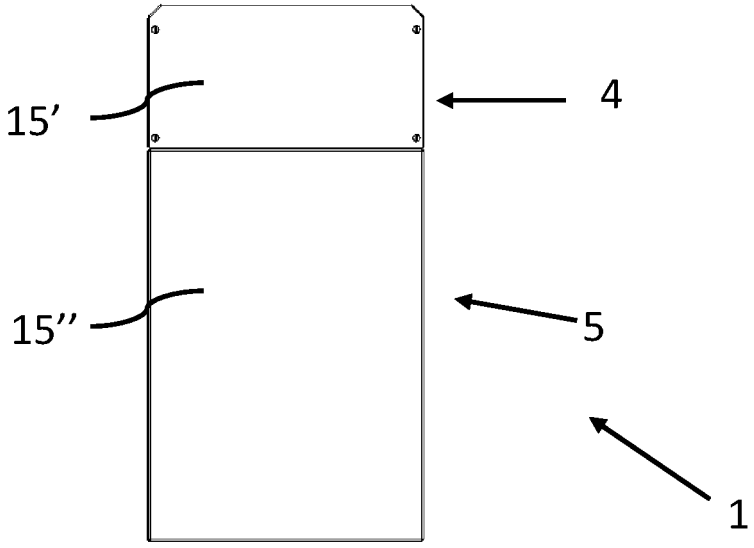


Fig. 3d

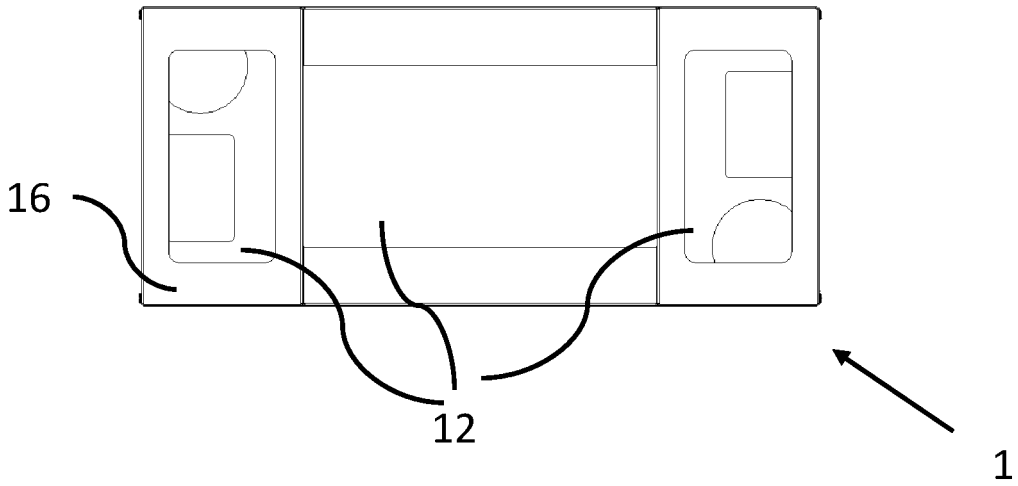


Fig. 4a

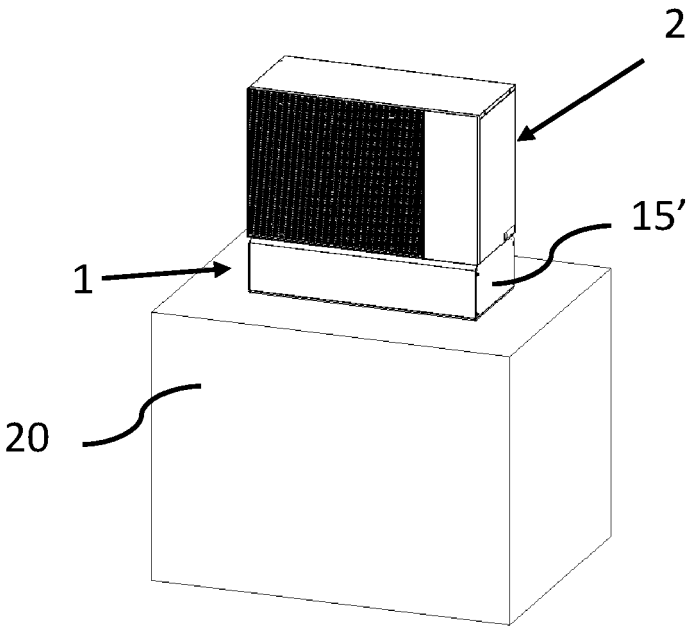


Fig. 4b

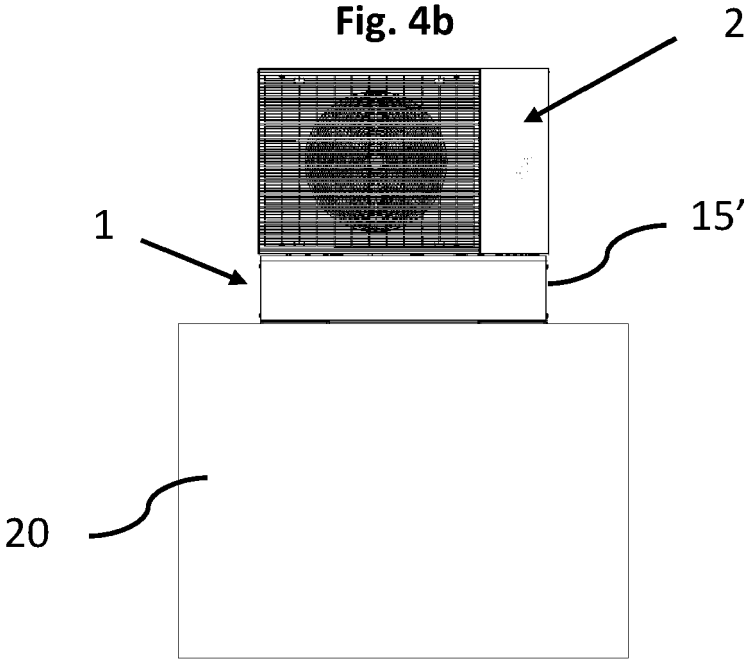


Fig. 5

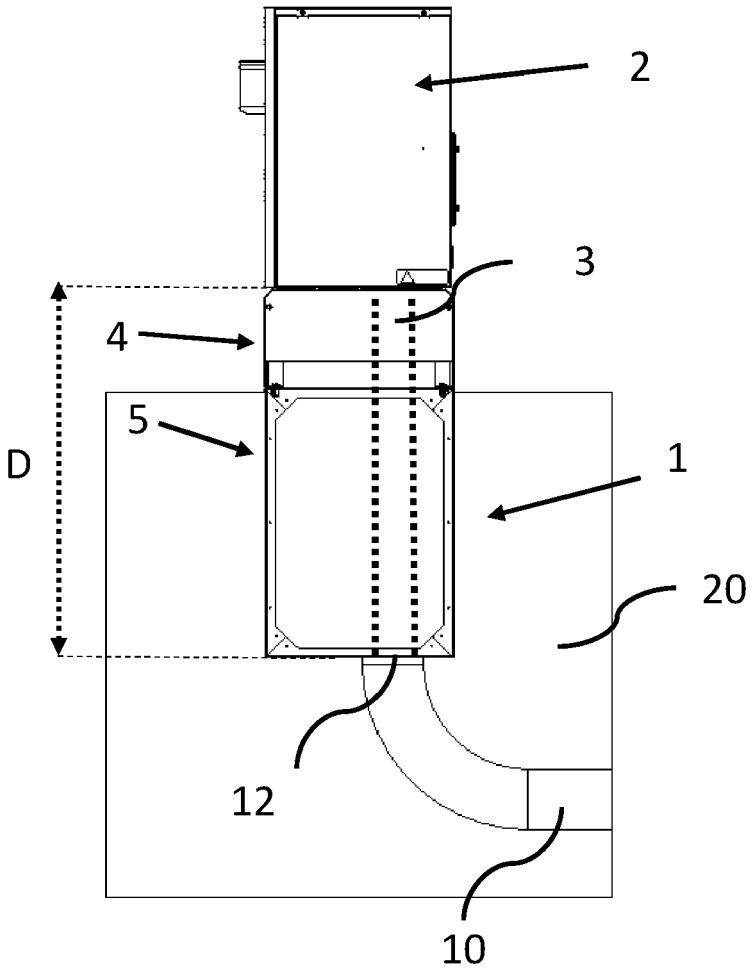


Fig. 6a

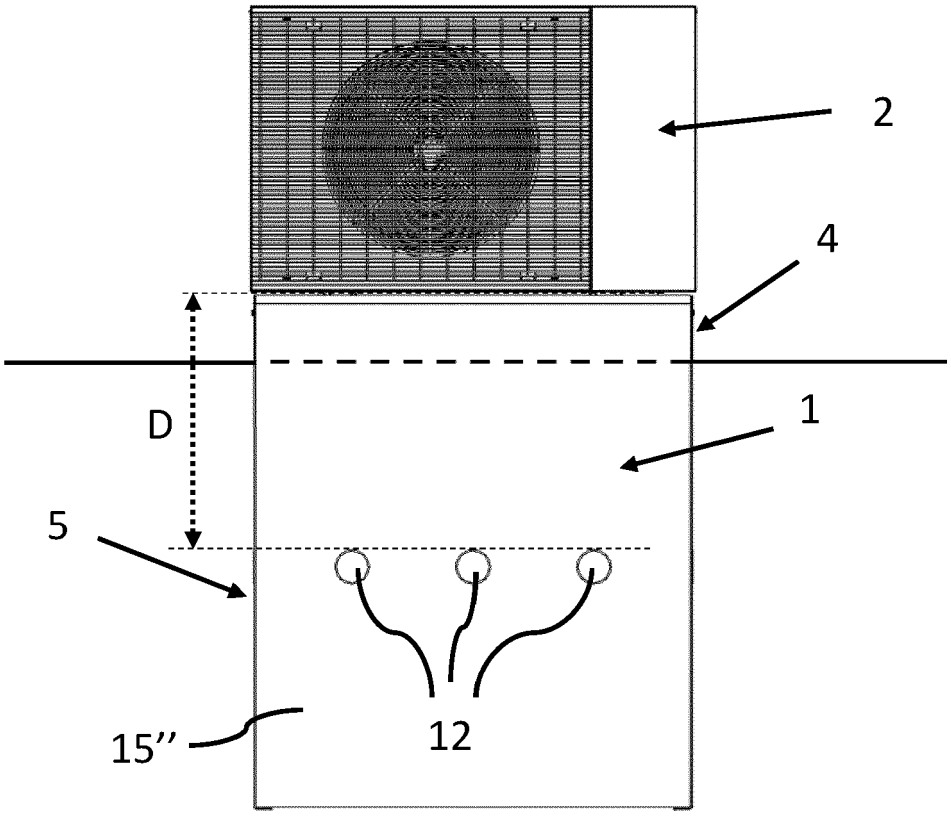


Fig. 6b

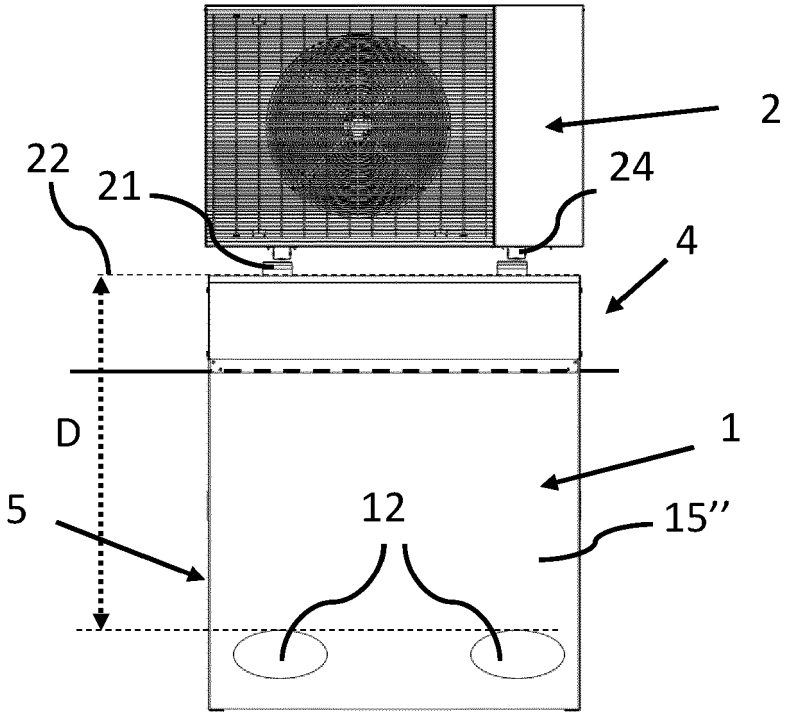


Fig. 7a

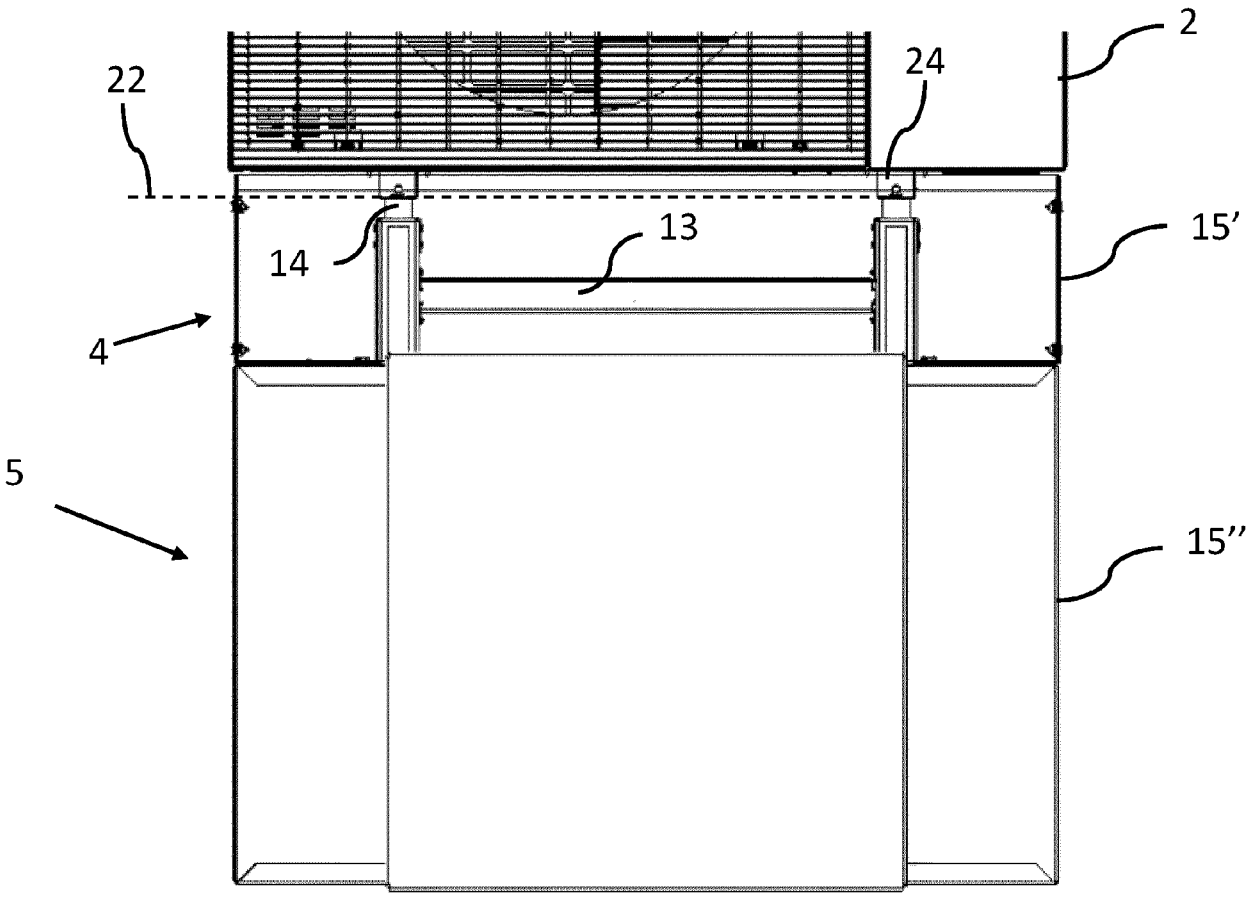
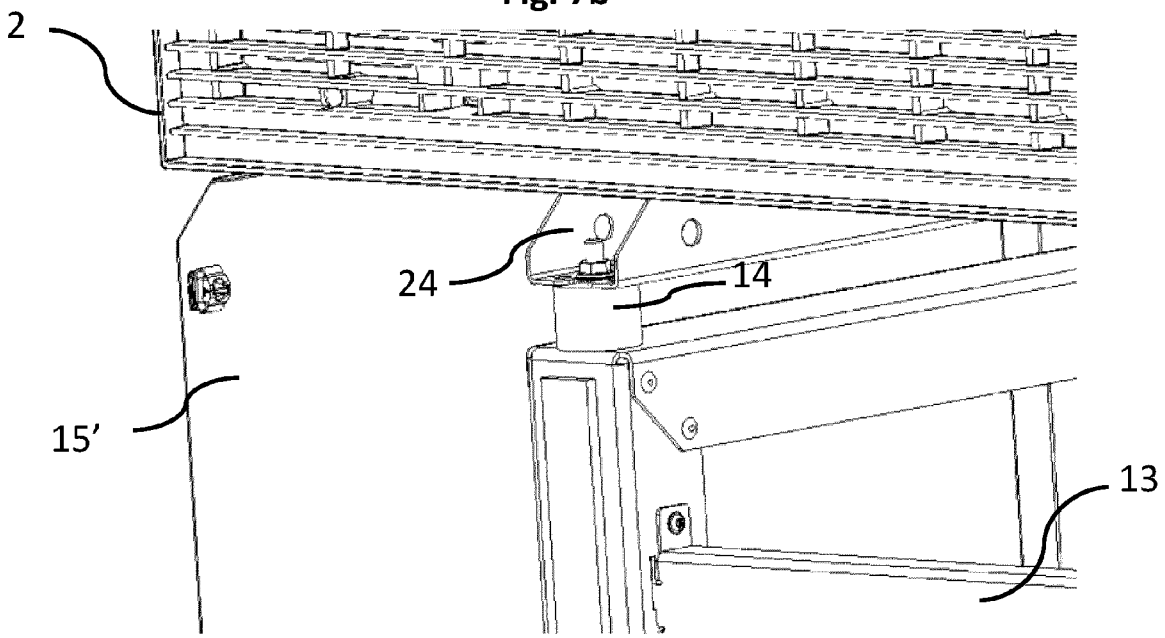


Fig. 7b



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EUROPEAN SEARCH REPORT

Application Number
EP 23 18 5013

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 2011/073017 A1 (WILSON JR JOHN [US] ET AL) 31 March 2011 (2011-03-31) * paragraphs [0034] - [0054]; figures 1-4 * -----	1 4,13	INV. F24F1/60 F24F13/32 F24F5/00
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Y	US 7 458 556 B1 (MANUCY RAYMOND ALLEN [US]) 2 December 2008 (2008-12-02) * figures 1-3 * -----	14	
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~~The present search report has been drawn up for all claims~~

1

Place of search	Date of completion of the search	Examiner
Munich	1 December 2023	Blot, Pierre-Edouard

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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L : document cited for other reasons

& : member of the same patent family, corresponding document

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Application Number
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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-14

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 23 18 5013

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-14

a heat pump support device wherein the at least one external opening is 50 cm or more below the at least at least one support

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2. claim: 15

a method of installing an outdoor heat pump unit with the steps of digging a hole in the ground, and positioning the heat pump support device in the hole

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 18 5013

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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