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(54) **A MOUNTING TRAY FOR HOLDING HEAT PUMP COMPONENTS**

(57) Providing a mounting tray for holding components of a heat pump, in particular for holding hydraulic components of a heat pump, wherein the mounting tray comprises a support structure for attaching components, a compartment situated under the support structure for collecting condensate, and a guiding mechanism at-

tached to the support structure for guiding the mounting tray into a heat pump. The mounting tray may be inserted, removed or replaced upon installation or maintenance of the heat pump to allow easy access to all the components installed on the mounting tray.

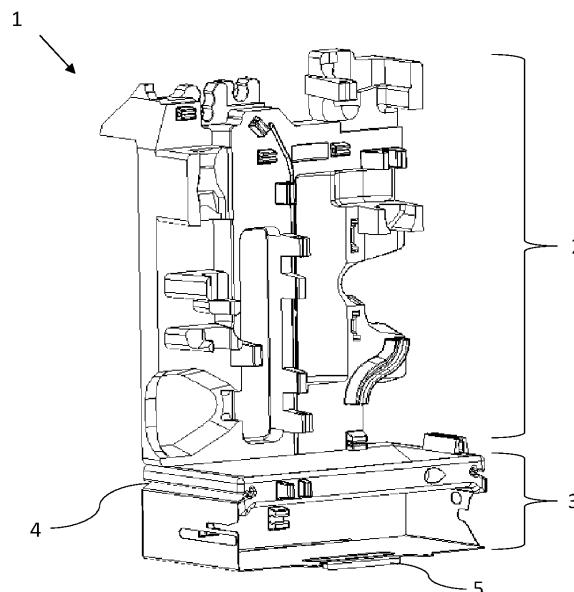


FIG. 1

Description

[0001] The invention relates to a mounting tray for holding components of a heat pump, in particular for holding hydraulic components of a heat pump, wherein the mounting tray comprises a support structure for attaching components and a guiding mechanism attached to the support structure for guiding the mounting tray into a heat pump. Additionally, the invention relates to an assembly for heating water in a building, in particular a heat pump, comprising said mounting tray.

[0002] Heating of water in buildings, such as heating water of a central heating system or heating of water for domestic use, may be accomplished by means of a heat pump system. Such a heat pump system may either be a ground source heat pump (GSHP) system or an air source heat pump (ASHP) system. In a GSHP system, calories are exchanged between the ground, or ground water, and a fluid, the fluid in particular being air or water. The calories in the ground may be extracted by capturing calories in a water table or by circulating a water-based circuit in the ground. In an ASHP system calories are exchanged between the air and a fluid, in particular air or water.

[0003] A heat pump system typically comprises at least one first heat exchanger for capturing calories from a first source, at least one second heat exchanger for transferring captured calories to a second destination fluid, and a refrigerant loop between both heat exchangers to transport the captured calories from the at least one first heat exchanger to the at least one second heat exchanger. The at least one first and second heat exchangers together with the refrigerant loop form, at least a part of, a heat exchanging circuit.

[0004] The heat exchange achieved can be used to cool or heat the desired medium. Among the most commonly used circuits for a heat pump, the medium to be heated can be a heating water circuit and/or a sanitary water circuit.

[0005] With the advent of flammable refrigerants, components are preferably grouped in refrigerant components and non-refrigerant components (e.g. hydraulics and electronics) where both groups are preferably separated for safety reasons. As such, positioning maintenance sensitive components at a particular position, for easy access, is limited as some components have to face a certain direction, or occupy a particular position, to accommodate a proper connection between the two component groupings. Thus, easy access for all components cannot be properly realized.

[0006] It is therefore desired to obtain a mounting tray, such as a drawer, where the non-refrigerant components can be grouped together and easily inserted in, and removed out, of the heat pump. This ensures easy access to most of the non-refrigerant components, which are more sensitive to maintenance, by having a drawer-like mechanism where the mounting tray can slide in and out of the heat pump, either partially or fully. This allows the

components being accessibly from outside the heat pump and as such improving access and ergonomics during maintenance and reducing the risk of incorrect assembly or re-assembly due to tight spacing of the components when they would be situated within the heat pump. It also permits access to the refrigerant components which would thus be positioned behind the non-refrigerant components. Furthermore, the mounting tray could also be replaced as a whole in the form as a replacement kit so all components on the mounting tray can be swapped out at once. Additionally, the refrigerant components could be positioned on a second mounting tray as well.

[0007] The object of the invention is obtained by providing a mounting tray for holding components of a heat pump, in particular for holding hydraulic components of a heat pump, wherein the mounting tray comprises a support structure for attaching components, and a guiding mechanism attached to the support structure for guiding the mounting tray into a heat pump, wherein the support structure is made from metal, plastic or a combination thereof. The support structure may hold all non-refrigerant components such as the hydraulic components and electronic components. This may include parts of the hydraulic piping, pumps, valves, drains, heaters, expansion vessels, condensate vessel or compartment, drain pipes, electrical boxes, and electrical wiring. The support structure may be shaped in such a way that all components are easily reachable on the support frame. The support frame preferably has at least two horizontal support surfaces allowing a support on the surface of at least 500 mm². This way, a variety of components, such as piping, pumps and valves, can be supported. Each components may be supported by at least two points. The components may be fixed by for instance keying pins integrated within the support frame to guide placement of the components and prevent incorrect assembly of components. The guiding mechanism attached to the support frame may be a part of a rail mechanism or any other suitable means for guiding and sliding the mounting tray. By having a mounting tray with a support frame that allows easy access to all the components attached to it, and a guiding mechanism attached to the support frame to allow sliding of the entire mounting tray inside and outside of an assembly such as a heat pump. Thus, when such a mounting tray is used in a heat pump, the components situated on the mounting tray could be accessed from outside the heat pump by sliding the mounting tray outside the heat pump. Moreover, the whole mounting tray could be removed and replaced at once and as such all non-refrigerant components could be removed and replaces together as one.

[0008] In an embodiment, the mounting tray wherein the support structure is made from a plastic foam such as expanded polystyrene (EPS) foam or expanded polypropylene (EPP) foam. By using EPS or EPP foam, the support structure can be easily molded and shaped to optimize the positioning of non-refrigerant components

that may be attached to the support structure. Preferably, EPP foam is used as EPP has the advantage of being compatible with the operating temperatures of the components, of being compatible with water contact, and of offering a great freedom of geometry, in particular due to the possibility of not having draft or of having undercuts. Thus EPP offers the realization of clips or supports for the components.

[0009] In an embodiment, the mounting tray wherein the support structure is made from a combination of metal and expanded polypropylene (EPP) foam or a combination of metal and expanded polystyrene (EPS) foam. By using EPS or EPP foam, the support structure can be easily molded and shaped to optimize the positioning of non-refrigerant components that may be attached to the support structure. For the foam, preferably EPP foam is used as EPP has the advantage of being compatible with the operating temperatures of the components, of being compatible with water contact, and of offering a great freedom of geometry, in particular due to the possibility of not having draft or of having undercuts. Thus EPP offers the realization of clips or supports for the components. By using metal or metal parts in addition to the EPS or EPP foam, the support structure can be stiffened and improve rigidity of the entire support structure.

[0010] In an embodiment, the expanded polypropylene foam has a density from 40 g/L to 90 g/L, preferably from 45 g/L to 80 g/L.

[0011] In an embodiment, the expanded polypropylene foam has a thickness of at least 12 mm, preferably at least 18 mm.

[0012] In an embodiment, the guiding mechanism attached to the support frame is a first part of a guide rail. The first part of the guide rail may be, for instance, one half of a drawer rail. This first part of the guide rail may interact with a second part of the guide rail. The second part of the guide rail may be situated within an assembly for heating a building, such as a heat pump. By interaction with the second part of the guide rail, a complete guide rail is formed and the entire mounting tray may thus act as a drawer. The first part of the guide rail may be made from metal, plastic, or a combination thereof.

[0013] In an embodiment, the first part of the guide rail is made from metal. Any suitable metal may be chosen for the first part of the guide rail. Furthermore, the metal may be steel. In particular, the metal may be painted or coated steel. Said paint or coat may reduce friction of the first part of the guide rail.

[0014] In an embodiment, the coefficient of friction between the surfaces in contact during sliding of the guide rail is less than 0.40, preferably less than 0.33. When the first part of the guide rail interacts with a second part of the guide rail, the coefficient of friction should preferably be as low as possible. This may be realized by, for instance, the choice of material for the guide rail or any sort of surface treatment of the guide rail.

[0015] In an embodiment, the guiding mechanism supports a sliding zone of at least 1500 mm² and supports

at least two points separated from at least 80 mm in between each point. As such, the guiding mechanism may support the entire weight of a mounting tray when equipped, with some or all components, without any major deformation to the guiding mechanism.

[0016] In an embodiment, the mounting tray further comprises a compartment situated under the support structure for collecting condensate and said compartment situated under the support frame has a capacity of at least 150 ml, preferably at least 300 ml, and further comprises a drain or outlet having a cross-section with a surface area of at least 120 mm². The compartment may be a structural part of the mounting tray or attached below the mounting tray as a separate vessel. Any condensate coming from any of the components mounted to the support frame, in particular condensation from any hydraulic component, may thus be suitably stored within the compartment and evacuated through the drain or outlet when necessary.

[0017] In an embodiment, the mounting tray further comprises a first part of hydraulic piping, electrical wiring, cable routing elements, and an expansion vessel. The mounting tray may also further comprises a handle. Said handle may be attached to the front side of the mounting tray to easily push or pull the mounting tray in or out of an assembly for heating a building.

[0018] In an aspect of the invention, an assembly for heating water in a building, in particular a heat pump, is provided wherein the assembly comprises a casing and a second part of a guide rail, wherein the casing has an open space capable of accepting the mounting tray according to any of the previous embodiment when said mounting tray is fixed on the second part of the guide rail. The second part of the guide rail may interact with a first part of a guide rail situated on a mounting tray. The casing of the assembly should provide sufficient space to allow said mounting tray to be inserted into the casing. With the combination of the assembly and the mounting tray, an assembly is realized wherein all parts situated on the mounting tray can be easily accessed by sliding the mounting tray out of the assembly casing using the guide rail.

[0019] In an embodiment, the assembly further comprises a second part of a hydraulic piping which can be connected to a first part of a hydraulic piping present within the mounting tray. The first and second part of hydraulic piping may be reversibly connected with each other by means of, for instance, a quick release connection.

[0020] In an embodiment, the connection between the second part of the hydraulic piping and the first part of the hydraulic piping comprises a quick-coupling connection. Said quick-coupling connection, also known as quick-connect fittings or quick-release couplings, allows a connection between the two parts of piping without the need to screw any kind of fittings to realise a proper connection. Without the quick-coupling connection, more space would be required within the assembly to allow

access for tooling to turn a screw fitting. With the quick-release, a more compact design of the assembly can be realised. Furthermore, with a screw fitting a higher risk of misalignment is present and as such a quick-coupling connection would reduce the chance of misalignment and reduce the chance of an improper connection.

[0021] 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 shows a schematic representation of a mounting frame according to the present invention.

Figure 2 shows a schematic representation of a mounting frame including certain components according to the present invention.

Figure 3 shows a side view of an assembly and a mounting frame according to an aspect of the present invention.

Figure 4 shows a schematic representation of an assembly and a mounting frame according to an aspect of the present invention.

Figure 5 shows a schematic representation of an assembly with a mounting frame according to an aspect of the present invention.

[0022] With reference to Figure 1, a mounting frame 1 according to the present invention is shown. The mounting frame 1 comprises a support frame 2, a compartment 3, a guide mechanism 4 and a handle 5. The mounting frame 1 is pre-shaped to accept several hydraulic and electrical components. The mounting frame 1 is shown without any such components.

[0023] In Figure 2, mounting frame 1 is shown including several hydraulic and electrical components such as the first set of hydraulic piping 9. In this Figure it can be seen that the first set of hydraulic piping 9 is bended over the top of the support frame 2. Furthermore, it can be seen that other components are attached onto the empty structures as shown in Figure 1. For instance, an expansion vessel is present in the compartment 3 above the handle 5, and two pumps, an electric heater, a plate heat exchanger, some piping and a flow meter are present on the support frame 2.

[0024] Figure 3 shows a side view of the mounting frame 1 as shown in Figure 2 together with an assembly 6 comprising a casing 7, an open space 8 and a second set of hydraulic piping 10. As shown by the dashed lines, the bottom of the mounting frame 1 aligns with the bottom of the open space 8 and the first set of hydraulic piping 9 aligns with the second set of hydraulic piping 10. Figure 3 is a representation of the mounting frame 1 in a maintenance and/or assembly position.

[0025] Figure 4 shows another view of the mounting frame 1 and the assembly 6 as previously shown, again showing a representation of the mounting frame 1 in a maintenance and/or assembly position. In Figure 5, the

mounting frame 1 is positioned within the assembly 6 where the previously shown open space 8 was present. As such, Figure 5 is a representation of the mounting frame 1 in working position.

Reference Signs

[0026]

- | | | |
|----|----|--------------------------------|
| 10 | 1 | mounting tray |
| | 2 | support structure |
| | 3 | compartment |
| | 4 | guiding mechanism |
| | 5 | handle |
| 15 | 6 | assembly |
| | 7 | casing |
| | 8 | open space |
| | 9 | first set of hydraulic piping |
| | 10 | second set of hydraulic piping |

Claims

1. A mounting tray (1) for holding components of a heat pump, in particular for holding hydraulic components of a heat pump, the mounting tray comprising:

- a support structure (2) for holding components; and
- a guiding mechanism (4) attached to the support structure for guiding the mounting tray into a heat pump;

wherein the support structure is made from metal, plastic, plastic foam or a combination thereof.

2. The mounting tray (1) according to claim 1, wherein the support structure (2) is made from a plastic foam such as expanded polystyrene or expanded polypropylene.
3. The mounting tray (1) according to claim 1, wherein the support structure (2) is made from a combination of metal and expanded polypropylene foam, or a combination of metal and expanded polystyrene foam
4. The mounting tray (1) according to claims 2 or 3, wherein the expanded polypropylene foam has a density from 40 g/L to 90 g/L, preferably from 45 g/L to 80 g/L.
5. The mounting tray (1) according to claims 2 to 4, wherein the expanded polypropylene foam has a thickness of at least 12 mm, preferably at least 18mm.
6. The mounting tray (1) according to any of the pre-

ceding claims, wherein the guiding mechanism (4) is a first part of a guide rail.

7. The mounting tray (1) according to claim 6, wherein the first part of the guide rail is made from metal. 5
8. The mounting tray (1) according to claims 6 or 7, wherein the coefficient of friction between the surfaces in contact during sliding of the guide rail is less than 0.40, preferably less than 0.33. 10
9. The mounting tray (1) according to any of the preceding claims, wherein the guiding mechanism (4) supports a sliding zone of at least 1500 mm² and supports at least two points separated from at least 80 mm in between each point. 15
10. The mounting tray (1) according to any of the preceding claims, wherein the mounting tray (1) further comprises a compartment (3) situated under the support structure for collecting condensate and said compartment (3) has a capacity of at least 150 ml, preferably at least 300 ml, and further comprises a drain or outlet having a cross-section with a surface area of at least 120 mm². 20
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11. The mounting tray (1) according to any of the preceding claims, wherein the mounting tray further comprises a first part of hydraulic piping (9), electrical wiring, cable routing elements, and an expansion vessel. 30
12. An assembly (6) for heating water in a building, in particular a heat pump, the assembly comprising: 35
 - a casing (7); and
 - a second part of a guide rail;

wherein the casing (7) has an open space (8) capable of accepting the mounting tray (1) according to any of the claims 1 to 10 when said mounting tray is fixed on the second part of the guide rail. 40
13. The assembly (6) according to claim 12, wherein the assembly (6) further comprises a second part of a hydraulic piping (10) which can be connected to a first part of a hydraulic piping (9) present within the mounting tray according to claim 11. 45
14. The assembly (6) according to claim 13, wherein the connection between the second part of the hydraulic piping (10) and the first part of the hydraulic piping (9) comprises a quick-coupling connection. 50
15. An assembly (6) according to claims 12 to 14, wherein the assembly (6) further comprises a mounting tray (1) according to any of the claims 1 to 12. 55

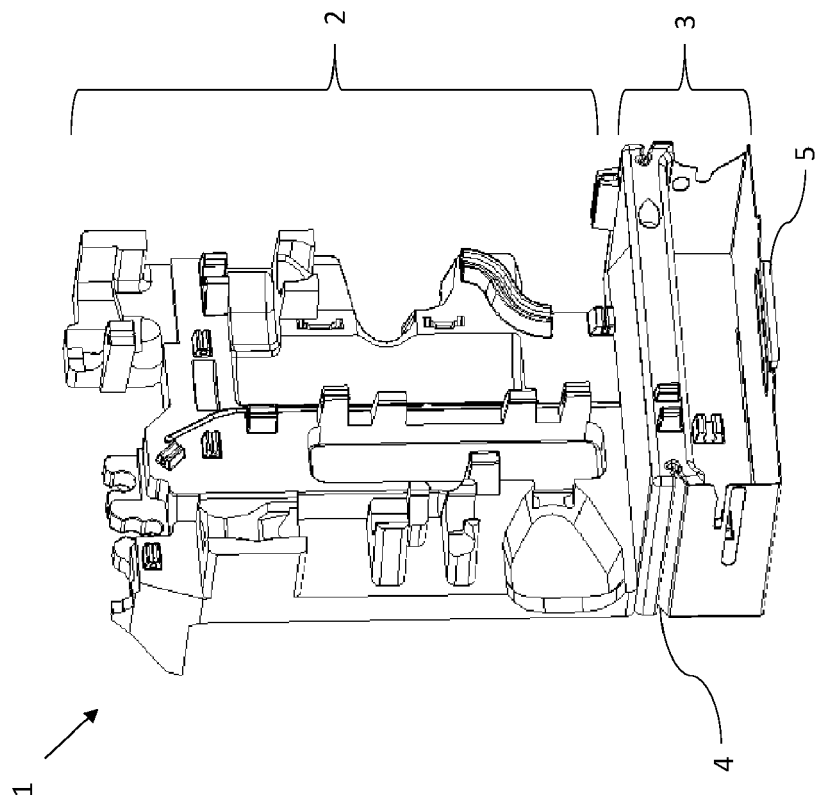


FIG. 1

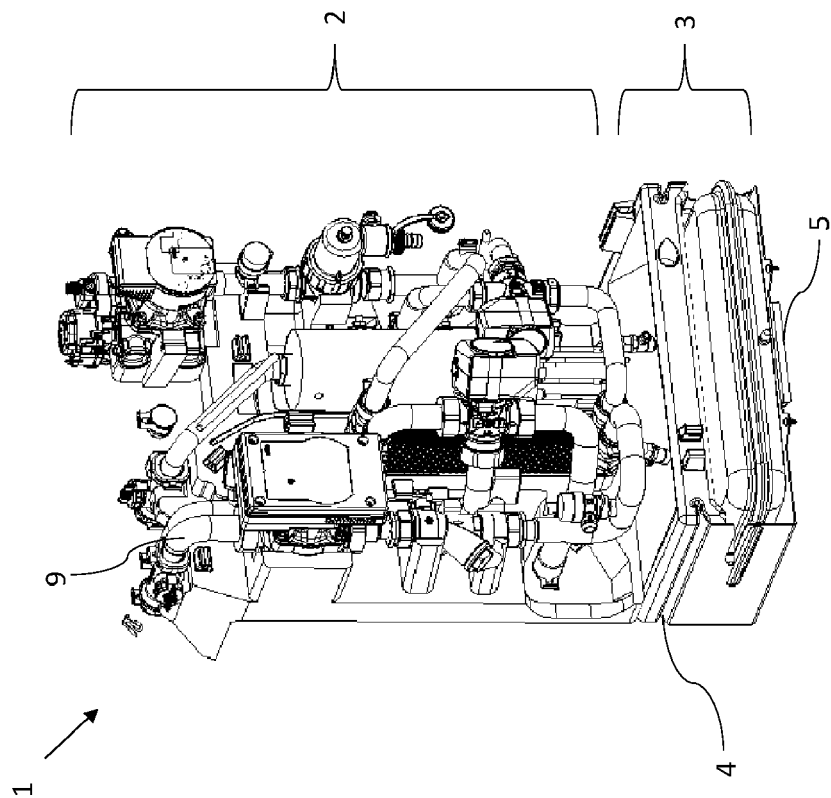


FIG. 2

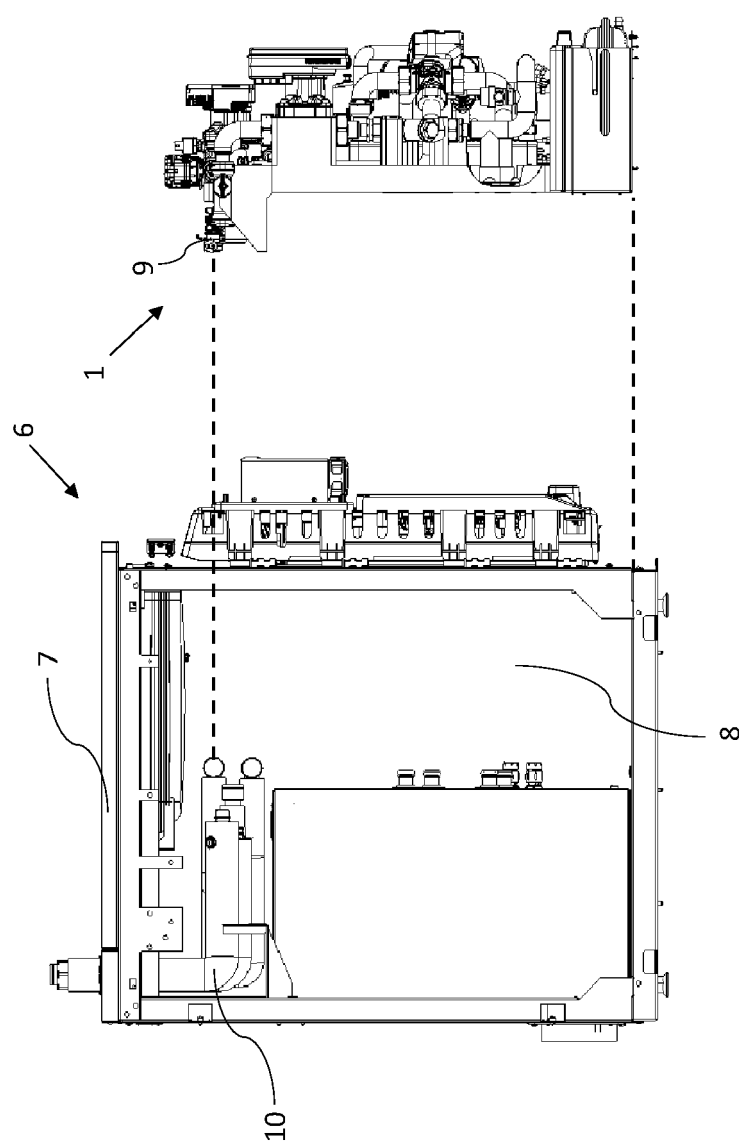


FIG. 3

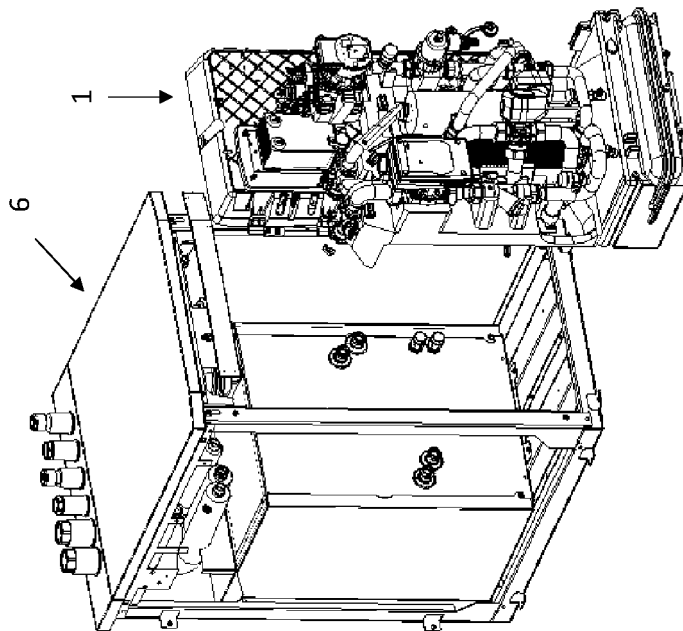


FIG. 4

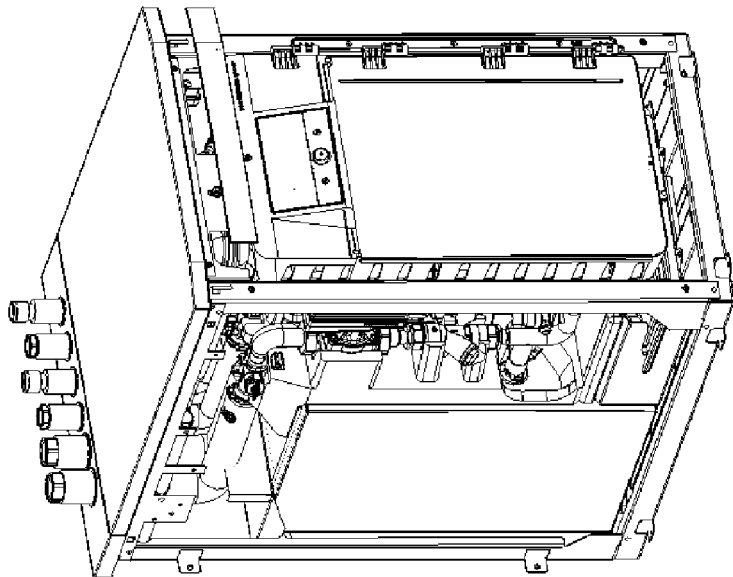


FIG. 5



EUROPEAN SEARCH REPORT

Application Number

EP 22 19 2067

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 3 705 820 A1 (DAIKIN IND LTD [JP]; DAIKIN EUROPE NV [BE]) 9 September 2020 (2020-09-09)	1-15	INV. F24H9/06 F24H4/04
Y	* paragraphs [0045] - [0085]; claims 1,11,12; figures 2-4,6,7 *	2-5	F24H9/02 F24F1/56 F24H4/02
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Y	* paragraphs [0009] - [0050]; figures 1-3 *	2-5	
Y	EP 3 611 440 A1 (BOSCH GMBH ROBERT [DE]) 19 February 2020 (2020-02-19) * paragraphs [0021] - [0026]; figures 1-3 *	2-5	
			TECHNICAL FIELDS SEARCHED (IPC)
			F24H F24F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 February 2023	Examiner Hoffmann, Stéphanie
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	

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 22 19 2067

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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