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Remarks:

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

(54) **OUTDOOR UNIT FOR A HEAT PUMP SYSTEM**

(57) The present invention concerns an outdoor unit containing at least part of a refrigerant circuit and a heat medium circuit in thermal communication with each other by means of heat exchanger. The heat medium circuit is advantageously provided with an air purge valve in order to discharge any refrigerant which may leak into the heat medium circuit. The safety and performance of the outdoor unit according to the invention is further, and greatly,

enhanced by a discharge path directed towards the outside of the housing of the outdoor unit following a substantially downwards path from an air purge valve disposed to the heat medium circuit. This advantageously permits take advantage of the density of the refrigerant, which being denser than air, will naturally flow downwards and away from the outdoor unit.

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to an outdoor unit for a heat pump system.

BACKGROUND

[0002] In air conditioning, and in particular, in heat pump systems, it is common to have combined refrigerant and heat medium circuits capable of exchanging heat between each other. For such thermal exchanges to take place, it is common to use heat exchangers. These heat exchangers are typically complex, usually metal constructions. As the system ages and/or due to external factors, such heat exchangers occasionally develop leakages which may pass unnoticed to the user but which leakages can cause the transfer of substantial amounts of refrigerant to the heat medium circuit of said systems. As such, a gas-liquid separator is an essential part of an air conditioning and/or heat pump in order to prevent high concentrations of refrigerant in indoor areas, should a leakage come to develop. Should refrigerant build up inside the gas-liquid separator, said refrigerant must be evacuated.

[0003] EP3967943 discloses an air conditioning outside unit comprising a gas-liquid separator at the highest part of the heat medium circuit. Said gas-liquid separator comprises a top outlet in fluid connection with an outlet disposed to the front plate, and above the ventilation element of said unit. The benefits of disposing of the refrigerant gas near the ventilation element of an outdoor unit, in particular above the center of said unit, should be obvious to one skilled in the art. However, the refrigerant gas is usually heavier than air, causing it to sink. The unit disclosed in EP '943 provides the most direct path between the gas-liquid separator and the refrigerant outlet by means of a substantially horizontal pipe or a pipe that is slightly inclined towards the outlet. This makes it difficult for the refrigerant to even reach the refrigerant outlet without having refrigerant flowing back into the gas-liquid separator and/or dwelling between the outlet and the gas-liquid separator.

[0004] The present invention aims to provide a device which resolves the disadvantage mentioned above. The present invention relates to an outdoor unit having an improved refrigerant evacuation.

SUMMARY OF THE INVENTION

[0005] The present invention aims to resolve at least some of the problems and disadvantages mentioned above.

[0006] The present invention and embodiments thereof serve to provide a solution to one or more of above-mentioned disadvantages. To this end, the present invention relates to an outdoor unit according to claim 1.

[0007] The first aspect of the invention relates to an outdoor unit for a heat pump system comprising a refrigerant circuit and a heat medium circuit in thermal communication with each other by means of a plate heat exchanger.

[0008] More in particular, the refrigerant circuit comprises a compressor, a heat source heat exchanger, an expansion valve, and a refrigerant side of the plate heat exchanger. the heat medium circuit comprises a heat medium side of the plate heat exchanger and an air purge valve, wherein the plate heat exchanger has a first lateral face and a second lateral face, wherein heat medium pipe connection ports are arranged on the first lateral face and wherein refrigerant pipe connection ports and an air purge valve connection port are arranged on the second lateral face. An air discharge path is provided connected to a discharge port of the air purge valve. This advantageously permits the evacuation of any refrigerant leaked into the heat medium circuit in a safe and controlled manner.

[0009] A housing is further provided for accommodating the compressor, the heat source heat exchanger, the expansion valve, the plate heat exchanger, the air purge valve and the air discharge path. The housing advantageously having an opening in fluid communication with the discharge port of the air purge valve via the air discharge path. In this way, the refrigerant gas evacuated from the heat exchanger via the air purge valve does not pool inside said housing where it could build up to a concentration which would propitiate an explosion. Said refrigerant is instead, and very advantageously, conveyed and expelled from the interior of the outdoor unit by means of discharge path. This air discharge path is arranged so that it faces downward from the discharge port of the air purge valve to the opening of the housing. Such arrangement advantageously permits taking advantage of the density of the refrigerant which, being denser than air, will drift down and leave the outdoor unit without the risk of this refrigerant floating back up and inside of said unit. Preferred embodiments of the device are shown in any of the claims 2 to 13.

[0010] In an embodiment, the opening of the housing is provided on a bottom plate of the housing. This permits discharging the refrigerant more effectively as the refrigerant, being heavier than air, will quickly reach the bottom of plate of the outdoor unit and evacuate through the discharge hole.

[0011] In an embodiment, the outdoor unit further comprises a partition plate that divides the outdoor unit in an air chamber, where a fan and the heat source heat exchanger are positioned, and in a machine chamber where the compressor, the expansion valve, the plate heat exchanger, the air purge valve and the air discharge path are positioned. The opening of the housing is provided at a bottom plate of the machine chamber. In this way, the opening is advantageously located in the compartment of the outdoor unit where most of the refrigerant-bearing elements, and thus the most likely sources of

refrigerant leakage, are located. This permits the evacuation of the leaked refrigerant before it is allowed to pool inside the machine chamber, and potentially ignite.

[0012] In an embodiment, the outdoor unit further comprises an electric component box in the machine chamber, wherein the electric component box is positioned at a top region of the machine chamber. Since the refrigerant is heavier than air, the placement of the electric component box advantageously eliminates the possibility of said refrigerant ever reaching the electric component box, and in this way greatly reduces or even entirely overcomes the risk of explosion by deflagration of the refrigerant.

[0013] In an embodiment, the machine chamber comprises a second partition plate, said second partition plate separating the electric component box from the air discharge path. In this way, any refrigerant purged out of the heat exchanger and conducted by the air discharge path to the outside of the outdoor unit, is safely kept away from any contact with any of the components inside the electric component box.

[0014] In an embodiment, an electric component box is arranged inside a second housing disposed on a top plate of the housing of the outdoor unit. This provides yet another barrier keeping the refrigerant out of the electric component box. Furthermore, since the refrigerant is heavier than air, the placement of the electric component box advantageously eliminates the possibility of said refrigerant ever reaching the electric component box, and in this way greatly reducing the risk of explosion by deflagration of the refrigerant.

[0015] In an embodiment, an electric component box is arranged inside a second housing disposed on a lateral side plate of the housing of the outdoor unit. In this way, all the components of inside the electrical component box are safely distanced and isolated from any leaking refrigerant.

[0016] In an embodiment, the electric component box is provided with an electrical connection extending internally into the housing of the outdoor unit. By preference, the electrical connection reaching the inside of the housing of the outdoor unit is airtight. In this way, electrical signals and energy can still be exchanged between the electrical component box and the different chambers inside the outdoor unit without increasing the risk of any refrigerant reaching inside the electric component box.

[0017] In an embodiment, the opening of the housing is provided in a rear plate of the housing. By preference, the first lateral face of the heat exchanger faces a rear plate of the housing, and the heat medium pipe connection ports are arranged on the rear plate, outside of the housing. In this way, the piping entering and leaving the outdoor unit is advantageously closer to the wall where said unit is mounted on, which permits maintaining a longer straight section of pipe after the heat exchanger. This promotes a laminar flow in said section of pipe and reduce the noise created by the flow of heat medium. This embodiment also provides a shorter path between the air purge valve

and the outside of the outdoor unit, thus reducing the time the leaked refrigerant remains inside said unit, and therefore also reducing the risk of any said refrigerant reaching any electrical component inside the unit.

[0018] In an embodiment, the opening of the housing is provided in a lateral plate of the housing. In this way, the outdoor unit can be mounted closer to a wall without risk of limiting the dispersion of the leaked refrigerant once it reaches the outside of the outdoor unit. By locating the opening on one of the lateral walls of the housing, a path between the air purge valve and the outside of the housing is advantageously made shorter. This location of the opening further permits taking advantage of any wind drafts passing by the housing of the outdoor unit in order to disperse any leaked refrigerant leaving the housing more quickly.

[0019] In an embodiment, the plate heat exchanger is a double-wall plate heat exchanger. The use of a double wall construction greatly reduces the risk of refrigerant leaking into heat medium side of the heat exchanger. In the unlikely scenario that such a leakage takes place, the amount of refrigerant leaked is advantageously small and easily dealt with by the air purge valve.

DESCRIPTION OF FIGURES

[0020] The following description of the figures of specific embodiments of the invention is merely exemplary in nature and is not intended to limit the present teachings, their application or uses. Throughout the drawings, corresponding reference numerals indicate like or corresponding parts and features.

[0021] Figure 1 shows a schematic view of the outdoor unit comprising a heat exchanger with an air purge valve.

DETAILED DESCRIPTION OF THE INVENTION

[0022] The invention is further described by the following non-limiting examples which further illustrate the invention, and are not intended to, nor should they be interpreted to, limit the scope of the invention.

[0023] The present invention concerns an outdoor unit containing at least part of a refrigerant circuit and a heat medium circuit in thermal communication with each other by means of heat exchanger. The heat medium circuit is advantageously provided with an air purge valve in order to discharge any refrigerant which may leak into the heat medium circuit. The safety and performance of the outdoor unit according to the invention is further, and greatly, enhanced by a discharge path directed towards the outside of the housing of the outdoor unit following a substantially downwards path from an air purge valve disposed to the heat medium circuit. This advantageously permits take advantage of the density of the refrigerant, which being denser than air, will naturally flow downwards and away from the outdoor unit.

[0024] Unless otherwise defined, all terms used in disclosing the invention, including technical and scientific

terms, have the meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. By means of further guidance, term definitions are included to better appreciate the teaching of the present invention.

[0025] As used herein, the following terms have the following meanings:

"A", "an", and "the" as used herein refers to both singular and plural referents unless the context clearly dictates otherwise. By way of example, "a compartment" refers to one or more than one compartment.

[0026] "Comprise", "comprising", and "comprises" and "comprised of" as used herein are synonymous with "include", "including", "includes" or "contain", "containing", "contains" and are inclusive or open-ended terms that specifies the presence of what follows e.g. component and do not exclude or preclude the presence of additional, non-recited components, features, element, members, steps, known in the art or disclosed therein.

[0027] Furthermore, the terms first, second, third and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order, unless specified. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

[0028] The recitation of numerical ranges by endpoints includes all numbers and fractions subsumed within that range, as well as the recited endpoints.

[0029] Whereas the terms "one or more" or "at least one", such as one or more or at least one member(s) of a group of members, is clear *per se*, by means of further exemplification, the term encompasses *inter alia* a reference to any one of said members, or to any two or more of said members, such as, e.g., any ≥ 3 , ≥ 4 , ≥ 5 , ≥ 6 or ≥ 7 etc. of said members, and up to all said members.

[0030] Unless otherwise defined, all terms used in disclosing the invention, including technical and scientific terms, have the meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. By means of further guidance, definitions for the terms used in the description are included to better appreciate the teaching of the present invention. The terms or definitions used herein are provided solely to aid in the understanding of the invention.

[0031] Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention.

[0032] Thus, appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment, but may. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner, as would be appar-

ent to a person skilled in the art from this disclosure, in one or more embodiments. Furthermore, while some embodiments described herein include some but not other features included in other embodiments, combinations of features of different embodiments are meant to be within the scope of the invention, and form different embodiments, as would be understood by those in the art. For example, in the following claims, any of the claimed embodiments can be used in any combination.

[0033] With as a goal illustrating better the properties of the invention the following presents, as an example and limiting in no way other potential applications, a description of a number of preferred embodiments of the outdoor unit based on the invention, wherein:

FIG. 1 shows a schematic view of the outdoor unit (1) comprising a heat exchanger (5) with an air purge valve (15). The figure shows an outdoor unit (1) for a heat pump according to the first aspect of the invention. The system comprises a refrigerant circuit (not shown) and a heat medium circuit (6) in thermal communication with each other by means of a plate heat exchanger (5).

[0034] More in particular, the refrigerant circuit (not shown) comprises a compressor (not shown), a heat source heat exchanger (not shown), an expansion valve (not shown), and a refrigerant side of the plate heat exchanger (5). the heat medium circuit (6) is shown comprising a heat medium side of the plate heat exchanger (5), which heat exchanger (5) is shown equipped with an air purge valve (15). The plate heat exchanger (5) has a first lateral face (7) and a second lateral face (8), wherein heat medium pipe connection ports (22, 23) are arranged on the first lateral face (7). The refrigerant pipe connection ports (27, 28) and the air purge valve (15) connection port are arranged on the second lateral face (8) of said plate heat exchanger (5). An air discharge path (16) is provided connected to a discharge port of the air purge valve (15). This advantageously permits the evacuation of any refrigerant leaked into the heat medium circuit (6) in a safe and controlled manner. The invention can be realized using many different types and dimensions of plate heat exchangers in order to meet, for example though not limited to, specific heat transfer and/or space restriction needs. This plate heat exchanger (5) is preferably a double-wall plate heat exchanger. The use of a double wall construction greatly reduces the risk of refrigerant leaking into heat medium side of the heat exchanger (5). In the unlikely scenario that such a leakage takes place, the amount of refrigerant leaked is advantageously small and easily dealt with by the air purge (15) valve.

[0035] A housing (29) is further shown accommodating the compressor, the heat source heat exchanger, the expansion valve, the plate heat exchanger (5), the air purge valve (15) and the air discharge path (16). The housing (29) advantageously provides an opening (17) in fluid communication with the discharge port of the air purge valve (15) via the air discharge path (16). In this way, the refrigerant gas evacuated from the heat exchan-

ger (5) via the air purge valve (15) does not pool inside said housing (29) where it could build up to a concentration which could lead up to an explosion. Said refrigerant is instead, and very advantageously, conveyed and expelled from the interior of the outdoor unit (1) by means of the discharge path (16). This air discharge path is arranged so that it faces downward from the discharge port of the air purge valve (15) to the opening of the housing (29). Such arrangement advantageously permits taking advantage of the density of the refrigerant which, being denser than air, will drift down and leave the outdoor unit (1) without the risk of this refrigerant floating back up and inside of said unit (1). There are many ways to realize the invention using housings (29) having different types of construction. Such housings (29) may be constructed of a single or multiple folded metal sheets, it may have a cast metal structure, or other structures which permits mounting and operation of the internal elements of the outdoor unit (1). In the embodiment shown in FIG. 1, the housing (29) comprises a front plate (9), a first side plate (10), a second side plate (11), a rear plate (12), a top plate (13) and a bottom plate (14). This type of construction advantageously allows for a more cost-effective manufacturing and assembly while permitting easy access to the internal elements of the outdoor unit (1) by simply removing a minimum number of plates. This type of construction is also quite light, thereby reducing transportation costs as well as facilitating installation.

[0036] The opening of the housing is, advantageously, provided on a bottom plate (14) of the housing (29). This permits discharging the refrigerant more effectively as the refrigerant, being heavier than air, will quickly reach the bottom of plate (14) of the outdoor unit (1) and evacuate through the discharge opening (17).

[0037] The outdoor unit further comprises a first partition plate (26) that divides the interior of the outdoor unit (1) in an air chamber (31), where a fan and the heat source heat exchanger (not shown) are positioned, and in a machine chamber (21) where the compressor (not shown), the expansion valve, the plate heat exchanger (5), the air purge valve (15) and the air discharge path (16) are positioned. The opening (17) of the housing is provided at a bottom plate (14) of the machine chamber (21). In this way, the opening (17) is advantageously located in the compartment of the outdoor unit (1) where most refrigerant-bearing elements, and thus most likely sources of refrigerant leakage, are located. This permits the evacuation of the leaked refrigerant before it is allowed to pool inside the machine chamber (21), and potentially ignite.

[0038] In an embodiment not shown in FIG. 1, the outdoor unit (1) further comprises an electric component box (19) in the machine chamber (21), wherein the electric component box (19) is positioned at a top region of the machine chamber 21. Since the refrigerant is heavier than air, the placement of the electric component box (19) advantageously eliminates the possibility of said refrigerant ever reaching the electric component box (19), and

in this way greatly reducing the risk of explosion by deflagration of the refrigerant.

[0039] In the embodiment shown in FIG. 1, the machine chamber (21) is shown comprising a second partition plate (18), said second partition plate (18) separating the electric component box (19) from the air discharge path (16). In this way, the electric component box section (20) defined by the second partition (18) further isolates the electric component box (19) and any of its components from any refrigerant purged out of the heat exchanger (5). Said refrigerant can therefore be more safely conducted by the air discharge path (16) to the outside of the outdoor unit (1) without any risk of explosion.

[0040] In another embodiment not shown in FIG. 1, the electric component box (19) is arranged inside a second housing disposed on a top plate (13) of the housing (29) of the outdoor unit (1). This provides yet another barrier keeping the refrigerant out of the electric component box (19). Furthermore, since the refrigerant is heavier than air, the placement of the electric component box (19) advantageously eliminates the possibility of said refrigerant ever reaching said electric component box (19), and in this way greatly reducing the risk of explosion by deflagration of the refrigerant.

[0041] In another embodiment not shown in FIG. 1, an electric component box (19) is arranged inside a second housing disposed on a lateral side plate (10 or 11) of the housing (29) of the outdoor unit (1). In this way, all the components of inside the electrical component box (19) are safely distanced and isolated from any leaking refrigerant.

[0042] In the embodiments wherein the electric component box (19) is provided inside a second housing, said electric component box (19) is provided with an electrical connection (not shown) extending internally into the housing (29) of the outdoor unit (1). By preference, the electrical connection reaching the inside of the housing (29) of the outdoor unit (1) is airtight. In this way, electrical signals and energy can still be exchanged between the electrical component box (19) and the different sections inside the outdoor unit (1) without increasing the risk of any refrigerant reaching inside the electric component box (19). In order to provide such airtight connection, the electric component box (19), and preferably also the housing (29) of the outdoor unit (1) are provided with cable glands equipped with sealing elements, such as O-rings or sleeves, and/or foam, such as polyurethane foam, and/or glue, such as silicone glue.

[0043] In an embodiment not shown in FIG. 1, the opening (17) of the housing (29) is provided in a rear plate (12) of the housing (29). By preference, the first lateral face of the plate heat exchanger (5) faces a rear plate (12) of the housing (29), and the heat medium pipe connection ports (22, 23) are arranged on the rear plate (12), outside of the housing (29). In this way, the pipes (24, 25) entering and leaving the outdoor unit (1) are advantageously closer to the wall where said unit (1) is

mounted on. This permits maintaining a longer straight section of pipe (24, 25) after the heat exchanger (5). This promotes a laminar flow in said section of pipe (24, 25) and reduces the noise created by the flow of heat medium. This embodiment also provides a shorter path between the air purge valve (15) and the outside of the outdoor unit (1), thus reducing the time the leaked refrigerant remains inside said unit (1), and therefore also reducing the risk of any said refrigerant reaching any electrical component inside the unit (1).

[0044] In an embodiment not shown in FIG. 1, the opening of the housing (17) is provided in a lateral plate (10, 11) of the housing (29). In this way, the outdoor unit (1) can be mounted closer to a wall without risk of limiting the dispersion of the leaked refrigerant once it reaches the outside of the outdoor unit (1). By locating the opening (17) on one of the lateral plates (10, 11) of the housing (29), a path between the air purge valve (15) and the outside of the housing (29) is advantageously made shorter. This location of the opening (17) further permits taking advantage of any wind drafts passing by the housing (29) of the outdoor unit (1) in order to disperse any leaked refrigerant more quickly.

[0045] The present invention is in no way limited to the embodiment shown in the figure. On the contrary, the present invention may be realized in many different ways without departing from the scope of the invention.

List of numbered items:

[0046]

- 1 outdoor unit
- 5 plate heat exchanger
- 6 heat medium circuit
- 7 first lateral face of the heat exchanger
- 8 second lateral face of the heat exchanger
- 9 front plate
- 10 first side plate
- 11 second side plate
- 12 rear plate
- 13 top plate
- 14 bottom plate
- 15 air purge valve
- 16 air discharge path
- 17 opening
- 18 second partition plate
- 19 electric component box
- 20 electric component box section
- 21 machine section
- 22 heat medium outlet port
- 23 heat medium inlet port
- 24 first heat medium pipe
- 25 second heat medium pipe
- 26 first partition plate
- 27 refrigerant outlet port
- 28 refrigerant inlet port
- 29 housing

31 air chamber

Claims

- 5 **1.** An outdoor unit for a heat pump system comprising:
 - 10 a refrigerant circuit comprising a compressor, a heat source heat exchanger, an expansion valve, and a refrigerant side of a plate heat exchanger;
 - 15 a heat medium circuit comprising a heat medium side of the plate heat exchanger and an air purge valve, wherein the plate heat exchanger has a first lateral face and a second lateral face, wherein heat medium pipe connection ports are arranged on the first lateral face and wherein refrigerant pipe connection ports and an air purge valve connection port are arranged on the second lateral face;
 - 20 an air discharge path connected to a discharge port of the air purge valve;
 - 25 a housing accommodating the compressor, the heat source heat exchanger, the expansion valve, the plate heat exchanger, the air purge valve and the air discharge path, the housing having an opening in fluid communication with the discharge port of the air purge valve via the air discharge path;
 - 30 wherein the air discharge path is arranged so that it faces downward from the discharge port of the air purge valve to the opening of the housing.
- 35 **2.** The outdoor unit according to the claim 1, wherein the opening of the housing is provided on a bottom plate of the housing.
- 40 **3.** The outdoor unit according to claim 1 or 2, wherein the outdoor unit further comprising a partition plate that divides the outdoor unit in an air chamber where a fan and the heat source heat exchanger are positioned and in a machine chamber where the compressor, the expansion valve, the plate heat exchanger, the air purge valve and the air discharge path are positioned, and wherein the opening of the housing is provided at a bottom plate of the machine chamber.
- 45 **4.** The outdoor unit according to claim 3, wherein the outdoor unit further comprises an electric component box in the machine chamber, wherein the electric component box is positioned at a top region of the machine chamber.
- 50 **5.** The outdoor unit according to claim 4, wherein the machine chamber comprises a second partition plate, said second partition plate separating the electric component box from the air discharge path.

6. The outdoor unit according to any one of the claims 1 to 5, wherein an electric component box is arranged inside a second housing disposed on a top plate of the housing of the outdoor unit.
7. The outdoor unit according to any one of the claims 1 to 5, wherein an electric component box is arranged inside a second housing disposed on a lateral side plate of the housing of the outdoor unit.
8. The outdoor unit according to any one of the claims 6 to 7, wherein the electric component box is provided with an electrical connection extending internally into the housing of the outdoor unit.
9. The outdoor unit according to claim 8, wherein the electrical connection reaching the inside of the housing of the outdoor unit is airtight.
10. The outdoor unit according to the claim 1, wherein the opening of the housing is provided in a rear plate of the housing.
11. The outdoor unit according to the claim 1, wherein the opening of the housing is provided in a lateral plate of the housing.
12. The outdoor unit according to any one of the claims 1 to 11, wherein the first lateral face of the heat exchanger faces a rear plate of the housing, and the heat medium pipe connection ports are arranged on the rear plate, outside of the housing.
13. The outdoor unit according to any one of the claims 1 to 12, wherein the plate heat exchanger is a double-wall plate heat exchanger.

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

1. An outdoor unit (1) for a heat pump system comprising:
 - a refrigerant circuit comprising a compressor, a heat source heat exchanger, an expansion valve, and a refrigerant side of a plate heat exchanger (5);
 - a heat medium circuit (6) comprising a heat medium side of the plate heat exchanger (5) and an air purge valve (15), wherein the plate heat exchanger has a first lateral face (7) and a second lateral face (8), wherein heat medium pipe connection ports (24, 25) are arranged on the first lateral face and wherein refrigerant pipe connection ports (27, 28) and an air purge valve connection port connected to an air purge valve (15) are arranged on the second lateral face; an air discharge path (16) connected to a dis-

charge port of the air purge valve;
 a housing (29) accommodating the compressor, the heat source heat exchanger, the expansion valve, the plate heat exchanger, the air purge valve and the air discharge path, the housing having an opening (17) in fluid communication with the discharge port of the air purge valve via the air discharge path;

characterized in that the air discharge path is arranged so that it faces downward from the discharge port of the air purge valve to the opening of the housing.

2. The outdoor unit according to the claim 1, wherein the opening of the housing is provided on a bottom plate (14) of the housing.
3. The outdoor unit according to claim 1 or 2, wherein the outdoor unit further comprising a first partition plate (26) that divides the outdoor unit in an air chamber (31) where a fan and the heat source heat exchanger are positioned and in a machine chamber (21) where the compressor, the expansion valve, the plate heat exchanger, the air purge valve and the air discharge path are positioned, and wherein the opening of the housing is provided at a bottom plate (14) of the machine chamber.
4. The outdoor unit according to claim 3, wherein the outdoor unit further comprises an electric component box (19) in the machine chamber, wherein the electric component box is positioned at a top region of the machine chamber.
5. The outdoor unit according to claim 4, wherein the machine chamber comprises a second partition plate (18), said second partition plate separating the electric component box from the air discharge path.
6. The outdoor unit according to any one of the claims 1 to 5, wherein an electric component box (19) is arranged inside a second housing disposed on a top plate (13) of the housing of the outdoor unit.
7. The outdoor unit according to any one of the claims 1 to 5, wherein an electric component box (19) is arranged inside a second housing disposed on a lateral side plate (10, 11) of the housing of the outdoor unit.
8. The outdoor unit according to any one of the claims 6 to 7, wherein the electric component box is provided with an electrical connection extending internally into the housing of the outdoor unit.
9. The outdoor unit according to claim 8, wherein the

electrical connection reaching the inside of the housing of the outdoor unit is airtight.

10. The outdoor unit according to the claim 1, wherein the opening of the housing is provided in a rear plate (12) of the housing. 5
11. The outdoor unit according to the claim 1, wherein the opening of the housing is provided in a lateral plate (11, 12) of the housing. 10
12. The outdoor unit according to any one of the claims 1 to 11, wherein the first lateral face of the heat exchanger faces a rear plate (12) of the housing, and the heat medium pipe connection ports are arranged on the rear plate, outside of the housing. 15
13. The outdoor unit according to any one of the claims 1 to 12, wherein the plate heat exchanger (5) is a double-wall plate heat exchanger. 20

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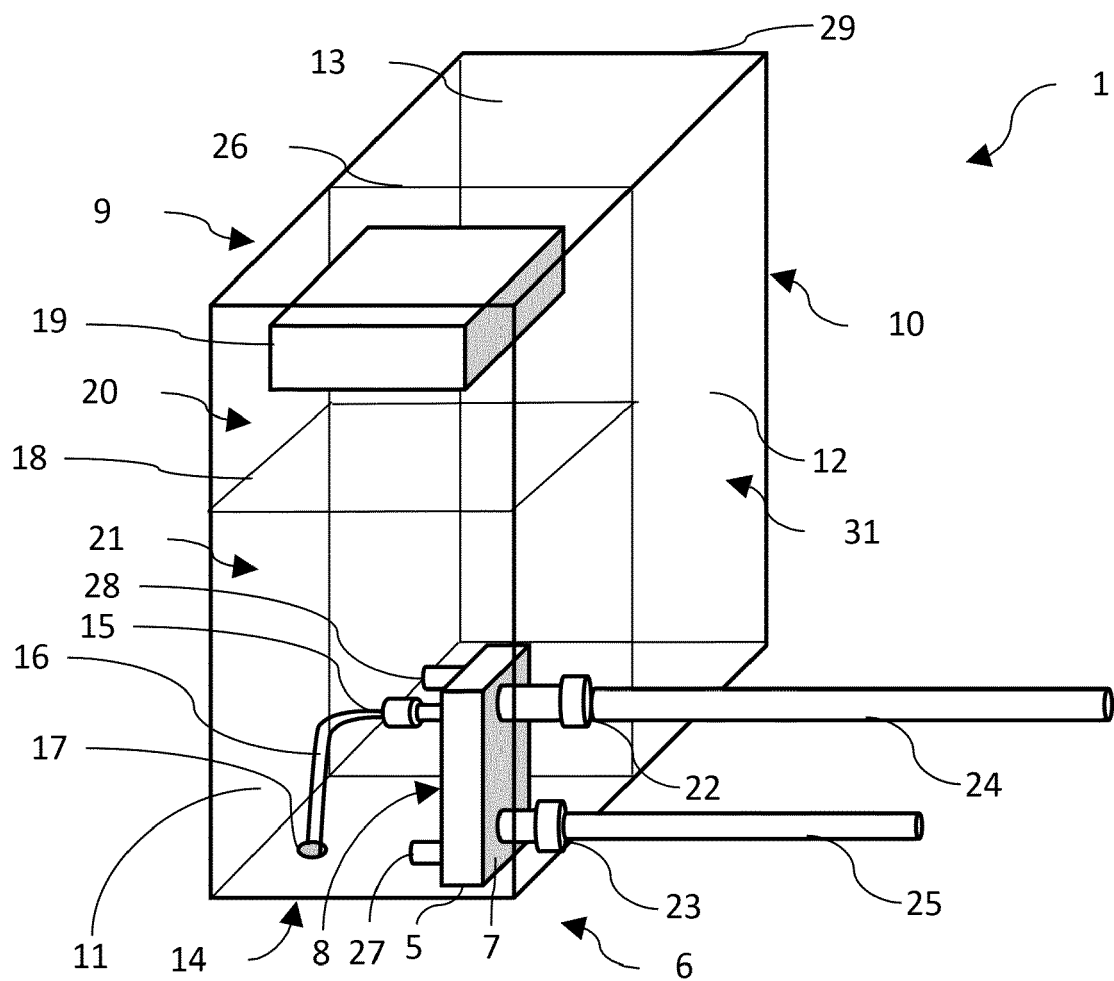


FIG. 1



EUROPEAN SEARCH REPORT

Application Number

EP 23 21 1295

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 4 075 074 A1 (PANASONIC IP MAN CO LTD [JP]) 19 October 2022 (2022-10-19) * the whole document *	1-13	INV. F24F1/26 F24F1/56 F24F5/00 F25B13/00 F24F1/16 F24F1/46 F24F11/89
A	WO 2023/095418 A1 (PANASONIC IP MAN CO LTD [JP]) 1 June 2023 (2023-06-01) * figure 1 *	1	
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A	EP 3 967 943 A1 (PANASONIC IP MAN CO LTD [JP]) 16 March 2022 (2022-03-16) * figure 1 *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
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