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

AUSSENEINHEIT FÜR EINE WÄRMEPUMPE

UNITÉ EXTÉRIEURE POUR UNE POMPE À CHALEUR

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(56) References cited:
EP-A2- 2 719 970
EP-A2- 2 792 964
CN-U- 207 113 067
JP-A- 2015 061 997
US-A1- 2011 016 903
US-A1- 2016 076 779

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Description

Technical Field

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

Background

[0002] Operating the heat pump in a heating operation may cause the formation of frost at the heat source heat exchanger accommodated in the outdoor unit. During a defrosting operation of the heat pump, a reverse - cycle operation to the heating operation is performed in order to defrost the heat source heat exchanger. Due to the reverse cycle, the heat source heat exchanger functions as a condenser dissipating heat and frost is thawed. The thawed frost (water) flows along the surfaces of the heat source heat exchanger towards a bottom plate comprising a drainage structure in order to drain the water.

[0003] One example of such a drainage structure (drainage channel) is shown in JP S63-178762 U. Those drainage structures are often perceived to not sufficiently guide water collected on an upper side of the bottom plate towards a drainage hole. To cope with this problem, it had been suggested to provide a plurality of drainage holes such as disclosed in EP 2 333 440 A1. A plurality of drainage holes our, however, perceived disadvantageous making it more difficult to drain the water to a desired location.

[0004] An additional problem of these drainage structures is that separate support elements need to be provided in order to support the heat source heat exchanger on the upper side of the bottom plate in an elevated position above an upper opening of the drainage structure (drainage channel).

[0005] Another outdoor unit is disclosed in CN 207 113 067 U forming the basis for the preamble of claim 1. Even further outer units are disclosed in US 2016/076779 A1 and JP 2015-061997 A.

Summary

[0006] In view of the aforesaid, it is an aim of the present disclosure to provide an outdoor unit for a heat pump which enables as complete as possible drainage of any water collecting on an upper side of the bottom plate and does not require separate support structures for supporting the heat source heat exchanger on the bottom plate.

[0007] This aim may be achieved by an outdoor unit as defined in claim 1. Embodiments may be found in the dependent claims, the following description and the accompanying drawings.

[0008] According to a first aspect, an outdoor unit for a heat pump is suggested. Generally speaking, a heat pump in its simplest configuration comprises a heat source heat exchanger (outdoor heat exchanger), which in the following is referred to merely as heat exchanger, a heat consumer heat exchanger (indoor heat exchanger), an expansion valve and a compressor connected by refrigerant pipes. In addition, the refrigerant circuit may comprise a 4-way switching valve for switching between heating operation and cooling/defrosting operation (reverse cycle operation).

[0009] The outdoor unit of this aspect comprises a bottom plate. The heat exchanger is supported on the bottom plate. The heat exchanger may in a view perpendicular to the bottom plate be basically L-shaped. In addition, the bottom plate comprises a drainage hole. In a particular example, the bottom plate comprises a single drainage hole. Moreover, an elongated drainage channel is provided. The elongated drainage channel is located below (beneath or underneath) the heat exchanger at least along a portion of the heat exchanger. To put it differently, the heat exchanger and the elongated drainage channel overlap in a top view perpendicular to the bottom plate. Further, the elongated drainage channel slopes towards the drainage hole. As the drainage hole, particularly if a single drainage hole is provided, may be located at an intermediate position of the drainage channel, the drainage channel may slope respectively from opposite ends relative to the drainage hole towards the drainage hole. The bottom plate has an outer and/or an inner support surface for supporting the heat exchanger. According to the first aspect, the outer and/or inner support surfaces are formed by a bank of the drainage channel. The "bank" of the drainage channel is to be understood as those surfaces extending respectively from the upper opening of the drainage channel away from the drainage channel in opposite direction to form an inner and an outer support surface with respect to the drainage channel. The heat exchanger is, along more than half of the longitudinal extension of the drainage channel, in contact with at least part of the inner and/or outer support surfaces and thereby supported in a vertical direction. To put it differently, the heat exchanger may sit directly on an upper side of the bottom plate covering at least a portion of the upper opening of the drainage channel.

[0010] Due to this configuration, no additional support structures are required for supporting the heat exchanger. Accordingly, the outdoor unit may be manufactured more cost-effectively with less parts being involved.

[0011] Further, the width of the drainage channel at an upper opening of the drainage channel is at least in portions along the longitudinal extension of the drainage channel smaller than the width (of a lower side) of the heat exchanger, so that the lower end of the exchanger closes the upper opening of the drainage channel in said portion, wherein the width of the drainage channel is the dimension of the drainage channel in a direction parallel to the bottom plate and perpendicular to the longitudinal

extension of the drainage channel and the width of the heat exchanger is the dimension of the heat exchanger in a direction parallel to the bottom plate and perpendicular to the longitudinal extension of the drainage channel.

[0012] Accordingly, a good and stable seat and positioning of the heat exchanger may be obtained.

[0013] According to a second aspect, the width of the drainage channel at a bottom of the drainage channel is at least in portions along the longitudinal extension of the drainage channel smaller than the width of the heat exchanger, wherein the width of the drainage channel is the dimension of the drainage channel in a direction parallel to the bottom plate and perpendicular to the longitudinal extension of the drainage channel and the width of the heat exchanger is the dimension of the heat exchanger in a direction parallel to the bottom plate and perpendicular to the longitudinal extension of the drainage channel.

[0014] Accordingly, a relatively small cross-section of the drainage channel may be achieved which can assure that, even with low amounts of water being involved, most of the water is reliably guided to the drainage hole and drained to the outside of the outdoor unit. Thus, the risk that the remaining water freezes on the bottom plate can be reduced.

[0015] Moreover, in order to improve the drainage characteristics it is beneficial to embody the drainage structure as a drainage system comprising a plurality of intersecting/interconnected elongated drainage channels. It is to be emphasized that the configuration of the drainage system may also be embodied independently of the feature that "the heat exchanger is, along more than half of the longitudinal extension of the drainage channel, in contact with at least part of the inner and/or outer support surfaces and thereby supported in a vertical direction".

[0016] According to a third aspect, the outdoor unit further comprises a fan having a fan support structure and a fan rotor having fan blades. The fan support structure may be directly fixed to an upper side of the bottom plate.

[0017] According to a fourth aspect, the mentioned drainage system comprises a first additional drainage channel in the bottom plate below (below/underneath a lower side of) the fan rotor, more particularly the fan blades.

[0018] As a result, also water dropping from the fan rotor, more particularly the fan blades, may effectively be collected in the first additional drainage channel and drained toward the drainage hole positioned in the drainage channel.

[0019] According to a fifth aspect, the first additional drainage channel slopes towards an intermediate position of the first additional drainage channel. In particular, the first additional drainage channel may have a slope starting at either one of opposite ends of the additional drainage channel sloping towards an intermediate position such as a central position.

[0020] Consequently, good collection of water can be realized even though a steeper slope is necessary due to the smaller amount of water coming from the fan rotor, more particularly the fan blades, as compared to drainage channel collecting the water from the heat exchanger.

[0021] In an alternative sixth aspect, the first additional drainage channel comprises two portions, the first additional drainage channel sloping in each of the portions towards an intermediate position of the respective portion.

[0022] As compared to the fifth aspect also fan rotors having a larger diameter may be covered with good water collecting properties without having to significantly increase the height of the bottom plate/depth of the first additional drainage channel. In particular and due to the two portions a shallower slope as compared to the fifth aspect may be realized still allowing water (even small amounts of water) to flow towards the drainage channel and drain it from the drainage hole.

[0023] According to an seventh aspect, the outdoor unit further comprises a second additional drainage channel in the bottom plate below the fan support structure. The second additional drainage channel may slope from one end away from the fan support structure towards the fan support structure.

[0024] Hence, also water flowing along the fan support structure downwards to the bottom plate may effectively be collected in the drainage system and be drained via the drainage hole outside the outdoor unit.

[0025] According to a eighth aspect, the outdoor unit further comprises a connecting channel connecting the first additional drainage channel and/or the second additional drainage channel with the drainage channel. In one example, the connecting channel extends perpendicular to a longitudinal extension of the elongated drainage channel, elongated first additional drainage channel and/or elongated second additional drainage channel.

[0026] In one example, the connecting channel may be connected to the first additional drainage channel at the intermediate position or at the intermediate positions of the two portions mentioned above.

[0027] Even further, the connecting channel may be connected to the second additional drainage channel at the end adjacent the fan support structure to which the second additional drainage channel slopes.

[0028] Thus, a drainage system is realized enabling superior collection and drainage of any water being collected on an upper side of the bottom plate.

[0029] According to ninth aspect, the angle of inclination of the slope in the drainage channel is smaller than in at least one of the first additional drainage channel, the second additional drainage channel and the connecting channel.

[0030] Because the amount of water in the first additional drainage channel, the second additional drainage channel and the connecting channel tends to be less than in the drainage channel situated below the heat exchanger and due to the surface tension of the water, it is ben-

eficial that the angle of inclination in those drainage channels is higher to assure that the water actually flows towards the drainage channel and into the drainage hole.

[0031] According to tenth aspect, opposite side walls in the width direction of the drainage channel/-s slope inwards. In an embodiment the angle between an inner side of the drainage channel/-s and a vertical line resides between 10° and 50° or 15° and 45°.

[0032] Thus, it can be realized that any water accumulated on the surroundings of the drainage channel/-s surely flows into the drainage channel/-s.

[0033] According to a eleventh aspect, the drainage channel slopes towards a single drainage hole.

[0034] Thus, drainage of water to the outside of the outdoor unit to a desired location is simplified.

[0035] According to a twelfth aspect, the bottom plate is a deep drawn part.

[0036] Thus, ease of manufacture may be realized.

Brief Description of the Drawings

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

[0038] In the drawings,

Figure 1 shows a perspective view of an outdoor unit in accordance with the present disclosure;

Figure 2 shows a perspective view of the outdoor unit in figure 1 with all parts being removed except for the bottom plate, the heat source heat exchanger and the fan;

Figure 3 shows a perspective view of the outdoor unit in figure 1 with the fan being removed and the heat source heat exchanger being shown in transparent;

Figure 4 shows an enlarged perspective of figure 3;

Figure 5 shows an enlarged cross-sectional view of figure 2 in a transverse direction of the bottom plate along the line 5 - 5;

Figure 6 shows a top view on the bottom plate;

Figure 7 shows a perspective view of the bottom plate in figure 6.

Detailed Description

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

[0040] Figure 1 shows a perspective view of an outdoor unit 10 of a split type heat pump. The heat pump comprises a refrigerant circuit, at least comprising a heat source heat exchanger 11, a compressor (not visible), a heat consumer heat exchanger (not shown), such as an indoor heat exchanger, and an expansion valve (not visible) connected by refrigerant pipes.

[0041] The shown outdoor unit 10 comprises an outer casing 13. The outer casing 13 has a bottom plate 14. Feet (not shown) for mounting the outdoor unit on a horizontal surface or via brackets to a vertical wall are fixed to the bottom plate 14. Further, the outer casing 13 has a top plate 16 and a side plate 17. In the shown embodiment, the side plate 17 extends around a rearward corner of the outdoor unit 10 being connected to (integrally formed with/forming a one piece structure with) a back plate 18 of the outer casing 13.

[0042] As will be best visible from figure 2 and 3, the heat source heat exchanger 11 occupies a part of the rear side of the outer casing 13 and the side of the outer casing 13 opposite to the side plate 17. The heat source heat exchanger 11 is "L" - shaped in a top view.

[0043] The front side of the outer casing 13 is closed by a front panel including a grille 19.

[0044] The heat source heat exchanger 11 has an upper side 20 facing away from the bottom plate 14 and the lower side 21 facing toward the bottom plate 14. Moreover, the heat source heat exchanger 11 has an inner side 22 and an outer side 23 opposite to the inner side 22. The heat source heat exchanger 11 has a plurality of parallel waffle plates extending from the inner side 22 to the outer side 23 and from the lower side 21 to the upper side 20. A plurality of heat exchanging tubes 24 extend perpendicularly through the waffle plates.

[0045] The heat exchanger has opposite ends, namely a first end 25 and a second end 26. The width of the heat source heat exchanger 11 is defined between the inner side 22 and the outer side 23. The height of the heat source heat exchanger 11 is defined between the upper side 20 and the lower side 21. Moreover, the heat source heat exchanger 11 is an elongated heat source heat exchanger, wherein its longitudinal extension is defined between the first and second ends 25 and 26.

[0046] As previously indicated, the heat source heat exchanger 11 is in a top view basically "L" shaped. Thus, the heat source heat exchanger 11 has a first portion 27 corresponding to the longer leg of the "L" and a second portion 28 corresponding to the shorter leg of the "L".

[0047] The bottom plate 14 of the outer casing 13 has an upright outer flange 15 extending around the outer peripheral edge of the bottom plate 14. Accordingly, the bottom plate 14 is formed like a pan.

[0048] The bottom plate 14 has an upper side 40 and a lower side 41. The lower side 41 serves for mounting the outdoor unit 10 to a horizontal surface or brackets

fixed to a vertical wall. For this purpose, feet may be provided at the lower side 41 of the bottom plate 14.

[0049] Moreover, the outdoor unit 10 accommodates a fan 30 (see figure 2). The fan comprises a support structure 31. The support structure 31, in the present example, comprises two upright columns 32 vertically (perpendicularly) extending from the bottom plate 14. The columns 32 are fixed at their lower end to the upper side 40 of the bottom plate.

[0050] The fan 30 further comprises a fan motor 33 attached to the support structure 31, particularly the columns 32 at an intermediate position between the opposite ends of the columns 32. A fan rotor 34 is mounted on the fan motor 33 so as to be rotatable about a rotational axis. The fan rotor 34 comprises a plurality of (here three) fan blades 35.

[0051] The bottom plate 14 further comprises a drainage structure 42. The drainage structure 42 represents a drainage system of a plurality of channels respectively having a slope towards a drainage hole 43 in one of the drainage channels. In the present example, the drainage structure 42 comprises a single drainage hole 43. Hence, any water being accumulated in the drainage structure is reliably guided to the drainage hole 43 and drained to the outside of the outdoor unit 10.

[0052] The drainage structure 42 comprises a first drainage channel (drainage channel) extending along the lengths of the heat source heat exchanger 11. Thus, the first drainage channel has in a top view as well a "L" shape (see figure 6). The drainage channel 44 has a first end 45 and a second opposite end 46. Moreover, an outer side 47 (the outer side being directed towards the peripheral outer edge of the bottom plate 14) and an inner side 48 (the inner side being opposite to the outer side) of the first drainage channel 44 define its width.

[0053] As will be best visible from figure 5, the outer side 47 and the inner side 48 of the drainage channel slope from an upper opening 49 of the drainage channel towards a bottom 50 of the drainage channel. In this context, the slope angle α and β may be different. In other examples the slope angles may be the same. In either case, it is preferred that the slope angle resides in a range between 10° and 50° or 15° and 45°.

[0054] The bottom 50 of the first drainage channel 44 slopes from the first end 45 and from the second end 46 respectively towards the drainage hole 43, wherein the drainage hole 33 is disposed at an intermediate position between the opposite ends 45 and 46.

[0055] The first drainage channel 44 mainly serves the purpose of collecting any water flowing along the surfaces of the heat source heat exchanger 11 towards the bottom plate 14 during the defrosting operation. In the defrosting operation, a reverse - cycle operation is performed during which the heat source heat exchanger 11 is functioning as a condenser, whereby any ice formed on the heat source heat exchanger 11 is thawed. This water flows along the surfaces of the heat source heat exchanger 11 downwards to the bottom plate 14 and is primarily collected in the first drainage channel 44.

[0056] The drainage structure 42 further comprises a second drainage channel (first additional drainage channel) 51. In the depicted example, the second drainage channel comprises a first portion 52a and a second portion 52b.

[0057] Each of the first and second portion 52a, b has opposite ends 53a, b and 54a, b. The bottom 55 of the second drainage channel 51 respectively slopes from the opposite ends 53a, b and 54a, b towards an intermediate position 56.

[0058] Considering figure 2, it will be apparent that the second drainage channel 51 is positioned underneath (below/underneath a lower side of) the fan rotor 34, more particularly the fan blades 35. Water adhering to the grill 19 or the heat source heat exchanger 11 may be drawn into the outer casing 13 by the air flow produced by the fan 30. This water may come into contact with the fan rotor 34, more particularly the fan blades 35, and be thrown or drop from the fan rotor 34, more particularly the fan blades 35, towards the bottom plate 14. The second drainage channel 51 is configured to collect this water.

[0059] Furthermore, a third drainage channel 57 (second additional drainage channel) is provided in the bottom plate 14. The third drainage channel 57 may comprise a plurality of portions 57a-b.

[0060] A first portion 57a is arranged in parallel to the second drainage channel 51 adjacent the fan support structure 31. The first portion 57a has opposite ends 58a, 59a. A bottom 60a of the first portion 57a slopes from the end 58a towards the opposite end 59a, i.e. from a position distanced from the fan support structure 31 towards the fan support structure 31.

[0061] A second portion 57b is substantially "T" shaped. The vertical leg of the "T" extends parallel to the axis of rotation of the fan rotor 34 and is positioned between the support columns 32 of the fan support structure 31 underneath the fan motor 33. The horizontal leg of the "T" extends perpendicularly thereto and, hence, parallel to the first portion 57a. The second portion 57b has a first end 58b at an end of the vertical leg opposite to the horizontal leg of the "T" and opposite second ends 59b at the respective ends of the horizontal leg of the "T". The bottom of the second portion 57b slopes from the first end 58b towards the second ends 59b.

[0062] It is to be understood that with respect to the third drainage channel 57 only one of the portions 57a and 57b may be provided. In either case, the third drainage channel 57 is configured to collect any water flowing downwards along the fan support structure 32 or dropping down from the fan motor 33 and guide that water towards the first drainage channel 44 and into the drainage hole 43.

[0063] Furthermore, a fourth drainage channel 61 (connecting channel) may be provided in order to connect the second and/or third drainage channel 51 and 57 to the first drainage channel 44. In the present example,

two fourth drainage channels 61a and 61b are provided. Each of the fourth drainage channels has a first end 62a, b and a second end 63a, b. A bottom 64a, b slopes from the respective first ends 62a, b towards the respective second ends 63a, b. Their respective first ends 62a, b merge with the intermediate positions 56 of the first and second portions 52a, b of the second drainage channel 51. The respective second ends 63a, b merge with the first drainage channel 44. In addition the ends 59a and 59b respectively merge with the fourth drainage channel 61.

[0064] In this context, the amount of water reaching the upper side 40 of the bottom plate 14 tends to be less in the area of the fan support structure 31 and the fan rotor 34, more particularly the fan blades 35, as compared to the area underneath the heat source heat exchanger 11. Accordingly, the slope angle (e.g. 3°) of bottoms 55, 60 and 64 of the second, third and fourth drainage channels 51, 57 and 61 is larger than the slope angle (e.g. 2°) of the bottom 50 of the first drainage channel 44. In addition, opposite side walls in a width direction of the respective drainage channel 51, 57 and 61 may as well be inclined (slope) towards the bottom 55, 60 and 64 in a similar slope angle range as described with respect to the first drainage channel 44.

[0065] For ease of manufacture, the entire drainage structure 42 is configured to allow deep drawing of the bottom plate 14.

[0066] In order to support the heat source heat exchanger 11 on the upper side 40 of the bottom plate 14, the bottom plate has an outer and/or an inner support surface 70 and 71. In particular and as best visible from figure 5, the outer support surface 70 and the inner support surface 71 are respectively formed by the bank of the first drainage channel 44. In this context, the term "bank" is to be understood as the raised land along the sides of the first drainage channel 44 (similar to a river). To put it differently, it refers to the substantially horizontal side surfaces (bordering the upper edges of the walls on the outer side 47 and the inner side 48) defining the upper opening 49 of the first drainage channel 44.

[0067] As far as the dimensions of the first drainage channel 44 are concerned, the width at the upper opening 49 is defined by the upper edges of the outer side 57 and the inner side 58. The width at the bottom 50 is defined by the lower edges of the outer side 57 at the inner side 58. The longitudinal dimension (lengths) is defined between the first end 45 and the second end 46. The height is defined between the bottom 50 in the upper opening 49. In this context, also the first drainage channel 44 as to portions corresponding to the first and second portions 27 and 28 of the heat source heat exchanger 11.

[0068] As will be apparent from figure 3 in which the heat source heat exchanger 11 is shown in transparent, the heat source heat exchanger 11 is supported on the bottom plate along more than half of the longitudinal extension of the first drainage channel 44. Particularly, the heat source heat exchanger 11 is supported on at least parts of the outer and/or inner support services 70, 71, respectively. Certainly, there are portions in which no support surfaces are provided and in which the heat source heat exchanger 11 is not supported on the bottom plate 14 such as the portions where the fourth drainage channels 61 merge with the first drainage channel 44, that is at their second ends 63a, b. Another portion may be the portion where some of the heat exchanging tubes are led out of the heat source heat exchanger 11. In this context, the heat source heat exchanger 11 is in any case supported along more than half of the longitudinal extension of the drainage channel and, hence, also of the longitudinal extension of the heat source heat exchanger 11. However, the support may be interrupted and the support may either be on the inner support surface 71 or the outer support surface 70 or both. To put it differently, the lower side of the heat source heat exchanger 11 is in contact with at least part of the inner and/or outer support services 71 and 70.

[0069] As a result, no additional or separate supporting structures need to be incorporated into the bottom plate 14 which may therefore be kept simple. In addition, because of the relatively long support, the heat source heat exchanger 11 is supported in a very stable manner on the bottom plate 14.

[0070] In one example, the width W_2 at the upper opening 49 is at least in parts of the longitudinal extension of the first drainage channel 44 smaller than the width of the lower side 21 of the heat source heat exchanger 11 (see figure 5). Thus, the lower side 21 of the heat source heat exchanger 11 closes the upper opening 49 of the first drainage channel 44 and is supported on both the inner and outer support surfaces 71 and 70. As a consequence, even more stable support of the heat source heat exchanger 11 in a vertical direction on the upper side 40 of the bottom plate 14 can be realized.

[0071] In another example, the width W_1 at the bottom 50 of the first drainage channel 44 is selected to be smaller than the width of the lower side 41 of the heat source heat exchanger 11 (figure 5). Accordingly the portion in which the water is guided toward the drainage hole 43 is relatively narrow so that even in case of relatively small amounts of water a sufficient water flow towards the drainage hole 43 may be realized and good drainage properties be achieved.

[0072] It is to be understood that the present description of an embodiment is not considered to be limiting. Rather several modifications may be realized by the skilled person. In this context, it is to be emphasized that the configuration of the drainage structure as defined in the dependent claims and the above example may also be embodied independently of the feature that the heat source heat exchanger is with its lower side 21 supported on the bank of the drainage channel. Other modifications are for example, that the second drainage channel 51 may be a single portion sloping from its opposite ends towards an intermediate position rather than being configured as described above. As previously mentioned al-

so the third drainage channel 57 may consist of only one of the portions 57a, b.

Reference list

[0073]

10 outdoor unit
11 heat source heat exchanger
13 outer casing
14 bottom plate
15 outer flange
16 top plate
17 side plate
18 back plate
19 grille
20 upper side of the heat source heat exchanger
21 lower side of the heat source heat exchanger
22 inner side of the heat source heat exchanger
23 outer side of the heat source heat exchanger
24 heat exchanging tube
25 first end of the heat source heat exchanger
26 second end of the heat source heat exchanger
27 first portion of the heat source heat exchanger
28 second portion of the heat source heat exchanger
30 fan
31 fan support structure
32 fan support column
33 fan motor
34 fan rotor
35 fan blade
40 upper side of the bottom plate
41 lower side of the bottom plate
42 drainage structure
43 drainage hole
44 first drainage channel (drainage channel)
45 first end of the first drainage channel
46 second end of the first drainage channel
47 outer side of the first drainage channel
48 inner side of the first drainage channel
49 upper opening of the first drainage channel
50 bottom of the first drainage channel
51 second drainage channel (first additional drainage channel)
52a, b first and second portion of the second drainage channel
53a, b first end of the first/second portion of the second drainage channel
54a, b second end of the first and second portion of the second drainage channel
55 bottom of the first and second portion of the second drainage channel
56 intermediate position of the first and second portion of the second drainage channel
57 third drainage channel (second additional drainage channel)
57a, b first and second portions of the third drainage channel
58a, b first end of the first and second portions of the third drainage channel
59a, b second end of the first and second portions of the third drainage channel
60 bottom of the first and second portions of the third drainage channel
61 fourth drainage channel (connecting channel)
62a, b first end of the fourth drainage channel
63a, b second end of the fourth drainage channel
64 bottom of the fourth drainage channel
70 outer support surface (outer bank)
71 inner support surface (inner bank)
72 non-supported portion

Claims

1. Outdoor unit (10) for a heat pump, the outdoor unit comprising:

a bottom plate (14),
a heat exchanger (11) supported on the bottom plate (14),
the bottom plate (14) comprising a drainage hole (43) and an elongated drainage channel (44) located below the heat exchanger (11) at least along a portion of the heat exchanger (11) and sloping towards the drainage hole (43),
wherein the bottom plate (14) has an outer (70) and/or an inner (71) support surface formed by a bank of the drainage channel (44), the heat exchanger (11) being, along more than half of the longitudinal extension of the drainage channel, in contact with at least part of the outer (70) and/or inner (71) support surfaces and thereby supported in a vertical direction,
characterized in that
the width (W_2) of the drainage channel (44) at an upper opening (49) of the drainage channel (44) is at least in portions along the longitudinal extension of the drainage channel (44) smaller than the width of the heat exchanger (11) so that the lower side (21) of the heat exchanger (11) closes the upper opening (49) of the drainage channel (44) in said portion, wherein the width of the drainage channel (44) is the dimension of the drainage channel (44) in a direction parallel to the bottom plate (14) and perpendicular to the longitudinal extension of the drainage channel (44) and the width of the heat exchanger (11) is the dimension of the heat exchanger (11) in a direction parallel to the bottom plate (14) and perpendicular to the longitudinal extension of the drainage channel (44).

2. Outdoor unit according to claim 1, wherein the width (W_1) of the drainage channel (44) at a bottom (50) of the drainage channel (44) is at least in portions along the longitudinal extension of the drainage channel (44) smaller than the width of the heat exchanger (11), wherein the width (W_1) of the drainage channel (44) is the dimension of the drainage channel (44) in a direction parallel to the bottom plate (14) and perpendicular to the longitudinal extension of the drainage channel (44) and the width of the heat exchanger (11) is the dimension of the heat exchanger (11) in a direction parallel to the bottom plate (14) and perpendicular to the longitudinal extension of the drainage channel (44).

3. Outdoor unit according to any one of the preceding claims, further comprising a fan (30) having a fan support structure (31) and a fan rotor (34) having fan blades (35).

4. Outdoor unit according to claim 3, further comprising a first additional drainage channel (51) in the bottom plate (14) below the fan blades (35).

5. Outdoor unit according to claim 4, wherein the first additional drainage channel (51) slopes towards an intermediate position (56) of the first additional drainage channel (51).

6. Outdoor unit according to claim 4, wherein the first additional drainage channel (51) comprises two portions (52a, b), the first additional drainage channel (51) sloping in each of the portions (52a, b) towards an intermediate position (56) of the respective portion (52a, b).

7. Outdoor unit according to any one of claims 3 to 6, further comprising a second additional drainage channel (57) in the bottom plate (14) below the fan support structure (31).

8. Outdoor unit according to any one of claims 4 to 7, further comprising a connecting channel (61) connecting the first additional drainage channel (51) and/or the second additional drainage channel (57) with the drainage channel (44).

9. Outdoor unit according to any one of claims 4 to 8, wherein the angle of inclination of the slope in the drainage channel (44) is smaller than in at least one of the first additional drainage channel (51), the second additional drainage channel (57) and the connecting channel (61).

10. Outdoor unit according to any one of the preceding claims, wherein opposite side walls (47, 48) in the width direction of the drainage channel (44) slope inwards.

11. Outdoor unit according to any one of the preceding claims, wherein the drainage channel (44) slopes towards a single drainage hole (43).

12. Outdoor unit according to any one of the preceding claims, wherein the bottom plate (14) is a deep drawn part.

13. Outdoor unit according to any one of the preceding claims, wherein the heat exchanger (11) is in a view perpendicular to the bottom plate (14) basically L-shaped.

Patentansprüche

1. Außeneinheit (10) für eine Wärmepumpe, wobei die Außeneinheit Folgendes umfasst:

   eine Unterteilplatte (14),
   einen Wärmetauscher (11), der auf der Unterteilplatte (14) gestützt ist, wobei die Unterteilplatte (14) eine Auslassöffnung (43) und einen länglichen Drainagekanal (44), der unter dem Wärmetauscher (11) mindestens entlang eines Abschnitts des Wärmetauschers (11) gelegen ist und zu der Auslassöffnung (43) hin geneigt ist, umfasst,
   wobei die Unterteilplatte (14) eine äußere (70) und/oder eine innere (71) Stützoberfläche aufweist, die durch eine Bank des Drainagekanals (44) gebildet ist, wobei der Wärmetauscher (11) entlang von mehr als der Hälfte der Längsausdehnung des Drainagekanals mit mindestens einem Teil der äußeren (70) und/oder der inneren (71) Stützoberfläche in Berührung ist und damit in eine vertikale Richtung gestützt wird,
   dadurch gekennzeichnet, dass
   die Breite (W_2) des Drainagekanals (44) an einer oberen Öffnung (49) des Drainagekanals (44) mindestens in Abschnitten entlang der Längsausdehnung des Drainagekanals (44) kleiner ist als die Breite des Wärmetauschers (11), so dass die untere Seite (21) des Wärmetauschers (11) die obere Öffnung (49) des Drainagekanals (44) in dem Abschnitt verschließt, wobei die Breite des Drainagekanals (44) die Abmessung des Drainagekanals (44) in eine Richtung parallel zu der Unterteilplatte (14) und rechtwinkelig zu der Längsausdehnung des Drainagekanals (44) ist, und die Breite des Wärmetauschers (11) die Abmessung des Wärmetauschers (11) in eine Richtung parallel zu der Unterteilplatte (14) und rechtwinkelig zu der Längsausdehnung des Drainagekanals (44) ist.

2. Außeneinheit nach Anspruch 1, wobei die Breite (W_1) des Drainagekanals (44) an einem Boden (50)

des Drainagekanals (44) mindestens in Abschnitten entlang der Längsausdehnung des Drainagekanals (44) kleiner ist als die Breite des Wärmetauschers (11), wobei die Breite (W_1) des Drainagekanals (44) die Abmessung des Drainagekanals (44) in einer Richtung parallel zu der Unterteilplatte (14) und rechtwinkelig zu der Längsausdehnung des Drainagekanals (44) ist, und die Breite des Wärmetauschers (11) die Abmessung des Wärmetauschers (11) in eine Richtung parallel zu der Unterteilplatte (14) und rechtwinkelig zu der Längsausdehnung des Drainagekanals (44) ist.

3. Außeneinheit nach einem der vorstehenden Ansprüche, weiter umfassend ein Gebläse (30), das eine Gebläsestützstruktur (31) und einen Gebläserotor (34), der Gebläseflügel (35) aufweist, aufweist.

4. Außeneinheit nach Anspruch 3, weiter umfassend einen ersten zusätzlichen Drainagekanal (51) in der Unterteilplatte (14) unter den Gebläseflügeln (35).

5. Außeneinheit nach Anspruch 4, wobei der erste zusätzliche Drainagekanal (51) zu einer Mittelposition (56) des ersten zusätzlichen Drainagekanals (51) hin geneigt ist.

6. Außeneinheit nach Anspruch 4, wobei der erste zusätzliche Drainagekanal (51) zwei Abschnitte (52a, b) umfasst, wobei der erste zusätzliche Drainagekanal (51) in jedem der Abschnitte (52a, b) zu einer Mittelposition (56) des jeweiligen Abschnitts (52a, b) hin geneigt ist.

7. Außeneinheit nach einem der Ansprüche 3 bis 6, weiter umfassend einen zweiten zusätzlichen Drainagekanal (57) in der Unterteilplatte (14) unter der Gebläsestützstruktur (31).

8. Außeneinheit nach einem der Ansprüche 4 bis 7, weiter umfassend einen Verbindungskanal (61), der den ersten zusätzlichen Drainagekanal (51) und/oder den zweiten zusätzlichen Drainagekanal (57) mit dem Drainagekanal (44) verbindet.

9. Außeneinheit nach einem der Ansprüche 4 bis 8, wobei der Neigungswinkel der Neigung in dem Drainagekanal (44) in mindestens einem des ersten zusätzlichen Drainagekanals (51), des zweiten zusätzlichen Drainagekanals (57) und des Verbindungskanals (61) kleiner ist.

10. Außeneinheit nach einem der vorstehenden Ansprüche, wobei gegenüberliegende Seitenwände (47, 48) in die Breitenrichtung des Drainagekanals (44) nach innen geneigt sind.

11. Außeneinheit nach einem der vorstehenden Ansprüche, wobei der Drainagekanal (44) zu einer einzigen Auslassöffnung (43) hin geneigt ist.

12. Außeneinheit nach einem der vorstehenden Ansprüche, wobei die Unterteilplatte (14) ein tiefgezogenes Teil ist.

13. Außeneinheit nach einem der vorstehenden Ansprüche, wobei der Wärmetauscher (11) in einer Ansicht rechtwinkelig zu der Unterteilplatte (14) im Wesentlichen L-förmig ist.

Revendications

1. Unité extérieure (10) pour une pompe à chaleur, l'unité extérieure comprenant :

une plaque inférieure (14),
un échangeur de chaleur (11) supporté sur la plaque inférieure (14), la plaque inférieure (14) comprenant un trou de drainage (43) et un canal de drainage allongé (44) situé sous l'échangeur de chaleur (11) au moins le long d'une portion de l'échangeur de chaleur (11) et s'inclinant vers le trou de drainage (43),
dans lequel la plaque inférieure (14) présente une surface de support extérieure (70) et/ou intérieure (71) formée par un banc du canal de drainage (44), l'échangeur de chaleur (11) étant, le long de plus de la moitié de l'extension longitudinale du canal de drainage, en contact avec au moins une partie des surfaces de support extérieure (70) et/ou intérieure (71) et ainsi supporté dans une direction verticale,
caractérisé en ce que
la largeur (W_2) du canal de drainage (44) au niveau d'une ouverture supérieure (49) du canal de drainage (44) est au moins dans des portions le long de l'extension longitudinale du canal de drainage (44) inférieure à la largeur de l'échangeur de chaleur (11) de sorte que le côté inférieur (21) de l'échangeur de chaleur (11) ferme l'ouverture supérieure (49) du canal de drainage (44) dans ladite portion, dans lequel la largeur du canal de drainage (44) est la dimension du canal de drainage (44) dans une direction parallèle à la plaque inférieure (14) et perpendiculaire à l'extension longitudinale du canal de drainage (44) et la largeur de l'échangeur de chaleur (11) est la dimension de l'échangeur de chaleur (11) dans une direction parallèle à la plaque inférieure (14) et perpendiculaire à l'extension longitudinale du canal de drainage (44).

2. Unité extérieure selon la revendication 1, dans laquelle la largeur (W_1) du canal de drainage (44) au niveau d'un fond (50) du canal de drainage (44) est

au moins dans des portions le long de l'extension longitudinale du canal de drainage (44) inférieure à la largeur de l'échangeur de chaleur (11), dans laquelle la largeur (W_1) du canal de drainage (44) est la dimension du canal de drainage (44) dans une direction parallèle à la plaque inférieure (14) et perpendiculaire à l'extension longitudinale du canal de drainage (44) et la largeur de l'échangeur de chaleur (11) est la dimension de l'échangeur de chaleur (11) dans une direction parallèle à la plaque inférieure (14) et perpendiculaire à l'extension longitudinale du canal de drainage (44).

3. Unité extérieure selon l'une quelconque des revendications précédentes, comprenant en outre un ventilateur (30) présentant une structure de support de ventilateur (31) et un rotor de ventilateur (34) présentant des pales de ventilateur (35).

4. Unité extérieure selon la revendication 3, comprenant en outre un premier canal de drainage supplémentaire (51) dans la plaque inférieure (14) sous les pales de ventilateur (35).

5. Unité extérieure selon la revendication 4, dans laquelle le premier canal de drainage supplémentaire (51) s'incline vers une position intermédiaire (56) du premier canal de drainage supplémentaire (51).

6. Unité extérieure selon la revendication 4, dans laquelle le premier canal de drainage supplémentaire (51) comprend deux portions (52a, b), le premier canal de drainage supplémentaire (51) s'inclinant dans chacune des portions (52a, b) vers une position intermédiaire (56) de la portion respective (52a, b).

7. Unité extérieure selon l'une quelconque des revendications 3 à 6, comprenant en outre un second canal de drainage supplémentaire (57) dans la plaque inférieure (14) sous la structure de support de ventilateur (31).

8. Unité extérieure selon l'une quelconque des revendications 4 à 7, comprenant en outre un canal de liaison (61) reliant le premier canal de drainage supplémentaire (51) et/ou le second canal de drainage supplémentaire (57) au canal de drainage (44).

9. Unité extérieure selon l'une quelconque des revendications 4 à 8, dans laquelle l'angle d'inclinaison de la pente dans le canal de drainage (44) est plus petit que dans au moins un du premier canal de drainage supplémentaire (51), du second canal de drainage supplémentaire (57) et du canal de liaison (61).

10. Unité extérieure selon l'une quelconque des revendications précédentes, dans laquelle des parois latérales opposées (47, 48) dans la direction de largeur du canal de drainage (44) s'inclinent vers l'intérieur.

11. Unité extérieure selon l'une quelconque des revendications précédentes, dans laquelle le canal de drainage (44) s'incline vers un seul trou de drainage (43).

12. Unité extérieure selon l'une quelconque des revendications précédentes, dans laquelle la plaque inférieure (14) est une pièce emboutie.

13. Unité extérieure selon l'une quelconque des revendications précédentes, dans laquelle l'échangeur de chaleur (11) est dans une vue perpendiculaire à la plaque inférieure (14) essentiellement en forme de L.

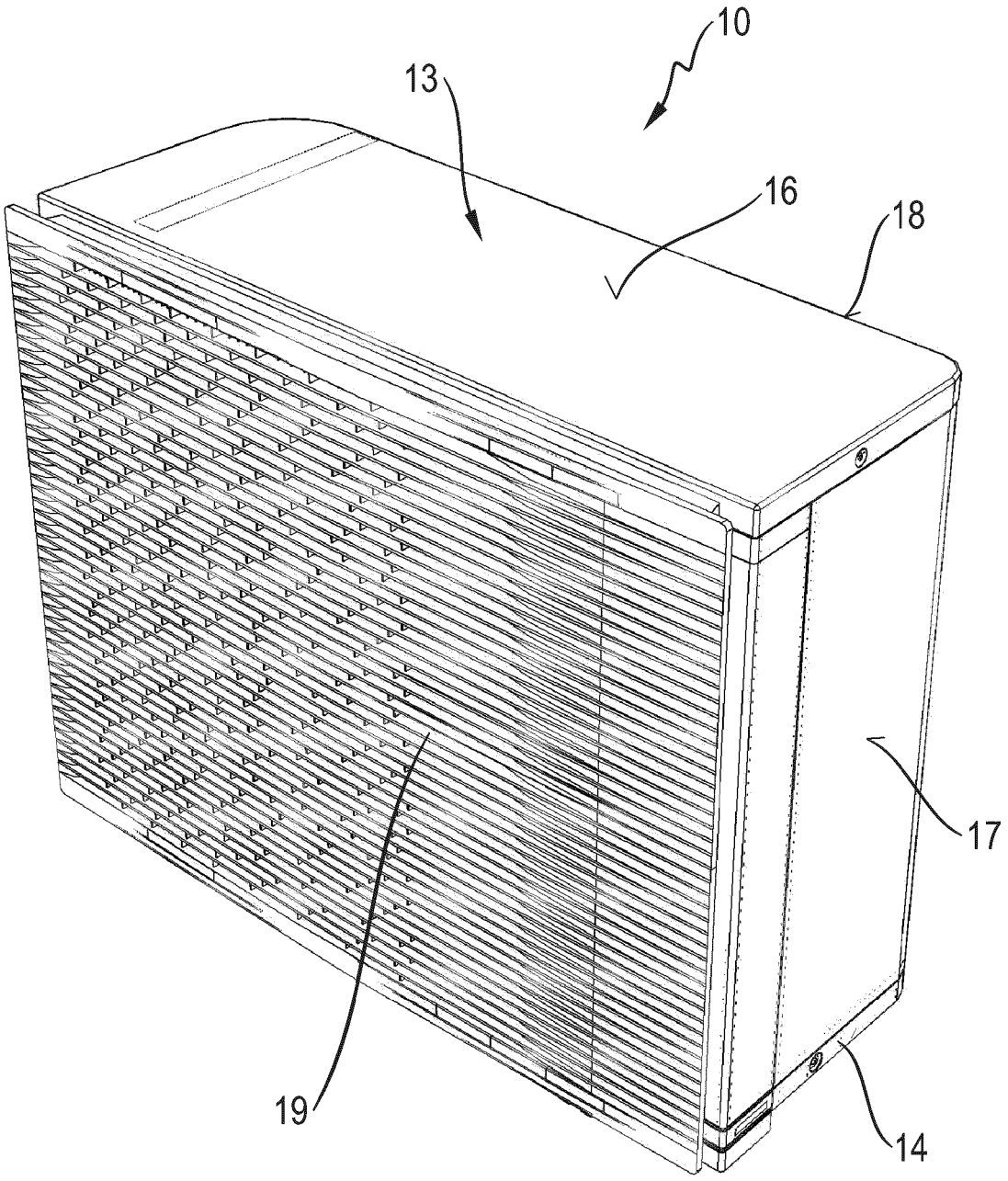


Fig. 1

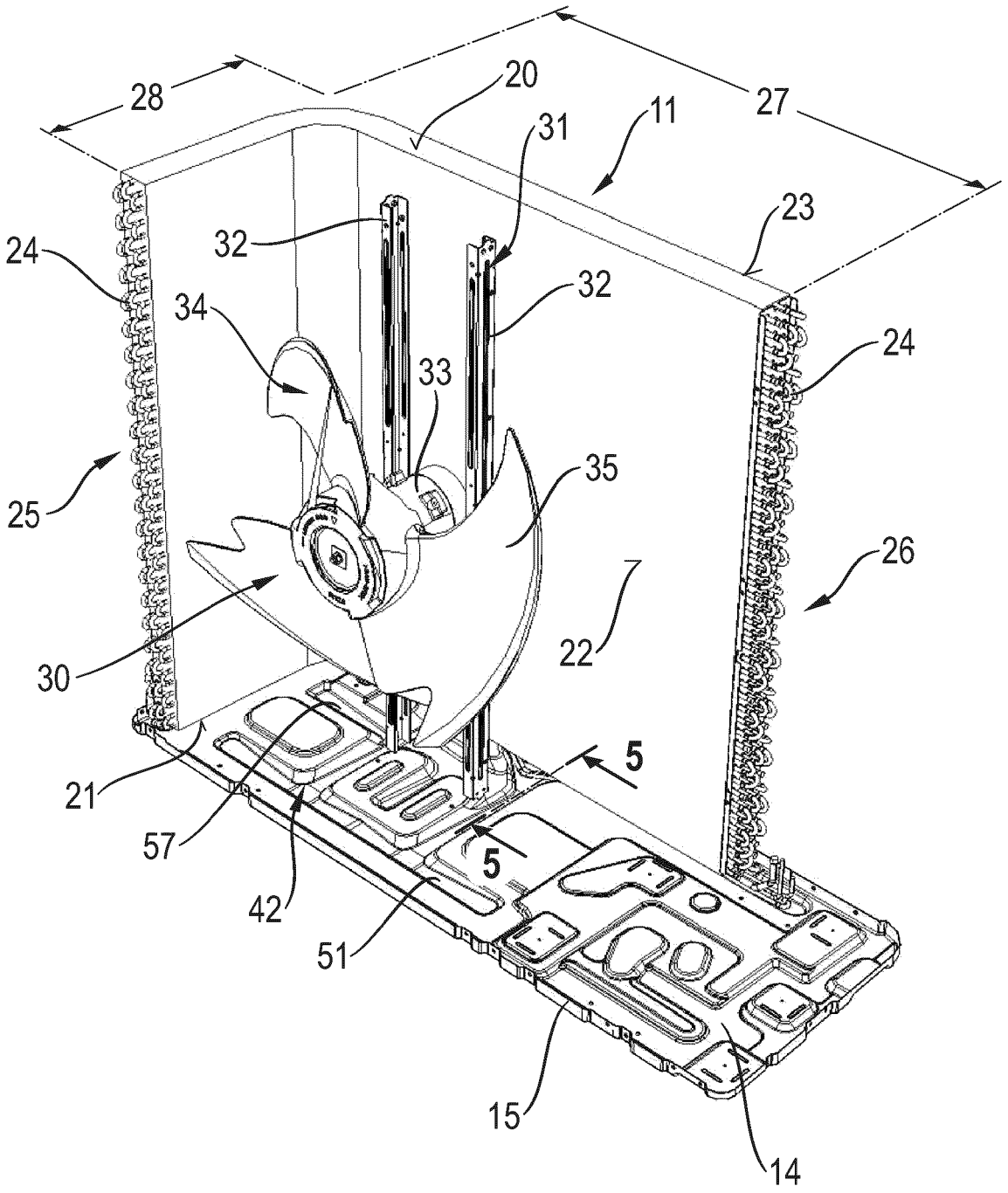


Fig. 2

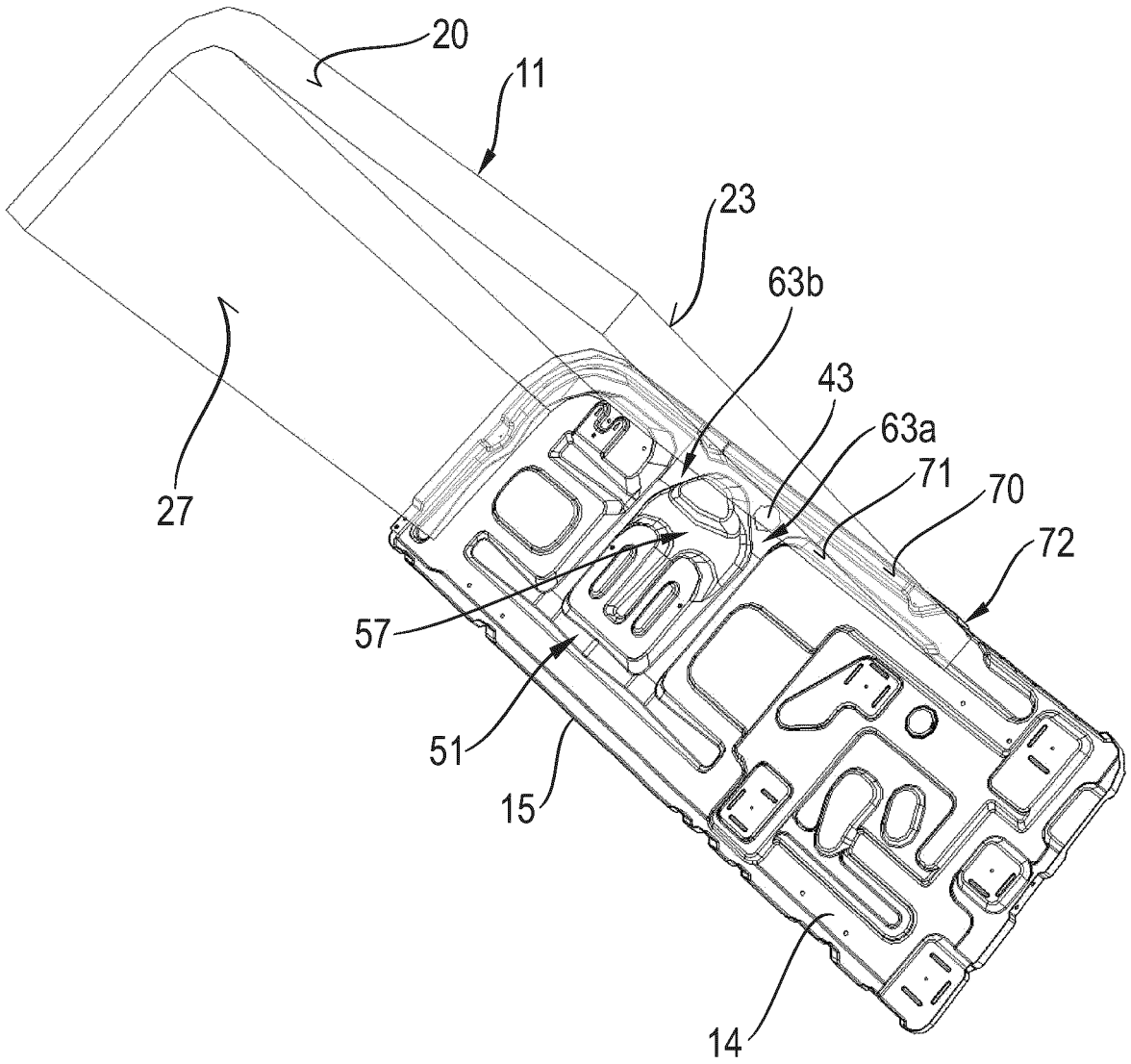


Fig. 3

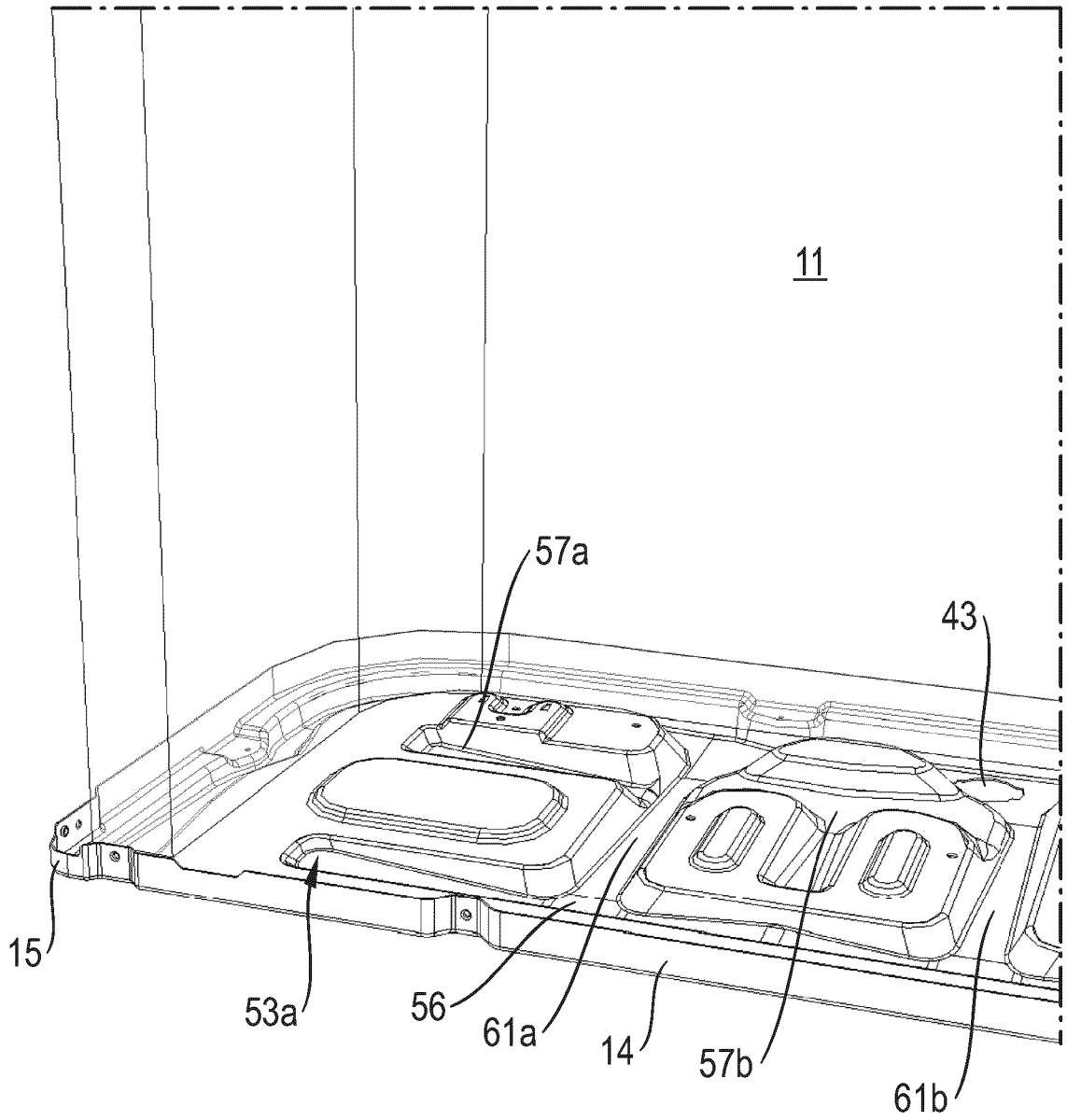


Fig. 4

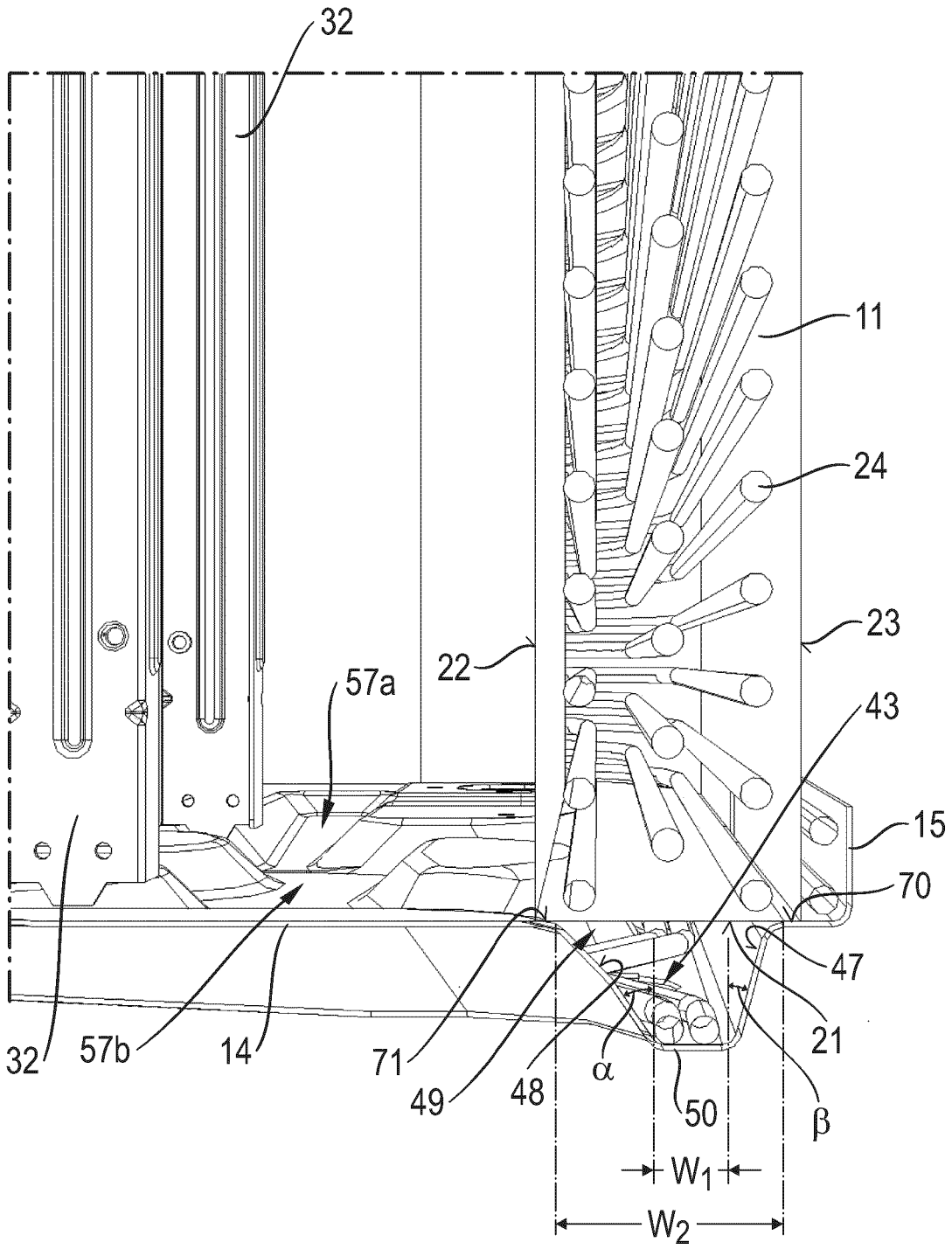
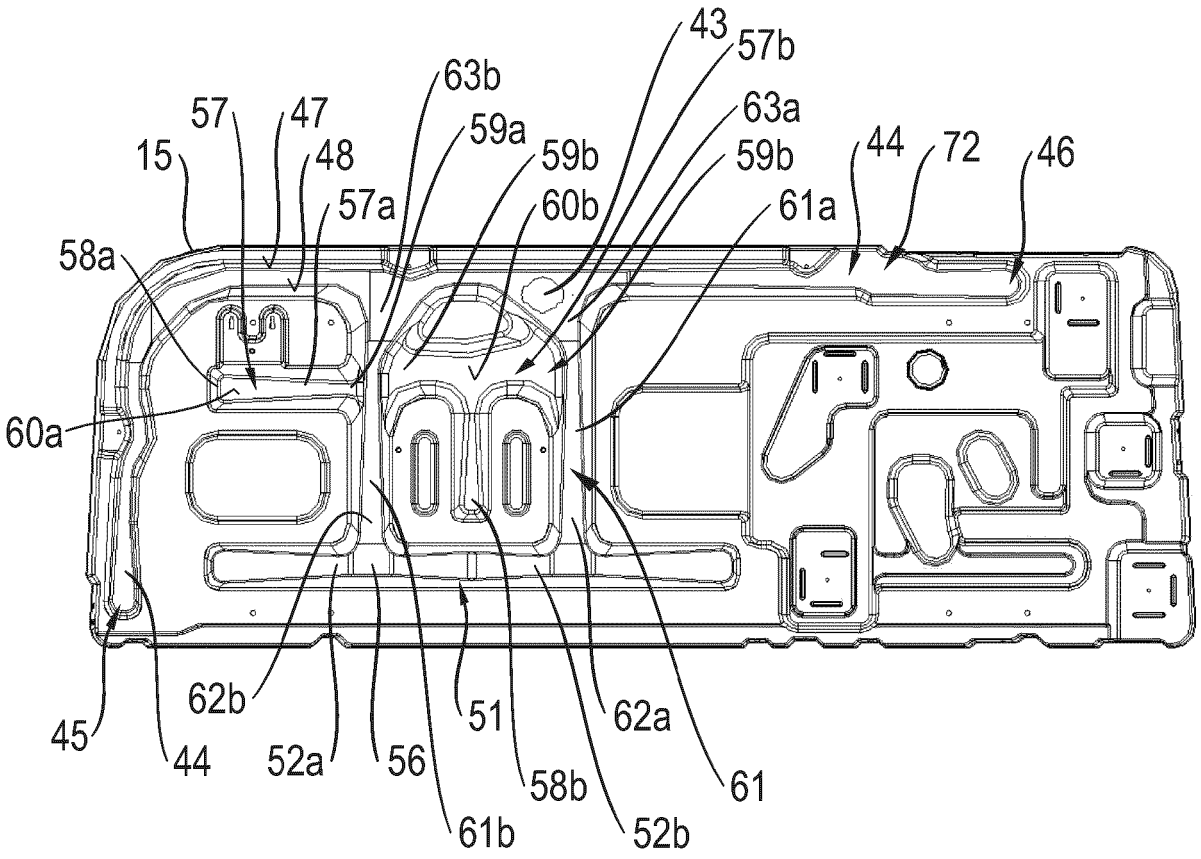


Fig. 5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61b
52b

Fig. 6

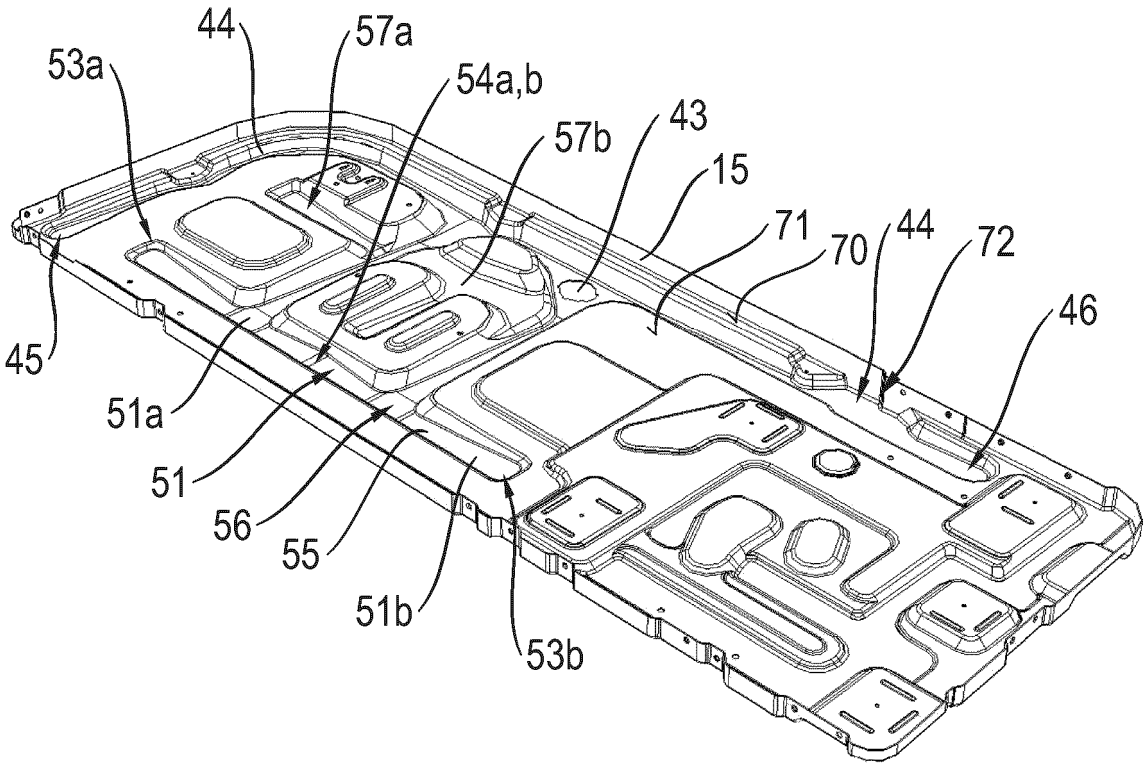

Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP S63178762 U **[0003]**
- EP 2333440 A1 **[0003]**
- CN 207113067 U **[0005]**
- US 2016076779 A1 **[0005]**
- JP 2015061997 A **[0005]**