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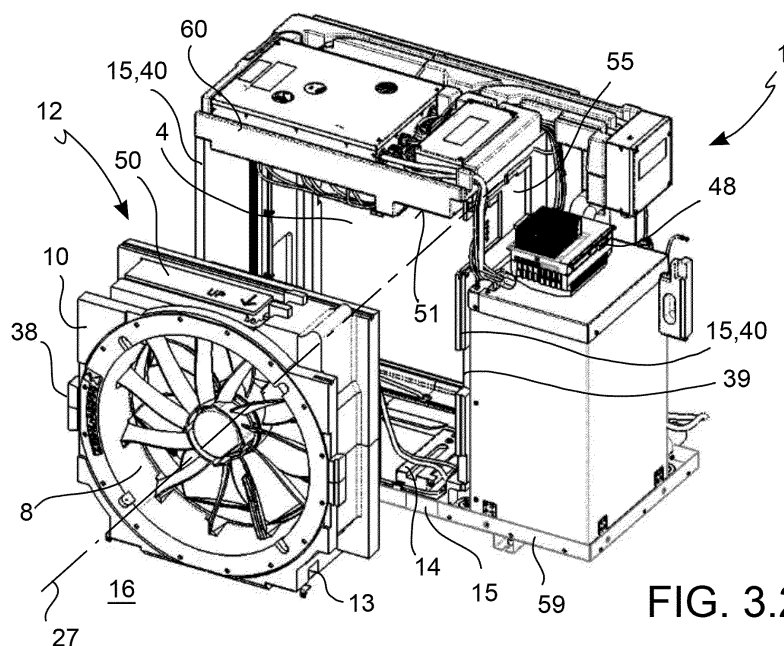
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(54) OUTDOOR UNIT FOR A HEAT PUMP AND HEAT PUMP

(57) An outdoor unit (1) for a heat pump (78) comprises a housing (2), at least one part of a refrigerant fluid circuit (3) with at least a first heat exchanger (4) accommodated in the housing (2), a fan (8) accommodated in the housing (2) and operable to convey an airflow through the housing (2) and through the first heat exchanger (4) for a heat exchange between the airflow and the refrigerant fluid,

a fan-holder drawer (10) having a fan seat (11) for removably accommodating the fan (8), and one or more translating members (13) interacting with corresponding translation guides (14) of a fixed support structure (15) of the housing (2) to allow a guided insertion and extraction of the fan-holder drawer (10) into and from the housing (2).

**FIG. 3.2**

Description

[0001] The invention relates to an outdoor unit of a heat pump, as well as a heat pump, for example for heating and/or cooling air and/or water, for example in a system for heating and/or cooling rooms and/or water.

[0002] A heat pump comprises a circuit for the circulation of a refrigerant fluid, a first heat exchanger (acting for example as a refrigerant fluid evaporator) placed in the circuit, a compressor placed in the circuit downstream of the first heat exchanger (acting for example as a refrigerant fluid condenser) placed in the circuit downstream of the compressor, and an expansion valve placed in the circuit downstream of the condenser and upstream of the evaporator. The indications "downstream" and "upstream" refer to a first circulation direction of the refrigerant fluid in at least a first operating mode. The compressor is operable to draw the refrigerant fluid in the gaseous phase and at low pressure from the first heat exchanger (evaporator), compress the refrigerant fluid, and push it into the second heat exchanger (condenser). Inside the second heat exchanger (condenser), the compressed refrigerant fluid releases heat and condenses at high pressure. After leaving the second heat exchanger (condenser), the refrigerant fluid passes through the expansion valve which decompresses it, bringing the refrigerant fluid to a depressurized liquid phase with a possible lower amount of gaseous phase. Again due to the suction effect of the compressor, the depressurized liquid refrigerant fluid is conveyed into the first heat exchanger (evaporator) where the refrigerant fluid absorbs heat and evaporates at low pressure, before being drawn and compressed again by the compressor.

[0003] The refrigerant fluid changes state inside the first heat exchanger (evaporator), switching from liquid to gaseous by absorbing heat, and inside the second heat exchanger (condenser), switching from gaseous to liquid by releasing heat. The environment where the heat exchanger acting as an evaporator is placed is then cooled, while the environment where the heat exchanger acting as a condenser is placed is heated.

[0004] It is further known to connect the compressor in the circuit by the interposition of a (four-way) switching valve which allows inverting the compression direction and inverting the circulation direction of the refrigerant fluid (from the first direction to a second direction), as well as switching the function of the first heat exchanger from evaporator to condenser and the second heat exchanger from condenser to evaporator, allowing both cooling and heating the spaces in which the first and second heat exchangers are placed.

[0005] Known heat pumps, described above, can be used in the heating mode, e.g., in winter months, taking heat from the external air and bringing the heat into a building.

[0006] In this case, the refrigerant fluid crosses the expansion valve and becomes a liquid-vapor mixture at low pressure, then enters into the first heat exchanger

(which acts as an evaporator), placed outside, where it absorbs heat until it becomes vapor at low temperature, which vapor is then drawn and compressed by the compressor resulting in a temperature increase, and the hot and compressed vapor is pushed from the compressor outlet into the second heat exchanger (which acts as a condenser), where it releases heat, e.g., to a water circuit for heating an indoor environment, and changes phase again from gas to liquid releasing the liquefaction heat. The liquid refrigerant fluid returns to the expansion valve, and the cycle is repeated.

[0007] By inverting the cooling cycle, e.g., through the (four-way) switching valve, the same heat pump can be used in the cooling mode, e.g., in the summer months, where the refrigerant fluid evaporates in the second heat exchanger (indoor environment) and condenses in the first heat exchanger (outdoor environment).

[0008] It is known to provide an outdoor unit of the heat pump, intended to be placed outside an environment that is intended to be heated and/or cooled, for example outside a building, where said outdoor unit comprises:

a housing,

at least one part of the refrigerant fluid circuit with at least the first heat exchanger and optionally the compressor, the expansion valve, and in some cases, also the second heat exchanger, all accommodated in the housing,

a fan (e.g., an axial fan) accommodated in the housing and operable to convey an airflow through the housing and through the first heat exchanger for a heat exchange between the airflow and the refrigerant fluid.

[0009] For space and aesthetics reasons, the components of the outdoor unit are necessarily arranged in a compact and integrated manner inside the housing. On the other hand, for reasons of performance and heat exchange efficiency, the first heat exchanger and the fan extend over very large areas of the outdoor unit and are in close interaction with the housing and other components of the outdoor unit.

[0010] The fan itself is the most stressed component of the outdoor unit, both mechanically (impeller, vibrations, friction, formation of ice), thermally (temperature variations between summer and winter), chemically (humidity, condensation, atmospheric pollutants), and electrically (fan motor) and thus requires maintenance, repair, and replacement.

[0011] In the prior art, interventions on the fan require a complete and very demanding (time, cost, space) disassembly of the entire outdoor unit, which is difficult to perform in the installation environments, or a detachment of the entire outdoor unit (with the need for intervention on the refrigerant circuit conductors or on water ducts of the heating water circuit) from the heating/cooling system, and the transport of the entire outdoor unit to the service center to carry out maintenance intervention on the fan,

especially if there are no partial spare parts for the fan. Both modes of intervention are unsatisfactory, slow, and expensive.

[0012] It is the object of the present invention to provide an outdoor unit for heat pumps of the type described in the introduction, having features such as to facilitate fan maintenance/replacement/repair interventions.

[0013] This and other objects are achieved by an outdoor unit for a heat pump according to claim 1. The dependent claims relate to advantageous and preferred embodiments.

[0014] According to an aspect of the invention, an outdoor unit for a heat pump comprises:

- a housing,
- at least one part of a refrigerant fluid circuit with at least a first heat exchanger accommodated in the housing, and optionally a compressor and/or an expansion valve and/or a second heat exchanger, accommodated in the housing,
- a fan accommodated in the housing and operable to convey an airflow through the housing and through the first heat exchanger for a heat exchange between the airflow and the refrigerant fluid,
- optionally, an electric control system accommodated in the housing for the electric power supply and control of compressor and fan,
- a fan-holder drawer accommodated in the housing and having:
 - a fan seat for removably accommodating the fan, and
- one or more translating members interacting with corresponding translation guides of a fixed support structure of the housing for a guided insertion and extraction of the fan-holder drawer into and from the housing along an insertion direction on an access side of the outdoor unit.

[0015] This allows extracting and inserting the fan more easily and quickly than in the prior art and facilitates the fan maintenance/repair/replacement interventions.

[0016] According to an aspect of the invention, the housing is openable on the access side by detaching an external wall portion from the fixed support structure, by means of a manipulation of the external wall portion which is different from the extraction and insertion movement of the fan-holder drawer, and the insertion and extraction of the fan-holder drawer with respect to the housing is only possible with said external wall portion detached from the fixed support structure.

[0017] This obviates the risk of accidental access to internal components of the outdoor unit and the risk of unintended and undesired opening of the outdoor unit due to the insertion and extraction mechanism of the fan-holder drawer.

Brief description of the drawings

[0018] In order to better understand the invention and appreciate the advantages thereof, some non-limiting embodiments will be described below with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of an outdoor unit of a heat pump, according to an embodiment, **Figure 1.1** shows a detail of the outdoor unit in **Figure 1**, in which external wall portions are screwed to a fixed support structure, **Figures 1.2 and 1.3** show the outdoor unit in **Figure 1** with the external wall portions removed, **Figures 2, 2.1, 2.2, 2.3** show paths of electric power supply and/or signal cables of the outdoor unit according to an embodiment,

Figures 3.1, 3.2, 3.3 are perspective views of a sequence of extracting the fan from the housing of the outdoor unit, using a fan-holder drawer, according to an embodiment,

Figures 4.1 and 4.2 are perspective views of the sliding guides of the outdoor unit housing, and **Figure 4.3** shows corresponding sliding pads of a fan-holder drawer, according to an embodiment,

Figure 5 is a front view of an assembly of a fan and a fan-holder drawer of the outdoor unit according to an embodiment, **Figure 5.1** shows a detail of the assembly in **Figure 5**, **Figures 5.2 and 5.3** are section views in two different vertical section planes of the assembly in **Figure 5**,

Figure 6 is a top view of the fan-holder drawer inserted into the outdoor unit housing, **Figure 6.1** is an enlarged view of a sealing region in **Figure 6**, **Figures 6.2, 6.3, 6.4** are perspective views of an upper part of the fan-holder drawer forming a ventilation channel for electrical components, and **Figure 6.5** is a vertical section view of the ventilation channel for electrical components,

Figures 7.1 and 7.2 are rear perspective views of a first access cap of the ventilation channel,

Figures 8.1 and 8.2 are rear perspective views of a second access cap of the ventilation channel,

Figures 9.1, 9.2, 9.3 are perspective views of an internal support frame of the outdoor unit,

Figure 10 is a diagrammatic depiction of a heat pump according to an embodiment.

Description of embodiments

[0019] With reference to the figures, an outdoor unit 1 for/of a heat pump 78 comprises:

- a housing 2,
- at least one part of a refrigerant fluid circuit 3 with at least a first heat exchanger 4, optionally a compressor 5 and/or an expansion valve 6, and optionally a second heat exchanger 7, accommodated in the housing 2,

a fan 8 accommodated in the housing 2 and operable to convey an airflow through the housing 2 and through the first heat exchanger 4 for a heat exchange between the airflow and the refrigerant fluid, optionally an electric control system 9 accommodated in the housing 2 for the electric power supply and control of compressor 5 and fan 8, a fan-holder drawer 10 accommodated in the housing 2 and having:

- a fan seat 11 for removably accommodating the fan 8 to form an assembly or group 12 of fan 8 and fan-holder drawer 10, and
- one or more translating members (advantageously sliding pads 13, alternatively translating gears or rolling translating members) interacting (in a sliding manner) with corresponding translation guides (advantageously sliding guides 14, alternatively translating counter-members or rolling translating counter-members or rolling tracks) of a fixed support structure 15 of the housing 2 for a guided insertion and extraction of the fan-holder drawer 10 into and from the housing 2 along an insertion direction 27 on an access side 16 of the outdoor unit 1 (**Figures 3.2, 4.1, 4.3**).

[0020] This allows extracting and inserting the fan 8 more easily and quickly than in the prior art and facilitates interventions of maintenance/repair/replacement of the fan 8.

[0021] According to an embodiment, the housing 2 is openable on the access side 16 by detaching or uncoupling an external wall portion 17, e.g., a wall with a protection grille, from the fixed support structure 15, by means of a manipulation of the external wall portion 17 which is different from the extraction and insertion movement of the fan-holder drawer 10, and the insertion and extraction of the fan-holder drawer 10 with respect to the housing 2 is only possible with said external wall portion 17 detached from the fixed support structure 15.

[0022] This obviates the risk of accidental access to internal components of the outdoor unit 1 and the risk of unintended and undesired opening of the outdoor unit 1 due to the insertion and extraction mechanism of the fan-holder drawer 10.

[0023] The external wall portion 17 can be a front wall portion which also forms a protection and air passage grille (**Figures 1, 1.1**). The detachment manipulation can comprise for example unscrewing fixing screws 18 and/or detaching an insertion coupling of the external wall portion 17 with the fixed support structure 15.

Description of the fan-holder drawer 10

[0024] According to an embodiment, the fan-holder drawer 10 is made (with the exception of the translating members) of a foamed synthetic material, for example expanded polypropylene. This provides a very light struc-

ture which is resistant to environmental influences (temperature, humidity), resistant to corrosion, and suitable for dampening possible vibrations of the fan 8 better than a metal material or a hard plastic material.

[0025] According to an embodiment, the fan-holder drawer 10 comprises two half-bodies 19, 20, for example a lower half-body 19 and an upper half-body 20, in the form of jaws and configured to be

- movable toward each other to a closed position (**Figure 3.2**) in which they embrace the fan 8 with shape coupling,
- movable away from each other or detached to an open position (**Figure 3.3**) in which the fan 8 can be removed from the (fan seat 11 of the) fan-holder drawer 10.

[0026] The fan 8 is preferably an axial fan with an impeller 21, an electric motor 22 to rotationally operate the impeller, and a drum 23 which supports the electric motor 22 and the impeller 21 and delimits an air channel 24 of the fan 8. The drum 23 has a tubular portion 25 extending between two flanges 26 (**Figure 3.3**).

[0027] The half-bodies 19, 20 define, in the closed position, the tubular fan seat 11 which is coupled to an outer surface of the fan 8, in particular of the drum 23, where:

- the flanges 26 of the drum 23 clamp portions 11' of the fan seat 11 therebetween (having a slightly oversized axial thickness 28 with respect to an axial distance 29 between the flanges 26) belonging to both the half-bodies 19, 20, in order to obtain an interference coupling between the fan and the half-bodies 19, 20, and/or
- the drum 23, for example at least one of the flanges 26, forms at least a pair of first opposite straight edges 30 and the fan seat 11 forms at least a pair of second opposite straight edges 31 which, in a correct angular position of the fan 8 with respect to the fan-holder drawer 10, face and are bordering with the first opposite straight edges 30 (**Figures 3.3, 5.1**), forming a geometric position reference, and/or
- the fan seat 11 forms a plurality of cavities 32, e.g., distributed at a constant pitch in a circumferential direction, which accommodate stiffening ribs 33 of the drum 23 of the fan 8, obviating a violation of space between the stiffening ribs 33 and the fan holder drawer 10 (**Figures 3.3, 5.3**), and/or
- the half-bodies 19, 20 each form one half (upper half and lower half) of the fan seat 11, respectively, and define a horizontal joining interface 34 at about half the height of the fan seat 11, which facilitates the manufacturing by molding/expansion of synthetic material of the half-bodies 19, 20, as well as the opening and closing of the fan seat 11 and the insertion and extraction of the fan 8 into and from the fan-holder drawer 10 (**Figure 3.3**), and/or

- at the joining interface 34 the half-bodies 19, 20 form projections 35 and corresponding recesses 36 mutually insertable in the closed position (**Figures 3.3, 5.2**), in order to form a temporary coupling of the half-bodies 19, 20 during the steps of inserting and extracting the fan-holder drawer 10 into and from the housing 2.

[0028] According to an embodiment (**Figure 5.2**) the fan-holder drawer 10, preferably the lower half-body 19, forms at least one fan wiring channel 37 extending in the foamed synthetic material from an inlet opening 37' on the lower side of the fan-holder drawer 10 to an outlet opening 37" on a lower side of the fan seat 11. This facilitates the electric wiring of the fan 8 and obviates uncontrolled passages of electrical cables at the movement region of the fan-holder drawer 10 and at the fan 8 itself.

[0029] According to an embodiment (**Figures 1.2, 2, 2.3, 5, 5.1, 5.3**), the fan-holder drawer 10 forms, on two opposite lateral sides, first coupling portions 38 aligned in the insertion direction 27 with second coupling portions 39 of the fixed support structure 15 (formed for example in two opposite vertical walls 40 of the fixed support structure 15), so that when the fan-holder drawer 10 is inserted into the housing 2 and reaches an inserted position with respect to the fixed support structure 15, the first coupling portions 38 engage the second coupling portions 39, thus creating in the inserted position of the fan-holder drawer 10 a shape coupling (preferably a dovetail-shaped coupling) between the fan-holder drawer 10 and the fixed support structure 15 in addition to the contact/support between the translating members (sliding pads 13) and the translation guides (sliding guides 14). The fan-holder drawer 10 thus stiffens and stabilizes the fixed structure 15 and vice versa, in particular in directions transverse to the insertion direction 27.

[0030] According to an embodiment, the translating members (sliding pads 13) and the translation guides (sliding guides 14) are located on a lower side of the fan-holder drawer 10 and the first and second coupling portions 38, 39 are located substantially at half height (+/-15%) of the fan-holder drawer 10, obviating an undesired collapse of the fixed support structure 15 towards the outside at the space occupied by the fan holder drawer 10.

[0031] With further advantage, each of the first coupling portions 38 is a dovetail-shaped male portion formed by both the half-bodies 19, 20 so that in the inserted position of the fan-holder drawer 10, the half-bodies 19, 20 are clamped together in their closed position by the coupling of the first coupling portions 38 with the second coupling portions 39.

[0032] According to an embodiment, in the insertion position the fan-holder drawer 10 is inserted into the fixed support structure 15 like a plug and forms an outer peripheral surface 42, 44 which (sealingly) engages a

corresponding inner peripheral surface 43, 45 of the fixed support structure 15, so as to prevent escaping airflows in parallel to a main airflow through the air channel 24 generated by the fan 8. In this context, the characterization "sealingly" does not mean watertight, but an adhesion such as not to create any significant additional flow passages.

[0033] With particular advantage, the drum 23 of the fan 8 prevents a collapse of the outer peripheral surface 42, 44 of the fan-holder drawer 10 towards the inside and the engagement between the first and second (dovetail-shaped) coupling portions 38, 39 prevents an undesired collapse of the inner peripheral surface 43, 45 of the fixed support structure 15 towards the outside.

[0034] The fan-holder drawer 10 forms two first opposite vertical lateral walls 41 facing (in the inserted position) corresponding second opposite vertical walls 40 of the fixed support structure 15, where the first vertical walls 41 form first sealing surfaces 42 (of said outer peripheral surface) wedge-like inclined in the insertion direction 27 and the second vertical walls 40 form vertical sealing ribs 43 (of said inner sealing surface) sealingly engaged with the first sealing surfaces 42 in the inserted position (**Figure 6.1**).

[0035] This bilateral sealing engagement between the fan-holder drawer 10 and the fixed support structure 15 obviates the onset of undesired escaping airflows and compensates for dimensional manufacturing tolerances of the fan-holder drawer 10 and of the parts of the support structure fixed 15 by molding foamed synthetic material.

[0036] The first opposite vertical side walls 41 and the second opposite vertical walls 40 are made of a foamed synthetic material, or expanded polypropylene, taking advantage of its reduced density, its corrosion resistance, its stiffness, and its ability to dampen vibrations.

[0037] According to a further embodiment (**Figure 6.2**), the fan-holder drawer 10 forms a second upper sealing surface 44 (of said outer sealing surface), wedge-like inclined in the insertion direction 27, for sealingly engaging a corresponding third upper sealing surface 45 (of said inner sealing surface) of the fixed support structure 15 in the insertion position, and to compensate for dimensional tolerances of the fan-holder drawer 10 and the fixed support structure 15.

[0038] A groove 45 is also formed (**Figures 6.2, 6.3**) adjacent to the second upper sealing surface 44, on one side facing the access side 16, in order to accommodate an auxiliary seal or an auxiliary spacer for rough compensation of dimensional tolerances of the fan-holder drawer 10 and/or of the fixed support structure 15.

[0039] According to an embodiment (**Figures 6.2, 6.4, 6.5**), the fan-holder drawer 10 forms a cooling channel 46 which puts one or more auxiliary electric fans 47 and electric power supply components of the compressor 5, in particular inverters 48 and reactors 49 (i.e., inductances/reactances for stabilizing the current entering into the inverter 48) in airflow communication, where the cooling channel 46 is separated from an air channel 24 of the fan

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[0040] Advantageously, the cooling channel 46 extends at least partly externally around the fan seat 11.

[0041] Advantageously, the cooling channel 46 is delimited by a first channel surface 50, formed by the fan-holder drawer 10, and by a second channel surface 51, formed by the fixed support structure 15, and takes its (closed) operating configuration only when the fan-holder drawer 10 is in the inserted position.

[0042] The one or more auxiliary fans 47 are accommodated in a respective auxiliary seat 52 formed in the cooling channel 46, for example in the first channel surface 50, and accessible from the outside of the cooling channel 46 through a first access opening 53 formed between the fan-holder drawer 10 and the fixed support structure 15 for manually positioning the one or more auxiliary fans 47 in an operating position (which would not allow the extraction of the fan-holder drawer 10) and in an overturned position which allows the extraction of the fan-holder drawer 10 from the fixed support structure 15.

[0043] The first access opening 53 is closable and openable by means of at least a first access cap 54 (**Figure 3.1**) preferably made of foamed synthetic material, e.g., of expanded polypropylene. Advantageously, the first access cap 54 delimits at the front (on the access side 16) an upper segment of the cooling channel 46 extending along the entire width of the fan-holder drawer 10 (**Figures 1.2, 3.1, 6.4, 6.5, 7.1, 7.2**).

[0044] The inverter 48 is accommodated in a respective inverter seat 55 and protrudes into the cooling channel 46 (in an installed position which would not allow the extraction of the fan-holder drawer 10) and is extractable from the cooling channel 46 through a second access opening 53' formed between the fan-holder drawer 10 and the fixed support structure 15 (**Figures 1.2, 3.1**).

[0045] The second access opening 53' is closable and openable by means of a second access cap 54' (**Figure 3.1**) preferably made of foamed synthetic material, e.g., of expanded polypropylene. The second access cap 54' can be couplable in a guided manner to the fan holder drawer 10 and to the fixed support structure 15 through the engagement of a first tab 56 of the second access cap 54' in a first groove 57 of the fan-holder drawer 10 and through the engagement of a second tab 56' of the second access cap 54' in a second groove 57' of the fixed support structure 15 (**Figure 3.2, 6.3, 8.1**).

[0046] An extraction and insertion direction of the second access cap 54' is transverse to an extraction and insertion direction of the inverter 48, so as to lock the inverter 48 in the installed position.

[0047] The first channel surface 50 forms a cable groove 58 in which an electric power supply cable extends, e.g., for the reactors 49.

Description of the fixed support structure 15

[0048] According to an embodiment, the fixed support structure 15 comprises a lower base wall 59, two opposite

side walls 40, and an upper wall 60, all made of a foamed synthetic material, preferably expanded polypropylene, as well as a metal support frame 61, for example made of aluminum, which forms two lateral uprights 62 in the shape of a C open towards the access side 16 and a crosspiece 63, and which supports the upper wall 60 when the fan-holder drawer 10 is extracted from the housing 2 (**Figures 9.1, 9.2, 9.3**).

[0049] The upper wall 60 made of foamed synthetic material forms seats to accommodate and/or support the electric power components (inverter 48, reactors 49, TDM digital multiplexing electronic board 80) of the compressor 5, and possibly also an energy management electronic board 81 of the electrical control system 9, as well as possibly a filter board 76.

[0050] According to an embodiment (**Figure 4.1**), the outdoor unit 1 forms a condensation discharge channel 68 in a (trapezoidal) gap between the base wall 59 of the fixed support structure 15 and the fan-holder drawer 10, for discharging condensation from the fan 8 towards the bottom of the outdoor unit 1.

Description of the translation mechanism of the fan-holder drawer 10

[0051] According to an embodiment, the sliding pads 13 are positioned on a lower side of the (lower half-body 19 of the) fan-holder drawer 10 and comprise two sheet metal profiles, e.g., made of stainless steel, extending in the insertion direction 27 and having an angular section shape to create a vertical and horizontal support constraint, transverse to the insertion direction 27, with respect to the translation guides 14 (**Figure 4.3**).

[0052] The sliding pads 13 are fixed to the fan-holder drawer 10 by screws screwed into hard plastic inserts embedded in the foamed synthetic material of the fan-holder drawer 10.

[0053] Similarly, the sliding guides 14 are positioned in a base wall 59 of the fixed support structure 15 and comprise two sheet metal profiles, e.g., made of stainless steel, extending in the insertion direction 27 and having an angular section shape to create a vertical and horizontal support constraint, transverse to the insertion direction 27, with respect to the sliding pads 13 (**Figure 4.1**).

[0054] The sliding guides 14 are fixed to the base wall 59 by screws screwed into hard plastic inserts embedded in the foamed synthetic material of the base wall 59.

[0055] Each sliding guide 14 forms a throat 64 extending in the insertion direction 27 at the screws of the corresponding sliding pad 13.

[0056] Similarly, each sliding pad 13 forms a throat 64 extending in the insertion direction 27 at the screws of the corresponding sliding guide 14. This avoids violations of space between the heads of the screws and the metal profiles of the sliding guides 14 and the sliding pads 13.

[0057] The sliding guide 14 forms (on the access side 16) a first fixing tab 65 with a threaded hole 66 (e.g., a nut),

whereas the corresponding sliding pad 13 forms (again on the access side 16) a second fixing tab 67 with a hole to receive a fixing screw screwable into the threaded hole 66 of the first fixing tab 65 (**Figures 4.1, 4.3**), to lock the fan-holder drawer 10 in the inserted position.

[0058] According to alternative embodiments, the translating members and the corresponding translation guides can comprise one or more of:

- a translating gear,
- a rolling mechanism,
- a telescopic mechanism,
- an articulated quadrilateral.

[0059] According to an embodiment, the outdoor unit 1 comprises a wiring path system 69 of electric power supply and signal cables, comprising at least one front wiring segment 70 constrained to the (base wall 59 of the) fixed support structure 15 and extending on the access side 16 with respect to the fan-holder drawer 10 in the inserted position, as well as on two lateral sides of the fan-holder drawer 10 (**Figures 2, 2.1, 2.2**) at a lower height than the space occupied by the fan-holder drawer 10, so that the front wiring segment 70 is freely accessible from the access side 16 when the fan-holder drawer 10 is in the inserted position, and not in violation of space with the fan-holder drawer 10 when the fan-holder drawer 10 is extracted from and inserted into the housing 2.

[0060] At the front wiring segment 70, preferably at a lower lateral angle of the fan-holder drawer 10, one or more quick electrical plug-and-socket connectors 71 are provided for a quick electrical and/or signal connection of cables of the front wiring path 70 with cables of an internal wiring path 72 extending into the fan wiring channel 37 of the fan-holder drawer 10. At the quick electrical connectors 71, the fan-holder drawer 10 comprises an access cavity 73 to increase the access space for connecting and disconnecting the quick electrical connectors 71, before the extraction and after the insertion of the fan-holder drawer 10, respectively.

[0061] Additionally or alternatively, the wiring path system 69 comprises at least a first rear wiring segment 74 and a second rear wiring segment 75, both constrained to the fixed support structure 15 (to a respective vertical wall 40 and possibly to the upper wall 60, for example to the lateral uprights 62 and to the crosspiece 63 of the metal support frame 61) and extending on one side of the (inserted) fan-holder drawer 10 opposite to the access side 16 (**Figure 2.3**) and extending spaced apart from each other on two opposite lateral sides of the fan-holder drawer 10. This allows reducing the electromagnetic influences between the cables (e.g., signal cables) of the first rear wiring path 74 and the cables (e.g., power cables) of the second rear wiring path 75.

[0062] The constraint of the wiring paths to the fixed support structure 15 is carried out by a plurality of clips and/or clamps.

[0063] The invention allows an ergonomic and com-

pact arrangement of the components of the outdoor unit 1, as well as a quick and easy access to the fan 8 for maintenance and replacement purposes.

[0064] The extraction of the fan 8 from the housing 2 advantageously occurs by means of the following steps.

- removing the external wall portion 17 (**Figures 1.1, 1.2**),
- extracting the first access cap 54 in the extraction direction along the insertion direction 27 (**Figure 3.1**),
- extracting the second access cap 54' in a direction transverse to the insertion direction 27 (to the right in **Figure 3.1**),
- extracting the inverter 48 from the inverter seat of the fixed support structure 15 and supporting the inverter 48, e.g., on a heat pump group box 77 which houses the compressor 5 and the expansion valve 6, without disconnecting the electrical cables of the inverter 48 which are sufficiently long (**Figure 3.1**),
- disconnecting the quick electrical connectors 71,
- unscrewing the locking screws from the fixing tabs 65, 67,
- extracting the fan-holder drawer 10 in a guided manner along the insertion direction 27 towards the access side 16, by sliding the sliding pads 13 on the sliding guides 14 (**Figure 3.2**),
- opening the fan seat 11 by detaching the upper half-body 20 from the lower half-body 19 and extracting the fan 8 from the fan seat 11 (**Figure 3.3**).

[0065] The insertion of the fan 8 into the housing 2 advantageously occurs by means of the following steps:

- inserting the fan 8 into the fan seat 11 and closing the fan seat 11 by approaching the upper half-body 20 close to the lower half-body 19,
- inserting the fan-holder drawer 10 in a guided manner along the insertion direction 27, by sliding the sliding pads 13 onto the sliding guides 14,
- screwing the locking screws into the fixing tabs 65, 67,
- inserting the inverter 48 into the inverter seat of the fixed support structure 15,
- connecting the quick electrical connectors 71,
- inserting the second access cap 54' in a direction transverse to the insertion direction 27 (to the left in **Figure 3.1**),
- inserting the first access cap 54 in the insertion direction 27,
- re-assembling the external wall portion 17.

Description of embodiments of the heat pump 1

[0066] According to an embodiment (**Figure 10.1**), the heat pump 78 comprises the refrigerant fluid circuit 3, the first heat exchanger 4 (acting for example as a refrigerant

fluid evaporator) placed in the circuit 3, the compressor 5 placed in the circuit 3 downstream of the first heat exchanger 4, a second heat exchanger 7 (acting for example as a refrigerant fluid condenser) placed in the circuit 3 downstream of the compressor 5, and an expansion valve 6 placed in the circuit 3 between the second heat exchanger 7 and the first heat exchanger 4. The indications "downstream" and "upstream" refer to a first circulation direction of the refrigerant fluid in at least a first operating mode.

[0067] The compressor 5 is operable to draw the refrigerant fluid in the gaseous phase and at low pressure from the first heat exchanger 4 (evaporator), compress the refrigerant fluid, and push it into the second heat exchanger 7 (condenser). Inside the second heat exchanger 7 (condenser), the compressed refrigerant fluid releases heat and condenses at high pressure. After leaving the second heat exchanger 7 (condenser), the refrigerant fluid passes through the expansion valve 6 which decompresses it, bringing the refrigerant fluid to a depressurized liquid phase with a possible lower amount of gaseous phase. Again due to the suction effect of the compressor 5, the depressurized liquid refrigerant fluid is conveyed into the first heat exchanger 4 (evaporator) where the refrigerant fluid absorbs heat and evaporates at low pressure, before being drawn and compressed again by the compressor 5.

[0068] The refrigerant fluid changes state inside the first heat exchanger 4 (evaporator), switching from liquid to gaseous by absorbing heat, and inside the second heat exchanger 7 (condenser), switching from gaseous to liquid by releasing heat. The environment where the heat exchanger acting as an evaporator is placed is then cooled, while the environment where the heat exchanger acting as a condenser is placed is heated.

[0069] The compressor 5 is connected in the circuit 3 by the interposition of a (four-way) switching valve 79 which allows inverting the compression direction and inverting the circulation direction of the refrigerant fluid (from the first direction to a second direction), as well as switching the function of the first heat exchanger 4 from evaporator to condenser and the second heat exchanger 7 from condenser to evaporator, allowing both cooling and heating the spaces in which the first and second heat exchangers 4, 7 are placed.

[0070] The heat pump 78 comprises the outdoor unit 1 described so far, intended to be positioned in the outdoor environment, and possibly an indoor unit intended to be positioned inside a building and connected to an application, for example a heating/cooling system with a primary water circuit.

[0071] Alternatively, the outdoor unit 1 itself can comprise the first heat exchanger 4 and the second heat exchanger 7, and thus the entire refrigerant circuit 3.

List of reference numerals in the figures

[0072]

Outdoor unit 1
housing 2,
refrigerant fluid circuit 3
first heat exchanger 4
compressor 5
expansion valve 6
second heat exchanger 7
fan 8
electronic control system 9
fan-holder drawer 10
fan seat 11
fan seat portions 11'
group 12 of fan 8 and fan-holder seat 10
translating members, sliding pads 13
translation guides, sliding guides 14
fixed support structure 15
access side 16
external wall portion 17
fixing screws 18
lower half-body 19
upper half-body 20
impeller 21,
electric motor 22
drum 23
air channel 24
tubular portion 25
flange 26
insertion direction 27
axial thickness 28
axial distance 29
first opposite straight edges 30 (fan)
second opposite straight edges 31 (drawer)
cavity 32
stiffening ribs 33
joining interface 34
projections 35
recesses 36
fan wiring channel 37
inlet opening 37'
outlet opening 37"
first coupling portions 38
second coupling portions 39
vertical walls 40 of the fixed support structure
opposite vertical side walls 41 of the drawer
first sealing surface 42
sealing ribs 43
second upper sealing surface 44 of the drawer
third upper sealing surface 45 of the fixed support structure
cooling channel 46
auxiliary fans 47
inverter 48
reactors 49
first channel surface 50
second channel surface 51
auxiliary seat 52
first access opening 53
first access cap 54

second access opening 53'
 second access cap 54'
 inverter seat 55
 first tab 56
 first groove 57
 second tab 56'
 second groove 57'
 cable groove 58
 base wall 59
 upper wall 60
 metal support frame 61
 lateral uprights 62
 crosspiece 63
 throats 64
 first fixing tab 65
 threaded hole 66
 second fixing tab 67
 condensation discharge channel 68
 wiring path system 69
 front wiring segment 70
 quick electrical connectors 71
 internal wiring path 72
 access cavity 73
 first wiring segment 74
 second wiring segment 75
 filter board 76
 heat pump group 77
 heat pump 78
 switching valve 79
 TDM board 80
 energy management board 81

Claims

1. An outdoor unit (1) for a heat pump (78), comprising:

- a housing (2),
- at least one part of a refrigerant fluid circuit (3) with at least a first heat exchanger (4) accommodated in the housing (2),
- a fan (8) accommodated in the housing (2) and operable to convey an airflow through the housing (2) and through the first heat exchanger (4) for a heat exchange between the airflow and the refrigerant fluid,
- a fan-holder drawer (10) accommodated in the housing (2) and having:

- a fan seat (11) for removably accommodating the fan (8), and
- one or more translating members (13) interacting with corresponding translation guides (14) of a fixed support structure (15) of the housing (2) to allow a guided insertion and extraction of the fan-holder drawer (10) into and from the housing (2) along an insertion direction (27) on an ac-

cess side (16) of the outdoor unit (1).

2. An outdoor unit (1) according to claim 1, comprising:

- 5 - a compressor (5) and an expansion valve (6) of the refrigerant fluid circuit (3) accommodated in the housing (2),
- an electric control system (9) accommodated in the housing (2) for the electric power supply and control of the compressor (5) and fan (8),

AND/OR

wherein the housing (2) is openable on the access side (16) by detaching an external wall portion (17) from the fixed support structure (15), by means of a manipulation of the external wall portion (17) which is different from the extraction and insertion of the fan-holder drawer (10), and the insertion and extraction of the fan-holder drawer (10) is only possible with said external wall portion (17) detached from the fixed support structure (15),

AND/OR

wherein the fan-holder drawer (10) is made of a foamed synthetic material or expanded polypropylene.

3. An outdoor unit (1) according to any one of the preceding claims, wherein the fan-holder drawer (10) comprises two half-bodies (19, 20), or a lower half-body (19) and an upper half-body (20), in the form of jaws and configured to be:

- 35 - movable toward each other to a closed position in which they embrace the fan (8) with a shape coupling,
- movable away from each other to an open position in which the fan (8) can be removed from the fan seat (11).

4. An outdoor unit (1) according to any one of the preceding claims, wherein the fan (8) is an axial fan with an impeller (21), an electric motor (22), and a drum (23) which supports the electric motor (22) and the impeller (21),

wherein the drum (23) has a tubular portion (25) with two end flanges (26) and delimits an air channel (24) of the fan (8), wherein the half-bodies (19,20) define, in the closed position, the tubular fan seat (11) which is coupled to an outer surface of the drum (23), wherein:

- the flanges (26) of the drum (23) clamp together portions (11') of the fan seat (11) belonging to both half-bodies (19, 20) and

- having an oversized nominal axial thickness (28) with respect to an axial distance (29) between the flanges (26) to achieve an interference coupling between the fan (8) and the half-bodies (19, 20), and/or
- the drum (23) forms at least a pair of first opposite straight edges (30) and the fan seat (11) forms at least a pair of second opposite straight edges (31) which, in a correct angular position of the fan (8) with respect to the fan-holder drawer (10), face and are bordering with the first opposite straight edges (30) and form a geometric position reference, and/or
 - the fan seat (11) forms a plurality of cavities (32) which accommodate stiffening ribs (33) of the drum (23) of the fan (8), and/or
 - the half-bodies (19, 20) form an upper half and a lower half of the fan seat (11), respectively, and define a horizontal joining interface (34) at half height of the fan seat (11), and/or
 - the half-bodies (19, 20) form projections (35) and corresponding recesses (36) mutually insertable in the closed position to form a temporary coupling of the half-bodies (19, 20) during the insertion and extraction of the fan-holder drawer (10) into and from the housing (2).
5. An outdoor unit (1) according to any one of the preceding claims, wherein the fan-holder drawer (10) forms at least one fan wiring channel (37) extending in the foamed synthetic material.
 6. An outdoor unit (1) according to any one of the preceding claims, wherein the fan-holder drawer (10) forms, on two opposite lateral sides, first coupling portions (38) aligned in the insertion direction (27) with second coupling portions (39) of the fixed support structure (15), so that, when the fan-holder drawer (10) is inserted into the housing (2) and reaches an inserted position with respect to the fixed support structure (15), the first coupling portions (38) engage the second coupling portions (39), thus creating a shape coupling in the shape of a dovetail coupling between the fan-holder drawer (10) and the fixed support structure (15) in the inserted position.
 7. An outdoor unit (1) according to claim 6, wherein the translating members or sliding pads (13) and the translation guides or sliding guides (14) are located on a lower side of the fan-holder drawer (10) and the first and second coupling portions (38, 39) are located at half $\pm 15\%$ of the height of the fan-holder drawer (10).
 8. An outdoor unit (1) according to claim 6 or 7, wherein each of the first coupling portions (38) is a dovetail-shaped male portion formed by both the half-bodies (19, 20) so that, in the inserted position of the fan-holder drawer (10), the half-bodies (19, 20) are locked together in their closed position by the coupling of the first coupling portions (38) with the second coupling portions (39).
 9. An outdoor unit (1) according to any one of the preceding claims, wherein in the insertion position the fan-holder drawer (10) is inserted into the fixed support structure (15) like a plug and forms an outer peripheral surface (42, 44) which sealingly engages a corresponding inner peripheral surface (43, 45) of the fixed support structure (15) so as to prevent escaping airflows in parallel to a main airflow through an air channel (24) of the fan (8), AND/OR wherein the fan-holder drawer (10) forms two first opposite vertical lateral walls (41) facing corresponding second opposite vertical walls (40) of the fixed support structure (15), wherein the first vertical walls (41) form first sealing surfaces (42) wedge-like inclined in the insertion direction (27) and the second vertical walls (40) form vertical sealing ribs (43) sealingly engaged with the first sealing surfaces (42) in the inserted position, wherein the first opposite vertical side walls (41) and the second opposite vertical walls (40) are made of a foamed synthetic material or expanded polypropylene.
 10. An outdoor unit (1) according to claim 6, wherein the fan-holder drawer (10) forms a second upper sealing surface (44), wedge-like inclined in the insertion direction (27), for sealingly engaging a corresponding third upper sealing surface (45) of the fixed support structure (15) in the insertion position, wherein the second upper sealing surface (44) and the third upper sealing surface (45) are made of a foamed synthetic material or foamed polypropylene.
 11. An outdoor unit (1) according to any one of claims 2 to 10, wherein the fan-holder drawer (10) forms a cooling channel (46) which puts one or more auxiliary electric fans (47) and electric power supply components (48, 49) of the compressor (5) in airflow communication, wherein the cooling channel (46) is separated from an air channel (24) of the fan (8).
 12. An outdoor unit (1) according to claim 9, wherein the cooling channel (46) is delimited by a first channel surface (50), formed by the fan-holder drawer (10), and by a second channel surface (51), formed by the fixed support structure (15), and takes its operating configuration only when the fan-holder drawer (10) is

in the inserted position.

- 13.** An outdoor unit (1) according to any one of claims 2 to 12, wherein the fixed support structure (15) comprises a lower base wall (59), two opposite side walls (40), and an upper wall (60), all made of a foamed synthetic material or foamed polypropylene, as well as a metal support frame (61), for example made of aluminum, which forms two lateral uprights (62) in the shape of a C open towards the access side (16) and a crosspiece (63), and which supports the upper wall (60) when the fan-holder drawer (10) is extracted from the housing (2), wherein the upper wall (60) forms seats for accommodating and supporting control and electric power supply components (48, 49, 80, 81, 76) of the compressor (5).

- 14.** An outdoor unit (1) according to any one of the preceding claims, having a condensation discharge channel (68) formed in a trapezoidal or funnel-shaped gap between a base wall (59) of the fixed support structure (15) and the fan-holder drawer (10), for discharging the condensation from the fan (8) towards the bottom of the outdoor unit (1), AND/OR

wherein the translating members (13) comprise sliding pads (13) positioned on a lower side of the fan-holder drawer (10) and formed by two sheet metal profiles extending in the insertion direction (27) and having an angular cross-section shape to create a vertical and horizontal support constraint, transverse to the insertion direction (27), with the translation guides (14), wherein the translation guides (14) comprise sliding guides (14) positioned in a base wall (59) of the fixed support structure (15) and formed by two sheet metal profiles extending in the insertion direction (27) and having angular cross-section shape to create a vertical and horizontal support constraint, transverse to the insertion direction (27), with the sliding pads (13),

AND/OR

wherein the sliding guide (14) forms, on the access side (16), a first fixing tab (65) with a hole (66) and the corresponding sliding pad (13) forms, on the access side (16) a second fixing tab (67) with a hole to receive a fixing screw screwable into the hole (66) of the first fixing tab (65) to lock the fan-holder drawer (10) in the inserted position.

- 15.** An outdoor unit (1) according to any one of the preceding claims, wherein the outdoor unit (1) comprises a wiring path system (69) of electric power supply and signal cables, comprising:

- at least one front wiring segment (70) constrained to the fixed support structure (15) and extending on the access side (16) with respect to the fan-holder drawer (10) in the inserted position, as well as on two lateral sides of the fan-holder drawer (10) at a lower height with respect to the space occupied by the fan-holder drawer (10) so that the front wiring segment (70) is freely accessible from the access side (16) when the fan-holder drawer (10) is in the inserted position, but not in violation of space with the fan-holder drawer (10) when the fan-holder drawer (10) is extracted from and inserted into the housing (2),

- one or more quick electrical plug-and-socket connectors (71) for a connection of cables of the front wiring path (70) with cables of an internal wiring path (72) extending in a fan wiring channel (37) of the fan-holder drawer (10),

- a first rear wiring segment (74) and a second rear wiring segment (75), both constrained to the fixed support structure (15) and extending on one side of the fan-holder drawer (10) opposite to the access side (16) and extending spaced apart from each other on two opposite lateral sides of the fan-holder drawer (10).

- 16.** A heat pump (78) comprising an outdoor unit (1) according to any one of the preceding claims.

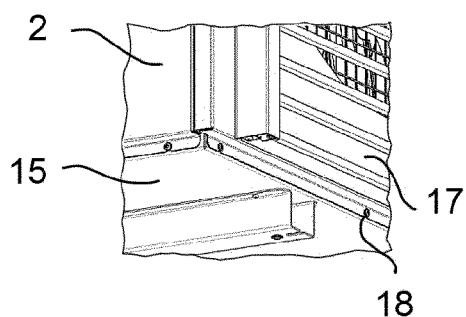
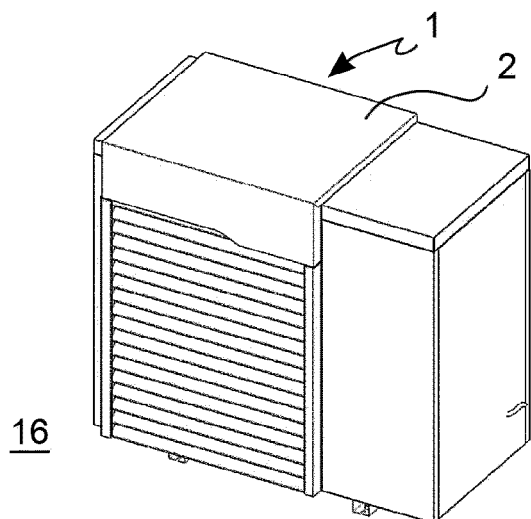


FIG. 1.1

FIG. 1

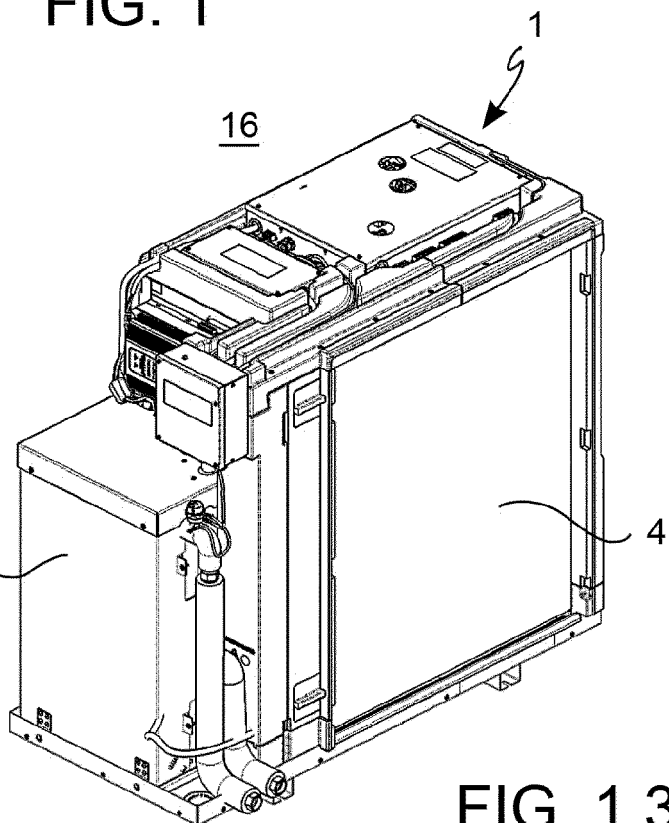


FIG. 1.3

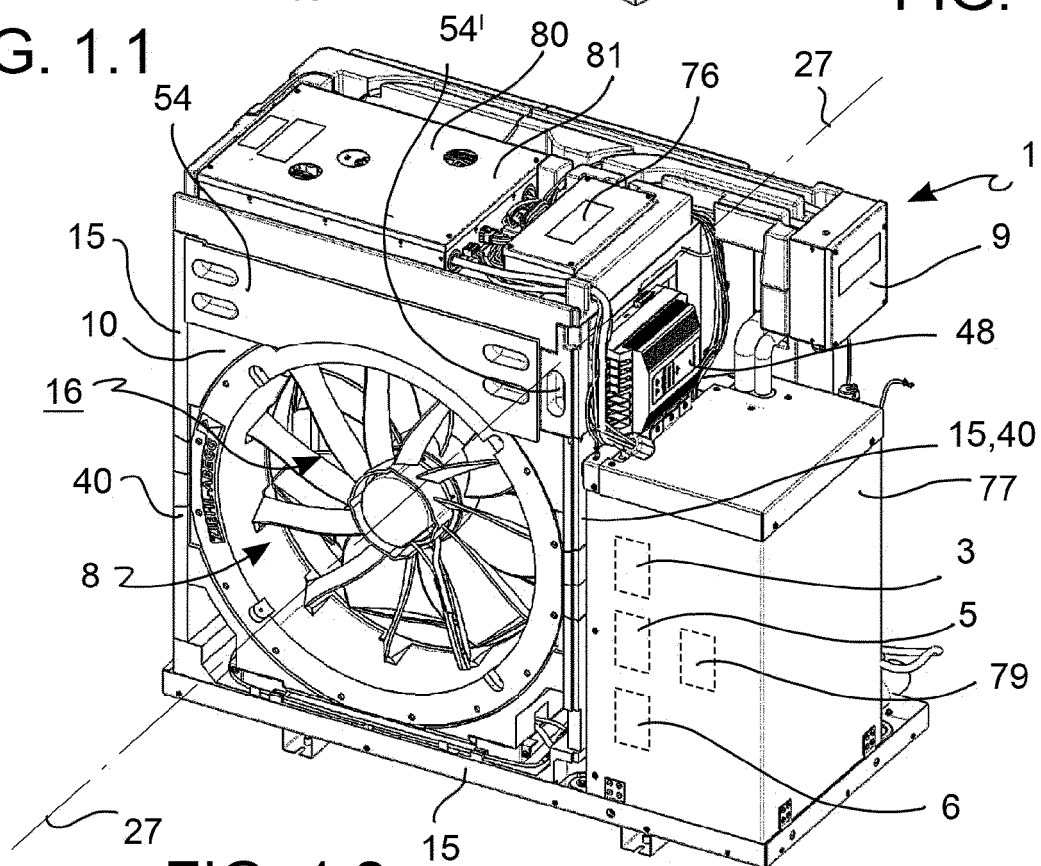


FIG. 1.2

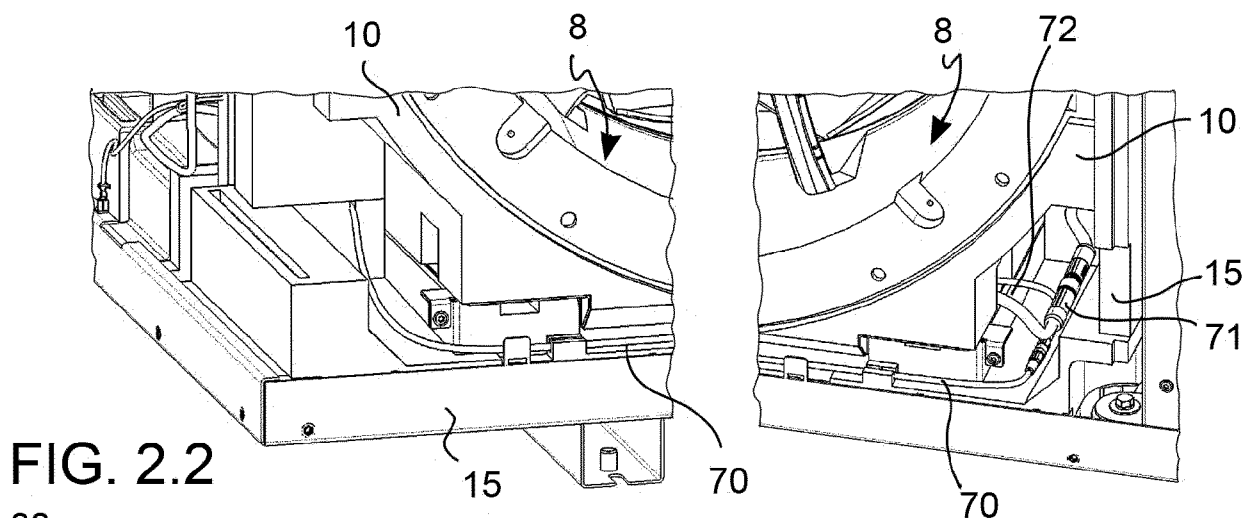


FIG. 2.2

FIG. 2.1

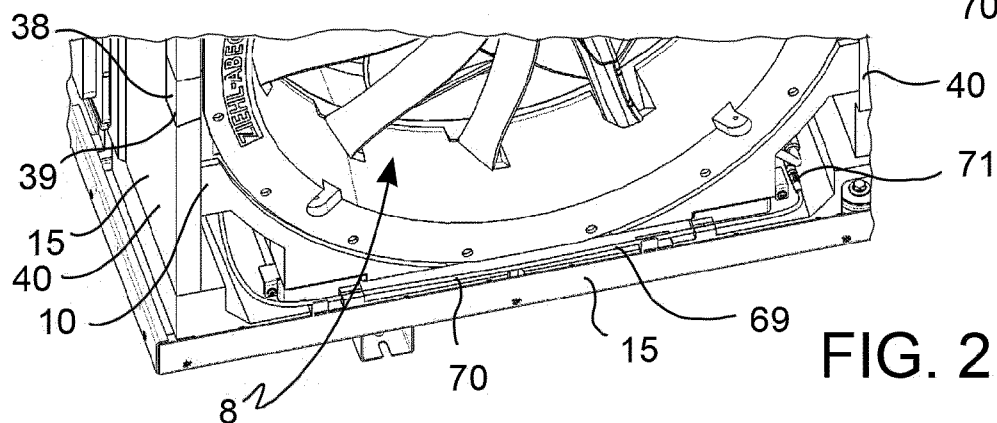


FIG. 2

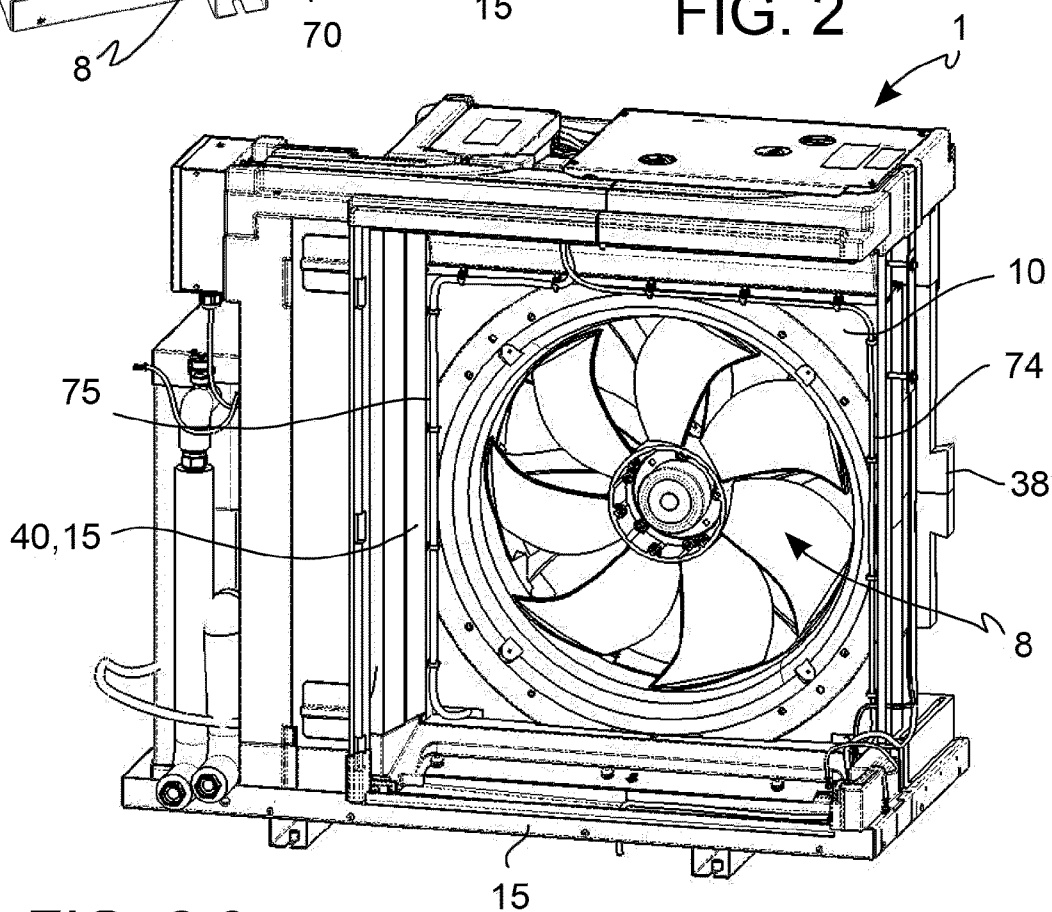
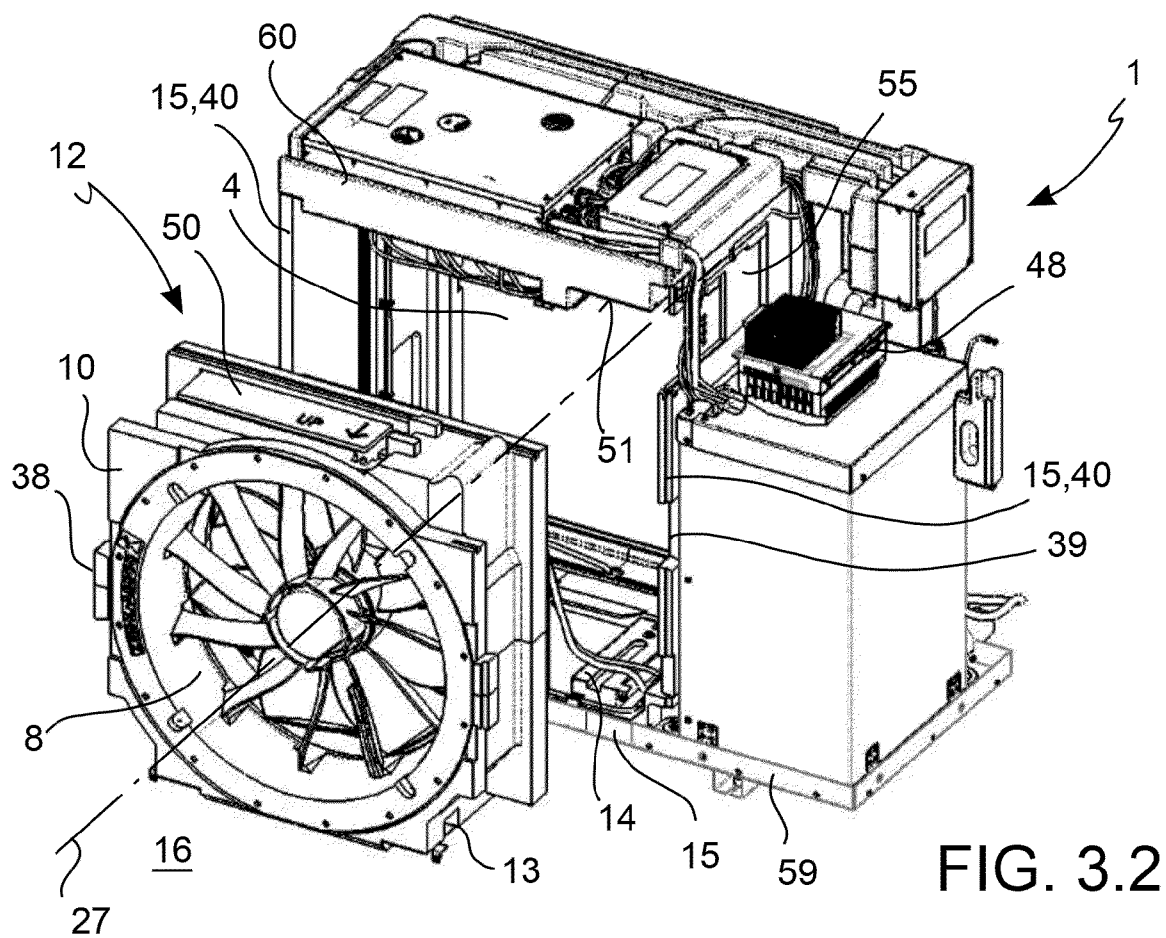
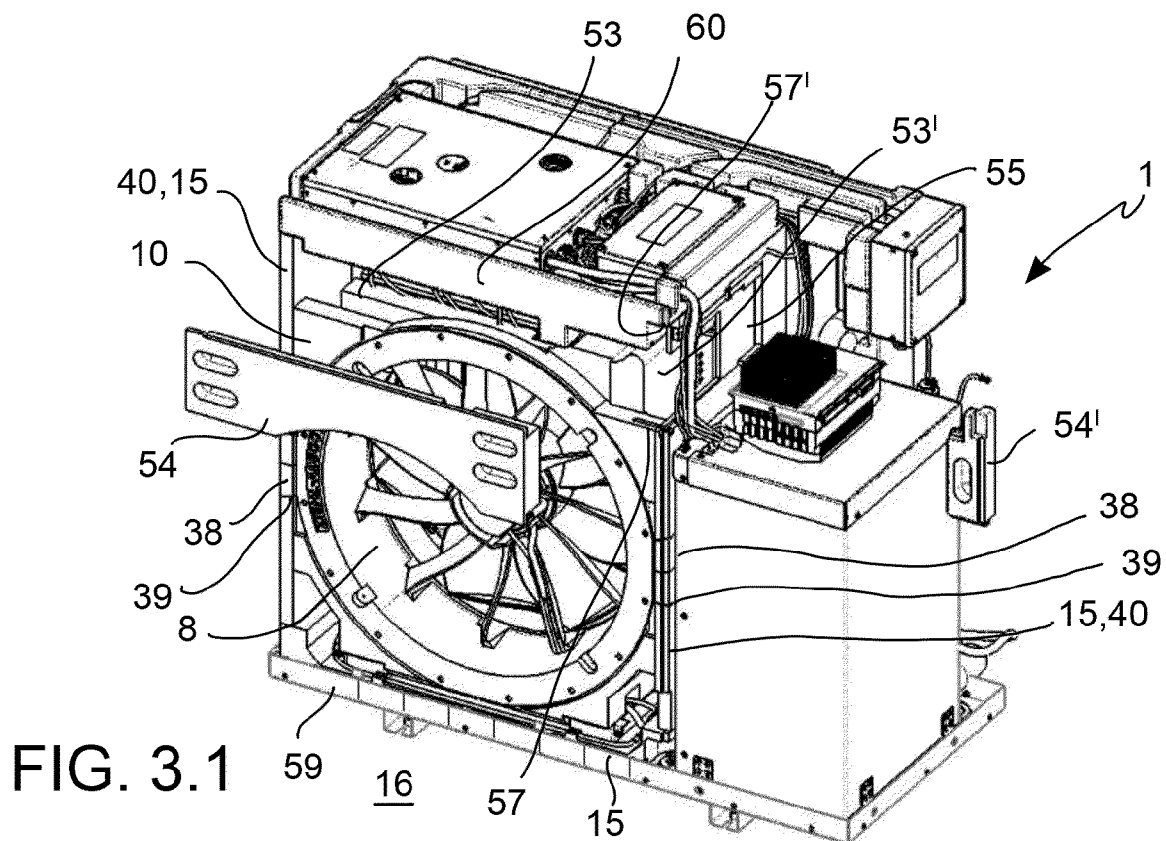


FIG. 2.3



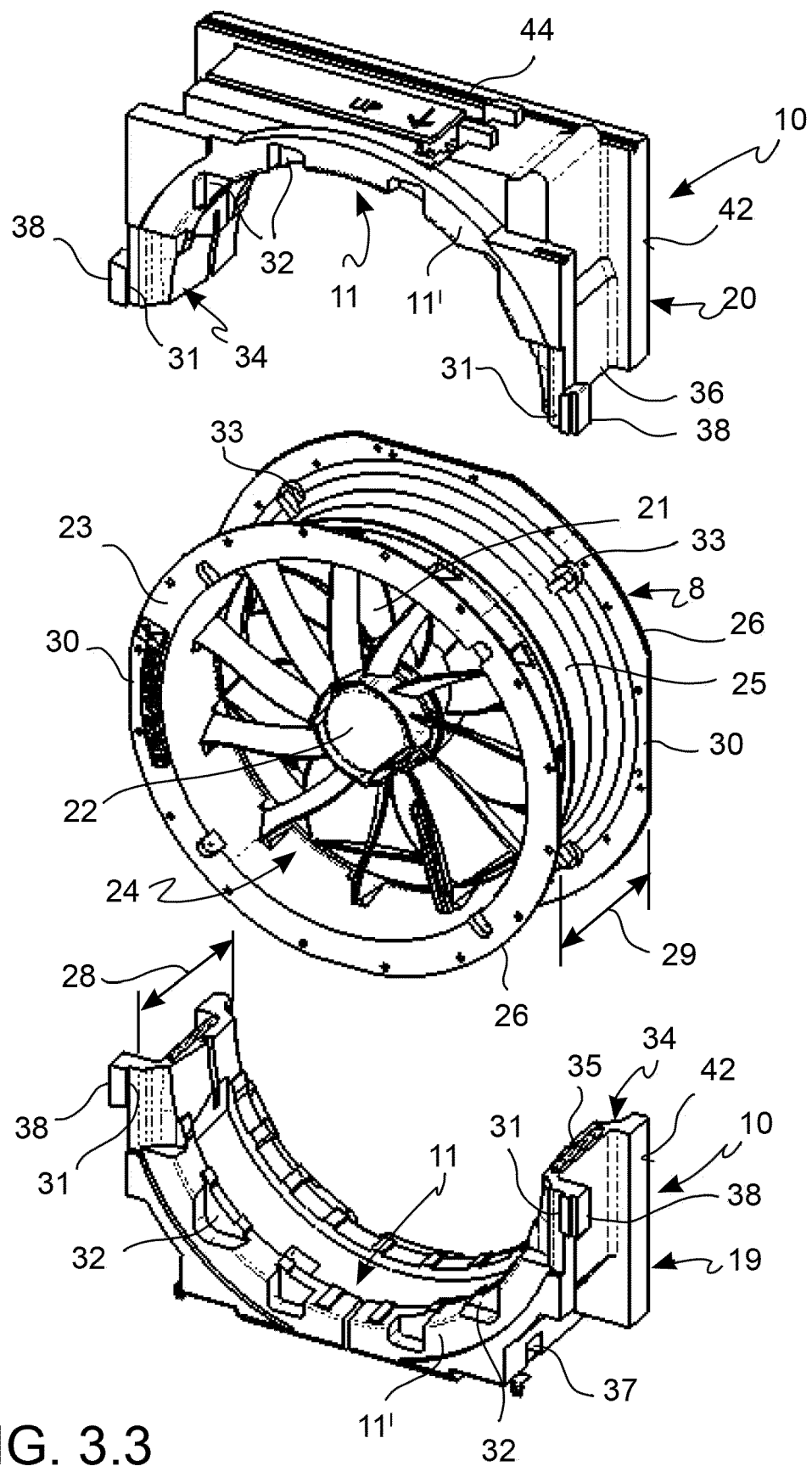


FIG. 3.3

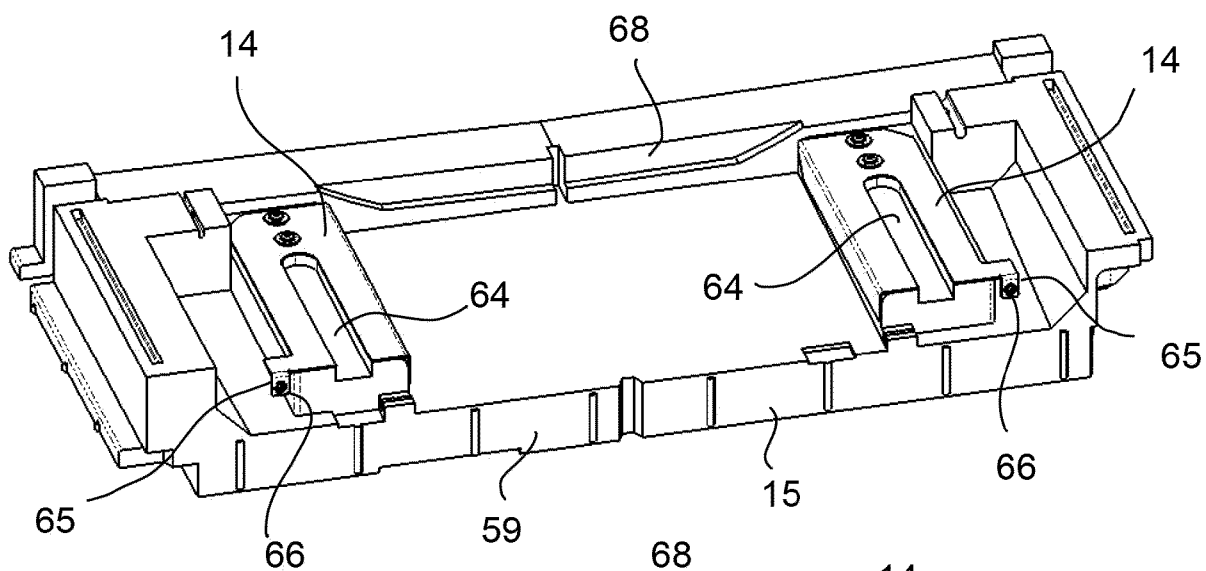


FIG. 4.1

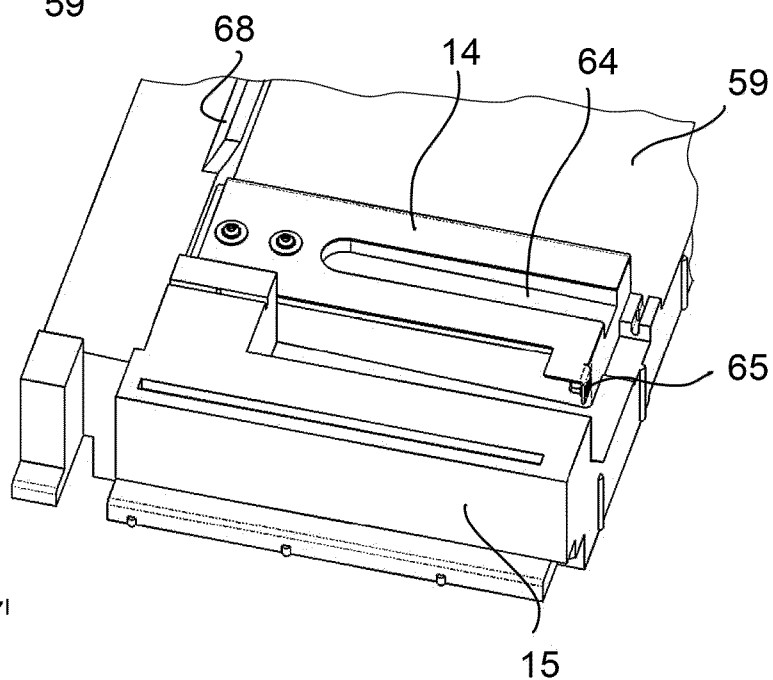


FIG. 4.2

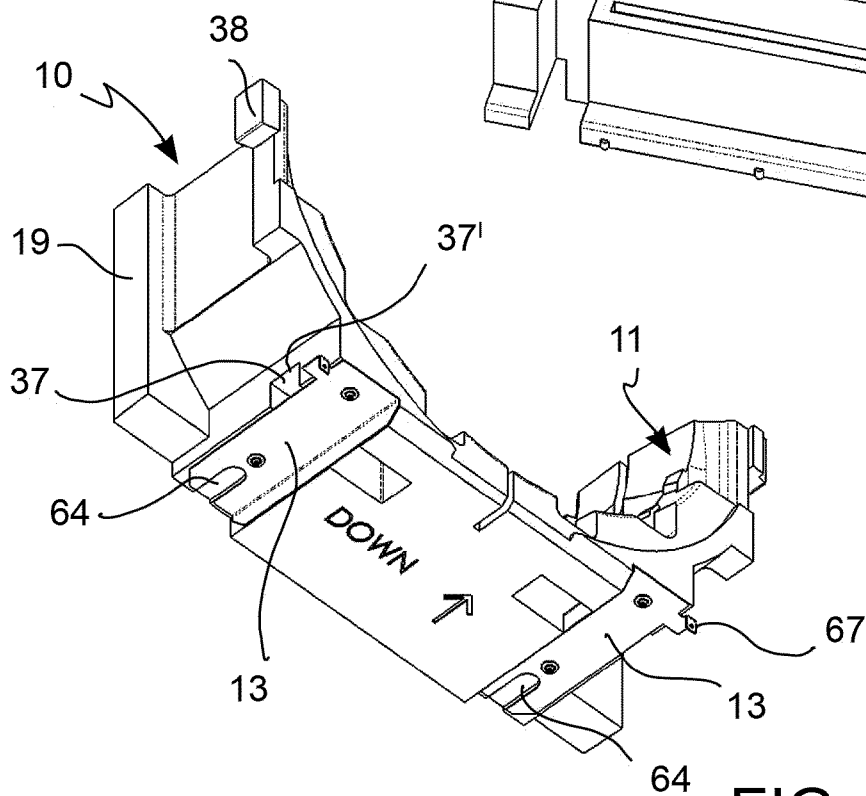


FIG. 4.3

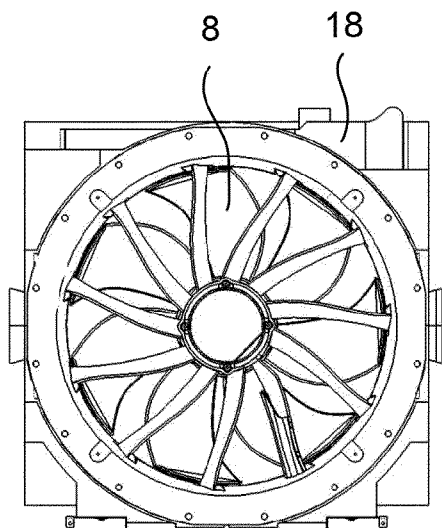


FIG. 5

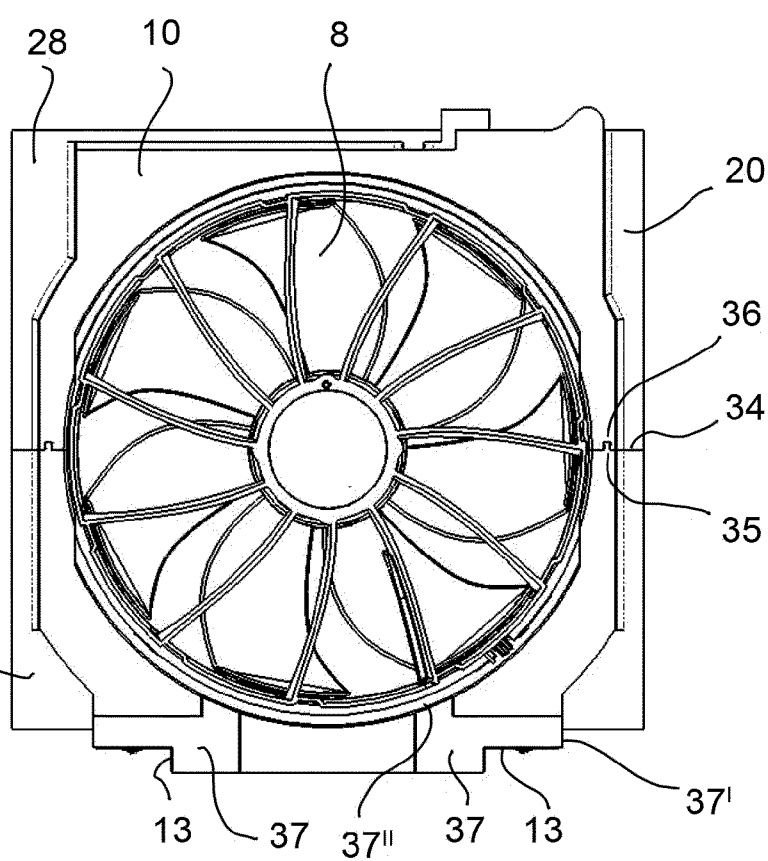


FIG. 5.2

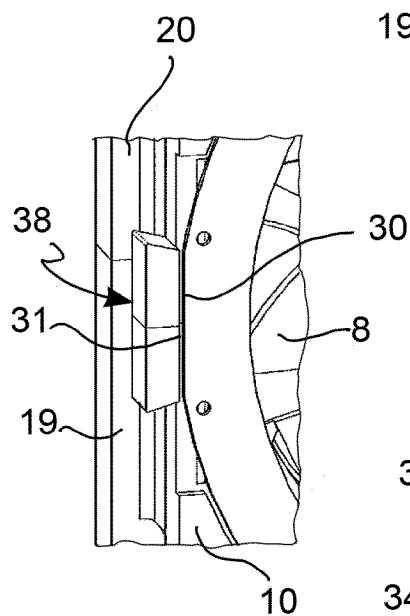


FIG. 5.1

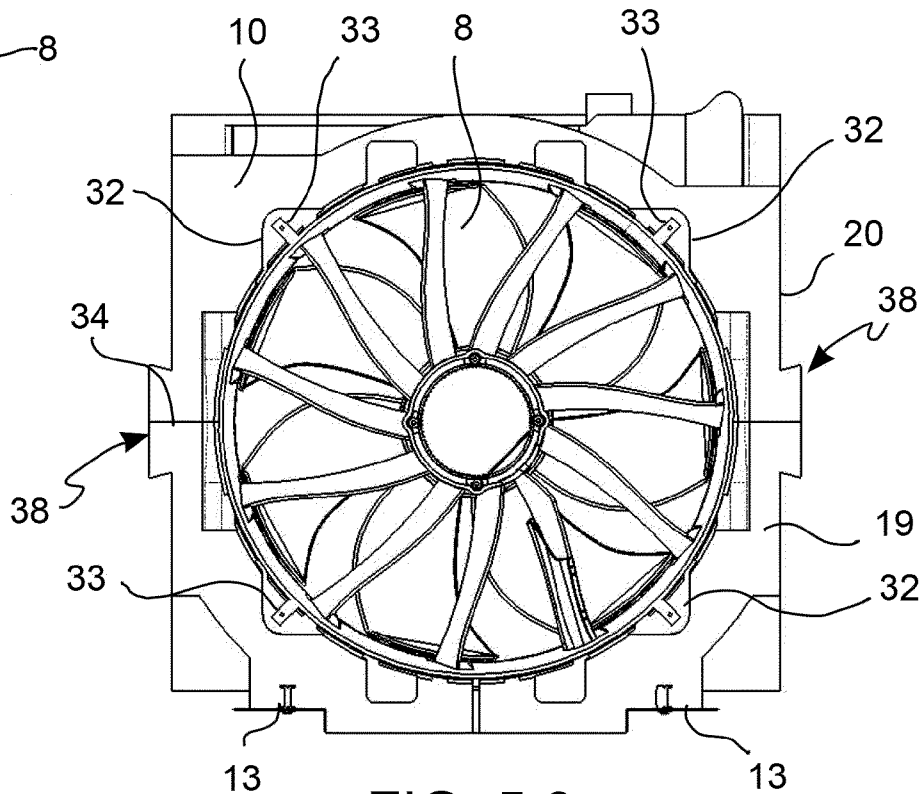


FIG. 5.3

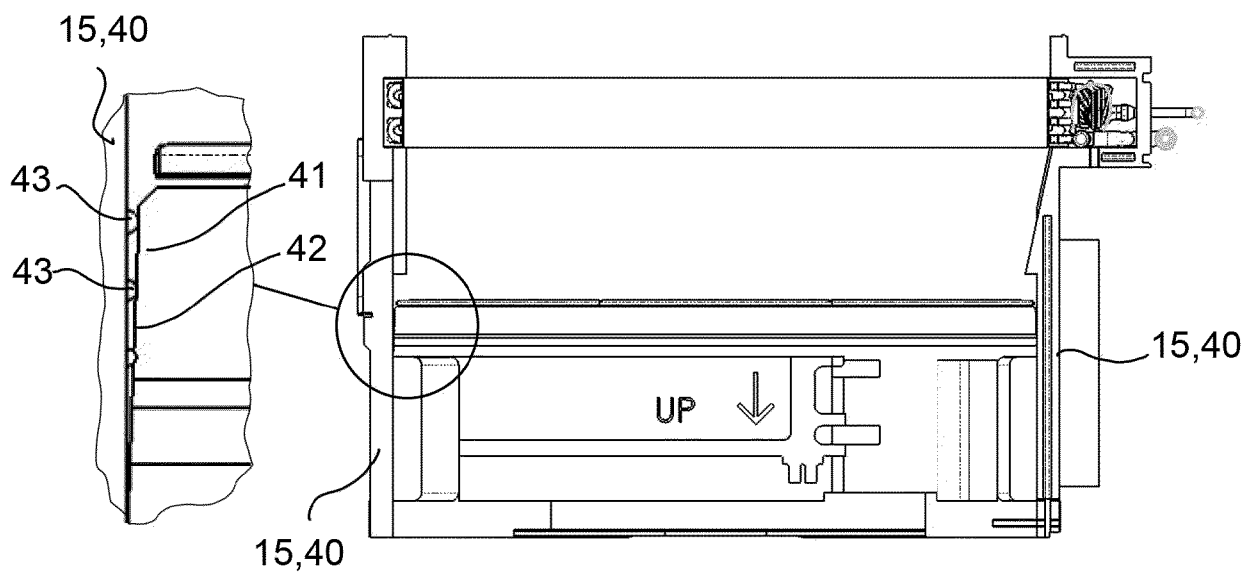


FIG. 6.1

FIG. 6

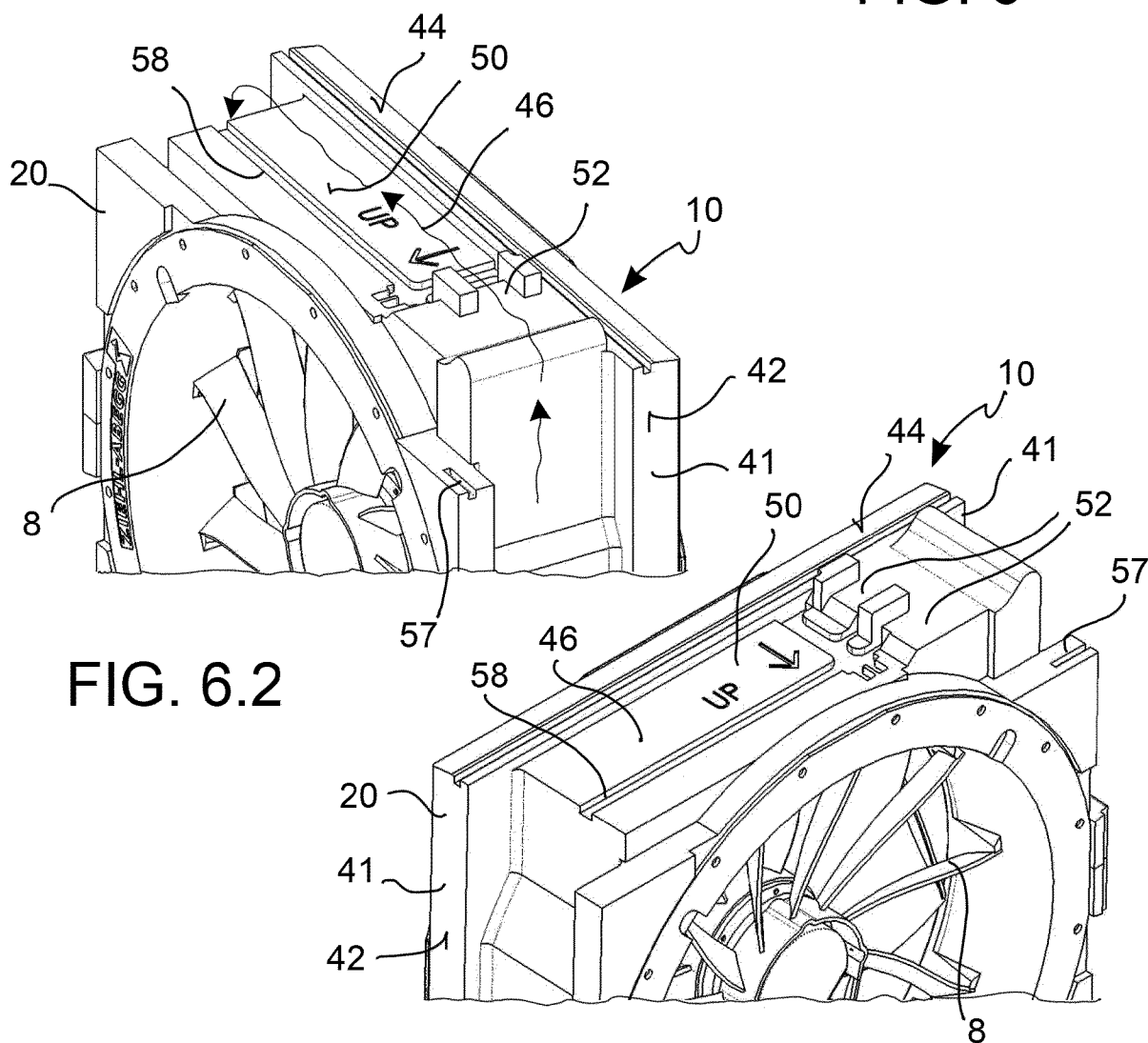


FIG. 6.2

FIG. 6.3

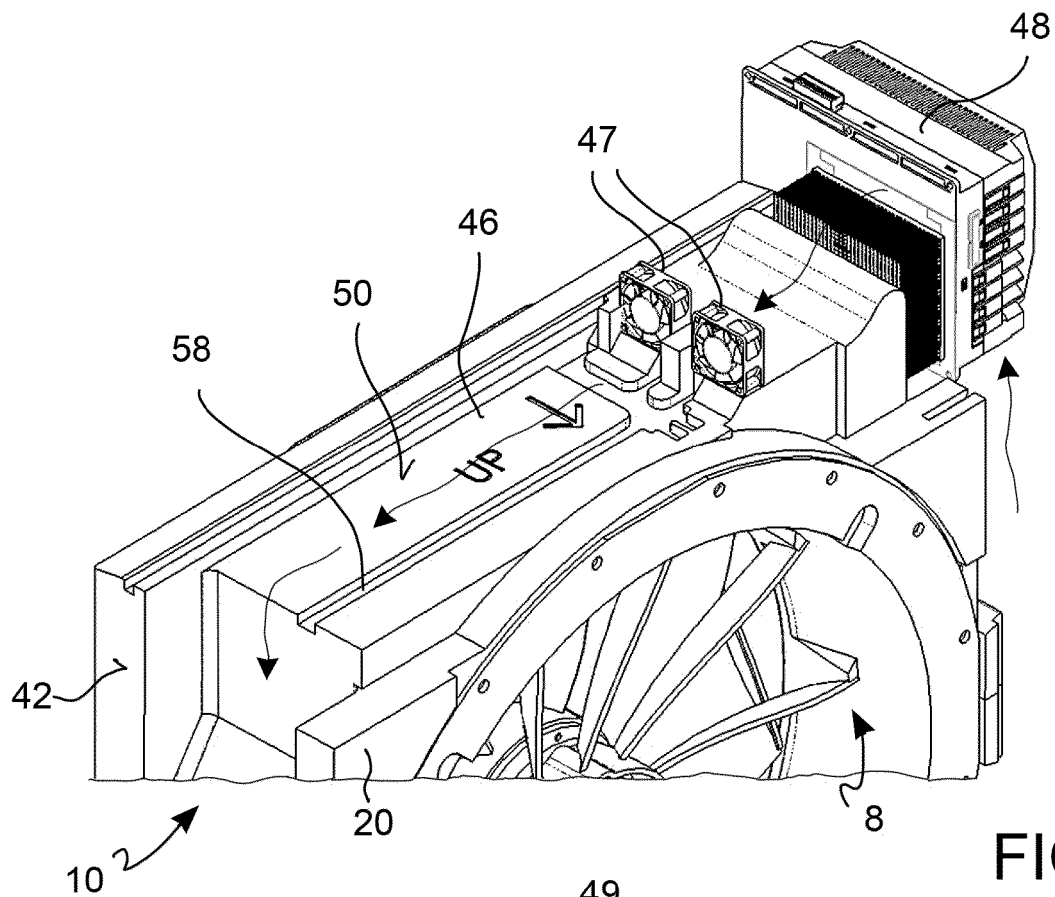


FIG. 6.4

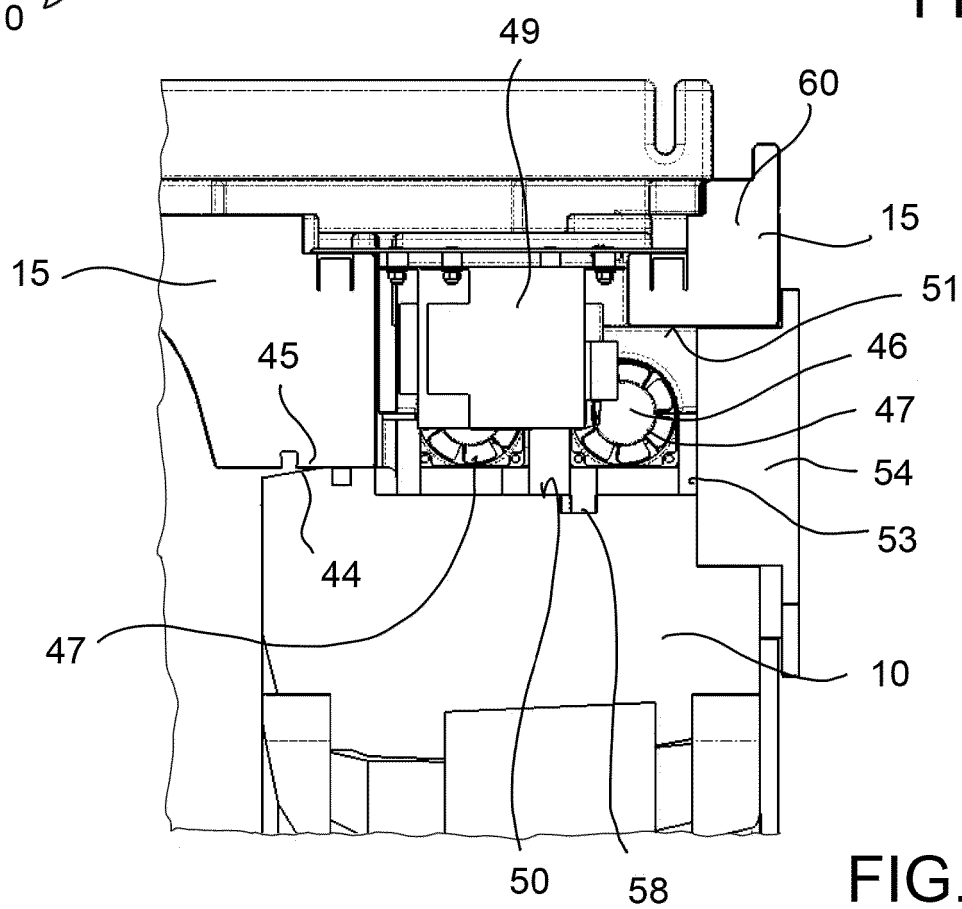
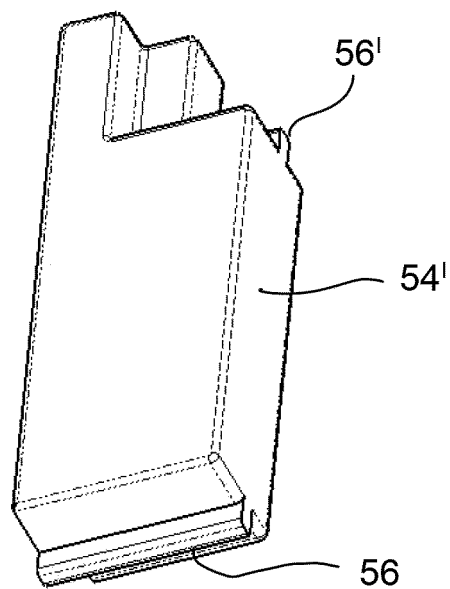
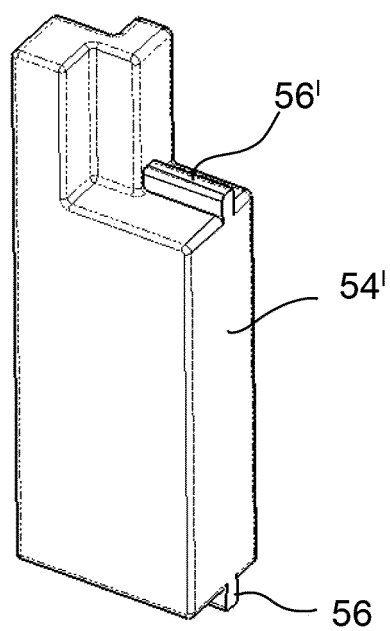
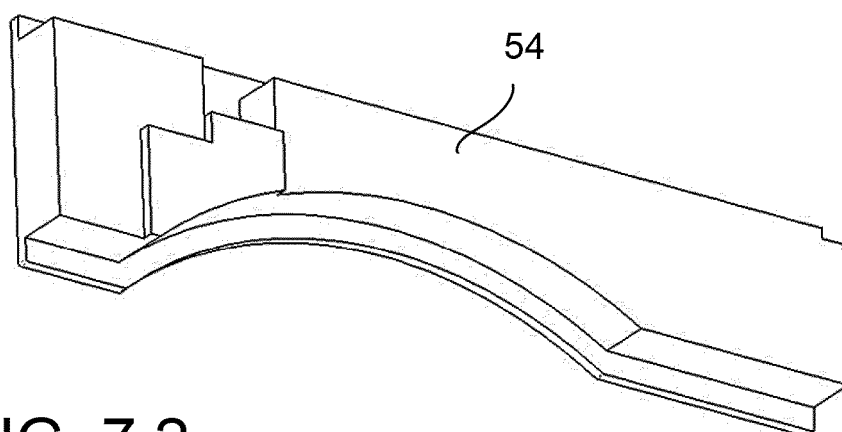
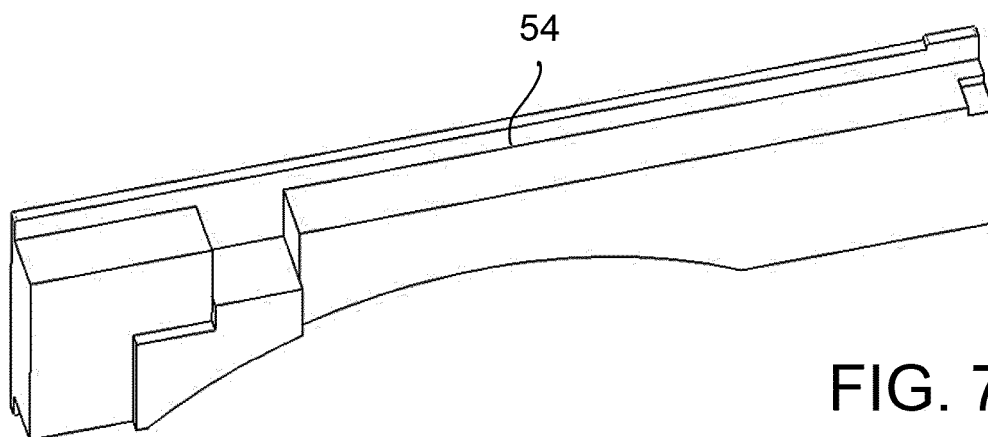


FIG. 6.5



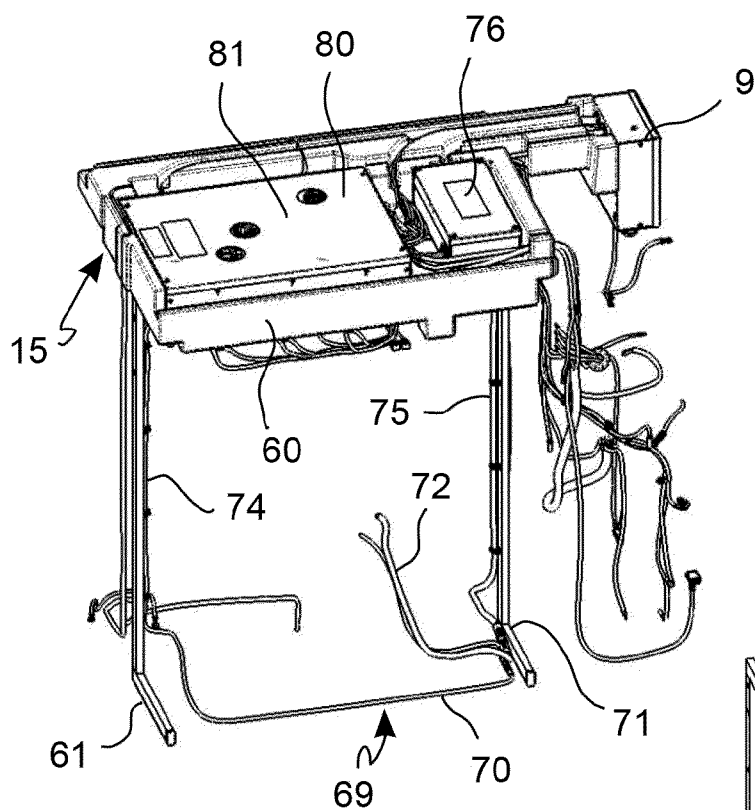


FIG. 9.1

FIG. 9.3

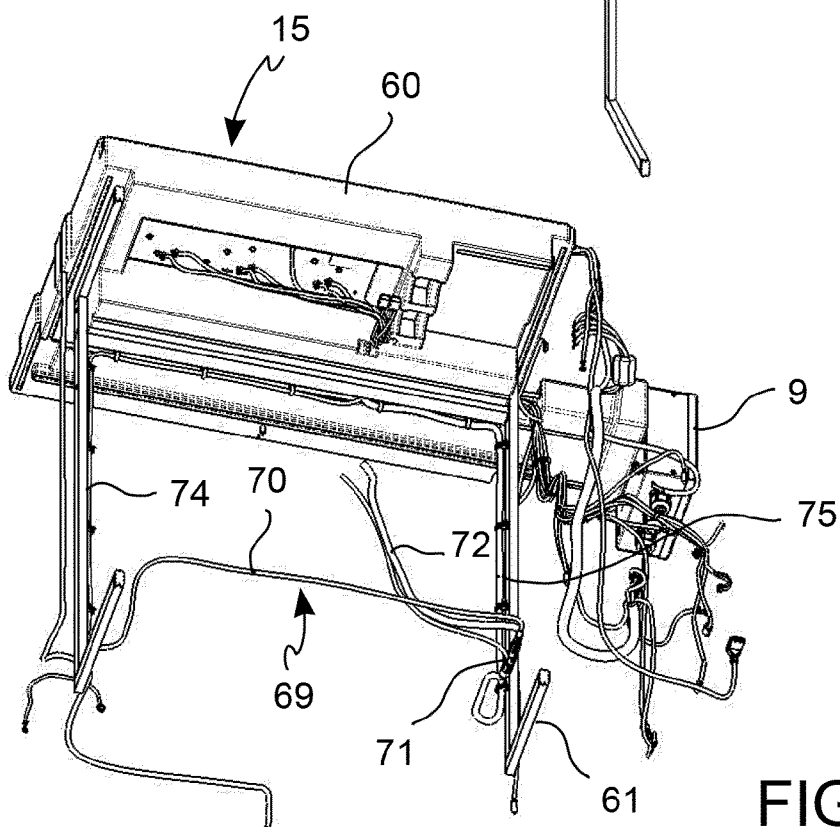
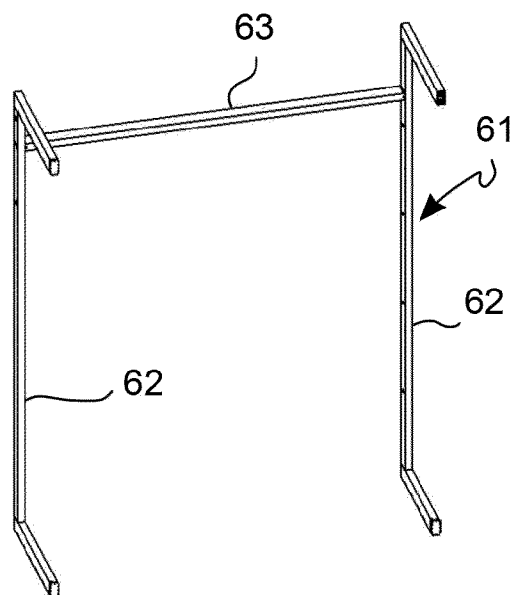


FIG. 9.2

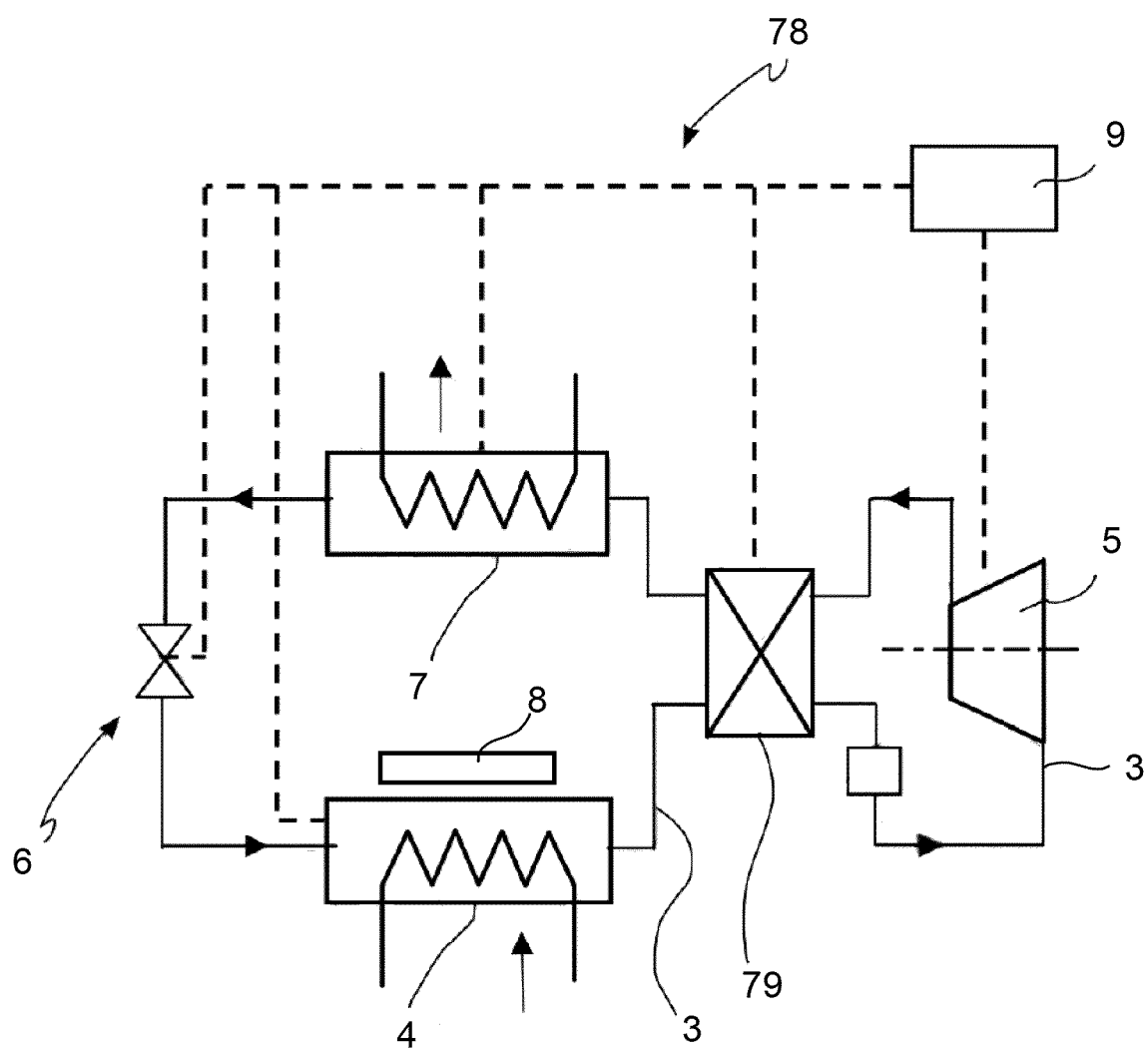


FIG. 10



EUROPEAN SEARCH REPORT

Application Number

EP 24 20 2671

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	CN 1 172 126 C (MATSUSHITA ELECTRIC IND CO LTD [JP]) 20 October 2004 (2004-10-20)	1,2,5,9, 13,14,16	INV.
Y	* abstract; figures 4-7 *	3	F24F1/38
A		4,6-8, 10-12,15	F24F1/46
	-----		F24F1/56
X	CN 101 617 174 A (LG ELECTRONICS INC) 30 December 2009 (2009-12-30)	1,2,5,9, 13,14,16	F24F13/20
Y	* figures 4, 5, 7, 8, 9 *	3	F24F13/32
A		4,6-8, 10-12,15	F24F13/22
	-----		F24F1/40
Y	EP 2 354 709 B1 (STIEBEL ELTRON GMBH & CO KG [DE]) 1 March 2023 (2023-03-01)	3	
	* abstract; figures 10,11 *		

Y	CN 112 833 544 B (QINGDAO ECONOMIC & TECH DEV ZONE HAIER WATER HEATER CO LTD ET AL.) 13 December 2022 (2022-12-13)	3	
	* abstract; figures 1-3 *		

Y	KR 2003 0040338 A (LG ELECTRONICS INC [KR]) 22 May 2003 (2003-05-22)	3	
	* abstract; figures 1, 2, 3a, 3b *		

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			F24F
Place of search			Examiner
Munich			Valenza, Davide
Date of completion of the search			
14 October 2024			
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 24 20 2671

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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14-10-2024

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 1172126 C	20-10-2004	CN 1162726 A	22-10-1997
		CN 1380519 A	20-11-2002
		CN 1380520 A	20-11-2002
		EP 0791789 A2	27-08-1997
		ES 2213787 T3	01-09-2004
		JP 3433338 B2	04-08-2003
		JP H09229428 A	05-09-1997

CN 101617174 A	30-12-2009	CN 101617174 A	30-12-2009
		KR 20070080646 A	13-08-2007

EP 2354709 B1	01-03-2023	DE 202010001244 U1	26-05-2011
		EP 2354709 A2	10-08-2011
		PL 2354709 T3	03-07-2023

CN 112833544 B	13-12-2022	CN 112833544 A	25-05-2021
		EP 3974742 A1	30-03-2022

KR 20030040338 A	22-05-2003	CN 2669050 Y	05-01-2005
		KR 20030040338 A	22-05-2003

EPO FORM P0459

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