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AIR GUIDING DUCT

(57)

Air guiding duct (1) for a heating device (2), in particular for a heat pump, the heating device (2) having a heat exchanger (3) and at least a fan element (4) arranged in an internal space (5) of the heating device (2), the air guiding duct (1) having a connection region (6) for receiving at least a portion of the heat exchanger (3) in

an inlet region (7) and for receiving at least a portion of the fan element (4) in an outlet region (8), wherein at least a portion of the connection region (6) has a surface roughness lower than 250 μm , in particular lower than 100 μm .

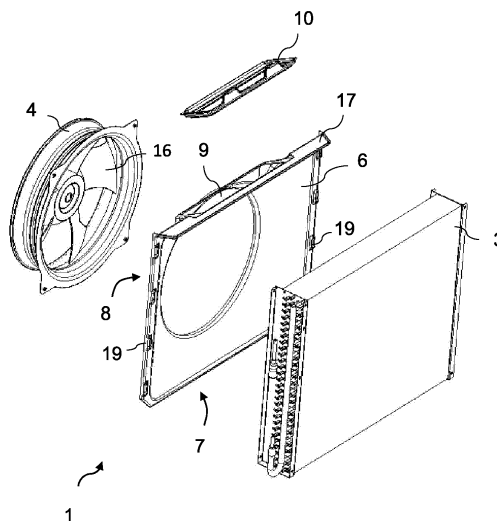


Fig. 2A

Description

[0001] The invention relates to an air guiding duct for a heating device, in particular for a heat pump, and to a heating device comprising said air guiding duct. Also, the invention relates to a use of said air guiding duct in a heating device, in particular a heat pump device.

[0002] A heating device like a heat pump is a device able to transfer calories from a source medium to a destination fluid. This is obtained using a refrigeration cycle carried out in the opposite direction of the heat transfer. Among the different refrigeration cycles, the most widely used is the vapor compression refrigeration, in which a refrigerant undergoes phase changes.

[0003] The heat pumps are usually customized to ensure thermal comfort of the houses where they are located. The solutions need to be more and more powerful from a thermal and acoustic point of view in order to be integrated in a maximum of cases of application. In particular, in an air source heat pump, air flow management plays a key role as it is the source of the energy used.

[0004] In order to improve the system's performance and power, the air flow must be as high as possible. On the other hand, in order to improve the acoustic performance of the system, the disturbance and airflow velocity must be as low as possible. It is noted that flow rate and velocity are strictly related. One of the best ways to achieve good performance (thermal and acoustic) is therefore to ensure a high flow rate and at the same time limit flow disturbances. In order to limit perturbations, the air flow must be guided as smoothly as possible, and friction must be limited.

[0005] Document EP2354709 discloses an air/water heat pump for external assembly using a closed channel between the heat exchanger and the fan made of plastic foam parts. These parts are relatively light and allow the realization of shapes allowing the improvement of the air guidance and thus the improvement of the acoustical performances. However, the surface condition of the closed channel, mainly made of plastic foams, is rough and generates disturbances of the air flow on the walls of the air duct. These disturbances distort the laminar air flow (straight air flow) into a turbulent air flow, thereby creating small rollers. These surface disturbances are then transmitted to the entire air flow. Furthermore, the air duct as described in this prior art document is made with a limited number of parts having a limited number of functions. Therefore, in order to increase the functionalities of the device, additional structural parts/elements are necessary. However, this tends to significantly increase the volume and weight of each part. This tendency is not satisfactory in terms of ergonomics of use as well as of reduction of the weight of the parts and does not facilitate the maintenance of the various components.

[0006] It is therefore desirable to obtain a system for managing the air flow able to improve the heat pump's performance in terms of both the thermal and acoustic performance. In particular, it is desirable to obtain an ef-

ficient system for guiding air from the evaporator to the fan element that ensures high flow rate and at the same time limits flow disturbances compared to prior art. Furthermore, it is desirable to obtain a system that is able to integrate several functions in same parts. Also, it is desirable to obtain a system that can be adapted to be used with one or more (e.g. two) fan elements.

[0007] The object is solved by an air guiding duct for a heating device, in particular for a heat pump, the heating device having a heat exchanger and at least a fan element arranged in an internal space of the heating device, the air guiding duct having a connection region for receiving at least a portion of the heat exchanger in an inlet region and for receiving at least a portion of the fan element in an outlet region, wherein at least a portion of the connection region has a surface roughness lower than 250 μm , in particular lower than 100 μm .

[0008] Advantageously, the value of the surface roughness of the connection region of the present air guiding duct allows to guide the air flow in a soft way, thereby limiting the frictions creating surface disturbances in the air flow. This solution makes it possible to reach high airflow speeds and therefore high heating powers while obtaining satisfactory acoustic performances.

[0009] Surface roughness is usually quantified by the deviations in the direction of the normal vector of a real surface from its ideal form. If these deviations are large, the surface is rough; if they are small, the surface is smooth. The roughness value defined throughout the present application is the (one-dimensional) profile roughness parameter Ra that is defined as the arithmetic average value of filtered roughness profile determined from deviations about the center line within the evaluation length. It is noted that this profile roughness parameter is included in the ISO 4287:1997 standard that is based on the "M" (mean line) system.

[0010] With the expression "at least a portion of the connection region has a surface roughness lower than 250 μm , in particular lower than 100 μm ", it is intended that only a part of the connection region can be configured to have such a surface roughness value, for example only the portion in contact with the air flow, i.e. the internal surface of the connection region. As is explained below more in detail, the connection region is used to guide the air between the heat exchanger and the fan. However, the expression is also intended that the entire connection region can be provided with such surface roughness value. Of course, this disclosed value is an average value of the roughness over the portion of the connection region taken into consideration.

[0011] According to an example, the connection region is at least partly made of at least one of metal, polymer, or fiber material, wherein in particular the connection region is made of at least one of steel, injected, thermoformed plastic, extruded plastic, thermoformed textile fiber, or thermosets, with or without reinforced fibers. Specifically, the thermoformed textile fiber can be natural or synthetic, non-woven or woven. Also, the thermosets can

be PUR/EP/SMC/BMC/silicon, with or without reinforced (natural or synthetic) fibers. With at least partly it is meant that the connection region can be covered with at least one of metal, polymer, or fiber material wherein the covered part of the connection region can be of another material. Alternatively, the total connection region can be made of at least one of metal, polymer, or fiber material.

[0012] Compared to the state of the art and in particular to solutions using plastic foam to form a closed channel between the heat exchanger and the fan, the present air guiding duct, since using a different material with lower surface roughness, has several advantages. First of all, thermoformed plastic, extruded or steel parts are more easily modified than plastic foam parts because they do not require important tooling. This allows for greater flexibility in product design and limits the ecological impact of creating and recycling tooling.

[0013] Also, the parts of the present air guiding duct are lighter because they are much thinner than plastic foam parts. For example, the average thickness of the identified parts for the air duct is between 1 mm and 3 mm while the plastic foam parts require a thickness of at least 15 mm in order to have a sufficient mechanical resistance.

[0014] Since the parts of the present air guiding duct have a reduced weight, it is easily possible to duplicate the construction to create units with several fans and several air ducts. Therefore, the same parts can be reused several times for the same product.

[0015] In addition, it is noted that the recycling channels for hard plastics and steel are largely developed compared to the recycling channels for plastic foams. This improves the ecological footprint of the product.

[0016] In examples that can be combined with previous configurations and/or examples, the connection region at least partially covers a surrounding area of the heat exchanger and/or a periphery of the blades of the fan element. In this way, the air guiding duct represents a continuous surface, i.e. a closed air duct, between the air/refrigerant heat exchanger and the fan of an air source heat pump. For example, the inlet region can have an inlet cross-section corresponding at least partially to the cross-section of the heat exchanger and the outlet region can have an outlet cross-section corresponding at least partially to the cross-section of the fan element.

[0017] In examples that can be combined with previous configurations and/or examples, the surface of the connection region between the inlet region and the outlet region is devoid of acute angles. In particular, to reduce flow turbulences, the profile of the air guiding duct between the fan element up to the heat exchanger has only curved and smooth shapes without angular shapes.

[0018] In examples that can be combined with previous configurations and/or examples, in the direction from the heat exchanger to the fan element, the cross section of the air flow first decreases and then increases. In this way, a homogeneous air flow is provided within the air guiding duct. In particular, the air guiding duct and spe-

cifically the connection region can comprise a plurality of successive sections of similar or different size. Also, since the connection region is made with soft shapes, there is no step greater than a maximum value between two successive sections, in the direction of the air flow between the heat exchanger and the fan element. The maximum value is advantageously comprised between 30 mm and 20 mm, in particular 26 mm.

[0019] In examples that can be combined with previous configurations and/or examples, the air guiding duct comprises at least one inspection opening for allowing an access between the heat exchanger and the fan element, wherein in particular the inspection opening is at least 50 mm x 50 mm in size to allow for visual analysis as well as to allow a cleaning tool to be inserted. The inspection opening can have different dimensions and shapes that are suitable for the above mentioned purpose. Advantageously, the inspection opening is located in the upper region of the air guiding duct. However, it can also be located in other regions of the duct, such as lateral regions or the bottom region. The air guiding duct can also be provided with a plurality of such inspection openings.

[0020] In examples that can be combined with previous configurations and/or examples, the air guiding duct comprises at least one hatch coupled to the inspection opening to cover said inspection opening. The hatch can have the same dimensions and shape of the inspection opening or can be different in dimension and size provided that it is configured to cover the inspection opening. The hatch can be fixable in a removable way to the air guiding duct. In case of a plurality of inspection opening, the air guiding duct can comprise a plurality of hatches each coupable to a corresponding inspection opening.

[0021] In examples that can be combined with previous configurations and/or examples, the inspection opening is present in a portion of the connection region. In this way, the connection region represents a closed air duct only when the hatch covers the inspection opening. Advantageously, the inspection opening is located in the upper part of the connection region. However, it can also be located in other parts of the connection region, such as lateral parts or the bottom part.

[0022] In examples that can be combined with previous configurations and/or examples, the surface of the connection region between the inlet region and the outlet region is a sloped surface having an average slope of less than 45°, preferably less than 35°, with respect to a central axis of the fan element. In this way, the air guiding duct comprises a gentle slope profile, thereby avoiding air flow turbulences.

[0023] In examples that can be combined with previous configurations and/or examples, the inlet region of the connection region has a polygonal cross-section, in particular a rectangular cross section. In this way the inlet region can fit the shape of a standard heat exchanger. Of course, the inlet region of the connection region can have a different shape, for example curved. In addition or in alternative, the outlet region of the connection region

has a circular cross section. In this way the outlet region can fit the shape of a standard fan element. Of course, the outlet region of the connection region can have a different shape, for example curved or polygonal.

[0024] In examples that can be combined with previous configurations and/or examples, the connection region comprises one inlet region and a plurality of outlet regions, wherein the surface dimensions of the inlet region is greater than the surface dimensions of the plurality of outlet regions. Each outlet region can advantageously be coupled to a fan element in order to take into account configurations of heat pumps having one heat exchanger and a plurality of fan elements. Alternatively or additionally several heat exchangers can be provided wherein the heat exchangers are connected to the same refrigerant circuit. The heat exchangers can be fluidically connected in a serial or parallel way to each other.

[0025] In another aspect of the invention, a heating device, in particular a heat pump device, is provided, the heating device comprising the inventive air guiding duct, wherein the air guiding duct is placed in an internal space of the device between a heat exchanger and the fan element of the heating device.

[0026] In examples that can be combined with previous configurations and/or examples, the heating device comprises one or more structural parts enclosing at least the connection region and/or holding the air guiding duct. These structural parts can be used to hold the air guiding duct, the heat exchanger, the fan element, but can also be used for other purposes. In particular, the air guiding duct as well as the fan element and the heat exchanger can be maintained in a set of structural parts. These parts can be largely openwork and are not subject to roughness or shape constraints as they do not play the role of an air guiding duct.

[0027] In examples that can be combined with previous configurations and/or examples, at least one structural part is made of a material different from the material of the connection region, in particular is made of plastic foam, more particularly of polypropylene expanded (PPE). In addition or in alternative, the one or more structural parts form a recess at the inlet region of the connection region. In this way, these structural parts are easy to mount and do not hinder the correct functioning of the heat exchanger. In addition or in alternative, the one or more structural parts comprise a condensate collecting region (i.e. condensate tray), and/or a support surface for casing or electronic elements. In this way, the structural parts can be used for multiple purposes. Since the functions and the parts are separated, it is possible to open up the structural parts to limit their weight and the consumption of material in order to ensure only the support function. Also, as the functions are dissociated, it is possible to replace only a small part in case of failure without replacing large parts. This improves the reparability of the product.

[0028] In addition or in alternative, at least one structural part comprises an accessing opening and in partic-

ular a hatch coupled to said accessing opening. It is noted that the accessing opening should be located at the inspection opening, for example in the connection region, so that an access to the internal parts of the connection region, i.e. to the fan element and/or the heat exchanger, can be possible also in presence of the structural part. A corresponding hatch coupled to the accessing opening is not essential when a hatch is already present at the inspection opening. Based on different possible configurations, the accessing opening can have the same or different dimension and/or size compared to the inspection opening present in the connection region.

[0029] In a further aspect of the invention, a use of the inventive air guiding duct is provided. The inventive air guiding duct is used in a heating device, in particular a heat pump device.

[0030] The present air guiding duct and system and apparatus comprising said duct improves both the acoustic and energy performance of the product compared to the existing ones. Accordingly, it allows the integration of the heat pump technology in a larger number of use cases and thus democratizes the use of renewable energy. In particular, the present air guiding duct can be used for mono-block or split units, and for devices producing cold or heat. Specifically, the present air guiding duct can be suitable for transfer heat/cold to air (air conditioner) or water (boiler) or other fluid, and more specifically for air source heat pump devices.

[0031] In the figures, the subject-matter of the invention is schematically shown, wherein identical or similarly acting elements are usually provided with the same reference signs.

Figure 1 shows a schematic representation of the air guiding duct according to an example.

Figures 2A-B show two perspective views of the duct together with a fan element and heat exchanger in a disassembled configuration according to an example without structural parts.

Figures 3A-B show two perspective views of the duct together with a fan element and heat exchanger in a disassembled configuration according to another example with structural parts.

Figures 4A-D show perspective views of the duct together with a fan element and heat exchanger in an assembled configuration according to two examples, i.e. without and with structural parts.

Figure 5 shows a lateral cross-section view of the air guiding duct assembled with a fan element and the heat exchanger ac-

cording to an example.

Figure 6 shows a lateral view of the air guiding duct assembled with two fan elements and the heat exchanger according to an example.

[0032] Figure 1 illustrates the duct 1 for guiding the air flow in a schematic representation. The duct 1 can be coupled to a heating device 2, for example a heat pump water heater. The heating device 2 comprises at least a heat exchanger such as an evaporator 3 for absorbing heat and producing a fluid in a gas/vapor form at a lower temperature and low pressure and a fan element 4. In the figure, one fan element 4 is represented. However, the duct 1 can be suitable for any number of fan elements 4 coupled to the evaporator 3. The evaporator 3 is crossed by an air circulating path (arrows in the figure). The air is conducted from the evaporator 3 to the fan element 4 and then outside the heating device 2. In particular, the heating device 2 is a heat pump, and the evaporator 3 and the fan element 4 are arranged in an internal space 5 of the device 2 defined at least in part by an external casing 15. The external casing 15 can be formed of metallic parts.

[0033] The air guiding duct 1 has a connection region 6 for receiving a portion of the heat exchanger 3 in an inlet region 7 and for receiving a portion of the fan element 4 in an outlet region 8. In this way, a closed duct is formed between the heat exchanger 3 and the fan element 4. In particular, the connection region 6 comprises an inlet region 7 for the inlet of the air flow and an outlet region 8, opposite to the inlet region 7, for the outlet of the air flow.

[0034] The connection region 6 is made of a material having a low surface roughness, for example Ra lower than 250 μm and preferably lower than 100 μm . For example, the connection region 6 is completely made of at least one of steel, injected, thermoformed plastic, extruded plastic, thermoformed textile fiber, or thermosets. Compared to air flow duct made of different materials, such as plastic foam, the connection region 6 is reduced in weight and thickness and has a smoother surface. This improves both the acoustic and energy performance of the heating device.

[0035] In the upper part of the connection region 6 an inspection opening 9 is provided for allowing access between the evaporator 3 and the fan 4 from outside. Also, a suitable hatch 10 can be coupled to the inspection opening 9 to cover and close it when the access inside the air guiding duct 1 is no more necessary. The coupling between the hatch 10 and the inspection opening 9 is such to ensure that the air guiding duct 1 represents a closed channel when the hatch 10 closes the opening 9. Accordingly, the coupling surface between the inspection opening 9 and the coupled hatch 10 is as smooth as possible to avoid an increased surface roughness in such part of the connection region 6.

[0036] Figures 2A and 2B illustrate a perspective view

(Fig.2A) and a lateral view (Fig. 2B) of the air conduction duct 1 combined with the fan element 4 and the heat exchanger 3. It is noted that the air conduction duct 1 basically comprises a single main body, i.e. the connection region 6, coupled to the hatch 10 that serves to cover and close the inspection opening 9. The connection region 6 has a tapered shape to be placed between the heat exchanger 3 and the fan element 4. As a matter of fact, the aim of the connection region 6 is to guide the air flow from the heat exchanger 3 to the blades 16 of the fan element 4 towards outside the device 2. For this purpose, the connection region has a rectangular cross-section at the inlet region 7 in order to receive a portion of the heat exchanger 3 and a circular cross-section at the outlet region 8 to receive a portion of the fan element 4, wherein the dimension of the inlet region 7 is greater than the dimension of the outlet region 8. In particular, the connection region 6 comprises an upper edge 17 at the inlet region 7 that fits together the upper surface of the heat exchanger 3 to facilitate the contact and eventually the fixing with the heat exchanger 3. To improve the fastening between the connection region 6 and the heat exchanger 3, a plurality of lateral fastening protuberances 19 are provided at the inlet region 7. These protuberances 19 are provided at both lateral sides of the connection region 6 at the inlet region 7. Also, the connection region 6 comprises a circular rim 18 at the outlet region 8 that advantageously fits together with the circular profile of the fan element 4.

[0037] Figures 3A and 3B illustrate a perspective view (Fig.3A) and a lateral view (Fig. 3B) of the air conduction duct 1 combined with the fan element 4 and the heat exchanger 3 and structural parts 12 of the heating device 2. Differently from the duct 1 of figures 2A and 2B, these figures additionally show structural parts 12. The structural parts 12 serve to support and protect the connection region 6, the fan element 4 and the heat exchanger 3 and envelope at least the connection region 6. Figures 3A and 3B show two structural parts 12, i.e., an upper and a lower structural part. The two structural parts 12 fit together to envelope the assembly represented by the fan element 4, the connection region 3 (with the hatch 10) and the heat exchanger 3. For this purpose, the shape of the structural parts 12 is such that they follow the shapes of the enclosed elements. For example, the front side has a circular profile to fit together with the fan element 4 and the rear side has an angular profile to fit together with at least a portion of the heat exchanger 3. It is noted that, since there are two structural parts 12 enclosing the assembly, the upper and the lower structural parts have both a semi-circular profile at the front side such that, when fitted together, they form a circular profile to completely envelope the fan element 4.

[0038] The assembled configurations of the air conduction duct 1 together with the fan element 4 and the heat exchanger 3 are shown in detail in figures 4A-D. In particular, figures 4A-B show the configuration without structural parts 12, whereas the figures 4C-D show the

configuration with structural parts 12. Referring to the latter configuration, it is noted that, when assembled together, the upper and lower structural parts basically envelope a good part of the fan element 4 and the connection region 6 but that a portion of the heat exchanger 3 is not covered. Specifically, in the front side, apart a circular front opening to allow the air flow passage, the structural parts 12 envelope the entire structure of the fan element 4. On the other hand, in the rear side the assembled structural parts 12 form a recess 13 for not hindering the correct functioning of the heat exchanger 3.

[0039] Figure 4C also shows the presence of an accessing opening 14 on a top surface of the upper structural part 12. This serves to access the inside of the air conduction duct 1, i.e. to access the fan element 4 and the heat exchanger 3, through the inspection opening 9 present on the top of the connection region 6 that can be opened using a corresponding hatch 10 (see figure 4A).

[0040] Figure 5 shows structural details of the air guiding duct 1. In particular, the connection region between the inlet region 7 and the outlet region 8 is a sloped surface having an average slope α of less than 45° , preferably less than 35° , with respect to a central axis 11 of the fan element 4. The angle α is the angle formed between the central axis 11 of the fan element 4 (dotted-dashed line in the figure) and a line defining the lateral profile of the connection region 6 (dashed line in the figure).

[0041] Also, from the figures emerges that, in the direction from the heat exchanger 3 to the fan element 4, the cross section of the air flow first decreases and then increases. In this way, an homogeneous air flow is provided within the air guiding duct 1.

[0042] Figure 6 shows a configuration, wherein the connection region 6 of the air conduction duct 1 is connected between a heat exchanger 3 and two fan elements 4. The connection region is therefore adapted to receive at least a portion of two fan elements 4 in addition to receive a portion of the heat exchanger 3. Accordingly, the connection region 6 comprises a single inlet region 7 and two outlet regions 8 so that the air flow is directed from the heat exchanger 3 to the two fan elements 4. It is noted that the surface dimensions of the inlet region 7 is greater than the sum of the surface dimensions of the two outlet regions 8. Also in this configuration, the connection region 6 can be provided with an access opening 9 coupled to a hatch 10 for accessing the heat exchanger 3 and both fan elements 4 from outside. It is noted that, although not shown in figure 6, suitable designed structural parts 12, similar to the structural parts shown in previous figures 3A-3B and 4C-4D, can be used to envelope the assembly formed by the heat exchanger 3, the connection region 6 (with the hatch 10) and the two fan elements 4.

Reference Signs

[0043]

- | | |
|----|------------------------|
| 1 | Air guiding duct |
| 2 | Heating device |
| 3 | Heat exchanger |
| 4 | Fan element |
| 5 | Internal space |
| 6 | Connection region |
| 7 | Inlet region |
| 8 | Outlet region |
| 9 | Inspection opening |
| 10 | Hatch |
| 11 | Central axis |
| 12 | Structural part |
| 13 | Recess |
| 14 | Access opening |
| 15 | Casing |
| 16 | Blade |
| 17 | Upper edge |
| 18 | Circular rim |
| 19 | Fastening protuberance |

Claims

1. Air guiding duct (1) for a heating device (2), in particular for a heat pump, the heating device (2) having at least a heat exchanger (3) and at least a fan element (4) arranged in an internal space (5) of the heating device (2), the air guiding duct (1) having a connection region (6) for receiving at least a portion of the heat exchanger (3) in an inlet region (7) and for receiving at least a portion of the fan element (4) in an outlet region (8), wherein at least a portion of the connection region (6) has a surface roughness lower than $250\text{ }\mu\text{m}$, in particular lower than $100\text{ }\mu\text{m}$.
2. Air guiding duct (1) according to claim 1, **characterized in that** the connection region (6) is at least partly made of at least one of metal, polymer, or fiber material, in particular wherein the connection region (6) is at least partly made of at least one of steel, injected, thermoformed plastic, extruded plastic, thermoformed textile fiber, or thermosets, with or without reinforced fibers.
3. Air guiding duct (1) according to any one of claims 1 to 2, **characterized in that** the connection region (6) at least partially covers:
 - a. a surrounding area of the heat exchanger (3), and/or
 - b. a periphery of the blades of the fan element (4).
4. Air guiding duct (1) according to any one of claims 1 to 3, **characterized in that** the surface of the connection region (6) between the inlet region (7) and the outlet region (8) is devoid of acute angles.

5. Air guiding duct (1) according to any one of claims 1 to 4, **characterized in that** in the direction from the heat exchanger (3) to the fan element (4), the cross section of the air flow first decreases and then increases. 5
6. Air guiding duct (1) according to any one of claims 1 to 5, **characterized in that** the air guiding duct (1) comprises at least one inspection opening (9) for allowing an access between the heat exchanger (3) and the fan element (4), in particular wherein the inspection opening (9) is at least 50 mm x 50 mm in size to allow for visual analysis as well as to allow a cleaning tool to be inserted. 10
7. Air guiding duct (1) according to claim 6, **characterized in that** the air guiding duct (1) comprises at least one hatch (10) coupled to the inspection opening (9) to cover said inspection opening (9). 15
8. Air guiding duct (1) according to any one of claims 6 to 7, **characterized in that** the inspection opening (9) is present in a portion of the connection region (6). 20
9. Air guiding duct (1) according to any one of claims 1 to 8, **characterized in that** the surface of the connection region (6) between the inlet region (7) and the outlet region (8) is a sloped surface having an average slope of less than 45°, preferably less than 35°, with respect to a central axis (11) of the fan element (4). 25
10. Air guiding duct (1) according to any one of claims 1 to 9, **characterized in that**: 30
- a. the inlet region (7) of the connection region (6) has a polygonal cross-section, in particular a rectangular cross section; and/or
 - b. the outlet region (8) of the connection region (6) has a circular cross section. 35
11. Air guiding duct (1) according to any one of claims 1 to 10, **characterized in that** the connection region (6) comprises one inlet region (7) and a plurality of outlet regions (8), wherein the surface dimensions of the inlet region (7) is greater than the surface dimensions of the plurality of outlet regions (8). 40
12. Heating device (2), in particular a heat pump device, comprising the air guiding duct (1) according to any one of claims 1 to 11, wherein the air guiding duct (1) is placed in an internal space (5) of the device (2) between a heat exchanger (3) and a fan element (4). 45
13. Heating device (2) according to claim 12, **characterized in that** the heating device (2) comprises one or more structural parts (12) enclosing at least the connection region (6) and/or holding the connection region (6). 50
14. Heating device (2) according to claim 12 or 13, **characterized in that**: 55
- a. at least one structural part (12) is made of a material different from the material of the connection region (6), in particular is made of plastic foam, more particularly of polypropylene expanded (PPE); and/or
 - b. the one or more structural parts (12) form a recess (13) at the inlet region (7) of the connection region (6); and/or
 - c. the one or more structural parts (12) comprise a condensate collecting region, and/or a support surface for casing or electronic elements; and/or
 - d. at least one structural part (12) comprises an accessing opening (14) and in particular a hatch coupled to said accessing opening (14).
15. Use of the air guiding duct (1) according to any one of claims 1 to 13 for a heating device (2), in particular a heat pump device.

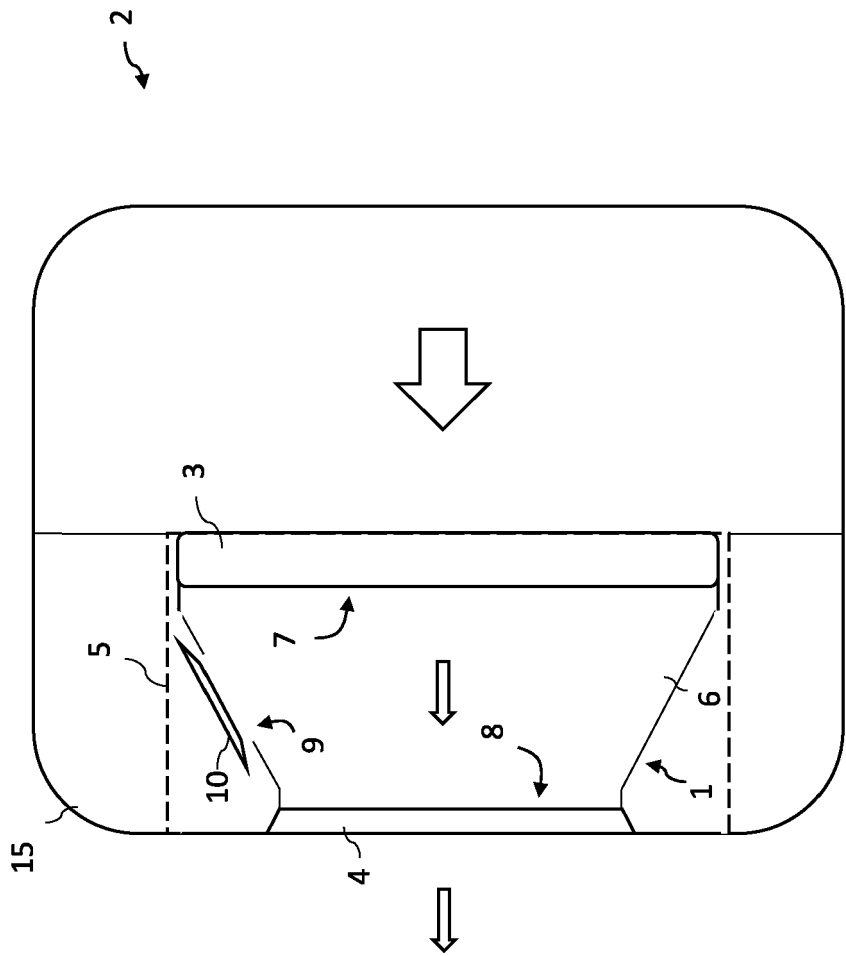


FIG. 1

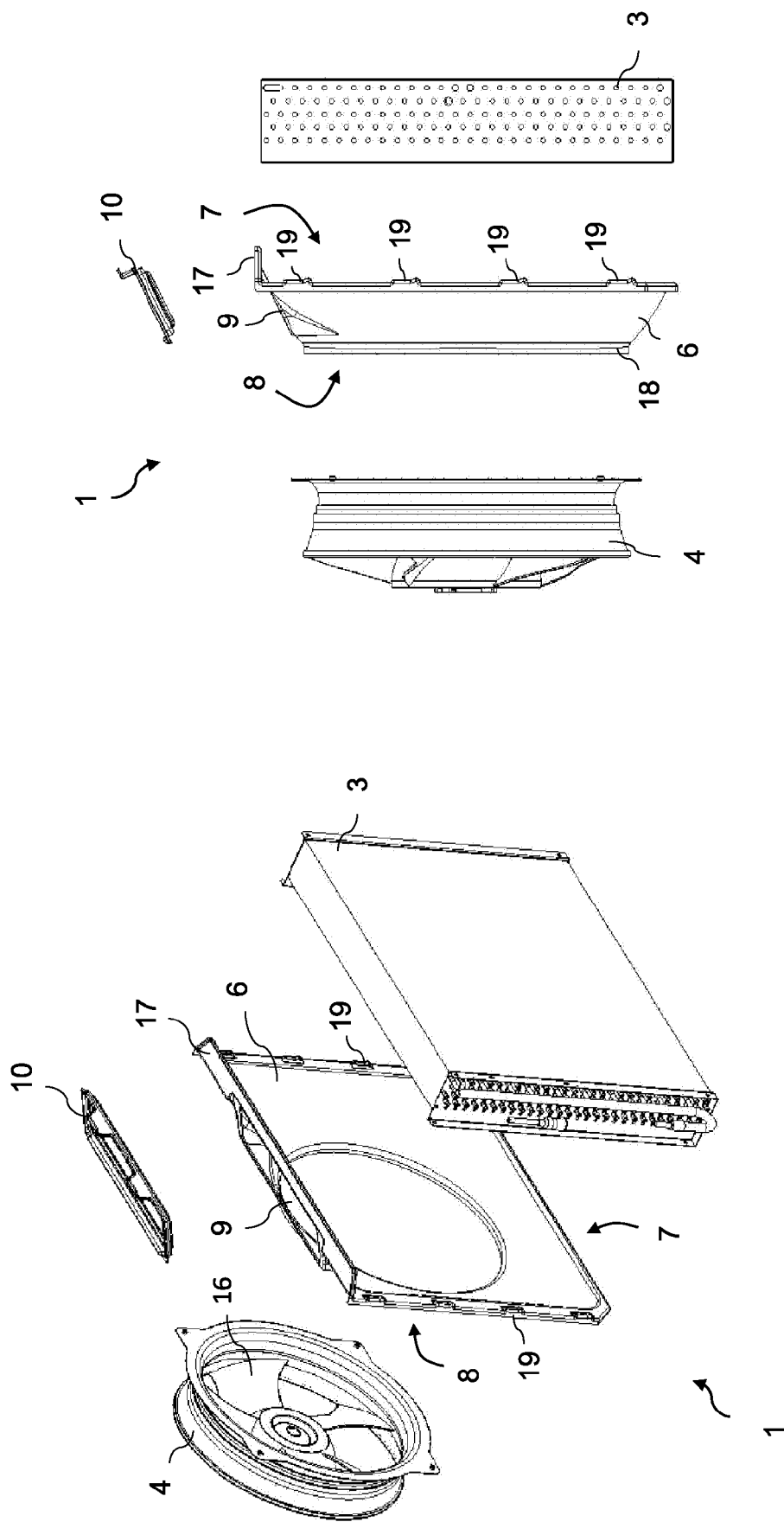


Fig. 2B

Fig. 2A

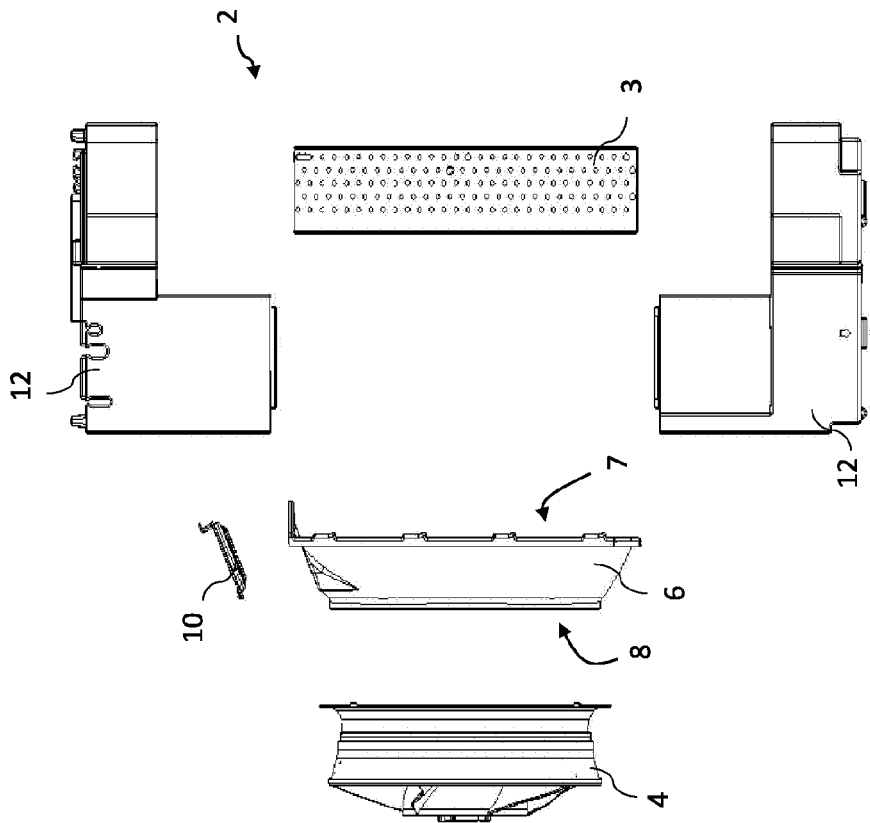


Fig. 3B

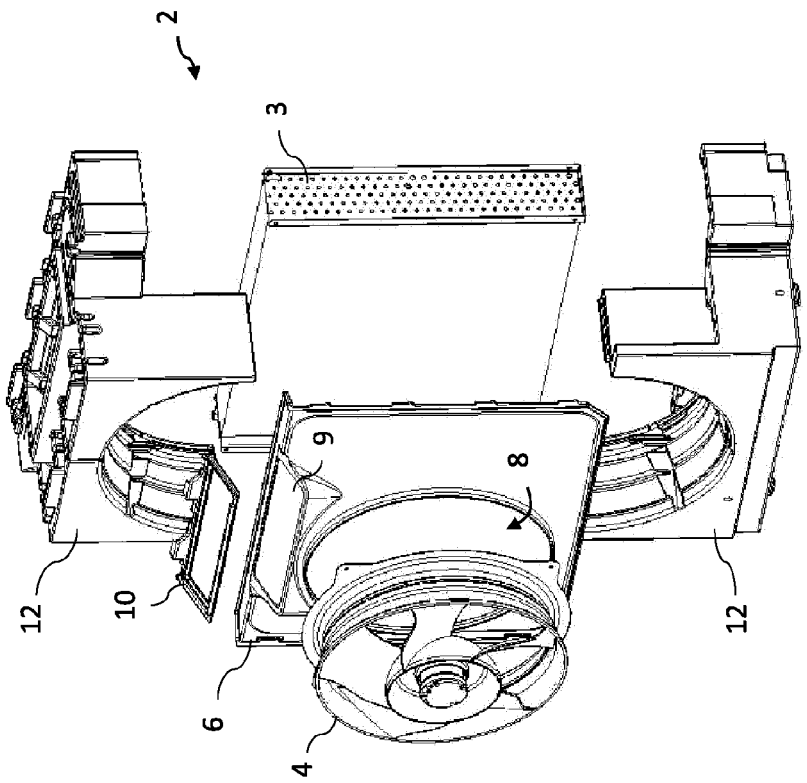


Fig. 3A

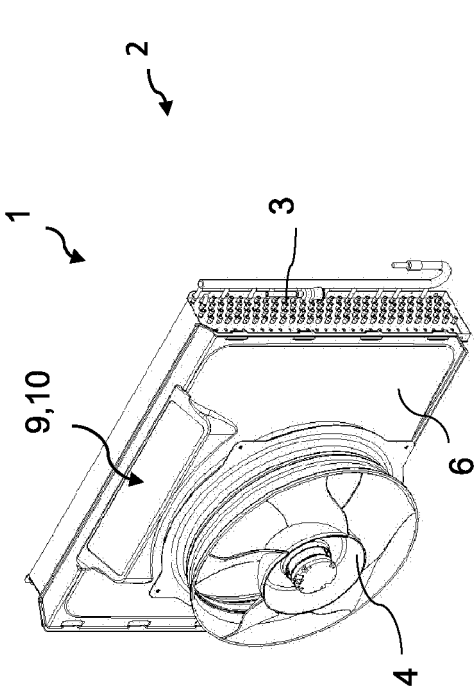


Fig. 4A

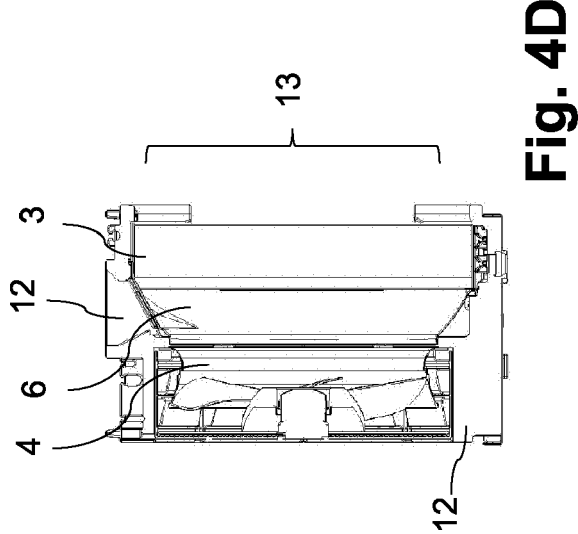


Fig. 4B

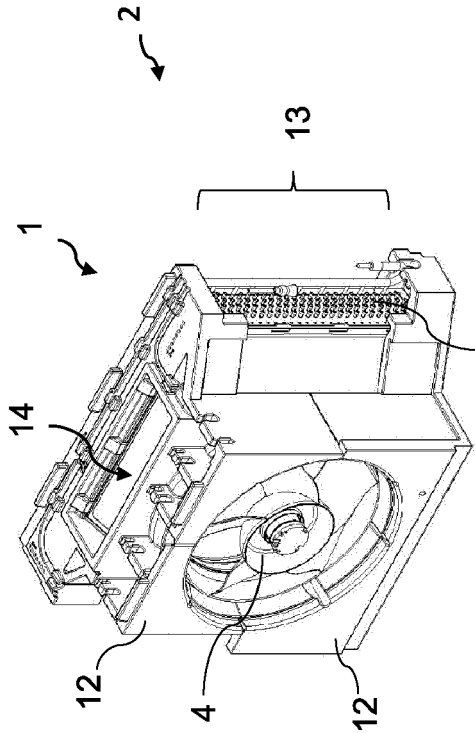


Fig. 4C

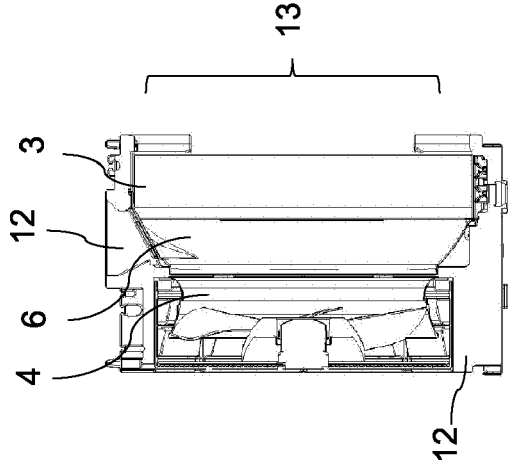


Fig. 4D

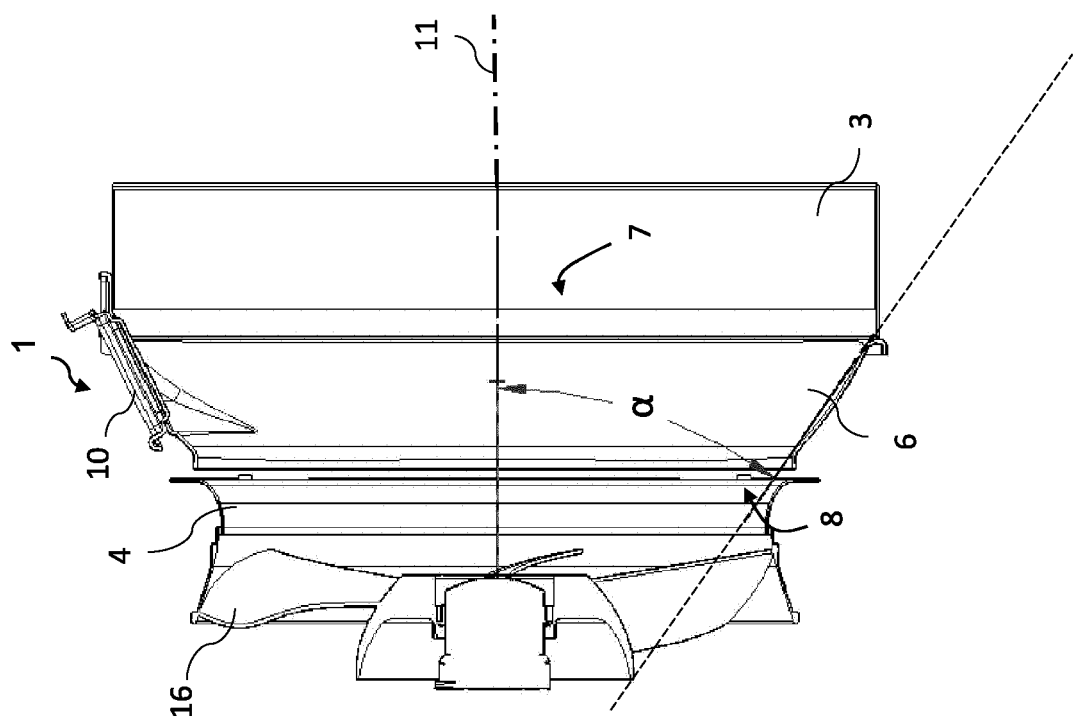


Fig. 5

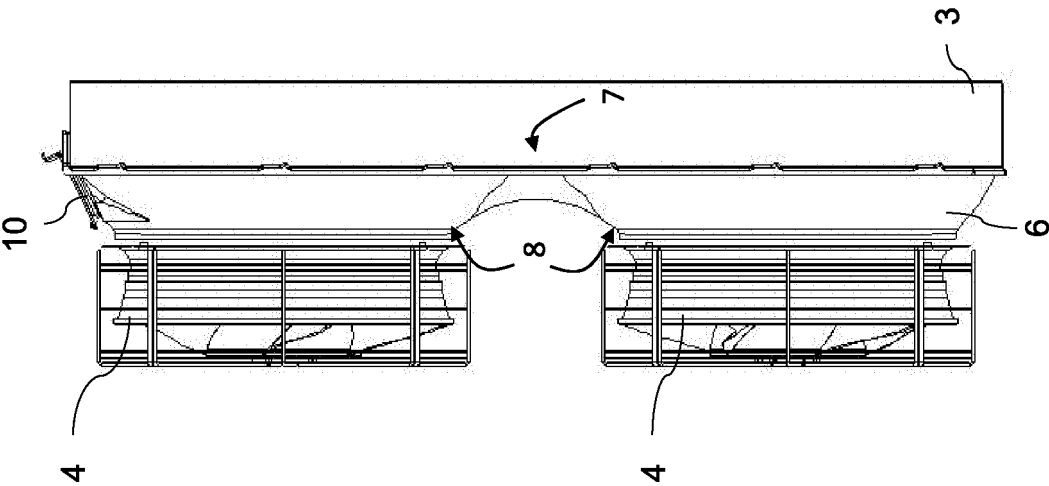


Fig. 6



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