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(54) **Heat pump laundry dryer**

Wärmepumpenwäschetrockner

Sèche-linge à pompe à chaleur

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Description

Technical field

[0001] The present invention relates to a laundry dryer including a heat pump system having an improved cooling of the compressor within the basement of the laundry dryer.

Background of the invention

[0002] The heat pump technology in a laundry dryer is at present the most efficient way to dry clothes in terms of energy consumption. In a heat pump system of the laundry dryer an air stream flows in a closed air stream circuit. Further, the heat pump system includes a closed refrigerant circuit. The air stream is moved by a fan, passes through a laundry chamber, which is preferably formed as a rotatable laundry drum, and removes there water from wet clothes. Then, the air stream is cooled down and dehumidified in an evaporator, heated up in a condenser and re-inserted into the laundry drum again.

[0003] The refrigerant is compressed by a compressor, condensed in the condenser, expanded in an expansion device and then vaporized in the evaporator.

[0004] Thus, the condenser and the evaporator are components of the air stream circuit as well as of the refrigerant circuit. The condenser and the evaporator are heat exchangers between the air stream circuit and the refrigerant circuit.

[0005] Usually, the components of the heat pump system (as described above) are placed in a basement of the laundry dryer. A basement of a laundry dryer is part of a casing in which the drum is housed and which further includes a front wall, a rear wall and two side walls. In particular, the compressor, the evaporator and the condenser are arranged in said basement below the laundry drum.

[0006] In the heat pump system, there are components which require to be cooled in order to constantly remove heat produced by them, like the compressor.

[0007] Normally, air taken from dryer machine surroundings is used as cooling means of the compressor. For this reason a plurality of inlet/outlet openings are provided in a laundry dryer casing.

[0008] Such openings are generally provided on one or more vertical side walls of the casing, and more generally in the front or lateral wall(s) of the casing. However such construction may result in a poor air intake and in particular poor air exhausting because of high flow resistance due to conduit path arrangement for connecting said openings to pumping means inside the casing. A further drawback of such opening configurations consist in that warm air exhausted from a first opening provided at a laundry dyer casing may be taken in again through a second opening thereby reducing the overall air cooling capacity of the system and the overall performance of the drying cycle.

[0009] Alternatively, in those prior art dryers in which openings are not provided in the casing of the laundry dryer and warm air is kept within the inside of the casing of the dryer itself, or also in case the above mentioned openings are formed but do not allow an efficient heated air exhaustion, this warm air may overheat one or more electronic components, e.g. motherboards or inverters for driving the drum and/or the compressor, which are generally included in dryers. Such components, like the inverter, by themselves already release a lot of heat.

[0010] Another drawback of providing openings on vertical side walls of the casing consists in that objects resting around the laundry dryer may obstruct at least partially said openings causing a reduction in the performance of the dryer, or even damages to its components.

[0011] Still another drawback of such opening arrangement is the high noise generated by the mass of air moved through the openings. This undesired noise is particularly disadvantageous because it often prevents the dryer to be used for instance in apartments during night hours and/or to be placed close to rooms or places where silent is needed, such as bedrooms.

[0012] EP 2 733 254 A1 discloses a heat pump laundry treatment apparatus, in particular a heat pump laundry dryer or a heat pump washing machine having drying function, and a method of operating such a heat pump laundry treatment apparatus. The laundry treatment apparatus comprises a control unit controlling the operation of the laundry treatment apparatus, a laundry treatment chamber for treating laundry using process air, a process air circuit for circulating the process air, a heat pump system having a refrigerant loop in which the refrigerant fluid is circulated through a first and a second heat exchanger, a compressor for circulating the refrigerant fluid through the refrigerant loop, and a cooling fan unit for cooling the compressor. During the operation the conveyance capacity of the cooling fan unit is varied, and a detector unit for detecting an operation parameter indicates a state of an electronic board. The method comprises operating the cooling fan unit in dependency of the electronic board operation parameter, and/or controlling the compressor operation output in dependency of the electronic board operation parameter, wherein the compressor is a variable speed compressor

[0013] EP 2 549 007 A1 discloses a method for operating a laundry treatment as well as to a laundry treatment apparatus, in particular a dryer, a washing machine or a washing machine having drying function, comprising: a laundry storing chamber for treating laundry using processing air, a blower for blowing cooling air, a processing air loop for circulating the processing air through the laundry storing chamber, and a heat pump system for dehumidifying and heating the processing air. The heat pump system has a refrigerant loop and comprises: a first heat exchanger for heating a refrigerant and cooling the processing air, a second heat exchanger for cooling the refrigerant and heating the processing air, a refrigerant expansion device arranged in the refrigerant loop between the second heat exchanger and the first heat exchanger, a compressor arranged in the refrigerant loop between the first heat exchanger and the second heat exchanger, and an auxiliary heat exchanger connected in the refrigerant loop for cooling the refrigerant, wherein the blower is adapted to remove heat from the auxiliary heat exchanger. According to the invention, a shielding device is arranged to shield the compressor against cooling air blown by the blower, and/or the compressor is insulated to prevent heat exchange with the compressor's ambient air and the cooling air.

[0014] EP 1 209 277 A2 discloses a heat-pump clothes drying machine in which the motor used to drive the drum holding the clothes to be dried is also connected to a first fan, which circulates the drying air, as well as a second fan that cools the compressor.

[0015] The aim of the present invention is therefore to solve the noted drawbacks and thus providing a laundry dryer having an improved cooling arrangement for drawing air from/to the laundry dryer in order to cool in particular a compressor of a heat pump system connected to or incorporated in such dryer.

[0016] Another object of the present invention is to provide a laundry dryer having a more efficient opening arrangement for a cooling air circuit to cool the compressor of the heat pump system.

[0017] A further object of the present invention is to provide a laundry dryer having an improved performance in cooling the compressor of such heat pump system, said laundry dryer ensuring a cooling air flow with improved efficiency.

[0018] Still another object of the invention is to provide a laundry dryer producing a reduced noise level during working operation compared to laundry dryer of known type.

[0019] Still another object of the invention is to provide a laundry dryer reducing the risk that openings leading air from a cooling air circuit may be completely obstructed by objects resting close to laundry dryer.

[0020] According to an aspect, the invention relates to a laundry dryer including:

- a casing, rotatably supporting a drum for receiving a load to be dried, said drum being apt to rotate around a rotational axis, said casing including a basement defining a bottom surface;

- A process air conduit in fluid communication with the drum where a process air stream is apt to flow;

- A heat pump system having a heat pump circuit in which a refrigerant can flow, said heat pump circuit including a first heat exchanger where the refrigerant is cooled off and the process air is heated up, and a second heat exchanger where the refrigerant is heated up and the process air is cooled off; said first heat exchanger and/or said second heat exchanger being apt to perform heat exchange between said refrigerant flowing in said heat pump circuit and said process air stream; and a compressor to compress the refrigerant exiting said first heat exchanger and located within said basement;

- A motor apt to rotate said drum and at least a motor support apt to support a component of said motor;

- A compressor air conduit allowing compressor air to flow therethrough from the inside of said casing to the outside of the same or vice versa;

- Said compressor air conduit including a first aperture for compressor air realized at a portion of said motor support facing said compressor and a second aperture for said compressor air realized at said bottom surface of said basement.

[0021] In the following, with the term "dryer" both drying machines which dry only as well as combined washer-dryers are meant. In particular also washer-dryers that wash the laundry, spin/centrifuge it and finally tumble dry it.

[0022] The dryer of the invention includes a drying chamber, such as a drum, in which the load, e.g. clothes or laundry, to be dried is placed. The drum is part of an air process circuit which includes a process air conduit for channeling a stream of air to dry the load. The process air conduit is connected with its two opposite ends to the drum. More specifically, hot dry air is fed into the drum, flowing over the laundry, and the resulting humid cool air exits the same. The humid air stream (rich in water vapor) is then fed to an evaporator (or second heat exchanger) of a heat pump system, where the moist warm process air is cooled and the humidity present therein condenses. The resulting cool dry air is then heated up before entering again in the drying chamber by means a condenser (or first heat exchanger) of the heat pump system, and the whole loop is repeated till the end of the drying cycle.

[0023] The dryer furthermore includes a casing or bearing structure, comprising preferably a basement, and for example also a front wall and a rear wall. The front wall may be advantageously provided with a through opening, at which a door is mounted to access the drum in order to locate or remove the laundry. Within the casing, the drum is rotatably mounted for rotating around a horizontal or substantially horizontal or tilted rotational axis. Support element(s) for rotatably supporting the drum are preferably provided for within the cabinet. In an advantageous embodiment, said drum support element includes a shaft, said shaft passing through said back wall of the drum, said shaft defining said axis of rotation of said drum. Alternatively or in addition, said drum support element includes at least one roller, the axis of rotation of the roller(s) being parallel to the axis of rotation of the drum.

[0024] The drum is rotated preferably by means of a motor which is rotatably supported by a motor support.

One or more motor supports can be present. Preferably the motor also defines a motor axis, which is advantageously the axis of a shaft of the motor. Furthermore, preferably the motor also drives a main fan of the air process circuit which blows the process air into the drum. Said main fan and motor are preferably close to each other and even more preferably coaxial.

[0025] In an advantageous embodiment, the basement of the dryer of the invention includes a portion of the process air conduit, called basement process air conduit, which is advantageously substantially a duct formed in the basement. Within said basement process air conduit both heat exchangers of the heat pump system are located. Furthermore, the basement process air conduit channels the process air exiting the condenser of the heat pump system to an outlet of the basement.

[0026] In a standard operative position, the basement of the dryer is positioned on a floor or other substrate on which the dryer performs its standard operations. Such positioning defines a horizontal or substantially horizontal plane, which is called the basement plane. Given such horizontal plane, also a vertical axis is defined as well. Furthermore, the basement surface which faces the floor or anyhow is located at the lowermost part of the basement is called bottom surface of the basement. In some embodiments this surface could be covered by an additional bottom panel of the casing.

[0027] In this standard operative position, also other terms are well defined: "front" or "rear" or "back", "top" or "bottom", "upper" or "lower" are always referred to the normal standard configuration of a dryer with the basement positioned on a floor. The front wall of the dryer is defined by the wall in which the door from which the drum is accessed is positioned.

[0028] Preferably, on the basement of the dryer the rear wall and the front wall are mounted. Even more preferably, the casing includes further walls, for instance lateral walls and a top wall.

[0029] In a top view of the dryer, the basement can be considered as "divided" in two longitudinal halves by the axis of rotation of the drum (or the projection of said axis onto the basement plane). Whether the axis is horizontal (thus parallel to the basement plane (X,Y)) or tilted with respect to the latter, on a top view of the basement, the projection of the drum axis divides the basement in two halves, a first or left longitudinal half and a second or right longitudinal half. In other words, taking a plane which is perpendicular to the basement plane and which passes through the rotational axis of the drum, which generally coincides with the centerline of the basement, this plane virtually sections the basement in two longitudinal halves. This plane, called first plane, when sectioned by a plane parallel to the (X, Y) plane defines a line of division of the basement in two in a top view.

[0030] The two halves do not need to be identical. In other words with a first and a second half, a "right" and a "left" portion of the basement with respect of the above mentioned plane (first plane) passing through the rotational axis of the drum and perpendicular to the basement plane are meant. The projection on the basement of such rotational axis can be thus shifted from the centerline of the basement. Preferably, the centerline and the projection of the rotational axis of the drum coincide.

[0031] The layout of the heat pump system located in the basement of the dryer of the invention is the following.

[0032] The first heat exchanger and the second heat exchanger are preferably located within the basement air conduit and extend for the majority of their volume within the first longitudinal half of the basement, e.g. they are preferably substantially located for the majority of their volume to the left of the rotational axis of the drum. The heat exchangers can be completely contained within the first longitudinal half of the basement or part of their volume, the minority, can also extend within the second longitudinal half of the basement. Also, the exit of process air from the condenser is located within the first longitudinal half of the basement, at least for most of its area.

[0033] The compressor is advantageously located in the second longitudinal half of the basement. The compressor during the normal functioning of the heat pump system increases its temperature and, in order not to overheat, needs to be cooled down. In the dryer of the invention, the compressor is cooled down by compressor air which is drawn from the outside of the casing. The compressor air which is then heated up by the compressor is then preferably exhausted from the inside of the casing, e.g. from the basement, otherwise it can heat up other components within the casing itself, such as the heat exchanger(s) of the heat pump system, an inverter or other electronic components.

[0034] According to the invention, a compressor air conduit is realized in the basement so that air can be either drawn from the outside of the casing to cool the compressor or exhausted from the basement to the outside in order to avoid that such heated air remains inside the basement. Preferably, a compressor air conduit having an inlet to draw cooling compressor air from the outside of the casing and an outlet to exhaust heated compressor air to the outside of the casing is present. Such a compressor air conduit is so construed that either the inlet for compressor air to cool the compressor or the outlet for compressor air to be exhausted is realized at one of the motor supports.

[0035] In this way no other components have to be realized inside the casing, but an element already present is used for forming the inlet or outlet of the compressor air conduit. Such inlet or outlet is preferably realized as one or more apertures on the motor support.

[0036] Furthermore, the processor air conduit has not only one aperture (which can be the inlet or the outlet) - called in the following first aperture - in the support of the motor, but preferably includes an additional aperture - called in the following second aperture - in fluid communication with the outside of the casing (such an aperture can be an inlet or outlet as well, depending on the function of the aperture realized on the motor support) so that the processor air conduit includes a passage or channel to intake or discharge air formed between the first aperture and the second aperture. This second aperture is realized on the bottom of the casing, i.e. on the bottom surface of the basement which is facing the floor in standard operative condition.

[0037] The fact that the second aperture of the passage or channel is realized in the bottom surface reduces the risk that such passage or channel is obstructed by external object and also that, in case from the passage exhaust heated air flows, other objects, located in proximity of the aperture, are directly heated by the discharged air.

[0038] Preferably, such air passage or channel - part of the compressor air circuit - is always accessible to air because the bottom surface of the basement extends in a position that is spaced apart - at least where the second aperture is located - to the floor on which the laundry dryer is placed. The distance between bottom surface and the floor could be for example determined in an adjustable manner through vertically adjustable supports placed under the casing in a known manner.

[0039] In order to be effective and either cooling air can flow from this passage substantially directly to the compressor without flowing for a long distance within the basement or exhaust air is substantially immediately exhausted via this passage without heating other components in the dryer, the first aperture of the passage at the support of the motor is located facing one side of the compressor itself. In this way either the cooling or the heated air has to travel a limited distance in order to reach the compressor or enter the exit passage towards the exterior of the casing.

[0040] Preferably, said compressor air conduit includes a compressor exhaust air conduit portion and said first aperture is an inlet aperture for heated compressor air from said compressor and said second aperture is an outlet aperture for said heated compressor air to exit said casing.

[0041] Heated air exiting the laundry dryer may heat up objects located in the proximity of the same, including a user operating the laundry dryer. Therefore it is preferred that any contact between the user of the dryer and such heated air is avoided. Thus, preferably, the compressor air conduit includes a compressor exhaust air conduit portion, i.e. the passage formed between the first and the second aperture, for the exhaust air that exits the casing from the bottom of the same.

[0042] Advantageously, said dryer includes a compressor fan apt to blow cooling compressor air towards said compressor.

[0043] In this embodiment, compressor air is blown directly towards the compressor so that the cooling of the latter is improved and is quicker. For this purpose a fan, called compressor fan, dedicated to the cooling of the compressor is located close to the compressor itself.

[0044] More preferably, said compressor fan is housed in said basement and located facing said compressor substantially on an opposite side than a side facing said first aperture realized at said portion of said motor support, so that said compressor fan blows cooling compressor air towards said compressor and heated compressor air towards said first aperture.

[0045] The compressor in this embodiment is "sandwiched" between the compressor fan which blows cooling compressor air on one side and the first aperture to exhaust heated compressor air on the other side. The cooling of the compressor therefore is very effective, the cooling compressor air has to travel a very limited distance within the basement in order to perform its cooling task impinging onto the compressor, while the exhaust compressor air also travels a limited distance before exiting the casing. Being the first aperture on the opposite side of the compressor fan with respect to the compressor improves the efficiency in exhausting the heated compressor air due to the circulation path of the compressor air which is already at least partially oriented towards the first aperture by the compressor fan motion.

[0046] Advantageously, said compressor air conduit includes a compressor cooling air intake conduit portion having an outside inlet aperture to allow cooling air from the outside of the casing to enter the latter.

[0047] Inside the basement, there are several components which heat up air inside the casing itself, for example not only the compressor, but also the other heat exchanger(s) of the heat pump system as well as the motor. Therefore it is better to cool the compressor with air drawn from the outside of the casing which has a lower temperature than air already present in the casing, which might have been heated up.

[0048] For this purpose, the compressor air conduit does not only include the passage between the first and second aperture which has the function of exhaust compress air conduit portion to exhaust the heated compressor air, but also an additional portion to intake cooling compressor air from the outside of the casing. This additional portion has an aperture in fluid communication with the outside of the casing.

[0049] Advantageously, said outside inlet aperture is realized upstream said compressor fan in a flow direction of said cooling air.

[0050] Preferably, said outside inlet aperture is realized at a front wall of said casing.

[0051] Due to the fact that air is drawn from the outside to the inside of the casing from this inlet aperture, no hot air is exhausted from it, and for this reason it can be located at the front wall of the casing without causing any disturbing emission for the user or heating objects located close to the dryer. Furthermore, in the front of the casing, the risk of positioning objects to obstruct the aperture is also reduced when compared to an aperture realized at the lateral wall or back wall of the casing.

[0052] In an advantageous embodiment, said motor support includes a wall for the support of a shaft of said motor.

[0053] Preferably, the motor includes a shaft rotatably supported by bearings located in elements of the basement, such as walls. Preferably, the motor support includes at least two walls to support the motor at its opposite ends. On one of these walls, the one facing the compressor, the first aperture is preferably formed.

[0054] Advantageously, said first aperture for air realized on a portion of said motor support includes a plurality of slots substantially vertically aligned.

[0055] A single aperture or a plurality of apertures could be realized in the motor support. For example a plurality of vents are realized, which are vertically aligned. This realization is simple to achieve in particular when the basement is realized in plastic material.

[0056] Preferably, said first and second apertures are opposite apertures of a through channel connecting said first and second apertures and are realized in or at said motor support.

[0057] The first and second apertures are substantially connected by a duct or passage which is for all its extension substantially included within the motor support.

[0058] More preferably, said motor support includes a first and a second wall facing each other at least for a portion, said first wall including said first aperture, and said second wall being substantially not perforated, said through channel being defined by said first and second walls.

[0059] The compressor air passage, part of the compressor air circuit and delimited by the first and second aperture is preferably formed by two walls, both part of the motor support, which are facing one the other. The gap between the walls defines the compressor air passage. Compressor air, for example, may enter the first wall via the first aperture and then leave the passage formed by the two walls through the second aperture formed in the bottom of the basement. The second wall is substantially facing the first aperture, therefore compressor air entering the first aperture impinges against the second wall which deflects the compressor air flow substantially from an horizontal direction to a vertical direction so that the compressor air flow is directed towards the second aperture on the basement bottom surface.

[0060] The second wall, in a portion in which the compressor air impinges it, is non perforated to force this change of direction from substantially horizontal to substantially vertical of the compressor air flow.

[0061] In an advantageous embodiment, said basement is realized in a plastic material, and said motor support is integrally formed with said basement.

[0062] It should also be observed that, in the present description and in the attached claims, the terms "plastic material" and the like, are used to indicate any plastic or synthetic material, e.g. polymeric, or based on plastic or synthetic material, possibly added with fillers suitable to improve the functional and robustness characteristics thereof, such as minerals, textile synthetic fillers and so on and so forth.

[0063] The fact that the basement is realized in plastic allows a minimization of the numbers of elements included in the dryer of the invention. Indeed, with a single producing process, for example with the same molding process, the basement can be realized including a plurality of additional functional elements for the dryer that do not have to be realized separately and then assembled, such as the support of the motor. However other functional elements could be integrated as well, such as a basement duct for the flow of process air through the heat exchangers of the heat pump system or/and the seats for the heat exchangers.

[0064] Preferably, said motor support extends substantially vertically from said basement.

[0065] In a preferred embodiment, a distance between said compressor and said first aperture for compressor air realized on a portion of said motor support is comprised between 10 mm and 100 mm.

[0066] As mentioned, it is preferred that the distance between the compressor and the first aperture realized on the support of the motor is as limited as possible, compatibly with the size of the various elements, so that the cooling air reaches or the heated air leaves the compressor as quickly as possible.

[0067] Advantageously, said basement defines a basement plane and in which a first longitudinal half and a second longitudinal half of said basement are identifiable by means of a first plane perpendicular to said basement plane and passing through said rotational axis of the drum, said motor and said compressor being located within said second longitudinal half of said basement.

[0068] Preferably, said first heat exchanger and said second heat exchanger are located for the majority of their respective volumes within said first longitudinal half of said basement.

[0069] Being the heat exchangers and the compressor and motor the "bulky" elements in a dryer, preferably they are arranged so as they occupy different parts of the basement.

Brief description of the drawings

[0070] Further advantages of the present invention will be better understood with non-limiting reference to the appended drawings, where:

- Fig. 1 is a perspective view of a laundry dryer realized according to the present invention;
- Fig. 2 is a perspective view of the laundry dryer of Fig. 1 with an element of the casing removed for showing some internal components;
- Fig. 2a is an enlarged view of a portion of the dryer of fig. 2;
- Fig. 3 is a perspective view, in a disassembled configuration, of the basement of the dryer of Fig. 1 or Fig. 2;
- Fig. 4 is a top view of the basement of Fig. 3;
- Fig. 4a is a front view of a first detail of the basement of Fig. 4;
- Fig. 4b is cross section of a second detail of the base-

ment of Fig. 4;

- Fig. 5 is a perspective view from below of the basement of Figs. 3 and 4; and
- Fig. 6 is a perspective view of the basement of Figs. 3 and 4 with internal components removed.

Detailed description of one or more embodiments of the invention

[0071] With initial reference to Figs. 1 and 2, a laundry dryer realized according to the present invention is globally indicated with 1.

[0072] Laundry dryer 1 comprises an outer box or casing 2, preferably but not necessarily parallelepiped-shaped, and a drying chamber, such as a drum 3, for example having the shape of a hollow cylinder, for housing the laundry and in general the clothes and garments to be dried. The drum 3 is preferably rotatably fixed to the cabinet 2, so that it can rotate around a preferably horizontal axis R (in alternative embodiments, rotation axis may be tilted). Access to the drum 3 is achieved for example via a door 4, preferably hinged to cabinet 2, which can open and close an opening 4a realized on the cabinet itself.

[0073] More in detail, casing 2 generally includes a front wall 20, a rear wall 21 and two sidewalls 25, all mounted on a basement 24. Preferably, the basement 24 is realized in plastic material. Preferably, basement 24 is molded via an injection molding process. Preferably, on the front wall 20, the door 4 is hinged so as to access the drum. The cabinet, with its walls, defines the volume of the laundry dryer 1. Advantageously, basement 24 includes an upper and a lower shell portion 24a, 24b (visible in Figures 3 and 6 detailed below).

[0074] The dryer 1, and in particular basement 24, defines an horizontal plane (X,Y) which is substantially the plane of the ground on which the dryer 1 is situated, thus it is considered to be substantially horizontal, and a vertical direction Z perpendicular to the plane (X,Y). Basement 24 includes a bottom surface 24bs (visible in full in Fig. 5) facing the exterior of the casing 2 and in particular a surface facing the floor or ground where the dryer 1 rests.

[0075] Laundry dryer 1 also preferably comprises an electrical motor assembly 50 for rotating, on command, revolving drum 3 along its axis inside cabinet 2. Motor 50 includes a shaft 51 which defines a motor axis of rotation M.

[0076] Further, laundry dryer 1 may include an electronic central control unit (not shown) which controls both the electrical motor assembly 50 and other components of the dryer 1 to perform, on command, one of the user-selectable drying cycles preferably stored in the same central control unit. The programs as well other parameters of the laundry dryer 1, or alarm and warning functions can be set and/or visualized in a control panel 11, preferably realized in a top portion of the dryer 1, such as above door 4.

[0077] With reference to Figure 2, the rotatable drum 3 includes a mantle, having preferably a substantially cylindrical, tubular body 3c, which is preferably made of metal material and is arranged inside the cabinet 2 and apt to rotate around the general rotational axis R which can be - as said - horizontal, i.e. parallel to the (X,Y) plane, or tilted with respect to the latter. The mantle 3c defines a first end 3a and a second end 3b and the drum 3 is so arranged that the first end 3a of the mantle 3c is faced to the laundry loading/unloading opening realized on the front wall 20 of the cabinet 2 and the door 4, while the second end 3b faces the rear wall 21.

[0078] Drum 3 may be an open drum, i.e. both ends 3a and 3b are opened, or it may include a back wall (not shown in the appended drawings) fixedly connected to the mantle and rotating with the latter.

[0079] In order to rotate, support elements for the rotation of the drum are provided as well in the laundry of the invention. Such support elements might include rollers at the front and/or at the back of the drum, as well as or alternatively a shaft connected to the rear end of the drum (shaft is not depicted in the appended drawings). In Fig. 2, for example, a roller 10 connected to the basement via a boss 101 is depicted. Any support element for the rotation of the drum around axis R is encompassed by the present invention.

[0080] Dryer 1 additionally includes a process air circuit which comprises the drum 3 and an air process conduit 18, depicted as a plurality of arrows showing the path flow of a process air stream through the dryer 1 (see Figures 3 and 4). In the basement 24, a portion of the air process conduit 18 is formed by the connection of the upper shell 24a and the lower shell 24b. Air process conduit 18 is preferably connected with its opposite ends to the two opposite sides of drum 3, i.e. first and second rear end 3a,3b of mantle 3c. Process air circuit also includes a fan or blower 12 (shown in Fig. 3).

[0081] The dryer 1 of the invention additionally comprises a heat pump system 30 including a first heat exchanger (called also condenser) 31 and a second heat exchanger (called also evaporator) 32 (see figure 3). Heat pump 30 also includes a refrigerant closed circuit (partly depicted) in which a refrigerant fluid flows, when the dryer 1 is in operation, cools off and may condense in correspondence of the condenser 31, releasing heat, and warms up, in correspondence of the second heat exchanger (evaporator) 32, absorbing heat. A compressor receives refrigerant in a gaseous state from the evaporator 32 and supplies the condenser 31, thereby closing the refrigerant cycle. In the following the heat exchangers are named either condenser and evaporator or first and second heat exchanger, respectively. More in detail, the heat pump circuit connects via piping 35 (see Fig. 3) the second heat exchanger (evaporator) 32 via a compressor 33 to the condenser 31. The outlet of condenser 31 is connected to the inlet of the evaporator 32 via an expansion device (not visible), such as a choke, a valve or a capillary tube.

[0082] Preferably, in correspondence of evaporator 32, the laundry dryer 1 of the invention may include a condensed-water canister (also not visible) which collects the condensed water produced, when the dryer 1 is in operation, inside evaporator 32 by condensation of the surplus moisture in the process air stream arriving from the drying chamber (i.e. drum) 3. The canister is located at the bottom of the evaporator 32. Preferably, through a connecting pipe and a pump (not shown in the drawings), the collected water is sent in a reservoir located in correspondence of the highest portion of the dryer 1 so as to facilitate a comfortable manual discharge of the water by the user of the dryer 1.

[0083] The condenser 31 and the evaporator 32 of the heat pump 30 are located in correspondence of the process air conduit 18 formed in the basement 24 (see figure 3).

[0084] In case of a condense-type dryer - as depicted in the appended figures - where the air process circuit is a closed loop circuit, the condenser 31 is located downstream of the evaporator 32. The air exiting the drum 3 enters the conduit 18 and reaches the evaporator 32 which cools down and dehumidifies the process air. The dry cool process air continues to flow through the conduit 18 till it enters the condenser 31, where it is warmed up by the heat pump 30 before re-entering the drum 3.

[0085] It is to be understood that in the dryer 1 of the invention, an air heater, such as an electrical heater, can also be present, in addition to the heat pump 30. In this case, heat pump 30 and heater can also work together to speed up the heating process (and thus reducing the drying cycle time). In the latter case, preferably condenser 31 of heat pump 30 is located upstream the heater. Appropriate measures should be provided to avoid the electric heater to fuse plastic components of the dryer 1.

[0086] Further, with now reference to Figures 4 and 6, in the basement, the process air conduit 18 preferably includes a duct formed by the upper and the lower shells 24a, 24b, having an inlet 19in from which process air is received from the drum 3 and an outlet 19 to channel process air out of the basement 24. Between inlet 19in and outlet 19, the duct is formed, preferably as two single pieces joined together and belonging to the upper and lower shell 24a, 24b, and including a first and a second portion 28 and 29. Advantageously, in the first portion 29 of this duct, seats 29s are formed for locating the first and the second heat exchangers 31, 32. Preferably, first and second heat exchanger 31, 32 are placed one after the other, the first heat exchanger 31 being downstream in the direction of flow of the process air the second heat exchanger 32. Further, the second portion 28, called basement air duct portion 28, channels the process air exiting from the first heat exchanger 31 towards the basement outlet 19.

[0087] The second portion 28 thus starts at the location of the exit 28in of the first heat exchanger 31, considered as the location of a plane sectioning the duct portion 28 and substantially in front or in contact with a surface of the first heat exchanger 31 from which process air exits.

[0088] Considering now a first plane P1 (depicted in Fig. 6) perpendicular to the basement plane (X,Y) and embedding the rotational axis R of the drum 3, this first plane P1 divides the basement 24 in two halves, called, with now reference to figure 6, basement first or right half 24 first half and basement second or left half 24 second half. These two halves 24 first half and 24 second half need not to be identical in dimension (i.e. they are not mathematical halves), however in the present depicted embodiment P1 also embeds a first - longitudinal - centerline H1 of the basement. Furthermore, still in the depicted embodiment, P1 is a vertical plane.

[0089] On the first half of the basement, 24 first half, preferably the portion 29 of the duct is positioned, where also the first and the second heat exchanger 31, 32 of heat pump 30 are located. The heat exchanger can be completely contained within the first half of the basement 24 first half or they can also extend beyond the limit defined by the first plane P1. If a portion of the first and/or second heat exchanger 31, 32 is also located within the second half of the basement 24 second half, this portion is the minority of the whole volume occupied by the first and/or second heat exchanger 31, 32.

[0090] On the second half of the basement 24 second half, preferably the compressor 33 is located. More preferably, also the motor 50 is located in this second half.

[0091] Preferably, motor 50 including shaft 51 defining motor axis M has the motor axis substantially parallel to the first plane P1 (see Figures 4 and 6).

[0092] Again with reference to Figs. 4 and 6, considering now a second plane P2, perpendicular to P1 and to the basement plane (X,Y) and passing through a second centerline H2 of the basement, the basement 24 is divided, by a combination of the first and the second plane P1, P2, in four quarters Q1 - Q4. The quarters are numbered in a clockwise manner, the first quarter Q1 being the rearmost quarter of the first half of the basement 24 (e.g. the quarter facing the rear wall 21), the second quarter Q2 being the rearmost quarter of the second half of the basement 24, the third quarter Q3 the foremost quarter (e.g. the quarter facing the front wall 20) of the second half of the basement and the last fourth quarter Q4 the foremost quarter of the first half of the basement 24.

[0093] It can be therefore seen that in this preferred embodiment the heat exchangers 31, 32 and the duct portion 29 are substantially contained for the majority of their volume within the fourth quarter Q4, the second heat exchanger closer to the front wall 20 than the first heat exchanger 31; preferably compressor 33 is contained within the third quarter Q3, and the outlet 19 of basement 19 is located in the second quarter Q2, preferably facing rear wall 21 of casing 2.

[0094] Motor 50 is preferably contained within the second quarter Q2 as well and its shaft 51 extends in such a way that it sticks out from the outlet 19, i.e. it exits the basement 24 with one of its ends through the basement outlet 19. Preferably, motor shaft 51 is also the shaft of fan 12, which is located in proximity of outlet 19, preferably facing the latter. Fan 12 blows the process air exiting the basement 24 through outlet 19 into the drum 3, preferably through a passage, not shown, part of the process air circuit 18, formed within the rear wall 21.

[0095] The duct portion 28 extends from the air exit, 28in, of the condenser which is located within the first quarter Q1 preferably close to the boundary with the fourth quarter Q4, i.e. close to centerline H2, to the outlet 19 of the basement, located in the second quarter Q4.

[0096] In the depicted embodiment, the duct portion 28 therefore comprises at least one curve or bend in order to extend from the first to the second quarter. Furthermore, duct portion 28 includes walls 28w which form and delimit the duct portion itself.

[0097] With now reference back to Fig. 2, motor 50 includes at least a support element 53, more preferably a first and a second support elements 53, 53' located at or in proximity of the two opposite axial ends of motor 50 to support shaft 51 in at least two locations. Preferably support elements 53, 53' are formed in plastic material and even more preferably are formed integrally with the lower shell 24b of basement 24 in a single moulding process. Support elements 53 and 53' extend substantially vertically from the lower shell portion 24b of basement 24 for a given height and on each of them includes - in the depicted embodiment - a bearing 53be, 53'be for the rotational support of shaft 51 mounted thereon. Preferably, in their vertical extension, support elements 53, 53' are substantially parallel, or only slightly tilted, with respect to a vertical plane, more preferably they are substantially parallel to the front wall 21.

[0098] First support element 53, having substantially a plate like form, faces on one side motor 50 and on the other side compressor 33, while second support element 53' faces on one side motor 50 and on the other said duct 28 of process air in proximity of the outlet 19 of the basement 24.

[0099] Compressor 33 is located in the third quarter Q3 between the first support element 53 and the front wall 20 of casing 2 in one direction and between lateral wall 25 and heat exchangers 31, 32 in the opposite direction. Laundry dryer 1 preferably includes a compressor air circuit 150 which in turn comprises a first portion to exhaust compressor air heated by the compressor 33 to the outside of the casing 2 and preferably also a second portion to introduce cooling processor air from the outside of the casing 2 to cool the processor.

[0100] Preferably, compressor air circuit 150 is contained within the second half 24 second half of the basement 24.

[0101] The portion to exhaust the heated compressor air is realized as follows.

[0102] As better visible in the enlarged detail of Fig. 2a, support element 53 includes at least an aperture 54, in the depicted embodiment a plurality of vertically aligned slots or vents 54, called first aperture. Apertures 54 also face compressor 33.

[0103] The distance between any of the apertures 54 and the compressor 33 is preferably comprised between 10 mm and 100 mm, said distance being also variable due to the fact that the surface of support 53 where the slots or apertures 54 are realized is slightly vertically inclined with respect to a compressor external surface. Although a plurality of apertures is depicted in the embodiment of the appended Figures, it is to be understood that a different number of apertures, including a single aperture, and a different shape of the same, is encompassed in the present invention.

[0104] Apertures 54 are inlets to a passage 57 (Fig. 4b) which is the portion of compressor air conduit 150 used to exhaust the heated compressor air.

[0105] As visible in the section of figure 4b, which is the section along line B-B of the top view of the basement 24 in figure 4, channel 57 is formed by two walls 53a, 53b part of the support element 53. Wall 53a can be clearly seen in the enlarged detail of Fig. 4a. In other words, support element 53 includes two walls facing each other at least for a portion, a first wall 53a including apertures 54 and a second wall 53b, spaced apart from the first wall so that a gap is formed therebetween. The second wall is non perforated. The gap formed by the two walls 54a, 54b defines the boundaries of the channel 57.

[0106] Channels 57 terminates with a second aperture 55 realized on the bottom of basement 24, e.g. on the bottom surface 24bs of basement 24, thus facing the floor on which the laundry dryer 1 is located (see Figs. 4a and 5).

[0107] A heated air flow coming from the compressor 33 entering the apertures 54 formed on the first wall 53a of support element 53 impinges on the second wall 53b which is located in front of apertures 54 and thus it is deflected. The deflection redirects the flow of heated compressor air towards the bottom of the basement 24 (downwardly), i.e. towards the second aperture 55 which has the function of an outlet for the heated compressor air.

[0108] In order to efficiently direct the heated compressor air towards the apertures 54 so that the heated air rapidly exits the basement 24 of the dryer, preferably a compressor fan 59 (schematically depicted with a rectangle in Figure 4) is located in proximity of compressor 33.

[0109] Preferably, compressor fan 59 is located on a side of the compressor 33 opposite to the side where compressor 33 faces apertures 54. In the present embodiment, compressor fan 59 is thus located in proximity of front wall 20.

[0110] Compressor fan 59 thus blows compressor air towards the compressor 33 and at the same time towards the apertures 54, improving the efficiency of exhaustion of air from the latter.

[0111] Furthermore, preferably the air blown by compressor fan 59 is not air already present within the casing 2 of the laundry, which might have been already warmed up, but it is "fresh" air coming from the outside of casing

2. In order to introduce air from the outside, the compressor air circuit 150 includes a second portion to introduce air from the outside of the casing and direct the latter towards the compressor 33. This second portion of compressor air conduit includes an inlet 150in for the introduction of cooling compressor air from the outside of the casing 2.

[0112] Due to the positioning of the fan or blower 59, it is preferred to form such an inlet 150in in the front wall 20 of the casing 2 to minimize the distance between the compressor fan 59 and the inlet 150in itself, so that air does not have to travel a long distance within the casing (and warm up in the meantime) before reaching the compressor 33. Cooling compressor air from the inlet aperture 150in is thus introduced in the casing 2, blown towards the compressor 33 by the compressor fan 59 and heated by compressor, then exhausted via passage 57 through the bottom of the basement to the outside of casing 2.

[0113] In this way, an efficient cooling of the compressor takes place, minimizing the risk of overheating of the compressor and of additional electrical components within the laundry dryer.

Claims

1. A laundry dryer including:

- a casing (2), rotatably supporting a drum (3) for receiving a load to be dried, said drum being apt to rotate around a rotational axis (R), said casing including a basement (24) defining a bottom surface (24bs);
- A process air conduit (18) in fluid communication with the drum (3) where a process air stream is apt to flow;
- A heat pump system (30) having a heat pump circuit in which a refrigerant can flow, said heat pump circuit including a first heat exchanger (31) where the refrigerant is cooled off and the process air is heated up, and a second heat exchanger (32) where the refrigerant is heated up and the process air is cooled off; said first heat exchanger (31) and/or said second heat exchanger (32) being apt to perform heat exchange between said refrigerant flowing in said heat pump circuit and said process air stream; and a compressor (33) to compress the refrigerant exiting said second heat exchanger (32) and located within said basement (24);
- A motor (50) apt to rotate said drum (3) and at least a motor support (53) apt to support a component of said motor (50);
- A compressor air conduit (150) allowing compressor air to flow therethrough from the inside of said casing (2) to the outside of the same or vice versa;

characterized in that

said compressor air conduit (150) includes a first aperture (54) for compressor air realized at a portion of said motor support (53) facing said compressor (33) and a second aperture (55) for said compressor air realized at said bottom surface (24bs) of said basement (24), such that compressor air drawn inside the casing from the outside thereof cools down the compressor and is then exhausted to the outside of the casing.

2. The laundry dryer (1) according to claim 1, wherein said compressor air conduit (150) includes a compressor exhaust air conduit portion and said first aperture (54) is an inlet aperture for heated compressor air from said compressor (33) and said second aperture (55) is an outlet aperture for said heated compressor air to exit said casing (2).

3. The laundry dryer (1) according to claim 1 or 2, including a compressor fan (59) apt to blow cooling air towards said compressor (33).

4. The laundry dryer (1) according to claim 3, wherein said compressor fan (59) is housed in said basement (24) and located facing said compressor (33) substantially on an opposite side than a side facing said first aperture (54) realized at said portion of said motor support (53), so that said compressor fan (59) blows cooling compressor air towards said compressor (33) and heated compressor air towards said first aperture (54).

5. The laundry dryer (1) according to any of the preceding claims, wherein said compressor air conduit (150) includes a compressor cooling air intake conduit portion having an outside inlet aperture (150in) to allow cooling compressor air from the outside of the casing (2) to enter the casing (2).

6. The laundry dryer (1) according to claim 5, wherein said outside inlet aperture (150in) is realized upstream said compressor fan (59) in a flow direction of said cooling compressor air.

7. The laundry dryer (1) according to claim 5 or 6, wherein said outside inlet aperture (150in) is realized at a front wall (20) of said casing (2).

8. The laundry dryer (1) according to any of the preceding claims, wherein said motor support (53) includes a first wall (53a) for the support of a shaft (51) of said motor (50).

9. The laundry dryer (1) according to any of the preceding claims, wherein said first aperture (54) realized at a portion of said motor support (53) includes a plurality of slots substantially vertically aligned.

10. The laundry dryer (1) according to any of the preceding claims, wherein said first aperture (54) and said second aperture (55) are opposite apertures of a through channel (57) connecting said first and second apertures (54, 55).

11. The laundry dryer (1) according to claim 10, wherein said motor support (53) includes a first and a second walls (53a, 53b) facing each other at least for a portion, said first wall including said first aperture (53), and said second wall being substantially not perforated, said through channel (57) being defined by said first and second walls (53a, 53b).

12. The laundry dryer (1) according to any of the preceding claims, wherein said basement (24) is realized in a plastic material and said motor support (53) is integrally formed with said basement (24).

13. The laundry dryer (1) according to any of the preceding claims, wherein said motor support (53) extends substantially vertically from said basement (24).

14. The laundry dryer (1) according to any of the preceding claim, wherein a distance between said compressor (33) and said first aperture (54) realized at a portion of said motor support (53) is comprised between 10 mm and 100 mm.

15. The laundry dryer (1) according to any of the preceding claims, wherein said basement (24) defines a basement plane (X, Y) and in which a first longitudinal (24 first half) and a second longitudinal half (24 second half) of said basement (24) are identifiable by means of a first plane (P1) perpendicular to said basement plane (X, Y) and passing through said rotational axis (R) of the drum (3); said motor (50) and said compressor (33) being located within said second longitudinal half (24 second half) of said basement (24).

Patentansprüche

1. Wäschetrockner, beinhaltend:

- ein Gehäuse (2), das eine Trommel (3) drehbar abstützt, zur Aufnahme einer zu trocknenden Wäschebefüllung, wobei die Trommel geeignet ist, sich um eine Drehachse (R) zu drehen, wobei das Gehäuse ein Unterteil (24) beinhaltet, das eine Bodenfläche (24bs) definiert;
- eine Prozessluftleitung (18), die fluidisch mit der Trommel (3) verbunden ist, durch die ein Prozessluftstrom strömen kann;
- ein Wärmepumpensystem (30) mit einem Wärmepumpenkreislauf, in dem ein Kühlmittel strömen kann, wobei der Wärmepumpenkreislauf einen ersten Wärmetauscher (31), in dem das Kühlmittel abgekühlt und die Prozessluft erwärmt wird, sowie einen zweiten Wärmetauscher (32) beinhaltet, in dem das Kühlmittel erwärmt und die Prozessluft abgekühlt wird, wobei der erste Wärmetauscher (31) und/oder der zweite Wärmetauscher (32) geeignet sind, einen Wärmetausch zwischen dem im Wärmepumpenkreislauf strömenden Kühlmittel und dem Prozessluftstrom zu bewirken, und wobei ein Verdichter (33) vorgesehen ist, um das aus dem zweiten Wärmetauscher (32) austretende Kühlmittel zu verdichten, das sich innerhalb des Unterteils (24) befindet;
- einen Motor (50), der geeignet ist, die Trommel (3) in Drehung zu versetzen, und mindestens eine Motorabstützung (53), die geeignet ist, ein Bauteil des Motors (50) abzustützen;
- eine Verdichterluftleitung (150), die es zulässt, dass durch sie Verdichterluft vom Inneren des Gehäuses (2) nach außerhalb des Gehäuses strömt oder umgekehrt; **dadurch gekennzeichnet, dass**

die Verdichterluftleitung (150) eine erste Öffnung (54) für an einem dem Verdichter (33) zugewandten Abschnitt der Motorabstützung (53) realisierte Verdichterluft sowie eine zweite Öffnung (55) für die an der Bodenfläche (24bs) des Unterteils (24) realisierte Verdichterluft beinhaltet, so dass von außerhalb des Gehäuses in das Innere des Gehäuses eingezogene Verdichterluft den Verdichter abkühlt und dann nach außerhalb des Gehäuses abgeleitet wird.

2. Wäschetrockner (1) nach Anspruch 1, bei dem die Verdichterluftleitung (150) einen Verdichterabluftleitungsabschnitt beinhaltet, wobei die erste Öffnung (54) eine Einlassöffnung für erwärmte Verdichterluft aus dem Verdichter (33) und die zweite Öffnung (55) eine Auslassöffnung für die aus dem Gehäuse (2) austretende erwärmte Verdichterluft ist.

3. Wäschetrockner (1) nach Anspruch 1 oder 2, der einen Verdichterlüfter (59) beinhaltet, der geeignet ist, Kühlluft hin zum Verdichter (33) zu blasen.

4. Wäschetrockner (1) nach Anspruch 3, bei dem der Verdichterlüfter (59) im Unterteil (24) untergebracht und, dem Verdichter (33) zugewandt, im Wesentlichen an einer gegenüberliegenden Seite zu einer der ersten Öffnung (54) zugewandten Seite angeordnet ist, die am Abschnitt der Motorabstützung (53) realisiert ist, so dass der Verdichterlüfter (59) kühlende Verdichterluft hin zum Verdichter (33) und erwärmte Verdichterluft hin zur ersten Öffnung (54) bläst.

5. Wäschetrockner (1) nach einem der vorstehend aufgeführten Ansprüche, bei dem die Verdichterluftleitung (150) einen Eintrittsleitungsabschnitt für Verdichterkühlluft beinhaltet, der eine Außeneintrittsöffnung (150in) aufweist, so dass kühlende Verdichterluft von außerhalb des Gehäuses (2) in das Gehäuse (2) gelangen kann.

6. Wäschetrockner (1) nach Anspruch 5, bei dem die Außeneintrittsöffnung (150in) stromaufwärts vor dem Verdichterlüfter (59) in einer Strömungsrichtung der kühlenden Verdichterluft realisiert ist.

7. Wäschetrockner (1) nach Anspruch 5 oder 6, bei dem die Außeneintrittsöffnung (150in) an einer Vorderwand (20) des Gehäuses (2) realisiert ist.

8. Wäschetrockner (1) nach einem der vorstehend aufgeführten Ansprüche, bei dem die Motorabstützung (53) eine erste Wand (53a) zur Abstützung einer Welle (51) des Motors (50) beinhaltet.

9. Wäschetrockner (1) nach einem der vorstehend aufgeführten Ansprüche, bei dem die an einem Abschnitt der Motorabstützung (53) realisierte erste Öffnung (54) mehrere im Wesentlichen vertikal ausgerichtete Schlitze beinhaltet.

10. Wäschetrockner (1) nach einem der vorstehend aufgeführten Ansprüche, bei dem die erste Öffnung (54) und die zweite Öffnung (55) gegenüberliegende Öffnungen eines durchgehenden Kanals (57) sind, der die erste und die zweite Öffnung (54, 55) miteinander verbindet.

11. Wäschetrockner (1) nach Anspruch 10, bei dem die Motorabstützung (53) eine erste und eine zweite Wand (53a, 53b) beinhaltet, die mindestens über einen Abschnitt einander zugewandt sind, wobei die erste Wand die erste Öffnung (53) beinhaltet und die zweite Wand im Wesentlichen nicht perforiert ist, wobei der durchgehende Kanal (57) durch die erste und die zweite Wand (53a, 53b) definiert ist.

12. Wäschetrockner (1) nach einem der vorstehend aufgeführten Ansprüche, bei dem das Unterteil (24) aus einem Kunststoffmaterial besteht und die Motorabstützung (53) integral mit dem Unterteil (24) ausgebildet ist.

13. Wäschetrockner (1) nach einem der vorstehend aufgeführten Ansprüche, bei dem die Motorabstützung (53) sich vom Unterteil (24) aus im Wesentlichen vertikal erstreckt.

14. Wäschetrockner (1) nach einem der vorstehend aufgeführten Ansprüche, bei dem eine Distanz zwischen dem Verdichter (33) und der an einem Abschnitt der Motorabstützung (53) realisierten ersten Öffnung (54) zwischen 10 mm und 100 mm beträgt.

15. Wäschetrockner (1) nach einem der vorstehend aufgeführten Ansprüche, bei dem das Unterteil (24) eine Unterteilebene (X, Y) definiert, und wobei eine erste Längshälfte (24, erste Hälfte) und eine zweite Längshälfte (24, zweite Hälfte) des Unterteils (24) mittels einer ersten Ebene (P1), die senkrecht zur Unterteilebene (X, Y) und durch die Drehachse (R) der Trommel (3) verläuft, identifizierbar sind, wobei der Motor (50) und der Verdichter (33) sich innerhalb der zweiten Längshälfte (24, zweite Hälfte) des Unterteils (24) befinden.

Revendications

1. Sèche-linge comprenant :

- une carrosserie (2), soutenant en rotation un tambour (3) pour recevoir une charge à sécher, ledit tambour étant apte à tourner autour d'un axe de rotation (R), ladite carrosserie comprenant un socle (24) définissant une surface de fond (24bs) ;
- un conduit (18) d'air de traitement en communication fluidique avec le tambour (3) où un courant d'air de traitement est apte à circuler ;
- un système de pompe à chaleur (30) comportant un circuit de pompe à chaleur dans lequel peut circuler un fluide frigorigène, ledit circuit de pompe à chaleur comprenant un premier échangeur thermique (31), où le frigorigène est refroidi et l'air de traitement est réchauffé, et un second échangeur thermique (32), où le frigorigène est réchauffé et l'air de traitement est refroidi ; ledit premier échangeur thermique (31) et/ou ledit second échangeur thermique (32) étant aptes à effectuer un échange de chaleur entre ledit fluide frigorigène circulant dans ledit circuit de pompe à chaleur et ledit courant d'air de traitement ; et un compresseur (33), situé à l'intérieur dudit socle (24), pour comprimer le fluide frigorigène sortant dudit second échangeur thermique (32) ;
- un moteur électrique (50) apte à faire tourner ledit tambour (3) et au moins un support (53) de moteur apte à soutenir un composant dudit moteur (50) ;
- un conduit (150) d'air du compresseur permettant à l'air du compresseur de circuler à travers de l'intérieur de ladite carrosserie (2) vers l'extérieur de celle-ci ou vice-versa,

caractérisé en ce que ledit conduit (150) d'air du compresseur comprend une première ouverture (54) pour l'air du compresseur, réalisée au niveau d'une partie dudit support (53) du moteur et faisant face audit compresseur (33), et une seconde ouverture (55) pour l'air du compresseur, réalisée au niveau de ladite surface de fond (24bs) dudit socle (24), de telle sorte que l'air du compresseur aspiré à l'intérieur de la carrosserie depuis l'extérieur de celle-ci refroidit le compresseur et est ensuite évacué vers l'extérieur de la carrosserie.

2. Sèche-linge (1) selon la revendication 1, dans lequel ledit conduit (150) d'air du compresseur comprend un conduit d'air d'échappement du compresseur et ladite première ouverture (54) est une ouverture d'entrée pour l'air chauffé de compresseur provenant dudit compresseur (33) et ladite seconde ouverture (55) est une ouverture de sortie pour ledit air chauffé de compresseur pour qu'il sorte de ladite carrosserie (2).

3. Sèche-linge (1) selon la revendication 1 ou 2, comprenant un ventilateur (59) de compresseur apte à souffler de l'air de refroidissement vers ledit compresseur (33).

4. Sèche-linge (1) selon la revendication 3, dans lequel ledit ventilateur (59) de compresseur est logé dans ledit socle (24) et situé en face dudit compresseur (33), pratiquement du côté opposé au côté tourné vers ladite première ouverture (54) réalisée au niveau de ladite partie dudit support (53) du moteur, de façon à ce que ledit ventilateur (59) de compresseur souffle de l'air de compresseur de refroidissement vers ledit compresseur (33) et de l'air de compresseur chauffé vers ladite première ouverture (54).

5. Sèche-linge (1) selon l'une quelconque des revendications précédentes, dans lequel ledit conduit (150) d'air du compresseur comprend une partie de conduit de prise d'air de refroidissement du compresseur comportant une ouverture (150in) d'entrée de l'extérieur pour permettre à l'air de refroidissement du compresseur venant de l'extérieur de la carrosserie (2) d'entrer dans la carrosserie (2).

6. Sèche-linge (1) selon la revendication 5, dans lequel ladite ouverture (150in) d'entrée de l'extérieur est réalisée en amont dudit ventilateur (59) de compresseur dans le sens d'écoulement dudit air de refroidissement du compresseur.

7. Sèche-linge (1) selon la revendication 5 ou 6, dans lequel ladite ouverture (150in) d'entrée de l'extérieur est réalisée au niveau de la paroi avant (20) de ladite carrosserie (2).

8. Sèche-linge (1) selon l'une quelconque des revendications précédentes, dans lequel ledit support (53) du moteur comprend une première paroi (53a) pour soutenir un arbre (51) dudit moteur (50).

9. Sèche-linge (1) selon l'une quelconque des revendications précédentes, dans lequel ladite première ouverture (54) réalisée au niveau d'une partie dudit support (53) du moteur comprend une pluralité de fentes alignées sensiblement verticalement.

10. Sèche-linge (1) selon l'une quelconque des revendications précédentes, dans lequel ladite première ouverture (54) et ladite seconde ouverture (55) sont les ouvertures opposées d'un canal traversant (57) raccordant lesdites première et seconde ouvertures (54, 55).

11. Sèche-linge (1) selon la revendication 10, dans lequel ledit support (53) du moteur comprend une première et une seconde parois (53a, 53b) en face l'une de l'autre au moins pour une partie, ladite première paroi comprenant ladite première ouverture (53) et ladite seconde paroi n'étant pratiquement pas perforée, ledit canal traversant (57) étant délimité par lesdites première et seconde parois (53a, 53b).

12. Sèche-linge (1) selon l'une quelconque des revendications précédentes, dans lequel ledit socle (24) est réalisé dans une matière plastique et ledit support (53) du moteur est formé d'une seule pièce avec ledit socle (24).

13. Sèche-linge (1) selon l'une quelconque des revendications précédentes, dans lequel ledit support (53) du moteur se dresse sensiblement à la verticale depuis ledit socle (24).

14. Sèche-linge (1) selon l'une quelconque des revendications précédentes, dans lequel la distance entre ledit compresseur (33) et ladite première ouverture (54) réalisée au niveau d'une partie dudit support (53) du moteur est comprise entre 10 mm et 100 mm.

15. Sèche-linge (1) selon l'une quelconque des revendications précédentes, dans lequel ledit socle (24) définit un plan (X, Y) de socle et dans lequel une première moitié longitudinale (24 first half) et une seconde moitié longitudinale (24 second half) dudit socle (24) peuvent être identifiées au moyen d'un premier plan (P1), perpendiculaire audit plan (X, Y) de socle et passant par ledit axe de rotation (R) du tambour (3) ; ledit moteur (50) et ledit compresseur (33) étant situés à l'intérieur de ladite seconde moitié longitudinale (24 second half) dudit socle (24).

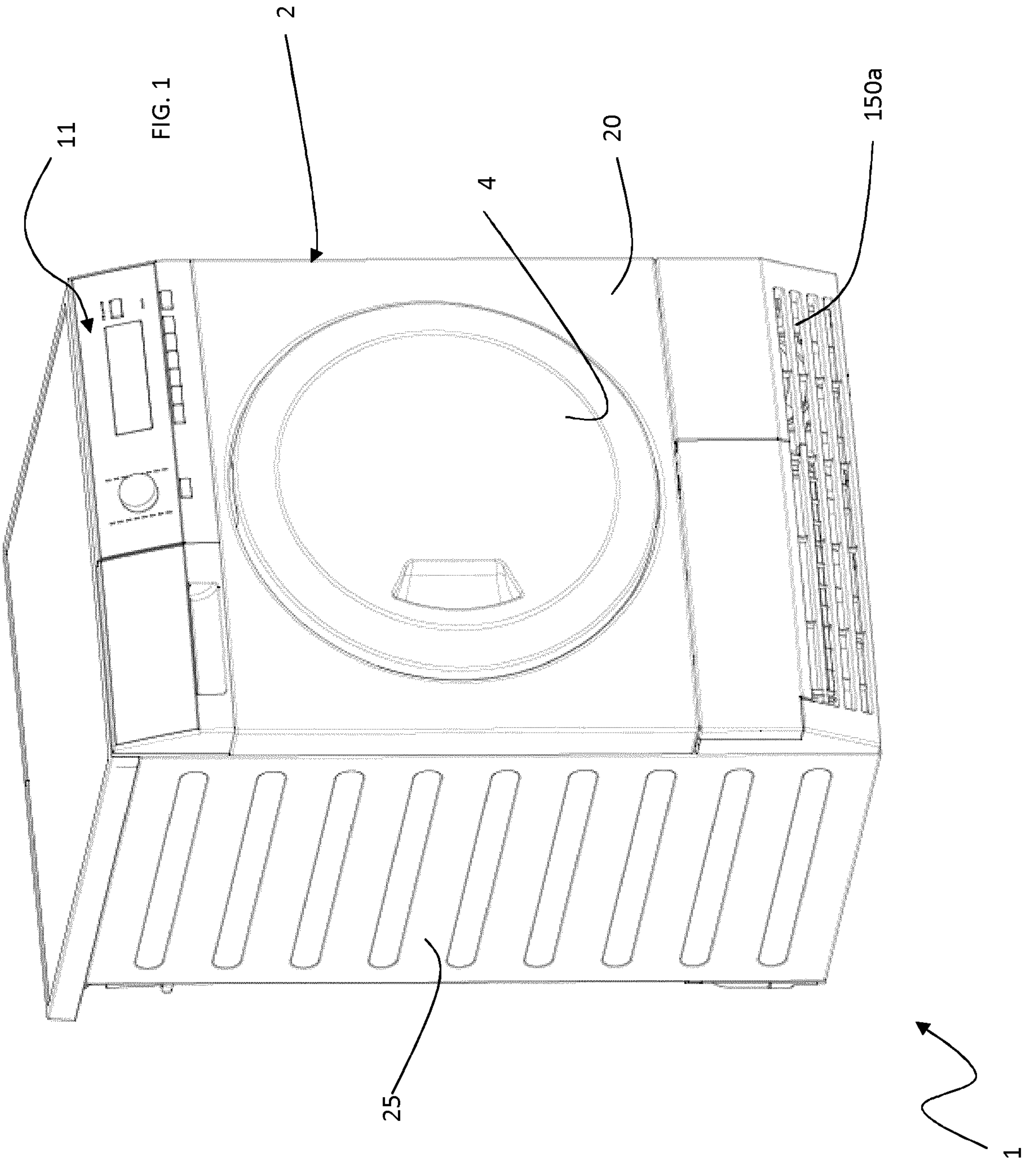


FIG. 1

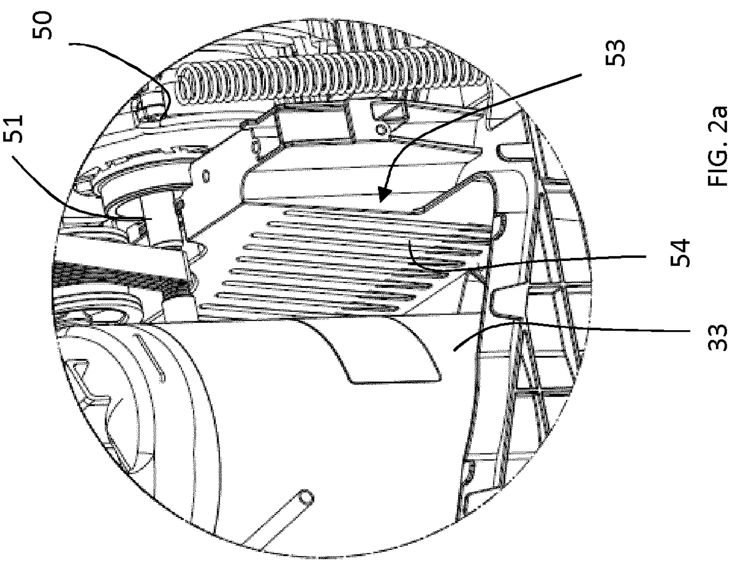

50
51
53
54
33

FIG. 2a

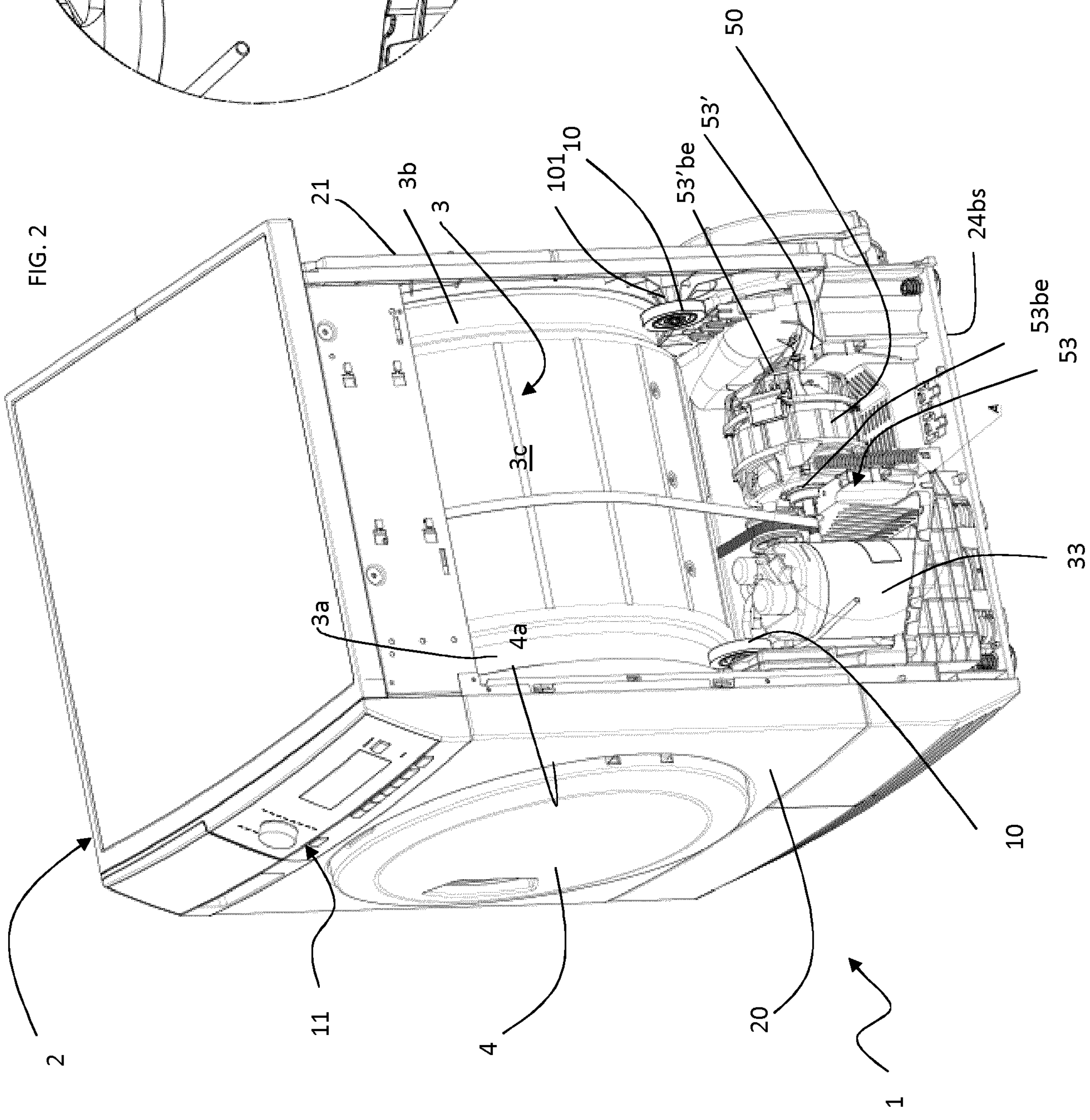

21
3b
3
101
10
53'be
53'
50
24bs
53be
53
3c
3a
4a
33
A
10
2
11
4
20
1

FIG. 2

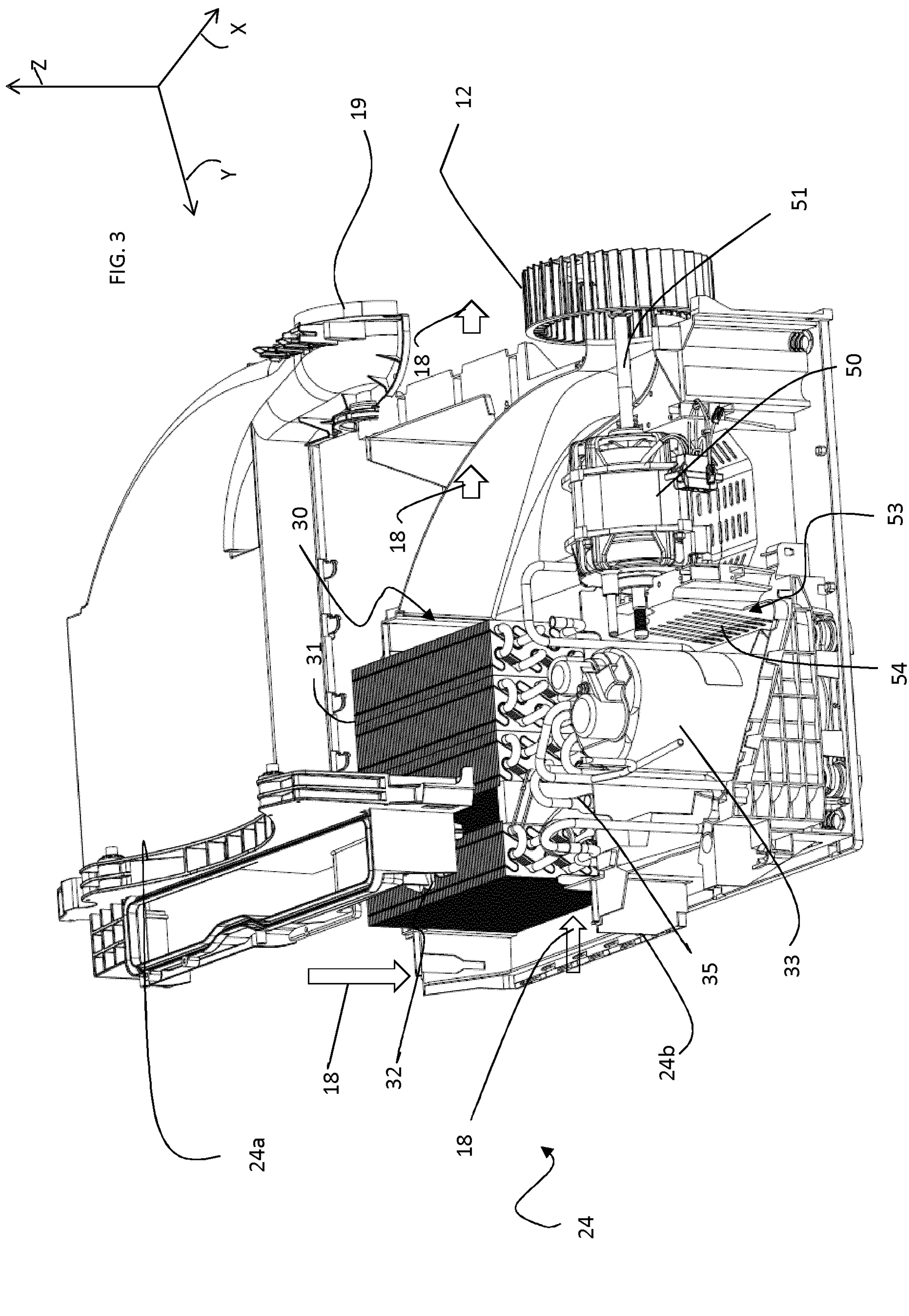


FIG. 3

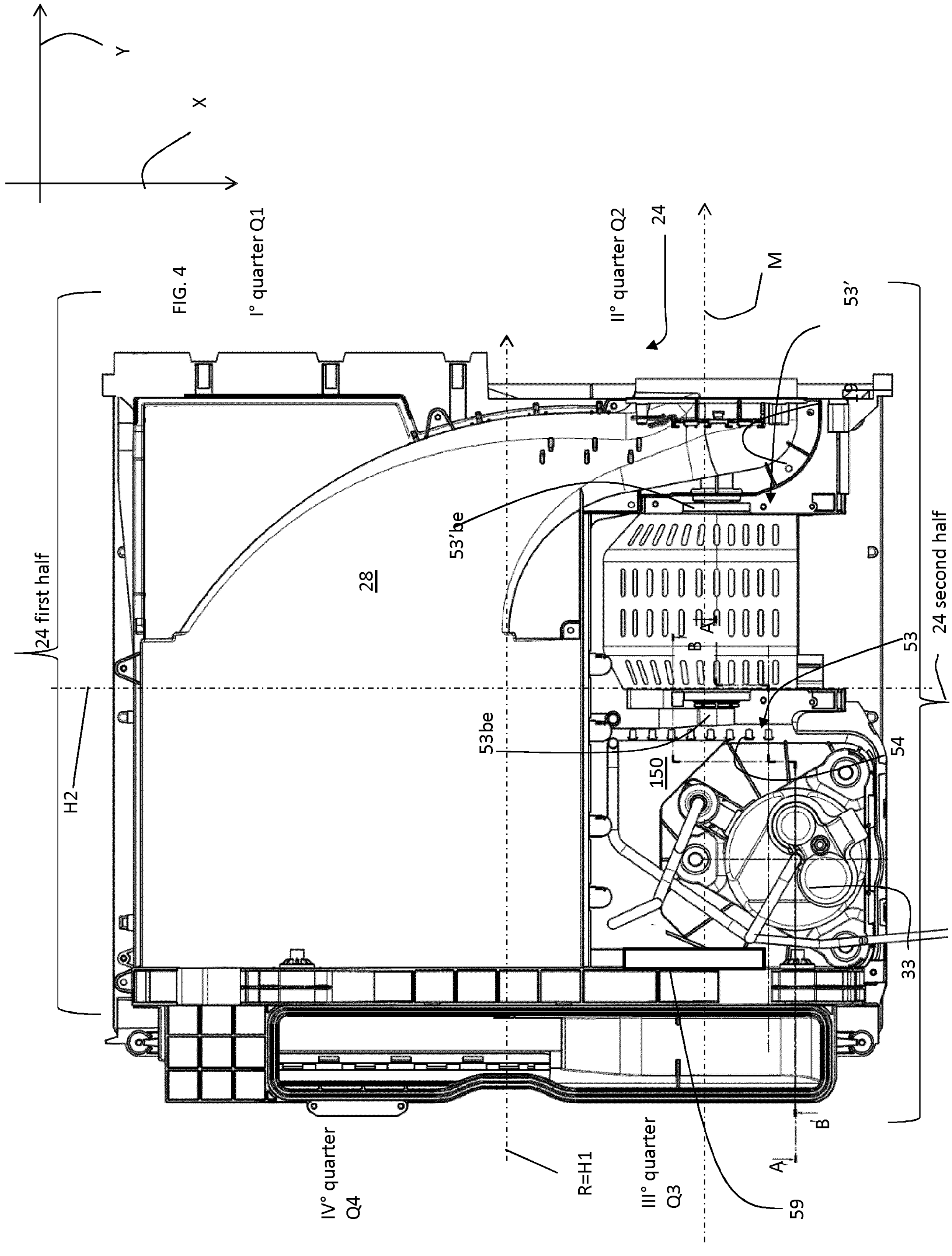

Y
X
I° quarter Q1
II° quarter Q2
24
M
53'
53'be
28
24 first half
24 second half
H2
53
53be
54
150
A
B
33
IV° quarter Q4
R=H1
III° quarter Q3
59
A
B'

FIG. 4

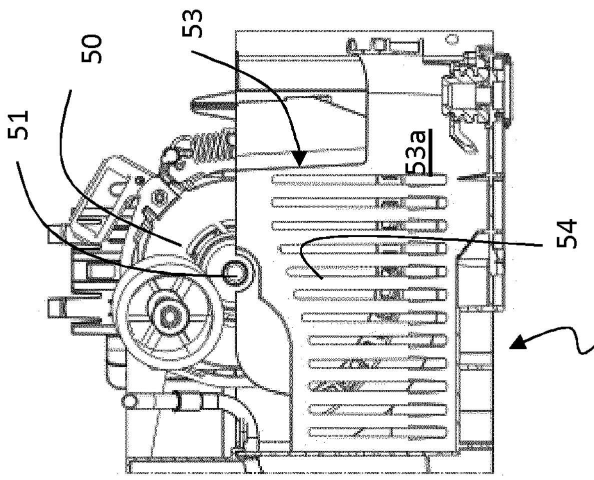


FIG. 4a

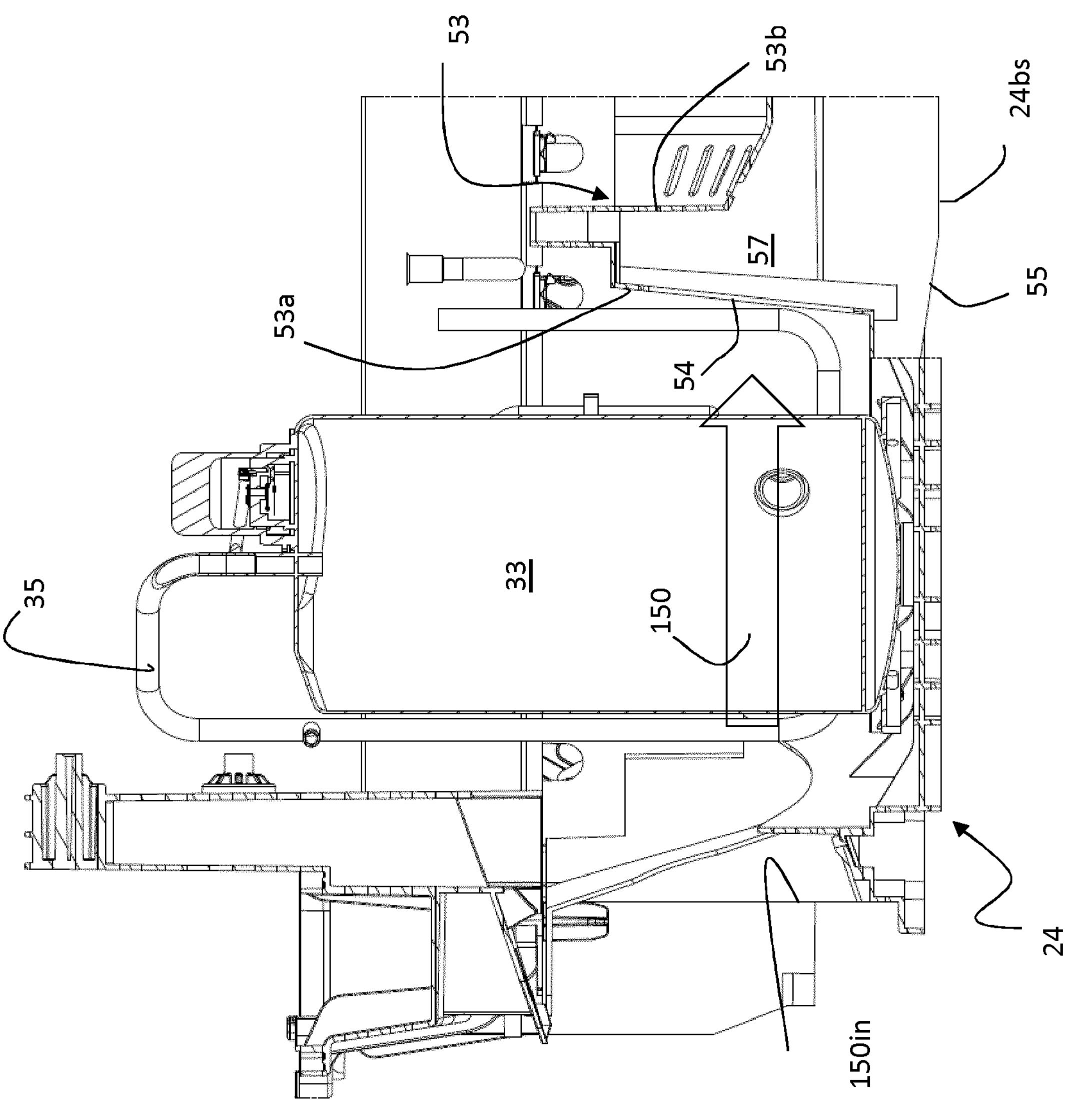


Fig. 4b

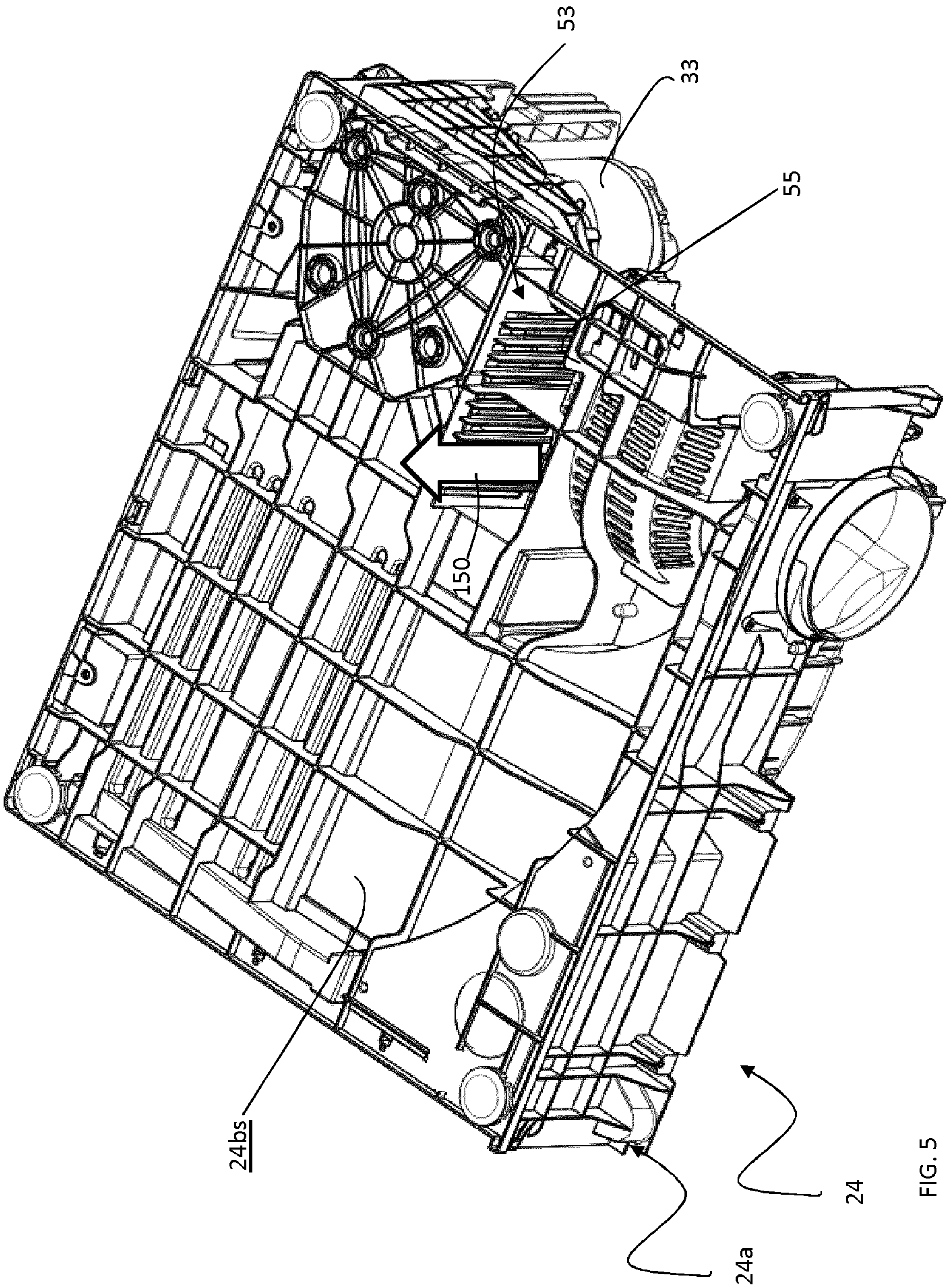
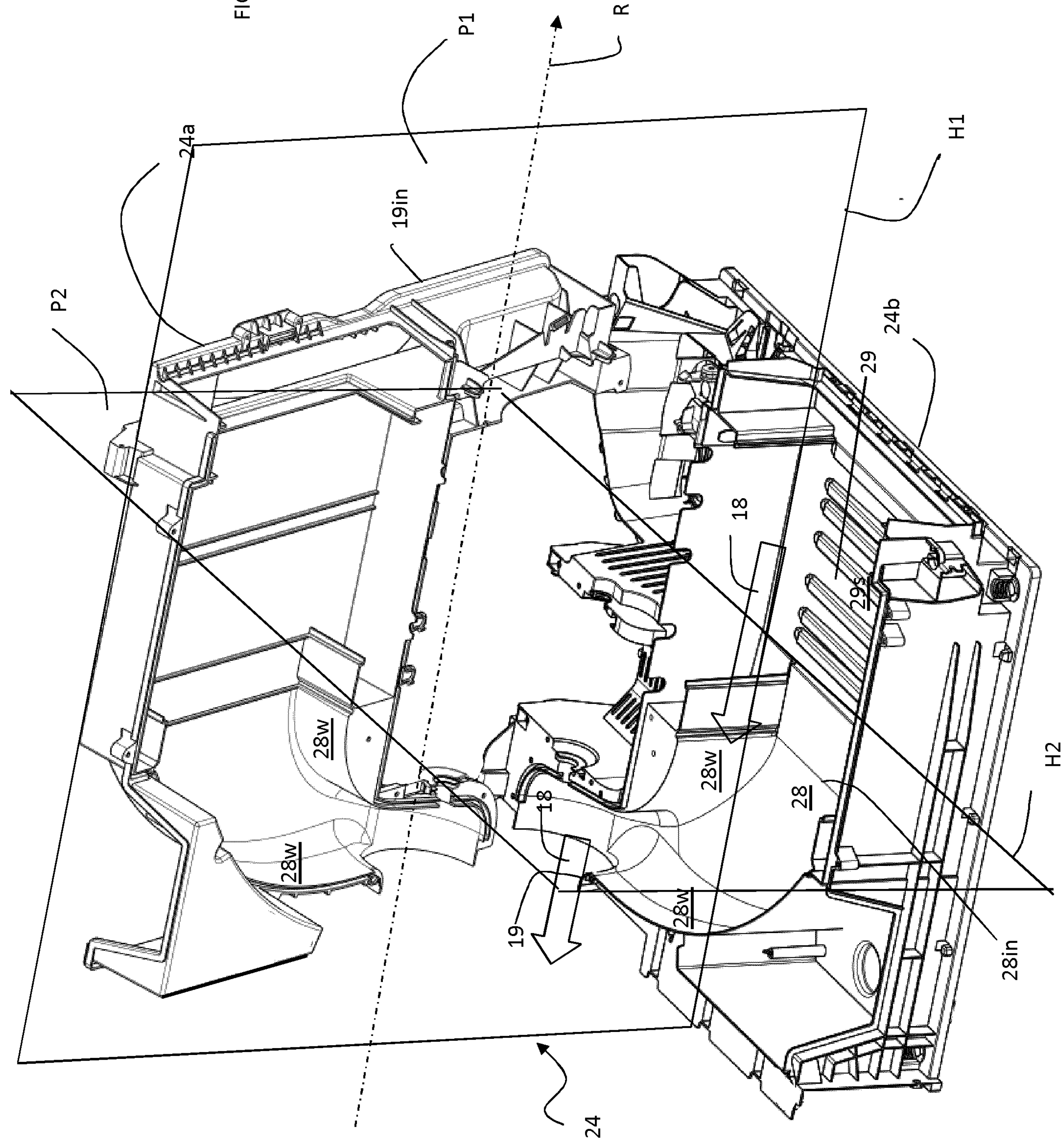


FIG. 5

FIG. 6


P1
R
24a
19in
H1
P2
24b
29
18
29s
28w
28
18
28w
28w
19
28w
H2
28in
24

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2733254 A1 **[0012]**
- EP 2549007 A1 **[0013]**
- EP 1209277 A2 **[0014]**