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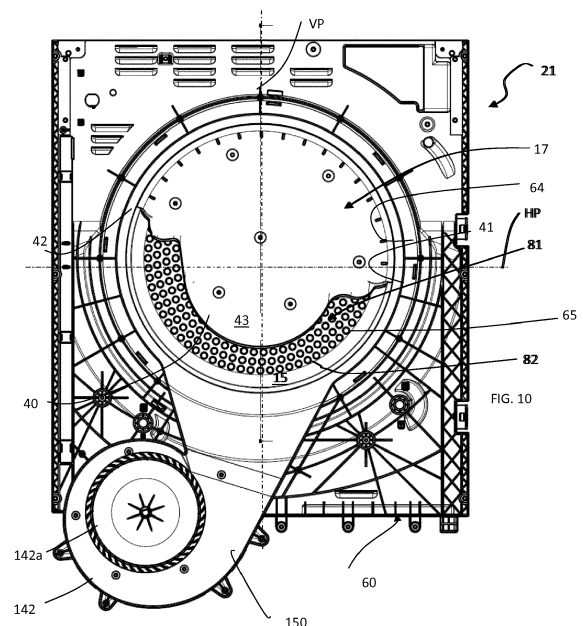
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(54) **LAUNDRY DRYER**

(57) A laundry dryer (1) comprising:
- an outer casing (2), a basement, a front wall (20) and a rear wall (21);
- a drum (3) being rotatably mounted inside the casing (2), comprising a front end (3a) and a rear end (3b);
- a back wall (8) to close the rear end (3b) of said drum, said back wall including a portion (81) which is air permeable, said air permeable portion having a delimiting edge (82);
- the rear wall (21) of the casing (2) comprising an outer cover (61), the outer cover delimiting an inner conduit (15) which is fluidly connected to a hot-air generator (30) and which channels the stream of process drying air towards the rear end (3b) of the drum (3);
- wherein the rear wall (21) of the casing (2) furthermore comprises an air-deflector member (17, 17') which is positioned in the inner conduit (15) and is fixed to the rear wall so that it is stationary with respect to the drum, the air-deflector member is configured so as to deflect the majority of the stream of process drying air that is flowing in the inner conduit (15) towards a portion of the back wall of the drum (3) located below a horizontal plane (HP) passing through an axis (R) of rotation of the drum, said portion of the back wall (8) of the drum including a part of the delimiting edge (82) of the air permeable portion (81) of the back wall (8).



Description

[0001] The present invention relates to a laundry dryer, in which the air flow of process air is preferably improved.

[0002] Generally, a laundry dryer comprises a boxlike casing structured for resting on the floor and a rotatable drum, which is structured for housing the laundry to be dried and is housed in axially rotating manner inside the casing. The drum faces a laundry loading/unloading opening formed in a wall of the casing and commonly a door is hinged to the wall of the casing to open and close the opening. Further, the dryer comprises an open-circuit or closed-circuit, hot-air generator which is housed inside the casing and is structured to circulate inside the rotatable drum a stream of process drying air which flows through the rotatable drum and over the laundry inside the drum to dry the same.

[0003] In some dryers, the stream of process air produced by the hot-air generator generally enters into the drum through an intake air-vent realized in the rear wall of the casing, for example within the perimeter of the rear rim of the drum, flows inside the drum for the entire length of the latter, and comes out of the drum through an escape air-vent usually realized on the annular frame that delimits the laundry loading/unloading opening on the wall of the casing.

[0004] In this way, the process air distributes inside the drum and flows more or less within the entire volume defined by the drum itself.

[0005] An example of such configuration is for example given in EP 2631357, in the name of the same Applicant, where it is disclosed a rotary-drum laundry dryer comprising an outer casing having a front wall and a rear wall, a rotatable drum which is structured for housing the laundry to be dried and is fixed in axially rotating manner inside the casing, and a hot-air generator structured to circulate a stream of hot air through the rotatable drum; said rotatable drum comprising a substantially cylindrical, tubular body having its front rim faced to the front wall of the casing and its rear rim faced to the rear wall of the casing; the rear wall of the casing comprising an inner section and an outer section that form/delimit in between themselves a inner cavity which is fluidly connected to the hot-air generator; a central portion of the inner section of the rear wall being furthermore permeable to air, so as to put the inside of tubular body in communication with the inner cavity; the rotary-drum laundry dryer being characterized in that the rear wall of the casing furthermore comprises an air-deflector member which is fitted/housed into the inner cavity of the rear wall and is shaped/structured so as to channel the stream of hot air that enters into the inner cavity towards the permeable-to-air central portion of the inner section of the rear wall or vice versa, while at same time keeping said stream of hot air away from the peripheral border of said inner cavity.

[0006] Applicant has noted that the air distribution in the drum according to the quoted prior art is not optimal.

Indeed, in this configuration, there is no preferred path for the process drying air, which means that the process air exiting a conduit in the casing and entering the drum can distribute throughout the whole volume of the drum itself, without any preferential path. Further, if a rather large path for the stream of process air is available, such as substantially the whole drum section, the process air flows through the drum via a way which has the least resistance, for example avoiding the laundry. Thus, the stream of process air may bypass the laundry and flows in the remaining of the drum. In this way, the drying of the laundry may take a rather long time.

[0007] Due to the above, some energy used to dry or heat up the process air is lost or wasted, because some process air, and in some cases even the majority of the process air, is not used to dry the laundry, being not in contact with the latter while flowing in the drum.

[0008] According to a first aspect, the invention relates to a laundry dryer comprising:

- an outer casing including a basement and having a front wall and a rear wall;
- a drum adapted to house the laundry to be dried, said drum being rotatably mounted inside the casing so that is apt to rotate around an axis and comprising a front end facing the front wall of the casing and a rear end facing the rear wall of the casing;
- a back wall to close the rear end of said drum, said back wall including a portion which is air permeable, said air permeable portion having a delimiting edge;
- and a hot-air generator structured to circulate a stream of process drying air through the rotatable drum;
- the rear wall of the casing comprising an outer cover facing the rear end of the drum, the outer cover delimiting an inner conduit which is fluidly connected to the hot-air generator and which channels the stream of process drying air towards the rear end of the drum;
- wherein the rear wall of the casing furthermore comprises an air-deflector member which is positioned in the inner conduit and is fixed to the rear wall so that it is stationary with respect to the drum, the air-deflector member is configured so as to deflect the majority of the stream of process drying air that is flowing in the inner conduit towards a portion of the back wall of the drum located below a horizontal plane passing through the axis of rotation of the drum, said portion of the back wall of the drum including a part of the delimiting edge of the air permeable portion of the back wall.

[0009] In the following, when relative terms such as "front", "back", "rear", "lateral", "top", "bottom", etc. are used, they refer to the normal operational position of the laundry dryer when in use, e.g. located on a floor which usually is (substantially) horizontal. Thus, a horizontal plane is a plane parallel to the floor where the dryer is

located. The location of a door of the laundry dryer, generally coupled to a front wall of the casing in order to access the drum, defines the "front" of the dryer itself. Given the horizontal plane on which the laundry is located, "top" and "bottom" - as their normal common meaning - refer to the position of an object along a vertical axis. The vertical axis is defined as an axis parallel to the horizontal plane, such as the floor.

[0010] With the terms "laundry dryer" or "dryer" both an appliance having drying functions only, or a combined washer-dryer appliance, which is capable of performing both washing and drying cycles, are meant.

[0011] The dryer includes a casing or bearing structure, comprising preferably a basement, a front wall and a rear wall. The front and rear wall are preferably mounted on the basement, which is standing on a surface, such as the floor. The front wall may advantageously be provided with a through opening, at which a door is mounted to access the interior of the casing in order to locate or remove the laundry.

[0012] The basement rests on a floor and its vertical distance from the floor may be advantageously adjusted through regulating feet provided on the lower surface of the basement facing the floor.

[0013] The rear wall of the casing forms preferably a rear bulkhead, which may include an aperture, as detailed below. The rear bulkhead may be the rear part of the casing, which may also support the drum and has at least a surface facing the exterior of the laundry dryer and a surface facing the drum.

[0014] The rear bulkhead - if present - preferably forms part of the air process circuit that brings process air to (or from) the drum.

[0015] Further, the rear wall includes a cover, which, in case a rear bulkhead is present, is preferably fixed to the rear bulkhead, for example closing the aperture in the same.

[0016] The laundry dryer of the invention includes a drying chamber, such as a drum, in which the load, e.g. clothes or other laundry, to be dried is placed. The drum further preferably includes a mantle defining a front end and a rear end, the front end facing the front wall of the casing, and preferably the opening therein realized and closed by the door for loading and unloading the laundry, and a rear end facing the rear wall of the casing.

[0017] The drum of the dryer of the invention may be closed drum, i.e. the rear end is closed by a back wall or a flange, which rotates as a single piece together with the mantle when the drum is driven into rotation. Alternatively, it can be an open drum, where the closure of the rear end of the drum is given by a back wall which is stationary, that is, it does not rotate with the drum and it is preferably integral to the casing. Thus, the back wall of the drum can be either attached to the drum and rotate with the same, or attached to the casing and be still.

[0018] Within the casing, the drum is rotatably mounted for rotating, preferably according to a substantially horizontal or tilted rotation axis. For example, at least one

drum support assembly for rotatably supporting the drum in its rotation around this given rotation axis is provided for within the casing.

[0019] The back wall of the drum, either attached to the rest of the drum or detached to the same and fixed to the casing, is preferably perforated, e.g. it includes a plurality of apertures, such as through holes, so that the process air to dry clothes or any other laundry can be introduced through the back wall into the drum. Thus, the back wall has an air permeable portion, for example the portion in which the perforations or holes are formed. The air permeable portion is preferably not covering the whole surface of the back wall, but only a portion of it, preferably a central portion, that is a portion that includes the position of the axis of rotation of the drum. The air permeable portion is delimited by a delimiting edge, which is a curve defining the "boundaries" of the air-permeable portion with respect to the remaining portion(s) of the back wall. The delimiting edge of the air-permeable portion can have any shape, for example it is a circumference. Outside the delimiting edge, the process air cannot pass through the back wall.

[0020] In case of a plurality of perforation, the delimiting edge can be considered for example as the curve which touches all the most external - or peripheral - perforations of the air-permeable portion and forms a convex curve.

[0021] The drum is part of a process air circuit, in particular a closed-loop circuit in case of a condensed dryer or an open circuit in case of a vented dryer, which in both cases includes a process air conduit for channelling a stream of process air to dry the load. The process air circuit 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 (and to a lower temperature cooled down) air exits the same. In case of a closed-loop drying air circuit, the humid air stream, rich in water vapour, is then fed into a humidity removal element and/or a hot air generator, such as a heat exchanger. In a preferred embodiment of the invention, the humid air is fed to an evaporator of a heat pump system, where the moist process air is further cooled down and the humidity present therein condenses. The resulting cool dry air is then heated up before re-entering again in the drying chamber by means of a hot drying air generator, which can be for example a condenser of the heat pump system, and the whole loop is repeated till the end of the drying cycle. Alternatively or in addition, to remove humidity from humid air stream exiting the drum, an air-air type heat exchanger may be used. Such heat exchanger receives ambient air as cooling fluid to cool down and remove humidity from humid air stream passing there-through. Furthermore, the hot drying air generator may comprise an electrical or gas powered heating device. In a vented dryer, ambient air is taken into the dryer via an inlet duct, such air is heated up by a hot drying air generator, such as condenser of the heat pump system and/or an electrical or gas powered heating device, be-

fore entering the drum. Heated air flowing through and on humid laundry contained in the drum, removes humidity from laundry. Humid air stream exiting the drum may be optionally dehumidified by an evaporator of a heat pump system, or an air-air type heat exchanger as explained above, before being exhausted outside the dryer.

[0022] Preferably, the hot or drying air generator is located in a basement of the casing.

[0023] The process air circuit above described preferably includes a process air inner conduit to channel the flow of drying air from the hot drying generator into the drum, such inner conduit includes an air passage that brings the process drying air from the hot drying air generator to the inside of the drum from its rear end, i.e. through its back wall.

[0024] The process air therefore from the generator enters into the drum from the rear end of the same and it can enter into the drum because a portion of the back wall of the drum is air-permeable, for example because the back wall is perforated forming an air-permeable portion. The outer cover of the rear wall forms a portion of the inner conduit for the process air to channel the process air into the drum. The process air can therefore enter the drum via the portion of back wall delimited by the delimiting edge.

[0025] Further, the laundry dryer includes an air-deflector member that is positioned in the inner conduit and is fixed to the rear wall so that it is stationary with respect to the drum. This air-deflector member may for example be attached to the rear wall of the casing by any known means, such as screws or rivets, or may be formed as a single unitary piece with the cover or any other part of the rear wall, for example by means of injection moulding. The air-deflector member "blocks" the stream of air, stopping the flow in a given direction inside the inner conduit, and deflects the stream of process air so that it flows for its majority within a specific portion of the drum. Indeed, the air-deflector member is configured so as to deflect the majority of the stream of process drying air flowing in the inner conduit so that it is directed in the lower part of the drum, that is, it is directed within the portion of the drum located below a horizontal plane passing through the axis of rotation of the drum. In particular, the deflection is such that the air passes through a part of the air permeable portion of the back wall from its delimiting edge. Preferably, the process air passes through the whole area of the air-permeable portion that is located below the deflecting wall. That is, the cross section of the conduit channelling process air into the drum includes a part of the delimiting edge of the air-permeable portion of the back wall located below the deflecting wall. The process air thus impinges onto the back wall after the deflection in such a way that it hits a portion of the delimiting edge of the air-permeable portion of the back wall. This portion of the delimiting edge can be for example a curve, such as an arc of circumference.

[0026] The horizontal plane contains the axis of rota-

tion of the drum and divides the back wall of the drum, either fixed to the drum or to the casing, in two parts, a "lower" part and an "upper" part. The air-deflector member deflects the majority of the process air stream towards the lower part of the back wall.

[0027] When the dryer is loaded with laundry, although the laundry is moved by the tumbling of the drum, most of the time the laundry remains within the lower part of the drum due to gravity. Therefore, forcing the stream of process drying air to pass for its majority in the lower part of the drum due to the fact that the air-deflector member forces the air to flow into the drum via the lower half of the back wall of the same, assures that the process air is most of the times in contact with the laundry to be dried.

[0028] A minority of the air stream anyhow may still pass through the remaining of the drum, that is, within the "upper part" of the same. For example, when the drum is closed by a back wall, which rotates with the drum itself, due to the fact that between the air inner conduit formed in the rear wall of the casing and the drum there is a certain spacing in order to allow the drum to rotate, some process air can still enters the drum via the upper part of the back wall. In case of an open drum, where the back wall is formed in the rear wall of the casing, when the stream of process air impinges onto the laundry, it can be deflected for a minor portion towards the upper part of the drum. However, according to the invention, the air-deflector member deflects the majority of the process air so that it flows where the laundry is placed most of the times.

[0029] According to the above mentioned aspect, the dryer of the invention may include, alternatively or in combination, one or more of the following characteristics.

[0030] Preferably, said portion of the back wall includes the lowest point of the delimiting edge of the back wall with respect to a vertical axis.

[0031] The air flowing in the inner conduit is deflected by the air deflector member and impinges upon the back wall. Air can enter into the drum mainly via the air permeable portion of the back wall, which for example may include perforations. According to the invention, the air is deflected in such a way that it impinges the back wall so that it can flow through the lowest part of the air permeable portion, delimited by the delimiting edge. In this way, the flow of process air may hit the laundry included in the drum staying for the majority of the time at the lower part of the drum. Generally, the laundry is located on the surface of the drum at its lowest portion.

[0032] Preferably, the rear wall includes a rear bulkhead to which the rear end of said drum is coupled in an axially rotating manner, said rear bulkhead facing on one side said rear end of the drum and on the other side the exterior of the casing, and having an aperture closed by said outer cover.

[0033] The rear bulkhead is substantially the major part of the rear wall of the casing, facing on one side the back wall of the drum, or anyhow the interior of the casing, and on the other side the exterior or the outside of the cabinet.

In case of an open drum, preferably, a rim of the rear drum end abuts against the rear bulkhead and even more preferably a gasket is interposed therein between.

[0034] As mentioned above, in the process air circuit, the process air exits the drum, preferably passes through the basement where generally the hot air generator is located and then re-enters the drum. Preferably, a portion of the process air circuit is formed in the rear bulkhead as well.

[0035] More preferably, said cover, said rear wall and said air-deflector member defines the inner conduit for the process drying air extending from said basement to the interior of said drum.

[0036] Preferably, said back wall delimits, together with said cover and said air-deflector member, said inner conduit.

[0037] The inner conduit is thus preferably formed between the back wall of the drum and the cover and preferably channels process air coming from the basement into the drum. The air travels in the basement substantially horizontally, then it turns by substantially 90° either in the basement or already in the rear wall of the casing, so that it can flow substantially vertically in the inner conduit, confined by the cover and the back wall of the drum. Preferably, the inner conduit channels the process air along the vertical direction. In the substantially vertical inner conduit formed by the back wall and the cover, the air-deflector member is positioned. The air-deflector member preferably deflects the process air - which is, up to the deflector member, travelling vertically - and makes it rotate of a given angle so that it enters the drum to dry the laundry along the axis of rotation of the drum.

[0038] The deflected stream hits the back wall of the drum and enters the drum via the air-permeable portion. The fact that the air is deflected so that it passes through the air permeable portion from its delimiting edge means that the whole lower area of the air-permeable portion of the back wall is hit by the stream of process air. The air therefore can pass through the laundry which is generally located in the lower part of the drum.

[0039] This deflection, preferably of substantially between 30° and 85°, is preferably such that the flow of process air can enter into the drum substantially along the axis of rotation of the same. This deflection is performed preferably before the process air reaches the back wall. Only a small fraction of the stream of air thus reaches the upper half of the drum, where the upper half of the drum is defined as the half drum above a horizontal plane which is passing through the axis of rotation of the drum.

[0040] In this way, the process air enters the drum via the lower part of the air permeable portion of the back wall, the lower part including a part of the delimiting edge, for the majority of the stream and enters in contact to the laundry.

[0041] Preferably, said inner conduit defines a peripheral surface and a width, and said air-deflecting member spans the whole width of the peripheral surface.

[0042] The inner conduit is delimited by a peripheral surface, for example formed by the surfaces of the cover and the back wall of the drum. The conduit also defines a width, which is the longest distance between two points on the peripheral surface when the conduit is sectioned by a plane perpendicular to the process air direction flowing in the conduit. The air-deflector member spans the whole width of the conduit, so that it preferably deflects the whole stream of air process flowing in the inner conduit.

[0043] Preferably, said air-deflector member is fastened to said cover or to said rear bulkhead.

[0044] The air-deflector member is fastened to a stationary part of the dryer, that is, to a portion of the dryer which is not rotating with the drum. The air-deflector member can be thus fastened to the cover, to the bulkhead or to both.

[0045] Preferably, said air-deflector member is releasably fastened to said rear wall.

[0046] In this way, the air deflector member can be mounted or removed from the dryer at any point in time. The remaining components of the dryer do not need to be modified by the invention, therefore only few parts of the dryer need to be modified due to the air-deflector member's presence. Further, in the same dryer, different air-deflector member could be mounted, having different deflecting effects on the stream of process air.

[0047] Preferably, said air-deflector member is integral in one piece construction with a portion of said rear wall.

[0048] According to a different embodiment, the air-deflector element is integrally formed in a single process step with the rear wall of the casing. For example, if the rear wall is formed in plastic material, the air-deflector member may be moulded together with a component of the rear wall, such as the cover.

[0049] Preferably, said air-deflector member includes a deflecting wall positioned into the inner conduit so as to deviate the stream of process drying air of an angle comprised between 35° and 80°.

[0050] The air-deflector member preferably includes a wall which is apt to deflect the stream of process air flowing in the inner conduit by an angle which allows a proper entrance of the stream into the drum, at least for its majority. This angle is preferably comprised between 35° and 80°. Preferably, as a result, the process air flows substantially parallel to the rotation axis of the drum.

[0051] More preferably, said inner conduit includes an inner surface substantially perpendicular to said axis of rotation and facing said rear end of the drum, and said deflecting wall projects from said inner surface.

[0052] The deflection of the process air is preferably due to the shape of the deflecting wall. The wall is preferably extending from an inner surface of the inner conduit, which is in turn preferably parallel to the direction of flow of the stream of the process air in the inner conduit before reaching the air-deflector member, and forms an angle with the latter. The inner surface of the inner conduit for example is an inner surface of the cover of the rear

wall of the casing. The deflecting wall preferably is tilted forming an angle with the inner wall. This angle may be constant or it may change, so that the deflection of the stream of process air is smooth.

[0053] Preferably, said air-deflector member includes a central portion which is air-impermeable and it is located facing a part of the air-permeable portion of the back wall.

[0054] Preferably, the whole air-deflector member is air-impermeable.

[0055] The air deflector member thus preferably faces a part of the air-permeable portion of the back wall blocking possible air from flowing into the air permeable part of the back wall faced by it. Preferably, the air impermeable part of the deflector member is located in front of an upper and/or central portion of the back wall.

[0056] Preferably, said air-deflector member is a-symmetric with respect to a vertical axis passing through said axis of rotation.

[0057] The stream of process air flowing within the inner conduit is not always symmetric, that is, the process air does not enter the inner conduit always in a symmetric and uniform manner. Therefore, the air-deflector member may need to be asymmetric to compensate for asymmetries in the air flow of the process air and counterbalance it at least partly, in order to optimise the drying process.

[0058] More preferably, a vertical plane passing through said axis of rotation of the drum divides said rear wall in a first and a second half, and said air deflector member includes a deflecting wall having a first and a second end, the first end being located in the first half of the rear wall and said second end being located in said second half of the rear wall, wherein said first end is positioned in said inner conduit higher than the second end relative to a vertical axis.

[0059] In order to form an asymmetry, the deflecting wall deflecting the stream of process air is asymmetric, having a portion on one side of the drum higher than a portion on the opposite side of the drum, with respect to a vertical plane passing through the axis of rotation of the drum. In this way, the speed of the stream of air flowing in one part of the inner channel and deflected by a higher portion of deflecting wall is different from the speed of the stream of process air flowing in another part of the channel and deflected by the lower portion of the deflecting wall.

[0060] More preferably, a direction of rotation of said drum is so selected that the drum rotates from said second half towards said first half.

[0061] While the drum is rotating, the laundry is shuffled and it falls, due to gravity, on that part of the drum according to the direction of rotation. Dividing the back wall and the drum in two halves by means of a vertical plane passing through the axis of rotation of the drum, a first and a second half (such as a "left" and "right" half), the drum may rotate from the second towards the first half. The laundry contained in the drum thus falls onto

the inner surface of the drum mainly within the first half of the drum. Having a higher end of the deflecting wall in such a region (i.e. within the first half) means that a wider area of the air permeable portion of the back all in the first half is hit by the process air, when compared to the area of the air permeable portion hit by the process air in the second half. In other words, more process air enters via the air permeable portion in the first half and having a wider portion of inner conduit transporting process air in the portion of the drum where the laundry is mainly located, further improves the drying performances.

[0062] Having a higher deflecting walls on one side of the rear wall means that in that side more process air is channelled in the inner conduit when compared to the other side, and thus more process air is deflected in that side of the drum.

[0063] Preferably, said deflecting wall is curved so as to partially encircle said axis of rotation.

[0064] More preferably, said deflecting wall defines a concave portion positioned for the majority of its extension below said horizontal plane.

[0065] Even more preferably, the deflecting walls includes a first and a second convex portions departing from two opposite ends of the concave portion.

[0066] More preferably, the first convex portion has a mean vertical height higher than a mean vertical height of the second convex portion with respect to a vertical axis.

[0067] The shape of the deflecting wall is optimized so that the velocity of the stream of process air, although deflected, is kept as high as possible, so that the drying of the laundry is as efficient as possible. The difference in height among the convex portions of the wall is provided for compensating for the asymmetries in the flow of process air in the inner conduit. Further, it may also compensate for the asymmetric distribution of laundry due to the preferential direction of rotation of the drum.

[0068] Preferably the process air enters into the drum in a stream delimited for its majority, in cross section along a vertical plane perpendicular to the horizontal plane and to an axis of rotation of the drum, by a part of the delimiting edge of the air permeable portion downwardly and by a deflecting wall of said air-deflector member upwardly.

[0069] As mentioned, the process air enters into the drum via the back wall, in particular via its air permeable portion. This air permeable portion is hit by the deflected process air in its lower part, because the inner conduit is delimited by the deflecting wall in its upper part and by the delimiting edge of the air permeable portion in the lower part. Preferably, the shape of both the air deflecting wall and of the part of delimiting edge is concave.

[0070] Preferably, the dryer includes at least one drum support assembly to rotatably support said drum along an axis of rotation within said casing; wherein said drum support assembly includes a drum support element provided on said rear bulkhead.

[0071] For example, the drum support assembly may

include a holder and a drum support element, said holder being provided on said rear bulkhead. According to an aspect invention, the drum is supported at the rear end thereof. For example, a portion of the at least one of said drum support assembly of the drum is formed at the rear bulkhead. The rear bulkhead thus has also the function to hold at least partially via a support assembly the drum for its rotation.

[0072] In this way, the rear bulkhead integrates different functions, it forms part of the drying air circuit, and it includes a portion of the support assembly for the rotatable support of the drum. The configuration of the rear portion of the dryer is thus simplified, limiting the number of elements, and thereby reducing the assembly time, in particular of the rear wall of the casing.

[0073] The drum support assembly includes a drum support element which is for example a shaft or a roller (or both) and a respective holder is provided according to this embodiment at the rear bulkhead. The holder can be of any type and it depends or follows the configuration of the drum supporting element.

[0074] According to a different aspect, the invention relates to a kit including the laundry dryer according to the previous aspect, wherein said air-deflector member includes a deflecting wall having a first and a second end, said first end being higher than the second end along a vertical axis, and wherein said kit includes a further air-deflector member, said further air-deflector member including a further deflecting wall having a first and a second end, wherein either said first end is lower than the second end relative to a vertical axis, or wherein said first and second end have the same height relative to said vertical axis.

[0075] A single dryer may include a kit of different air-deflector members, which might have different shapes. Preferably, the air-deflector members differ in the shape and layout of their deflecting walls. Indeed, depending on the type of dryer, the characteristics of the stream of process air flowing into the inner conduit might be different. Therefore, the deflecting walls differ from one air-deflector member to the other in order to optimize the deflected stream of process air in the lower part of the drum depending on the stream of process air present in the specific dryer. Such optimized air-deflector member adapted for the stream of process air flowing in a specific dryer among the plurality of air-deflector members is thus preferably mounted in the dryer. The further air-deflector member might be symmetric or asymmetric.

[0076] Further advantages of the present invention will be better understood with nonlimiting 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 figure 1 with an element of the casing removed for showing some internal components;

Fig. 3 is a front view, in a disassembled configuration, of the rear wall of the dryer of figure 1 or figure 2;

Fig. 4 is a lateral view of the rear wall of figure 3;

Fig. 5 is a rear view of the rear wall of figures 3 and 4;

Fig. 6 is a lateral view in section of figure 5 along the line A-A;

Fig. 6a is an enlarged view of a detail of figure 6;

Fig. 7 is a perspective exploded view of a portion of the rear wall of the dryer casing of figures 3-6a;

Fig. 8 is a lateral view in section of the dryer of the invention with a schematic view of the stream of process air;

Fig. 9 is a perspective view of a drum of the dryer of figures 1 and 2;

Fig. 10 is a rear view, in a further disassembled configuration, of the rear wall of the dryer of figure 5;

Fig. 11 is a lateral view of the rear wall of figure 10; and

Fig. 12 is a rear view, in a disassembled configuration, of a further embodiment of the rear wall of the dryer of figure 5.

[0077] With initial reference to Figs. 1 and 2, a laundry dryer realized according to the present invention is globally indicated with 1.

[0078] Laundry dryer 1 comprises an outer box casing 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 casing 2. Access to the drum 3 is achieved for example via a door 4, preferably hinged to casing 2, which can open and close an opening 4a realized on the casing itself.

[0079] 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 basement 24 rests on a floor and its vertical distance from the floor may be advantageously adjusted through regulating feet (not depicted in the appended drawings) provided on the lower surface of the basement facing the floor.

[0080] 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).

[0081] Laundry dryer 1 also preferably comprises an electrical motor assembly 50 for rotating, on command, revolving drum 3 along its axis inside casing 2. Door 4 and electrical motor assembly 50 are common parts in the technical field and are considered to be known; therefore they will not be described in detail.

[0082] 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.

[0083] 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, is arranged inside the casing 2 and is apt to rotate around a general rotational axis R which can be 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 (including a circular front rim 3f) of the mantle 3c is faced to the laundry loading/unloading opening realized on the front wall 20 of the casing 2 and the door 4, while the second end 3b has also a rim 3e which shows preferably a circular shape.

[0084] The second or rear end 3b of the drum 3 (including rim 3e) is closed by a back wall 8, as visible in figure 9.

[0085] Preferably, drum back wall 8 is faced to the rear wall 21 of the casing 2 and is permanently and rigidly coupled to the second end 3b of mantle 3c of the drum 3 so as to close said second end 3b. Back wall 8 forms, together with lateral mantle 3c, a substantially cylindrical, cup-shaped rigid container structured for housing the laundry to be dried. Preferably, the drum back wall 8 is coupled to the circular rim 3e second end 3b of mantle 3c of the drum 3. In a preferred embodiment, the rotatable drum 3 is formed only by two bodies joined together, one of said two bodies being the mantle 3c and the other of said two bodies being the back wall 8 which is permanently fixed to the rear end 3b of said mantle 3c and rotates therewith when drum 3 rotates.

[0086] Preferably, the back wall 8 is furthermore suitably perforated so as to allow a stream of drying air to flow through the back wall 8 of the tubular shaped body of the drum 3.

[0087] With now reference to figure 9, the drum 3 of the dryer 1 is shown in greater detail. The back wall 8 of the drum includes an air permeable portion 81 defining a delimiting edge 82, which separates the air-permeable portion 81 from the rest of the back wall. In the depicted

embodiment, the delimiting edge of the air-permeable portion is substantially a circumference.

[0088] The air permeable portion 81 includes a perforated portion, which is located approximately at the center of the back wall 8 so as to be substantially coaxial to the longitudinal rotational axis R of the rotatable drum 3, and is preferably substantially circular in shape. The remaining portion of the back wall 8, including an outer rim 8a thereof, is not perforated. The perforated portions include a plurality of through-holes - all indicated with 65, which are arranged so as to form a symmetric pattern.

[0089] Dryer 1 additionally includes a process air circuit which comprises the drum 3 and a process air conduit 18, depicted as a plurality of arrows showing the path flow of a process air stream through the dryer 1 (see Figure 8). A portion of the process air conduit 18 is formed in the basement. 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 18 also includes a fan or blower (not depicted).

[0090] The dryer 1 of the invention additionally comprises a hot drying air generator, that in the depicted embodiment includes a condenser of a heat pump system 30. The heat pump system 30 includes a first heat exchanger (called also condenser) and a second heat exchanger (called also evaporator). Heat pump 30 also includes a refrigerant closed circuit (not depicted) in which a refrigerant fluid flows, when the dryer 1 is in operation, cools off and may condense in correspondence of the condenser, releasing heat, and warms up, in correspondence of the second heat exchanger (evaporator), absorbing heat. A compressor 33 receives refrigerant in a gaseous state from the evaporator and supplies the condenser, thereby closing the refrigerant cycle. In the following the heat exchangers are named either condenser and evaporator or first and second heat exchanger, respectively.

[0091] 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).

[0092] With reference to Figure 2, the front rim 3f of drum 3, e.g. the circular front rim of the substantially cylindrical mantle 3c, is furthermore coupled in preferably substantially airtight and axially rotating manner to the front wall 20 of casing 2, preferably with the interposition of a first circular sealing gasket (not depicted). Front wall 20 is preferably coupled to basement 24. Front wall 20 preferably includes a front bulkhead (not shown) where the opening 4a for the door 4 is realized and to which the drum 3 is coupled for rotation. The front bulkhead is then preferably covered by a panel 20a extending around the opening 4a and defining the external front surface of the front wall 20 of casing 2. The front bulkhead is preferably made of a plastic, i.e. polymeric, material, as an integral,

i.e. single, unitary piece. Advantageously, a portion of the process air conduit 18 is formed integrally with the front bulkhead. Process air exits the drum through an air-vent formed in the front bulkhead 70. Such air-vent (not shown) is preferably shaped so as to receive an air filter therein.

[0093] With reference to Figs. 3 to 5, the rear wall 21 of the casing 2 includes a supporting panel or rear bulkhead 60. The back wall 8 of drum 3 substantially faces the rear bulkhead 60. The rear bulkhead 60 is preferably made in a plastic, for instance polymeric, material by means, for instance, of an injection molding process.

[0094] Further, the rear wall 21 includes a cover 61. In a preferred embodiment of the invention, the rear wall 21 of the casing 2 includes only two elements, the rear bulkhead 60 and the cover 61, simplifying the construction of the back wall 21 of the casing 2. In particular, the rear bulkhead 60 includes a first surface 60a facing the interior of the casing 2, such as the back wall 8 of the drum 3, and a second surface 60b facing the exterior or the outside of the casing 2. Optionally, the rear bulkhead 60 includes at least a portion of a, more preferably a whole, fan housing 150 to house an impeller (not depicted) of the fan 12 (shown only in figure 6 and partially in figure 6a) of the process air circuit.

[0095] The rear bulkhead 60 includes a through drum aperture 64 located in front of the back wall 8 of the drum 3, thus from this drum aperture 64 the back wall 8 is visible. Further, the cover 61 is coupled to the rear bulkhead 60 in order to close aperture 64.

[0096] A fan aperture 61a is formed in the bulkhead 60, which is also closed by the cover 61, fan aperture used to access the fan 12, and in particular an impeller of the same (not visible in the appended drawings). The aperture 61a is located substantially below the location of the back wall 8 and faces the interior of the casing 2, in this example, the basement 24 and more preferably an outlet 19 of the air from the basement 24.

[0097] The whole fan housing 150 is realized within the rear wall 21 and it is composed by a cup-shaped portion 142 (which belongs to the rear bulkhead 60) and the cover 61.

[0098] The first cup-shaped portion 142 is provided with a through opening 142a, in the example shown circular, for housing the relevant shaft (not shown) of the fan 12. The same opening 142a is also used for the inlet process air to enter the fan. Therefore, in the process air conduit 18, process air exits the basement, where it has been heated and/or dried by the drying air generator - heat pump 30 -, from outlet 19, and enters into the fan housing 150 via inlet 142a. From the fan housing 150, which is a closed element being the fan aperture 61a closed by cover 61, a conduit portion formed by the rear bulkhead 60 and the cover 61 channels air towards a central portion of the cover 61, for example a central bulge 63, from where air enters into the drum 3 via the back wall 8, as detailed below.

[0099] The conduit portion delimited by the rear bulk-

head 60 and the cover 61 is called inner conduit 15 and it is visible in particular in figures 3, 6, 6a, and 10. The process air coming from the basement 24 and flowing through fan 12 has to turn by substantially 90° from the substantially horizontal flowing direction within the basement 24 to a substantially vertical direction, so that it can flow substantially parallel to the cover 61, along an inner - preferably vertical - surface 66 (see figures 6 and 6a) of the same facing the back wall 8 of drum 3. The width of the cover 61 represents substantially also the width of the inner conduit 15, which, due to the construction of the rear wall of casing 2, can substantially only flow for a given path in a conduit delimited in width by the cover 61.

[0100] The cover 61 closes both through drum aperture 64 and fan aperture 61a, putting the two in connection.

[0101] In the example shown, the drum 3 is preferably structured for being rotatably supported by a drum support assembly, including a plurality of rollers 10 which are arranged - off-axis with respect to the general rotational axis R of the drum 3 - approximately at the two axial ends 3a, 3b of the drum 3, with their rotation axis substantially parallel to the general rotational axis R of the drum 3, so as to allow the tubular body of the drum 3 to rotate about the longitudinal reference or general rotational axis R inside the casing 2. Preferably, two of such rollers 10 are located at the front end 3a of the drum 3 and two other of such rollers 10 are located at the back end 3b of the drum 3. Advantageously, rollers 10 comprise a plastic, i.e. polymeric, material.

[0102] Two rollers (or more) are fixed to the rear bulkhead 60. Further, the drum support assembly includes, bosses or pins or brackets 101 by means of which the rollers are attached to the rear bulkhead and are fixed therein by means of screws or snap-fitting connections (not depicted in the present drawings). The bosses or brackets are preferably formed as a single unitary piece with the rear bulkhead.

[0103] The rear bulkhead 60 thus includes a supporting boss 101 of the corresponding supporting roller 10, which is preferably built also in one piece (preferably via an injection molding process) with the rear bulkhead 60 (see for example figure 2). More preferably, all supporting bosses of the rollers 10 located in proximity of the rear end 3b of drum 3 are located at, and more preferably integral to, the rear bulkhead 60. Each supporting boss 101 protrudes inwardly from the rear bulkhead 60, i.e. protrudes towards the rotatable drum 3 when the rear bulkhead 60 is mounted on the casing 2.

[0104] In an advantageous embodiment, the bosses 101 could be conically shaped, tapered outwardly and provided with a central bore 102. The idle supporting roller 10 in turn may comprise a bearing which is mounted on the supporting boss 101 by means of a screw (bearing and screws not shown in the drawings). The rollers 10 located at the front of the drum 3 may be either connected to the front bulkhead or they might be connected to the basement 24. For example, Fig. 2 shows a roller 10 con-

nected to the basement via a bracket 101a. A front bulkhead made of a plastic, i.e. polymeric, material allows forming, if desired, a roller support as an integral piece of the front bulkhead.

[0105] Further, the dryer 1 includes an air-deflector member 17 which is positioned in the inner conduit 15. The air deflector member 17, as better visible in figure 7, is fixed to the cover 61 so that it is stationary with respect to the drum 3. The fixing takes place by means of screws, all indicated with 18, which are screwed into threaded holes 19 formed in the inner surface 66 of the cover 61. Due to the chosen type of fixing, the air-deflector member can be thus detached and removed from cover 61, by unscrewing and removing screws 18.

[0106] Air deflector member 17 is preferably fixed to the central bulge portion 63 of the cover 61 and faces the back wall 8 of drum 3, at its central portion. Preferably, the air-deflector member 17 covers the whole upper portion of cover 61, that is, it blocks completely inner conduit 15 in its upper region with respect to the vertical axis Z. Figure 5 shows the rear wall 21 of the casing 2 with the cover 61 attached to the rear bulkhead 60, while figure 10 shows the same rear wall 21 where the cover 61 has been removed and the back wall 8 and the air-deflector member 17 are visible.

[0107] The air deflector member 17 includes a deflecting wall 40 which runs from one side to the other of the inner surface 66 of cover 61, that is, the deflecting wall spans the whole width of the conduit 15. The whole flow of process air flowing from the basement 24 and passing through the fan 12 in conduit 15, thus impinges against deflecting wall 40, which blocks the flow of process air completely within the inner conduit 15.

[0108] The deflecting wall 40 projects from the inner surface 66 of the cover 61 and it is inclined with respect to the same. The inner surface 66 is preferably substantially vertical, and the deflecting wall 40 forms an angle with the inner surface 66. This angle can be better appreciated in figure 6 and in the enlarged view of figure 6a. The angle is chosen so that the stream of process air which is deflected while flowing in the inner conduit does not develop turbulences, or only minimally, and it maintains a relatively high speed.

[0109] The air-deflector member 17 deflects substantially all the stream of process drying air that is flowing in the inner conduit 15. Due to the inclination of the wall 40, the majority of the deflected stream of process air is directed towards a portion of the rear end 3b of the drum 3 located below a horizontal plane HP passing through the axis of rotation R of the drum (see figures 3 and 10). The horizontal plane HP divides the drum 3 in a lower half and an upper half. As shown in figure 8 in a schematic way, the laundry is located substantially for most of the time in the lower half of the drum 3, and therefore deflecting the process air flowing by means of the air-deflector member 17 in inner conduit 15 towards the lower half of the drum 3 implies that the process air is for its majority in contact with the laundry while flowing through

the drum.

[0110] Referring back to figures 3 - 5 and 10, the air-deflector member 17 mounted on the cover 61 and the drum 3 are sectioned in two by a vertical plane VP passing through the rotational axis R of the drum 3, which divides each of them in a left and in a right half. The two planes HP and VP thus divide the drum 3 in four quarters, a lower right quarter, and upper right quarter, a upper left quarter and a lower left quarter. The deflecting wall 40 defines a first end 41 which is located at the first half of the cover 61, and a second end 42 at the right half, of the cover 61. The first and second end 41 and 42 are located at the peripheral boundaries of the conduit 15. In the depicted embodiment, the second end 42 is positioned higher (in a front view) than the first end 41 with respect to the vertical axis Z, so that the configuration of the inner conduit 15 delimited upwardly by the wall 40 is substantially asymmetric with respect to the vertical plane VP.

[0111] The deflecting wall 40 includes a concave portion 43 located substantially below plane HA and a first and second convex portions 44, 45, including respectively the first and second ends 41, 42. These first and second convex portions are thus also asymmetric with respect to the vertical plane VP. The average height of the second portion is higher than the average height of the first portion, with respect to the vertical axis Z.

[0112] As visible in figure 6, 6a and 10, the inner conduit 15 brings process air towards the back wall 8. Air main enter the drum only via the air permeable portion 81 of the back wall 8. In the present invention, process air is deflected by the air-deflector member 17 in such a way that the process air impinges the whole lower part of the air permeable portion 81 of the back wall 17. The process air impinges the air permeable portion 81 of the back wall from its lower boundary, that is, from the lower part of the delimiting edge 82. In the depicted embodiment, as clearly shown in figure 10, the part of the delimiting edge which is hit by the process air is a portion of circumference, including the lowermost portion of delimiting edge 82 with respect to the Z axis.

[0113] Preferably, the direction of rotation of the drum 3 in the depicted embodiment is clockwise, so that the laundry, due to the combined actions of centrifugal forces and gravity, remains for most of the time in the lower right quarter of the drum 3. Due to the asymmetry in the conduit 15, also the majority of the process air is flowing within the lower right half quarter of the drum.

[0114] Figure 12 shows an additional embodiment of the air deflector member 17'. In this different embodiment, the inclination of the deflecting wall 40' is different than the inclination of deflecting wall 40 and the height of the first and second ends 41', 42' are different than in the previous embodiment. The laundry 1 may be the same in both embodiments, only the deflecting member 17, 17' may differ.

Claims**1. Laundry dryer (1) comprising:**

- an outer casing (2) including a basement and having a front wall (20) and a rear wall (21);
- a drum (3) adapted to house the laundry to be dried, said drum being rotatably mounted inside the casing (2) so that is apt to rotate around an axis (R) and comprising a front end (3a) facing the front wall (20) of the casing (2) and a rear end (3b) facing the rear wall (21) of the casing (2);
- a back wall (8) to close the rear end (3b) of said drum, said back wall including a portion (81) which is air permeable, said air permeable portion having a delimiting edge (82);
- a hot-air generator (30) structured to circulate a stream of process drying air through the rotatable drum (3);
- the rear wall (21) of the casing (2) comprising an outer cover (61) facing the rear end of the drum (3), the outer cover delimiting an inner conduit (15) which is fluidly connected to the hot-air generator (30) and which channels the stream of process drying air towards the rear end (3b) of the drum (3);
- wherein the rear wall (21) of the casing (2) furthermore comprises an air-deflector member (17, 17') which is positioned in the inner conduit (15) and is fixed to the rear wall so that it is stationary with respect to the drum, the air-deflector member is configured so as to deflect the majority of the stream of process drying air that is flowing in the inner conduit (15) towards a portion of the back wall of the drum (3) located below a horizontal plane (HP) passing through the axis (R) of rotation of the drum, said portion of the back wall (8) of the drum including a part of the delimiting edge (82) of the air permeable portion (81) of the back wall (8).

- 2.** The dryer (1) according to claim 1, wherein said portion of the back wall includes the lowest point of the delimiting edge (82) of the back wall (8) with respect to a vertical axis (Z).
- 3.** The dryer (1) according to claim 1 or 2, wherein the rear wall (21) includes a rear bulkhead (60) to which the rear end (3b) of said drum is coupled in an axially rotating manner, said rear bulkhead facing on one side said rear end of the drum (3) and on the other side the exterior of the casing, and having an aperture (64) closed by said outer cover (61).
- 4.** The dryer (1) according to claim 3, wherein said air-deflector member (17) is fastened to said cover (61) or to said rear bulkhead (60).

- 5.** The dryer (1) according to any of the preceding claims, wherein said back wall (8) delimits, together with said cover and said air-deflector member, said inner conduit.
- 6.** The dryer (1) according to claim 5, wherein said cover (61), said rear wall (21) and said air-deflector member (17, 17') defines the inner conduit (15) for the process drying air extending from said basement (24) to the interior of said drum.
- 7.** The dryer (1) according to any of the preceding claims, wherein said inner conduit (15) defines a peripheral surface and a width, and said air-deflecting member (17, 17') spans the whole width of the peripheral surface.
- 8.** The dryer (1) according to any of the preceding claims, wherein said air-deflector member (17, 17') is releasably fastened to said rear wall (21).
- 9.** The dryer (1) according to any of the claims 1 - 7, wherein said air-deflector member (17, 17') is integral in one piece construction with a portion of said rear wall (21).
- 10.** The dryer (1) according to any of the preceding claims, wherein said air-deflector member (17, 17') includes a deflecting wall (40, 40') positioned into the inner conduit (15) so as to deviate the stream of process drying air of an angle comprised between 30° and 85°.
- 11.** The dryer (1) according to claim 10, wherein said inner conduit includes an inner surface (66) substantially perpendicular to said axis of rotation (R) and facing said rear end of the drum, and said deflecting wall (30) projects from said inner surface (66).
- 12.** The dryer (1) according to any of the preceding claims, wherein said air-deflector member (17, 17') includes a central portion which is air-impermeable and it is located facing a further part of the air-permeable portion of the back wall.
- 13.** The dryer (1) according to any of the preceding claims, wherein said air-deflector member (17, 17') is a-symmetric with respect to a vertical axis passing through said axis of rotation (R).
- 14.** The dryer (1) according to claim 13, wherein a vertical plane (VP) passing through said axis of rotation (R) of the drum (3) divides said rear wall in a first and a second half, and said air deflector member (17, 17') includes a deflecting wall (40, 40') having a first and a second end (41, 42; 41', 42'), the first end being located in the first half of the rear wall and said second end being located in said second half of the

rear wall, wherein said first end is positioned in said inner conduit higher than the second end relative to a vertical axis (Z).

15. The dryer (1) according to any of the preceding claims, wherein the process air enters into the drum (3) in a stream delimited for its majority, in cross section along a vertical plane perpendicular to the horizontal plane and to an axis (R) of rotation of the drum (3), by a part of the delimiting edge (82) of the air permeable portion downwardly and by a deflecting wall (40, 40') of said air-deflector member (17, 17') upwardly. 5 10
16. A kit including the laundry dryer according to any claims 1- 8 and 10 - 15, wherein said air-deflector member includes a deflecting wall having a first and a second end, said first end being higher than the second end along a vertical axis, and wherein said kit includes a further air-deflector member, said further air-deflector member including a further deflecting wall having a first and a second end, wherein either said first end is lower than the second end relative to a vertical axis, or wherein said first and second end have the same height relative to said vertical axis. 15 20 25

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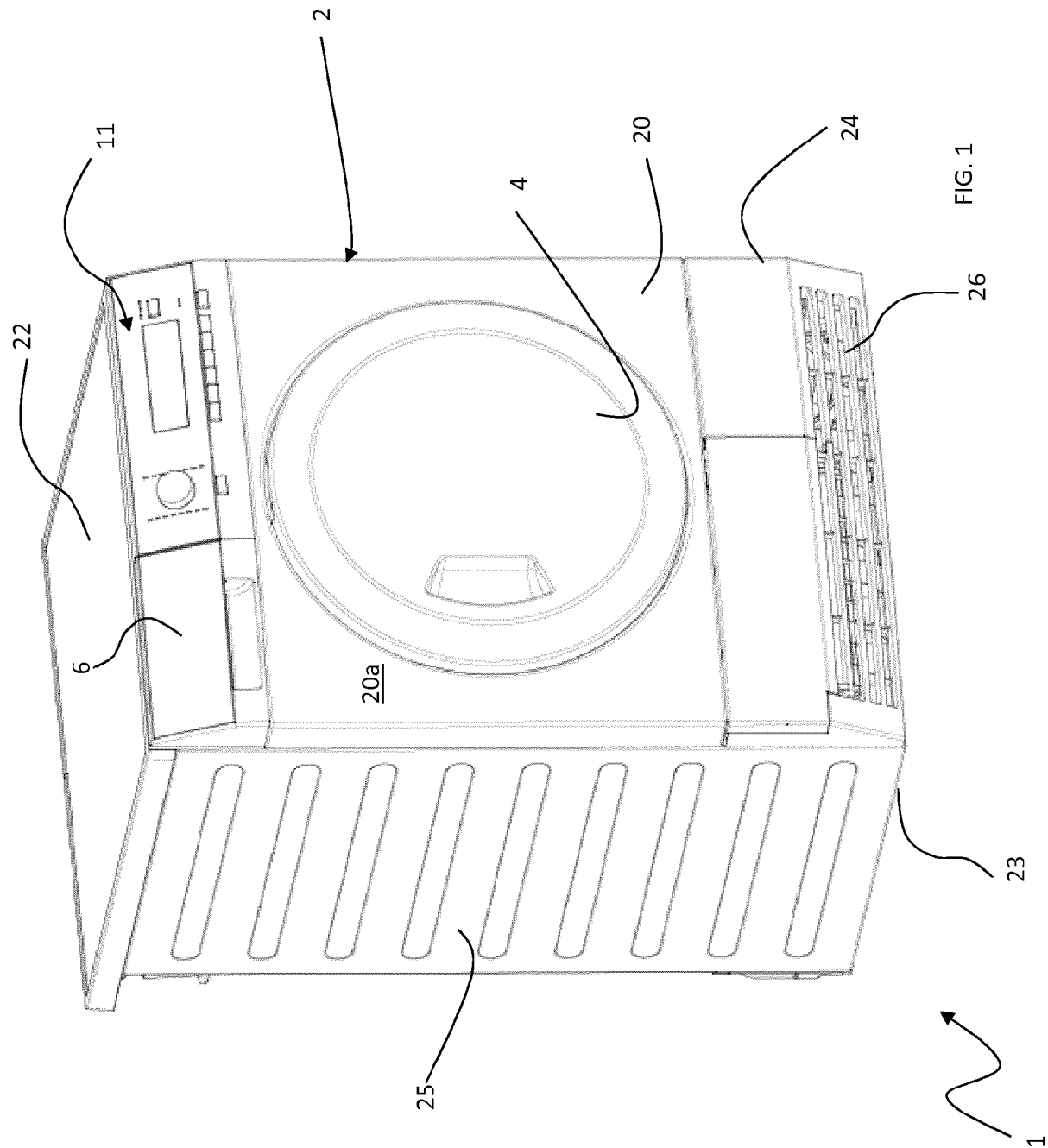
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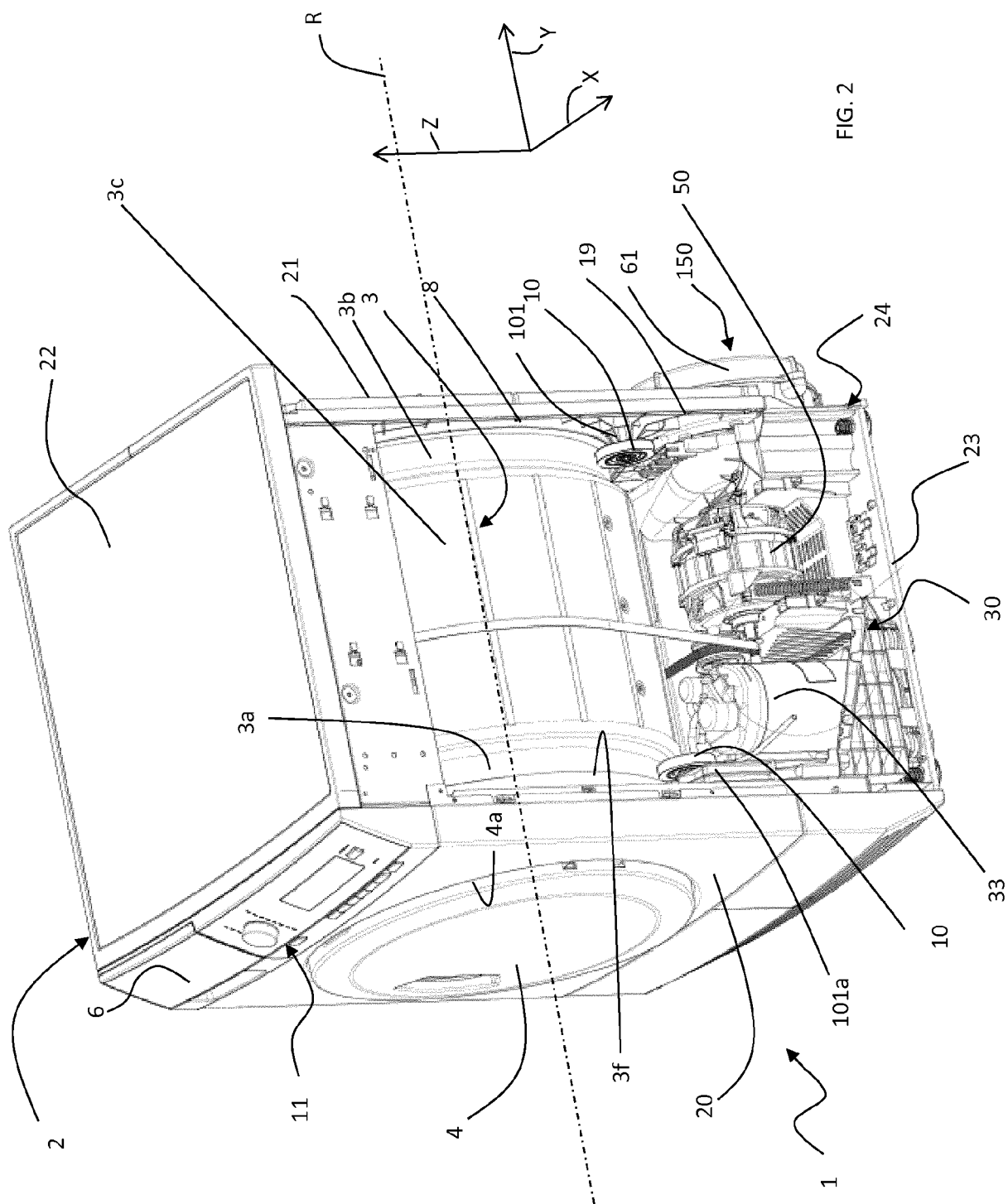
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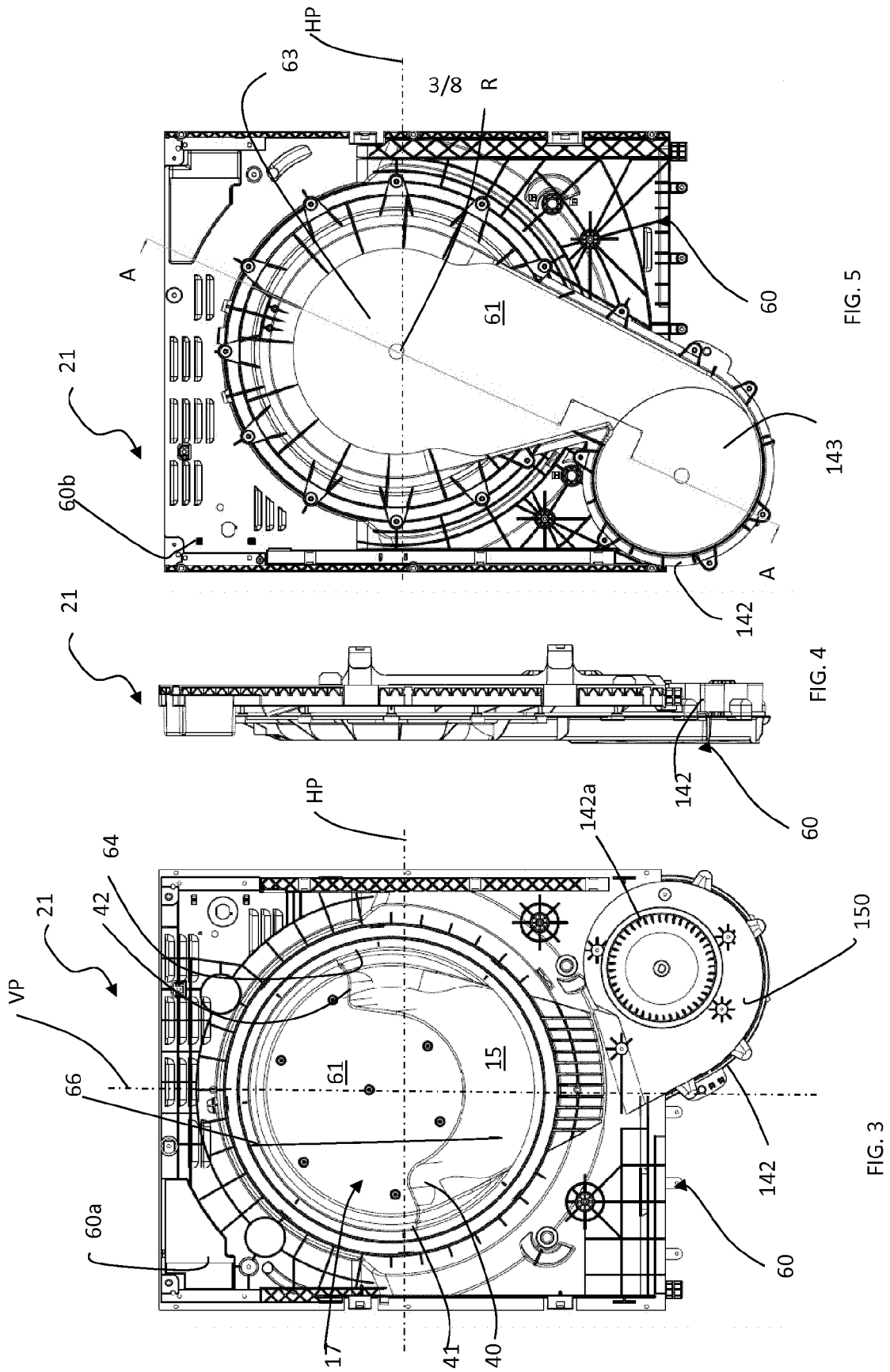
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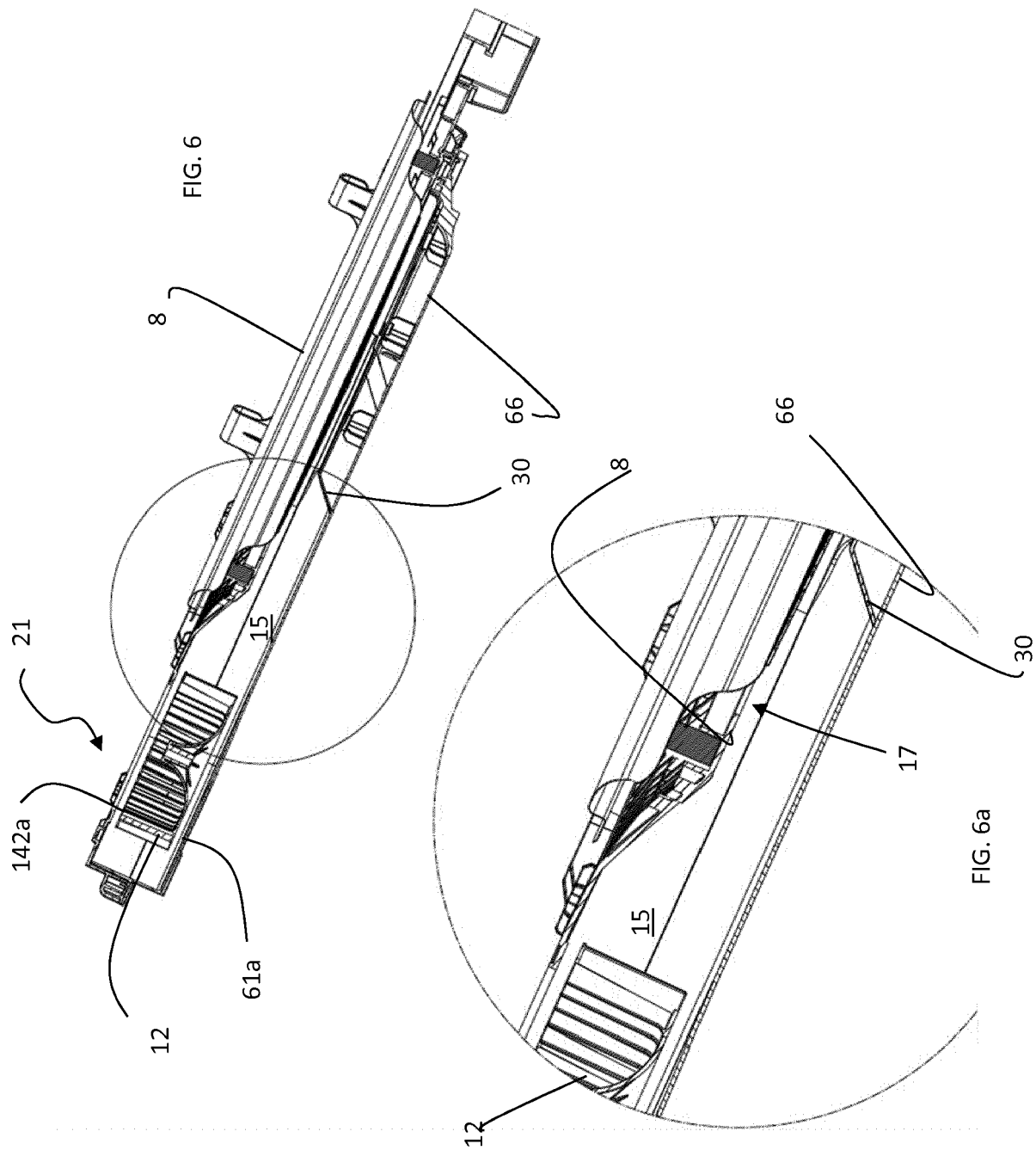
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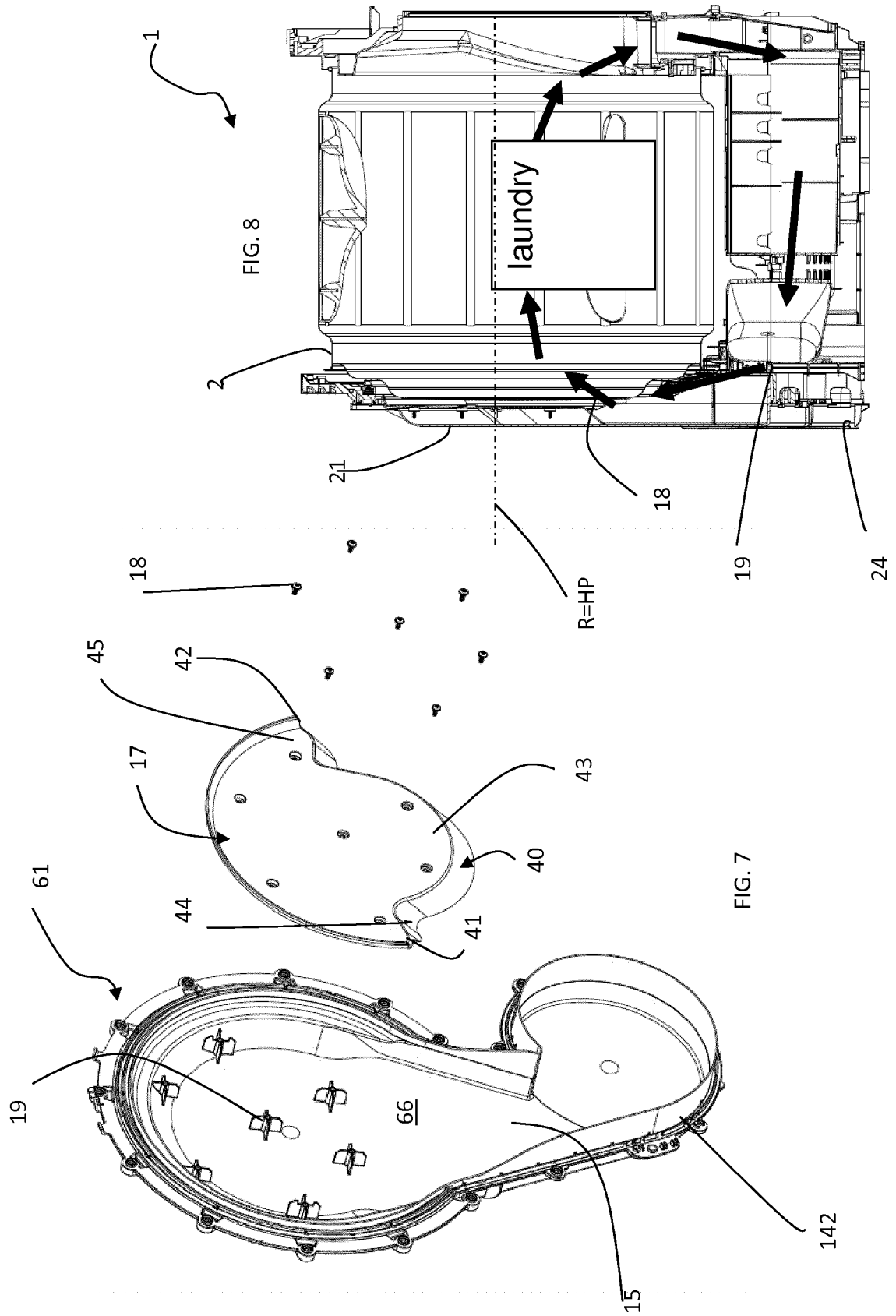
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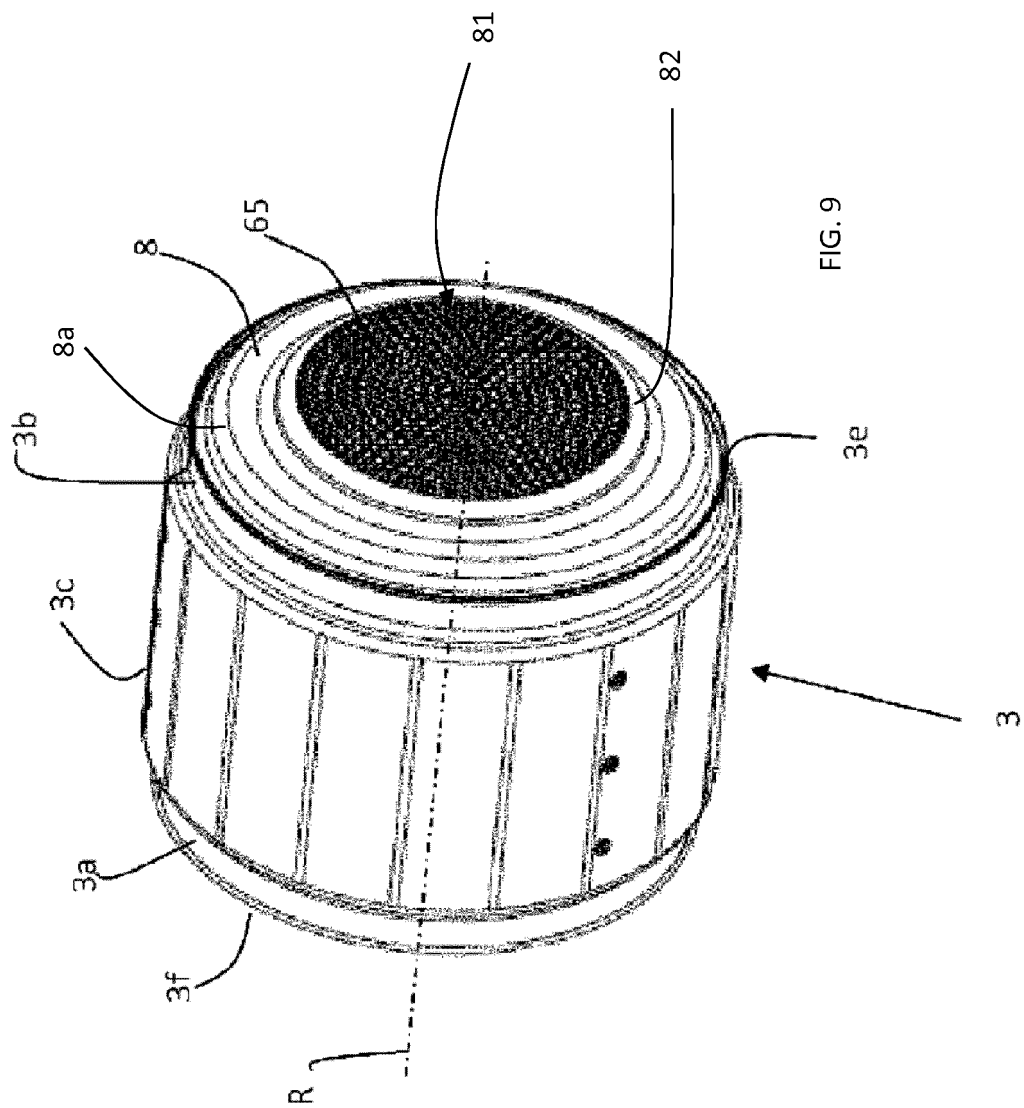


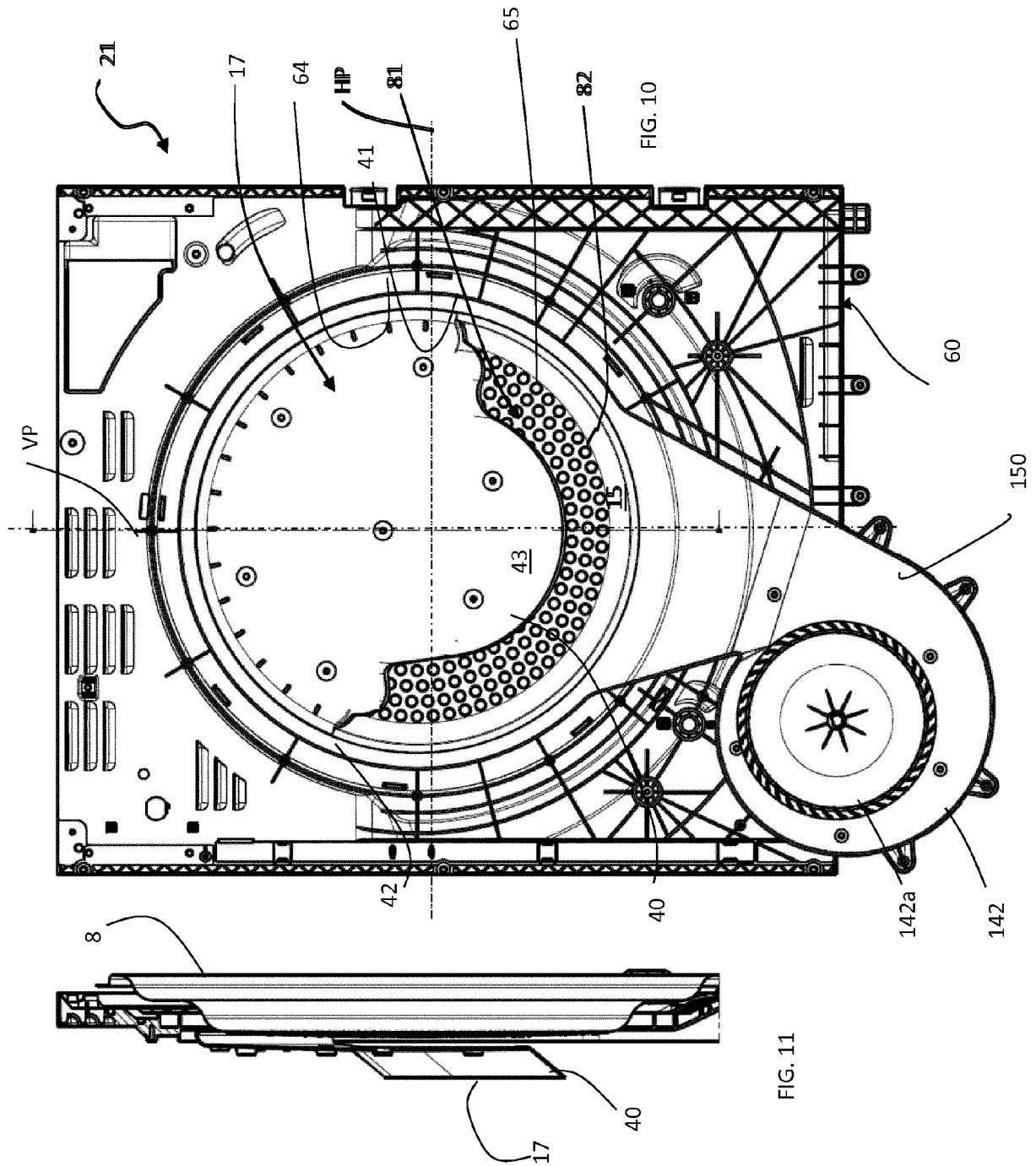


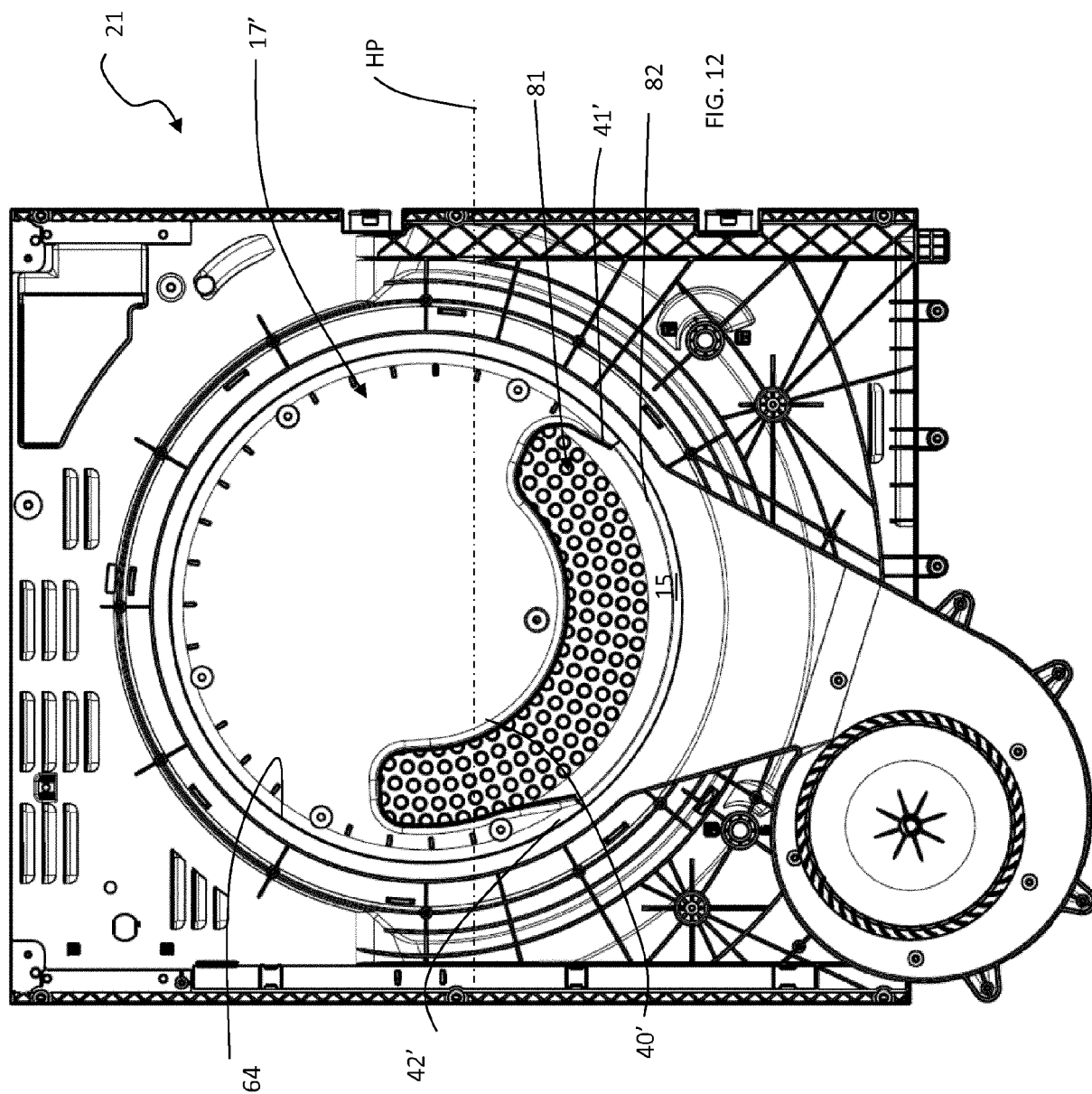














EUROPEAN SEARCH REPORT

Application Number
EP 16 17 1679

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 1 September 2016	Examiner Bermejo, Marco
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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