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(54) Title: ROTARY-DRUM LAUNDRY DRYER

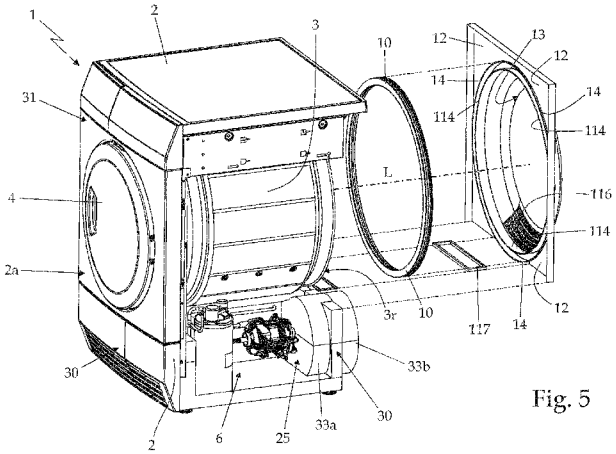

Fig. 5

(57) Abstract: Rotary-drum laundry dryer (1) comprising an outer casing (2) having a front wall (2a) and a rear wall (2b), a rotatable drum (3) which is structured for housing the laundry to be dried and is fixed in axially rotating manner inside the casing (2), and a hot-air generator (6) structured to circulate a stream of hot air through the rotatable drum (3); said rotatable drum (3) comprising a substantially cylindrical, tubular body (3) having its front rim (3f) coupled in axially rotating manner to the front wall (2a) of the casing (2) and its rear rim (3r) coupled in substantially airtight and axially rotating manner to the rear wall (2b) of the casing (2) with the interposition of a rear circular sealing gasket (10); the rotary-drum laundry dryer (1) being characterized in that the rear wall (2b) of the casing (2) comprises: a substantially vertically-oriented supporting bulkhead (12) which is made of plastic material and is centrally provided with a substantially sink-shaped bulge (13) which, in turn, is aligned/faced to the rear mouth of the tubular body (3) delimited by said rear rim (3r), protrudes outwards of the outer casing (2) and is fluidly connected to the hot-air generator (6); and a substantially cylindrical first gasket-supporting collar (14) which protrudes from the inner face of the supporting bulkhead (12) towards the tubular body (3) while remaining substantially coaxial to the rear rim (3r) of said tubular body (3), and has a nominal diameter greater than that of the rear rim (3r) of the tubular body (3) so as to encircle the sink-shaped bulge (13) and said rear rim (3r); the rear circular sealing gasket (10) being fitted into the first gasket-supporting collar (14) and said first gasket-supporting collar (14) being realized in one piece with said supporting bulkhead (12).

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ROTARY-DRUM LAUNDRY DRYER

The present invention relates to a rotary-drum laundry dryer.

In particular, the present invention relates to a rotary-drum home laundry dryer to which the following description refers purely by way of example without implying any loss of generality.

As is known, rotary-drum home laundry dryers currently on the market generally comprise: a substantially parallelepiped-shaped, outer boxlike casing structured for resting on the floor; a substantially cylindrical rotatable drum which is structured for housing the laundry to be dried and is housed in axially rotating manner inside the casing to rotate about an horizontally-oriented longitudinal reference axis, facing a laundry loading/unloading opening formed in the front wall of the casing; a porthole door hinged to the front wall of the casing to rotate to and from a closing position in which the door rests against the front wall of the casing to close the laundry loading/unloading opening and airtight seal the rotatable drum; an electrically-powered motor assembly which is housed inside the casing and is structured for driving into rotation the rotatable drum about its longitudinal reference axis; 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 hot air which has a very low moisture content and flows through the rotatable drum and over the laundry inside the drum to dry the laundry; and an electronic central control unit which controls both the motor assembly and the hot-air generator to perform, on command, one of the user-selectable drying cycles stored in the same central control unit.

In most of the rotary-drum home laundry dryers currently on the market, the rotatable drum furthermore consists in a substantially cylindrical, rigid tubular body generally made of metal material and which extends substantially horizontally inside the boxlike casing, aligned to the laundry loading/unloading opening, and is structured for resting on a number of idle supporting rollers which are arranged at the two axial ends of the tubular body parallel to the drum longitudinal reference axis,

and may be fixed to the appliance casing in free revolving manner so as to allow the tubular body to rotate about its horizontally-oriented longitudinal reference axis. The circular front rim of the tubular body surrounds the laundry loading/ unloading opening and is coupled in axially rotating manner to the front wall of the boxlike casing; whereas the circular rear rim of the tubular body abuts against the rear wall of the boxlike casing and is coupled in axially rotating manner to said rear wall.

The stream of hot air produced by the hot-air generator usually enters into the tubular body via an intake air-vent realized in the rear wall of the boxlike casing, within the perimeter of the rear rim of the tubular body, flows inside the tubular body for the entire length of the latter, and comes out of the tubular body via an escape air-vent usually realized on the annular frame that delimits the laundry loading/unloading opening on the front wall of the casing.

To avoid air leakages from the two axial ends of the tubular body, a first circular sealing gasket is generally interposed between the front rim of the tubular body and the front wall of the casing, whereas a second circular sealing gasket is generally interposed between the rear rim of the tubular body and the rear wall of the appliance casing.

In most of the rotary-drum home laundry dryers currently on market, the front circular sealing gasket is generally recessed into a circular groove realized on the front wall of the casing and is firmly fixed to the bottom of the groove so to remain stationary when the rotatable drum rotates about its longitudinal reference axis.

The second circular sealing gasket, instead, is usually fixed and/or glued and/or force-fitted into a cylindrical gasket-supporting collar which is rigidly fixed to the back panel forming the rear wall of the boxlike casing, so to be coaxial to the rear rim of the tubular body. Furthermore, the gasket-supporting collar and the back panel are made of metal material and the gasket-supporting collar is generally clinched onto the inner face of the back panel forming the rear wall of the boxlike casing. Also the rear circular sealing gaskets therefore remains stationary when the rotatable drum rotates about its longitudinal reference axis.

Despite being extremely cost effective, this particular construction of the rear wall of the casing makes the assembly of the laundry dryer relatively difficult. The

back panel and the gasket-supporting collar, in fact, usually have very sharp edges, thus people working along the appliance production line are requested to handle these components with extreme care for not being injured.

Aim of the present invention is to simplify both the structure of the rear wall of the boxlike casing both its assembling procedure so to bring almost close to zero the injuring risk for people handling the rear-wall component parts.

In compliance with the above aims, according to the present invention there is provided 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 coupled in axially rotating manner to a front bulkhead and its rear rim coupled in substantially airtight and axially rotating manner to the rear wall of the casing with the interposition of a rear circular sealing gasket; the rotary-drum laundry dryer **being characterized in that** the rear wall of the casing comprises:

- a substantially vertically-oriented supporting bulkhead which is made of plastic material and is aligned/faced to a rear mouth of the tubular body delimited by said rear rim; and
- a substantially cylindrical first gasket-supporting collar which protrudes from the inner face of the supporting bulkhead towards the tubular body while remaining substantially coaxial to the rear rim of said tubular body, and which encircles a central portion of the supporting bulkhead aligned/faced to the rear mouth of the tubular body and fluidly connected to the hot-air generator;

the rear circular sealing gasket being fitted into the first gasket-supporting collar and said first gasket-supporting collar being realized in one piece with said supporting bulkhead.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that said first gasket-supporting collar is realized in one piece with said supporting bulkhead via an injection molding process.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the central portion of said supporting bulkhead comprises a substantially sink-shaped bulge which is aligned/faced to the rear mouth of the tubular body delimited by said rear rim, protrudes outwards of the outer casing and is fluidly connected to the hot-air generator.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the sink-shaped bulge of the supporting bulkhead is substantially circular in shape and preferably projects outwards of the casing while remaining substantially coaxial to the rear rim of the tubular body.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the first gasket-supporting collar has a diameter greater than that of the rear rim of the tubular body so as to encircle the rear rim of said tubular body.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the supporting bulkhead is provided with a number of stiffening ribs that protrude from the outer face of the same supporting bulkhead.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that said stiffening ribs cross to one another at the sink-shaped bulge of the supporting bulkhead.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that said stiffening ribs are oriented radially and cross to one another substantially at center of the substantially circular-shaped, sink-shaped bulge of the supporting bulkhead.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the rear wall of the casing furthermore comprises a lid or cover which has a permeable-to-air portion and is arranged on the inner face of the supporting bulkhead to cover the central portion (13) of the supporting bulkhead (12), so as to form/delimit, together with the supporting bulkhead, an inner cavity which is fluidly connected to the hot-air generator and to the inside of the rotatable drum.

Preferably, though not necessarily, the rotary-drum laundry dryer is

furthermore characterized in that said lid or cover is substantially circular in shape and has an outer diameter slightly lower than the inner diameter of the first gasket-supporting collar.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that said lid or cover is substantially dish- or basin-shaped and is fixed to the supporting bulkhead with its concavity facing a sink-shaped bulge formed on said supporting bulkhead (12), so to form, together with the first gasket-supporting collar, a substantially circular-shaped annular seat or groove which is arranged coaxial to the rear mouth of the tubular body and is suitably shaped/dimensioned to house the circular sealing gasket.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that said lid or cover is made of plastic material.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized by also comprising a laundry anti-entangling nose which protrudes from the inner face of the lid or cover, extends inside the tubular body, and is shaped/dimensioned so as to prevent, when the tubular body rotates, the entangling of the damp laundry located into the rotatable drum.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that said laundry anti-entangling nose is realized in one piece with said lid or cover.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the supporting bulkhead has a pass-through opening that communicates with the hot-air generator; and in that the rear wall of the casing additionally comprises a grid-like lid or cover which is arranged on the supporting bulkhead to cover said pass-through opening.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the sink-shaped bulge formed on the supporting bulkhead has, on the bottom, a pass-through opening that communicates with the hot-air generator; and in that the rear wall of the casing additionally comprises a grid-like lid or cover which is arranged on the bottom of the sink-shaped bulge to cover said pass-through opening.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the supporting bulkhead is provided with a second substantially cylindrical, gasket-supporting collar which protrudes from the inner face of the supporting bulkhead towards the tubular body while remaining substantially coaxial to the first gasket-supporting collar, and has a nominal diameter lower than that of the rear rim of the tubular body so as to form, together with the first gasket-supporting collar, a substantially circular-shaped annular seat or grove which is arranged coaxial to the rear mouth of the tubular body and is suitably shaped/dimensioned to house the circular sealing gasket.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that said second gasket-supporting collar is realized in one piece with the supporting bulkhead.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that said grid-like lid or cover is realized in one piece with the supporting bulkhead.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that said grid-like lid or cover is realized in one piece with a sink-shaped bulge formed on the supporting bulkhead.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the hot-air generator comprises: an air recirculating conduit having a first end fluidly connected to central portion of the supporting bulkhead, and a second end fluidly connected to the front mouth of the tubular body delimited by said front rim; an air circulating pump which is located along the air recirculating conduit and is structured to produce an airflow which flows in closed loop through the air recirculating conduit and the rotatable drum; an air cooling device which is located along the air recirculating conduit and is structured to remove moisture from the moist air arriving the from rotatable drum; and an air heating device which is located along the air recirculating conduit, downstream of the air cooling device, and is structured for heating the dehumidified airflow arriving from the air cooling device and directed back to rotatable drum.

Preferably, though not necessarily, the rotary-drum laundry dryer is

furthermore characterized in that said hot-air generator furthermore comprises a heat-pump assembly which comprises a first and a second air/refrigerant heat exchanger both located inside the air recirculating conduit; the first air/refrigerant heat exchanger being structured to remove moisture from the airflow arriving from the rotatable drum, thus forming the air cooling device of the hot-air generator; the second air/refrigerant heat exchanger being located inside the air recirculating conduit downstream of the first air/refrigerant heat exchanger, and being structured to release heat to the airflow arriving from the first air/refrigerant heat exchanger, thus forming the air heating device of the hot-air generator.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the outer casing comprises a lower supporting basement or socle which is structured for resting on the floor and for housing at least part of the hot-air generator; a central/intermediate section of the air recirculating conduit extending in pass-through manner across the lower supporting basement or socle; and a first auxiliary annular sealing gasket being interposed between an end section of the air recirculating conduit incorporated in the supporting bulkhead, and the central/intermediate section of the air recirculating conduit incorporated into the lower supporting basement or socle of the casing.

Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that a second auxiliary annular sealing gasket is furthermore interposed between a starting section of the air recirculating conduit incorporated into the front wall of the upper boxlike cabinet and the central/intermediate section of the air recirculating conduit incorporated into the lower supporting basement or socle of the casing; the first auxiliary annular sealing gasket being arranged so as to be substantially coplanar to a second auxiliary annular sealing gasket.

A non-limiting embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

- Figures 1 and 2 are two perspective views, with parts removed for clarity, of a rotary-drum laundry dryer realized in accordance with the teachings of the present invention;

- Figure 3 is a section view of the Figure 1 laundry dryer with parts removed for clarity;
- Figure 4 is a partly-exploded perspective view of the rear wall of the Figure 1 laundry dryer with parts removed for clarity;
- Figure 5 is a partly-exploded perspective view of a different embodiment of the rear wall of the Figure 1 laundry dryer with parts removed for clarity; and
- Figure 6 is a section view of the Figure 5 laundry dryer with parts removed for clarity.

With reference to Figures 1, 2 and 3, reference number 1 indicates as a whole a rotary-drum laundry dryer which comprises: a preferably, though not necessarily, parallelepiped-shaped, outer boxlike casing 2 which is structured for resting on the floor and is provided with reciprocally-faced, substantially vertically-oriented, front and rear walls 2a and 2b; a substantially cylindrical, rotatable drum 3 structured for housing the laundry to be dried, and which is fixed in axially rotating manner inside the boxlike casing 2, facing a laundry loading/unloading pass-through opening formed on the front wall 2a of casing 2; and a porthole door 4 hinged to the front wall 2a of casing 2 so to be able to rotate about a preferably, though not necessarily, vertically-oriented reference axis, to and from a closing position in which the porthole door 4 rests against the front wall 2a to close the laundry loading/unloading opening and substantially airtight seal the rotatable drum 3.

Inside the boxlike casing 2, the laundry dryer 1 additionally comprises an electrically-powered motor assembly (not shown) structured for driving into rotation the rotatable drum 3 about its longitudinal reference axis; an open-circuit or closed-circuit, hot-air generator 6 which is structured to circulate through the rotatable drum 3 a stream of hot air having a low moisture level, and which flows over and dries the laundry located inside the drum 3; and an electronic central control unit 7 which controls both the motor assembly and the hot-air generator 6 to perform, on command, one of the user-selectable drying cycles preferably, though not necessarily, stored in the same central control unit.

With reference to Figure 2, the rotatable drum 3 preferably consists in a

substantially cylindrical-shaped, rigid tubular body 3 preferably made of metal material and which extends inside the boxlike casing 2 coaxial to a preferably substantially horizontally-oriented, longitudinal reference axis L while remaining substantially aligned to the laundry loading/unloading opening on the front wall 2a of the boxlike casing 2. The substantially cylindrical-shaped, rigid tubular body 3 is furthermore preferably structured for resting on a number of idle supporting rollers 8 which are arranged approximately at the two axial ends of the tubular body 3 with their rotation axis substantially parallel to the longitudinal reference axis L of tubular body 3, and are preferably, though not necessarily, fixed to the boxlike casing 2 in free revolving manner so as to allow the tubular body 3 to rotate about its longitudinal reference axis L inside the boxlike casing 2.

The circular front rim 3f of tubular body 3 surrounds the laundry loading/unloading opening realized on the front wall 2a of boxlike casing 2 and is coupled in substantially airtight and axially rotating manner to the front wall 2a, preferably with the interposition of a first circular sealing gasket 9. The circular rear rim 3r of tubular body 3 instead abuts against the rear wall 2b of boxlike casing 2 and is coupled in substantially airtight and axially rotating manner to said rear wall 2b with the interposition of a second circular sealing gasket 10. Front and rear circular sealing gaskets 9 and 10 are therefore substantially coaxial to the longitudinal reference axis L of tubular body 3.

In the example shown, circular sealing gasket 9 is preferably, though not necessarily, stationary recessed into a circular groove realized on a front panel or bulkhead 11 which is preferably associated to the front wall 2a of casing 2, so as to surround the laundry loading/unloading opening on the front wall 2a, and the front rim 3f of tubular body 3 abuts against said front circular sealing gasket 9.

Furthermore, the front bulkhead 11 preferably comprises a substantially funnel-shaped coupling element which surrounds the laundry loading/unloading opening on the front wall 2a of casing 2 and is preferably shaped/structured so as to connect the laundry loading/unloading opening on front wall 2a to the front rim 3f of tubular body 3, and the circular sealing gasket 9 is preferably stationary recessed into a circular groove or seat realized on the periphery of the funnel-shaped coupling

element of front bulkhead 11.

The second circular sealing gasket 10 is instead firmly fixed to the rear wall 2b of the boxlike casing 2.

With reference to Figure 3, the stream of hot air produced by the hot-air generator 6 preferably enters into the tubular body 3 through the rear mouth of tubular body 3, i.e. the mouth of tubular body 3 delimited by the rear rim 3r, flows inside tubular body 3 for the entire length of the latter, and comes out of tubular body 3 through the front mouth of tubular body 3, i.e. the mouth of tubular body 3 delimited by the front rim 3f, or vice versa.

In other words, the stream of hot air produced by the hot-air generator 6 preferably enters into tubular body 3 via an intake air-vent located in the rear wall 2b of the boxlike casing 2 aligned/faced to the rear mouth of tubular body 3, i.e. within the perimeter of the rear rim 3r of tubular body 3, and comes out of tubular body 3 via an escape air-vent which is preferably located either on the porthole door 4 that selectively closes the laundry loading/unloading opening of front wall 2a, or on the front wall 2a of the boxlike casing 2, preferably very close to the laundry loading/unloading opening.

In the example shown, the stream of hot air produced by hot-air generator 6 preferably comes out of tubular body 3 via an escape air-vent incorporated in the preferably funnel-shaped coupling element of front bulkhead 11 that delimits/surrounds the laundry loading/unloading opening on front wall 2a.

With reference to Figures 3 and 4, the intake air-vent of the hot-air generator 6 is instead incorporated into the rear wall 2b of boxlike casing 2.

Furthermore, the rear wall 2b of the boxlike casing 2 preferably comprises a substantially vertically-oriented, supporting panel or bulkhead 12 which is made of plastic material preferably via an injection molding process, and which is preferably centrally provided with a substantially sink-shaped bulge 13 that is aligned/faced to the rear mouth of tubular body 3 delimited by rear rim 3r, projects/ protrudes outwards of the boxlike casing 2 and is in communication with, i.e. is fluidly connected to, the hot-air generator 6 so as to receive the stream of hot air produced by the hot-air generator 6.

In the example shown, the sink-shaped bulge 13 preferably communicates with the hot-air generator 6 via a pass-through opening 13a realized on the bottom of the same sink-shaped bulge 13.

With reference to Figures 3 and 4, the sink-shaped bulge 13 is furthermore preferably substantially circular in shape and preferably projects/protrudes outwards of the boxlike casing 2 while remaining substantially coaxial to the longitudinal axis L of the tubular body 3, i.e. while remaining substantially coaxial to the rear rim 3r of tubular body 3. Furthermore the sink-shaped bulge 13 has an outer diameter lower than that of the circular sealing gasket 10 and of the rear rim 3r of tubular body 3, so as to be located inside the perimeter of the rear rim 3r of tubular body 3.

The supporting bulkhead 12 is additionally provided with a substantially cylindrical gasket-supporting collar 14 which protrudes from the inner face of the supporting bulkhead 12 towards tubular body 3 while remaining substantially coaxial to the longitudinal axis L of tubular body 3, i.e. coaxial to the rear rim 3r of tubular body 3, and has a nominal diameter greater than that of the rear rim 3r of tubular body 3 so as to encircle the sink-shaped bulge 13 and the rear rim 3r of tubular body 3. This gasket-supporting collar 14 is structured to house within itself the circular sealing gasket 10 and is furthermore realized in one piece with the supporting bulkhead 12.

In other words, the gasket-supporting collar 14 is realized in one piece with the supporting bulkhead 12 together with the sink-shaped bulge 13, preferably via an injection molding process, and the circular sealing gasket 10 is firmly fitted into the gasket-supporting collar 14.

Furthermore, the circular sealing gasket 10 is encircled into and preferably also firmly fixed in abutment inside the gasket-supporting collar 14 preferably in substantially airtight manner, and it is suitably shaped/dimensioned so as to come in abutment against the rear rim 3r of tubular body 3 without interruption all around the perimeter of the latter, so as to avoid any air leakage between the rear rim 3r of tubular body 3 and the supporting bulkhead 12.

In the example shown, the rear circular sealing gasket 10 is preferably fixed and/or glued and/or force-fitted into the gasket-supporting collar 14.

With reference to Figures 2 and 3, the supporting bulkhead 12 is preferably provided with a number of preferably radially oriented, stiffening ribs 15 which protrude from the outer face of the supporting bulkhead 12 and which preferably cross to one another preferably, though not necessarily, at center of the substantially circular-shaped, sink-shaped bulge 13 realized on the same supporting bulkhead 12.

With particular reference to Figures 3 and 4, the rear wall 2b of the boxlike casing 2 preferably additionally comprises a lid or cover 16 which has a permeable-to-air portion 16c and is arranged on the inner face of the supporting bulkhead 12 to preferably cover the sink-shaped bulge 13 located within the perimeter of the gasket-supporting collar 14, so as to form/delimit, together with the supporting bulkhead 12, an inner cavity 17 which is fluidly connected to the hot-air generator 6 and to the inside of the rotatable drum 3.

Furthermore, the lid or cover 16 is firmly fixed in abutment on the inner face of the supporting bulkhead 12 above the outwards-projecting bulge 13 of the same bulkhead 12, i.e. aligned/faced to the rear mouth of tubular body 3 delimited by rear rim 3r, and it is properly shaped/ dimensioned so to cover the outwards-projecting bulge 13 located within the perimeter of the gasket-supporting collar 14, so as to form/delimit, together with the supporting bulkhead 12, an inner cavity 17 which is aligned/ faced to the rear mouth of tubular body 3, i.e. the mouth of tubular body 3 delimited by rear rim 3r, and which communicates with, i.e. is fluidly connected to, the hot-air generator 6 so as to receive the stream of hot air produced by the same hot-air generator 6.

A central portion of 16c of the lid or cover 16 is furthermore properly perforated, or at any rate structured to be permeable to air, so that the stream of hot air flowing along the tubular body 3 is allowed to flow through the lid or cover 16, from tubular body 3 to the inner cavity 17 or vice versa.

In the example shown, the inner cavity 17 of the rear wall 2b is preferably substantially circular in shape and is arranged substantially coaxial to the longitudinal reference axis L of tubular body 3.

With reference to Figures 3 and 4, in the example shown the lid or cover 16 is preferably substantially circular in shape and preferably, though not necessarily, has

an outer diameter slightly lower than the inner diameter of the gasket-supporting collar 14, so that the circular sealing gasket 10, when fixed in place into the gasket-supporting collar 14, rests/abuts on the peripheral border of the circular-shaped lid or cover 16 preferably in substantially airtight manner.

In addition to the above, the lid or cover 16 is preferably firmly fixed to the supporting bulkhead 12 by means of a number of pass-through fixing screws or rivets (not shown) suitably arranged along the perimeter of the lid or cover 16, and is moreover preferably coupled in substantially airtight manner to the inner face of the supporting bulkhead 12 with the interposition of an annular sealing gasket 18 which surrounds the perimeter of the sink-shaped bulge 13, so as to form/ delimit, together with the supporting bulkhead 12, a substantially circular-shaped, inner cavity 17 which is coaxial to the rear mouth of tubular body 3, and which communicates with, i.e. is fluidly connected to, both the inside of tubular body 3 and the hot-air generator 6, so that the stream of hot air circulating inside the rotatable drum 3 is obliged to flow into, or flow out of, the rear mouth of rotatable drum 3 through said inner cavity 17.

Preferably, though not necessarily, the lid or cover 16 is furthermore substantially dish- or basin-shaped and is firmly fixed to the supporting panel or bulkhead 12 with its concavity faced to the substantially circular, sink-shaped bulge 13 of bulkhead 12, so as to form, on the rear wall 2b of the boxlike casing 2 and together with the gasket-supporting collar 14, a substantially circular-shaped annular groove or seat 10a which is arranged coaxial to the rear mouth of tubular body 3 and is suitably shaped/dimensioned to house the circular sealing gasket 10; and so as to form, inside the rear wall 2b of the boxlike casing 2, a substantially circular inner cavity 17.

The permeable-to-air central portion of 16c of the lid or cover 16 is furthermore preferably substantially circular in shape, and it located on the bottom of the substantially dish- or basin-shaped lid or cover 16, preferably at center of the same lid or cover, so as to be substantially coaxial to the longitudinal reference axis L of tubular body 3.

Alike the supporting panel or bulkhead 12, also the lid or cover 16 is

preferably, though not necessarily, made of plastic material, preferably via an injection molding process.

With reference to Figures 3 and 4, the rotary-drum home laundry dryer 1 preferably, though not necessarily, also comprises a laundry anti-entangling nose 19 which protrudes from the inner face of the lid or cover 16 and extends inside the tubular body 3 preferably while remaining substantially coaxial to the longitudinal reference axis L of tubular body 3, and is properly shaped/dimensioned so as to prevent, when tubular body 3 rotates, the entangling of the damp laundry located into the rotatable drum 3. The anti-entangling nose 19 is preferably substantially frustoconical in shape.

In the example shown, the anti-entangling nose 19 preferably comprises: a supporting socket 20 which is structured for being rigidly fixed in abutment on the inner face of the lid or cover 16, preferably substantially at centre of the permeable-to-air central portion of 16c of the same lid or cover 16, preferably, though not necessarily, via a number of anchoring screws 21; and a preferably, though not necessarily, substantially cone shaped, oblong member 22 which is rigidly fixed onto the supporting socket 20, sticks out from the supporting socket 20 inside tubular body 3, and is properly dimensioned/ shaped so as to prevent the damp laundry located into the rotatable drum 3 from entangling, when tubular body 3 rotates, on the inner face of the rear wall 2b.

As an alternative, the anti-entangling nose 19 could be realized in one piece with the lid or cover 16 and preferably, though not necessarily, may consists in a preferably substantially ogival-shaped bulge or recess which is realized approximately at centre of the lid or cover 16 and protrudes inside tubular body 3 preferably while remaining substantially coaxial to the longitudinal reference axis L of tubular body 3.

In other words, the anti-entangling nose 19 is preferably realized in one piece with the lid or cover 16, preferably via an injection molding process.

With reference to Figures 1, 2, 3 and 4, the hot-air generator 6, in turn, preferably, though not necessarily, consists in a closed-circuit, hot-air generator 6 which is structured for gradually drawing air from rotatable drum 3; cooling down

the air arriving from rotatable drum 3 so to extract the surplus moisture in the air drawn from rotatable drum 3; heating the dehumidified air to a predetermined temperature normally higher than the temperature of the air drawn out from rotatable drum 3; and supplying the heated, dehumidified air back into the rotatable drum 3, where it flows over, the laundry inside the drum to dry said laundry.

In other words, the hot-air generator 6 provides for continually dehumidifying and heating the air circulating inside rotatable drum 3 to dry the laundry located inside the drum 3, and preferably comprises:

- an air recirculating conduit 24 having a first end in communication with, i.e. fluidly connected to, the inner cavity 17 formed inside the rear wall 2b of casing 2, and a second end in communication with, i.e. is fluidly connected to, the front mouth of tubular body 3;
- an electrically-powered centrifugal fan 25 or other type of air circulating pump, which is located along the air recirculating conduit 24 and is structured to produce an airflow f which flows in closed loop through the air recirculating conduit 24 and the rotatable drum 3;
- an air cooling device 26 which is located along the air recirculating conduit 24 preferably, thought not necessarily, upstream of the air centrifugal fan 25, and is structured to remove moisture from the moist air arriving from rotatable drum 3 so as to cause the condensation of the surplus moisture inside the airflow f; and
- an air heating device 27 which is located along the air recirculating conduit 24, downstream of the air cooling device 26 and preferably also upstream of the air centrifugal fan 25, and which is structured for heating the dehumidified airflow f arriving from the air cooling device 26 and directed back to rotatable drum 3, so that the airflow f directed back into rotatable drum 3 is heated to a temperature preferably, though not necessarily, higher than or equal to that of the moist air flowing out of rotatable drum 3.

Furthermore, the first end of the air recirculating conduit 24 communicates with, i.e. is fluidly connected to, the sink-shaped bulge 13 of the supporting panel or

bulkhead 12, i.e. with/to the inner cavity 17 of the rear wall 2b, via the pass-through opening 13a. The second end of the air recirculating conduit 24, instead, communicates with, i.e. is fluidly connected to, the front mouth of tubular body 3 via a pass-through opening realized in the preferably funnel-shaped coupling element of front bulkhead 11 that delimits/surrounds the laundry loading/unloading opening on the front wall 2a of the boxlike casing 2.

As regards air cooling device 26 and air heating device 27, in the example shown the hot-air generator 6 is preferably, though not necessarily, provided with a heat-pump assembly which comprises a first and a second air/refrigerant heat exchanger both located inside the air recirculating conduit 24, preferably upstream of the centrifugal fan 25. The first air/refrigerant heat exchanger, traditionally referred to as the "evaporator" of the heat-pump circuit, is located inside the air recirculating conduit 24 preferably upstream of the centrifugal fan 25, and is structured to remove moisture from the airflow arriving from rotatable drum 3, thus forming the air cooling device 26 of the hot-air generator 6. The second air/refrigerant heat exchanger, traditionally referred to as the "condenser" of the heat-pump circuit, is instead located inside the air recirculating conduit 24 downstream of the first air/refrigerant heat exchanger 26, and is structured to release heat to the airflow arriving from the first air/refrigerant heat exchanger 26, thus forming the air heating device 27 of the hot-air generator 6.

As an alternative, the air cooling device 26 of hot-air generator 6 may comprise an air/air heat exchanger which is located inside the air recirculating conduit 24, preferably upstream of the centrifugal fan 25; and it is structured for using the external air to remove moisture from the airflow arriving from rotatable drum 3; whereas the air heating device 27 of hot-air generator 6 may consists in a resistor which is located inside the air recirculating conduit 24, downstream of the air/air heat exchanger and preferably also downstream of the centrifugal fan 25.

With reference to Figures 1, 2 and 3, in the example shown furthermore the outer boxlike casing 2 preferably, though not necessarily, comprises a substantially parallelepiped-shaped supporting basement or socle 30 which is structured for resting on the floor and preferably also for housing at least part of the hot-air generator 6;

and a substantially parallelepiped-shaped boxlike cabinet 31 which is rigidly fixed to the top of the lower supporting basement or socle 30 and is structured so as to house the rotatable drum 3.

In other words, the laundry loading/unloading opening of the boxlike casing 2 is realized in the front wall of the upper boxlike cabinet 31, and the porthole door 4 is hinged to the front wall of the same upper boxlike cabinet 31. The idle supporting rollers 8 that support in a revolving manner the tubular body 3 are preferably fixed to the top of the supporting basement or socle 30.

As regards tubular body 3, the circular front rim 3f of tubular body 3 surrounds the laundry loading/unloading opening on the front wall of the boxlike cabinet 31 and is coupled in substantially airtight and axially rotating manner to the same front wall of the boxlike cabinet 31, preferably with the interposition of the front circular sealing gasket 9. The circular rear rim 3r of tubular body 3 instead abuts against the rear wall of the upper boxlike cabinet 12 and is coupled in substantially airtight and axially rotating manner to the same rear wall of the boxlike cabinet 31 with the interposition of the rear circular sealing gasket 10.

In the example shown, the front circular sealing gasket 9 is preferably, though not necessarily, stationary recessed into a circular groove or seat realized on the periphery of the preferably funnel-shaped coupling element of front bulkhead 11 which is preferably incorporated into the front wall of the upper boxlike cabinet 31, so as to surround the laundry loading/unloading opening of the same front wall, and is shaped/structured so as to connect the laundry loading/ unloading opening of the boxlike casing 2 to the front rim 3f of tubular body 3. The circular sealing gasket 10 is instead firmly fixed to the rear wall of the upper boxlike cabinet 31, and the intake air-vent of hot-air generator 6 is incorporated into the same rear wall of the upper boxlike cabinet 12.

As regards the hot-air generator 6, a central/intermediate section 24c of the air recirculating conduit 24 preferably extends in pass-through manner across the supporting basement or socle 30, and the air cooling device 26 and air heating device 27 are preferably recessed/housed inside said central/intermediate section 24c of the air recirculating conduit 24.

With reference to Figures 1, 2 and 3, the centrifugal fan 25 of hot-air generator 6, instead, is preferably located on the back of the supporting basement or socle 30, i.e. on the rear wall 2b of the boxlike casing 2, and is preferably arranged beneath the rear mouth of tubular body 3. Centrifugal fan 25 is furthermore structured so to communicate with, i.e. be fluidly connected to, both the outwards-projecting, sink-shaped bulge 13 of supporting bulkhead 12, and the central/intermediate section 24c of the air recirculating conduit 24, so as to produce an airflow f that flows from the central/intermediate section 24c of the air recirculating conduit 24 to the inner cavity 17, or vice versa.

In the example shown, the centrifugal fan 25 of the hot-air generator 6 is preferably at least partly housed/recessed into the lower supporting basement or socle 31 of casing 2, i.e. into the rear wall 2b of the boxlike casing 2, roughly at the end-opening of the central/intermediate section 24c of the air recirculating conduit 24, and the outer volute or impeller housing of the pump is shaped/structured so as to communicate with, i.e. be fluidly connected to, both the central/intermediate section 24c of the air recirculating conduit 24 and with the pass-through opening 13a realized on the bottom of the outwards-projecting, sink-shaped bulge 13 of supporting bulkhead 12.

Furthermore, in the example shown the outer volute or impeller housing of centrifugal fan 25 is preferably, though not necessarily, divided into a first portion 33a realized in one piece with the lower supporting basement or socle 30, and into a complementary second portion 33b which consists into a separated, cap-shaped cover 33b which is shaped/structured for being substantially airtight coupled to the first portion 33a of the impeller housing, so as to form/compose the complete outer volute or impeller housing of centrifugal fan 25, and which is furthermore shaped/structured so to communicate with, i.e. be fluidly connected to, the bottom of the outwards-projecting, sink-shaped bulge 13 of supporting bulkhead 12.

General operation of the rotary-drum home laundry drier 1 is clearly inferable from the above description, with no further explanation required.

The advantages connected to the particular structure of the rear wall 2b of the boxlike casing 2 are large in number. First of all, a supporting panel or bulkhead 12

made in plastic material and shaped so as to form/incorporate the gasket-supporting collar 14, allows to significantly reducing the appliance production costs. Furthermore the one-piece structure greatly simplifies the assembly of the rear wall 2b of the boxlike casing 2.

Clearly, changes may be made to the rotary-drum home laundry drier 1 as described herein without, however, departing from the scope of the present invention.

For example, with reference to Figures 5 and 6, in an alternative embodiment the rear wall 2b of boxlike casing 2 lacks the lid or cover 16, and the supporting bulkhead 12 is preferably provided with a second substantially cylindrical gasket-supporting collar 114 which protrudes from the inner face of the supporting bulkhead 12 towards tubular body 3 while remaining substantially coaxial to the gasket-supporting collar 14, and has a nominal diameter lower than that of the rear rim 3r of tubular body 3 and preferably also greater than that of the sink-shaped bulge 13, so as to form, together with the gasket-supporting collar 14, a substantially circular-shaped, annular seat or grove which is arranged coaxial to the rear mouth of rotatable drum 3 and is suitably shaped/ dimensioned to house the rear circular sealing gasket 10. Alike the gasket-supporting collar 14, the gasket-supporting collar 114 is realized in one piece with the supporting panel or bulkhead 12.

The absence of the lid or cover 16 has the great advantage of significantly increasing the inner volume of the rotatable drum 3.

Moreover, in this embodiment the rear wall 2b of casing 2 preferably also comprises a grid-like lid or cover 116 which is firmly fixed on the bottom of the sink-shaped bulge 13 of the supporting bulkhead 12, above the pass-through opening 13a realized on the same bottom of the sink-shaped bulge 13, and is suitably shaped/structured to cover the pass-through opening 13a realized on the bottom of the sink-shaped bulge 13 allowing nevertheless the stream f of hot air circulating inside the tubular body 3 to flow through the grid-like lid or cover 116, from the tubular body 3 to the air recirculating conduit 24, or vice versa.

As an alternative, the grid-like lid or cover 116 may be integrally formed on the bottom of the sink-shaped bulge 13 of supporting bulkhead 12.

In other words, the grid-like lid or cover 116 is realized in one piece with the sink-shaped bulge 13, preferably during the injection molding of the supporting panel or bulkhead 12.

An auxiliary annular sealing gasket 117 may also be interposed between the perimeter of the pass-through opening 13a formed on the bottom of the sink-shaped bulge 13 and the outer volute or impeller housing of centrifugal fan 25.

Furthermore, with reference to Figure 6, an end section 24a of the air recirculating conduit 24 extending between the pass-through opening 13a on the bottom of the sink-shaped bulge 13 and the outer volute of the centrifugal pump 25 may be optionally realized in one piece with the supporting bulkhead 12 during the injection molding process of the supporting bulkhead 12. The annular sealing gasket 117 is therefore preferably interposed between the end section 24a of the air recirculating conduit 24 incorporated in the supporting bulkhead 12 and the central/intermediate section of the air recirculating conduit 24 incorporated into the lower supporting basement or socle 30 of casing 2.

The end section 24a of the air recirculating conduit 24 incorporated in the supporting bulkhead 12 and the central/intermediate section 24c of the air recirculating conduit 24 incorporated into the lower supporting basement or socle 30 of casing 2 are furthermore preferably, though not necessarily, shaped so that the annular sealing gasket 117 lies on a substantially horizontally-oriented reference laying plane.

With reference to Figure 6, preferably, though not necessarily, the annular sealing gasket 117 is furthermore arranged so as to be substantially coplanar to a second auxiliary annular sealing gasket 118 which is interposed between a starting section 24b of the air recirculating conduit 24 incorporated into the front wall 2a of the upper boxlike cabinet 31 and the central/intermediate section 24c of the air recirculating conduit 24 incorporated into the lower supporting basement or socle 30 of the boxlike casing 2. Therefore also the annular sealing gasket 118 preferably lies on a substantially horizontally-oriented reference laying plane.

In a further non-shown embodiment, the supporting panel or bulkhead 12 of rear wall 2b lacks the sink-shaped bulge 13, and the pass-through opening 13a is

realized on a substantially flat supporting bulkhead 12 encircled/surrounded by the gasket-supporting collar 14. Preferably, the pass-through opening 13a is realized on a central portion of the supporting bulkhead 12. A grid-like lid or cover 116 is fixed above the pass-through opening 13a. Further preferably, said grid-like lid or cover (116) is realized in one piece with the supporting bulkhead (12).

In other words, in this embodiment the gasket-supporting collar 14 surrounds/ encircles a substantially flat, supporting bulkhead 12 which is aligned/faced to the rear mouth of tubular body 3 and is fluidly connected to, i.e. communicates with, the hot-air generator 6 via the pass-through opening 13a formed thereon.

CLAIMS

1. Rotary-drum laundry dryer (1) comprising an outer casing (2) having a front wall (2a) and a rear wall (2b), a rotatable drum (3) which is structured for housing the laundry to be dried and is fixed in axially rotating manner inside the casing (2), and a hot-air generator (6) structured to circulate a stream of hot air through the rotatable drum (3); said rotatable drum (3) comprising a substantially cylindrical, tubular body (3) having its front rim (3f) coupled in axially rotating manner to a front bulkhead (11) and its rear rim (3r) coupled in substantially airtight and axially rotating manner to the rear wall (2b) of the casing (2) with the interposition of a rear circular sealing gasket (10);

the rotary-drum laundry dryer (1) **being characterized in that** the rear wall (2b) of the casing (2) comprises:

- a substantially vertically-oriented supporting bulkhead (12) which is made of plastic material and is aligned/faced to a rear mouth of the tubular body (3) delimited by said rear rim (3r); and
- a substantially cylindrical first gasket-supporting collar (14) which protrudes from the inner face of the supporting bulkhead (12) towards the tubular body (3) while remaining substantially coaxial to the rear rim (3r) of said tubular body (3), and which encircles a central portion (13) of the supporting bulkhead (12) aligned/faced to the rear mouth of the tubular body (3) and fluidly connected to the hot-air generator (6);

the rear circular sealing gasket (10) being fitted into the first gasket-supporting collar (14) and said first gasket-supporting collar (14) being realized in one piece with said supporting bulkhead (12).

2. Rotary-drum laundry dryer according to Claim 1, characterized in that the central portion (13) of said supporting bulkhead (12) comprises a substantially sink-shaped bulge (13) which is aligned/faced to the rear mouth of the tubular body (3) delimited by said rear rim (3r), protrudes outwards of the outer casing (2) and is fluidly connected to the hot-air generator (6).

3. Rotary-drum laundry dryer according to Claim 1 or 2, characterized in that the first gasket-supporting collar (14) has a diameter greater than that of the rear rim

(3r) of the tubular body (3) so as to encircle the rear rim (3r) of said tubular body (3).

4. Rotary-drum laundry dryer according to any one of the foregoing claims, characterized in that the supporting bulkhead (12) is provided with a number of stiffening ribs (15) that protrude from the outer face of the same supporting bulkhead (12).

5. Rotary-drum laundry dryer according to any one of the foregoing claims, characterized in that the rear wall (2b) of the casing (2) furthermore comprises a lid or cover (16) which has a permeable-to-air portion (16c) and is arranged on the inner face of the supporting bulkhead (12) to cover the central portion (13) of the supporting bulkhead (12), so as to form/delimit, together with the supporting bulkhead (12), an inner cavity (17) which is fluidly connected to the hot-air generator (6) and to the inside of the rotatable drum (3).

6. Rotary-drum laundry dryer according to Claim 5, characterized in that said lid or cover (16) is substantially circular in shape and has an outer diameter slightly lower than the inner diameter of the first gasket-supporting collar (14).

7. Rotary-drum laundry dryer according to Claim 6, characterized in that said lid or cover (16) is substantially dish- or basin-shaped and is fixed to the supporting bulkhead (12) with its concavity facing a sink-shaped bulge (13) formed on said supporting bulkhead (12), so to form, together with the first gasket-supporting collar (14), a substantially circular-shaped annular seat or groove (10a) which is arranged coaxial to the rear mouth of the tubular body (3) and is suitably shaped/dimensioned to house the circular sealing gasket (10).

8. Rotary-drum laundry dryer according to any claim 5 to 8, characterized in that said lid or cover (16) is made of plastic material.

9. Rotary-drum laundry dryer according to any one of Claims 5-8, characterized by also comprising a laundry anti-entangling nose (19) which protrudes from the inner face of the lid or cover (16), extends inside the tubular body (3), and is shaped/dimensioned so as to prevent, when the tubular body (3) rotates, the entangling of the damp laundry located into the rotatable drum (3).

10. Rotary-drum laundry dryer according to Claim 1 or 2, characterized in that the supporting bulkhead (12) has a pass-through opening (13a) that communicates

with the hot-air generator (6); and in that the rear wall (2b) of the casing (2) additionally comprises a grid-like lid or cover (116) which is arranged on the supporting bulkhead (12) to cover said pass-through opening (13a).

11. Rotary-drum laundry dryer according to Claim 10, characterized in that the supporting bulkhead (12) is provided with a second substantially cylindrical, gasket-supporting collar (114) which protrudes from the inner face of the supporting bulkhead (12) towards the tubular body (3) while remaining substantially coaxial to the first gasket-supporting collar (14), and has a nominal diameter lower than that of the rear rim (3r) of the tubular body (3) so as to form, together with the first gasket-supporting collar (14), a substantially circular-shaped annular seat or groove which is arranged coaxial to the rear mouth of the tubular body (3) and is suitably shaped/dimensioned to house the circular sealing gasket (10).

12. Rotary-drum laundry dryer according to Claim 11, characterized in that said second gasket-supporting collar (114) is realized in one piece with the supporting bulkhead (12).

13. Rotary-drum laundry dryer according to any Claim 10 to 12, characterized in that said grid-like lid or cover (116) is realized in one piece with the supporting bulkhead (12).

14. Rotary-drum laundry dryer according to any one of the foregoing claims, characterized in that the hot-air generator (6) comprises: an air recirculating conduit (24) having a first end fluidly connected to central portion (13) of the supporting bulkhead (12), and a second end fluidly connected to the front mouth of the tubular body (3) delimited by said front rim (3f); an air circulating pump (25) which is located along the air recirculating conduit (24) and is structured to produce an airflow (f) which flows in closed loop through the air recirculating conduit (24) and the rotatable drum (3); an air cooling device (26) which is located along the air recirculating conduit (24) and is structured to remove moisture from the moist air arriving the from rotatable drum (3); and an air heating device (27) which is located along the air recirculating conduit (24), downstream of the air cooling device (26), and is structured for heating the dehumidified airflow (f) arriving from the air cooling device (26) and directed back to rotatable drum (3).

15. Rotary-drum laundry dryer according to Claim 14, characterized in that said hot-air generator (6) furthermore comprises a heat-pump assembly which comprises a first (26) and a second air/refrigerant heat exchanger (27) both located inside the air recirculating conduit (24); the first air/refrigerant heat exchanger (26) being structured to remove moisture from the airflow arriving from the rotatable drum (3), thus forming the air cooling device (26) of the hot-air generator (6); the second air/refrigerant heat exchanger (27) being located inside the air recirculating conduit (24) downstream of the first air/refrigerant heat exchanger (26), and being structured to release heat to the airflow arriving from the first air/refrigerant heat exchanger (26), thus forming the air heating device (27) of the hot-air generator (6).

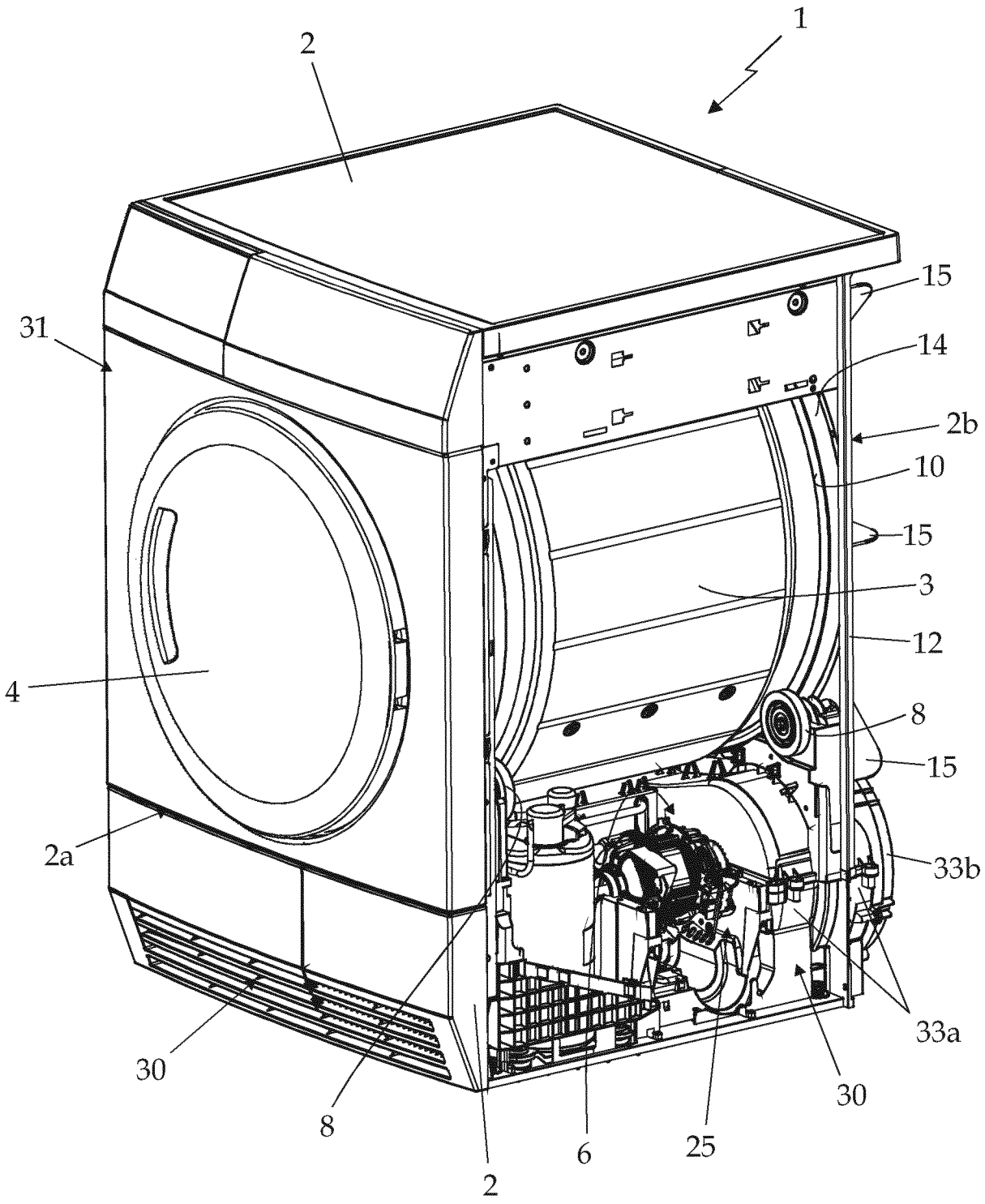

Fig. 1

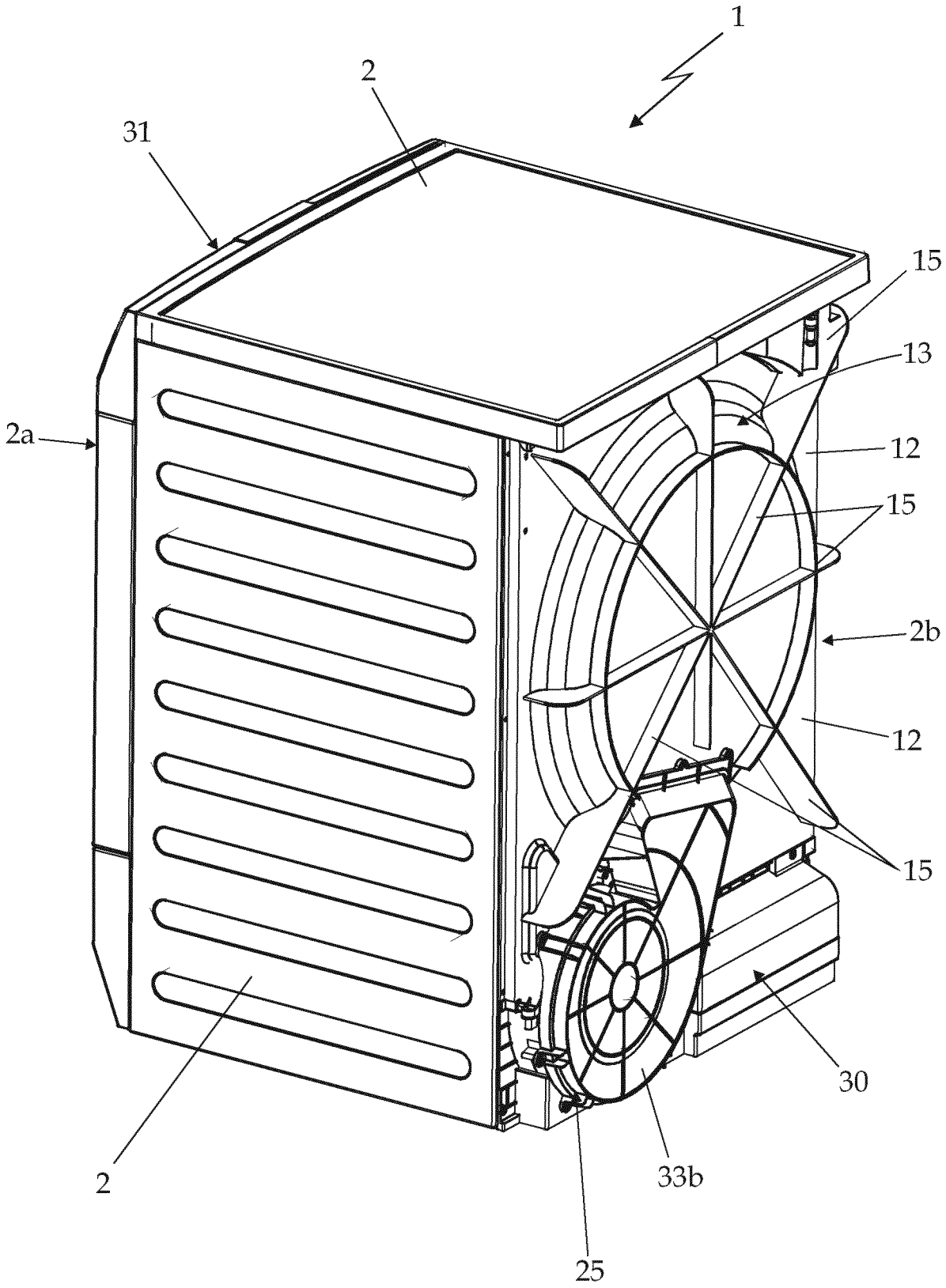

Fig. 2

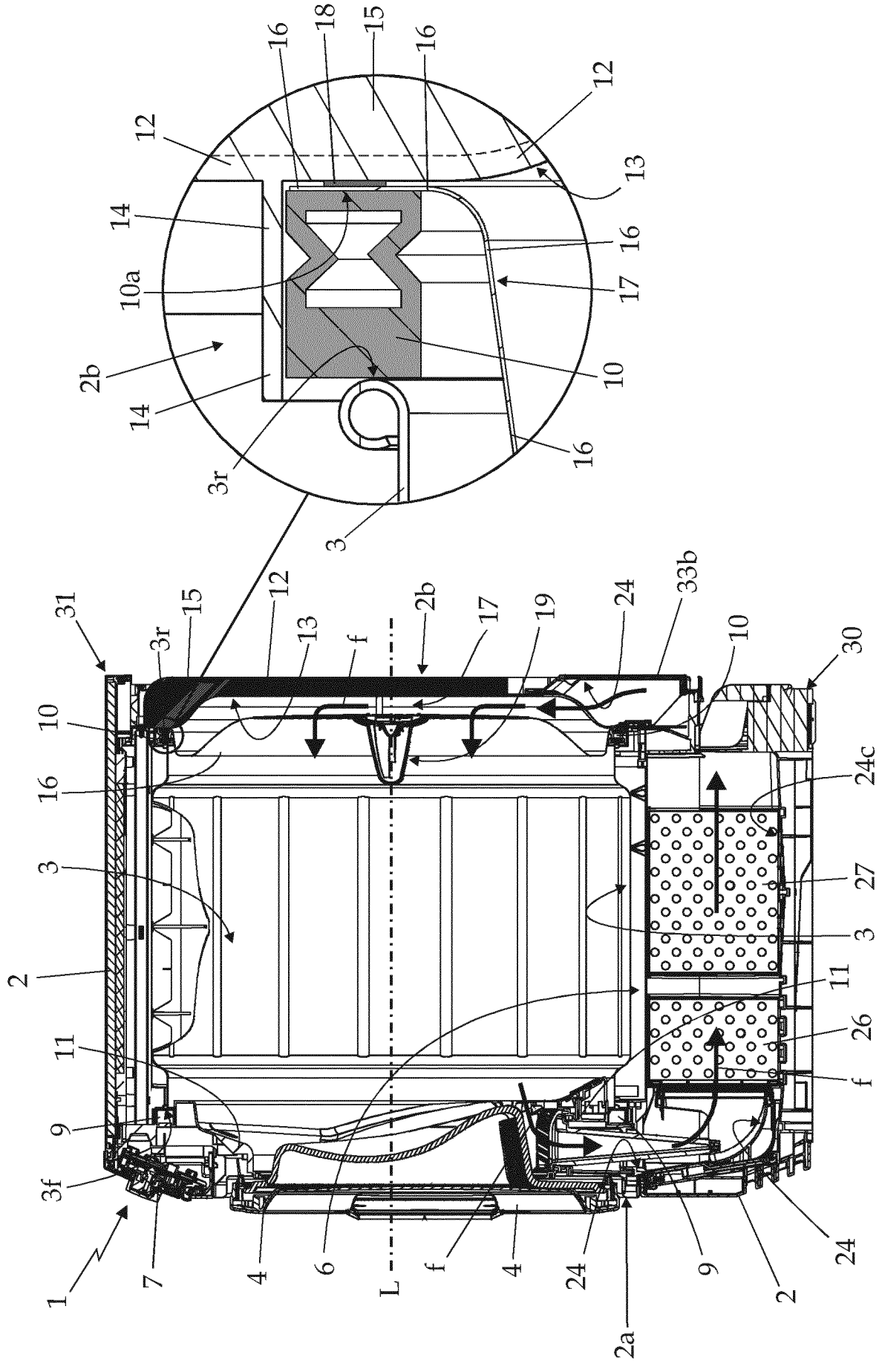
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Fig. 3

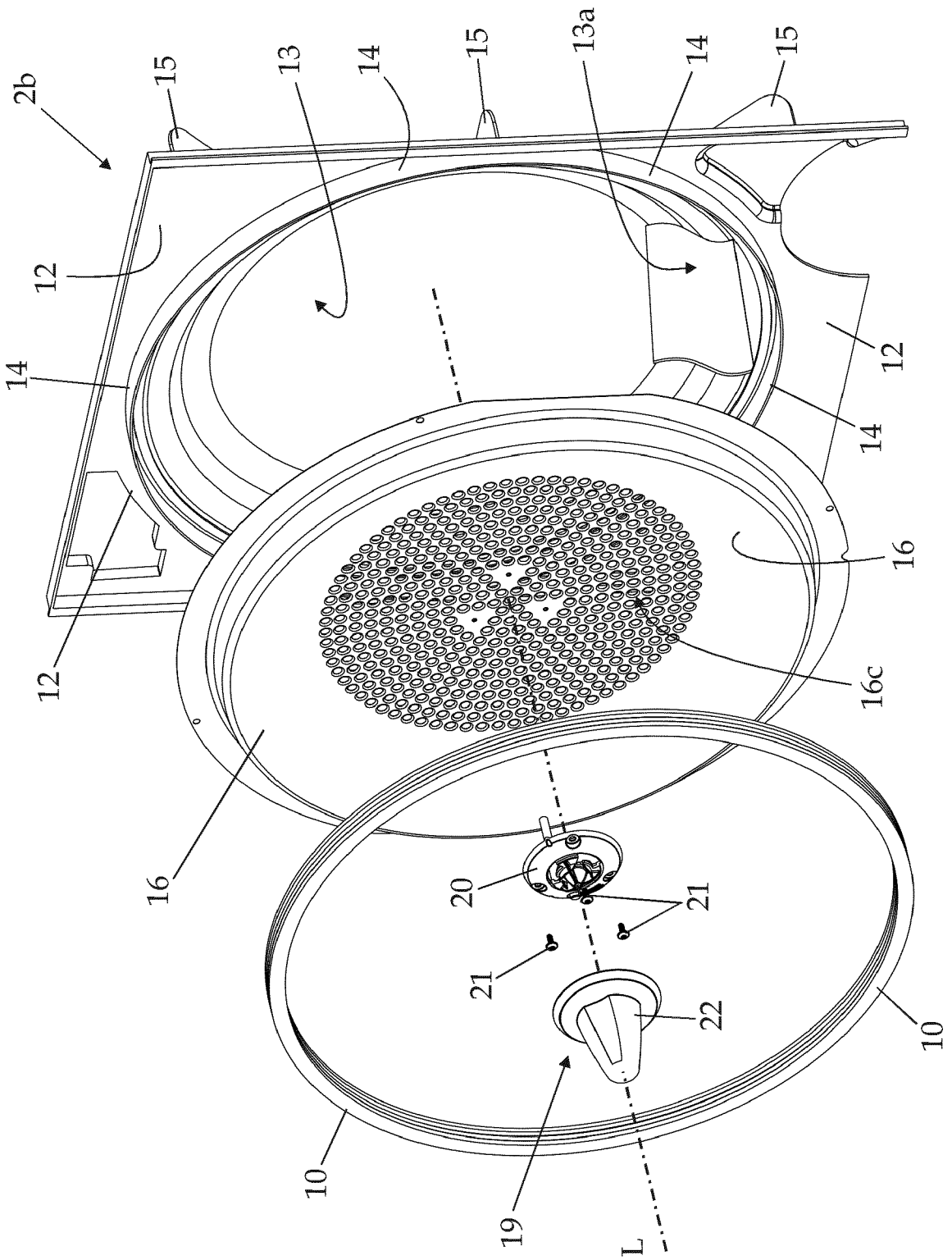

Fig. 4

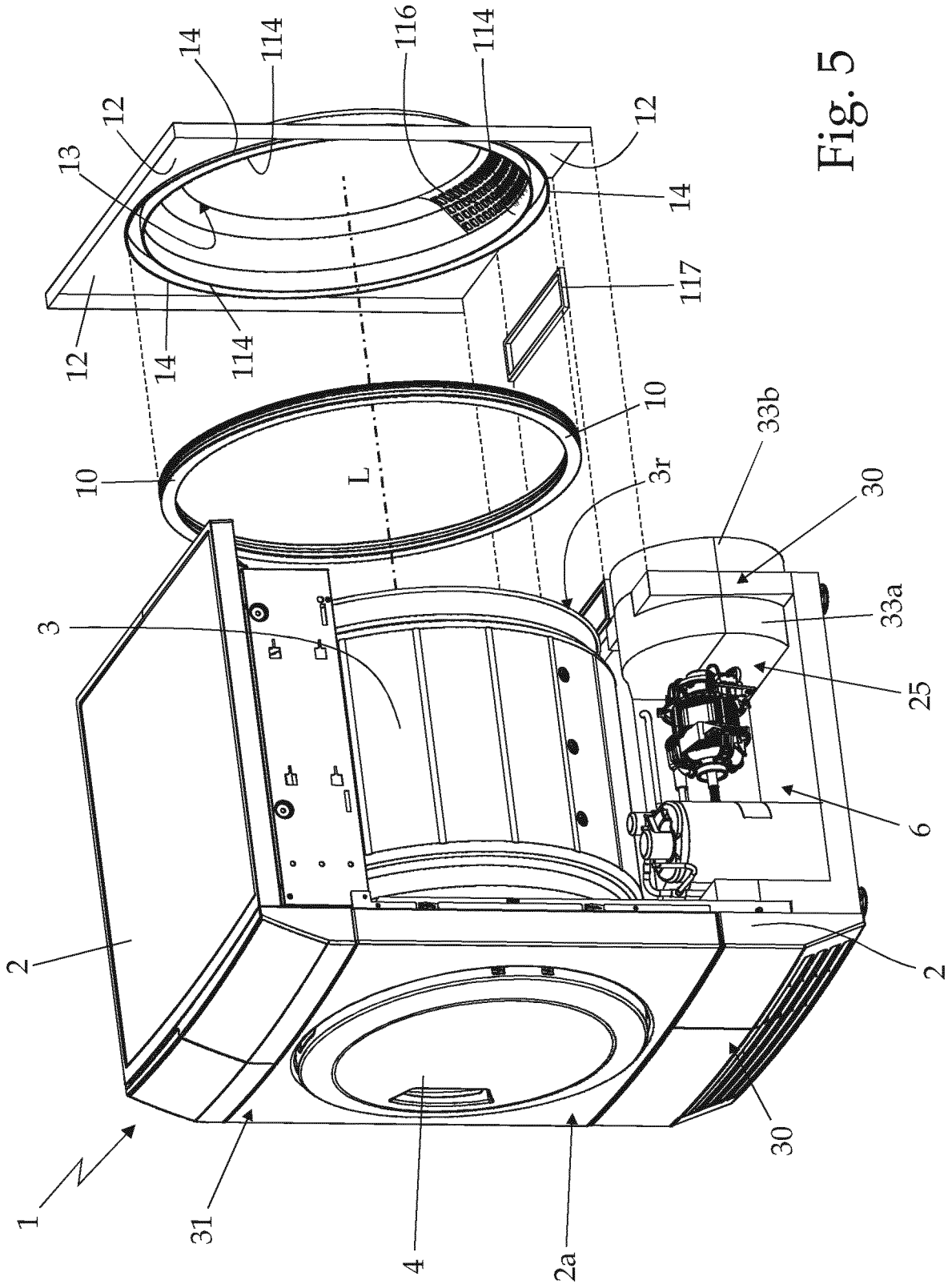
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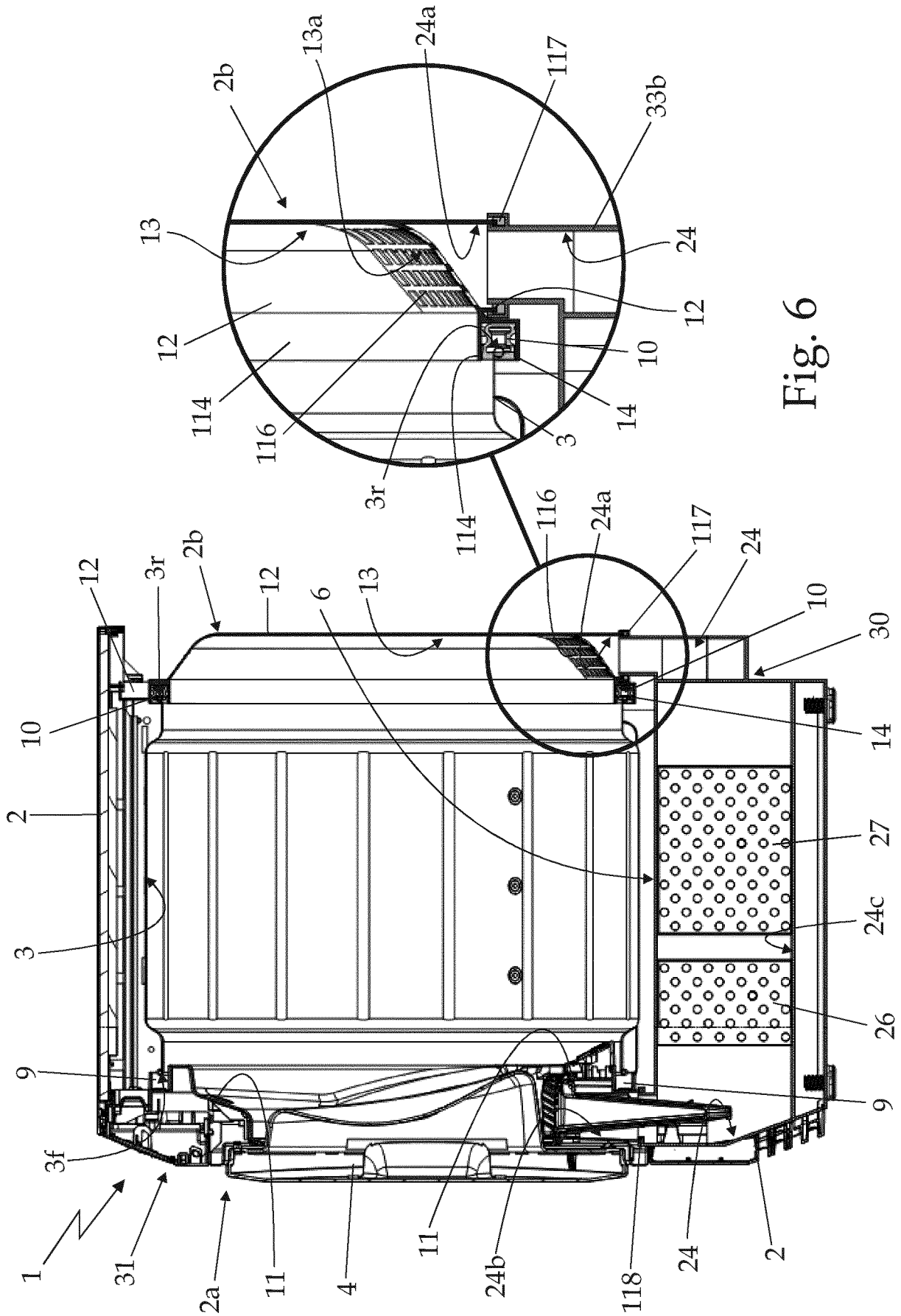
Fig. 5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33b
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24a

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/053769

A. CLASSIFICATION OF SUBJECT MATTER
INV. D06F58/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3 816 942 A (SMITH T) 18 June 1974 (1974-06-18) column 2, line 26 - column 4, line 37 figures 1,2	1-15
Y	EP 2 072 657 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 24 June 2009 (2009-06-24) paragraphs [0001] - [0005] paragraphs [0010], [0012], [0015] claims 1,8,9; figures 1-2	1-15
A	US 4 669 200 A (CARR KEITH E [US]) 2 June 1987 (1987-06-02) column 2, lines 18-68; figures 1-5	1-15
A	US 5 317 816 A (KADAKIA PRATISH [US]) 7 June 1994 (1994-06-07) abstract; figures 1-5	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents :

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 April 2013	16/04/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Weinberg, Ekkehard

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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