(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 865 803 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.04.2015 Bulletin 2015/18

(51) Int Cl.:
D06F 58/04 *(2006.01)* ***D06F 58/20*** *(2006.01)*

(21) Application number: **14195015.4**

(22) Date of filing: **27.02.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
12157178.0 / 2 631 354

(27) Previously filed application:
27.02.2012 EP 12157178

(71) Applicant: **Electrolux Home Products Corporation N.V.**
1130 Brussels (BE)

(72) Inventor: **Dal Ben, Diego**
33080 Porcia (PN) (IT)

(74) Representative: **Petruccelli, Davide et al**
Electrolux Italia S.p.A.
Corso Lino Zanussi 30
33080 Porcia (PN) (IT)

Remarks:
This application was filed on 26-11-2014 as a divisional application to the application mentioned under INID code 62.

(54) Rotary-drum laundry dryer

(57) 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); the rotatable drum (3) comprising a substantially cylindrical, tubular body (3) having a back wall (9) rigidly connected thereto, the tubular body (3) being arranged so that a front rim (3f) thereof is coupled in axially rotating manner to a front bulkhead (13) and so that the back wall (9) is coupled in substantially airtight and axially rotating manner to the rear wall (2b) of the casing (2) with the interposition of a rear sealing gasket (12); the rear wall (2b) of the outer casing (2) comprising: a substantially vertically-oriented supporting bulkhead (14) having a central portion (15) which is substantially aligned/faced to a permeable-to-air inner portion (9c) of the back wall (9) of the rotatable drum (3); and a gasket-supporting member (16) which is fixed/attached to the inner face of the supporting bulkhead (14) so to be interposed between the central portion (15) of said supporting bulkhead (14) and the back wall (9) of the tubular body (3), and which has a central passthrough opening (16a) substantially aligned/faced to the permeable-to-air inner portion (9c) of said back wall (9) and fluidly connected to the hot-air generator (6); the rotary-drum laundry dryer (1) **being characterized in that** said supporting bulkhead (14) is fluidly connected to the hot-air generator (6) and said gasket-supporting member (16) is provided with an annular groove (16b) which is faced to the back wall (9) of the tubular body (3), encircles the central pass-through opening (16a) of the gasket-supporting member (16) and is shaped/ dimensioned so to house the rear sealing gasket (12) and keep said rear sealing gasket (12) in abutment against the back wall (9) of the tubular body (3), **and in that** the tubular body (3) comprises a substantially cylindrical lateral wall (8) which is structured for resting on a number of idle supporting rollers (10) which are arranged approximately at the two axial ends of the tubular body (3) so as to allow the tubular body (3) to rotate about its longitudinal reference axis (L) inside the casing (2).

EP 2 865 803 A1

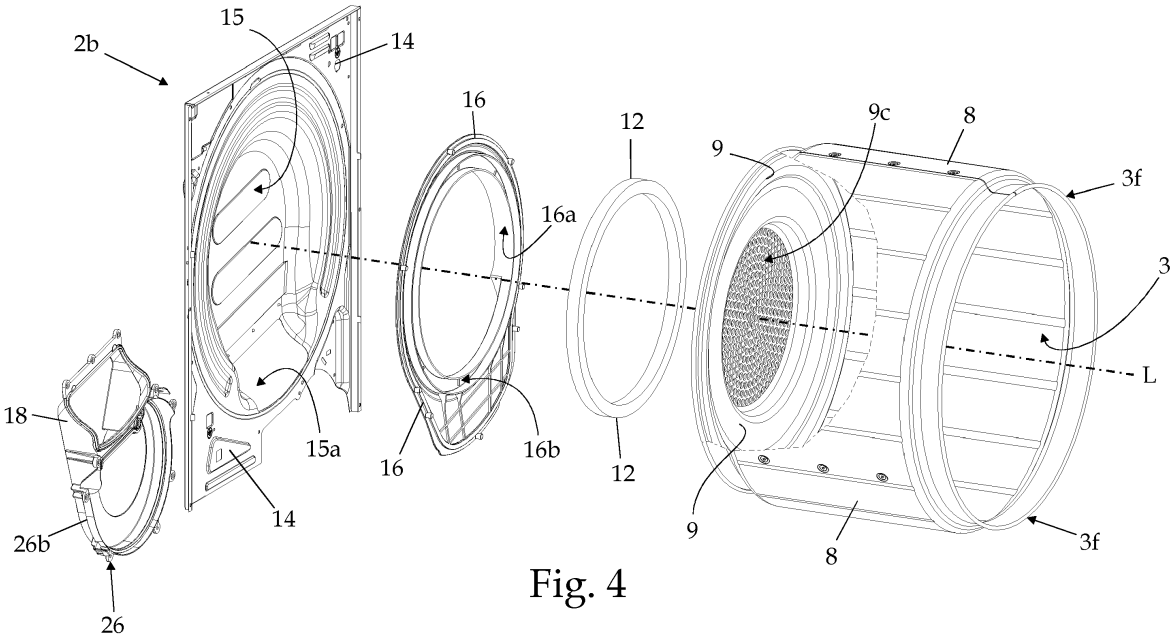


Fig. 4

Description

[0001] The present invention relates to a rotary-drum laundry dryer.

[0002] 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.

[0003] 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 completely 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.

[0004] Furthermore, in most of the rotary-drum home laundry dryers currently on the market, the rotatable drum 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 rotatable 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 abuts against the front wall of the boxlike casing so as to surround the laundry loading/unloading opening, and is coupled in axially rotating manner to said front wall; 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.

[0005] The stream of hot air produced by the hot-air generator generally 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.

[0006] 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.

[0007] In most of the rotary-drum home laundry dryers currently on market, the front circular sealing gasket is generally recessed into a circular groove or seat realized on the front wall of the casing, and is firmly fixed to the bottom of the groove or seat so to remain stationary when the rotatable drum rotates about its longitudinal reference axis.

[0008] The rear circular sealing gasket, instead, is usually recessed into a circular groove or seat exteriorly delimited by a cylindrical gasket-supporting collar which is rigidly fixed to the inner face of the vertically-oriented, supporting panel or bulkhead forming the rear wall of the boxlike casing, so as to encircle and be coaxial to the rear rim of the tubular body. Furthermore, the supporting panel or bulkhead and the gasket-supporting collar are made both of metal material and the gasket-supporting collar is clinched onto the inner face of the supporting bulkhead.

[0009] The inner wall of the circular groove or seat instead is usually formed by the peripheral edge of a substantially circular lid or cover which has a perforated central portion and is rigidly fixed to the inner face of the supporting panel coaxial to the rear rim of the tubular body, so as to cover the intake air-vent on the rear wall of the boxlike casing.

[0010] Similarly to the front circular sealing gasket, also the rear circular sealing gaskets is usually firmly fixed to the bottom of the groove or seat so to remain stationary when the rotatable drum rotates about its longitudinal reference axis.

[0011] Aim of the present invention is to simplify the structure of the rear wall of the boxlike casing so as to significantly reduce the appliance production costs, and simplifying the laundry dryer assembling procedure.

[0012] 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; the rotatable drum comprising a substantially cylindrical, tubular body having a back wall rigidly connected thereto, the tubular body being arranged so that a front rim thereof is coupled in axially rotating manner to a front bulkhead and so that the back wall is coupled in substantially airtight and axially rotating manner to the

rear wall of the casing with the interposition of a rear sealing gasket; the rear wall of the outer casing comprising: a substantially vertically-oriented supporting bulkhead having a central portion which is substantially aligned/faced to a permeable-to-air inner portion of the back wall of the rotatable drum and a gasket-supporting member which is fixed/attached to the inner face of the supporting bulkhead so to be interposed between the central portion of said supporting bulkhead and the back wall of the tubular body, and which has a central pass-through opening substantially aligned/faced to the permeable-to-air inner portion of said back wall and fluidly connected to the hot-air generator; the rotary-drum laundry dryer **being characterized in that** said supporting bulkhead is fluidly connected to the hot-air generator and said gasket-supporting member is provided with an annular groove which is faced to the back wall of the tubular body, encircles the central pass-through opening of the gasket-supporting member and is shaped/ dimensioned so to house the rear sealing gasket and keep said rear sealing gasket in abutment against the back wall of the tubular body.

[0013] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the gasket-supporting member is substantially ring-shaped.

[0014] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the supporting bulkhead is centrally provided with a substantially sink-shaped bulge which is substantially aligned/faced to the permeable-to-air inner portion of the back wall of said tubular body, 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 outer casing comprises a lower supporting basement or socle structured for resting on the floor, and in that the supporting bulkhead rests on said supporting basement or socle.

[0015] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the ring-shaped gasket-supporting member is shaped/dimensioned so to completely cover and/or surround the peripheral border of the sink-shaped bulge.

[0016] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the annular groove is substantially circular in shape and is dimensioned so to house the rear sealing gasket and keep said rear sealing gasket in abutment against the back wall of the rotatable drum all around the permeable-to-air inner portion of said back wall.

[0017] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the permeable-to-air inner portion of the back wall of the tubular body is substantially circular in shape and is located approximately at centre of said back wall.

[0018] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the central pass-through opening of the gasket-supporting member is substantially circular in shape and the diameter of said central pass-through opening is greater than the peripheral diameter of the permeable-to-air inner portion of the back wall of the tubular body.

[0019] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the back wall of the tubular body is substantially dish-shaped so as to partly protrude into the central pass-through opening of the gasket-supporting member to place the permeable-to-air inner portion of the back wall inside the sink-shaped bulge of the supporting bulkhead.

[0020] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the gasket-supporting member is realized in plastic material. 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 is arranged substantially coaxial to the back wall of the bell-shaped body.

[0021] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the rear wall of the outer casing furthermore comprises an outer lid or cover which is rigidly attached to the outer face of the supporting bulkhead, and is suitably shaped/structured to fluidly connected the sink-shaped bulge of the supporting bulkhead to the hot-air generator, so as to channel the stream of hot air produced by the hot-air generator towards the sink-shaped bulge, or vice versa.

[0022] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the tubular body comprises a substantially cylindrical lateral wall which is structured for resting on a number of idle supporting rollers which are arranged approximately at the two axial ends of the tubular body so as to allow the tubular body to rotate about its longitudinal reference axis (L) inside the casing. 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 the supporting bulkhead, and a second end fluidly connected to the front mouth of the tubular body delimited by said front rim; and a centrifugal fan located along the air recirculating conduit and structured to produce an airflow which flows through the air recirculating conduit and the rotatable drum.

[0023] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the hot-air generator comprises a heat-pump assembly which is structured for continuously removing moisture from and heating the air circulating inside the air recirculating conduit and the rotatable drum.

[0024] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the rotatable drum (3) is formed only by two bodies joined together, one of said bodies being a cylindrical lateral wall having a front and a rear end, and the other of said

bodies being a wall which is permanently fixed to the rear end of said cylindrical portion.

[0025] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that the centrifugal fan is at least partly housed/recessed into the rear wall of the casing, and in that the outer lid or cover of the rear wall of the casing is suitably shaped/structured to fluidly connect the centrifugal fan to the sink-shaped bulge of the supporting bulkhead.

[0026] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that said centrifugal fan comprises an impeller housing shaped/structured so to be fluidly connected to the sink-shaped bulge of the supporting bulkhead; and a rotating impeller which is housed in axially rotating manner inside the impeller housing so to generate, when rotating about its reference axis, an airflow that flows to the sink-shaped bulge or vice versa.

[0027] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that at least a portion of the impeller housing of the centrifugal fan is realized in one piece with said outer lid or cover.

[0028] Preferably, though not necessarily, the rotary-drum laundry dryer is furthermore characterized in that said lid or cover is realized in plastic material.

[0029] A non-limiting embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

- Figure 1 is a perspective view, with parts removed for clarity, of a rotary-drum laundry dryer realized in accordance with the teachings of the present invention;
- Figure 2 is a section view of the Figure 1 laundry dryer with parts removed for clarity;
- Figure 3 is an enlarged view of a portion of the rear wall of the Figure 2 laundry dryer with parts removed for clarity; and
- Figure 4 is a partly-exploded perspective view of the rear wall of the

[0030] Figures 1 and 2 laundry dryer with parts removed for clarity.

[0031] With reference to Figures 1 and 2, reference number 1 indicates as a whole a rotary-drum home 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 completely against the front wall 2a to close the laundry loading/unloading opening and substantially airtight seal the rotatable drum 3.

[0032] 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 (not shown) 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.

[0033] With reference to Figures 2, 3 and 4, the rotatable drum 3 consists in a substantially cylindrical, tubular body 3 which is preferably made of metal material and is arranged inside the boxlike casing 2 coaxial to a preferably substantially horizontally-oriented, longitudinal reference axis L, so that the circular front rim 3f of the tubular body 3 is faced/aligned to the laundry loading/unloading opening realized on the front wall 2a of the boxlike casing 2, and so that the back of the tubular body 3 is faced to the rear wall 2b of the same boxlike casing 2. The back of the tubular body 3 is furthermore shaped/structured so to be at least partly permeable to air, so that the stream of hot air arriving from the hot-air generator 6 is allowed to flow through the back/bottom of the bell-shaped body 3.

[0034] In other words, the tubular body 3 comprises a substantially cylindrical lateral wall 8 which extends inside the boxlike casing 2 coaxial to a preferably substantially horizontally-oriented, longitudinal reference axis L which is aligned to the laundry loading/unloading opening realized on front wall 2a, so that circular front rim of the same substantially cylindrical lateral wall 8, i.e. the front rim 3f of the tubular body 3, abuts against the front wall 2a of casing 2 and surrounds the laundry loading/unloading opening of the same front wall 2a; and a preferably, though not necessarily, dish-shaped, back wall 9 which is faced to the rear wall 2b of the boxlike casing 2, and is permanently rigidly coupled to the circular rear rim of the substantially cylindrical lateral wall 8 so as to close said rear rim and form, together with lateral wall 8, a substantially cylindrical, cup-shaped rigid container 3 structured for housing the laundry to be dried.

[0035] Preferably the rotatable drum (3) is formed only by two bodies joined together, one of said bodies being the cylindrical lateral wall (8) having a front and a rear end, and the other of said bodies being a wall (9) which is permanently fixed to the rear end of said cylindrical portion (8).

[0036] An inner portion 9c of the preferably substantially dish-shaped back wall 9 is furthermore suitably perforated, or at any rate structured to be permeable to air, so as to allow the stream of hot air arriving from the hot-

air generator 6 to flow through the back wall 9 of the tubular body 3.

[0037] With reference to Figures 2 and 4, in the example shown, the substantially cylindrical lateral wall 8 of tubular body 3 is preferably structured for resting on a number of idle supporting rollers 10 which are arranged approximately at the two axial ends of the tubular body 3 with their rotation axis substantially parallel to the drum longitudinal reference axis L, so as to allow the tubular body 3 to rotate about the longitudinal reference axis L inside the boxlike casing 2. The idle supporting rollers 10 may be preferably fixed to the boxlike casing 2 in rotatable manner,

[0038] The permeable-to-air inner portion 9c of back wall 9 is preferably located approximately at centre of the preferably dish-shaped back wall 9 so as to be substantially coaxial to the longitudinal reference axis L of the rotatable drum 3, and is preferably substantially circular in shape.

[0039] In addition to the above, with reference to Figure 2, the front rim 3f of tubular body 3, i.e. the circular front rim of the substantially cylindrical lateral wall 8, is furthermore coupled in substantially airtight and axially rotating manner to a front panel or bulkhead 13 preferably with the interposition of a first circular sealing gasket 11. The front panel or bulkhead 13 is associated to the front wall 2a of boxlike casing 2. The preferably dish-shaped back wall 9 of tubular body 3 substantially abuts against the rear wall 2b of the 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 12. Front and rear circular sealing gaskets 11 and 12 are substantially coaxial to the drum longitudinal reference axis L.

[0040] In the example shown, the circular sealing gasket 11 is preferably, though not necessarily, stationary recessed into a circular groove realized on the front panel or bulkhead 13 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.

[0041] Furthermore, the front bulkhead 13 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 13.

[0042] The second circular sealing gasket 12 is instead firmly fixed to the rear wall 2b of the boxlike casing 2.

[0043] With reference to Figure 2, the stream of hot air produced by the hot-air generator 6 preferably enters into the tubular body 3 through the permeable-to-air inner portion 9c of back wall 9, flows inside the tubular body 3 for the entire length of the latter, and comes out of the tubular body 3 through the front mouth of the tubular body 3 delimited by the front rim 3f, or vice versa.

[0044] In other words, the stream of hot air produced by hot-air generator 6 preferably enters into the tubular body 3 through an intake air-vent located in the rear wall 2b of the boxlike casing 2 substantially aligned/faced to the permeable-to-air inner portion 9c of the preferably dish-shaped back wall 9 of tubular body 3, and comes out of tubular body 3 through 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.

[0045] In the example shown, the stream of hot air produced by hot-air generator 6 preferably comes out of the tubular body 3 via an escape air-vent incorporated in the preferably funnel-shaped coupling element of the front bulkhead 13 that delimits/surrounds the laundry loading/unloading opening on front wall 2a.

[0046] With reference to Figures 2, 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.

[0047] Furthermore, the rear wall 2b of boxlike casing 2 comprises a substantially vertically-oriented, supporting panel or bulkhead 14 which is preferably, though not necessarily, made of metal material and is preferably centrally provided with a substantially sink-shaped bulge 15 which is substantially aligned/faced to the permeable-to-air inner portion 9c of the preferably dish-shaped back wall 9 of tubular body 3, 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.

[0048] In other words, the permeable-to-air inner portion 9c of back wall 9 of tubular body 3 is located/arranged within the perimeter of the sink-shaped bulge 15 on supporting bulkhead 14.

[0049] In the example shown, the sink-shaped bulge 15 is preferably substantially circular in shape and protrudes outwards of the boxlike casing 2 while remaining substantially coaxial to the drum longitudinal reference axis L, i.e. while remaining substantially coaxial to the back wall 9 of the tubular body 3. The sink-shaped bulge 15 furthermore has a peripheral diameter lower than the nominal diameter of the substantially cylindrical lateral wall 8 of the tubular body 3 and/or the outer diameter of back wall 9, and preferably also greater than the peripheral diameter of the permeable-to-air inner portion 9c of back wall 9, so that the permeable-to-air inner portion 9c of back wall 9 is located/arranged approximately at centre of the sink-shaped bulge 15.

[0050] Lastly, the sink-shaped bulge 15 of supporting bulkhead 14 preferably communicates with the hot-air generator 6 via a pass-trough opening 15a realized on the bottom of the same sink-shaped bulge 15.

[0051] With reference to Figures 2, 3 and 4, the rear wall 2b of boxlike casing 2 moreover comprises a substantially ring-shaped gasket-supporting member 16 which is fixed/attached to the inner face of the supporting bulkhead 14, above the sink-shaped bulge 15 of supporting bulkhead 14 and substantially coaxial to the back wall 9 of tubular body 3, i.e. substantially coaxial to the drum longitudinal reference axis L, so as to protrude from the inner face of the supporting bulkhead 14 and be interposed between the supporting bulkhead 14 and the back wall 9 of tubular body 3. This ring-shaped gasket-supporting member 16 is furthermore suitably shaped/dimensioned so to cover and/or encircle the peripheral border of the sink-shaped bulge 15 on supporting bulkhead 14, and so that the preferably substantially circular-shaped, central pass-through opening 16a of the gasket-supporting member 16 is substantially faced/aligned to the permeable-to-air inner portion 9c of the back wall 9 of tubular body 3.

[0052] In other words, the gasket-supporting member 16 is attached to the inner face of the supporting bulkhead 14 so to surround and cover the peripheral border of the sink-shaped bulge 15 on supporting bulkhead 14, and so that the central pass-trough opening 16a of the gasket-supporting member 16 is preferably arranged substantially coaxial to the drum longitudinal reference axis L, i. e. substantially coaxial to the back wall 9 of tubular body 3.

[0053] Preferably the diameter of the central pass-trough opening 16a of the gasket-supporting member 16 is furthermore greater than the peripheral diameter of the permeable-to-air inner portion 9c of the back wall 9 of tubular body 3.

[0054] In the example shown, the back wall 9 of tubular body 3 is preferably, though not necessarily, shaped so as to partly protrude into the central pass-trough opening 16a of the gasket-supporting member 16 for placing the permeable-to-air inner portion 9c of back wall 9 inside the sink-shaped bulge 15 of supporting bulkhead 14. The central pass-trough opening 16a of gasket-supporting member 16 therefore surrounds the permeable-to-air inner portion 9c of back wall 9.

[0055] With reference to Figures 2, 3 and 4, the front side of the substantially ring-shaped gasket-supporting member 16 faced to the back wall 9 of tubular body 3 is furthermore provided with a circular-shaped, annular groove 16b which is arranged substantially coaxial to the drum longitudinal reference axis L, i.e. substantially coaxial to the back wall 9 of tubular body 3, encircles the central pass-trough opening 16a of the gasket-supporting member 16 and preferably also the permeable-to-air inner portion 9c of back wall 9, and it is suitably shaped/dimensioned so to permanently house the rear circular sealing gasket 12 and keep said sealing gasket 12 in abutment against the back wall 9 of tubular body 3. This circular-shaped, annular groove 16b preferably has a substantially U-shaped cross-section.

[0056] In other words, the gasket-supporting member 16 is provided with a circular-shaped, annular groove 16b which is faced to the back wall 9 of tubular body 3, is arranged substantially coaxial to the back wall 9 of tubular body 3, and is shaped/dimensioned so to encircle the central pass-trough opening 16a of the gasket-supporting member 16 and so to house the rear circular sealing gasket 12 and keep said gasket in abutment against the back wall 9 of tubular body 3 preferably all around the permeable-to-air inner portion 9c.

[0057] Moreover, the circular-shaped, annular groove 16b is dimensioned so as to keep the rear circular sealing gasket 12 in abutment against the back wall 9 of tubular body 3 preferably on the annular sector between the circular rear rim of the cylindrical lateral wall 8 and the permeable-to-air inner portion 9c of the back wall 9. However, the annular groove 16b may be dimensioned so as to keep the rear circular sealing gasket 12 in abutment against the edge region of the back wall 9, i.e. in the region where the back wall 9 is fixed to the cylindrical lateral wall 8 of the tubular body 3.

[0058] Furthermore, the circular-shaped, annular groove 16b of the gasket-supporting member 16 is preferably arranged substantially coaxial to the drum longitudinal reference axis L, and has a nominal diameter slightly greater than that of the central pass-trough opening 16a of the gasket-supporting member 16, so as to encircle both the central pass-trough opening 16a of gasket-supporting member 16 and the permeable-to-air inner portion 9c of back wall 9.

[0059] In the example shown, the ring-shaped gasket-supporting member 16 is preferably, though not necessarily, realized in plastic material, preferably via an injection molding process. Furthermore, in the example shown the ring-shaped gasket-supporting member 16 is preferably attached/fixed to the inner face of supporting bulkhead 14 in substantially airtight manner, preferably, though not necessarily, with the interposition of an annular sealing gasket 17 that completely surrounds the sink-shaped bulge 15 of supporting bulkhead 14.

[0060] With reference to Figure 3, the rear circular sealing gasket 12 is shaped to fit into the circular-shaped, annular groove 16b of the gasket-supporting member 16 preferably in substantially airtight manner, and is furthermore suitably shaped/dimensioned so to come in abutment against the back wall 9 of the tubular body 3 without interruption all around the perimeter of the permeable-to-air inner portion 9c of the same back wall 9, so as to avoid any air leakage between the back wall 9 of the tubular body 3 and the adjacent supporting bulkhead 14.

[0061] In the example shown, the rear circular sealing gasket 12 is preferably fixed and/or glued and/or force-fitted into the circular-shaped, annular groove 16b of the gasket-supporting member 16.

[0062] With reference to Figures 2, 3 and 4, the rear wall 2b of boxlike casing 2 preferably comprises an outer lid or cover 18 which is attached to the outer face of supporting bulkhead 14 preferably in substantially airtight manner, and is suitably shaped/structured to fluidly con-

nect the sink-shaped bulge 15 of the supporting bulkhead 14 to the hot-air generator 6, so as to channel the stream of hot air produced by hot-air generator 6 towards the sink-shaped bulge 15, or vice versa.

[0063] In other words, the outer lid or cover 18 is suitably shaped/structured to put the pass-trough opening 15a on the bottom of the sink-shaped bulge 15 in fluid communication with the hot-air generator 6.

[0064] Alike the gasket-supporting member 16, in the example shown the outer lid or cover 18 is preferably, though not necessarily, realized in plastic material, preferably via an injection molding process.

[0065] With reference to Figures 1, 2, 3 and 4, in the example shown, the boxlike casing 2 preferably comprises a supporting basement or socle 19 which is structured for resting on the floor and also for housing at least part of the hot-air generator 6; and a substantially parallelepiped-shaped upper boxlike cabinet 20 which is rigidly fixed to the top of the supporting basement or socle 19 and is structured so as to house the rotatable drum 3, i. e. the tubular body 3.

[0066] The laundry loading/unloading opening of boxlike casing 2 is located on the front wall of the upper boxlike cabinet 20, and the porthole door 4 is hinged to the front wall of the same upper boxlike cabinet 20. The idle supporting rollers 10 that support in rotatable manner the tubular body 3 are instead preferably fixed to the top of the supporting basement or socle 19. Preferably the supporting bulkhead 14 rests on the supporting basement or socle 19 and extends vertically up to the top panel of the casing 2.

[0067] As regards the tubular body 3, the front rim 3f of the tubular body 3 surrounds the laundry loading/unloading opening on the front wall of the upper boxlike cabinet 20 and is coupled in substantially airtight and axially rotating manner to the same front wall of the boxlike cabinet 20, preferably with the interposition of the front circular sealing gasket 11.

[0068] Furthermore, in the example shown the front circular sealing gasket 11 is preferably, though not necessarily, stationary recessed into a circular groove or seat realized on the preferably funnel-shaped coupling element of front bulkhead 13 which is preferably incorporated into the front wall of the upper boxlike cabinet 20, so as to completely 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 upper boxlike cabinet 20 to the front rim 3f of tubular body 3.

[0069] The back wall 9 of the tubular body 3 substantially abuts against the rear wall of the upper boxlike cabinet 20, and is coupled in substantially airtight and axially rotating manner to the same rear wall with the interposition of the rear circular sealing gasket 12. The circular sealing gasket 12 is therefore firmly fixed to the rear wall of the upper boxlike cabinet 20, and the intake air-vent of the hot-air generator 6 is incorporated into the same rear wall of the upper boxlike cabinet 14.

[0070] In other words, the supporting bulkhead 14, the gasket-supporting member 16 and the outer lid or cover 18 form the rear wall of the upper boxlike cabinet 20, and the outer lid or cover 18 extends downwards from the sink-shaped bulge 15 of supporting bulkhead 14 to the beneath-located lower supporting basement or socle 19 of boxlike casing 2, for connecting the pass-trough opening 15a on the bottom of the sink-shaped bulge 15 to the hot-air generator 6.

[0071] With reference to Figures 1, 2 and 3, 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 feeding the heated, dehumidified air back into the rotatable drum 3, where it flows over, the laundry inside the drum to dry said laundry.

[0072] 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 22 having a first end in communication with, i.e. fluidly connected to, the sink-shaped bulge 15 formed on supporting bulkhead 14, and a second end in communication with, i.e. is fluidly connected to, the front mouth of the tubular body 3;
- an electrically-powered centrifugal fan 23 or other type of air circulating pump, which is located along the air recirculating conduit 22 and is structured to produce an airflow f which flows in closed loop through the air recirculating conduit 22 and the rotatable drum 3;
- an air cooling device 24 which is located along the air recirculating conduit 22 preferably, thought not necessarily, upstream of the air centrifugal fan 23, and is structured to cool 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 25 which is located along the air recirculating conduit 22, downstream of the air cooling device 24 and preferably also upstream of the air centrifugal fan 23, and which is structured for heating the dehumidified airflow f arriving from the air cooling device 24 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.

[0073] Furthermore, the first end of the air recirculating conduit 22 communicates with, i.e. is fluidly connected to, the sink-shaped bulge 15 of the supporting bulkhead

14 via the outer lid or cover 18 attached to the outer face of the supporting bulkhead 14. The second end of the air recirculating conduit 22, instead, communicates with, i. e. is fluidly connected to, the front mouth of the tubular body 3 via a pass-trough opening realized in the preferably funnel-shaped coupling element of front bulkhead 13 that delimits/surrounds the laundry loading/unloading opening on the front wall 2a of the upper boxlike cabinet 20, i.e. of boxlike casing 2.

[0074] Furthermore, a central/intermediate section of the air recirculating conduit 22 preferably extends in pass-through manner across the supporting basement or socle 19 of the boxlike casing 2, and the air cooling device 24 and air heating device 25 are preferably completely recessed/housed inside said central/intermediate section of the air recirculating conduit 22.

[0075] With reference to Figures 1 and 2, the centrifugal fan 23 of hot-air generator 6 is preferably located on the back of the supporting basement or socle 19, immediately beneath the sink-shaped bulge 15 of supporting bulkhead 14, and is structured so to communicate with, i.e. be fluidly connected to, the central/intermediate section of the air recirculating conduit 22, and the outer lid or cover 18 of rear wall 2b is shaped/structured to fluidly connect the centrifugal fan 23 to the sink-shaped bulge 15 of supporting bulkhead 14.

[0076] The centrifugal fan 23 therefore communicates with, i.e. is fluidly connected to, the central/intermediate section of the air recirculating conduit 22 and the outwards-projecting, sink-shaped bulge 15 of supporting bulkhead 14, an is able to produce an airflow f which flows from the central/intermediate section of the air recirculating conduit 22 to the sink-shaped bulge 15 of supporting bulkhead 14, or vice versa.

[0077] In the example shown, the centrifugal fan 23 of hot-air generator 6 is preferably at least partly housed/recessed into the rear wall 2b of the boxlike casing 2, preferably beneath the sink-shaped bulge 15 of supporting bulkhead 14, and the outer lid or cover 18 of rear wall 2b is suitably shaped/structured to fluidly connect the centrifugal fan 23 to the sink-shaped bulge 15 of supporting bulkhead 14.

[0078] Furthermore, with reference to Figures 1, 2 and 4, the centrifugal fan 23 of hot-air generator 6 is preferably at least partly housed/recessed into the back of the supporting basement or socle 19 of casing 2, roughly at the end-opening of the central/intermediate section of the air recirculating conduit 22, and preferably comprises: an outer volute or impeller housing 26 which communicates with the central/intermediate section of the air recirculating conduit 22, and with the pass-trough opening 15a on the bottom of the sink-shaped bulge 15 of bulkhead 14 via the outer lid or cover 18; and a rotating impeller (not shown) which is housed in axially rotating manner inside the impeller housing 26 so to generate, when rotating about its reference axis, an airflow f that flows from the central/intermediate section of the air recirculating conduit 22 to the sink-shaped bulge 15 of supporting bulkhead 14, or vice versa.

[0079] Furthermore, in the example shown the impeller housing 26 of centrifugal fan 23 is preferably, though not necessarily, divided into a first portion 26a realized in one piece with the supporting basement or socle 19 of casing 2, and into a complementary second portion 26b which consists into a separated, cap-shaped rigid cover 26b which is shaped/structured for being substantially airtight coupled to the first portion 26a of the impeller housing 26, so as to form/compose the complete outer volute of centrifugal fan 23.

[0080] With reference to Figure 2 and 4, the second portion 26b of the impeller housing 26 is preferably realized in plastic material, preferably via an injection molding process. Furthermore the outer lid or cover 18 is preferably, though not necessarily, realized in one piece with the second portion 26b of the impeller housing 26 so as to form a single component part.

[0081] As regards the air cooling device 24 and air heating device 25, in the example shown the hot-air generator 6 is preferably, though not necessarily, provided with a heat-pump assembly which is structured for continuously removing moisture from, and then heating, the air circulating inside the air recirculating conduit 22 and the rotatable drum 3.

[0082] This heat-pump assembly comprises a first and a second air/refrigerant heat exchangers both located inside the air recirculating conduit 22, preferably upstream of the centrifugal fan 23. The first air/refrigerant heat exchanger, traditionally referred to as the "evaporator" of the heat-pump circuit, is located inside the air recirculating conduit 22 preferably upstream of the centrifugal fan 23, and is structured to remove moisture from the airflow arriving from rotatable drum 3, thus forming the air cooling device 24 of 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 22 downstream of the first air/refrigerant heat exchanger 24, and is structured to release heat to the airflow arriving from the first air/refrigerant heat exchanger 24, thus forming the air heating device 25 of hot-air generator 6.

[0083] General operation of the rotary-drum home laundry drier 1 is clearly inferable from the above description, with no further explanation required.

[0084] The advantages connected to the structure of rotatable drum 3 and of the rear wall 2b of boxlike casing 2 are large in number. First of all, oil or grease can now be used to lubricate the rear circular sealing gasket 12 with no risks for said oil or grease to reach the inside of the rotatable drum 3, thus significantly increasing the lifetime of the rear circular sealing gasket 12.

[0085] Furthermore, the rotatable drum 3 and the rear wall 2b as such allows to use a rear circular sealing gasket 12 having a nominal diameter significantly smaller than that of the rear circular sealing gaskets of traditional laundry dryers with rotatable drum, thus the relative speed and friction between the rear circular sealing gasket 12

and the back wall 9 of the rotatable drum 3 are considerably reduced, thus significantly reducing the wear of the rear circular sealing gasket 12.

[0086] Moreover the structures of rotatable drum 3 and of the rear wall 2b of boxlike casing 2 allows to significantly increase the maximum rate of the airflow entering into the rotatable drum 3, thus significantly reducing duration of the drying cycle.

[0087] Moreover the fact that the preferably dish-shaped back wall 9 of tubular body 3 partly protrudes into the central pass-trough opening 16a of the gasket-supporting member 16 for placing the permeable-to-air inner portion 9c of back wall 9 inside the sink-shaped bulge 15 significantly increases the inner volume of the rotatable drum 3.

[0088] Last but not least, the structures of rotatable drum 3 and of the rear wall 2b of boxlike casing 2 allow to greatly simplifying the assembly of the rear wall 2b of the boxlike casing 2, thus significantly reducing the appliance production costs. The one-piece structure of impeller housing 26 and outer lid or cover 18 greatly simplifies the assembly of the rear wall 2b of boxlike casing 2.

[0089] 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.

[0090] For example, in a different embodiment, the air cooling device 24 of hot-air generator 6 may comprise an air/air heat exchanger which is located inside the air recirculating conduit 22, preferably upstream of the centrifugal fan 23; and is structured for using the external air to cool down the airflow arriving from rotatable drum 3; whereas the air heating device 25 of hot-air generator 6 may consists in a resistor which is located inside the air recirculating conduit 22, downstream of the air/air heat exchanger and preferably also downstream of the centrifugal fan 23.

[0091] In a further non-shown embodiment, the supporting panel or bulkhead 14 of rear wall 2b lacks the sink-shaped bulge 15, and the pass-through opening 15a is realized on a substantially flat, central portion of supporting bulkhead 14 encircled/surrounded by the gasket-supporting member 16.

[0092] In other words, in this embodiment the gasket-supporting member 16 surrounds/encircles a substantially flat, central portion of supporting bulkhead 14 which is aligned/faced to the back wall 9 of tubular body 3 and is fluidly connected to, i.e. communicates with, the hot-air generator 6 via the pass-through opening 15a.

Claims

1. Rotary-drum laundry dryer (1) comprising an outer casing (2) having a front wall (2a), a rear wall (2b), and a lower supporting basement or socle (19), 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);
the rotatable drum (3) comprising a substantially cylindrical, tubular body (3) having a back wall (9) rigidly connected thereto, the tubular body (3) being arranged so that a front rim (3f) thereof is coupled in axially rotating manner to a front bulkhead (13) and so that the back wall (9) is coupled in substantially airtight and axially rotating manner to the rear wall (2b) of the casing (2) with the interposition of a rear sealing gasket (12);
the rear wall (2b) of the outer casing (2) comprising: a substantially vertically-oriented supporting bulkhead (14) having a central portion (15) which is substantially aligned/faced to a permeable-to-air inner portion (9c) of the back wall (9) of the rotatable drum (3); and a gasket-supporting member (16) which is fixed/attached to the inner face of the supporting bulkhead (14) so to be interposed between the central portion (15) of said supporting bulkhead (14) and the back wall (9) of the tubular body (3), and which has a central pass-through opening (16a) substantially aligned/faced to the permeable-to-air inner portion (9c) of said back wall (9) and fluidly connected to the hot-air generator (6);
the rotary-drum laundry dryer (1) **being characterized in that**

   - said supporting bulkhead (14) is fluidly connected to the hot-air generator (6) and said gasket-supporting member (16) is provided with an annular groove (16b) which is faced to the back wall (9) of the tubular body (3), encircles the central pass-through opening (16a) of the gasket-supporting member (16) and is shaped/ dimensioned so to house the rear sealing gasket (12) and keep said rear sealing gasket (12) in abutment against the back wall (9) of the tubular body (3),
   - the tubular body (3) comprises a substantially cylindrical lateral wall (8) which is structured for resting on a number of idle supporting rollers (10) which are arranged approximately at the two axial ends of the tubular body (3) so as to allow the tubular body (3) to rotate about its longitudinal reference axis (L) inside the casing (2).

2. Rotary-drum laundry dryer according to Claim 1, **characterized in that** the idle supporting rollers (10) are fixed in rotatable manner to the boxlike casing (2) or to the top of the supporting basement or socle (19).

3. Rotary-drum laundry dryer according to Claim 1 or 2, **characterized in that** the gasket-supporting member (16) is substantially ring-shaped.

4. Rotary-drum laundry dryer according any Claim 1 to 3, **characterized in that** the supporting bulkhead (14) is centrally provided with a substantially sink-shaped bulge (15) which is substantially aligned/faced to the permeable-to-air inner portion (9c) of the back wall (9) of said tubular body (3), protrudes outwards of the outer casing (2) and is fluidly connected to the hot-air generator (6).

5. Rotary-drum laundry dryer according to any claim 1 to 4, **characterized in that** the supporting bulkhead (14) rests on said supporting basement or socle (19).

6. Rotary-drum laundry dryer according to Claim 3 and 4, **characterized in that** the ring-shaped gasket-supporting member (16) is shaped/dimensioned so to completely cover and/or surround the peripheral border of the sink-shaped bulge (15).

7. Rotary-drum laundry dryer according to any one of the foregoing claims, **characterized in that** the annular groove (16b) is substantially circular in shape and is dimensioned so to house the rear sealing gasket (12) and keep said rear sealing gasket (12) in abutment against the back wall (9) of the rotatable drum (3) all around the permeable-to-air inner portion (9c) of said back wall (9).

8. Rotary-drum laundry dryer according to any one of the foregoing claims, **characterized in that** the permeable-to-air inner portion (9c) of the back wall (9) of the tubular body (3) is substantially circular in shape and is located approximately at centre of said back wall (9).

9. Rotary-drum laundry dryer according to any one of the foregoing claims, **characterized in that** the central pass-through opening (16a) of the gasket-supporting member (16) is substantially circular in shape and the diameter of said central pass-through opening (16a) is greater than the peripheral diameter of the permeable-to-air inner portion (9c) of the back wall (9) of the tubular body (3).

10. Rotary-drum laundry dryer according to any one of the claims 3 to 8, **characterized in that** the back wall (9) of the tubular body (3) is substantially dish-shaped so as to partly protrude into the central pass-through opening (16a) of the gasket-supporting member (16) to place the permeable-to-air inner portion (9c) of the back wall (9) inside the sink-shaped bulge (15) of the supporting bulkhead (14).

11. Rotary-drum laundry dryer according to any one of the foregoing claims, **characterized in that** the gasket-supporting member (16) is realized in plastic material.

12. Rotary-drum laundry dryer according to any one of Claims 4 to 11, **characterized in that** the rear wall (2b) of the outer casing (2) furthermore comprises an outer lid or cover (18) which is rigidly attached to the outer face of the supporting bulkhead (14), and is suitably shaped/structured to fluidly connected the sink-shaped bulge (15) of the supporting bulkhead (14) to the hot-air generator (6), so as to channel the stream of hot air produced by the hot-air generator (6) towards the sink-shaped bulge (15), or vice versa.

13. 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 (22) having a first end fluidly connected to the supporting bulkhead (14), and a second end fluidly connected to the front mouth of the tubular body (3) delimited by said front rim (3f); and a centrifugal fan (23) located along the air recirculating conduit (22) and structured to produce an airflow (f) which flows through the air recirculating conduit (22) and the rotatable drum (3).

14. Rotary-drum laundry dryer according to any one of the foregoing Claims, **characterized in that** the hot-air generator (6) comprises a heat-pump assembly which is structured for continuously removing moisture from and heating the air circulating inside the air recirculating conduit (22) and the rotatable drum (3).

15. Rotary-drum laundry dryer according to any one of the foregoing claims, **characterized in that** the rotatable drum (3) is formed only by two bodies (8, 9) joined together, one of said bodies being a cylindrical lateral wall (8) having a front and a rear end, and the other of said bodies being a wall (9) which is permanently fixed to the rear end of said cylindrical portion (8).

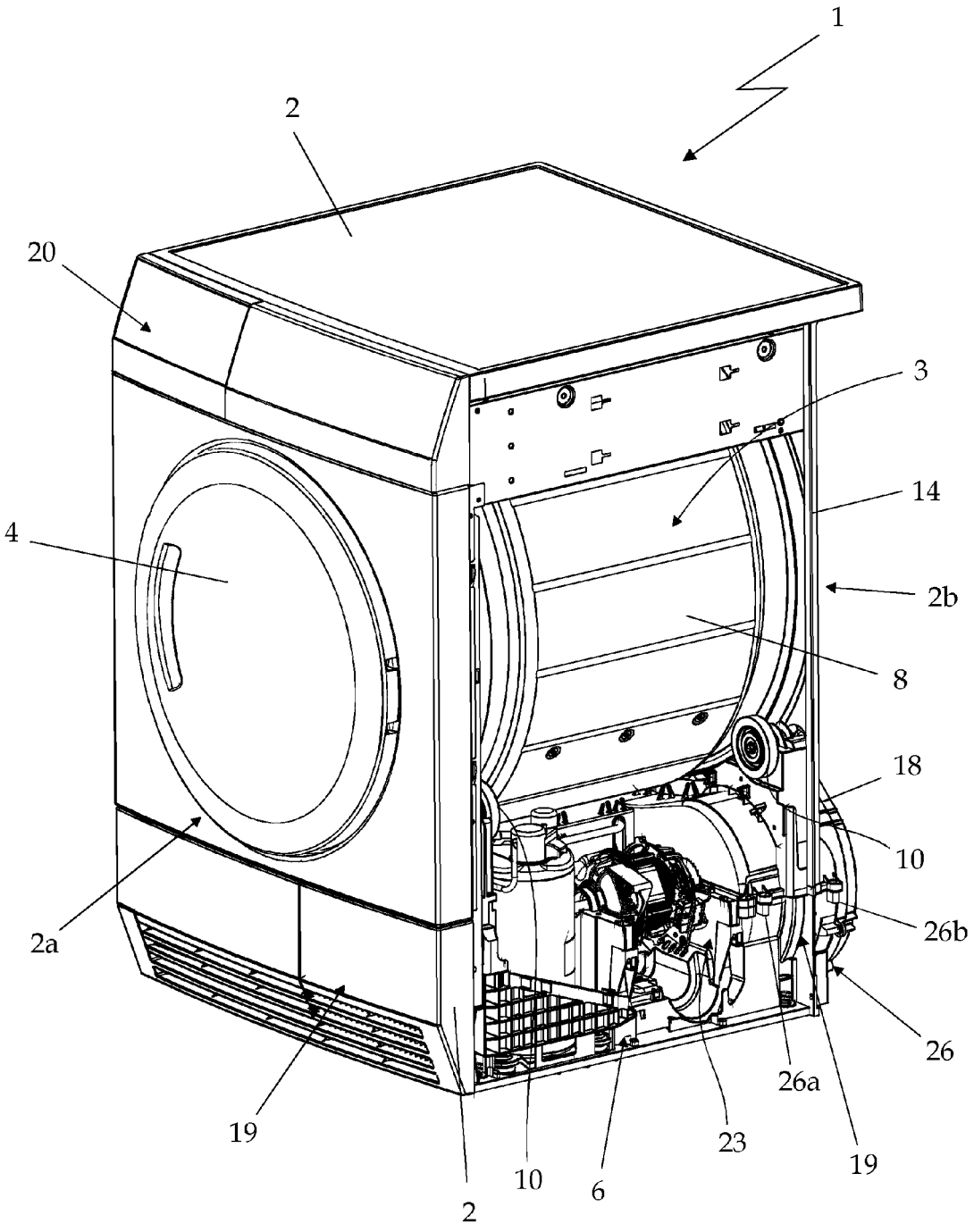


Fig. 1

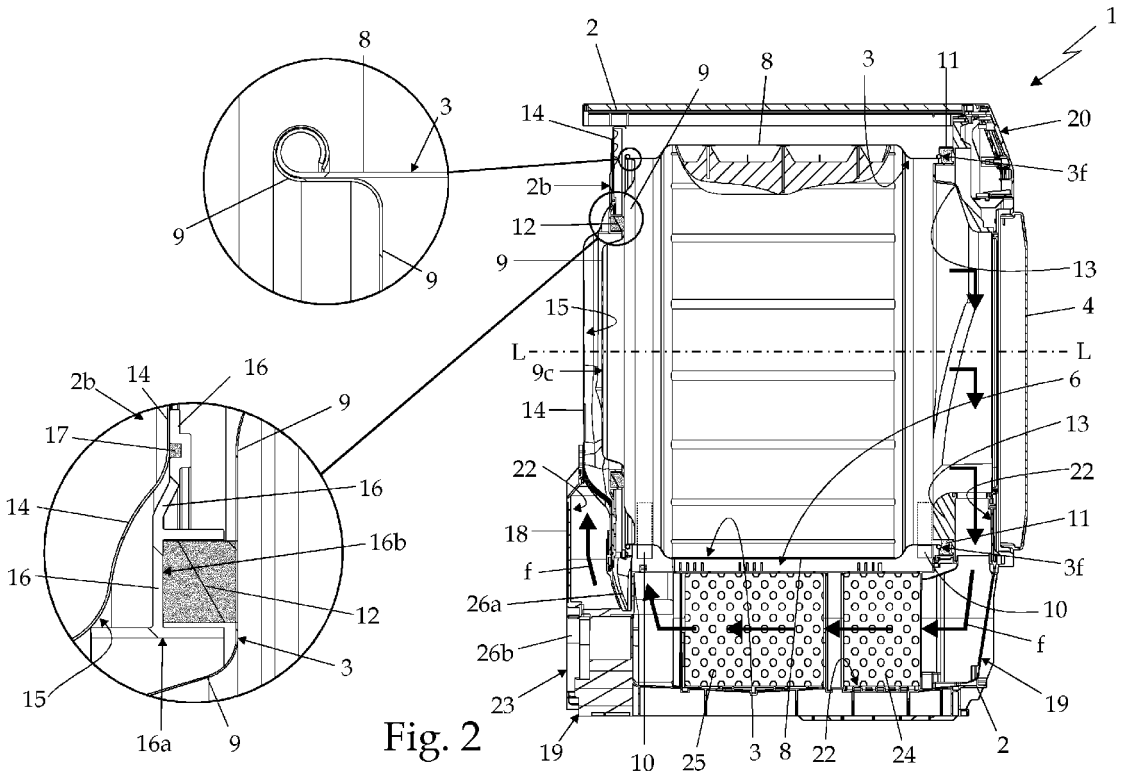

1
2
8
9
8
3
11
14
20
3f
2b
12
9
13
15
4
L
L
9c
6
14
13
22
22
11
18
3f
f
26a
10
26b
f
23
19
19
10
25
3
8
22
24
2
2b
14
16
9
17
16
14
16b
16
12
3
15
16a
9

Fig. 2

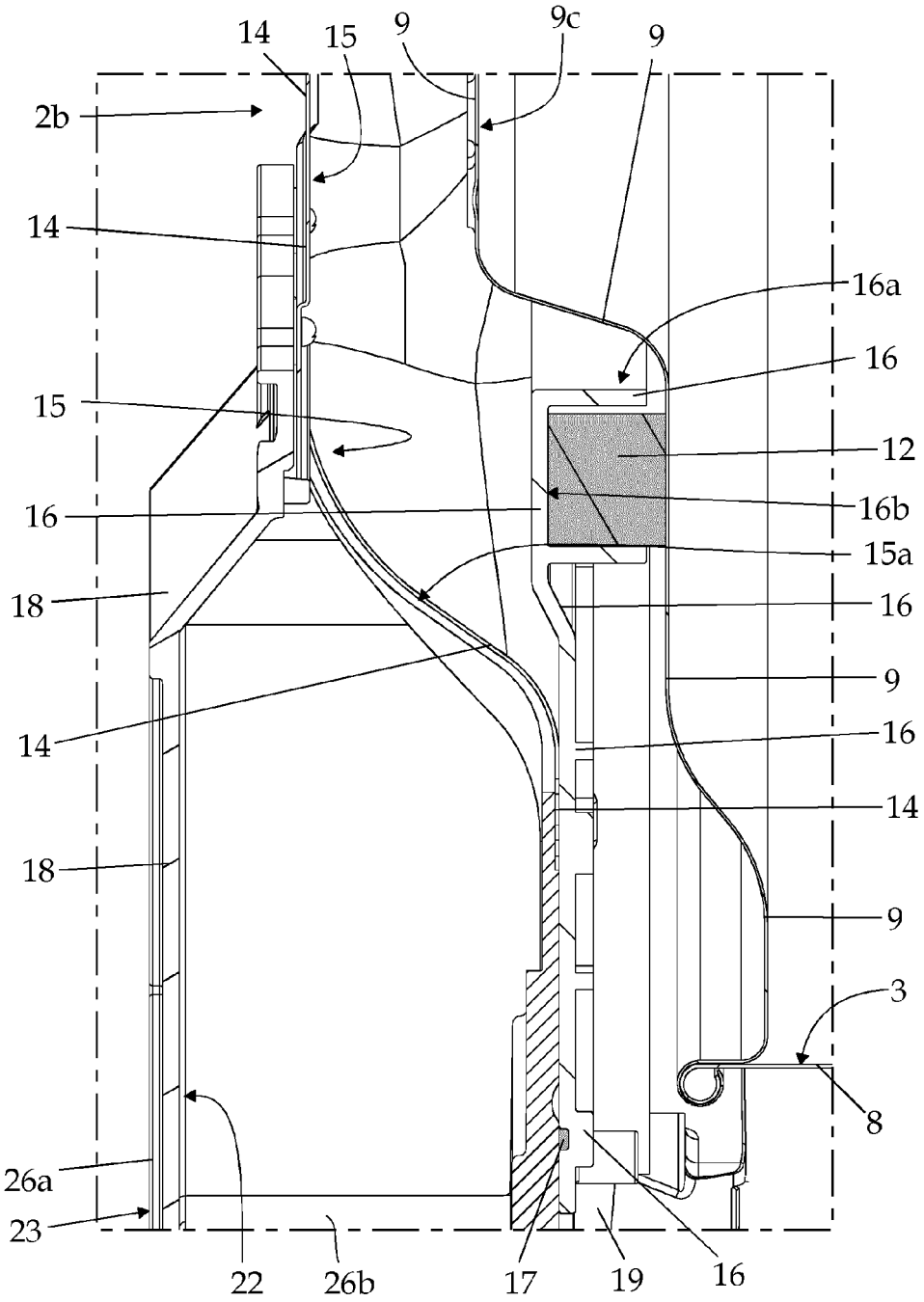

14
15
9
9c
9
2b
14
16a
16
15
12
16b
16
15a
18
16
9
14
16
14
18
9
3
8
26a
23
22
26b
17
19
16

Fig. 3

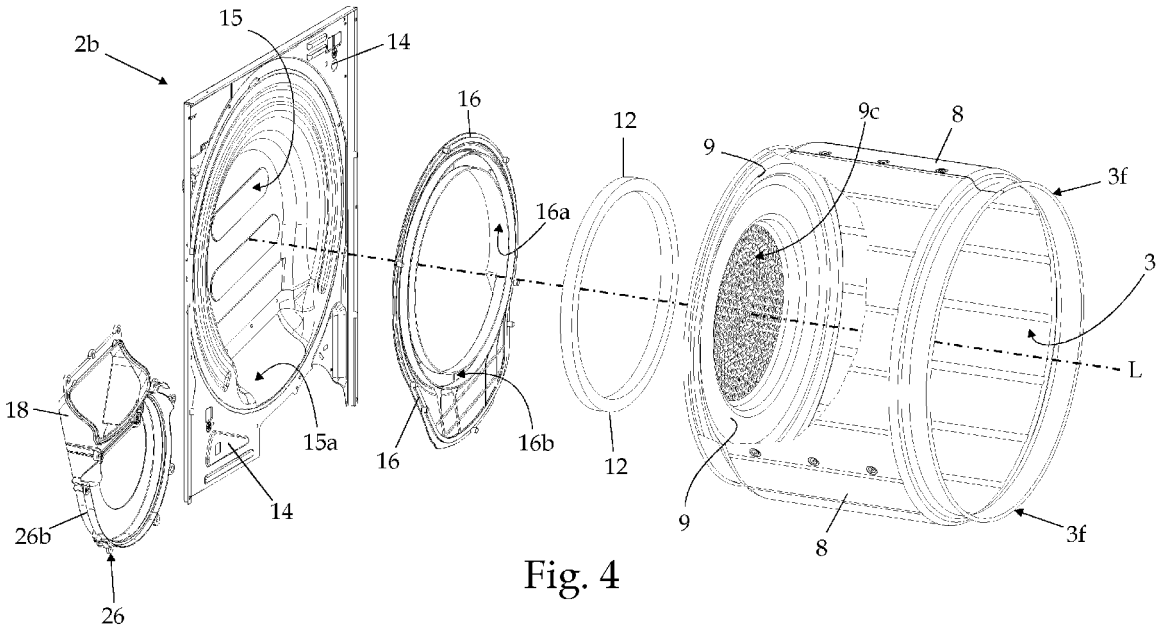


Fig. 4

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 14 19 5015

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 199 07 602 A1 (MIELE & CIE [DE]) 24 August 2000 (2000-08-24) * claims 1,2; figures 1,2 * -----	1	INV. D06F58/04 D06F58/20
A	GB 2 111 142 A (BAUKNECHT GMBH G) 29 June 1983 (1983-06-29) * the whole document * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 March 2015	Stroppa, Giovanni

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 19 5015

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-03-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19907602 A1	24-08-2000	NONE	
GB 2111142 A	29-06-1983	DE 8136238 U1	27-05-1982
		GB 2111142 A	29-06-1983
		NL 8203937 A	01-07-1983

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82