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(54) **Home laundry drier**

(57) A home laundry drier (1) comprising an outer casing (2) and, inside the casing, a laundry drying container (3) for housing the laundry to be dried, and a hot-air generator (7, 17) for circulating a stream of hot air inside the laundry drying container (3); said hot-air generator (7, 17) comprising an air circulating conduit (8, 8b) through which an airflow (f) of hot, moist air is channeled out of said laundry drying container (3), and at least a first air/air heat exchanger (10, 13) located along said first air circulating conduit (8, 8b) to cool the airflow (f) from the laundry drying container (3) and condense the surplus moisture in said airflow (f); said first air/air heat exchanger (13) being designed so as to generate, by chimney effect, a natural ascensional convective current (g) of cold air from outside the casing (2) and which flows through the first air/air heat exchanger (13) together with the airflow (f) from the laundry drying container (3), so that the cold air ascensional convective current (g) cools the airflow (f) from said laundry drying container (3) to condense at least part of the surplus moisture inside said hot airflow (f).

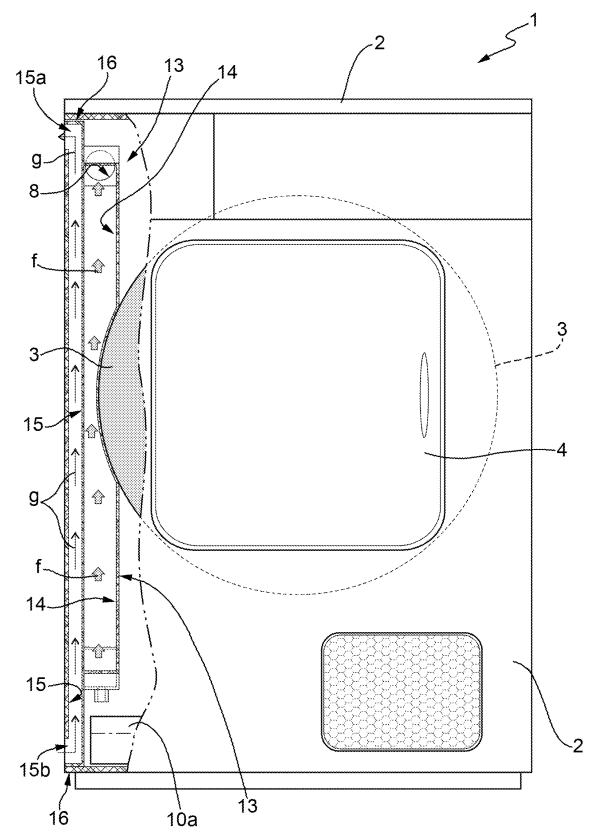


Fig. 1

Description

[0001] The present invention relates to a home laundry drier.

[0002] More specifically, the present invention relates to a rotary-drum home laundry drier, to which the following description refers purely by way of example.

[0003] As is known, rotary-drum laundry driers usually comprise a substantially parallelepiped-shaped outer casing; a cylindrical bell-shaped drum for housing the laundry to be dried, and which is housed in axially rotating manner inside the casing to rotate about a horizontal longitudinal axis, directly facing a laundry loading and unloading opening formed in the front face of the casing; a door hinged to the front face of the casing to rotate to and from a rest position closing the opening in the front face of the casing to seal the casing and the revolving drum; and an electric motor assembly for rotating the drum about its longitudinal axis inside the casing.

[0004] Rotary-drum laundry driers of the above type also comprise a closed-circuit, hot-air generator designed to circulate inside the revolving drum a stream of hot air with a low moisture content, and which flows through the revolving drum and over the laundry inside the drum to rapidly dry the laundry.

[0005] In the most widely marketed driers, the closed-circuit, hot-air generator comprises an air recirculating conduit having its two ends connected to the revolving drum, on opposite sides of the latter; an electric circulating fan or similar located along the recirculating conduit for producing, inside the recirculating conduit, an airflow which flows through the revolving drum; an air/air heat exchanger located along the recirculating conduit and designed for rapidly cooling the airflow from the revolving drum to condense the surplus moisture in the airflow; and finally an electric heater located along the recirculating conduit, downstream of the air/air heat exchanger, for rapidly heating the airflow from the heat exchanger back to the revolving drum, so that the air flowing directed into the drum is heated rapidly to a temperature higher than or equal to that of the same air flowing out of the revolving drum.

[0006] In addition to the above, the closed-circuit, hot-air generator of the above type finally comprises an electric cooling fan which is located into the dryer casing, next to the air/air heat exchanger, for generating, on command, an airflow of external cold air which flows through the air/air heat exchanger to maximize efficiency of the air/air heat exchanger.

[0007] Though highly efficient, the high noise level of rotary-drum laundry driers in certain operating conditions has been the object of frequent criticism over the past few years.

[0008] More specifically, in recent years, users of rotary-drum laundry driers have voiced complaints about the excessive noise level of the electric cooling fan which draws air directly from the outside of the dryer casing.

[0009] To reduce noise level of the cooling fan, some

models of rotary-drum laundry driers currently on the market use a variable-speed electric fan, but this type of electric fan is more expensive than the normal ones, thus increasing the final production cost of the household appliance.

[0010] It is the aim of the present invention to provide a rotary-drum home laundry drier designed to eliminate the aforementioned drawbacks.

[0011] According to the present invention, there is provided a home laundry dryer as claimed in Claim 1 and preferably, though not necessarily, in any one of the Claims depending directly or indirectly on Claim 1.

[0012] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

- Figure 1 shows a schematic front view, with parts in section and parts removed for clarity, of a home laundry drier in accordance with the teachings of the present invention;
- Figure 2 shows a schematic side view, with parts in section and parts removed for clarity, of the Figure 1 home laundry drier;
- Figure 3 shows a schematic side view, with parts in section and parts removed for clarity, of a second embodiment of the Figure 1 home laundry drier;
- Figure 4 shows a schematic front view, with parts in section and parts removed for clarity, of the Figure 3 laundry drier.

[0013] With reference to Figures 1 and 2, number 1 indicates as a whole a home laundry drier comprising a preferably, though not necessarily, parallelepiped-shaped outer box casing 2; a preferably, though not necessarily, cylindrical bell-shaped drum 3 for housing the laundry to be dried, and which is fixed in axially rotating manner inside casing 2, directly facing a laundry loading and unloading opening 2a formed in the front face of casing 2; and a door 4 hinged to the front face of casing 2 to rotate to and from a rest position closing opening 2a in the front face to seal revolving drum 3.

[0014] More specifically, in the example shown revolving drum 3 rests horizontally inside casing 2 on a number of horizontal supporting rollers 5 which are fitted to casing 2 to let revolving drum 3 freely rotate about its longitudinal axis L.

[0015] Laundry drier 1 also comprises an electric motor assembly 6 for rotating, on command, revolving drum 3 about its longitudinal axis L inside casing 2; and a closed-circuit, hot-air generator 7 housed inside casing 2 and designed to circulate through revolving drum 3 a stream of hot air having a low moisture level, and which flows over and rapidly dries the laundry inside drum 3.

[0016] Casing 2, revolving drum 3, door 4, supporting rollers 5, and electric motor assembly 6 are commonly known parts in the industry, and therefore not described in detail.

[0017] As regards closed-circuit, hot-air generator 7,

it provides for gradually drawing air from revolving drum 3; extracting surplus moisture from the hot air drawn from revolving drum 3; heating the dehumidified air to a predetermined temperature, normally higher than the temperature of the air from revolving drum 3; and feeding the heated, dehumidified air back into revolving drum 3, where it flows over, to rapidly dry, the laundry inside the drum.

[0018] In other words, hot-air generator 7 provides for continually dehumidifying and heating the air circulating inside revolving drum 3 to rapidly dry the laundry inside the drum, and substantially comprises:

an air recirculating conduit 8, the two ends of which are connected to revolving drum 3 on opposite sides of the latter;

an electric centrifugal fan 9, or other type of air circulating pump, located along recirculating conduit 8 to produce, inside recirculating conduit 8, an airflow f which flows into revolving drum 3 and over the laundry inside drum 5;

an air/air heat exchanger 10 or similar - commonly referred to as a condenser - which is located along recirculating conduit 8 so that the airflow f from revolving drum 3 and a cold airflow w from outside casing 2 flow through it simultaneously, and which is designed so that the external cold airflow w rapidly cools the airflow f from revolving drum 3 to condense the surplus moisture inside airflow f;

an electric cooling fan 11, or other type of air circulating pump, which is housed into casing 2 for generating, on command, the airflow w of external cold air which flows through heat exchanger 10 to cool the airflow f from revolving drum 3; and

an electric heater 12 (in the example shown, a resistor) located along recirculating conduit 8, downstream from heat exchanger 10, and which provides for rapidly heating the airflow f from heat exchanger 10 back to revolving drum 3, so that the air flowing into revolving drum 3 is heated rapidly to a temperature preferably, though not necessarily, higher than or equal to that of the same air flowing out of revolving drum 3.

[0019] More specifically, with reference to figure 2, in the example shown the intake end of recirculating conduit 8 is integrated in door 4, and is faced to the front opening of revolving drum 3; the end wall 3a of revolving drum 3 is perforated, or at any rate permeable to air, to permit air entry into drum 3; and the exhaust end of recirculating conduit 8 is coupled in airtight manner directly to the end wall 3a of revolving drum 3.

[0020] Electric centrifugal fan 9, in turn, is structured to produce an airflow f flowing along recirculating conduit 8, from the intake end of recirculating conduit 8, i.e. door 4, to the exhaust end of recirculating conduit 8, i.e. the perforated end wall 3a of revolving drum 3.

[0021] With reference to Figure 2, given its large di-

mensions, heat exchanger 10 is preferably, though not necessarily, located at the bottom of casing 2, and it is also provided with a condensed-water canister 10a which collects the liquid distilled water produced, when the drier is running, inside heat exchanger 10 by condensation of the surplus moisture in airflow f arriving from revolving drum 3. Obviously condensed-water canister 10a is located in the bottom of heat exchanger 10.

[0022] With reference to Figures 1 and 2, unlike known home laundry driers, hot-air generator 7 is also provided with a second air/air heat exchanger 13 which is located along recirculating conduit 8, between the intake end of recirculating conduit 8 (i.e. door 4) and heat exchanger 10, preferably, though not necessarily, downstream of electric centrifugal fan 9, and which is designed so that the airflow f from revolving drum 3 and a natural chimney-pot-effect generated ascensional convective current g of cold air from outside casing 2 flow through it simultaneously, so that the cold air ascensional convective current g cools the airflow f from revolving drum 3 to condense the surplus moisture inside airflow f.

[0023] More specifically, with reference to Figure 1, heat exchanger 13 comprises at least two vertically-oriented air ducts 14 and 15 which are housed inside casing 2 one close to the other, so as to share at least part of a partitioning wall made of heat-conductive material. Vertically-oriented air duct 14 is inserted along recirculating conduit 8 so that the hot airflow f from revolving drum 3 can release heat to the partitioning wall that separates air ducts 14 and 15 one from the other; whereas vertically-oriented air duct 15 has its upper and lower ends in direct communication with the outside so as to allow the cold air from outside casing 2 to establish, through duct 15, a natural ascensional convective current g that cools the partitioning wall separating air ducts 14 and 15.

[0024] In other words, the hot airflow f from revolving drum 3 keeps the partitioning wall separating air ducts 14 and 15 at a temperature greater than that of the cold air from outside casing 2, so that the cold air from outside casing 2, after entering into air duct 15 from the lower end of duct 15, starts heating up while flowing on the partitioning wall. As a consequence of the heat received by the partitioning wall, the cold air from outside casing 2 starts expanding inside air duct 15 and is then driven upwards along air duct 15 by chimney-pot-effect.

[0025] The upwards movement of the cold air along air duct 15 generates, over the lower end of air duct 15, a depression which draws into air duct 15 new fresh cold air from the outside of casing 2. This new fresh cold air, in turn, starts heating up inside air duct 15, thus establishing, along air duct 15, a natural ascensional convective current g that cools the partitioning wall separating air ducts 14 and 15 and, therefore, the hot airflow f from revolving drum 3.

[0026] With reference to Figures 1 and 2, in the example shown the vertically-oriented air duct 15 is integrated in one of the vertical walls of casing 2, whereas air duct 14 consists of a substantially flat boxlike element 14

which lies on this vertical wall of casing 2 for maximizing heat exchange.

[0027] More specifically, one of the vertical walls of casing 2 consists of a substantially flat, rectangular-shaped panel 16 made of a heat-conductive material (such as a metal material), and which is provided with an internal airspace extending vertically within the panel body. Said airspace defines duct 15 and communicates directly with the outside of casing 2 via two openings 15a e 15b located one next to the upper edge of panel 16 (i.e. next to the worktop of drier casing 2), and the other next to the lower edge of panel 16 (i.e. next to the bottom of drier casing 2).

[0028] Air duct 14, in turn, consists of an elongated rectangular cross-section tubular element made of a heat-conductive material, which is fixed on the inner face of panel 16, in a substantially vertical position, with one of its main lateral walls in direct contact with the inner face of panel 16, just upon airspace 15; and of two substantially funnel-shaped manifolds fitted on both ends of the tubular element for connecting, in airtight manner, said tubular element to two consecutive sections of recirculating conduit 8.

[0029] In addition to the above, with reference to Figures 1 and 2, the manifold closing the lower end of the vertically-oriented tubular element lying on the inner face of panel 16, is also shaped so as to collect and drain to condensed-water canister 10a the liquid distilled water produced, when the drier is running, inside the vertically-oriented tubular element (i.e. inside air duct 14) by condensation of the surplus moisture in airflow f arriving from revolving drum 3.

[0030] Obviously, in a different embodiment, the vertically-oriented tubular element forming air duct 14 may be in one piece with panel 16, and/or only the portion of panel 16 separating air duct 14 from air duct 15 may be made of a heat-conductive material.

[0031] General operation of laundry drier 1 is clearly inferable from the above description with no further explanation required, other than to specify that air/air heat exchanger 13 is completely noiseless.

[0032] The presence of heat exchanger 13 has lots of advantages: first and foremost, it allows a remarkable downsizing of the main air/air heat exchanger 10 and of electric cooling fan 11.

[0033] Clearly, changes may be made to home laundry drier 1 as described herein without, however, departing from the scope of the present invention.

[0034] For example, in a non-shown less sophisticated embodiment, closed-circuit, hot-air generator 7 lacks heat exchanger 10 and electric cooling fan 11, and may preferably, though not necessarily, comprise an auxiliary electric circulating fan or other type of air circulating pump, which is housed into air duct 15 for generating, on command and when the natural ascensional convective current g along air duct 15 does not suffices in sufficiently cooling the airflow f from revolving drum 3, an additional force-circulated airflow along air duct 15 for better cooling

the partitioning wall separating air ducts 14 and 15, and so the airflow f arriving from revolving drum 3.

[0035] In this less sophisticated embodiment, heat exchanger 13 has its own condensed-water canister for collecting the liquid distilled water produced, when the drier is running, inside air duct 14 by condensation of the surplus moisture in airflow f arriving from revolving drum 3. Obviously, the condensed-water canister is located on the bottom of casing 2, just beneath the manifold closing the lower end of the vertically-oriented tubular element forming the main section of air duct 14.

[0036] With reference to Figures 3 and 4, in a further less sophisticated embodiment of laundry drier 1, the closed-circuit, hot-air generator 7 is replaced by an open-circuit, hot-air generator 17 which provides for drawing cold air from the outside of casing 2; heating the external cold air to a predetermined temperature, normally higher than the temperature of the air in revolving drum 3; feeding the heated external air into revolving drum 3, where it flows over, to rapidly dry, the laundry inside the drum; and finally drawing the moist warm air out of revolving drum 3 back to the outside of casing 2.

[0037] The open-circuit, hot-air generator 17 differs from the closed-circuit, hot-air generator 7 in that the air/air heat exchanger 10 is missing, and that air recirculating conduit 8 is replaced by two air circulating conduits 8a and 8b each connecting revolving drum 3 with the outside of casing 2.

[0038] More specifically, the intake end of air circulating conduit 8a communicates with the outside of casing 2, preferably, though not necessarily, on the rear wall of casing 2, whereas the exhaust end of air circulating conduit 8a is coupled in airtight manner directly to the end wall 3a of revolving drum 3. The intake end of air circulating conduit 8b, on the contrary, is integrated in door 4, and is faced to the front opening of revolving drum 3, whereas the exhaust end of air circulating conduit 8b communicates with the outside of casing 2.

[0039] As regards electric centrifugal fan 9 and electric heater 12, in this embodiment electric centrifugal fan 9 is located along air circulating conduit 8a and/or 8b to produce an airflow f which flows, in closes succession, through air circulating conduit 8a, through revolving drum 3 and over the laundry inside drum 3, and finally through air circulating conduit 8ab back to the outside; whereas electric heater 12 (in the example shown, a resistor) is located along air circulating conduit 8a for rapidly heating the airflow f arriving from the outside and directed towards the revolving drum 3, so that the air entering into revolving drum 3 is heated rapidly to a temperature preferably, though not necessarily, higher than or equal to that of the same air flowing out of revolving drum 3.

[0040] In Figure 3 embodiment, heat exchanger 13 is placed along air circulating conduit 8b so that the airflow f from revolving drum 3 is cooled by the natural chimney-pot-effect generated ascensional convective current g of cold air from outside casing 2 to condense part of the surplus moisture inside airflow f from revolving drum 3.

[0041] With reference to Figures 3 and 4, in this embodiment heat exchanger 13 has a condensed-water canister 13a for collecting the liquid distilled water produced, when the drier is running, inside air duct 14 by condensation of the surplus moisture in airflow f arriving from revolving drum 3, and hot-air generator 17 also comprises a pressurized-steam generator 18 which, on command, drains distilled water from canister 13a and produces jets of steam into revolving drum 3 to eliminate or at least greatly reduce wrinkling of the fabrics produced during the drying cycle.

[0042] More specifically, condensed-water canister 13a is preferably, though not necessarily, located on the bottom of casing 2, just beneath the manifold closing the lower end of the vertically-oriented tubular element forming the main section of air duct 14, whereas pressurized-steam generator 18 comprises an instant in-pressure electric boiler 19 designed to receive a given quantity of water and immediately convert it into a stream of high-pressure steam whose pressure is slightly higher than external pressure; a steam injection nozzle 20 located inside casing 2, in the collar connecting the front opening of revolving drum 3 to opening 2a in the front face of casing 2, and structured for projecting jets of high-pressure steam directly inside drying drum 3; and a steam exhaust pipe 21 connecting the outlet of boiler 19 to the steam injection nozzle 20 for feeding the high-pressure steam produced by boiler 19 directly to nozzle 20.

[0043] Finally pressurized-steam generator 18 is provided with a water pump 22 which sucks, on command, distilled water from canister 13a and feed it to electric boiler 19, and with an electrovalve 23 or similar electrically-operated flow-regulating valve which is located along the pipe connecting pump 22 to boiler 19 for controlling the flow rate of distilled water towards electric boiler 19.

[0044] Likewise currently marketed laundry driers, the electronic central control unit 24 of laundry drier 1 controls electric boiler 19, water pump 22 and electrovalve 23 in predetermined manner, as memorized inside it, to feed jets of high-pressure steam into revolving drum 3 when required by the user-selected drying cycle.

[0045] In-pressure electric boiler 19, steam injection nozzle 20, steam exhaust pipe 21, water pump 22 and electrovalve 23 are commonly known parts in the industry, and therefore not described in detail.

[0046] In addition to the above, open-circuit, hot-air generator 17 may optionally comprise an auxiliary electric circulating fan 25 or other type of air circulating pump, which is housed into air duct 15 for generating, on command and when the natural ascensional convective current g along air duct 15 does not suffices in sufficiently cooling the airflow f from revolving drum 3, an additional force-circulated airflow along air duct 15 for better cooling the partitioning wall separating air ducts 14 and 15, and so the airflow f arriving from revolving drum 3.

[0047] Obviously, pressurized-steam generator 18 may be integrated also in hot-air generator 7. In which

case, pressurized-steam generator 18 drains distilled water from canister 10a.

5 Claims

1. A home laundry drier (1) comprising an outer casing (2) and, inside the casing, a laundry drying container (3) for housing the laundry to be dried, and a hot-air generator (7, 17) for circulating a stream of hot air inside the laundry drying container (3); said hot-air generator (7, 17) comprising a first air circulating conduit (8, 8b) through which an airflow (f) of hot, moist air is channeled out of said laundry drying container (3), and at least a first air/air heat exchanger (10, 13) located along said first air circulating conduit (8, 8b) to cool the airflow (f) from the laundry drying container (3) and condense the surplus moisture in said airflow (f); said home laundry drier (1) being **characterized in that** said first air/air heat exchanger (13) is designed so as to generate, by chimney effect, a natural ascensional convective current (g) of cold air from outside the casing (2) and which flows through the first air/air heat exchanger (13) together with the airflow (f) from the laundry drying container (3), so that the cold air ascensional convective current (g) cools the airflow (f) from said laundry drying container (3) to condense at least part of the surplus moisture inside said hot airflow (f).
2. A home laundry drier as claimed in Claim 1, wherein said first air/air heat exchanger (13) comprises at least a first (14) and a second air duct (15) housed inside the casing (2) one close to the other, so as to share at least part of a partitioning wall; the first air duct (14) being inserted along said first air circulating conduit (8, 8b); the second air duct (15) being oriented substantially vertically, and having its upper and lower ends (15a, 15b) in direct communication with the outside so as to allow the cold air from outside the casing (2) to establish, through the second air duct (15), a natural ascensional convective current (g) that cools the partitioning wall separating said first (14) and said second air duct (15) one another.
3. A home laundry drier as claimed in Claim 1, wherein at least said second air duct (15) is integrated in one (16) of the vertical walls of the casing (2).
4. A home laundry drier as claimed in Claim 3, wherein said vertical wall (16) of the casing (2) comprises a substantially flat panel (16) provided with an internal airspace (15) extending vertically within the panel body; said airspace (15) communicating directly with the outside of the casing (2) via two openings (15a, 15b) located one next to the upper edge of the panel (16), and the other next to the lower edge of the panel

(16), so as to define said second air duct (15).

5. A home laundry drier as claimed in Claim 4, wherein said first air duct (14) lies on the inner face of said vertical wall (16). 5
6. A home laundry drier as claimed in Claim 5, wherein said first air duct (14) comprises an elongated rectangular cross-section tubular element which is fixed on the inner face of the panel (16), in a substantially vertical position, with one of its main lateral walls in direct contact with the inner face of the panel (16); and two substantially funnel-shaped manifolds fitted on both ends of said tubular element for connecting said tubular element to two consecutive sections of said first air circulating conduit (8, 8b). 10
7. A home laundry drier as claimed in any one of the foregoing Claims 2 to 6, wherein said first air/air heat exchanger (13) is provided with a condensed-water canister (10a, 13a) for collecting the liquid distilled water produced, when the drier is running, inside said first air duct (14) by condensation of the surplus moisture in the hot airflow (f) arriving from said laundry drying container (3); said hot-air generator (7, 17) also comprising a pressurized-steam generator (18) which, on command, drains distilled water from said condensed-water canister (10a, 13a) and produces jets of steam into said laundry drying container (3). 15
8. A home laundry drier as claimed in Claim 7, wherein said pressurized-steam generator (18) comprises an electric boiler (19) designed to receive a given quantity of water and immediately convert it into a stream of steam whose pressure is higher than external pressure; a steam injection nozzle (20) located inside the casing (2) for projecting jets of steam directly inside said laundry drying container (3); and a steam exhaust pipe (21) connecting the outlet of said boiler (19) to the steam injection nozzle (20) for feeding the steam produced by said boiler (19) directly to said nozzle (20). 20
9. A home laundry drier as claimed in Claim 8, wherein said pressurized-steam generator (18) also comprises a water pump (22) which sucks, on command, the distilled water from the condensed-water canister (10a, 13a) of the first air/air heat exchanger (10, 13) and feed it to said electric boiler (19), and electrically-operated flow-regulating means (23) which are located along the pipe connecting the water pump (22) to the boiler (19) for controlling the flow rate of the distilled water towards the electric boiler (19). 25
10. A home laundry drier as claimed in any one of the foregoing Claims, wherein said laundry drier (1) also 30

comprises ventilating means (9) able to produce, along said first air circulating conduit (8), an airflow (f) which flows through said laundry drying container (3). 35

11. A home laundry drier as claimed in any one of Claims 2 to 10, wherein said hot-air generator (7, 17) also comprises auxiliary ventilating means (25) which are housed into the second air duct (15) for generating, on command, an additional force-circulated airflow along the second air duct (15) for better cooling the hot airflow (f) arriving from said laundry drying container (3). 40
12. A home laundry drier as claimed in any one of the foregoing Claims, wherein said hot-air generator (7, 17) comprises a second air circulating conduit (8, 8b) through which an airflow (f) of hot air is channeled into said laundry drying container (3), and heating means (12) located along said second air circulating conduit (8, 8a) to heat, on command, the airflow (f) flowing into said laundry drying container (3). 45
13. A home laundry drier as claimed in Claim 12, wherein said first (8, 8b) and second air circulating conduits (8, 8a) are connected one to the other so as to define an air recirculating conduit (8) having both ends connected to said laundry drying container (3); said heating means (12) being located along said air recirculating conduit (8), downstream of said first air/air heat exchanger (13), to heat the airflow (f) flowing out of the first air/air heat exchanger (10) and back into the laundry drying container (3). 50
14. A home laundry drier as claimed in Claim 13, wherein said hot-air generator (7) comprises a second heat exchanger (10) located along said air recirculating conduit (8), between the first air/air heat exchanger (13) and the heating means (12), to further cool the airflow (f) from the laundry drying container (3) and condense the surplus moisture in said airflow (f). 55
15. A home laundry drier as claimed in any one of the foregoing Claims, wherein said laundry drying container (3) comprises a substantially bell-shaped drum (3) which is fixed in axially rotating manner inside the casing (2), directly facing a laundry loading and unloading opening (2a) formed in the front face of said casing (2).

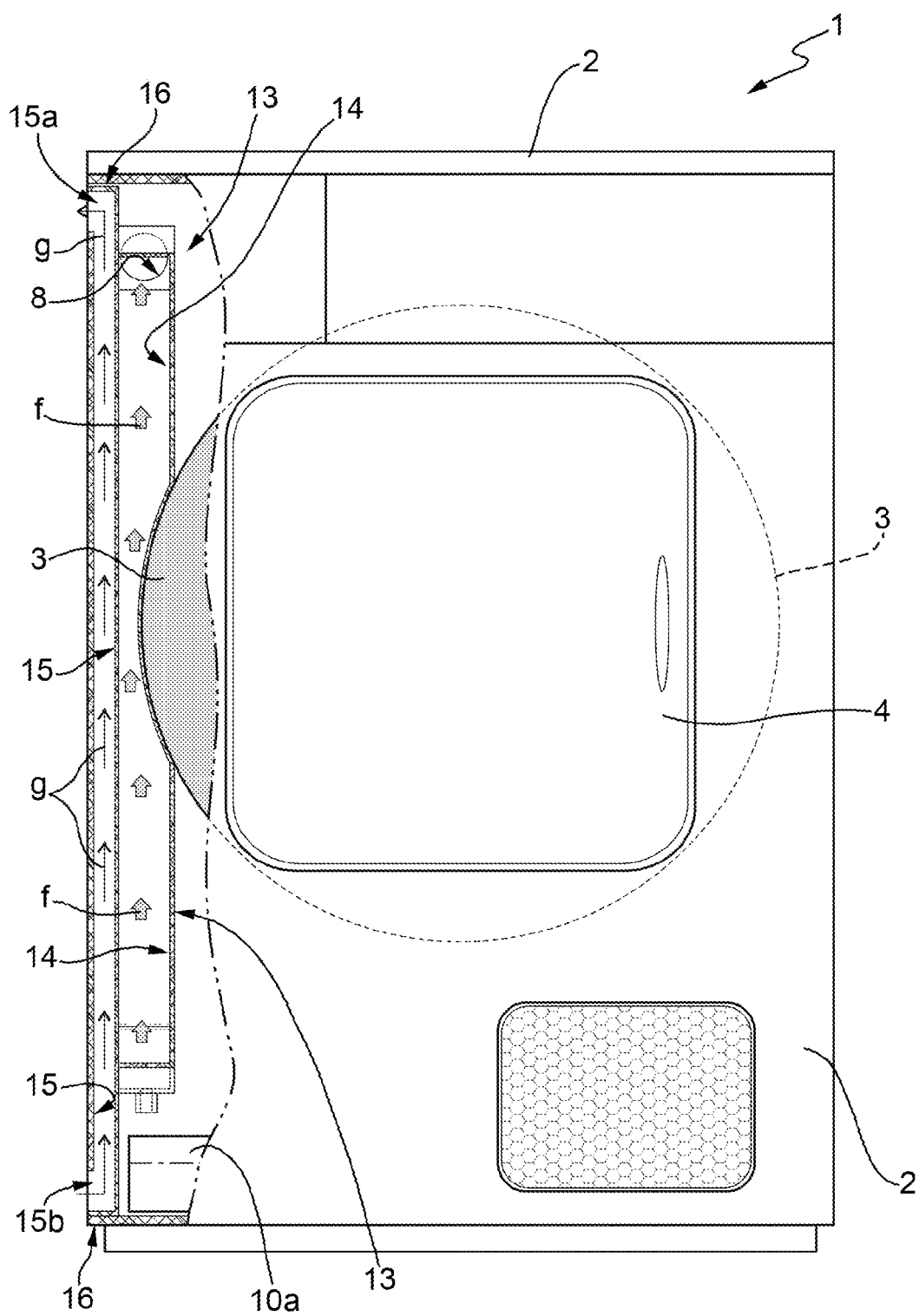


Fig. 1

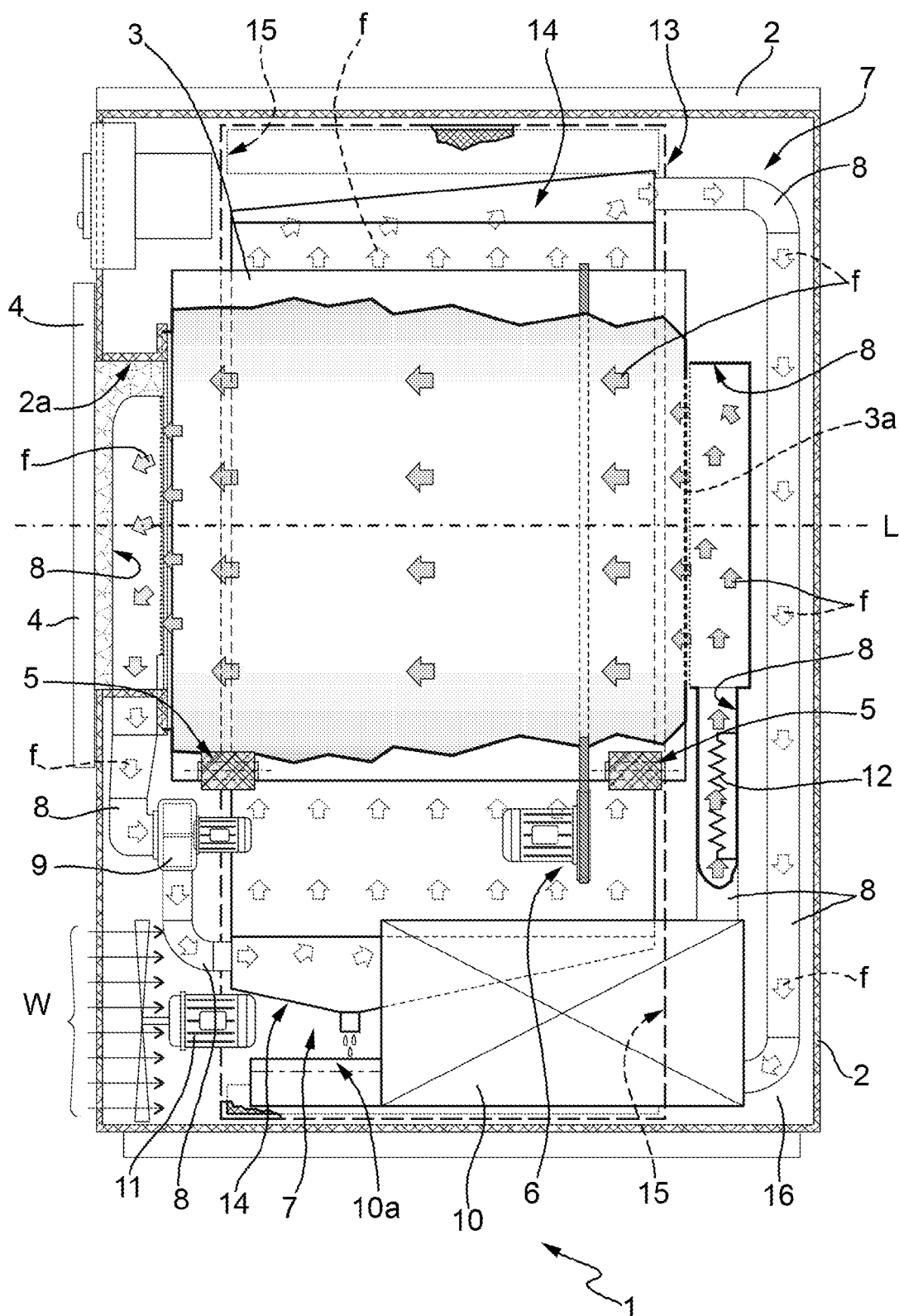


Fig. 2

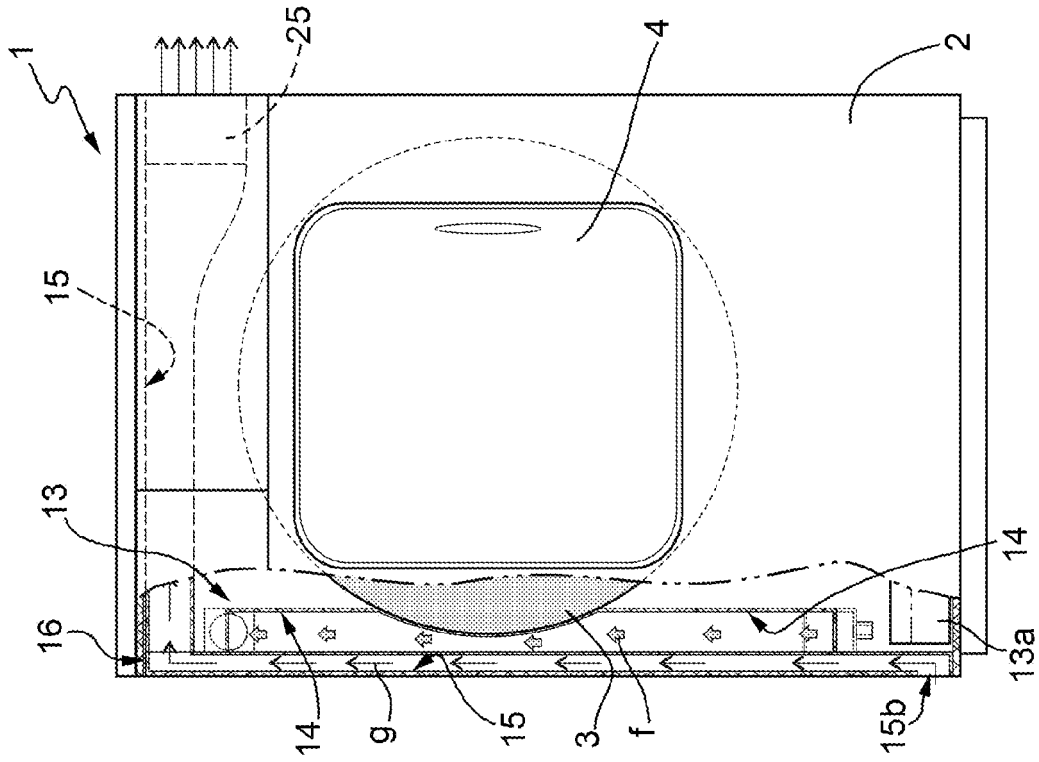


Fig. 4

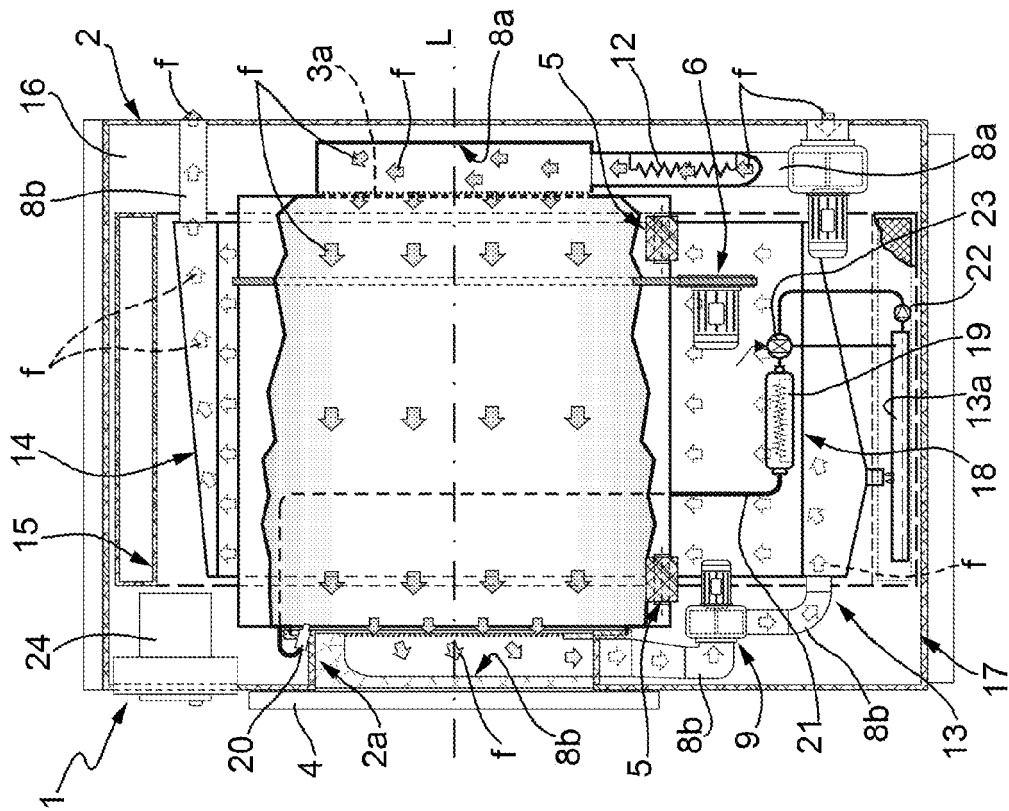


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 08 15 6769

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 179 821 A (HERBST LEROY J [US] ET AL) 25 December 1979 (1979-12-25) * column 4, line 21 - line 36; figures 1-3 *	1-3	INV. D06F58/24
A	----- US 5 146 693 A (DOTTOR GIAMBATTISTA [IT] ET AL) 15 September 1992 (1992-09-15) * abstract; figure 1 *	1-15	
A	----- FR 2 646 501 A (ESSWEIN SA [FR]) 2 November 1990 (1990-11-02) * abstract; figure 1 * -----	1-15	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) D06F A47L
Place of search Munich		Date of completion of the search 22 October 2008	Examiner Westermayer, Wilhelm
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			

 1
EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 08 15 6769

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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22-10-2008

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