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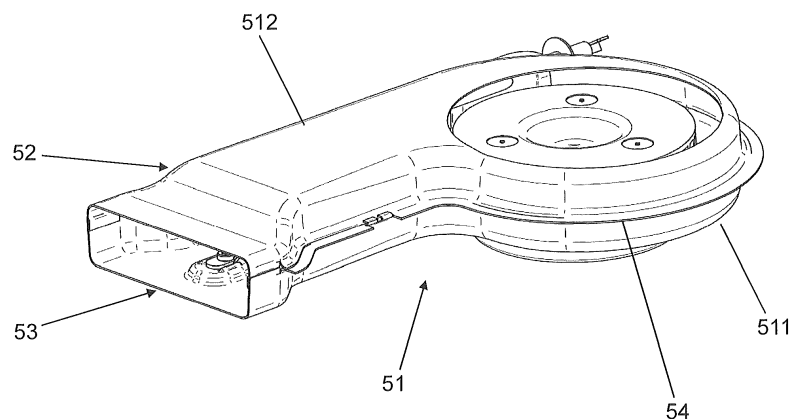
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(54) **HOUSEHOLD APPLIANCE ADAPTED TO PERFORM AT LEAST A DRYING CYCLE, SUCH AS A WASHING/DRYING MACHINE OR A DRYING MACHINE**

(57) Household appliance adapted to perform at least a drying cycle, said appliance (1) comprising: a tub (3) in which a drum (2) is rotatably mounted, said tub comprising at least a tub body (3B) and a front annular component (3A) mounted at a front section (3B') of said tub body (3B); a drying system (10), having an inlet (10a) for receiving wet air from said tub (3) and an outlet (10b)

for providing dried air to said tub (3), said drying system (10) comprising a blowing unit (5) mounted on said tub body (3B) to promote an air flow inside said drying system (10); a connection conduit (6) connecting said blowing unit (5) and an annular shaped gasket (7) mounted on said front annular component (3A); said connection conduit (6) extends at least partly over said tub body (3B).

Fig. 3



Description

FIELD OF THE INVENTION

[0001] The present invention refers to a household appliance adapted to perform at least a drying cycle, such as a washing/drying machine or a drying machine.

PRIOR ART

[0002] Drying machines and washing/drying machines comprise a rotating drum in which the items to be dried are placed. The drum is rotatably mounted in a tub. To perform the drying through a recirculation line, the air is extracted from the tub, treated and reintroduced therein. The recirculation line includes:

a condenser that causes the condensation of the moisture contained in the air extracted from the tub (such moisture is transferred to the air by the linen whilst it is drying);

a blowing unit that moves the air along the recirculation line; the blowing unit typically comprises a fan (or impeller) and a casing, in which the fan is rotatably mounted; the fan is driven in rotation by a respective motor, mounted to the casing;

an element that heats the air before reintroducing it into the tub.

[0003] The tub is usually made of three structural components: a tub body; a front annular component, mounted at a front section of the tub body; a rear component, mounted at a rear section of the tub body.

[0004] Tubs of different capacities are often made available. The different capacities are typically obtained by maintaining the radius of the tub structure, and by increasing the axial length of the tub body or the front annular component.

[0005] The recirculation line or drying system has to be modified accordingly, so as to adapt to the new dimension of the tub.

[0006] The solutions currently made available by the state of the art include blowing units of increased length. In practical terms, the length of the blowing unit, and in particular of the conduit arranged downstream of the impeller, is increased so as to match the increase of the tub axial dimension.

[0007] The Applicant has noted that this solution is often complex from a structural point of view and quite expensive.

SUMMARY OF THE INVENTION

[0008] It is an object of the present invention to provide a household appliance adapted to perform at least a drying cycle in which the capacity of the tub can be varied without expensive and structurally complex consequences on the remaining parts of the appliance.

[0009] In particular, it is an object of the present invention to provide a household appliance adapted to perform at least a drying cycle wherein the structure of the drying system is easily adapted to modifications of the axial length of the tub.

[0010] These and further objects are substantially achieved by a household appliance as described in the appended claims.

[0011] The basic idea of the present invention is, upon modifications of the axial length of the tub, to keep substantially unchanged the length of the blowing unit and modify instead the length of the connection conduit interposed between the blowing unit and the annular gasket mounted on the front annular component of the tub.

[0012] According to one aspect, the invention refers to a household appliance adapted to perform at least a drying cycle, said appliance comprising:

a. a tub in which a drum is rotatably mounted, said tub comprising at least a tub body and a front annular component mounted at a front section of said tub body;

b. a drying system, having an inlet for receiving wet air from said tub and an outlet for providing dried air to said tub, said drying system comprising a blowing unit mounted on said tub body to promote an air flow inside said drying system;

c. a connection conduit connecting said blowing unit and an annular shaped gasket mounted on said front annular component;

wherein said connection conduit extends at least partly over said tub body.

[0013] Preferably said connection conduit has a front end connected to said annular gasket and a rear end connected to said blowing unit, wherein said rear end is located over said tub body.

[0014] Preferably the front end of said connection conduit faces an opening formed in said annular shaped gasket so that air flowing from said blowing unit is inserted in said tub through said opening.

[0015] Preferably said connection conduit and said annular shaped gasket are made in one piece. Preferably said drying system further comprises a condenser adapted to receive a flow of wet air from said tub and to make it condense and obtain dried air, said blowing unit being interposed between said condenser and said connection conduit.

[0016] Preferably said blowing unit comprises:

a. a casing made of metallic material;

b. an impeller rotatably mounted in said casing;

c. an electric motor mounted on said casing and adapted to drive said impeller in rotation.

[0017] Preferably said casing comprises a first semi-shell and a second semi-shell which are mutually joined to form said casing.

[0018] Preferably said metallic material is metal-sheet.
[0019] Preferably said household appliance further comprises a heating element mounted inside said casing.
[0020] Preferably said casing comprises a scroll surrounding said impeller and a conduit radially extending from said impeller.
[0021] Preferably said heating element is mounted in said conduit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Some examples of preferred and advantageous embodiments are described for purely illustrative and non limiting purposes, with reference to the attached drawings, in which:

figure 1 shows a block diagram of a household appliance according to the invention;
 figure 2 shows a perspective view of a portion of a household appliance to which the invention can be applied;
 figure 3 shows a perspective view of a detail of figure 2;
 figure 4 shows a perspective exploded view of the portion of figure 2;
 figure 5a shows a schematic side view of a household appliance according to the prior art;
 figure 5b shows a schematic side view of a household appliance according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0023] In the accompanying drawings, 1 indicates a household appliance adapted to perform at least a drying cycle.
[0024] The appliance 1 can be a drying machine, adapted to dry linen and/or clothes previously washed by a different machine.
[0025] The appliance 1 can also be a washer-drier, namely a machine capable of both washing and drying linen and/or clothes. In this case, the appliance 1 is also adapted to perform at least a washing cycle.
[0026] The appliance 1 (figure 1) comprises a drum 2 which can rotate and which is intended to house the items to be dried.
[0027] The appliance 1 comprises a tub 3, in which the drum 2 is rotatably mounted. Advantageously the tub 3 comprises a plurality of structural components.
[0028] Said structural components comprise at least a front annular component 3A and a tub body 3B.
[0029] Preferably the structural components of the tub 3 further comprise a rear component 3C. Preferably the tub body 3B has a substantially cylindrical shape, having a front section 3B' and a rear section 3B".
[0030] The front annular component 3A is mounted at the front section 3B' of the tub body 3B. The rear component 3C is mounted at the rear section 3B" of the tub body 3B.

[0031] The rear section 3B" is substantially closed by a rear base RB.

[0032] Preferably the rear component 3C comprises a plurality of radial structural supports 3C' extending from a central hub 3C".

[0033] Advantageously the appliance 1 comprises a drying system 10 which has an inlet 10a for receiving wet air from the tub 3 and an outlet 10b for providing dried air to be inserted back into the tub 3. This allows the air rich in moisture (following contact with the items to be dried contained in the drum 2 placed in the tub 3) to be taken and reintroduced into the same tub 3 after being dried and heated.

[0034] The drying system 10 comprises a blowing unit 5, externally mounted on the tub body 3B; the blowing unit 5 is adapted to promote an air flow inside the drying system 10. Preferably the blowing unit 5 (figures 1-3) comprises casing 51 and an impeller 59 rotatably mounted into said casing 51 so as to promote the flow of air.

[0035] The casing 51 is made of metal, preferably of sheet metal.

[0036] The sheet metal of the casing 51 is preferably steel. In particular it is a type of steel for moulding. By way of non-limiting example the sheet metal can be aluminum- or zinc-coated or electro-galvanized. In a particular embodiment the sheet metal may be aluminum.

[0037] Preferably the sheet metal of the casing 51 has a thickness of less than 1 millimeter, in particular less than 0.8 mm. The reduced thickness of the sheet metal allows a light structure to be created but which can at the same time provide maximum resistance to strain.

[0038] Advantageously the casing 51 comprises a scroll 511 which surrounds the impeller 59 and a conduit 512 which extends from said scroll 511. Advantageously the conduit 512 houses a heating element 58, e.g. an electrical element, for heating the air before it is fed back into the tub 3.

[0039] Preferably the blowing unit 5 is of the centrifugal type.

[0040] The casing 51 preferably comprises, and is in particular can be made of, a first semi-shell 52 and a second semi-shell 53.

[0041] Preferably the first semi-shell 52 defines an upper portion of the casing 51 whereas the second semi-shell 53 defines a lower position of the same casing 51.

[0042] Preferably, the first and the second semi-shell 52, 53 are connected to each other by a seaming. The seaming allows a fast and cheap connection to be obtained, potentially even without the need to use additional interposed gaskets (which would certainly be necessary if, for example, the two semi-shells were connected through threaded connections). Preferably the casing 51 is provided with a perimetral flange 54, for example formed by said seaming.

[0043] An example of how a two semi-shell casing can be made is disclosed in European patent application EP 2 725 131 A1, in the name of the same Applicant.

[0044] The structure of the casing 51 according of the

present invention can be the same as the casing disclosed in said European patent application.

[0045] The impeller 59 can be realized as a fan, mounted inside the casing 51.

[0046] The impeller 59 is driven in rotation by a respective electric motor 52'.

[0047] The appliance 1 further comprises a connection conduit 6 adapted to guide the flow of dried air from the outlet 10b of the drying system 10 to the tub 3.

[0048] Preferably, the connection conduit 6 is associated to an annular shaped gasket 7, arranged around the loading opening 7a of the tub 3 and provided with a passage to let the dried air reach the inside of the same tub 3.

[0049] In a preferred embodiment, the connection conduit 6 is made of an elastomeric material, e.g. the same material as the annular gasket 7.

[0050] In a preferred embodiment, the connection conduit 6 and the annular gasket 7 are made in one piece.

[0051] According to the invention, the connection conduit 6 extends at least partly over the tub body 3B.

[0052] In particular, the connection conduit 6 has a front end 6A connected to the annular gasket 7 and a rear end 6B connected to the blowing unit 5; advantageously, the rear end 6B is located over the tub body 3B.

[0053] In practical terms, in machines according to the state of the art, the junction between the connection conduit 6 and the blowing unit 5 is substantially located over the junction between the front annular component 3A and the tub body 3B. Accordingly, the horizontal part of the connection conduit 6 substantially extends over (i.e. is arranged in a position radially external to) the front annular component 3A, and the blowing unit 5 substantially extends over (i.e. is arranged in a position radially external to) the tub body 3B (figure 5a). By contrast, in the household appliance 1 according to the present invention, the connection conduit 6 extends also over the tub body 3B, so as to connect with the blowing unit 5 when the axial length of the same tub body 3B is increased (figure 5b).

[0054] In this way, appliances having different capacities, obtained by varying the axial length of the tub body, can be easily manufactured.

[0055] In particular, a configurable mould for conduits having different lengths can be provided; once the length of the connection conduit 6 has been determined, the mould is properly configured and the suitable conduit is realized.

[0056] As said, the annular gasket 7 and the connection conduit 6 are preferably made in one piece. In this case, the mould is so shaped as to manufacture gaskets always having the same dimensions, integral with conduits having variable lengths.

[0057] Preferably the front end 6A of the connection conduit 6 faces an opening 7B formed in the annular shaped gasket 7 so that air flowing from the blowing unit 5 is inserted in the tub 3 through said opening 7B.

[0058] The drying system 10 comprises a condenser

4 that receives a gaseous fluid containing particles of vapor from said tub 3 and that causes at least partial condensation thereof. Preferably the inlet 10a of the drying system 10 coincides with the inlet of the condenser 4. The structure and operation of the condenser 4 are per se known and will not be disclosed in further detail.

[0059] In operation, after the items to be dried are arranged into the drum 2, the latter is rotated according to preset program(s) and the drying system 10 is operated so as to withdraw wet air from the tub 3 through inlet 10a and provide dried hot air at the outlet 10b. In particular, the wet air flowing through the inlet 10a is first condensed by condenser 4; then the air passes through the blowing unit 5: the impeller 59 first, and then the conduit 512. In the conduit 512 the air is also heated by heating element 58. The dried and heated air is then fed back into the tub 3 through the connection conduit 6.

Claims

- Household appliance adapted to perform at least a drying cycle, said appliance (1) comprising:
 - a tub (3) in which a drum (2) is rotatably mounted, said tub comprising at least a tub body (3B) and a front annular component (3A) mounted at a front section (3B') of said tub body (3B);
 - a drying system (10), having an inlet (10a) for receiving wet air from said tub (3) and an outlet (10b) for providing dried air to said tub (3), said drying system (10) comprising a blowing unit (5) mounted on said tub body (3B) to promote an air flow inside said drying system (10);
 - a connection conduit (6) connecting said blowing unit (5) and an annular shaped gasket (7) mounted on said front annular component (3A); wherein said connection conduit (6) extends at least partly over said tub body (3B).
- Household appliance according to claim 1 wherein said connection conduit (6) has a front end (6A) connected to said annular gasket (7) and a rear end (6B) connected to said blowing unit (5), wherein said rear end (6B) is located over said tub body (3B).
- Household appliance according to claim 1 or 2 wherein the front end (6A) of said connection conduit (6) faces an opening (7B) formed in said annular shaped gasket (7) so that air flowing from said blowing unit (5) is inserted in said tub (3) through said opening (7B).
- Household appliance according to any one of the preceding claims wherein said connection conduit (6) and said annular shaped gasket (7) are made in one piece.

5. Household appliance according to claim 11 wherein said drying system (10) further comprises a condenser (4) adapted to receive a flow of wet air from said tub (3) and to make it condense and obtain dried air, wherein said blowing unit (5) is interposed between said condenser (4) and said connection conduit (6). 5

6. Household appliance according to any one of the preceding claims wherein said blowing unit (5) comprises: 10
 - a. a casing (51) made of metallic material;
 - b. an impeller (59) rotatably mounted in said casing (51); 15
 - c. an electric motor (52') mounted on said casing and adapted to drive said impeller (59) in rotation.

7. Household appliance according to claim 6 wherein said casing (51) comprises a first semi-shell (52) and a second semi-shell (53) which are mutually joined to form said casing (51). 20

8. Household appliance according to claim 6 or 7 wherein said metallic material is metal-sheet. 25

9. Household appliance according to any one of claims 6 to 8 further comprising a heating element (58) mounted inside said casing (51). 30

10. Household appliance according to any one of claims 6 to 9 wherein said casing (51) comprises a scroll (511) surrounding said impeller (59) and a conduit (512) radially extending from said impeller (511). 35

11. Household appliance according to claims 9 and 10 wherein said heating element (58) is mounted in said conduit (512). 40

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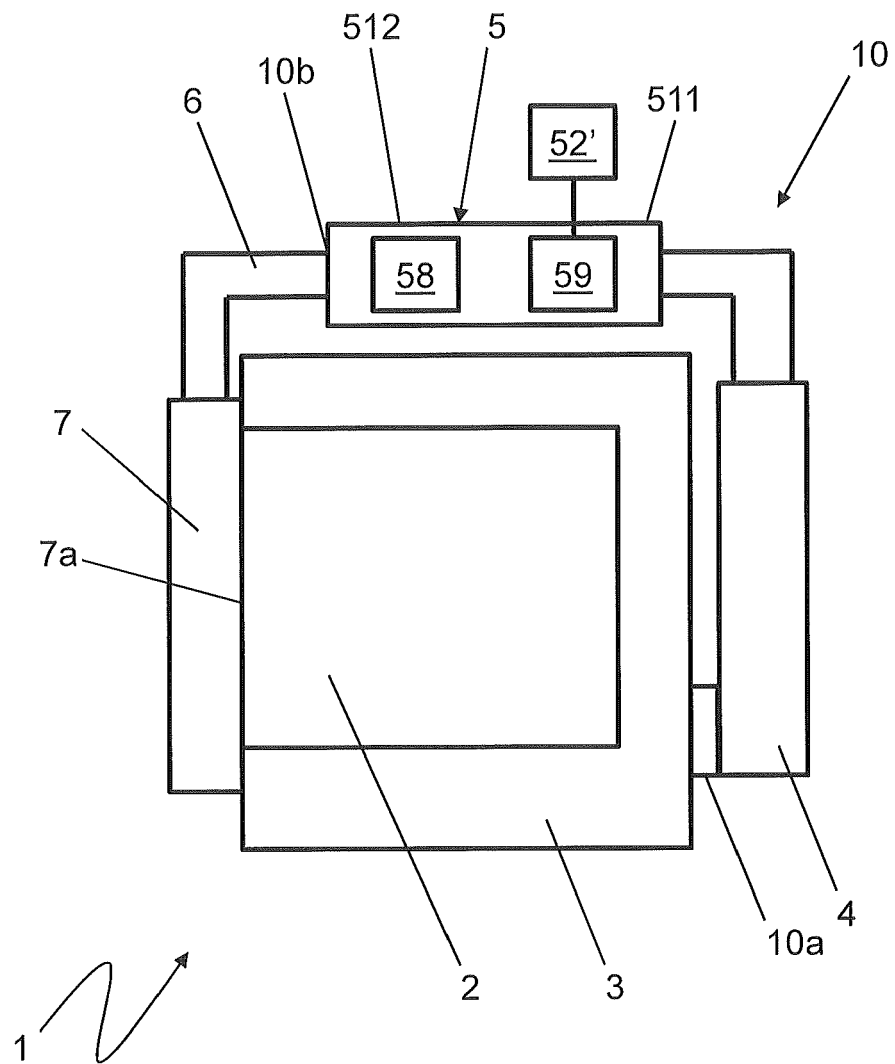


Fig. 1

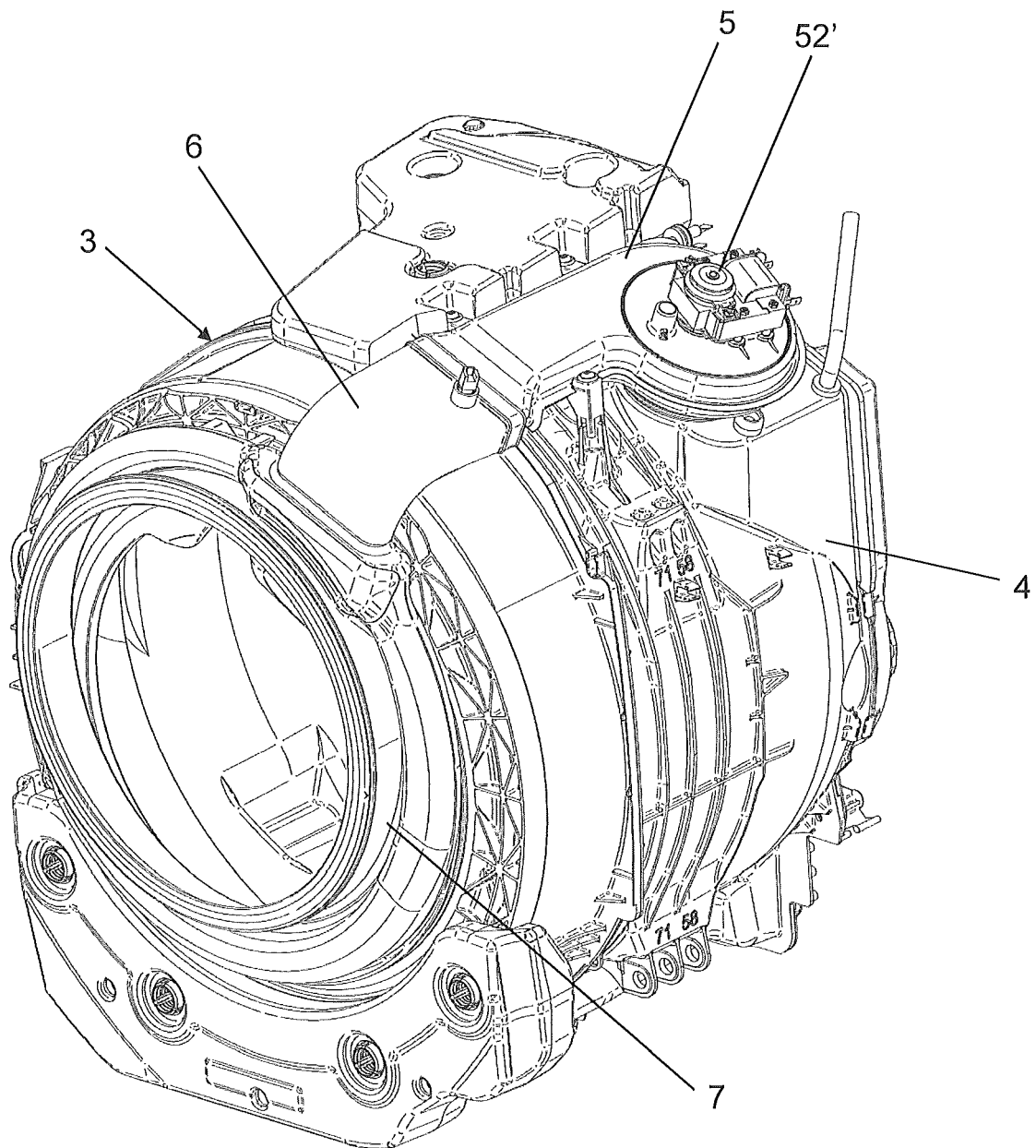
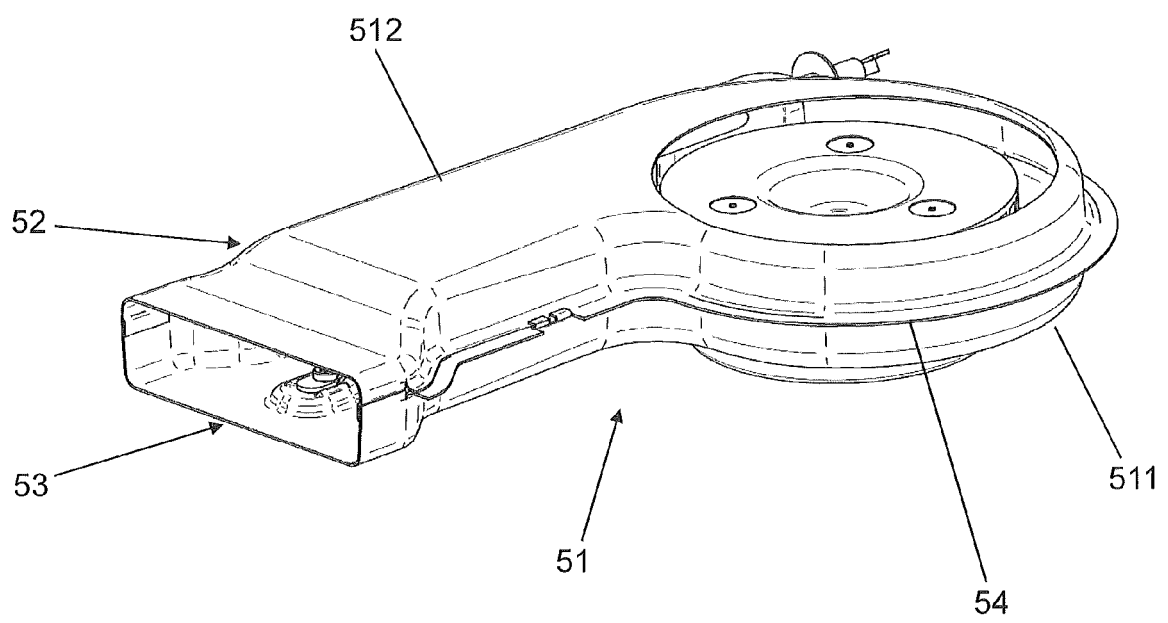


Fig. 2

Fig. 3



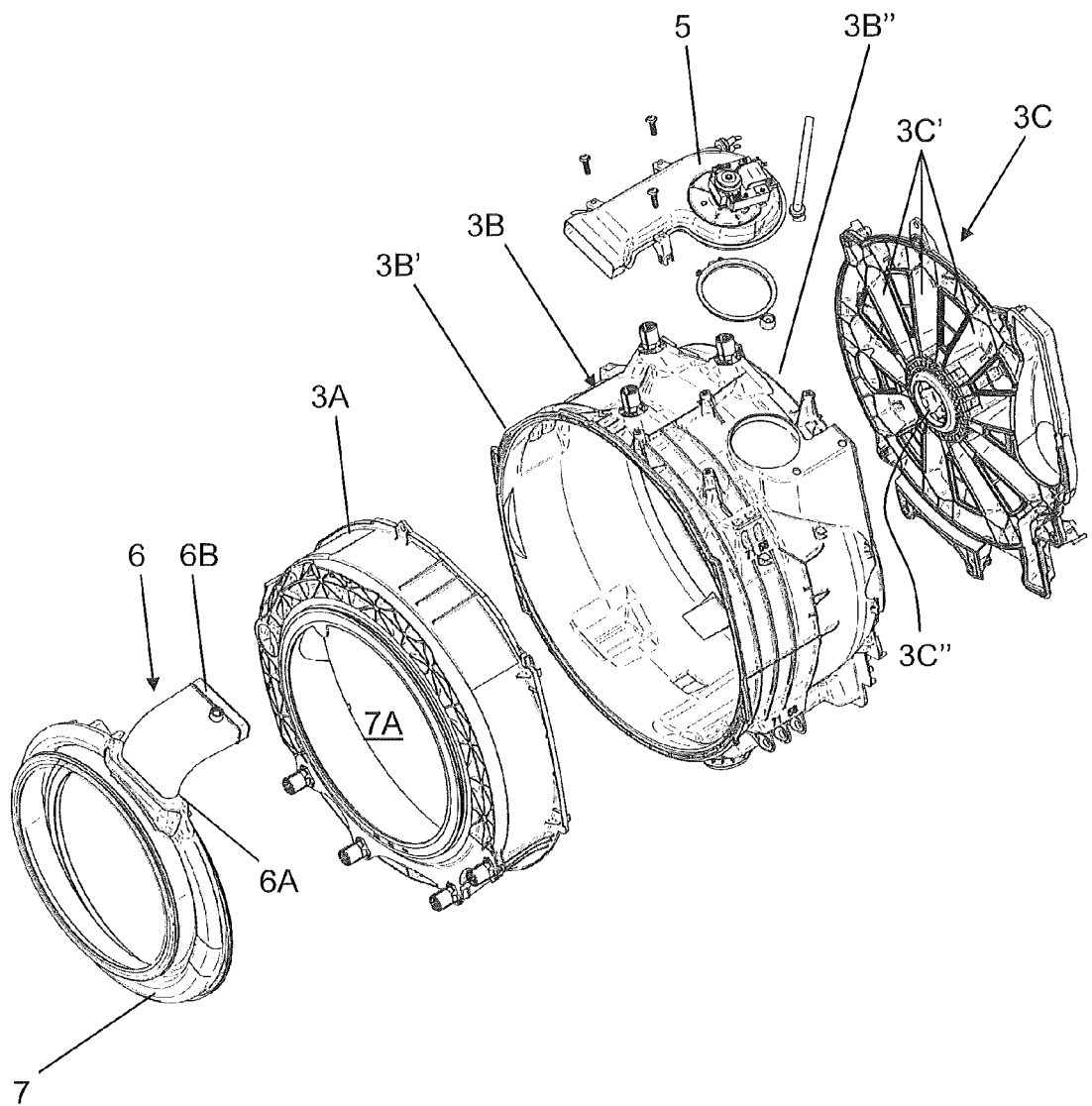


Fig. 4

Fig. 5a

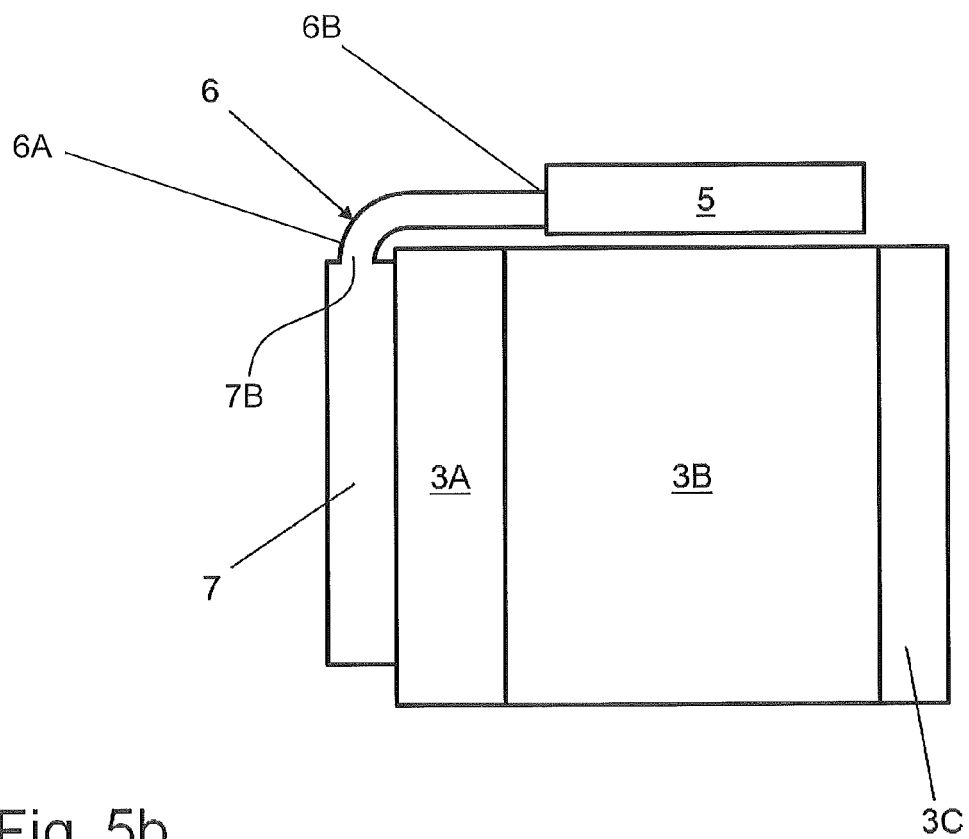
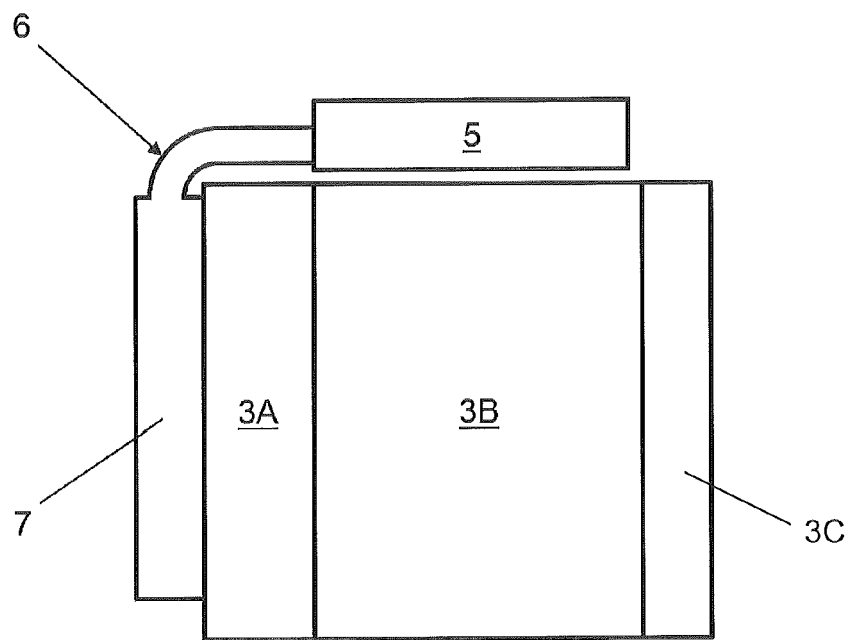


Fig. 5b



EUROPEAN SEARCH REPORT

 Application Number
 EP 15 19 2295

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 181 222 A (PHILIPS ELECTRONIC ASSOCIATED) 15 April 1987 (1987-04-15)	1-3,5	INV. D06F58/02
Y	* the whole document *	4,6-11	
Y	EP 2 843 099 A1 (ELECTROLUX APPLIANCES AB [SE]) 4 March 2015 (2015-03-04) * the whole document *	4	ADD. D06F58/04 D06F58/26 D06F25/00 D06F37/26
X,D	EP 2 725 131 A1 (INDESIT CO SPA [IT]) 30 April 2014 (2014-04-30)	1-3,5-11	
Y	* the whole document *	6-11	
X	EP 1 353 004 A1 (BONFERRARO SPA [IT]) 15 October 2003 (2003-10-15) * the whole document *	1-3,5-11	
X	US 2014/230270 A1 (LIM HYUNG SUB [KR] ET AL) 21 August 2014 (2014-08-21) * abstract * * paragraphs [0058], [0069] - [0075], [0085]; figures 1,2,12 *	1-3,6-11	
X	EP 2 039 819 A1 (CANDY SPA [IT]) 25 March 2009 (2009-03-25) * abstract * * paragraphs [0030], [0031], [0036] - [0037], [0060]; figures 1-4 *	1-3,5-11	TECHNICAL FIELDS SEARCHED (IPC) D06F
Y	JP 2000 189691 A (TOSHIBA CORP) 11 July 2000 (2000-07-11) * abstract; figures *	1-11	
Y	WO 2009/083396 A1 (ARCELIK AS [TR]; OZKALAY KORHAN [TR]) 9 July 2009 (2009-07-09) * abstract * * paragraphs [0024] - [0027]; figure 3 *	1-11	
		-/--	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 December 2015	Examiner Prosig, Christina
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EUROPEAN SEARCH REPORT

Application Number
EP 15 19 2295

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50

55

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	US 2010/257902 A1 (PERSSON LEIF [SE] ET AL) 14 October 2010 (2010-10-14) * abstract * * paragraph [0052]; figures * -----	1-4	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 December 2015	Examiner Prosig, Christina
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03/02 (P04C01)

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

EP 15 19 2295

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The members are as contained in the European Patent Office EDP file on
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40

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2181222 A	15-04-1987	NONE	
EP 2843099 A1	04-03-2015	NONE	
EP 2725131 A1	30-04-2014	NONE	
EP 1353004 A1	15-10-2003	NONE	
US 2014230270 A1	21-08-2014	AU 2014219634 A1 CN 104005197 A EP 2770100 A1 KR 20140104304 A US 2014230270 A1 WO 2014129770 A1	13-08-2015 27-08-2014 27-08-2014 28-08-2014 21-08-2014 28-08-2014
EP 2039819 A1	25-03-2009	NONE	
JP 2000189691 A	11-07-2000	JP 3544876 B2 JP 2000189691 A	21-07-2004 11-07-2000
WO 2009083396 A1	09-07-2009	NONE	
US 2010257902 A1	14-10-2010	EP 2155950 A2 EP 2167720 A1 JP 5209704 B2 JP 5226780 B2 JP 2010528734 A JP 2010528735 A US 2010229607 A1 US 2010257902 A1 WO 2008148508 A1 WO 2008148509 A2	24-02-2010 31-03-2010 12-06-2013 03-07-2013 26-08-2010 26-08-2010 16-09-2010 14-10-2010 11-12-2008 11-12-2008

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2725131 A1 [0043]