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(72) Inventors:
• **PIROLA, Gianbattista**
I-24044 Dalmine (BG) (IT)
• **BIANCOSPINO, Mario**
I-60044 Fabriano (AN) (IT)

(74) Representative: **Zelioli, Giovanni et al**
Metroconsult S.r.l.
Foro Buonaparte, 51
20121 Milano (IT)

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(71) Applicant: **Indesit Company S.p.A.**
60044 Fabriano (AN) (IT)

(54) **LAUNDRY DRYER WITH AIR DUCT**

(57) The present invention relates to a laundry dryer comprising: a drum (102) adapted to contain laundry to be dried, a base (107) comprising air circulating means and comprising a first channel (109) for circulating the air through the drum (102), an air duct (104) adapted to recover the air from the drum (102) and comprising a second channel (110), the air duct (104) being configured to be positioned on top of the base (107) by coupling the first channel (109) to the second channel (110) in order to put them in fluidic communication with each other; the first channel (109) comprises a tapered lateral surface (201) adapted to enclose the second channel (110) and configured to guide the second channel (110) during the coupling.

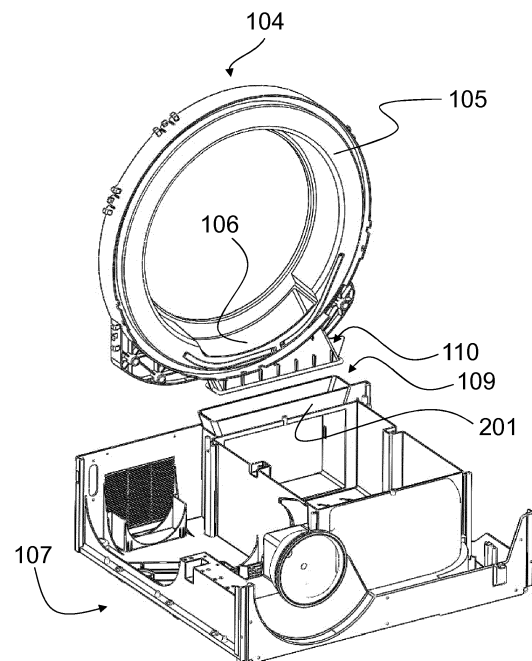


FIG. 2

Description

[TECHNICAL FIELD]

[0001] The present invention relates to a laundry dryer, typically for household use.

[0002] In particular, the present invention relates to a laundry dryer comprising channels for air circulation, which are in fluidic communication with each other.

[PRIOR ART]

[0003] Nowadays laundry dryers are known which typically comprise a drum or basket that houses laundry or clothes to be dried. Drying occurs through an air jet, which is generated by a fan, and which is typically heated by an electric resistor, or typically dehumidified by a condenser device in a machine equipped with a heat pump.

[0004] The hot air jet flows through the laundry in the drum, thereby subtracting moisture therefrom, and then flows through a filter that eliminates any impurities or lint that may be present in the air jet.

[0005] Also, said air jet flows through a heat exchanger, where it cools down through the effect of the thermal exchange occurring with the colder environmental air, thus condensing and yielding water that flows into a collection tank, typically arranged in the lower part of the machine.

[0006] In some laundry dryers, the water is then conveyed by a pump from the collection tank to a container typically arranged in the higher part of the machine, in a position easily accessible to a user, who can then periodically remove and empty said container. Other laundry dryers known in the art may not include a collection tank; in such cases, they are only equipped with the container for collecting condensed water, said container being usually positioned in the lower part of the machine.

[0007] Machines are also known wherein the humid air coming from the drum is not allowed to condense, being discharged out of the machine.

[0008] Consequently, the laundry driers known in the art comprise a base that contains some air circulating means and some air conditioning/heating means, as well as an air duct for distributing the air in the drum and drying the laundry, said air duct and base being mechanically coupled to each other.

[0009] In order to allow air circulation between the conditioning/heating means and the drum, it is known to use a plurality of channels in fluidic connection with each other by means of suitable couplings.

[0010] The execution of such couplings is very important because of the role that they play when the laundry dryer is assembled.

[0011] In fact, if on the one hand it is important that the couplings ensure proper fluid sealing to avoid air leakage, on the other hand it is as much important that the ducts are coupled in manners and configurations that do not turn out to be too costly or complex when assembling the

laundry dryer.

[0012] Some known solutions use a gasket between the air ducts, which are fastened to the profile of the base of the laundry dryer.

[0013] Other known solutions use one or more pins and respective seats to provide the coupling between the base and the air duct. Examples of such known technical solutions are described in patent applications EP 1783266 and EP 2519682.

[0014] These known solutions, while they aim at providing a properly sealed coupling, cause some difficulties when assembling the laundry dryer.

[0015] It is in fact costly and complex to ensure a perfect alignment of the gasket, and it is even more difficult to ensure a perfect alignment of a plurality of pins.

[0016] According to the solutions known in the art, therefore, the coupling between the channels of the air duct and those of the base is not optimal and may cause difficulties during the assembly, thus making the laundry dryer more difficult and expensive to manufacture.

[OBJECTS AND SUMMARY OF THE INVENTION]

[0017] It is the object of the present invention to overcome some of the problems of the prior art.

[0018] In particular, it is one object of the present invention to provide a laundry dryer wherein the channels of the air duct and those of the base can be coupled together quickly and effectively. It is another object of the present invention to provide a laundry dryer wherein the coupling between the channels of the air duct and those of the base simplifies the assembly of the laundry dryer.

[0019] It is a further object of the present invention to provide a laundry dryer wherein the coupling between the channels of the air duct and those of the base ensures good fluid sealing, thus avoiding air leakage.

[0020] These and other objects of the present invention are achieved through a laundry dryer incorporating the features set out in the appended claims, which are intended to be an integral part of the present description.

[0021] One idea at the basis of the present invention is to provide a laundry dryer comprising a drum adapted to contain laundry to be dried, a base comprising air circulating means and comprising a first channel for circulating air through the drum, an air duct adapted to take the air from the drum and convey it towards the air circulating means inside the base, and comprising a second channel, wherein the air duct is configured to be positioned above the base, the first channel being coupled to and in fluidic communication with the second channel; the first channel comprises a tapered lateral surface adapted to enclose the second channel and configured to guide the second channel during their mutual coupling.

[0022] This solution allows fitting the air duct to the base in such a way that the second channel will be guided by a tapered lateral surface of the first channel. Thus, the first and second channels can be coupled together in a quick and effective manner. In fact, the entire wall of

the first channel, in the section thereof corresponding to the tapered lateral surface, guides the second channel, like a funnel, towards the final assembly position. Furthermore, the particular tapered shape ensures a precise insertion and improves the fluid sealing of the coupling.

[0023] In other words, the present invention allows coupling the channels of the air duct and of the base of a laundry dryer in a manner such that the coupling is ensured by the channels themselves without needing any additional gaskets or centering pins.

[0024] Preferably, the tapered lateral surface narrows after the inlet of the first channel, towards the base, thus guiding the second channel, just like a funnel, into the first channel for coupling them together.

[0025] Preferably, the first channel further comprises an annular support surface on the inner edge of the tapered lateral surface, and the second channel comprises an external coupling flange configured to abut on and match with the annular support surface; it is thus possible to improve the fluid sealing of the coupling even further.

[0026] Preferably, the second channel further comprises, on its external surface, a plurality of vertical ribs above the flange, which also guide the second channel during the coupling, thereby further simplifying the assembly of the laundry dryer.

[0027] Preferably, the first channel has a main development direction in which the dimension of the first channel is prevalently, preferably exclusively, reduced because of the tapering thereof. Preferably, the second channel further comprises at least one substantially triangular fin aligned with the main development direction of the first channel; during the coupling, the fin cooperates with the inside of the tapered lateral surface to align the first channel, by interference, with the second channel. In this manner, the channels are further guided towards each other, simplifying the assembly of the laundry dryer.

[0028] Preferably, the air duct further comprises an annular body on top of the second channel to allow loading the drum with laundry through a door; said annular body further comprises air conveying means for recovering the air from within the drum.

[0029] Preferably, the laundry dryer comprises a front panel, typically made from sheet metal, adapted to be frontally coupled to the body and also to the base, in order to improve the fastening of the coupled elements.

[0030] Preferably, during the assembly the second channel is inserted from above into the lateral surface of the first channel, and is guided from above towards the bottom of the laundry dryer, thus simplifying the assembly of the laundry dryer.

[0031] Preferably, the base of the laundry dryer is configured for housing the air circulating means and, preferably, the air conditioning or heating means for drying the laundry.

[0032] Further objects and advantages of the present invention will become more apparent from the following detailed description and from the annexed drawings.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[0033] Some preferred and advantageous embodiments will now be described by way of non-limiting example with reference to the annexed drawings, wherein:

- Figure 1 exemplifies the structure of a laundry dryer.
- Figure 2 shows an embodiment of the coupling between the base and the air duct according to the present invention, in a non-assembled condition.
- Figure 3 shows in detail the coupling of Figure 2.
- Figure 4 shows the coupling of Figure 2 in the assembled condition.

[0034] The drawings show different aspects and embodiments of the present invention and, where appropriate, similar structures, components, materials and/or elements in the various drawings are designated by the same reference numerals.

[DETAILED DESCRIPTION OF THE INVENTION]

[0035] Figure 1 exemplifies a generic laundry dryer, or dryer, or drying machine.

[0036] The laundry dryer 1 comprises a frame 101 that houses a drum 102 adapted to contain laundry (not shown) to be dried, said drum 102 being accessible from the outside through a door 103 usually fitted with sealing gaskets.

[0037] Also, the drying machine 1 comprises an air duct 104 for recovering the air from within the drum 102. As will become more apparent below, the air duct 104 further comprises an annular body 105 to allow loading the drum 102 with laundry through the door 103.

[0038] In particular, the annular body 105 comprises air conveying means 106 for directing the air into the drum 102.

[0039] The front panel 103 is adapted to be frontally coupled to the annular body 105 and also to the base 107.

[0040] The base 107 is configured for housing functional components of the machine, such as the air circulating means and, preferably, the air conditioning or heating means, for drying the laundry; for clarity, such elements are not wholly depicted in the drawings, being simply exemplified by the channel 108 located inside the base 107.

[0041] Such means may comprise an electric resistor, or a heat pump, a fan, heat exchangers, condensers, condensed water collection tanks, filters, etc., in accordance with the teachings known to those skilled in the art.

[0042] The base 107, which includes the air circulating means 108, comprises, in particular, a first channel 109 for circulating the air from the drum 102 to the air duct 104 and then out of the latter. From the air circulating means 108, the air flow is then directed into the rear channel and then back into the drum 102. The air duct 104, which is configured to be positioned on top of the base 107, in turn comprises a second channel 110, to be cou-

pled to and put in fluidic communication with the first channel 109.

[0043] The invention particularly relates to the coupling between the first channel 109 and the second channel 110, and will be illustrated more in detail with reference to Figures 2, 3 and 4, which will be described below.

[0044] It must be pointed out that the exemplificative drawing of the laundry dryer 1 has been described herein only to explain how it operates; in practice, however, the drying machine 1 may be equipped with further components that will not be mentioned herein for simplicity's sake.

[0045] Figure 2 shows a sub-set of elements of the laundry dryer 1, in particular the air duct 104 and the base 107, wherein the coupling has not yet been effected (i.e. the elements have not yet been assembled together).

[0046] Preferably, the air duct 104 is made from moulded plastic material.

[0047] As aforesaid, the base 107 is adapted to house the air circulating and/or heating and/or conditioning means, not shown for simplicity. Preferably, the base 107 is made from moulded plastic material.

[0048] The air duct 104 is configured to be positioned on top of the base 107 and to be coupled thereto. For this purpose, the base 107 comprises a first channel 109, and the air duct 104 comprises a second channel 110, which can be coupled together and put in fluidic communication with each other.

[0049] The first channel 109 comprises a tapered lateral surface 201 adapted to enclose the second channel 110 as the latter is inserted, thus guiding it during the coupling.

[0050] As can be seen in the drawing, the tapered lateral surface 201 narrows towards the bottom after the inlet of the first channel 109.

[0051] The air duct 104 is configured to be assembled, in particular at the annular element 105, to a front panel (not shown) of the frame, which also supports the door (also not shown). In particular, the coupling between the channels will be further ensured by the fastening of the front panel to both the base 107 and the air duct 104.

[0052] As concerns the laundry dryer 1, "high" and "low" have the usual meanings related to the operating position of the laundry dryer itself, with the feet down and the upper part up.

[0053] Figure 3 shows in more detail how the first channel 109 is coupled to the second channel 110. The first channel 109 has a particular main development direction, i.e. the direction in which it is longer. Preferably, the tapered lateral surface 201 modifies the dimension of the first channel prevalently in said main development direction, i.e. it is in that direction that the first channel 109 extends in a "funnel-like" fashion.

[0054] More preferably, the tapered lateral surface 201 modifies the dimension of the first channel exclusively in said main development direction, so as to not excessively increase the depth of the front part of the base 107.

[0055] As can be seen in Figure 2, the second channel

110 comprises an external coupling flange 301 on its lower edge. Said external coupling flange 301 is configured to be coupled, through a respective annular support surface, to the inner edge (not visible) of the tapered lateral surface 201, the purpose of which will be described below.

[0056] The second channel 110 further comprises, on its external surface, a plurality of vertical ribs 302 above the flange 301, which contribute to further guiding the second channel 110 as it is coupled to the first channel 109, by cooperating with the tapered shape of the latter.

[0057] In particular, the vertical ribs 302 contribute to occupying the volume that would otherwise be free within the tapered lateral surface 201 when the assembly process is complete; this improves the stability of the assembly.

[0058] In the preferred embodiment shown herein, the second channel 110 further comprises a fin 303, which has a substantially triangular, downward-tapered shape, and which is aligned with the main development direction, i.e. the tapering, of the surface 201. The fin 303 tapers downwards, so that, during the coupling of the channels 109 and 110, it will cooperate with the inside of the tapered lateral surface 201 to align, by interference, the first channel 109 with the second channel 110. In this manner, the fin 303 acts as a guide towards the funnel of the tapered lateral surface 201, while at the same time the whole tapered lateral surface 201 acts as a guide for the air duct 104 towards the base 107.

[0059] Figure 4 shows the air duct 104 and the base 107, wherein the coupling has been effected and the elements have been assembled together.

[0060] In particular, as shown in Figure 4, as opposed to Figure 2, the second channel 110 of the air duct 104 has been fitted into the first channel 109 of the base 107, thus coupling the ducts and putting them in fluidic connection while assembling the laundry dryer. Ideally, the air duct 104 rests on top of the base 107.

[0061] In order to improve the sealing between the first channel 109 and the second channel 110 and reduce or, ideally, eliminate any air leakage, the tapered lateral surface comprises, on its inner edge, an annular support surface.

[0062] Said annular support surface is configured to cooperate with the external coupling flange of the second channel, which abuts on and matches with the annular support surface. This improves the fluid sealing of the coupling, even though the tapering that narrows the dimensions of the first channel 109 (thus contributing to the "gasket" effect) mainly or exclusively extends in the main development direction of the first channel 109. In other words, tightness is ensured also in the direction with no tapering for the first channel 109, by the coupling between the internal annular support surface and the external coupling flange. As aforementioned, on the coupled configuration shown in Figure 4 it is possible to install an additional front panel frontally connected to both the annular body 105 and the base 107, so as to improve

the coupling and stability of the assembly.

[0063] To this end, the front panel is first fitted to the air duct 104 by means of screws, and the assembly thus obtained is then fitted onto the base 107. Subsequently, the front panel is further secured to the base 107 by means of screws. In order to improve the stability of the assembly even further, it is advantageously conceivable to fit connection screws between the base 107 and the air duct 104.

[0064] It must be observed once again that the second channel 110, once inserted from above into the tapered lateral surface 201 of the first channel 110, is guided from above towards the bottom of the laundry dryer 1 during the coupling; the assembly is thus subjected to a guiding and conveying effect, wherein proper coupling and sealing are ensured by cooperation between the channels 109 and 110.

[0065] It is obvious that, in the light of the teachings of the present description, the man skilled in the art may conceive further variants of the present invention, without however departing from the protection scope as defined by the appended claims.

[0066] For example, the man skilled in the art may also conceive different tapered shapes for the first channel and the respective portion of the second channel, other than those shown and described herein, so long as the tapered lateral surface remains suitable for enclosing the second channel and configured to guide the second channel during the coupling.

[0067] In an equivalent embodiment, the second channel of the air duct may be equipped with a tapered lateral surface adapted to enclose and connect to a first channel, while still guiding the second channel during the coupling.

[0068] In general, a laundry dryer according to the present invention may use prior-art teachings as far as materials, construction details, equipment and functions are concerned: all the general aspects of the laundry dryer, whether or not described herein, may therefore vary, provided that they are not in conflict with the teachings of the present invention.

Claims

1. Laundry dryer comprising:

a drum (102) adapted to contain laundry to be dried,
a base (107) comprising air circulating means and comprising a first channel (109) for circulating said air through said drum (102),
an air duct (104) adapted to recover said air from said drum (102) and comprising a second channel (110), said air duct (104) being configured to be positioned on top of said base (107) by coupling said first channel (109) to said second channel (110) in order to put them in fluidic communication with each other,

characterized in that said first channel (109) comprises a tapered lateral surface (201) adapted to enclose said second channel (110) and configured to guide said second channel (110) during said coupling.

2. Laundry dryer according to claim 1, wherein said tapered lateral surface (201) narrows towards said base (107) after the inlet of said first channel (109).
3. Laundry dryer according to claim 1 or 2, wherein said first channel (109) further comprises an annular support surface on the inner edge of said tapered lateral surface, and wherein said second channel (110) comprises an external coupling flange (301) configured to abut on and match with said annular support surface, so as to improve the fluid sealing of said coupling.
4. Laundry dryer according to claim 3, wherein said second channel (110) further comprises, on its external surface, a plurality of vertical ribs (302) above said flange (301), said plurality of vertical ribs (302) being adapted to further guide said second channel (110) during said coupling.
5. Laundry dryer according to any one of claims 1 to 4, wherein said first channel (109) has a main development direction, and wherein said tapered lateral surface (201) modifies the dimension of said first channel (109) prevalently, preferably exclusively, in said main development direction.
6. Laundry dryer according to claim 5, wherein said second channel (110) further comprises at least one substantially triangular fin (303) aligned with said main development direction during said coupling, said fin (303) being configured to cooperate with the inside of said tapered lateral surface (201) and to align said first channel (109), by interference, with said second channel (110) during said coupling.
7. Laundry dryer according to any one of claims 1 to 6, wherein said air duct (104) further comprises an annular body (105) on top of said second channel (110), which is adapted to allow loading said drum (102) with laundry through a door (103), said annular body (105) further comprising means (106) for recovering air from within said drum (201).
8. Laundry dryer according to claim 7, further comprising a front panel (101) adapted to be frontally coupled to said annular body (104) and also to said base (107).
9. Laundry dryer according to any one of claims 1 to 8, wherein said second channel (110) is inserted from above into said tapered lateral surface (201) of said

first channel (109), and is guided from above towards the bottom of said laundry dryer during said coupling.

10. Laundry dryer according to any one of claims 1 to 9, wherein said base (107) is further configured to house air circulating means and, preferably, air conditioning or heating means for drying said laundry.

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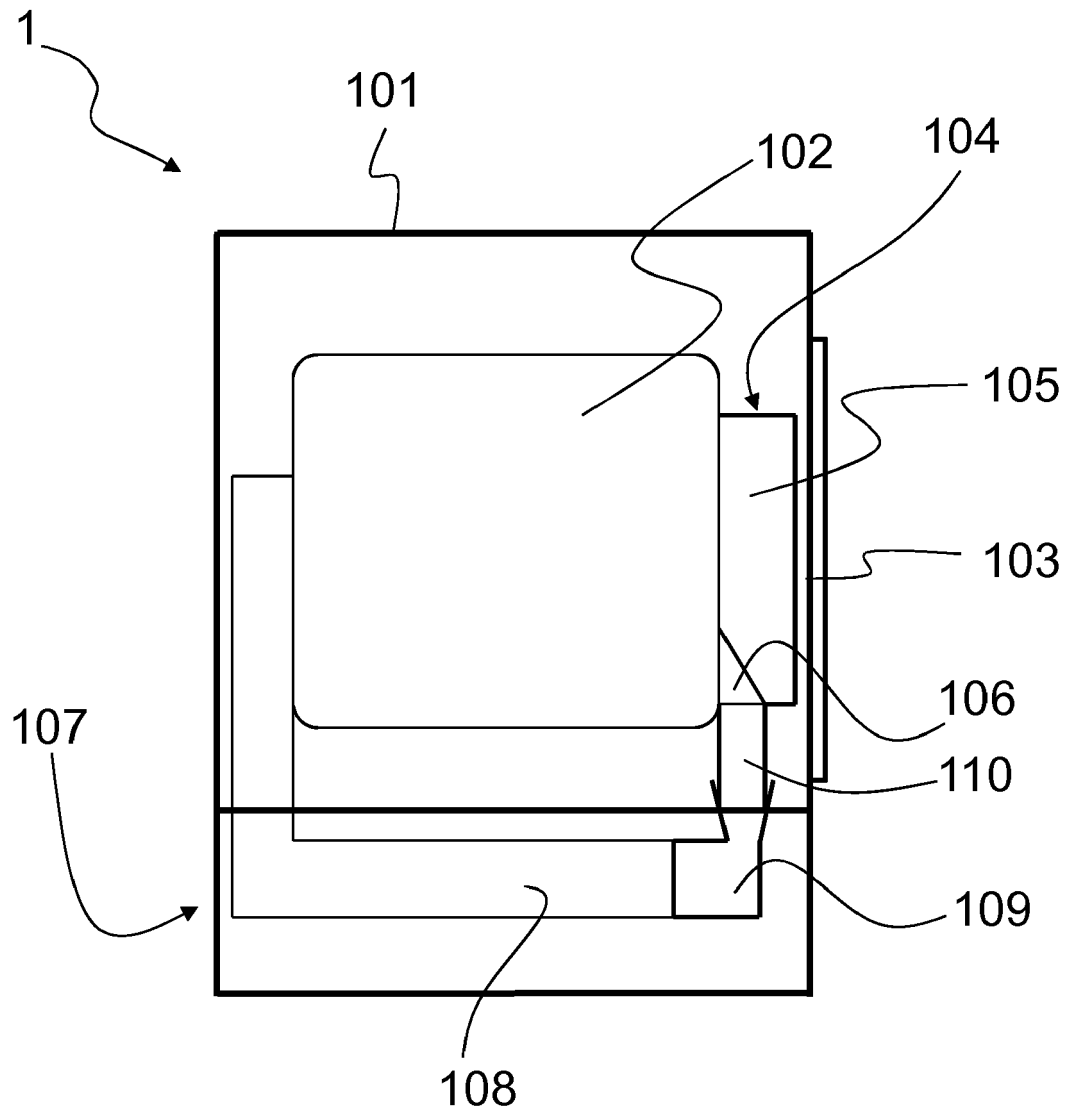


FIG. 1

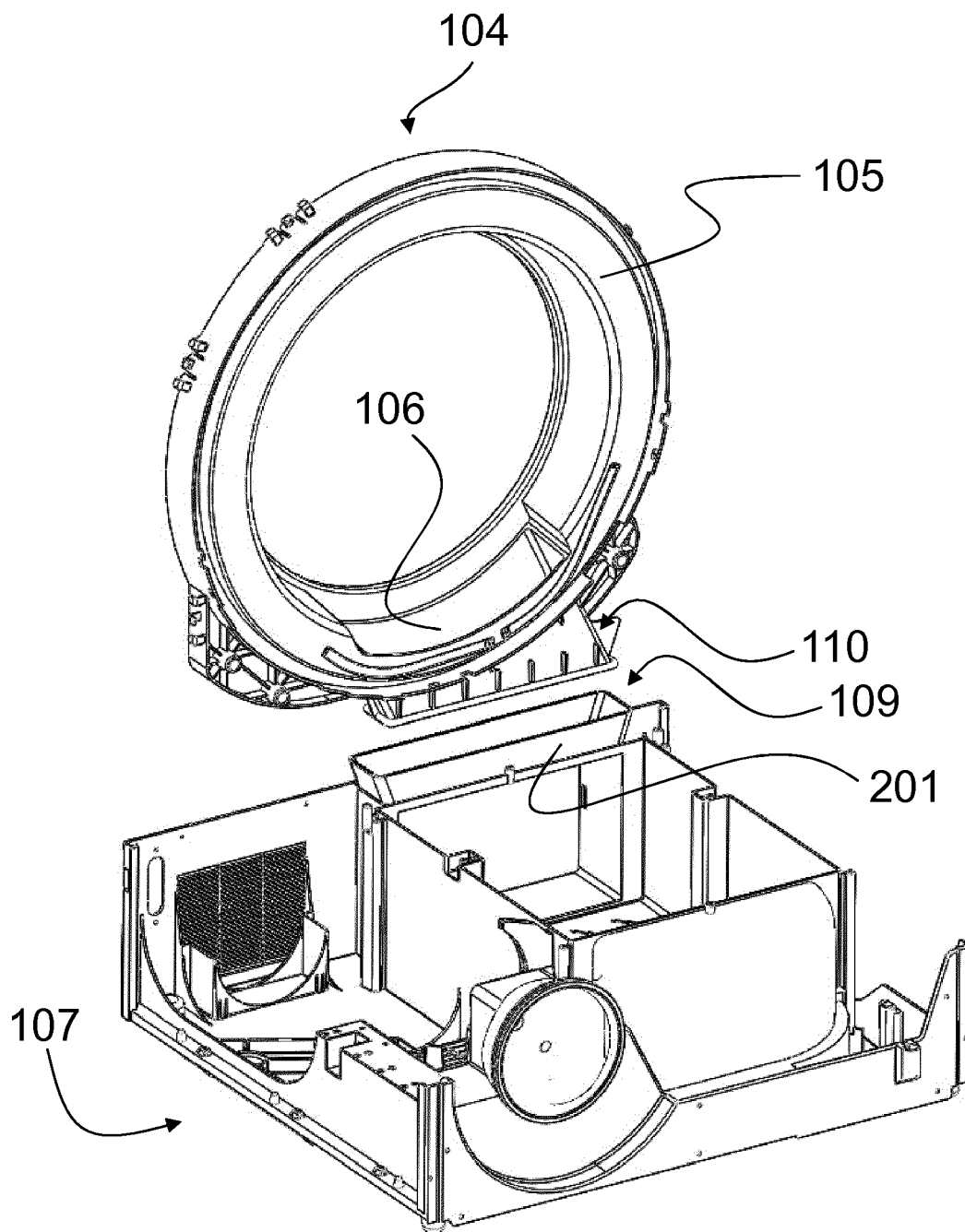


FIG. 2

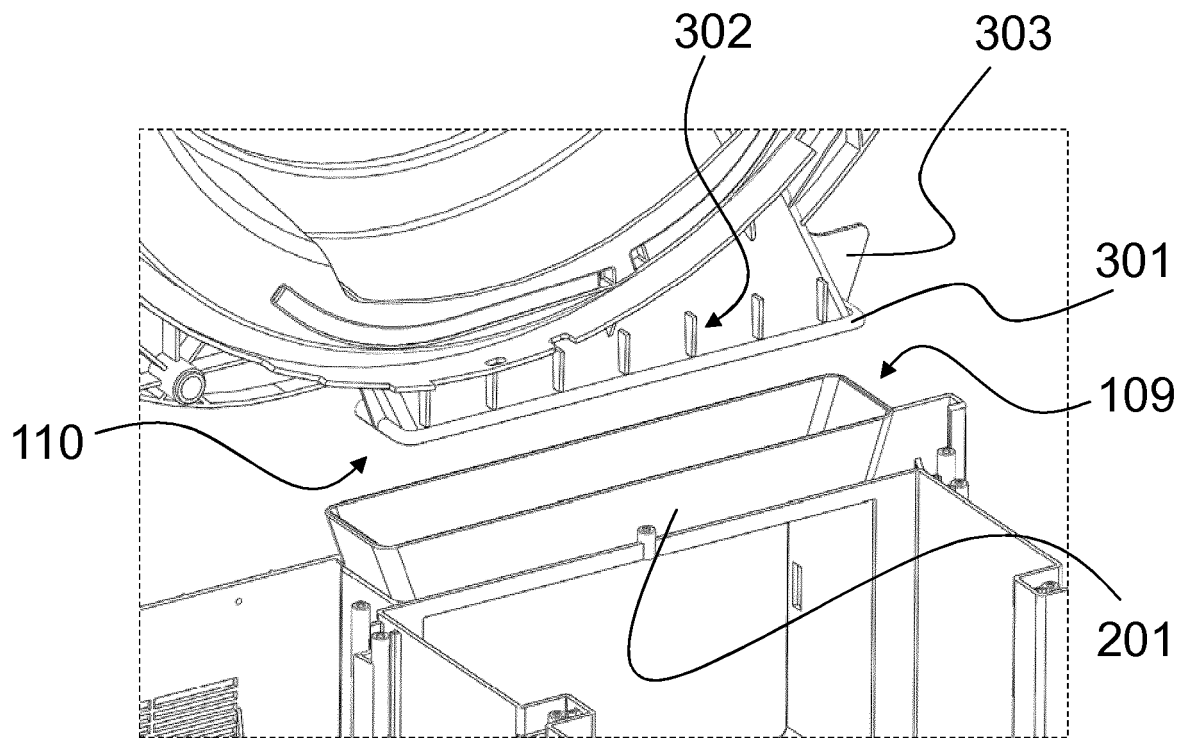


FIG. 3

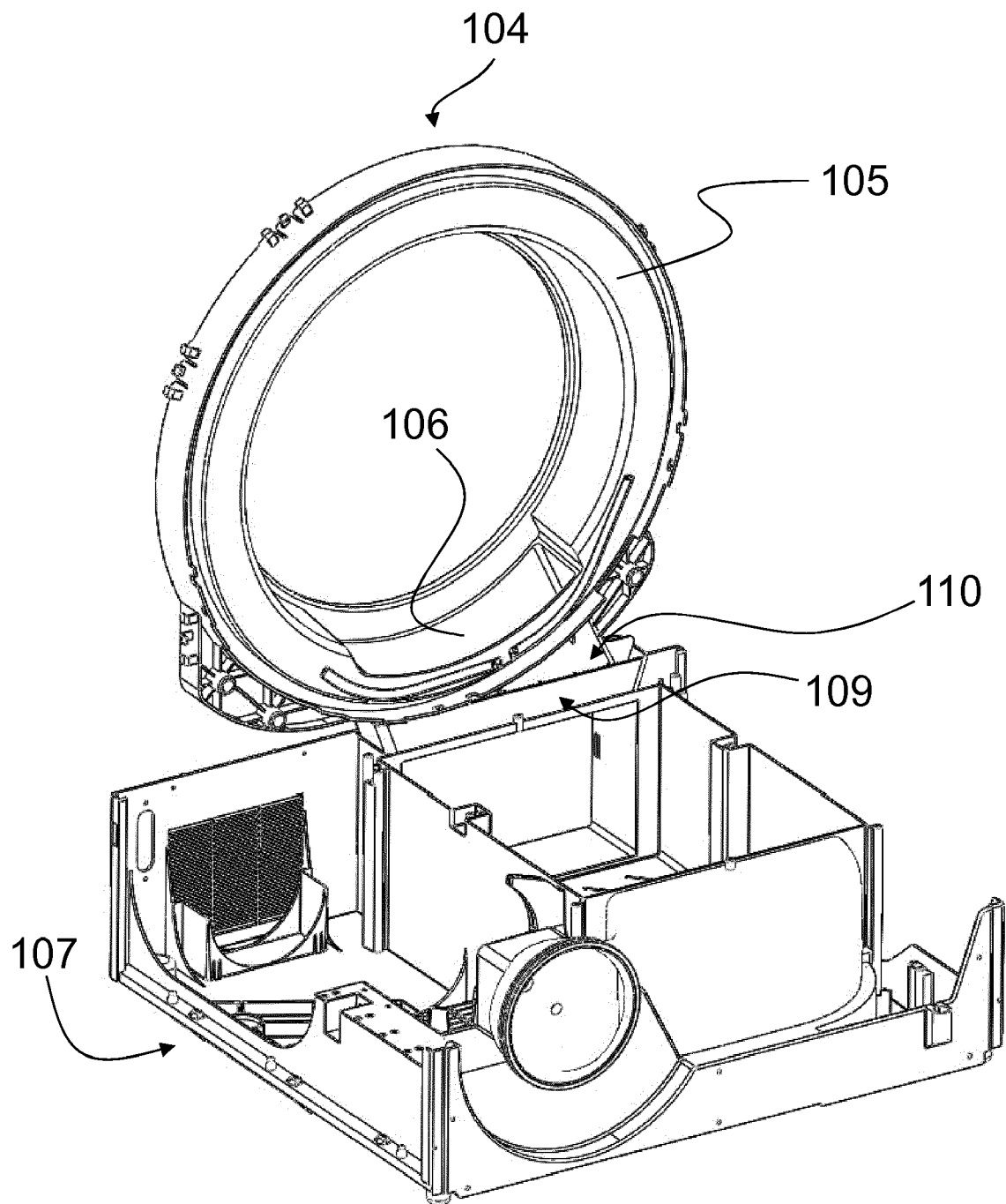


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 15 18 2659

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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	WO 2006/097901 A2 (ARCELIK AS [TR]; KARATAS HAKAN [TR]) 21 September 2006 (2006-09-21)	1-3,5,9,10	INV. D06F58/02 D06F58/20
Y	* page 1, lines 1-7; page 2, line 17 -	7,8	
A	page 5, line 9; claims 1-4; figures *	4,6	
Y	----- WO 2011/080114 A1 (ARCELIK AS [TR]; GULBAY UMIT [TR]; CINAR LEVENT [TR]; CAN REMZI [TR]) 7 July 2011 (2011-07-07)	7,8	
A	* paragraphs [0001], [0002], [0021] - [0029]; claims; figures *	1-6,9,10	
A	----- EP 2 423 375 A1 (ELECTROLUX HOME PROD CORP [BE]) 29 February 2012 (2012-02-29) * paragraphs [0032] - [0042]; claims; figures *	1-10	
A	----- WO 2008/127027 A2 (LG ELECTRONICS INC [KR]; HAN DONG JOO [KR]; CHOI CHUL JIN [KR]; SON YO) 23 October 2008 (2008-10-23) * the whole document *	1-10	TECHNICAL FIELDS SEARCHED (IPC)
			D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 October 2015	Examiner Clivio, Eugenio
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p> <p>& : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P04C01)

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

EP 15 18 2659

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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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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2006097901 A2	21-09-2006	NONE	
WO 2011080114 A1	07-07-2011	EP 2519682 A1 ES 2443317 T3 WO 2011080114 A1	07-11-2012 18-02-2014 07-07-2011
EP 2423375 A1	29-02-2012	CN 102373611 A EP 2423375 A1 RU 2011135242 A US 2012047759 A1	14-03-2012 29-02-2012 10-03-2013 01-03-2012
WO 2008127027 A2	23-10-2008	CN 101657581 A EP 2145039 A2 KR 20080092723 A US 2010281929 A1 WO 2008127027 A2	24-02-2010 20-01-2010 16-10-2008 11-11-2010 23-10-2008

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1783266 A [0013]
- EP 2519682 A [0013]