



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**30.05.2012 Bulletin 2012/22**

(51) Int Cl.:  
**D06F 58/22 (2006.01)**

(21) Application number: **11190855.4**

(22) Date of filing: **25.11.2011**

(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**  
 Designated Extension States:  
**BA ME**

(72) Inventors:  
 • **Murphy, Kieran**  
**Bristol, BS30 7DN (GB)**  
 • **Ten Hoff, Vanessa**  
**60035 Jesi (AN) (IT)**

(30) Priority: **29.11.2010 IT TO20100184 U**

(74) Representative: **Santonicola, Paolo**  
**Indesit Company S.p.A.**  
**Industrial Property Management Team**  
**Via Lamberto Corsi, 55**  
**60044 Fabriano (AN) (IT)**

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

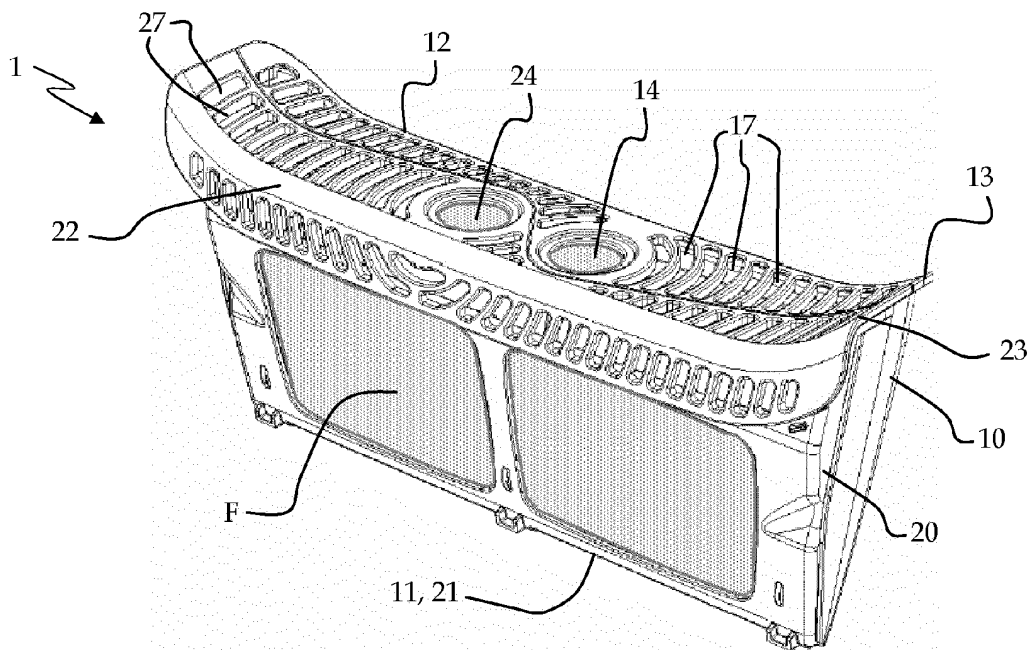
(54) **Filter for filtering impurities in a dryer, and dryer thereof**

(57) The present invention relates to a filter (1) for eliminating impurities present in the air jet of a clothes dryer (100), said filter (1) comprising a first frame (10) and a second frame (20) which enclose a filtering element (F), said first (10) and second (20) frames being connected together along respective first edges (11, 21) adjacent to each other, so that the filter (1) can be opened like a

book.

The invention is characterized in that said first (10) and second (20) frames comprise respective second edges (12, 22) fitted with straps (13, 23), each one of said straps (13, 23) comprising:

- a hole (14, 24);
- coupling means (15, 25) that allow the filter (1) to be kept in the closed condition.



**Fig. 2a**

## Description

**[0001]** The present invention relates to a filter for eliminating impurities present in the air jet of a clothes dryer according to the preamble of claim 1. The present invention also relates to a clothes dryer equipped therewith.

**[0002]** Clothes dryers are per se known, and typically comprise a drum containing laundry to be dried by an air jet generated by a fan and heated by an electric resistor or by a condenser device in a machine fitted with a heat pump.

**[0003]** 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 present in the air jet.

**[0004]** Said air jet also flows through a heat exchanger, where it cools down through the effect of thermal exchange with colder environmental air, thus condensing and yielding water, which flows into a collection tank usually located in the lower part of the machine; from the collection tank, the water is conveyed by a pump into a removable container typically arranged in the upper part of the machine, in a position easily accessible to a user, who can then periodically remove and empty said container.

**[0005]** It is clear that the clothes dryers known in the art may not include a collection tank; in such cases, they are only equipped with the container for collecting the condensed water, said container being usually positioned in the lower part of the machine.

**[0006]** As a consequence, the clothes dryers known in the art comprise:

- a frame that houses a drum for containing laundry to be dried,
- first means for delivering heated air into said drum,
- a filter for eliminating any impurities present in the air jet coming from the drum.

**[0007]** Furthermore, said clothes dryers may also comprise:

- heat exchanger means crossed by the air coming from the drum,
- at least one container for collecting the condensed water produced by said heat exchanger means.

**[0008]** In particular, a filter for eliminating air jet impurities is known whose structure contains a filtering element. Such a filter usually has an aperture that makes it easier for the entire air jet coming from the drum to enter the filter, so as to obtain the elimination of any impurities present in said air jet. Moreover, said filter is generally so shaped that it can be placed into a suitable housing of the clothes dryer.

**[0009]** However, the filters known in the art suffer from some drawbacks, in that it often happens that it is difficult to remove the impurities collected therein.

**[0010]** A further drawback of prior-art filters is that, even when said filters can be opened in order to remove the collected impurities, such task is often difficult, in particular because it is difficult to separate the closing means used for holding the filters in the closed condition.

**[0011]** Another drawback of the above-described filters is that, in an attempt to limit the room taken up by the filter inside the clothes dryer, these filters are often difficult to extract from the respective housings.

**[0012]** In this frame, it is the main object of the present invention to overcome the above-described drawbacks by providing a filter for eliminating impurities present in the air jet of a clothes dryer as well as a clothes dryer equipped therewith, said filter being so designed as to facilitate the task of removing the impurities collected therein.

**[0013]** It is another object of the present invention to provide a filter for eliminating impurities present in the air jet of a clothes dryer and a clothes dryer equipped therewith which are so designed as to facilitate the task of opening the filter itself.

**[0014]** It is a further object of the present invention to provide a filter for eliminating impurities present in the air jet of a clothes dryer and a clothes dryer equipped therewith which are so designed as to allow the filter to be easily extracted from the respective housing in the clothes dryer.

**[0015]** Said objects are achieved through a filter for eliminating impurities present in the air jet of a clothes dryer and a clothes dryer equipped therewith incorporating the features set out in the appended claims, which are intended as an integral part of the present description.

**[0016]** Further objects, features and advantages of the present invention will become apparent from the following detailed description and from the annexed drawings, which are supplied by way of non-limiting example, wherein:

- Fig. 1 schematically shows a clothes dryer according to the present invention;
- Figs. 2a and 2b respectively show a first and a second perspective views of a filter for eliminating impurities present in the air jet of the clothes dryer of Fig. 1, designed in accordance with the present invention;
- Figs. 3a and 3b are perspective views of a first and a second details, respectively, of the filter of Figs. 2a and 2b.

**[0017]** With reference to the annexed drawings, in Fig. 1 reference numeral 100 designates as a whole a clothes dryer according to the present invention.

**[0018]** The clothes dryer 100 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 (not shown).

**[0019]** The clothes dryer 100 also comprises first

means 104, 105 for delivering heated air into said drum 102. In particular, said first means may comprise an electric resistor 104 and a fan 105 (as shown in Fig. 1); or, in the case of a clothes dryer equipped with a heat pump (not shown in the drawings), said first means may comprise a condenser and a fan.

**[0020]** The clothes dryer 100 further comprises second heat exchanger means 106 crossed by the air coming from the drum 102; preferably, said second means comprise an exchanger 106, where the humid air coming from the drum 102 condenses.

**[0021]** The clothes dryer 100 also comprises at least one container 107 for collecting the condensed water produced by said second heat exchanger means 106.

**[0022]** In particular, when exiting the drum 102 the humid air flows through a filter 1 adapted to eliminate the impurities present in the air jet; the hot humid air is then cooled by thermal exchange with colder air (normally at ambient temperature) in said second means 106, said colder air being possibly conveyed by a second fan (not shown in Fig. 1).

**[0023]** The condensed water present in a collection tank 108 is delivered by a pump 109 towards the container 107, wherein it is collected. It is however clear that the container 107 may also be arranged in a lower part of the clothes dryer 100 according to the present invention; in such a case, the clothes dryer 100 may even lack the collection tank 108 and/or the pump 109.

**[0024]** The one described above is a basic scheme of a clothes dryer, useful for understanding the operation thereof; in practice, however, the clothes dryer 100 may include additional components which have been omitted in the present description for simplicity.

**[0025]** Figs. 2a and 2b respectively show a first and a second perspective views of the filter 1 according to the present invention.

**[0026]** As can be seen in these drawings, the filter 10 comprises a first frame 10 and a second frame 20 which enclose a filtering element F (schematically shown in Fig. 2a only), said first 10 and second 20 frames being connected together along respective first edges 11, 21 adjacent to each other, so that the filter 1 can be opened like a book.

**[0027]** The connection along said first edges 11, 21 substantially allows said first 10 and second 20 frames to rotate about an axis X, indicated in Fig. 2b by means of a dashed-dotted line.

**[0028]** The particular shape of the filter 1 according to the present invention facilitates the task of removing the impurities collected inside said filter 1; in fact, the possibility of opening the filter 1 like a book allows the filtering element F to be easily extracted for reconditioning, in particular by removing the impurities trapped therein.

**[0029]** According to the present invention, the first 10 and second 20 frames comprise respective second edges 12, 22 fitted with straps 13, 23, each one of said straps 13, 23 comprising:

- a hole 14, 24;
- coupling means 15, 25 that allow the filter 1 to be kept in the closed condition.

**[0030]** In particular, said closed condition of the filter 1 is shown in Fig. 2a, whereas Fig. 2b shows the filter 1 in an open condition. These drawings also show that the first strap 13 comprises a first hole 14 and the second strap 23 comprises a second hole 24.

**[0031]** The above-described particular design of the filter 1 also facilitates the extraction of the filter 1 from the respective housing in the clothes dryer 100, as well as the tasks of opening the filter 1 and removing the impurities collected inside the filter 1.

**[0032]** In fact, the holes 14, 24 of said straps 13, 23 allow the user to put his/her fingers into them in order to extract the filter 1 from the clothes dryer 100 and to disengage the coupling means 15, 25 for opening the filter 1. In particular, to open the filter the user will just have to move the holes 14, 24 apart so as to disengage said coupling means 15, 25.

**[0033]** In particular, said coupling means comprise:

- at least one protuberance 15 associated with the first strap 13 of the first frame 10;
- at least one recess 25 obtained on the second strap 23 of the second frame 20, said recess 25 being adapted to receive the protuberance 15 of the first strap 13 of the first frame 10.

**[0034]** In Figs. 3a and 3b, which respectively show a perspective top view of the first frame 10 (and of the first strap 13) and a perspective bottom view of the second frame 20 (and of the second strap 23), it is possible to observe more clearly said at least one protuberance 15 and said at least one recess 25.

**[0035]** In particular, Figs. 2b, 3a and 3b show that said at least one protuberance 15 is associated with a free end 13E of the first strap 13 and said at least one recess 25 is associated with a free end 23E of the second strap 23. Preferably, said at least one protuberance 15 is obtained on a top face 13S of the first strap 13, in particular near said free end 13E of the first strap 13; in a complementary manner, said at least one recess 25 is obtained on a bottom face 23I of said second strap 23, in particular near said free end 23E of the second strap 23.

**[0036]** It is clear that said first 13 and second 23 straps may comprise a plurality of protuberances 15 and/or recesses 25; moreover, each one of said first 13 and second 23 straps may comprise one or more protuberances 15 and/or one or more recesses 25.

**[0037]** In a preferred embodiment, said first 13 and second 23 straps comprise abutment means 16, 26 that ensure the correct alignment between the first 10 and the second 20 frames when the filter 1 is in the closed condition (as shown in Fig. 2a). In particular, said abutment means comprise:

- a window 16 obtained on the first strap 13, in particular near said free end 13E of the first strap 13;
- a tooth 26 obtained on the second strap 23, adapted to enter into said window 16, in particular said tooth 26 being obtained near said free end 23E of the second strap 23.

**[0038]** In addition, said first 13 and second 23 straps may be made in one piece with said first 10 and second 20 frames, respectively, e.g. when moulding said first 10 and second 20 frames, which are usually made of plastic material; as an alternative, said first 13 and second 23 straps may be manufactured separately from the first 10 and second 20 frames and then associated therewith.

**[0039]** Preferably, said first 13 and second 23 straps are positioned substantially perpendicular to said first 10 and second 20 frames.

**[0040]** In a preferred embodiment, the free ends 13E, 23E of said first 13 and second 23 straps are corrugated, so as to increase the area of mutual contact. Furthermore, each one of said straps 13, 23 has a plurality of slots 17, 27, in particular for the purpose of allowing an adequate flow of air from the drum 102 of the clothes dryer 100.

**[0041]** Preferably, the filter 1 substantially has a V-shaped cross-section, i.e. it is so designed as to be widest at said second edges 12, 22 and/or at said straps 13, 23, said filter 1 then getting progressively narrower to a minimum value at said first edges 11 and 21.

**[0042]** To this end, the first 10 and/or the second 20 frames preferably have side walls 18, 28 (which are visible in particular in Figs. 2b, 3a and 3b) getting narrower in the proximity of said first edges 11, 21.

**[0043]** In the annexed drawings, the straps 13, 23 are associated with said first 10 and second 20 frames at the ends opposite to the first edges 11, 21; it is however apparent that it is not necessary that said second edges 12, 22 correspond to the ends of said first 10 and second 20 frames which are opposite to the first edges 11, 21. As a consequence, it is clear that the straps 13, 23 may be associated with different points with respect to the ends of said first 10 and second 20 frames.

**[0044]** As can be seen in particular in Fig. 1, the filter 1 is positioned underneath the door 103 of the clothes dryer 100, so that it can be easily reached by a user after opening said door 103; preferably, said filter 1 is housed in a duct C for recirculating air inside the clothes dryer 100.

**[0045]** The advantages of a filter 1 for eliminating impurities present in the air jet of a clothes dryer 100 and of a clothes dryer 100 equipped therewith according to the present invention are apparent from the above description. In particular, one of such advantages is that the peculiar design of the filter 1 according to the present invention facilitates the extraction of the filter 1 from the respective housing in the clothes dryer 100.

**[0046]** Furthermore, such a design facilitates the tasks of removing the impurities collected inside the filter 1 and

of opening the filter 1 itself.

**[0047]** In fact, the holes 14, 24 of the straps 13, 23 allow the user to easily extract the filter 1 from the clothes dryer 100 as well as to easily disengage the coupling means 15, 25 to open the filter 1 by simply moving apart the holes 14,24.

**[0048]** The filter for eliminating impurities present in the air jet of a clothes dryer and the clothes dryer equipped therewith described herein by way of example may be subject to many possible variations without departing from the novelty spirit of the inventive idea; it is also clear that in the practical implementation of the invention the illustrated details may have different shapes or be replaced with other technically equivalent elements.

**[0049]** It can therefore be easily understood that the present invention is not limited to the above-described filter for eliminating impurities present in the air jet of a clothes dryer and the clothes dryer equipped therewith, but may be subject to many modifications, improvements or replacements of equivalent parts and elements without departing from the inventive idea, as clearly specified in the following claims.

## 25 Claims

1. A filter (1) for eliminating impurities present in the air jet of a clothes dryer (100), said filter (1) comprising a first frame (10) and a second frame (20) which enclose a filtering element (F), said first (10) and second (20) frames being connected together along respective first edges (11,21) adjacent to each other, so that the filter (1) can be opened like a book, **characterized in that** said first (10) and second (20) frames comprise respective second edges (12, 22) fitted with straps (13, 23), each one of said straps (13, 23) comprising:
  - a hole (14, 24);
  - coupling means (15, 25) that allow the filter (1) to be kept in the closed condition.
2. A filter (1) according to claim 1, **characterized in that** said coupling means comprise:
  - at least one protuberance (15) associated with the first strap (13) of the first frame (10);
  - at least one recess (25) obtained on the second strap (23) of the second frame (20), said recess (25) being adapted to receive the protuberance (15) of the first strap (13) of the first frame (10).
3. A filter (1) according to claim 2, **characterized in that** said at least one protuberance (15) is associated with a free end (13E) of the first strap (13).
4. A filter (1) according to claim 3, **characterized in that** said at least one protuberance (15) is obtained

on a top face (13 S) of the first strap (13), in particular near said free end (13E) of the first strap (13).

5. A filter (1) according to claim 2, **characterized in that** said at least one recess (25) is associated with a free end (23E) of the second strap (23). 5
6. A filter (1) according to claim 5, **characterized in that** said at least one recess (25) is obtained on a bottom face (23I) of said second strap (23), in particular near said free end (23E) of the second strap (23). 10
7. A filter (1) according to one or more of the preceding claims, **characterized in that** said first (13) and second (23) straps are made in one piece with said first (10) and second (20) frames, respectively. 15
8. A filter (1) according to one or more of the preceding claims, **characterized in that** said first (13) and second (23) straps are positioned substantially perpendicular to said first (10) and second (20) frames. 20
9. A filter (1) according to claims 3 and 5, **characterized in that** the free ends (13E, 23E) of said first (13) and second (23) straps are corrugated. 25
10. A filter (1) according to one or more of the preceding claims, **characterized in that** said first (13) and second (23) straps comprise abutment means (16, 26) that ensure the correct alignment between the first (10) and the second (20) frames when the filter (1) is in the closed condition. 30
11. A filter (1) according to one or more of the preceding claims, **characterized in that** each one of said straps (13, 23) has a plurality of slots (17, 27). 35
12. A filter (1) according to one or more of the preceding claims, **characterized in that** said filter (1) substantially has a V-shaped cross-section, in particular the first (10) and/or the second (20) frames having side walls (18, 28) getting narrower near said first edges (11, 21). 40  
45
13. A filter (1) according to one or more of the preceding claims, **characterized in that** said filter (1) is positioned underneath a door (103) of the clothes dryer (100). 50
14. A filter (10) according to one or more of claims 1 and 12, **characterized in that** said filter (1) is housed in a duct (C) for recirculating air inside the clothes dryer (100). 55
15. A clothes dryer (100) comprising a filter (1) for eliminating impurities present in the air jet in accordance with one or more of the preceding claims 1 to 14.

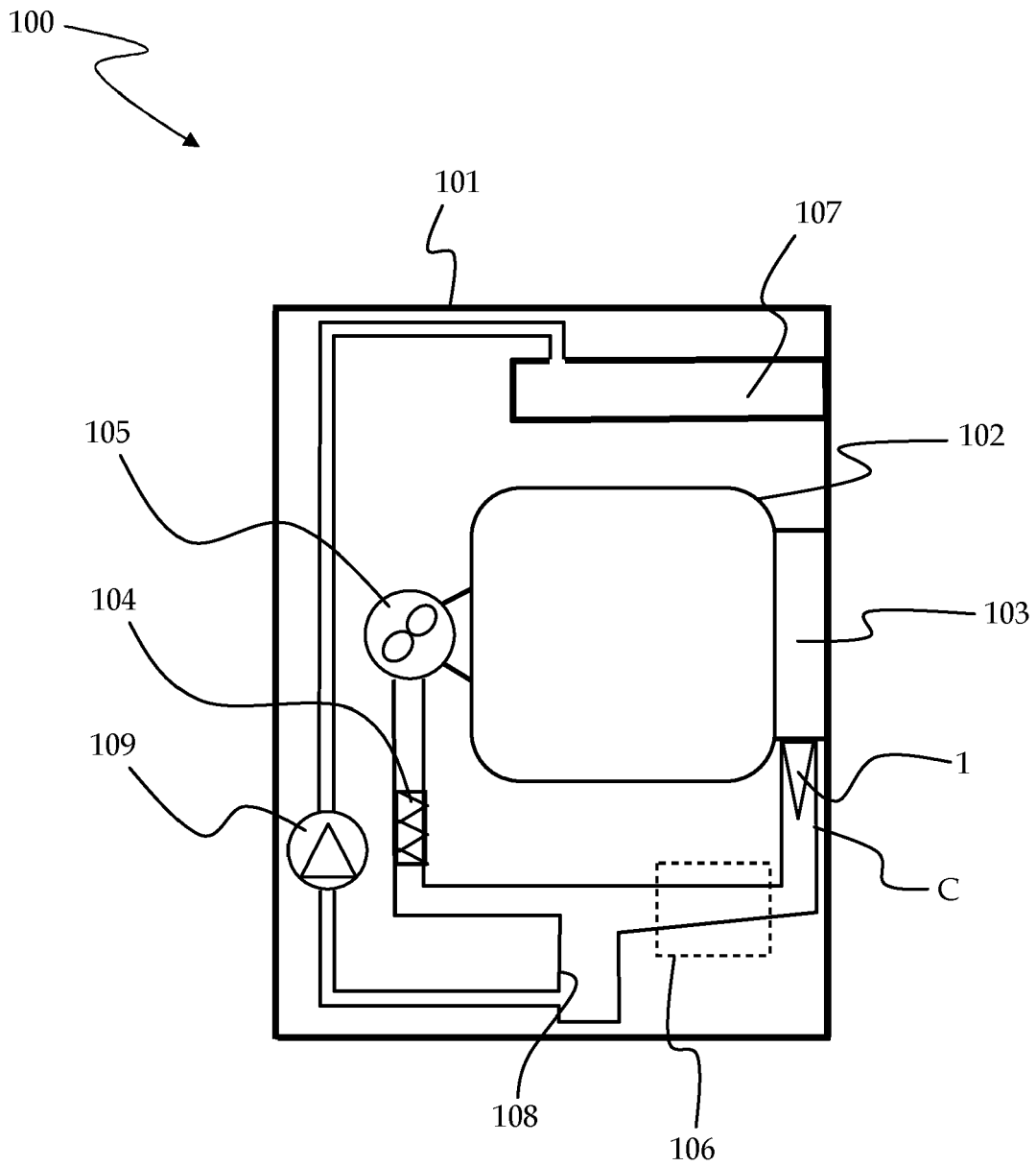


Fig. 1

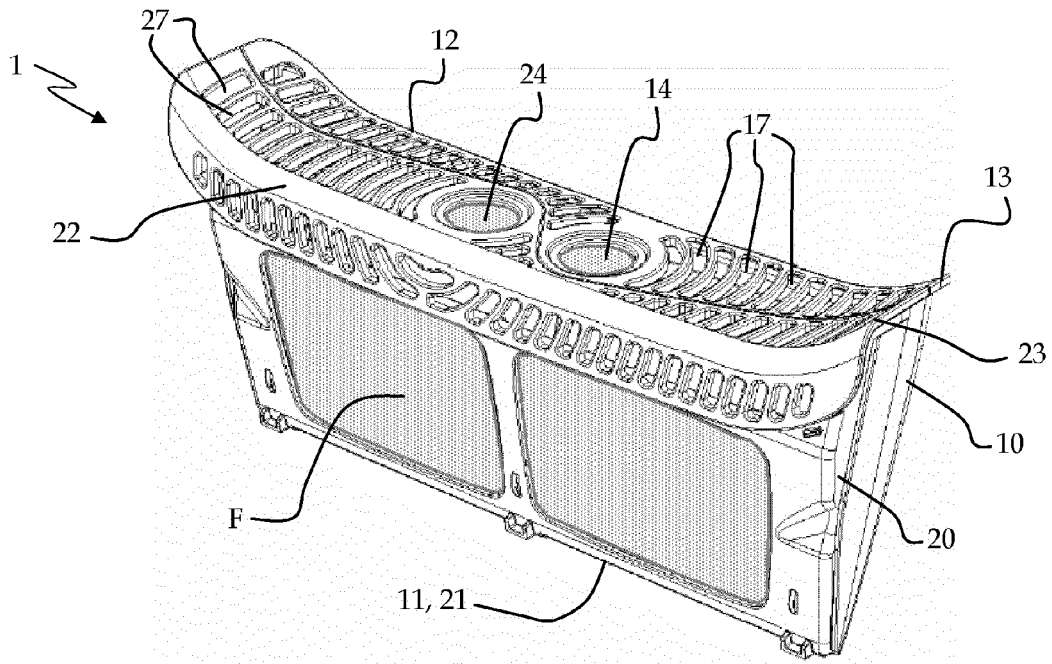


Fig. 2a

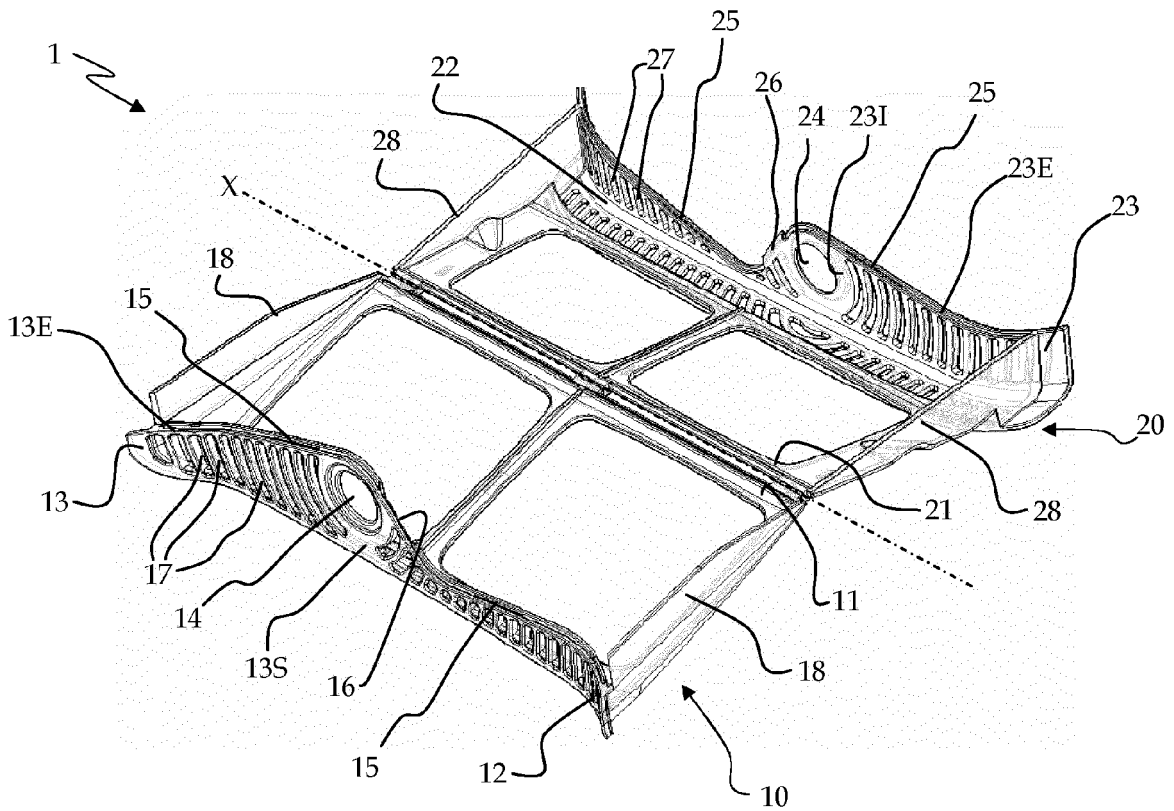


Fig. 2b

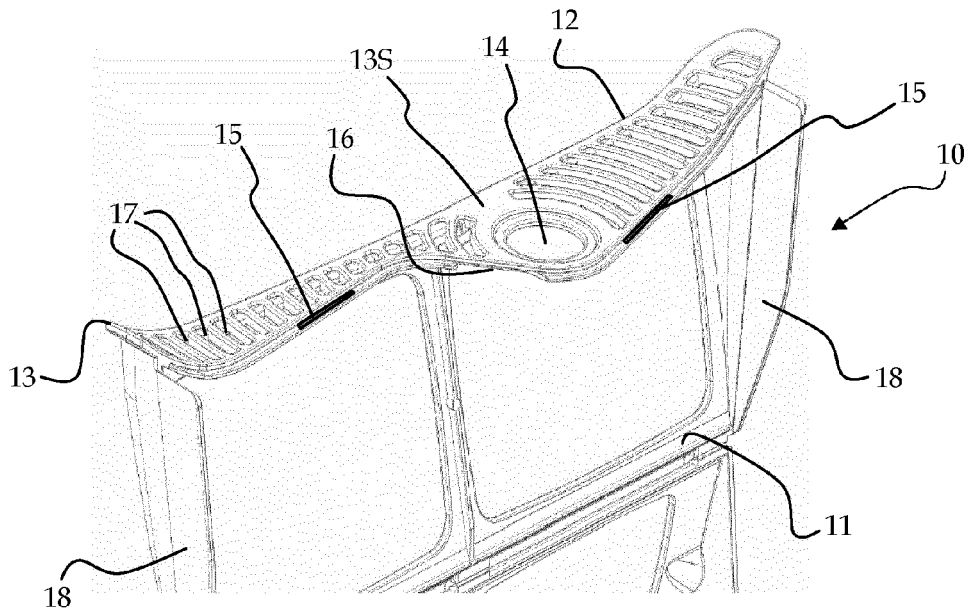


Fig. 3a

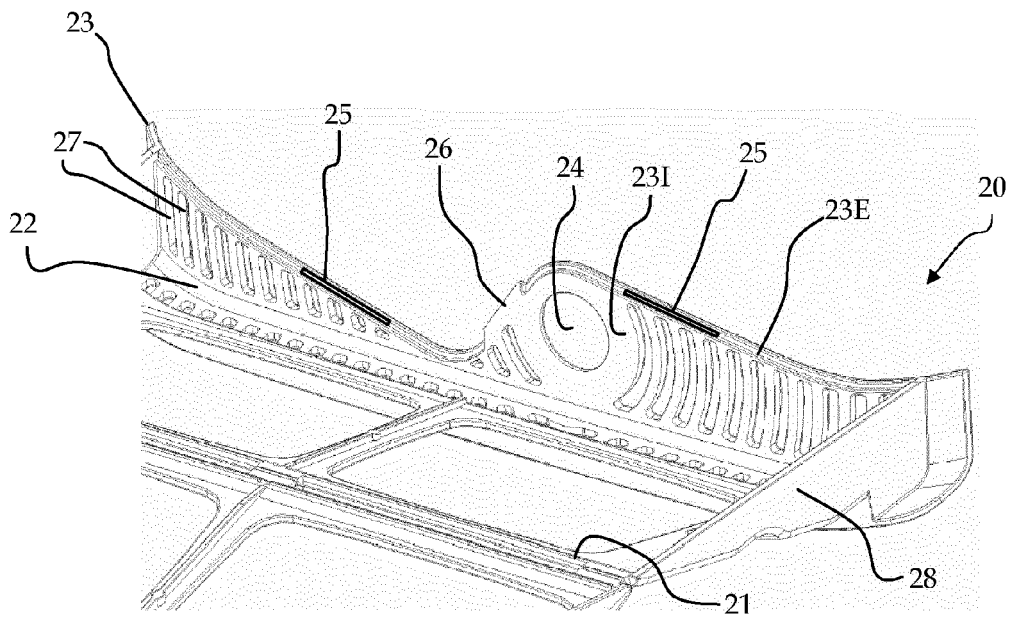


Fig. 3b



EUROPEAN SEARCH REPORT

Application Number  
EP 11 19 0855

DOCUMENTS CONSIDERED TO BE RELEVANT				
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)	
E	EP 2 407 588 A1 (ELECTROLUX HOME PROD CORP [BE]) 18 January 2012 (2012-01-18) * figures 4,8 *	1	INV. D06F58/22	
A	----- US 2010/146812 A1 (AHN SEUNG PHYO [KR] ET AL) 17 June 2010 (2010-06-17) * figure 3 *	1		
A	----- US 3 378 934 A (ERICKSON CLIFFORD E) 23 April 1968 (1968-04-23) * figure 5 *	1		
A	----- GB 2 116 068 A (BAUKNECHT GMBH G) 21 September 1983 (1983-09-21) * page 2, lines 28-39; figure 2 *	1		
A	----- EP 2 230 349 A1 (ELECTROLUX HOME PROD CORP [BE]) 22 September 2010 (2010-09-22) * figures 2,3 *	1		
A	----- EP 2 055 825 A1 (FAGORBRANDT SAS [FR]) 6 May 2009 (2009-05-06) * figure 2 *	1		TECHNICAL FIELDS SEARCHED (IPC)
A	----- KR 2010 0031925 A (LG ELECTRONICS INC [KR]) 25 March 2010 (2010-03-25) * figure 4 *	1		D06F
A	----- KR 2010 0070017 A (LG ELECTRONICS INC [KR]) 25 June 2010 (2010-06-25) * figures 3,4 *	1		
A	----- US 2010/154241 A1 (AHN SEUNG PHYO [KR] ET AL) 24 June 2010 (2010-06-24) * figures 7,8 *	1		
	----- -/--			
The present search report has been drawn up for all claims				
Place of search Munich		Date of completion of the search 17 February 2012	Examiner Hoffmann, Alexander	
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)



EUROPEAN SEARCH REPORT

Application Number  
EP 11 19 0855

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 2008/196452 A1 (BAE JONG DEUK [KR] ET AL) 21 August 2008 (2008-08-21) * figures 4,7 *	1	
A	US 3 889 392 A (DAVIS RODNEY L ET AL) 17 June 1975 (1975-06-17) * figure 2 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>17 February 2012</b>	Examiner <b>Hoffmann, Alexander</b>
<b>CATEGORY OF CITED DOCUMENTS</b> 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 03.02 (P04C01)

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

EP 11 19 0855

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.

17-02-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2407588 A1	18-01-2012	NONE	
US 2010146812 A1	17-06-2010	CN 101748583 A DE 102009058442 A1 KR 20100070016 A US 2010146812 A1	23-06-2010 08-07-2010 25-06-2010 17-06-2010
US 3378934 A	23-04-1968	NONE	
GB 2116068 A	21-09-1983	CH 659097 A5 DE 8203419 U1 GB 2116068 A IT 1161566 B NL 8205049 A SE 457538 B SE 8300406 A YU 292282 A	31-12-1986 24-06-1982 21-09-1983 18-03-1987 01-09-1983 09-01-1989 10-08-1983 31-12-1986
EP 2230349 A1	22-09-2010	EP 2230349 A1 RU 2010110539 A	22-09-2010 27-09-2011
EP 2055825 A1	06-05-2009	AT 497557 T EP 2055825 A1 ES 2358303 T3 FR 2922903 A1	15-02-2011 06-05-2009 09-05-2011 01-05-2009
KR 20100031925 A	25-03-2010	NONE	
KR 20100070017 A	25-06-2010	NONE	
US 2010154241 A1	24-06-2010	CN 101760944 A DE 102009058441 A1 KR 20100072399 A US 2010154241 A1	30-06-2010 08-07-2010 01-07-2010 24-06-2010
US 2008196452 A1	21-08-2008	US 2008196452 A1 WO 2005118940 A1	21-08-2008 15-12-2005
US 3889392 A	17-06-1975	NONE	