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(54) Title: APPARATUS FOR PREPARING FOOD INGREDIENTS WITH IMPROVED AIR CIRCULATION OF HOT AIR

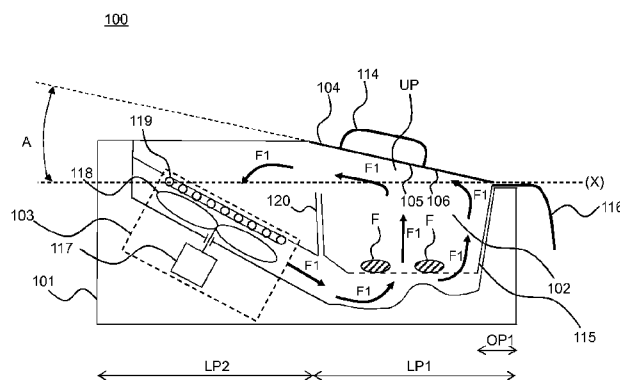


FIG.1

(57) **Abstract:** The invention relates to an apparatus (100) for preparing food ingredients (F). The apparatus (100) comprises a housing (101), a food preparation chamber (102) to receive food ingredients (F) to be prepared, the food preparation chamber (102) being disposed on a first lateral part (LP1) of the housing (101), and an arrangement (103) for circulating a flow of hot air in an upward direction in the food preparation chamber (102) and upwards through the food ingredients (F) received in the food preparation chamber (102). The arrangement (103) is disposed on a second lateral part (LP2) of the housing (101) being opposite the first lateral part (LP1). The apparatus (100) also comprises a lid assembly (104) to access an inside part of the food preparation chamber (102). The lid assembly (104) comprises an inner cover element (105) closing the upper part (UP) of the food preparation chamber (102). The inner cover element (105) extends downward towards an outer part (OP1) of the first lateral part (LP1), for directing the flow of hot air that has passed through the food ingredients (F) away from the upper part (UP) and back towards the second lateral part (LP2) to be further circulated by the arrangement (103). Thanks to the inner cover element extending downward, the air reaching the upper part of the food preparation chamber is smoothly directed laterally towards the second lateral part. In other words, this smooth redirection of the air flow prevents the flow of hot air losing speed along the air-flow path.

Apparatus for preparing food ingredients with improved air circulation of hot air

FIELD OF THE INVENTION

The invention relates to an apparatus for preparing food ingredients, in particular an apparatus for preparing food ingredients via circulation of hot air.

The invention may be used in the field of kitchen appliances.

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BACKGROUND OF THE INVENTION

Air-based fryers are known for cooking food ingredients, for example fries or chicken, wherein the heat for preparing the food is provided by a flow of hot air. The flow of hot air is generated by a motor / fan assembly, and is circulated around the food ingredients placed in a food preparation chamber.

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The cooking efficiency of such types of apparatus is dependent on whether the speed of hot air which is circulated in the food preparation chamber is maintained constant at a relatively high value, even after food ingredients are disposed in the food preparation chamber. This can be achieved, for example, by using a motor / fan assembly generating a sufficiently high air flow rate. However, in the case of apparatus having a housing with a limited internal volume, this solution may be difficult to implement due to the possibly large size of the motor / fan needed. Alternative solutions are therefore needed to optimize the speed of hot air which is circulated in the food preparation chamber, while at the same ensuring that implementation in apparatus having a housing with a limited volume is possible.

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An apparatus and method for present, serving and protecting food and beverages is known from US 2005/0103212A1. It includes a means for directing and circulating a stream of thermally controlled air over the food.

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OBJECT AND SUMMARY OF THE INVENTION

It is an object of the invention to propose an apparatus for preparing food that avoids or mitigates the above-mentioned problems.

The invention is defined by the independent claims. The dependent claims define advantageous embodiments.

To this end, the apparatus according to the invention for preparing food ingredients comprises:

- 5 - a housing,
- a food preparation chamber to receive food ingredients to be prepared, the food preparation chamber being disposed on a first lateral part of said housing,
- an arrangement for circulating a flow of hot air in an upward direction in said food preparation chamber and upwards through the food ingredients received in the food
- 10 preparation chamber, said arrangement being disposed on a second lateral part of said housing being opposite said first lateral part,
- a lid assembly to access an inside part of said food preparation chamber, said lid assembly comprising an inner cover element closing the upper part of said food
- preparation chamber, said inner cover element extending downward towards an outer part of
- 15 said first lateral part, for directing the flow of hot air that has passed through the food ingredients away from said upper part and back towards said second lateral part to be further circulated by the arrangement.

Thanks to the inner cover element extending downward, the air reaching the upper part of the food preparation chamber is smoothly directed laterally towards the second

20 lateral part. In other words, this smooth redirection of the air-flow prevents the flow of hot air losing speed along the air-flow path.

Detailed explanations and other aspects of the invention will be given below.

BRIEF DESCRIPTION OF THE DRAWINGS

25 Particular aspects of the invention will now be explained with reference to the embodiments described hereinafter and considered in connection with the accompanying drawings, in which identical parts or sub-steps are designated in the same manner :

Fig.1 depicts a first embodiment of an apparatus for preparing food ingredients according to the invention,

30 Fig.2 depicts a first lid assembly used in an apparatus for preparing food ingredients according to the invention,

Fig.3 depicts a second embodiment of an apparatus for preparing food ingredients according to the invention,

Fig.4 depicts a second lid assembly used in an apparatus for preparing food ingredients according to the invention,

Fig.5 depicts a third embodiment of an apparatus for preparing food ingredients according to the invention,

5 Fig.6 depicts an exploded view of a lid assembly used in an apparatus for preparing food ingredients according to the invention,

DETAILED DESCRIPTION OF THE INVENTION

Fig.1 depicts a first embodiment of an apparatus 100 for preparing food
10 ingredients according to the invention.

The apparatus 100 comprises a housing 101. The housing 101 corresponds to the external shell of the apparatus which encases various inside components.

The apparatus 100 also comprises a food preparation chamber 102 disposed on a first lateral part LP1 of the housing 101. For example, as illustrated, the first lateral part
15 LP1 corresponds to the right half-side of the apparatus.

The apparatus 100 also comprises an arrangement 103 for circulating a flow of hot air in an upward direction in the food preparation chamber 102. The arrangement 103 is disposed on a second lateral part LP2 of the housing 101 being opposite the first lateral part LP1.

20 The apparatus 100 also comprises a lid assembly 104 to access an inside part of the food preparation chamber 102. The lid assembly 104 comprises an inner cover element 105 closing the upper part UP of the food preparation chamber 102. The inner cover element 105 extends downward towards an outer part OP1 of the first lateral part LP1, for directing the flow of hot air away from the upper part UP and towards the second lateral part LP2. The
25 lid assembly 104 is arranged above and covers the food preparation chamber 102. The lid assembly 104 is air-impermeable and cooperates with the housing 101 in an air-tight manner, so that the air-flow F1 circulating inside the apparatus does not leak outside the apparatus. For example, the inner cover element 105 is made of a sheet of stainless steel.

For preparing food ingredients F with this apparatus 100, the lid assembly 104
30 is arranged above the food preparation chamber 102. The lid assembly 104 is preferably equipped with a handle 114 to lift the lid away from the apparatus in order for a user to access the inside part of the food preparation chamber 102. Preferably, the lid assembly 104 is detachable from the housing 101. Alternatively, a hinge mechanism (not shown) is arranged between the housing 101 and the lid assembly 104. When the inside of the food

preparation chamber 102 is accessible, food ingredients F are disposed by user in a food basket 115. The food basket 115 is preferably equipped with a handle 116 to take the food basket 115 out of the food preparation chamber 102 in order for a user to more conveniently dispose food ingredients F in the food basket 115. The food basket 115 has an air-permeable bottom so that the air-flow F1 can pass through it and heat by convection the food ingredients F. Thanks to the inclination of the inner cover element 105, the air-flow F1 reaching the upper part is smoothly redirected towards the second lateral part LP2 without substantial speed loss.

For example, the arrangement 103 comprises a motor 117, a fan 118 coupled to the motor 117 for generating the air flow (illustrated by arrows F1), and a heating element 119. The air flow F1 circulates in loop between the second lateral part LP2 and the first lateral part LP1 via the food preparation chamber 102. For example, the heating element 119 is disposed in front of the fan 118, but could also be disposed at other positions along the path of air flow F1. The looped air circulation is facilitated by the implementation of a wall element 120 leaving a free opening above the wall 120 where the air-flow F1 circulates from right to left, and a free opening below the wall element 120 where the air flow F1 circulates from left to right. The blades of the fan 118 are oriented such that air is sucked from the upper part of the food preparation chamber 102. Preferably, an air guide member 121 is formed below the food basket 115 to facilitate that air-flow F1 circulates upwards inside the food preparation chamber 102.

Preferably, the inner cover element 105 forms a flat surface 106 tilted to an angle A in the range [5;15] degrees compared to the horizontal direction X. Fig.2 depicts an example of a lid assembly 104 where the flat surface 106 is illustrated with a checkerboard pattern. In this example, the housing 101 extends upward to abut the border of the flat surface 106, in order to ensure an air-tight cooperation.

Preferably, the inner cover element 105 further comprises a curved portion 107 abutting a lower point P1 of the flat surface 106. This characteristic is illustrated by Fig.3 which depicts a second embodiment of an apparatus 100 according to the invention. The curved portion 107 bends downwards to abut an upper point P2 of the outer part OP1. The curved portion 107 is formed at the intersection of the lid assembly 104 and the wall of the food preparation chamber 102 being situated on the first lateral part LP1. The point P2 corresponds to the upper part of the outer part OP1, also corresponding to the upper opening of the food preparation chamber 102. The curved portion 107 allows to further smoothing the

circulation of air flow F1, thus preventing that the speed of air-flow F1 decreases in the upper part UP of the food preparation chamber 102.

Preferably, the curved portion 107 has a curvature radius R being a percentage in the range [10;20] % of the length L of the flat surface 106.

5 Preferably, the curved portion 107 has a curvature radius R in the range [20;40] mm.

For example, if the length L of the flat surface is 184 mm, the percentage can be chosen to be 16%, resulting in a curvature radius R of 30 mm.

Preferably, the inner cover element 105 comprises vertical lateral walls 108.

10 This characteristic is illustrated by Fig.4. The vertical lateral walls 108 ensure an air-tight cooperation between the lid assembly 104 and the opening of the food preparation chamber 102, which extends horizontally.

Preferably, the lid assembly 104 further comprises an outer cover element 109 located at distance from the inner cover element 105. This characteristic is illustrated by
15 Fig.5 which depicts a third embodiment of an apparatus 100 according to the invention. The air gap created between the inner cover element 105 and the outer cover element 109 creates a thermal isolation for the lid assembly 104. As a result, the lid assembly 104 does not get heated by the hot air-flow F1 to a temperature that could create safety concerns for the user. For example, the outer cover element 109 is made of stainless steel.

20 Preferably, the lid assembly 104 comprises spacer elements 110 arranged between said inner cover element 105 and said outer cover element 109, to maintain a given distance D between said inner cover element 105 and said outer cover element 109. For example, the spacer elements 110 are made of heat resistant material, for example Polybutylene terephthalate (PBT) or Polyphthalamide (PPA).

25 Preferably, the spacer elements 110 are sized such that the given distance D is a percentage in the range [5;15] % of the length L of the flat surface 106. The greater the length L, the more the lid assembly gets exposed to the heated air flow. It is thus required to increase the air gap between the inner cover element and the outer cover element to increase the thermal isolation of the lid assembly.

30 For example, if the length L of the flat surface is 184 mm, the percentage can be chosen to be 10%, resulting in the spacer elements 110 having a length of 18.4 mm.

Preferably, the given distance D is in the range [10;30] mm. This range is appropriate for the size of household appliances.

Preferably, the apparatus 100 further comprises a frame structure 111 for attaching the spacer elements 110. The frame structure 111 comprises a base 112 extending horizontally for making contact with an upper opening of the food preparation chamber 102. This characteristic is illustrated by Fig.6.

5 Preferably, as illustrated in Fig.6, the outer cover element 109 comprises vertical lateral walls 113. An air gap is thus formed between the vertical lateral walls 108 of the inner cover element 105 and the vertical lateral walls 113 of the outer cover element 109. This air gap creates a thermal isolation of the lateral sides of the lid assembly 104, which improves user's safety.

10 The above embodiments as described are only illustrative, and not intended to limit the technique approaches of the present invention. Although the present invention is described in details referring to the preferable embodiments, those skilled in the art will understand that the technique approaches of the present invention can be modified or equally displaced without departing from the protective scope of the claims of the present invention.

15 In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. Any reference signs in the claims should not be construed as limiting the scope.

CLAIMS:

1. An apparatus (100) for preparing food ingredients (F), said apparatus (100) comprising:
 - a housing (101),
 - a food preparation chamber (102) to receive food ingredients (F) to be

5 prepared, the food preparation chamber (102) being disposed on a first lateral part (LP1) of said housing (101),

 - an arrangement (103) for circulating a flow of hot air in an upward direction in said food preparation chamber (102) and upwards through said food ingredients (F) received in said food preparation chamber (102), said arrangement (103) being disposed on a

10 second lateral part (LP2) of said housing (101) being opposite said first lateral part (LP1),

 - a lid assembly (104) to access an inside part of said food preparation chamber (102), said lid assembly (104) comprising an inner cover element (105) closing the upper part (UP) of said food preparation chamber (102), said inner cover element (105) extending downward towards an outer part (OP1) of said first lateral part (LP1), for directing

15 the flow of hot air that has passed through said food ingredients (F) away from said upper part (UP) and back towards said second lateral part (LP2) to be further circulated by said arrangement (103).
2. An apparatus as claimed in claim 1, wherein said inner cover element (105) forms a flat surface (106) tilted to an angle (A) in the range [5;15] degrees compared to the horizontal direction (X).

20

3. An apparatus as claimed in claim 2, wherein said inner cover element (105) further comprises a curved portion (107) abutting a lower point (P1) of said flat surface (106),

25 said curved portion (107) bending downwards to abut an upper point (P2) of said outer part (OP1).

4. An apparatus as claimed in claim 3, wherein said curved portion (107) has a curvature radius (R) being a percentage in the range [10;20] % of the length (L) of said flat surface (106).

5 5. An apparatus as claimed in claim 4, wherein said curved portion (107) has a curvature radius (R) in the range [20;40] mm.

6. An apparatus as claimed in claim 1, wherein said inner cover element (105) comprises vertical lateral walls (108).

10

7. An apparatus as claimed in claim 1, wherein said lid assembly (104) further comprises an outer cover element (109) located at a distance from said inner cover element (105).

15 8. An apparatus as claimed in claim 7, wherein said lid assembly (104) comprises spacer elements (110) arranged between said inner cover element (105) and said outer cover element (109), to maintain a given distance (D) between said inner cover element (105) and said outer cover element (109).

20 9. An apparatus as claimed in claim 8, wherein said spacer elements (110) are sized such that said given distance (D) is a percentage in the range [5;15] % of the length (L) of said flat surface (106).

10. An apparatus as claimed in claim 9, wherein said given distance (D) is in the
25 range [10;30] mm.

11. An apparatus as claimed in any one of claims 8 to 10, further comprising a frame structure (111) for attaching said spacer elements (110), said frame structure (111) comprising a base (112) extending horizontally for making contact with an upper opening of
30 said food preparation chamber (102).

12. An apparatus as claimed in claim 7, wherein said outer cover element (109) comprises vertical lateral walls (113).

13. An apparatus as claimed in claim 1 or 7, further comprising a handle (114) attached to said lid assembly (104).

14. An apparatus as claimed in claim 7, wherein said lid assembly (104) is
5 detachable from said housing (101).

15. An apparatus according to any preceding claim, wherein the housing (101) comprises an air guide member (121) formed below the food preparation chamber (102).

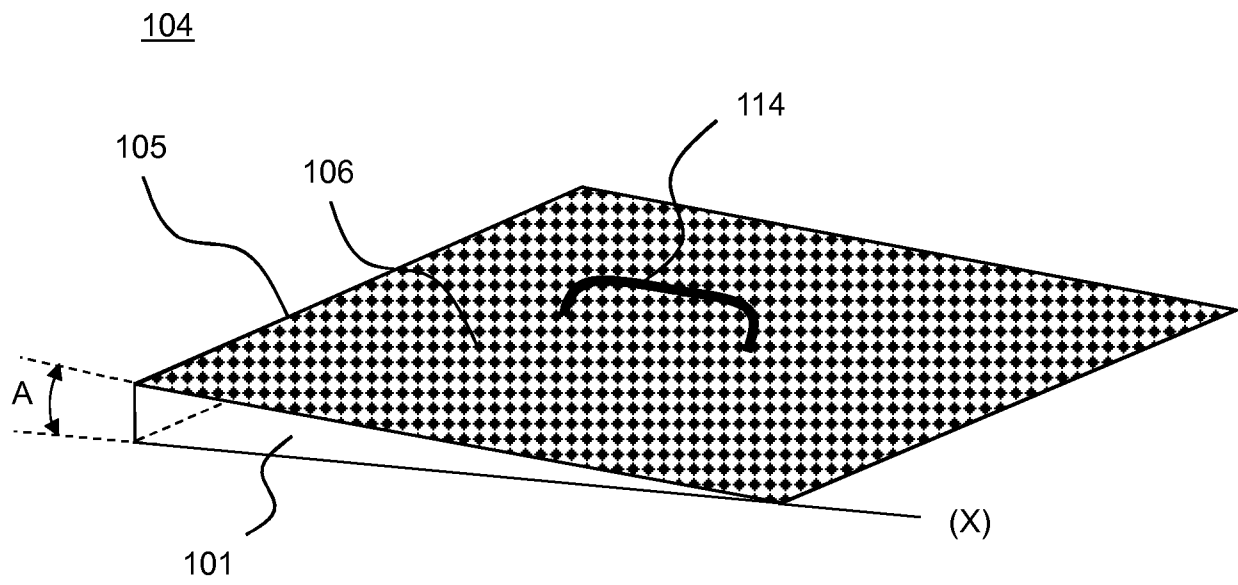


FIG.2

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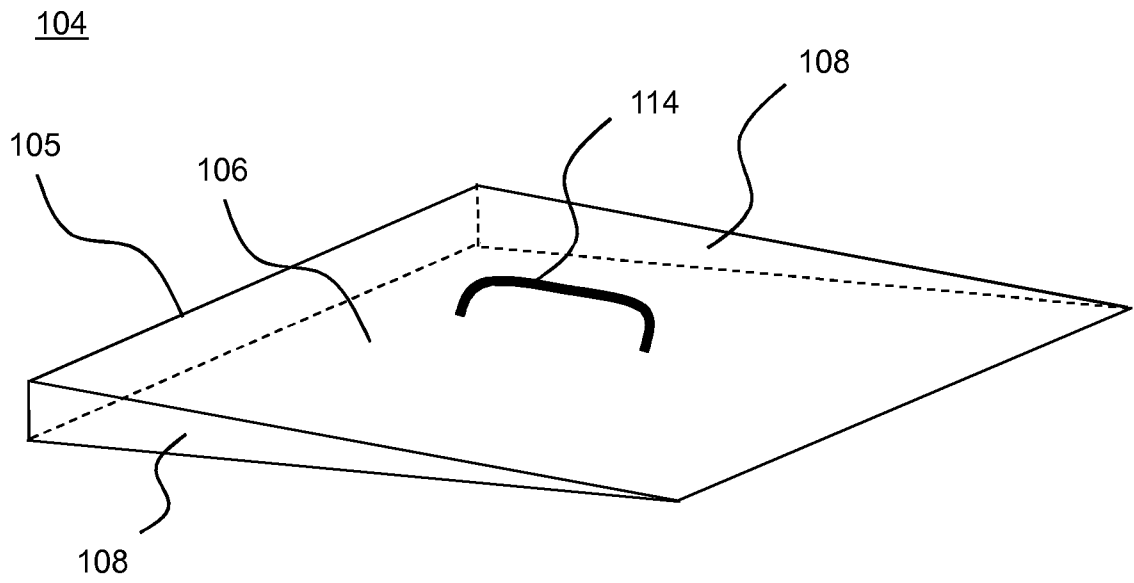


FIG.4

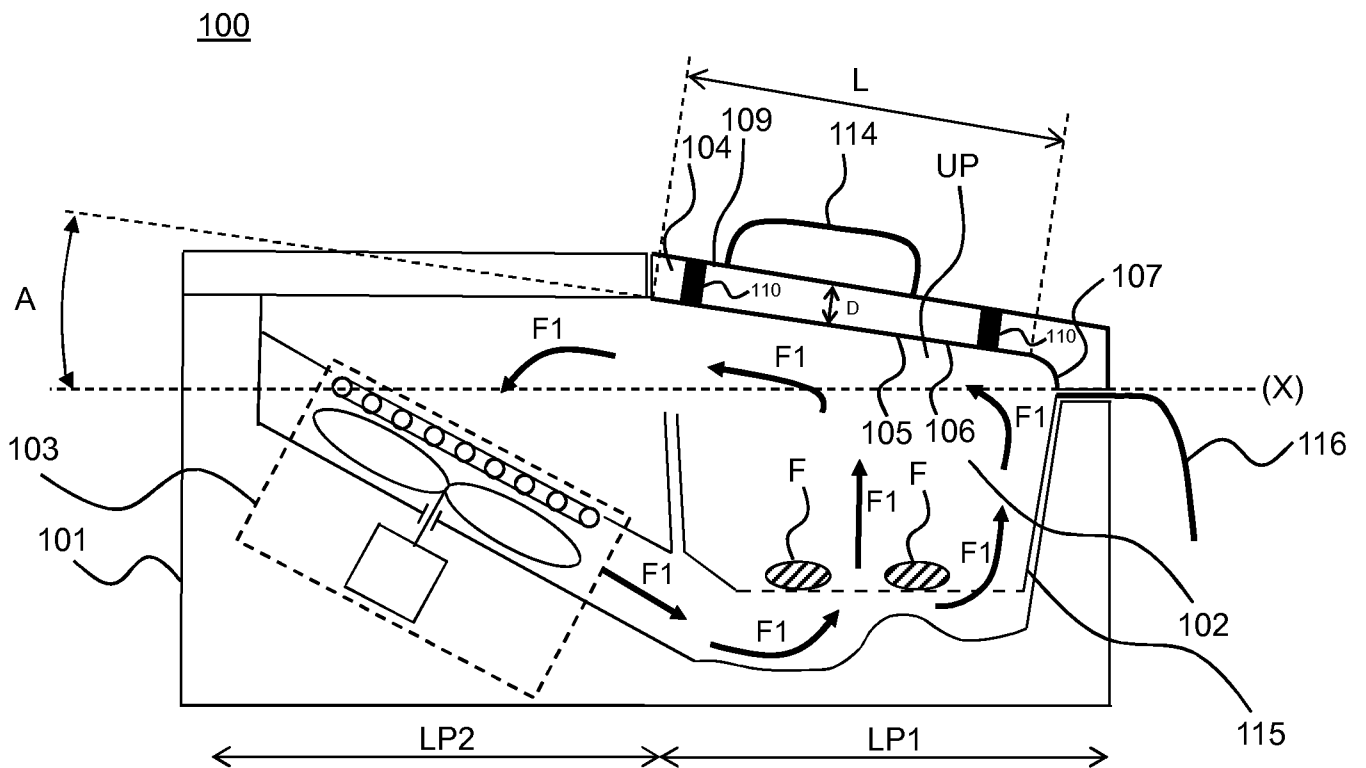


FIG.5

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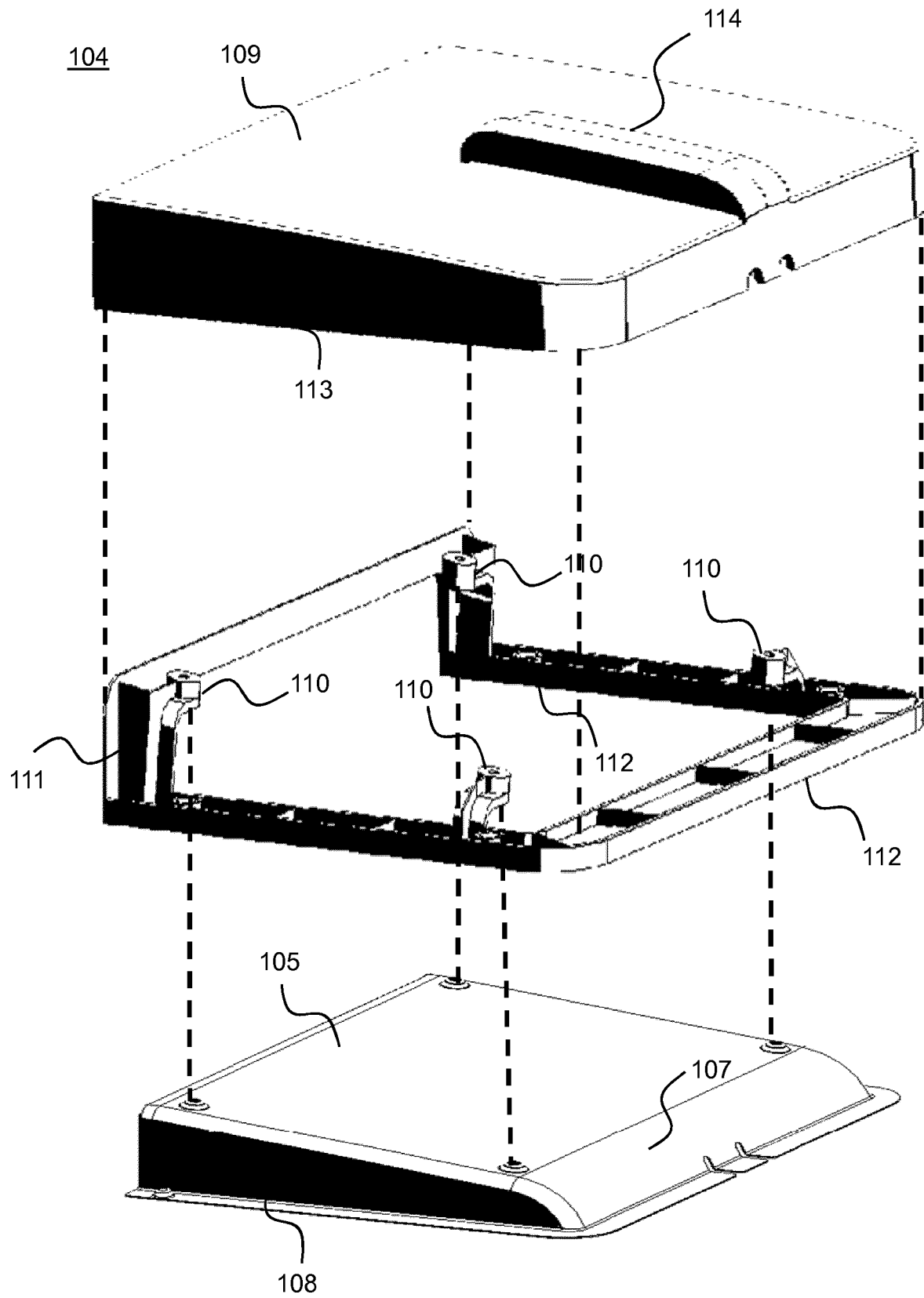


FIG.6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/050151

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47J37/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	FR 2 591 879 A3 (INOX EQUIPEMENT [FR]) 26 June 1987 (1987-06-26) page 2, line 35 - page 5, line 23; figure 1	1-5, 13-15 6-12
X A	----- GB 2 466 989 A (STEWART KENNETH THOMAS [IE]; STEWART COLIN WILLIAM [IE]; STEWART KEITH) 21 July 2010 (2010-07-21) page 7, line 24 - page 11, line 10; figure 1	1-6, 13-15 7-12
A	----- US 2005/103212 A1 (CRONIN DAVID V [US] ET AL) 19 May 2005 (2005-05-19) paragraph [0066] - paragraph [0072]; figures 1-7B	1-15
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/050151

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010/089248 A1 (JONES EDWARD MICHAEL [US]) 15 April 2010 (2010-04-15) paragraph [0025] - paragraph [0037]; figures 1-4 -----	1-15
A	US 8 437 627 B1 (MAGNER ERIK [US]) 7 May 2013 (2013-05-07) column 2, line 65 - column 4, line 57; figures 1-3 -----	1-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/050151

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2591879	A3	26-06-1987	NONE
GB 2466989	A	21-07-2010	NONE
US 2005103212	A1	19-05-2005	NONE
US 2010089248	A1	15-04-2010	NONE
US 8437627	B1	07-05-2013	NONE