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(54) Cooking oven with heating element

(57) Cooking oven comprising an oven muffle (1) having muffle walls (2a, 2b) which define a cooking chamber (13) and at least one heating element (6) which is fixed to at least one of the muffle walls (2a, 2b) by means of at least one fixing element,
characterized in that
said at least one muffle wall (2a, 2b) is provided with at least one embossing (4), wherein said fixing element rests against said embossing (4).

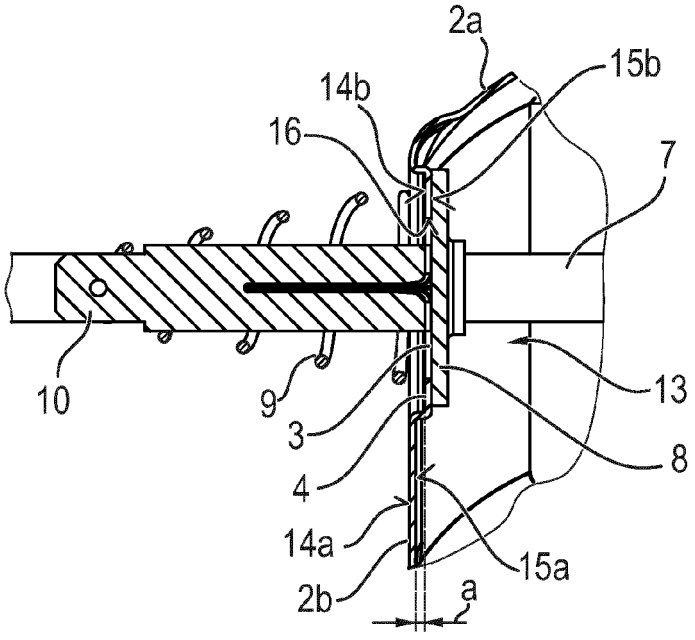

FIG. 3

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Description

[0001] The present invention relates to a cooking oven comprising an oven muffle having muffle walls which define a cooking chamber and at least one heating element which is fixed to at least one of the muffle walls by means of at least one fixing element.

[0002] Known cooking ovens comprise a cooking chamber being defined by the walls of an oven muffle. For providing the cooking chamber with thermal energy, heating elements are provided within and/or outside of the cooking chamber. Usually the heating elements are arranged in a certain distance to the oven muffle walls. In the case of a heating element which is provided within the cooking chamber, the heating element can be guided at least partly through the oven muffle walls, such that the heating section of the heating element extends within the interior side of the oven muffle.

[0003] Furthermore usual is that the oven muffle is assembled from several muffle parts manufactured in deep-drawing processes and cutting processes, wherein the muffle parts are welded together afterwards. Due to the deep-drawing, cutting and - if applicable - enamelling processes the muffle parts are manufactured within relatively large tolerances which cause a certain bandwidth of geometrical variations from oven muffle to oven muffle. Said geometrical variations cause difficulties in subsequent manufacturing steps such as mounting and/or installation of a heating element.

[0004] It is an object of the present invention to provide a cooking oven wherein the negative effect of the geometrical variations of the oven muffle on the mounting and/or installation of a heating element is reduced. In particular, it is an object of the invention to avoid a gap between the muffle and the fixation of the heating element, that could cause problems with condensation and energy loss.

[0005] The solution to achieve that object is achieved by a cooking oven according to the indicating statement of claim 1, wherein said at least one muffle wall is provided with at least one embossing, wherein said fixing element rests against said embossing.

[0006] The main idea of the present invention is to compensate the variations of the geometry muffle part to which the heating element shall be mounted by providing an embossing which acts as a supporting structure or resting structure for the fixing element. Thus, a precise structure is produced to which the heating element can be mounted. The position of the heating element within the oven muffle, in particular relative to the muffle walls, can be reproduced within the given tolerance window.

[0007] In an advantageous embodiment of the invention, said fixing element is a fixation flange, in particular said fixing element is a substantially flat fixation flange.

[0008] A fixation flange is easily mounted to the heating element. A flat flange can be in planar contact to the embossing and, thus, provide structural stability for the heating element.

[0009] In a further advantageous embodiment of the invention, said muffle wall has at least one recess through which said heating element extends into the cooking chamber.

[0010] Particularly advantageous is this solution for an embodiment having a recess through which said heating element extends. In the manufacturing process, the recess is cut out and due to the process forces, the cut edges of the recess can be bent or have unintended variations of geometry. In this case, the embossing can stabilize the edges of recess and keep the recess within a defined tolerance window. The bending of the cut edges of the recess is minimized.

[0011] In a particular advantageous embodiment of the invention, said recess is arranged within said embossing, in particular in a central portion of said embossing.

[0012] The effect to keep the cut edges of the recess in a very small tolerance window is particularly achieved, when the recess is arranged in a central portion of said embossing.

[0013] In a further advantageous embodiment of the invention, said fixing element rests against said embossing in a planar manner, preferably forming a substantially air tight connection.

[0014] A planar connection of the fixing element with the embossing results in an advantageous stable and air tight connection. Thus, fumes or heat cannot evade from the cooking chamber to the exterior.

[0015] In a further advantageous embodiment of the invention, the fixing element is arranged on and/or in contact with a projecting side formed by the embossment in said muffle wall.

[0016] Thus, a defined support structure for the fixation element is created. That fixation arrangement is advantageous for cleaning purposes, because accumulation of fat or grease in the fixation element is impeded.

[0017] In an alternative advantageous embodiment of the invention, the fixing element is arranged within a deepened section formed by the embossment in said muffle wall.

[0018] In that way, the fixation element and the heating element attached thereto, can be placed in their intended mounting position very easy, due to the form closure provided between fixation element and muffle wall. A kind of a labyrinth seal is established in such way, that evasion of fumes and heat are minimized.

[0019] According to a further advantageous embodiment of the invention, said embossing is embossed towards the interior of the cooking chamber.

[0020] Thus, the heating element can be positioned slightly displaced in direction to the cooking chamber. The heat transfer of the heating element occurs, consequently, in a more central section of the cooking chamber, resulting a more economic heating of the cooking chamber.

[0021] According to a further advantageous embodiment of the invention said embossing is embossed towards a direction opposite to the interior of the cooking

chamber.

[0022] Thus, it is possible to arrange the embossing and the fixation element closer to the heat insulation of the muffle.

[0023] In a further advantageous embodiment of the invention said muffle wall comprises a first interior surface (15a) and that said embossing comprises a second interior surface, wherein a distance is provided between said first interior surface and said second interior surface.

[0024] A value for the distance between the different interior surfaces can be determined which can be advantageously adapted to the dimensions or thickness of the fixation element. First interior surface and second interior surface might be parallel to each other, but it is also possible, that the first and second interior surface intersect.

[0025] According to the invention, the distance can be equal or smaller or larger than the thickness of the fixing element. In a preferred embodiment of the invention, the distance is equal or smaller than the thickness of the fixing element. Thus, heat transfer from the heating element via the fixing element to the muffle wall can be minimized. Further, in such way, the embossing provides only small condensation surfaces. Thus, condensation on the fixation arrangement is reduced.

[0026] In a further advantageous embodiment of the invention at least one resilient element is provided which applies a force to the heating element pulling said fixing element against said embossing.

[0027] The use of resilient elements, such as spiral springs, allows a quick and easy installation and deinstallation of the heating element. Particularly advantageous is that the heating element can be moved inside of the cooking chamber, e.g. to attach the heating element to another fixing element, wherein the resilient elements fixes the heating element to the rear wall and allows the movement at the same time.

[0028] In a further advantageous embodiment of the invention said flange is screwed to said muffle wall.

[0029] The fixing flange can be secured to the muffle wall by screwing it thereto in a last step of the installation, when all further movement of the heating element shall be prevented.

[0030] In a further advantageous embodiment of the invention the embossing is formed substantially rectangular and has lateral embossing edges and longitudinal embossing edges which are interconnected to each other via rounded corners.

[0031] Alternatively and also advantageous, the embossing is formed substantially rectangular and has lateral embossing edges which are formed semicircular.

[0032] Thus, it is possible, to install different types of heating elements to the muffle. The fixation elements can be adapted to the form of the embossing, wherein each type of heating element has one specific kind of fixation element. The worker, therefore, can understand by the form of the embossing which type of heating element shall be installed and is impeded to install the wrong one due to not fitting forms.

[0033] The present invention will be described in further detail with reference to the drawings, in which

FIG 1 illustrates a perspective view of a top part of an oven muffle according to the present invention;

FIG 2 illustrates a sectional side view a top part of an oven muffle according to the present invention;

FIG 3 illustrates a detailed sectional side view of a top part of an oven muffle according to the present invention;

FIG 4 illustrates a detailed sectional side view of a top part of an oven muffle according to an alternative embodiment of the present invention;

FIG 5 illustrates a rear view of a top part of an oven muffle according to the present invention;

FIG 6 illustrates a rear view of a top part of an oven muffle according to a further alternative embodiment of the present invention;

[0034] FIG 1 illustrates a perspective view of an upper part of an oven muffle 1. The oven muffle 1 has a top part 2 which comprises a top wall section 2a and a rear wall section 2b. The top part 2 can also have lateral wall sections and/or a front wall section (not shown). In a central section of the rear wall section 2b, an embossing 4 is provided. A recess 3 is provided in the embossed section of the rear wall section by removing material from there. Lateral from the recess 3, fastening holes 5 are formed. A connection flange 17 is bent off rectangular from the rear wall section 2b forms a rearward and lower end section of the top part 2. A rear part 11 of the oven muffle 1 connected to the top part 2, e.g. by a welding connection.

[0035] FIG 2 illustrates a sectional side view a top region of the oven muffle 1. As can be seen, the oven muffle 1 is formed by the top part 2 and a rear part 11 being joined in a fixation region 12. Usually, further parts (not shown), forming lateral walls and a bottom wall are provided and, together with the top part 2 and the rear part 11, delimit a cavity that forms a cooking chamber 13, wherein foodstuff to be cooked can be placed.

[0036] Inside of the cooking chamber 13, a heating element 6 is placed for heating up the cooking chamber 13. Besides the heating element 6, other heating elements in different configurations can be provided. The heating element 6 comprises a heating wire 7, being connected to electrical terminals 10 for providing energy supply to the heating wire 7. The heating wire 7 is encompassed by a fixing element such as a fixation flange 8, wherein one or more resilient elements 9 can be provided for fastening the heating element 6 to the oven muffle 1 by cooperating with the fixation flange 8. A fixing element shall be understood as an element that supports or fixes

the heating element on an oven muffle wall or as an element that cooperates or interacts with another element, e.g. a resilient element or screws or the like, to support or to fix the heating element on the oven muffle wall. The fixation flange 8 is firmly fixed to the heating wire 7. Besides a fixation flange 8, also other fixation elements could be provided, such as fixation discs or fixation rods.

[0037] FIG 3 illustrates a detailed sectional side view of a top part 2 of an oven muffle 1. The heating wire 7 is guided through the recess 3 formed in the rear wall section 2b. The recess 3 is provided in the region of the embossing 4 and has cutting edges 16. The embossing 4 is embossed in a direction towards the interior of the cooking chamber 13. Thus, the embossing 4 forms a second interior surface 15b which extends in a plane different from a plane in which a first interior surface 15a extends, wherein the first interior surface 15a is formed by the rear wall section 2b or by the rear part 11 of the oven muffle 1. In the shown embodiment the planes wherein first interior surface 15a and second interior surface 15b extend are substantially parallel to each other. However, it is also possible that the planes intersect.

[0038] Further, on the rear side of the oven muffle 1, the embossing 4 forms a second exterior surface 14b which extends in a plane different from the plane wherein a first exterior surface 14a extends that is formed by the rear wall section 2b or the rear part 11 of the oven muffle 1. First exterior surface 14a and second exterior surface 14b are exterior surfaces of the oven muffle 1. The embossing forms a deepening on the exterior side of the oven muffle 1 and a projection on the interior side of the oven muffle 1.

[0039] Thus, a distance a is defined between the second exterior surface 14b and the first interior surface 15a, or their planes, respectively. The distance a can be smaller than the thickness of the rear wall section 2b or it can be larger than the thickness of the rear wall section 2b. The value of the distance a can be adapted to the length of the heating element 6 or heating wire 7. Another possibility is that the value of distance a corresponds to the dimension or the thickness, respectively, of the fixation flange 8.

[0040] The second interior surface 15b forms a contact surface or support surface for the fixation flange 8. The fixation flange 8 can rest against the second interior surface 15b in a laminar or planar manner, providing an air-tight connection between the heating element 6 and the oven muffle 1. In other words, the recess 3 through which the heating element 6 is guided into the cooking chamber 13 is closed air-tight by means of the fixation flange 8 resting against the second interior surface 15b. The resilient element 9 secures the heating element 6 by providing a force that pulls the heating element 6 and the fixation flange 8 against the second interior surface 15b. Advantageously, the planar extension of the embossing 4 is substantially as large as the planar extension of the fixation flange 8.

[0041] FIG 4 illustrates a detailed sectional side view of a top part of an oven muffle according to an alternative embodiment of the present invention. In this embodiment, the embossing 4 is embossed in a direction towards a direction opposite to the interior of the cooking chamber 13. The fixation flange 8 is arranged within the deepening formed by the embossing 4. A distance b is defined between the second exterior surface 14b and the first interior surface 15a, or their planes, respectively, and being a value for the deepness of the embossing 4. Advantageously, the embossing 4 is formed such that the value of b is slightly less than the thickness of the fixation flange 8. In the case, that the fixation flange 8 comprises a form corresponding to the form of the embossing 4, an advantageous fixation can be established. In general, the fixation flange 8 could be arranged on the exterior side of the muffle wall 2b or on the interior side of the muffle wall 2b. The embossing forms a deepening on the interior side of the oven muffle 1 and a projection on the exterior side of the oven muffle 1.

[0042] FIG 5 illustrates a rear view of a top part 2 of an oven muffle 1. The rear wall section 2b of the top part 2 comprises the embossing 4. The embossing 4 has a substantially rectangular form with lateral embossing edges 4a and longitudinal embossing edges 4b and with rounded corner sections interconnecting the lateral embossing edges 4a with the respective longitudinal embossing edges 4b.

[0043] In a center region of the embossing 4, the recess 3 is arranged. The recess 3 is delimited by its cut edge 16. The heating element 6 is guided through the recess 3. Resilient elements 9, e.g. spiral springs, are provided in lateral sections of the embossing 4. The heating element 6 abuts with its fixation flange 8 against the interior side of the oven muffle 1 and is fixed in its position by the resilient elements 9 which pull the fixation flange 8 against the interior wall of the rear wall section 2b. The fixation flange 8 is therefore larger than the recess 3 having a circumferential line that can be seen as a dashed line in the figure. More precisely, the fixation flange 8 abuts against the second interior surface 15b.

[0044] The recess 3 and the embossing 4 can be produced in one manufacturing step by embossing and die cutting, either in one manufacturing step or in two separate steps. The resulting edges of recess 16 are even more advantageous when the recess 3 and embossing 4 are produced in one manufacturing step, because in this case, the bending or deformation of the cut edges of recess 16 is minimized.

[0045] FIG 6 illustrates a rear view of a top part 2 of an oven muffle 1 having a different configuration. The heating element 6 has four electric terminals 10 which are provided in a row. The embossing 4 has lateral embossing edges 4a and longitudinal embossing edges 4b, wherein the lateral embossing edges 4a are formed as semicircles. Thus, the embossing 4 is adapted to the form of the resilient elements 9 provided as spiral springs. Further, in such configuration, the form of the embossing 4 corresponds to the form of recess 3. In other words, the

lateral embossing edges 4a have a form that corresponds to the form of the lateral sections of the recess 3. In this way, the force applied from the resilient elements 9 to the fixation flange 8 is transferred in an optimized way via the geometry of the embossing 4. Consequently, the contact of the fixation flange 8 with the embossing 4, in particular with the contact surface of the embossing 4, is provided in an advantageous planar and air tight manner.

[0046] It is possible, that different fixation flanges 8 can be adapted to the different forms of different embossing 4. E Each type of heating element 6 has one specific kind of fixation element. The worker, therefore, can understand by the form of the embossing 4 which type of heating element 6 shall be installed and is impeded to install the wrong one due to not fitting forms.

List of reference numerals

[0047]

1	oven muffle
2	top part
2a	top wall section
2b	rear wall section
3	recess
4	embossing
4a	lateral embossing edge
4b	longitudinal embossing edge
5	fastening holes
6	heating element
7	heating wire
8	fixation flange
9	resilient element
10	electric terminal
11	rear part
12	fixation region
13	cooking chamber
14a	first exterior surface
14b	second exterior surface
15a	first interior surface
15b	second interior surface
16	edge of recess
17	connection flange
a, b	distances

Claims

1. Cooking oven comprising an oven muffle (1) having muffle walls (2a, 2b) which define a cooking chamber (13) and at least one heating element (6) which is fixed to at least one of the muffle walls (2a, 2b) by means of at least one fixing element,
characterized in that
said at least one muffle wall (2a, 2b) is provided with at least one embossing (4), wherein said fixing element rests against said embossing (4).

2. Cooking oven according to claim 1, **characterized in that** said fixing element is a fixation flange (8), in particular said fixing element is a substantially flat fixation flange (8).

3. Cooking oven according to one of the preceding claims, **characterized in that** said muffle wall (2a, 2b) has at least one recess (3) through which said heating element (6) extends into the cooking chamber (13).

4. Cooking oven according to claim 3, **characterized in that** said recess (3) is arranged within said embossing (4).

5. Cooking oven according to one of the preceding claims, **characterized in that** said fixing element (8) rests against said embossing (4) in a planar manner, preferably forming a substantially air tight connection.

6. Cooking oven according to one of the preceding claims, **characterized in that** the fixing element (8) is arranged on and/or in contact with a projecting side formed by the embossment (4) in said muffle wall (2a, 2b).

7. Cooking oven according to one of the claims 1 to 5, **characterized in that** the fixing element (8) is arranged within a deepened section formed by the embossment (4) in said muffle wall (2a, 2b).

8. Cooking oven according to one of the preceding claims, **characterized in that** said embossing (4) is embossed towards the interior of the cooking chamber (13).

9. Cooking oven according to one of the claims 1 to 7, **characterized in that** said embossing (4) is embossed towards a direction opposite to the interior of the cooking chamber (13).

10. Cooking oven according to one of the preceding claims, **characterized in that** said muffle wall (2a, 2b) comprises a first interior surface (15a) and that said embossing (4) comprises a second interior surface (15b), wherein a distance (a, b) is provided between said first interior surface (15a) and said second interior surface (15a).

11. Cooking oven according to claim 10, **characterized in that** the distance (a, b) is equal or smaller or larger than the thickness of the fixing element (8).

12. Cooking oven according to one of the preceding claims, **characterized in that** at least one resilient element (9) is provided which applies a force to the heating element (6) pulling said fixing element (8)

against said embossing (4).

13. Cooking oven according to one of the preceding claims, **characterized in that** said fixing element (8) is screwed to said muffle wall (2a, 2b).

14. Cooking oven according to one of the preceding claims, **characterized in that** the embossing (4) is formed substantially rectangular and has lateral embossing edges (4a) and longitudinal embossing edges (4b) which are interconnected to each other via rounded corners.

15. Cooking oven according to one of the claims 1 to 13, **characterized in that** the embossing (4) is formed substantially rectangular and has lateral embossing edges (4a) which are formed semicircular.

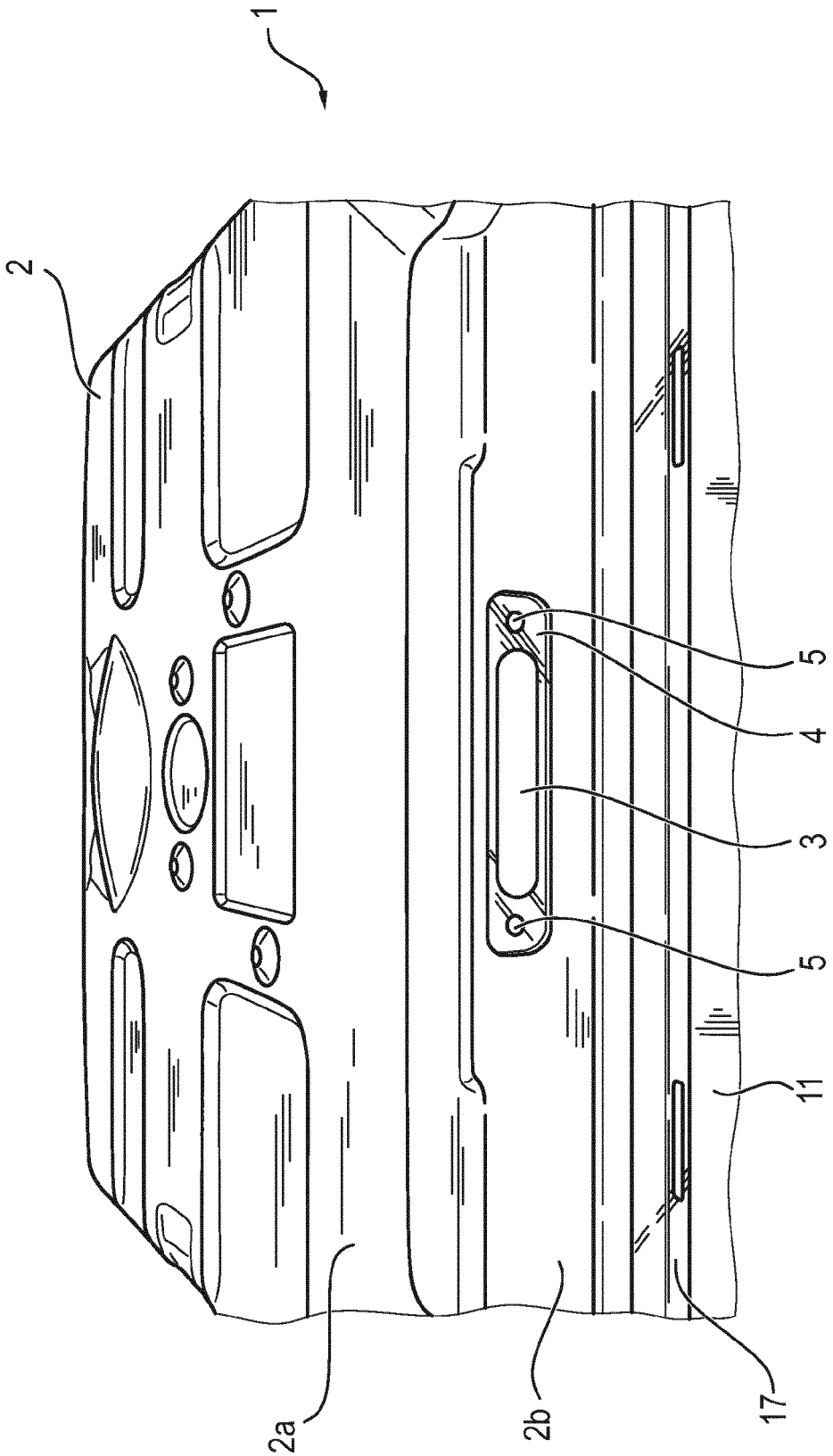

FIG. 1

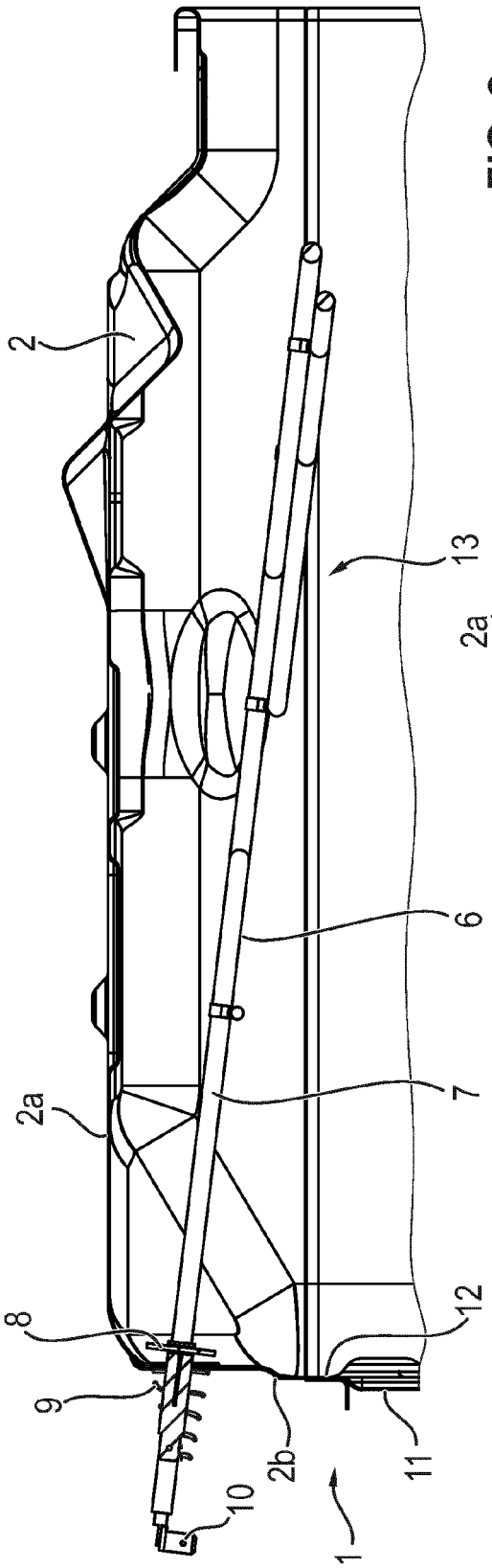

FIG. 2

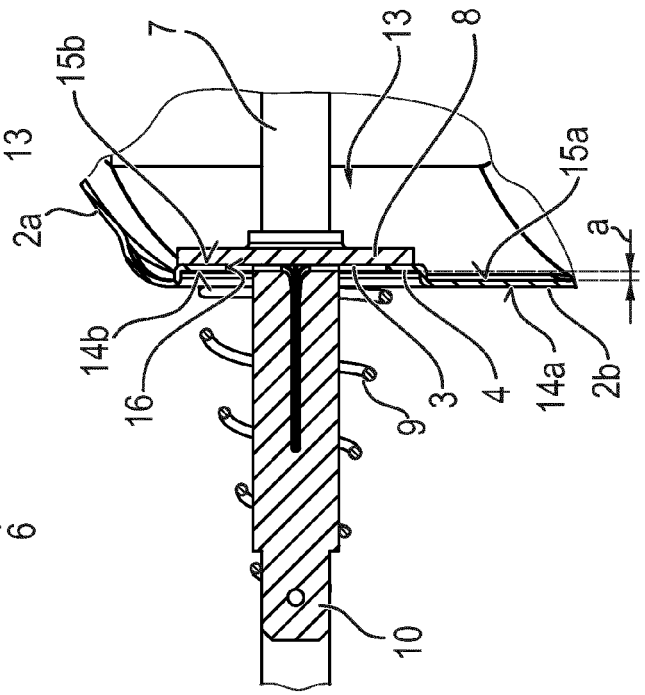

FIG. 3

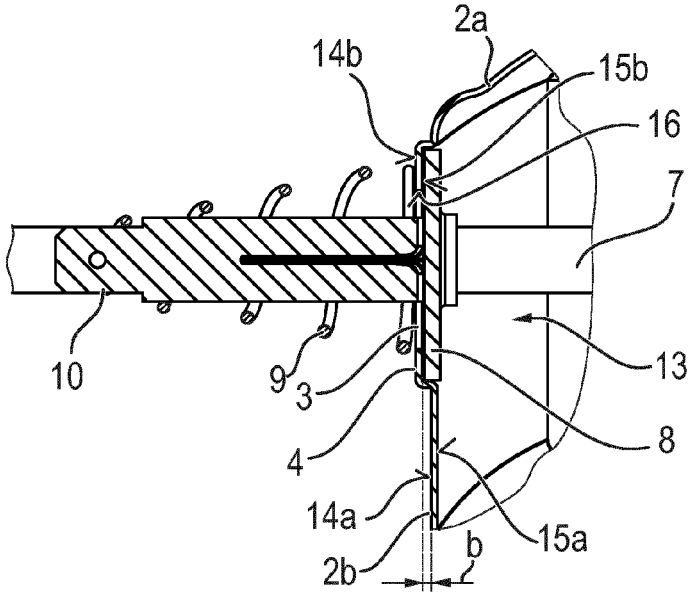
2a
14b
15b
16
7
10
9
3
13
4
8
14a
15a
2b
b

FIG. 4

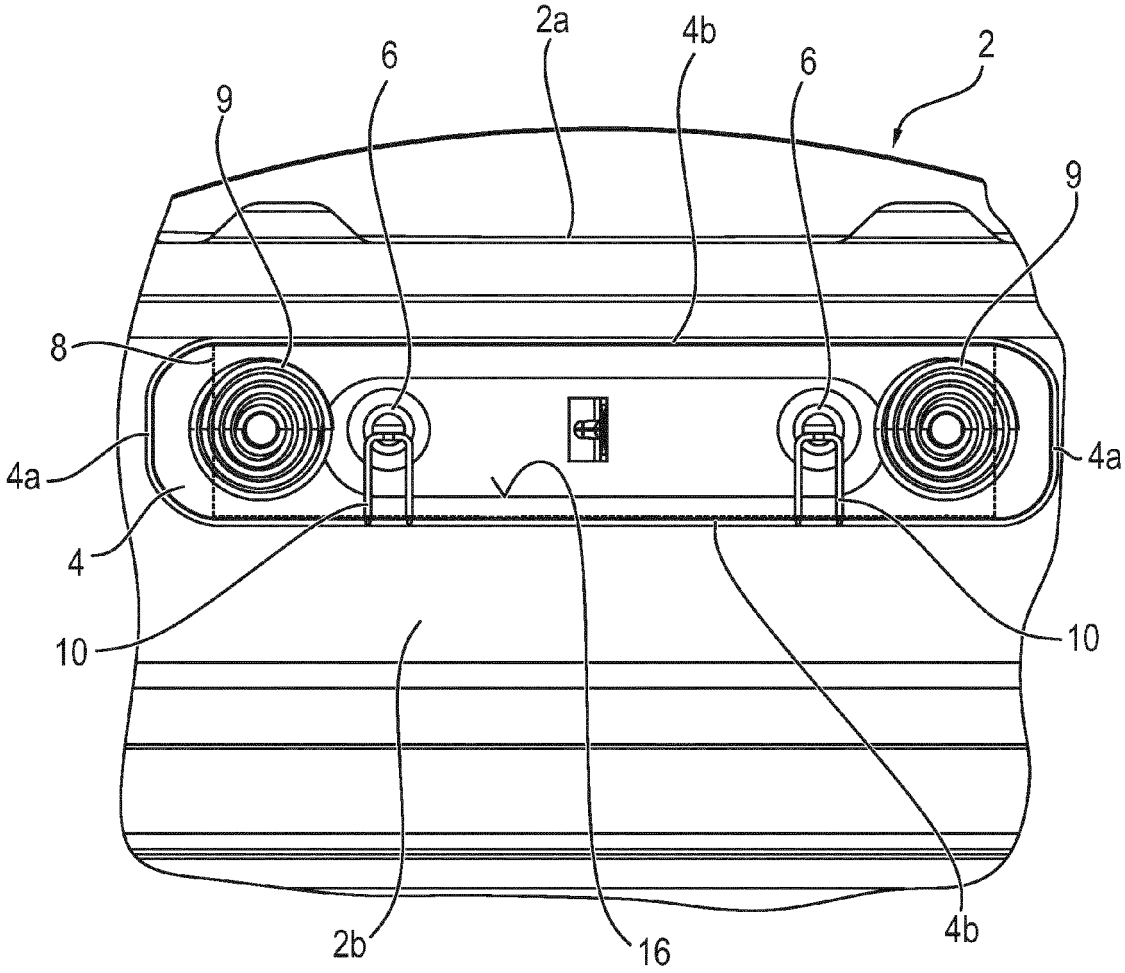
2a
4b
6
6
2
9
9
8
4a
4a
4
10
10
2b
16
4b

FIG. 5

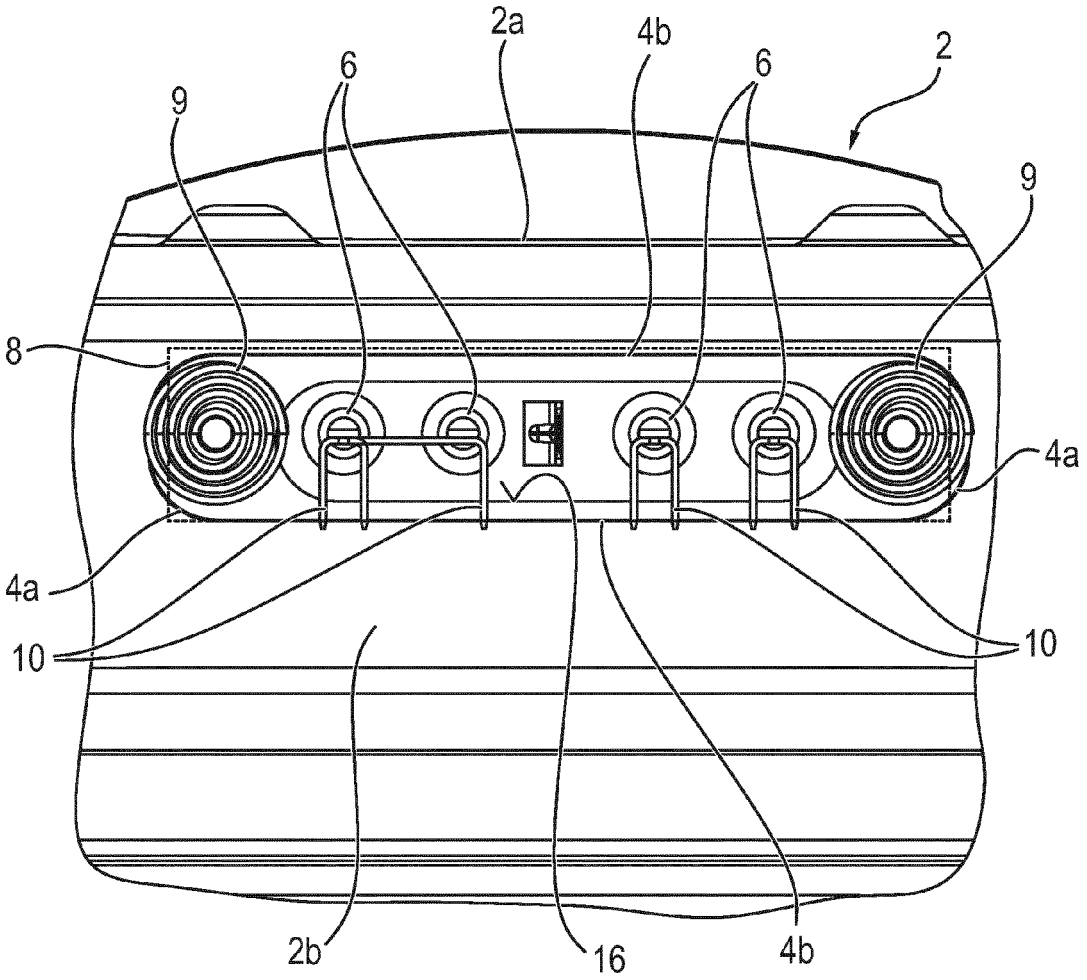

FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 12 19 7153

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	DE 195 22 545 A1 (LG ELECTRONICS INC [KR]) 11 January 1996 (1996-01-11) * column 2, line 15 - line 22; figure 3c * * column 2, line 51 - line 54 *	1,3-6, 9-11	INV. F24C7/06
X	US 3 296 417 A (MACAULAY ANGUS J) 3 January 1967 (1967-01-03)	1,3,5,6, 8,10,11, 13-15	
Y	* column 3, line 6 - line 20; figures 2,3 *	12	
X	EP 0 523 324 A2 (BOSCH SIEMENS HAUSGERAETE [DE] BOSCH SIEMENS HAUSGERAETE [US]) 20 January 1993 (1993-01-20) * paragraph [0010]; figure 1 *	1,2,5-7, 9-11,13	
X	DE 12 12 649 B (JOHANN ACHTERFELD) 17 March 1966 (1966-03-17) * column 3, line 66 - column 4, line 13; figure 2 *	1,3,4, 9-11	
X	FR 1 247 226 A (HOMANN WERKE) 25 November 1960 (1960-11-25) * figure 3 *	1,3,4, 8-11	TECHNICAL FIELDS SEARCHED (IPC) F24C
Y	DE 94 11 320 U1 (WHIRLPOOL EUROP [IT]) 8 September 1994 (1994-09-08) * page 4, paragraph 2 - page 5, paragraph 3; figures 1,2,4 *	12	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 February 2014	Verdoodt, Luk

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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12-02-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19522545 A1	11-01-1996	CN 1122996 A	22-05-1996
		DE 19522545 A1	11-01-1996
US 3296417 A	03-01-1967	NONE	
EP 0523324 A2	20-01-1993	AT 142766 T	15-09-1996
		DE 4123425 A1	21-01-1993
		EP 0523324 A2	20-01-1993
		ES 2092590 T3	01-12-1996
		GR 3020991 T3	31-12-1996
DE 1212649 B	17-03-1966	NONE	
FR 1247226 A	25-11-1960	NONE	
DE 9411320 U1	08-09-1994	NONE	

EPO FORM P0459

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