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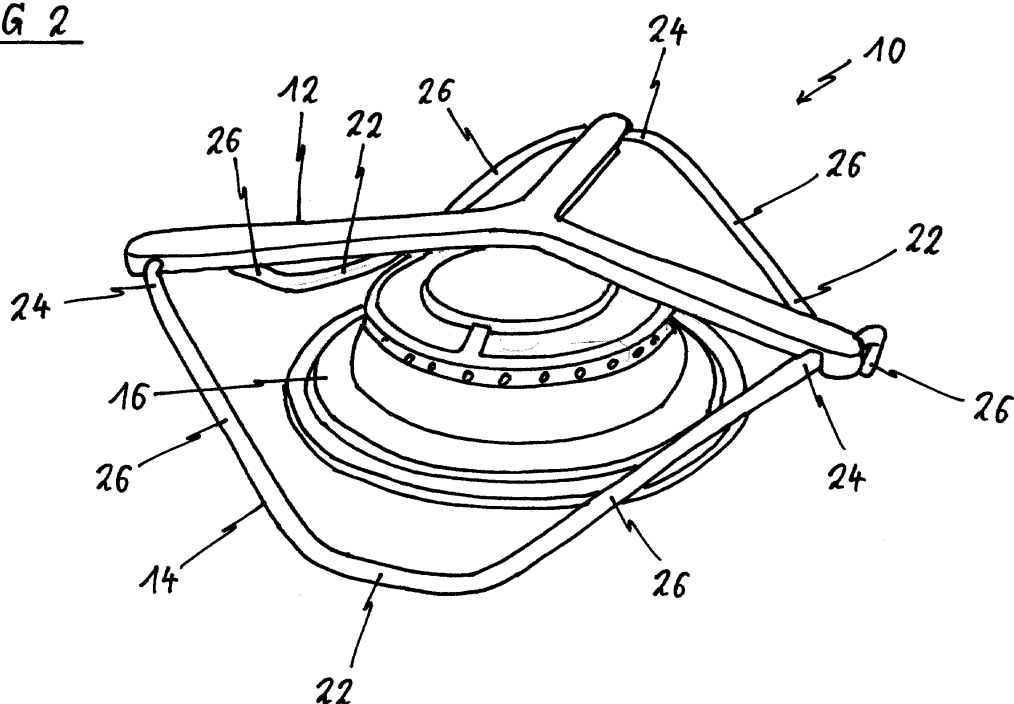
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(54) **PAN SUPPORT DEVICE**

(57) The present invention relates to a pan support device (10) for a gas burner assembly (16) of a gas cooking hob. The pan support device (10) comprises a support part (12) and a frame part (14). The support part (12) forms an upper part of the pan support device (10), while the frame part (14) forms a lower part of said pan support device (10). The support part (12) is provided for supporting a bottom of a cooking utensil. The frame part (14)

is provided for being arranged around the gas burner assembly (16). The support part (12) and the frame part (14) form a single-piece part. The frame part (14) is made of a light metal alloy. The support part (12) is made of a cast metal alloy or a metal matrix composite system. Further, the present invention relates to a gas burner assembly (16) with a pan support device (10). Moreover, the present invention relates to a gas cooking hob.

FIG 2



Description

[0001] The present invention relates to a pan support device for a gas burner assembly of a gas cooking hob. Further, the present invention relates to a gas burner assembly with a pan support device. Moreover, the present invention relates to a gas cooking hob.

[0002] A pan support device for a gas burner assembly of a gas cooking hob is provided for supporting a cooking utility above a flame of the gas burner assembly. Usually, the pan support device is made of stainless steel, porcelain-coated cast iron, porcelain-coated steel, cast iron or chrome-plated steel. The pan support device made of stainless steel is corrosion resistant and a long-life component, but is very expensive. The pan support device made of porcelain-coated cast iron has similar properties as the pan support device made of stainless steel, but comprises thicker rods and is a heavier component. The pan support device made of porcelain-coated steel is also very expensive. The pan support device made of cast iron is usually for charcoal grills. The pan support device made of cast iron must be covered with oil in order to protect it from corrosion. The pan support device made of chrome-plated steel is very cheap, but is a short-life component.

[0003] It is an object of the present invention to provide an improved pan support device having a little weight, a suitable corrosion resistance and a high thermal conductivity.

[0004] The object is achieved by the pan support device according to claim 1.

[0005] According to the present invention a pan support device for a gas burner assembly of a gas cooking hob is provided, wherein

- the pan support device comprises a support part and a frame part,
- the support part forms an upper part of the pan support device, while the frame part forms a lower part of said pan support device,
- the support part is provided for supporting a bottom of a cooking utensil,
- the frame part is provided for being arranged around the gas burner assembly,
- the support part and the frame part form a single-piece part,
- the frame part is made of a light metal alloy, and
- the support part is made of a cast metal alloy or a metal matrix composite system.

[0006] The pan support device is a single-piece part consisting of the support part and the frame part, wherein the support part and the frame part are made of different materials. The materials used for the pan support device allow a small weight, a suitable corrosion resistance and a high thermal conductivity.

[0007] Preferably, the support part includes a grid. The grid covers only a small part of the bottom of the cooking

utensil.

[0008] In particular, the frame part includes a ring provided for enclosing the gas burner assembly.

[0009] For example, the frame part is made of an aluminium alloy, in particular of an aluminium alloy 242.0.

[0010] Further, the support part may be made of cast iron, in particular of cast iron of grade 25 ASTM.

[0011] Alternatively, the support part is made of a metal matrix composite system including a metal matrix and a reinforcing material.

[0012] Preferably, the material of the metal matrix is aluminium, an aluminium alloy, magnesium or a magnesium alloy, while the reinforcing material is a ceramic material, in particular silicon carbide SiC or aluminium oxide Al_2O_3 .

[0013] According to one embodiment, the frame part includes a circular ring and a plurality of vertical rods extending upward from said circular ring, wherein the support part is attached at the upper ends of said vertical rods.

[0014] For example, the frame part includes four vertical rods and the support part is formed as a cross.

[0015] According to another embodiment, the frame part includes a polyangular ring extending in a three-dimensional domain and includes a number of lower portions and upper portions.

[0016] In this case, the support part may be attached at least at a part of the upper portions of the frame part, while at least at a part of the lower portions of the frame part may be provided as pedestals of the pan support device.

[0017] For example, the frame part includes three lower portions and three upper portions, wherein the support part is formed as a three-pointed star and extends within one plane, and wherein preferably the outer ends of said three-pointed star are attached at the upper portions of the frame part.

[0018] Further, the present invention relates to a gas burner assembly with a pan support device, wherein the gas burner assembly comprises or corresponds with a pan support device mentioned above.

[0019] At last, the present invention relates to a gas cooking hob comprising at least one pan support device mentioned above.

[0020] Novel and inventive features of the present invention are set forth in the appended claims.

[0021] The present invention will be described in further detail with reference to the drawing, in which

50 FIG 1 illustrates a schematic perspective view of a pan support device according to a first embodiment of the present invention, and

55 FIG 2 illustrates a schematic perspective view of the pan support device according to a second embodiment of the present invention.

[0022] FIG 1 illustrates a schematic perspective view

of a pan support device 10 according to a first embodiment of the present invention. The pan support device 10 is arranged above a gas burner assembly 16.

[0023] The pan support device 10 is formed as a single-piece part and comprises a support part 12 and a frame part 14. The support part 12 forms an upper part of the pan support device 10, while the frame part 14 forms a lower part of said pan support device 10. The frame part 14 includes a circular ring 18 and four vertical rods 20. The circular ring 18 forms a base portion of the frame part 14. The vertical rods 20 extend upward from the circular ring 18 and perpendicular to the plane of said circular ring 18. The vertical rods 20 are equally distributed on the circular ring 18, i.e. the distances between neighboured vertical rods 20 are equal. The support part 12 is formed as a cross. Each outer end of the support part 12 is connected to a corresponding upper end of the vertical rod 20. The circular ring 18 is provided for the direct contact to a panel of the cooking hob, while the support part 12 is provided for the direct contact to the cooking utensil. In this example, the circular ring 18 and the vertical rods 20 of the frame part 14 and the support part 12 have rectangular and/or square cross-sections.

[0024] The support part 12 is made of a cast metal alloy, for example cast iron of grade 25 ASTM. The frame part 14 is made of a light metal alloy, for example an aluminium alloy 242.0.

[0025] There are two methods for producing the pan support device 10 of the first embodiment. According to a first method the support part 12 or the frame part 14 is casted in a mould during a first cast step. Then, the mould is prepared for a second cast step. During the second cast step, the frame part 14 or the support part 12, respectively, is casted in the mould. Once the support part 12 and the frame part 14 are cooled down, they remain attached to each other without any further treatment. According to a second method the support part 12 and the frame part 14 are casted separately. The support part 12 and the frame part 14 are treated thermally in order to exploit the deformation as a result of the thermal expansion. Then, the support part 12 and the frame part 14 are assembled. When the support part 12 and the frame part 14 are cooled down, then a shrink fitting occurs.

[0026] The temperature at the contact points of the support part 12 and the flame is about 700°C, while the temperature of the flame is about 980°C. The pan support device 10 of the first embodiment allows a significant weight reduction to about 70 % compared to conventional devices.

[0027] FIG 2 illustrates a schematic perspective view of the pan support device 10 according to a second embodiment of the present invention. The pan support device 10 is arranged above the gas burner assembly 16.

[0028] The pan support device 10 comprises the support part 12 and the frame part 14. The support part 12 forms the upper part of the pan support device 10, while the frame part 14 forms the lower part of said pan support device 10. The frame part 14 of the second embodiment

is a polyangular ring extending in a three-dimensional domain. In this example, the frame part 14 includes three lower portions 22, three upper portions 24 and six intermediate portions 26. The lower portions 22 of the frame part 14 are provided for the direct contact to the panel of the cooking hob, while the upper portions 24 of the frame part 14 are provided for a connection to the act to the support part 12. The support part 12 is formed as a three-pointed star and extends within one plane. Each outer end of the support part 12 is in contact to one of the upper portions 24 of the frame part 14. The support part 12 is provided for the direct contact to the cooking utensil. In this example, the polyangular ring of the frame part 14 has a circular cross-section.

[0029] The support part 12 of the second embodiment is made of a metal matrix composite system. The metal matrix composite system consists of a metal matrix and a reinforcing material. In this example, the material of the metal matrix is aluminium, an aluminium alloy, magnesium or a magnesium alloy, while the reinforcing material is silicon carbide SiC or aluminium oxide Al_2O_3 . The metal matrix made of the materials mentioned above allows a lightweight support part 12. The discontinuous ceramic reinforcing materials increase the performance of the matrix in terms of mechanical properties such as tensile strength and Young modulus. Further, the discontinuous ceramic reinforcing materials increase the performance of the matrix in terms of thermal properties, in particular the thermal conductivity. The support part 12 of the second embodiment may be produced by fusion infiltration, extrusion, forging, die casting, gravity die casting and squeeze casting.

[0030] The frame part 14 is made of an aluminium alloy, so that the frame part 14 matches the support part 12 in view of the thermal expansion coefficient. The matched thermal expansion coefficient allows the assembling of the support part 12 and the frame part 14 without any difficulty. The support part 12 and the frame part 14 may be assembled by screwing, snapping and/or gluing. The support part 12 and the frame part 14 may be assembled either temporarily or permanently. For example, the support part 12 and the frame part 14 may be assembled by the user or a technician.

[0031] The temperature at the contact points of the support part 12 and the flame is about 700°C, while the temperature of the flame is about 980°C. These temperatures are above the melting temperatures of the materials of the metal matrix. With a suitable thermal conductivity, cross-section and geometric shape, the support part 12 reaches a temperature of about 450°C, which is clearly below the melting temperature. The metal matrix composite system of the support part 12 has a thermal conductivity of about 160 W/(m*K), which is about three times higher than the thermal conductivity of cast iron being about 46 W/(m*K). The density of the metal matrix composite system is about 3.5 g/cm³, while the density of the cast iron is about 7.2 g/cm³. The yield stress limit of the metal matrix composite system is about 290 MPa,

while the yield stress limit of cast iron is about between 100 MPa and 130 MPa.

[0032] The pan support device 10 according to the present invention allows a higher efficiency of the gas burner assembly, since the heat transfer from the flames of said gas burner assembly to the cooking vessel is improved. The user can easier handle the pan support device 10 of the present invention, since the weight of said pan support device 10 is relative lightweight. The inventive pan support device 10 is corrosion resistant. The pan support device 10 according to the present invention allows an increased flexibility of the parameters for the design of the gas cooking hob. For example, the heat distribution, the layout of the gas burner assembly 10 and the geometric properties of the gas cooking hob are variable within a wide range.

[0033] Although illustrative embodiments of the present invention have been described herein with reference to the accompanying drawings, it is to be understood that the present invention is not limited to those precise embodiments, and that various other changes and modifications may be affected therein by one skilled in the art without departing from the scope or spirit of the invention. All such changes and modifications are intended to be included within the scope of the invention as defined by the appended claims.

List of reference numerals

[0034]

- 10 pan support device
- 12 support part
- 14 frame part
- 16 gas burner assembly
- 18 circular ring
- 20 vertical rod
- 22 lower portion
- 24 upper portion
- 26 intermediate portion

Claims

1. A pan support device (10) for a gas burner assembly (16) of a gas cooking hob, wherein
 - the pan support device (10) comprises a support part (12) and a frame part (14),
 - the support part (12) forms an upper part of the pan support device (10), while the frame part (14) forms a lower part of said pan support device (10),
 - the support part (12) is provided for supporting a bottom of a cooking utensil,
 - the frame part (14) is provided for being arranged around the gas burner assembly (16),
 - the support part (12) and the frame part (14)

form a single-piece part,

- the frame part (14) is made of a light metal alloy, and

- the support part (12) is made of a cast metal alloy or a metal matrix composite system.

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2. The pan support device according to claim 1, **characterised in that** the support part (12) includes a grid.
3. The pan support device according to claim 1 or 2, **characterised in that** the frame part (14) includes a ring provided for enclosing the gas burner assembly (16).
4. The pan support device according to any one of the preceding claims, **characterised in that** the frame part (14) is made of an aluminium alloy, in particular of an aluminium alloy 242.0.
5. The pan support device according to any one of the preceding claims, **characterised in that** the support part (12) is made of cast iron, in particular of cast iron of grade 25 ASTM.
6. The pan support device according to any one of the claims 1 to 4, **characterised in that** the support part (12) is made of a metal matrix composite system including a metal matrix and a reinforcing material.
7. The pan support device according to claim 6, **characterised in that** the material of the metal matrix is aluminium, an aluminium alloy, magnesium or a magnesium alloy.
8. The pan support device according to claim 6 or 7, **characterised in that** the reinforcing material is a ceramic material, in particular silicon carbide (SiC) or aluminium oxide (Al₂O₃).
9. The pan support device according to any one of the preceding claims, **characterised in that** the frame part (14) includes a circular ring (18) and a plurality of vertical rods (20) extending upward from said circular ring (18), wherein preferably the support part (12) is attached at the upper ends of said vertical rods (20).
10. The pan support device according to claim 9, **characterised in that** the frame part (14) includes four vertical rods (20) and the support part (12) is formed as a cross.

11. The pan support device according to any one of the claims 1 to 8,
characterised in that
the frame part (14) includes a polyangular ring extending in a three-dimensional domain and includes a number of lower portions (22) and upper portions (24). 5
12. The pan support device according to claim 11,
characterised in that 10
the support part (12) is attached at least at a part of the upper portions (24) of the frame part (20), while at least a part of the lower portions (22) of the frame part (20) is provided as pedestals of the pan support device (10). 15
13. The pan support device according to claim 12,
characterised in that
the frame part (14) includes three lower portions (22) and three upper portions (24), wherein the support part (12) is formed as a three-pointed star and extends within one plane, and wherein preferably the outer ends of said three-pointed star are attached at the upper portions (24) of the frame part (20). 20 25
14. A gas burner assembly (16) for a gas cooking hob,
characterised in that
the gas burner assembly (16) comprises or corresponds with a pan support device (10) according to any one of the claims 1 to 13. 30
15. A gas cooking hob comprising at least one gas burner assembly (16),
characterised in that
the gas cooking hob comprises at least one pan support device (10) according to any one of the claims 1 to 13. 35

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FIG 1

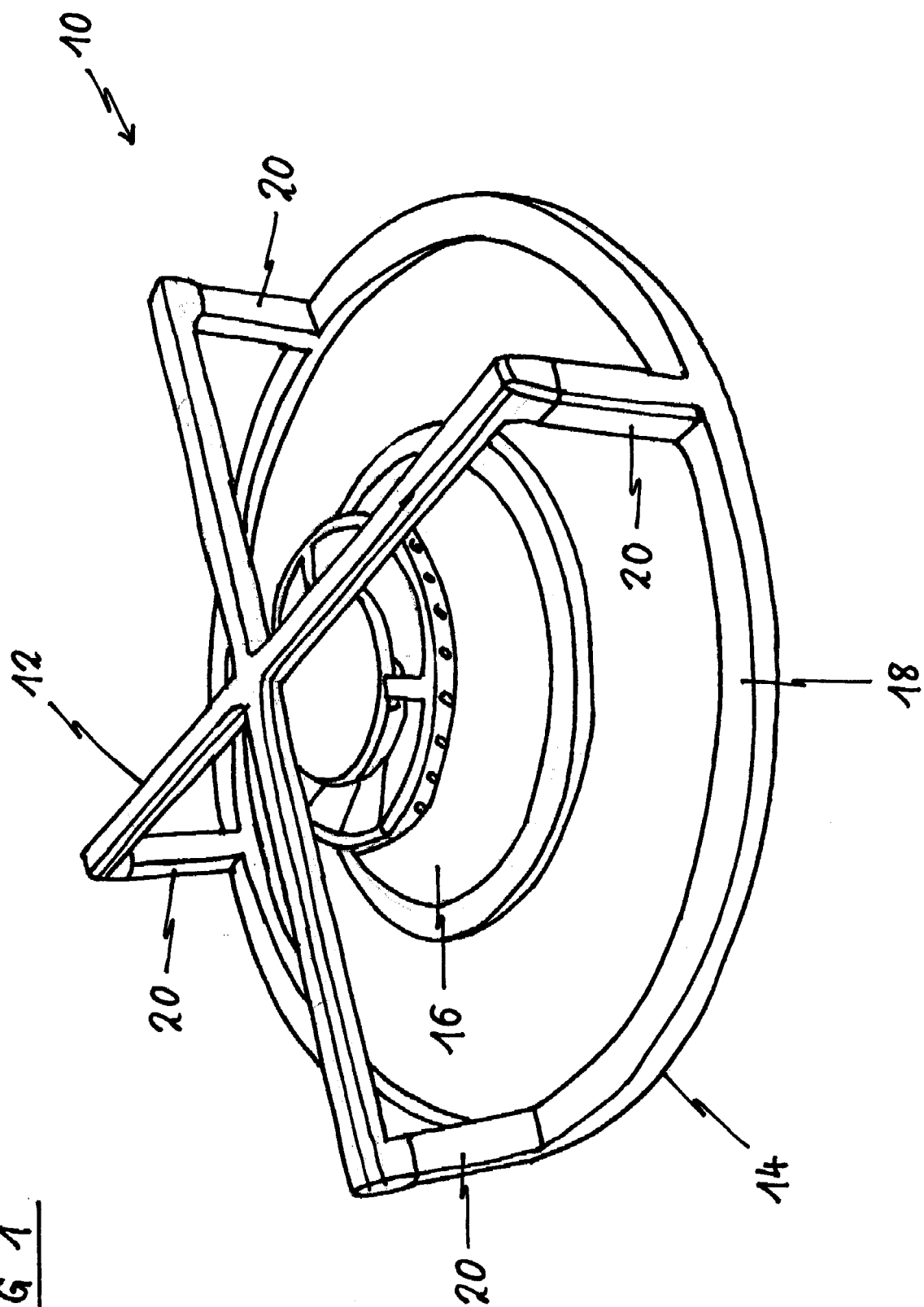
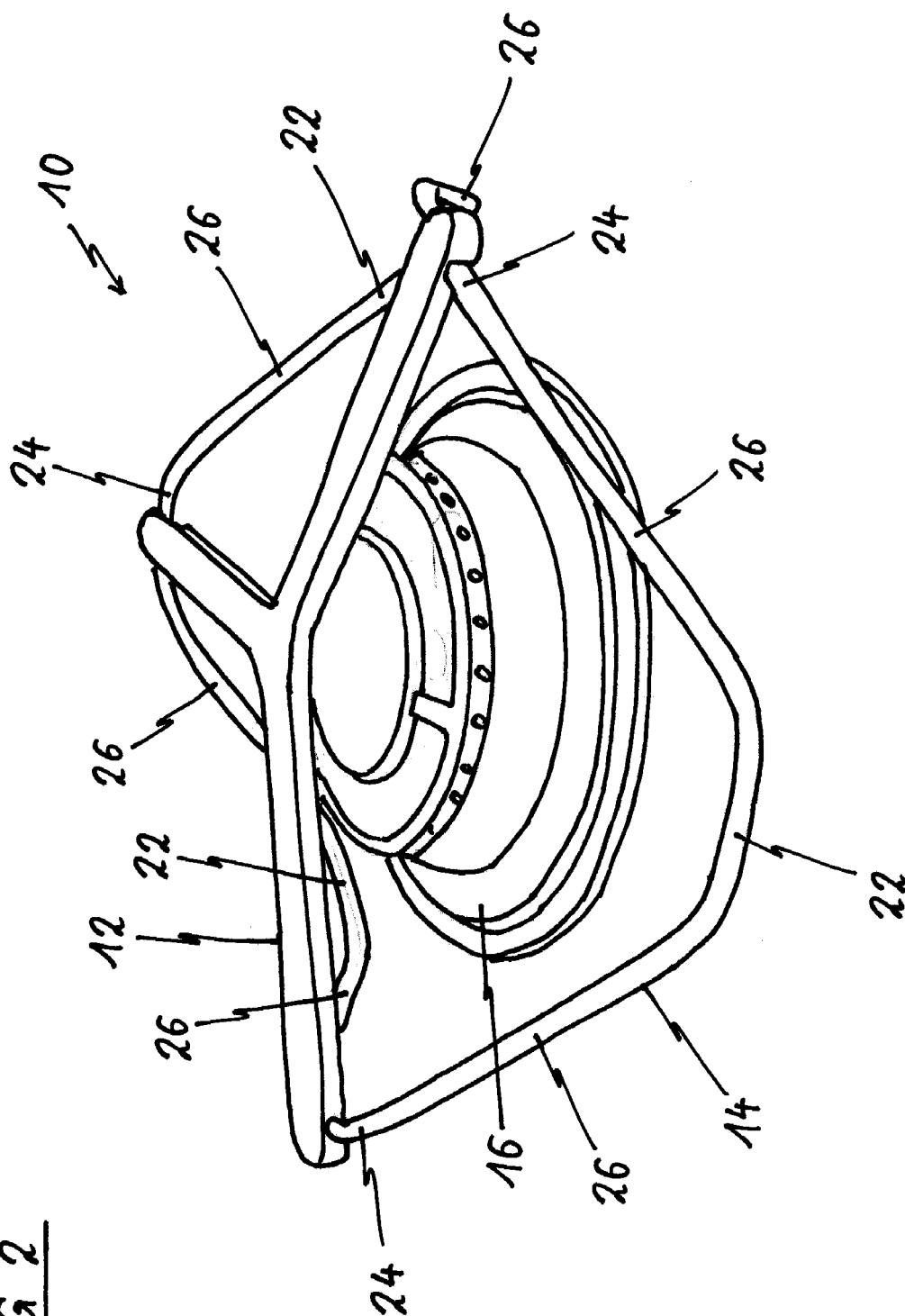


FIG 2





EUROPEAN SEARCH REPORT

 Application Number
 EP 15 19 7203

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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	US 2011/095146 A1 (KING SCOTT [AU] ET AL) 28 April 2011 (2011-04-28)	1,2,4,5, 9,10,14, 15	INV. F24C15/10
Y	* the whole document *	3,6-8, 11-13	
Y	DE 10 2012 205466 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 10 October 2013 (2013-10-10) * the whole document *	3,11-13	
Y	JP H07 190387 A (MATSUSHITA ELECTRIC IND CO LTD) 28 July 1995 (1995-07-28) * the whole document *	3,11-13	
Y	US 2009/127246 A1 (HENDRICKS DONALD [US] ET AL) 21 May 2009 (2009-05-21) * the whole document *	6-8	
Y	US 2007/272231 A1 (AMBROSE JEFFREY A [US]) 29 November 2007 (2007-11-29) * the whole document *	6-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			F24C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 9 February 2016	Examiner Makúch, Milan
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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

EP 15 19 7203

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011095146 A1	28-04-2011	AU 2009231233 A1	08-10-2009
		BR PI0910071 A2	29-12-2015
		CA 2718563 A1	08-10-2009
		CN 101978217 A	16-02-2011
		EP 2286152 A1	23-02-2011
		RU 2010145168 A	20-05-2012
		US 2011095146 A1	28-04-2011
		WO 2009121598 A1	08-10-2009

DE 102012205466 A1	10-10-2013	DE 102012205466 A1	10-10-2013
		WO 2013150004 A1	10-10-2013

JP H07190387 A	28-07-1995	NONE	

US 2009127246 A1	21-05-2009	US 2009127246 A1	21-05-2009
		WO 2009062815 A2	22-05-2009

US 2007272231 A1	29-11-2007	CA 2653325 A1	31-01-2008
		US 2007272231 A1	29-11-2007
		US 2010059041 A1	11-03-2010
		WO 2008013596 A2	31-01-2008
