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(54) **PAN SUPPORT DEVICE**

TOPFTRÄGER

SUPPORT DE RÉCIPIENT

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Description

[0001] The present invention relates to a pan support device for a gas burner assembly of a gas cooking hob according to the preamble of claim 1. 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] US 2011/0095146 A1 discloses a pan support device comprising a first bar and one or more transverse bars. At the end of each bar a footing is attached, wherein said footing extends downwardly. The footing is fastened by a screw at the end of the bar. A tubular shell of the footing may be made of stainless steel, aluminium or glass. The bar may be made of cast iron.

[0004] DE 10 2012 205 466 A1 discloses a pan support device including a pan support frame. Said pan support frame forms a base. Further, the pan support frame includes portions bent upwards. From the tops of said portions horizontal protrusions extend inwardly and form the proper support area.

[0005] JP H07-190387 A discloses a pan support device formed as a polyangular ring extending in a three-dimensional domain. Said polyangular ring is made of one sheet of a steel plate. The polyangular ring is formed after having punched the steel plate. According to an example, the pan support device includes five lower portions and five upper portions.

[0006] 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.

[0007] The object is achieved by the pan support device according to claim 1.

[0008] According to the present invention the support part and the frame part form a single-piece part, wherein the support part is made of a metal matrix composite system including a metal matrix and a reinforcing material, and wherein the material of the metal matrix is aluminium, an aluminium alloy, magnesium or a magnesium

alloy, and wherein the reinforcing material is a ceramic material.

[0009] 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.

[0010] Preferably, the support part includes a grid. The grid covers only a small part of the bottom of the cooking utensil.

[0011] In particular, the frame part includes a ring provided for enclosing the gas burner assembly.

[0012] According to the present invention the frame part is made of an aluminium alloy, in particular of an aluminium alloy 242.0.

[0013] Alternatively, the support part may be made of cast iron, in particular of cast iron of grade 25 ASTM.

[0014] According to the present invention the support part is made of a metal matrix composite system including a metal matrix and a reinforcing material, wherein 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 Al₂O₃.

[0015] 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.

[0016] For example, the frame part includes four vertical rods and the support part is formed as a cross.

[0017] 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.

[0018] 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.

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.

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

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

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

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

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

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

[0019] 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.

[0020] 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.

[0021] 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.

[0022] 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.

[0023] 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.

[0024] 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.

[0025] 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.

[0026] 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 Al₂O₃. 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.

[0027] 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.

[0028] 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.

[0029] 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.

List of reference numerals

[0030]

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), and
 - the frame part (14) is made of an aluminium

alloy,

characterised in that

the support part (12) and the frame part (14) form a single-piece part, wherein the support part (12) is made of a metal matrix composite system including a metal matrix and a reinforcing material, and wherein the material of the metal matrix is aluminium, an aluminium alloy, magnesium or a magnesium alloy, and wherein the reinforcing material is a ceramic material.

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 242.0.
5. The pan support device according to any one of the preceding claims, **characterised in that** the reinforcing material is silicon carbide (SiC) or aluminium oxide (Al₂O₃).
6. 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).
7. The pan support device according to claim 6, **characterised in that** the frame part (14) includes four vertical rods (20) and the support part (12) is formed as a cross.
8. The pan support device according to any one of the claims 1 to 5, **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).
9. The pan support device according to claim 8, **characterised in that** 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).

10. The pan support device according to claim 9, **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).
11. A gas burner assembly (16) for a gas cooking hob, **characterised in that** the gas burner assembly (16) comprises a pan support device (10) according to any one of the claims 1 to 10.
12. 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 10.

Patentansprüche

1. Topfträger (10) für eine Gasbrenneranordnung (16) eines Gaskochfelds, wobei
- der Topfträger (10) ein Trägerteil (12) und ein Rahmenteil (14) umfasst,
 - das Trägerteil (12) ein Oberteil des Topfträgers (10) bildet, während das Rahmenteil (14) ein Unterteil des Topfträgers (10) bildet,
 - das Trägerteil (12) zum Tragen eines Bodens eines Kochutensils bereitgestellt wird,
 - das Rahmenteil (14) bereitgestellt wird, so dass es um die Gasbrenneranordnung (16) herum angeordnet ist, und
 - das Rahmenteil (14) aus einer Aluminiumlegierung gefertigt ist,
- dadurch gekennzeichnet, dass** das Trägerteil (12) und das Rahmenteil (14) ein einstückiges Teil bilden, wobei das Trägerteil (12) aus einem Metallmatrixverbundsystem gefertigt ist, das eine Metallmatrix und ein Verstärkungsmaterial einschließt, und wobei das Material der Metallmatrix Aluminium, eine Aluminiumlegierung, Magnesium oder eine Magnesiumlegierung ist, und wobei das Verstärkungsmaterial ein Keramikmaterial ist.
2. Topfträger nach Anspruch 1, **dadurch gekennzeichnet, dass**

das Trägerteil (12) ein Gitter einschließt.

3. Topfträger nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** das Rahmenteil (14) einen Ring einschließt, der zum Umschließen der Gasbrenneranordnung (16) bereitgestellt wird.
4. Topfträger nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Rahmenteil (14) aus einer Aluminiumlegierung 242.0 gefertigt ist.
5. Topfträger nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Verstärkungsmaterial Siliciumcarbid (SiC) oder Aluminiumoxid (Al₂O₃) ist.
6. Topfträger nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Rahmenteil (14) einen Kreisring (18) und eine Vielzahl vertikaler Stäbe (20) einschließt, die sich von dem Kreisring (18) aus aufwärts erstrecken, wobei das Trägerteil (12) vorzugsweise an den oberen Enden der vertikalen Stäbe (20) befestigt ist.
7. Topfträger nach Anspruch 6, **dadurch gekennzeichnet, dass** das Rahmenteil (14) vier vertikale Stäbe (20) einschließt und das Trägerteil (12) als Kreuz gebildet ist.
8. Topfträger nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** das Rahmenteil (14) einen vieleckigen Ring einschließt, der sich in einen dreidimensionalen Bereich erstreckt und eine Anzahl von unteren Abschnitten (22) und oberen Abschnitten (24) einschließt.
9. Topfträger nach Anspruch 8, **dadurch gekennzeichnet, dass** das Trägerteil (12) an mindestens einem Teil der oberen Abschnitte (24) des Rahmenteils (20) befestigt ist, während mindestens ein Teil der unteren Abschnitte (22) des Rahmenteils (20) als Sockel des Topfträgers (10) bereitgestellt wird.
10. Topfträger nach Anspruch 9, **dadurch gekennzeichnet, dass** das Rahmenteil (14) drei untere Abschnitte (22) und drei obere Abschnitte (24) einschließt, wobei das Trägerteil (12) als Dreizackstern gebildet ist und sich innerhalb einer Ebene erstreckt, und wobei die äußeren Enden des Dreizacksterns an den oberen Abschnitten (24) des Rahmenteils (20) befestigt sind.

11. Gasbrenneranordnung (16) für ein Gaskochfeld, **dadurch gekennzeichnet, dass** die Gasbrenneranordnung (16) einen Topfträger (10) gemäß einem der Ansprüche 1 bis 10 umfasst.
12. Gaskochfeld, umfassend mindestens eine Gasbrenneranordnung (16), **dadurch gekennzeichnet, dass** das Gaskochfeld mindestens einen Topfträger (10) nach einem der Ansprüche 1 bis 10 umfasst.

Revendications

1. Dispositif de support de récipient de cuisson (10) pour un ensemble de brûleur au gaz (16) d'une plaque de cuisson au gaz, dans lequel:

le dispositif de support de récipient de cuisson (10) comprend une partie de support (12) et une partie de cadre (14),
la partie de support (12) forme une partie supérieure du dispositif de support de récipient de cuisson (10), alors que la partie de cadre (14) forme une partie inférieure dudit dispositif de support de récipient de cuisson (10),
la partie de support (12) est prévue pour supporter un fond d'un ustensile de cuisson,
la partie de cadre (14) est prévue pour être agencée autour de l'ensemble de brûleur au gaz (16),
et
la partie de cadre (14) est constituée d'un alliage d'aluminium,
caractérisé en ce que la partie de support (12) et la partie de cadre (14) forment une partie d'une seule pièce, dans lequel la partie de support (12) est constituée d'un système composite de matrice métallique comprenant une matrice métallique et un matériau de renforcement, et dans lequel le matériau de la matrice métallique est l'aluminium, un alliage d'aluminium, le magnésium ou un alliage de magnésium, et dans lequel le matériau de renforcement est un matériau céramique.

2. Dispositif de support de récipient de cuisson selon la revendication 1, **caractérisé en ce que** la partie de support (12) comprend une grille.
3. Dispositif de support de récipient de cuisson selon la revendication 1 ou 2, **caractérisé en ce que** la partie de cadre (14) comprend un anneau qui est prévu pour entourer l'ensemble de brûleur au gaz (16).
4. Dispositif de support de récipient de cuisson selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la partie de cadre (14) est

constituée d'un alliage d'aluminium 242.0.

5. Dispositif de support de récipient de cuisson selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le matériau de renforcement est le carbure de silicium (SiC) ou l'oxyde d'aluminium (Al₂O₃).
6. Dispositif de support de récipient de cuisson selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la partie de cadre (14) comprend un anneau circulaire (18) et une pluralité de tiges verticales (20) qui s'étendent vers le haut à partir dudit anneau circulaire (18), dans lequel de préférence la partie de support (12) est attachée aux extrémités supérieures desdites tiges verticales (20).
7. Dispositif de support de récipient de cuisson selon la revendication 6, **caractérisé en ce que** la partie de cadre (14) comprend quatre tiges verticales (20), et la partie de support (12) est en forme de croix.
8. Dispositif de support de récipient de cuisson selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** la partie de cadre (14) comprend un anneau poly-angulaire qui s'étend dans un domaine en trois dimensions et comprend un certain nombre de parties inférieures (22) et de parties supérieures (24).
9. Dispositif de support de récipient de cuisson selon la revendication 8, **caractérisé en ce que** la partie de support (12) est attachée à au moins une partie des parties supérieures (24) de la partie de cadre (20) alors qu'au moins une partie des parties inférieures (22) de la partie de cadre (20) est prévue sous la forme de piédestaux du dispositif de support de récipient de cuisson (10).
10. Dispositif de support de récipient de cuisson selon la revendication 9, **caractérisé en ce que** la partie de cadre (14) comprend trois parties inférieures (22) et trois parties supérieures (24), dans lequel la partie de support (12) est formée comme une étoile à trois branches et s'étend à l'intérieur d'un plan, et dans lequel de préférence les extrémités extérieures de ladite étoile à trois branches sont attachées aux parties supérieures (24) de la partie de cadre (20).
11. Ensemble de brûleur au gaz (16) pour une plaque de cuisson au gaz, **caractérisé en ce que** l'ensemble de brûleur au gaz (16) comprend un dispositif de support de récipient de cuisson (10) selon l'une quelconque des revendications 1 à 10.
12. Plaque de cuisson au gaz comprenant au moins un ensemble de brûleur au gaz (16), **caractérisée en**

ce que la plaque de cuisson au gaz comprend au moins un dispositif de support de récipient de cuisson (10) selon l'une quelconque des revendications 1 à 10.

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FIG 1

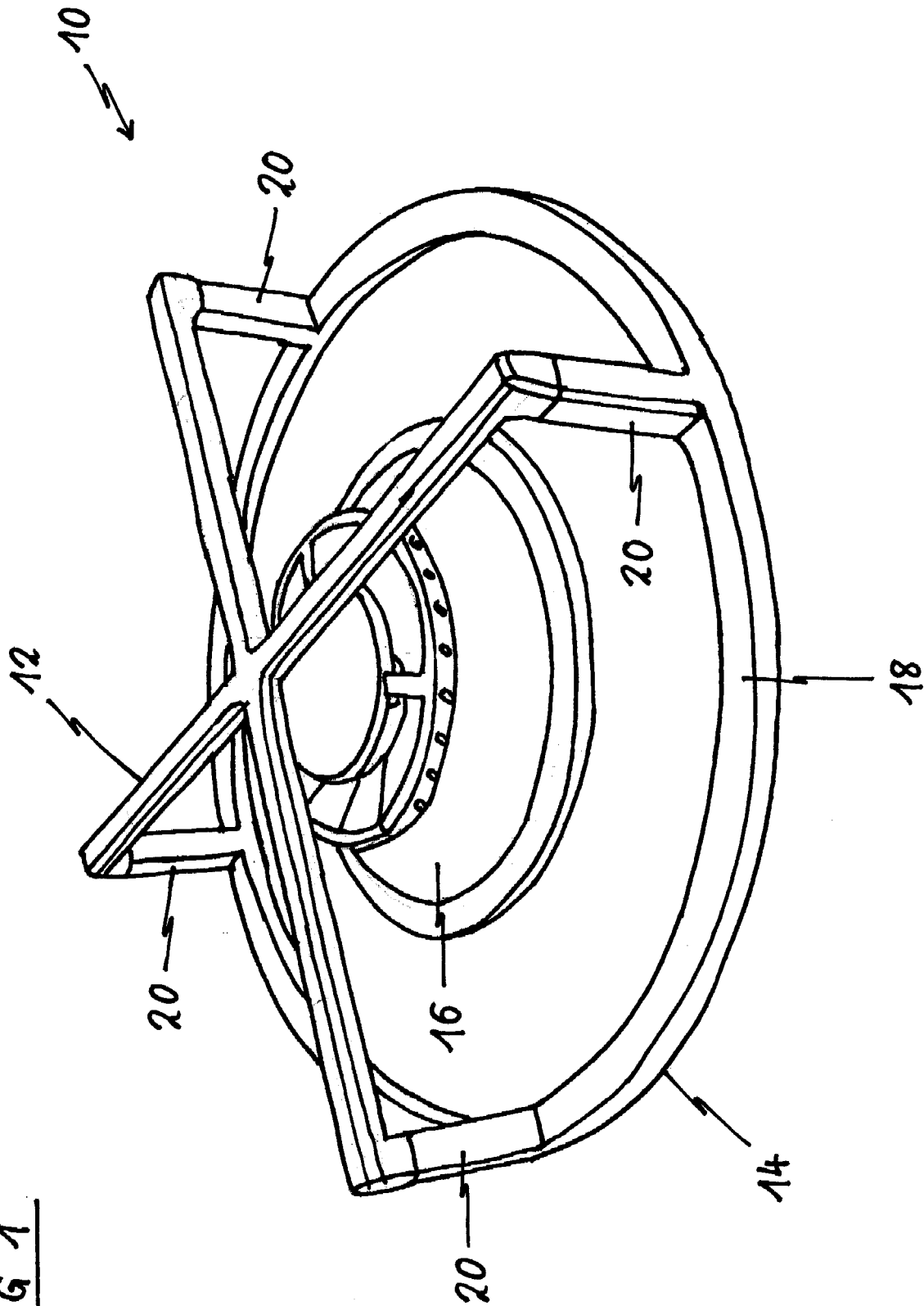
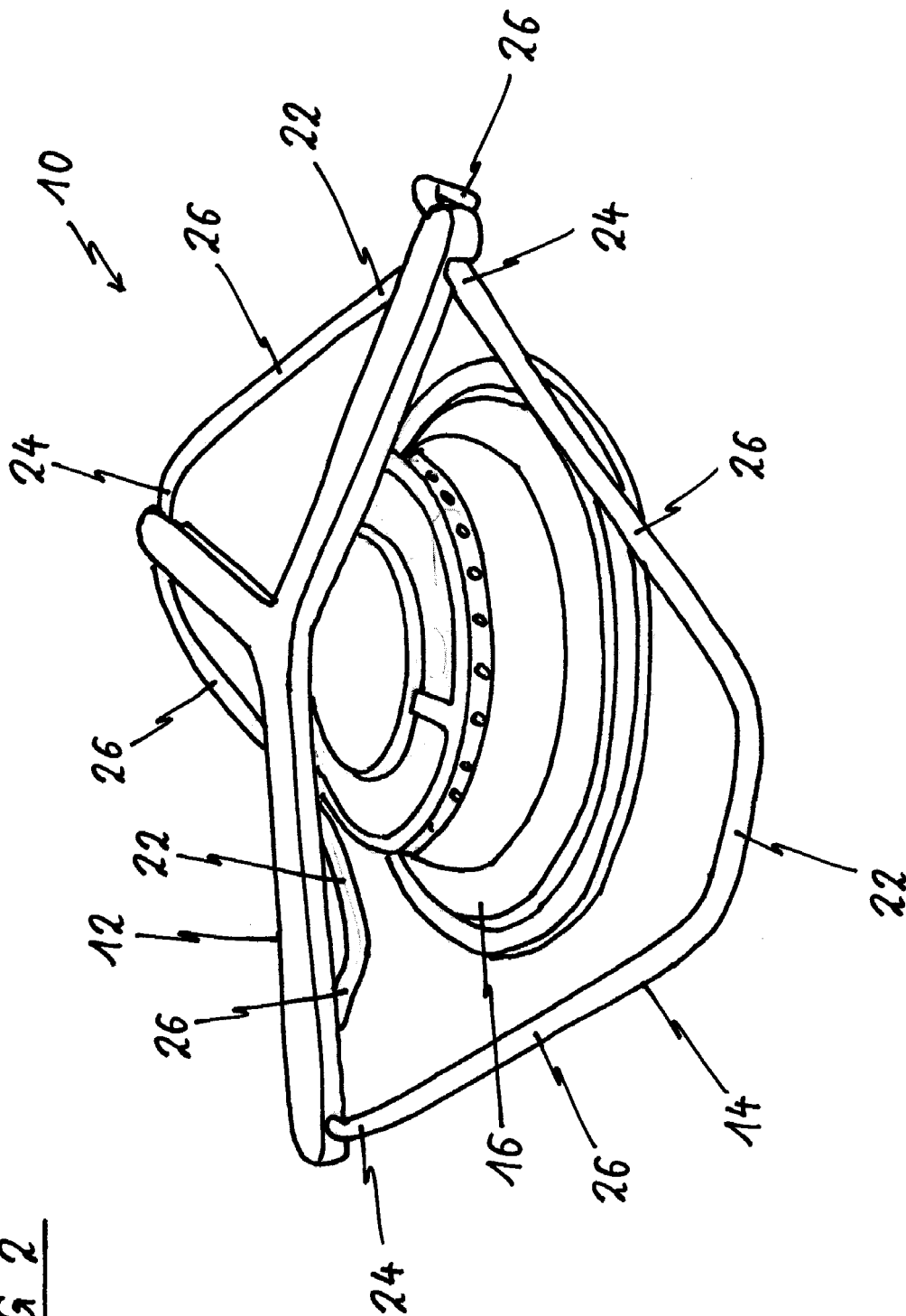


FIG 2



REFERENCES CITED IN THE DESCRIPTION

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