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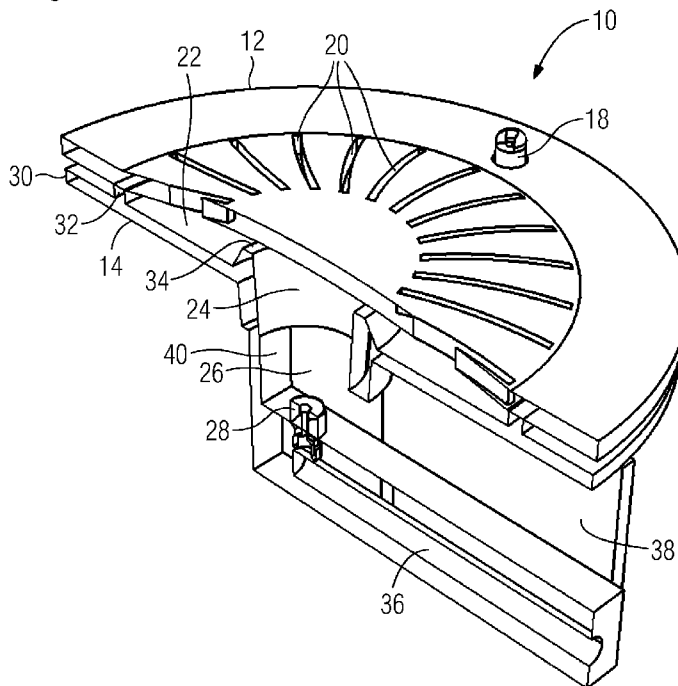
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[Continued on next page]

(54) Title: A GAS BURNER ASSEMBLY

FIG 7



(57) Abstract: A gas burner assembly (10), in particular for a gas cooking hob, comprising a burner cap (12) and a burner body (14). The burner cap (12) is arranged or ar-rangeable upon the burner body (14). The burner cap (12) includes a plurality of flame ports (20). The flame ports (20) are formed within a horizontal portion or within a substantially horizontal portion of the burner cap (12). The burner body (14) includes a mixing chamber (22), a Venturi pipe (24), at least one air inlet (26), a gas injector (28) and a gas supply channel (36). At least the mixing chamber (22), the Venturi pipe (24), the at least one air inlet (26) and the gas supply channel (36) form a single-piece part. The flame ports (20) of the burner cap (12) are arranged above the mixing chamber (22) of the burner body (14), when the burner cap (12) is arranged upon the burner body (14).

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DescriptionA gas burner assembly

The present invention relates to a gas burner assembly, in particular for a gas cooking hob. Further, the present invention relates to a gas cooking hob comprising at least one gas burner assembly.

A conventional gas burner assembly is composed of a number of components. Usually, the gas burner assembly comprises a gas injector, a Venturi pipe, a burner body, a flame spreader, a thermocouple element and a spark plug element. Further, the gas burner assembly requires a holding element for the gas injector. Moreover, the gas burner assembly requires connecting elements and/or fastening elements for fixing the components. For example, the holding element for the gas injector has to be connected to the burner body. Further, the thermocouple element and the spark plug element have to be fastened to the burner body. Such a gas burner assembly includes a high number of components and is therefore very expensive.

The flame spreader is often made of enamelled steel, which impairs a good gas flow and is relative expensive. Moreover, a change of the gas injector requires usually the disassembling of the cooking appliance.

It is an object of the present invention to provide a gas burner assembly with an improved gas flow and a reduced number of components.

The object is achieved by the gas burner assembly according to claim 1.

According to the present invention the gas burner assembly, in particular for a gas cooking hob, comprises a burner cap and a burner body, wherein

- the burner cap is arranged or arrangeable upon the burner body,
- the burner cap includes a plurality of flame ports,
- the flame ports are formed within a horizontal portion or within a substantially horizontal portion of the burner cap,
- the burner body includes a mixing chamber, a Venturi pipe, at least one air inlet, a gas injector and a gas supply channel,
- at least the mixing chamber, the Venturi pipe, the at least one air inlet and the gas supply channel form a single-piece part, and
- the flame ports of the burner cap are arranged above the mixing chamber of the burner body, when the burner cap is arranged upon the burner body.

The core of the present invention is that the flame ports are formed within the at least substantially horizontal portion of the burner cap and arranged above the mixing chamber of the burner body on the one hand and that the burner body with the mixing chamber, the Venturi pipe, the at least one air inlet forms a single-piece part on the other hand. The gas injector may be formed either as an integrated part burner body or as a separate part. In the latter case, the gas injector may be attached at the burner body by a screw thread or a plug connection, for example. The arrangement of the flame ports within the at least substantially horizontal portion of the burner cap and above the mixing chamber of the burner body improves the gas flow. The formation of the burner body with the mixing chamber, the Venturi pipe, the at least one air inlet and the gas injector as single-piece part reduces the number of components and the production costs. The arrangement of the gas injector at the

burner body allows a change of said gas injector without disassembling the cooking appliance. The constellation of the gas burner assembly allows that the burner cap may be flush with a cooking surface of the gas cooking hob.

Preferably, the burner cap is made of cast iron. In particular, the burner cap is made by a sintering process. The sintered cast iron allows high quality and very good tolerances.

According to an embodiment of the present invention, the burner cap is formed as a circular disk.

Further, the burner cap may include at least one convex portion, wherein the flame ports are formed within said convex portion. Thus, the flame ports are formed within an inclined plane.

For example, the flame ports are formed as elongated slots extending along radial directions.

Preferably, the burner body is made of aluminium.

In particular, the Venturi pipe extends vertically downwards from the mixing chamber.

Further, the gas injector may be arranged below the Venturi pipe.

Moreover, the at least one air inlet is arranged between the gas injector and the Venturi pipe.

According to a preferred embodiment of the present invention, the burner body includes a base plate, an outer circumferential wall and an inner circumferential wall, wherein the mixing cham-

ber is arranged between the outer circumferential wall and the inner circumferential wall.

In particular, the outer circumferential wall and inner circumferential wall of the burner body extend upward from the base plate of said burner body.

Further, the gas burner assembly may comprise at least one thermocouple element.

Additionally, the gas burner assembly may comprise at least one spark plug element.

At last, the present invention relates to a gas cooking hob comprising at least one gas burner assembly 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 gas burner assembly according to a preferred embodiment of the present invention,

FIG 2 illustrates a schematic perspective view of the gas burner assembly according to the preferred embodiment of the present invention, wherein a burner cap is removed,

FIG 3 illustrates a schematic top view of the gas burner assembly according to the preferred embodiment of the present invention,

FIG 4 illustrates a schematic top view of the gas burner assembly according to the preferred embodiment of the present invention, wherein the burner cap is removed,

FIG 5 illustrates a further schematic perspective view of the gas burner assembly according to the preferred embodiment of the present invention,

FIG 6 illustrates a schematic sectional side view of the gas burner assembly according to the preferred embodiment of the present invention, and

FIG 7 illustrates a schematic sectional perspective view of the gas burner assembly according to the preferred embodiment of the present invention.

FIG 1 illustrates a schematic perspective view of a gas burner assembly 10 according to a preferred embodiment of the present invention. The gas burner assembly 10 comprises a burner cap 12, a burner body 14, a thermocouple element 16 and a spark plug element 18. The burner cap 12 is arranged above the burner body 14.

The burner cap 12 is formed as a substantially flat circular disk. In this example, a central portion of the burner cap 12 is convex. In particular, the burner cap 12 is made of cast iron. Preferably, the burner cap 12 is made by a sintering process. Said sintering process allows high quality and very good tolerances. The burner cap 12 includes a plurality of flame ports 20. In this example, the flame ports 20 are formed as slots, wherein said slots extend along radial directions in view of the circular burner cap 12. In general, the flame ports 20 may have different shapes. For example, the flame ports 20 may be round holes, long holes and/or squares. In this example, the flame

ports 20 are formed within the convex central portion of the burner cap 12. The burner cap 12 or at least the portion of the flame ports 20 acts as a flame spreader.

The thermocouple element 16 penetrates an outer portion of the burner cap 12. The thermocouple element 16 is arranged out of the flame ports 20, but in contact with the flames. The spark plug element 18 penetrates an outer portion of the burner cap 12. The spark plug element 18 is arranged out of the flame ports 20.

The burner body 14 includes an elongated gas supply channel 36 in its lower portion. The gas supply channel 36 is arranged between two vertical support panels 38 of said burner body 14. The planes of the vertical support panels 38 extend parallel to the longitudinal axis of the gas supply channel 36. The gas supply channel 36 extends horizontally from the border to the centre of the burner body 14.

FIG 2 illustrates a schematic perspective view of the gas burner assembly 10 according to the preferred embodiment of the present invention, wherein the burner cap 12 is removed. In particular, FIG 2 clarifies the structure of the burner body 14.

The burner body 14 includes a mixing chamber 22, a Venturi pipe 24, one or more primary air inlets 26 and a gas injector 28. The bottom and the side wall of the mixing chamber 22 are formed by a portion of the burner body 14, while the top side of said mixing chamber 22 is formed by the central portion of the burner cap 12. In this example, the mixing chamber 22 has the form of an outer portion of a flat cylinder. The Venturi pipe 24 extends vertically downwards from the centre of the mixing chamber 22. The gas injector 28 is arranged below the Venturi pipe 24. The one or more primary air inlets 26 are arranged between the gas

injector 28 and the Venturi pipe 24. The burner body 14 with the mixing chamber 22, the Venturi pipe 24, the one or more primary air inlets 26 and the gas supply channel 36 is formed as a single-piece part. In this example, the gas injector 28 is formed either as a separate part. The gas injector 28 may be attached at the gas supply channel 36 by a screw thread or a plug connection. Alternatively, the gas injector 28 may be formed either as an integrated part of the burner body 14 and/or gas supply channel 36. Preferably, the burner body 14 with the mixing chamber 22, the Venturi pipe 24, the one or more primary air inlets 26, the gas injector 28, the gas supply channel 36 and the support panels 38 is made of aluminium.

In this example, the burner body 14 includes a base plate 30, an outer circumferential wall 32 and an inner circumferential wall 34. The base plate 30 extends horizontally. The outer circumferential wall 32 and the inner circumferential wall 34 extend upward from said horizontal base plate 30. The mixing chamber 22 is arranged between the outer circumferential wall 32 and the inner circumferential wall 34. A portion of the base plate 30 forms the bottom of the mixing chamber 22. Further, the inner side of the inner circumferential wall 34 forms an upper portion of the Venturi pipe 24.

FIG 3 illustrates a schematic top view of the gas burner assembly 10 according to the preferred embodiment of the present invention.

The burner cap 12 includes the plurality of flame ports 20 formed as elongated slots. Said elongated slots extend along radial directions in view of the circular burner cap 12. The flame ports 20 are arranged in the convex portion of the burner cap 12. The mixing chamber 22 of the burner body 14 is arranged below the flame ports 20. The thermocouple element 16 and the

spark plug element 18 are arranged in the portion of the burner cap 12.

FIG 4 illustrates a schematic top view of the gas burner assembly 10 according to the preferred embodiment of the present invention, wherein the burner cap 12 is removed.

The mixing chamber 22 is arranged between the outer circumferential wall 32 and the inner circumferential wall 34. The outer side of the inner circumferential wall 34 limits the mixing chamber 22, while the inner side of said inner circumferential wall 34 forms the upper portion of the Venturi pipe 24. The gas injector 28 is arranged below the Venturi pipe 24 and at an inner end and on an upper side of the gas supply channel 36. The one or more primary air inlets 26 are arranged between the gas injector 28 and the Venturi pipe 24. The primary air inlets 26 are formed by connecting elements between the Venturi pipe 24 and the gas injector 28. The primary air inlets 26 may be formed by the interspaces between said connecting elements. The gas injector 28 is connected or connectable via the gas supply channel 36 to a gas pipe.

FIG 5 illustrates a further schematic perspective view of the gas burner assembly 10 according to the preferred embodiment of the present invention.

The thermocouple element 16 and the spark plug element 18 penetrate the outer portion of the burner cap 12 and the base plate 30 of the burner body 14. The thermocouple element 16 is arranged out of the flame ports 20, but in contact with the flames. The spark plug element 18 penetrates an outer portion of the burner cap 12. The spark plug element 18 is arranged out of the flame ports 20.

Further, FIG 5 clarifies the arrangement of the gas injector 28 and the primary air inlets 26. The gas injector 28 is arranged below the Venturi pipe 24. The inlets 26 are formed as inter-spaces between the support panels 38 and a connecting part 40. Said connecting part 40 links the inner end of the gas supply channel 36 to the Venturi pipe 24.

FIG 6 illustrates a schematic sectional side view of the gas burner assembly 10 according to the preferred embodiment of the present invention.

The burner cap 12 rests on the outer circumferential wall 32 of the burner body 14. In contrast, there is a distance between the inner circumferential wall 34 of the burner body 14 and the burner cap 12. The inner circumferential wall 34 forms an upper part of the Venturi pipe 24. The flame ports 20 are arranged above a circular ring between the outer circumferential wall 32 and the inner circumferential wall 34.

In this example, the portion of the burner cap 12 including the flame ports 20 is inclined between ten and twenty degrees. In general, the portion of the burner cap 12 including the flame ports 20 is inclined between zero and fifty degrees.

FIG 7 illustrates a schematic sectional perspective view of the gas burner assembly 10 according to the preferred embodiment of the present invention.

The burner cap 12 rests directly on the outer circumferential wall 32 of the burner body 14, while the inner circumferential wall 34 of the burner body 14 is spaced from the burner cap 12. The Venturi pipe 24 is spaced from the gas injector 28. The primary air inlets 26 are arranged below the Venturi pipe 24.

The gas burner assembly 10 adopts a bottom breather technology. Primary air from an inner space of the cooking appliance is caught by the one or more primary air inlets 26. The gas and the primary air are conveyed through the Venturi pipe 24 into the mixing chamber 22. Flames are generated above the flame ports 20. The flames are provided for heating a cooking vessel arranged upon the gas burner assembly.

Since the burner body 14, including the mixing chamber 22, the Venturi pipe 24, the one or more primary air inlets 26 and the gas injector 28, is formed as a single-piece part, the number of components and the costs of the gas burner assembly 10 are reduced. The gas injector 28 may be changed without disassembling the cooking appliance. The gas burner assembly 10 allows an improved gas flow. The burner cap 12 is flat or nearly flat and may be an integrated part of a cooking hob, wherein the burner cap 12 is flush with the cooking surface.

Although an illustrative embodiment of the present invention has been described herein with reference to the accompanying drawing, it is to be understood that the present invention is not limited to that precise embodiment, 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

- 10 gas burner assembly
- 12 burner cap
- 14 burner body
- 16 thermocouple element
- 18 spark plug element
- 20 flame port
- 22 mixing chamber
- 24 Venturi pipe
- 26 primary air inlet
- 28 gas injector
- 30 base plate
- 32 outer circumferential wall
- 34 inner circumferential wall
- 36 gas supply channel
- 38 support panel
- 40 connecting part

Claims

1. A gas burner assembly (10), in particular for a gas cooking hob, comprising a burner cap (12) and a burner body (14), wherein
 - the burner cap (12) is arranged or arrangeable upon the burner body (14),
 - the burner cap (12) includes a plurality of flame ports (20),
 - the flame ports (20) are formed within a horizontal portion or within a substantially horizontal portion of the burner cap (12),
 - the burner body (14) includes a mixing chamber (22), a Venturi pipe (24), at least one air inlet (26), a gas supply channel (36) and a gas injector (28),
 - at least the mixing chamber (22), the Venturi pipe (24), the at least one air inlet (26) and the gas supply channel (36) form a single-piece part, and
 - the flame ports (20) of the burner cap (12) are arranged above the mixing chamber (22) of the burner body (14), when the burner cap (12) is arranged upon the burner body (14).
2. The gas burner assembly (10) according to claim 1, characterized in that the burner cap (12) is made of cast iron.
3. The gas burner assembly (10) according to claim 2, characterized in that the burner cap (12) is made by a sintering process.
4. The gas burner assembly (10) according to any one of the preceding claims, characterized in that

- the burner cap (12) is formed as a circular disk.
5. The gas burner assembly (10) according to any one of the preceding claims,
characterized in that
the burner cap (12) includes at least one convex portion,
wherein the flame ports (20) are formed within said convex portion.
 6. The gas burner assembly (10) according to any one of the preceding claims,
characterized in that
the flame ports (20) are formed as elongated slots extending along radial directions.
 7. The gas burner assembly (10) according to any one of the preceding claims,
characterized in that
the burner body (14) is made of aluminium.
 8. The gas burner assembly (10) according to any one of the preceding claims,
characterized in that
the Venturi pipe (24) extends vertically downwards from the mixing chamber (22).
 9. The gas burner assembly (10) according to any one of the preceding claims,
characterized in that
the gas injector (28) is arranged below the Venturi pipe (24).
 10. The gas burner assembly (10) according to any one of the preceding claims,

- characterized in that
the at least one air inlet (26) is arranged between the gas injector (28) and the Venturi pipe (24).
11. The gas burner assembly (10) according to any one of the preceding claims,
characterized in that
the burner body (14) includes a base plate (30), an outer circumferential wall (32) and an inner circumferential wall (34), wherein the mixing chamber (22) is arranged between the outer circumferential wall (32) and the inner circumferential wall (34) of the burner body (14).
 12. The gas burner assembly (10) according to any one of the preceding claims,
characterized in that
the outer circumferential wall (32) and the inner circumferential wall (34) of the burner body (14) extend upward from the base plate (30) of the burner body (14).
 13. The gas burner assembly (10) according to any one of the preceding claims,
characterized in that
the gas burner assembly (10) comprises at least one thermocouple element (16).
 14. The gas burner assembly (10) according to any one of the preceding claims,
characterized in that
the gas burner assembly (10) comprises at least one spark plug element (18).
 15. A gas cooking hob comprising at least one gas burner assembly (10),

characterized in that
the gas cooking hob comprises at least one gas burner assembly (10) according to any one of the claims 1 to 14.

FIG 1

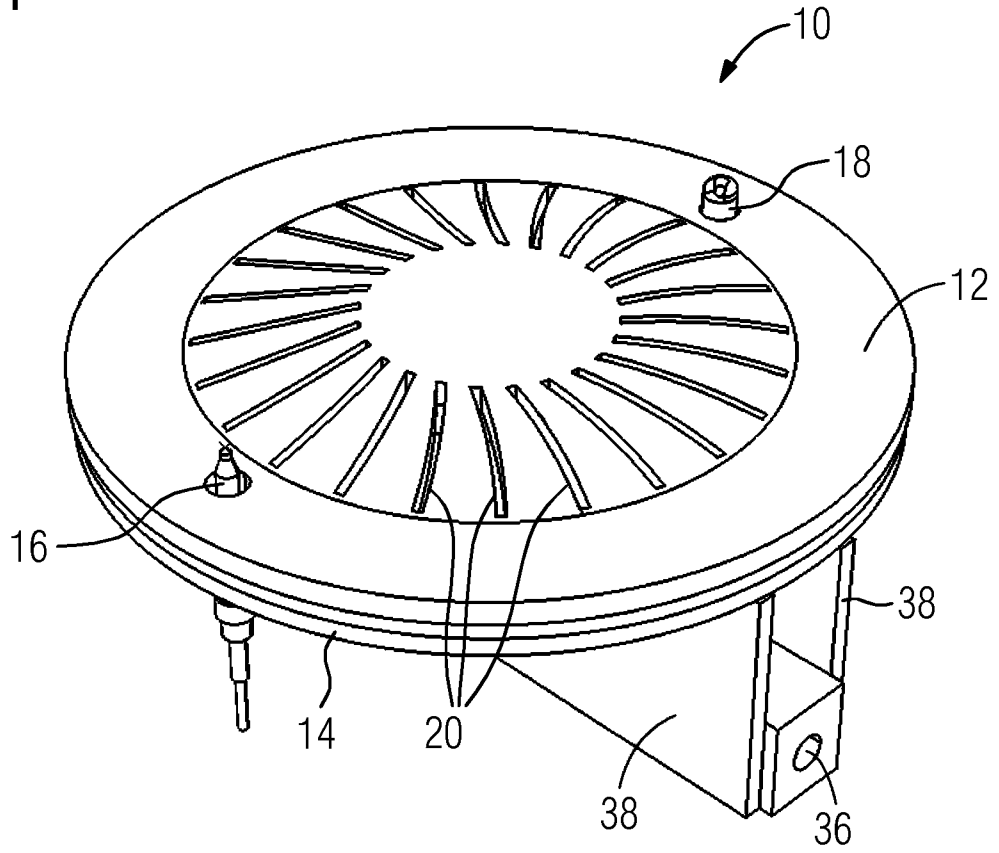


FIG 2

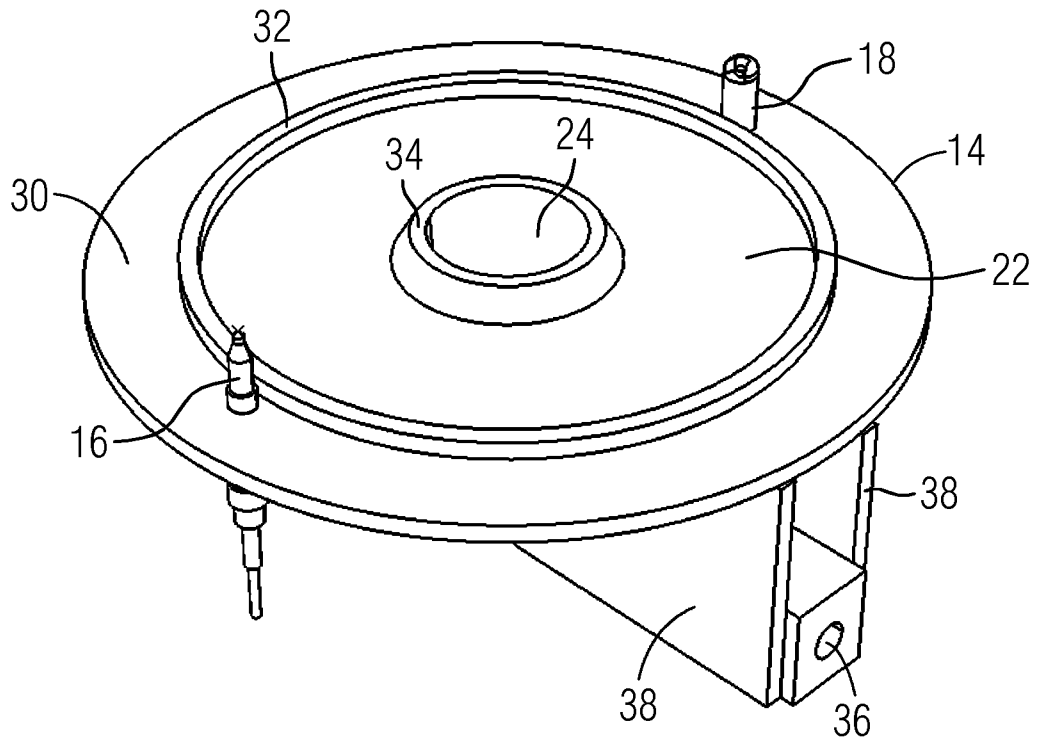


FIG 3

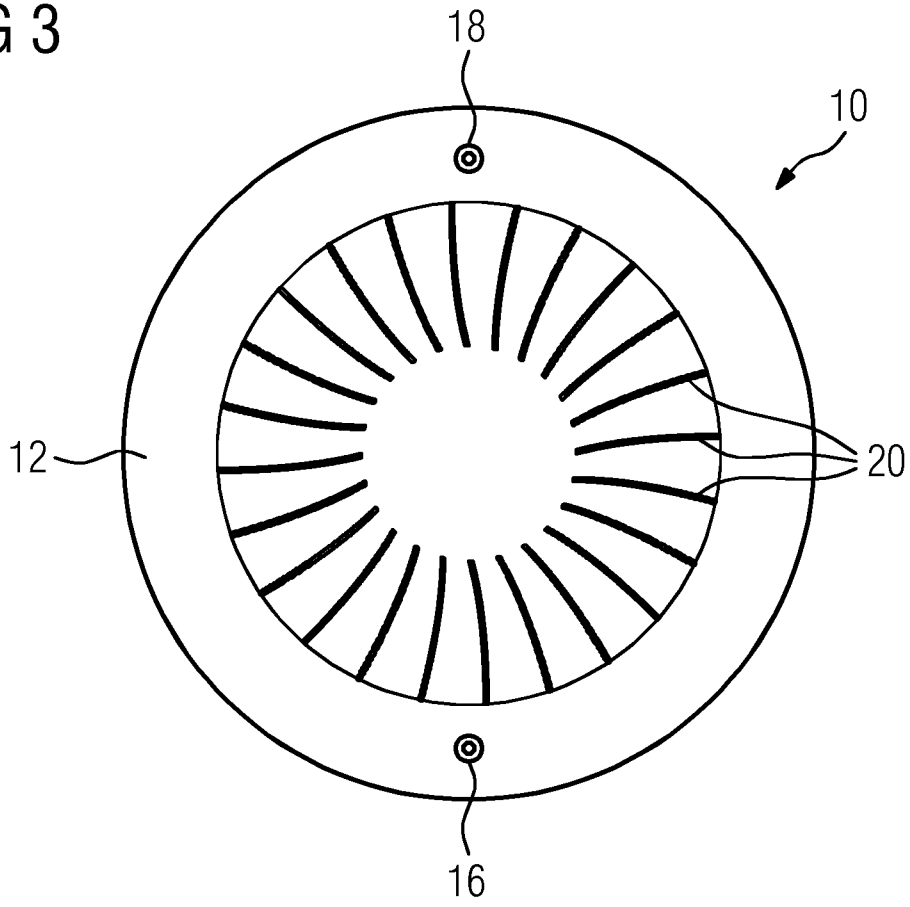


FIG 4

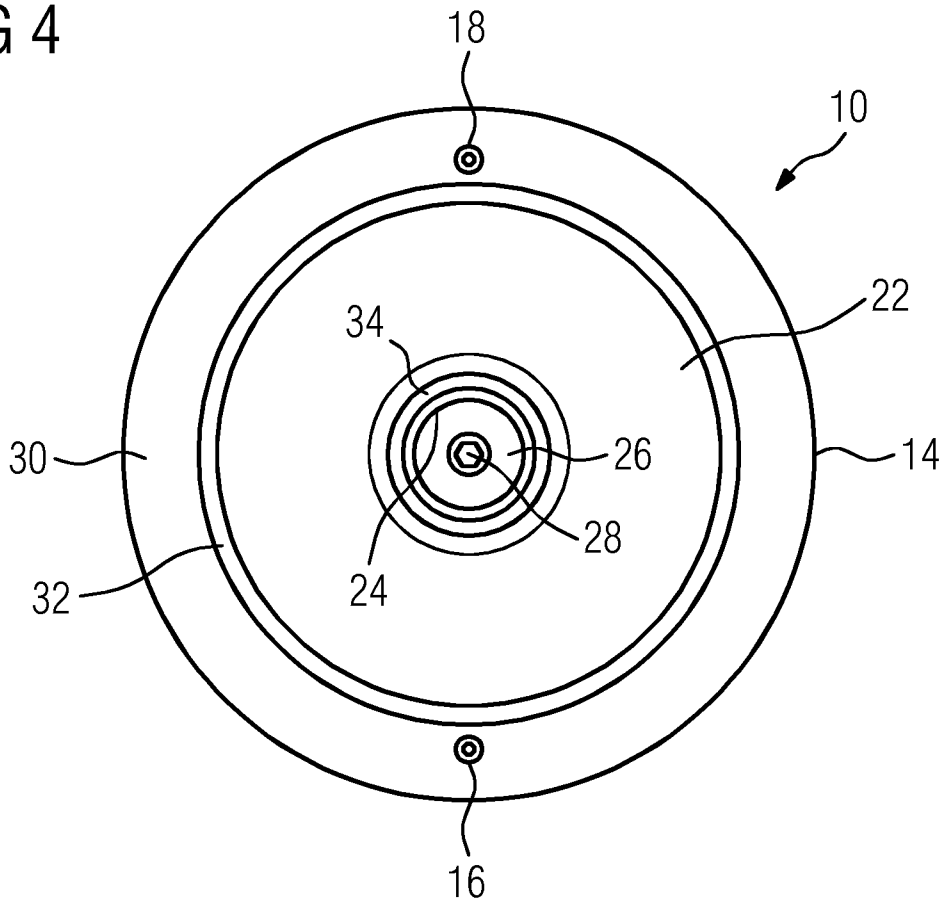


FIG 5

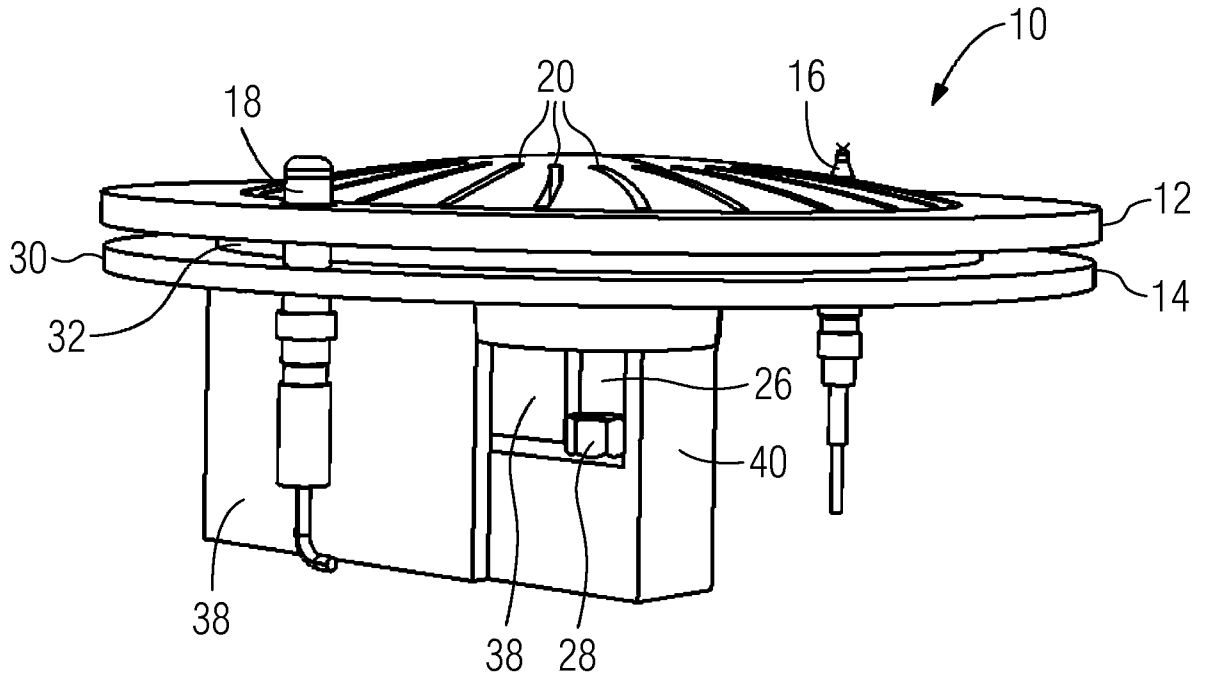


FIG 6

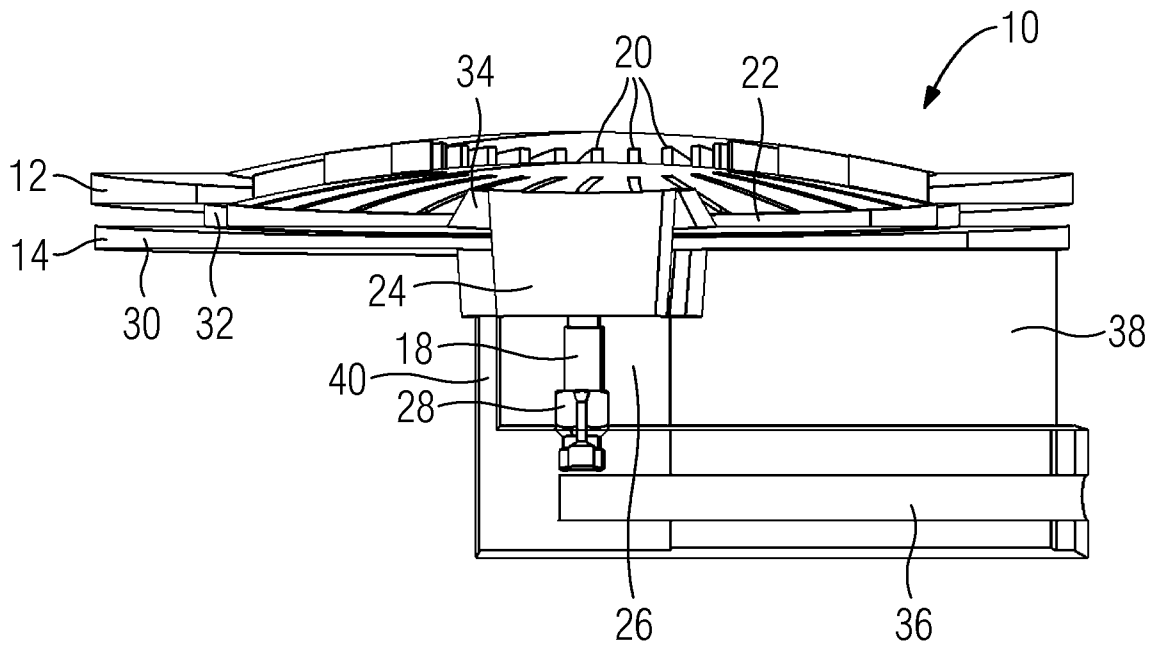
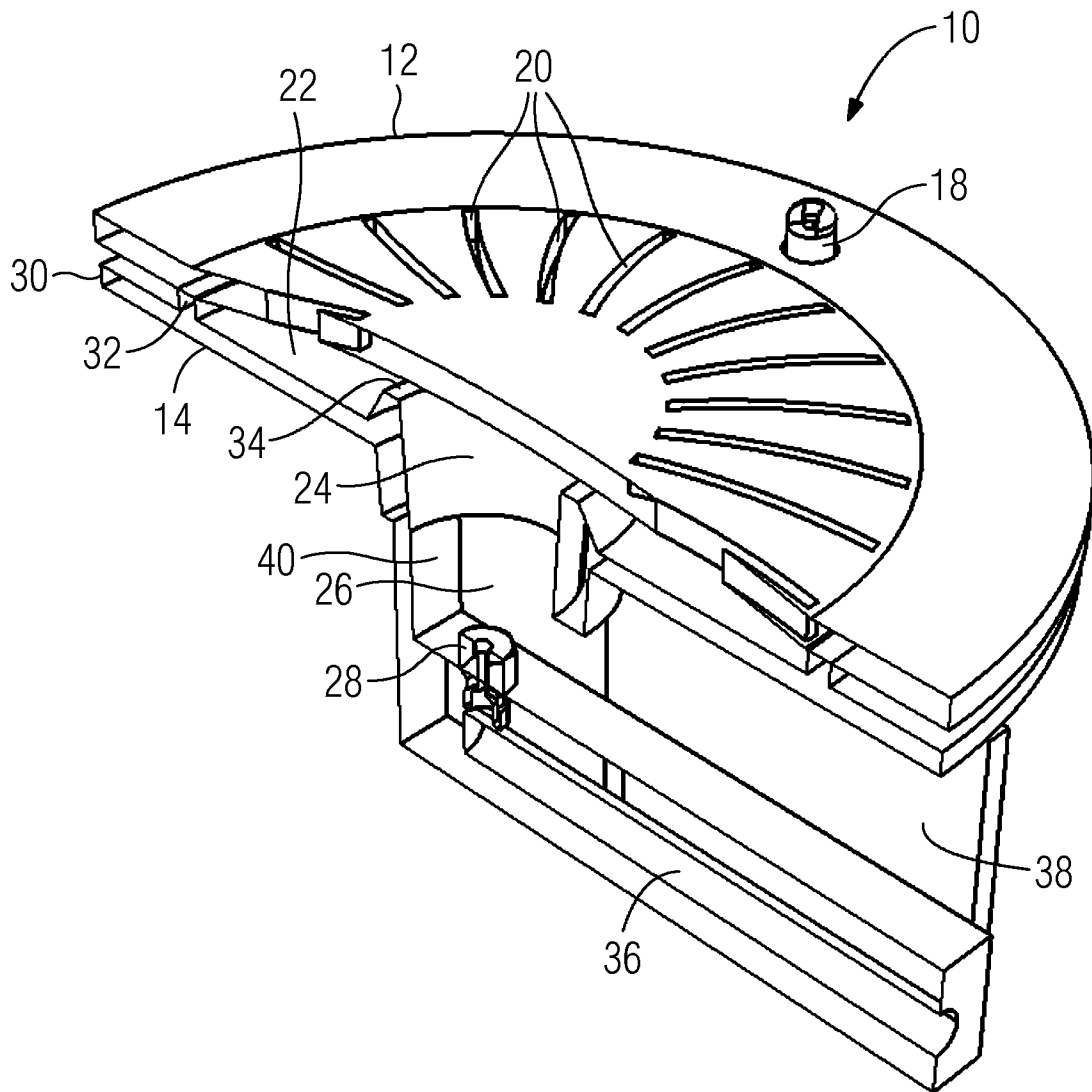


FIG 7



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/052026

A. CLASSIFICATION OF SUBJECT MATTER
INV. F23D14/08 F24C3/08 F23D14/58
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)
F23D F24C
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	US 1 749 385 A (KOLTS JOHN H ET AL) 4 March 1930 (1930-03-04) figures 1-6 page 1, line 66 - page 2, line 89 -----	1
Y	WO 2013/065018 A2 (INDESIT CO SPA [IT]) 10 May 2013 (2013-05-10) figures 1-10 page 1, lines 22-26 pages 5-10 pages 28-29 -----	1-15
Y	DE 296 18 892 U1 (ATAG KITCHEN GROUP BV [NL]) 5 February 1998 (1998-02-05) figures 1-3 pages 1-5 -----	1-15
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>
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Date of the actual completion of the international search 11 April 2016	Date of mailing of the international search report 22/04/2016
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer De Meester, Reni
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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2016/052026

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	ES 2 232 211 A1 (JIMENEZ ALAPONT JAVIER [ES]) 16 May 2005 (2005-05-16) figures 1-3 column 2	1-15
A	----- US 2009/277439 A1 (GASPARINI ALBERTO [IT] ET AL) 12 November 2009 (2009-11-12) the whole document	5
A	----- EP 2 799 771 A2 (INDESIT CO SPA [IT]) 5 November 2014 (2014-11-05) the whole document	1-15
A	----- US 2014/338651 A1 (HAGSTRÖM MAGNUS FREDRIK [SE]) 20 November 2014 (2014-11-20) the whole document	1-15
A	----- US 2012/070792 A1 (RASI FABIO [IT]) 22 March 2012 (2012-03-22) the whole document -----	1-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/EP2016/052026

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 1749385	A	04-03-1930	NONE

WO 2013065018	A2	10-05-2013	EA 201490917 A1 30-09-2014 EP 2773905 A2 10-09-2014 WO 2013065018 A2 10-05-2013

DE 29618892	U1	05-02-1998	NONE

ES 2232211	A1	16-05-2005	NONE

US 2009277439	A1	12-11-2009	CN 101278154 A 01-10-2008 EA 200800976 A1 29-08-2008 EP 1934532 A1 25-06-2008 EP 2182293 A1 05-05-2010 JP 5064397 B2 31-10-2012 JP 2009510382 A 12-03-2009 US 2009277439 A1 12-11-2009 WO 2007036772 A1 05-04-2007

EP 2799771	A2	05-11-2014	EP 2799771 A2 05-11-2014 IT T020130070 U1 30-10-2014 RU 2014117183 A 10-11-2015

US 2014338651	A1	20-11-2014	CN 204114935 U 21-01-2015 EP 2803912 A1 19-11-2014 US 2014338651 A1 20-11-2014

US 2012070792	A1	22-03-2012	AU 2010243885 A1 27-10-2011 CA 2760083 A1 04-11-2010 CN 102405374 A 04-04-2012 EP 2246619 A1 03-11-2010 ES 2552547 T3 30-11-2015 JP 5645923 B2 24-12-2014 JP 2012525557 A 22-10-2012 KR 20120013326 A 14-02-2012 RU 2011148593 A 10-06-2013 TW 201043879 A 16-12-2010 US 2012070792 A1 22-03-2012 WO 2010124834 A1 04-11-2010
