(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 128 235 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
08.02.2017 Bulletin 2017/06

(51) Int Cl.:
F23D 14/08 *(2006.01)* ***F23D 14/06*** *(2006.01)*

(21) Application number: **15179560.6**

(22) Date of filing: **03.08.2015**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

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(54) GAS BURNER, IN PARTICULAR FOR A COOKING TOP FOR HOUSEHOLD USE

(57) The present invention relates to a gas burner (10), in particular for a cooking top (1) for household use, comprising:
- a base (20) equipped with a Venturi element (21) adapted to receive a gas coming from an injector (4), and with a duct (22) for supplying the gas to said burner (10);
- a burner body (30) associated with the base (20) and comprising a hole (31) for the passage of an air-gas mixture coming from said duct (22);
- a flame divider (40) associated with said burner body (30) and comprising a plurality of apertures (41) to allow the air-gas mixture to exit.

The peculiar characteristic of the present invention is that said base (20) is made from sheet, in particular metal or metal-alloy sheet, which is shaped by deep drawing.

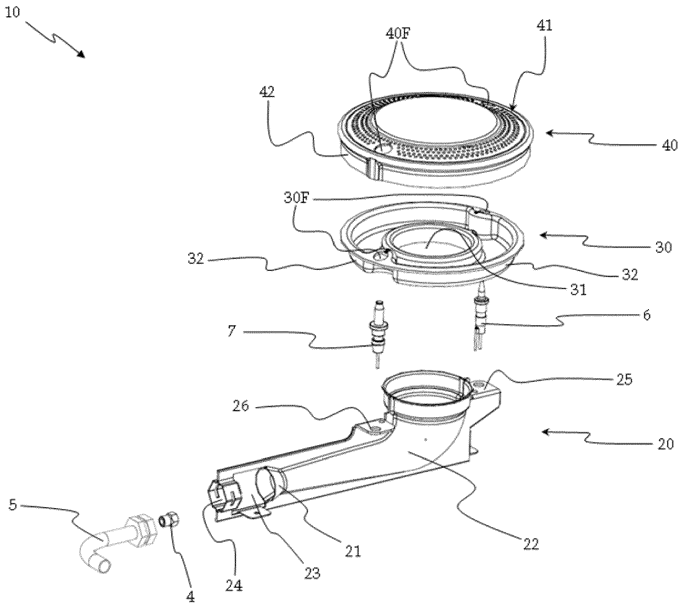

Fig. 3

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Description

[0001] The present invention relates to a gas burner, in particular for a cooking top for household use, according to the preamble of claim 1.

[0002] The present invention also relates to a cooking top comprising said gas burner.

[0003] At present, several typologies of cooking tops are available on the market, the most widespread typology using one or more gas burners, wherein the amount of heat necessary for cooking food is generated through combustion of a gas appropriately mixed with air.

[0004] Such gas burners usually comprise a cup associated with supply means that supply gas to said burner.

[0005] Said supply means may comprise a Venturi effect chamber adapted to receive gas coming from an injector associated with a duct; in particular, said injector, duct and/or Venturi effect chamber may be either vertical, i.e. with their axis parallel to an axis of the burner cup, or horizontal, i.e. with their axis orthogonal to the axis of the burner cup.

[0006] Gas burners currently installed in cooking tops for household use typically comprise a cup and a flame divider (or cap) arranged on the cooking top, and utilize, as primary air to be mixed with gas, the air available above the cooking top. The cup is usually made of die-cast aluminium, while the flame divider or cap is usually made of enamelled cast iron (or brass alloy or steel) and acts as a cup closing element. Known burners typically propagate a flame known as "crown flame"; a "crown flame" is a flame with a substantially radial direction of propagation, i.e. a flame that propagates outwards from the gas burner in a substantially radial direction with respect to the burner axis, and therefore in a direction which is substantially tangential to a visible surface of the cooking top. Said "crown flame", when emitted at an insufficient height above the cooking top, may cause low-CO_2 combustion, resulting in the generation of a high level of unburnt products (CO and NOx).

[0007] Document No. EP1934532 by the present Applicant discloses a gas burner, in particular for a cooking top, comprising:

- a cup associated with supply means for supplying gas to said burner, wherein said supply means comprise a body equipped with a duct associated with a Venturi effect chamber adapted to receive a gas coming from an injector;
- a flame divider or cap comprising a plurality of apertures adapted to generate a "carpet flame", i.e. a flame that propagates out of the gas burner in a substantially axial direction with respect to the axis of the burner, and therefore in a direction

which is substantially orthogonal to a visible surface of the cooking top.

[0008] A carpet flame may be a total carpet flame or a perimetric carpet flame, depending on whether it covers a geometric figure (generally a circle) entirely or just the peripheral portion of said geometric figure (generally a circular crown).

[0009] Also in the case of a perimetric carpet flame, it has been thought of providing a plurality of concentric rows of apertures adapted to generate a "carpet flame", in particular for the purpose of optimally heating also the central portion of the base of a cooking vessel positioned over the gas burner.

[0010] As a result, document EP1934532 ensures all the advantages that distinguish a "carpet flame" from a "crown flame", including optimal gas efficiency.

[0011] However, such a solution also has a few drawbacks, which are common to other solutions known in the art.

[0012] In particular, in the solutions known in the art the burner components are substantially made by die casting, being typically made of die-cast aluminium alloys; it is clear that this solution is an expensive one, and therefore a cooking top comprising such burners will implement solutions that are not very effective in economical terms. Furthermore, in the solution described above and disclosed in document EP1934532, the flame divider is so realized as to be positioned flush with the visible surface of the cooking top. When the burner is in use, it has been noticed that such a realization may cause overheating of that area of the visible surface of the cooking top which is closest to the burner; it is clear that this overheating may also cause damage to the cooking top, particularly when the latter is made from glassy materials or the like.

[0013] In this frame, it is the main object of the present invention to provide a gas burner, in particular for a cooking top for household use, and an associated cooking top which are adapted to overcome the drawbacks of prior-art solutions.

[0014] Consequently, it is one object of the present invention to provide a gas burner and an associated cooking top which are so realized as to prove particularly efficient and economical.

[0015] In particular, it is one object of the present invention to provide a gas burner which is so realized as to ensure optimal gas efficiency while at the same time lowering its production costs.

[0016] It is another object of the present invention to provide a gas burner which is so realized as to prevent overheating of the region of the cooking top proximal to the burner, and to avoid possible damage to the cooking top, particularly when the latter is made from glassy materials or the like.

[0017] Said objects are achieved by the present invention through a gas burner, in particular for a cooking top for household use, and an associated cooking top incorporating the features set out in the appended claims, which are intended to be an integral part of the present description.

[0018] Further objects, features and advantages of the

present invention will become apparent from the following detailed description and from the annexed drawings, which are supplied by way of non-limiting example, wherein:

- Fig. 1 is a perspective view of a cooking top and a gas burner making up one possible embodiment of the present invention;
- Fig. 2 is a schematic sectional view of the gas burner according to the present invention;
- Fig. 3 is a schematic exploded perspective view of a gas burner according to the present invention;
- Fig. 4 is a schematic exploded view of a component of the gas burner according to the present invention.

[0019] Referring now to Figure 1, reference numeral 1 designates as a whole a cooking top according to the present invention, in particular intended for household use and of the built-in type.

[0020] The cooking top 1 is so shaped as to comprise a substantially flat visible surface 2, on which a plurality of housings 3 are formed or obtained for accommodating at least one gas burner 10, such as the one shown in the sectional view of Fig. 2 and in the exploded perspective view of Fig. 3.

[0021] The cooking top 1 may also comprise supporting means (not shown) for cooking vessels containing foods to be cooked, which are adapted to ensure an adequate separation distance between the visible surface 2 of the cooking top 1 and said cooking vessels.

[0022] In addition, the cooking top 1 may comprise interfacing means (not shown) adapted to, among other things, allow adjusting and/or displaying the operating parameters of each burner 10. For example, the interfacing means may comprise a "touch control" interface, or a mechanical interface, for controlling on-off taps.

[0023] As can be seen in Figures 2 and 3, the burner 10 adapted for installation in a cooking top 1 according to the present invention comprises a base (designated as a whole by reference numeral 20 in the annexed drawings) equipped with a Venturi element 21 adapted to receive a gas coming from an injector 4, and with a duct 22 for supplying an air-gas mixture to said burner 10. Fig. 2 also shows a tube 5 for supplying gas to said injector 4.

[0024] In particular, the Venturi element 21 is arranged substantially horizontally, i.e. with its axis substantially orthogonal to an axis A-A (shown in Fig. 2) of the burner 10; preferably, also the injector 4 is substantially horizontal. In this embodiment, the assembly consisting of the Venturi element 21 and the duct 22 is shaped substantially like a pipe, in particular of the type known as "straight pipe". It is however clear that at least one of said elements may be positioned differently, e.g. vertically, i.e. with its axis parallel to said axis A-A of the burner 10.

[0025] It must be pointed out that, for the purposes of the present invention, the terms "vertical", "horizontal", etc. are used with reference to a burner 10 installed on a cooking top 1.

[0026] As is known, said Venturi element 21 allows creating, within the duct 22 and within the entire burner 10, a pressure drop for conveying gas and primary air (i.e. the air-gas mixture) towards the mixing and/or combustion zone of the burner 10.

[0027] It is also worth specifying the meaning of the terms "primary air" and "secondary air" as used in the present description.

[0028] "Primary air" is air mixed with fuel gas inside the gas burner 10, whereas "secondary air" is air added to the already formed air-gas mixture in the area outside the cooking top 1 surrounding the gas burner 10, which air is called "secondary air" because it is necessary for providing the additional Oxygen required for a proper combustion.

[0029] In this regard, the base 20 comprises at least one air intake 23 to allow entry of primary air, in particular said at least one air intake 23 being associated with that part of said base 20 which is adjacent to the injector 4 and upstream of the Venturi element 21, with reference to the gas path. In order to ensure a stoichiometrically correct mixture of gas and primary air as a function of the combustion process to which the air-gas mixture will then have to be subjected, said at least one air intake 23 is sufficiently large to ensure an adequate flow of primary air through it. In the event that natural circulation should not guarantee a sufficient primary air flow rate to properly supply air to the burner 10, a primary air forced circulation system may be associated with said burner 10.

[0030] It is apparent from the above description that the gas burner 10 according to the present invention is of the type that takes primary air from below the cooking top 1.

[0031] The base 20 further comprises a seat 24 for housing the injector 4 and/or a terminal portion of said tube 5 for supplying gas to the injector 4, in particular said seat 24 being positioned upstream of said at least one air intake 23 (with reference to the path of the gas and of the primary air/gas mixture).

[0032] Preferably, the base 20 comprises at least one bracket 25, 26 for associating at least one ignition spark plug 6 and at least one thermocouple 7 with the burner 10; in particular, said base 20 comprises a first bracket 25 for associating said at least one ignition spark plug 6 with the burner 10, and a second bracket 26 for associating said at least one thermocouple 7 with the burner 10.

[0033] The burner 10 further comprises a burner body 30 associated with the base 20 and comprising a hole 31 for the passage of the air-gas mixture coming from the duct 22 of the base 20.

[0034] In addition, the burner 10 comprises a flame divider 40 associated with said burner body 30 and comprising a plurality of apertures 41 to allow the air-gas mixture to exit, in particular said apertures 41 being so realized as to generate a "carpet flame", i.e. a flame (not shown in the drawings) that propagates outwards from the burner 10 in a substantially axial direction with respect to the axis A-A of the burner 10. Preferably, the burner

body 30 comprises a pair of first openings 30F, and the flame divider 40 comprises a pair of second openings 40F adapted to allow the passage of said at least one ignition spark plug 6 and at least one thermocouple 7. It is in fact clear that, in an operating condition (in particular a condition in which the burner body 30 and the flame divider 40 of the burner 10 are assembled together), said first openings 30F and second openings 40F are aligned to each other.

[0035] In accordance with the present invention, said base 20 is made from sheet, in particular metal or metal-alloy sheet, which is shaped by deep drawing; preferably, said base 20 is made from aluminized sheet metal.

[0036] In a preferred embodiment (also shown in Fig. 4), said base 20 comprises a first half shell 20A and a second half shell 20B made from sheet metal and joined together. For example, the first half shell 20A and the second half shell 20B may be joined together, in particular, by welding; it is however clear that such components may also be joined together otherwise, e.g. by glueing.

[0037] In a preferred embodiment, also the burner body 30 is made from sheet, in particular metal or metal-alloy sheet, which is shaped by deep drawing.

[0038] In particular, the burner body 30 is preferably made from enamelled sheet metal.

[0039] In accordance with the present invention, also the flame divider 40 is made from sheet, in particular metal or metal-alloy sheet.

[0040] The flame divider 40 is arranged on the burner body 30, in particular said flame divider 40 resting on the burner body 30.

[0041] Preferably, the flame divider 40 comprises a side wall 42 that allows the apertures 41 to be kept in a raised position relative to the cooking top 1.

[0042] Preferably, said side wall 42 has a height H (see Fig. 2) in the range of 10 mm to 20 mm, in particular said height H being approximately 15 mm.

[0043] Thanks to this provision, the flames propagating from said apertures 41 will not cause overheating of the visible surface 2 of the cooking top 1 near the burner 10.

[0044] In a preferred embodiment, the burner body 30 comprises a flank 32, the height of which is essentially close to the height H of said side wall 42, so that the coupling between the burner body 30 and the flame divider 40 will ensure proper sealing and will prevent the air-gas mixture from escaping sideways; in an operating condition of the burner 10 (i.e. a condition in which the burner body 30 and the flame divider 40 of the burner 10 are assembled together), the flank 32 of the burner body 30 and the side wall 42 of the flame divider 40 are arranged substantially side by side and cooperate to keeping the apertures 41 of the flame divider 40 raised relative to the cooking top 1, in particular at a distance substantially corresponding to or slightly greater than said height H.

[0045] It clearly emerges from the above description that the burner 10 according to the present invention is realized in such a way to be particularly efficient and economical.

[0046] In particular, the burner 10 can ensure optimal gas efficiency thanks to the apertures 41, which provide a "carpet flame"; furthermore, the fact that the base 20 is made from sheet metal (just like the burner body 30 and the flame divider 40) allows reducing the costs incurred for manufacturing the burner 10 and the whole cooking top 1.

[0047] In addition, the particular realization of the flank 32 of the burner body 30 and of the side wall 42 of the flame divider 40 allows the apertures 41 to be positioned at a certain distance (substantially corresponding to the height H) from the visible surface 2 of the cooking top 1, thus preventing overheating of the area of the cooking top 1 around the burner 10; it is clear that this prevents said cooking top 1 from suffering possible damage, particularly when it is made from glassy materials or the like.

[0048] The annexed drawings show that the burner body 30 and the flame divider 40 advantageously have a substantially axially symmetrical shape, since preferably the axis of the burner body 30 and/or of the flame divider 40 substantially coincides with the axis A-A of the burner 10.

[0049] It should be noted that the flame divider 40 also performs the functions of delimiting at the top the inner environment of the burner 10 and allowing the flame originated by the combustion of the air-gas mixture to come out of the burner 10 through the plurality of apertures 41.

[0050] Furthermore, said flame divider 40 is preferably microperforated, i.e. it comprises a plurality of apertures 41, the diameter of which is substantially the same as the thickness of the metal sheet or smaller. In particular, the thickness of the microperforated sheet is preferably approx. 1 mm, and the diameter of the apertures 41 of the microperforated sheet is conveniently comprised between 100 μm and 1 mm.

[0051] The features and advantages of the gas burner, in particular for a cooking top for household use, and of the associated cooking top according to the present invention are apparent in the light of the above description.

[0052] In particular, the burner 10 according to the present invention is so realized as to turn out to be particularly effective, since it ensures optimal gas efficiency thanks to the apertures 41, which produce a "carpet flame"; in addition, the burner 10 according to the present invention has an economical realization, in that the fact that the base 20 is made from sheet metal (just like the burner body 30 and the flame divider 40) makes for lower costs incurred for manufacturing the burner 10 and the whole cooking top 1.

[0053] It must also be pointed out that the particular realization of the flank 32 of the burner body 30 and of the side wall 42 of the flame divider 40 prevents overheating of the area of the cooking top 1 around the burner 10, while also preventing said cooking top 1 from suffering damage, particularly when the latter is made from glassy materials or the like.

[0054] It is however clear that many changes may be

made to the gas burner, in particular for a cooking top for household use, and to the associated cooking top according to the present invention, and that in its practical implementation the various components may have different shapes and arrangements or be replaced with other technically equivalent elements without departing from the novelty spirit of the inventive idea.

[0055] In particular, the present invention has disclosed in detail a gas burner and a cooking top particularly suited for use in a household environment. Nevertheless, the present invention may also be conveniently implemented in gas burners and cooking tops intended for different applications, e.g. in the hotel industry.

[0056] It can therefore be easily understood that the present invention is not limited to the above-described gas burner and associated cooking top, but may be subject to many modifications, improvements or replacements of equivalent parts and elements without departing from the inventive idea, as clearly specified in the following claims.

Claims

1. Gas burner (10), in particular for a cooking top (1) for household use, comprising:

   - a base (20) equipped with a Venturi element (21) adapted to receive a gas coming from an injector (4), and with a duct (22) for supplying an air-gas mixture to said burner (10);
   - a burner body (30) associated with the base (20) and comprising a hole (31) for the passage of the air-gas mixture coming from said duct (22);
   - a flame divider (40) associated with said burner body (30) and comprising a plurality of apertures (41) to allow the air-gas mixture to exit,

   characterized in that
   said base (20) is made from sheet, in particular metal or metal-alloy sheet, which is shaped by deep drawing.

2. Burner (10) according to claim 1, **characterized in that** said base (20) is made from aluminized sheet metal.

3. Burner (10) according to one or more of the preceding claims, **characterized in that** said base (20) comprises a first half shell (20A) and a second half shell (20B) made from sheet metal and joined together.

4. Burner (10) according to one or more of the preceding claims, **characterized in that** said burner body (30) is made from sheet, in particular metal or metal-alloy sheet, suitably shaped by deep drawing.

5. Burner (10) according to one or more of the preceding claims, **characterized in that** said flame divider (40) is made from sheet, in particular metal or metal-alloy sheet.

6. Burner (10) according to one or more of the preceding claims, **characterized in that** said flame divider (40) comprises a side wall (42) that allows keeping the apertures (41) in a raised position relative to the cooking top (1).

7. Burner (10) according to claim 6, **characterized in that** said side wall (42) has a height (H) comprised between 10 mm and 20 mm, in particular said height (H) being approximately 15 mm.

8. Burner (10) according to claims 6 and 7, **characterized in that** said burner body (30) comprises a flank (32), the height of which is essentially close to said height (H) of said side wall (42), so that the coupling between the burner body (30) and the flame divider (40) will ensure proper sealing and will prevent the air-gas mixture from escaping sideways, the flank (32) of the burner body (30) and the side wall (42) of the flame divider (40) being arranged substantially side by side in an operating condition of the burner (10).

9. Burner (10) according to one or more of the preceding claims, **characterized in that** said flame divider (40) is preferably microperforated, i.e. it comprises a plurality of apertures (41) so realized as to generate a "carpet flame", said apertures (41) having a diameter which is substantially equal to the thickness of the sheet or a diameter which is smaller than the thickness of the sheet.

10. Burner (10) according to one or more of the preceding claims, **characterized in that** said base (20) comprises at least one air intake (23) allowing entry of primary air, in particular said at least one air intake (23) being associated with that part of said base (20) which is adjacent to the injector (4) and upstream of the Venturi element (21).

11. Burner (10) according to one or more of the preceding claims, **characterized in that** said base (20) comprises a seat (24) adapted to house the injector (4) and/or a terminal portion of a tube (5) for supplying gas to the injector (4), in particular said seat (24) being positioned upstream of said at least one air intake (23).

12. Burner (10) according to one or more of the preceding claims, **characterized in that** said base (20) comprises at least one bracket (25, 26) for associating at least one ignition spark plug (6) and at least one thermocouple (7) with the burner (10).

13. Burner (10) according to claim 12, **characterized in that** the burner body (30) comprises a pair of first openings (30F) and the flame divider (40) comprises a pair of second openings (40F) adapted to allow the passage of said at least one ignition spark plug (6) and at least one thermocouple (7).

14. Burner (10) according to one or more of the preceding claims, **characterized in that** said Venturi element (21) is arranged substantially horizontally, in particular its axis being substantially orthogonal to an axis (A-A) of the burner (10).

15. Cooking top (1) comprising a gas burner (10) according to one or more of the preceding claims 1 to 14.

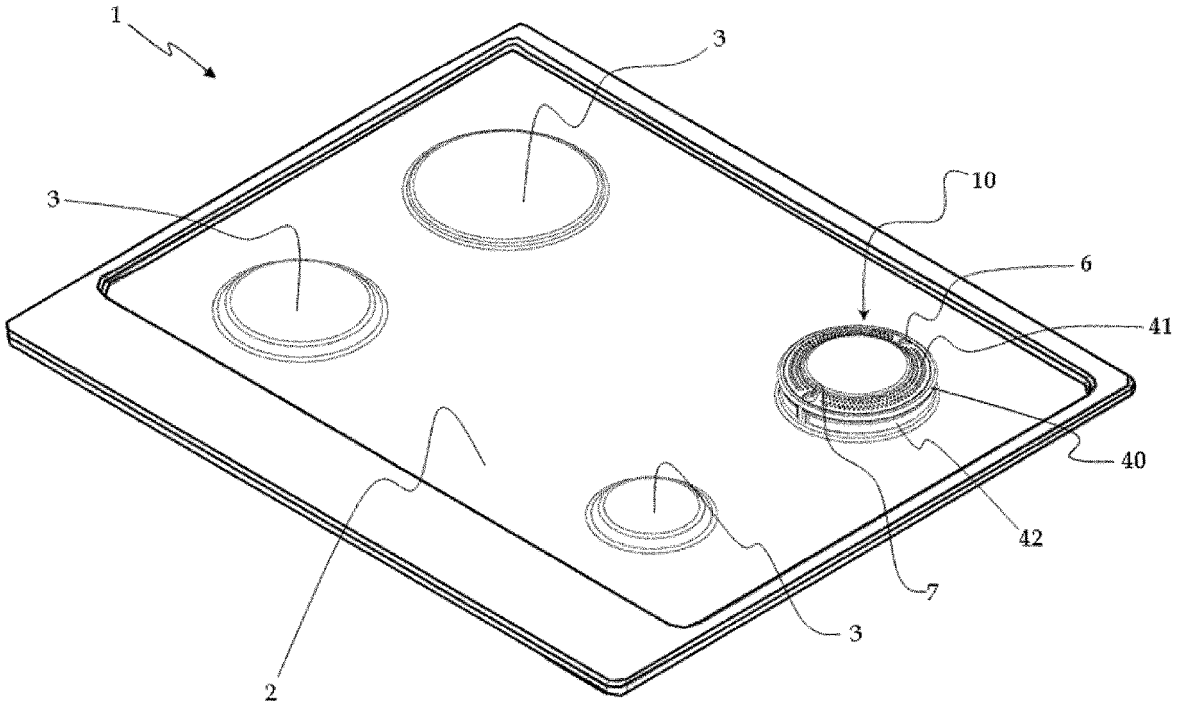

Fig. 1

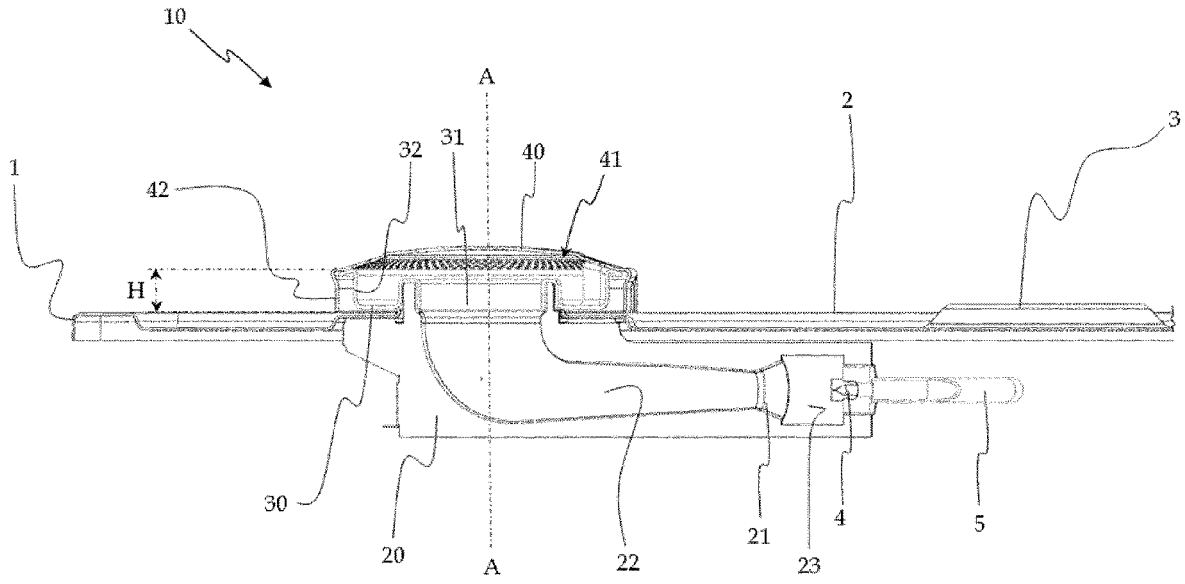

Fig. 2

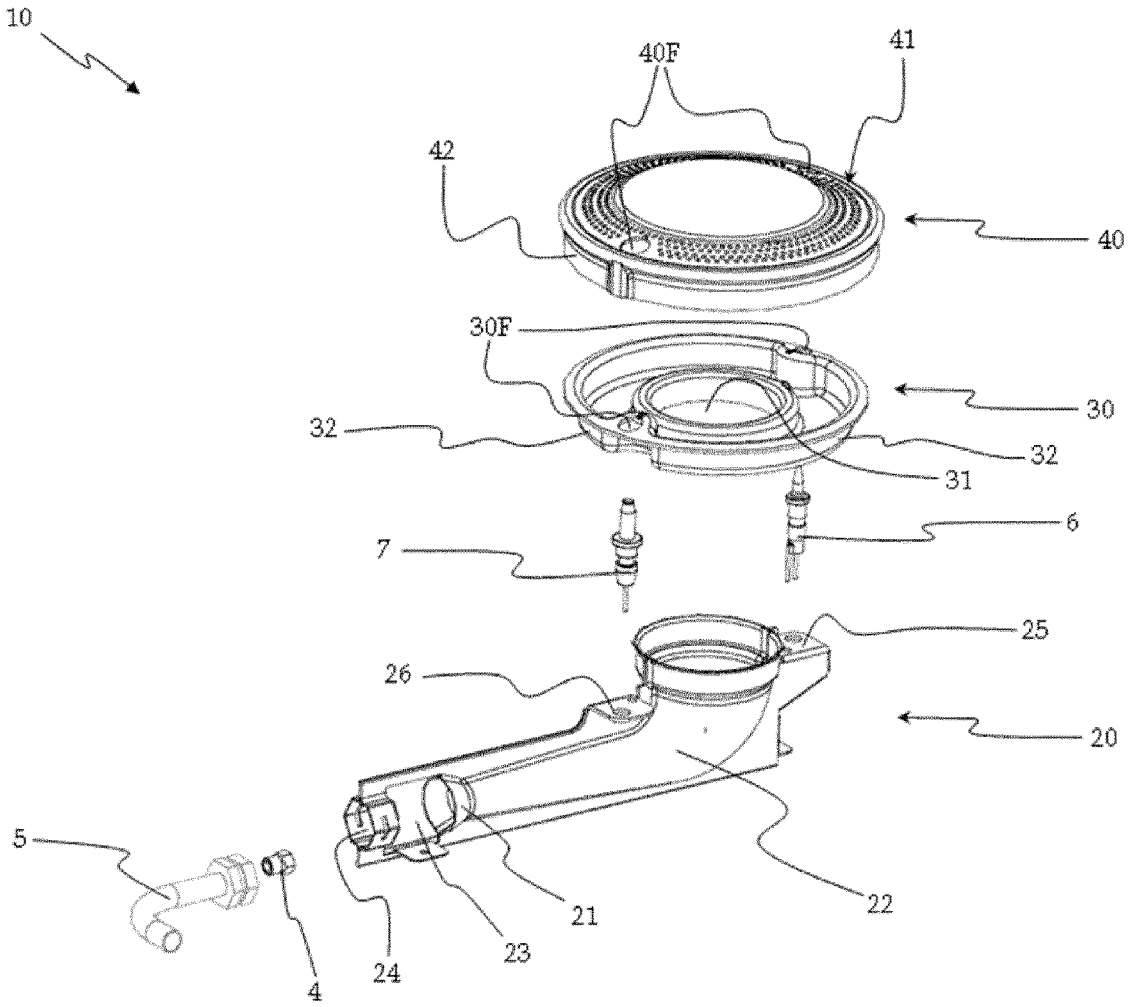

Fig. 3

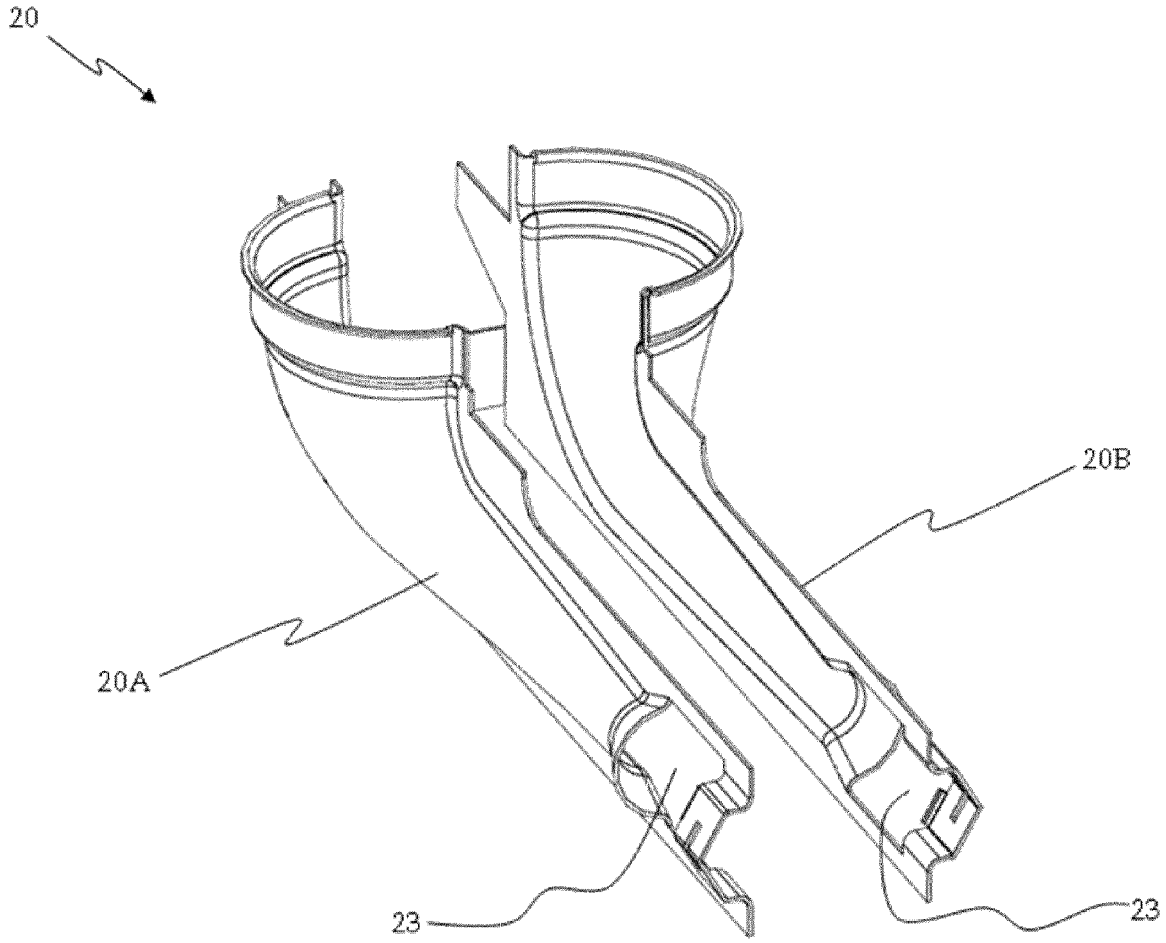

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 15 17 9560

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 January 2016	Mougey, Maurice

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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