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(54) A burner for professional or domestic gas cookers, particularly of the type of vertical-flame burners adapted for cooking with woks and the like

(57) The present invention relates to a burner for professional or domestic gas cookers, particularly of the type of vertical-flame burners adapted for cooking with woks and the like, which comprises

- a burner body (11) which is substantially annular and encloses a tubular chamber (12) that lies in a substantially helical arrangement around a central axis (A) and is provided with an access hole (13),
- a Venturi-type supply tube (14), which is connected to the body (11) and opens onto the hole (13) to introduce the combustion gas into the chamber (12),

the body (11) being provided with

- upper outflow ports (15) for the gas, which open onto the face (16) of the body (11) that is the upper one during use and are adapted to form a flame that is oriented substantially along the central axis (A),
- central outflow ports (17) for the gas, which open onto the body (11) substantially toward the central axis (A).

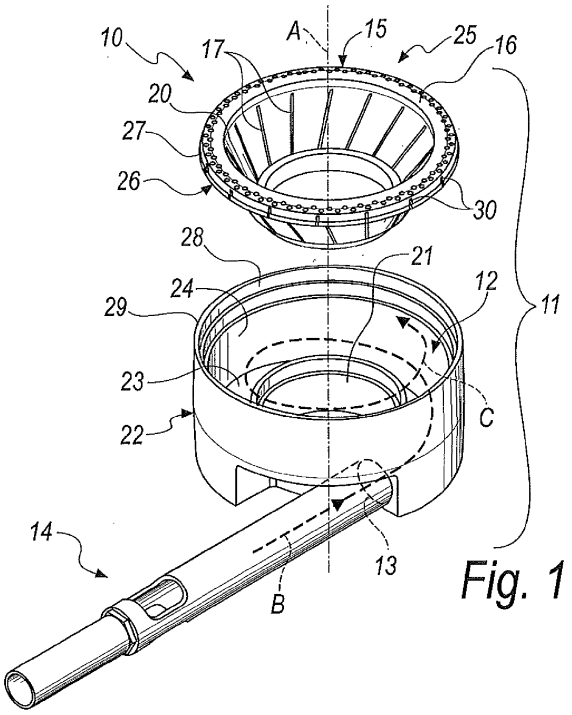

Fig. 1

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Description

[0001] The present invention relates to a burner for professional or domestic gas cookers, particularly of the type of vertical-flame burners adapted for cooking with woks and the like.

[0002] Nowadays, in the sector of makers of burners for professional or domestic gas cookers, vertical-flame burners are known which are particularly adapted to perform types of cooking that require the use of pans with bottoms that are rounded, not flat, such as pans known by the Chinese name of woks.

[0003] In order to be used correctly, these pans need their lower central point, where the food to be cooked collects, to be directly lapped by the flame.

[0004] Radial flame burners are not suitable for this purpose, because they involve the formation of one or more crowns of rays of flame extending from substantially horizontal orifices and the absence of nozzles adapted to form a central flame, in accordance with the widespread need to use flat-bottomed pans in European and Western cuisine in general.

[0005] Moreover, cooking methods using woks generally require thermal flows that are much higher than those generated by the radial flame burners which are adapted to the needs of European cooking.

[0006] So, for the formation of centrally-concentrated flames, nowadays burners are known that are fitted with burner caps that have a series of central orifices, which extend substantially vertically and are adapted to form a plurality of rays of flame that are gathered centrally in the burner.

[0007] These types of burner however have a high combustion inefficiency, which is due to the difficulty of the combustible gas mixing with an adequate quantity of secondary oxidizing air.

[0008] Indeed, these burners have a chamber, below the burner cap, which is fed by a Venturi-type tube into which the gas is injected and into which oxidizing air, known as primary air, is sucked by the Venturi effect.

[0009] In order to obtain an efficient mixing of the primary air with the gas, and an exit speed of their mixture from the orifices which is sufficiently low to prevent the phenomenon of flame detachment, nowadays these burners have long Venturi-type expansion tubes and large chambers, to the detriment of containing their encumbrance.

[0010] Moreover, for correct combustion, the gas mixed with the primary air needs to be further mixed with oxidizing air, known as secondary air.

[0011] This mixing occurs at the ejection from the orifices of the burner cap, but, owing to the density of the rays of flame and the high outflow of gas necessary to generate the thermal power required, the mixing with secondary air is inefficient and leads to a scant efficiency of combustion, and it also induces the noisy phenomenon of flame detachment, i.e. of the formation of the flame in a detached position above the orifice supplying the mixture of gas and primary air.

[0012] Thus, in order to overcome these limitations, nowadays burners are known which have an annular body in which a tubular chamber is defined that has a series of slits facing towards the central axis of the body.

[0013] In use, the gas, mixed with the primary air, is injected by means of a Venturi-type tube tangentially into the tubular chamber, from which it exits through the suitably positioned slits inclined towards the center of the burner body where, mixing vortically with the secondary air sucked in through the central opening delimited by the annular body of the burner, it burns effectively, forming a flame that rises centrally from the burner.

[0014] This type of burner however has the drawback of producing a flame that is highly concentrated in its center, and thus it is adapted to perform types of cooking that involve the use of pans of greater thickness, which are capable of diffusing the heat with a good level of uniformity throughout the portion of the bottom thereof which is in contact with the dish to be cooked.

[0015] On the other hand, for wok pans which are made with a relatively thin layer, the strong central concentration of the flame in the central region alone of the burner induces a strong temperature gradient, which rapidly decreases towards the periphery of the pan, to the detriment of an efficient cooking session.

[0016] Nowadays, in the wake of the spread of the use of woks in Western cuisine as well, the need is increasingly felt to provide central flame burners that make it possible to effectively heat these pans, by providing adequate thermal flows and concentrated flames that are adapted to effectively heat all of the central portion thereof, while enabling an efficient burning of the combustible gas.

[0017] The aim of the present invention is to provide a burner that makes it possible to meet this need, by enabling the formation of a central flame which is obtained by means of an efficient burning of the combustible gas.

[0018] Within this aim, an object of the invention is to provide a burner that makes it possible to prevent the phenomenon of flame detachment.

[0019] Another object of the invention is to provide a burner that makes it possible to present an ample heating region in order to enable the effective heating of a greater portion of the pan compared to that which can be effectively heated by the burners known today.

[0020] Another object of the invention is to provide a burner that, thanks to the stability of its flame, makes it possible to modulate the thermal power dispensed commensurately to the level useful to obtaining the correct cooking of the foodstuffs to be cooked.

[0021] A further object of the invention is to provide a burner that is structurally simple and easy to use, and which can be produced at relatively low cost.

[0022] This aim, as well as these and other objects which will become better apparent hereinafter, are achieved by a burner for professional or domestic gas cookers, particularly of the type of vertical-flame burners

adapted for cooking with woks and the like, characterized in that it comprises

- a burner body which is substantially annular and encloses a tubular chamber that lies in a substantially helical arrangement around a central axis and is provided with an access hole,
- a Venturi-type supply tube, which is connected to said body and opens onto said hole to introduce the combustion gas into said chamber, said body being provided with
- upper outflow ports for said gas, which open onto the face of said body that is the upper one during use and are adapted to form a flame that is oriented substantially along said central axis,
- central outflow ports for said gas, which open onto said body substantially toward said central axis.

[0023] Further characteristics and advantages of the invention will become better apparent from the description of a preferred, but not exclusive, embodiment of the burner according to the invention, illustrated by way of non-limiting example in the accompanying drawings wherein:

Figure 1 is an exploded perspective view of a burner, according to the invention;
Figure 2 is a view of a burner, according to the invention, in a configuration of use;
Figure 3 is a plan view of a component of a burner, according to the invention;
Figure 4 is a cross-sectional view of a burner, according to the invention, taken along the line IV-IV in Figure 3;
Figure 5 is an enlarged-scale view of a detail of a burner, according to the invention, partially cross-sectional along a meridian plane and partially cross-sectional along the line V-V in Figure 3.

[0024] It should be noted that everything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0025] With reference to the figures, the reference numeral 10 generally indicates a burner for professional or domestic gas cookers, particularly of the type of vertical-flame burners adapted for cooking with woks and the like, which has a distinctive characteristic in that it comprises

- a body 11 of the burner 10 which is substantially annular and encloses a tubular chamber 12 that lies in a substantially helical arrangement around a central axis A and is provided with an access hole 13,
- a Venturi-type supply tube 14, which is connected to the body 11 and opens onto the hole 13 so as to introduce the combustion gas into the chamber 12,

the body 11 being provided with

- upper outflow ports 15 for the gas, which open onto the face 16 of the body 11 that is the upper one during use and are adapted to form a flame that is oriented substantially along the central axis A,
- central outflow ports 17 for the gas, which open onto the body 11 substantially toward the central axis A.

[0026] Advantageously, the Venturi-type tube 14 defines, for the gas, an inflow direction B, in the chamber 12, which is substantially tangential to the central axis A.

[0027] In this way, the gas introduced through the Venturi-type tube 14, and mixed therein with primary air, is conveyed through the chamber 12 according to a helicoid flow which in Figure 1 is shown for the purposes of non-limiting example with the dotted curve indicated by the reference letter C.

[0028] The upper outflow ports 15 comprise orifices 18a and 18b which are arranged substantially circumferentially to the central axis A and peripherally to the body 11.

[0029] The orifices 18a and 18b comprise first orifices 18a and second orifices 18b provided at different radial distances from the central axis A, the first orifices 18a, with respect to the second orifices 18b, being offset circumferentially around the central axis A.

[0030] Moreover, the upper outflow ports 15 conveniently also comprise an annular opening 19 that is peripheral to the body 11.

[0031] The central outflow ports 17 are preferably slot-shaped and distributed substantially uniformly on a wall 20 of the body 11 that is substantially frustum-shaped and diverges upward, during use, and is substantially coaxial to the central axis A, which it faces.

[0032] The central outflow ports 17 furthermore advantageously extend substantially along planes D which are tangent to a cylindrical surface E which has a selected radius and is coaxial to the central axis A, as illustrated for the purposes of non-limiting example in Figure 3.

[0033] In this way the gas, mixed in the Venturi-type tube 14 with the primary air, and swirling according to the helicoid flow C, exits through the central outflow ports 17 while maintaining a rotational component that creates a vortical motion of the flame which is shown for the purposes of non-limiting example in Figure 3 with the arrows indicated with the reference letters F.

[0034] This vortical motion F generates a fluid-dynamic vacuum effect at the central space 21 delimited by the body 11.

[0035] Thus, to the draft of secondary air through the central space 21, owing to the burning, the draft generated by the vacuum is added, to the advantage of an efficient supply of secondary air to the curtains of flame in use which are formed by burning the combustible mixture flowing from the central outflow ports 17.

[0036] More specifically, the body 11 comprises

- a base 22, which comprises a bottom 23 shaped like a helical ramp, and a perimetric collar 24,

- a cover 25, which comprises an annular portion 26 and the wall 20 and is adapted to mate complementarily with the base 22.

[0037] The orifices 18a and 18b conveniently open onto the annular portion 26, which has a peripheral circular flap 27 that is adjacent to the orifices 18a and 18b, for resting in a contoured seat 28 provided at the edge 29 of the collar 24.

[0038] The flap 27 and the edge 29 conveniently define the annular opening 19, below the flap 27 slits 30 being also provided for communication between the chamber 12 and the annular opening 19 to feed the gas thereto so as to form, in use, a curtain of pilot flame for igniting the gas that flows out of the orifices 18a and 18b.

[0039] In this way, in use the curtain of pilot flame develops in the direction of the central axis A, i.e. vertically, and ensures the effective burning of the gas mixed with the primary air that exits through the orifices 18a and 18b, thus enabling a prompt ignition thereof at the opening of the orifices, so as to prevent the phenomenon of flame detachment.

[0040] In practice it has been found that the invention fully achieves the intended aim and objects by providing a burner that makes it possible to form a central flame that is obtained by means of an efficient burning of the combustible gas, thanks to the combined effect of the draft due to burning and the draft due to the fluid-dynamic vacuum effect induced by the vortical nature of the curtains of flame formed, in use, by the central outflow ports.

[0041] A burner according to the invention makes it possible to prevent the phenomenon of flame detachment, particularly of the vertical flames which burn the gas flowing out from the orifices, partly thanks to the burn-assist effect generated, at the orifices, by the presence of the curtain of pilot flame, which in use is lit adjacent thereto.

[0042] What is more, a burner according to the invention makes it possible to present an ample heating region in order to enable the effective heating of a larger portion of the pan compared to that which can be effectively heated by the burners known today, this heating region being obtained from the combination of the curtains of flame emanating from the central outflow ports, with the rays of flame emanating from the orifices that are perimetric to the burner body.

[0043] A burner according to the invention is also structurally simple, easy to use, and can be made at relatively low cost.

[0044] Thus, in particular, a burner according to the invention makes it possible to obtain a high level of thermal power thanks to the combination of the two types of flame obtained, namely

- the central flames, which come from the central outflow ports with vortical motion and aspiration of the air from the central space, and
- the vertical flames, perimetric to the burner, which are powerful and efficient thanks to the curtain of pilot flame which enables their ignition right from the openings of the orifices, thus hindering flame detachment.

[0045] The stability of the flames that can be obtained using a burner according to the invention allows the modulation thereof, for example by modulation means which are known per se and which are not shown or described here, the burners used today for cooking with woks being in contrast substantially incapable of allowing the modulation of the thermal power produced.

[0046] The invention, thus conceived, is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims. Moreover, all the details may be substituted by other, technically equivalent elements.

[0047] In practice the materials employed, provided they are compatible with the specific use, and the dimensions and the contingent shapes, may be any according to requirements and to the state of the art.

[0048] The disclosures in Italian Patent Application No. PD2010A000159 from which this application claims priority are incorporated herein by reference.

[0049] Where technical features mentioned in any claim are followed by reference signs, such reference signs have been inserted for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A burner for professional or domestic gas cookers, particularly of the type of vertical-flame burners adapted for cooking with woks and the like, **characterized in that** it comprises

   - a burner body (11) which is substantially annular and encloses a tubular chamber (12) that lies in a substantially helical arrangement around a central axis (A) and is provided with an access hole (13),
   - a Venturi-type supply tube (14), which is connected to said body (11) and opens onto said hole (13) to introduce the combustion gas into said chamber (12),

   said body (11) being provided with

   - upper outflow ports (15) for said gas, which open onto the face (16) of said body (11) that is the upper one during use and are adapted to form a flame that is oriented substantially along said central axis (A),
   - central outflow ports (17) for said gas, which

open onto said body (11) substantially toward said central axis (A).

2. The burner according to claim 1, **characterized in that** said Venturi tube (14) defines, for said gas, an inflow direction (B), in said chamber (12), which is substantially tangent to said central axis (A).

3. The burner according to one or more of the preceding claims, **characterized in that** said upper outflow ports (15) comprise orifices (18a, 18b) which are arranged substantially circumferentially with respect to said central axis (A) and peripherally to said body (11).

4. The burner according to claim 3, **characterized in that** said orifices (18a, 18b) comprise first orifices (18a) and second orifices (18b) provided at different radial distances, said first orifices (18a), with respect to said second orifices (18b), being offset circumferentially around said central axis (A).

5. The burner according to one or more of the preceding claims, **characterized in that** said upper outflow ports (15) comprise an annular opening (19) which is peripheral with respect to said body (11).

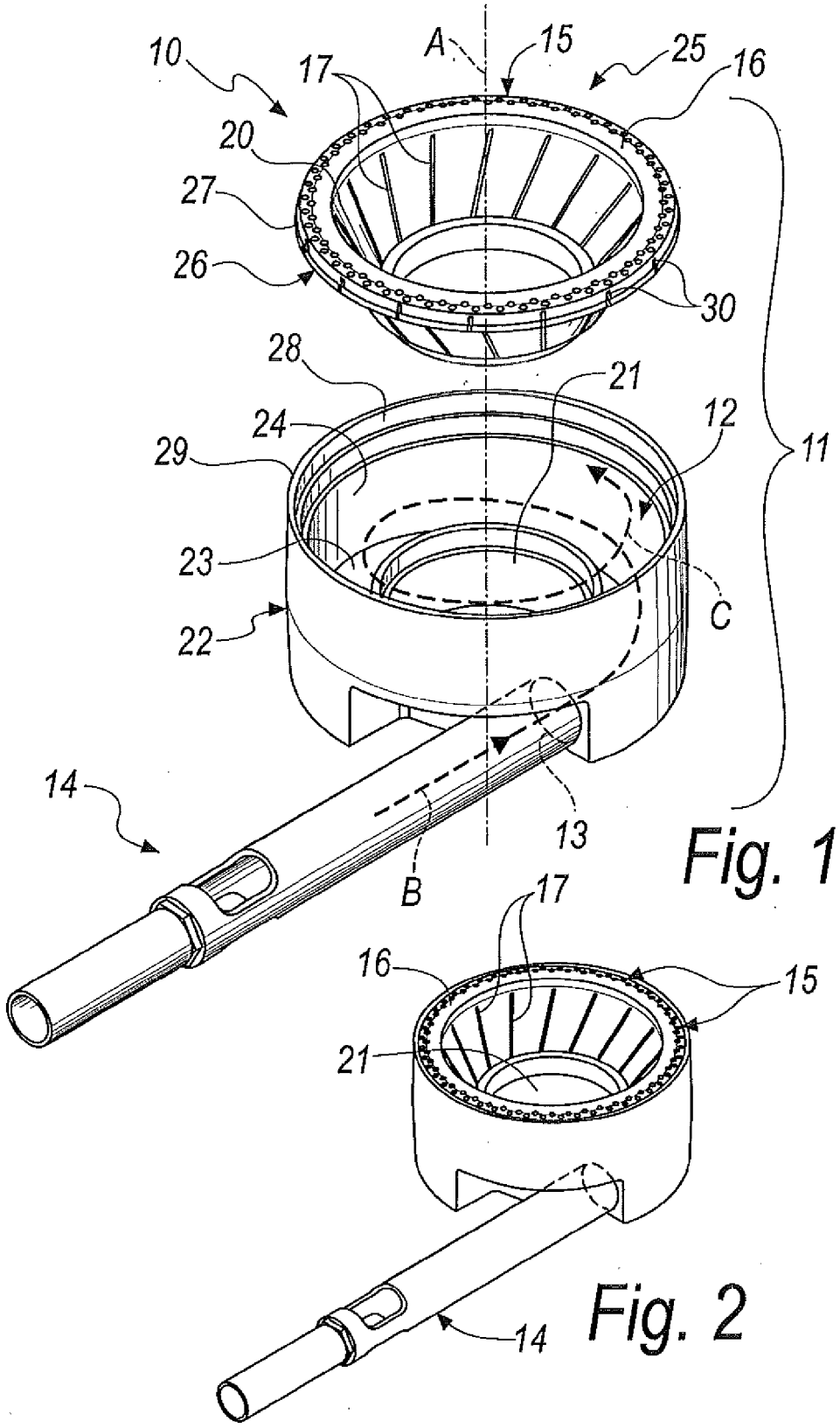
6. The burner according to one or more of the preceding claims, **characterized in that** said central outflow ports (17) are slot-shaped and are distributed substantially uniformly on a wall (20) of said body (11) that is substantially frustum-shaped and diverges upward, during use, and is substantially coaxial to said central axis (A), which it faces.

7. The burner according to claim 6, **characterized in** said central outflow ports (17) lie substantially along planes (D) which are tangent to a cylindrical surface (E) which has a selected radius and is coaxial to said central axis (A).

8. The burner according to one or more of the preceding claims, **characterized in that** said body (11) comprises

- a base (22), which comprises a bottom (23) shaped like a helical ramp, and a perimetric collar (24),
- a cover (25), which comprises an annular portion (26) and said wall (20) and is adapted to mate complementarily with said base (22).

9. The burner according to claim 8, **characterized in that** said orifices (18a, 18b) open onto said annular portion (26), which has a peripheral circular flap (27) that is adjacent to said orifices (18a, 18b), for resting in a contoured seat (28) provided at the edge (29) of said collar (24), said flap (27) and said edge (29) forming said annular opening (19), slits (30) for connection between said chamber (12) and said annular opening (19) being furthermore provided, below said flap (27), in order to feed said gas thereto so as to form a curtain of pilot flame to ignite said gas that exits from said orifices (18a, 18b).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C
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B

Fig. 1

17
16
15
21
14

Fig. 2

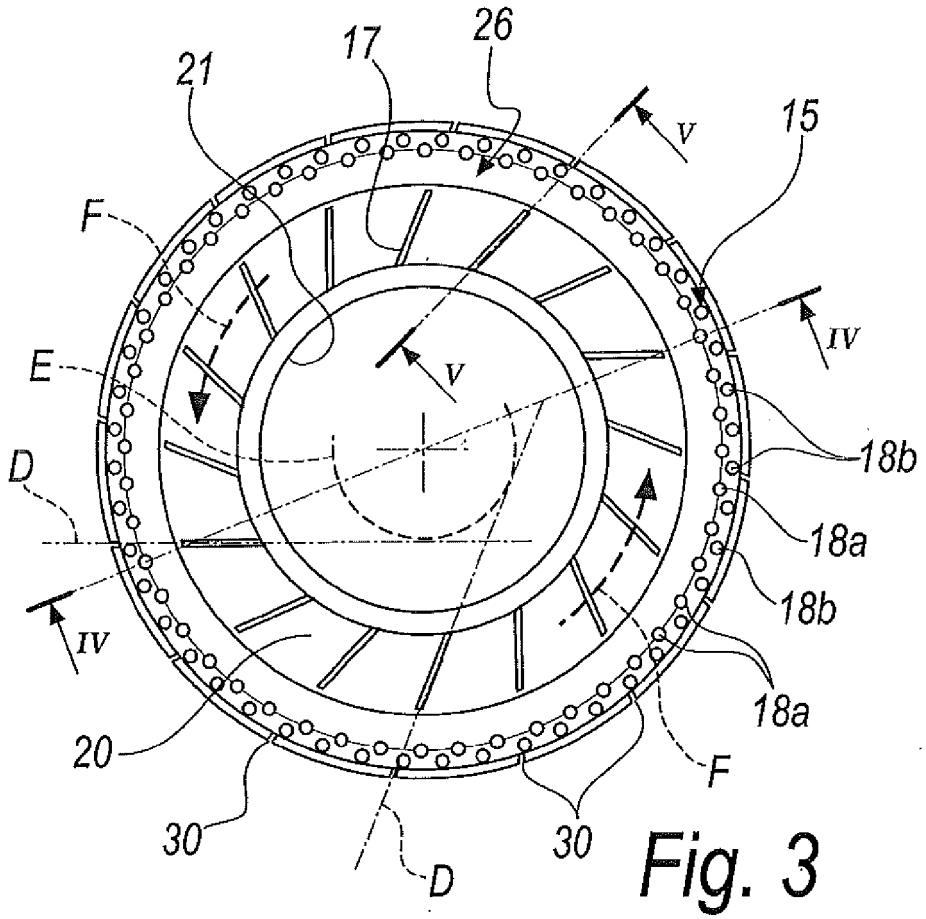
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Fig. 3

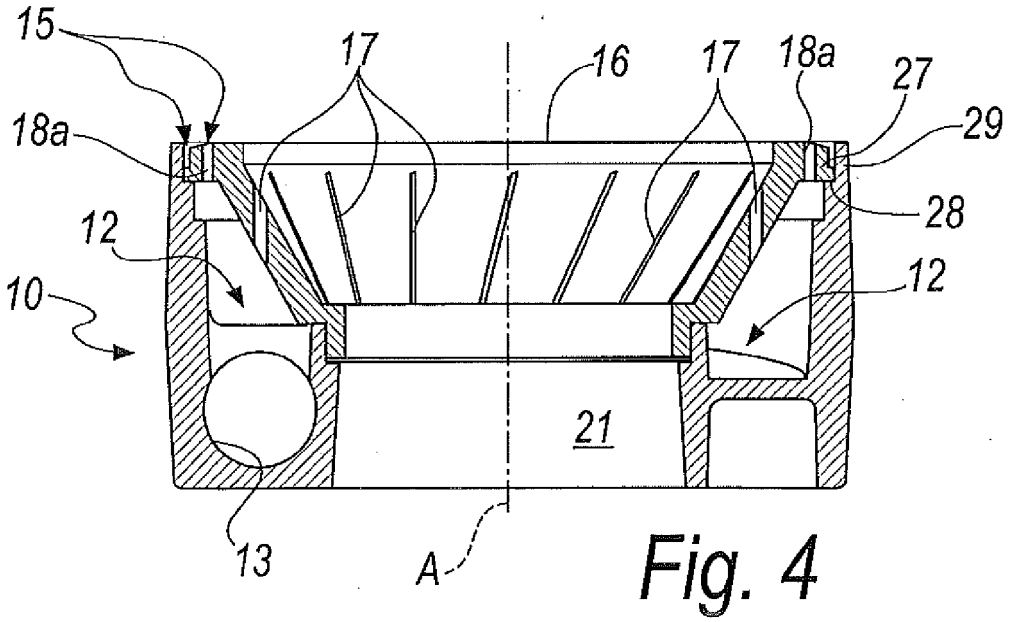
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Fig. 4

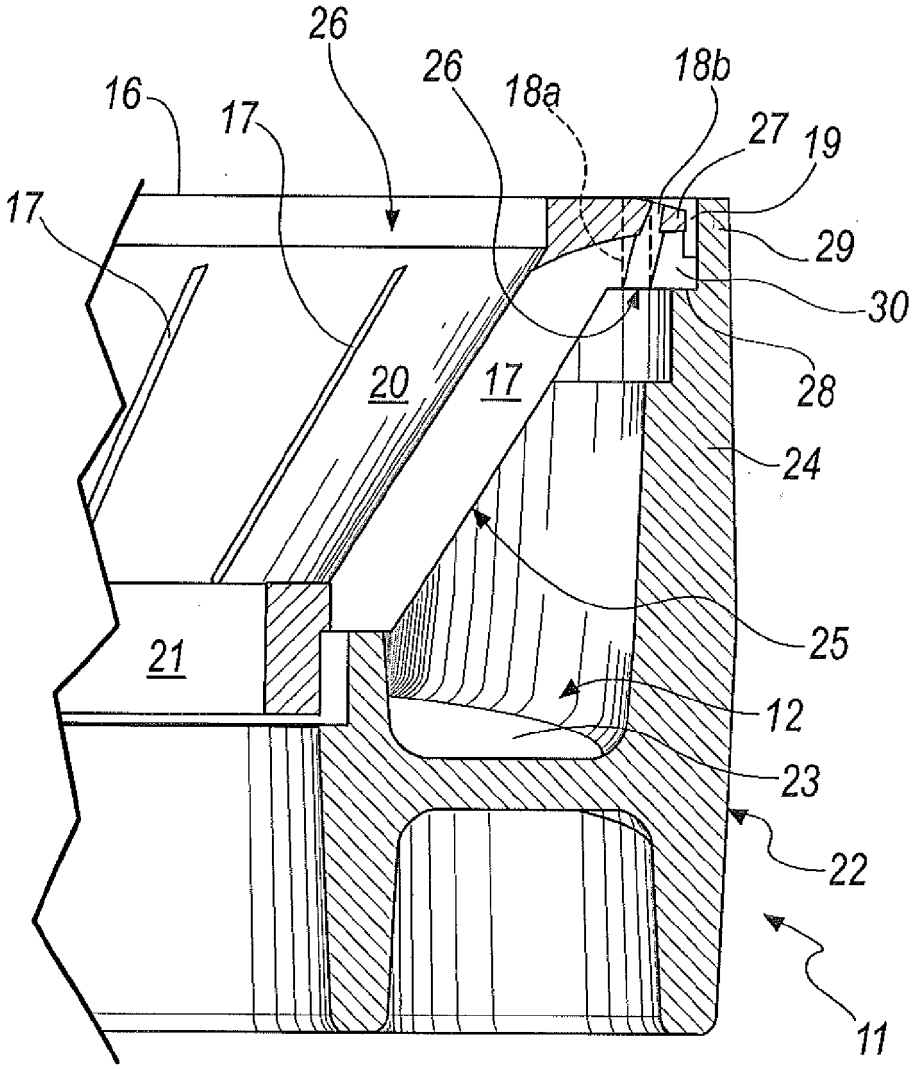

Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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