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(54) **Gas burner and cooking top**

(57) A burner unit (7) for a gas stove (1) comprises a gas distribution chamber (16) able to be connected with a gas feeding system (30) of the stove (1), said gas distribution chamber (16) being covered through a burner plate (13) that defines gas outlet holes (14), an air distribution

chamber (17) separate from the gas distribution chamber (16) and able to be connected to a forced ventilation group (11) of the stove (1), the air distribution chamber (17) being covered through an air diffuser (41) that at least partially defines one or more air outlet openings (36) spaced from the gas outlet openings (14).

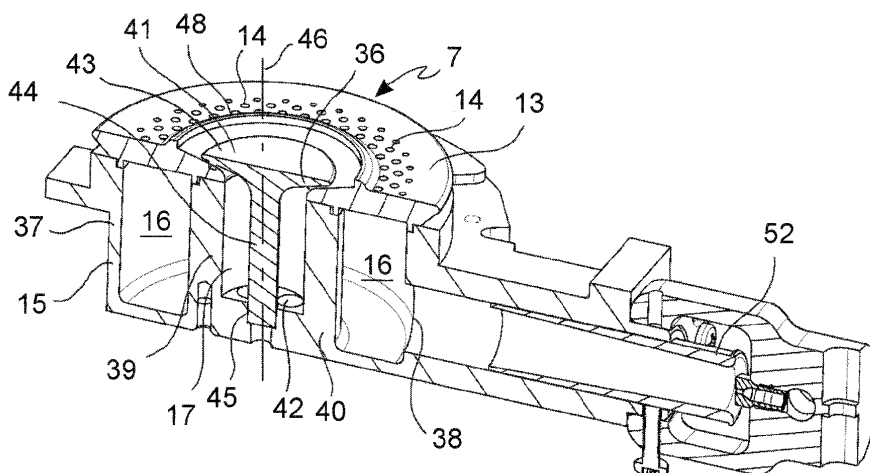


FIG. 4

Description

[0001] The present invention refers to a burner unit and to a gas stove for the home.

[0002] As known, a gas stove comprises a support and containment structure having an upper wall with a visible surface facing upwards, a support grating arranged on the visible surface that defines a plane on which to rest containers to be heated, for example pans, and one or more combustible gas burners configured to generate a series of flames in the gap between the visible surface and the support plane to heat the containers supported by the support grating.

[0003] The burners for known gas stoves usually comprise a main gas supply duct able to be connected with an external combustible gas source, for example with the gas supply network or with a gas cylinder. One or more burner units are connected to the main duct through one or more partial gas ducts, respectively. Each of the partial gas ducts has an adjustment valve (usually called gas tap) associated with it, which is configured to adjust the passage of gas through the partial duct between a closed position and a maximum open position. As well as the adjustment valve there is a safety valve to interrupt the passage of gas through the partial duct in response to a signal indicating irregular operation of the burner unit. Such a safety valve can be arranged upstream or downstream of the adjustment valve (with reference to the flow direction of the gas from the main duct to the burner unit) or else integrated in the valve body of the adjustment valve.

[0004] In known gas stoves for the home, the burner is a non-aerated burner or else an atmospheric air burner (called induced air burner), in which there is a venturi tube mixer arranged in the partial duct upstream of the burner unit and suitable for sucking up an amount of primary air in the partial gas flow. For efficient burning it is necessary for there to be a further volume of secondary air that is drawn by the flames themselves in the gap between the support plane (bottom of the pan) and the visible surface of the upper wall.

[0005] In order to obtain the most complete possible burning it is necessary to have a large amount of secondary air and, consequently, such a gap must have a minimum free height (currently about 35 mm) in order to just meet the standards regarding reduction of emissions, in particular CO and CO₂. Consequently, the stoves of the prior art are undesirably bulky and do not meet the needs of users who are ever more aware of environmental sustainability, the impact on health and the design of their household appliances and furnishings.

[0006] European patent application EP2072901A describes a gas stove for the home with an upper wall having a visible surface, a burner unit arranged at the upper wall and configured so as to generate flames in the space between the visible surface and a pan support plane, a gas feeding system configured to feed a flow of gas to the burner unit, as well as a forced suction group suitable

for sucking up a volume of secondary air and feeding it to the burner unit.

[0007] Although such a known solution allows a drastic reduction in CO and CO₂ emissions and a reduction in the distance between the support plane (bottom of the pan) and the visible surface to allow innovative design solutions, the flame itself can be unstable and small relative movements of the individual components of the burner unit can result in effects of instability of the flame.

[0008] The purpose of the present invention is therefore to provide a burner unit and a gas stove for the home, having characteristics such as to obviate at least some of the quoted drawbacks with reference to the prior art.

[0009] In the main purpose, a particular purpose of the present invention is to propose a burner unit and a gas stove for the home that ensure high stability of the flame and a reliable and precise feed of the secondary air to the flame itself.

[0010] A further purpose of the present invention is to configure the burner unit and the stove so that, in operative conditions, the burner unit and the system for feeding secondary air are always completely and correctly assembled.

[0011] These and other purposes are accomplished through a burner unit according to claim 1 and through a gas stove for the home according to claim 14.

[0012] Advantageous embodiments are the object of the dependent claims.

[0013] In order to better understand the present invention and appreciate its advantages, some embodiments thereof will be described hereafter as an example and not for limiting purposes, with reference to the attached figures, in which:

[0014] figure 1 is a perspective view of a gas stove according to an embodiment of the invention;

[0015] figure 2 is a horizontal section view of the stove in figure 1;

[0016] figure 3 is a section view of a part of a stove according to an embodiment;

[0017] figure 4 is a perspective section view of a burner unit of the stove in figure 3;

[0018] figures 5A-5C illustrate a component of the stove in a side view, a perspective view and from above, respectively;

[0019] figure 5D is a section view according to the line V-V in figure 5B.

[0020] With reference to the figures, a gas stove for the home is wholly indicated with reference numeral 1. The stove 1 comprises a support and containment structure 2 with an upper wall 3 that has a visible surface 4. At the upper wall 3 there are one or more resting members 5 that support the containers to be heated, for example pans, pots, coffee makers, etc., and define a support plane 6 thereof on the side of the visible surface 4 of the upper wall 3. One or more burner units 7 are arranged at the upper wall 3, preferably partially projecting and partially inserted in such an upper wall. The burner units 7 are configured so as to generate flames in a space 8

between the visible surface 4 and the support plane 6 that during use corresponds with the plane of the bottom of the pan. The gas stove 1 also comprises a gas feeding system 30 supported by the support and containment structure 2 and configured to be able to feed a flow of gas 34 possibly premixed with primary air 35 (Figure 3) to the burner unit 7.

[0021] The gas stove also comprises a forced ventilation group with an electrical blower 9 suitable for sucking in a volume of secondary air 10 through a suction opening formed in the support and containment structure 2 and for conveying such secondary air 10 in a ventilation duct 11 that extends in the support structure 2 (at least partially, preferably completely) under the visible surface 4. In other words, the ventilation duct 11 preferably extends on a lower side 12 of the upper wall 3 opposite the visible surface 4.

[0022] The ventilation duct 11 connects the electric ventilator 9 with the burner unit 7 so as to be able to feed the volume of secondary air 10 to the latter.

[0023] The resting members 5 can be formed in one piece with the upper wall 3 that can preferably be made from cast iron or stainless steel.

[0024] Part of the burner unit 7 can also be formed in one piece with the upper wall 3.

[0025] In accordance with an embodiment, part of the burner unit 7 or the entire burner unit 7 can be made as a preassembled group (Fig. 4) initially separate from and then connected to the upper wall 3, and possibly from a different material to the material of the upper wall 3, in particular aluminium.

[0026] The burner unit(s) 7 comprise a burner plate 13 with a substantially annular shape that defines a plurality of gas outlet holes 14 and a base portion 15 that forms a gas distribution chamber 16 in communication with the gas feeding system 30 and with the gas outlet holes 14, as well as an air distribution chamber 17 separate from the gas distribution chamber 16 and in communication with the ventilation duct 11 and with one or more air openings 36 separate and spaced from the gas outlet openings 14.

[0027] In accordance with an embodiment, the gas distribution chamber 16 has an annular shape defined at the top by the burner plate 13 with the gas outlet holes 14, at the side by an outer circumferential wall 37 equipped with a side opening 38 for connecting with the gas feeding system 30 and by an inner tubular wall 39, as well as at the bottom by a bottom wall 40 opposite the burner plate 13.

[0028] The air distribution chamber 17 can be formed inside the gas distribution chamber 16 and, preferably, coaxial with the latter. In particular, the air distribution chamber 17 is defined at the top by an air diffuser 41 that at least partially defines the air openings 36, at the side by the tubular wall 39 and at the bottom by the bottom wall 40 opposite the air openings 36.

[0029] Advantageously, the bottom wall 40 forms one or more holes 42 for the entry of the secondary air into

the air distribution chamber 17.

[0030] In accordance with an important aspect of the present invention, the air diffuser 41 has an upper portion 43 that, by itself or preferably together with the burner plate 13, defines the aforementioned air openings 36, as well as a positioning stem 44 that projects from the upper portion 43 in the air distribution chamber 17 and that is received through shape coupling in a diffuser seat 45 formed in the bottom wall 40.

[0031] This ensures a certain, precise and reliable positioning of the air diffuser 41 and therefore a correct and homogeneous secondary air flow to the flame.

[0032] In accordance with an embodiment, the positioning stem 44 and the diffuser seat 45 make a sliding coupling along a single axis 46 through mutual insertion, preferably along an axis 46 that is concentric and, preferably substantially coaxial with axes of symmetry of the air and gas distribution chambers 17, 16. In particular, the diffuser seat 45 forms a hole suitable for receiving a free end of the positioning stem 44, but allowing its extraction for easy cleaning or maintenance of the burner unit.

[0033] Advantageously, the air diffuser 41 is mushroom shaped and the upper portion 43 has a lower surface 47 facing towards the inside of the air distribution chamber 17 and that rests on a radially inner edge of the burner plate 13 so as to define, together with the latter, the aforementioned air openings 36. The lower surface 47 of the air diffuser 41 is inclined so as to direct the secondary air flow radially outwards and upwards (in other words towards the support plane 6) so as to meet the flames a certain distance from the gas outlet holes 14.

[0034] Advantageously, the burner plate 13 forms an annular projection 48 or a projection fanned by sections extended along a circle between the gas outlet holes 14 and the air openings 36, so as to deviate the secondary air flow (downstream of the air openings 36) further upwards in the area of the flame.

[0035] In accordance with an embodiment, at least one burner unit 7 comprises a rest reducer 49, for example a cross-shaped frame, for example made from case iron or stainless steel, able to be positioned above the burner plate 13 so as to make a support plane for small pans, for example with diameters of less than 120 mm. Such a rest reducer 49 is advantageously connected with the upper portion 43 of the air diffuser 41. In this way, a removal of the rest reducer 49 from the burner unit 7 makes the burner unit unusable, thus ensuring a correct and complete assembly (and the presence of the rest reducer) of the stove in operative conditions.

[0036] For the connection between the air diffuser 41 and the rest reducer 49, the upper portion 43 has a hole 51 to receive a connection screw and the positioning stem 44 has an open tubular portion 50 to facilitate access to the screw through a screwdriver.

[0037] The gas feeding system 30 of the stove 1 comprises a main duct 31 for feeding gas that can be connected with an external combustible gas source. One or

more partial ducts 32 connect the main duct 31 with each of the burner units 7 and an adjustment valve 33 associated with the partial duct 32 allows adjustment, preferably continuous, of the passage of gas through the partial duct 32 between a closed position and a maximum open position.

[0038] As already stated earlier, in the partial duct 32 there can be air supply means configured so that, during operation, the flow of gas 34 in the partial duct draws a first volume of primary comburent air 35. The air supply means for example comprise a venturi tube device 52 with a passage for the gas having a portion with throttled section and one or more passages for the primary air 35 that open out close to the portion with throttled section, so that the gas acts as a driving fluid to take the volume of primary air into the partial gas flow 34.

[0039] In the case in which the aforementioned primary air supply means are foreseen, the forced suction group 9 is advantageously configured to suck up the secondary air 10 from a different area from the area of the suction of the primary air.

[0040] A control unit 53 controls the forced suction group 9 in response to an actuation of the adjustment valve 33, so as to activate the forced flow of secondary air at the same time as gas is fed to the burner unit 7.

[0041] The gas stove for the home 1 has numerous advantages. Thanks to the configuration of the air diffuser and to its positioning through shape connection on the bottom of the burner unit, the flow of secondary air is distributed homogeneously and conveyed precisely and reliably to the flame. In this way it is ensured that there is high flame stability even in the case of great reductions of the height of the space 8 between the visible surface 4 and the bottom of the pan.

[0042] The high flame stability in turn contributes to more complete combustion, as well as a reduction in CO and CO₂ emissions for the same thermal power of the burner unit.

[0043] Of course, a man skilled in the art can bring further modifications and variants to the burner unit and to the gas stove for the home according to the present invention, in order to satisfy contingent and specific requirements, all of which are in any case covered by the scope of protection of the invention, as defined by the following claims.

Claims

1. Burner unit (7) for a gas stove (1), said burner unit (7) comprising:

- a gas distribution chamber (16) able to be connected with a gas feeding system (30) for the stove (1), said gas distribution chamber (16) being covered through a burner plate (13) that defines gas outlet holes (14),
- an air distribution chamber (17) separate from

the gas distribution chamber (16) and able to be connected to a forced ventilation group (11) of the stove (1), the air distribution chamber (17) being covered through an air diffuser (41) that at least partially defines one or more air outlet openings (36) spaced from the gas outlet openings (14),

characterised in that the air diffuser (41) comprises an upper portion (43) that at least partially defines the air outlet openings (36) and a positioning stem (44) the projects from the upper portion (43) into the air distribution chamber (17) and that is received through shape coupling in a diffuser seat (45) formed in a bottom wall (40) of the air distribution chamber (17) opposite the air outlet openings (36).

2. Burner unit (7) according to claim 1, wherein the gas distribution chamber (16) has an annular shape defined by said burner plate (13), by an outer circumferential wall (37) equipped with a side opening (38) for connection with the gas feeding system (30), by an inner tubular wall (39), as well as by a bottom wall (40) opposite the burner plate (13), wherein the air distribution chamber (17) is formed inside the gas distribution chamber (16) and is defined by said air diffuser (41), by the tubular wall (39) and by the bottom wall (40) opposite the air openings (36), wherein said bottom wall (40) forms one or more holes (42) for the communication of the air distribution chamber (17) with the forced ventilation group (11).
3. Burner unit (7) according to any one of the previous claims, wherein the upper portion (43) of the air diffuser (41) together with the burner plate (13) defines said air openings (36).
4. Burner unit (7) according to any one of the previous claims, wherein said positioning stem (44) and the diffuser seat (45) make a sliding coupling along a single axis (46) through mutual insertion.
5. Burner unit (7) according to the previous claim, wherein said axis (46) is concentric with the air and gas distribution chambers (17, 16).
6. Burner unit (7) according to any one of the previous claims, wherein the diffuser seat (45) forms a hole suitable for extractably receiving a free end of the positioning stem (44).
7. Burner unit (7) according to any one of the previous claims, wherein said air diffuser (41) is mushroom shaped and the upper portion (43) has a lower surface (47) facing towards the inside of the air distribution chamber (17) and resting on a radially inner edge of the burner plate (13) so as to jointly define

the air openings (36).

8. Burner unit (7) according to the previous claim, wherein said lower surface (47) of the air diffuser (41) is inclined so as to direct the secondary air flow coming from the forced ventilation group radially outwards and away from the burner unit (7), so as to meet the flames a certain distance from the gas outlet holes (14). 5
9. Burner unit (7) according to any one of the previous claims, comprising an annular projection (48) between the gas outlet holes (14) and the air openings (36). 10
10. Burner unit (7) according to any one of the previous claims, comprising a rest reducer (49) able to be positioned above the burner plate (13) so as to make a support plane for small pans, said rest reducer (49) being connected with the upper portion (43) of the air diffuser (41). 15
11. Burner unit (7) according to the previous claim, wherein the upper portion (43) of the air diffuser (41) forms a hole (51) that receives a connection screw and the positioning stem (44) forms an open tubular portion (50) to facilitate access to the screw. 20
12. Burner unit (7) according to any one of the previous claims, wherein the entire burner unit (7) is made as a preassembled group that can be connected to an upper wall (3) of the stove (1). 25
13. Burner unit (7) according to any one of the previous claims, wherein the burner unit (7) is made substantially from aluminium. 30
14. Gas stove for the home (1) comprising: 35
 - one or more burner units (7) according to any one of the previous claims, 40
 - a gas feeding system (30, 31, 32, 33) configured to feed a flow of gas (34) to said burner unit (7),
 - a forced ventilation group (9, 11) suitable for sucking in a secondary volume of air (10) and feeding said secondary air flow (10) to said burner unit (7), 45
15. Gas stove for the home (1), comprising: 50
 - a support and containment structure (2) with an upper wall (3) having a visible surface (4),
 - one or more resting members (5) arranged at said upper wall (3) and defining a support plane (6) for the containers to be heated, said support plane (6) being on the side of the visible surface (4) of the upper wall (3), 55

wherein said one or more burner units (7) are arranged at said upper wall (3) and configured so as to generate flames in the space (8) between said visible surface (4) and said support plane (6).

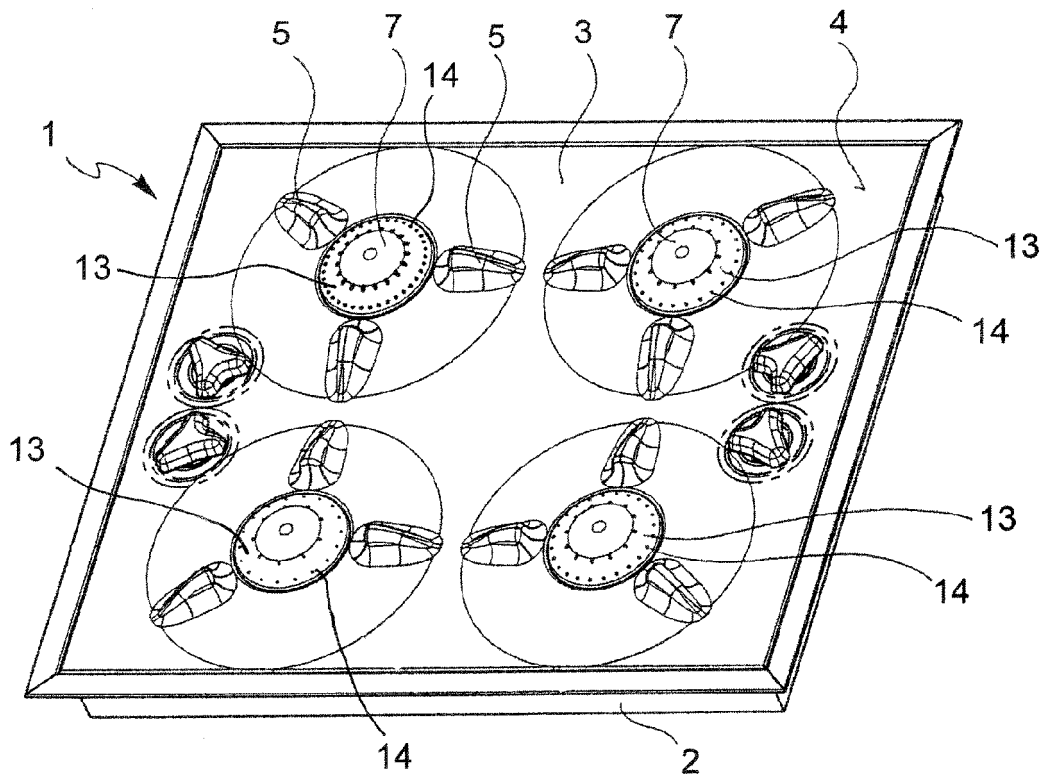


FIG. 1

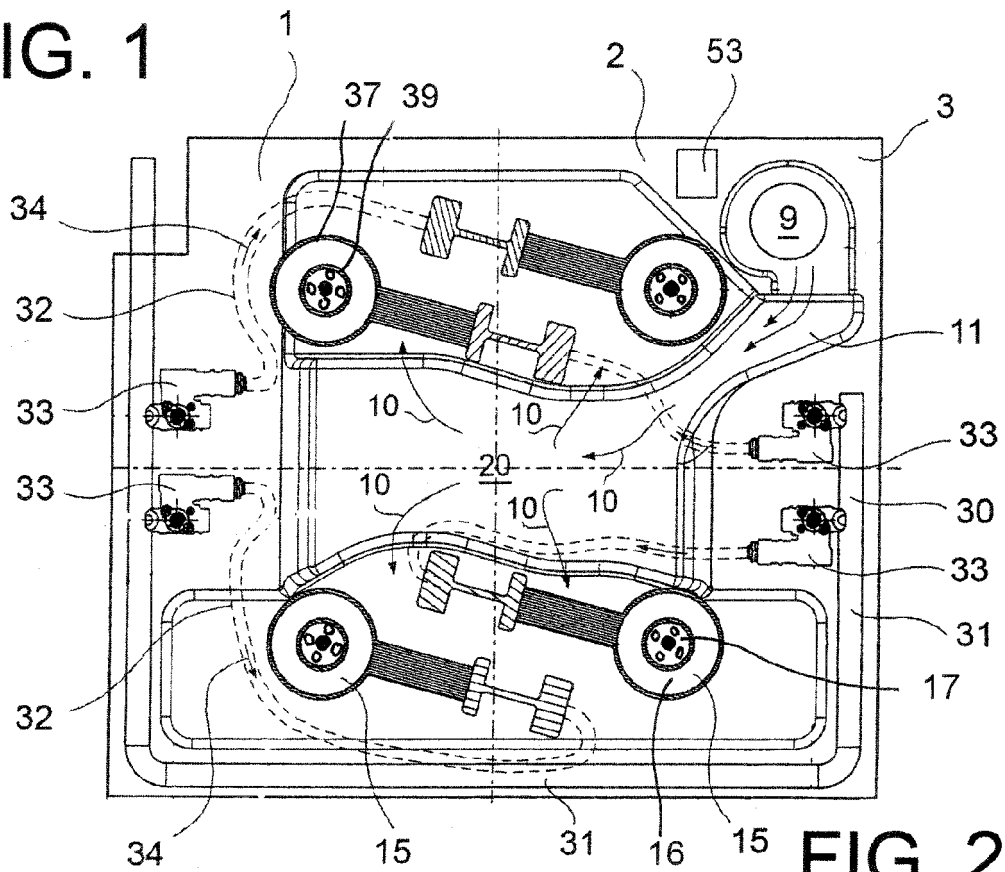
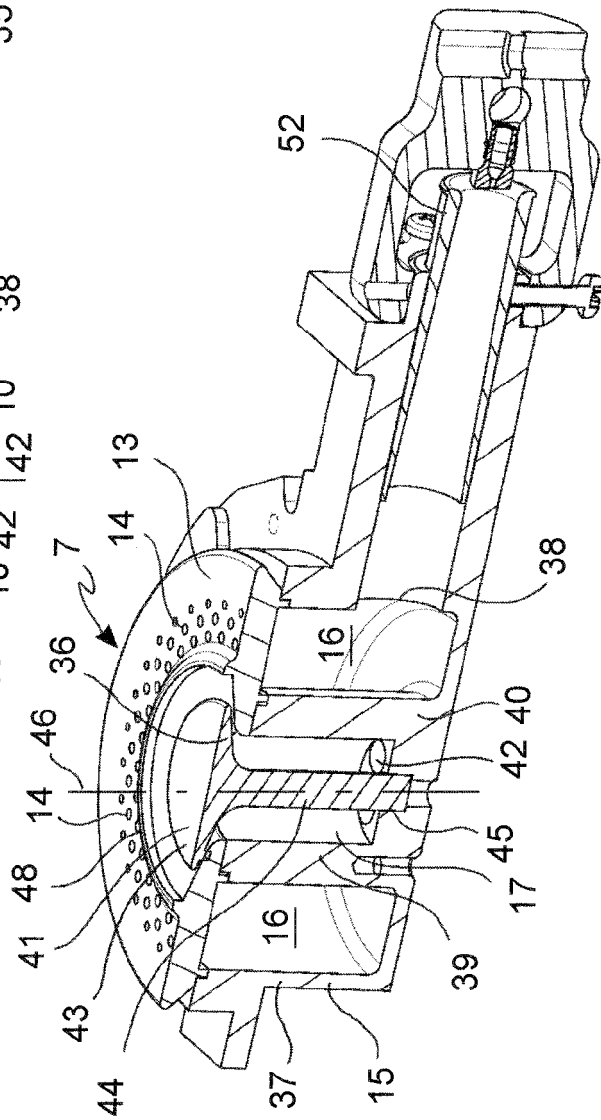
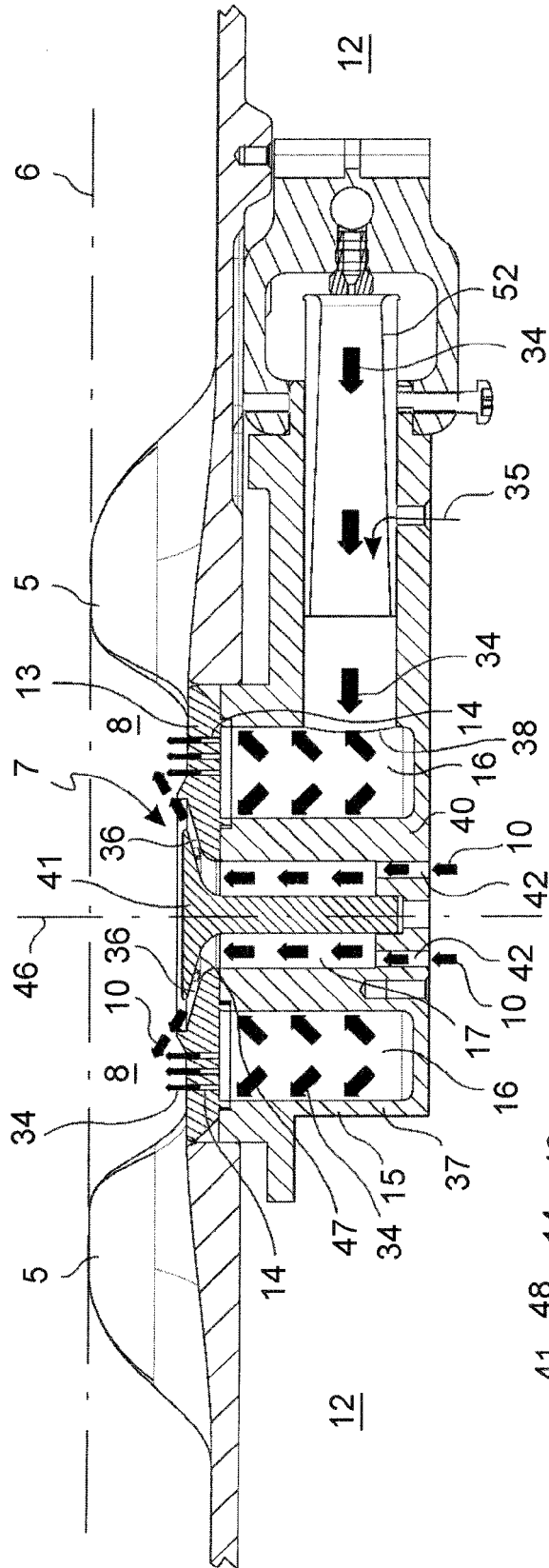


FIG. 2



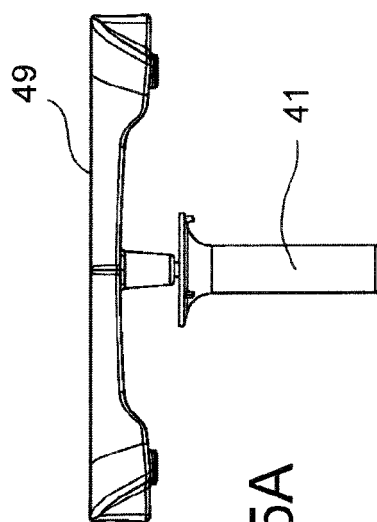


FIG. 5A

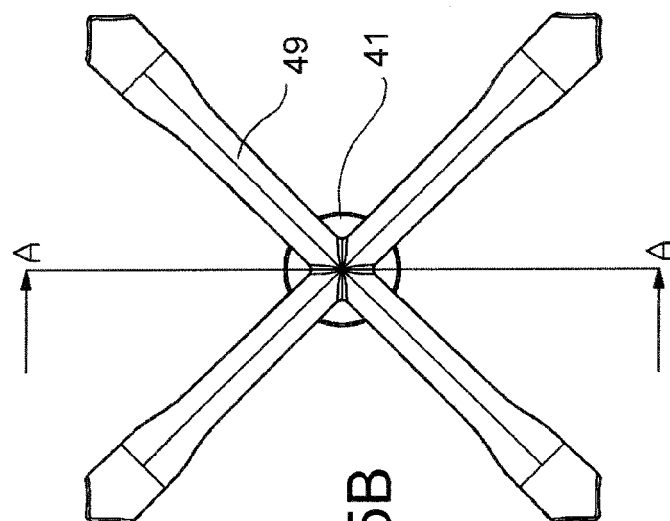


FIG. 5B

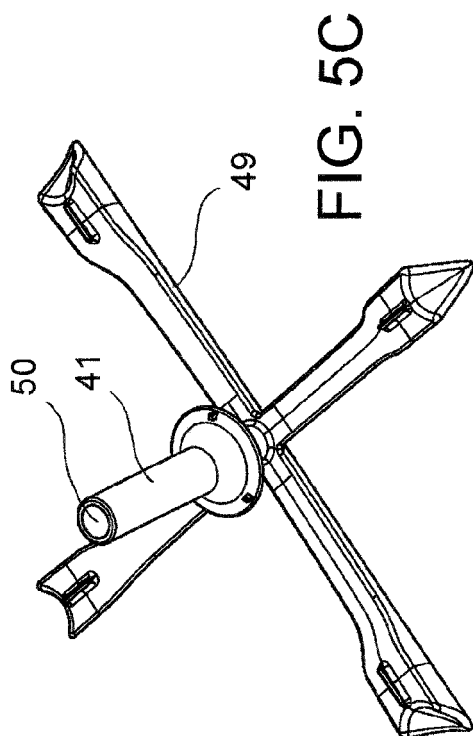


FIG. 5C

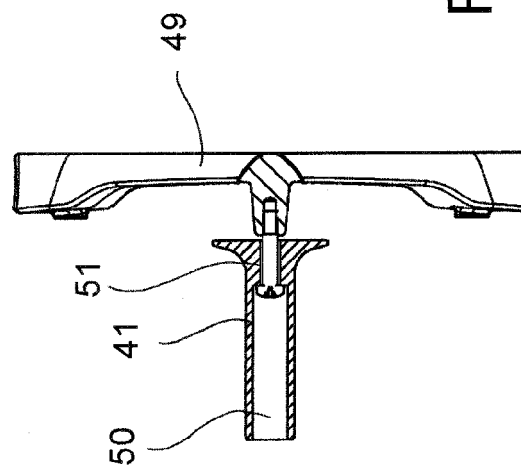


FIG. 5D



EUROPEAN SEARCH REPORT

Application Number
EP 11 16 0680

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* page 4, line 23 - page 5, line 21 * * page 6, line 29 - page 7, line 16 * * page 7, line 33 - page 8, line 8; figures 3-6 *	14,15	F23L5/02 F23L9/02 F24C3/08
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) F23D F23L F24C
Place of search The Hague		Date of completion of the search 19 October 2011	Examiner Coli, Enrico
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03/02 (P04C01)

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

EP 11 16 0680

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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19-10-2011

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