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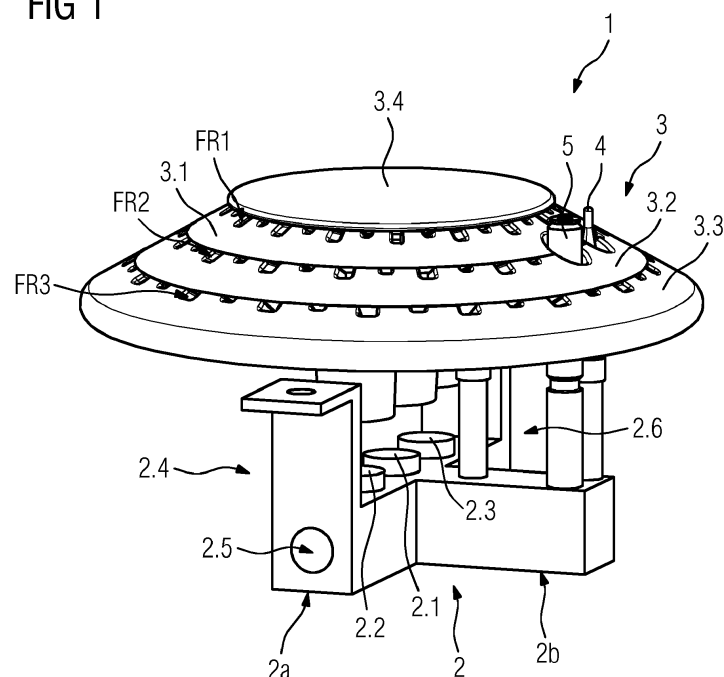
(54) **GAS BURNER AND HOB COMPRISING A GAS BURNER**

(57) The invention relates to a gas burner comprising:

- an injection holder (2) with at least three gas injectors (2.1, 2.2, 2.3) ;
- a burner crown assembly (3), the burner crown assembly (3) comprising at least three flame rings (FR1, FR2, FR3) with different sizes, the burner crown assembly (3) further comprising at least three chambers (CH1, CH2, CH3) and at least three pipes (3.1.1, 3.2.1, 3.3.1), each

pipe (3.1.1, 3.2.1, 3.3.1) being fluidly coupled with a single chamber (CH1, CH2, CH3);  
wherein each gas injector (2.1, 2.2, 2.3) is associated with one of said pipes (3.1.1, 3.2.1, 3.3.1) for providing gas into said pipe (3.1.1, 3.2.1, 3.3.1), said pipe (3.1.1, 3.2.1, 3.3.1) being adapted to receive primary air in the area of the injection holder (2) and to provide a combustion mixture of gas and primary air to one of said flame rings (FR1, FR2, FR3) of the burner crown assembly (3).

**FIG 1**



## Description

**[0001]** Generally, the present invention relates to the field of gas burners. More specifically, the present invention relates to a gas burner with multiple flame rings comprising different sizes for providing different heating power levels within a single gas burner.

## BACKGROUND OF THE INVENTION

**[0002]** Gas burners are well-known in prior art. Specifically, cooking hob gas burners are known which comprise an injection holder, a burner crown and a burner cap. Said burner crown and burner cap form a combustion gas chamber providing a mixture of gas and primary air to a flame ring comprising a plurality of flame ports.

**[0003]** Gas hobs are known which comprise multiple gas burners of different sizes, specifically, different diameters in order to provide burners with different heating power levels.

**[0004]** Disadvantageously, current gas hobs do not provide the possibility to provide heat at multiple high-power, large-sized burners. So, in case that the gas hob comprises four burners and four pieces of cookware should be heated at high-power burners, gas burners have to be used which do not have the desired power level.

## SUMMARY OF THE INVENTION

**[0005]** It is an objective of the embodiments of the present invention to provide a gas burner with improved flexibility in view of the heating power range provided by the gas burner. The objective is solved by the features of the independent claims. Preferred embodiments are given in the dependent claims. If not explicitly indicated otherwise, embodiments of the invention and single features of said embodiments can be freely combined with each other.

**[0006]** According to an aspect, the invention relates to a gas burner comprising:

- an injection holder with at least three gas injectors; and
- a burner crown assembly, the burner crown assembly comprising at least three flame rings with different sizes, the burner crown assembly further comprising at least three chambers and at least three pipes, each pipe being fluidly coupled with a single chamber.

**[0007]** Each gas injector is associated with one of said pipes for providing gas into said pipe, said pipe being adapted to receive primary air in the area of the injection holder and to provide a combustion mixture of gas and primary air to one of said flame rings of the burner crown assembly.

**[0008]** Said gas burner is advantageous because due

to the at least three different-sized flame rings said gas burner can provide a small heating power by only powering the smallest flame ring or a higher heating power by powering two or more of said flame rings.

**[0009]** According to embodiments, the burner crown assembly comprises at least three burner crowns of different sizes wherein a smaller-sized burner crown is at least partially inserted at an upper-side recess of the next-sized burner crown. Said burner crowns may be superimposed or stacked such that an upper burner crown is at least partially received within the recess of a burner crown arranged below. According to an embodiment, said burner crown assembly may be disassembled into multiple burner crowns which have different sizes. Preferably, said burner crowns may be arranged concentrically. The assembled burner crown assembly may comprise a shape according to a truncated cone.

**[0010]** According to embodiments, a lower wall portion of an upper burner crown provides an upper boundary for the chamber provided within a lower burner crown. So, in other words, the recess provided within a certain burner crown is limited at the top side by a bottom portion of the burner crown arranged above in order to form a gas mixture chamber within the respective burner crown.

**[0011]** According to embodiments, the chambers are separated from each other with respect to the provision of a combustion mixture of gas and primary air into the respective chamber. So, the combustion gas mixture provided to a certain chamber is not able to flow into another chamber provided above or below. Thereby, said combustion gas mixture can be provided to each flame ring separately.

**[0012]** According to embodiments, each gas injector is coupled with a separate gas inlet. The gas inlet may be, for example, provided at the injection holder. Thereby it is possible to control the provision of gas separately to each chamber, respectively to each flame ring.

**[0013]** According to embodiments, the burner crown assembly is arranged above the injection holder. So, gas provided by the gas injectors arranged at the injection holder can flow upwardly into the respective chamber in order to be guided by said chamber towards the flame ports of the flame ring which are circumferentially arranged at the respective burner crown.

**[0014]** According to embodiments, the pipes are arranged at a lateral distance to each other. Thereby it is possible to arrange separate gas injectors below the free end of the pipes in order to provide selectively gas into said pipes.

**[0015]** According to embodiments, the pipes are arranged next to each other in a straight line. Said arrangement is advantageous because the provision of gas to said pipes is simplified. The arrangement of the gas injectors may be chosen similarly in order to enable a technically simple provision of gas to said pipes.

**[0016]** According to embodiments, the pipe of the upper burner crown is arranged in the centre of the burner crown assembly. Said configuration is advantageous be-

cause the upper burner crown comprises the smallest cross-sectional area and due to the centred arrangement of the pipe, the construction of the burner crown assembly is simplified and a homogenous flame formation at the first flame ring is obtained.

**[0017]** According to embodiments, the longitudinal axes of the pipes are vertically arranged. Thereby, the gas guided within the pipe can flow upwardly through the pipe thereby being mixed with the primary air sucked at the bottom of the pipe.

**[0018]** According to embodiments, the chamber of the upper burner crown is covered by a burner cap. Said burner cap may close a recess provided in the upper burner crown in order to form said chamber.

**[0019]** According to embodiments, each pipe comprises at its bottom an open free end. Said open free end provides an air inlet at which primary air is sucked in in order to be mixed with the gas provided by the gas injector. Said air inlet may be provided below a workplate of the gas burner (also referred to as bottom breather technology).

**[0020]** According to embodiments, the burner crown assembly comprises at least an upper, a middle and a lower burner crown, wherein the middle burner crown comprise at least one passage for the pipe of the upper burner crown and the lower burner crown comprises at least two passages for the pipes of the upper and middle burner crown. Thereby it is possible that the pipes can pass through the respective burner crowns or cambers.

**[0021]** According to embodiments, at least the upper burner crown comprises a passage for a spark plug and/or a thermocouple. Said spark plug and/or thermocouple may be arranged within the upper burner crown or in an area between the upper and middle burner crown. Thereby the ignition behaviour and operational safety is significantly improved.

**[0022]** According to a further aspect, the invention refers to a gas hob with a gas burner configured according to anyone of the preceding embodiments.

**[0023]** The terms "essentially", "substantially" or "approximately" as used in the invention means deviations from the exact value by +/- 10%, preferably by +/- 5% and/or deviations in the form of changes that are insignificant for the function.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0024]** The various aspects of the invention, including its particular features and advantages, will be readily understood from the following detailed description and the accompanying drawings, in which:

Fig. 1 shows an example perspective view of a gas burner according to an embodiment; and

Fig. 2 shows an example exploded perspective view of the gas burner according to Fig. 1.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

**[0025]** The present invention will now be described more fully with reference to the accompanying drawings, in which example embodiments are shown. However, this invention should not be construed as limited to the embodiments set forth herein. Throughout the following description similar reference numerals have been used to denote similar elements, parts, items or features, when applicable.

**[0026]** Fig. 1 illustrates an embodiment of a gas burner 1 in an assembled state and Fig. 2 illustrates said gas burner 1 according to an exploded view. The gas burner 1 comprises an injector holder 2. Said injector holder 2 may be adapted to be arranged below a work plate of a gas hob. In other words, the injector holder 2 may be integrated in the cooktop. The injector holder 2 comprises gas inlets 2.4, 2.5, 2.6 which are fluidly coupled with gas injectors 2.1, 2.2, 2.3.

**[0027]** According to an embodiment, the injector holder 2 may comprise multiple end faces. For example, the injector holder 2 may comprise a T-like or cross-like shape with a first and a second injector holder portion 2a, 2b and the gas inlets 2.4, 2.5, 2.6 are provided at the free ends of said injector holder portions 2a, 2b. The gas injectors 2.1, 2.2, 2.3 may be arranged at an upper side of the injector holder 2 in order to provide an upwardly directed gas flow. For example, the gas injectors 2.1, 2.2, 2.3 may be arranged next to each other along a straight line.

**[0028]** In addition, the gas burner 1 comprises a burner crown assembly 3. The burner crown assembly 3 may be adapted to be arranged above the injector holder 2. The burner crown assembly 3 may comprise multiple parts, namely a first burner crown 3.1, in the following also referred to as upper burner crown 3.1, a second burner crown 3.2, in the following also referred to as middle burner crown 3.2 and a third burner crown 3.3, in the following also referred to as lower burner crown 3.3. As shown in fig. 2, the burner crowns 3.1, 3.2, 3.3 comprise different sizes, namely the first burner crown 3.1 is the smallest one, the second burner crown 3.2 is greater than the first burner crown 3.1 but smaller than the third burner crown 3.3 and said third burner crown 3.3 is the biggest one. Said burner crowns 3.1, 3.2, 3.3 are adapted to be arranged concentrically and superimposed such that said burner crowns 3.1, 3.2, 3.3 can be stacked one above the other.

**[0029]** More in detail, the second and the third burner crown 3.2, 3.3 comprises a recess 3.2.3, 3.3.3 for receiving a lower portion of the burner crown 3.1, 3.2 arranged above. When arranging the burner crowns 3.1, 3.2, 3.3 above each other, chambers CH2, CH3 may be obtained in an area between two adjacent burner crowns 3.1, 3.2, 3.3. More in detail, between a lower wall portion of the recess 3.2.3 of the second burner crown 3.2 and a lower wall portion of the first burner crown 3.1, a chamber CH2

may be formed. A further chamber CH3 is built between a lower wall portion of the recess 3.3.3 of the third burner crown 3.3 and a lower wall portion of the second burner crown 3.2. In addition, also the first burner crown 3.1 may comprise a recess 3.1.2 which is closed at its upper side by a burner cap 3.4, thereby forming a chamber CH1 between the first burner crown 3.1 and the burner cap 3.4. Said chambers CH1, CH2, CH3 may be, for example, radial Venturi effect chambers. Said chambers CH1, CH2, CH3 may be stacked on top of one another.

**[0030]** In order to provide a combustion gas mixture, each burner crown 3.1, 3.2, 3.3 comprise a flame ring FR1, FR2, FR3. Said flame ring FR1, FR2, FR3 is provided circumferentially at the respective burner crown 3.1, 3.2, 3.3. As shown in Fig. 1, the flame rings FR1, FR2, FR3 may be arranged in a concentric manner with respect to the middle axis of the gas burner 1, respectively its burner crown assembly 3. The flame rings FR1, FR2, FR3 may be constituted by multiple openings or grooves provided through the circumferential side wall of the burner crowns 3.1, 3.2, 3.3. Said openings or grooves form flame ports of the burner.

**[0031]** In order to be able to selectively provide a combustion gas mixture in a certain chamber CH1, CH2, CH3, the chambers CH1, CH2, CH3 are separated from each other and said combustion gas mixture is provided separately to each chamber CH1, CH2, CH3. More in detail, the burner crown assembly 3 comprises multiple pipes 3.1.1, 3.2.1, 3.3.1 adapted to provide a combustion gas mixture to said chamber CH1, CH2, CH3. Each pipe 3.1.1, 3.2.1, 3.3.1 may be associated with a certain chamber CH1, CH2, CH3. For example, a first pipe 3.1.1 may be adapted to provide said combustion gas mixture to the first chamber CH1, a second pipe 3.2.1 may be adapted to provide said combustion gas mixture to the second chamber CH2 and the third pipe 3.3.1 may be adapted to provide said combustion gas mixture to the third chamber CH3. Said pipe 3.1.1, 3.2.1, 3.3.1 may be Venturi effect pipes.

**[0032]** Said pipes 3.1.1, 3.2.1, 3.3.1 may be vertically arranged within the burner crown assembly 3, i.e. the longitudinal axis of the respective pipe 3.1.1, 3.2.1, 3.3.1 is vertically arranged. Said pipe 3.1.1, 3.2.1, 3.3.1 may be, for example, an integral part of the respective burner crown 3.1, 3.2, 3.3. The pipe 3.1.1, 3.2.1, 3.3.1 may protrude at the lower side of the burner crown 3.1, 3.2, 3.3 and may have a first free end arranged within the respective chamber CH1, CH2, CH3 and a further free end arranged below the respective chamber CH1, CH2, CH3. Said further free end may be arranged closely above a gas injector 2.1, 2.2, 2.3. Thereby, the each gas injector 2.1, 2.2, 2.3 may be able to provide an upwardly directed stream of gas into said pipe 3.1.1, 3.2.1, 3.3.1 and said pipe 3.1.1, 3.2.1, 3.3.1 guides the gas into the chamber CH1, CH2, CH3 in which its upper free end is located.

**[0033]** The lower free ends of the pipe 3.1.1, 3.2.1, 3.3.1 may be at least partially open in order to be able to suck primary air. Said primary air is mixed within the re-

spective pipe 3.1.1, 3.2.1, 3.3.1 and the chambers CH1, CH2, CH3 in order to provide a combustion gas mixture at the flame rings FR1, FR2, FR3.

**[0034]** As shown in Fig 1, said pipes 3.1.1, 3.2.1, 3.3.1 are arranged at a distance to each other. The pipe 3.1.1 (fluidly connected with the first, upper chamber CH1) may be arranged in the center of the burner crown assembly 3 and the pipes 3.2.1, 3.3.1 may be arranged at different sides of said pipe 3.1.1. The gas injectors 2.1, 2.2, 2.3 may be arranged at the injection holder 2 such that - in the assembled state of the gas burner 1 - the lower free ends of the pipes 3.1.1, 3.2.1, 3.3.1 are arranged directly above the respective gas injector 2.1, 2.2, 2.3.

**[0035]** In order to enable the pipes 3.1.1, 3.2.1 to pass through the chambers CH2, CH3, the second and third burner crown 3.2, 3.3 comprises a passage 3.2.2, 3.3.2 for said pipe(s). More in detail, the third burner crown 3.3 comprises two passages 3.3.2 for pipe 3.1.1 and pipe 3.2.1. The second burner crown 3.2 comprises a single passage 3.2.2 for pipe 3.1.1. Said passages 3.2.2, 3.3.2 may be arranged coaxially with the gas injectors 2.2, 2.3. Thus, during assembling of the gas burner 1, the burner crowns 3.1, 3.2, 3.3 can be arranged one above another and the pipes 3.1.1, 3.2.1 pass through the respective passages 3.2.2, 3.3.2.

**[0036]** Due to the different size of the flame rings FR1, FR2, FR3, respectively the burner crowns 3.1, 3.2, 3.3, the gas burner 1 provides multiple gas burner stages with different heating power. For example, small-sized flame ring FR1 may provide lower heating power than flame ring FR2 and flame ring FR2 may provide lower heating power than flame ring FR3.

**[0037]** The gas burner may be adapted to be driven according to a three-stage power concept, namely a lower power stage in which only the first flame ring FR1 is active, a medium power stage in which the first and the second flame ring FR1, FR2 is active, and a maximum power level in which all flame rings FR1, FR2, FR3 are active. The heating power of the lower power stage may be, for example, in the range of 0.3KW to 1KW, the medium power stage may be, for example, in the range of 1.6KW to 2.5KW and the maximum power stage may be, for example, in the range of 1.6KW to 4KW.

**[0038]** The burner cap 4 may be a single piece element made of drawn sheet metal, e.g. of steel, aluminum, brass, stainless steel, sintered steel or other suitable metal alloys.

**[0039]** The burner crowns 3.1, 3.2, 3.3 may be preferably made of aluminum.

**[0040]** In the disclosure before, an embodiment with three flame rings, respectively, burner crowns have been described. It is worth mentioning that the gas burner may comprise even more than three flame rings, respectively, burner crowns, e.g. four or five flame rings/ burner crowns.

**[0041]** It should be noted that the description and drawings merely illustrate the principles of the proposed gas burner. Those skilled in the art will be able to implement

various arrangements that, although not explicitly described or shown herein, embody the principles of the invention.

#### List of reference numerals

#### [0042]

|               |                          |
|---------------|--------------------------|
| 1             | gas burner               |
| 2             | injection holder         |
| 2a            | injection holder portion |
| 2b            | injection holder portion |
| 2.1, 2.2, 2.3 | gas injector             |
| 2.4, 2.5, 2.6 | gas inlet                |
| 3             | burner crown assembly    |
| 3.1           | first burner crown       |
| 3.1.1         | pipe                     |
| 3.1.2         | recess                   |
| 3.2           | second burner crown      |
| 3.2.1         | pipe                     |
| 3.2.2         | passage                  |
| 3.2.3         | recess                   |
| 3.3           | third burner crown       |
| 3.3.1         | pipe                     |
| 3.3.2         | passage                  |
| 3.3.3         | recess                   |
| 3.4           | burner cap               |
| 4             | spark plug               |
| 5             | thermocouple             |

|     |                   |
|-----|-------------------|
| CH1 | first chamber     |
| CH2 | second chamber    |
| CH3 | third chamber     |
| FR1 | first flame ring  |
| FR2 | second flame ring |
| FR3 | third flame ring  |

#### Claims

##### 1. Gas burner comprising:

- an injection holder (2) with at least three gas injectors (2.1, 2.2, 2.3);
- a burner crown assembly (3), the burner crown assembly (3) comprising at least three flame rings (FR1, FR2, FR3) with different sizes, the burner crown assembly (3) further comprising at least three chambers (CH1, CH2, CH3) and at least three pipes (3.1.1, 3.2.1, 3.3.1), each pipe (3.1.1, 3.2.1, 3.3.1) being fluidly coupled with a single chamber (CH1, CH2, CH3);

wherein each gas injector (2.1, 2.2, 2.3) is associated with one of said pipes (3.1.1, 3.2.1, 3.3.1) for providing gas into said pipe (3.1.1, 3.2.1, 3.3.1), said pipe (3.1.1, 3.2.1, 3.3.1) being adapted to receive primary air in the area of the injection holder (2) and to provide

a combustion mixture of gas and primary air to one of said flame rings (FR1, FR2, FR3) of the burner crown assembly (3).

- 5 2. Gas burner according to claim 1, wherein the burner crown assembly (3) comprises at least three burner crowns (3.1, 3.2, 3.3) of different sizes wherein a smaller-sized burner crown (3.1, 3.2) is at least partially inserted at an upper-side recess of the next-sized burner crown (3.2, 3.3).
- 10 3. Gas burner according to claim 2, wherein a lower wall portion of an upper burner crown (3.1, 3.2) provides an upper boundary for the chamber (CH2, CH3) provided within a lower burner crown (3.2, 3.3).
- 15 4. Gas burner according to anyone of the preceding claims, wherein the chambers (CH1, CH2, CH3) are separated from each other with respect to the provision of a combustion mixture of gas and primary air into the respective chamber (CH1, CH2, CH3).
- 20 5. Gas burner according to anyone of the preceding claims, wherein each gas injector (2.1, 2.2, 2.3) is coupled with a separate gas inlet (2.4, 2.5, 2.6).
- 25 6. Gas burner according to anyone of the preceding claims, wherein the burner crown (3) assembly is arranged above the injection holder (2).
- 30 7. Gas burner according to anyone of the preceding claims, wherein the pipes (3.1.1, 3.2.1, 3.3.1) are arranged at a lateral distance to each other.
- 35 8. Gas burner according to anyone of the preceding claims, wherein the pipes (3.1.1, 3.2.1, 3.3.1) are arranged next to each other in a straight line.
- 40 9. Gas burner according to anyone of the preceding claims 2 to 8, wherein the pipe (3.1.1) of the upper burner crown (3.1) is arranged in the centre of the burner crown assembly (3).
- 45 10. Gas burner according to anyone of the preceding claims, wherein the longitudinal axes of the pipes (3.1.1, 3.2.1, 3.3.1) are vertically arranged.
- 50 11. Gas burner according to anyone of the preceding claims, wherein the chamber (CH1) of the upper burner crown (3.1) is covered by a burner cap.
- 55 12. Gas burner according to anyone of the preceding claims, wherein each pipe (3.1.1, 3.2.1, 3.3.1) comprise at its bottom an open free end.
13. Gas burner according to anyone of the preceding claims, wherein the burner crown assembly (3) comprises at least an upper, a middle and a lower burner

crown (3.1, 3.2, 3.3), wherein the middle burner crown (3.2) comprise at least one passage (3.2.2) for the pipe (3.1.1) of the upper burner crown (3.1) and the lower burner crown (3.3) comprises at least two passages (3.2.2, 3.3.2) for the pipes (3.1.1, 3.2.1) of the upper and middle burner crown (3.1, 3.2). 5

14. Gas burner according to anyone of the preceding claims, wherein at least the upper burner crown (3.1) comprises a passage for a spark plug (4) and/or a thermocouple (5). 10

15. Cooking hob comprising a gas burner (1) configured according to anyone of the preceding claims. 15

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FIG 1

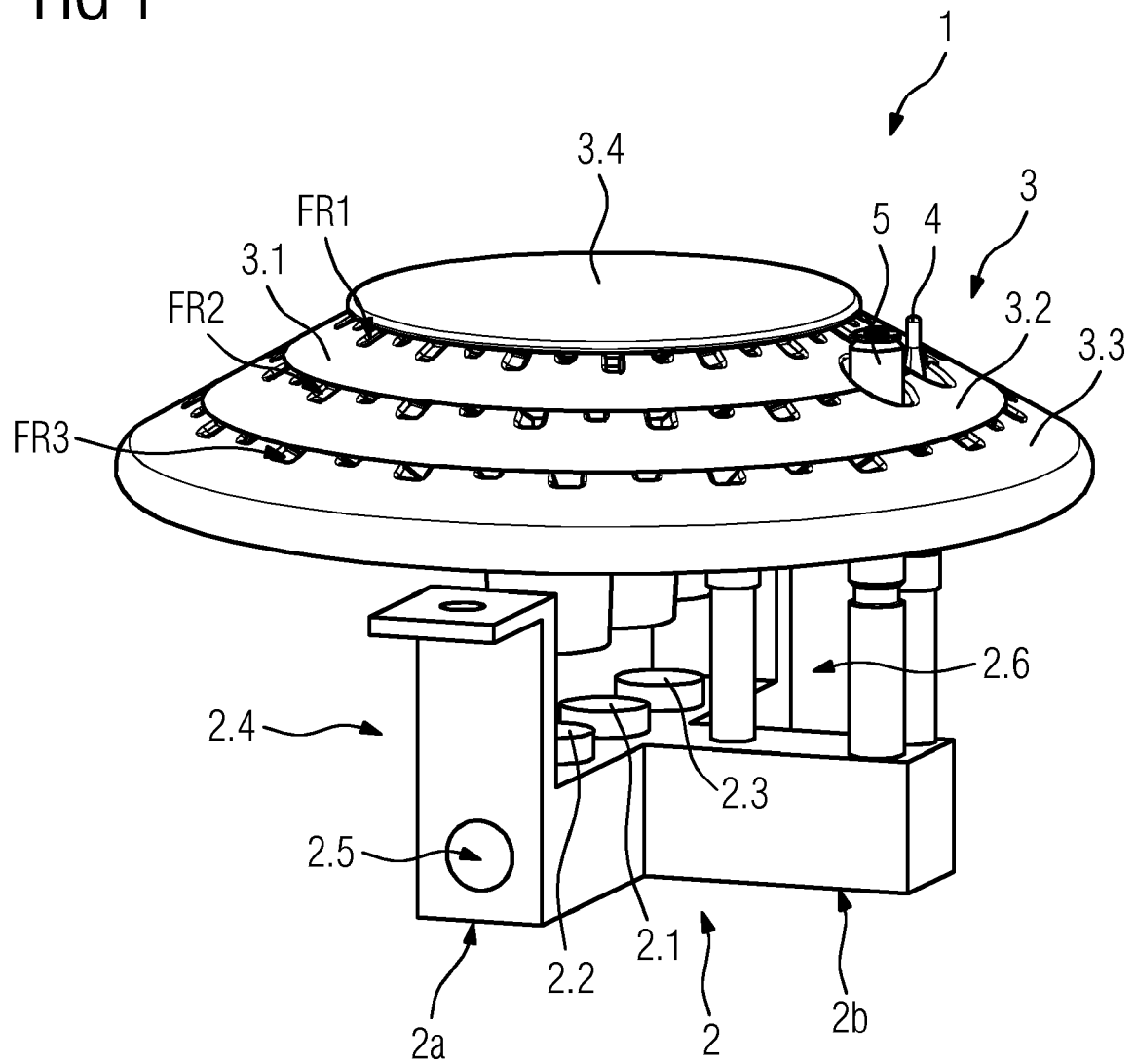
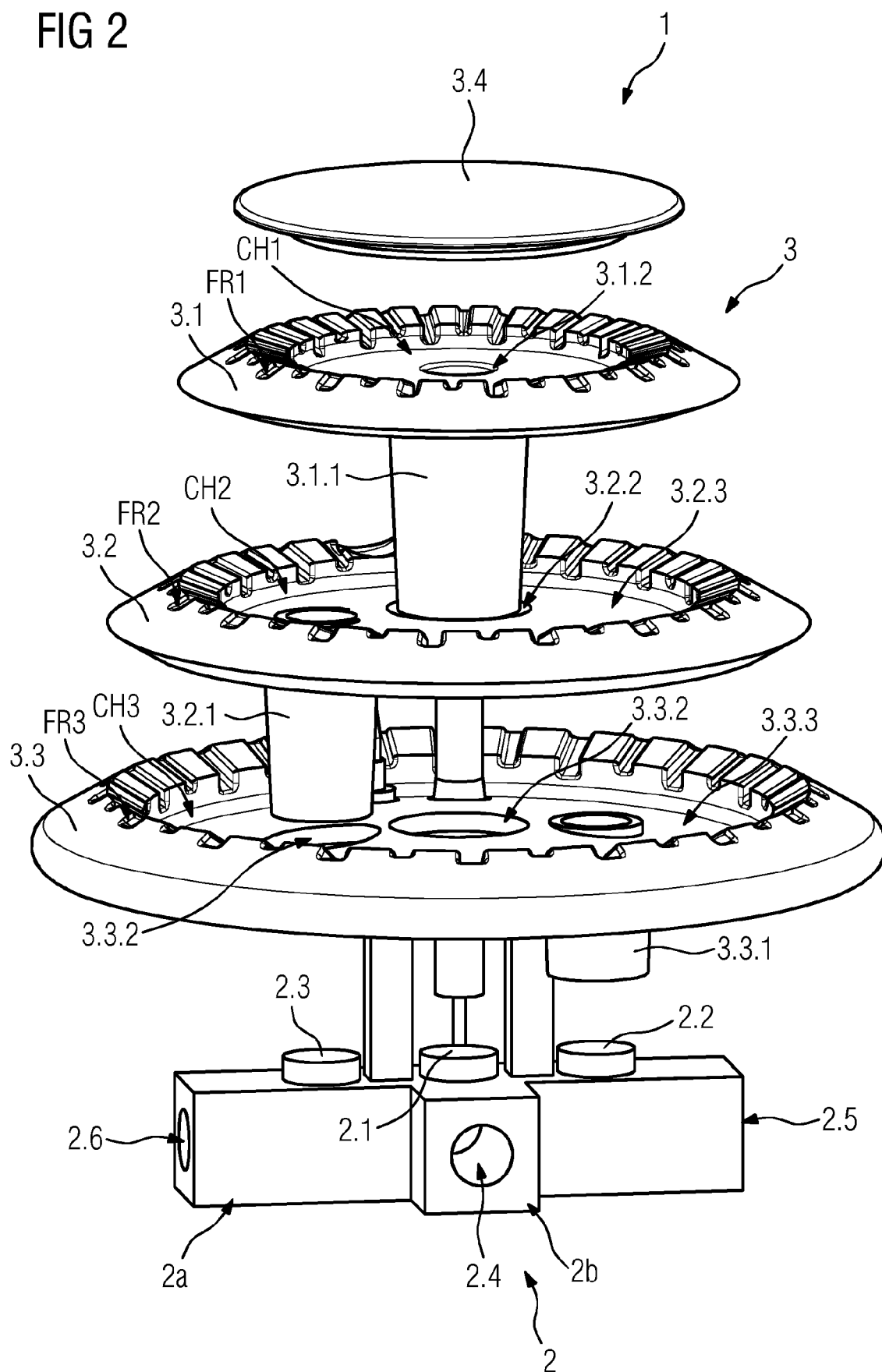


FIG 2







## EUROPEAN SEARCH REPORT

Application Number  
EP 16 20 5401

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                               |                                                        |                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Citation of document with indication, where appropriate, of relevant passages                                                                                                 | Relevant to claim                                      | CLASSIFICATION OF THE APPLICATION (IPC) |
| X<br><br>A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | WO 2006/114063 A1 (ZHEJIANG SHUAIKANG ELECTRIC ST [CN]; ZOU GUOYING [CN])<br>2 November 2006 (2006-11-02)<br>* figure 1 *<br>* paragraph [0026] - paragraph [0031] *<br>----- | 1,2,4-7,<br>10,12,15<br><br>3,8,9,<br>11,13,14         | INV.<br>F23D14/06<br>F23D14/64          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                               |                                                        | TECHNICAL FIELDS SEARCHED (IPC)         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                               |                                                        | F23D                                    |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                               |                                                        |                                         |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                               | Date of completion of the search<br><b>16 May 2017</b> | Examiner<br><b>Christen, Jérôme</b>     |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>.....<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                                                               |                                                        |                                         |

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

EP 16 20 5401

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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16-05-2017

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