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(54) **Gas burning system, in particular for a food cooking appliance**

(57) The present invention refers to a gas burners system (1), in particular for a food cooking appliance, said burners system (1) comprising a couple of burners (10, 20) substantially concentric, said couple of burners (10, 20) comprising an outer burner (10) provided with a first burner cap (11) and an inner burner (20) provided with a second burner cap (21).

The characteristic of the invention consists in the fact that said first burner cap (11) and said second burner cap (21) respectively comprise a plurality of first openings (13) and second openings (23) to allow the gas emission, said first openings (13) and second openings (23) being realized in order to develop in a substantially parallel way to an axis (A-A) of the burner (1).

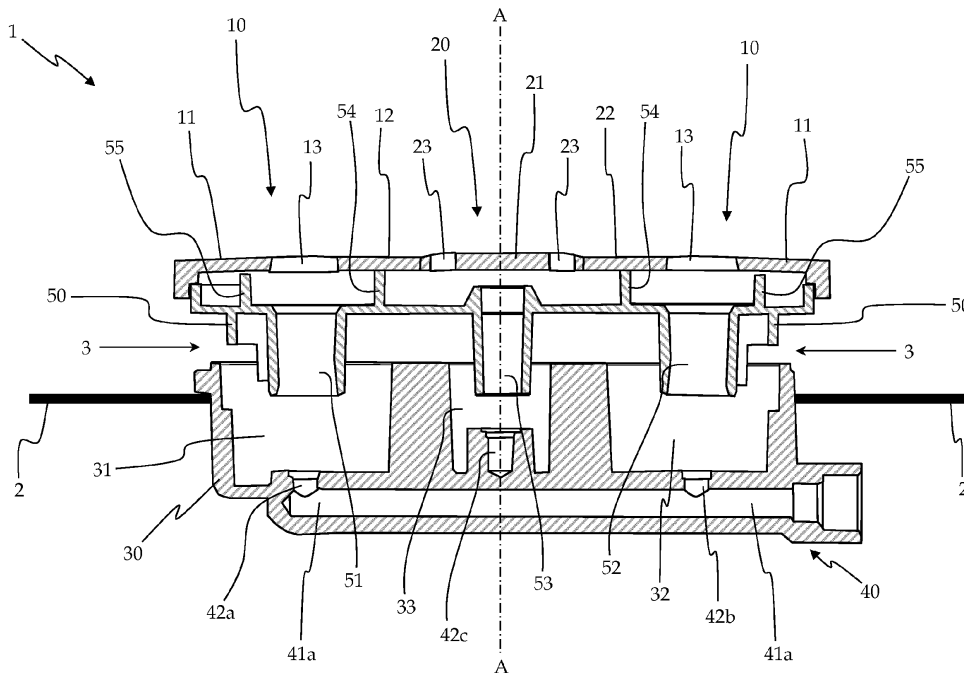


Fig.2

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Description

[0001] This object of the present invention is a gas burner system, in particular for a food cooking appliance, according to preamble of claim 1.

[0002] Are known to the state of the art, burner systems comprising two concentric burners, generally an outer burner and an inner burner, substantially of circular shape; such systems are known as burners like "double crown".

[0003] Are also known to the state of the art burner systems of the type "double crown" and that can be fed by a pair of gas inlet ducts associated with control valves independent between them, so the two burners can be used jointly or separately in order to achieve a good variability and a homogeneous distribution of heat which must be supplied to the cooking containers. Alternatively, the two concentric burners may be fed by a single gas inlet duct, with its tap, which simultaneously feeds the different adduction ducts of the air-gas mixture to the concentric burners.

[0004] In the patent IT 1232887 in the name of the same applicant, it is described a system of gas burners comprising two concentric burners, in which the gas mixture with the primary air occurs above the hob on which is mounted the burners system and through ducts which serve as the Venturi tube. To allow a uniform exit of the air-gas mixture through the holes or openings of the outer burner, wedge shaped profiles were obtained on the lower surface of the burner cap which cover the outer burners; however, these wedge shaped profiles will implies the disadvantage of having to realize burner cap of complex construction and having excessive and unwanted height.

[0005] In International patent application No. WO2004/044490 in the name Sabaf is described a system of gas burners for cooking food, comprising a central burner having a first crown of flames and at least one outer burner, concentric with the central burner. The air-gas mixture is supplied separately to the burners, as a horizontal chamber with a radial Venturi effect is provided for mixing primary air and gas.

[0006] In order to allow a uniform air-gas mixture exit through the openings for the formation and propagation of the outer burner flame, it is provided to use an additional element made of metallic material, which is fixed by screws to the upper surface of said external burner. In order to improve the air-gas mixture exit through the openings for the formation and propagation of the flame of the inner burner, a further additional element made of the metallic material was fixed to the lower surface of the burner cap of the central burner.

[0007] Therefore, even this solution has drawbacks, such as the substantial number of components adapted to constitute the whole burners system ; said complexity, inevitably explains in a higher cost.

[0008] Moreover, the burners systems of the known type propagate a flame known as "crown flame"; for

"crown flame" means a flame having a substantially radial direction of propagation, namely that propagates from the gas burner to outside in a substantially radial direction relative to the burner axis , and then in a substantially tangential direction from a visible surface of the hob.. This "crown flame", if it is emitted at a insufficient height compared to the cooking hob, produces a poor combustion in O₂ and a resulting high generation of uncombusted (CO and NO_x); furthermore, it usually causes deformations and / or blackening of the hob portion surrounding the burner, especially because of the heat contained in the flame..

[0009] Moreover, in such burner systems, only openings in outermost positions are reached in an appropriate manner by the secondary air, necessary to reach optimum combustion of the gas.

[0010] In fact, the flame which is emitted from the outermost openings of the burners system creates a sort of barrier for the secondary air which, consequently, is unable to adequately reach the innermost openings of the burners system , in particular of the inner burner; this will inevitably lead to poor combustion in O₂ and a consequent high generation of incombusted gas.

[0011] The present invention proposes to solve the above mentioned drawbacks and indicate a gas burner system for a food cooking appliance of improved and optimized realization compared to the known solutions.

[0012] In this field, the main purpose of the this invention is to indicate a gas burners system , in particular for a food cooking appliance, provided with cheap and efficient means to allow a uniform air-gas mixture exit through the openings for the formation and propagation of the flame of the concentric burners.

[0013] A further purpose of the this invention is to indicate a gas burners system , in particular for a food cooking appliance , that allows to reach a gas optimal efficiency allowing at the same time to contain the costs of realization of the burners system.

[0014] A further purpose of this invention is to indicate a gas burner made in such a way that the secondary air can be achieved in a proper way the openings of both the outer burner and the inner burner.

[0015] To achieve those purposes , the object of the present invention is gas burners system, in particular for food cooking appliance, incorporating the features of the attached claims, which form an integral part of the present description.

[0016] Further purposes, features and advantages of the this invention will become clear from the following detailed description and attached drawings, provided purely by way of non limiting example, in which:

- Fig 1 is an exploded view of a gas burners system, in particular for a food cooking appliance , according to the present invention;
- Fig 2 represents a section of the gas burners system according to the present invention;
- Fig 3 is a top plan view of the gas burners system

according to the present invention.

[0017] Turning now to the description of the attached figures, with the reference number 1 is indicated, as a whole, a gas burners system, in particular for a food cooking appliance, according to the this invention.

[0018] The burners system 1 further comprises a couple of burners 10, 20 substantially concentric, said couple of burners 10, 20 comprising an outer burner 10 which has a first burner cap 11 and an inner burner 20 which has a second burner cap 21.

[0019] In fact the first burner cap 11 is positioned on the outer burner 10, while the second burner cap 21 is positioned on the inner burner 20; preferably, in a top view of the burner system 1 according to this invention (for example such as that referred to in Fig 3), the shape and size of said first burner cap 11 and second burner cap 21 are almost coincident respectively those of such external burner 10 and the inner burner 20.

[0020] In order to decrease the number of parts that make up the burners system 1 object of this invention, the first burner cap 11 is preferably formed in one piece suitable to be positioned on the outer burner 10; furthermore, the second burner cap 21 is preferably coupled to said first burner cap 11 through at least one arm 12, 22, in particular said at least one arm comprising a first arm 12 and a second arm 22 positioned substantially opposite sides from the second burner cap 21.

[0021] According to this invention, said first burner cap 11 and said second burner cap 21 respectively comprise a plurality of first openings 13 and second openings 23 to allow the gas emission, said first openings 13 and second openings 23 being made so as to develop in a manner substantially parallel to an axis A-A (as shown in Figures 1 and 2 by a dash-dot line and indicated by the reference A) of the burner 1.

[0022] The particular realization of the first openings 13 and the second openings 23 is particularly appreciable in a sectional view and when viewed in a direction substantially perpendicular to the axis A-A of the burner 1 (that is the view of Fig 2).

[0023] From what described above it is clear that said first openings 13 and second openings 23 are made in such a way as to generate a flame which propagates from the burners system 1 towards the outside in a direction substantially parallel with respect to said axis A-A of the burners system 1, said first openings 13 and second openings 23, therefore, being made in such a way to generate a "carpet flame".

[0024] Moreover, according to this invention said first openings 13 of the first burner cap 11 are made in order to have an elongated shape when viewed in plan (for example when viewed in a substantially axial direction relative to the axis A-A of the burner 1).

[0025] As can be seen especially from Fig 3, the first burner cap 11 is made in order to have a substantially circular shape when viewed in plan, and in particular with center A belonging to the axis A-A of the burner 1.

[0026] From this figure it can also be noted that each first opening 13 comprises a first portion 13a, a second portion 13b and an intermediate portion 13c, said second portion 13b being closer to the central burner 20 from said first portion 13a; accordingly, each first opening 13 is oriented substantially radially on said first burner cap 11.

[0027] Each first opening 13 has a predominant direction of development along a second axis A2, in the orthogonal plane to the axis A-A, which preferably is inclined relatively to a radius R (in Fig 3 a plurality of rays R are indicated with a dotted line) of said first burner cap 11; this is equivalent to saying that said first portion 13a and second portion 13b of each first opening 13 each lie on a different ray R.

[0028] From the attached figures it can be noted that the inclination of said second axis A2 with respect to the ray R is not particularly accentuated; this inclination is in fact comprised in a range between -3° and $+30^\circ$, preferably between -15° and $+15^\circ$, even more preferably between -10° and $+10^\circ$.

[0029] In the attached figures said first openings 13 are represented having predominant directions of development along said axis A2 not parallel to each other but inclined substantially with the same angle from the respective rays R; however, it is clear that the inclination of each first opening 13 can also be different.

[0030] Moreover, in figures 1 and 3 attached it may be noted that the first openings 13 of the first burner cap 11 positioned in correspondence with said at least one arm 12, 22 are made in order to have the size smaller than the size of the remaining first openings 13 of the first burner cap 11.

[0031] Note that said remaining first openings 13 may include a second portion 13b made in such a way to have at least one portion inclined respect to the second axis A2 of said first opening 13; in particular, the first openings 13 which are not positioned in correspondence of said at least one arm 12, 22 comprise a second portion 13b which has said inclined portion with respect to the second axis A2. Consequently, said first openings 13 may have a shape of a "J" when viewed in plan (as can be seen from Fig 3).

[0032] The particular conformation of said first openings 13 allows to favor the mixing of the mixture of primary air / gas with the secondary air necessary to reach optimum gas combustion.

[0033] According to this invention, also the second openings 23 of the second burner cap 21 are made in such a way to:

- develop in a substantially parallel way respect to the axis A of the burner 1;
- having an elongated shape when viewed in plan (that is when it is viewed in a substantially axial direction relative to the axis A of the burner 1), in particular the second openings 23 having a substantially rectangular shape and preferably with rounded edges.

[0034] However, it is clear that the elongated shape of the said second openings 23 can also be different, for example a substantially elliptical shape. As can be seen especially from Fig 3, the second burner cap 21 is made in such a way to have a substantially circular shape when viewed in plan, said second openings 23 being oriented substantially radially on said second burner cap 21.

[0035] Consequently, the predictions of this invention allow to indicate a burners system 1 provided with cheap and efficient means to allow a uniform air-gas mixture exit through the openings 13, 23 for the formation and propagation of the flame of the concentric burners 10, 20.

[0036] In particular, the peculiar shape of said first openings 13 and second openings 23 is particularly advantageous both for the simplicity and convenience of their realization that allows to contain the costs of production methods of the burners system 1, both for their capability to reach an optimal efficiency of gas combustion.

[0037] In fact, the particular conformation of the first openings 13 and second openings 23 allows to avoid the formation of a sort of barrier for the secondary air, which consequently is able to reach even the inner most positions of the first burner cap 10 and second burner cap 20, particularly in the presence of a possible container (not shown) positioned on the burner system 1, the container which could contribute to make difficult the flowing of the secondary air.

[0038] This inevitably implies a rich combustion in O₂ and a consequent lack of (if anything) generation of uncombusted gas, without having to make complex and expensive changes in the realization of the gas burners system, in particular for a food cooking appliance, according to the this invention.

[0039] It is then clear that the first the burner cap 11 and / or the second burner cap 21, according to this invention may then comprise a plurality of secondary openings (not shown in the figures) for the flame propagation, in particular each secondary opening being preferably positioned between a couple of said first openings 13 and / or second openings 23.

[0040] According to this invention, the burners system 1 comprises:

- a lower body 30 comprising at least one burner cup 31, 32, 33 associated with supply means (indicated as a whole with the reference number 40 in Figures 1 and 2 attached) for the gas supply to said burner system 1;
- a burner body 50 comprising at least one chamber 51, 52, 53 with the Venturi effect which develops substantially vertically above said at least one cap 31, 32, 33.

[0041] In the burners system 1 according to the this invention, the primary air is taken above a cooking hob 2 (visible in Fig 2) on which is mounted said burners system 1. In particular, the primary air is sucked through

passages 3 formed on a side surface of the outer burner 10 and positioned on opposite sides from the axis A of said burner system 1. The fact to withdraw the primary air above the cooking hob 2 allows to avoid some drawbacks that frequently occur in cases where the primary air is sucked below of a cooking hob; these drawbacks are caused both by any disturbance of the air flow, for example due to the opening and closing of the furniture doors to the underlying burners system 1, both the primary air pollution due to the possible presence of a cooking oven in the spaces below said burners system 1. Furthermore, the primary air suction above the cooking hob 2 allows to increase mainly the aeration of the burners system 1 maintaining at the same time reduced the height of the burners system 1.

[0042] Consequently, it is clear that said at least one chamber 51, 52, 53 with the Venturi effect is positioned in such a way to receive a gas-air mixture (formed within said at least one cap 31, 32, 33) coming from said at least a cap 31, 32, 33 and to direct the air-gas mixture flow to the first openings 13 of the first burner cap 11 and to the second openings 23 of the second burner cap 21.

[0043] Preferably, the lower body 30 comprises a number of caps 31, 32, 33 corresponding to the number of chambers 51, 52, 53 with the Venturi effect of the burner body 50.

[0044] In a preferred embodiment, the burners system 1 comprises:

- A first cap 31 and a second burner cup 32 respectively associated with a first chamber 51 and a second chamber 52 of the burner body 50 to supply the outer burner 10;
- A third burner cup 33 associated with a third chamber 53 to supply the inner burner 20.

[0045] However, it is clear that the burners system 1, according to the this invention, can be realized in such a way to comprise a different number of burner cups 31, 32, 33, and chambers 51, 52, 53 with the Venturi effect.

[0046] As can be seen especially from Figures 1 and 2, the burner body 50 is preferably formed in one piece comprising the first chamber 51, the second chamber 52 and third chamber 53, in particular said burner body 50 having a shape (if it viewed in the plan) substantially corresponding to that of the whole constituted by the first burner cap 11 and second burner cap 21.

[0047] This allows to couple in a quick and easy way the first burner cap 11 and the second burner cap 21 to the burner body 50, in addition to achieve a saving thanks to the decrease of the number of parts that make up the burners system 1 object of this invention.

[0048] Preferably, the burner body 50 includes first walls 54 designed to keep separated the area surrounding the third chamber 53 from the areas surrounding the first chamber 51 and second chamber 52; this prevision allows to direct in an optimal manner the air-gas mixture coming from the third chamber 53 to the second openings

23 of the second burner cap 21.

[0049] The burner body 50 may comprise second walls 55 designed to keep separate the areas surrounding the first chamber 51 and second chamber 52 from the outside, in order to optimally direct the air-gas mixture from said first chamber 51 and second chamber 52 to the first openings 13 of the first burner cap 11.

[0050] Preferably, the first burner cap 11 and the second burner cap 21 are formed in a single piece of sintered steel; the lower body 30 and the burner body 50 are then preferably made of die-cast aluminum.

[0051] Moreover, according to the present invention said supply means 40 comprise at least a duct 41 a, 41b to supply the burners system 1.

[0052] In a preferred embodiment (shown in Figures 1 and 2), said at least one duct 41a, 41b includes:

- A first duct 41a for supplying the outer burner 10, in particular said first duct 41a being connected to the first burner cup 31 through a first nozzle 42a and the second burner cup 32 through a second nozzle 42b;
- A second duct 41b (shown in Fig 1) for supplying the inner burner 20, and in particular said second duct 41b being connected to the third burner cup 33 through a third nozzle 42c.

[0053] Those provisions allow to use both jointly and separately the outer burner 10 and the inner burner 20, in order to get a good variability and a homogeneous heat distribution that must be supplied to a cooking container (not shown in the figures) placed on the burners system 1 object of this invention.

[0054] However it is clear that said burners system 1 may also comprise a single duct that supplies simultaneously the different adduction ducts of the air-gas mixture to the burners 10, 20.

[0055] Preferably, the burners system 1 comprises coupling means 14 and / or some shaped portions 24 adapted to allow the passage of at least a spark plug and / or at least one thermocouple (not shown in the figures).

[0056] From the above description, the characteristics and advantages of the burners system 1 object of this invention are clear.

[0057] In particular, the provisions of this invention allow to indicate a burners system 1 provided with cheap and efficient means in order to allow a uniform exit of the air-gas mixture through the openings 13, 23 for the formation and propagation of the flame of the concentric burners 10, 20.

[0058] In fact, the particular shape of said first openings 13 and second openings 23 is particularly advantageous both for the simplicity and convenience of their realization (which also allows to contain the costs of production method of the burners system 1), and for their capability to obtain optimum efficiency of the gas combustion.

[0059] The particular conformation of the first openings 13 and second openings 23 allows to avoid the formation of a sort of barrier for the secondary air, which is conse-

quently good to reach even the inner most portions of the first burner cap 10 and second burner cap 20, particularly in presence of a possible container (not shown) positioned on the gas burners system 1, container which could contribute to make difficult the passage of the secondary air.

[0060] This inevitably implies a rich combustion in O₂ and a consequent lack of (if anything) generation of un-combusted gas, without having to make complex and costly changes in the realization of the gas burners system 1, in particular for a food cooking appliance, according to this invention.

[0061] The fact to suck the primary air above the cooking hob 2 allows then to avoid any disturbance of the air flow, for example due to the opening and closing of the furniture doors to the underlying burners system 1, and also a pollution of primary air due to the presence of a cooking oven in the spaces below to said burners system 1.

[0062] Furthermore, the suction of the primary air above the cooking hob 2 allows increase mainly the aeration of the burners system 1 maintaining at the same time reduced the height of the burners system 1.

[0063] The provisions of this invention allow to indicate a burners system 1 realized in such a way the outer burner 10 and the inner burner 20 can be used jointly or separately; this allows to reach a good variability and a homogeneous distribution of heat which must be supplied to a cooking container.

[0064] However, it is clear that numerous variants are possible to the burners system object of this invention, as long as it is clear that in these embodiments the forms and arrangements of the various details may be different, and the same may be replaced by technically equivalent elements, without exit from the innovation field inherent in the inventive idea.

[0065] Therefore it is easily understandable that this invention is not limited to the burners system described above, but it is subject to various modifications, improvements, substitutions of parts and elements equivalent without getting away from the idea of the invention, as it is stated in the following claims.

Claims

1. Gas burners system (1) o, in particular for a food cooking appliance, said burners system (1) comprising a couple of burners (10, 20) substantially concentric, said couple of burners (10, 20) comprising an outer burner (10) provided with a first burner cap (11) and an inner burner (20) provided with a second burner cap (21), **characterized in that** said first burner cap (11) and said second burner cap (21) respectively comprise a plurality of first openings (13) and second openings (23) to allow the emission of gas, said first openings (13) and second openings (23) being realized in such a way to develop in a way

- substantially parallel to an axis (A-A) of the burner (1).
2. Burners system (1) according to claim 1, **characterized in that** said first openings (13) of the first burner cap (11) are made in order to have an elongated shape when viewed in plan. 5
 3. Burners system (1) according to one or more of the preceding claims, **characterized in that** said first burner cap (11) is made in such a way to have a substantially circular shape when viewed in plan. 10
 4. Burners system (1) according to claim 3, **characterized in that** each first opening (13) comprises a first portion (13a), a second portion (13b) and an intermediate portion (13c), said second portion (13b) being closest to the central burner (20) respect to the said first portion (13a), in particular each first opening (13) being oriented substantially in radial way on said first burner cap (11). 15 20
 5. Burners system (1) according to claim 4, **characterized in that** each first opening (13) results inclined relatively to a radius (R) of said first burner cap (11). 25
 6. Burners system (1) according to one or more of the preceding claims, **characterized in that** the second burner cap (21) is coupled to said first burner cap (11) by at least one arm (12, 22), in particular said at least one arm comprising a first arm (12) and a second arm (22) positioned substantially opposite sides from the second burner cap (21). 30
 7. Burners system (1) according to claim 6, **characterized in that** the first openings (13) of the first burner cap (11) positioned in correspondence of said at least one arm (12, 22) are made in order to have the smaller size compared to the size of the remaining first openings (13) of the first burner cap (13). 35 40
 8. Burners system (1) according to one or more of the preceding claims, **characterized in that** said first openings (13) comprise a second portion (13b) formed in such a way as to have at least one portion inclined with respect to a second axis (A2) of predominant development of said first opening (13). 45
 9. Burners system (1) according to one or more of the preceding claims, **characterized in that** said second openings (23) of the second burner cap (21) are realized in such a way as to: 50
 - develop in a substantially parallel way to the axis (A) of the burner (1); 55
 - having an elongated shape when viewed in plan, in particular the second openings (23) having a substantially rectangular shape.
 10. Burners system (1) according to one or more of the preceding claims, **characterized in that** said second burner cap (21) is made in such a way as to present a substantially circular shape when viewed in plan, said second openings (23) being oriented in such a way substantially radially on said second burner cap (21).
 11. Burners system (1) according to one or more of the preceding claims, **characterized in that** of comprising:
 - a lower body (30) comprising at least one burner cup (31, 32, 33) associated with supply means (40) for gas supply to said burners system (1);
 - a burner body (50) comprising at least one chamber (51, 52, 53) with the Venturi effect which develops substantially vertically above said at least one burner cup (31, 32, 33).
 12. Burners system (1) according to one or more of the preceding claims, **characterized in that** it comprises passages (3) formed on a side surface of the outer burner (10), in particular said passages (3) being positioned on opposite sides respect to an axis (A) of said burners system (1), said passages allowing to suck the primary air above a cooking hob (2).
 13. Burners system (1) according to one or more of claims 11 and 12, **characterized in that** the lower body (30) comprises a number of burner cups (31, 32, 33) corresponding to the number of chambers (51, 52, 53) with Venturi effect of the burner body (50), in particular the burners system 1 comprising:
 - a first burner cup (31) and a second burner cup (32) respectively associated with a first chamber (51) and to a second chamber (52) of the burner body (50) for supplying the outer burner (10);
 - a third burner cup (33) associated with a third chamber (53) for supplying the inner burner (20).
 14. Burners system (1) according to claim 13, **characterized in that** said burner body 50 includes:
 - first walls (54) designed to keep separate the area surrounding the third chamber (53) from the areas surrounding the first chamber (51) and the second chamber (52), and / or;
 - second walls (55) designed to keep separate the areas surrounding the first chamber (51) and the second chamber (52) from the outside.
 15. Burners system (1) according to one or more of the preceding claims, **characterized in that** of comprising supply means (40) comprising at least one duct (41a, 41b) for supplying the burners system (1), in particular said at least one duct (41a, 41b) compris-

ing:

- a first duct (41a) for supplying the outer burner (10), in particular said first duct (41a) being connected to the first burner cup (31) through a first nozzle (42a) and the second burner cup (32) through a second nozzle(42b); 5
- A second duct (41b) for supplying the inner burner (20), in particular said second duct (41b) being connected to the third burner cup (33) through a third nozzle (42c). 10

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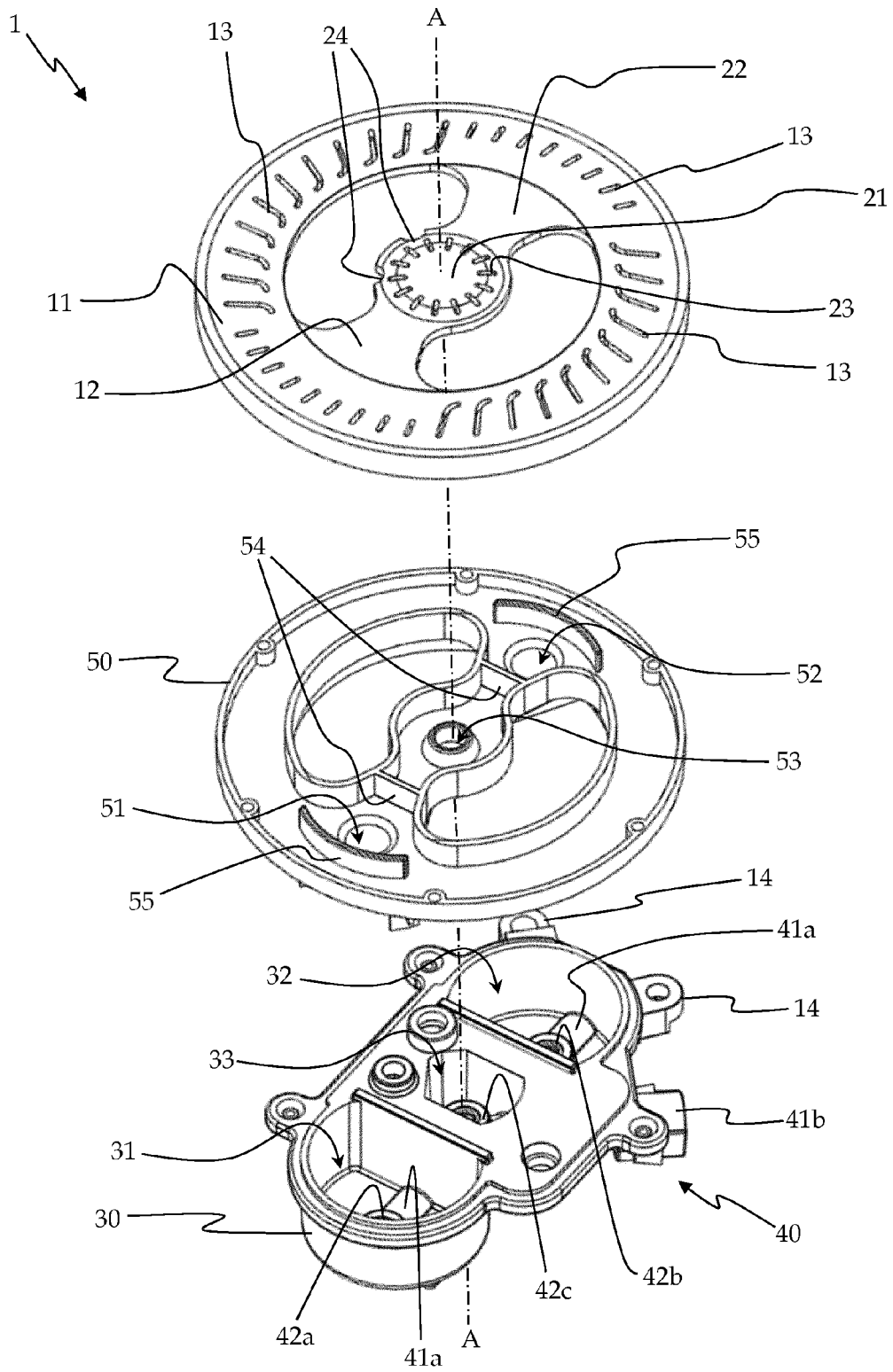


Fig. 1

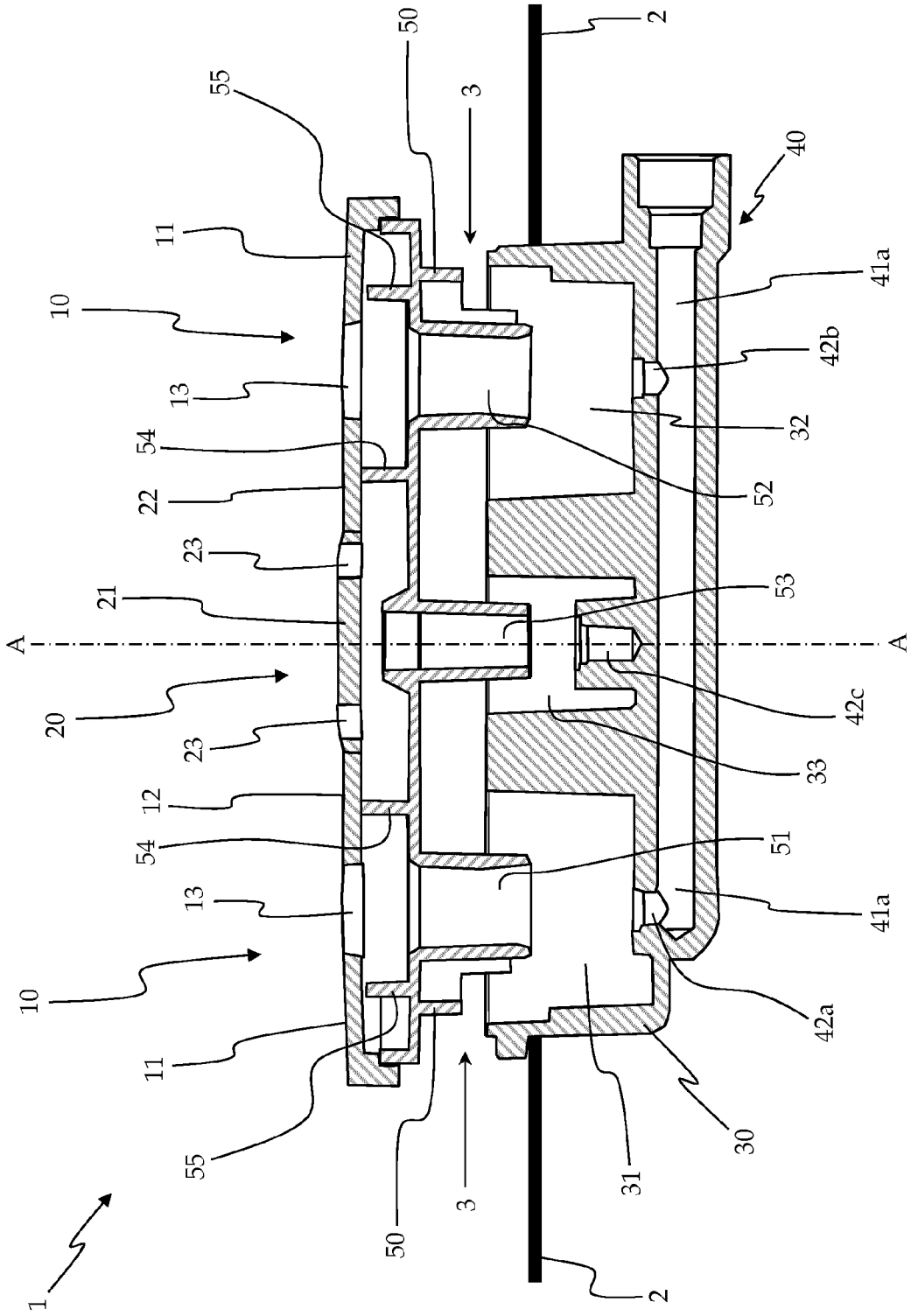


Fig.2

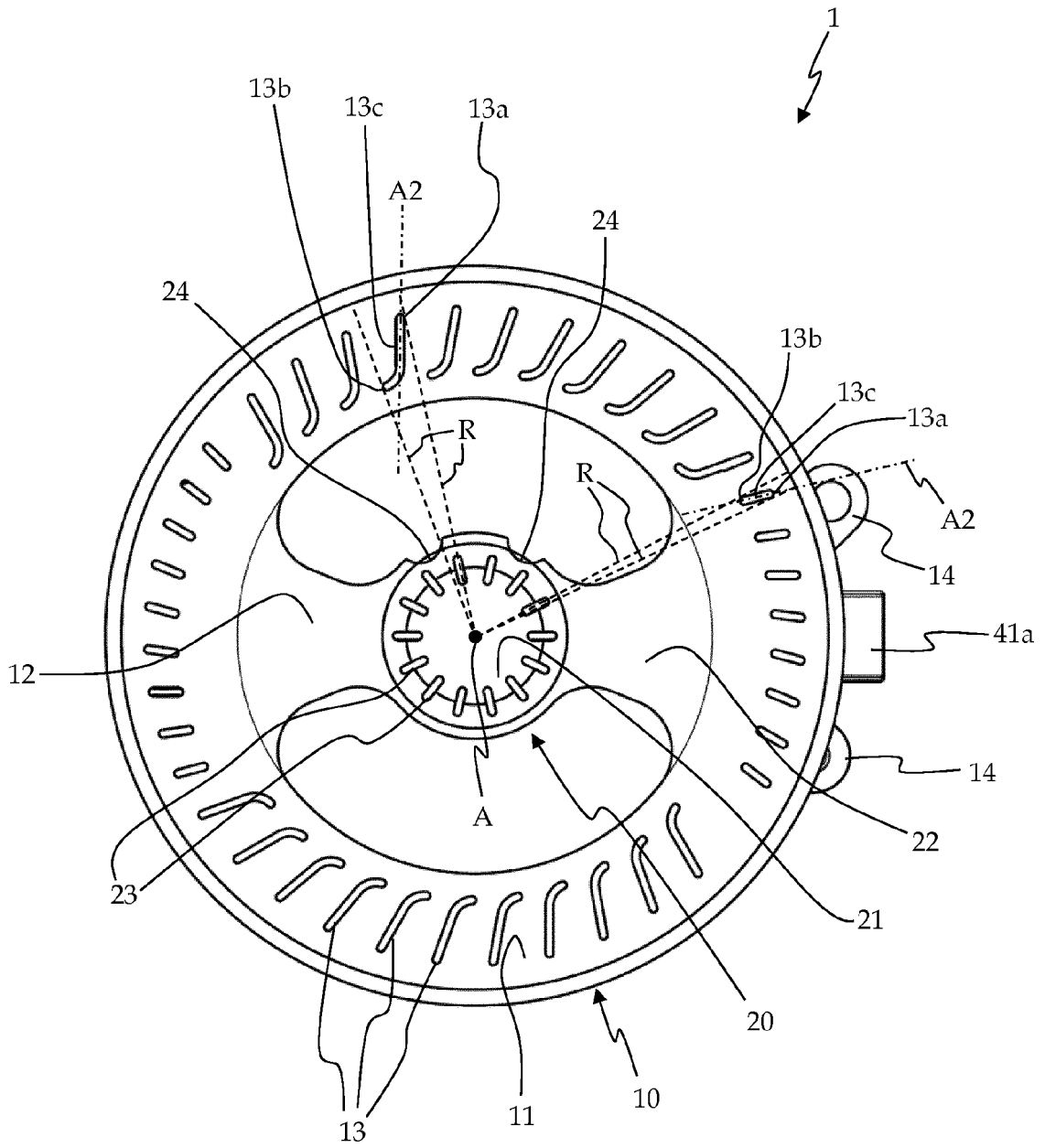


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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