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(54) GAS-AIR MIXER

GAS-LUFT-MISCHER

MÉLANGEUR AIR-GAZ

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Description

Field of the Invention

[0001] The present invention relates to a modular gas-air mixer which is used to transfer gas and air to the combustion chamber upon mixing thereof.

Background of the Invention

[0002] In gas burning devices such as boilers, the combustion products (gas and air) are mixed by the fan and gas-air mixer and sent to the combustion chamber. Since the gas-air mixture formed in this way is supplied homogeneously, all or almost all of the gas burns. With the pre-mixing fan used in gas burning devices, air and gas are sucked and the gas-air mixture is blown into the burner. Electronically or pneumatically adjustable gas valves are used to adjust the mixing ratio. In systems with pneumatic gas valves, the gas valve provides gas flow with the effect of negative pressure and the gas is directly mixed into the sucked air. In the prior art, gas-air mixers are comprised of a chamber, an air passage channel for the passage of air through the chamber, a gas inlet opening into the chamber and a plurality of holes located on the air passage channel. While the air passes through the air channel, the gas enters the chamber. Gas mixes with air by passing through the holes on the air passage channel. Depending on the flow of the sucked air, the gas mixes at an appropriate rate and the air + gas mixture required for combustion is formed. Here, it is a known method that the negative pressure (the vacuum effect) is obtained by means of a venturi arranged on the suction side of the fan, wherein a locally higher flow velocity and negative pressure are obtained by locally reducing the flow cross-section (Bernoulli-equation). In the state of the art, the air passage channel is comprised of two conical cylindrical parts which are separate from each other and are joined afterwards, and the holes used for gas passage are located at the joints of the said two parts.

[0003] In the current technique, different gas-air mixer configurations must be used in order to make modulations of boilers with different energy levels. For example, the gas-air mixer that should be used for a 24 kW boiler and the gas-air mixer that should be used for a 45 kW boiler are different from each other. Therefore, it is required to use a different mixer for boilers with different capacities. This situation causes the production of gas-air mixers to be more complex. Since the gas-air mixers used in the current technique do not comprise common parts, they need molds different from each other. This situation creates the need for using different molds for boilers at different energy levels for mass production of gas-air mixers, and creates problems such as continuous mold change and decrease in labor times and thus increase in production costs. It should provide the same ideal mixture at different fan speeds of gas-air mixers.

[0004] International patent document no WO2018015130A1, an application known in the state of the art, discloses a gas-air mixing device comprising an air inlet channel body including a narrowing section, an air outlet channel body, and which is comprised of extension openings provided on the air outlet channel body. In the said application, for the passage of the gas into the air passage channel, the invention comprises two conical cylindrical parts with different diameters in the part where they are connected to each other and the gas passes through the extension openings at the junction part of the said two parts. The said application cannot be used for gas burners (boilers, etc.) with different energy levels; a separate mixer must be prepared for each energy group (24 kW, 45 kW, etc.). The structure in the said application does not allow the modulation rate to be changed according to the demand of the device.

[0005] International patent document no DE202018106411U1, an application known in the state of the art, discloses a gas-air mixing device comprising an air inlet channel body including a narrowing section, an air outlet channel body, and which is comprised of extension openings provided on the air outlet channel body. In the said application, for the passage of the gas into the air passage channel, the invention comprises two conical cylindrical parts with different diameters in the part where they are connected to each other and the gas passes through the extension openings at the junction part of the said two parts. The said application cannot be used for gas burners (boilers, etc.) with different energy levels; a separate mixer must be prepared for each energy group (24 kW, 45 kW, etc.). The structure in the said application does not allow the modulation rate to be changed according to the demand of the device.

[0006] In National Patent application no 2019/18395, an application known in the state of the art, there is an air mixer comprising a narrowing section. The said application cannot be used for gas burners (boilers, etc.) with different energy levels; a separate mixer must be prepared for each energy group (24 kW, 45 kW, etc.). The said application cannot be used for different gas families; it is required to prepare a different mixer for each gas family (G20, G31 etc.).

[0007] In the European Patent no EP2653215B1, known in the state of the art, there is an air mixer comprising two narrowing sections and a structure which can change the air and gas inlet according to the load in one of the channels. Different from the said application, adjustment of the gas intake amount of a single venturi nozzle can be provided. In the aforementioned application, springs are used to provide modulation and this shortens the life of the product due to the problems that may arise due to the change of the spring properties over time. The said invention also cannot be used for different gas families; it is required to prepare a different mixer for each gas family (G20, G31 etc.).

[0008] The International Patent Application WO 02/29319 A1 discloses an air-gas mixer according to the preamble of claims 1, 2, and 10.

[0009] The European Patent Application EP3662989A1 discloses a fluid mixer wherein a valve is arranged inside a venturi tube.

Summary of the Invention

[0010] The objective of the present invention is to provide a gas-air mixer which is modular for gas burning devices with different energy levels in which they are to be used and whose capacity can be changed without changing its interior part.

[0011] The objective of the present invention is to provide a gas-air mixer, which enables to increase the modulation rate of the product by keeping the minimum fan speed of the device at a range in which the fan of the device can operate safely, and in which the amount of the incoming air can be changed.

[0012] The objective of the present invention is to provide a gas-air mixer which allows the air passage to be more turbulent and therefore to increase the amount of gas in the mixture without increasing the pressure loss of the product.

[0013] The objective of the present invention is to provide a gas-air mixer which has low pressure loss.

[0014] The objective of the invention is to increase the modulation level with a modular structure while keeping the minimum fan speed within the safe range in which the fan can operate without increasing the maximum fan speed, and thereby preventing the high noise level caused by the high maximum fan speed.

Detailed Description of the Invention

[0015] The gas-air mixer developed in order to achieve the objectives of the present invention is illustrated in the accompanying figures, in which:

Figure 1 is the front perspective view of the gas-air mixer of the present invention with turbulator.
Figure 2 is the front cross-section view of the gas-air mixer of the present invention without valve system or turbulator.
Figure 3 is the front cross-section view of the gas-air mixer of the present invention with turbulator.
Figure 4 is the side cross-section view of the gas-air mixer of the present invention.
Figure 5 is the front perspective view of the valve system in the gas-air mixer of the present invention.
Figure 6 is the rear perspective view of the valve system in the gas-air mixer of the present invention.
Figure 7 is the front perspective view of the turbulator in the gas-air mixer of the present invention.
Figure 8 is the rear perspective view of the turbulator in the gas-air mixer of the present invention.

[0016] The components shown in the figures are each given reference numbers as follows:

1. Mixer
2. Outer body

21. Gas inlet
22. Lock channel

3. Inner body

31. Inlet channel

311. Mounting surface

32. Outlet channel
33. Opening
35. Slot

4. Turbulator

41. First ring
42. Center part
43. Blade
45. First lug

5. Valve system

51. Second ring

52. Pin
53. Flap
54. Second mounting elevation
55. Second lug

6. Sealing member

[0017] The mixer (1) of the present invention is comprised of an outer body (2) into which gas is transferred through a gas inlet (21), an inner body (3) in the form of a cylinder which is placed inside the outer body (2) and comprises air inlet-outlet, openings (33) which are provided on the inner body (3), and the turbulator (4) or valve system (5) which is located on the air inlet of the inner body (3). The outer body (2) located in the mixer (1) is preferably in the form of a cylinder that is open at both ends and there is a gas inlet (21) in the form of a hole, preferably on the middle part of the outer body (2). The inner body (3) located in the mixer (1) comprises parts, the section of which narrows and expands, and it has an opening (33) in the form of a hole preferably where the section is narrow. There is a turbulator (4) and/or valve system (5) at the air inlet part of the inner body. Both the turbulator (4) and the valve system (5) have the same purpose and allow to increase the modulation rate of the device and to increase the minimum fan speed of the device by increasing the maximum fan speed, at which the device can operate, by a minimum amount. The turbulator (4) and/or the valve system (5) makes the air which will enter into the inner body (3) more turbulent without changing the fan (which transfers the air to the

inner body (3)) or by increasing its speed at a minimum level, and in this way, it enables to increase the amount of gas in the mixture without increasing the pressure loss of the product. Therefore, for gas burning devices having different energy levels (24 kW, 45 kW boiler, etc.), a single mixer (1) can be used without changing the inner body (3) and outer body (2), only by changing the valve system (5) and/or the turbulator (4). Thus, it is possible to provide the air-gas mixture of the boilers with different energy needs by changing only the turbulator (4) and/or the valve system (5) during production. In addition, this minimizes labor and mold costs, and also reduces mass production costs. Since different modulation rates can be provided easily with the modular structure, it also reduces inventory costs.

[0018] In the mixer (1) of the present invention, only the turbulator (4) and/or the valve system (5) are changed according to the boiler energy level after mounting of the outer body (2) and the inner body (3) in the production. The air first comes onto the turbulator (4) and/or the valve system (5) on the inner body (3), and the air moves in the inner body (3) upon becoming turbulent in the turbulator (4) and/or the valve system (5) and/or in a desired amount of passage. The gas is filled into the outer body (2) through the gas inlet (21) on the outer body (2) and the gas flows into the inner body (3) through the opening (33) according to the Bernoulli-equation (negative pressure state with high flow velocity due to narrowing section in the inner body (3)), and mixes with the air.

[0019] In one embodiment of the present invention, the inner body (3) is comprised of air inlet channel (31) and outlet channel (32), which are a single piece, and openings (33) located at the junction of the air inlet channel (31) and the air outlet channel (32). The air inlet channel (31) is comprised of the flat mounting surface and the narrowing section, and the outlet channel (32) section has a conical structure with an expanding section. The turbulator (4) and/or the valve system (5) are placed on the flat mounting surface on the air inlet channel (31). In this way, before the air reaches the narrowing section structure, it is regulated by the turbulator (4) and/or the valve system (5), it becomes a turbulent flow and/or the amount of air passage is determined and the noise and poor quality combustion that may occur in different gases is prevented. The regulated flow prevents poor quality combustion caused by the gas quality.

[0020] In one embodiment of the present invention, the air inlet channel (31) has a mounting surface (311) extending outward from the outer body (2) and when the inner body (3) is placed inside the outer body (2), the mounting surface (311) remains outside the outer body length. In this way, the turbulator (4) and/or the valve system (5) is fixed on the inner body (3) mounting surface (311) outside the outer body (2). In this way, the turbulator (4) and/or the valve system (5) can be easily detached from and attached to the inner body (3) and outer body (2). The minimum load and maximum load ratio which the mixer (Venturi) (1) can provide in gas burning devices is called the modulation ratio. Since the mixer (venturi) (1) provides the gas mixture, it enables the maximum possible gas ratio to be determined. The device has a modular venturi structure so that it can operate in different modulation ranges in different models. The said modulation range is adjusted with the turbulator (4) and/or the valve system (5).

Claims

1. A mixer (1), which is used to transfer gas and air into the combustion chamber in gas burning devices such as boilers upon mixing thereof, comprising

- at least one outer body (2) which has at least one gas inlet (21) for gas transfer to its inner part and has a volume inside,
- at least one inner body (3) which is placed inside the outer body (2), comprises an inlet for air passage and an outlet for air-gas mixture, and at least one opening (33) for gas passage therein from the outer body (2),
- at least one turbulator (4) which is used for increasing the amount of turbulence in the air inlet, increasing the modulation rate of the device and increasing a minimum fan speed of the device by increasing the maximum fan speed at which the device can operate in a minimum amount, and which is comprised of

  • at least one first ring member (41)
  • a center part (42) which is provided preferably on the middle part of the first ring member (41) and
  • a plurality of fixed blades (43) positioned between the center part (42) and the first ring member (41), **characterized in that** the at least one first ring member (41) is fixed to the air inlet part of the inner body (3).

2. A mixer (1), which is used to transfer gas and air into the combustion chamber in gas burning devices such as boilers upon mixing thereof, comprising

- at least one outer body (2) which has at least one gas inlet (21) for gas transfer to its inner part and has a volume inside,
- at least one inner body (3) which is placed inside the outer body (2), comprises an inlet for air passage and an outlet for air-gas mixture, and at least one opening (33) for gas passage therein from the outer body (2), **characterized by**
- at least one valve system (5) which enables to keep a minimum fan speed of the device at a safe range in which the fan can operate by increasing the maximum fan speed at which the

device can operate at minimum level to determine modulation rate, and which is comprised of
• a second ring member (51) fixed to the air inlet part of the inner body (3),
• at least one rotary pin (52) which is fixed on the second ring member (51),
• at least one flap (53) which is fixed to the rotary pin (52) and is movable with the rotary pin (52).

3. A mixer (1) according to claim 1 or 2, **comprising** inner body (3) which is comprised of an air inlet channel (31) and an outlet channel (32) that are single piece, and openings (33) located at the junction of the air inlet channel (31) and the air outlet channel (32).

4. A mixer (1) according to claim 1 or 2, **comprising** a mounting surface (311) of the air inlet channel (31) which extends outward from the outer body (2) and remains outside the outer body length when the inner body (3) is placed inside the outer body (2).

5. A mixer (1) according to claim 1 or 3, **comprising** blade (43) which is fixed to the center part (42) at an angle according to the air intake direction.

6. A mixer (1) according to claim 1 or 2, **comprising** at least one sealing member (6) which prevents the gas entering the inner part of the outer body (2) from leaking (exiting) between the inner wall of the outer body (2) and the upper surface of the inner body (3).

7. A mixer (1) according to claim 6, **comprising** sealing member (6) which is a gasket or O-ring.

8. A mixer (1) according to claim 6, **comprising** at least one slot (35) which is formed with protruding surfaces on the outer surface of the inner body (3) and in which the sealing member (6) fits.

9. A mixer (1) according to claim 1 or 2, **comprising** fixing assembly which is used in fixing the inner body on the outer body (2) and which comprises:

- at least one lock pin in the form of a protrusion which is provided on the outer surface of the inner body (3),
- at least one lock channel (22) which is provided at the end part of the outer body (2) in the form of an inclined channel recess on the outer body (2) and is adapted for the lock pin to be inserted therein..

10. A mixer (1), which is used to transfer gas and air into the combustion chamber in gas burning devices such as boilers upon mixing thereof, comprising

- at least one outer body (2) which has at least one gas inlet (21) for gas transfer to its inner part and has a volume inside,
- at least one inner body (3) which is placed inside the outer body (2), comprises an inlet for air passage and an outlet for air-gas mixture, and at least one opening (33) for gas passage therein from the outer body (2),
- at least one turbulator (4) which is used for making the air more turbulent and which is comprised of

• a first ring member (41), a center part (42) preferably located on the middle part of the first ring member (41), and a plurality of fixed blades (43) positioned between the center part (42) and the first ring member (41), **characterized by**

- at least one valve system (5) which enables to determine modulation rate and to increase a minimum fan speed of the device by increasing the maximum fan speed at which the device can operate in minimum amount, and which is comprised of

• a second ring member (51) fixed to the air inlet part of the inner body (3), at least one rotary pin (52) which is fixed on the second ring member (51), at least one flap (53) which is fixed to the rotary pin (52) and is movable with the rotary pin (52).

Patentansprüche

1. Ein Mischer (1), der verwendet wird, um Gas und Luft in die Verbrennungskammer in Gasverbrennungsvorrichtungen, wie z.B. Heizkesseln, nach deren Vermischung zu überführen, umfassend

- mindestens einen Außenkörper (2), der mindestens einen Gaseinlass (21) für Gasüberführung in seinen inneren Teil und ein Innenvolumen aufweist,
- mindestens einen Innenkörper (3), der im Inneren des Außenkörpers (2) angeordnet ist, einen Einlass für den Luftdurchtritt und einen Auslass für das Luft-Gas-Gemisch sowie mindestens eine Öffnung (33) für den Gasdurchtritt dahinein aus dem Außenkörper (2) aufweist,
- mindestens einen Turbulator (4), der zur Erhöhung des Turbulenzgrades im Lufteinlass, zur Erhöhung der Modulationsrate der Vorrichtung und zur Erhöhung einer minimalen Gebläsedrehzahl der Vorrichtung durch Erhöhung der maximalen Gebläsedrehzahl, bei der die Vorrichtung in minimalem Umfang arbeiten kann, verwendet wird, und aus

• mindestens einem ersten Ringelement (41)
• einem Mittelteil (42), das vorzugsweise auf dem mittleren Abschnitt des ersten Ringelements (41) vorgesehen ist, und
• einer Vielzahl von ortsfesten Lamellen (43), die zwischen dem Mittelteil (42) und dem ersten Ringelement (41) angeordnet sind, besteht,

dadurch gekennzeichnet, dass das mindestens ein erstes Ringelement (41) an dem Lufteinlassteil des Innenkörpers (3) befestigt ist.

2. Ein Mischer (1), der verwendet wird, um Gas und Luft in die Verbrennungskammer in Gasverbrennungsvorrichtungen, wie z.B. Heizkesseln, nach deren Vermischung zu überführen, umfassend

- mindestens einen Außenkörper (2), der mindestens einen Gaseinlass (21) für die Gasüberführung in seinen inneren Teil und ein Innenvolumen aufweist,
- mindestens einen Innenkörper (3), der im Inneren des Außenkörpers (2) angeordnet ist, einen Einlass für den Luftdurchtritt und einen Auslass für das Luft-Gas-Gemisch sowie mindestens eine Öffnung (33) für die Gasdurchtritt dahinein aus dem Außenkörper (2) aufweist, **gekennzeichnet durch,**
- mindestens ein Ventilsystem (5), das es ermöglicht, eine minimale Gebläsedrehzahl der Vorrichtung in einem sicheren Bereich zu halten, in welchem das Gebläse arbeiten kann, indem es die maximale Gebläsedrehzahl, mit der die Vorrichtung arbeiten kann, auf ein minimales Niveau erhöht, um die Modulationsrate zu bestimmen, umfassend

• ein zweites Ringelement (51), das am Lufteintrittsteil des Innenkörpers (3) befestigt ist,
• mindestens einen Drehstift (52), der auf dem zweiten Ringelement (51) befestigt ist,
• mindestens eine Klappe (53), die an dem Drehstift (52) befestigt ist und mit dem Drehstift (52) verstellbar ist.

3. Ein Mischer (1) nach Anspruch 1 oder 2, **umfassend** einen Innenkörper (3), der einen Lufteinlasskanal (31) und einen Luftauslasskanal (32) umfasst, die einstückig ausgebildet sind, und Öffnungen (33), die sich an der Verbindungsstelle des Lufteinlasskanals (31) und des Luftauslasskanals (32) befinden.

4. Ein Mischer (1) nach Anspruch 1 oder 2, umfassend eine Montagefläche (311) des Lufteinlasskanals (31), die sich von dem Außenkörper (2) nach außen erstreckt und außerhalb der Länge des Außenkörpers verbleibt, wenn der Innenkörper (3) in dem Außenkörper (2) angeordnet ist.

5. Ein Mischer (1) nach Anspruch 1 oder 3, **umfassend** eine Schaufel (43), die am Mittelteil (42) in einem Winkel entsprechend der Lufteinlassrichtung befestigt ist.

6. Ein Mischer (1) nach Anspruch 1 oder 2, **umfassend** mindestens ein Dichtungselement (6), das verhindert, dass das in den inneren Teil des Außenkörpers (2) eintretende Gas zwischen der Innenwand des Außenkörpers (2) und der Oberseite des Innenkörpers (3) entweicht (austritt).

7. Ein Mischer (1) nach Anspruch 6, **umfassend** ein Dichtungselement (6), das eine Dichtung oder ein O-Ring ist.

8. Ein Mischer (1) nach Anspruch 6, **umfassend** mindestens einen Schlitz (35), der mit vorspringenden Flächen an der Außenfläche des Innenkörpers (3) ausgebildet ist und in den das Dichtungselement (6) passt.

9. Ein Mischer (1) nach Anspruch 1 oder 2, **umfassend** eine Befestigungsanordnung, die zur Befestigung des Innenkörpers am Außenkörper (2) verwendet wird und Folgendes umfasst:

- mindestens ein Sperrstift in Form eines Vorsprungs, der an der Außenfläche des Innenkörpers (3) vorgesehen ist,
- mindestens ein Verriegelungskanal (22), der am Endteil des Außenkörpers (2) in Form einer schrägen Kanalausnehmung am Außenkörper (2) vorgesehen ist und in den der Verriegelungsstift eingeführt werden kann.

10. Ein Mischer (1), der verwendet wird, um Gas und Luft in die Verbrennungskammer in Gasverbrennungsvorrichtungen, wie z.B. Heizkesseln, nach deren Vermischung zu überführen, **umfassend**

- mindestens einen Außenkörper (2), der mindestens einen Gaseinlass (21) für die Gasüberführung in seinen inneren Teil und ein Innenvolumen aufweist,
- mindestens ein Innenkörper (3), der im Inneren des Außenkörpers (2) angeordnet ist, einen Einlass für den Luftdurchtritt und einen Auslass für das Luft-Gas- Gemisch sowie mindestens eine Öffnung (33) für den Gasdurchtritt dahinein aus dem Außenkörper (2) aufweist,
- mindestens ein Turbulator (4), der dazu dient, die Luft zu verwirbeln, umfassend

• ein erstes Ringelement (41), ein Mittelteil (42), das vorzugsweise auf dem mittleren Teil des ersten Ringelements (41) angeordnet ist, und eine Vielzahl von festen Lamellen (43), die zwischen dem Mittelteil (42) und dem ersten Ringelement (41) angeordnet sind, **gekennzeichnet durch**

- mindestens ein Ventilsystem (5), das es ermöglicht, die Modulationsrate zu bestimmen und eine minimale Gebläsedrehzahl der Vorrichtung zu erhöhen, indem die maximale Gebläsedrehzahl, mit der die Vorrichtung arbeiten kann, auf ein Minimum erhöht wird, und Folgendes umfasst:

• ein zweites Ringelement (51), das an dem Lufteinlassteil des Innenkörpers (3) befestigt ist, mindestens ein Drehstift (52), der an dem zweiten Ringelement (51) befestigt ist, mindestens eine Klappe (53), die an dem Drehstift (52) befestigt und mit dem Drehstift (52) verstellbar ist.

Revendications

1. Un mélangeur (1) utilisé pour transférer le gaz et l'air dans la chambre de combustion dans les dispositifs de combustion de gaz, tels que les chaudières après mélange du même, comprenant :

- au moins un corps extérieur (2) doté d'au moins une entrée de gaz (21) pour le transfert de gaz vers sa partie intérieure et d'un volume intérieur,
- au moins un corps intérieur (3) placé à l'intérieur du corps extérieur (2), comprenant une entrée pour le passage de l'air et une sortie pour le mélange air-gaz, et au moins une ouverture (33) pour le passage du gaz à l'intérieur du corps extérieur (2),
- au moins un turbulateur (4) utilisé pour augmenter la turbulence dans l'entrée d'air, augmenter le taux de modulation du dispositif et augmenter la vitesse minimale du ventilateur du dispositif en augmentant la vitesse maximale du ventilateur à laquelle le dispositif peut fonctionner dans une mesure minimale, et qui est composé de :

• au moins un premier membre annulaire (41)
• une partie centrale (42) qui est fournie de préférence sur la partie centrale du premier élément annulaire (41) et
• une pluralité de lames fixés (43) positionnées entre la partie centrale (42) et le premier élément annulaire (41),

caractérisé par le fait que au moins un premier élément annulaire (41) est fixé à la partie d'entrée d'air du corps intérieur (3).

2. Un mélangeur (1), utilisé pour transférer le gaz et l'air dans la chambre de combustion dans les dispositifs de combustion de gaz, tels que les chaudières après leur mélange, comprenant:

- au moins un corps extérieur (2) doté d'au moins une entrée de gaz (21) pour le transfert de gaz vers sa partie intérieur et d'un volume intérieur,
- au moins un corps intérieur (3) placé à l'intérieur du corps extérieur (2), comprenant une entrée pour le passage de l'air et une sortie pour le mélange air-gaz, et au moins une ouverture (33) pour le passage du gaz à l'intérieur du corps extérieur (2),

caractérisé par:

- au moins un système de valve (5) qui permet de maintenir la vitesse minimale du ventilateur de l'appareil dans une plage sûre dans laquelle le ventilateur peut fonctionner en augmentant la vitesse maximale du ventilateur à laquelle l'appareil peut fonctionner à un niveau minimal pour déterminer le taux de modulation et qui est composé de :

• un deuxième élément annulaire (51) fixé à la partie d'entrée d'air du corps intérieur (3),
• au moins un axe rotatif (52) qui est fixé sur le deuxième élément annulaire (51),
• au moins un volet (53) fixé à l'axe rotatif (52) et qui est mobile avec l'axe rotatif (52).

3. Un mélangeur (1) selon la revendication 1 ou 2, **comprenant** un corps intérieur (3) constitué d'un canal d'entrée d'air (31) et d'un canal de sortie (32) qui sont d'une seule pièce, et des ouvertures (33) situées à la jonction du canal d'entrée d'air (31) et du canal de sortie d'air (32).

4. Un mélangeur (1) selon la revendication 1 ou 2, **comprenant** une surface de montage (311) du canal d'entrée d'air (31) qui s'étend vers l'extérieur du corps extérieur (2) et reste à l'extérieur de la longueur du corps extérieur lorsque le corps intérieur (3) est placé à l'intérieur du corps extérieur (2).

5. Un mélangeur (1) selon la revendication 1 ou 3, **comprenant** une lame (43) fixée à la partie centrale (42) à un angle correspondant à la direction d'entrée de l'air.

6. Un mélangeur (1) selon la revendication 1 ou 2, **com-**

prenant au moins un élément d'étanchéité (6) qui empêche le gaz entrant dans la partie intérieure du corps extérieur (2) de fuir (sortir) entre la paroi intérieure du corps extérieur (2) et la surface supérieure du corps intérieur (3).

7. Un mélangeur (1) selon la revendication 6, **comprenant** un élément d'étanchéité (6) qui est un joint ou un joint torique.

8. Un mélangeur (1) selon la revendication 6, **comprenant** au moins une fente (35) formée avec des surfaces saillantes sur la surface extérieure du corps intérieur (3) et dans laquelle l'élément d'étanchéité (6) s'insère.

9. Un mélangeur (1) selon la revendication 1 ou 2, **comprenant** un ensemble de fixation qui est utilisé pour fixer le corps intérieur sur le corps extérieur (2) et qui comprend :

- au moins une goupille de verrouillage sous la forme d'une protubérance qui est donnée sur la surface extérieure du corps intérieur (3),
- au moins un canal de verrouillage (22) donné à l'extrémité du corps extérieur (2) sous la forme d'une cavité inclinée sur le corps extérieur (2) et adapté à l'insertion de la goupille de verrouillage dans ce canal.

10. Un mélangeur (1), utilisé pour transférer le gaz et l'air dans la chambre de combustion dans les dispositifs de combustion de gaz tels que les chaudières après mélange, comprenant:

- au moins un corps extérieur (2) doté d'au moins une entrée de gaz (21) pour le transfert de gaz vers sa partie intérieure et ayant un volume intérieur,
- au moins un corps intérieur (3) placé à l'intérieur du corps extérieur (2), comprenant une entrée pour le passage de l'air et une sortie pour le mélange air-gaz, et au moins une ouverture (33) pour le passage du gaz à l'intérieur du corps extérieur (2),
- au moins un turbulateur (4) qui est utilisé pour rendre l'air plus turbulent et qui est composé de:

  • un premier élément annulaire (41), une partie centrale (42) située de préférence sur la partie médiane du premier élément annulaire (41), et une pluralité de lames fixés (43) positionnées entre la partie centrale (42) et le premier élément annulaire (41), **caractérisés par** :

- au moins un système de valves (5) qui permet de déterminer le taux de modulation et d'augmenter la vitesse minimale du ventilateur de l'appareil en augmentant la vitesse maximale du ventilateur à laquelle l'appareil peut fonctionner en quantité minimale, et qui est composé de:

  • un deuxième élément annulaire (51) fixé à la partie d'entrée d'air du corps intérieur (3), au moins un axe rotatif (52) fixé sur le deuxième élément annulaire (51), au moins un volet (53) étant fixé à l'axe rotatif (52) et étant mobile avec l'axe rotatif (52).

FIGURE 1

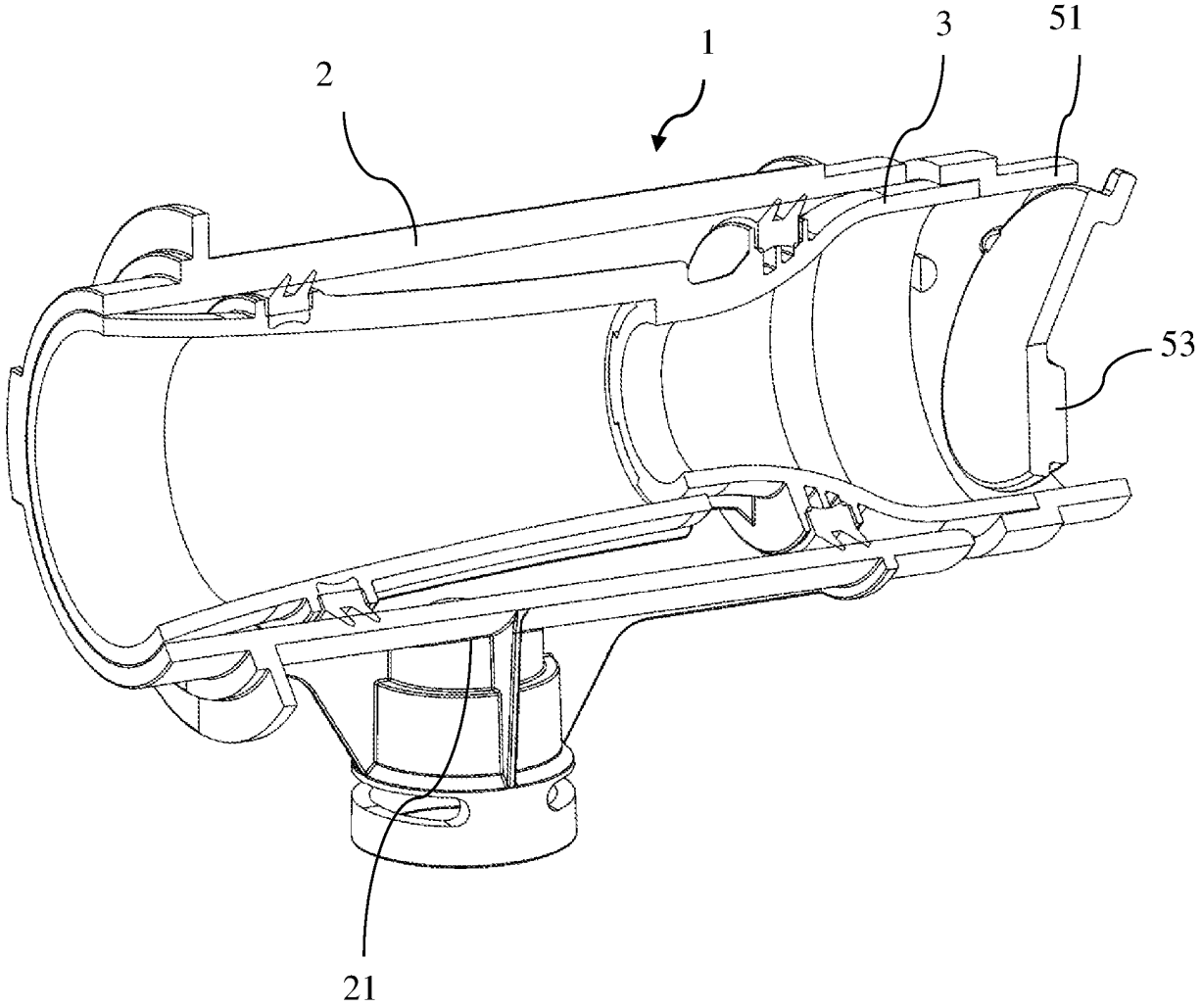


FIGURE 2

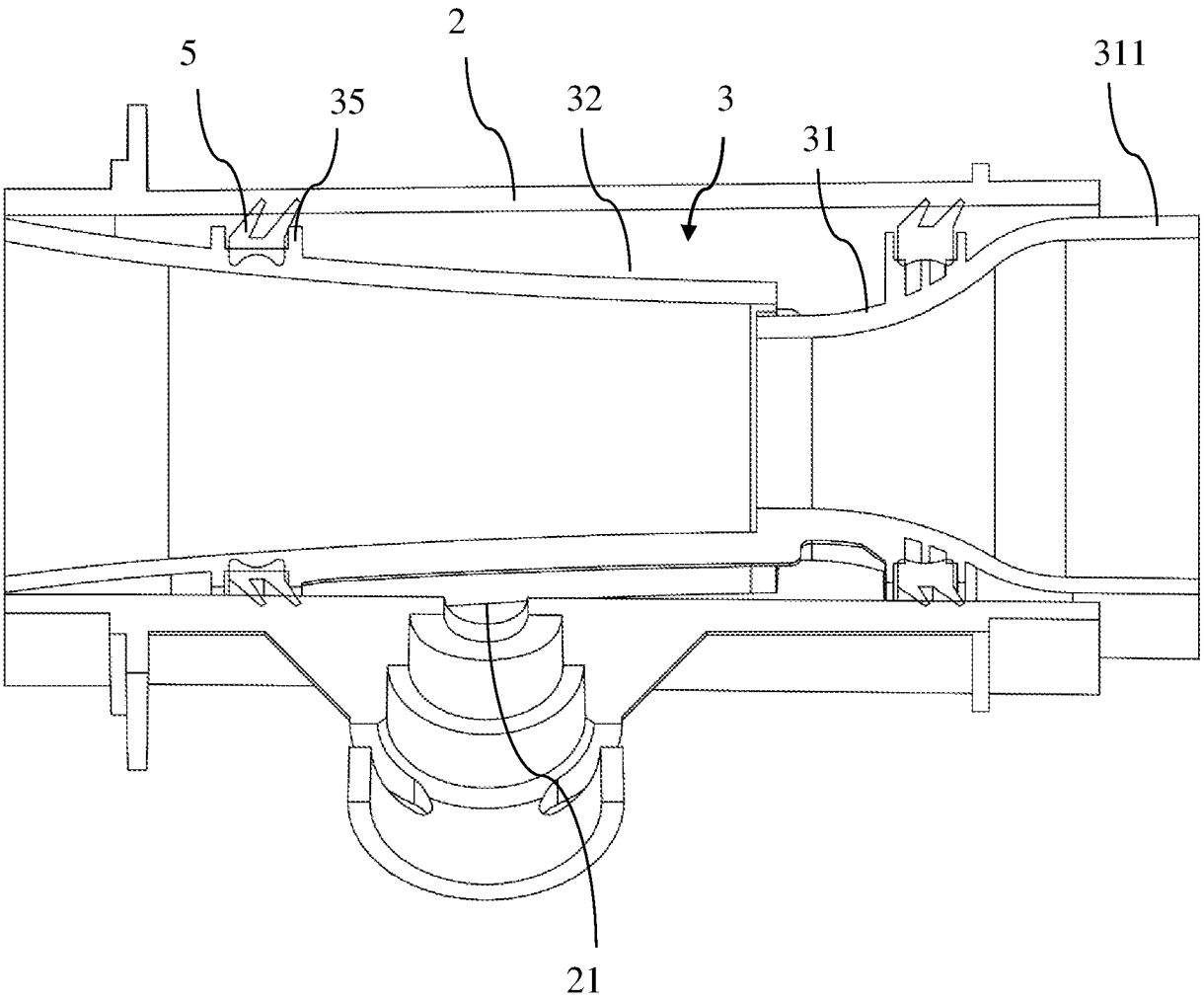


FIGURE 3

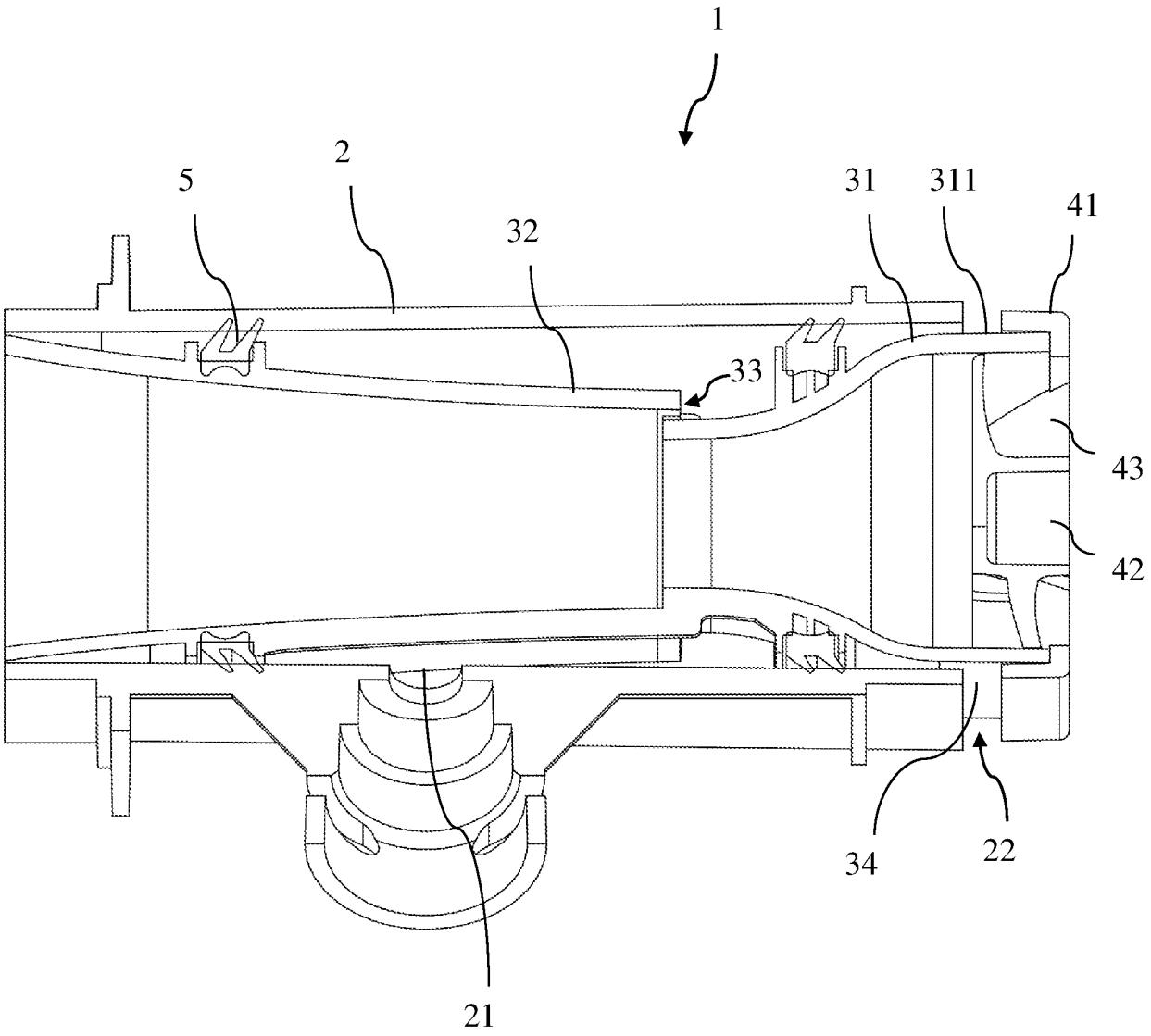


FIGURE 4

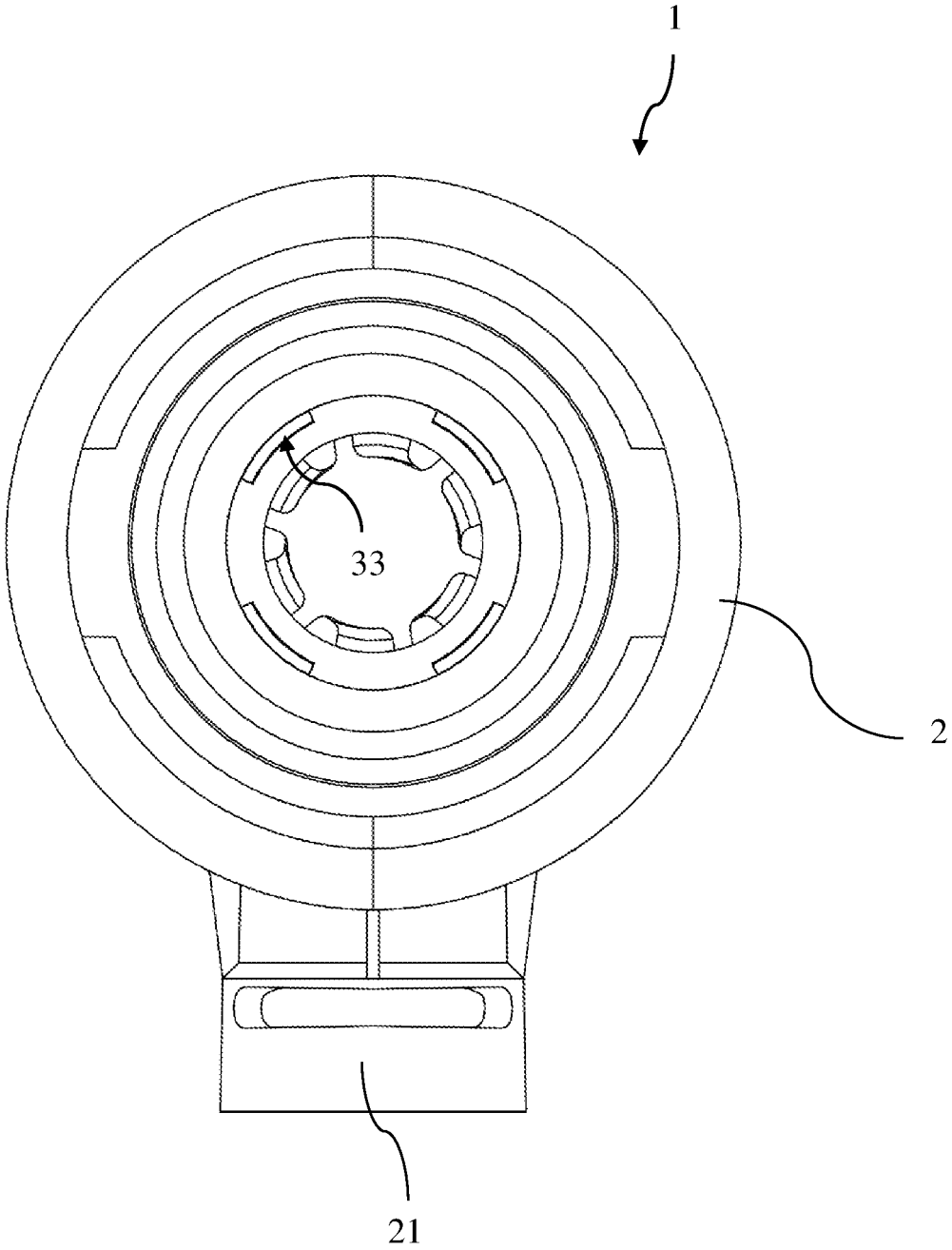


FIGURE 5

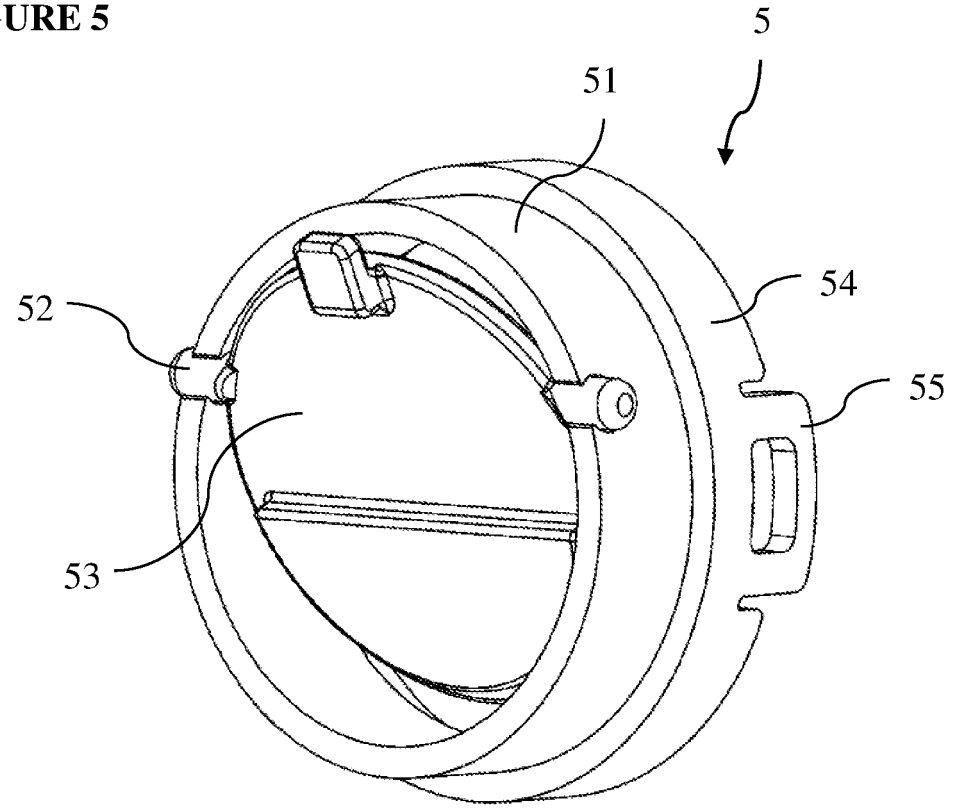


FIGURE 6

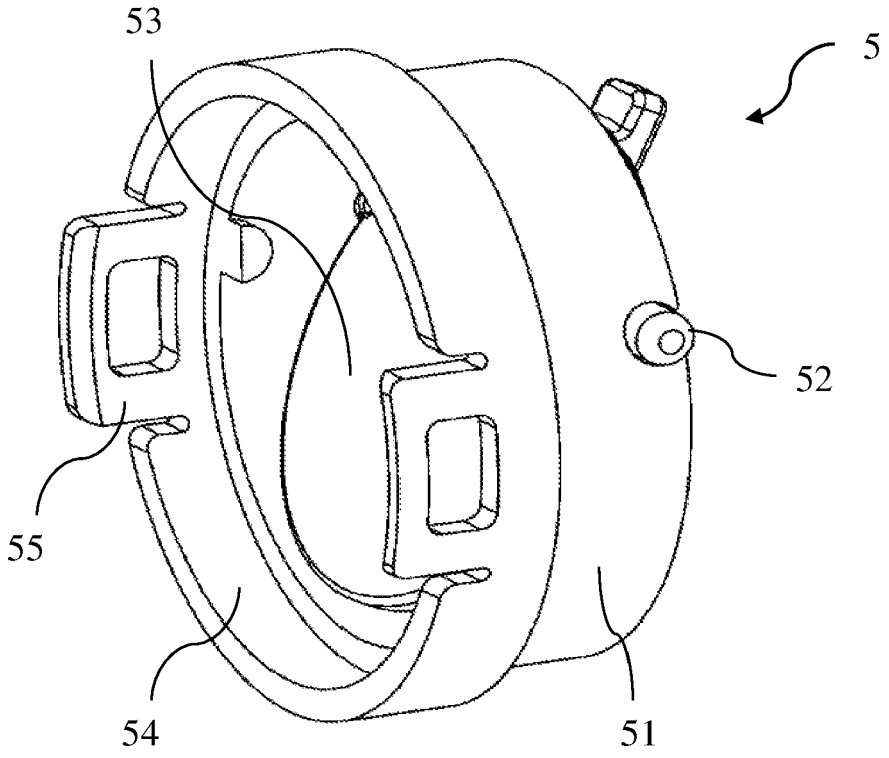


FIGURE 7

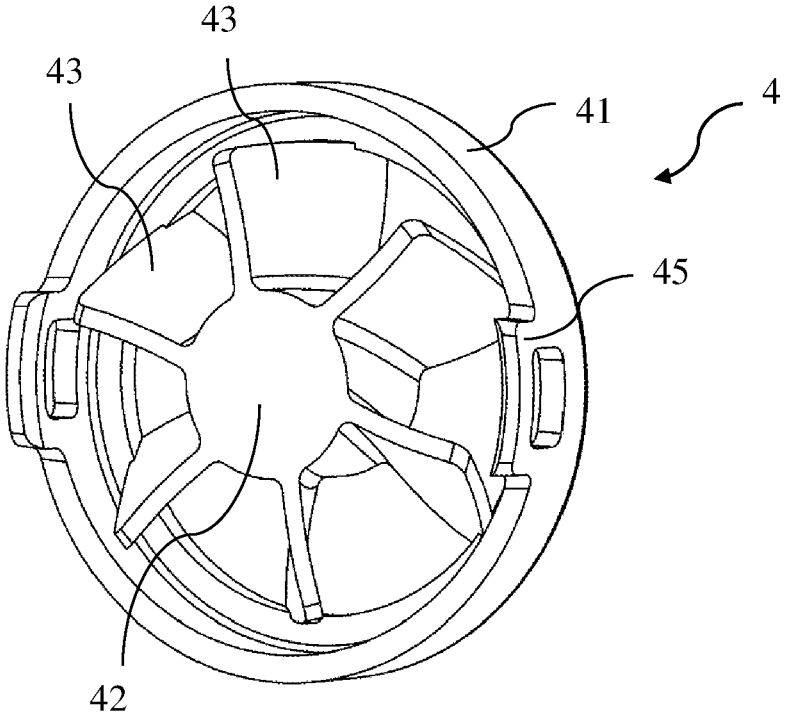
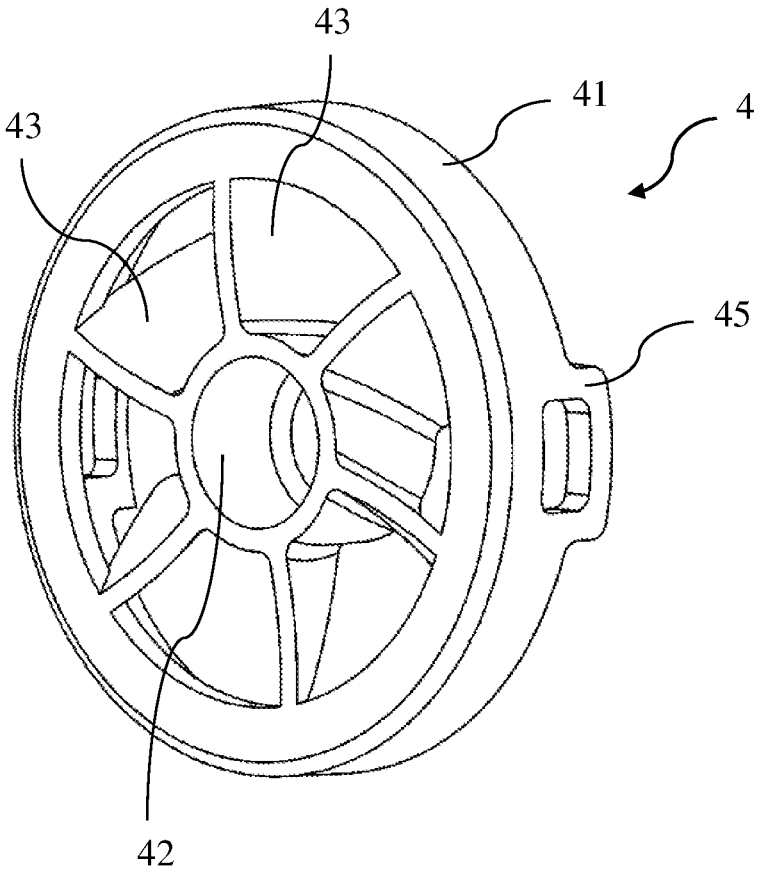


FIGURE 8



REFERENCES CITED IN THE DESCRIPTION

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