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(54) **FAN UNIT FOR GAS-BURNERS WITH PRE-MIXING AND BURNER APPARATUS INCLUDING SAID FAN**

GEBLÄSEEINHEIT FÜR GASBRENNER MIT VORMISCHUNG UND BRENNERVORRICHTUNG MIT DEM GEBLÄSE

UNITÉ DE VENTILATEUR POUR BRÛLEURS À GAZ AVEC PRÉMÉLANGE ET APPAREIL DE BRÛLEUR COMPRENANT LEDIT VENTILATEUR

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(73) Proprietor: **SIT S.P.A.**
35129 Padova (IT)

(72) Inventors:
- **RANALLI, Antonio**
  66020 Scerni (CH) (IT)
- **USCI, Rosalino**
  60035 Jesi (AN) (IT)
- **MARCANTONI, Michele**
  60020 Polverigi (AN) (IT)

(74) Representative: **Fabris, Stefano et al**
Cantaluppi & Partners S.r.l.
Piazzetta Cappellato Pedrocchi, 18
35122 Padova (IT)

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Description

[0001] The present invention concerns an arrangement comprising a fan unit and a gas burner with premixing, having the characteristics mentioned in the preamble of claim 1.

[0002] A fan unit for gas burners having the features outlined above is known from EP 834695 A1.

[0003] In the specific technical field, it is known to produce burners for gas of the premixed type in which the combustion head is intended to be housed in a combustion chamber into which the air/gas mixture is fed via the delivery side of a fan unit. Typically, the burner is connected to a gate or another similar member for closing the combustion chamber, and the intake section of the fan is positioned on the axially opposed side of the head with respect to the fan. This results in relative bulkiness at the gate, externally of the combustion chamber, owing to the structure for conveying air and gas towards the intake section of the fan.

[0004] A principal aim of the invention is that of providing a fan unit structurally and functionally designed to obtain, compared with known solutions, positioning within the burner body which is less bulky, making better use of the space and with smaller overall dimensions, and at the same time achieving an improvement in the functionality of the fan, especially in terms of efficiency in the premixing of the air-gas mixture directed to the combustion head.

[0005] This and other aims which will become clear hereinafter are achieved by the invention by means of a fan unit produced according to the following claims.

[0006] Further characteristics and advantages of the invention will become clearer from the following detailed description of a preferred exemplary embodiment thereof, illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Figure 1 is a partially sectioned perspective view of a fan unit associated with the combustion head of a burner body according to the invention,
- Figure 2 is a view in axial section of the unit of Figure 1,
- Figure 3 is a partially sectioned schematic view of the fan unit of the preceding Figures,
- Figure 3A is a view in section along the line III-III of Figure 3,
- Figures 4 and 5 are perspective views of respective details of the fan unit of the preceding Figures,
- Figure 6 is a further partially sectioned perspective view of the fan unit.

[0007] With reference to the drawings listed, the reference 1 indicates as a whole a fan unit arranged for feeding to its delivery side a combustible air/gas mixture intended to be conveyed to a combustion head 2 of a gas burner 3 in which the ignition and combustion of the mixture takes place.

[0008] The fan is of the centrifugal type and comprises a bladed impeller 4 with a manifold 5 for housing the impeller itself in which an intake section 6 and a delivery section 7 of the fan are provided.

[0009] The impeller 4 is capable of being rotated about an axis of rotation X, by means of a drive means 8, for example an electric motor onto the drive shaft of which the impeller is keyed.

[0010] The fan is further arranged to be secured to the structure of the burner 3, and in particular is mounted, in combination with the burner, above a gate 9, constituting the closure member of the combustion chamber associated with the burner. The gate conveniently comprises a plate-like base 9a on which are fixed, by means of suitable flanges, the motor 8, the manifold 5 and the combustion head 2, coaxial with one another and axially disposed one after the other, as shown diagrammatically in Figure 3.

[0011] The combustion head 2 preferably has a configuration which is like a cap or spherical segment, the base of which is suitably secured to a support flange 10. Behind the head 2, and within the latter, a distributor member, indicated by 11, is provided, also substantially shaped like a cap and arranged with through openings for distributing the mixture on the combustion head.

[0012] Between the distributor member 11 and the impeller 4 facing the latter, in the body of the burner, an internal space or volume is defined, indicated as a whole by 12, into which are conveyed, separately and distinctly, the mixture coming from the delivery side 7 of the fan and directed to the distributor 11, and also the flow of air and gas directed to the intake section 6 of the fan, as will become clear from the continuation of the description.

[0013] In more detail, according to the invention, first conveying means, indicated by 13, are provided for conveying the combustible air/gas mixture onto the head 2 fed via the delivery side 7 of the fan, and second, separate and distinct, conveying means, indicated by 14, for conveying the flow of air, and optionally gas, drawn from outside the burner body 3, in the direction of the intake section 6. According to a principal characteristic of the invention, the intake section 6 of the fan is arranged on the same side as the combustion head 2, being in communication with a first chamber 15 defined in the volume space 12, which is contained between the combustion head and the impeller.

[0014] Furthermore, the conveying means 13, 14 are selected to have a length and configuration such that the flow of the air/gas mixture to the delivery side of the fan crosses the flow of air and/or gas directed to the intake section 6, as shown diagrammatically in Figure 3, in which the flows are conducted separately and distinctly from each other by the respective first and second conveying means.

[0015] In Figure 3, arrows coloured white (intake flow) and black (flow to delivery side) respectively designate the directions of the aforesaid flows, which cross at a zone designated by M in the axial section of Figure 3.

[0016] In more detail, the first conveying means 13 comprise a first plurality of ducts, all indicated by 16, which extend at the delivery section 7 of the fan, beyond the outside diameter of the impeller 4, to connect the delivery section with a second chamber 17 for distributing the mixture, also defined in the space 12 contained between the distributor member 11 and the impeller, and also separated from the chamber 15 by means of a wall 18, as illustrated diagrammatically in Figure 3.

[0017] The ducts 16 are distributed circumferentially, downstream of the delivery section 7, at a predetermined angular pitch, in particular at a regular angular pitch. Moreover, each duct 16 has, with respect to the flow direction, an intake opening 16a for the mixture (supplied by the delivery side of the fan) in which the flow has a predominant radial component, and an outlet opening 16b, at the opposite end, in which the flow has a predominant axial component.

[0018] Downstream of the outlet opening, the configuration of the chamber 17 is such as to further deflect the flow in order to convey it along the distributor 11, in order to impinge effectively on the combustion head 2.

[0019] The second conveying means 14 themselves comprise a respective plurality of ducts, all indicated by 19, which are disposed alternately with the ducts 16, such that in the zone M where the flows cross, a duct 19 is interposed between a pair of ducts 16 adjacent to each other. Each duct 19 is further conveniently defined in the central cavity 20a passing through a respective straightener blade 20, which is part of a plurality of stator straightener blades. Between each pair of stator blades 20 is defined a corresponding duct 16 of the first plurality of ducts.

[0020] Each duct 19 also has, with respect to the flow direction, an inlet opening 19a, open to the outside of the burner body (for the admission of the air, and optionally gas, of the gas) and an opposed outlet opening 19b, communicating with the chamber 15 which is itself connected to the intake section 6 of the fan.

[0021] The reference 21 also indicates stator blades provided in the chamber 15 for suitably conveying the flow of air, and optionally gas, in the direction of the intake section 6, and capable of imparting to the flow an optional pre-rotational component, obtained by the curved profile of the stator blades.

[0022] Preferably, the ducts 19 are also distributed along a circumferential profile concentric with the axis of the impeller and located downstream of the delivery section 7. Moreover, a distribution of ducts at a regular angular pitch is preferred. The inlet opening 19a of each duct is such as to impart a predominant axial component to the flow, which is then deflected to reach the outlet opening 19b where it has a predominant radial component, at the entry into the chamber 15, through which it is conveyed to the intake section 6 of the fan. The latter conveniently comprises an opening 6a coaxial with the axis X of the impeller.

[0023] Figure 1 illustrates a preferred configuration of ducts 19, the air entry openings 19a of which can be seen. Through one or more of the openings 19a, the entry of the gas to the inside of the fan unit may take place.

[0024] One of the principal advantages of the invention lies in the fact that by conveying the intake air/gas flow on the same side as the head, it is possible to take advantage of the space inside the head which is arranged between the head and the impeller, thus reducing as far as possible the overall dimensions required outside the impeller in the zone conventionally dedicated to the intake of the air or of the gas (located in proximity to the axis of the impeller, on the opposite side of the combustion head from the impeller itself). The arrangement according to the invention is obtained by means of respective stator straightener devices located at the intake side and at the delivery side of the fan, and which in fact impart to the flows a relative intersection, as demonstrated above.

[0025] Another advantage lies in the fact that in the arrangement according to the invention it is possible to obtain the measurement of the flow rate by arranging a pressure sensor in the intake chamber.

[0026] Yet another advantage is that of being able to have in the fan unit according to the invention an air/gas mixing chamber incorporated in the fan itself.

[0027] Another advantage is linked to the fact of being able to ensure an improved degree of quietness for the arrangement produced according to the invention.

[0028] Another advantage is linked to the greater compactness obtainable in the arrangement according to the invention, compared with known machines having similar performance characteristics.

[0029] Yet another advantage lies in the lower cost at which the invention can be produced owing to the fact that the arrangement incorporates within it more functions for each component.

[0030] The invention thus achieves the aims proposed with respect to the known solutions, obtaining the advantages listed compared with the known solutions.

Claims

1. Arrangement comprising a fan unit and a gas burner (3) with pre-mixing of the type comprising a combustion head (2) and first conveying means (13) for conveying a combustible air/gas mixture fed to the delivery side of the fan in the direction of the head (2), said fan unit comprising a radial impeller (4) and a manifold (5) for housing said impeller, the fan being provided with at least one intake section (6) and at least one delivery section (7) for the flow which are defined in the manifold (5), drive means (8) being provided for rotating the impeller (4) about an axis of rotation (X), the intake section (6) of the fan being arranged on the same side as the combustion head (2), said arrangement comprising second conveying means (14) for conveying the flow of air, and option-

ally gas, between the head (2) and the impeller (4) in the direction of said intake section (6), **characterized in that** said first and second conveying means (13, 14) have a length and configuration such that the flow of the air/gas mixture supplied at the delivery side (7) of the fan crosses the flow of air, and optionally gas, directed to the intake section (6) of the fan, said flows being conducted separately and distinctly by said respective first and second conveying means (13, 14).

2. Arrangement according to claim 1, wherein said intake section (6) comprises an opening of the manifold (5) coaxial with the axis of rotation of the impeller (4) and axially facing towards the combustion head (2).

3. Arrangement according to claim 1 or 2, wherein said first and second conveying means (13, 14) comprise a respective first (16) and second (19) plurality of ducts disposed alternately with one another, such that in the zone (M) with said intersecting flows a duct of one of said plurality is interposed between a pair of ducts of the other plurality.

4. Arrangement according to claim 3, wherein the ducts (19) of said second plurality are at least partially defined by respective cavities (20a) passing through corresponding straightener blades (20) of a first straightener stator device, each duct (16) of said first plurality being at least partly defined between pairs of adjacent blades (20).

5. Arrangement according to claim 4, wherein the ducts (19) of said second plurality are in fluid communication, at one of their ends, with a first chamber (15) for connection to the intake section (6) of the impeller (4), said chamber (15) extending between the head (2) and the impeller (4).

6. Arrangement according to claim 5, wherein said chamber (15) is provided with stator blades.

7. Arrangement according to any one of claims 3 to 6, wherein the ducts (19) of said second plurality are distributed along a circumferential profile concentric with the axis (X) of the impeller, located downstream of the delivery section (7) with respect to the flow direction.

8. Arrangement according to claim 7, wherein the ducts (19) of said second plurality are disposed at a regular angular pitch along said circumferential profile.

9. Arrangement according to any one of claims 3 to 8, wherein the ducts (16) of said first plurality extend to connect the delivery section (7) of the fan with a second chamber (17) for distribution of the mixture which itself communicates with the combustion head (2).

10. Arrangement according to claim 9, wherein the first and the second chamber (15, 17) are axially interposed between the head (2) and the impeller (4) of the fan.

11. Arrangement according to any one of claims 3 to 10, wherein, at the ducts (16, 19) of said first and second conveying means, with intersecting flows, the direction of the intake flow has a dominant axial component and the direction of the delivery flow has a dominant radial component.

12. Arrangement according to any one of claims 3 to 11, wherein the injection of the gas inside said first chamber (15), upstream of the intake section (6) of the impeller, takes place through one or more of the ducts (19) of said second plurality.

Patentansprüche

1. Anordnung, umfassend eine Lüftereinheit und einen Gasbrenner (3), mit Vormischer des Typs umfassend einen Brennerkopf (2) und eine erste Weiterleitungseinrichtung (13) zum Weiterleiten einer brennbaren Luft-/Gasmischung die der Zuführseite des Lüfters in die Richtung des Kopfes (2) zugeführt wird, wobei die Lüftereinheit ein radiales Laufrad (4) und einen Verteiler (5) zum Aufnehmen des Laufrades aufweist, wobei der Lüfter mit zumindest einem Ansaugbereich (6) und zumindest einem Zuführbereich (7) für die Strömung versehen ist, die im Verteiler (5) definiert sind, wobei eine Antriebseinrichtung (8) zum Drehen des Laufrades (4) um eine Drehachse (X) herum vorgesehen ist, wobei der Ansaugbereich (6) des Lüfters auf derselben Seite wie der Brennerkopf (2) angeordnet ist, wobei die Anordnung eine zweite Weiterleitungseinrichtung (14) zum Weiterleiten der Strömung von Luft und optional von Gas zwischen dem Kopf (2) und dem Laufrad (4) in die Richtung des Ansaugbereiches (6) aufweist,
dadurch gekennzeichnet, dass die ersten und zweiten Weiterleitungseinrichtungen (13, 14) eine Länge und eine Konfiguration aufweisen, sodass die Strömung der Luft-/Gasmischung, die der Zuführseite (7) des Lüfters zugeführt wird, die Strömung von Luft und optional von Gas kreuzt, die zum Ansaugbereich (6) des Lüfters geleitet wird, wobei die Strömungen durch jeweilige erste und zweite Weiterleitungseinrichtungen (13, 14) separat und eigenständig geführt werden.

2. Anordnung gemäß Anspruch 1, wobei der Ansaugbereich (6) eine Öffnung des Verteilers (5) aufweist,

der mit der Drehachse des Laufrades (4) koaxial ist und dem Brennerkopf (2) axial zugewandt ist.

3. Anordnung gemäß Anspruch 1 oder 2, wobei die ersten und zweiten Weiterleitungseinrichtungen (13, 14) eine jeweilige erste (16) und zweite (19) Mehrzahl von Kanälen aufweisen, die abwechselnd miteinander angeordnet sind, sodass im Bereich (M) mit den sich kreuzenden Strömungen ein Kanal von der einen Mehrzahl zwischen einem Paar von Kanälen von der anderen Mehrzahl angeordnet ist.

4. Anordnung gemäß Anspruch 3, wobei die Kanäle (19) der zweiten Mehrzahl zumindest teilweise durch jeweilige Hohlräume (20 a) definiert sind, die durch entsprechende Richtschaufeln (20) einer ersten Richtstatorvorrichtung hindurchgehen, wobei jeder Kanal (16) der ersten Mehrzahl zumindest teilweise zwischen den Paaren von benachbarten Schaufeln (20) definiert ist.

5. Anordnung gemäß Anspruch 4, wobei die Kanäle (19) der zweiten Mehrzahl in Fluidverbindung an einem ihrer Enden mit einer ersten Kammer (15) zur Verbindung mit dem Ansaugbereich (6) des Laufrades (4) sind, wobei sich die Kammer (15) zwischen dem Kopf (2) und dem Laufrad (4) erstreckt.

6. Anordnung gemäß Anspruch 5, wobei die Kammer (15) mit Statorschaufeln versehen ist.

7. Anordnung gemäß einem der Ansprüche 3 bis 6, wobei die Kanäle (19) der zweiten Mehrzahl entlang eines Umfangsprofils verteilt sind, das mit der Achse (X) des Laufrades konzentrisch ist, das stromabwärts des Zuführbereichs (7) bezüglich der Strömungsrichtung angeordnet ist.

8. Anordnung gemäß Anspruch 7, wobei die Kanäle (19) der zweiten Mehrzahl mit einem regulären Teilungswinkel entlang des Umfangprofils angeordnet sind.

9. Anordnung gemäß einem der Ansprüche 3 bis 8, wobei sich die Kanäle (16) der ersten Mehrzahl erstrecken, um den Zuführbereich (7) des Lüfters mit einer zweiten Kammer (17) zum Verteilen der Mischung zu verbinden, die selbst mit dem Brennerkopf (2) in Verbindung ist.

10. Anordnung gemäß Anspruch 9, wobei die erste und die zweite Kammer (15, 17) axial zwischen dem Kopf (2) und dem Laufrad (4) des Lüfters angeordnet sind.

11. Anordnung gemäß einem der Ansprüche 3 bis 10, wobei an den Kanälen (16, 19) der ersten und zweiten Weiterleitungseinrichtung mit den sich kreuzenden Strömungen die Richtung der Ansaugströmung eine dominante axiale Komponente und die Richtung der Zuführströmung eine dominante radiale Komponente aufweist.

12. Anordnung gemäß einem der Ansprüche 3 bis 11, wobei das Einleiten des Gases in die erste Kammer (50), stromaufwärts des Ansaugbereiches (6) des Laufrades (4), durch einen oder mehrere der Kanäle (19) der zweiten Mehrzahl erfolgt.

Revendications

1. Agencement comprenant une unité de ventilateur et un brûleur de gaz (3) avec prémélange du type comprenant une tête de combustion (2) et des premiers moyens de transport (13) pour le transport d'un mélange air-gaz combustible alimenté au côté de fourniture du ventilateur dans la direction de la tête (2), ladite unité de ventilateur comprenant un rotor radial (4) et un collecteur (5) pour loger ledit rotor, le ventilateur étant doté d'au moins une section d'admission (6) et d'au moins une section de fourniture (7) pour le flux qui sont définies dans le collecteur (5), des moyens d'entraînement (8) étant prévus pour la rotation du rotor (4) autour d'un axe de rotation (X), la section d'admission (6) du ventilateur étant agencée du même côté que la tête de combustion (2), ledit agencement comprenant des seconds moyens de transport (14) pour le transport du flux d'air, et en option de gaz, entre la tête (2) et le rotor (4) dans la direction de ladite section d'admission (6), **caractérisé en ce que** lesdits premier et second moyens de transport (13, 14) présentent une longueur et une configuration telles que le flux du mélange air et gaz amené au côté de fourniture (7) du ventilateur croise le flux d'air, et en option de gaz, dirigé vers la section d'admission (6) du ventilateur, lesdits flux étant conduits séparément et distinctement par lesdits premier et second moyens de transport (13, 14) respectifs.

2. Agencement selon la revendication 1, dans lequel ladite section d'admission (6) comprend une ouverture du collecteur (5) coaxiale à l'axe de rotation du rotor (4) et tournée axialement vers la tête de combustion (2).

3. Agencement selon la revendication 1 ou 2, dans lequel lesdits premiers et seconds moyens de transport (13, 14) comprennent une première (16) et une seconde (19) pluralité respective de conduits disposés en alternance les uns par rapport aux autres, de sorte que dans la zone (M) avec lesdits flux se croisant, un conduit d'une de ladite pluralité soit interposé entre une paire de conduits de l'autre pluralité.

4. Agencement selon la revendication 3, dans lequel

les conduits (19) de ladite seconde pluralité sont au moins partiellement définis par des cavités respectives (20a) passant par des pales plus droites correspondantes (20) d'un premier dispositif de stator plus droit, chaque conduit (16) de ladite première pluralité étant au moins partiellement défini entre des paires de pales adjacentes (20).

5. Agencement selon la revendication 4, dans lequel les conduits (19) de ladite seconde pluralité sont en communication fluidique au niveau d'une de leurs extrémités avec une première chambre (15) pour la connexion avec la section d'admission (6) du rotor (4), ladite chambre (15) s'étendant entre la tête (2) et le rotor (4).

6. Agencement selon la revendication 5, dans lequel ladite chambre (15) est dotée de pales de stator.

7. Agencement selon l'une quelconque des revendications 3 à 6, dans lequel les conduits (19) de ladite seconde pluralité sont distribués le long d'un profil circonférentiel concentrique avec l'axe (X) du rotor, situé en aval de la section de fourniture (7) par rapport à la direction de flux.

8. Agencement selon la revendication 7, dans lequel les conduits (19) de ladite seconde pluralité sont disposés selon un pas angulaire régulier le long dudit profil circonférentiel.

9. Agencement selon l'une quelconque des revendications 3 à 8, dans lequel les conduits (16) de ladite première pluralité s'étendent afin de relier la section de fourniture (7) du ventilateur à une seconde chambre (17) pour la distribution du mélange qui communique lui-même avec la tête de combustion (2).

10. Agencement selon la revendication 9, dans lequel la première et la seconde chambre (15, 17) sont interposées axialement entre la tête (2) et le rotor (4) du ventilateur.

11. Agencement selon l'une quelconque des revendications 3 à 10, dans lequel au niveau des conduits (16, 19) desdits premier et second moyens de transport avec des flux se croisant, la direction du flux d'admission présente une composante axiale dominante et la direction du flux de fourniture présente une composante radiale dominante.

12. Agencement selon l'une quelconque des revendications 3 à 11, dans lequel l'injection du gaz dans ladite première chambre (15), en amont de la section d'admission (6) du rotor, a lieu à travers un ou plusieurs des conduits (19) de ladite seconde pluralité.

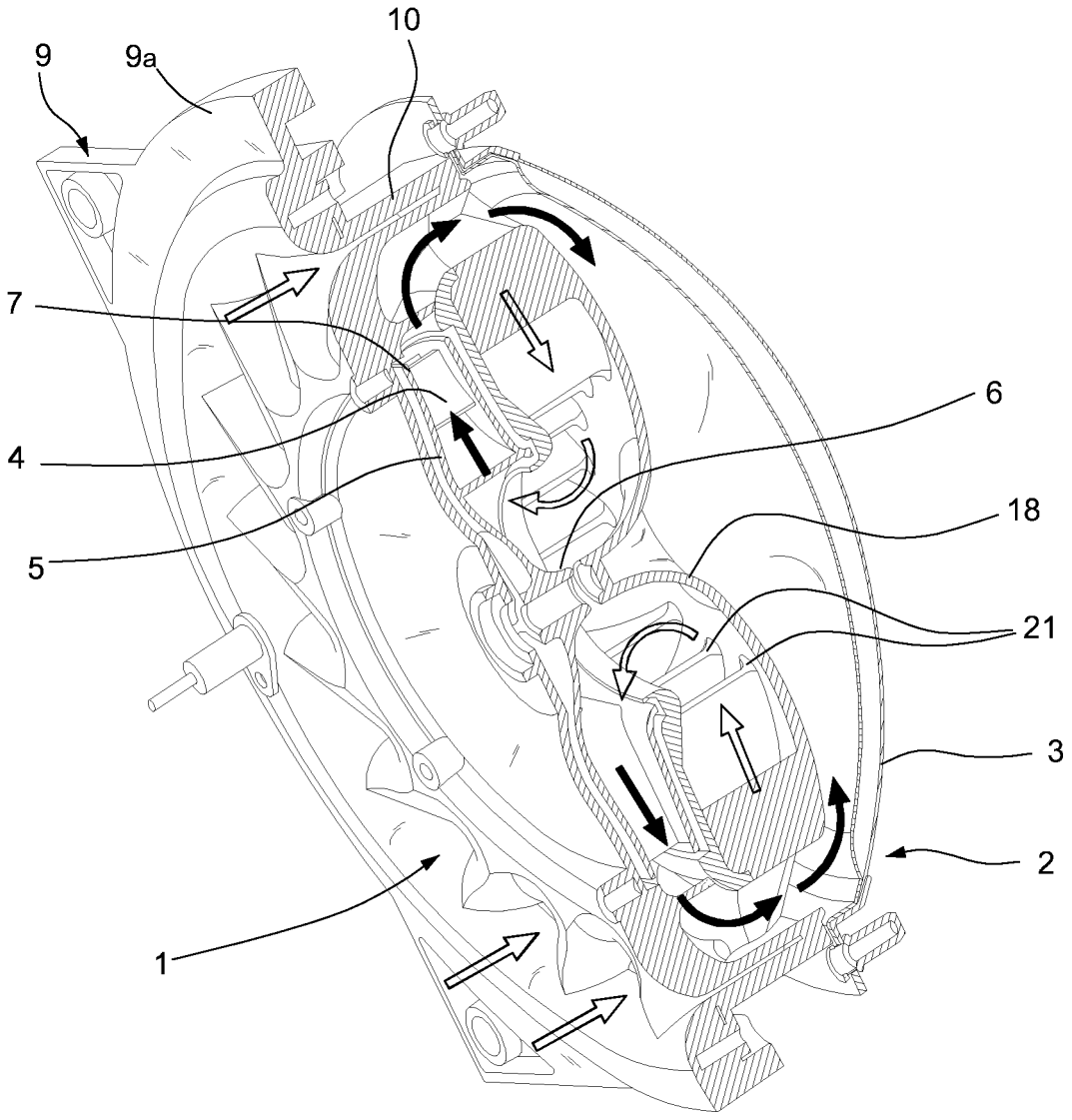

Fig.1

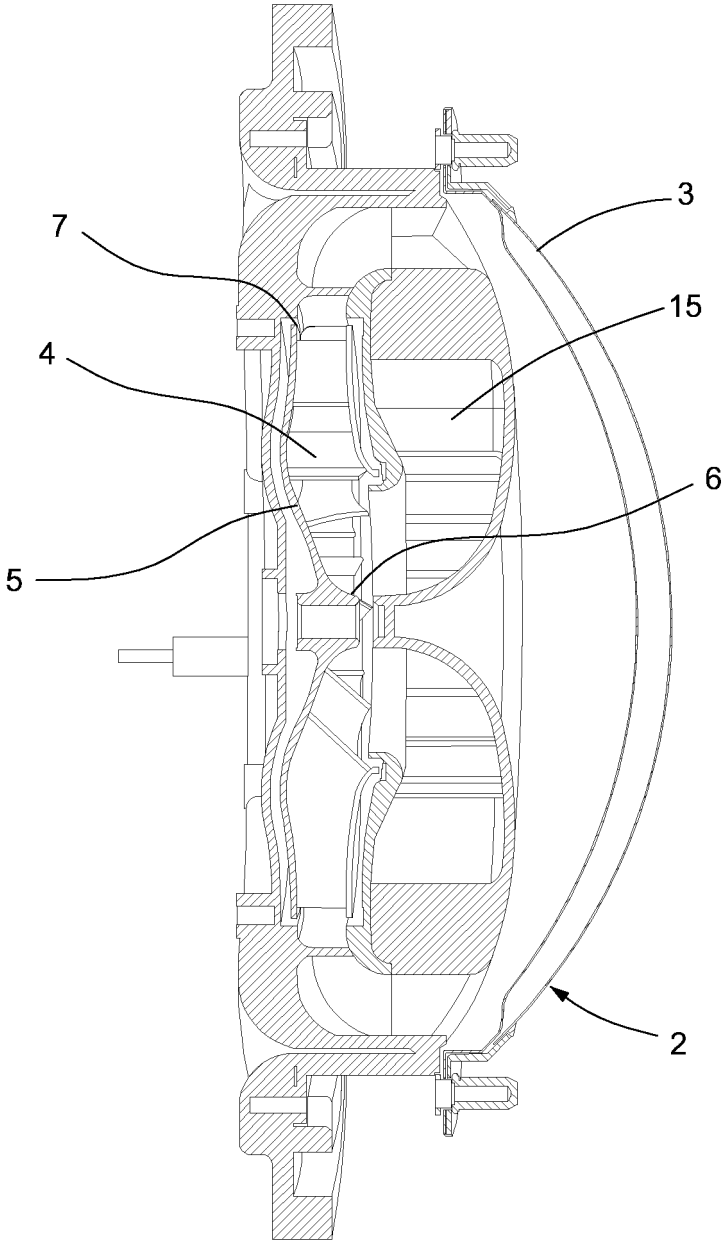

Fig.2

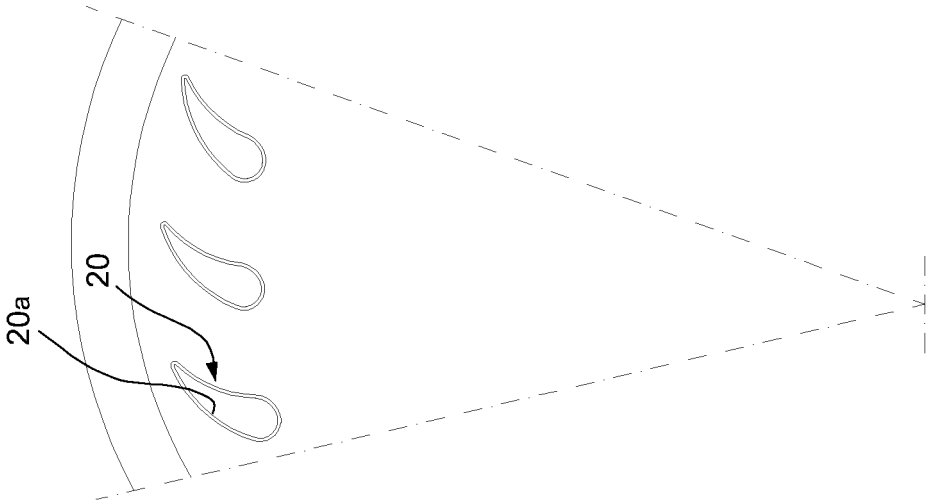

Fig. 3A

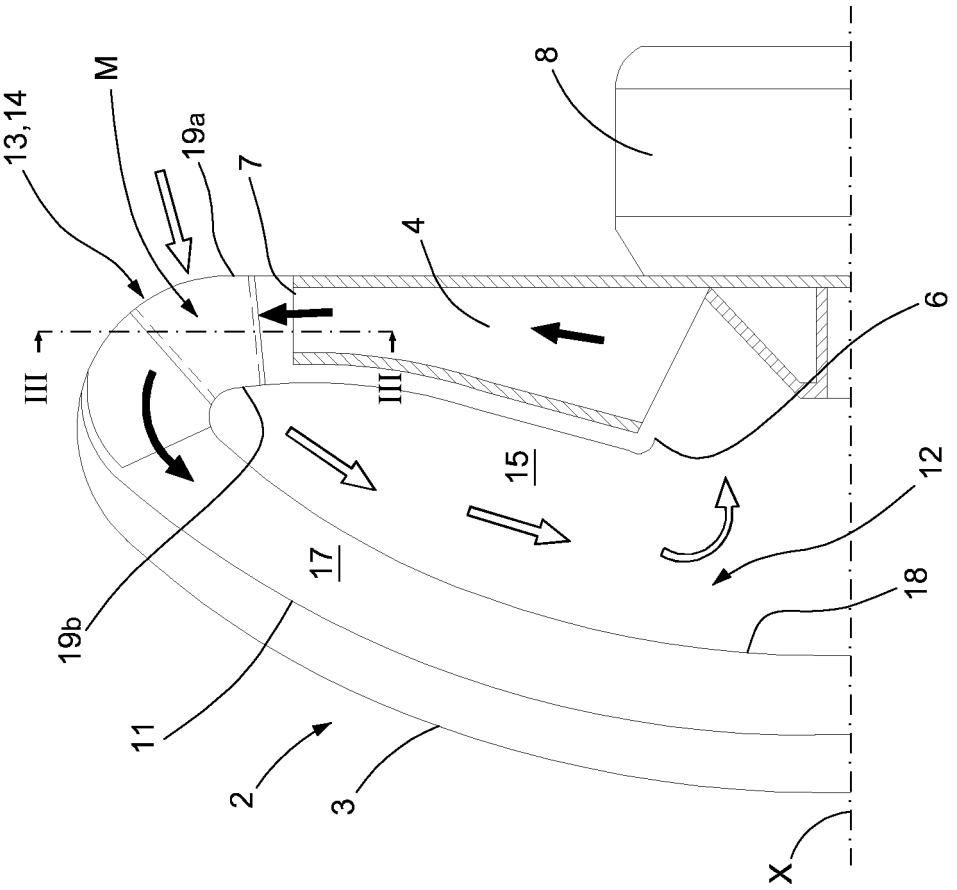

Fig.3

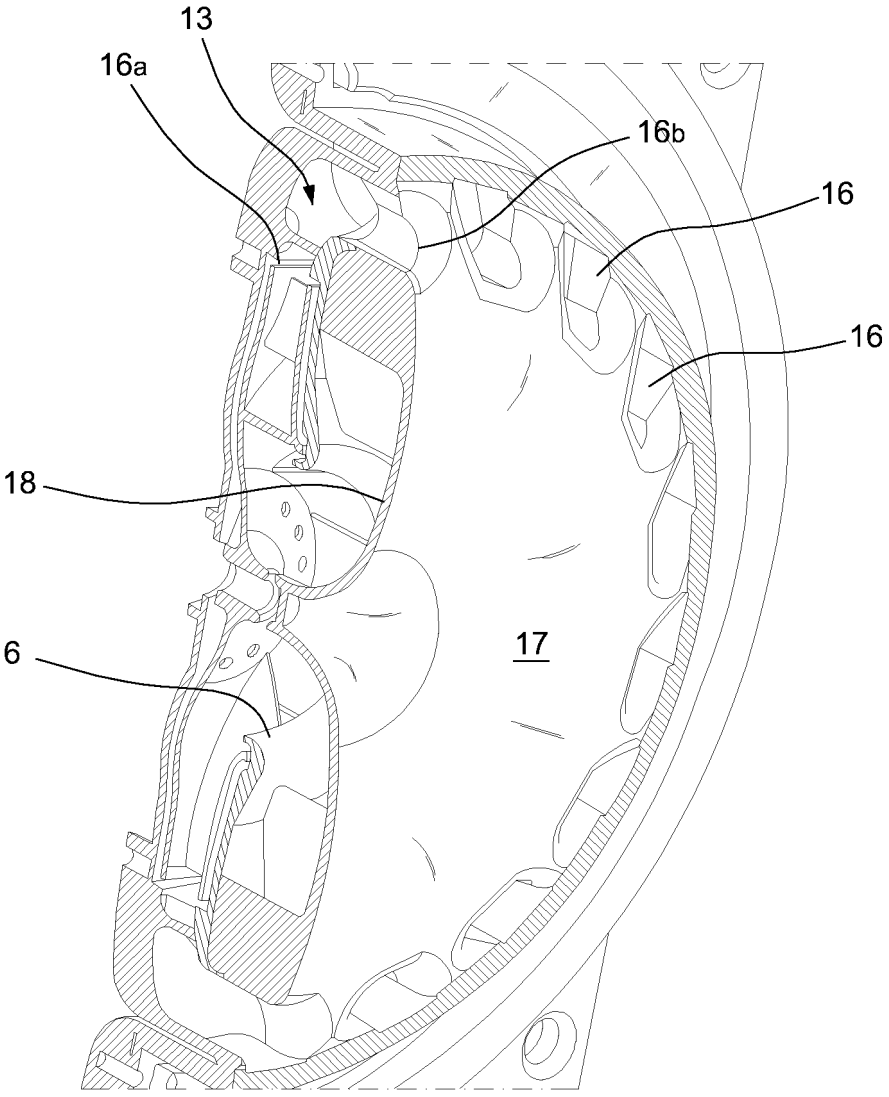

Fig. 4

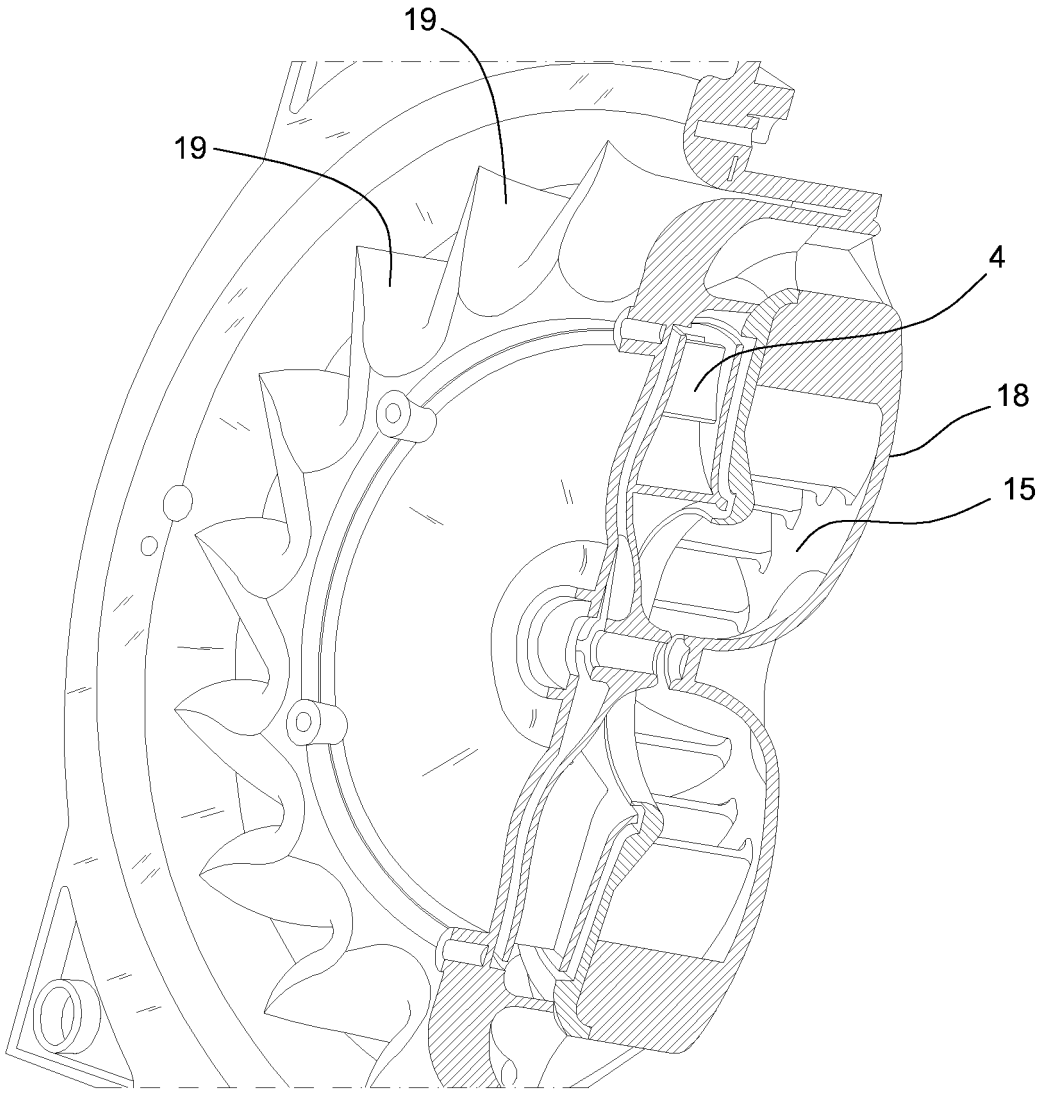

Fig. 5

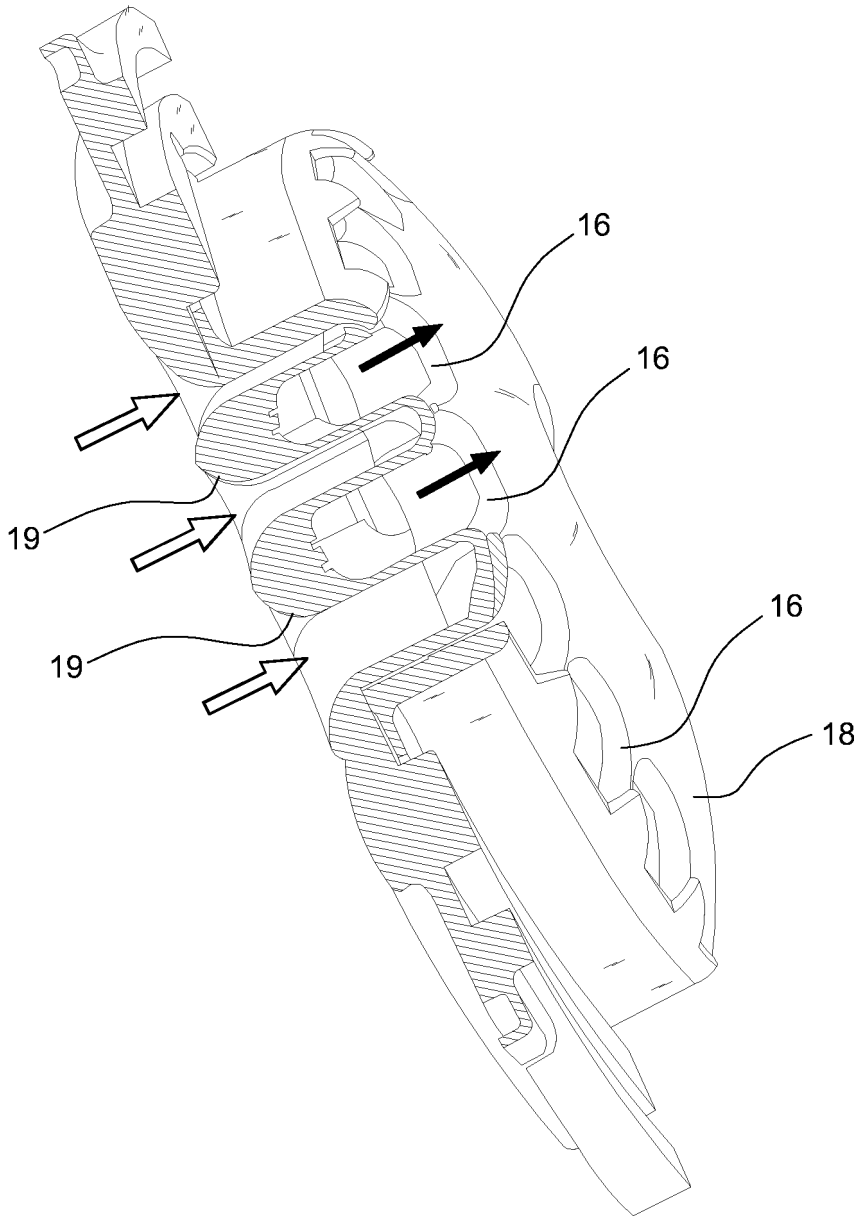

Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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