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(54) **Radial conveyor for suction hoods**

Radialer Förderer für Absaughaube

Convoyeur radial pour hottes aspirantes

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Description

[0001] The present invention concerns a radial conveyor, in particular for suction hoods, of the type comprising a housing with two axial air intake openings opposite one another and a radial air outlet opening, as well as a conveying group with an electric motor and an impeller arranged inside of the housing and connected to the housing through a support portion.

[0002] Radial conveyors of the aforementioned type are known for example from the documents US-A-2 923 460, DE 297 06 216 and EP 0 985 829.

[0003] The conveyor described in DE 297 06 216 comprises two lateral shells equipped with intake openings and a circumferential wall that connects the lateral shells and defines an air outlet opening. The motor-impeller group is rotatably supported inside of the housing through opposite support portions fixed to the two lateral shells.

[0004] In the conveyor described in EP 0 985 829, the support portions are initially separated by two half-shells of the housing and held between them during the assembly. EP1156224A2 describes a radial conveyor having the features of the preamble of claim 1.

[0005] The conveyors of the prior art comprise a high number of individual components to be assembled and thus have a complex and bulky structure. Moreover, the performance of known radial conveyors is still not satisfactory both in terms of noise and in terms of the consumption, as aspects which are particularly noticeable for the user of household suction hoods.

[0006] The purpose of the present invention is therefore that of proposing a radial conveyor of the aforementioned type, having characteristics such as to avoid at least some of the mentioned drawbacks with reference to the prior art.

[0007] One particular purpose of the invention is that of devising a radial conveyor that has a simple structure and that is not bulky.

[0008] A further particular purpose of the invention is that of proposing a radial conveyor having reduced energy consumptions at the same conveying power.

[0009] A further purpose of the invention is that of proposing a radial conveyor having very low noise and vibration levels.

[0010] These and other purposes are achieved by a radial conveyor defined by claim 1.

[0011] The dependent claims concern advantageous embodiments of the invention.

[0012] In order to better understand the invention and to appreciate the advantages, hereafter, with reference to the attached figures, we shall describe some of its non limiting example embodiments, in which:

figure 1 is an exploded perspective view of a radial conveyor according to the invention;
figure 2 is a further exploded perspective view of the radial conveyor in figure 1;
figure 3 is a section view in a plane radial with respect

to the rotation axis of the radial conveyor according to one embodiment;

figure 4 is a front view of an impeller of the conveyor according to one embodiment;

figure 5 is a section view according to the line V-V in figure 4;

figure 6 is an enlarged view of a sequence of blades of the impeller of the radial conveyor according to one embodiment;

figure 7 is an enlarged section view of a blade of the impeller of the radial conveyor according to one embodiment;

figure 8 is an internal side view of a half-shell of the housing of the radial conveyor according to one embodiment;

figure 9 is a section view according to the line IX-IX in figure 8;

figure 10 is a section view according to the line X-X in figure 8;

figures 11 and 12 are perspective views of a condenser space of the radial conveyor according to one embodiment.

[0013] With reference to the figures, a radial conveyor, in particular for household suction hoods is generally indicated with reference numeral 1. The conveyor 1 defines a rotation axis R of the impeller and the definitions of positions or orientation "axial", "radial" "circumferential" and "peripheral" refer to such a rotation axis R or to geometrical shapes developed around the rotation axis R. Moreover, in the present description, the expression "radially towards the inside" means "coming closer to the rotation axis R" and the expression "radially towards the outside" means "away from the rotation axis R".

[0014] The conveyor 1 comprises a housing 2 with a first axial intake opening 3 and a second axial intake opening 4 opposite to the first intake opening 3 and a radial air outlet opening 5, as well as a conveying group arranged inside of the housing 2 and having an electric motor 6 and an impeller 7 connected with a drive shaft 8 of the electric motor 6.

[0015] The electric motor 6 is fixed to the housing 2 cantilevered and non rotating through a plurality of support portions 9 protruding from an edge 10 of the first intake opening 3.

[0016] Thanks to the connection of the cantilevered motor through support portions that protrude from an edge of one of the intake openings, a reduction is obtained in the number of the individual pieces to be assembled and in the quantity of mechanical connections with the result of making the entire conveyor more simple and compact.

[0017] The housing 2 has a substantially toroidal shape with two side walls 11, 12 that define the intake openings 3, 4 and a peripheral wall 13 that forms a substantially tangential portion 14 defining the opening of the air outlet opening 5.

[0018] The housing 2 is formed by two half-shells 14,

16 connected to one another along a joint line 17 in the peripheral wall 13 through matching joint edges 18 being step-shaped, in cross section, so as to make a labyrinth connection interface, for example "Z"-shaped with two angles (in cross-section) and a plurality of alignment pins 19 protruding from the joint edges 18 of one of the half-shells 15, 16, and received in corresponding alignment holes 20 formed in the joint edge 18 of the other half-shell, respectively. The joint edges 18 also comprise joint flanges 22 protruding radially outwards from the housing 2 and having an undercut to receive one or more joint clips 21, in particular "Ω"-shaped springs, or, alternatively, holes to receive connection screws, that lock the two half-shells 15, 16 one against the other.

[0019] Advantageously, the labyrinth joint edges 18 and the joint flanges 22 substantially extend along the entire joint line 17.

[0020] Thanks to the aforementioned characteristics, the assembly of the housing is simple, sturdy and particularly precise.

[0021] In accordance with one embodiment, the intake openings 3, 4 are circular and coaxial with the impeller 7 (also circular) and the inner diameter D1 of the edge of the intake opening 3, 4 (without considering the support portions 9) is shorter than the inner diameter D2 of the end of the impeller 7 facing it. Advantageously, the difference $\Delta D = D2 - D1$ between the two diameters D1, D2 is within the range of 2mm and 6mm, preferably between 3mm to 5mm, even more preferably $\Delta D = 4$ mm.

[0022] Moreover, the free axial distance 23 between the edge of the intake opening 3, 4 (without considering the support portions 9) and the end of the impeller 7 facing it is advantageously between 1mm and 3mm, preferably the free axial distance 23 is of about 2mm on both sides of the impeller 7.

[0023] According to the invention (figure 3), the axially outer ends 25 (or, in other words, the ends facing the intake openings 3, 4) of the blades 24 of the impeller 7 have a curvature (in a plane radial with respect to the rotation axis R) which is substantially identical to the curvature of the edge 10 of the intake openings 3, 4 (in section according to a plane radial with respect to the rotation axis R). Advantageously, the aforementioned curvature is shaped as a circle arc with a radius of curvature 26 within the range of 4mm and 7mm, preferably about 5.5mm.

[0024] This allows very low noise air suction and reduces the flow resistance.

[0025] The support portions 9 extend both radially and axially towards the inside of the housing and form a first hole 48 for the connection of the electric motor 6 and, preferably, a second hole 49 for fixing a protective grating 50 independent from the fixing of the motor (figure 1). Advantageously, the support portions 9 are formed in a single piece with a first half-shell 14 that forms the aforementioned first intake opening 3.

[0026] The housing 2 internally defines a circumferential conveying space 27 that gradually widens, preferably

radially, from an initial minimum section 28 to a final maximum section 29.

[0027] Such a widening of the conveying space 27 is obtained by forming the peripheral wall 13 as a circumferential succession of a plurality of (preferably 4) circle arcs 33A, 33B, 33C, 33D which are not concentric and have an increasing radius of curvature and transition points 34 with a tangent direction.

[0028] The choice of a shape based upon a succession of circle arcs allows a precise and easy control of the correct shape of the housing in the production step or of a mould for manufacturing it.

[0029] The tangential outlet portion 14 of the housing 2 has an outer wall portion 30 that connects in an approximately tangent manner to the peripheral wall 13 at the final section 29 of the conveying space 27 and an inner wall portion 31 opposite the outer wall portion 30 and connected to the peripheral wall 13 at the initial section 28 of the conveying space 27. Between the peripheral wall 13 and the inner wall 31 a guide nose 32 is formed (also known as guide tongue) that protrudes towards the outer wall portion 30 and that defines the transition from the peripheral wall 13 to the inner wall portion 31.

[0030] The opening of the air outlet opening 5 is defined by a tubular end 35 of the tangential portion 14 that defines an opening plane 36 and an outlet direction 37 perpendicular to the opening plane 36 and that comprises an outer coupling flange 38.

[0031] Advantageously, the outer wall portion 30 comprises a section 39 (preferably rectilinear) inclined with respect to the outlet direction 37 towards the guide nose 32, so as to introduce a flow thrust in the direction of the guide nose that prevents the flow from detaching from it and to reduce the overall bulk of the conveyor 1.

[0032] The guide nose itself comprises a root portion 40 formed in the throat between the peripheral wall 13 and the inner wall portion 31 of the tangential portion 14, said root portion 40 having a tongue 41 with a circle arc-shaped free edge 42 projecting out from it. The joint line 17 of the half-shells 15, 16 of the housing 2 extends through the root portion 40, which can have an inner cavity 42 formed by two grooves obtained in the half-shells 15, 16 and a coupling ridge 43 projecting from a half-shell and that can be inserted in the groove of the other half-shell.

[0033] Thanks to this configuration, the thickness of the walls of the housing is highly even, avoiding the problem of uneven shrinkage during injection moulding, as well as a reduction in weight and a high rigidity of the housing.

[0034] In accordance with a preferred embodiment, the guide nose 32, in particular its root portion 40, extends past the coupling flange 38 to inside the tubular coupling portion 35.

[0035] In this way it is possible to exploit the coupling space also for guiding the flow outside from the conveying space and, thus, reduce the overall bulk of the conveyor.

[0036] In accordance with a further embodiment, between the outer wall portion 30 and the side walls of the tangential portion 14 two leading edges 45 of the flow that extend from the final section 29 of the conveying space to inside the tubular coupling portion 35 are formed and that, in the cross section, have a flat cusp-shape (figures 8, 9, 10).

[0037] The position and configuration of the leading edges in the conveying space, which is otherwise completely smooth, increases the flow stability and ensures its correct direction in the outlet area.

[0038] The peripheral wall 13 of the housing 2 can also form one or more connection protuberances 44 arranged on one side opposite the opening of the air outlet opening 5 and protruding radially outwards.

[0039] This makes it possible to advantageously lock the conveyor inside a suction hood (not illustrated) through fixing (for example by clamping or through screws or fastening clips) in a point opposite the outlet opening and thus opposite the coupling position of the discharge conduit, making the suction hood easier to assemble.

[0040] The radial conveyor 1 can also comprise a condenser carrier space 46 to receive the condenser of a condenser electric motor 6, said condenser carrier space 46 being removably connected to the peripheral wall of the housing in at least two different positions and comprises a plurality of condenser seats 47 with slightly different sizes for an interference locking of the condenser.

[0041] Thanks to the at least two connection positions, the radial conveyor with a condenser motor can easily be adapted to different models of suction hoods having different space conditions and the plurality of condenser seats makes it possible to reliably lock various types of condensers regardless of the possible fabrication tolerances or differences in diameter.

[0042] As already highlighted previously, the housing is advantageously made from plastic material through injection moulding, in particular made from polypropylene, for example filled with fibreglass, glass spheres, talc, etc.

[0043] The impeller 7 comprises a first plurality of blades 24 extending between a front ring 51 and a central wall 52, as well as a second plurality of blades 24 extending between a back ring 53 opposite the front ring 51 and the central wall 52, in which the second plurality of blades is advantageously angularly offset with respect to the first plurality of blades.

[0044] The blades 24 are arranged at a constant angular pitch, for example 61 blades at an angular pitch $\beta = 5.9^\circ$, excluding a single irregular blade 24' arranged at different distances from the adjacent blades 24, for example $\beta_1 = 5.5^\circ$ and $\beta_2 = 6.3^\circ$.

[0045] Such an arrangement of the blades 24 prevents the impeller from reaching a resonant frequency and consequently reduces the noise and the vibrations of the radial conveyor.

[0046] The central wall 52 is a substantially closed wall

with a dome or cup-shaped central portion 54 suitable for receiving a front portion of the electric motor 6 and a connection seat 55 for fixing the impeller to the drive shaft 8. The connection seat 55 comprises a metallic hub (preferably made from brass) co-moulded with the central portion 54 made from plastic material. The impeller 7 is advantageously injection moulded in polypropylene or ABS.

[0047] In accordance with an advantageous embodiment, the blade 24 has a concave front surface 56, facing towards the rotation direction of the impeller 7, a convex back surface 57 opposite the front surface 56 and a surface 58 of the rim radially inside the blade, in which, in a section plane perpendicular to the rotation axis R,

- the front surface 56 has a circle arc-shape having a first radius R1;
- the back surface 57 has a shape made up of a radially outer circle arc and a radially inner circle arc that meet at about mid radial height of the blade and that have a second radius R2 (outside) and a third radius R3 (inside);
- the surface 58 of the rim has a circle arc-shaped having a fourth radius R4,

in which, $R_2 > R_1 > R_3 > R_4$.

[0048] Advantageously:

- the ratio R_1/R_2 is between 0.65 and 0.85 and, preferably, of about 0.80;
- the ratio R_1/R_3 is between 1.3 and 1.9 and, preferably, of about 1.77;
- the ratio R_1/R_4 is between 20.0 and 40, and, preferably, of about 30.8.

[0049] In accordance with a preferred embodiment, the blade 24 is constructed through the aforementioned four circle arcs having radius of about: $R_1 = 7.7$ mm, $R_2 = 9.6$ mm, $R_3 = 4.35$ mm and $R_4 = 0.25$ mm.

[0050] Moreover, the exit angle α_u of the blade is between 57° and 67° and is advantageously of about 62.5° , whereas the entry angle α_i of the blade is between 12° and 20° and is advantageously of about 16.0° .

[0051] This particular shape of the blades contributes to a reduction of the noise of the conveyor at the same conveying flow-rate and pressure.

[0052] Advantageously, the blades 24 have a radial width of $1/12 \dots 1/18$ of the outer diameter 60 of the impeller 7, preferably the ratio between the radial extension of the blade 24 and the outer diameter 60 of the impeller 7 is of about 0.065.

[0053] The blades 24 can extend from an inner diameter 59 of 130 mm to 140 mm, preferably about 135 mm to an outer diameter 60 of 150 mm to 160 mm, preferably about 155 mm.

[0054] In accordance with a further preferred embodiment, the outer diameter 60 of the impeller 7 is substantially the same as its axial length 61.

[0055] With reference to the embodiment illustrated in

figure 5, the radial extension of the blades 24, or in other words their "chord", gradually increases in an axial direction from the external rings 51, 53 up to the central wall 52. This advantageously contributes to evening out the suction flow velocity along the rotation axis R.

Claims

1. Radial conveyor (1), in particular for suction hoods, having a revolving rotation axis (R) and comprising:

- a housing (2) with a first axial intake opening (3) and a second axial intake opening (4) opposite the first intake opening (3) and a radial air outlet opening (5),
- a conveying group (6, 7) arranged inside the housing (2) and having an electric motor (6) and an impeller (7) connected with a drive shaft (8) of the electric motor (6),

wherein the electric motor (6) is fixed to the housing (2) cantilevered and in a non rotatable manner through a plurality of support portions (9) projecting from an edge (10) of the first intake opening (3), wherein the intake openings (3, 4) are circular and coaxial with the impeller (7) and an inner diameter (D1) of the edge of the intake opening (3, 4) is smaller than the inner diameter (D2) of the end of the impeller (7) facing it, **characterized in that** the axially outer ends (25) of the blades (24) of the impeller (7) have a curvature which is substantially identical to the curvature of the edge (10) of the intake openings (3, 4) sectioned according to a plane that is radial with respect to the rotation axis (R).

2. Radial conveyor (1) according to claim 1, wherein the difference between the inner diameter (D1) of the edge of the intake opening (3, 4) and the inner diameter (D2) of the end of the impeller (7) is within the range of 2mm to 6mm, preferably between 3mm and 5mm, even more preferably about 4mm.
3. Radial conveyor (1) according to any one of the previous claims, wherein the free axial distance (23) between the edge of the intake opening (3, 4), excluding the support portions (9), and the end of the impeller (7) facing it is between 1mm and 3mm, preferably about 2mm.
4. Radial conveyor (1) according to any one of the previous claims, wherein the curvature of the axially outer ends (25) of the blades (24) of the impeller (7) and the curvature of the edge (10) are circle arc-shaped with a radius of curvature (26) within the range of 4mm and 7mm, preferably about 5.5mm.
5. Radial conveyor (1) according to any one of the pre-

vious claims, wherein said support portions (9) are formed in a single piece with a first half-shell (14) of the housing (2) that forms said first intake opening (3) and they extend both radially and axially towards the inside of the housing (2) and define a first hole (48) for the connection of the electric motor (6) and a second hole (49) for attaching a protective grating (50) independent from the attachment of the electric motor (6)

6. Radial conveyor (1) according to any one of the previous claims, wherein the housing (2) has a substantially toroidal shape with two side walls (11, 12) and a peripheral wall (13) that define a circumferential conveying space (27) that widens radially from an initial minimum section (28) to a final maximum section (29) at which a substantially tangential portion is connected (14) defining the air outlet opening (5).
7. Radial conveyor (1) according to claim 6, wherein the tangential portion (14) comprises:

- an outer wall portion (30) that connects to the peripheral wall (13) in an approximately tangential manner at the final section (29) of the conveying space (27) and,
- an inner wall portion (31) opposite the outer wall portion (30) and connected to the peripheral wall (13) at the initial section (28) of the conveying space (27),
- a guide nose (32) arranged between the peripheral wall (13) and the inner wall (31) and projecting towards the outer wall portion (30),
- a tubular end (35) defining an opening plane (36) and comprising an outer coupling flange (38),

wherein the outer wall portion (30) comprises a portion (39) inclined with respect to the opening plane (36) towards the guide nose (32).

8. Radial conveyor (1) according to claim 6 or 7, wherein the housing (2) is formed by two half-shells (14, 16) connected to one another along a joint line (17) in the peripheral wall (13) through matching step-shaped joint edges (18) so as to obtain a labyrinth-type connection interface and a plurality of alignment pins (19) protruding from the joint edge (18) of one of the half-shells (15, 16) and received in corresponding alignment holes (20) of the other half-shell, wherein said joint edges (18) also comprise joint flanges (22) protruding radially outwards from the housing (2) and having an undercut to receive one or more joint clips (21) that lock the two half-shells (15, 16) against one another.
9. Radial conveyor (1) according to one of the claims from 6 to 8, wherein a guide nose (32) arranged be-

tween the peripheral wall (13) and an inner wall (31) of the tangential portion (14) extends past the coupling flange (38) to inside the tubular coupling portion (35).

10. Radial conveyor (1) according to the previous claim, wherein the guide nose (32) comprises:

- a root portion (40) formed in a throat between the peripheral wall (13) and the inner wall portion (31) of the tangential portion (14),
- a tongue (41) projecting from the root portion (40) and having a circle arc-shaped free edge (42).

11. Radial conveyor (1) according to claim 9 or 10, wherein a root portion (40) of the guide nose (32) has an inner cavity (42) formed by two grooves obtained in the half-shells (15, 16) and a coupling ridge (43) projecting from a half-shell and being able to be inserted in the groove of the other half-shell.

12. Radial conveyor (1) according to one of claims from 6 to 11, wherein between the outer wall portion (30) and the side walls of the tangential portion (14) two leading edges (45) are formed that extend from the final section (29) of the conveying space (27) to inside the tubular coupling portion (35).

13. Radial conveyor (1) according to any one of the previous claims, wherein the impeller (7) comprises a first plurality of blades (24) extending between a front ring (51) and a central wall (52), as well as a second plurality of blades (24) extending between a back ring (53) opposite the front ring (51) and the central wall (52), wherein the second plurality of blades is angularly offset with respect to the first plurality of blades.

14. Radial conveyor (1) according to the previous claim, wherein the blades (24) are arranged at a constant angular pitch, excluding a single irregular blade (24') arranged at different distances from the adjacent blades (24).

15. Radial conveyor (1) according to claim 13 or 14, wherein each blade (24) has a concave front surface (56), facing towards the rotation direction of the impeller (7), a convex back surface (57) opposite the front surface (56) and a surface (58) of the rim radially inside the blade, wherein, in a section plane perpendicular to the rotation axis (R):

- the front surface (56) is circle arc-shaped having a first radius (R1);
- the back surface (57) has a shape made up of a radially outer circle arc having a second radius

(R2) and a radially inner circle arc having a third radius (R3) that meet at about mid-radial height of the blade;

- the surface (58) of the rim is circle arc-shaped and has a fourth radius (R4),

wherein, $R2 > R1 > R3 > R4$.

16. Radial conveyor (1) according to claim 15, wherein:

- the ratio between the first and second radius ($R1/R2$) is between 0.65 and 0.85, preferably about 0.80;
- the ratio between the first and third radius ($R1/R3$) is between 1.3 and 1.9, preferably about 1.77;
- the ratio between the first and fourth radius ($R1/R4$) is between 20.0 and 40, preferably about 30.8,

and wherein:

- the exit angle (α_u) of the blade is between 57° and 67° , preferably about 62.5° ,
- the entry angle (α_i) of the blade is between 12° and 20° , preferably about 16.0° .

17. Radial conveyor (1) according to claim 15 or 16, wherein the blades (24) have a radial extension of $1/12 \dots 1/18$ of the outer diameter (60) of the impeller (7).

18. Radial conveyor (1) according to any one of the previous claims, wherein the outer diameter (60) of the impeller (7) is substantially equal to its axial length (61).

Patentansprüche

1. Radialförderer (1), insbesondere für Saughauben, mit einer drehenden Rotationsachse (R) und umfassend:

- ein Gehäuse (2) mit einer ersten axialen Einlassöffnung (3) und einer zweiten axialen Einlassöffnung (4), welche der ersten Einlassöffnung (3) entgegengesetzt ist, und einer radialen Luftauslassöffnung (5),
- eine Fördergruppe (6, 7), welche in dem Gehäuse (2) angeordnet ist, und mit einem Elektromotor (6) und einem Impeller (7), welcher mit einer Antriebswelle (8) des Elektromotors (6) verbunden ist,

wobei der Elektromotor (6) an dem Gehäuse (2) auskragend und in einer nicht-rotierbaren Weise durch eine Mehrzahl von Halterungsabschnitten (9) befestigt ist.

- tigt ist, welche von einem Rand (10) der ersten Einlassöffnung (3) vorstehen, wobei die Einlassöffnungen (3, 4) kreisförmig und coaxial mit dem Impeller (7) sind und ein innerer Durchmesser (D1) des Randes der Einlassöffnung (3, 4) kleiner ist als der Innendurchmesser (D2) des Endes des Impellers (7), welches darauf weist, **dadurch gekennzeichnet, dass** die axialen äußeren Enden (25) der Schaufeln (24) des Impellers (7) eine Krümmung aufweisen, welche im Wesentlichen identisch zu der Krümmung des Randes (10) der Einlassöffnungen (3, 4) ist, geschnitten gemäß einer Ebene, welche radial in Bezug auf die Rotationsachse (R) ist.
2. Radialförderer (1) nach Anspruch 1, wobei die Differenz zwischen dem inneren Durchmesser (D1) des Randes der Einlassöffnung (3, 4) und dem inneren Durchmesser (D2) des Endes des Impellers (7) innerhalb des Bereichs von 2 mm bis 6 mm, vorzugsweise zwischen 3 mm und 5 mm, noch mehr bevorzugt in etwa 4 mm ist.
 3. Radialförderer (1) nach einem der vorhergehenden Ansprüche, wobei der freie axiale Abstand (23) zwischen dem Rand der Einlassöffnung (3, 4), mit Ausnahme der Halterungsabschnitte (9), und dem Ende des Impellers (7), welches darauf weist, zwischen 1 mm und 3 mm, vorzugsweise in etwa 2 mm beträgt.
 4. Radialförderer (1) nach einem der vorhergehenden Ansprüche, wobei die Krümmung der axialen äußeren Enden (25) der Schaufeln (24) des Impellers (7) und die Krümmung des Randes (10) kreisbogenförmig mit einem Krümmungsradius (26) innerhalb des Bereichs von 4 mm und 7 mm, vorzugsweise in etwa 5,5 mm, sind.
 5. Radialförderer (1) nach einem der vorhergehenden Ansprüche, wobei die Halterungsabschnitte (9) aus einem einzelnen Stück mit einer ersten Halbschale (14) des Gehäuses (2) gebildet sind, welches die erste Einlassöffnung (3) bildet, und sie erstrecken sich beide radial und axial in Richtung der Innenseite des Gehäuses (2) und definieren ein erstes Loch (48) für die Verbindung des Elektromotors (6) und ein zweites Loch (49) zum Anbringen eines Schutzgitters (50), welches von der Anbringung des Elektromotors (6) unabhängig ist.
 6. Radialförderer (1) nach einem der vorhergehenden Ansprüche, wobei das Gehäuse (2) eine im Wesentlichen Toroid-Form mit zwei Seitenwänden (11, 12) und einer Umfangswand (13) aufweist, welche einen Umfangs-Förderraum (27) definieren, welcher sich radial von einem anfänglich minimalen Querschnitt (28) zu einem finalen maximalen Querschnitt (29) aufweitet, an welchem ein im Wesentlichen tangentialer Abschnitt verbunden ist (14), welcher die Luftauslassöffnung (5) definiert.
 7. Radialförderer (1) nach Anspruch 6, wobei der tangentialer Abschnitt (14) umfasst:
 - einen äußeren Wandabschnitt (30), welcher sich mit der Umfangswand (13) in einer annähernd tangentialen Weise an dem finalen Querschnitt (29) des Förderraums (27) verbindet und,
 - einen inneren Wandabschnitt (31), welcher dem äußeren Wandabschnitt (30) gegenüber liegt und mit der Umfangswand (13) an dem anfänglichen Querschnitt (28) des Förderraums (27) verbunden ist,
 - eine Führungsnase (32), welche zwischen der Umfangswand (13) und der inneren Wand (31) angeordnet ist und in Richtung des äußeren Wandabschnitts (30) vorsteht,
 - ein röhrenförmiges Ende (35), welches eine Öffnungsebene (36) definiert und einen äußeren Kopplungsflansch (38) umfasst,
 wobei der äußere Wandabschnitt (30) einen Abschnitt (39) umfasst, welcher in Bezug auf die Öffnungsebene (36) in Richtung der Führungsnase (32) geneigt ist.
 8. Radialförderer (1) nach Anspruch 6 oder 7, wobei das Gehäuse (2) durch zwei Halbschalen (14, 16) gebildet ist, welche miteinander entlang einer Verbindungslinie (17) in der Umfangswand (13) durch zueinander passende stufenförmige Verbindungsränder (18) verbunden sind, um eine labyrinthartige Verbindungsschnittstelle und eine Mehrzahl von Ausrichtungsstiften (19) zu erhalten, welche von dem Verbindungsrand (18) von einer der Halbschalen (15, 16) vorstehen und in entsprechenden Ausrichtungslöchern (20) der anderen Halbschale aufgenommen sind, wobei die Verbindungsränder (18) auch Verbindungsflansche (22) umfassen, welche radial von dem Gehäuse (2) nach außen vorstehen und einen Hinterschnitt aufweisen, um einen oder mehrere Verbindungsclips (21) aufzunehmen, welche die zwei Halbschalen (15, 16) gegeneinander verriegeln.
 9. Radialförderer (1) nach einem der Ansprüche 6 bis 8, wobei eine Führungsnase (32), welche zwischen der Umfangswand (13) und einer inneren Wand (31) des tangentialen Abschnitts (14) angeordnet ist, sich über den Kopplungsflansch (38) hinweg zu einer Innenseite des röhrenförmigen Kopplungsabschnitts (35) erstreckt.
 10. Radialförderer (1) nach dem vorhergehenden An-

spruch, wobei die Führungsnase (32) umfasst:

- einen Wurzelabschnitt (40), welcher in einem Hals zwischen der Umfangswand (13) und dem inneren Wandabschnitt (31) des tangentialen Abschnitts (14) gebildet ist,
- eine Zunge (41), welche von dem Wurzelabschnitt (40) vorsteht und einen kreisbogenförmigen freien Rand (42) aufweist.

11. Radialförderer (1) nach Anspruch 9 oder 10, wobei ein Wurzelabschnitt (40) der Führungsnase (32) einen inneren Hohlraum (42), welcher durch zwei Nuten gebildet ist, welche in den Halbschalen (15, 16) erhalten sind, und einen Kopplungsgrat (43) aufweist, welcher von einer Halbschale vorsteht und in der Lage ist, in die Nut der anderen Halbschale eingesetzt zu werden.

12. Radialförderer (1) nach einem der Ansprüche 6 bis 11, wobei zwischen dem äußeren Wandabschnitt (30) und den Seitenwänden des tangentialen Abschnitts (14) zwei Führungsränder (45) gebildet sind, welche sich von dem finalen Querschnitt (29) des Förderraums (27) zu einer Innenseite des röhrenförmigen Kopplungsabschnitts (35) erstrecken.

13. Radialförderer (1) nach einem der vorhergehenden Ansprüche, wobei der Impeller (7) eine erste Mehrzahl von Schaufeln (24), welche sich zwischen einem vorderen Ring (51) und einer zentralen Wand (52) erstrecken, sowie eine zweite Mehrzahl von Schaufeln (24) umfasst, welche sich zwischen einem hinteren Ring (53), welcher dem vorderen Ring (51) gegenüberliegend ist, und der zentralen Wand (52) erstrecken, wobei die zweite Mehrzahl von Schaufeln in Bezug auf die erste Mehrzahl von Schaufeln winkelfersetzt ist.

14. Radialförderer (1) nach dem vorhergehenden Anspruch, wobei die Schaufeln (24) in einem konstanten Teilungswinkel angeordnet sind, mit Ausnahme einer einzelnen unregelmäßigen Schaufel (24'), welche in unterschiedlichen Abständen von den benachbarten Schaufeln (24) angeordnet ist.

15. Radialförderer (1) nach Anspruch 13 oder 14, wobei jede Schaufel (24) eine konkave vordere Fläche (56), welche in Richtung der Rotationsrichtung des Impellers (7) weist, eine konvexe hintere Fläche (57), welche der vorderen Fläche (56) entgegengesetzt ist, und eine Fläche (58) des Randes radial innerhalb der Schaufel aufweist, wobei in einer Querschnittebene orthogonal zu der Rotationsachse (R):

- die vordere Fläche (56) kreisbogenförmig mit einem ersten Radius (R) ist;

- die hintere Fläche (57) eine Form aufweist, welche aus einem radial äußeren Kreisbogen mit einem zweiten Radius (R2) und einem radial inneren Kreisbogen mit einem dritten Radius (R3) gebildet ist, welche sich in ungefähr der mittleradialen Höhe der Schaufel treffen;
- die Fläche (58) des Randes kreisbogenförmig ist und einen vierten Radius (R4) aufweist,

wobei $R2 > R1 > R3 > R4$.

16. Radialförderer (1) nach Anspruch 15, wobei:

- das Verhältnis zwischen dem ersten und dem zweiten Radius ($R1/R2$) zwischen 0,65 und 0,85, vorzugsweise in etwa 0,80 beträgt;
- das Verhältnis zwischen dem ersten und dem dritten Radius ($R1/R3$) zwischen 1,3 und 1,9, vorzugsweise in etwa 1,77 beträgt;
- das Verhältnis zwischen dem ersten und dem vierten Radius ($R1/R4$) zwischen 20,0 und 40, vorzugsweise in etwa 30,8 beträgt, und wobei:
- der Austrittswinkel (α_u) der Schaufel zwischen 57° und 67° , vorzugsweise in etwa $62,5^\circ$ beträgt,
- der Eintrittswinkel (α_i) der Schaufel zwischen 12° und 20° , vorzugsweise in etwa $16,0^\circ$ beträgt.

17. Radialförderer (1) nach Anspruch 15 oder 16, wobei die Schaufeln (24) eine radiale Erstreckung von $1/12 \dots 1/18$ des äußeren Durchmessers (60) des Impellers (7) aufweisen.

18. Radialförderer (1) nach einem der vorhergehenden Ansprüche, wobei der äußere Durchmesser (60) des Impellers (7) im Wesentlichen gleich dessen axialer Länge (61) ist.

Revendications

1. Convoyeur radial (1), notamment pour hottes aspirantes, ayant un axe de rotation (R) et comprenant

- un boîtier (2) avec une première ouverture d'entrée axiale (3) et une deuxième ouverture d'entrée axiale (4) à l'opposé de la première ouverture d'entrée axiale (3) et une ouverture de sortie radiale (5),
- un groupe de transport (6, 7) disposé à l'intérieur du boîtier (2) et comportant un moteur électrique (6) et un rotor (7) relié à un axe d'entraînement (8) du moteur électrique (6),

le moteur électrique (6) étant fixé au boîtier (2) en porte-à-faux et de manière non rotative par une pluralité de parties de support (9) s'étendant à partir d'un bord (10) de la première ouverture d'entrée (3),

les ouvertures d'entrée (3, 4) étant circulaires et coaxiales avec le rotor (7), et un diamètre intérieur (D1) du bord de l'ouverture d'entrée (3, 4) étant inférieur au diamètre intérieur (D2) de l'extrémité du rotor (7) en regard de celle-ci,

caractérisé en ce que les extrémités axialement extérieures (25) des pales (24) du rotor (7) ont une courbure qui est sensiblement identique à la courbure du bord (10) des ouvertures d'entrée (3, 4) coupées dans un plan qui est radial par rapport à l'axe de rotation (R).

2. Convoyeur radial (1) selon la revendication 1, **caractérisé en ce que** la différence entre le diamètre intérieur (D1) du bord de l'ouverture d'entrée (3, 4) et le diamètre intérieur (D2) de l'extrémité du rotor (7) est dans la plage de 2 mm à 6 mm, de préférence entre 3 mm et 5 mm, de façon davantage préférée d'environ 4 mm.
3. Convoyeur radial (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la distance axiale libre (23) entre le bord de l'ouverture d'entrée (3, 4), hors parties de support (9), et l'extrémité du rotor (7) en regard est entre 1 mm et 3 mm, de préférence d'environ 2 mm.
4. Convoyeur radial (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la courbure des extrémités axialement extérieures (25) des pales (24) du rotor (7) et la courbure du bord (10) présente la forme d'un arc de cercle avec un rayon de courbure (26) dans la plage de 4 mm à 7 mm, de préférence d'environ 5,5 mm.
5. Convoyeur radial (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les parties de support (9) sont formées en une seule pièce avec une première demi-coque (14) du boîtier (2) qui forme la première ouverture d'entrée (3) et elles s'étendent aussi bien radialement qu'axialement vers l'intérieur du boîtier (2) et définissent un premier trou (48) pour la connexion du moteur électrique (6) et un deuxième trou (49) pour attacher une grille de protection (50) indépendante de la fixation du moteur électrique (6).
6. Convoyeur radial (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le boîtier (2) présente une forme sensiblement toroïdale avec deux parois latérales (11, 12) et une paroi périphérique (13) qui définissent un espace de transport circonférentiel (27) qui s'élargit radialement à partir d'une section minimale initiale (28) jusqu'à une section maximale finale (29) à laquelle une partie sensiblement tangentielle (14) est attachée qui définit l'ouverture de sortie d'air (5).

7. Convoyeur radial (1) selon la revendication 6, **caractérisé en ce que** la partie tangentielle (14) comprend :

- 5 - une partie de paroi extérieure (30) attachée à la paroi périphérique (13) de façon sensiblement tangentielle à la section finale (29) de l'espace de transport (27) et
- 10 - une partie de paroi intérieure (31) à l'opposé de la partie de paroi extérieure (30) et attachée à la paroi périphérique (13) à la section initiale (28) de l'espace de transport (27),
- un nez de guidage (32) disposé entre la paroi périphérique (13) et la paroi intérieure (31) et s'étendant vers la partie de paroi extérieure (30),
- une extrémité tubulaire (35) définissant un plan d'ouverture (36) et comportant une bride d'accouplement extérieure (38),

- 20 la partie de paroi extérieure (30) comprenant une partie (39) inclinée par rapport au plan d'ouverture (36) vers le nez de guidage (32).

8. Convoyeur radial (1) selon la revendication 6 ou 7, **caractérisé en ce que** le boîtier (2) est formé de deux demi-coques (14, 16) attachées l'une à l'autre le long d'une ligne de jonction (17) dans la paroi périphérique (13) par des bords de jonction (18) en forme d'épaulement afin d'obtenir une interface de connexion en forme de labyrinthe et une pluralité de tiges d'alignement (19) en saillie sur le bord de jonction (18) de l'une des demi-coques (15, 16) et reçues dans des trous d'alignement correspondants (20) de l'autre demi-coque,
- 35 les bords de jonction (18) comprenant également des brides de jonction (22) s'étendant radialement vers l'extérieur à partir du boîtier (2) et ayant une contre-dépouille pour recevoir un ou davantage de clips de jonction (21) qui verrouillent les deux demi-coques (15, 16) l'une avec l'autre.

9. Convoyeur radial (1) selon l'une des revendications 6 à 8, **caractérisé en ce qu'**un nez de guidage (32) disposé entre la paroi périphérique (13) et une paroi intérieure (31) de la partie tangentielle (14) s'étend au-delà de la bride d'accouplement (38) vers l'intérieur de la partie tubulaire d'accouplement (35).

10. Convoyeur radial (1) selon la revendication précédente, **caractérisé en ce que** le nez de guidage (32) comprend :

- 55 - une partie de base (40) formée dans une gorge entre la paroi périphérique (13) et la partie de paroi intérieure (31) de la partie tangentielle (14),
- une langue (41) s'étendant à partir de la partie de base (40) et ayant un bord libre (42) en forme

d'arc de cercle.

11. Convoyeur radial (1) selon la revendication 9 ou 10, **caractérisé en ce qu'**une partie de base (40) du nez de guidage (32) comporte une cavité intérieure (42) formée par deux rainures obtenues dans les demi-coques (15, 16) et une crête d'accouplement (43) s'étendant à partir d'une demi-coque et adaptée pour être insérée dans la rainure de l'autre demi-coque. 5 10
12. Convoyeur radial (1) selon l'une des revendications 6 à 11, **caractérisé en ce que** entre la partie de paroi extérieure (30) et les parois latérales de la partie tangentielle (14), deux bords avant (45) sont formés qui s'étendent de la section finale (29) de l'espace de transport (27) jusqu'à l'intérieur de la partie tubulaire d'accouplement (35). 15
13. Convoyeur radial (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le rotor (7) comprend une première pluralité de pales (24) s'étendant entre une bague avant (51) et une paroi centrale (52), ainsi qu'une deuxième pluralité de pales (24) s'étendant entre une bague arrière (53) à l'opposé de la bague avant (51) et la paroi centrale (52), la deuxième pluralité de pales étant décalée de manière régulière par rapport à la première pluralité de pales. 20 25
14. Convoyeur radial (1) selon la revendication précédente, **caractérisé en ce que** les pales (24) sont disposées avec un espacement angulaire constant, à l'exception d'une seule pale irrégulière (24') disposée à des distances différentes des pales adjacentes (24). 30 35
15. Convoyeur radial (1) selon la revendication 13 ou 14, **caractérisé en ce que** chaque pale comprend une surface avant concave (56) orientée dans la direction de rotation du rotor (7), une surface arrière convexe (57) à l'opposé de la surface avant (56) et une surface (58) du bord radialement à l'intérieur de la pale, 40 dans un plan de coupe perpendiculaire à l'axe de rotation (R) : 45
- la surface avant (56) ayant une forme en arc de cercle avec un premier rayon (R1),
 - la surface arrière (57) ayant une forme constituée d'un arc de cercle radialement extérieur avec un deuxième rayon (R2) et un arc de cercle radialement intérieur avec un troisième rayon (R3), qui se rejoignent à peu près à mi-hauteur radiale de la pale, 50
 - la surface (58) du bord ayant la forme d'un arc de cercle et ayant un quatrième rayon (R4), 55

où $R2 > R1 > R3 > R4$.

16. Convoyeur radial (1) selon la revendication 15, **caractérisé en ce que**

- le rapport entre le premier et le deuxième rayons (R1/R2) est entre 0,65 et 0,85, de préférence d'environ 0,80,
- le rapport entre le premier et le troisième rayons (R1/R3) est entre 1,3 et 1,9, de préférence d'environ 1,77,
- le rapport entre le premier et le quatrième rayons (R1/R4) est entre 20,0 et 40, de préférence d'environ 30,8,

et en ce que

- l'angle de sortie (α_u) de la pale est entre 57° et 67°, de préférence d'environ 62,5°,
- l'angle d'entrée (α_i) de la pale est entre 12° et 20°, de préférence d'environ 16,0°.

17. Convoyeur radial (1) selon la revendication 15 ou 16, **caractérisé en ce que** les pales (24) ont une étendue radiale d'un 1/12^e à un 1/18^e du diamètre extérieur (60) du rotor (7)

18. Convoyeur radial (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le diamètre extérieur (60) du rotor (7) est sensiblement égal à sa longueur axiale (61).

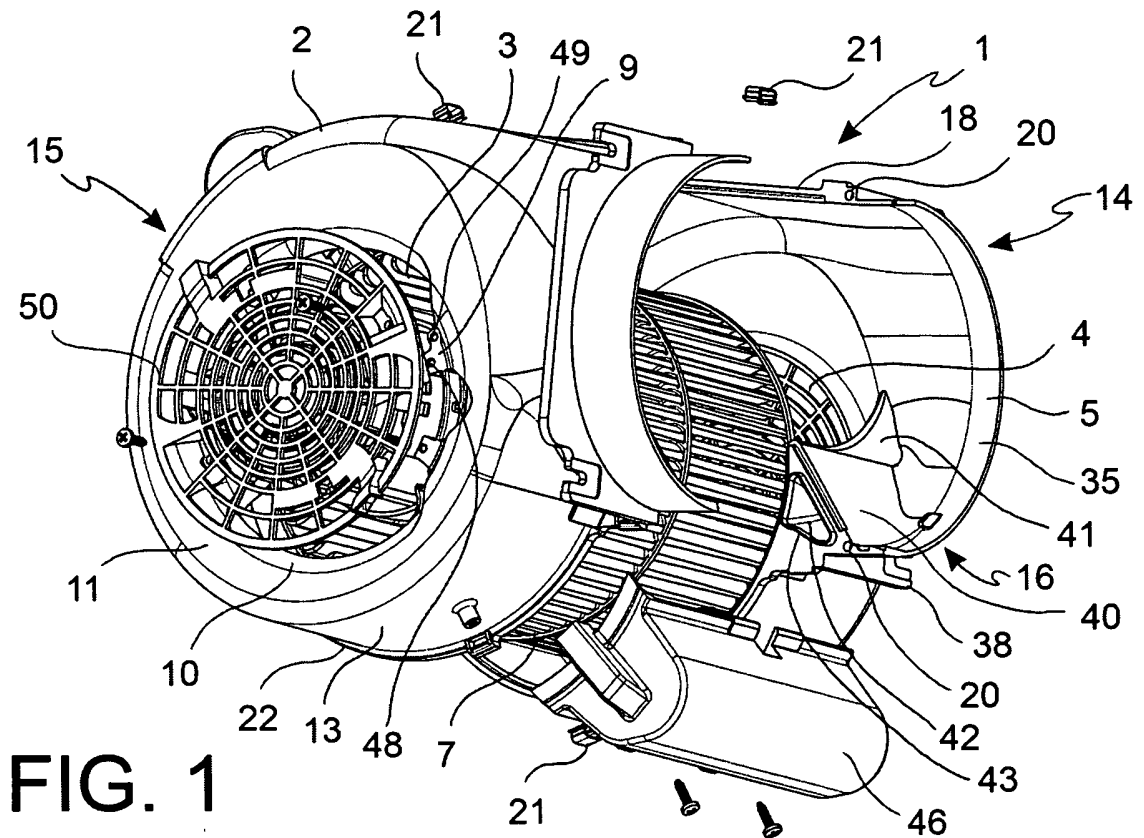


FIG. 1

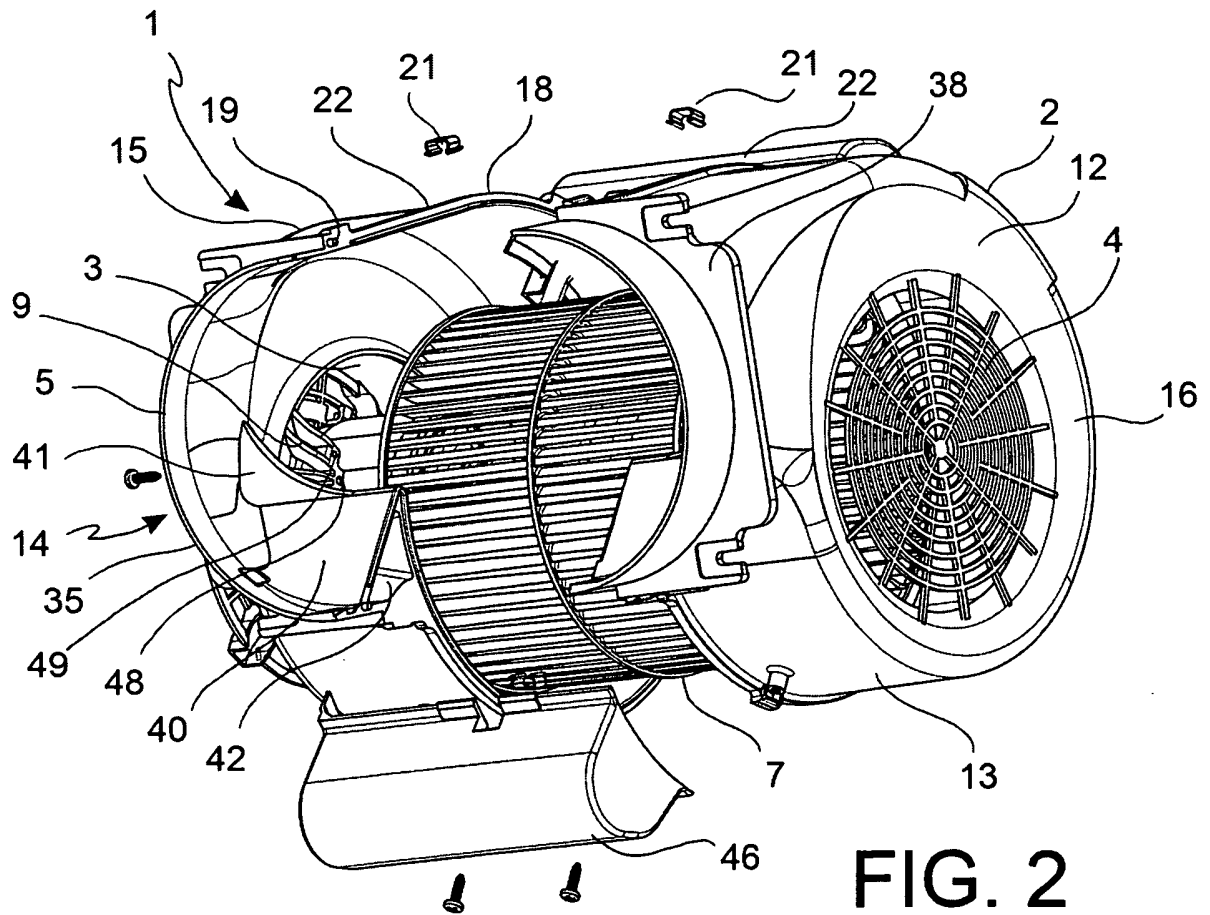


FIG. 2

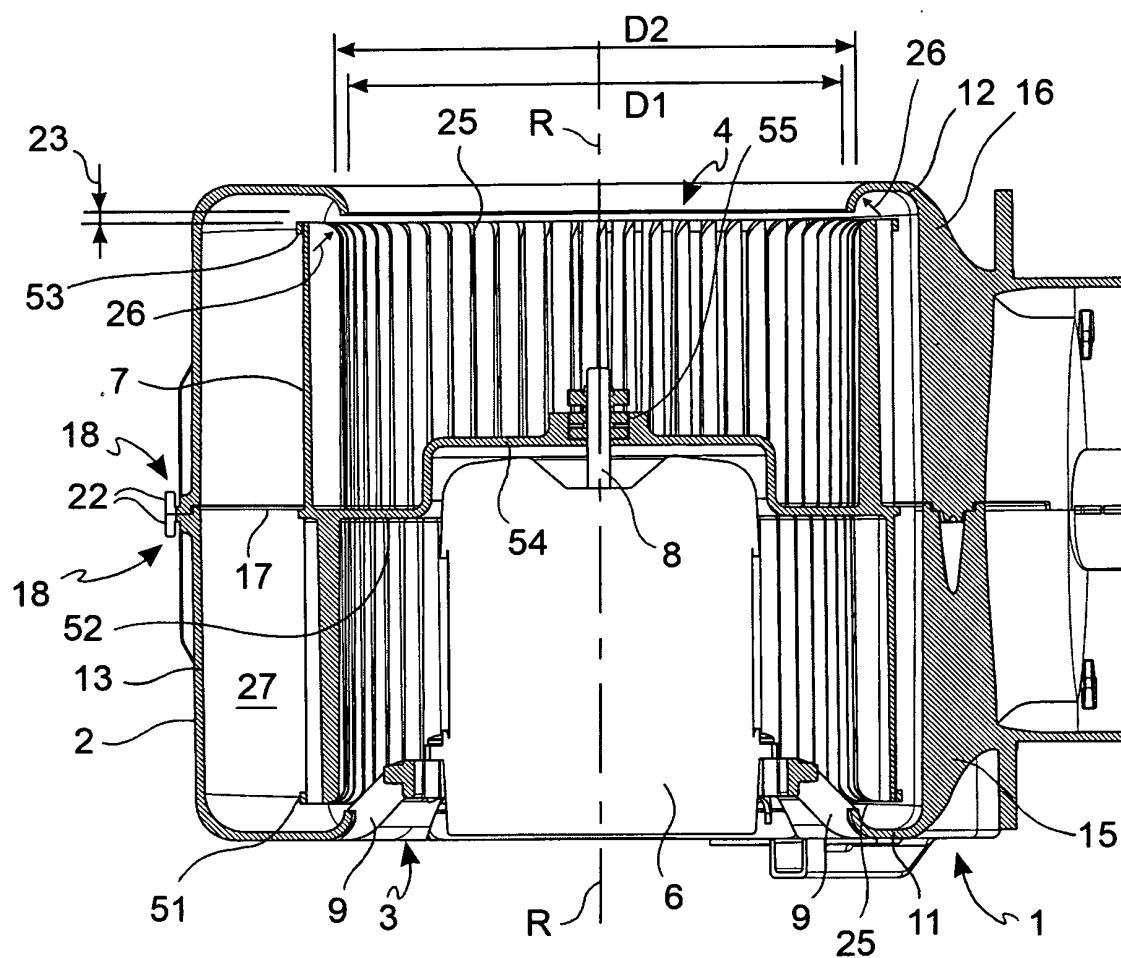


FIG. 3

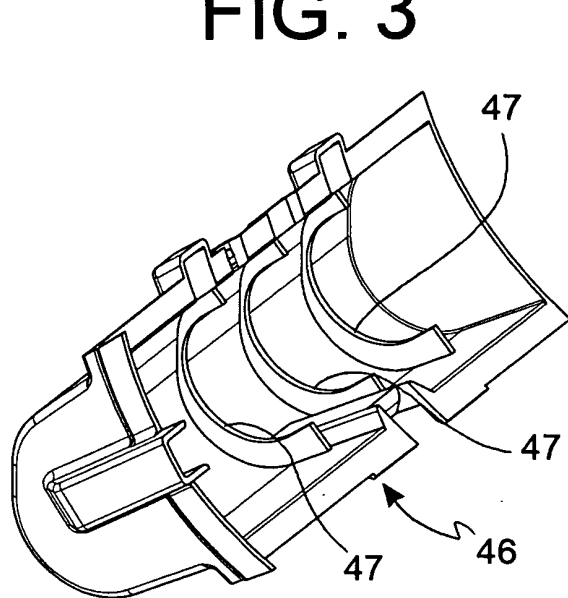


FIG. 11

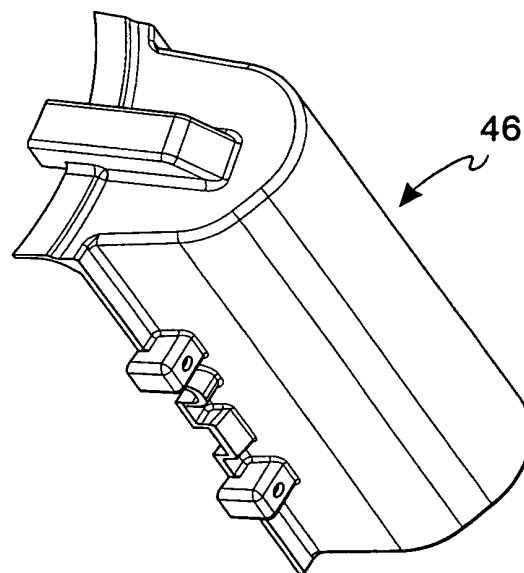
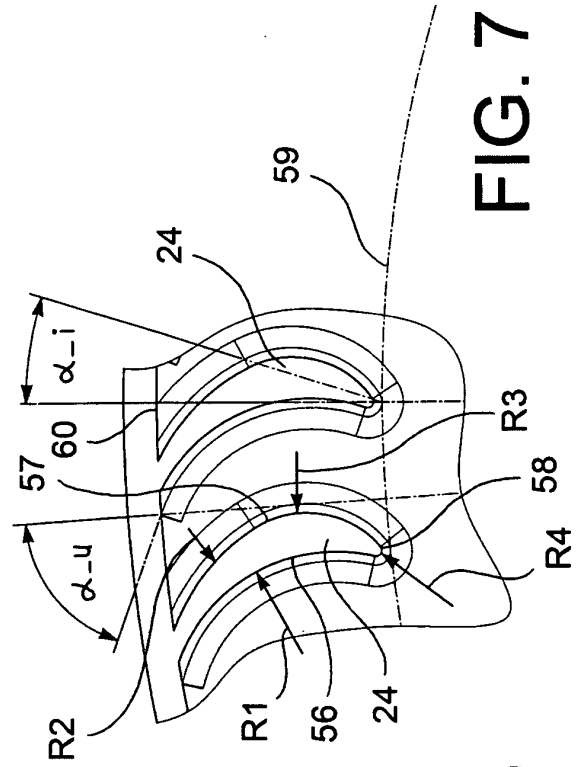
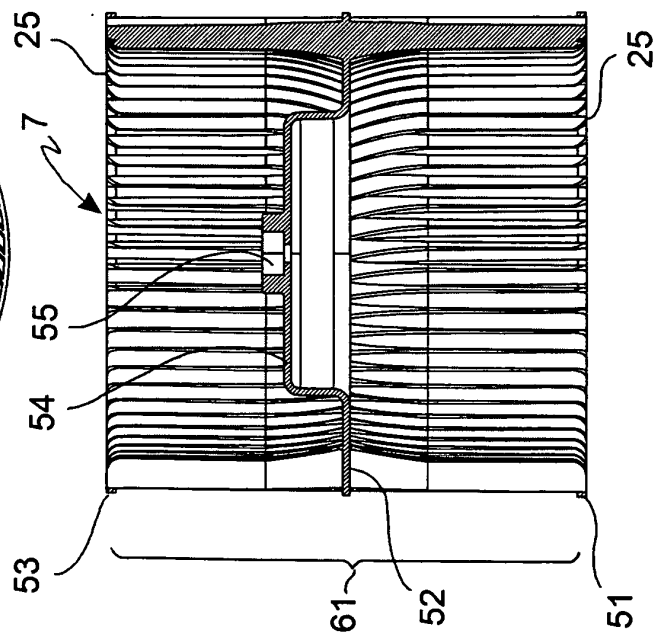
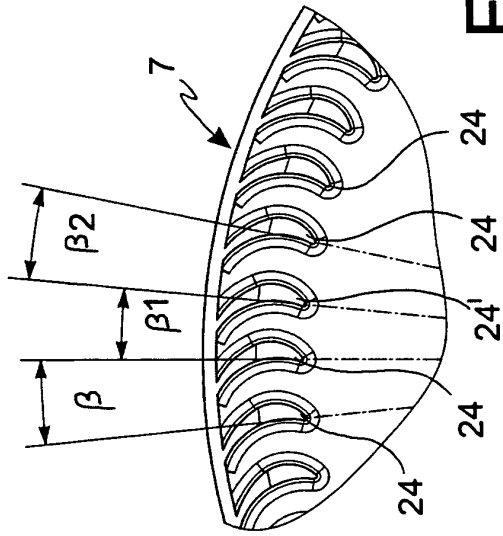
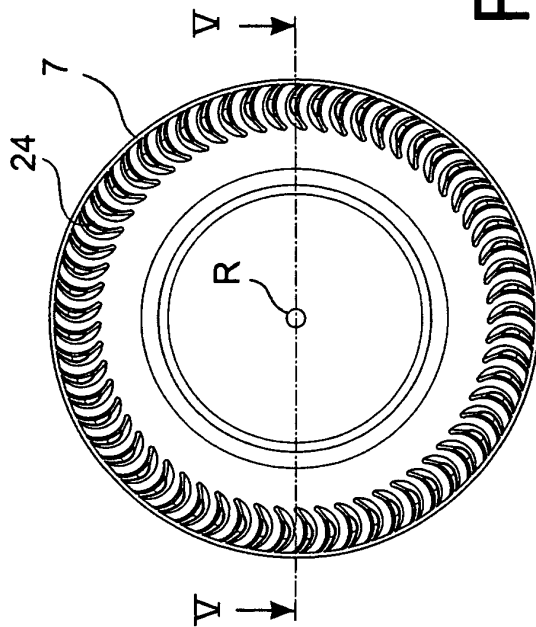


FIG. 12



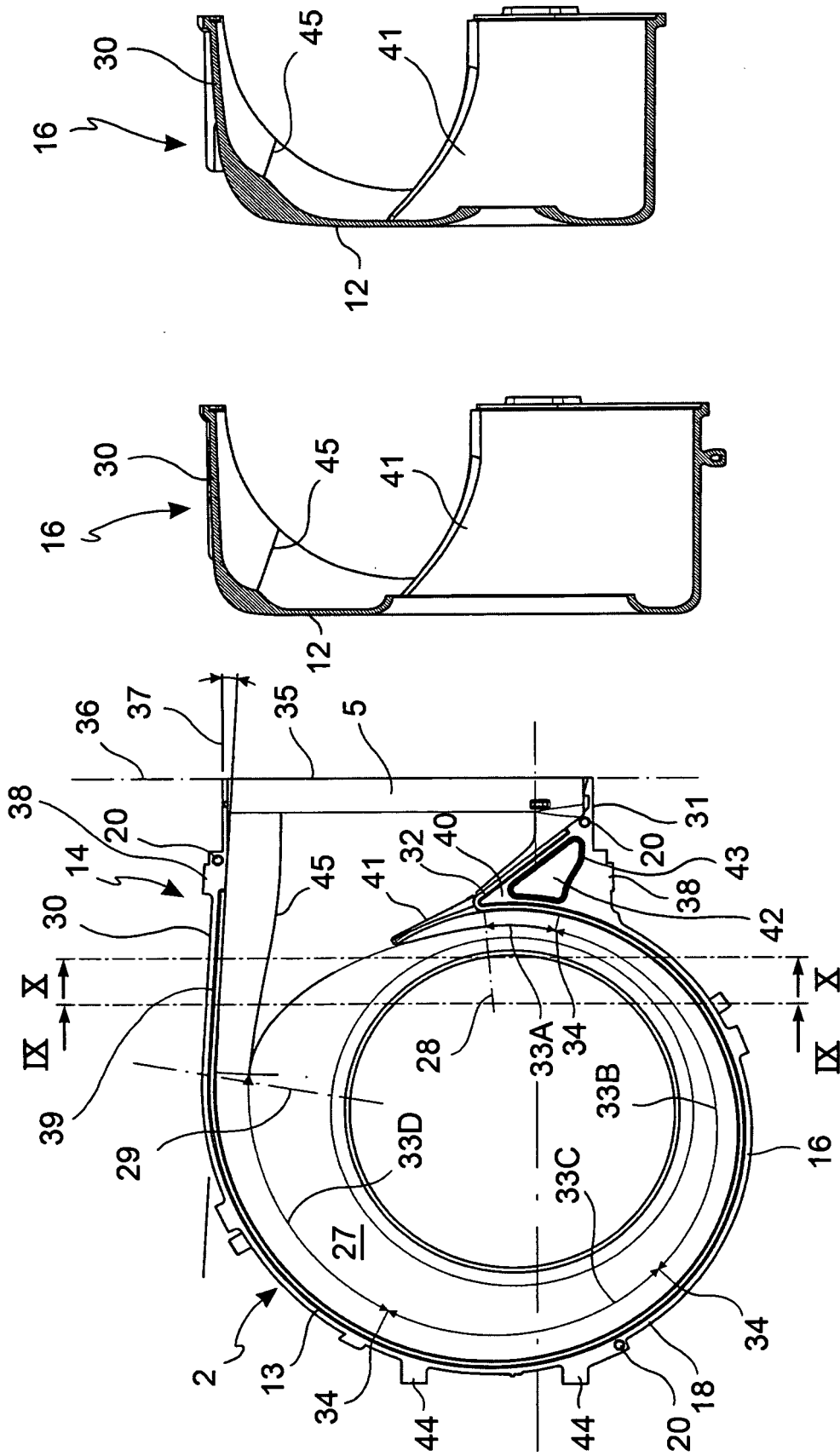


FIG. 8

FIG. 9

FIG. 10

REFERENCES CITED IN THE DESCRIPTION

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