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(54) **VENTILATION SYSTEM**

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns an in-line mixed flow ventilation system, usable in the industrial, commercial, residential or other fields.

BACKGROUND OF THE INVENTION

[0002] It is known that various ventilation systems exist, which can be used in the above fields for example to suck or extract air from an indoor space and expel it to the outside. In particular, ventilation systems exist that are installed in line with the ventilation conduits, they therefore substantially comprise a housing casing for an electric motor with which an impeller is associated. The impeller is able to rotate according to an axis of rotation substantially parallel to the flow of air that passes through the ventilation system from an inlet conduit to an outlet conduit.

[0003] However, in practice these ventilation systems are rather noisy and access to the internal parts is difficult, for example for access to the electric motor or the impeller, due to inspection, maintenance or replacement of parts or other needs.

[0004] In order to reduce noise emissions, ventilation devices exist that comprise a completely perforated motor-carrying casing, to which air suction and delivery nozzles are connected, which are also completely perforated.

[0005] Above this assembly, formed by the motor-carrying casing and the suction and delivery nozzles, a shell made of soundproofing material is positioned, which is attached to said assembly, for example by means of adhesive tapes or suchlike and which is bound by one or more layers of film. A rigid covering casing is then positioned above this shell of soundproofing material, which represents the external casing of the ventilation device. In this way a structure is substantially generated, consisting of three separate and distinct components and an attachment material for two of these.

[0006] It is obvious that this system is quite disadvantageous if it becomes necessary to inspect the motor-carrying assembly and possibly, as mentioned above, to carry out inspection, maintenance and/or replacement of the electric motor or other parts. In such cases, in fact, it is necessary to remove all the elements that have been positioned in layers above the assembly comprising the motor-carrying element. Therefore, to disassemble the ventilation device it is necessary to remove the outer casing, the layers of film, any adhesive tapes, or other, and the shell of soundproofing material wrapped around said assembly.

[0007] Furthermore, following disassembly of the ventilation device, the soundproofing material could be damaged and therefore it could become necessary to replace it, as well as any adhesive tapes used to clamp it in

place, wrapping films, or other.

[0008] Any possible internal inspection operations of known ventilation devices are therefore often time-consuming and laborious, and furthermore the soundproofing efficiency could be compromised following these laborious operations to disassemble and assemble the device.

[0009] One known ventilation system that has the above problems is described for example in document US-A-2012/051889. Another known ventilation system is described in US-A-3346174.

[0010] There is therefore a need to perfect a ventilation system, which can overcome at least one of the disadvantages of the state of the art.

[0011] In particular, one purpose of the present invention is to provide a ventilation system that guarantees effective soundproofing, maintained over time even after disassembly and reassembly operations.

[0012] Another purpose of the present invention is to provide a ventilation system in which the assembly and disassembly operations are carried out in a simple and rapid manner and in which substantially direct access at least to the motor-carrying element is guaranteed, so that if inspection, maintenance, replacement of parts or other operations become necessary, access to these parts is fast, immediate and does not compromise the soundproofing effectiveness of the ventilation system.

[0013] Another purpose of the present invention is to provide a ventilation system in which high aerodynamic and soundproofing efficiency is guaranteed, as well as adequate protection of the moving parts of the system, for example the impeller.

[0014] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0015] The present invention is set forth and characterized in the independent claim. The dependent claims describe other characteristics of the present invention or variants to the main inventive idea.

[0016] In accordance with the above purposes, a ventilation system according to the present invention comprises at least one impeller associated with at least one motor for driving the impeller, at least one motor-carrying element able to house the motor, at least one suction conduit and at least one delivery conduit both associated with the motor-carrying element, wherein the motor-carrying element is hollow and, by driving the impeller, allows the passage of a flow of air from the suction conduit to the delivery conduit.

[0017] According to the invention, the ventilation system comprises an external casing able to be positioned around the motor-carrying element, the suction conduit and the delivery conduit, and provided with at least one external layer made of a rigid protective material and with

at least one internal layer made of soundproofing material and integrated in the external casing.

[0018] Therefore, the present ventilation system has at least one layer of soundproofing material integral with the external casing, which externally comprises a rigid protective material, therefore by means of a single operation in which the external casing is removed, it is possible to directly access the motor-carrying element and the air suction and delivery conduits. Therefore, it is no longer necessary to remove multiple layers of material and the functional integrity of the ventilation system is guaranteed, both from the aerodynamic point of view and also from the point of view of soundproofing the system.

[0019] Therefore, the operations of assembling and disassembling the present ventilation system can be advantageously carried out in a simple and rapid manner; furthermore, following the removal of the external casing, there is guaranteed a direct access to the motor-carrying element, so that in the event operations of inspection, maintenance, replacement of parts or other are necessary, access to these parts is fast, immediate and does not compromise the soundproofing effectiveness. Let us consider, for example, the case in which the motor has to be replaced or interventions have to be carried out on the latter and/or on the impeller.

[0020] According to further aspects of the invention, the soundproofing material of the internal layer is co-molded with the rigid protective material of the external layer.

[0021] In other embodiments, the soundproofing material of the internal layer can be constrained to the rigid protective material of the external layer by gluing or other suitable attachment mean.

[0022] In some embodiments, the motor-carrying element can have a substantially solid external surface, with the exception of a possible access aperture for the electrical connections.

[0023] As well as the motor, the impeller can also be housed completely inside the motor-carrying element. In this way, the impeller is adequately protected, and the aerodynamic effectiveness of the system is improved.

[0024] Furthermore, the impeller can be housed inside a feed element which is in turn housed in the motor-carrying element and is coaxial with the motor-carrying element.

[0025] The positioning of the impeller in the motor-carrying element and the ease with which the motor-carrying element can be separated from the other feed and transfer components allows to protect the impeller in the event it were necessary to completely remove and separate the motor support.

[0026] Another passage portion can be positioned upstream of the feed element, wherein the feed element and such passage portion can have an internal section with a substantially truncated cone shape, and wherein such passage portion can have a gradually decreasing internal section, while the feed element has a gradually increasing internal section, so as to achieve the so-called Venturi

effect on the flow of air that passes through the ventilation system.

[0027] Alternatively, in order to achieve this Venturi effect, the suction conduits can comprise conduit segments having an internal section which is initially progressively decreasing and subsequently progressively increasing.

[0028] According to further aspects of the invention, upstream of the delivery conduit there can be positioned a nose cone provided with through holes on its external surface.

[0029] The function of such nose cone is to reduce vorticity, decrease noise and increase the aerodynamic efficiency of the assembly. Such nose cone is provided with soundproofing material inside it, which substantially replicates its internal shape, again with the purpose of reducing noise.

[0030] In some embodiments, the external casing already provided with the at least one internal layer of soundproofing material is formed by at least two half-shells. This solution allows to remove the external casing in a particularly effective manner, for example in the event of system maintenance operations or other. Each of these half-shells will naturally be equipped with the external layer of rigid material and the internal layer of soundproofing material. These half-shells may also be equipped with a system for joining and assembling them in a univocal manner, so as to guarantee precision and integrity when reassembling the external casing.

[0031] Furthermore, in the present ventilation system the impeller can be rotated by the motor according to an axis of rotation substantially parallel to the direction of the flow of air in the ventilation system.

[0032] In some embodiments, the external casing can comprise one or more indicators able to allow its correct positioning.

[0033] The present ventilation system can also comprise one or more resonator devices positioned around the suction conduit and/or the delivery conduit. These resonator devices further contribute to the sound absorption on specific frequencies of the present ventilation system.

[0034] These one or more resonator devices can comprise one or more chambers fluidically communicating with the air delivery conduit and/or the air suction conduit by means of at least one through hole.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] These and other aspects, characteristics and advantages of the present invention will become apparent from the following description of some embodiments, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a three-dimensional and exploded view of a ventilation system according to one embodiment of the present invention;

- fig. 2 is a lateral view of the ventilation system of fig. 1, once assembled;
- fig. 3 is a longitudinal section view of the ventilation system of fig. 1 and fig. 2;
- fig. 4 is a longitudinal section view of a ventilation system according to one variant of the present invention;
- fig. 5 is a longitudinal section view of a ventilation system according to another variant of the present invention;
- fig. 6 is a longitudinal section view of a ventilation system according to yet another variant of the present invention;
- fig. 7 is a three-dimensional view of a conduit for the passage of air of the present ventilation system.

[0036] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one embodiment can conveniently be incorporated into other embodiments without further clarifications.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

[0037] We will now refer in detail to the possible embodiments of the invention, of which one or more examples are shown in the attached drawings. Each example is supplied by way of illustration of the invention and shall not be understood as a limitation thereof. For example, one or more characteristics shown or described insofar as they are part of one embodiment can be varied or adopted on, or in association with, other embodiments to produce further embodiments. It is understood that the present invention shall include all such modifications and variants.

[0038] Before describing these embodiments, we must also clarify that the present description is not limited in its application to details of the construction and disposition of the components as described in the following description using the attached drawings. The present description can provide other embodiments and can be obtained or executed in various other ways. We must also clarify that the phraseology and terminology used here is for the purposes of description only, and cannot be considered as limitative. The scope of the invention is solely defined by the appended claims.

[0039] With reference to the attached drawings, see for example fig. 1, a ventilation system 10 according to the present invention, and in particular of the in-line mixed flow type, comprises at least one impeller 11 associated with at least one motor 12 for driving the impeller 11.

[0040] The impeller 11 is provided with a series of blades 36 suitably positioned around an axis of rotation R. Such axis of rotation R is substantially directed in the direction of the flow of air inside the ventilation system 10.

[0041] The motor 12 can be, for example, an alternating current or brushless type electric motor.

[0042] The motor 12 is housed inside a motor-carrying element 13, which is hollow, therefore substantially the motor-carrying element 13 is a tubular element with which an air suction conduit 14 and a delivery conduit 15 are associated. Therefore, the motor-carrying element 13 allows a flow of air to pass from the suction conduit 14 to the delivery conduit 15.

[0043] In particular, the suction conduit 14 and the delivery conduit 15 can be connected on opposite ends of the motor-carrying element 13 by means of rotary couplings, for example bayonet type couplings or other.

[0044] The present ventilation system 10 comprises an external casing 16, see also fig. 2, able to be positioned around the motor-carrying element 13 and the suction and delivery conduits 14 and 15, and provided with at least one external layer 17 made of a rigid protective material and at least one internal layer 18, see in particular fig. 1, made of soundproofing material and integral with the external casing 16.

[0045] The soundproofing material that the internal layer 18 is made of is preferably co-molded with the rigid protective material of the external layer 17, for example by means of a confined exothermic forming process, or suchlike.

[0046] Co-molding is therefore a way to integrate, or to make solid with each other, the material that the internal layer 18 is made of with the rigid protective material of the external layer 17. The internal layer 18 and the external layer 17 are thus reciprocally constrained.

[0047] In other embodiments, the soundproofing material of the internal layer 18 can be constrained to the rigid protective material of the external layer 17 by means of gluing or other suitable attachment means.

[0048] In this way, the external casing 16 can be easily removed from the rest of the system, since the internal layer 18 of soundproofing material is in any case integral with, and constrained to, the external layer 17 of rigid material, both in the solution in which the internal layer is co-molded with the external layer, and also in the solution in which the internal layer is attached to the external layer.

[0049] The external casing 16 could also comprise a multilayer structure, and therefore be provided with several protective layers, even of different materials, and/or with a plurality of layers of soundproofing material, which are also made with the same material and/or with different materials. In the case of multilayer structures, the composition and/or thickness of the various layers of protective material and/or soundproofing material can be chosen, for example, as a function of the specific uses of the ventilation system.

[0050] In order to guarantee adequate protection for the motor 12 and increase the fluid-dynamic characteristics of the present ventilation system 10, the motor-carrying element 13 has a substantially solid external surface 19.

[0051] Possibly, an aperture 20 can be made on this external surface 19 for the electrical connections for the functioning of the motor 12 and the ventilation system 10

to pass.

[0052] On the other hand, the suction and delivery conduits 14 and 15 are substantially completely perforated and therefore have an external surface provided with through holes 21, able to allow the passage of the sound waves produced by the functioning of the drive motor 12 and the impeller 11 toward the internal layer 18 of soundproofing material integrated with the external casing 16.

[0053] As can be observed, these through holes 21 are preferably produced in a uniform manner, substantially on the entire external surface of the suction conduit 14 and of the delivery conduit 15. Therefore, these through holes 21 are made substantially on the entire cylindrical or truncated cone shaped surface of the suction and delivery conduits 14 and 15.

[0054] The impeller 11, advantageously, see also the section of fig. 3, is completely housed inside the motor-carrying element 13, thus guaranteeing its optimal protection and further increasing the fluid-dynamic efficiency of the present ventilation system 10. Furthermore, the present ventilation system 10 proves to be compact and of a small size, in particular as regards its overall extension.

[0055] In order to further increase the fluid-dynamic efficiency, the impeller 11 can be housed inside a feed element 22, which for example substantially has a truncated cone shape, which is housed inside the motor-carrying element 13, see also the section of fig. 3.

[0056] This feed element 22 is coaxial with the motor-carrying element 13 and with the axis of rotation R of the impeller 11, and is located downstream of the suction conduit 14.

[0057] Between the feed element 22 and the suction conduit 14 it is also provided to position another passage portion 34 with a substantially truncated cone shape, see in particular the section of fig. 3.

[0058] The passage portion 34 substantially has a gradually decreasing internal section while the feed element 22 has a gradually increasing internal section, so as to achieve the so-called Venturi effect on the flow of air passing through the ventilation system 10, see in particular the longitudinal section of fig. 3.

[0059] In proximity to the delivery conduit 15 there is housed a nose cone 23, able to allow the adequate aerodynamics to the present ventilation system 10. This nose cone 23 is advantageously provided, on its external surface, with a series of through holes 24, able to allow a better passage of the sound waves toward the internal surface of the external casing 16 which is equipped with the at least one internal layer 18 of soundproofing material. The nose cone 23 is also internally equipped with soundproofing material, in particular at least one layer of soundproofing material that replicates its internal shape.

[0060] Inside the motor-carrying element 13 and upstream of the nose cone 23 there are positioned suitable blades 35, see again the section of fig. 3.

[0061] The suction 14 and delivery 15 conduits can be

positioned on supports 25 and 26 for connection with the air passage pipes of any ventilation system whatsoever.

[0062] These supports 25 and 26 can comprise means for connection with the suction and delivery conduits 14 and 15, and can further comprise clamping bands 27 or suchlike. Such connection means can be rotary couplings or other.

[0063] The external casing 16 can be formed, for example, by two half-shells 16a and 16b which can be connected to each other by means of snap-in, interlocking or other systems. This solution allows to remove the external casing particularly effectively in the event, for example, of maintenance operations or other. These half-shells 16a and 16b will naturally each be provided with the external layer 17 of rigid material and with the internal layer 18 of soundproofing material. These half-shells 16a and 16b may also be equipped with a system for joining and assembling them in a univocal manner, so as to guarantee precision and integrity when reassembling the external casing 16.

[0064] The external casing 16 can also be positioned on a support plate 28, for example by means of removable attachment elements, such as screws, bolts, pins or other. Therefore, once assembled, the present ventilation system presents itself as shown in fig. 2.

[0065] The external casing 16 can also comprise an aperture 29 topped by a box 30 for the electrical connections, which is closed by means of a cover 31.

[0066] The external casing 16 can also comprise one or more correct positioning indicators 32 and 33, for example a first positioning indicator 32 on the suction conduit 14 and a second positioning indicator 33 on the delivery conduit 15. These indicators 32 and 33 show, for example, indicating the direction of the flow of air within the ventilation system 10.

[0067] The present ventilation system 10 can also be equipped with one or more resonator devices 37, for example one or more Helmholtz resonators positioned around the suction conduit 14 and/or around the delivery conduit 15. These resonator devices 37 advantageously contribute to further increasing the soundproofing effectiveness of the present ventilation system 10.

[0068] As can be seen in fig. 7, the resonator device 37 can be provided with one or more resonance chambers 38, each of which is equipped with its own through hole 39 for sound waves, coming from the air passage conduits, for example the delivery conduit 15 and/or the suction conduit 14, to enter. This chamber 38 is therefore fluidically communicating with the delivery conduit 15 and/or the suction conduit 14.

[0069] On the basis of the volume defined in each of these chambers 38, and as a function of the length and diameter of the through hole 39, each of the chambers 38 of the resonator device will be able to dampen sounds with a determinate frequency range.

[0070] Fig. 4, fig. 5 and fig. 6 show further variants of the present ventilation system 10a, 10b, 10c. In these variants, for example, the suction conduits 14a, 14b and

14c have a conduit segment 40a, 40b, 40c having an internal section which is initially gradually decreasing and then gradually increasing, so as to produce the so-called Venturi effect on the flow of air passing through the ventilation system.

[0071] The delivery conduits 15a, 15b and 15c are also made in such a way as to comprise a first conduit segment 41a, 41b, 41c with a progressively decreasing internal section. For example, such conduit segment 41a, 41b, 41c can be made with a shape similar to the shape of the nose cone 23 around which it is positioned.

[0072] This conduit segment 40a, 40b, 40c represents an alternative to the provision of the feed element 22 and of the passage portion 34.

[0073] As can be observed, the suction conduits 14a, 14b and 14c and the delivery conduits 15a, 15b and 15c can have different lengths and different diameters, as a function of the variant of the ventilation system 10a, 10b, 10c adopted.

[0074] Furthermore, as can be observed, such suction conduits 14a, 14b and 14c and/or such delivery conduits 15a, 15b and 15c can also be provided with resonator devices 37.

[0075] As can be ascertained from the previous description, the present ventilation system 10, 10a, 10b, 10c guarantees an effective soundproofing, which can be maintained over time even after assembly and disassembly operations, for example operations in which the casing 16 is removed and reassembled.

[0076] The operations of assembling and disassembling the present ventilation system 10, 10a, 10b, 10c can be advantageously carried out in a simple and rapid manner; furthermore, following the removal of the external casing 16, direct access to the motor-carrying element 13 is guaranteed, so that if inspection, maintenance, replacement of parts or other operations were necessary, access to these parts is fast, immediate and does not damage the soundproofing layer, compromising its soundproofing effectiveness. Consider, for example, the case in which the motor 12 has to be replaced, or interventions have to be carried out on the latter and/or on the impeller 11.

[0077] The present ventilation system 10, 10a, 10b, 10c also has high aerodynamic and soundproofing effectiveness, as well as adequate protection of the moving parts of the system, such as for example the impeller 11 housed entirely in the motor-carrying element 13.

[0078] Therefore, the present ventilation system 10, 10a, 10b, 10c, in particular with mixed flow and for application on conduits, proves to have a low acoustic impact and can also be provided with an external casing 16 consisting of two rigid half-shells 16a, 16b inclusive of soundproofing material and assembled in a univocal manner.

[0079] The external casing 16 possibly provided with such half-shells 16a, 16b allows the internal components of the system to be maintained in an optimal and prompt manner, since it is only necessary to separate the half-

shells 16a, 16b in order to access such components. The acoustic performance of the system remains advantageously unchanged, even after the reassembly of the system at the end of the maintenance step, that is, by once again joining the two half-shells 16a, 16b in a precise and univocal manner.

[0080] The external casing 16 possibly made by means of the two half-shells 16a, 16b remains advantageously intact for the entire length of its operating life; however, its components, that is, the internal layer 18 and external layer 17, can also be separated once no longer used, promoting recycling.

[0081] It is clear that modifications and/or additions of parts may be made to the ventilation system as described heretofore, without departing from the scope of the present invention, as defined by the claims.

[0082] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of ventilation system, having the characteristics as set forth in the claims and hence all coming within the scope of the present invention as defined by the following claims.

Claims

1. Ventilation system, comprising at least one impeller (11) associated with at least one motor (12) for driving said impeller (11), at least one motor-carrying element (13) able to house said motor (12), at least one suction conduit (14, 14a, 14b, 14c) and at least one delivery conduit (15, 15a, 15b, 15c) associated with said motor-carrying element (13), wherein said motor-carrying element (13) is hollow and allows the passage of a flow of air from said suction conduit (14, 14a, 14b, 14c) to said delivery conduit (15, 15a, 15b, 15c) by driving the impeller (11), wherein said ventilation system further comprises an external casing (16) able to be positioned around said motor-carrying element (13), said suction conduit (14, 14a, 14b, 14c) and said delivery conduit (15, 15a, 15b, 15c), said ventilation system being **characterised in that** the external casing (16) is provided with at least one external layer (17) made of a rigid protective material, and with at least one internal layer (18) made of soundproofing material and integrated in said external casing (16).
2. Ventilation system as in claim 1, **characterized in that** said soundproofing material of said internal layer (18) is co-molded with said rigid protective material of said external layer (17).
3. Ventilation system as in claim 1, **characterized in that** said soundproofing material of said internal layer (18) is constrained to said rigid protective material of said external layer (17) by gluing or other

suitable attachment mean.

4. Ventilation system as in any claim hereinbefore, **characterized in that** said motor-carrying element (13) has a substantially solid external surface (19), with the exception of a possible access aperture (20) for the electrical connections. 5
5. Ventilation system as in any claim hereinbefore, **characterized in that** said impeller (11) is housed completely inside the motor-carrying element (13). 10
6. Ventilation system as in claim 5, **characterized in that** said impeller (11) is housed inside a feed element (22) which is in turn housed in the motor-carrying element (13) and coaxial with said motor-carrying element (13). 15
7. Ventilation system as in claim 6, **characterized in that** another passage portion (34) is positioned upstream of said feed element (22), wherein said feed element (22) and said passage portion (34) have a substantially truncated cone shaped internal section, and wherein said passage portion (34) has a gradually decreasing internal section, while said feed element (22) has a gradually increasing internal section, so as to achieve the so-called Venturi effect on the flow of air that passes through the ventilation system (10). 20 25 30
8. Ventilation system as in any claim hereinbefore, **characterized in that** said suction conduits (14a, 14b, 14c) comprise conduit segments (40a, 40b, 40c) having an internal section which is initially progressively decreasing and subsequently progressively increasing. 35
9. Ventilation system as in any claim hereinbefore, **characterized in that** upstream of the delivery conduit (15, 15a, 15b, 15c) a nose cone (23) is positioned, which is provided with through holes (24) on its external surface and with soundproofing material inside it. 40
10. Ventilation system as in any claim hereinbefore, **characterized in that** said external casing (16) already provided with said at least one internal layer (18) of soundproofing material is formed by at least two half-shells (16a, 16b). 45
11. Ventilation system as in any claim hereinbefore, **characterized in that** said external casing (16) comprises one or more indicators (32, 33) able to allow its correct positioning. 50
12. Ventilation system as in any claim hereinbefore, **characterized in that** it comprises one or more resonator devices (37) positioned around said suc-

tion conduit (14, 14a, 14b, 14c) and/or said delivery conduit (15, 15a, 15b, 15c).

13. Ventilation system as in claim 12, **characterized in that** said one or more resonator devices (37) comprise one or more chambers (38) fluidically communicating with the air delivery conduit (15, 15a, 15b, 15c) and/or the air suction conduit (14, 14a, 14b, 14c) by means of at least one through hole (39).

Patentansprüche

1. Belüftungssystem mit zumindest einem Laufrad (11), das zu zumindest einem Motor (12) zum Antreiben des Laufrades (11) zugehörig ist, zumindest einem Motortrageelement (13), das den Motor (12) unterbringen kann, zumindest einer Saugleitung (14, 14a, 14b, 14c) und zumindest einer Lieferleitung (15, 15a, 15b, 15c), die zu dem Motortrageelement (13) zugehörig ist, wobei das Motortrageelement (13) hohl ist und das Passieren einer Luftströmung von der Saugleitung (14, 14a, 14b, 14c) zu der Lieferleitung (15, 15a, 15b, 15c) durch Antreiben des Laufrades (11) ermöglicht, wobei das Belüftungssystem des Weiteren ein externes Gehäuse (16) aufweist, das um das Motortrageelement (13), die Saugleitung (14, 14a, 14b, 14c) und die Lieferleitung (15, 15a, 15b, 15c) herum positioniert werden kann, wobei das Belüftungssystem **dadurch gekennzeichnet ist, dass** das externe Gehäuse (16) mit zumindest einer externen Lage (17), die aus einem steifen Schutzmaterial hergestellt ist, und mit zumindest einer Innenlage (18) versehen ist, die aus einem schalldichten Material hergestellt ist und in dem externen Gehäuse (16) integriert ist.
2. Belüftungssystem gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das schalldichte Material der Innenlage (18) mit dem steifen Schutzmaterial der externen Lage (17) per Co-Molding geformt ist.
3. Belüftungssystem gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das schalldichte Material der Innenlage (18) an dem steifen Schutzmaterial der externen Lage (17) durch Kleben oder eine andere geeignete Befestigungseinrichtung eingezwängt ist.
4. Belüftungssystem gemäß einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** das Motortrageelement (13) eine im Wesentlichen massive Außenfläche (19) mit Ausnahme einer möglichen Zugriffsöffnung (20) für elektrische Verbindungen hat.
5. Belüftungssystem gemäß einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** das

Lauftrad (11) vollständig im Inneren des Motortrageelementes (13) untergebracht ist.

6. Belüftungssystem gemäß Anspruch 5, **dadurch gekennzeichnet, dass** das Lauftrad (11) im Inneren eines Zuführelementes (22) untergebracht ist, das wiederum in dem Motortrageelement (13) untergebracht ist und mit dem Motortrageelement (13) koaxial ist.
7. Belüftungssystem gemäß Anspruch 6, **dadurch gekennzeichnet, dass** ein anderer Kanalabschnitt (34) stromaufwärtig des Zuführelementes (22) positioniert ist, wobei das Zuführelement (22) und der Kanalabschnitt (34) einen im Wesentlichen kegelförmigen Innenquerschnitt haben, und wobei der Kanalabschnitt (34) einen sich allmählich verkleinernden Innenquerschnitt hat, wobei das Zuführelement (22) einen sich allmählich vergrößernden Innenquerschnitt hat, um so den sogenannten Venturi-Effekt bei der Luftströmung zu erzielen, die durch das Belüftungssystem (10) tritt.
8. Belüftungssystem gemäß einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** die Saugleitungen (14a, 14b, 14c) Leitungssegmente (40a, 40b, 40c) aufweisen, die einen Innenquerschnitt haben, der anfänglich immer mehr abnehmend ist und anschließend immer mehr zunehmend ist.
9. Belüftungssystem gemäß einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** stromaufwärtig der Lieferleitung (15, 15a, 15b, 15c) ein Schlauchkonus (23) positioniert ist, der mit Durchgangslöchern (24) an seiner Außenfläche und mit einem schalldichten Material in seinem Inneren versehen ist.
10. Belüftungssystem gemäß einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** das externe Gehäuse (16), das bereits mit der zumindest einen Innenlage (18) aus schalldichtem Material versehen ist, durch zumindest zwei Halbschalen (16a, 16b) ausgebildet ist.
11. Belüftungssystem gemäß einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** das externe Gehäuse (16) einen oder mehrere Indikatoren (32, 33) aufweist, die sein korrektes Positionieren ermöglichen können.
12. Belüftungssystem gemäß einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** es einen oder mehrere Resonatorvorrichtungen (37) aufweist, die um die Saugleitung (14, 14a, 14b, 14c) und/oder die Lieferleitung (15, 15a, 15b, 15c) herum positioniert sind.

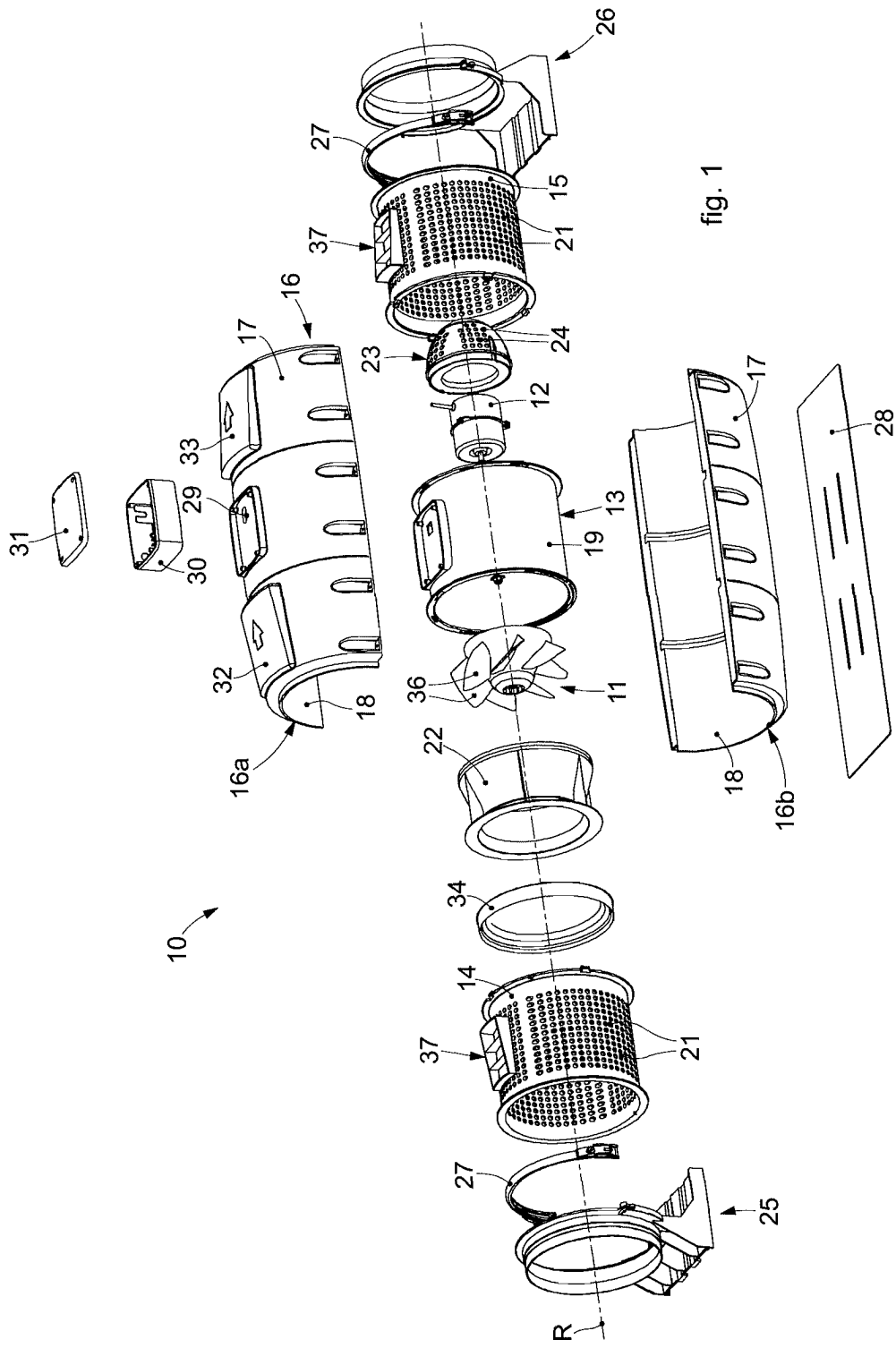
13. Belüftungssystem gemäß Anspruch 12, **dadurch gekennzeichnet, dass** die eine oder mehrere Resonatorvorrichtungen (37) eine oder mehrere Kammern (38) aufweisen, die mit der Luftlieferleitung (15, 15a, 15b, 15c) und/oder der Luftsaugleitung (14, 14a, 14b, 14c) mittels zumindest einem Durchgangslot (39) in Fluidkommunikation stehen.

10 Revendications

1. Système de ventilation, comprenant au moins une roue (11) associée à au moins un moteur (12) pour entraîner ladite roue (11), au moins un élément porteur de moteur (13) pouvant loger ledit moteur (12), au moins un conduit d'aspiration (14, 14a, 14b, 14c) et au moins un conduit de distribution (15, 15a, 15b, 15c) associé audit élément porteur de moteur (13), dans lequel ledit élément porteur de moteur (13) est creux et permet le passage d'un flux d'air dudit conduit d'aspiration (14, 14a, 14b, 14c) audit conduit de distribution (15, 15a, 15b, 15c) par entraînement de la roue (11), dans lequel ledit système de ventilation comprend en outre un boîtier externe (16) pouvant être positionné autour dudit élément porteur de moteur (13), dudit conduit d'aspiration (14, 14a, 14b, 14c) et dudit conduit de distribution (15, 15a, 15b, 15c), ledit système de ventilation étant **caractérisé en ce que** le boîtier externe (16) est pourvu d'au moins une couche externe (17) constituée d'un matériau de protection rigide, et d'au moins une couche interne (18) constituée d'un matériau d'insonorisation et intégrée dans ledit boîtier (16).
2. Système de ventilation selon la revendication 1, **caractérisé en ce que** ledit matériau d'insonorisation de ladite couche interne (18) est co-moulé avec ledit matériau de protection rigide de ladite couche externe (17).
3. Système de ventilation selon la revendication 1, **caractérisé en ce que** ledit matériau d'insonorisation de ladite couche interne (18) est contraint audit matériau de protection rigide de ladite couche externe (17) par collage ou autre moyen de fixation approprié.
4. Système de ventilation selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit élément porteur de moteur (13) a une surface externe sensiblement solide (19), à l'exception d'une ouverture d'accès possible (20) pour les connexions électriques.
5. Système de ventilation selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ladite roue (11) est complètement logée à l'intérieur de l'élément porteur de moteur (13).

6. Système de ventilation selon la revendication 5, **caractérisé en ce que** ladite roue (11) est logée à l'intérieur d'un élément d'alimentation (22) qui est à son tour logé dans l'élément porteur de moteur (13) et coaxial audit élément porteur de moteur (13). 5
7. Système de ventilation selon la revendication 6, **caractérisé en ce qu'**une autre partie de passage (34) est positionnée en amont dudit élément d'alimentation (22), dans lequel ledit élément d'alimentation (22) et ladite partie de passage (34) ont une section interne sensiblement tronconique, et dans lequel ladite partie de passage (34) a une section interne progressivement décroissante, tandis que ledit élément d'alimentation (22) a une section interne progressivement croissante, de manière à obtenir ce qu'on appelle l'effet Venturi sur le flux d'air qui passe à travers le système de ventilation (10). 10 15
8. Système de ventilation selon l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdits conduits d'aspiration (14a, 14b, 14c) comprennent des segments de conduit (40a, 40b, 40c) ayant une section interne qui diminue initialement progressivement et augmente ensuite progressivement. 20 25
9. Système de ventilation selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**en amont du conduit de distribution (15, 15a, 15b, 15c), un cône de nez (23) est positionné, qui est muni de trous traversants (24) sur sa surface externe et d'un matériau d'insonorisation à l'intérieur. 30 35
10. Système de ventilation selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit boîtier externe (16) déjà pourvu de ladite au moins une couche interne (18) de matériau d'insonorisation est formé par au moins deux demi-coquilles (16a, 16b). 40
11. Système de ventilation selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit boîtier externe (16) comprend un ou plusieurs indicateurs (32, 33) pouvant permettre son positionnement correct. 45
12. Système de ventilation selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend un ou plusieurs dispositifs résonateurs (37) positionnés autour dudit conduit d'aspiration (14, 14a, 14b, 14c) et/ou dudit conduit de distribution (15, 15a, 15b, 15c). 50 55
13. Système de ventilation selon la revendication 12, **caractérisé en ce que** lesdits un ou plusieurs dispositifs résonateurs (37) comprennent une ou plu-

sieurs chambres (38) communiquant fluidiquement avec le conduit de distribution d'air (15, 15a, 15b, 15c) et/ou le conduit d'aspiration d'air (14, 14a, 14b, 14c) au moyen d'au moins un trou traversant (39).



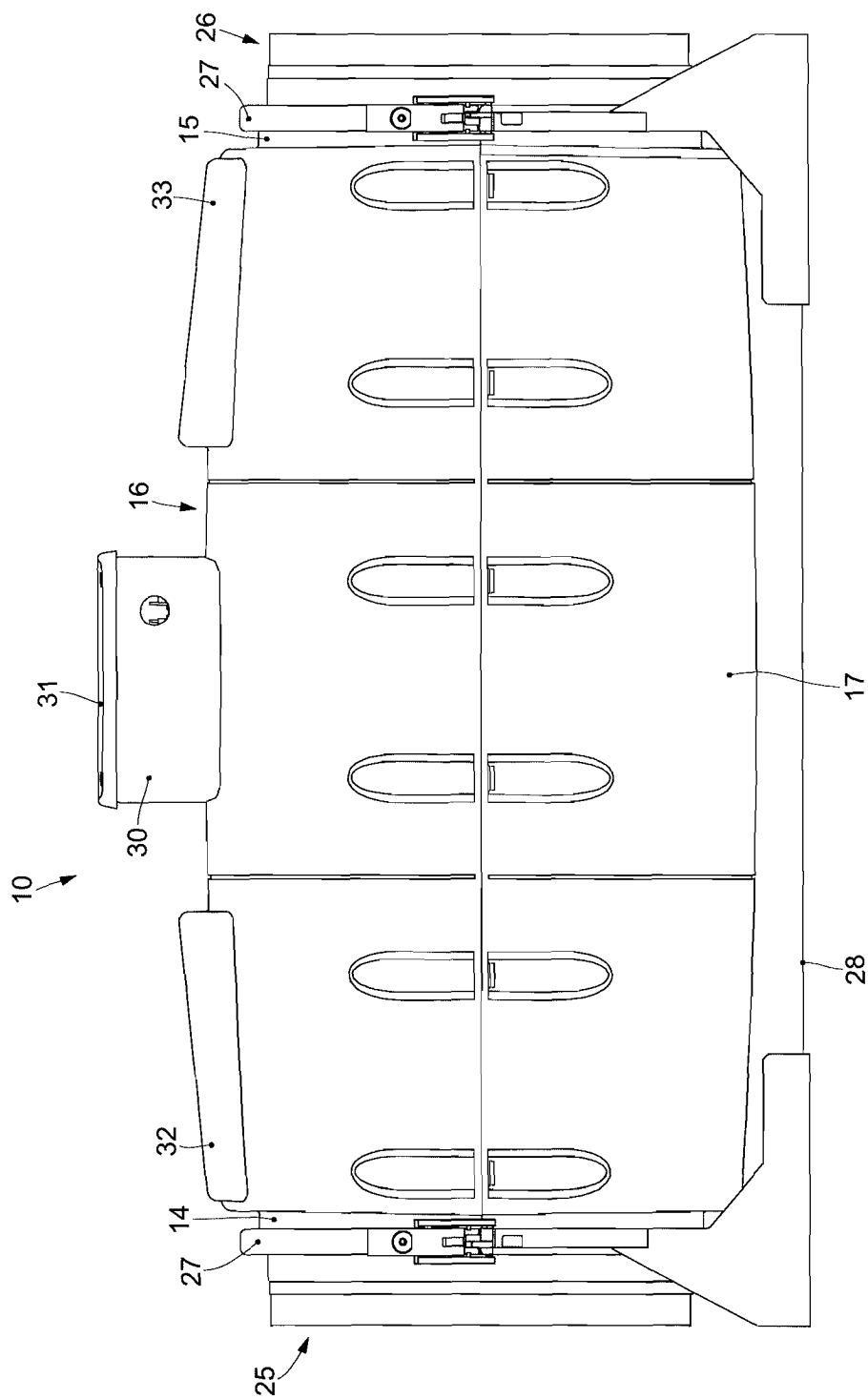


fig. 2

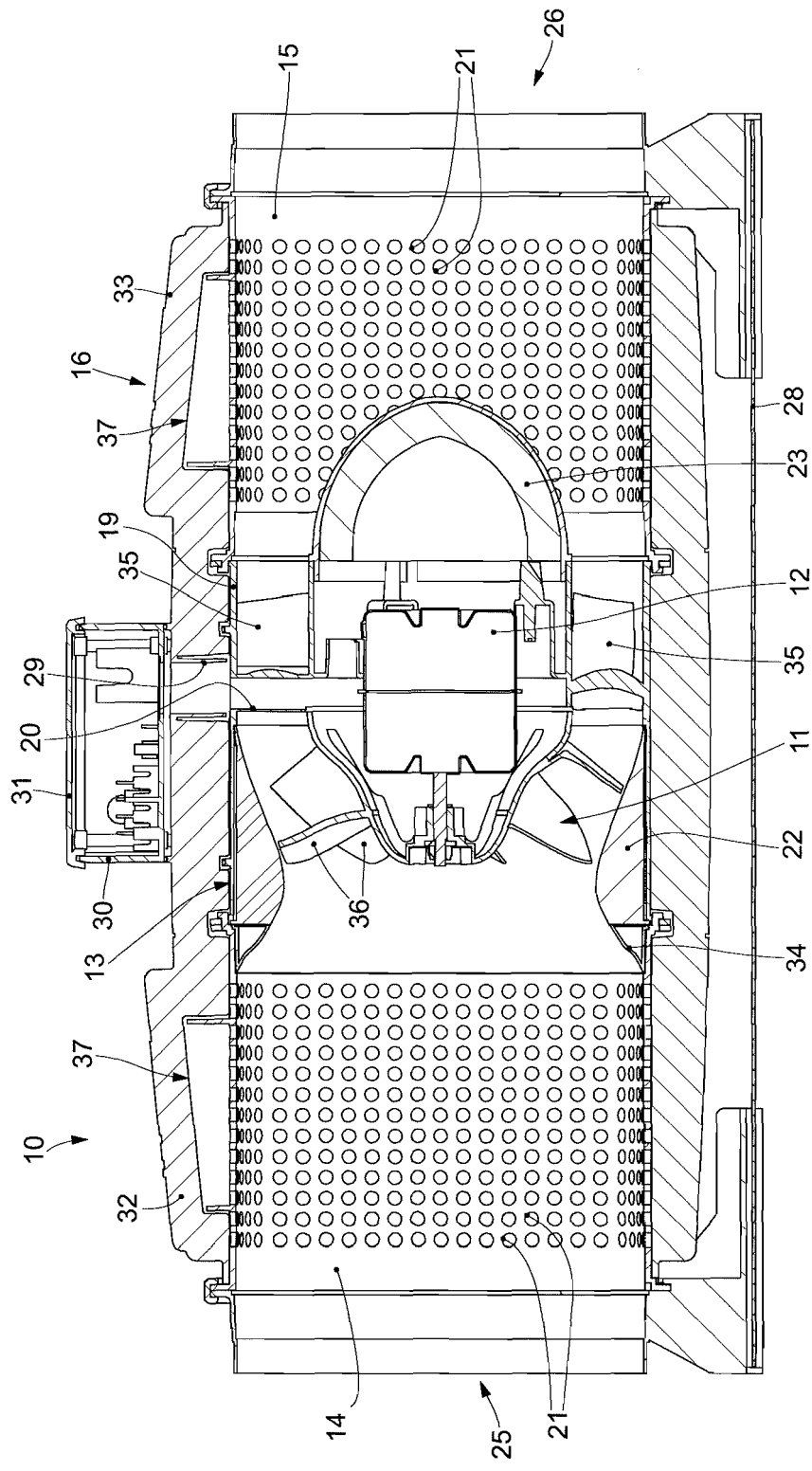


fig. 3

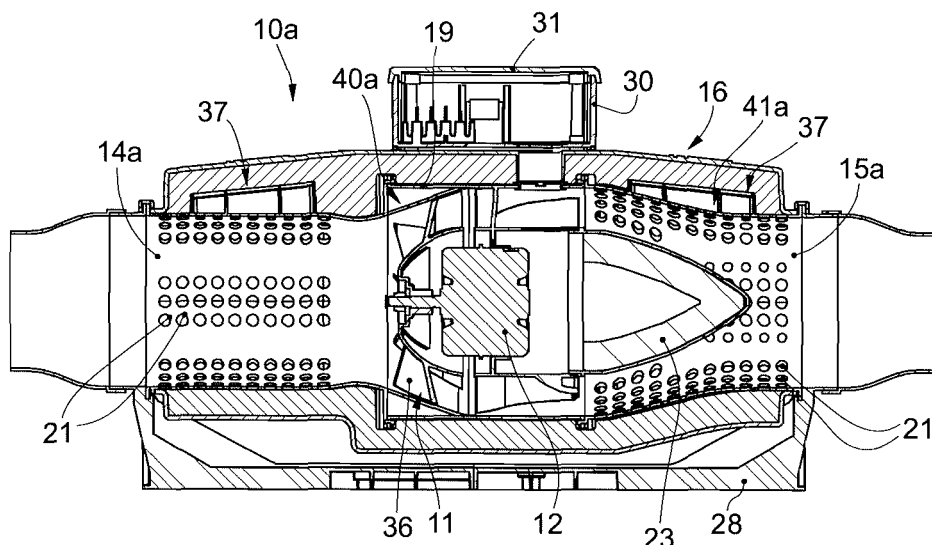


fig. 4

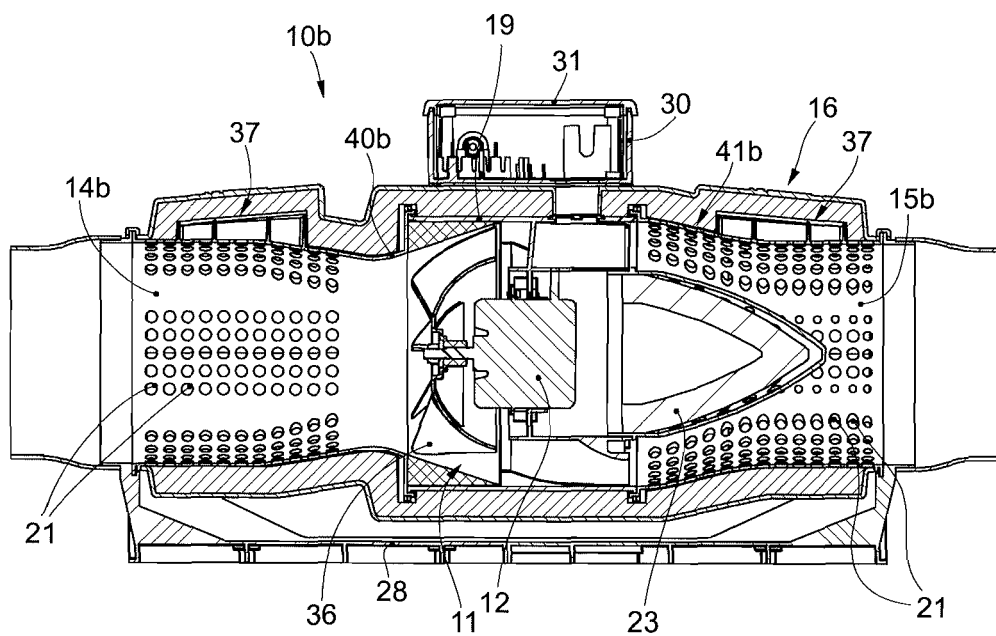


fig. 5

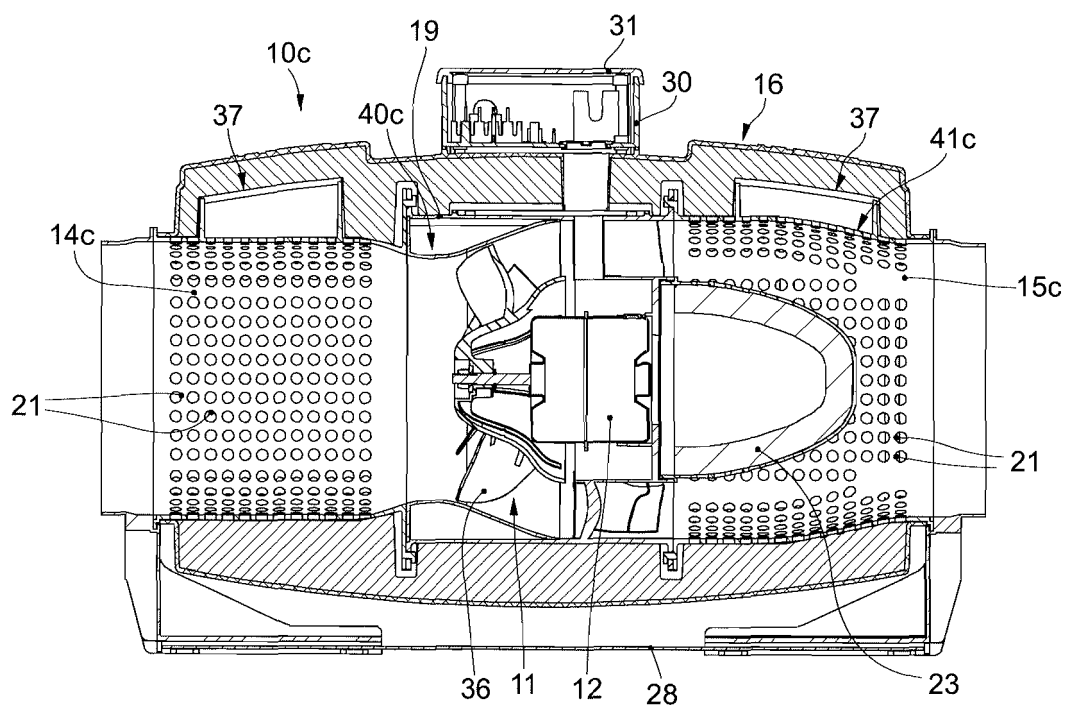


fig. 6

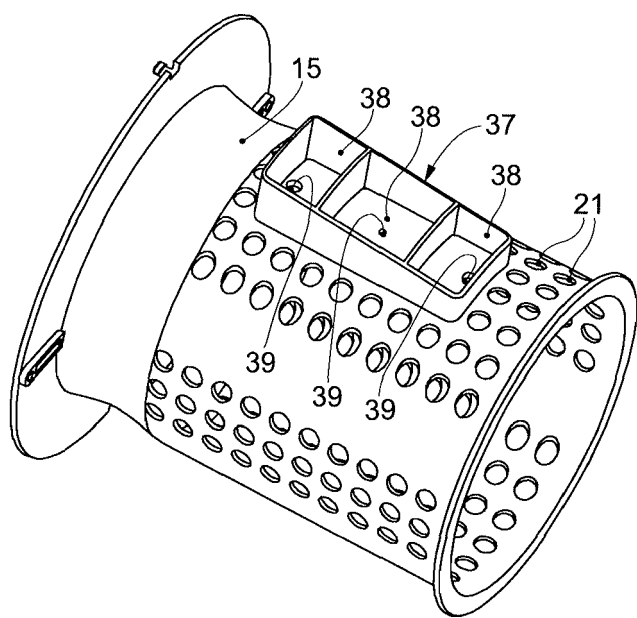


fig. 7

REFERENCES CITED IN THE DESCRIPTION

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