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Amended claims in accordance with Rule 137(2) EPC.

(54) **CMV DEVICE WITH TRANSITION CONNECTOR**

(57) The invention relates to a Controlled Mechanical Ventilation, CMV, device (100) of the type comprising at least one fan (110) with an outer casing (112) having connections to external ducts for each respective fan (110), said device comprising at least one transition connector (130) that can be coupled between a corresponding outlet (114) of the casing (112) of a fan (110) and a connection hole (121) wherein the external duct is connected, comprising engaging and detaching means at the outlet (114) of the fan and/or at the joining end of the transition connector (130) for coupling the transition connector (130) to the fan (110) so that said transition connector (130) can be fixed by means of detachable engagement in the operating position.

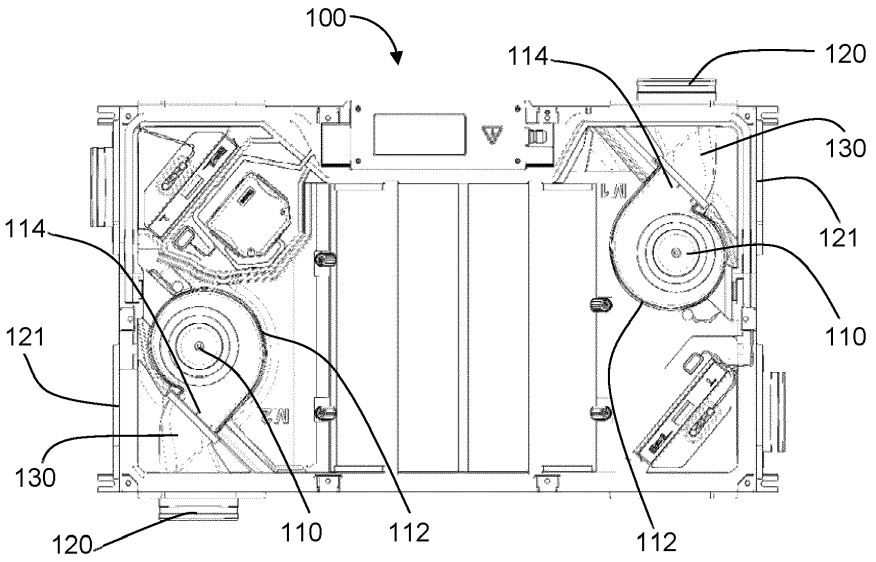

FIG. 3

EP 4 549 828 A1

Description

Technical field

[0001] The present invention relates to the technical sector of ventilation systems for enclosed spaces. More specifically, it relates to Controlled Mechanical Ventilation (CMV) systems of the type used in homes, premises, buildings and the like to facilitate the renewal of stale air with new outdoor air.

State of the art

[0002] Systems used for ventilating homes or premises (in general, any enclosed space that requires the renewal of indoor air) include the so-called Controlled Mechanical Ventilation (CMV) systems in which two circuits of air flow ducts are essentially created, for the air that must be expelled from inside the enclosure and for the new air that must be introduced into the same, respectively. This therefore creates an indoor environment with a higher quality of habitability. In general, the function of these circuits is to extract stale air from the so-called wet rooms, that is, kitchens, bathrooms and toilets, and propel new filtered air into the dry rooms, that is, bedrooms, living rooms, dining rooms, etc.

[0003] To do so, there are two types of alternatives: single-flow systems and double-flow systems. In single-flow systems, contaminated air is extracted from the premises and expelled outdoors, this system being a simple system in which the inlet air is not controlled and the extracted air will be replaced by the air that enters through cracks and porosities in the building. On the other hand, in addition to controlling extraction air, double-flow systems also control renewal air, thus having one fan for the inlet and another for the outlet.

[0004] The present invention is based on this second type of double-flow systems. It is worth mentioning that in double-flow CMV systems the new air is preferably introduced at a temperature that is very similar to the temperature of the ventilated room by means of heat exchangers between the incoming flow and the outgoing flow.

[0005] In equipment such as CMV boxes, which may incorporate heat exchange devices and air flow propulsion devices or distribution mechanisms for distributing both the incoming flow and the outgoing flow, it is important to ensure transit of said flows with as much uniformity as possible to achieve low pressure losses and, therefore, greater energy efficiency and improved performance for the end user. Some of the points where these pressure losses are the greatest are inside the ventilation box itself due to the prismatic geometry of said box, with rectangular faces that form right angles and connection areas for the external ducts of the circuit on the surfaces of said faces. For example, for one same fan installed in the ventilation box there may be more than one connection socket available for the aforementioned external ducts, whereby the direction of the outgoing flow from the fan may not be properly aligned with all the connection sockets for which it is intended.

[0006] As is known, pressure losses are normally generated in bends, reductions, widenings, branches and similar anomalies of the circuit that hinder a uniform flow of the fluid. These anomalies are features of the joining points between elements of a different functional or constructive nature, such as those located inside a ventilation box or on the outer surface thereof (for example, as mentioned in the previous paragraph, the connections between the internal fans and the outlets of the box or between said outlets and the external air ducts).

[0007] Therefore, technical elements or devices that address the aforementioned drawbacks are required, especially with regard to the section that the air must travel from the outlet of a casing or volute of a centrifugal fan to the different connection sockets of the ventilation box intended for the external circuit ducts. Furthermore, it would be desirable to have a solution that, apart from taking into account the task of maintaining optimal flow conditions, also focuses on its adaptability with respect to different connection sockets located in different areas of the box and, therefore, with a different spatial orientation; all this also providing an ease of assembly that makes it possible to achieve this adaptability in a practical and quick way, as is the case of the present invention and as will be deduced from the following sections in this specification.

Object of the invention

[0008] Considering the objectives set out in the previous section, the present invention thus provides a Controlled Mechanical Ventilation, CMV, device of the type comprising one or more fans inside the box thereof and one or more connection sockets in said box for connecting external ducts, wherein each of the fans has a corresponding casing or volute with a respective air outlet; and the fans are used to make air flow to one or more of the aforementioned connections. In this aspect, one of the features of this device is that it comprises at least one transition connector for each fan. Said transition connector is preferably made of a single piece and can be coupled between an outlet of the casing of one of the fans and at least one of the connection holes corresponding to the fan in question. The transition connector further comprises engaging and detaching means at the outlet of the fan and/or at the coupling end of the transition connector for coupling the transition connector to the fan. Therefore, in order for the transition connector to constitute a continuous duct between the fan and the connection hole, it is assembled by means of detachable engagement of the connector between both end points of the aforementioned path. This can be achieved in one of the embodiments without any additional parts, tools or means of fixation.

[0009] Due to this configuration, pressure losses ex-

isting in solutions in which air strikes the walls of the CMV casing are avoided. Additionally, assembly and maintenance tasks are facilitated, where only the transition duct must be detached for the replacement or cleaning thereof.

[0010] The engaging means between the outlet of the fan and the end of the transition connector may entail the arrangement of an engaging geometry that is complementary to the geometry of the fan outlet or vice versa, such as with grooves or clips. Furthermore, said engaging means preferably correspond to a sealing gasket arranged at the outlet of the fan and/or at the coupling end of the transition connector that provides direct engagement and can be detached for maintenance and assembly tasks. This sealing gasket will preferably be axial.

[0011] According to another feature of the device of the invention, the outer surface of the transition connector can be provided with at least one rib or protrusion (which projects outwards with respect to the level of said surface) and the function of which is for the connector to be fit by interference in the connection hole in which it will be assembled. One or more of these ribs or protrusions may exist and each one may run along the surface of the connector continuously and without interruptions, or they may be made up of discrete elements with a certain separation therebetween.

[0012] Preferably, the transition connector comprises a connection socket at the connection end thereof to the connection hole with the external duct. The element that can be coupled to the fan and to which the external duct is coupled can be made of a single piece. Said connection socket is normally arranged in the casing of the CMV device at the outlet of the connection hole.

[0013] According to another feature of the invention, the end of the transition connector that is intended to be coupled to the corresponding connection hole may comprise a ridge along the contour of the outer surface thereof, such that this ridge acts as a stop against the external face of the CMV device in which said connection hole is located. This ridge may be like a pipe flange, continuous along the entire contour of the connector, or it may be formed by a plurality of discrete ridge elements in such a way that they prevent the transition connector from unduly leaking or moving towards the inside of the box of the CMV device.

[0014] Due to this configuration, assembly and maintenance tasks are facilitated, manually engaging the transition connector in an easy manner and abutting the CMV casing and tightly coupling at the outlet of the volute.

[0015] Another feature of the CMV device of the invention refers to the fact that the transition connector may comprise one or more sections. It can have complementary sections that can be considered as fittings for a main transition connector, whereby said main transition connector can be used as provided (and as set out in the previous paragraphs) in a single piece, or it can be used in combination with one or more of these complementary sections to be able to complete the path from the outlet of the fan to a connection socket to which the main transition connector does not reach. For this, the complementary section or sections can be preferably mounted and disassembled with respect to the transition connector and with respect to each other. They may also be engaged in the outlet of the fan or in a corresponding connection socket when mounted at one of the ends of the main body of the transition connector, in accordance with the main features disclosed in the first paragraph of this section.

[0016] According to an additional feature of the invention, and as previously mentioned, these complementary sections can be connected to each other, to the main body of the transition connector, to the outlet of the fan, and to the connection sockets of the CMV device. Any of these joints or couplings may comprise a corresponding sealing gasket.

[0017] According to another feature of the invention, the transition connector has dimensions such that, together with the physical arrangement of the outlet of the fan and the position and/or orientation of at least two of the connection sockets, they ensure that said connector can be engaged or mounted on one connection socket or another (and simultaneously at the outlet of the fan) simply by changing the position and/or orientation thereof. For example, the outlet of the fan can be arranged in a symmetrical position with respect to two connections, so that one same connector can be coupled to both connections simply by changing the orientation thereof. This configuration makes it possible to reduce installation costs and facilitate assembly tasks in the event that one outlet or another must be used with two hands in a building. This arrangement also contributes to the better use of the inside of the CMV device, resulting in more compact devices.

[0018] Finally, according to another feature of the invention, the inner surfaces of the transition connector are curved or straight, but always smooth, in the sense that they do not comprise angles or projections that may act as obstacles that alter the uniform flow of air, such that an aerodynamic surface is provided which reduces pressure losses.

Description of the figures

[0019] The attached drawings illustrate the CMV device of the present invention as a nonlimiting example, and as well as some examples of prior art devices to better explain the problem addressed. In said drawings:

Figure 1 is a detail view of a CMV device according to the prior art, with the connection socket enabled in front of the outlet of the fan.

Figure 2 is a detail view of the CMV device of figure 1, but with the connection socket enabled at 90° with respect to the outlet of the fan.

Figures 3 and 4 are two views of a CMV device of the present invention, without the front cover, and with two transition connectors in different positions, respectively, in each of the figures.

Figure 5 is a detail view of a CMV device according to the present invention, showing a transition connector coupled to a connection socket.

Figure 6 is a detail view of the CMV device of figure 5, with the transition connector coupled to another connection socket.

Figure 7 is a perspective view of a transition connector of the present invention for 125 mm ducts.

Figure 8 is a perspective view of a transition connector of the present invention for 160 mm ducts.

Detailed description of the invention

[0020] Next, a detailed description of the invention will be carried out with reference to the figures listed above.

[0021] When reference is made to "operating position" both in the claims and in the description, it refers to the position of the elements of the ventilation device (100), and specifically to the position of the transition connector (130), when said device (100) is installed and functioning as intended in the corresponding premises, building or home.

[0022] Figure 1 shows a detail of one of the known solutions in CMV devices, in which external ducts must be coupled to connection sockets (120) of the device that are positioned or oriented in different ways in the connection holes (121) in the external ducts. These external ducts must receive air propelled from a fan (110) installed inside the CMV device. (As will be seen below, references 110, 114, 120 and 121 are used for the corresponding elements used both in CMV devices of the prior art and in devices (100) of the present invention, to the extent that these elements may be identical in both cases).

[0023] Continuing with figure 1, the air flow is expelled from the fan (110) through the outlet (114) so that when the connection hole (121) that is located right in the line of the air flow, as in the case of figure 1, on the lower face or wall of the device is selected, optimal guiding of said flow occurs. On the other hand, when the external duct must be coupled to the connection socket (120) that forms 90° with the outlet (114) (example in figure 2), the air flow will mainly strike, in the first instance, the closed hole (121), located right in front (face of the CMV device represented horizontally and at the bottom of figure 2), and then, after the movement thereof is hindered, it will find the connection hole (121) in the adjacent face (drawn vertically) of the CMV device. This represents flow guiding conditions with pressure loss and, therefore, with room for improvement.

[0024] Another solution of the prior art consists of placing the outlet (114) of the fan (110) facing the 90° angle formed by the two walls or faces of the CMV device in which there are adjacent connection holes (121). This is a compromise solution in which a decision has been made to distribute the drawbacks of angled flow guiding between the two connection possibilities but without either of them being the optimal solution. In other words, the air flow would come out from the fan (110) in the direction of the corner formed by the two faces of the CMV device and this solution could be considered better than the corresponding solution when the air first directly strikes a closed connection hole (121) (figure 2), but it would be worse than the situation in which the flow comes out directly, in a straight line, through the aligned connection hole (121) (figure 1).

[0025] The solution proposed by the present invention, according to the practical embodiment that is shown in figures 3 to 8, consists of providing a CMV device (100) in which a transition connector (130) is coupled between the outlet (114) of the fan (110) and the corresponding connection hole (121) so that guiding conditions that facilitate air flow and reduce pressure losses are achieved, therefore improving the performance of the device. Figures 3 and 4 show a CMV device (100) of the invention in which two fans (110) are provided at opposite corners of the device (100) and with two corresponding transition connectors (130) connected to different connection holes (121) in each of said figures. Figure 3 shows that the two transition connectors (130) are coupled so that the air is propelled to the outside of the box of the device (100) by the upper and lower horizontal walls thus represented in said figure. Figure 4 shows, however, that the same transition connectors (130) have been coupled in a different way to expel air by the side walls, which have thus been represented with a vertical orientation in this figure.

[0026] It should be noted that, in the preferred embodiment represented in figures 3 and 4, the arrangement of the outlet (114) of the casing or volute (112) of the fan (110) is as such, with respect to the two corresponding connection holes (121) thereof located at 90° to each other, that by simply changing the position of the transition connector (130), this allows the fan (110) to be optimally connected to the connection hole (121) chosen in each case (either figure 3 or figure 4). Said outlet (114) is arranged in a diagonal position to the joining corner of the walls of the device (100) wherein the connection holes (121) are arranged. The coupling of the transition connector (130) in the two represented positions is produced by engaging, facilitated by the physical arrangement of the elements involved, so that no specific or special tool or means of fixation is necessary for this.

[0027] As mentioned, in this preferred embodiment, an arrangement and dimensions of the elements involved in the interconnection (fan (110) and connection holes (121)) are provided such that they allow using a single transition connector (130) for two or more connection holes (121) by simply changing the position of the first. In

another embodiment, it is possible for the position of the different connection holes (121) to not be symmetrical with respect to the outlet (114) of the corresponding fan (110) (in other words, the connection holes (121) could be positioned at angles and/or at different distances therebetween relative to the outlet (114)) and then the transition connector (130) can comprise one or more complementary connection sections that would serve to complete the guiding of the flow to the connection hole (121) that requires it. For example, returning to figure 3 or 4, in the case of the upper right corner of the device (100), it is possible that the transition connector (130) was designed to properly be engaged between the outlet (114) of the volute (112) and the connection hole (121) located in the upper face of the device. At the same time, the other connection hole (121) that is located in the right side face of the device (100) could be at a distance with respect to the outlet (114) that was greater than the distance illustrated in the figures (therefore greater than the distance at which the connection hole (121) is located from the upper wall) and, for connection thereof, a complementary section could be used from one end of the main body of the connector (130) to that connection hole (121) or to the outlet (114). Also, instead of a single section, two or more complementary sections could be provided to complete the desired guiding path, based on the position of the connection hole (121) in question.

[0028] In the preferred embodiment, the transition connector (130) comprises sealing gaskets (115) either at its coupling end to the outlet (114) of the fan (110) and/or at the very outlet (114) of the fan (110), which allows for the tight engagement of the transition connector (130) and where this gasket (115) is preferably axial so that manual engagement is facilitated. In this regard, and in the case of the embodiment that comprises one or more complementary sections for the connector (130), said sections may also comprise corresponding sealing gaskets at the coupling ends thereof, either when these ends are coupled to the outlet (114) of the fan (110), to either end of the transition connector (130), or between one section and another consecutive section when said configuration is necessary.

[0029] Figures 5 and 6 show enlarged views of two different positions of the transition connector (130) corresponding to those illustrated in figures 3 and 4. These figures better show a feature of one of the embodiments of the invention, whereby the transition connector (130) comprises a stop (134) in the form of a ridge along the outer contour thereof to delimit its possible movement towards the inside of the box of the device (100). This stop (134) could be a continuous projection or ridge along the entire outer contour of the connector (130) or it could be formed by discrete ridge elements, spaced apart from each other. In another embodiment, when one of the aforementioned complementary sections is intended to be coupled between the end of the connector (130) and the connection of the corresponding external duct (therefore acting as the final end before the external duct of the air circuit), said section could comprise, in the connection area thereof with the connection hole (121), a stop (134) like the one previously described for the main body of the transition connector (130). Regarding this feature of the stop (134), according to this embodiment, the transition connector (130) will comprise in a single piece a connection socket (120) in the connector itself, instead of the connection socket (120) with the external duct being arranged in the casing of the CMV system (100). Therefore, the transition connector (130) will be inserted into the connection hole (121), engaging it and coupling it to the outlet (114) of the fan (110), abutting the stop (134) and leaving the connection socket (120) ready to couple an external duct.

[0030] Figures 7 and 8 represent two perspective views of two transition connectors (130) suitable, respectively, for two different external duct diameters. These two figures clearly show the technical feature relative to one or more ribs (132) arranged on the outer contour of the connector (130), so that they facilitate the engagement of the latter in the corresponding connection hole. These ribs (132), as defined in the claims, may be presented individually (only one) or in the form of several (as in the figures) with a certain pattern or design that serves to achieve engaging by interference with the connection hole (121). The representation illustrated in figures 7 and 8 is, therefore, a merely example and it is understood that the shape, arrangement and number of the ribs (132) may differ from those shown as long as the aforementioned technical effect is achieved. The edges of the ribs (132) could be rubberised or have a finish or an added material or piece with a rubbery finish to improve engagement. It is understood that these ribs (132) could also be provided in the complementary connection sections when said sections must be coupled to the connection holes (121).

[0031] The transition connector (130) may also comprise an air flow inlet section that substantially coincides with the outlet section of the volute or casing (112) of the fan (110) as can be seen at the left ends of the two connectors (130) represented in figures 7 and 8. This inlet section that coincides with the section of the casing (112) can progressively disappear (to avoid alterations or pressure losses in the air stream) as the flow moves through the connector (130) or it can be maintained throughout the entire path of the connector (130). For example, one of the typical shapes of the outlet of the casing (112) is square or rectangular, and the section, at least the inlet section, of the connector (130) can substantially coincide with said square or rectangular shape (figures 7 and 8).

[0032] The inlet, the outlet and the internal duct of both the transition connector (130) and the possible complementary sections that can be mounted thereon can have any dimension since this factor does not affect the advantageous performance obtained with the present invention, as long as the claimed and described technical features are met. In other words, at least two versions of

the transition connector (130) (and of the complementary sections when necessary) are provided for ducts measuring, respectively, 125 mm and 160 mm (for example, figures 7 and 8, respectively) but it is evident that these values could be different and in a range greater than two.

[0033] With regard to the aforementioned improvement in the performance provided by the equipment of the present invention, it should be noted that, according to data obtained from experiments, the device (100) increases the pressure and reduces the pressure loss of the system with respect to devices of the prior art. In addition, it also considerably reduces the differences between the models for 125 mm and 160 mm ducts.

[0034] As shown in figures 7 and 8, it is also envisaged that the connection sockets (120) of the transition connector (130) comprise a sealing gasket (135) that will be radially coupled in order to connect the external ducts.

[0035] Although the device (100) of the invention is described relative to a Controlled Mechanical Ventilation device, given the structural and operating details set forth herein (both in the description and in the claims) it is evident that said device, with its main feature of the transition connector (130), could be applied in any ventilation box that includes a fan casing (112) with a corresponding outlet and one or more connection holes (121) for said outlet of the casing (112).

Claims

1. A Controlled Mechanical Ventilation, CMV, device (100) of the type comprising at least one fan (110) with an outer casing (112) having connections to external ducts for each respective fan (110), said device **characterised in that** it comprises at least one transition connector (130) that can be coupled between a corresponding outlet (114) of the casing (112) of a fan (110) and a connection hole (121) wherein the external duct is connected, comprising engaging and detaching means at the outlet (114) of the fan and/or at the coupling end of the transition connector (130) for coupling the transition connector (130) to the fan (110) so that said transition connector (130) can be fixed by means of detachable engagement in the operating position.

2. The CMV device (100) according to claim 1, wherein the engaging and detaching means are in the form of a sealing gasket (115) for the tight coupling of the transition connector (130) to the fan (110) in a removable manner.

3. The CMV device (100) according to the preceding claim, wherein the sealing gasket (115) for coupling the transition connector (130) to the fan (110) is an axial gasket.

4. The CMV device (100) according to any one of the preceding claims, wherein the transition connector (130) comprises at least one rib (132) on the outer surface thereof to be fit by interference, in the operating position thereof, in the corresponding connection hole (121).

5. The CMV device (100) according to any one of the preceding claims, wherein the transition connector (130) comprises a connection socket (120) at the connection end thereof to the connection hole (121) with the external duct.

6. The CMV device (100) according to the preceding claim, wherein the end of the transition connector (130) intended to couple to the connection hole of the corresponding external duct comprises at least one ridge (134) that runs along at least part of the outer contour thereof, arranged to act as a stop against the outer edge of said connection hole.

7. The CMV device (100) according to any one of the preceding claims, wherein the transition connector (130) is made up of two or more independent sections.

8. The CMV device (100) according to any one of the preceding claims, wherein the dimensions of the transition connector (130) and the arrangement of the outlet (114) of the casing (112) of the fan (110) and of the connections with corresponding external ducts are such that said transition connector (130) can be fixed, changing its position and/or orientation, on at least two of the connections associated with the fan (110).

9. The CMV device (100) according to any one of the preceding claims, wherein the inner surfaces of the transition connector (130) comprise only curved or straight surfaces, without angles or obstacles protruding from said surfaces and altering the guided air flow, providing an aerodynamic surface.

Amended claims in accordance with Rule 137(2) EPC.

1. A Controlled Mechanical Ventilation, CMV, device (100) of the type comprising at least one fan (110) with an outer casing (112) having connections to external ducts for each respective fan (110), said device (100) comprising at least one transition connector (130) that can be coupled between a corresponding outlet (114) of the casing (112) of the fan (110) and a connection hole (121) wherein the external duct is connected,

   characterized in that the transition connector (130) comprises engaging and detaching means at the outlet (114) of the fan (110) and/or

at a coupling end of the transition connector (130) for coupling the transition connector (130) to the fan (110) so that said transition connector (130) can be fixed by means of detachable engagement in the operating position, wherein the dimensions of the transition connector (130) and the arrangement of the outlet (114) of the casing (112) of the fan (110) and of the connections with corresponding external ducts are such that said transition connector (130) can be fixed, changing its position and/or orientation, on at least two of the connections associated with the fan (110).

2. The CMV device (100) according to claim 1, wherein the engaging and detaching means are in the form of a sealing gasket (115) for the tight coupling of the transition connector (130) to the fan (110) in a removable manner.

3. The CMV device (100) according to the preceding claim, wherein the sealing gasket (115) for coupling the transition connector (130) to the fan (110) is an axial gasket.

4. The CMV device (100) according to any one of the preceding claims, wherein the transition connector (130) comprises at least one rib (132) on an outer surface thereof to be fit by interference, in the operating position thereof, in the corresponding connection hole (121).

5. The CMV device (100) according to any one of the preceding claims, wherein the transition connector (130) comprises a connection socket (120) at a connection end thereof to the connection hole (121) with the external duct.

6. The CMV device (100) according to the preceding claim, wherein the end of the transition connector (130) intended to couple to the connection hole (121) of the corresponding external duct comprises at least one ridge (134) that runs along at least part of the outer contour thereof, arranged to act as a stop against an outer edge of said connection hole (121).

7. The CMV device (100) according to any one of the preceding claims, wherein the transition connector (130) is made up of two or more independent sections.

8. The CMV device (100) according to any one of the preceding claims, wherein inner surfaces of the transition connector (130) comprise only curved or straight surfaces, without angles or obstacles protruding from said surfaces and altering the guided air flow, providing an aerodynamic surface.

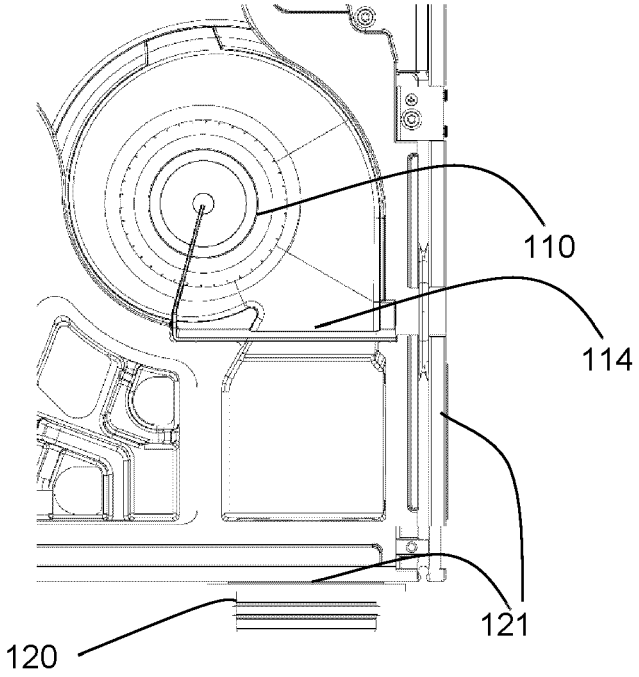

FIG. 1

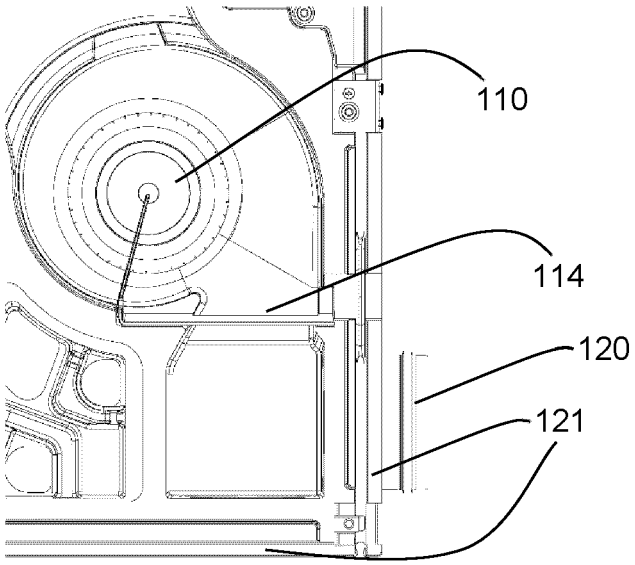

FIG. 2

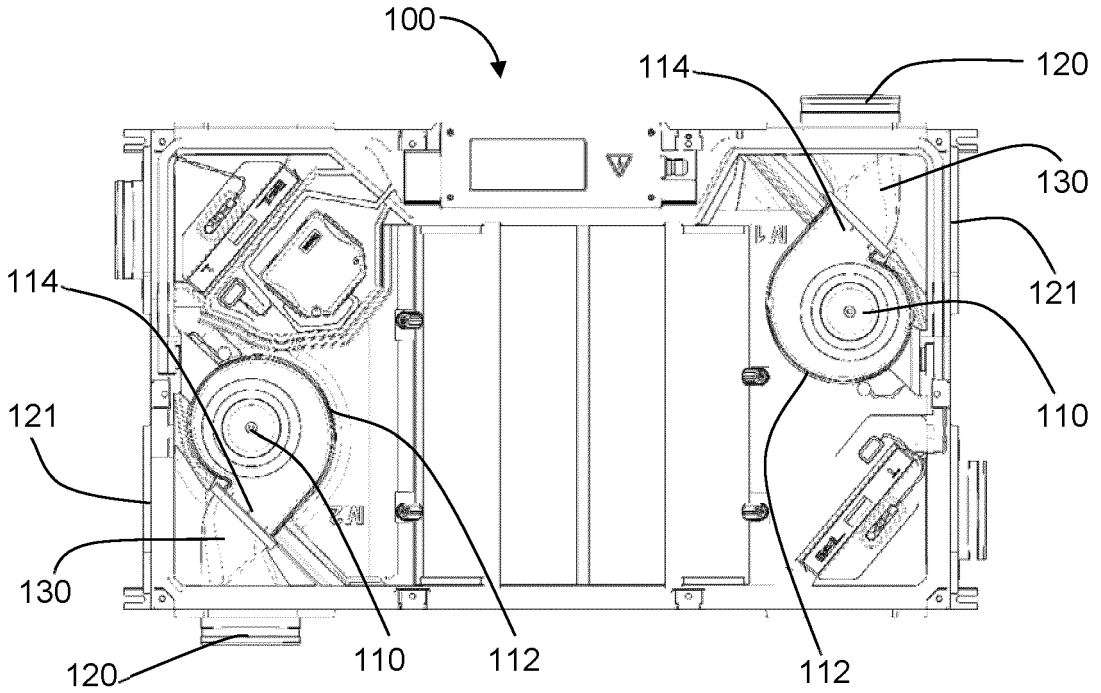
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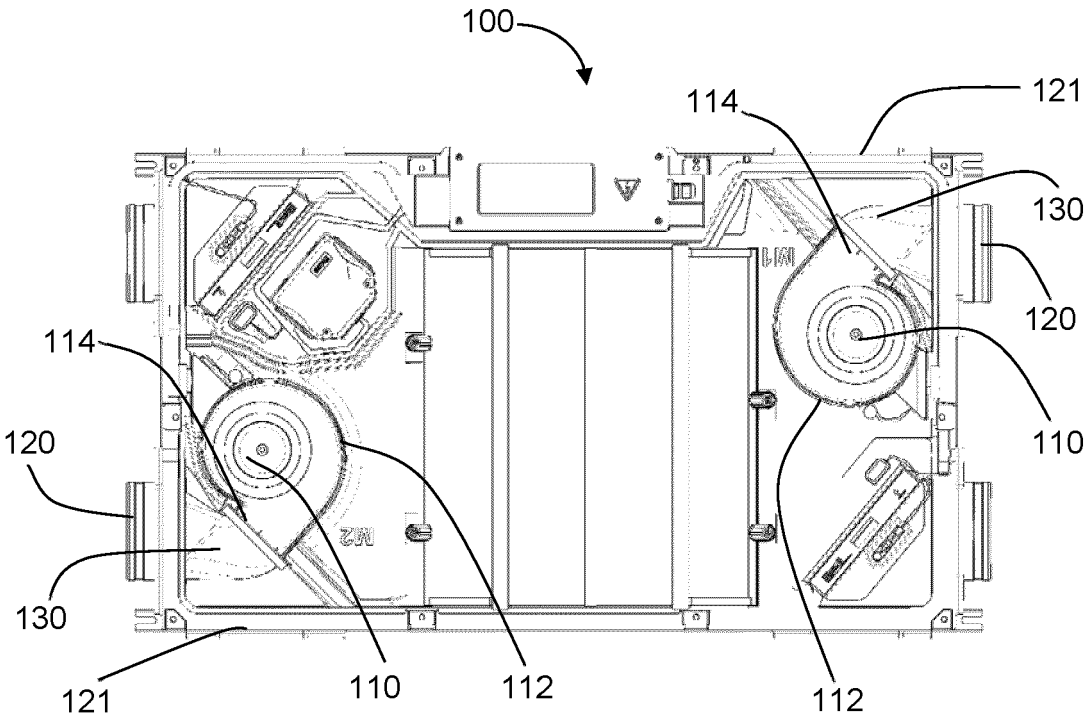
FIG. 3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112

FIG. 4

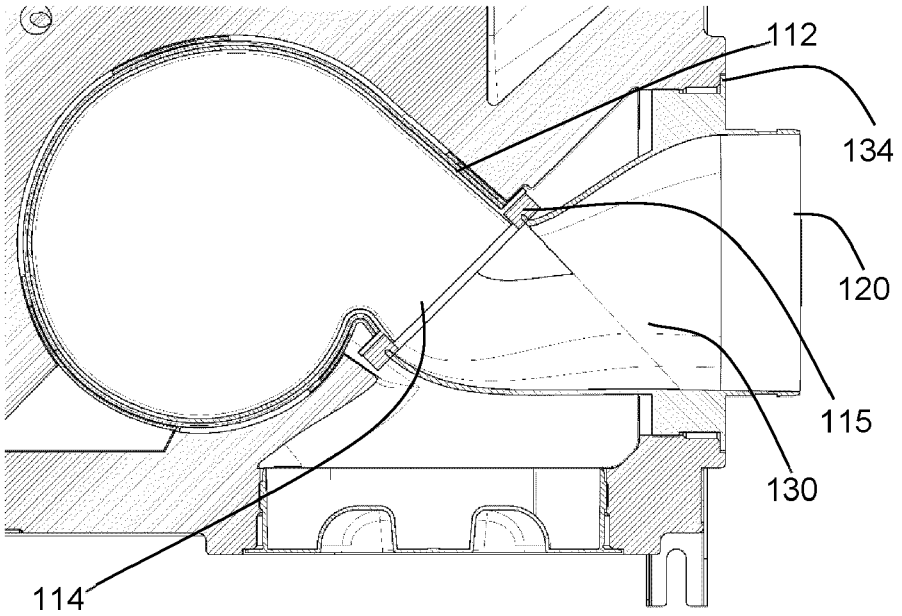

FIG. 5

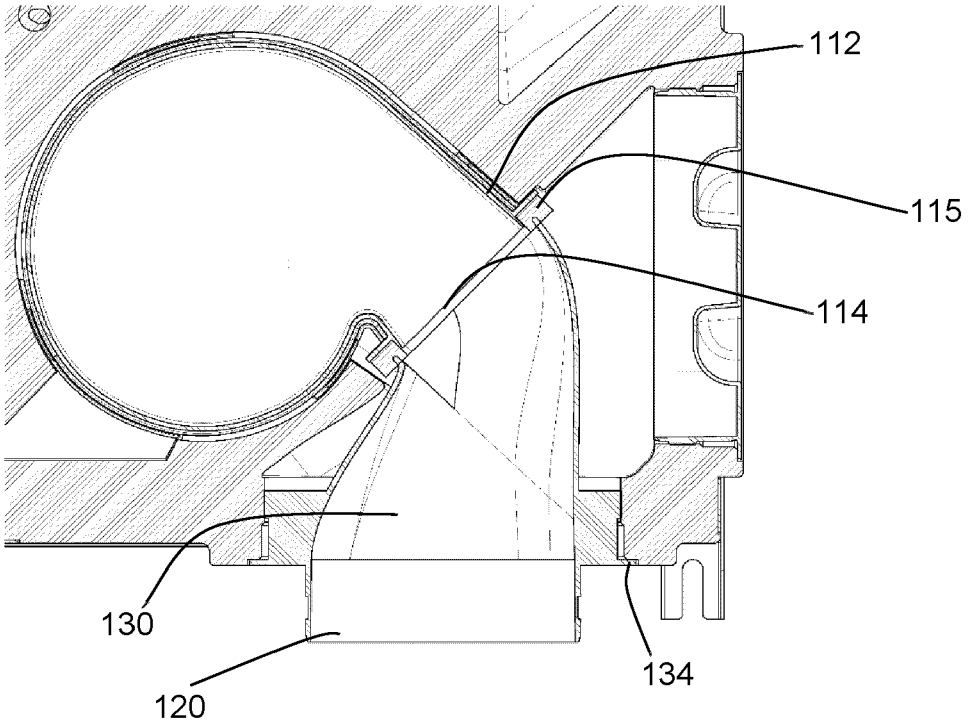

FIG. 6

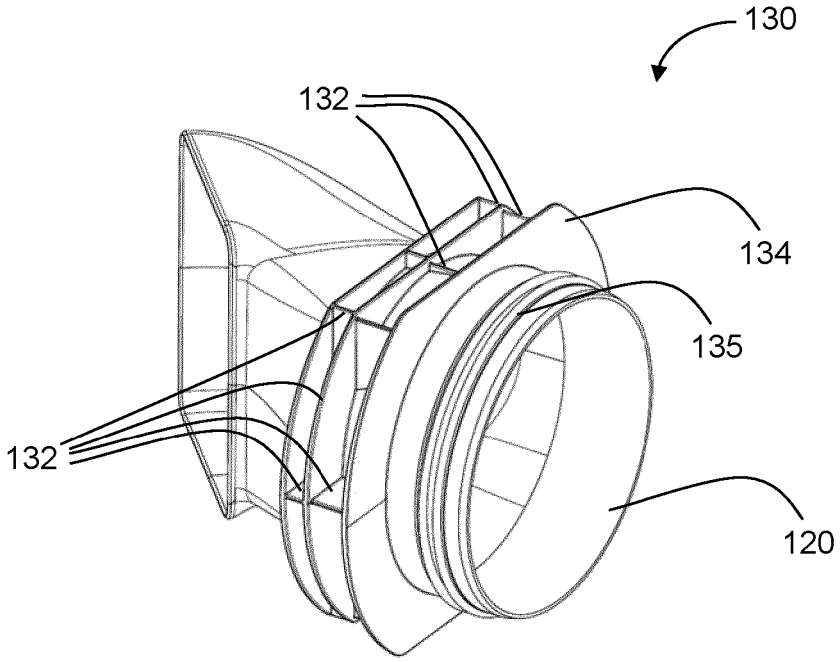

FIG. 7

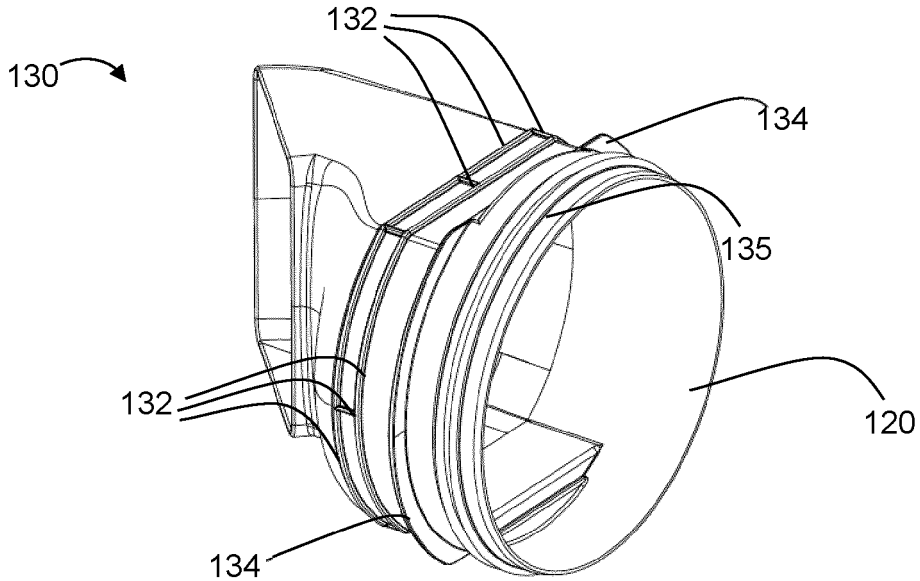

FIG. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 23 38 3105

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	WO 2014/020489 A1 (ELICA SPA [IT]) 6 February 2014 (2014-02-06) * figure 4 * * page 3, line 13 - page 7, line 11 *	1-9	
			TECHNICAL FIELDS SEARCHED (IPC) F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 February 2024	Arndt, Markus

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27-02-2024

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