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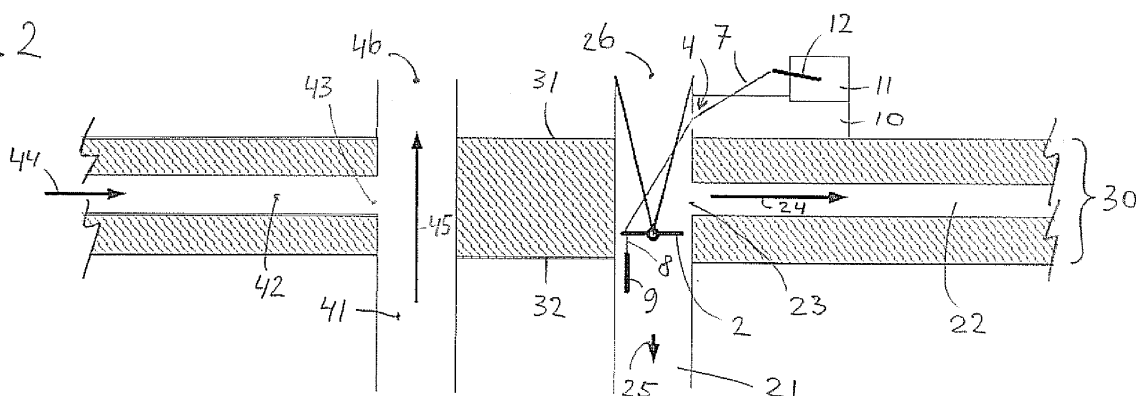
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(54) **Ventilation system for a building structure and method of installing a valve assembly in such a ventilation system.**

(57) A ventilation system for a building structure comprises a first air channel (21) extending from above an upper surface level (31) of a floor (30) to below a lower surface level (32) of said floor, a second air channel (22) which at a branch location (23) between said upper surface level and said lower surface level branches off from said first air channel and which at least partly extends

within said floor, and a valve assembly (1) comprising a controllably adjustable air flow restriction member (2) for adjusting the extent of restricting air flow through said first air channel, while not restricting air flow via said branch location. At least part of said valve assembly is extending between said upper surface level and said lower surface level.

Fig. 2



Description

[0001] The invention relates to a ventilation system for a building structure. Such a building structure may be of various kinds, such as a private house, an apartment building, a commercial and/or industrial building, an animal accommodation, a ship/offshore building structure, etcetera. More in particular the invention relates to a mechanical ventilation system, i.e. a ventilation system in which mechanical means, such as one or more ventilators, is/are arranged to pump polluted air out of the concerning building structure and/or to pump fresh air into the building structure. The invention also relates to a method of installing a valve assembly in such a ventilation system.

[0002] Nowadays, especially in case of larger buildings such as commercial and/or industrial buildings, increasing use is made of valves installed in air channel structures of mechanical ventilation systems of such buildings. Such valves serve the following purpose. As regards its mechanical ventilation system such a building has been subdivided into different areas, each such area comprising for example one or more rooms of the building. Each such area has one or more air inlets and/or air outlets of the air channel structure of the mechanical ventilation system for pumping fresh air into that area and/or pumping polluted air out of that area. In dependence of the different demands for fresh air in the different areas, respectively, the different areas can be ventilated differently by adjusting the valves. Said demands for fresh air can for example be determined by means of sensors that detect characteristics of the existent air quality in the different areas. Adjusting the valves can for example be controlled automatically based upon the detection results delivered by the sensors.

[0003] Application of such "demand controlled" mechanical ventilation systems, said demand being area-dependent as explained, provides the advantage that effective ventilation is achieved with low energy consumption and low noise production. The reason is that less energy and noise, required and caused by ventilators, is wasted for refreshing air in those areas of the building that do not need such air refreshment. Furthermore, energy losses due to unnecessary heat exchange between the inside and outside of a building are prevented.

[0004] In case of larger buildings, such demand controlled area-dependent mechanical ventilation systems are in general relatively practicable as regards their installation and maintenance. The reason is that larger buildings generally have relatively large structures, in which the air channel structures are relatively exposed and therefore relatively easily accessible for mounting of valve assemblies to the air channels and for repairing and replacing of broken valve assemblies. In such cases, a valve assembly box is interposed, in an insertion direction which is transverse to the longitudinal direction of an air channel, in an interspace in-between a longitudinal interruption of the air channel and is connected at its one end to

the longitudinal end of one of the two longitudinally interrupted air channel sections and at its other end to the longitudinal end of the other of the two longitudinally interrupted air channel sections. Such a valve assembly box can easily be installed and is easily accessible and removable for repair and replacement.

[0005] In case of dwellings, the application of such demand controlled area-dependent mechanical ventilation systems has already been suggested, as disclosed in EP1795822A2. However, in dwellings the application of such demand controlled mechanical ventilation systems has so far hardly been used, since it is in general highly unpracticable as regards the installation and maintenance of such systems. The reason is that in modern dwellings the air channel structures of mechanical ventilation systems are generally unexposed. That is, in a modern dwelling such air channels are generally so designed as to be hidden as much as possible. Often, horizontal air channels are hidden within storey dividing floors of the dwelling, these horizontal air channels being embedded in poured concrete, while vertical air channels are hidden within vertical shafts or the like, such shafts or the like being covered by plastered plasterboards. Therefore the accessibility of these systems for mounting of valve assemblies to the air channels and for repairing and replacing of broken valve assemblies is very poor.

[0006] It is an object of the invention to provide a solution according to which, especially in dwellings but also in other building structures, demand controlled area-dependent mechanical ventilation systems can easily be realized and accessed for maintenance, while preventing exposed air channels in such a building structure.

[0007] For that purpose the invention provides a ventilation system for a building structure, said ventilation system comprising:

- at least one air channel structure which comprises at least one first air channel extending within the building structure from above an upper surface level of a storey dividing floor of the building structure to below a lower surface level of said floor, and at least one second air channel which at a branch location between said upper surface level and said lower surface level branches off from said first air channel and which at least partly extends within said floor; and
- at least one valve assembly comprising a controllably adjustable air flow restriction member which is at least partly extending within said first air channel for adjusting the extent of restricting air flow through said first air channel in a first direction from above said upper surface level to below said lower surface level, or vice versa, while not restricting air flow via said branch location in a second direction from said first air channel to said second air channel, or vice versa;

wherein at least part of said valve assembly is extending between said upper surface level and said lower surface level.

[0008] The invention may also be embodied in a method of installing a valve assembly in a ventilation system for a building structure,

said ventilation system comprising at least one air channel structure which comprises at least one first air channel extending within the building structure from above an upper surface level of a storey dividing floor of the building structure to below a lower surface level of said floor, and at least one second air channel which at a branch location between said upper surface level and said lower surface level branches off from said first air channel and which at least partly extends within said floor;

said valve assembly comprising a controllable air flow restriction member; and

said method comprising installing said controllable air flow restriction member in such manner that, after said installing the valve assembly, said controllable air flow restriction member is at least partly extending within said first air channel for adjusting the extent of restricting air flow through said first air channel in a first direction from above said upper surface level to below said lower surface level, or vice versa, while not restricting air flow via said branch location in a second direction from said first air channel to said second air channel, or vice versa; and said method further comprising inserting at least part of said valve assembly into said first air channel in longitudinal direction of said first air channel and via a longitudinal end opening of said first air channel in such manner that, after said installing the valve assembly, at least part of said valve assembly is extending between said upper surface level and said lower surface level.

[0009] Hence, according to the invention, after installing the valve assembly, at least part of the valve assembly is extending in an area between the upper surface level of said floor and the lower surface level of said floor, i.e. an area where also said branch location of the second air channel, which extends within said floor, is situated.

[0010] Note that, of all areas, such a location is the least exposed area of the first air channel. That is, because of the lateral presence of parts of the floor, that location is totally unaccessible for a valve assembly box to be interposed, in an insertion direction which is transverse to the longitudinal direction of the first air channel, in an interspace in-between a longitudinal interruption of the first air channel, which is the usual way of inserting valve assemblies in the exposed air channel structures of larger buildings, as described above. Therefore, the skilled person would not consider such an area as an option for installing the valve assembly in the first air channel.

[0011] However, the inventors of the present invention have found out that inserting at least part of the valve assembly into said first air channel in longitudinal direction of said first air channel and via a longitudinal end opening of said first air channel appeared to be a practicable solution in many cases, such as in many dwellings. Such a longitudinal end opening of said first air channel may for example be realized closely above the

upper surface level of said floor.

[0012] For example, in many dwellings a ventilation device, having one or more ventilators and being connected to an air inlet and/or an air outlet extending through the roof of the dwelling for connecting the air channel structure with the outside environment of the dwelling, is located in the attic/upper storey of the dwelling. This ventilation device connects with the first air channel which vertically passes through the floor of the attic/upper storey, wherein the branch location for such a second air channel, as mentioned above, is located within said floor. Between this ventilation device and the floor of the attic/upper storey the first air channel often is relatively exposed. This relatively exposed part of the first air channel may be provided with a transversely removable longitudinal section of the first air channel in order to temporarily obtain the abovementioned longitudinal end opening of said first air channel closely above the upper surface level of said floor. Via this end opening at least part of said valve assembly may be longitudinally inserted into said first air channel in such manner that after this insertion at least part of the controllably adjustable air flow restriction member extends into the first air channel beyond the branch location where the second air channel branches off from the first air channel. After installation of the valve assembly, the transversely removable longitudinal section of the first air channel in the attic/upper storey of the dwelling may be refitted again. Also in cases of maintenance of an already installed valve assembly, the transversely removable longitudinal section of the first air channel in the attic/upper storey of the dwelling can be removed, the valve assembly taken out of the first air channel, repaired or replaced, and the longitudinal section of the first air channel in the attic/upper storey be refitted again.

[0013] Specific embodiments of the invention are set forth in the appended dependent claims.

[0014] In a preferable embodiment of the invention said valve assembly further comprises a connecting structure connecting distal portions of said valve assembly, said distal portions comprising at least part of said controllable air flow restriction member, with proximal portions of said valve assembly, said proximal portions being situated on one side of said branch location as seen in longitudinal direction of said first air channel, said one side being referred to as the proximal side of said branch location, and said distal portions being situated on the other, opposite side of said branch location as seen in said longitudinal direction of said first air channel, said other, opposite side being referred to as the distal side of said branch location. An advantage of such a connecting structure and such proximal portions of said valve assembly is that thereby ample space is provided at the location of said air flow restriction member for an effective air flow past said air flow restriction member in conditions where said air flow restriction member is not restricting air flow through said first air channel to its maximum possible extent.

[0015] In a further preferable embodiment of the invention said connecting structure comprises at least part of a mounting structure for mounting the valve assembly relative to said air channel structure, said mounting structure being held in position relative to the first air channel, by being fastened, by being suspended, by being clamped, or otherwise, at said proximal side of said branch location, and said controllable air flow restriction member being held by said mounting structure at said distal side of the branch location. An advantage of such a mounting structure being held in position relative to the first air channel at the proximal side of the branch location is ease of installing the valve assembly when inserting at least part of it into the first air channel via said longitudinal end opening of the first air channel, and, vice versa, ease of de-installing the valve assembly.

[0016] In another further preferable embodiment of the invention said connecting structure comprises at least part of a control and/or actuating structure for controlling and/or actuating said controllable air flow restriction member, said control and/or actuating structure extending from said proximal side of said branch location to said distal side of the branch location. This offers the advantage that the control and/or actuating structure of the valve assembly is easily accessible.

[0017] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter, by way of non-limiting examples only, with reference to the schematic drawing, in which:

Fig. 1 shows an example of an embodiment of a ventilation system according to the invention in cross sectional view through a storey dividing floor of a building structure;

Fig. 2 shows the example of Fig. 1 once again, however, in another condition of the shown valve assembly of the shown ventilation system; and

Fig. 3 shows part of the valve assembly shown in Figs. 1 and 2 in perspective view.

[0018] In Figs. 1 and 2 the storey dividing floor is indicated by reference numeral 30. The floor 30 has an upper exterior surface at the indicated upper surface level 31 and a lower exterior surface at the indicated lower surface level 32.

[0019] In the shown example the floor 30 is a storey dividing floor of a dwelling having three successive storeys, i.e. a lowermost storey (ground floor), an uppermost storey (attic) and an intermediate storey (first floor) in between the ground floor and the attic. The shown storey dividing floor 30 divides the attic, substantially located directly above the upper surface level 31 of the shown floor 30, from the first floor, substantially located directly below the lower surface level 32 of the shown floor 30. For simplicity, the storey dividing floor between the first floor and the ground floor has not been shown in Figs. 1 and 2.

[0020] The shown ventilation system for the dwelling comprises an air channel structure 20, basically shown in the right-hand sides of Figs. 1 and 2. The air channel structure 20 comprises a first air channel 21 which in its shown trajectory is extending substantially in vertical direction through the floor 30 from above the upper surface level 31 to below the lower surface level 32. The air channel structure 20 furthermore comprises a second air channel 22, which in its shown trajectory is extending substantially in horizontal direction through the floor 30 and which at a branch location 23 between the upper surface level 31 and the lower surface level 31 branches off from the first air channel 21.

[0021] In the example, the ventilation system furthermore comprises a ventilation device located in the attic of the dwelling. This ventilation device is connected to an air inlet extending through the roof of the dwelling for connection with the outside environment of the dwelling. Also, the ventilation device is connected to the first air channel 21. The ventilation device has a ventilator which is arranged for sucking in fresh air, via said air inlet, from the outside environment of the dwelling and thrusting said fresh air into the first air channel in the direction of arrow 25 indicated in Fig. 1. For simplicity the ventilation device and said air inlet have not been shown in Figs. 1 and 2.

[0022] In the example, the second air channel 22 has one or more ends, facing away from its end at the branch location 23, which form one or more air outlets on the first floor of the dwelling for spreading the sucked in fresh air over the first floor. The flow direction of the sucked in fresh air within the second air channel 22 towards such an air outlet of the second air channel 22 has been indicated in Figs. 1 and 2 by arrow 24. Furthermore, the first air channel 21 is extending further in downward direction of Figs. 1 and 2 through a further, lower storey dividing floor, between the first floor and the ground floor, and ends in one or more air outlets on the ground floor of the dwelling for spreading the sucked in fresh air over the ground floor. The flow direction of the sucked in fresh air within the first air channel 21 towards such an air outlet of the first air channel 21 has been indicated in Figs. 1 and 2 by arrow 25. For simplicity this further trajectory of the first air channel 2 has not been shown in Figs. 1 and 2.

[0023] The shown ventilation system furthermore comprises a valve assembly 1, which in the shown example is of the butterfly valve type. The valve assembly 1 has an air flow restriction member 2 which is rotatable via a rotation axis 3, as indicated by double arrow 14 in Fig. 3. The rotation axis 3 is mounted on wires 5, 6.

[0024] As shown in Figs. 1 and 2, the rotation axis 3 is located in the first air channel 21 just below the branch location 23 and is oriented substantially in transverse direction to the longitudinal direction of the first air channel 21. In Fig. 1 the air flow restriction member 2 is in a rotation position that corresponds to a condition in which the extent of restricting air flow through the first air channel 21 in a first direction from above the upper surface level 31 to below said lower surface level 32, or vice versa,

sa, is a minimum as allowed by the air flow restriction member 2 (maximally opened condition of the butterfly valve). In Fig. 2 the air flow restriction member 2 is in a rotation position that corresponds to a condition in which said extent of restricting air flow is a maximum as allowed by the air flow restriction member 2 (maximally closed condition of the butterfly valve). Note that in the different rotation positions of the air flow restriction member 2, the air flow restriction member 2 is not restricting air flow via the branch location 23 in a second direction from the first air channel 21 to the second air channel 22, or vice versa. It is remarked that the rotation axis 3 and the air flow restriction member 2 may be located farther downward in the first air channel 21, for example far below the lower surface level 32.

[0025] In the shown example, a proximal side and a distal side of the branch location 23 are defined, in the sense of the direction 25 of the abovementioned sucked in fresh air flow in the first air channel 21, as the upstream side and downstream side, respectively, of the branch location 23. As seen in Figs. 1 and 2 and as explained further below, the valve assembly 1 further comprises two different connecting structures, each of which is connecting distal portions of the valve assembly 1, these distal portions being situated at said distal side of the branch location 23 and comprising at least part of the controllable air flow restriction member 2, with proximal portions of said valve assembly, these proximal portions being situated at said proximal side of the branch location 23.

[0026] In the shown example, one of the abovementioned two different connecting structures is at least part of a mounting structure for mounting the valve assembly 1 relative to the air channel structure 20. In the example this mounting structure comprises the abovementioned two wires 5, 6. In Figs. 1 and 2 it is seen that the construction of the air flow restriction member 2 and rotation axis 3 is held by the two wires 5, 6 at the distal side of the branch location 23. The two wires 5, 6 are held in position relative to the first air channel 21 by being suspended from the surrounding edge of a longitudinal end opening 26 of the first air channel 21 at the proximal side of the branch location 23. This suspension is realized by means of hooked ends of the wires 5, 6. Fig. 3 shows these hooked ends. These wires 5, 6 provide ease of installing the valve assembly 1 when at least part of it is inserted into the first air channel 21 via the longitudinal end opening 26 of the first air channel 21. Vice versa, these wires 5, 6 provide ease of de-installing the valve assembly 1 in reverse direction to the direction of said insertion. Note that at least part of the valve assembly 1 is extending between the upper surface level 31 and the lower surface level 32 in that at least part of the mounting structure, more specifically at least part of the wires 5, 6, is extending between the upper surface level 31 and the lower surface level 32.

[0027] In the shown example, the other one of the abovementioned two different connecting structures is

at least part of a control and/or actuating structure for controlling and/or actuating the controllable air flow restriction member 2, said control and/or actuating structure extending from said proximal side of said branch location 23 to said distal side of the branch location 23. In the example this control and/or actuating structure comprises a first cord 7, a second cord 8, a counterweight 9, a control unit 10, an actuating (servo) motor 11 and an actuating lever 12 being driven by said motor 11. The first cord 7 connects the air flow restriction member 2 with the actuating lever 12, wherein the first cord 7 extends through an opening 4 in the wall of the first air channel 21. The second cord 8 connects the air flow restriction member 2 with the counterweight 9. By actuating the motor 11, controlled by the control unit 10, the lever 12 can be moved so as to draw or ease the first cord 7 whereby, with the help of the counterweight 9, the position of the air flow restriction member 2 can be adjusted. Note that at least part of the valve assembly 1 is extending between the upper surface level 31 and the lower surface level 32 in that at least part of the control and/or actuating structure, more specifically at least part of the first cord 7, is extending between the upper surface level 31 and the lower surface level 32.

[0028] It is remarked that the ventilation system as explained above may also be applied when the abovementioned ventilator of the ventilation device is exhausting polluted air to the outside environment of the dwelling instead of sucking in fresh air from said outside environment.

[0029] Also the ventilation device may have at least two ventilators, at least one of which is exhausting polluted air to the outside environment of the dwelling and at least one other one of which is sucking in fresh air from said outside environment. Such a situation is illustrated with reference to the additional air channel structure basically shown in the left-hand sides of Figs. 1 and 2. There, the reference numerals 40, 41, 42, 43 and 46, respectively, indicate parts similar to the air channel structure 20, the first air channel 21, the second air channel 22, the branch location 23, and the end opening 26, respectively, shown in the right-hand sides of Figs. 1 and 2. In fact, the channel configuration in the left-hand sides of Figs. 1 and 2 is a mirror image relative to that in the right-hand sides of Figs. 1 and 2, with respect to a vertical mirroring plane.

[0030] However, since the situation in the left-hand sides of Figs. 1 and 2 relates to exhausting polluted air to the outside environment, the air flow arrows 44 and 45 have been drawn in directions properly adjusted relative to the air flow arrows 24 and 25. For use in connection with air channel structure 40, a similar valve assembly as the valve assembly 1 may be installed. After installation, the location of that similar valve assembly in the left-hand sides of Figs. 1 and 2 may be similar to that of the valve assembly 1, for example a mirror image relative to that in the right-hand sides of Figs. 1 and 2, with respect to a vertical mirroring plane.

[0031] In the foregoing specification, the invention has been described with reference to specific examples of embodiments of the invention. It will, however, be evident that various modifications and changes may be made therein without departing from the broader scope of the invention as set forth in the appended claims.

[0032] For example, instead of the butterfly valve type, a wide variety of other valve types are possible. Also, various other types of the mounting structure, as well as various other types of the control and/or actuating structure are possible. Furthermore, the first and second air channels may have various shapes, such as circular, oval, polygonal (e.g. rectangular, square, etc.), etc., and the shapes of the air flow restriction members may be adapted to such cross sectional shapes of the first air channel.

[0033] Furthermore it is possible that, instead of a configuration as explained with reference to Figs. 1 and 2, the ventilator device is situated in a lower storey than the storeys that have to be ventilated. In such a case the configuration of the air channel structures and the valve assemblies can be a mirror image relative to that of Figs. 1 and 2, with respect to a horizontal mirroring plane. Note that in such a mirrored configuration the valve assembly will be oriented in "upside-down" orientation relative to that of Figs. 1 and 2. Instead of holding two wires in position relative to the first air channel by being suspended, by means of hooked ends of the wires, from the surrounding edge of a longitudinal end opening of the first air channel at the proximal side of the branch location, various other ways of holding the mounting structure of the valve assembly in position relative to the first air channel may be applied then.

[0034] Also, further parts of the control and/or actuating structure, such as the control unit 10 or the actuating motor 11, may be located inside the first air channel, instead of outside the first air channel. In such cases an electrical energy source, such as a battery, may for example still be located outside the first air channel, for example by means of one or more electric cables, which cables then are part of the control and/or actuating structure.

[0035] However, other modifications, variations and alternatives are also possible. The specifications and drawings are, accordingly, to be regarded in an illustrative rather than in a restrictive sense.

Claims

1. Ventilation system for a building structure, said ventilation system comprising:

- at least one air channel structure (20) which comprises at least one first air channel (21) extending within the building structure from above an upper surface level (31) of a storey dividing floor (30) of the building structure to below a low-

er surface level (32) of said floor (30), and at least one second air channel (22) which at a branch location (23) between said upper surface level and said lower surface level branches off from said first air channel and which at least partly extends within said floor; and

- at least one valve assembly (1) comprising a controllably adjustable air flow restriction member (2) which is at least partly extending within said first air channel (21) for adjusting the extent of restricting air flow through said first air channel in a first direction from above said upper surface level (31) to below said lower surface level (32), or vice versa, while not restricting air flow via said branch location (23) in a second direction from said first air channel (21) to said second air channel (22), or vice versa;

characterized in that at least part of said valve assembly (1) is extending between said upper surface level (31) and said lower surface level (32).

2. Ventilation system according to claim 1, wherein said valve assembly (1) further comprises a connecting structure connecting distal portions of said valve assembly, said distal portions comprising at least part of said controllable air flow restriction member (2), with proximal portions of said valve assembly, said proximal portions being situated on one side of said branch location (23) as seen in longitudinal direction of said first air channel (21), said one side being referred to as the proximal side of said branch location, and said distal portions being situated on the other, opposite side of said branch location (23) as seen in said longitudinal direction of said first air channel (21), said other, opposite side being referred to as the distal side of said branch location.
3. Ventilation system according to claim 2, wherein said connecting structure comprises at least part of a mounting structure (5, 6) for mounting the valve assembly (1) relative to said air channel structure (20), said mounting structure (5, 6) being held in position relative to the first air channel (21), by being fastened, by being suspended, by being clamped, or otherwise, at said proximal side of said branch location (23), and said controllable air flow restriction member (2) being held by said mounting structure (5, 6) at said distal side of the branch location (23).
4. Ventilation system according to claim 2 or 3, wherein said connecting structure comprises at least part of a control and/or actuating structure (7, 8, 9, 10, 11, 12) for controlling and/or actuating said controllable air flow restriction member (2), said control and/or actuating structure extending from said proximal side of said branch location (23) to said distal side

of the branch location (23).

5. Method of installing a valve assembly (1) in a ventilation system for a building structure, said ventilation system comprising at least one air channel structure (20) which comprises at least one first air channel (21) extending within the building structure from above an upper surface level (31) of a storey dividing floor (30) of the building structure to below a lower surface level (32) of said floor, and at least one second air channel (22) which at a branch location (23) between said upper surface level and said lower surface level branches off from said first air channel and which at least partly extends within said floor; said valve assembly comprising a controllable air flow restriction member (2); and said method comprising installing said controllable air flow restriction member in such manner that, after said installing the valve assembly, said controllable air flow restriction member is at least partly extending within said first air channel for adjusting the extent of restricting air flow through said first air channel in a first direction from above said upper surface level to below said lower surface level, or vice versa, while not restricting air flow via said branch location in a second direction from said first air channel to said second air channel, or vice versa; **characterized by** inserting at least part of said valve assembly (1) into said first air channel (21) in longitudinal direction of said first air channel and via a longitudinal end opening (26) of said first air channel in such manner that, after said installing the valve assembly, at least part of said valve assembly is extending between said upper surface level (31) and said lower surface level (32).

6. Method according to claim 5, wherein:

said valve assembly (1) further comprises a connecting structure connecting distal portions of said valve assembly, said distal portions comprising at least part of said controllable air flow restriction member (2), with proximal portions of said valve assembly; and said inserting of said at least part of said valve assembly into said first air channel (21) is performed in such manner that, after said installing the valve assembly, said proximal portions are situated on one side of said branch location (23) as seen in longitudinal direction of said first air channel, said one side being referred to as the proximal side of said branch location, and said distal portions are situated on the other, opposite side of said branch location as seen in said longitudinal direction of said first air channel, said other, opposite side being referred to as the distal side of said branch location.

7. Method according to claim 6, wherein:

said connecting structure comprises at least part of a mounting (5, 6) structure for mounting the valve assembly (1) relative to said air channel structure (20); and said inserting of said at least part of said valve assembly into said first air channel (21) is performed in such manner that, after said installing the valve assembly, said mounting structure is held in position relative to the first air channel, by being fastened, by being suspended, by being clamped, or otherwise, at said proximal side of said branch location (23); and said controllable air flow restriction member (2) is held by said mounting structure at said distal side of the branch location.

8. Method according to claim 6 or 7, wherein:

said connecting structure comprises at least part of a control and/or actuating structure (7, 8, 9, 10, 11, 12) for controlling and/or actuating said controllable air flow restriction member (2); and said inserting of said at least part of said valve assembly (1) into said first air channel (21) is performed in such manner that, after said installing the valve assembly, said control and/or actuating structure is extending from said proximal side of said branch location (23) to said distal side of the branch location.

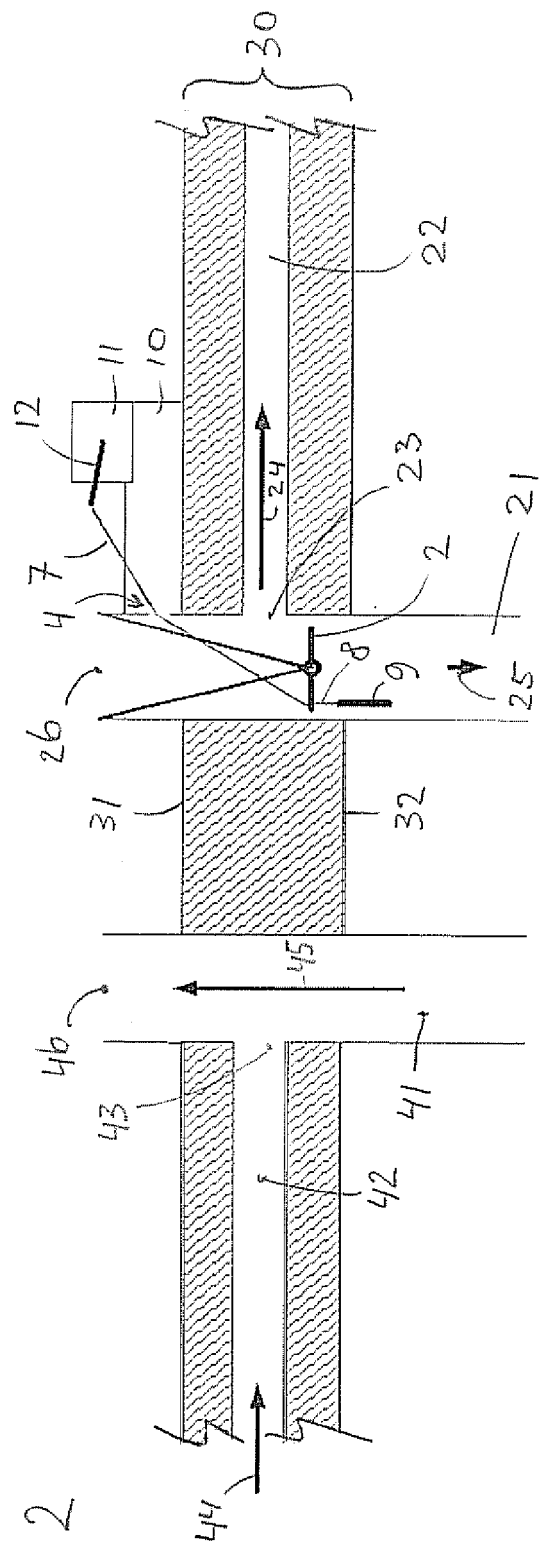
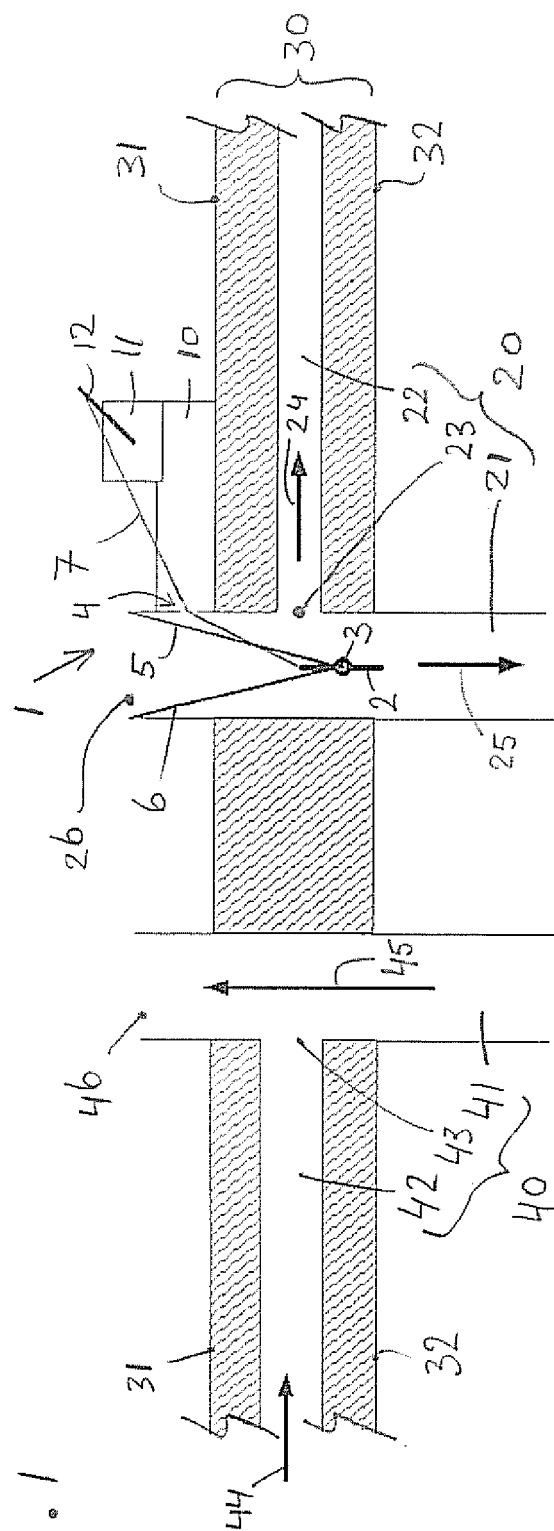
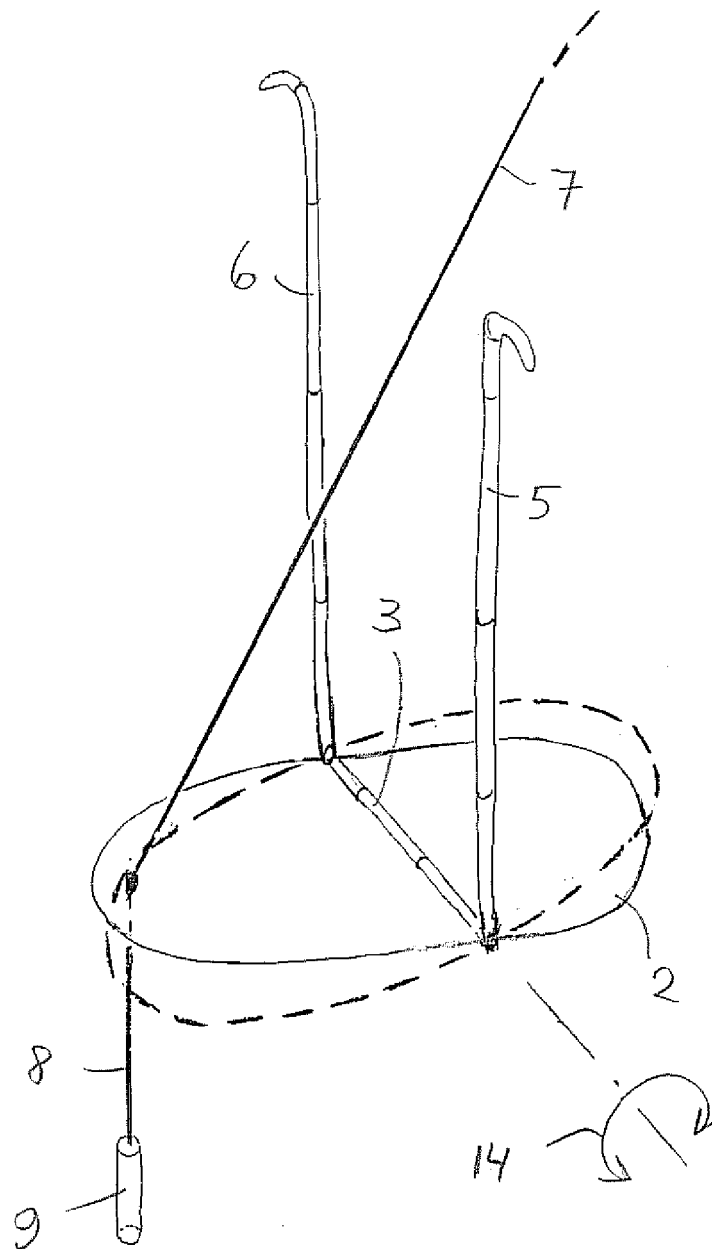


Fig.3





EUROPEAN SEARCH REPORT

Application Number
EP 11 17 1521

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 6 346544 A (OHBAYASHI CORP) 20 December 1994 (1994-12-20) * paragraph [0012] - paragraph [0027]; figures 4,5 *	1-8	INV. F24F13/02 F24F13/14
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A	JP 10 197044 A (KURIMOTO LTD) 31 July 1998 (1998-07-31) * abstract; figures *	4,8	
			TECHNICAL FIELDS SEARCHED (IPC)
			F24F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 December 2011	Examiner González-Granda, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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