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(54) **Backflow protection apparatus for ventilation device**

(57) The invention relates to A backflow protection apparatus (1) for an air ventilator (2). The air ventilator (2) comprises a first air inlet (2.1), an air outlet (2.2), and an air channel (2.3) to enable air flow between the first air inlet (2.1) and the air outlet (2.2). The backflow protection apparatus (1) comprises a backflow trap (1.1) having a first edge (1.1.1) and a second edge (1.1.2) and a convex surface between said first edge (1.1.1) and said second edge (1.1.2). The backflow protection apparatus (1) further comprises an installation element (1.2), which comprises a support element (1.2.2) for supporting the backflow trap (1.1) at said first edge (1.1.1).

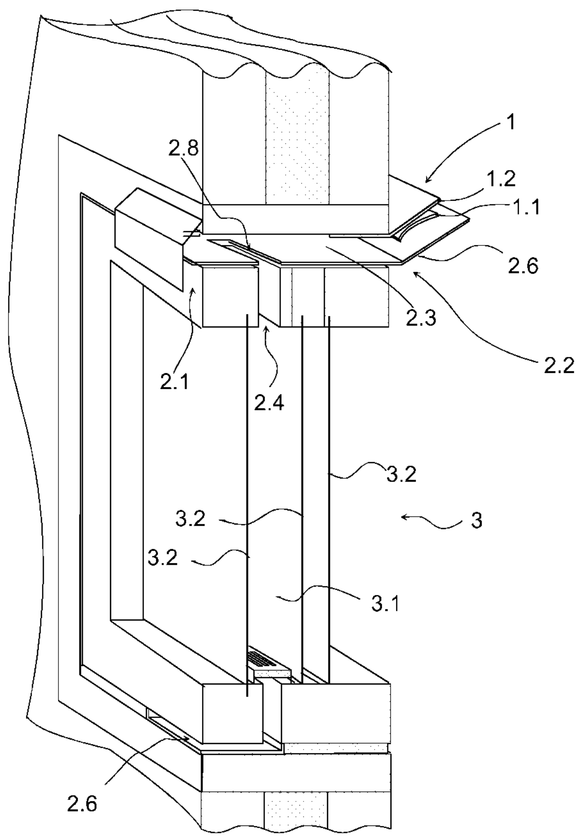

Fig. 6

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Description

Field of the Invention

[0001] The present invention relates to a backflow protection apparatus for an air ventilator which comprises a first air inlet, an air outlet, and an air channel to enable air flow between the first air inlet and the air outlet. The invention also relates to an air ventilator comprising the backflow protection apparatus.

Background of the Invention

[0002] Air ventilators are known which can be used to input replacement air from outside to a room to improve the air quality in the room. Air ventilators are known which can be installed above a window, either in the frame of the window or in a narrow space (slit) just above the frame of the window. These kinds of air ventilators usually have an internal air channel for guiding the incoming air to a certain direction in the room when the air leaves the air ventilator. The direction is e.g. partly upwards and partly sidewards from the window so that the air flow is not perpendicular to the plane of the window. For example, the publication EP 0 801 275 discloses such an air ventilator which can be installed in a narrow slit above a window.

[0003] The above describer air ventilators do not have fans or other means which would force the air to flow from outdoors to the room. The operation of such air ventilators is based on a pressure difference between the room and outdoor air. When there is underpressure in the room, that is, the air pressure in the room is lower than the pressure of the outdoor air, air flows through the air ventilator from outdoors to inside the room. The underpressure is typically generated in the room by an exhaust fan which blows air from the room to outdoors. However, sometimes it may happen that the pressure difference between the room and outdoor air becomes very low or even that the room will become overpressurized i.e. the air pressure in the room is greater than outdoor air pressure.

[0004] Prior art air ventilators which can be installed in a slit above a window do not usually have backflow protection which works well enough also with small pressure differences. For example, a prior art backward protection is based on a narrow cloth, which is positioned in the air channel. In normal operation the air flow in the air channel makes the cloth to tend a little so that the air can flow in the air channel. However, such a cloth induces resistance to the air flow and decreases the efficiency of the air ventilator. Further, the cloth may not properly close the air channel when the pressure difference decreases or when the room is slightly overpressurized compared to the outdoor air pressure. Therefore, such prior art backflow protectors tend to remain open and they only operate properly when the overpressure in the room becomes big enough. This can cause that air flow may be reversed in the air ventilator meaning that replacement air is not flowing from outdoors to the room through the air ventilator but the air may flow from the room to outdoors through the air ventilator.

Summary of the Invention

[0005] An aim of the present invention is to provide a backflow protection apparatus for an air ventilator. The invention is based on the idea that a backflow trap is formed of a sheet like material and positioned near the air outlet of the air ventilator so that incoming air makes the backflow trap move so that the air channel is not trapped by the backflow trap. When the pressure in the room is almost the same or greater than the outdoor air pressure, the backflow trap will substantially close the air channel of the air ventilator preferably at the air outlet. The backflow trap is advantageously formed as a curved sheet to further improve the operation of the backflow protecting apparatus especially when the pressure difference between the room air and outdoor air is small. Preferably, the backflow trap is not fixed or hinged to the air ventilator but it is a kind of a floating element.

[0006] According to a first aspect of the present invention there is provided a backflow protection apparatus for an air ventilator which air ventilator comprises a first air inlet, an air outlet, and an air channel to enable air flow between the first air inlet and the air outlet, characterised in that the backflow protection apparatus comprises:

- a backflow trap having a first edge and a second edge and a convex surface between said first edge and said second edge; and
- an installation element comprising a support element for supporting the backflow trap at said first edge.

[0007] According to an advantageous embodiment of the present invention the width of the support element is approximately the same than the width of the backflow trap in the longitudinal direction. The support element of this embodiment is preferably formed by pending the same sheet of which the installation element is formed. Therefore, no holes need to be made to form the support element. In this kind of structure the formation of the support element does not induce slits or holes through which air could unintentionally flow and weaken the operation of the backflow trap.

[0008] The backflow protection apparatus according to the present invention improves the operation of air ventilators of prior art by preventing or at least reducing the backflow through the air ventilator. The operation of the backflow protection apparatus according to the present invention is automatic and does not need any external power sources or manual adjustment.

Description of the Drawings

[0009] In the following the present invention will be described in more detail with reference to the attached drawings in which

Fig. 1 depicts a wall of a room and an air ventilator installed above a window in the room,

Fig. 2a depicts an advantageous embodiment of the backflow protection apparatus as a perspective view from bottom side,

Fig. 2b depicts an advantageous embodiment of a preform for the backflow protection apparatus,

Fig. 2c depicts a cross-sectional side view of an advantageous embodiment of the backflow protection apparatus according to the present invention installed in the air ventilator above a window,

Fig. 2d depicts as a perspective view an example embodiment of the backflow trap according to the present invention,

Fig. 3 depicts as a side view an advantageous embodiment of the backflow protection apparatus attached with an air outlet of an air ventilator,

Fig.4 depicts from above a cross section of an example air ventilator in which the backflow protection apparatus according to the present invention is installed,

Figs. 5a-5d depict some details of the operation of the backflow protection apparatus according to the present invention,

Fig. 6 shows as a cross-sectional view the structure of a window and the frame at the location where an air ventilator of another embodiment is installed.

Fig. 7a depicts another advantageous embodiment of the backflow protection apparatus as a perspective view from bottom side,

Fig. 7b depicts another advantageous embodiment of a preform for the backflow protection apparatus, and

Fig. 7c depicts a cross-sectional side view of another advantageous embodiment of the backflow protection apparatus according to the present invention

Figs. 8a-8c depict some details of the operation of the backflow protection apparatus according to another embodiment of the present invention,

Fig. 9a depicts as a perspective view an example embodiment of the backflow protection apparatus according to the present invention combined with an air outlet of an air ventilator, and

Fig. 9b depicts the apparatus of Fig. 9a as a cross sectional view.

Detailed Description of the Invention

[0010] In the following, the structure of an advantageous embodiment of the backflow protection apparatus 1 for an air ventilator 2 according to the present invention will be described in more detail with reference to Fig. 2a. The backflow protection apparatus 1 comprises a backflow trap 1.1 and an installation element 1.2. The backflow trap 1.1 is a sheet like element preferably made of a thin metal sheet or a thin plastic sheet. The air channel in the air outlet 2.2 of the air ventilator 2 has a rectangular form in such a way that the height of the air channel is smaller than the width of the air channel. Therefore, the backflow trap 1.1 is a rectangular element so that the length of the backflow trap 1.1 is almost the same than the width of the air channel in the air outlet 2.2 of the air ventilator 2 and the width of the backflow trap 1.1 is greater than the height of the air channel in the air outlet 2.2 of the air ventilator 2. Hence, the backflow trap 1.1 can totally, or almost totally close the air channel inside the air outlet 2.2 of the air ventilator 2 to effectively prevent backflow through the air ventilator 2. This will be discussed in more detail below in this specification.

[0011] The backflow trap 1.1 is curved in the width direction of the backflow trap 1.1 i.e. the cross section of the backflow trap 1.1 is convex when looked at one narrower side of the backflow trap 1.1.

[0012] The installation element 1.2 of the backflow protection apparatus 1 is formed e.g. from a metal sheet or a plastic sheet. The sheet is punched or cut to form a preform 3. The preform 3 is then bent at certain locations (marked as dotted lines in Fig. 2b) to form the installation element 1.2. However, it is obvious that the installation element 1.2 can also be formed by fixing separate parts together. It is also possible to use injection molding technique in manufacturing the installation element 1.2. An advantageous embodiment of the installation element 1.2. comprises two end portions 1.2.1, which are formed e.g. by bending the material from which the installation element 1.2 is formed. However, the end portions 1.2.1 are not always necessary if the installation of the backflow protection apparatus 1 can be performed without using the end portions 1.2.1. The installation element 1.2 is also bent in the longitudinal direction so that the cross section has an angle • . This bending location is marked with the line A in Fig. 2b. The installation element 1.2 can also have one or more support elements 1.2.2, 1.2.3 which can be used as a guidance for the installation of the backflow trap 1.1. The support elements 1.2.2, 1.2.3 also keep the backflow trap 1.1 in proper position with respect to the air channel of the air outlet 2.2 of the air ventilator 2. The first support elements 1.2.2 prevents one edge of the backflow trap 1.1 dropping down when the backflow protection apparatus 1 has been installed in the air outlet 2.2 of the air ventilator 2. The backflow trap 1.1 is adapted to be rotatable e.g. by tilting with respect to the first support elements 1.2.2 by air flowing from the first air inlet 2.1 to the air outlet 2.2 of the air ventilator 2. Preferably, the backflow trap (1.1) is adapted to be rotatable between a first position and a second position. In the first position (Figs. 5a and 5c) the air channel of the outlet 2.2 of the air ventilator 2 is substantially closed and in the second position the air channel of the outlet 2.2 of the air ventilator 2 is open so that air can flow from the air channel 2.3 of the air ventilator 2 through the outlet 2.2. to the room.

[0013] According to a preferred embodiment of the present invention the backflow trap 1.1 is not fixed to the installation element 1.2, which enables the backflow trap 1.1 move easily in the backflow protection apparatus 1. However, to make the installation of the backflow protection apparatus 1 relatively easy at a construction site the backflow trap 1.1 should be installed to the installation element 1.2 at the manufacturing stage of the backflow protection apparatus 1. Therefore, the second support element 1.2.3 together with the first support elements 1.2.2 should keep the backflow trap 1.1 together with the installation element 1.2 when the backflow protection apparatus 1 is not yet installed in the air outlet 2.2 of the air ventilator 2. This can be achieved by selecting the dimensions of the first 1.2.2 and the second support elements 1.2.3 in such a way that the backflow trap 1.1 does not easily apart from the installation element 1.2. Fig. 2a shows one embodiment in which this point of view has been taken into account. However, also other ways to form these support elements 1.2.2, 1.2.3 can be found.

[0014] The backflow protection apparatus 1 is installed inside the air ventilator 2, preferably in the air outlet 2.2 of the air ventilator 2. In an advantageous embodiment the backflow protection apparatus 1 is attached to the air ventilator in such a way that the narrow slits 1.4.1 in the side walls 1.4 are pushed towards the air guiding element 2.6 of the air outlet 2.2 until the slits 1.4.1 come into contact with the air guiding element 2.6 as shown in Fig. 3. Usually no other fixing means are needed to keep the backflow protection apparatus 1 attached with the air outlet 2.2 of the air ventilator 2. The air ventilator 2 also comprises a first air inlet 2.1 and one or more air channels 2.3 between the first air inlet 2.1 and the air outlet 2.2. An example embodiment of the air channels 2.3 are shown in Fig. 4.

[0015] The air ventilator 2 can also comprise a second air inlet 2.4 which can be used when the window 3 has an air channel 3.1 between two glasses 3.2. An example of this kind of embodiment is depicted in Fig. 6. Hence, the air ventilator 2 has two positions, one for summer (warmer days) and another for winter (colder days). The switching between these two positions can be made e.g. by horizontally moving the air guiding element 2.6. When the air ventilator 2 is set to the first position (the summer position), the second air inlet 2.4 is in a closed position and the first air inlet 2.1 is in an open position thus allowing the air flowing from the first air inlet 2.1 through the air channel 2.3 to the air outlet 2.2. On the other hand, When the air ventilator 2 is set to the second position (the winter position), the first air inlet 2.1 is in a closed position and the second air inlet 2.4 is in an open position thus opening an air channel 2.8 between the second air inlet 2.4 and the air channel 3.1 of the window thus allowing air flowing through the air channel 3.1 of the window to the air channel 2.3 of the air ventilator 2 and further to the air outlet 2.2. The air flowing through the air channel 3.1 of the window is usually warmer in winter than if the air flowed directly from the first air inlet 2.1 to the air outlet 2.2 because the room temperature warms the glasses 3.2 of the window, which warms air flowing between the glasses 3.2. In the winter position the air is flowing inside the window through the third air inlet 2.5.

[0016] The air ventilator 2 also has an air guiding element 2.6 which turns the air flow at least slightly upwards when the air flow exits the air outlet 2.2 of the air ventilator 2. This improves the air distribution in the room so that the air coming in the room does not drop down near the window but propagates farther from the window before dropping downwards. Further, the structure of the air channel 2.3 inside the air ventilator makes the air flow spreading at least slightly sidewards further improving the distribution of the air inside the room.

[0017] Next, the operation of the backflow protection apparatus 1 according to the present invention will be described in more detail with reference to Fig. 2c and Figs. 5a-5c. First, some terms are explained. The backflow trap 1.1 comprises two longer edges 1.1.1, 1.1.2 and two shorter edges 1.1.3, 1.1.4. The longer edges are substantially perpendicular to the air flow when the backflow protection apparatus 1 is installed in the air outlet 2.2 of the air ventilator 2 and there is a normal air flow in the air ventilator 2. One of the longer edges 1.1.1, 1.1.2 can further be named as a leading edge 1.1.1 and the other long edge can be names as a trailing edge 1.1.2. The leading edge 1.1.1 rests on the first support elements 1.2.2. The trailing edge 1.1.2 rests on the air guiding element 2.6 of the air ventilator 2 when there is no air flow through the air ventilator 2. This situation is also illustrated in Fig. 5a. The backflow trap 1.1 is curved in such a way that the upper surface 1.3.1 of the backflow trap 1.1 is convex upwards as can be seen e.g. from Figs. 5a-5c.

[0018] When the air pressure inside the room is lower than the outlet air pressure i.e. the room is underpressurized, the air flows from outdoors to the air channel 2.3

through the first air inlet 2.1 or through the second air inlet 2.4. From the air channel 2.3 the air flows to the air outlet 2.2 and reaches the backflow trap 1.1 as shown by the arrows F1, F2 in Fig. 5a. The force caused by air flow F1 makes the trailing edge 1.1.2 of the backflow trap 1.1 to rise thus opening the air channel of the air outlet 2.2. There is usually air flow also above the backflow trap 1.1 as shown by the arrow F2 in Fig. 5b. Because the upper surface 1.3.1 of the backflow trap 1.1 is convex upwards, the air flow F2 causes an uplift pressure to the backflow trap 1.1 thus further increasing the force which rises the trailing edge 1.1.2 of the backflow trap 1.1. This further reduces the resistance the backflow trap 1.1 may cause to the air flowing in the air ventilator 2.

[0019] In a situation in which the pressure difference between outdoors and indoors is almost zero, there is no air flow in the air ventilator 2, or the air flow is very weak. Hence, the backwards trap 1.1 returns to the rest position i.e. the trailing edge 1.1.2 is resting on the air guiding element 2.6 of the air ventilator 2. This closes the air channel of the air outlet 2.2 of the air ventilator 2. If the room becomes overpressurized, i.e. the air pressure in the room becomes greater than the air pressure outdoors, the air attempts to flow backwards (arrow F3 in Fig. 5c) from the air outlet 2.1 to the air inlet 2.1, 2.4. However, because the backflow trap 1.1 closes the air channel inside the air outlet 2.2, air can not flow to the air channel 2.3 of the air ventilator 2 thus backflow is prevented. The curved form of the backflow trap 1.1 now improves the tightness of the backflow protection apparatus 1 because the air flow coming from the room in the air outlet 2.2 pushes the trailing edge 1.1.2 of the backflow trap 1.1 towards the air guiding element 2.6 of the air ventilator 2. The air flow reaches the backflow trap 1.1 at angle · with respect to a horizontal plane (Fig. 5d). The greater the angle · the larger force is generated by the air pressure (and gravitation force) on the backflow trap 1.1. As a non-limiting example, the angle · is greater than 30°, advantageously greater or equal than 45 °.

[0020] The material of the backflow trap 1.1 should be rather light so that air flow can rise the trailing edge 1.1.2 of the backflow trap 1.1 when the direction of the air flow is normal, i.e. to the room. On the other hand, the backflow trap 1.1 should fall to the rest position when there is no air flow through the air ventilator 2. Therefore, the backflow trap 1.1 should be heavy enough to make this happen. It should be noted that the weight is not the only parameter which affects the operation of the backflow trap 1.1 but also the angle • also affects the operation of the backflow trap 1.1. As was discloses above, the angle • means the angle of the backflow trap 1.1 in the rest position with respect to the horizontal plane. Basically, it can be deduced that the greater the angle · the easier it is to rise the trailing edge 1.1.2 of the backflow trap 1.1 by the air flow. However, the greater the angle · the greater force is needed to push the trailing edge 1.1.2 of the backflow trap 1.1 against the air guiding element 2.6 of the air ventilator 2. Therefore, compromises might be needed in designing the structure of the backward protection apparatus 1.

[0021] The backward protection apparatus 1 according to the present invention can also be installed to an existing air ventilator 2. Therefore, backflow protection can be improved without replacing an old air ventilator with a new air ventilator in such situations in which the air outlet of the air ventilator and the backward protection apparatus 1 has corresponding dimensions so that the installation element 1.2 is properly attachable with the casing of the air ventilator, or the air outlet of the air ventilator.

[0022] Due to the manufacturing process of the backflow protection apparatus there may exist some slits, holes or other small portions through which air leakages may occur. If necessary, such portions can be filled with some filler material, such as an adhesive tape. It is also possible to put a tape, a piece of fabrics, or other suitable material on the surface of the air guiding element 2.6 of the air ventilator 2 to further improve the backflow prevention effect of the backflow trap 1.1.

[0023] In the following, the structure of another advantageous embodiment of the backflow protection apparatus 1 for an air ventilator 2 according to the present invention will be described in more detail with reference to Fig. 7a. Also in this embodiment the backflow protection apparatus 1 comprises a backflow trap 1.1 and an installation element 1.2. The backflow trap 1.1 is a sheet like element preferably made of a thin metal sheet or of a thin plastic sheet. The air channel in the air outlet 2.2 of the air ventilator 2 has a rectangular form in such a way that the height of the air channel is smaller than the width of the air channel. Therefore, the backflow trap 1.1 is a rectangular element so that the length of the backflow trap 1.1 is almost the same than the width of the air channel in the air outlet 2.2 of the air ventilator 2 and the width of the backflow trap 1.1 is greater than the height of the air channel in the air outlet 2.2 of the air ventilator 2. Hence, the backflow trap 1.1 can totally, or almost totally close the air channel inside the air outlet 2.2 of the air ventilator 2 to effectively prevent backflow through the air ventilator 2. This will be discussed in more detail below in this specification.

[0024] The backflow trap 1.1 is curved in the width direction of the backflow trap 1.1 i.e. the cross section of the backflow trap 1.1 is convex when looked at one narrower side of the backflow trap 1.1.

[0025] The main difference between the above disclosed embodiment and this embodiment is that the support element is formed differently. In this embodiment the support element is formed by bending one edge of the perform 3 so that it forms a kind of a longitudinal shelf against which one edge of the backflow trap 1.1 is arranged to rest when the backflow trap 1.1 is placed in connection with the backflow protection apparatus 1. Therefore, the shape of the perform 3 differs form from the shape of the perform of the first embodiment as can be seen from Fig. 7b. In this embodiment the perform 3 has a cantilevered plane 1.2.2, which can be bent around (about 180 degrees) at the line B so that the cantilevered plane 1.2.2 will be positioned beneath the middle part 1.2.0 of the perform. Hence, the cantilevered plane 1.2.2 is substantially parallel to the middle part 1.2.0 of the perform. When the cantilevered plane 1.2.2 has been bent around about 180 degrees, as is shown in Fig. 7c, the outer edge of the cantilevered plane 1.2.2 extends over the other bending location which is marked with the line A in Fig. 7b.

[0026] This embodiment has the advantage that there is no need to make any holes through the perform to form the support element. Hence, there will be no leakage of air due to the support element. This will improve the operation of the backflow trap 1.1 when it closes the air channel inside the air outlet 2.2.

[0027] The operation of the backflow trap 1.1 of this embodiment is mainly similar to the operation of the backflow trap 1.1 of the first embodiment. When the air pressure inside the room is lower than the outlet air pressure the air flows from outdoors to the air channel 2.3 through the first air inlet 2.1 or through the second air inlet 2.4. From the air channel 2.3 the air flows to the air outlet 2.2 and reaches the backflow trap 1.1 as shown by the arrow F1 in Fig. 8a. The force caused by air flow makes the trailing edge 1.1.2 of the backflow trap 1.1 to rise thus opening the air channel of the air outlet 2.2 as shown in Fig. 8b. The difference in this second embodiment compared to the first embodiment is that the support element prevents air flowing above the backward trap 1.1 in both directions. This phenomenon is advantageous when the backward trap 1.1 eliminates air flows from the room back to the air channel 2.3.

[0028] In a situation in which the pressure difference between outdoors and indoors is almost zero, there is no air flow in the air ventilator 2, or the air flow is very weak. Hence, the backwards trap 1.1 returns to the rest position i.e. the trailing edge 1.1.2 is resting on the air guiding element 2.6 of the air ventilator 2. Hence, the backward trap 1.1 closes the air channel of the air outlet 2.2 of the air ventilator 2. If the room becomes overpressurized, i.e. the air pressure in the room becomes greater than the air pressure outdoors, the air attempts to flow backwards (arrow F3 in Fig. 8c) from the air outlet 2.1 to the air inlet 2.1, 2.4. However, because the backflow trap 1.1 closes the air channel inside the air outlet 2.2, air can not flow to the air channel 2.3 of the air ventilator 2 thus backflow is prevented. The curved form of the backflow trap 1.1 now improves the tightness of the backflow protection apparatus 1 because the air flow coming from the room in the air outlet 2.2 and the gravitation force push the trailing edge 1.1.2 of the backflow trap 1.1 towards the air guiding element 2.6 of the air ventilator 2.

[0029] Although it was mentioned above that the preform 3 is bent at certain locations (marked as dotted lines in Fig. 7b) to form the installation element 1.2, it is obvious that the installation element 1.2 can also be formed by fixing separate parts together. It is also possible to use injection molding technique in manufacturing the installation element 1.2. An advantageous embodiment of the installation element 1.2. comprises two end portions 1.2.1, which are formed e.g. by bending the material from which the installation element 1.2 is formed. However, the end portions 1.2.1 are not always necessary if the installation of the backflow protection apparatus 1 can be performed without using the end portions 1.2.1. The installation element 1.2 is also bent in the longitudinal direction so that the cross section has an angle • . This bending location is marked with the line A in Fig. 2b. The support elements 1.2.2, 1.2.3 also keep the backflow trap 1.1 in proper position with respect to the air channel of the air outlet 2.2 of the air ventilator 2. The first support element 1.2.2 prevents one edge (the leading edge 1.1.1) of the backflow trap 1.1 dropping down when the backflow protection apparatus 1 has been installed in the air outlet 2.2 of the air ventilator 2. The backflow trap 1.1 is adapted to be rotatable with respect to the first support element 1.2.2 by air flowing from the first air inlet 2.1 to the air outlet 2.2 of the air ventilator 2. Preferably, the backflow trap 1.1 is adapted to be movable by tilting the backflow trap between a first position and a second position with respect to the leading edge 1.1.1 which rests against the support element 1.2.2.

[0030] When using the apparatus of the present invention there is no need to fix the backward trap 1.1 to the other parts of the apparatus i.e. no hinges or the like are needed. The support element 1.2.2 and the air guiding element 2.6 of the air outlet limit the movement of the backflow trap 1.1.

[0031] The backflow protection apparatus 1 and the outlet of the air ventilator 2 can also be formed as a single element which can be installed e.g. on a window frame so that the air flowing through the air channel 2.3 of the air ventilator 2 can flow through the air outlet 2.2. An example of this kind of embodiment is illustrated in Figs. 9a and 9b.

Claims

1. A backflow protection apparatus (1) for an air ventilator (2) which air ventilator (2) comprises a first air inlet (2.1), an air outlet (2.2), and an air channel (2.3) to enable air flow between the first air inlet (2.1) and the air outlet (2.2), **characterised in that** the backflow protection apparatus (1) comprises:

   - a backflow trap (1.1) having a first edge (1.1.1) and a second edge (1.1.2) and a convex surface between said first edge (1.1.1) and said second edge (1.1.2); and
   - an installation element (1.2) comprising a support element (1.2.2) for supporting the backflow trap (1.1) at said first edge (1.1.1).

2. A backflow protection apparatus (1) according to

claim 1, **characterised in that** the backflow trap (1.1) is adapted to be rotatable with respect to said second edge (1.1.2) by air flowing from the first air inlet (2.1) to the air outlet (2.2) of the air ventilator (2).

3. A backflow protection apparatus (1) according to claim 1 or 2, **characterised in that** the backflow trap (1.1) is a curved metal sheet.

4. A backflow protection apparatus (1) according to claim 1, 2 or 3, **characterised in that** the length of the support element (1.2.2) is greater or equal to the length of the first edge (1.1.1) of the backflow trap (1.1).

5. A backflow protection apparatus (1) according to claim 1, 2, 3 or 4, **characterised in that** the installation element (1.2) comprises a side wall (1.4) at both ends of the installation element (1.2).

6. A backflow protection apparatus (1) according to claim 5, **characterised in that** said side walls (1.4) comprise a slit (1.4.1) for attaching the backflow protection apparatus (1) to the air ventilator (2).

7. A backflow protection apparatus (1) according to any of claims 1 to 6, **characterised in that** the backflow trap (1.1) is adapted to be rotatable between a first position and a second position.

8. A backflow protection apparatus (1) according to claim 7, **characterised in that** in said first position the backflow trap 1.1 is at angle · with respect to a horizontal plane.

9. A backflow protection apparatus (1) according to claim 8, **characterised in that** said angle · is greater 30 °.

10. A backflow protection apparatus (1) according to any of claims 1 to 9, **characterised in that** the backflow protection apparatus (1) comprises said air outlet (2.2).

11. An air ventilator (2) comprising the backflow protection apparatus (1) according to any of claims 1 to 10.

12. A window (3) comprising an air ventilator (1) according to the claim 11.

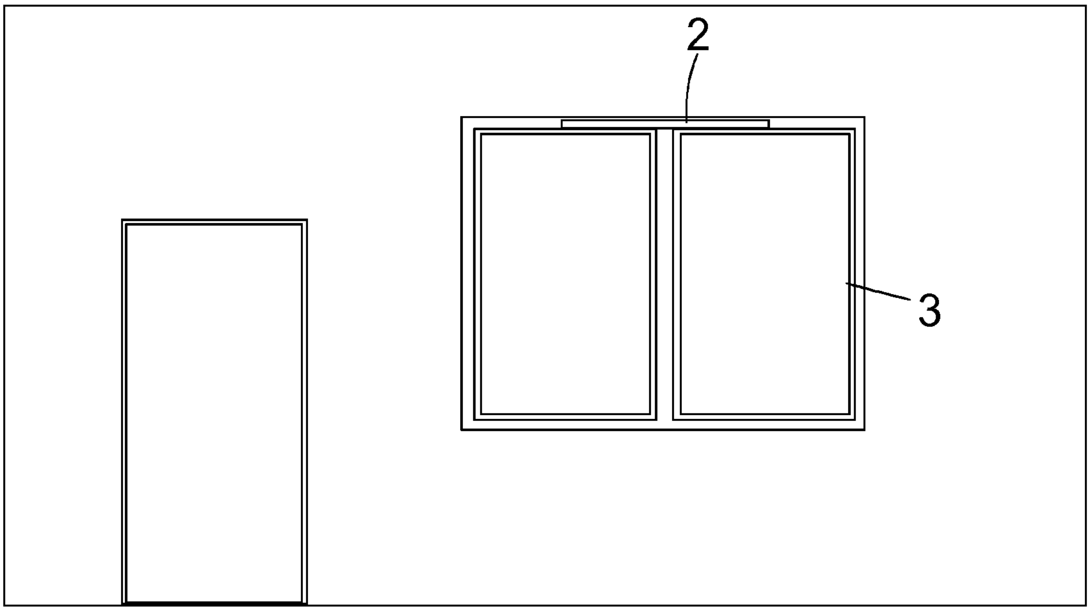

Fig. 1

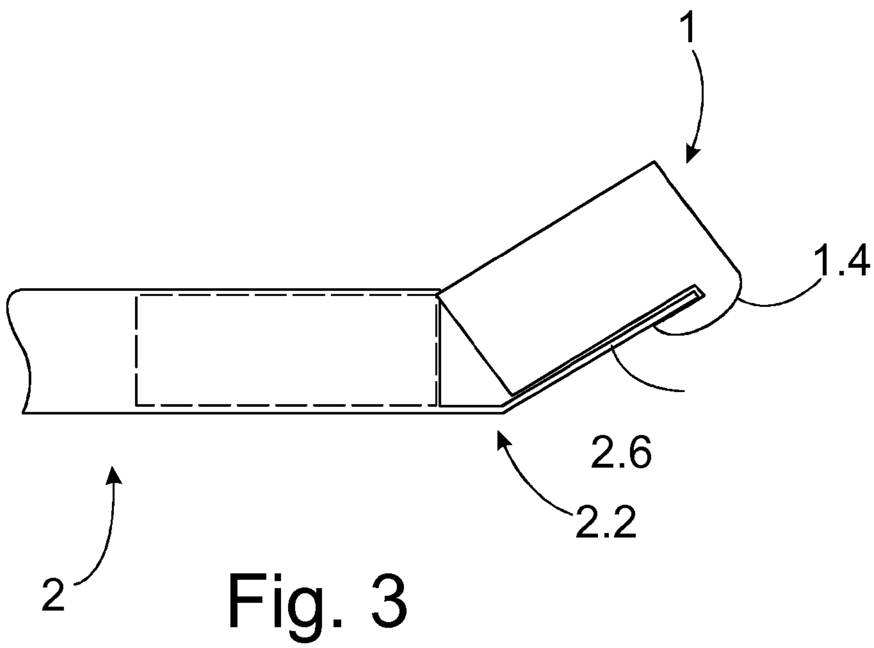

Fig. 3

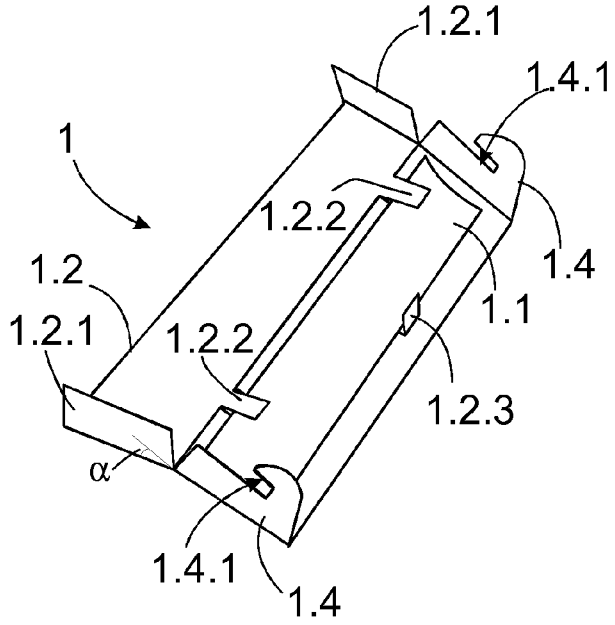

Fig. 2a

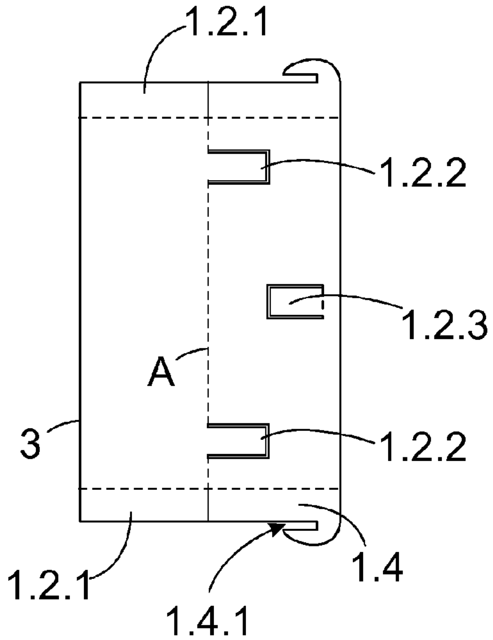

Fig. 2b

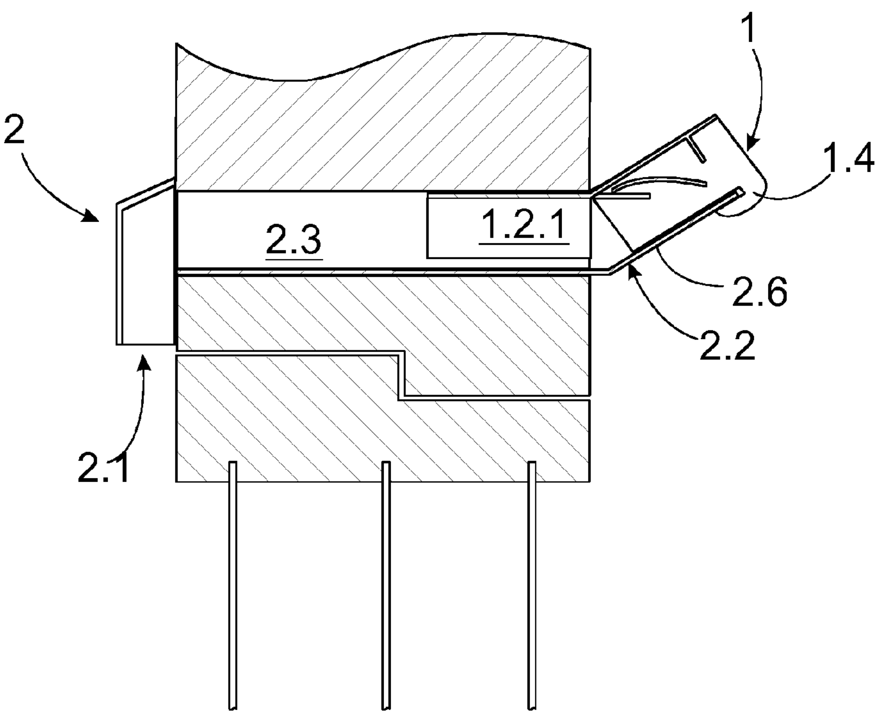

Fig. 2c

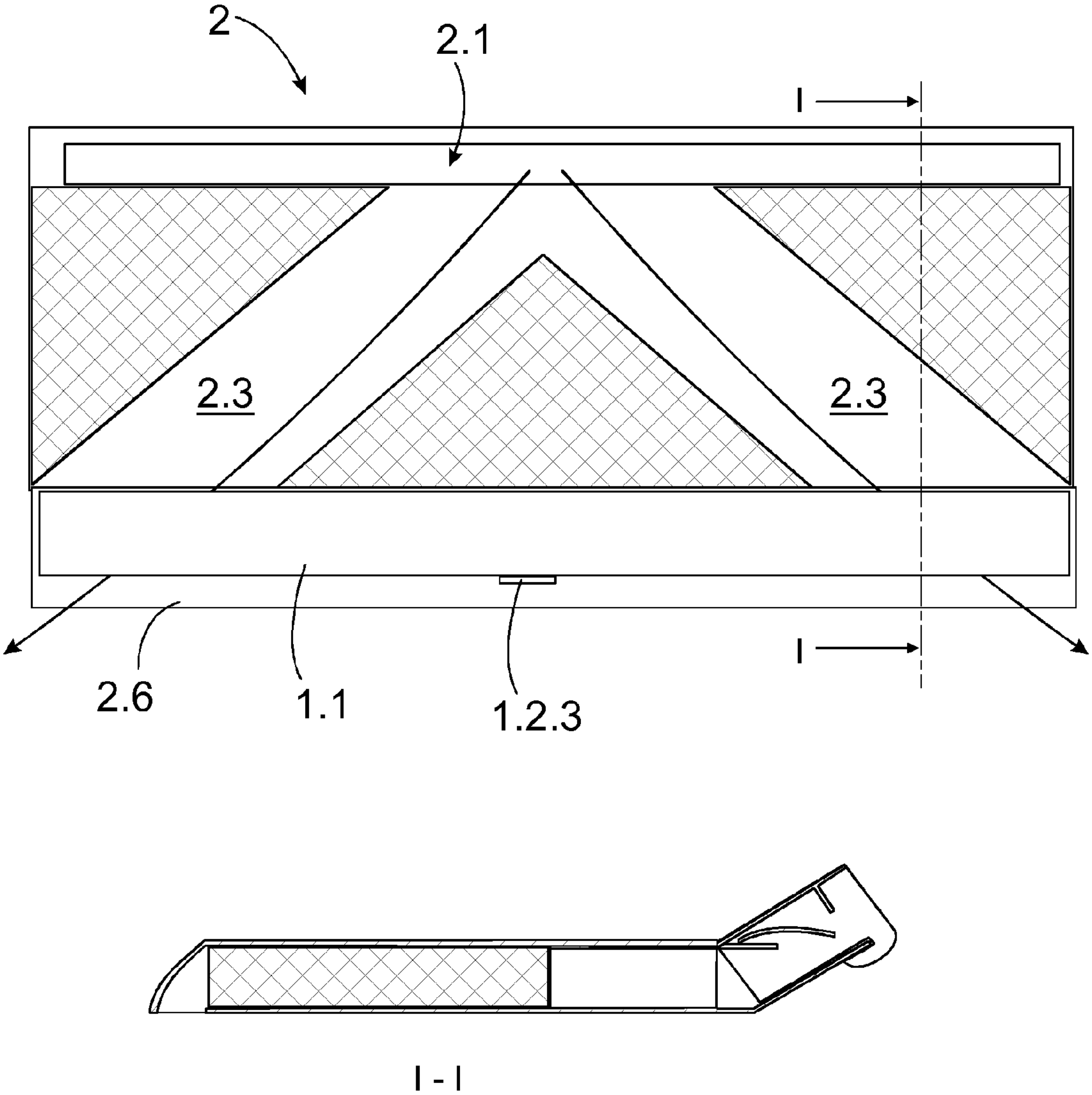

Fig. 4

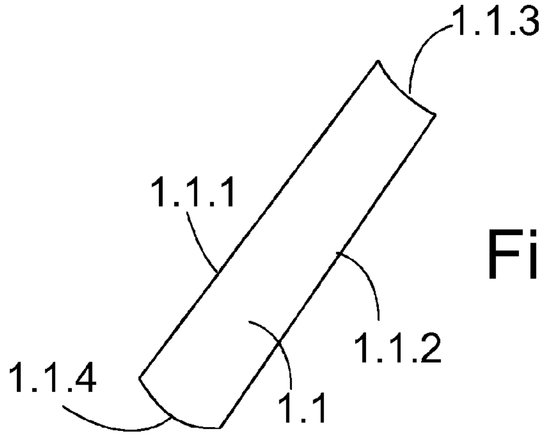

Fig. 2d

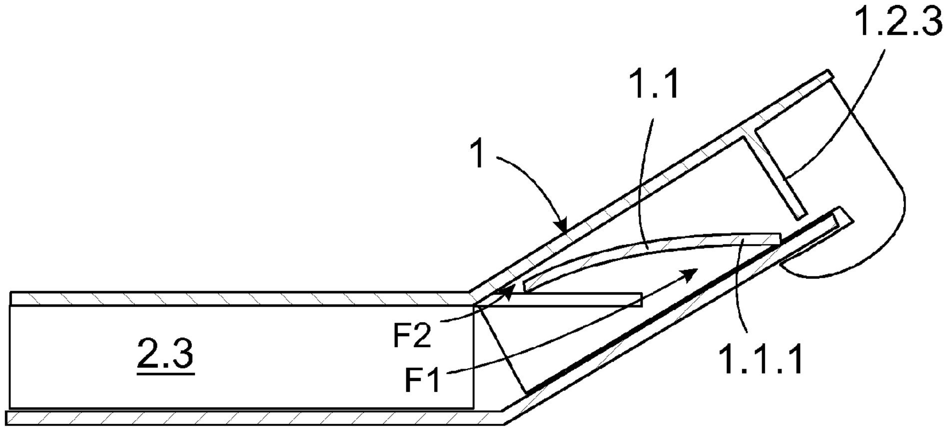

Fig. 5a

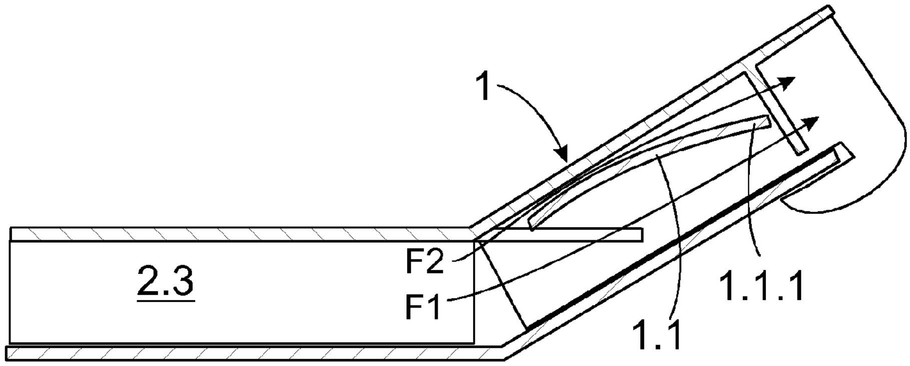

Fig. 5b

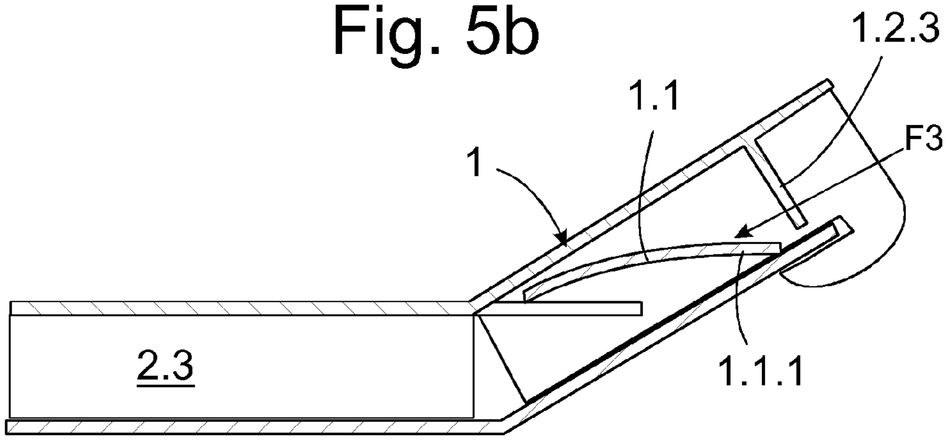

Fig. 5c

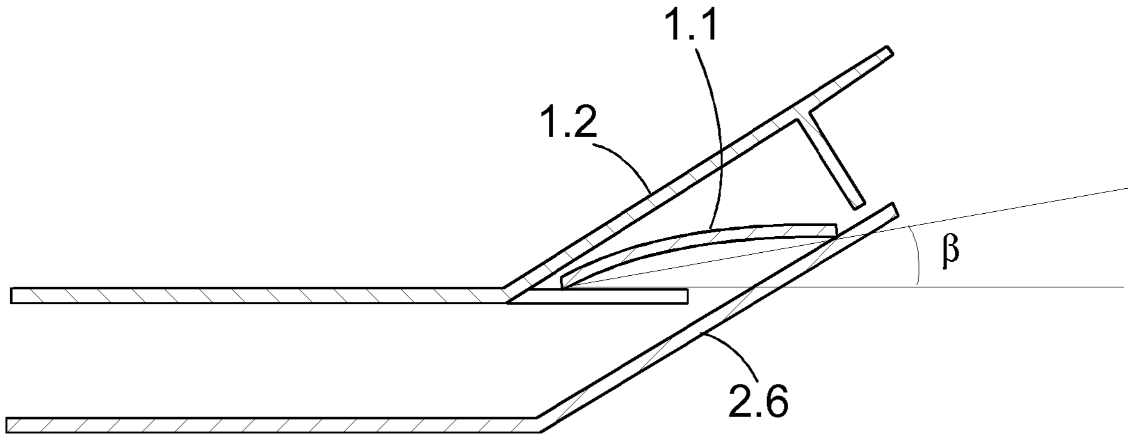

Fig. 5d

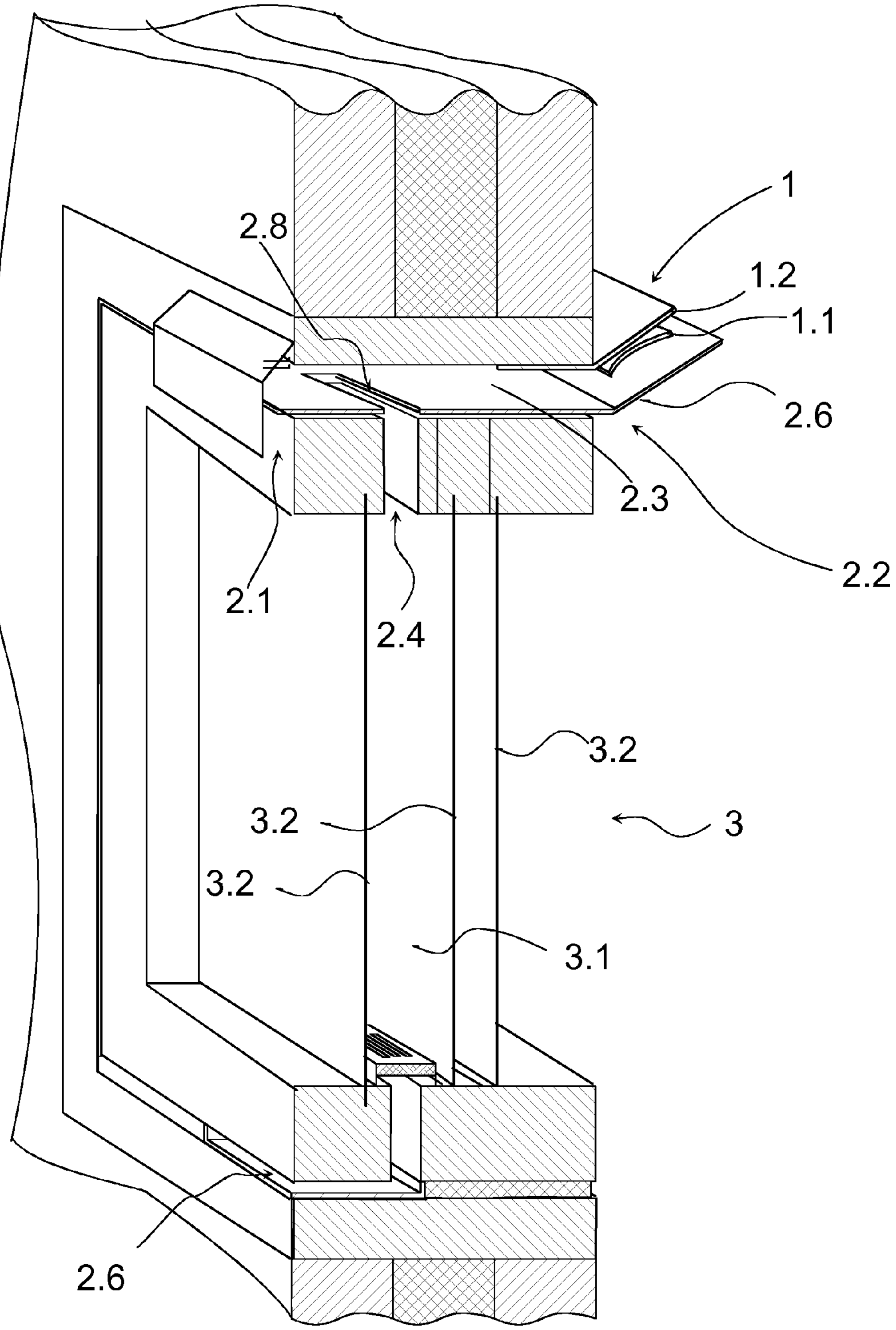

Fig. 6

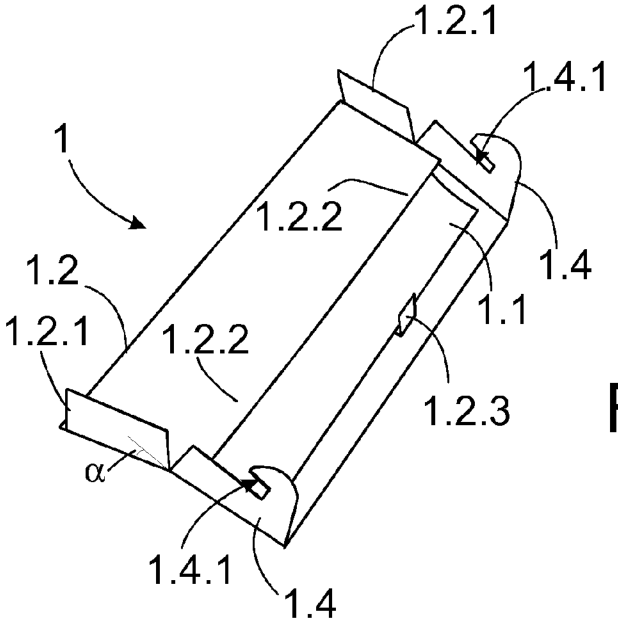

Fig. 7a

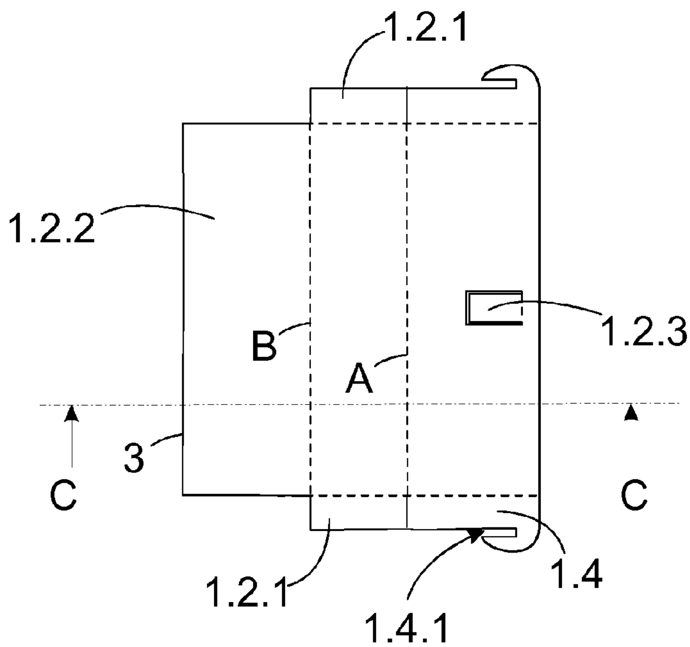

Fig. 7b

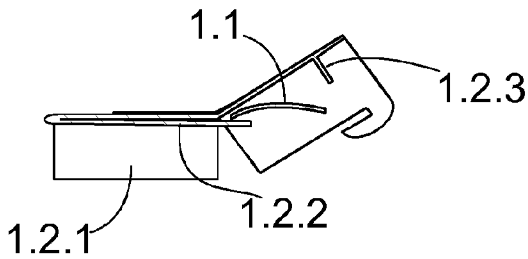

Fig. 7c

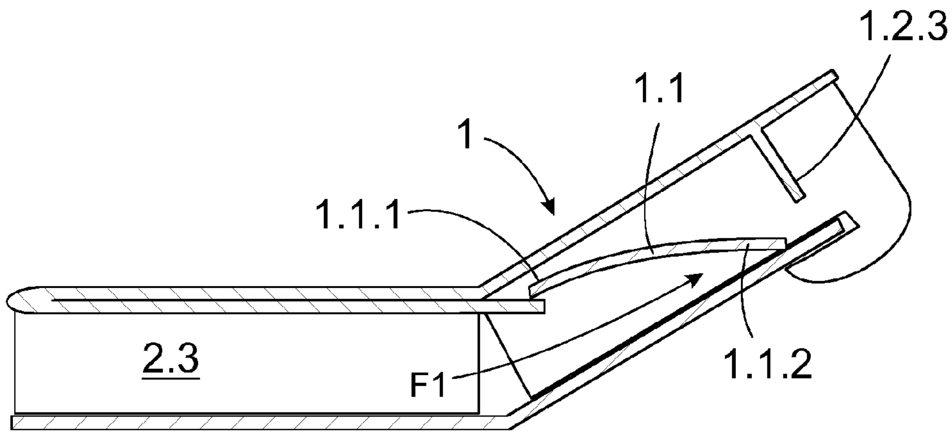

Fig. 8a

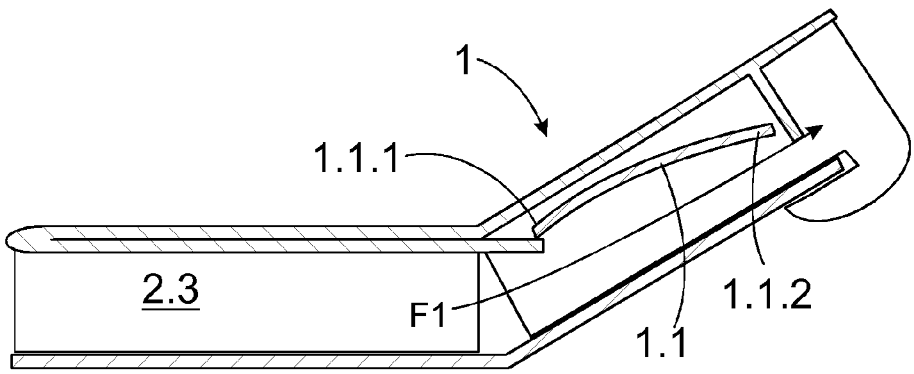

Fig. 8b

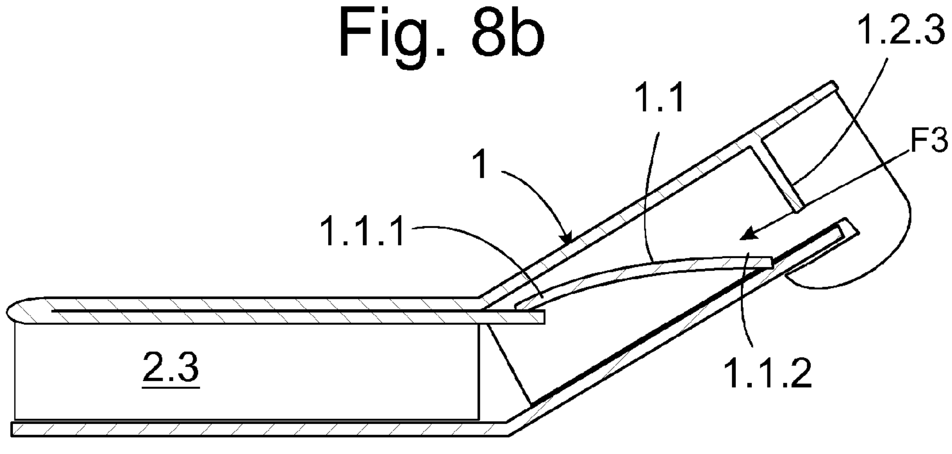

Fig. 8c

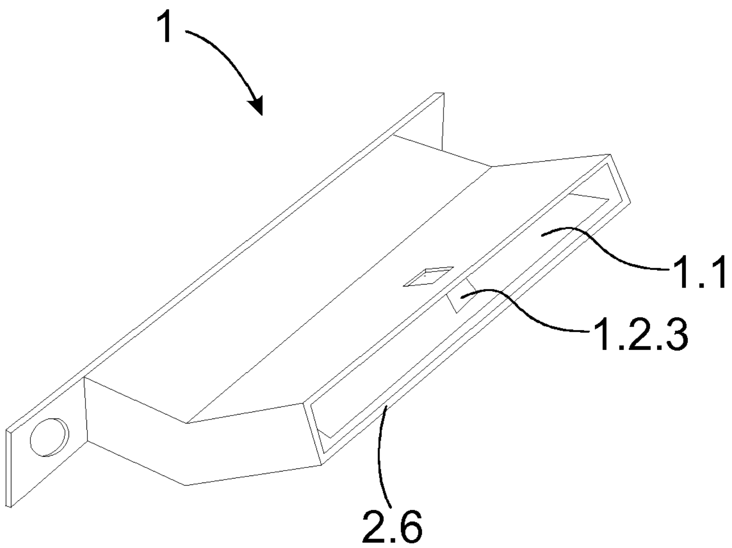

Fig. 9a

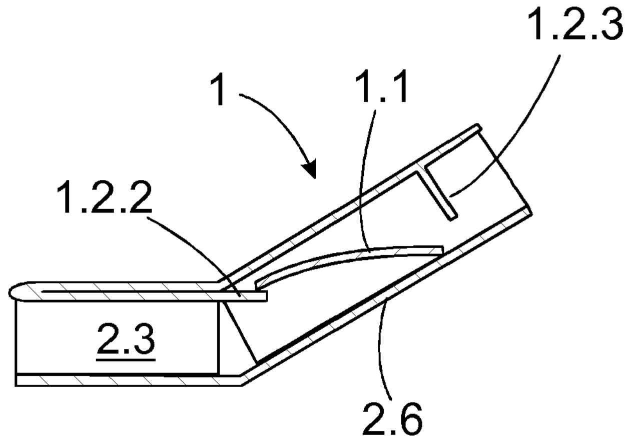

Fig. 9b

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Place of search	Date of completion of the search	Examiner
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