(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 442 044 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
18.04.2012 Bulletin 2012/16

(51) Int Cl.:
F24F 13/18 *(2006.01)* ***E06B 7/02*** *(2006.01)*

(21) Application number: **11397525.4**

(22) Date of filing: **10.10.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **14.10.2010 FI 20106061**

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(54) An end element for a substitution air valve, and a substitution air valve

(57) The present invention relates to an end element (10, 20) for a replacement air valve (1), the replacement air valve (1) comprising at least a first wall (1.1) and a second wall (1.2). The end element (10, 20) comprises an end piece (11, 21) and a mounting piece (30). The end piece (11, 21) comprises at least a first groove (12, 22), in which one end of the first wall (1.1) of the replacement air valve (1) is arranged to be placed, a second groove (13, 23), in which one end of the second wall (1.2) of the replacement air valve (1) is arranged to be placed, and coupling members (18, 28, 31, 32) for connecting the end piece (11, 21) and the mounting piece (30) to each other. The invention also relates to a replacement air valve (1) comprising at least a first wall (1.1), a second wall (1.2), a first end element (10), and a second end element (20).

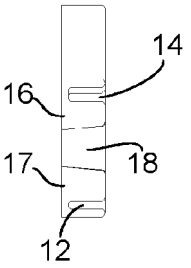

Fig. 3a

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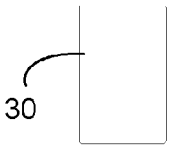


Fig. 3k

Description

Field of the invention

[0001] The present invention relates to an end element for a replacement air valve, the replacement air valve comprising at least a first wall and a second wall. The invention also relates to a replacement air valve comprising at least a first wall and a second wall.

Background of the invention

[0002] Gravitational ventilation systems, exhaust air ventilation systems, as well as supply air/exhaust air ventilation systems are known for implementing the ventilation of rooms. In the gravitational ventilation system, the ventilation of rooms is based on pressure differences and temperature differences, wherein warm indoor air tends to rise upwards and exits the room via an exhaust valve. This will result in an underpressure, by means of which replacement air is sucked from the outside of the room, typically from atmospheric air, via a replacement air valve into the room. The exhaust air ventilation system comprises a mechanical vent device which removes air mechanically from a room and causes an underpressure in the room. Thus, the underpressure causes a flow of replacement air via the replacement air valve into the room. The supply air/exhaust air system also comprises a mechanical vent arrangement for removing spent air from a room, and an inlet air duct system, through which replacement air is introduced into the room.

[0003] Of the above-mentioned ventilation systems, both the gravitational system and the exhaust air ventilation system apply a replacement air valve, via which replacement air is introduced into the room. Such a replacement air valve is typically provided in connection with a window, for example in the frame above the window or in the casement frame. Such valves may comprise an inlet air duct system, by means of which replacement air is introduced from atmospheric air into the room. The replacement air valve may also comprise an air guide for the purpose of directing replacement air introduced via the inlet air duct system diagonally upward towards the ceiling of the room on the indoor side. Furthermore, the inlet air duct system may be implemented in such a way that air is also guided in the lateral direction so that most of the air flow does not leave the replacement air valve in a direction transverse to the main plane of the window (that is, the direction of the air flow is not at an angle of 90 degrees to this main plane), but most of the air flow is directed diagonally to this main plane.

[0004] Replacement air valves of the above-presented kind have been developed, among other things, by supplementing them with a backflow trap to prevent the travel of the air flow from the room to the replacement air valve. Such a situation could occur, for example, when the underpressure in the room would, for any reason, disappear and the room would become even pressurized. In such a situation, the backflow trap tends to close the inlet air duct system.

[0005] Furthermore, replacement air valves according to prior art often comprise a filter element or the like, to prevent or to reduce the entry of impurities possibly entrained in the replacement air into the room. Because at least part of the impurities adhere to such a filter element, this means that impurities accumulate in the filter element, which is soiled. The soiled filter element should be either cleaned or replaced with a clean filter element, to maintain an adequate filtering capacity. The filter element is normally placed in the air duct system inside the replacement air valve, so that the removal of the filter element may require the removal of the replacement air valve. This can be done, for example, by opening the fastening screws or corresponding fastening members of the replacement air valve; that is, the use of tools is required for the removal, which may have the consequence that the filter element is not replaced very often.

Brief summary of the invention

[0006] It is an aim of the present invention to provide an end element for a replacement air valve, with which it may be easier to assemble the replacement air valve, and the fixing and removal of the replacement air valve is easier and can be done even without tools. To put it more precisely, the end element for a replacement air valve according to the present invention is primarily characterized in that the end element comprises:

- an end piece and a mounting piece, said end piece comprising at least:
- a first groove, in which one end of the first wall of the replacement air valve is arranged to be placed,
- a second groove, in which one end of the second wall of the replacement air valve is arranged to be placed, and
- coupling means for connecting the end piece and the mounting piece to each other.

[0007] The replacement air valve according to the present invention is primarily characterized in that the replacement air valve also comprises:

- a first end element, and
- a second end element,

the first end element comprising:

- a first end piece,
- a first mounting piece, and
- coupling means for connecting the first end piece and the first mounting piece to each other;

and the second end element comprising:

- a second end piece,

- a second mounting piece, and

coupling means for connecting the second end piece and the second mounting piece to each other.

[0008] The present invention shows remarkable advantages over solutions of prior art. Using the end element for a replacement air valve according to the invention, the assembly of the replacement air valve can be made easier and faster compared with solutions of prior art. Furthermore, using the end element according to the invention, air guides and the rest of the replacement air valve can be implemented in a simpler way and with fewer sheet folds, and the provision of complex sheet folds may even be avoided. Moreover, the consumption of sheet material used in the manufacture of the replacement air valve can be reduced. The end elements for a replacement air valve according to the invention also make it easier to remove the replacement air valve, for example for cleaning of the filter element. The replacement air valve can also be reinstalled in an easier way. Further, there is no need to apply tools in the removal and reinstallation. Because a relatively close fit of the parts is obtained with the solution of the invention, it is possible to achieve a structure with hardly any eventual leakage points between the replacement air valve and the base used for its installation, for example a casement. This makes it possible that e.g. separate gaskets are no longer needed around the replacement air valve. Moreover, there is no need to install a film to reduce condensation in the part above the replacement air valve (the upper air guide).

Description of the drawings

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

Fig. 1 shows the wall of a room with a window and a replacement air valve according to an embodiment of the invention, installed above the window;

Fig. 2 shows a reduced cross-sectional view of a replacement air valve according to an advantageous embodiment of the invention, installed above a window in a wall;

Figs. 3a to 3k show the structure of parts of an end element according to an advantageous embodiment of the invention in reduced views from different directions,

Fig. 4 shows a replacement air valve according to an advantageous embodiment of the invention in a reduced cross-section,

Fig. 5 shows a replacement air valve assembled with end elements according to an advantageous embodiment of the invention in a perspective view; and

Figs. 6a to 6f show components of an end element according to an advantageous embodiment of the invention in perspective views from different directions.

Detailed description of the invention

[0010] In the following, we shall discuss the replacement air valve 1 of Fig. 1 in more detail with reference to Figs. 1 and 2. In the advantageous example shown in Fig. 1, the replacement air valve 1 is installed above a window 3, for example in a slit or in a gap formed in the built-in frame. In some embodiments, such a gap is provided in the casement of the window, in which case the replacement air valve 1 can be fixed in a gap in the casement accordingly. It is a function of said gap to enable the flow of replacement air from atmospheric air into the room. In some cases, the replacement air valve is provided with an air channel system for guiding the movement of the replacement air, if necessary. The air duct system may comprise, for example, channelling means for deflecting the flow of replacement air in the lateral direction.

[0011] Figure 2 shows a reduced cross-sectional view of a replacement air valve 1 according to an advantageous embodiment of the invention, installed above a window in a wall. In this case, the replacement air valve 1 is connected to the surface of the casement 4 of the window, at a location with a gap 5 for the replacement air duct system. The cross-sectional area of the replacement air valve 1 is larger than the cross-sectional area of the gap in the surface of the built-in frame 4 on the side of the room 6, wherein the replacement air valve 1 can be used to cover the whole gap 5. Figure 2 does not show channelling means, but it is obvious that channelling means can also be provided in the gap 5, if necessary.

[0012] The replacement air valve 1 comprises a first wall 1.1 for directing the air flow diagonally upwards. Furthermore, the replacement air valve 1 comprises a second wall 1.2 which is substantially parallel to the diagonal part of the first wall 1.1. Thus, the first wall 1.1 and the second wall 1.2 together with the first end element 10 and the second end element 20 (Fig. 5) delimit an air flow duct 1.5. This air flow duct 1.5 is provided with a backflow trap 7 which is advantageously arranged to be pivotable with respect to a first edge 7.1. The backflow trap 7 is supported at its first edge 7.1. to the replacement air guide 1, for example by means of a protrusion 1.6 or in another suitable way. It should be mentioned that the backflow trap 7 does not necessarily have to be connected to the replacement air valve 1, but it may be arranged in a so-called floating manner in connection with the re-

placement air valve 1. What is essential is that the backflow trap 7 can, on one hand, pivot by the effect of the replacement air flow in such a way that replacement air can flow through the air flow duct 1.5 of the replacement air valve 1 into the room 6 and, on the other hand, block the air flow duct 1.5 in a situation in which backflow could be possible.

[0013] Figures 3a to 3k show the structure of parts of an end element 10, 20 according to an advantageous embodiment of the invention in reduced views from different directions. The end element 10, 20 comprises an end piece 11, 21 and a mounting piece 30. Figure 3a shows the first end piece 11 seen from the direction of the first end. In a corresponding manner, Fig. 3b shows the first end piece 11 seen from the direction of the first side. Figure 3c shows the first end piece 11 seen from the direction of the second end, and Fig. 3d shows the first end piece 11 seen from the direction of the second side. Figures 3e to 3g show the second end piece 21 seen from the direction of the first side, seen from the direction of the first end, and seen from the direction of the second side, respectively. Figure 3h shows the structure of the mounting piece 30 of the end element in a reduced view from the direction of the first side, Fig. 3i shows the mounting piece 30 seen from the direction of the first end, Fig. 3j shows the mounting piece 30 seen from the direction of the second side, and Fig. 3i shows the mounting piece 30 seen from the direction of the second end.

[0014] As seen from Figs. 3b, 3d, 3e, and 3g, the first end piece 11 and the second end piece 21 are substantially equal in shape but mirror images of each other, which is natural, because the first end piece 11 is intended to form the first end 1 a of the replacement air valve 1 and, correspondingly, the second end piece 21 is intended to form the second end 1 b of the replacement air valve 1. Consequently, it will be sufficient to discuss the end pieces 10, 20 in more detail primarily for the part of one end piece 10, 20 only.

[0015] The first end piece 11 comprises a first groove 12, 22, in which the first end of the first wall 1.1 of the replacement air valve 1 is arranged to be placed, and correspondingly, the second end piece 21 comprises a second groove 22, in which the second end of the first wall 1.1 of the replacement air valve 1 is arranged to be placed. Advantageously, this first groove 12, 22 extends from the first end of the end piece 11, 21 to the vicinity of the second end of the end piece 11, 21 in such a way that the first groove 12, 22 consists of two substantially straight parts of uniform width, forming an angle therebetween. Consequently, the shape of the groove enables it to receive the first wall 1.1 which comprises a fold in one point, the magnitude of the fold being in the same order as the angle of the first groove 12, 22. In an advantageous embodiment of the invention, the distance between the first groove 12, 22 and the edge of the end piece is substantially constant, but it may also vary. The depth of the first groove 12, 22 is slightly smaller than the thickness of the end piece, for example 3/4 or 5/6 of the thickness of the end piece, but it may also be one half of the thickness of the end piece, or even smaller.

[0016] The first end piece 11 also comprises a second groove 13, in which the first end of the second wall 1.2 of the replacement air valve 1 is arranged to be placed, and correspondingly, the second end piece 21 comprises a second groove 23, in which the second end of the second wall 1.2 of the replacement air valve 1 is arranged to be placed. This second groove 13, 23, which is preferably substantially straight, preferably extends from the folding point in the end piece 11, 21 to the vicinity of the second end of the end piece 11, 21. In this way, the shape of the groove enables it to receive the second wall 1.1 which has a substantially straight cross-sectional shape in the direction of the narrower side of the second wall. In an advantageous embodiment of the invention, the distance between the second groove 13, 23 and the edge of the end piece is also substantially constant, but it may vary as well. The depth of the second groove 13, 23 is also slightly smaller than the thickness of the end piece, for example 3/4 or 5/6 of the thickness of the end piece, but it may also be one half of the thickness of the end piece, or even smaller.

[0017] The first end piece 11 also comprises yet a third groove 14, in which the first end of the second wall 1.3 of the replacement air valve 1 is arranged to be placed, and correspondingly, the second end piece 21 comprises a third groove 24, in which the second end of the third wall 1.3 of the replacement air valve 1 is arranged to be placed. This third groove 14, 24, which is preferably substantially straight, extends advantageously from the first end of the end piece 11, 21 to the folding point in the end piece 11, 21 and slightly further, as can be seen from Figs. 3b and 3e. The shape of the groove enables it to receive the third wall 1.3 which has a substantially straight cross-sectional shape in the direction of the narrower side of the third wall. In an advantageous embodiment of the invention, the distance between this third groove 14, 24 and the edge of the end piece is substantially constant, but it may also vary. The depth of the second groove 14, 24 is also slightly smaller than the thickness of the end piece, for example 3/4 or 5/6 of the thickness of the end piece, but it may also be one half of the thickness of the end piece, or even smaller.

[0018] In an advantageous embodiment of the invention, the second groove 13, 23 and the third groove 14, 24 constitute a continuous groove, and the second wall 1.2 has a cross-sectional shape equal to the shape of these grooves 13, 23, 14, 24 so that a separate third wall 1.3 is not necessarily needed but the second wall extends all the way to the place of the third wall.

[0019] The third wall 1.3, or the second wall 1.2 if it is of the above-described type, also forms a kind of a threshold (indicated with the reference numeral 1.6 in Fig. 2) whose one function is to provide a support for the backflow trap 7. The first edge 7.1 of the backflow trap 7 is placed on top of this protrusion 1.6 to enable the backflow

trap 7 to rotate inside the replacement air valve, within limits defined by the first wall 1.1, the second wall 1.2 and a possible limiter 8.

[0020] In the end pieces 11, 21 according to the invention, the grooves 12, 22; 13, 23; 14, 24 are formed on the side of the same surface of the end piece 11, 21, which is the surface visible in Figs. 3b and 3e, for instance. This surface can also be called the grooved surface. The surface opposite to this grooved surface, which is the surface visible in Figs. 3d and 3g, for instance, can be called the ungrooved surface. The plane parallel to the grooved and ungrooved surfaces of the end pieces 11, 21 can be called the main plane. Using these terms, we shall now briefly describe the design of the gap 18, 28 and the protrusions 16, 17; 26, 27 of the end pieces 11, 21. The gap 18, 28 is preferably designed in such a way that its width on the ungrooved surface is at least partly different from the width of the gap 18, 28 on the grooved surface. An example of this can be seen in Figs. 3a and 3f. Preferably, the width of the gap 18, 28 is greater on the grooved surface than on the ungrooved surface. In an advantageous embodiment of the invention, the width of this gap 18, 28 is not constant in the other direction either; that is, the width of the gap 18, 28 changes towards the bottom of the gap 18, 28. Preferably, the width of the gap 18, 28 in this direction is greater around the midpoint of the gap than in the vicinity of the bottom and the initial point of the gap. Figures 3b, 3d, 3e, and 3g illustrate an example of such a design of the gap 18, 28. The supporting members 31, 32 of the mounting piece 30 are designed in a corresponding way so that they form a complementary pair for the gap 18, 28 of the end pieces 11, 21, to provide as good a fastening as possible and still removability with relative ease. Consequently, the thickness of the supporting members 31, 32 of the mounting piece 30 is not constant but it varies in different parts of the supporting members 31, 32. Preferably, a space 33 is left between the supporting members 31, 32. This is illustrated in Figs. 3h, 3i and 3j.

[0021] The gap 18, 28 and the supporting members 31, 32 can be called, for example, connecting members, by means of which the end piece 11, 21 and the mounting piece 30 can be connected to each other and removed from each other, if necessary.

[0022] Further, Figs. 6a to 6f show components of the end element 10, 20 according to an advantageous embodiment of the invention in perspective views from different directions. Figures 6a and 6d show the mounting piece 30, Fig. 6b shows the end piece 11, 21 from the side of the ungrooved surface, Fig. 6e shows the end piece 11, 21 from the side of the grooved surface, and Figs. 6c and 6f show the end piece 11, 21 and the mounting piece 30 connected to each other.

[0023] The assembly of the replacement air valve 1 according to the invention can be accomplished for example in the following way. A filter element 9 is placed either on the surface of the first wall 1.1 or on the surface of the third wall 1.3. Furthermore, possible air guides (not shown) are installed on the surface of the first wall 1.1 or the second wall 1.2. After this, the first end of the first wall 1.1 is inserted in the first groove 12 of the first end piece 11, the first end of the second wall 1.2. is inserted in the second groove 13 of the first end piece 11, and the first end of a possible third wall 1.3 is inserted in the third groove 14. It is obvious that in the above-mentioned embodiment, in which the second wall 1.2 also constitutes the third wall 1.3, the first end of the second wall is inserted in both the second groove 12 and the third groove 14.

[0024] The filter element 9 is, for example, an electrostatic filter or another filter material that provides relatively good purification of replacement air from small particles and impurities possibly entrained therein.

[0025] The second end piece 21 is installed in a corresponding way; that is, the second end of the first wall 1.1 is inserted in the first groove 22 of the second end piece 21, the second end of the second wall 1.2 is inserted in the second groove 23 of the second end piece 21, and the second end of a possible third wall 1.3 is inserted in the third groove 24.

[0026] Furthermore, a film (not shown) for reducing condensation can be installed on the upper surface of the first wall 1.1, that is, the surface on the side of the air flow channel 1.5 of the replacement air valve, if necessary. However, such a film to reduce condensation does not necessarily need to be installed on the surface of the second wall 1.2 and the possible third wall 1.3, because the joint between the replacement air valve 1 and its mounting base can be made relatively tight by using the end element 10, 20 according to the invention. This prevents or at least significantly reduces the occurrence of air leaks at the joint between the replacement air valve 1 and the base.

[0027] In this context, it should be mentioned that the assembly of the replacement air valve 1 can also be performed in a different order than mentioned above. For example, it is possible to begin with placing the walls 1.1, 1.2, 1.3 in the second end piece 21 first.

[0028] In fixing the end elements and thereby the replacement air valve 1 to the object of use, mounting pieces 30 can be utilized for example in the following way. One mounting piece is placed in connection with the first end piece 11 in such a way that the supporting members 31, 32 in the mounting piece 30 are placed in the gap 18 in the first end piece 11, and the second mounting piece is placed in connection with the second end piece 21 in such a way that the supporting members 31, 32 in the mounting piece 30 are placed in the gap 28 in the second end piece 21. This gap 18 is formed at the first end of the first end piece 11 by providing the first end with two protrusions 16, 17, the space therebetween forming the gap 18. In a corresponding way, the second end piece is provided with two protrusions 26, 27, the space therebetween forming the gap 28. A slit 33 is preferably provided with the supporting members 31, 32 of the mounting piece 30, to make it possible for the supporting mem-

bers 31, 32 to bend slightly towards each other when the mounting piece 30 is being inserted in the gap 18, 28 in the end piece 11, 21. This bend may be at least partly reversible when the mounting piece 30 has been inserted in the gap 18, 28, but they may remain slightly bent, which may further secure the mounting piece 30 in the gap 18, 20. After the mounting pieces 30 have been inserted, the mounting pieces 30 can be connected to the mounting base, for example to the casement of a window 3, by fastening members, such as screws, staples, or the like. In this way, the replacement air valve 1 is installed in its position. The replacement air valve 1 can be removed, for example for cleaning or replacement of the filter 9, by removing the end pieces 11, 21 from the mounting pieces 30. For this removal, no tools are needed, but it can be performed, for example, by pulling the replacement air valve 1 away from the fastening base and, if necessary, by deflecting the replacement air valve 1 slightly, for example downwards or upwards. The replacement air valve 1 can also be reinstalled in the mounting pieces 30 by pushing the end pieces 11, 21 in the above-described way to the engagement with the mounting pieces 30.

[0029] It is obvious that the mounting pieces 30 do not need to be installed in connection with the end pieces 11, 21 first, but the installation can also be done by first fastening the mounting pieces 20 to the mounting base, suitably spaced from each other, and then installing the replacement air valve structure formed by the end pieces 11, 21 and the walls 1.1, 1.2, 1.3 to the mounting pieces 30.

[0030] For the manufacture of the end pieces 11, 21 and the mounting pieces 30, it is possible to use plastic, rubber or a corresponding material that can be worked or cast to provide the desired shape. For example, molten plastic can be cast into a mould (not shown) in which the plastic hardens when it is cooled, after which the piece 11, 21, 30 can be removed from the mould.

[0031] The replacement air valve 1 according to the invention may further comprise a limiter 8 for restricting the path of motion of the backflow trap 7. The aim of this limiting is to prevent the backflow trap 7 from turning to the maximum position, that is, the position in which the distance between the second edge 7.2 of the backflow trap and the first wall 1.1 of the replacement air valve 1 reaches its maximum. Thus, the path of motion of the backflow trap 7 is restricted between the minimum position and this restricted position. In an advantageous embodiment of the invention, this restricted position can be set according to the need to any position between these minimum and maximum positions. In some embodiments, the restricted position can even be set at the minimum point and/or the maximum point. The restricted position is preferably adjustable, so that the position of the limiter 8 is changed as needed.

[0032] Preferably, the limiter 8 extends through the end pieces 11, 21; in other words, the limiter 8 is longer than the distance between the end pieces 11, 21. The limiter 8 is arranged to be movable within limits defined by openings 19, 29 in the first end piece and the second end piece. Thus, the limiter 8 can be moved in the opening 19, 29 as needed. The movement of the limiter 8 results in a change in the space of movement of the backflow trap 7. By means of the limiter 8, it is possible to define the position to which the backflow trap 7 can pivot by the effect of the flow of replacement air. On the other hand, the limiter 8 does not prevent the functioning of the backflow trap 7 in a backflow situation. In other words, the purpose of the limiter 8 is to restrict the movement of the backflow trap 7 caused by the effect of replacement air flowing through the replacement air valve 1.

[0033] Changing the position of the limiter 8 (movement in the opening(s) 19, 29) can take place in a stepless manner between a first position and a second position (Fig. 4), or changing the position may be stepwise between said first and second positions. A stepwise change in the position can be arranged, for example by providing openings 19, 29 which are not equal in width but the width of the opening varies at its one edge, for example, in a wave-like manner, or the edge may comprise curved portions. Thus, the limiter 8 can be moved in the direction of the opening in such a way that the limiter 8 is, in a way, locked by a wave or a curve in the wall.

[0034] In an advantageous embodiment of the invention, the replacement air valve 1 also comprises a control member 40 for controlling the operation of the replacement air valve, for example, by switching the replacement air valve 1 to operate either in a so-called summer position, in which replacement air flows substantially directly from atmospheric air into the room, or in a winter position, in which replacement air flows from atmospheric air first through an interspace between the panes of the window and then into the room. However, it is obvious that the invention can also be applied in replacement air valves in which there are no separate summer and winter positions available.

[0035] Although it has been presented above that the end piece 11, 21 is provided with a gap 18, 28 for the supporting members 31, 32 of the mounting piece 30, it is obvious that a corresponding function can be provided by placing the supporting members 31, 32 in the end piece 11, 21 in such a way that the supporting members 31, 32 protrude from the ungrooved surface of the end piece 11, 21, and a gap corresponding to the gap 18, 28 is provided in the fastening member 30.

[0036] It is obvious that the present invention is not limited solely to the above-presented embodiments but it can be modified within the scope of the appended claims.

Claims

1. An end element (10, 20) for a replacement air valve (1), which replacement air valve (1) is provided with at least a first wall (1.1) and a second wall (1.2), **characterized in that** the end element (10, 20) com-

prises:

- an end piece (11, 21) and a mounting piece (30), said end piece (11, 21) comprising at least
  - a first groove (12, 22), in which one end of the first wall (1.1) of the replacement air valve (1) is arranged to be placed,
  - a second groove (13, 23), in which one end of the second wall (1.2) of the replacement air valve (1) is arranged to be placed, and
- coupling members (18, 28; 31, 32) for connecting the end piece (11, 21) and the mounting piece (30) to each other.

2. The end element (10, 20) according to claim 1, **characterized in that** the coupling members comprise a gap (18, 28) and one or several supporting members (31, 32) which can be fitted in said gap (18, 28).

3. The end element (10, 20) according to claim 2, **characterized in that** said gap (18, 28) is provided in the end piece (11, 21) and said one or more supporting members (31, 32) are provided in the mounting piece (30).

4. The end element (10, 20) according to claim 1, 2 or 3, **characterized in that** the end piece (11, 21) further comprises an opening (19, 29) for a limiter (8) for the replacement air valve (1).

5. The end element (10, 20) according to any of the claims 2 to 4, **characterized in that** the width of the gap (18, 28) on the grooved surface of the end piece (11, 21) is different from the width of the gap (18, 28) on the ungrooved surface of the end piece (11, 21).

6. The end element (10, 20) according to any of the claims 2 to 5, **characterized in that** the width of the gap (18, 28) is greater in the middle part of the gap (18, 28) than at the ends of the gap (18, 28).

7. A replacement air valve (1) comprising at least a first wall (1.1) and a second wall (1.2), **characterized in that** the replacement air valve (1) also comprises:

- a first end element (10), and
- a second end element (20),

the first end element (10) comprising:

- a first end piece (11),
- a first mounting piece (30), and
- coupling members (18, 28, 32) for connecting the first end piece (11) and the first mounting piece (30) to each other,

and the second end element comprising:

- a second end piece (21),
- a second mounting piece (30), and
- coupling members (28, 31, 32) for connecting the second end piece (21) and the second mounting piece (30) to each other.

8. The replacement air valve (1) according to claim 7, **characterized in that** said coupling members comprise a gap (18, 28) and one or several supporting members (31, 32) which can be fitted in said gap (18, 28).

9. The replacement air valve (1) according to claim 8, **characterized in that** said gap (18, 28) is provided in the first end piece (11) and the second end piece (21), and said one or more supporting members (31, 32) are provided in the first and second mounting pieces (30).

10. The replacement air valve (1) according to claim 7, 8 or 9, **characterized in that** the replacement air valve further comprises a limiter (8), wherein the first and second end pieces (11, 21) further comprise an opening (19, 29) for said limiter (8).

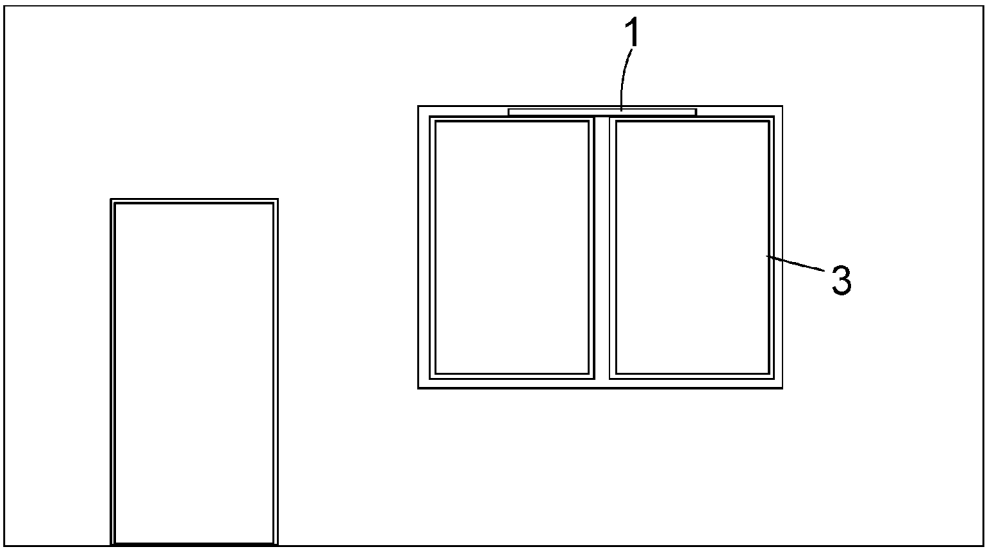


Fig. 1

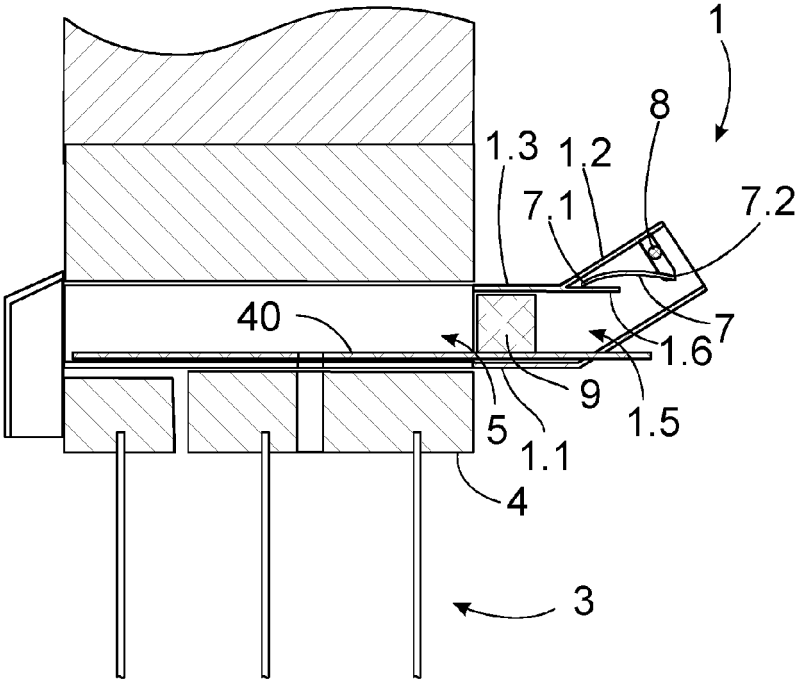


Fig. 2

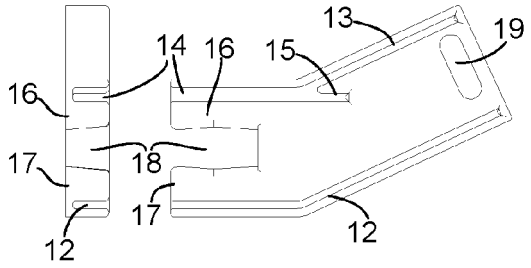


Fig. 3a

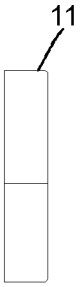


Fig. 3b

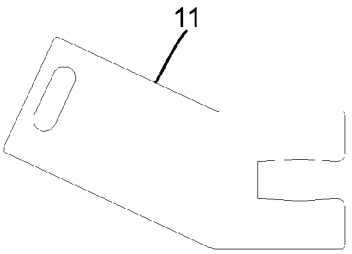


Fig. 3c

Fig. 3d

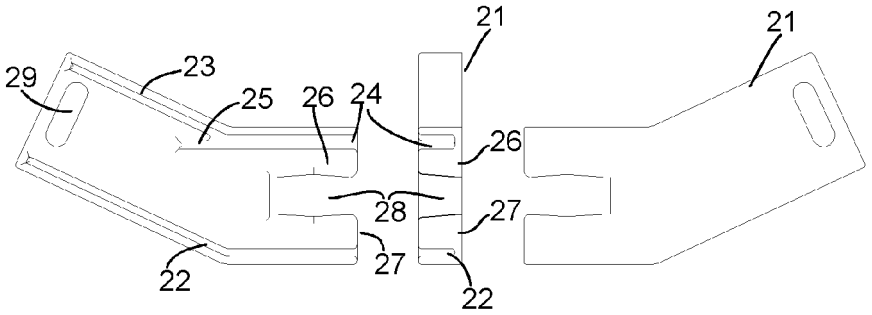


Fig. 3e

Fig. 3f

Fig. 3g

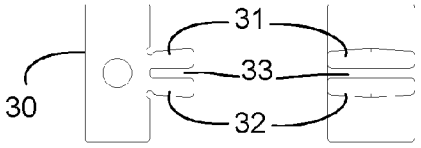
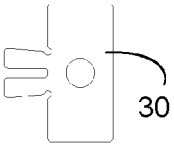


Fig. 3h

Fig. 3i



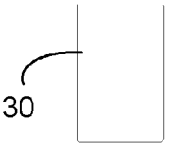


Fig. 3j

Fig. 3k

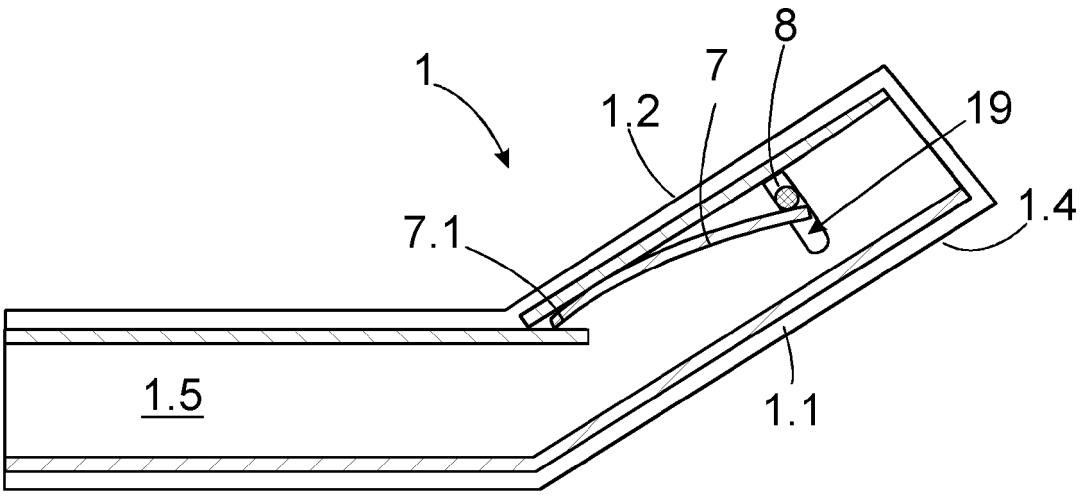


Fig. 4

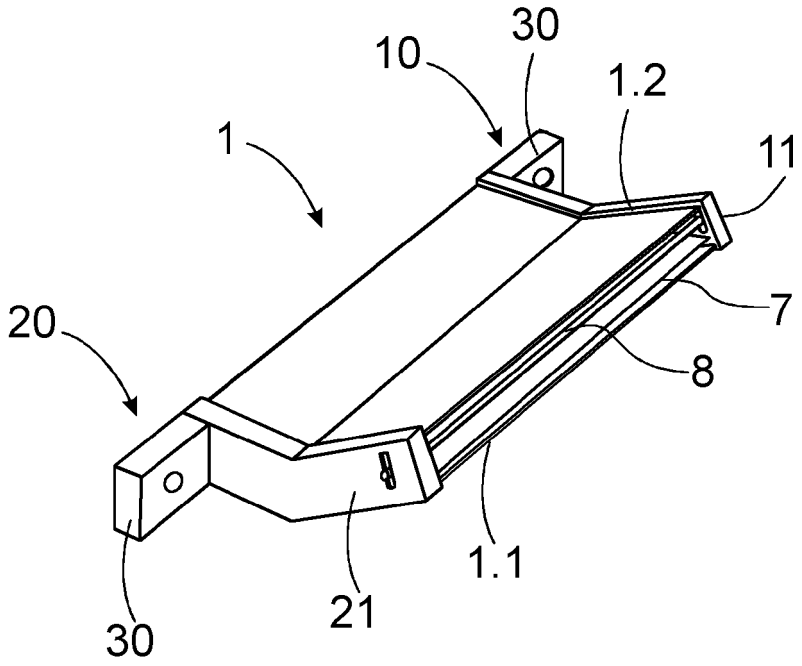


Fig. 5

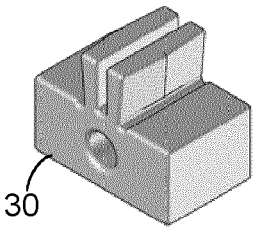


Fig. 6a

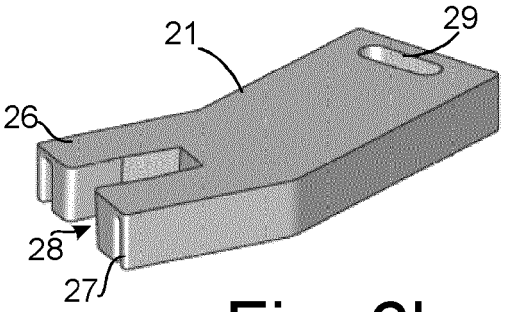


Fig. 6b

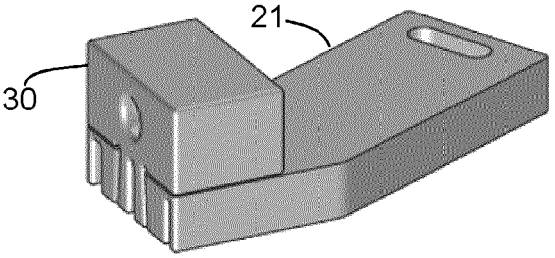


Fig. 6c

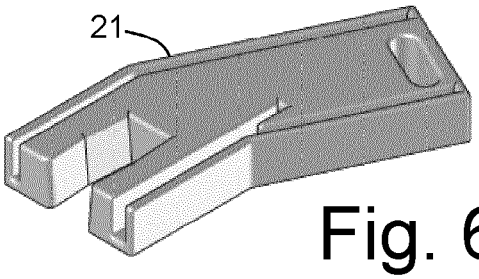


Fig. 6e

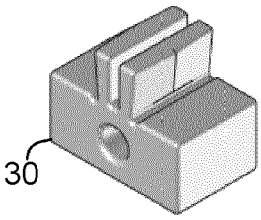


Fig. 6d

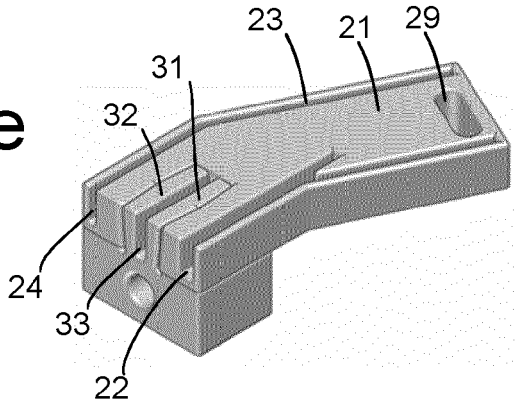


Fig. 6f