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(54) **WINDOW WITH A VENTILATION TUBE**
FENSTER MIT EINEM LÜFTUNGSROHR
FENÊTRE AVEC UN TUBE DE VENTILATION

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EP 2 235 312 B1

Description

[0001] The present invention relates to roof windows to be positioned in flat roofs, i.e. roofs having an inclination in relation to horizontal of approximately 0°, i.e. less than about 15°.

[0002] A number of problems arise when windows are to be positioned in such flat roofs. One problem is that it is difficult to provide a satisfactory heat transmission coefficient because normal insulating windows cannot be directly transferred to this specific use. Often only a standard acrylic dome is positioned over the roof opening, resulting in poor insulation.

[0003] In flat roofs it would be advantageous to be able to apply, for example, a window similar to a standard Velux® top-hung roof window, this window having a very low overall heat transmission coefficient. This type of window often comprises wood parts in the sash and frame, the sash enclosing a multiglazing, insulating pane. It should normally only be mounted in inclined roofs, i.e. roofs with an inclination of 15-90° in relation to horizontal, in order to satisfactorily drain off rainwater.

[0004] When such a window is positioned in an inclined roof, water from rainfall, leaves etc. are thus diverted from the window by means of gravitational forces. If, however, such a window is positioned in a flat roof, water and leaves etc. will not automatically be removed from the outer surface of the window. Eventually, water will gain entrance into the structure of the window, wood will deteriorate, i.e. rot or dry rot, and the outer surface of the windowpane will become filthy and more or less opaque.

[0005] Placing a base for raising the window such that it assumes a suitable inclined position is one way to solve this problem. Another way to provide an inclination is to position a dome, typically made from acrylic, on top of and covering all exterior faces of the window portion. The dome may be shaped like a hemisphere and should comprise a peak point from which the surface descends to all sides. It is preferably attached to the sash, resting on sealing projections or weather strips of the sash.

[0006] Provision of an insulating window portion, which in itself corresponds to a standard Velux® top-hung roof window, covered by a dome combine removal of water and dirt from the window surface with a low heat transmission coefficient.

[0007] However, in such a structure a lower surface of the dome and an upper pane surface of the window portion define a somewhat large interior space, which is filled with air. If water of this trapped air condensates on the lower surface of the dome, i.e. during cold weather, water is likely to penetrate into the window, which might lead to deterioration of wood parts in the window or the roof structure. Further, condensated water might drip down onto the upper pane surface, inhibiting view and light incidence through the windowpane.

[0008] It is thus the object of the present invention to provide a suitable and advantageous solution to the problems concerning condensation in this interior space.

[0009] To meet this object a ventilation tube is provided, which is positioned in the window for ventilation of the interior space of said window. An insect filter may be provided at one end of said ventilation tube such as to prevent insects from entering said ventilation tube from said one end.

[0010] The present invention relates to a window according to claim 1

[0011] The ventilation tube may be positioned for example in a hole of a seal or weather strip on which a dome rests in order to provide ventilation of the interior space trapped beneath the dome. It is thus possible in an inexpensive way to provide a well-defined cross section and area of a ventilation passage extending from the interior space of the window to the surroundings. And it is possible to very efficiently control ventilation of the interior space, making it possible to minimize condensation of water on the internal surface of the dome, while minimizing heat loss because of ventilation.

[0012] The ventilation tube may be readily manufactured, e.g. from a plastics material, and it is easy to position it correctly, e.g. in a cut hole of a seal or weather strip. Further, being a separate element of the window it can be readily exchanged and cleaned.

[0013] The ventilation tube including insect filter may be positioned as a single module in the window. Hereby, the insect filter primarily prevents insects and larger dirt grains from entering the interior space of the window. If the insect filter is positioned at an end of the ventilation tube facing the surroundings, insects will further be prevented from entering the very ventilation tube itself. Thus, the ventilation passage will less likely clog up because of insects and dirt getting stuck in the tube.

[0014] In an embodiment of the invention said insect filter is moulded integrally with said ventilation tube, making it possible to attach the filter firmly to the tube in a cost-efficient way.

[0015] In another embodiment said insect filter comprises a number of bars extending across a cross section between peripheral sections of said ventilation tube. Said insect filter may comprise 4 to 15, preferably 6 to 9, of said bars. In a development of said bars a width of slots between said bars is in the range of 0.2 to 1 times a width of said bars, preferably said width of said slots is in the range of 0.5 to 2 mm.

[0016] In a further embodiment a cross section of said ventilation tube is substantially oval, ellipse-shaped, super-ellipse-shaped, rectangular, quadratic, parallelogram-shaped or pyramid-shaped, preferably said cross section is substantially circular.

[0017] If the ventilation tube further comprises a foot adapted to function as a backstop when mounting said ventilation tube, installation of the tube is made easier and it is positioned in a more secure manner. Said foot is preferably moulded integrally with said ventilation tube at an opposite end of said ventilation tube.

[0018] The tube may comprise at least two tube parts, which may be releasably connected, e.g. by means of a

snap, bayonet or like connection. This makes it possible to insert each tube part from opposite sides of the window.

[0019] If an end opposite to said one end of said ventilation tube comprises a preferably similar insect net, positioning of the tube ends is unimportant.

[0020] Effects and advantages similar to those described above in connection to the ventilation tube per se apply similarly to the invention as defined in the attached claims. More specifically, it is possible in an inexpensive way to provide a well-defined cross section and area of the ventilation passage extending from the interior space of the window to the surroundings, and it is possible to efficiently control the air change of the interior space of the window. The ventilation tube may be readily manufactured, e.g. from a plastics material and it is easy to position it correctly, e.g. in a drilled hole of a seal or weather strip of the window. Being a separate element of the window the ventilation tube can be readily exchanged and cleaned.

[0021] In an embodiment of the invention said ventilation tube is positioned directly below said dome portion. If said sash comprises a sealing projection for sealing said sash against said dome portion, said ventilation tube preferably extends through said sealing projection. Hereby the ventilation tube may be readily positioned in an advantageous position regarding ventilation of the interior space of the window.

[0022] In another embodiment said ventilation tube comprises an insect filter or net positioned at an outwards end of said ventilation tube.

[0023] To optimize the insulation abilities of the window, said window portion further comprises multiple layer glazing, preferably insulation glazing.

[0024] Said interior space is defined by a pane of said window portion and a pane of said dome portion.

[0025] In another embodiment said ventilation tube is positioned in a corner joint of said sash.

[0026] The invention also relates to a method according to claim 8.

[0027] In an embodiment of the method according to the invention said ventilation tube comprises two tube parts, said method further comprising the step of inserting one tube part from one and the other tube part from the other side of said ventilation aperture.

[0028] Preferably, the applied ventilation tube is according to any one of the above embodiments of the ventilation tube per se.

[0029] The invention will be explained in detail in the following by means of examples of embodiments with reference to the schematic drawing, in which

Fig. 1 is a perspective view of a window according to the invention,

Fig. 2 is a cross-sectional view of the window according to Fig. 1,

Fig. 3 is a perspective view of a ventilation tube,

Fig. 4 is a left end view of the ventilation tube ac-

cording to Fig. 3,

Fig. 5 is a right end view of the ventilation tube according to Fig. 3,

Fig. 6 is a side view of the ventilation tube according to Fig. 3,

Fig. 7 is a perspective view of a detail of a sash of the window according to Fig. 1,

Fig. 8 is an elevational view of the detail according to Fig. 7

Fig. 9 is a side view of the detail according to Fig. 7, Fig. 10 is an end view of the detail according to Fig. 7 seen from the left end,

Fig. 11 is a perspective view of a second embodiment of a ventilation tube in an unassembled position, and Fig. 12 is a perspective view of the ventilation tube of Fig. 11 in an assembled position.

[0030] Throughout the drawings like reference signs in different embodiments refer to like elements or elements of the same function.

[0031] Figs 1 and 2 show different views of a window according to the present invention. The window comprises a rectangular window portion 1 in the form of a standard Velux® top-hung roof window (GHL type), which is able to pivot about a horizontal axis positioned along a side of the window. The window portion 1 is installed in a flat roof 2 and comprises a sash 3 positioned in a frame 4, which are both extruded PVC profiles. In other embodiments the frame and sash may be in the form of for example extruded aluminium profiles or they may comprise wooden parts. The sash 3 encloses a windowpane 5 with two layers of glazing sandwiching a layer of gas to provide insulation glazing.

[0032] A dome portion 6 in the form of a dome-shaped acrylic plate is attached to the sash 3 to form a weather shield protecting the window portion 1. The dome portion 6 comprises a peak point from which the surface descends to the sides. Supporting the dome portion 6 are sealing projections or weather strips 7, 8, sealing the sash 3 against the dome portion 6.

[0033] Pivoting the sash 3 and dome 6 about said horizontal axis by means of a chain operator 23 embedded in the frame 4 provides movement between an open and a closed position. The chain operator 23 may be driven automatically and may be radio controlled.

[0034] A lower surface of the dome portion 6 and an upper surface of the windowpane 5 define an interior space 9, which is filled with air.

[0035] Figs 3 to 6 show a ventilation tube 10. The ventilation tube 10 is adapted to be positioned in the window according to Figs 1 and 2 for ventilation of the interior space 9.

[0036] As is most clear from Fig. 4, a main part 11 of the ventilation tube 10 is shaped as a circular cylinder. The ventilation tube 10 comprises at the right end of Figs. 3 and 6 a foot in the form of flanges 12, which extend to opposite sides from a periphery of the main part 11. From the flanges 12 slot 13a, 13b provided on opposite sides

of the main part 11 extend about $\frac{3}{4}$ of the length of the ventilation tube 10. Triangular projections 14 extend from the sides of the main part 11 of the ventilation tube 10.

[0037] An insect filter 15 is provided at one end of the ventilation tube 10, i.e. the left end in the views of Figs 3 and 6. The insect filter 15 comprises seven bars 16. The bars 16 extend in parallel with each other across a cross section of the main part 11 between points on a peripheral circumference of the main part 11. As is best shown in Fig. 4, slots 17 between the bars 16 have a width $\frac{1}{3}$ a width of the bars 16.

[0038] The ventilation tube 10 is preferably moulded from a plastics material, the flanges 12, triangular projections 14 and bars 16 being moulded integrally with the main part 11 of the ventilation tube 10.

[0039] The sealing projections 7, 8 of the sash portion 3 shown in fig. 2 are shown in more detail in Figs 7 to 9, Figs 7 to 9 showing a detail of the sash portion 3 of the window according to Figs 1 and 2. The detail of Figs. 7 to 9 is an arbitrary detail of any part of the sash 3 of the window according to Figs 1 and 2, the end view of Fig. 10, however, being comparable to the left side sash section shown in Fig. 2.

[0040] The sealing projections 7, 8 are made from a standard seal material such as rubber, and each comprises a respective sealing base 18, 19, which are fixed to the sash 3, cf. Fig. 10. The base parts 18, 19 extend into sealing tips 20, 21, which point upwards in the view of Fig. 10. In the views of Figs 7 to 10 the dome portion 6 has not been positioned above the window portion 1. When the dome portion 6 is in position, the sealing tips 20, 21 will bend downwards to abut the sealing bases 18, 19, thus supporting the dome portion 6 (cf. also Fig. 2).

[0041] As is shown in Figs 7 to 10, a ventilation tube 10 according to the embodiment of Figs 3 to 6 has been inserted to extend from the interior space 9 beneath the dome portion 6 (when in position) through the sealing projections 7, 8 of the sash 3. The right side of the sash detail as shown in Fig. 8 forms part of an inner surface of the sash 3, and the left side forms part of an outer side of the sash 3. The ventilation tube 10 is thus positioned directly below the dome portion 6 such that the insect filter 15 is positioned at the outer side of the sash 3.

[0042] Positioning the ventilation tube 10 through the sealing projections 7, 8, a suitable ventilation aperture corresponding to the cross section of the main part 11 of the ventilation tube 10 may be cut (or drilled) in the material of the sealing projections 7, 8. Preferably, however, a "pointed" end (i.e. the left end of Fig. 6) is forced through the soft material, a predrilling of significantly smaller cross section perhaps having been made in the sealing projections 7, 8. Hereby, the sealing material fits tightly around the ventilation tube 10.

[0043] Guiding the ventilation tube 10 from the inner surface of the sash 3 through the sealing projections 7, 8, the slots 13 provide flexibility to the main part 11 of the ventilation tube 10, making it easier to push the ventilation tube 10 through. The flanges 12 function as a backstop,

ensuring that the ventilation tube 10 is positioned properly.

[0044] Fusing or welding end surfaces of PVC profiles of side sash members forms the sash 3. Sealing projections 7, 8 of two sash members are not suitable for being fused together since, when re-solidified, the sealing material becomes hard and inflexible. To solve this problem, while providing ventilation of the interior space 9, a ventilation tube can be positioned in a corner joint of the sash 3, more specifically joining two sealing projections of two sash members fused together. In this regard a ventilation tube with a rectangular cross section would be particularly suitable. If the sealing projections are not attached to the respective sash members near the end surfaces such as to avoid welding together during welding together of the PVC profiles, after welding the PVC profiles the ventilation tube can be pushed from the interior space 9 into a gap between the sealing projections, pushing the sealing projections backwards to resiliently and thus sealingly abut the ventilation tube sides. The ventilation tube could be manufactured from a resilient and flexible material or be provided with a resilient sealing projection on its top surface to ensure functionality and completeness of the sealing between dome portion 6 and window portion 1.

[0045] One or more ventilation tubes 10 may be positioned on one or more sides of the window portion 1, depending on the desired amount of ventilation of the interior space 9. If on a mounted window the accumulated ventilation area of installed ventilation tubes 10 proves to be too small to provide a satisfactory ventilation of the interior space 9 beneath the dome 6, further ventilation tubes 10 may be readily retrofitted in the mounted window.

[0046] Figs 11 and 12 show a second embodiment of a ventilation tube, which could form part of a window according to the invention, including the window described above and shown in the previous figures. The present ventilation tube 10 could be applied as a replacement or supplement to the ventilation tube 10 of the embodiment of Figs 1 to 10.

[0047] The ventilation tube 10 of Figs 11 and 12 comprises two tube parts 10a, 10b. To form the assembled ventilation tube 10 as shown in Fig 12 an insect filter or net in the form of a flexible web or cloth 15 is positioned between the tube parts 10a, 10b. The web or cloth 15 has been cut out from an infinite web and need not be circular. A tube protrusion 10c of the tube part 10b is inserted into the tube part 10a such as to hold the web or cloth 15 stretched out within the ventilation tube 10 to form a filter or net suitable for keeping out insects. The web or cloth 15 is not visible in the assembled ventilation tube 10 as shown in Fig. 12.

[0048] With the present embodiment the dimensions of the tube parts 10a, 10b could advantageously be adapted such as to position the insect filter at one end of the ventilation tube 10.

[0049] The insect net of the ventilation tube according

to the invention need not be positioned normal to axis of the ventilation tube; a more obliquely provided insect net could provide for a larger filter area. Thus, the necessary mesh size of the insect net might be made smaller with the same flow through the ventilation tube. Also, more than one insect filter may be provided in one ventilation tube, e.g. one insect filter at each end. Hereby, both ends of the ventilation tube could be positioned towards the outside.

Claims

1. A window, comprising
a dome portion (6), and
a window portion (1) with a sash (3) and a frame (4),
said dome (6) and window (1) portions defining an
interior space (9),
characterized in that
at least one ventilation tube (10) extends from said
interior space (9) through said sash (3) or said frame
(4) such as to be adapted to ventilate said interior
space (9).
2. A window according to claim 1, wherein said ventila-
tion tube (10) is positioned directly below said
dome portion (6).
3. A window according to claim 1 or 2, wherein said
sash (3) comprises a sealing projection or weather
strip (7, 8) for sealing said sash (3) against said dome
portion (6), said ventilation tube (10) extending
through said sealing projection (7, 8).
4. A window according to any one of claims 1 to 3,
wherein said ventilation tube (10) comprises an in-
sect filter or net (15) positioned at an outwards end
of said ventilation tube (10).
5. A window according to any one of claims 1 to 4,
wherein said window portion (1) further comprises
multiple layer glazing, preferably insulation glazing.
6. A window according to any one of claims 1 to 5,
wherein said interior space (9) is defined by a pane
of said window portion (1) and a pane of said dome
portion (6).
7. A window according to any one of claims 1 to 6,
wherein said ventilation tube is positioned in a corner
joint of said sash (3).
8. A method for positioning a ventilation tube (10) in a
window for ventilation of an interior space (9) of said
window, comprising the steps of
 - a. providing a window comprising a dome por-
tion (6), and a window portion (1) with a sash (3)

and a frame (4), said dome (6) and window (1)
portions defining said interior space (9), and
b. positioning said ventilation tube (10) in a ven-
tilation aperture to extend from said interior
space (9) through said sash (3) or said frame
(4) such as to be adapted to ventilate said interior
space (9).

9. A method according to claim 8 wherein said ventila-
tion tube (10) comprises two tube parts, said method
further comprising the step of inserting one tube part
from one and the other tube part from the other side
of said ventilation aperture.
10. A method according to claim 8 or 9 wherein an insect
filter (15) is provided at one end of said ventilation
tube (10) such as to prevent insects from entering
said ventilation tube (10) from said one end.

Patentansprüche

1. Fenster umfassend
ein Kuppelteil (6) und
ein Fensterteil (1) mit einem Flügel (3) und einem
Blendrahmen (4),
wobei das Kuppelteil (6) und das Fensterteil (1) ei-
nen Innenraum (9) definieren,
dadurch gekennzeichnet,
dass zumindest ein Lüftungsrohr (10) vom Innen-
raum (9) durch den Flügel (3) oder den Blendrahmen
(4) hindurch verläuft, um für Lüftung des Innenraums
(9) angepasst zu werden.
2. Fenster nach Anspruch 1, worin das Lüftungsrohr
(10) direkt unter dem Kuppelteil (6) angebracht ist.
3. Fenster nach Anspruch 1 oder 2, worin der Flügel
(3) eine Dichtungsprojektion oder einen Dichtungs-
streifen (7, 8) für Dichtung des Flügels (3) gegen das
Kuppelteil (6) umfasst, wobei das Lüftungsrohr (10)
durch die Dichtungsprojektion (7, 8) hindurch ver-
läuft.
4. Fenster nach einem der Ansprüche 1 bis 3, worin
das Lüftungsrohr (10) ein Insektenfilter oder -gitter
(15) umfasst, das an einem nach Außen gerichteten
Ende des Lüftungsrohrs (10) angebracht ist.
5. Fenster nach einem der Ansprüche 1 bis 4, worin
das Fensterteil (1) ferner Merhscheibenglas um-
fasst, vorzugsweise Isolierverglasung.
6. Fenster nach einem der Ansprüche 1 bis 5, worin
der Innenraum (9) durch eine Scheibe des Fenster-
teils (1) und eine Scheibe des Kuppelteils (6) defi-
niert ist.

7. Fenster nach einem der Ansprüche 1 bis 6, worin das Lüftungsrohr in einer Eckverbindung des Flügels (3) angebracht ist.
8. Verfahren zur Anbringung eines Lüftungsrohrs (10) in einem Fenster für Lüftung eines Innenraums (9) des Fensters, umfassend die Schritte:
- a. Vorsehen eines Fensters umfassend ein Kuppelteil (6), und ein Fensterteil (1) mit einem Flügel (3) und einem Blendrahmen (4), wobei das Kuppelteil (6) und das Fensterteil den Innenraum (9) definieren, und
 - b. Anbringung des Lüftungsrohrs (10) in einer Lüftungsöffnung, so dass es vom Innenraum (9) durch den Flügel (3) oder den Blendrahmen (4) hindurch verläuft, um für Lüftung des Innenraums (9) angepasst zu werden.
9. Verfahren nach Anspruch 8, worin das Lüftungsrohr (10) zwei Rohrteile umfasst, wobei das Verfahren ferner den Schritt umfasst, ein Rohrteil von einer Seite und das andere Rohrteil von der anderen Seite der Lüftungsöffnung einzusetzen.
10. Verfahren nach Anspruch 8 oder 9, worin ein Insektfilter (15) an einem Ende des Lüftungsrohrs (10) vorgesehen ist, um Insekten daran zu hindern, ins Lüftungsrohr (10) aus dem einen Ende einzudringen.

Revendications

1. Fenêtre, comprenant une portion de coupole (6), et une portion de fenêtre (1) avec un châssis (3) et un cadre (4), lesdites portions de coupole (6) et de fenêtre (1) définissant un espace intérieur (9), **caractérisée en ce que** au moins un tube de ventilation (10) s'étend à partir dudit espace intérieur (9), à travers ledit châssis (3) ou ledit cadre (4), de manière à être adapté pour ventiler ledit espace intérieur (9).
2. Fenêtre selon la revendication 1, dans laquelle ledit tube de ventilation (10) est disposé directement en-dessous de ladite portion de coupole (6).
3. Fenêtre selon la revendication 1 ou 2, dans laquelle ledit châssis (3) comprend une projection d'étanchéité ou un bourrelet d'étanchéité (7, 8) pour isoler ledit châssis (3) par rapport à ladite portion de coupole (6), ledit tube de ventilation (10) s'étendant à travers ladite projection d'étanchéité (7, 8).
4. Fenêtre selon l'une quelconque des revendications 1 à 3, dans laquelle ledit tube de ventilation (10) comprend un filtre à insectes ou une toile (15) disposée à une extrémité extérieure dudit tube de ventilation (10).
5. Fenêtre selon l'une quelconque des revendications 1 à 4, dans laquelle ladite portion de fenêtre (1) comprend en outre un vitrage à plusieurs couches, de préférence un vitrage isolant.
6. Fenêtre selon l'une quelconque des revendications 1 à 5, dans laquelle ledit espace intérieur (9) est défini par un carreau de ladite portion de fenêtre (1) et un carreau de ladite portion de coupole (6).
7. Fenêtre selon l'une quelconque des revendications 1 à 6, dans laquelle ledit tube de ventilation est disposé dans un joint d'angle dudit châssis (3).
8. Méthode pour le positionnement d'un tube de ventilation (10) dans une fenêtre, pour l'aération d'un espace intérieur (9) de ladite fenêtre, comprenant les étapes suivantes :
 - a. Mise à disposition d'une fenêtre comprenant une portion de coupole (6), et une portion de fenêtre (1) avec un châssis (3) et un cadre (4), lesdites portions de coupole (6) et de fenêtre (1) définissant ledit espace intérieur (9), et
 - b. Positionnement dudit tube de ventilation (10) dans une ouverture de ventilation, de manière à ce qu'il s'étende à partir dudit espace intérieur (9), à travers ledit châssis (3) ou ledit cadre (4), de façon à l'adapter pour la ventilation dudit espace intérieur (9).
9. Méthode selon la revendication 8, dans laquelle ledit tube de ventilation (10) comprend deux parties de tube, ladite méthode comprenant en outre l'étape d'insertion d'une partie de tube d'un côté et de l'autre partie de tube par l'autre côté de ladite ouverture de ventilation.
10. Méthode selon la revendication 8 ou 9, dans laquelle un filtre à insectes (15) est prévu à une extrémité dudit tube de ventilation (10), de manière à empêcher les insectes de pénétrer dans ledit tube de ventilation (10) par ladite extrémité.

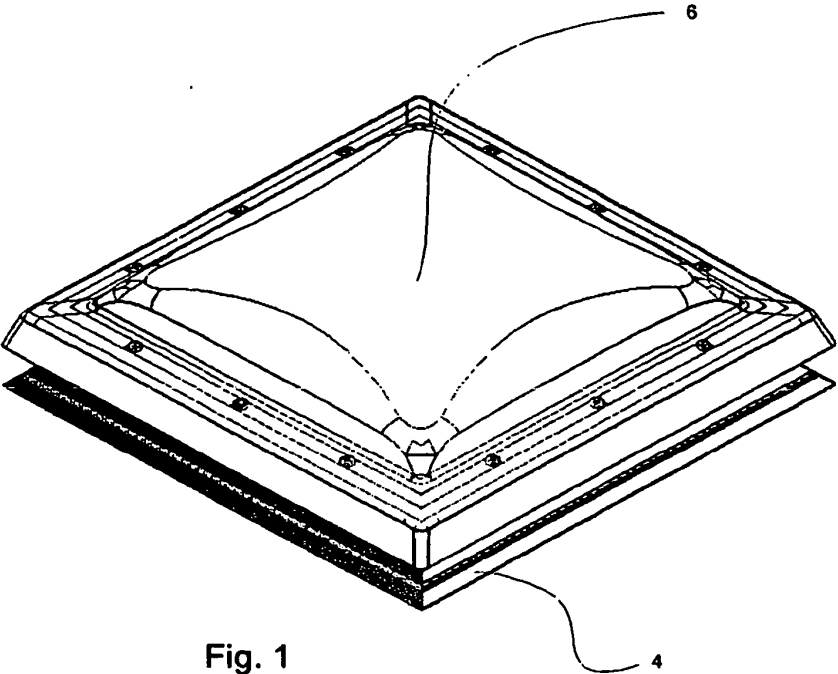


Fig. 1

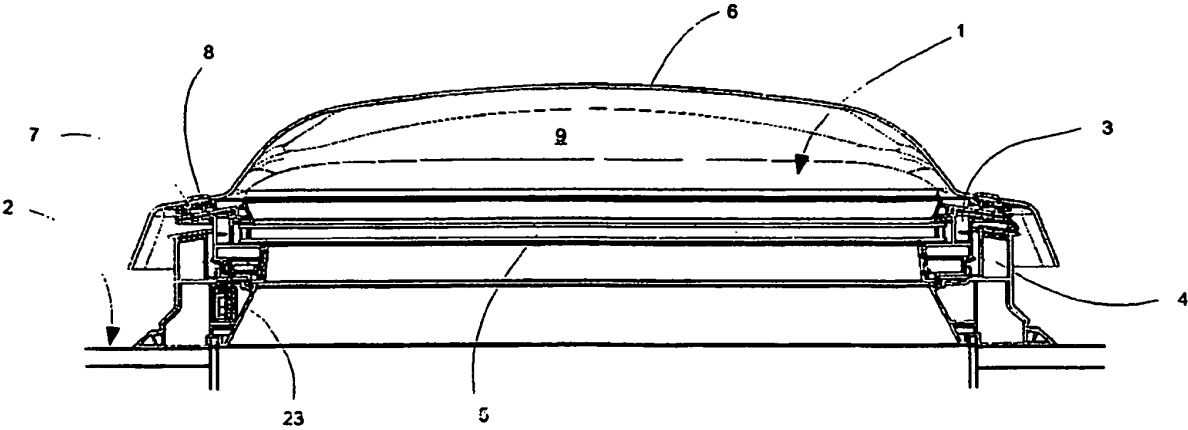


Fig. 2

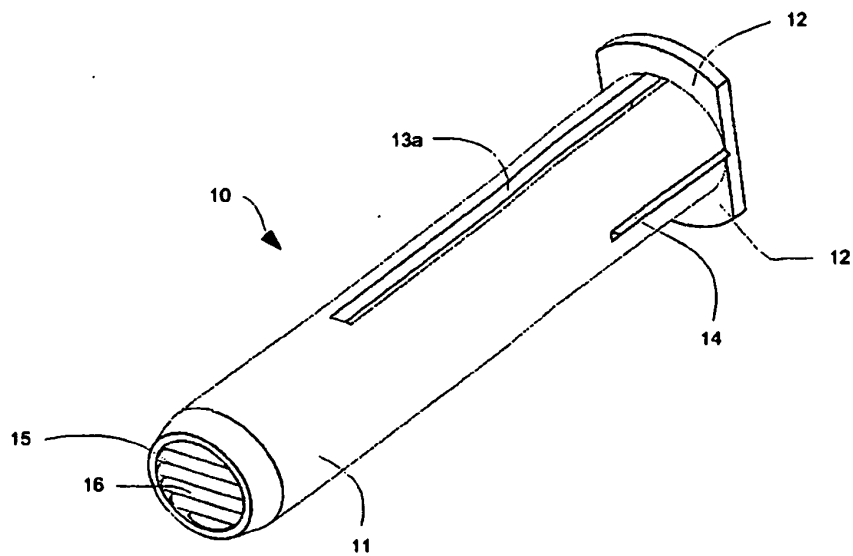


Fig. 3

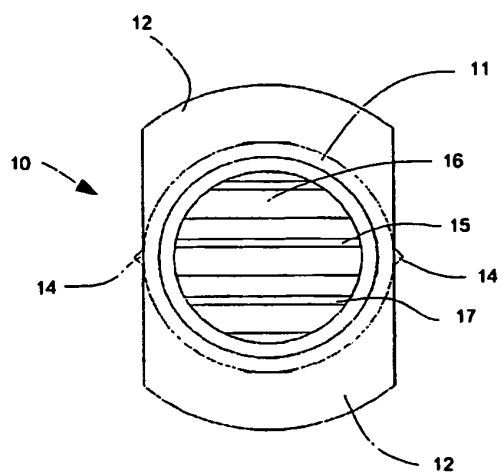


Fig. 4

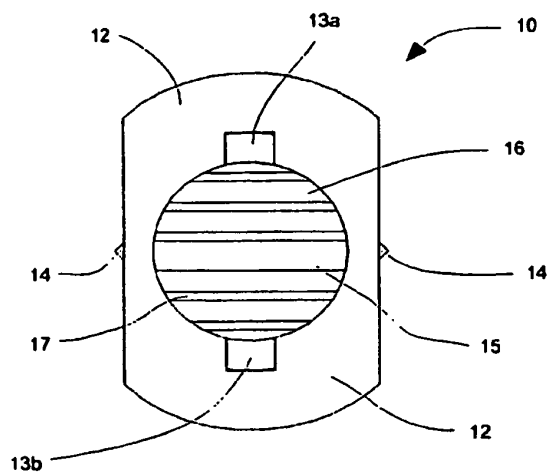


Fig. 5

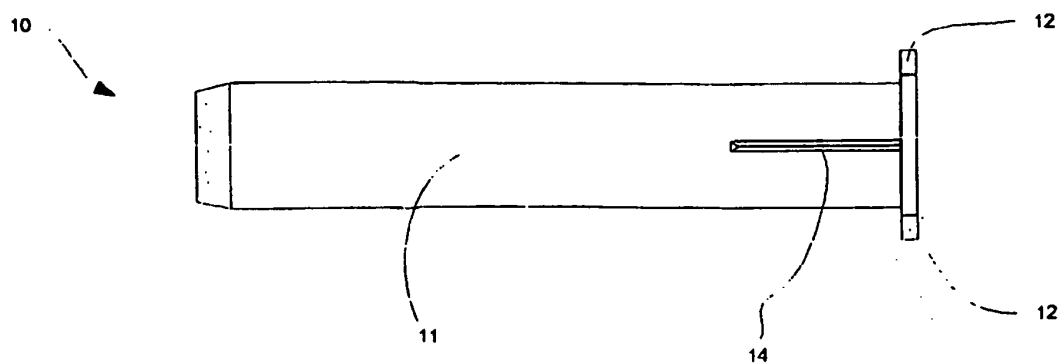


Fig. 6

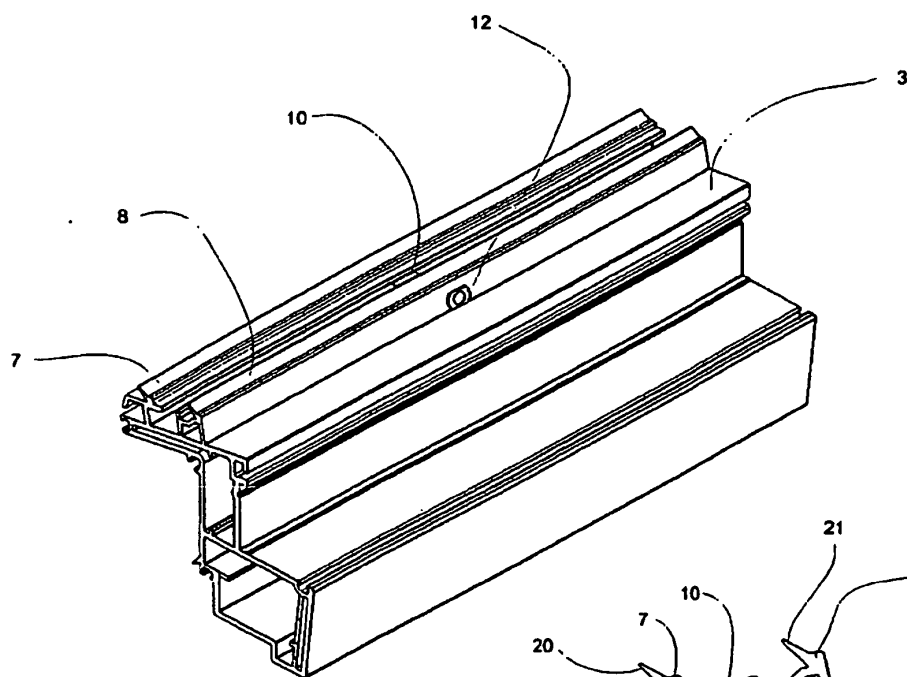


Fig. 7

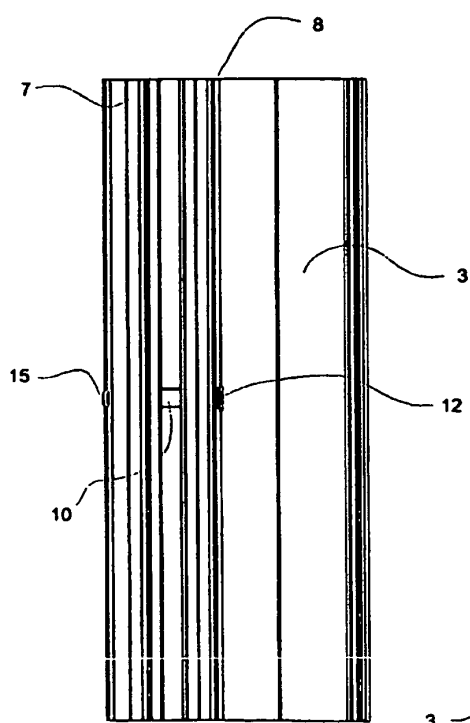


Fig. 8

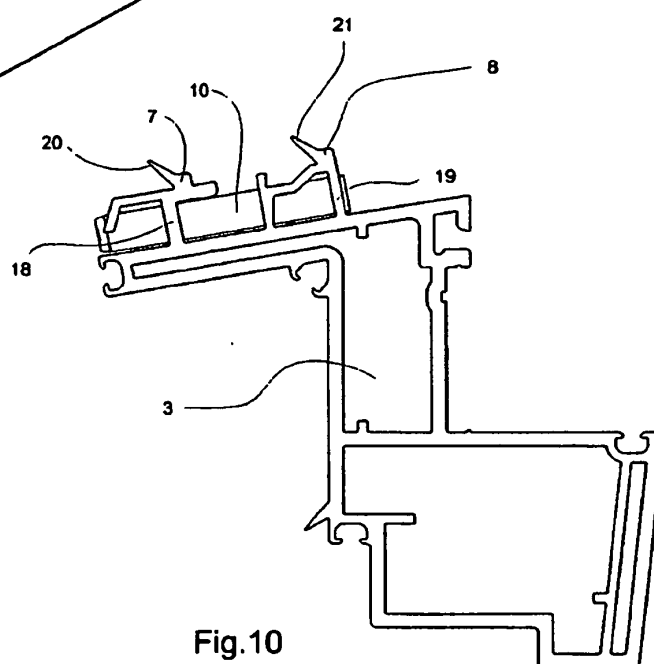


Fig. 10

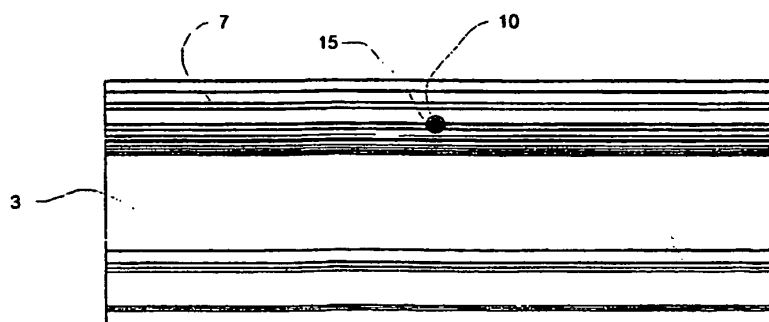


Fig. 9

