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(54) **A ROOF WINDOW AND A SLOPING ROOF STRUCTURE**

(57) The invention relates to a roof where, in the mounted state and closed state of the window, the exterior side of the frame bottom member is located in the interval between 0 mm and 30 mm above the exterior side of the pane measured in a direction perpendicularly to the exterior side of the pane, and to a kit including a bottom flashing member and a roof window comprising, where the highest point on the bottom flashing member is located in the above interval. In an embodiment a covering member is provided at a lower edge of the pane, said covering member being arranged at an angle to the exterior side of the roofing so that in the mounted state and closed state of the window it has a lower inclination than the exterior side of the roofing and extends over the exterior side of the bottom frame member.

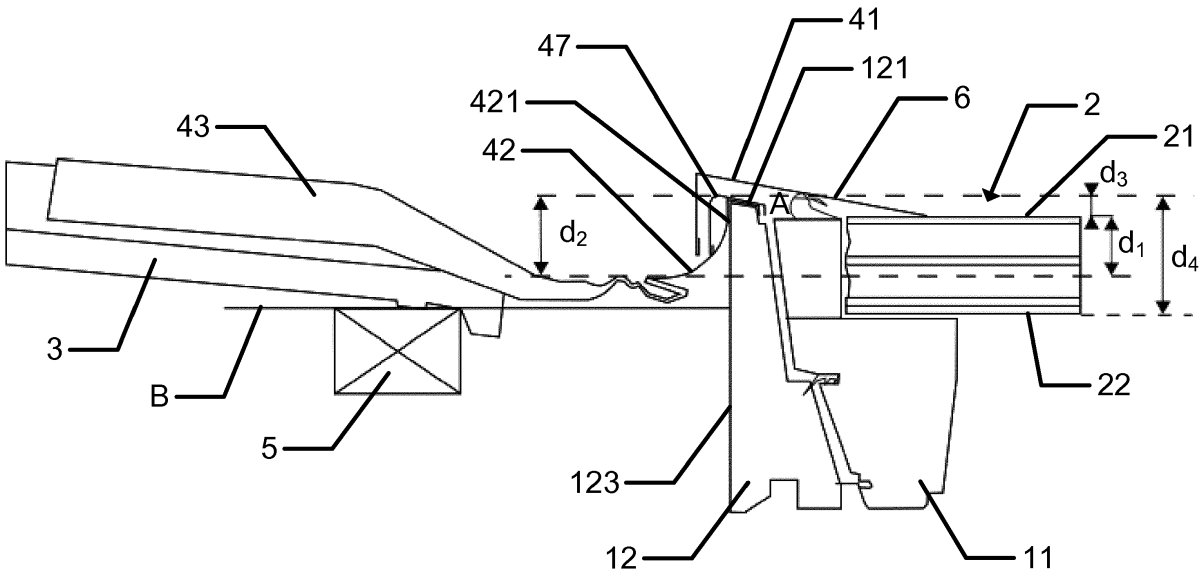

Fig. 2

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Description

[0001] The present invention relates to a roof window comprising a sash and a frame, said sash carrying a pane and being connected to the frame via hinges, and said frame being adapted for being connected to a load-bearing structure of a roof of a building, where each of the sash and the frame comprises two side members, a top member and a bottom member, where said frame members delimit a frame opening and said sash members delimit a sash opening, where each of the pane, the sash members and frame members has an interior side adapted for facing the interior of the building in the mounted state and an exterior side adapted for facing the exterior of the building in the mounted state. The invention further relates to a kit including a bottom flashing member and such a roof window, and to a roof structure including such a roof window.

[0002] When windows of this kind are mounted deep in the roof structure, they project only a little or not at all above the exterior surface of the roofing used as the outermost weather screen of the roof structure. Mounting the windows deep in the roof is often considered to provide aesthetics advantages, but it also provides thermal advantages as explained in EP2843148A and/or gives room for sun-screening devices as in DE20316919U1.

[0003] Arranging the window with the exterior surface of the pane below an exterior surface of the roof, however, means that precipitation hitting the pane and running or sliding down towards the bottom members of the sash and frame will end up at a level from where it cannot continue directly onto the roofing. It therefore has to be brought up to the level of the exterior side of the roofing in order to be drained off.

[0004] Typically, a gutter shaped flashing member is provided below the window seen in the direction of slope of the roof structure, said flashing member having a first section, which is arranged to abut directly or indirectly against an outer side of the bottom frame member facing away from the frame opening, and a second section, which is arranged with a lower inclination than the roof in the mounted state, so that it may "lift" water up to the exterior surface of the roofing.

[0005] Such gutter flashing members, which typically have a U- og V-shaped cross-section, work very well, but there is a limit to how deep they can project into the roof construction without influencing the thermal properties of the construction too much in a negative direction. This sets a limit on the possible distance from the exterior side of the pane to the bottom of the gutter in a direction perpendicular to the plane of the roof and thus a limit on the amount of water which can be accommodated in the gutter. When windows are mounted with the pane below the exterior side of the roofing this has been seen to result in water overflowing the upper side of the first section of the gutter flashing member and penetrating into the roof construction. Particularly the problem occurs if the precipitation includes snow or hail, which does not easily flow onto the roofing material and thus fills the gutter, or if the gutter is filled wholly or partially with dirt, such as leaves or moss.

[0006] It is therefore an object of the invention to provide a roof window, which is suitable for being mounted with the pane at least partially below an exterior surface of the roof, and where the risk of water penetrating into the roof construction at the bottom member of the frame is reduced.

[0007] This is achieved with a roof window where, in the mounted and closed state of the window, the exterior side of the frame bottom member is located in the interval between 0 mm and 30 mm above the exterior side of the pane measured in a direction perpendicularly to the exterior side of the pane. Compared to prior art roof windows this means that at least the bottom member of the frame projects considerably higher in a direction perpendicular to the plane of the roof relative to the level of the pane, and thus allows the distance between the bottom of the gutter formed by the bottom flashing member and the exterior side of the bottom frame member to be larger. This in turn means that the first section of the bottom flashing member may also project relatively far from the bottom of the gutter and hence that the gutter may have a larger volume than with a prior art window mounted in the same depth in the roof structure.

[0008] The reference to "the exterior side of the frame bottom member" is to be understood as meaning the highest point on the frame bottom member when seen in a direction from the interior side of the frame bottom member towards the exterior side and perpendicularly to the exterior side of the pane. Often this will also be the point located highest in the mounted state, but it need not be case.

[0009] For roof windows of traditional dimensions and intended for use in roofs with a pitch between 15 and 90 degrees the exterior side of the frame bottom member is located in the interval between 15 mm and 25 mm, preferably approximately 20 mm, above the exterior side of the pane measured in a direction perpendicularly to the exterior side of the pane.

[0010] In presently preferred embodiments, the distance from the interior side of the pane to the exterior side of the bottom frame member is 25-100 mm, more specifically 45-85 mm measured in a direction perpendicularly to the exterior side of the pane.

[0011] In one embodiment, in order to provide the roof window with a bottom frame member projecting high above the bottom of the gutter while at the same time allowing a smooth transition to other parts of the window, a first section of the exterior side of the frame bottom member located at an outer side of the frame facing away from the frame opening is located above a second section of the exterior side of the frame bottom member located at an inner side of the frame facing the frame opening measured in a direction from the interior side of the frame bottom member towards the exterior side of the frame bottom member and perpendicularly to the exterior side

of the pane. This may for example be achieved with an inclined exterior side of the frame bottom member so that in the mounted and closed state of the window the exterior side of the frame bottom member has a lower inclination than the exterior side of the pane.

[0012] The exterior side of the bottom frame member may be embodied in several different ways, including a wooden surface covered by lacquer or paint in the case of a window having a traditional wooden frame or a polymer surface if the window frame is for example made by moulding polyurethane onto a core of reinforcing and/or insulating members as is also well-known within this field. If, however, the bottom frame member is composed of several different elements, the exterior surface may be formed by for example an insulating element attached to the exterior surface of a load-bearing frame member such that the insulating member is forming the actual exterior surface of the frame at the bottom member. Likewise, it will also be understood that a frame bottom cladding, covering or flashing member may be arranged on the exterior side of frame member, thereby forming the exterior surface of the frame at the bottom member.

[0013] Most traditional roof windows are provided with a sash bottom covering, which extends from the exterior side of the pane over the frame bottom member so as to lead water etc. onto the flashing member arranged below the window. In some cases, the sash bottom covering also covers the joint between the pane and the sash bottom member.

[0014] In one embodiment, such a sash bottom covering is arranged at an angle to the exterior side of the pane so that in the mounted and closed state of the window it has a lower inclination than the exterior side of the pane. In other words, the sash bottom covering is angled slightly upwards in relation to the plane defined by the exterior side of the pane, thereby "lifting" water or other precipitation running down along the pane and thus effectively creating a greater distance to the bottom of the gutter formed by the bottom flashing member. This allows for the use of an even higher bottom frame member and/or a bottom flashing member having a first section, which extends above the exterior side of the bottom frame member, and hence the risk of water overflowing the first section of the bottom flashing member is reduced.

[0015] Depending on the angle of the sash bottom covering it may also hinder the downwards travel of snow, hail etc. along the pane and thus prevent at least some of it from reaching the gutter until melted or at least delay it so that the risk of blockage of the gutter is reduced. A negative inclination of the sash bottom covering, i.e. an inclination in a direction opposite the pitch of the roof, is, however, usually undesirable as it may result in the formation of pools of water, which cannot be drained off and which in turn can cause deterioration of the materials of the window and/or leakage into the roof construction.

[0016] If the exterior side of bottom frame member is inclined as described above it may be given substantially the same angle of inclination as the sash bottom covering, so that in the closed state of the roof window the sash bottom covering will be substantially parallel with the exterior side of the frame bottom member and with a possible frame bottom covering arranged on and in parallel with the exterior side of the frame bottom member. This will reduce the risk of wind and dirt entering the space between the sash and the frame, particularly if the sash bottom covering and a frame bottom covering are both provided with a bend, so that a section extends towards the interior side.

[0017] Depending on the design of the window, the sash bottom covering may be attached either to the pane or to the sash or to both.

[0018] In some embodiments, the sash bottom covering is connected directly to the pane in a manner, which allows water to pass from the exterior side of the pane and onto the sash bottom covering. This may for example be achieved by attaching the sash bottom covering to the pane using an adhesive, and/or by waterproofing the joint between the sash bottom covering and the pane using a sealing strip or a caulking compound.

[0019] It is, however, also possible to attach the sash bottom covering to a border element attached to the pane. Such a border element may for example be provided by moulding and may extend only along the bottom edge of the pane, along several edges of the pane, or even along the entire circumference of the pane. Likewise, it will be understood that a border element may embrace the rim of the pane entirely so that it extends from interior side to the exterior side and extends over both of them, or that it may be locate only at one side of the pane. Moreover, a border element may be provided as one or more discrete member(s) having a shorter extend than the width of the pane.

[0020] It is also possible to attach the sash bottom covering to the bottom sash member, either as the sole means of attachment or as a supplement to an attachment to the pane as described above. Attachment to the bottom sash member may for example be achieved by means of screws.

[0021] If the sash bottom covering is attached to the bottom sash member, a cladding may be provided and adapted to lead water from the pane onto the sash bottom covering.

[0022] In traditional type roof windows, the sash bottom covering will typically be provided at the exterior side of the pane, but is also possible to provide it at the interior side of the pane, particularly if using a pane projecting over the exterior side of the bottom sash member.

[0023] Above the invention has been described with reference to a window where the frame bottom member projects above the exterior surface of the pane. Similar advantages may be achieved with a kit including a bottom flashing member and a roof window comprising a sash and a frame, said sash carrying a pane and being connected to the frame via hinges, and said frame being adapted for being connected to a load-bearing structure

of a roof of a building, where each of the sash and the frame comprises two side members, a top member and a bottom member, where said frame members delimit a frame opening and said sash members delimit a sash opening, where each of the pane, the sash members and frame members has an interior side adapted for facing the interior of the building in the mounted state and an exterior side adapted for facing the exterior of the building in the mounted state, where, in the mounted and closed state of the window, the highest point on the bottom flashing member, which is located furthest away from interior side of the frame bottom member when measured in a direction perpendicularly to the exterior side of the pane, is located in the interval between 0 mm and 30 mm above the exterior side of the pane measured in a direction perpendicularly to the exterior side of the pane. Even if the exterior side of the frame bottom member is not located as high as described above with reference to the first aspect of the invention, the corresponding high position of the highest point on the bottom flashing member will still make it possible to reduce the risk of water penetrating into the roof construction at the bottom member of the frame when the roof window is mounted with the pane at least partially below an exterior surface of the roof. This may require the bottom flashing member to be made of a somewhat stiffer material in order to withstand the water pressure occurring when the gutter is full, since it is not supported by the frame bottom member along its entire height, but otherwise the flashing member can be substantially the same as described above.

[0024] In one embodiment of the kit, in the mounted and closed state of the window, the highest point on the bottom flashing member, which is located furthest away from interior side of the frame bottom member when measured in a direction perpendicularly to the exterior side of the pane, is located in the interval between 15 mm and 25 mm, preferably approximately 20 mm, above the exterior side of the pane measured in a direction perpendicularly to the exterior side of the pane.

[0025] In the following the invention will be described in closer detail with reference to non-limiting embodiments shown in the drawing, where:

Fig. 1 is a photo of a roof window mounted deep in a roof,

Fig. 2 is a cross-sectional partly cut-away illustration of a roof window according to a first embodiment of the present invention mounted deep in a roof,

Fig. 3 is a cross-sectional partly cut-away sketch of a roof window according to a second embodiment of the present invention,

Fig. 4 is a cross-sectional partly cut-away sketch of a roof window according to a third embodiment of the present invention,

Fig. 5 is a cross-sectional partly cut-away sketch of a roof window according to a fourth embodiment of the present invention,

Fig. 6 corresponds to Fig. 5 but shown in a perspective view, and

Fig. 7 is a cross-sectional partly cut-away sketch of a kit including a bottom flashing member and a roof window.

[0026] A roof window 1 comprising a frame and a sash carrying a pane 2 and where the sash is connected to the frame via hinges is shown in Fig. 1. Here the window is mounted in a roof with a pitch of approximately 40 degrees and the roofing is tiles, but it will be understood that the window may also be used in other types of roofs. The joint between the roof and the window is weather-proofed with a flashing assembly 4, which includes a series of flashings members and covering members, of which only the sash bottom covering 41 and the bottom flashing member 42 with the skirt member 43 are clearly visible in Fig. 1, as well as a top casing 44 and cladding members 45, 46 on the side members of the frame and sash, respectively. Such flashing assemblies are well known and will therefore not be described in further detail.

[0027] Turning now to Fig. 2, a roof window according to the invention is shown in a cross-sectional partly cut-away view, where the load-bearing structure is represented by a lath 5 supporting the roofing 3. The sash is represented only by the sash bottom member 11 and the frame by the bottom member of the frame 12, but it will be understood that both the sash and frame further comprises a top member and two side members, so that the frame members delimit a substantially rectangular frame opening and the sash members delimit a substantially rectangular sash opening in the same way as shown in Fig. 1.

[0028] The bottom flashing member 42 has a first section 421 extending up along an outer side 123 of the frame bottom member 12 so that the bottom flashing member 42 with the skirt member 43 forms a gutter below the window. In this embodiment, the first section is provided with a flange projecting over the exterior side 121 of the frame bottom member and a frame bottom covering 47 is attached on top of it and extending down along the outer side of the frame bottom member in order to provide extra weather-proofing, but this need not be the case.

[0029] In this embodiment the exterior side 121 of the frame bottom member 12 is located at a distance d_3 above the exterior side 21 of the pane measured in a direction perpendicularly to the exterior side of the pane, the distance d_3 here being approximately 15 mm.

[0030] The distance d_3 from the exterior side 21 of the pane to the highest point on frame bottom member 12 will of course depend on the thickness of the pane. In this embodiment the window is provided with a three-layer pane, where the interior pane layer forming the interior side 22 of the pane is laminated glass. Such a pane 2 has a thickness of approximately 50 mm, meaning that the distance d_4 from the interior side 22 of the pane to the highest point on the bottom frame member 12 measured in a direction perpendicularly to the exterior side of the pane is here approximately 65 mm.

[0031] In this embodiment the window is mounted deep in the roof with the interior side 22 of the pane 2 substantially at level with the level B defined by the exterior surfaces of the laths 5 (also known as the blue level) and with the pane located below the exterior surface of the roofing in the mounted and closed state of the window. Consequently, the distance d_1 from the lowermost point on the bottom flashing member 42 to the exterior side 21 of pane is relatively low. With a traditional roof window (not shown) this would result in that the distance from the lowest point on bottom flashing member including the skirt member to the highest point on the exterior side of the frame bottom member and hence the uppermost level of the first section of the bottom flashing member becoming very small, thus leading to a potential risk of water overflowing the exterior side of the frame bottom member and entering the building. With this window on the other hand the distance d_2 from the lowest point on bottom flashing member to the highest point on the exterior side of the frame bottom member remains sufficiently high to ensure a good weather proofing thanks to the exterior side 121 of the frame bottom member being positioned above the exterior side 21 of the pane.

[0032] It is noted that in the mounted state of the window the position of the actual highest point on the frame bottom member and the lowest point on the bottom flashing member in a vertical direction will depend on the inclination of the roof window, but the comparison between traditional roof windows and roof windows according to the present invention remains the same.

[0033] In this embodiment the highest point on the bottom flashing member 42, which is located furthest away from interior side of the frame bottom member 12 when measured in a direction perpendicularly to the exterior side of the pane, is the bend where the flange projecting over the exterior side 121 of the frame bottom member is connected to the main part of the first section 421.

[0034] The fact that the exterior side 121 of the frame bottom member is arranged above the exterior side 21 of the pane means that water cannot be drained from the pane onto the bottom flashing member in the traditional way at all inclinations. To solve this problem, the sash bottom covering 41 in Fig. 2 has been arranged at an angle A with respect to the plane defined by the exterior side 21 of the pane, so that in the mounted and closed state of the window the sash bottom covering has a lower inclination than the exterior side of the pane and extends over the exterior side of the bottom frame member 12. This allows the sash bottom covering to "lift" water running down along the pane to a higher level in a direction perpendicularly to the exterior side of the pane, thereby allowing it to pass over the exterior side of the frame bottom member.

[0035] Changing the angle A allows the window to be adapted for different pitches of the roof and/or the exterior side of the frame bottom member to be located even higher. Regardless how the sash bottom covering 41 is embodied and attached the angle A should preferably be such that in the mounted and closed position of the window, the part of the covering extending from the exterior of the pane is inclined in the same direction as the roof. This ensures that water and other precipitation will flow or slide off the sash bottom covering instead of forming a pool or pile on the pane.

[0036] In the embodiment in Fig. 2 the sash bottom covering 41 is attached to a moulded border element 6, which is provided on the edge of the pane 2, but it is also possible to attach it to the sash in a manner known per se.

[0037] Fig. 3 shows another embodiment of the invention, where the exterior side 121 of the frame bottom member 12 is located even higher, here approximately 25 mm, above the exterior side 21 of the pane 2, and where the angle A is consequently somewhat larger than in Fig. 2. In this embodiment the sash bottom covering 41 is provided with a flange extending in parallel with the exterior side of the pane and this flange has been attached directly to the pane by means of a caulking material 23. Adhesives or other means for attachment may also be used for this purpose.

[0038] In Fig. 3 as well as in Figs 4 and 5, which will be described below, the windows are shown with a bottom flashing member 42 as the only weather protection of the frame bottom member, but it is to be understood that a frame bottom covering 47 may be provide as in Fig. 2 and that the flashing assembly may vary in other ways. Likewise, it is to be understood that the invention is not limited to a particular type of panes and that unless otherwise stated the shapes of the sash member, frame members and other parts of the window and/or flashing assembly may vary in relation to what is shown.

[0039] Both in Fig 2 and in Fig. 3 the exterior surface 121 of the frame bottom member 12 is shown as being inclined with substantially the same inclination as the sash bottom covering. This allows the frame member and hence the flashing member 42 attached thereto to follow the shape of the covering and hence prevent wind and dirt from entering the space between the sash and the frame. The exterior side 121 of the frame bottom member includes a first section located at an outer side 123 of the frame facing away from a frame opening and a second section at an inner side, where the first section is located above the second section when measured in a direction from the interior side of the frame bottom member towards the exterior side 121 of the frame bottom member and perpendicularly to the exterior side 21 of the pane. Said first and second sections do not have to be provided in continuation of each other as in this embodiment, but may also be embodied in other ways, including being formed as separate steps and/or being separated by a groove adapted for receiving a flange (not shown) on the flashing or covering member or a sealing strip (not shown).

[0040] Another embodiment of a roof window according to the invention is shown in Fig. 4. Here the exterior side 121 of the frame bottom member 12 is located at level with the exterior side 21 of the pane 2 and the bottom

flashing member 42 does not project over the exterior side of the frame bottom member. This allows the sash bottom covering 41 to be substantially parallel to the exterior side of the pane, allowing the use of standard sash bottom covering also used for other types of roof windows.

[0041] The distance d_4 is here approximately 25 mm corresponding to a traditional double glazing unit.

[0042] An embodiment resembling the one in Fig. 2 with respect to the height of the bottom frame member 12 is shown in Figs 5 and 6. In this embodiment skirt member 43 extends beyond the bottom flashing member 42 in order to provide an overlap with a side flashing member 48 and the side sash cladding member 45 is seen extending along the side of the pane 2 in Fig. 6.

[0043] The sash bottom covering 41 is here attached to two holders 411 arranged one at each side of the window, and the exterior side of the sash bottom covering abuts on an interior side of a flange 61 of the border element 6. A bend edge 412 provides the sash bottom covering 41 with sufficient strength and stiffness to maintain its shape, but it is also possible to attach it to the border element for extra support, either at discrete points or sections or continuously along the entire length. A continuous attachment to the border element is presently preferred as it will also provide improved water-tightness.

[0044] Alternatively, or as a supplement, further holders (not shown) may be provided in the space between the inner side 122 of the bottom frame member 12 and the border element. Such holders may also contribute to supporting the pane 2.

[0045] Fig. 7 shows a window mounted with a flashing kit where the exterior side 121 of the frame bottom member 12 is at level with the interior side of the pane and where the bottom flashing member projects above the exterior side 21 of the pane. This means that the highest point, which any water collected in the gutter formed by the bottom flashing member 42 and a possible skirt attached thereto will have to pass over to penetrate into the roof construction, is the highest point on the bottom flashing member 42, i.e. the bend 424 where the flange 423 projecting over the exterior side 121 of the frame bottom member is connected to the main part of the first section 421. The distance d_3 is here 30 mm. The kit consisting of the bottom flashing member 42 and the roof window 1 allows the roof window to be installed deep in the roof even if the roof window itself is designed for other purposes. The room 425 provided between the bottom flashing member 42, the frame bottom member 12 and the sash bottom member 11 may for example be used to house a ventilation unit (not shown) or allow the provision of additional insulation material (not shown) depending on the climate zone in which the kit is to be used.

[0046] The embodiments shown in the drawing the exterior side of the frame bottom member is located in the interval between 0 mm and 30 mm above the exterior side of the pane measured in a direction perpendicularly to the exterior side of the pane in the mounted and closed state of the window. It must, however, be understood that the dimensions will depend on the overall size of the window and particularly the dimensions of the pane.

[0047] The small distance between the bottom flashing members 42 and frame bottom member 12 shown in Figs 3, 4 and 7 is intended only to illustrate that the flashing members are separate members, but it will be understood that in such embodiments the bottom flashing member will usually be attached directly to the exterior side of the frame bottom member. Likewise it is to be understood that even though the invention has primarily been described with reference to embodiments, where a skirt member 43 is attached to the bottom flashing member 42 as is common practice in flashing assemblies for use where the roofing material is undulated tiles or roof plates, the invention also relates to flashing assemblies without skirt members.

Claims

1. A roof window comprising a sash and a frame, said sash carrying a pane and being connected to the frame via hinges, and said frame being adapted for being connected to a load-bearing structure of a roof of a building, where each of the sash and the frame comprises two side members, a top member and a bottom member, where said frame members delimit a frame opening and said sash members delimit a sash opening, where each of the pane, the sash members and frame members has an interior side adapted for facing the interior of the building in the mounted state and an exterior side adapted for facing the exterior of the building in the mounted state, **characterized in that**, in the mounted and closed state of the window, the exterior side of the frame bottom member is located in the interval between 0 mm and 30 mm above the exterior side of the pane measured in a direction perpendicularly to the exterior side of the pane.

2. A roof window according to claim 1, **characterized in that**, in the mounted and closed state of the window, the exterior side of the frame bottom member is located in the interval between 15 mm and 25 mm, preferably approximately 20 mm, above the exterior side of the pane measured in a direction perpendicularly to the exterior side of the pane.

3. A roof window according to claim 1 or 2, **characterized in that** the distance from the interior side of the pane to the exterior side of the bottom frame member is 25-100 mm, more specifically 45-85 mm measured in a direction perpendicularly to the exterior side of the pane.

4. A roof window according to one or more of claims 1-3, **characterized in that** a sash bottom covering

is provided at a lower edge of the pane and/or at the exterior side of the bottom sash member, said sash bottom covering being arranged at an angle to the exterior side of the pane so that in the mounted and closed state of the window it has a lower inclination than the exterior side of the pane and extends over the exterior side of the bottom frame member.

5. A roof window according to claim 4, where the sash bottom covering is connected directly to the pane or to a border element attached to the pane.

6. A roof window according to one or more of claims 1-5, **charac- terized** in that a first section of the exterior side of the frame bottom member located at an outer side of the frame facing away from a frame opening is located above a second section of the exterior side of the frame bottom member located at an inner side of the frame facing the frame opening measured in a direction from the interior side of the frame bottom member towards the exterior side of the frame bottom member and perpendicularly to the exterior side of the pane.

7. A roof window according to one or more of the preceding claims, where the sash bottom covering is attached to the bottom sash member.

8. A sloping roof structure comprising a roof window according to one or more of claims 1-7, a roofing having an exterior side facing the exterior of a building, and at least one flashing member arranged below the roof window seen in the direction of slope of the roof structure, said flashing member having a first section, which is arranged to abut directly or indirectly against an outer side of the bottom frame member, and a second section, which is arranged with a lower inclination than the roof structure, **characterized in that** a covering member is provided at a lower edge of the pane and/or at the exterior side of the bottom sash member, said covering member being arranged at an angle to the exterior side of the roofing so that in the mounted and closed state of the window it has a lower inclination than the exterior side of the roofing and extends over the exterior side of the bottom frame member.

9. A roof structure according to claim 8, **characterized in that** the pane is located at least partially below the exterior surface of the roofing in the mounted and closed state of the window.

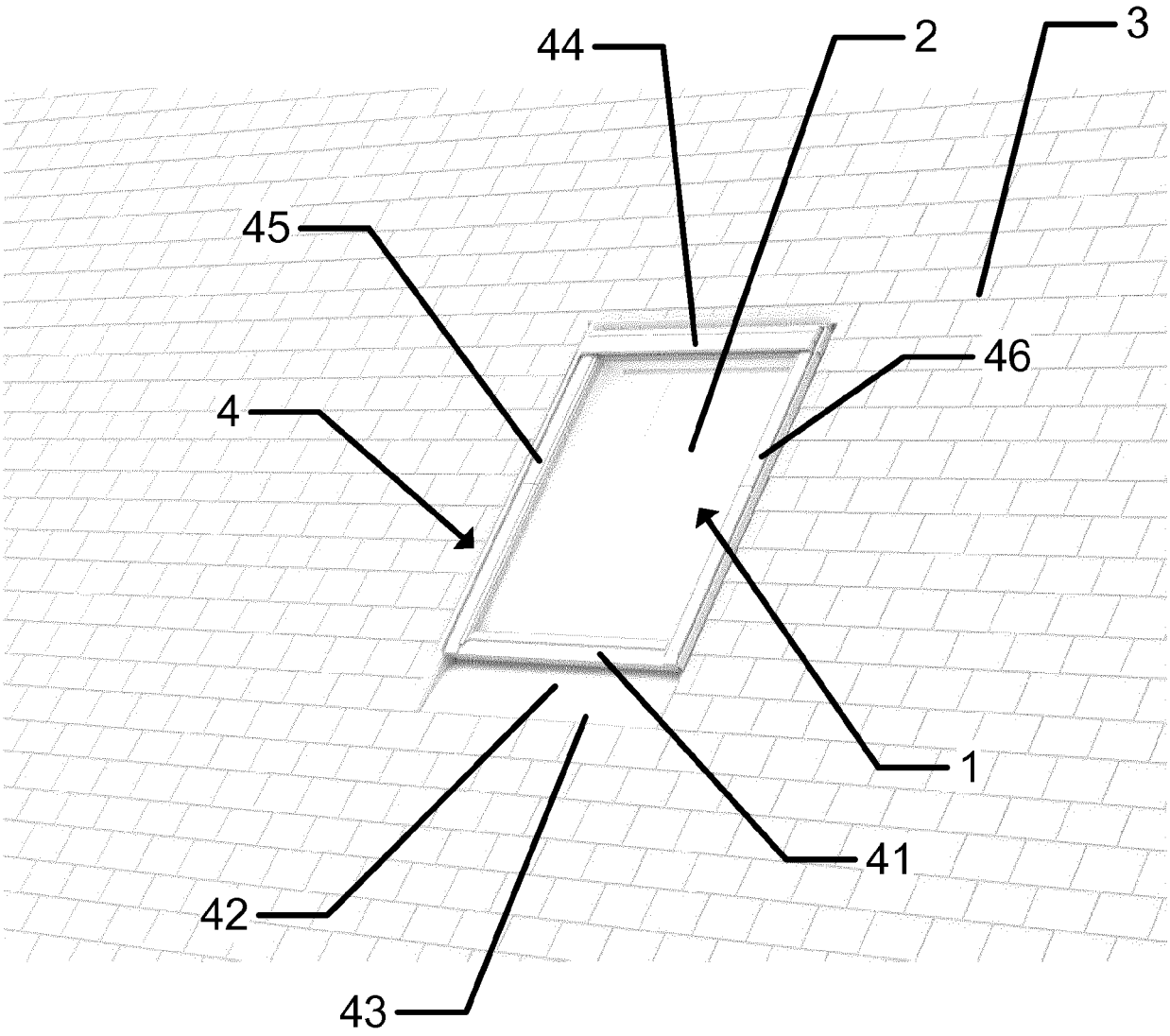


Fig. 1

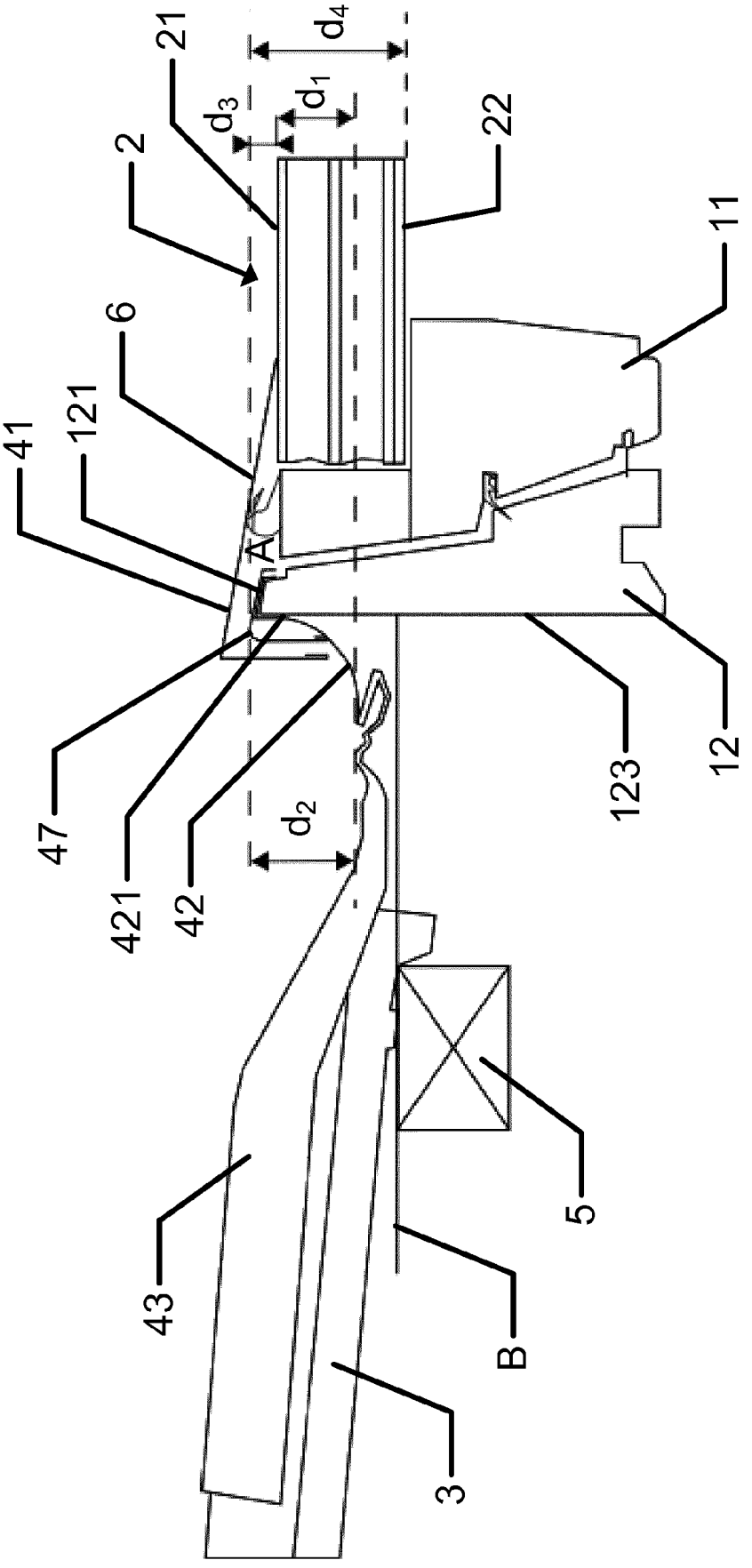


Fig. 2

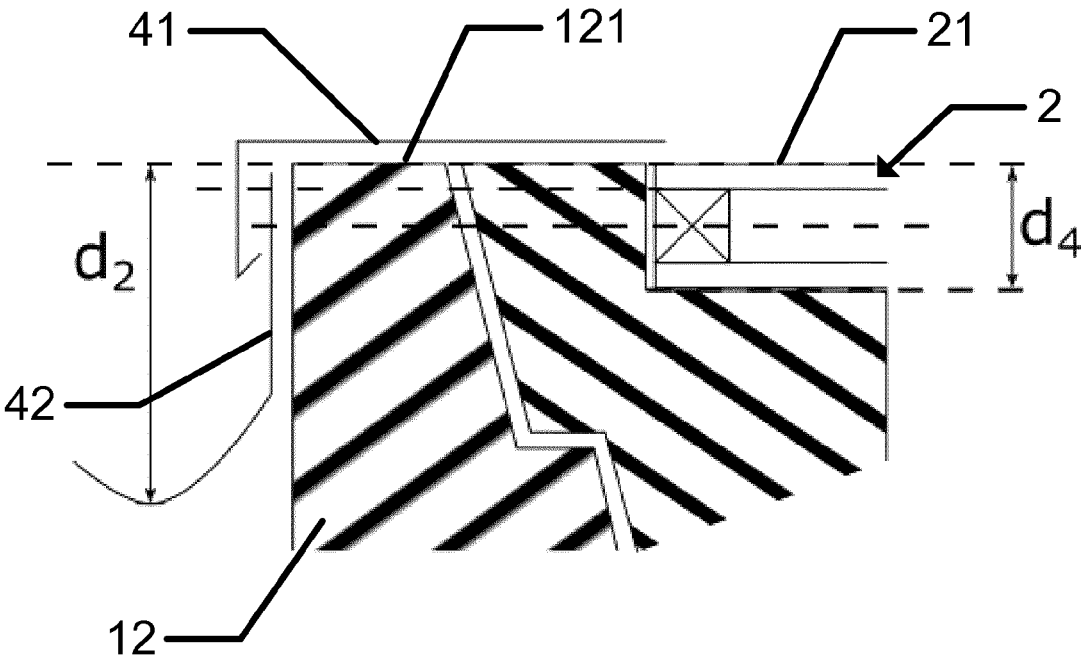


Fig. 4

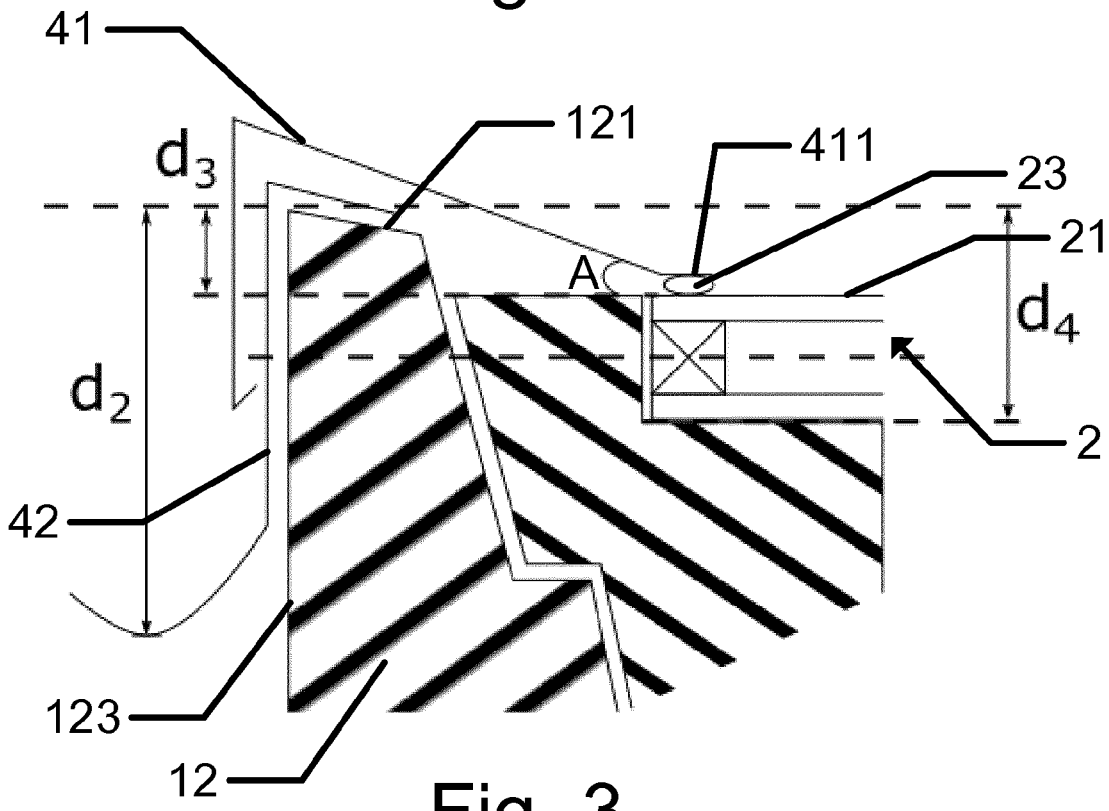


Fig. 3

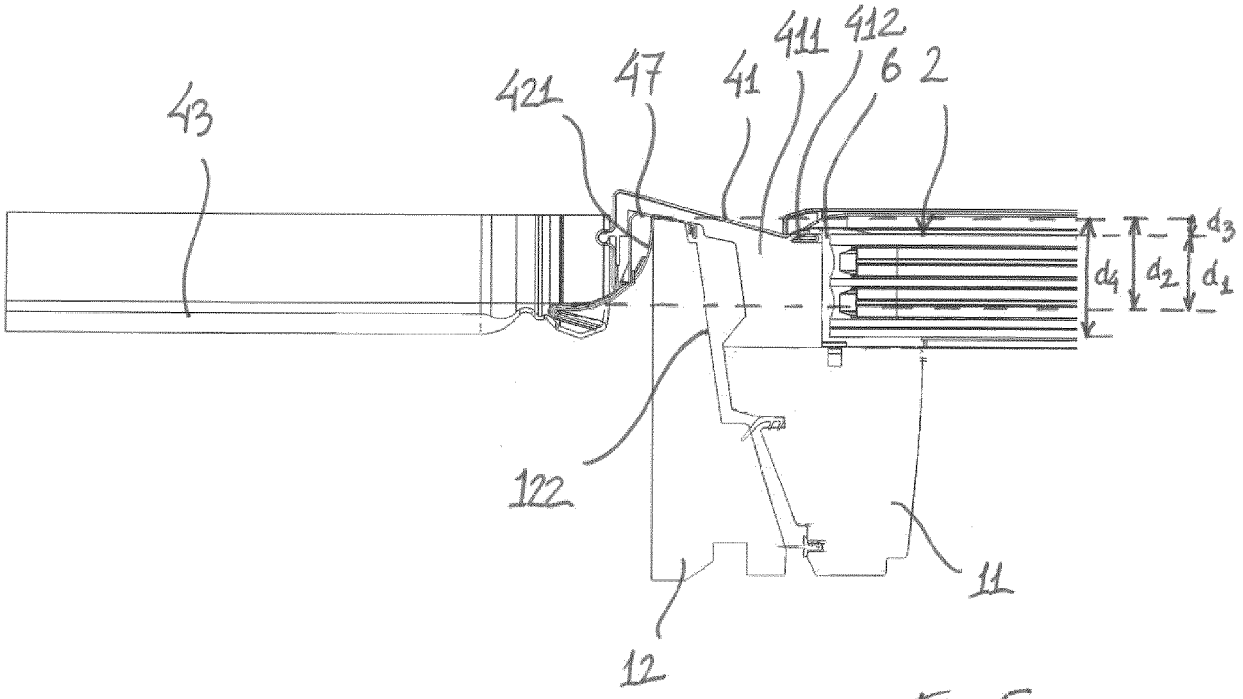
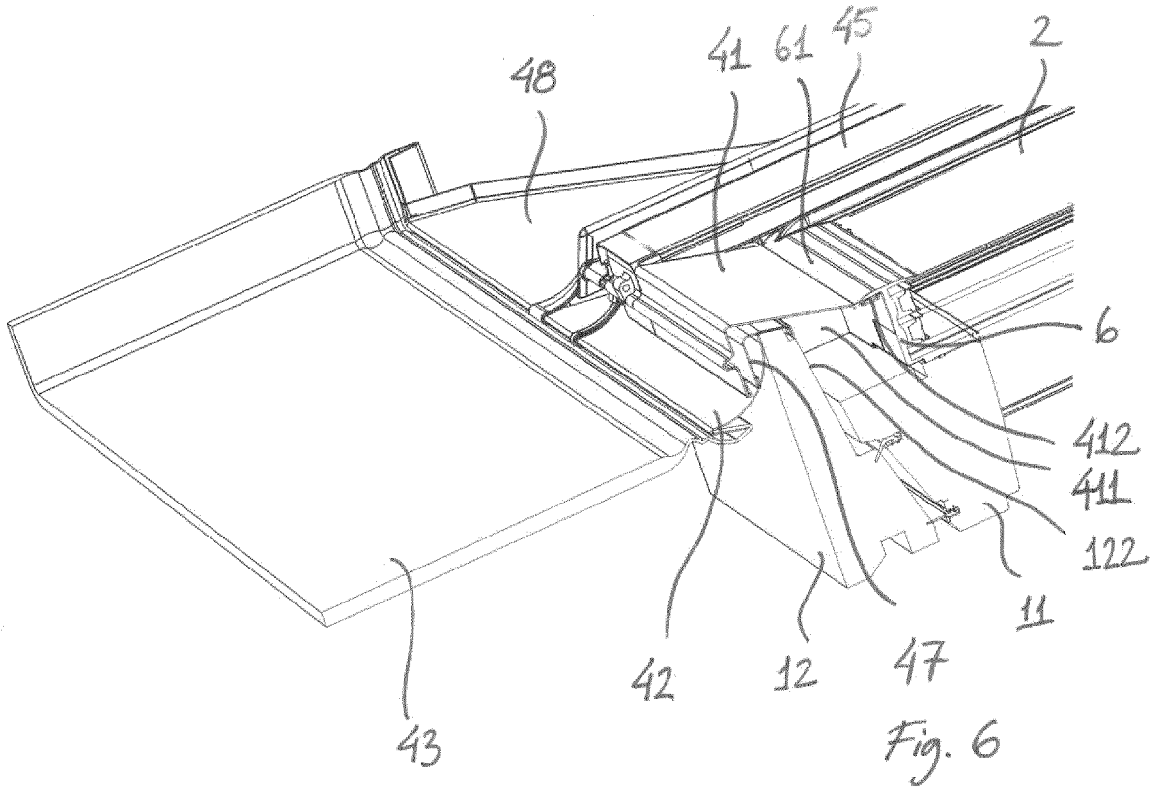

43
421
47
41
411
412
6
2
d3
d4
d2
d1
122
11
12

Fig. 5


48
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42
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Fig. 6

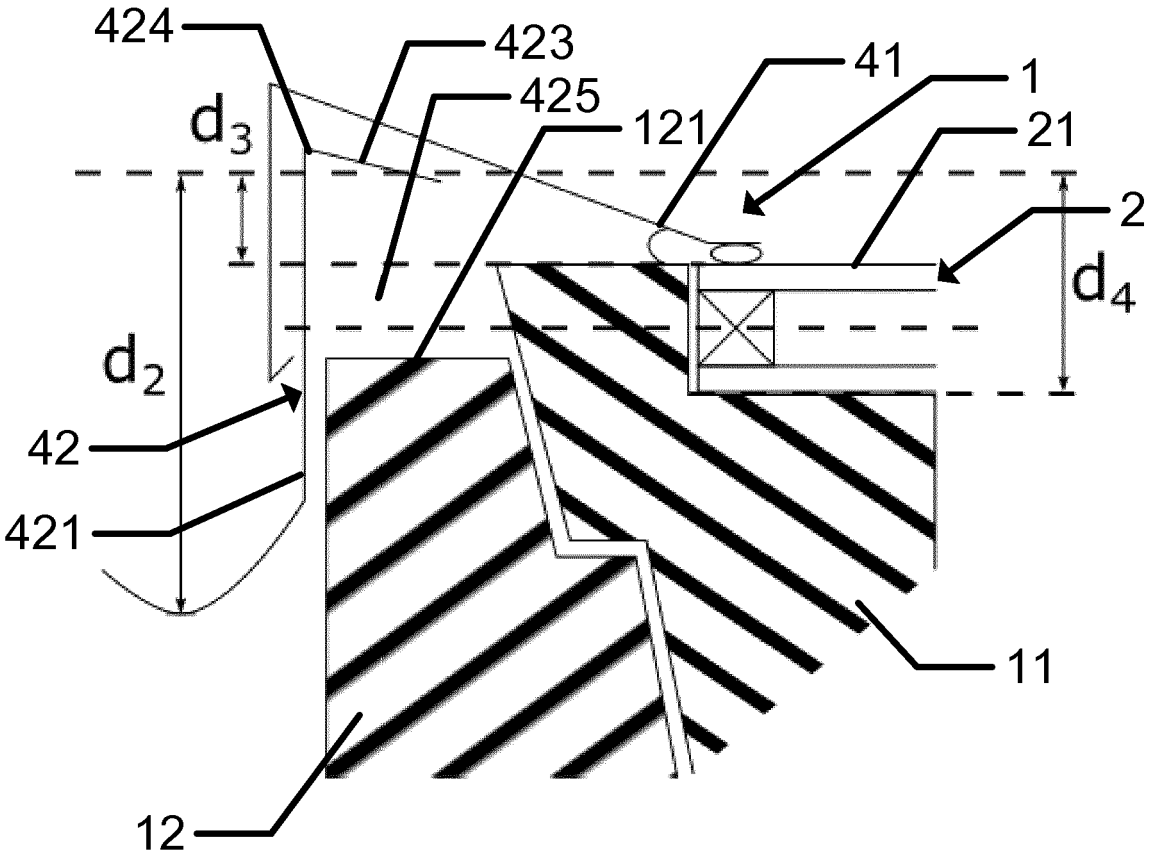

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 17 17 8911

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21 September 2017	Tran, Kim Lien

CATEGORY OF CITED DOCUMENTS

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