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(54) **A ROOF WINDOW INSTALLED IN AN INCLINED ROOF STRUCTURE WITH A FLASHING ASSEMBLY AND A METHOD FOR WEATHER PROOFING A ROOF WINDOW**

(57) A roof window installed in an inclined roof structure with a flashing assembly covering a joint between the roof window and the roof surface, where at least the top flashing member and the side flashing member each has a first leg lying substantially in plane with the roof surface and a second leg extending at an angle with respect to the first leg, said angle being larger than 90 degrees on the exterior side of the flashing member. The first leg of the side flashing member is adapted for extending above the outer side of the top frame member and resting on a batten of the roof structure above the roof window seen in the direction of inclination of the roof structure. The flashing assembly may further include at least one top corner flashing member adapted for overlapping the top flashing member and a side flashing member.

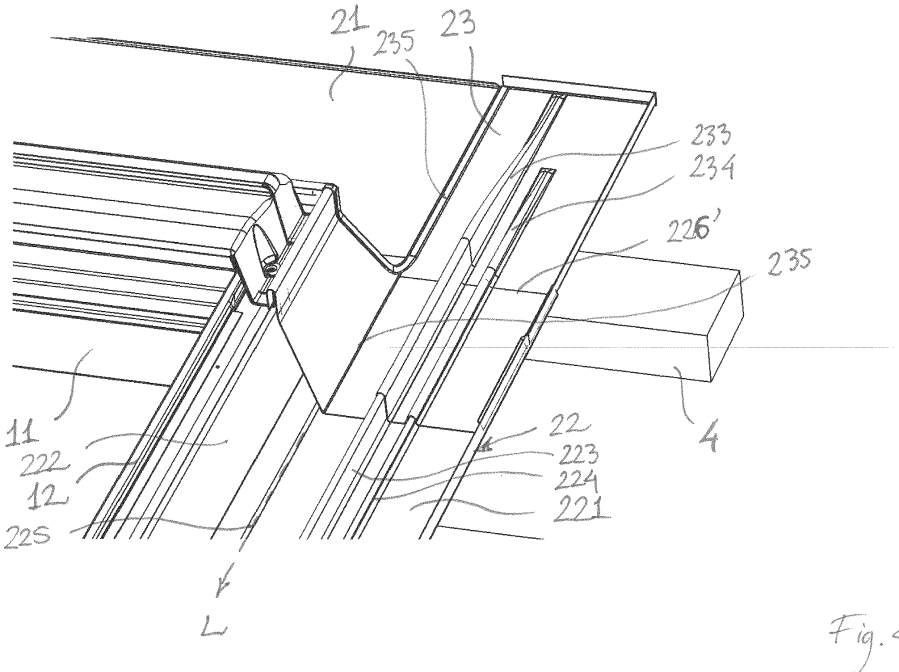

Fig. 4

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Description

[0001] The present invention relates to a roof window installed in an inclined roof structure with a flashing assembly covering a joint between the roof window and the roof structure, said roof structure including a plurality of battens supporting a roofing material thereby forming a roof surface, and said roof window comprising a frame including a plurality of frame members delimiting a frame opening, and said flashing assembly including a top flashing member arranged above the roof window extending along a top frame member of the roof window, a bottom flashing member arranged below the roof window extending along a bottom frame member of the roof window, and at least one side flashing member extending between the top flashing member and the bottom flashing member along a side frame member of the roof window, where each flashing member has an interior side and an exterior side, said exterior side facing the exterior, where at least the top flashing member and the side flashing member each has a first leg and a second leg, said first leg lying substantially in plane with the roof surface and extending away from the roof window, and said second leg extending at an angle with respect to the first leg and extending up along an outer side of an adjacent frame member, said outer side facing away from the frame opening, and a joint between the first leg and the second leg extending substantially in parallel with the adjacent frame member and defining a length direction of the flashing member, and where said angle of the second leg with respect to the first leg is non-perpendicular so that the exterior angle between the first leg and the second leg on the exterior side of the flashing member is larger than 90 degrees, and so that the joint between the first leg and the second leg is located at a distance from the outer side of the adjacent frame member in the mounted state thereby giving room for insulating material between the frame of the roof window and the interior side of the flashing member. The invention further relates to a roof structure comprising a roof window with a flashing assembly and a method for weather proofing a roof window mounted in an inclined roof structure.

[0002] Flashing assemblies of the kind mentioned above are used for weather proofing the joint between the roof window and the roof structure. In windows with a moveable sash and a stationary frame, cover members are typically used together with the flashing members, said covering members covering exterior surfaces of the sash and frame and overlapping the flashing members. Both the flashing members and the covering members are usually made from bent sheet metal.

[0003] A roof window with such a flashing assembly is known from EP1550777B1. This patent, however, is primarily concerned with the advantages of providing a wedge shaped space between the outer side of the roof window frame and the interior side of the flashing members for housing insulating material. It does not provide much information on how the flashing members should be interconnected. At that time the flashing assembly was simply provided with corner flashing members, which were in some instances integrated in the top, bottom or side flashing members, so that water would run from one onto the other and eventually pass onto the roof surface below the roof window as it was already known from traditional flashing assemblies.

[0004] Later experiments, however, has showed that the non-perpendicular angling of the second leg of the flashing members in relation to the first leg results in different flow patterns on the roof, not only for water but also for wind. This in some cases has been seen to result in small amounts of water entering underneath the flashing assembly at the top corners of the window between the top flashing member and the side flashing members.

[0005] It is therefore the object of the invention to provide improved water proofing properties to a roof window of the type mentioned above.

[0006] According to a first aspect of the invention this is achieved with a roof window where the first leg of the side flashing member is adapted for extending above the outer side of the top frame member and resting on a batten of the roof structure above the roof window seen in the direction of inclination of the roof structure.

[0007] By making the side flashing member extend above the outer side of the top frame member, the overlap with the top flashing member becomes larger than at traditional roof windows, and any substantial downwards movement of the part of the side flashing member overlapping with the top flashing member is prevented by the end part of the side flashing member resting on the batten. Together this results in a tighter connection between the side flashing member and the top flashing member and thus reduces the risk of water penetrating between them and reaching the roof structure below.

[0008] Whenever reference is made to the top, bottom or sides in this text it is intended as a reference to the positon in the mounted state, i.e. the top corners of the roof window are the corners intended to be facing upwards on the inclined roof in the mounted state. The same applies to the flashing assembly, flashing members and any other items mentioned herein, and to other indications of orientation such as above, below, upper or lower. Accordingly, the reference to the side flashing member being adapted for extending above the outer side of the top frame member means that in the mounted state a part of the side flashing member is arranged above the roof window when seen in the direction of inclination of the roof structure.

[0009] If the second leg of the side flashing member also extends up to the batten the side flashing member at least partially closes the space extending underneath the top flashing member along the outer surface of the top frame member, thus affecting the air flow pattern underneath the flashing assembly. In some situations, this reduces the risk of water being forced in underneath the flashing members the top corners of the roof window.

[0010] Similar effects may be achieved at the bottom

of the roof window, but here it will be the part of the bottom flashing member, which is overlapped by the side flashing member, which should be resting on a batten. As the water pressure is different at the bottom due to the influence of gravity, the problems relating to water tightness are not entirely the same as at the top. In the following description reference will therefore be made primarily to the top of the roof window, but it is to be understood that unless otherwise stated similar considerations and advantages apply at the bottom of the roof window.

[0011] In order to secure the positioning of the side flashing member and to prevent the end part of it from being lifted from the batten, for example under the influence of wind suction, the first leg of the side flashing member may be adapted for being attached to the batten.

[0012] Above, reference has been made to an overlap between the top flashing member and the side flashing member as traditional top flashing members are provided with one or two corner sections each adapted to embrace an upper corner of the roof window and to overlap with a side flashing member in the mounted state. The flashing assembly may, however, include at least one top corner flashing member adapted for overlapping the top flashing member and a side flashing member in the mounted state so that a substantially water tight connection is established between the top flashing member and the side flashing member. This makes the flashing assembly more versatile, allowing for example to replace one corner member with a bridge member adapted for establishing a connection between two top flashing members when two roof windows are mounted side-by-side. Providing separate top corner flashing members may also make the manufacture of the flashing assembly easier, thus reducing costs.

[0013] When using separate top corner flashing members, the joints between the top flashing member and the top corner flashing members may be positioned above the outer side of the top frame member in the mounted state. In that case the end edges of the side flashing members may be adapted to the shape of these joints and/or to the shape of the interior side of the top corner flashing members rather than to the shape of the interior side of the top flashing member.

[0014] Even though reference has here been made only to top corner flashing members is it to be understood that the flashing assembly may also include bottom corner flashing members and that such bottom corner flashing members may have substantially the same features and advantageous as described with reference to the top corner flashing members.

[0015] In one embodiment, the batten is an installation batten arranged above the window in parallel with the top frame member and serving to support the top flashing member. Such installation battens are commonly used when roof windows are mounted in positions, where the top frame member is not optimally aligned with one of the existing batten of the roof structure serving to support the roofing material. An installation batten, which is usually of substantially the same dimensions as the existing battens and spanning between two neighbouring rafters of the roof structure, is then provided between the existing battens in parallel with these.

[0016] In a presently preferred embodiment the flashing assembly includes two side flashing members adapted for being arranged on opposite sides of the frame of the roof window extending along each of the side frame members of the roof window, thus providing weather protection at both sides of the roof window. In the simplest embodiment these two side flashing members are embodied identically except for being mirror-inverted, but in other embodiments they may have differently angled end edges, for example in order to be adapted for use in side-by-side installations where two roof windows are mounted next to each other and sharing one or more flashing or cover members. It is also envisaged to provide a flashing assembly specially adapted for side-by-side installation including a right-hand side flashing member for use on the right-hand side of the group of roof windows, a left-hand side flashing member for use on the left-hand side of the group of roof windows, and at least one centre side flashing member for use between the roof windows. Both the right-hand side flashing member, the left-hand side flashing member, and the centre side flashing member(s) may advantageously be arranged to rest on a batten as described above.

[0017] Each side flashing member does not have to extend along the entire side of the roof window frame. It is within the scope of the invention to arrange two or more side flashing members in continuation of each other so that they together cover the distance from the top flashing member or a top corner flashing member to the bottom flashing member. If using shorter side flashing members, each side flashing member should preferably rest on at least two battens.

[0018] One or more flashing members may be provided with insulating material on the interior side, or insulating members may be provided separately to be arranged along the outer sides of the frame members before installation of the flashing assembly.

[0019] In addition, or alternatively, one or more flashing members may be provided with sealing strips or other weather proofing members. Sealing strip may for example be provided where flashing members are intended to overlap in the mounted state, and they will typically be made from elastic materials, such as butyl rubber, ethylene propylene diene monomer (EPDM) rubber, ethylene-vinyl acetate (EVA) foam or the like.

[0020] According to a second aspect of the invention a roof window with improved water proofing properties is achieved with a method for mounting the flashing assembly including the following steps:

arranging a bottom flashing member below the roof window along a bottom frame member,

arranging at least one side flashing member along a side frame member,

arranging a top flashing member above the roof window along a top frame member,
where each flashing member has an interior side and an exterior side, said exterior side being arranged to face the exterior,
where at least the top flashing member and the side flashing member are arranged with a first leg substantially in plane with the roof surface and with a second leg extending up along an outer side of an adjacent frame member, said outer side facing away from the frame opening,
where the second leg of each flashing member extends at an angle with respect to the first leg, said angle of the second leg with respect to the first leg being non-perpendicular so that the exterior angle between the first leg and the second leg on the exterior side of the flashing member is larger than 90 degrees, and so that the joint between the first leg and the second leg is located at a distance from the outer side of the adjacent frame member in the mounted state thereby giving room for insulating material between the frame of the roof window and the interior side of the flashing member,
and where, when arranging the side flashing member, it is positioned so that the first leg of the side flashing member extends above the outer side of the top frame member and rests on a batten of the roof structure above the roof window seen in the direction of inclination of the roof structure.

[0021] Arranging the flashing members in this way means that the upper end part of the side flashing member is supported thereby reducing the risk of an unintentional gap between the end edge of the side flashing member and the interior side of the top flashing member. This in turn reduces the risk of water being forced up between the upper end part of the side flashing member and the top flashing member or the top corner flashing member.

[0022] Unless otherwise stated the advantages described with reference to the roof window also applies to the method.

[0023] In one embodiment the method further includes the step of arranging an installation batten above the window in parallel with the top frame member, arranging the top flashing member on said installation batten, and arranging the side flashing member so that an end part of the side flashing members located at the top flashing member comes to rest on the installation batten.

[0024] An additional aspect of the invention is a roof structure comprising a roof window with a flashing assembly according to the invention and at least one batten.

[0025] In the following the invention will be described in more detail with reference to an embodiment of the invention shown in the drawing, where:

Fig. 1 is a perspective view of a frame for a roof window mounted with a flashing assembly,
Fig. 2 is a cross sectional view along the line II-II in Fig. 1,
Fig. 3 shows the detail marked II in Fig. 1
Fig. 4 corresponds to Fig. 3 but with the corner flashing assembly removed,
Fig. 5 corresponds to Fig. 4 but seen from the direction shown by the arrow IV in Fig. 1.
Fig. 6 corresponds to Fig. 4 but showing a different embodiment of the side flashing member, and
Fig. 7 corresponds to Fig. 5 but with the same side flashing member as in Fig. 6.

[0026] A frame 1 for a roof window is shown in Fig. 1 with a flashing assembly 2 including a top flashing member 21, a side flashing member 22, two top corner flashing members 23, a bottom flashing member 24 and two bottom corner flashing members 25. The top flashing member 21 is arranged so that it extends along a top frame member 11 of the frame 1 and the side flashing member 22 extends along substantially the entire length of the right-hand side frame member 12 spanning from a top corner flashing member 23 to a bottom corner flashing member 25.

[0027] Each of the flashing members comprise a first leg 211,221,231,241,251 and a second leg 212,222,232,242,252 joined at a bend 215,225,235,245,255, which extends substantially in parallel with the respective frame member and defines a length direction of the flashing member.

[0028] As is also seen from the cross-sectional view of the side in Fig. 2, the first leg 211,221,231,241,251 is extending away from the opening 13 defined by the frame members 11, 12, 14 and adapted for lying substantially in plane with the roof surface in which the roof window and flashing assembly are mounted. For the sake of simplicity, the roof structure is here represented only by a single batten 3 and an installation batten 4 arranged at level with the battens of the roof structure. Likewise, the roof window is shown only by the frame 1 but will also include a pane covering the frame opening and possibly a sash carrying the pane.

[0029] The second leg 212,222,232,242,252 extends up along the outer sides of the adjacent frame members facing away from the frame opening 13 and is angled with an angle A with respect to a vertical plane. This means that the exterior angle B between the first leg and the second leg on the exterior side of the flashing member is larger than 90 degrees, and so that the joint 225 between the first leg and the second leg is located at a distance D from the outer side 111,121 of the adjacent frame member.

[0030] It is noted that the angles A, B and hence also the distance D, which are shown only in Fig. 2, may be different at the top.

[0031] The distance D gives room for insulating material 51 between the frame 1 and the interior side of the flashing members. Here the insulating material is shown only along one side of the frame, but it will be understood

that it may be present along all four sides of the frame 1. The exact amount and shape of the insulating material may vary depending on several factors such as the construction of the roof window, the roof structure and how the window is installed, and in some case it may be advantageous to leave it out at the bottom of the window. For the same reason, the bottom flashing member may be embodied with first and second legs that are perpendicular to each other or arranged so that the exterior angle B is less than 90 degrees.

[0032] In the embodiment shown in the drawing the side flashing member 22 is provided with two parallel folds 223,224 extending perpendicularly to and over the length of the first leg. These folds are intended to guide water in the length direction L of the side flashing member in a manner well known to the skilled person and further serves to position the side flashing member 22 in relation to the top corner flashing member 23 and the bottom corner flashing members 25 by mating with corresponding folds 233,234,253 in these.

[0033] The connection between the top flashing member 21, the side flashing member 22 and the top corner flashing member 23 is shown in an enlarged view in Fig. 3. Here the joint 235 between top corner flashing member 23 and the top flashing member 21 extends substantially in continuation of and in parallel with the bend 225 forming the joint between the first leg 221 and second leg 222 of the side flashing member 22. In other embodiments the joint between the top corner flashing member and the top flashing member is located elsewhere or the top corner flashing member is integrated in the top flashing member. In order to achieve even further water tightness, the top flashing member 21 and/or the top corner flashing member 23 may be provided with sealing strips at the joint between them.

[0034] The top corner flashing member 23 overlaps the side flashing member 22 as illustrated by the line 226' indicating the position of the upper end edge of the first leg 221 of the side flashing member. A similar overlap is found at the second legs 222, 232 of the top corner flashing member and the side flashing member. Sealing strips or other weather proofing members may be provided at the overlap to enhance water tightness.

[0035] Turning now to Figs 4 and 5, where the right-hand top corner flashing member has been removed, it is seen that the upper end part of the side flashing member 22 extends over the installation batten 4, which is provided in order to support the top flashing member 21 in a manner well known to the skilled person. This prevents any substantial downwards movement at the end edge 226 of the side flashing member, which might result in the flashing assembly becoming untight.

[0036] In this embodiment the entire first leg 221 is simply resting on the installation batten 4, but for increased stability of the flashing assembly the side flashing member is adapted for being attached to the batten, for example by being provided with one or more holes (not shown) allowing a fastener to pass through them and into the batten.

[0037] In this embodiment the first leg 221 of the side flashing member 22 has the same cross-sectional shape over its entire length. In other embodiments the end part projecting above the outer side of the top frame member 11 is of a different design, for example to facilitate connection to the batten or to a top corner flashing member.

[0038] Turning now to Figs 6 and 7 another embodiment of the side flashing member 22 is shown having an oblique end edge 227 at the second leg 222 so that the second leg extends all the way up to the batten 3,4 at the joint 225 with the first leg 221, but is shorter at the free edge opposite the joint. The angle of the end edge 227 of the second leg in the plane of the drawing corresponds to the angle A of the second leg 211 of the top flashing member 21 such that it is substantially parallel to the interior side of the second leg of the top flashing member. This means that the space formed underneath the top flashing member 21 to make room for the insulating material 51 is closed off at the ends of the top flashing member. Moreover, the end edge 227 of the second leg of the side flashing member is possibly kept from sideways movement by being kept under a bend edge 216 on the top flashing member. A still further advantage is, that the bending strength and torsional stiffness of the side flashing member 22 is increased compared to the embodiment in Figs 4 and 5, which contributes to preventing unintentional deformation of the side flashing member which might lead to leakage.

[0039] The installation of a roof window of this type can advantageously be done in the following way:

arranging at least the frame 1 of the roof window on an opening in the rood structure,
attaching the frame 1 of the roof window to the rood structure,
arranging a bottom flashing member 24 below the roof window along a bottom frame member 14,
arranging at least one side flashing member 22 along a side frame member 12 and positioning it so that it extends above the outer side of the top frame member and rests on a batten 3,4 above the outer side of the top frame member,
arranging a top flashing member 21 above the roof window along a top frame member 11.

[0040] At least the top flashing member 21 and the side flashing member 22 are arranged with a first leg 211,221,231,241,251 substantially in plane with the roof surface and with a second leg 212,222,232,242,252 extending up along an outer side of the adjacent frame member 11,12,14, said outer side facing away from the frame opening 13. Unless the roof window is mounted close to another window or like roof penetrating structure, a side flashing member 22 will usually be arranged at both sides of the roof window.

[0041] Insulating material 51 may be arranged at the outer side of one or more frame members before arrang-

ing the flashing members, but it is also possible to provide flashing members with insulating material on the interior side before arranging them at the roof window.

[0042] In order to help in the installation of the top flashing member 21 and the side flashing member(s) 22, an installation batten 4 may be arranged above the window in parallel with the top frame member 11. This installation batten 4 will serve to support the top flashing member 21 and the end part of the side flashing member 22 located at the top flashing member.

[0043] The side flashing member 22 may be attached to the batten for example by means of screws, nails or staples in order to keep it in place.

[0044] Even though the roof window and the installation thereof has only been illustrated by a single embodiment in the drawing, the skilled person will understand that different features of this embodiment are not necessarily functionally linked and depending on each other unless explicitly stated above.

Claims

1. A roof window installed in an inclined roof structure with a flashing assembly (2) covering a joint between the roof window and the roof structure, said roof structure including a plurality of battens (3, 4) supporting a roofing material thereby forming a roof surface, and said roof window comprising a frame (1) including a plurality of frame members (11, 12, 14) delimiting a frame opening (13), and said flashing assembly (2) including a top flashing member (21) arranged above the roof window extending along a top frame member (11) of the roof window, a bottom flashing member (24) arranged below the roof window extending along a bottom frame member (14) of the roof window, and at least one side flashing member (22) extending between the top flashing member (21) and the bottom flashing member (24) along a side frame member (12) of the roof window, where each flashing member (21, 22, 23, 24, 25) has an interior side and an exterior side, said exterior side facing the exterior,
where at least the top flashing member (21) and the side flashing member (22) each has a first leg (211, 221, 231, 241, 251) and a second leg (212, 222, 232, 242, 252), said first leg (211, 221, 231, 241, 251) lying substantially in plane with the roof surface and extending away from the roof window, and said second (212, 222, 232, 242, 252) leg extending at an angle with respect to the first leg (211, 221, 231, 241, 251) and extending up along an outer side of an adjacent frame member, said outer side facing away from the frame opening (13), and a joint (215, 225, 235, 245, 255) between the first leg (211, 221, 231, 241, 251) and the second leg (212, 222, 232, 242, 252) extending substantially in parallel with the adjacent frame member and defining a length direction of the flashing member (21, 22, 23, 24, 25), and
where said angle of the second leg (212, 222, 232, 242, 252) with respect to the first leg (211, 221, 231, 241, 251) is non-perpendicular so that the exterior angle (B) between the first leg (211, 221, 231, 241, 251) and the second leg (212, 222, 232, 242, 252) on the exterior side of the flashing member (21, 22, 23, 24, 25) is larger than 90 degrees, and so that the joint (215, 225, 235, 245, 255) between the first leg (211, 221, 231, 241, 251) and the second leg (212, 222, 232, 242, 252) is located at a distance (D) from the outer side of the adjacent frame member in the mounted state thereby giving room for insulating material (51) between the frame (1) of the roof window and the interior side of the flashing member (21, 22, 23, 24, 25),
characterized in that the first leg (221) of the side flashing member (22) is adapted for extending above the outer side of the top frame member (11) and resting on a batten (3, 4) of the roof structure above the roof window seen in the direction of inclination of the roof structure.

2. A roof window according to claim 1, where the first leg (221) of the side flashing member (22) is adapted for being attached to the batten (3, 4).

3. A roof window according to claim 1 or 2, where the flashing assembly (2) further includes at least one top corner flashing member (23) adapted for overlapping the top flashing member (21) and a side flashing member (22) in the mounted state so that a substantially water tight connection is established between the top flashing member (21) and the side flashing member (22).

4. A roof window according to one or more of the preceding claims, where the batten is an installation batten (4) arranged above the roof window in parallel with the top frame member (11) and serving to support the top flashing member (21).

5. A roof window according to one or more of the preceding claims including two side flashing members (22) adapted for being arranged on opposite sides of the frame (1) of the roof window extending along each of the side frame members (12) of the roof window.

6. A roof window according to one or more of the preceding claims where one or more flashing members (21, 22, 23, 24, 25) is/are provided with insulating material (51) on the interior side and/or with sealing strips or other weather proofing members.

7. A roof structure comprising a roof window with a flashing assembly (2) according to one or more of claims 1-6 and at least one batten (3, 4).

8. A method for weather proofing a roof window mounted in an inclined roof structure, said roof structure including a plurality of battens (3, 4) supporting a roofing material and forming a roof surface, and said roof window having a frame (1) comprising a plurality of frame members (11, 12, 14) delimiting a frame opening (13), including the following steps:

arranging a bottom flashing member (24) below the roof window along a bottom frame member (14),
arranging at least one side flashing member (22) along a side frame member (12),
arranging a top flashing member (21) above the roof window along a top frame member (11),
where each flashing member (21, 22, 23, 24, 25) has an interior side and an exterior side, said exterior side being arranged to face the exterior,
where at least the side flashing member (22) is arranged with a first leg (211, 221, 231, 241, 251) substantially in plane with the roof surface and with a second leg (212, 222, 232, 242, 252) extending up along an outer side of an adjacent frame member, said outer side facing away from the frame opening (13), and
where said angle of the second leg (212, 222, 232, 242, 252) with respect to the first leg (211, 221, 231, 241, 251) is non-perpendicular so that the exterior angle (B) between the first leg (211, 221, 231, 241, 251) and the second leg (212, 222, 232, 242, 252) on the exterior side of the flashing member (21, 22, 23, 24, 25) is larger than 90 degrees, and so that the joint (215, 225, 235, 245, 255) between the first leg (211, 221, 231, 241, 251) and the second leg (212, 222, 232, 242, 252) is located at a distance (D) from the outer side of the adjacent frame member in the mounted state thereby giving room for insulating material (51) between the frame (1) of the roof window and the interior side of the flashing member (21, 22, 23, 24, 25)
characterized in that
when arranging the side flashing member (22), it is positioned so that the first leg (221) of the side flashing member (22) extends above the outer side of the top frame member (11) and rests on a batten (3, 4) of the roof structure above the roof window seen in the direction of inclination of the roof structure.

9. A method according to claim 8, further including the step of arranging an installation batten (4) above the roof window in parallel with the top frame member (11) in a position so that the top flashing member (21) is supported on the installation batten (4) when arranged above the roof window, and so that the first leg (221) of the side flashing member (22) comes to rest on the installation batten (4).

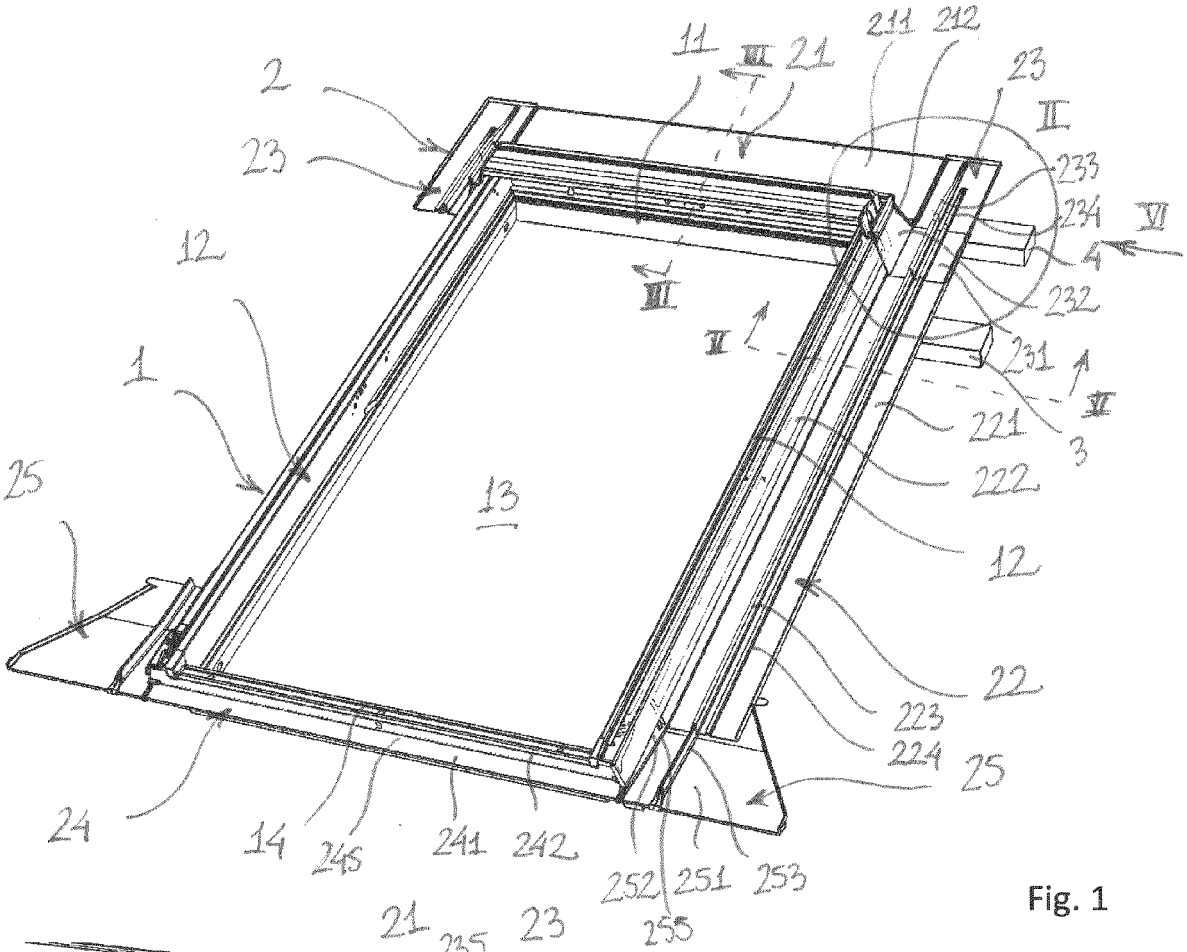
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Fig. 1

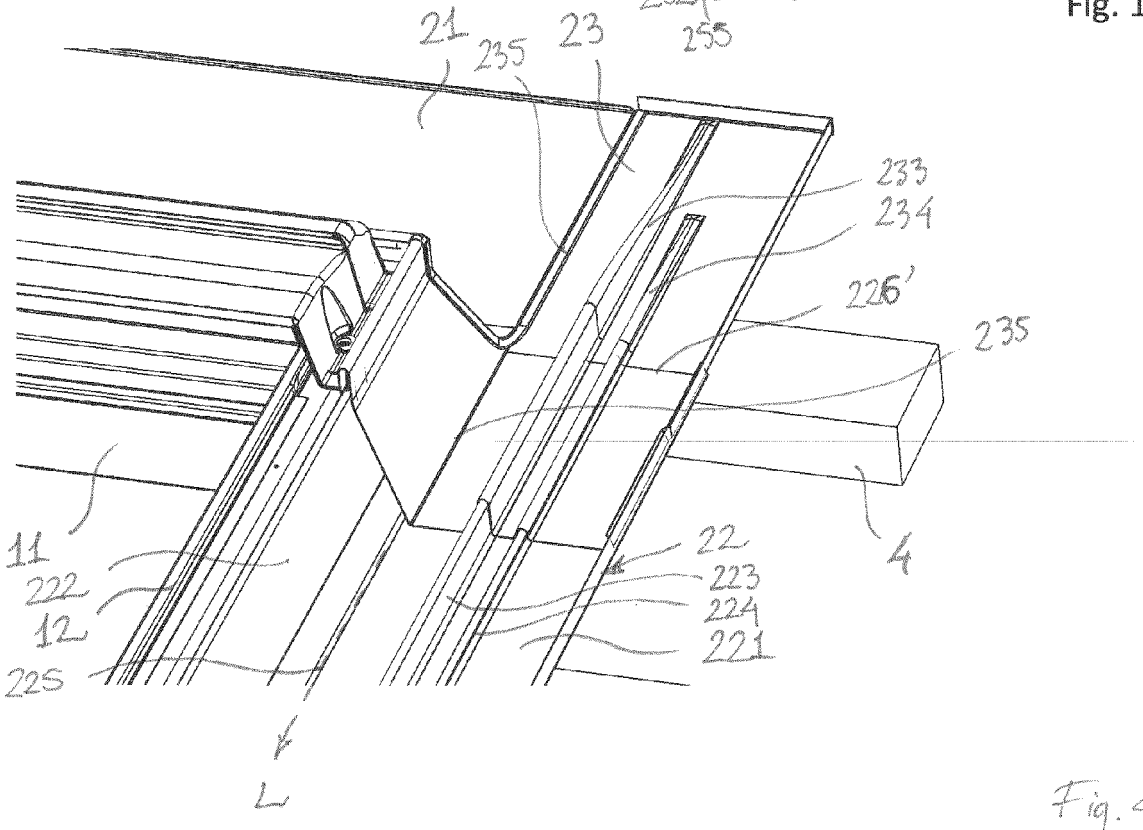
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Fig. 4

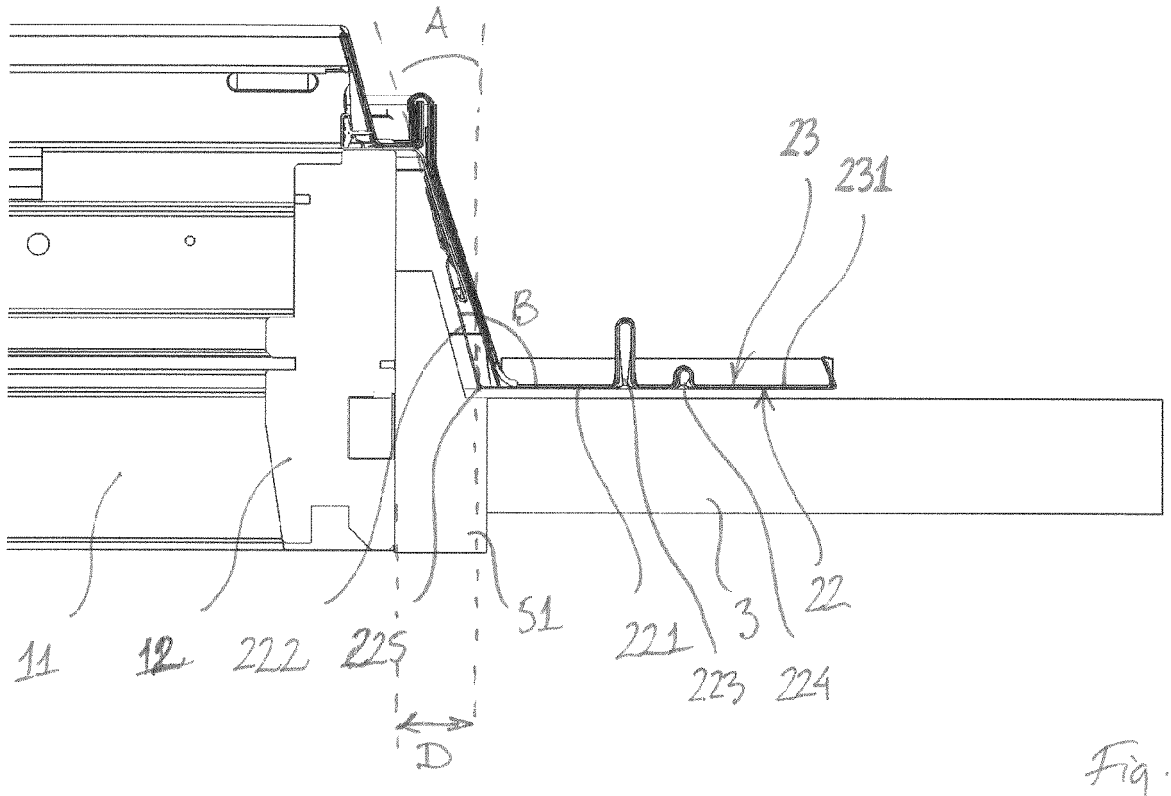
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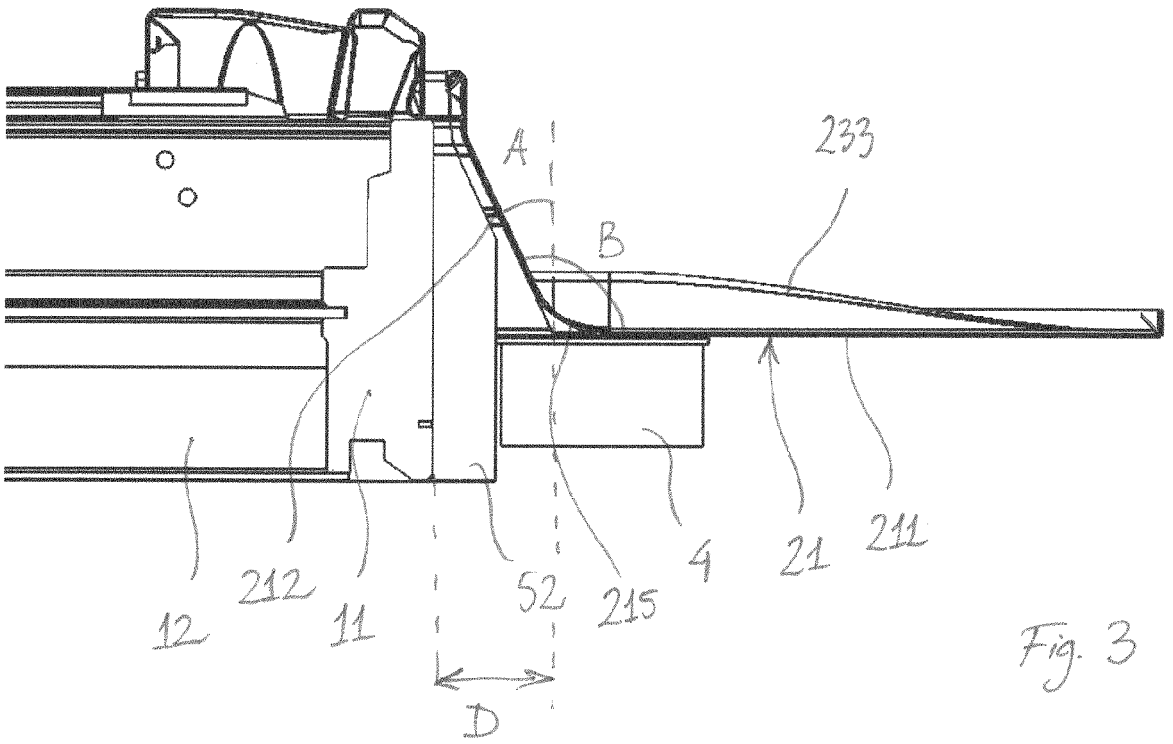
Fig. 2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D

Fig. 3

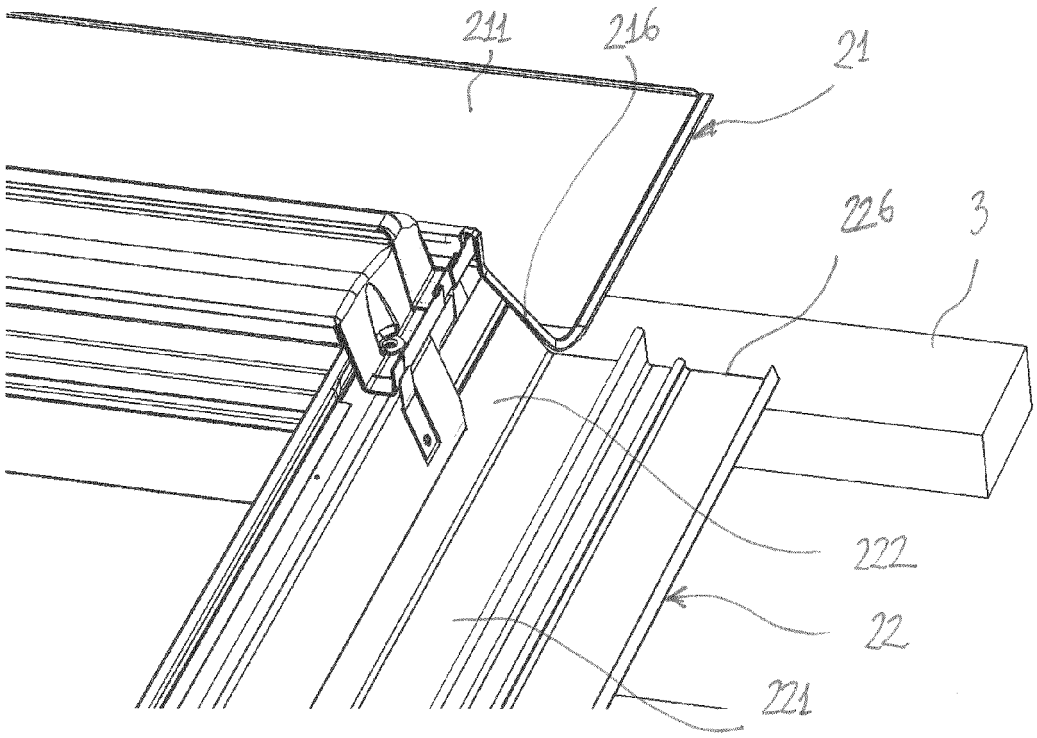

Fig.5

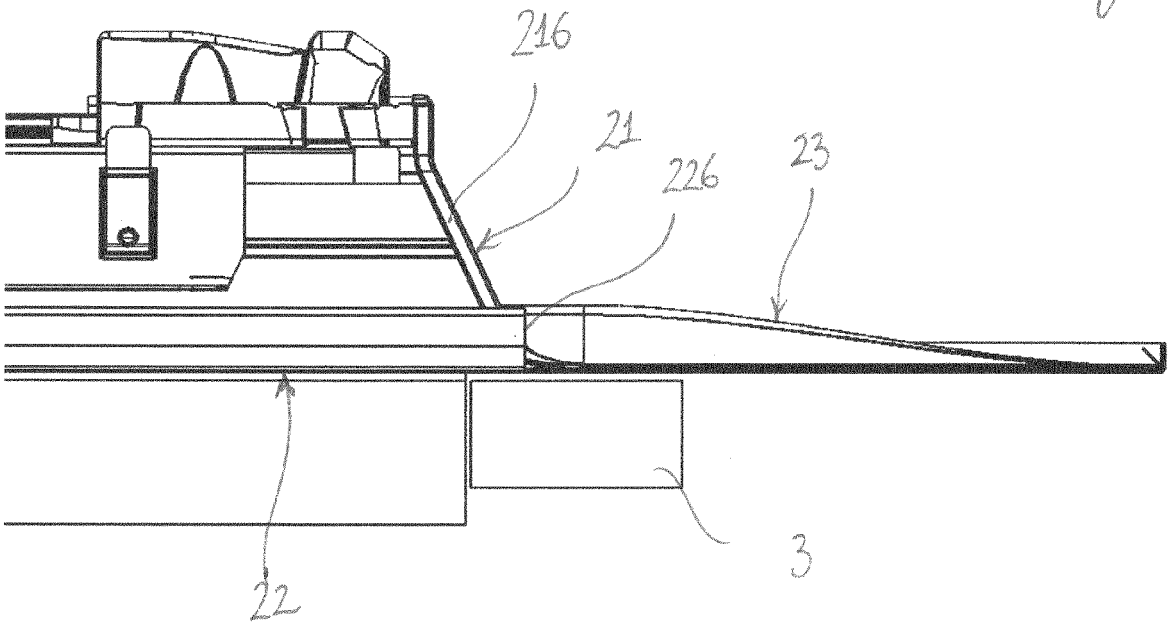

Fig.6.

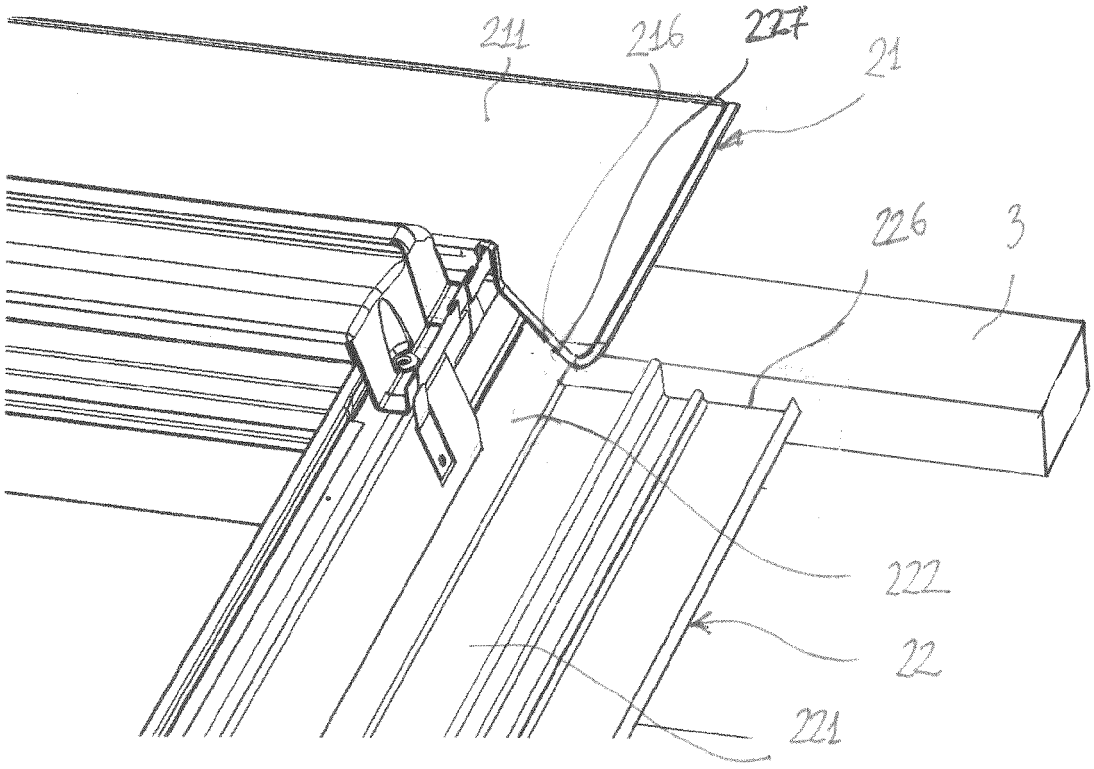

Fig 7

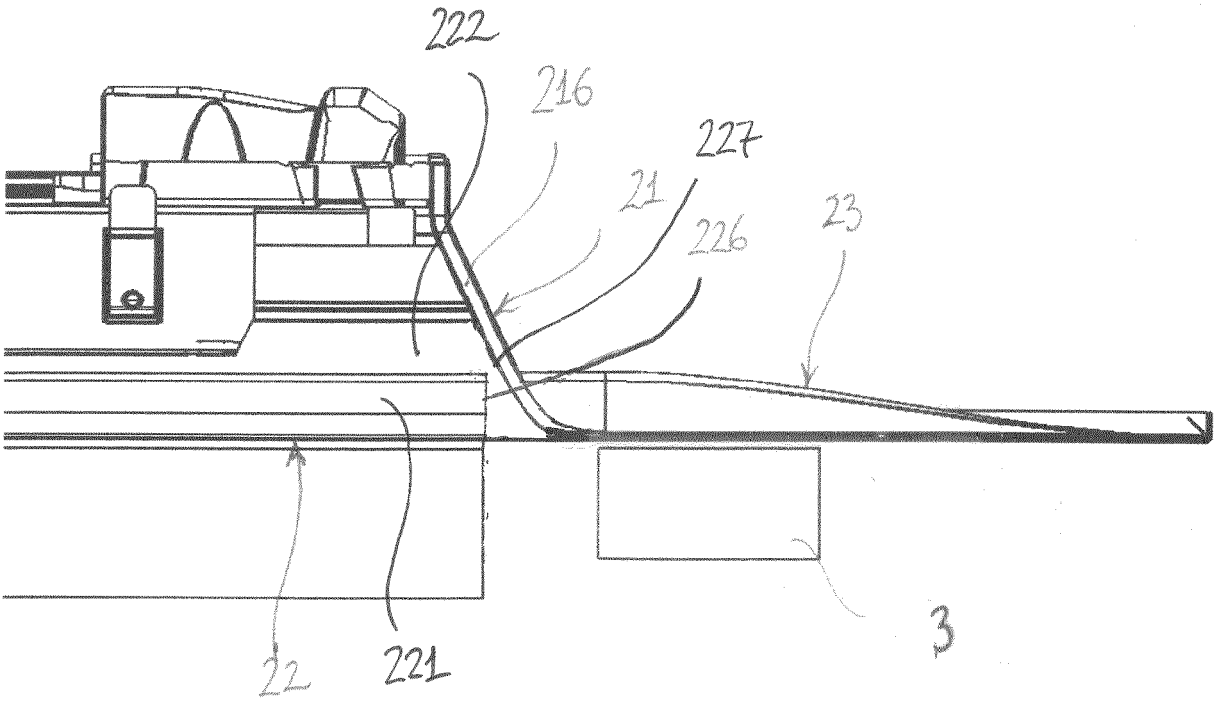

Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 18 17 2619

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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	3 October 2018	Leroux, Corentine

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