



## Description

**[0001]** The present invention relates to a skylight window for being installed in a roof of a building, the skylight window comprising:

a window frame having four frame side members, a window sash having four sash side members supporting an insulating glazing unit (IGU) having multiple layers of glazing, said window sash being movable in relation to the window frame between an open and a closed position of the skylight window, and a weather shield attached to the sash so as to protect a window portion of the skylight window, the window portion comprising the sash, frame and IGU, each frame side member being associated with a respective sash side member, each of said frame and sash side members extending in a respective longitudinal direction substantially in parallel with a respective peripheral side of the IGU, said IGU having an exposed interior major surface for facing an interior of said building in an installed position of the skylight window, said interior major surface extending in an outward direction away from a centre of the IGU, an inward direction extending in a direction opposite to said outward direction, said IGU further having an exposed exterior major surface for facing in an exterior direction which is opposite of said interior of said building in said installed position of the skylight window and extending away from and at a right angle to said exterior major surface of the IGU, said exterior major surface extending in the outward direction, where said weather shield extends across substantially the entire exposed exterior major surface, said frame side members comprising at least one sealing element.

## Background

**[0002]** There is often a desire to position one or more skylight windows in a roof of a building in order to allow daylight to reach the interior of the building. This, however, may give rise to a variety of challenges.

**[0003]** Inclined skylight windows are typically built into an opening in an inclined roof structure with an angle above 15 degrees with a substantial part of the inclined skylight window is positioned within the inclined roof structure in an installed position. Flat-roof skylight windows are generally installed on top of the exterior side of flat roofs of buildings, where the inclination of the roof is less than 5 degrees with respect to a horizontal plane of the roof. In general, flat-roof skylight windows are installed to cover an opening in the roof, i.e. a substantial part of the flat-roof skylight window extends above an exterior side of the flat roof structure in an installed position.

**[0004]** Furthermore, skylight windows of this type often

comprise a dome-shaped weather shield attached to the sash. During an opening movement, the weather shield typically follows the movement of the sash. The main purpose of the dome or weather shield is to protect the sash and frame from the weather and to avoid accumulation of precipitation and dirt on the IGU.

**[0005]** It is common today to use a skylight window in flat roofs and potentially cover the window portion with a dome-shaped weather shield. One example of this type of skylight window is disclosed in WO 2009/080026 A1. This roof window comprises a standard VELUX® outwardly hung window, to the sash of which a dome-shaped weather shield is attached.

**[0006]** In general, skylight windows of the prior art may be associated with relatively poor insulating properties and/or limited entry of light into an interior of the building on which the flat-roof skylight window is installed, as well as limited visibility through the window from the interior of the building as well as limited compatibility with different roof angles. This may be attributed to the manner, in which flat-roof skylight windows are installed on a roof structure of a building which generally results in a larger proportion of the window portion structure being exposed to the surrounding environment. Furthermore, with a weather shield attached to the top of the skylight, there are more layers of glazing which may result in a long travel path for light entering the flat-roof skylight window into the interior of the building.

**[0007]** On this background it may be an object of the present invention to provide a skylight window according to the introduction in which the insulation properties are improved.

**[0008]** A further object of the invention may be to provide a skylight window with improved light entry and/or in which view through the window is improved.

**[0009]** According to the invention these and further objects are met by a skylight window according to the introduction, characterized in that said first frame side member comprises a primary leg, which in said closed position extends in the longitudinal direction and in the exterior direction substantially in parallel with a peripheral side of the IGU along an outwardly facing surface of the IGU, and a secondary leg, which in said closed position extends along a part of the exposed interior major surface of the IGU and substantially in parallel with the interior major surface of the IGU, that said at least one sealing element is provided on the secondary leg of the first frame side member, and that in said closed position of the skylight window, said exposed interior major surface of the IGU abuts on said at least one sealing element.

**[0010]** That is, sealing between the IGU and the frame is achieved by a sealing element sealing directly against the IGU. Typically, in skylights of the prior art, sealing between the IGU and the frame of the skylight in the closed position is achieved by a sealing element sealing against the skylight sash and the frame. By sealing directly between the IGU and the frame, this removes the need for a sash side member to seal against a frame side

member. This may have the effect of eliminating the need for a sash side member to extend along the exposed interior major surface of the IGU. The absence of a sash extending along the exposed interior major surface of the IGU reduces the area of sash through which thermal energy can be transferred between the interior of the building and the exterior. The absence of a sash side member extending along the exposed interior major surface of the IGU may also allow the IGU to be positioned deeper in the skylight window, thus providing a more compact skylight which may improve the view through the skylight from the interior of the building. A further advantage of not having a sash extending along the exposed interior major surface of the IGU may be that there is less or no material below the IGU with different thermal expansion properties, that has to be taken into account when considering the insulating and/or weatherproofing or sealing properties of the skylight.

**[0011]** With no sash side member extending along the exposed interior major surface of the IGU, it may eliminate the need for a sash side member that is attached to a peripheral side of the IGU. The absence of a sash side member attached to a peripheral side of the IGU, may have the advantage of enabling the IGU to extend closer to the frame side member i.e. for the IGU to be placed closer to the frame side member. This may have the effect of increasing the relative area of the IGU relative to the rest of the skylight and thus improving the thermal insulation properties of the skylight window, given the superior insulation properties of the IGU relative to other components of the skylight.

**[0012]** Due to the high temperatures that may occur inside the skylight window between the IGU and the weather shield, the sealing element needs to be sufficiently tall in a height dimension perpendicular to a glazing pane of the IGU in the closed position of the Skylight to function as intended throughout the operating temperature range, as the IGU and frame may expand differently as they may comprise materials having different coefficients of thermal expansion.

**[0013]** In an embodiment, one or more frame side members may comprise a sealing recess adapted for securing a sealing element.

**[0014]** In an embodiment, one or more frame side members may comprise a drain channel for draining condensate or the like. The drain channel may be located adjacent to the sealing element. The drain channel may be located between the sealing element and the frame.

**[0015]** In an embodiment in said closed position of said skylight window, a periphery of the exposed interior major surface of the IGU abuts on said sealing element.

**[0016]** This may provide a better view through the window as only a periphery of the skylight window is potentially blocked by a sealing element.

**[0017]** In an embodiment said at least one sealing element is provided on an exterior surface of the secondary leg of the first frame side member facing in the exterior direction, but is it also possible to provide it on a surface

of the secondary leg of the first frame side member facing in the inward direction.

**[0018]** In an embodiment, a primary leg of a first frame side member extends in a longitudinal direction substantially in parallel with a peripheral side of the IGU.

**[0019]** This may improve support of the IGU. It may further provide a mounting surface for hinges, motors or the like to facilitate opening of the window.

**[0020]** In an embodiment, said first frame side member comprises a secondary leg which may be connected to the primary leg.

**[0021]** In a development of the previous embodiment, said first frame side member may comprise a tertiary leg which may be connected to the secondary and/or primary leg. The frame side member may further comprise a quaternary leg which may be connected to the tertiary and/or secondary and/or primary leg.

**[0022]** The different legs may be shaped to accommodate the IGU in a compact manner. This may be achieved by a leg of the frame side member shaped to allow the IGU to extend as close to the frame side member as possible and still provide the necessary space above and around the IGU to facilitate opening thereof.

**[0023]** In an embodiment, said exposed interior major surface of the IGU abuts on said sealing element on the secondary leg of the first frame side member which extends along the exposed interior major surface of the IGU.

**[0024]** Additionally or alternatively, said exposed interior major surface of the IGU abuts on said sealing element on the tertiary and/or quaternary leg of the first frame side member which extends along exposed interior major surface of the IGU.

**[0025]** This may have the advantage of allowing the leg extending along the exposed interior major surface of the IGU to be adapted to accommodate the sealing element and seal against the IGU.

**[0026]** In an embodiment, said exposed interior major surface of the IGU abuts on said sealing element by compressing said sealing element.

**[0027]** The IGU may compress said sealing element by substantially 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85 % measured between an uncompressed state and a compressed state in a height dimension. The height dimension being equivalent to the height dimension defined for the sash and frame side members.

**[0028]** In an embodiment, the secondary leg of the first frame side member forms a lining below the exposed interior major surface of the IGU.

**[0029]** This may have the advantage of improving the insulation properties of the skylight. The lining may also improve the sealing properties of the skylight window.

**[0030]** In an embodiment, the first sash side member may comprise a first leg which may be connected to a second leg, where the first or second leg may be connected to a third leg.

**[0031]** This may provide a sash with legs that may be adapted, shaped and/or positioned to perform a specific purpose, such as e.g. supporting the IGU, providing a

step surface, abutting a frame side member, providing a mounting surface etc.

**[0032]** The third leg may be connected to a fourth leg.

**[0033]** A leg of the sash side member may comprise a mounting surface for a hinge or the like to facilitate opening and closing of the skylight.

**[0034]** In an embodiment, the first sash side member and/or the first frame side member has a stepped profile.

**[0035]** This may have the effect of contributing to preventing dirt and/or water and/or other contaminants from entering the interior of the building from the exterior of the building due to the steps of the stepped profile. It may act similarly to a labyrinth seal.

**[0036]** In an embodiment, in a closed position of said skylight window, substantially the entire periphery of the exposed interior major surface of the IGU abuts on said at least one sealing element.

**[0037]** This may have the effect of providing a consistent seal between the IGU and the window frame.

**[0038]** In an embodiment, said sealing element is a continuous, uninterrupted sealing element.

**[0039]** This may have the effect of improving the sealing properties, as leaks that may occur at joining between discontinuous and sealing elements may be prevented.

**[0040]** In an embodiment, the sash comprises at least one abutment element to prevent the at least one sealing element from carrying substantial load and/or prevent the at least one sealing element from being damaged.

**[0041]** The term "damaged" may be understood as the sealing element being excessively compressed. This may cause cracks or the like to form in the sealing element resulting in a reduced sealing performance and/or leak. Excessive compression of the sealing element may result from the sealing element carrying a substantial load. A substantial load may be more than 30, 40, 50, 60, 70, 80, 90, 95, 99% of the load exerted through the sash.

**[0042]** In an embodiment, the sealing element is positioned on an upper surface of a frame side member, said upper surface facing the exposed interior major surface of the IGU in a closed position of the skylight window.

**[0043]** When the frame side member has a stepped profile, the top surface may be the step surface.

**[0044]** In general in this specification, in relation to the first sash side member, a length dimension may be defined as a dimension in which said longitudinal direction extends, a height dimension may be defined as a direction perpendicular to the length dimension and to major surfaces of the IGU, and a width dimension may be defined as a dimension perpendicular to the height and length dimensions. The width and length dimensions are thus parallel to the major surfaces of the IGU. Whereas the longitudinal direction extends in the length dimension, the width and height dimensions can be said to extend in transverse or lateral directions. The length dimension may also be denoted longitudinal direction. The width dimension may also be denoted width direction. The height dimension may also be denoted height direction.

**[0045]** Throughout this text the term "interior" is used to indicate that something is intended to face the interior of the building in which the skylight window is installed, in an installed position of the skylight window. The term "exterior" is used to indicate that something is intended to face in a direction opposite to the interior of the building in which the skylight window is installed, in an installed position of the skylight window. The terms "inner" and "outer" are used to indicate that something is intended for facing towards or away, respectively, from the opening in the frame of an assembled skylight window.

**[0046]** The terms "insulation", "insulating", "insulation properties" and "insulating properties" are to be understood in the sense of thermal insulation and thermal insulation properties and thermally insulating and insulating properties. However, other insulation may also be provided such as for example acoustic insulation.

**[0047]** As mentioned above, skylight windows for inclined roofs are typically built into the roof structure. This means that the frame and sash, i.e. most of the frame and sash structures, are embedded in the roof so that much, most or all of an outer surface of the frame facing away from the opening in the frame is positioned within the roof structure. The inventors of the present invention have realized that in inclined skylight windows installed in this way the insulation properties of the frame and sash are to a large extent not decisive for the total heat loss through the window. However, in skylight windows where the frame and sash are positioned higher than the level of the roof i.e. above the exterior surface of the roof, the typically inferior insulation properties of the frame and sash structures compared to those of the IGU are to a much lesser degree alleviated by the insulation properties of the roof structure. In prior art skylight windows of the above described type the IGU is typically the best insulated part of the window, i.e. having the lowest thermal conductivity or "U-factor", unit W/(m<sup>2</sup>K), especially compared to the thermal conductivity of the frame and sash. Thus, the inventors have realized that it is important to minimize the area of the sash and frame through which heat energy will escape.

**[0048]** The IGU may have multiple layers of glass which define a volume comprising an inert gas or aerogels or vacuum. The IGU may in a conventional manner comprise one or, preferably two, three or more layers of glazing, i.e. layers of glazing positioned at a distance from each other to form one or more sealed spacings or cavities between them. This spacing may be filled with an inert gas or may hold a vacuum to improve insulation. One or more of the layers of glazing may have a low emissivity coating or coating stack. One or more of the layers of glazing may be laminated e.g. the interior layer of glazing. One or more of the layers of glazing may be tempered. Similarly, the weather shield pane may be tempered. The IGU may be see-through transparent to provide a view out. The exposed interior major surface of the IGU may in that case a lower major surface of a lowermost of the layers of glazing. Sealing and/or sup-

porting members may be provided at one or more of four peripheral sides of the IGU between the layers of glazing. The sealing and/or supporting members may distance adjacent layers of glazing from each other and may together with lateral edges of the window glazing layers form respective side or lateral surfaces of the IGU. These side surfaces may be substantially plane and extend substantially in the height dimension as defined herein.

**[0049]** The sash may be made movable in relation to the window frame by the sash being outwardly hung, i.e. being rotatable about an axis extending along one of the sash side members. Generally by outwardly hung it is to be understood that the sash moves outwards from the frame during opening. This is contrary to pivot hung skylights which move both outwards and inwards during opening and employ a different design. The sash being outwardly hung may be achieved by using a rotary hinge positioned at this sash side member and connecting this sash side member with an associated, adjacent frame side member. Alternatively or additionally, the sash may be parallel-displaceable so that all four sash side members shift upwardly or downwardly between the open and closed positions of the window in which case further or other hinges or the like connect the sash with the frame. The skylight window may be openable by a combination of a rotary movement and a shifting movement or other movement paths of the sash in relation to the frame.

**[0050]** Hinges may be linear displacement mechanisms or multi-link mechanisms. The skylight window may be hinged to open in the exterior direction i.e. away from the interior of the building.

**[0051]** In an embodiment the frame side members each have a respective outer side surfaces facing outwardly and away from the IGU. The outer side surfaces of the frame side members may be planar or flat surfaces. The outer side surfaces may be substantially parallel with the height direction. This may provide a surface suitable for mounting attachments to the window frame, such as a curb flange.

**[0052]** The exposed interior major surface of the IGU may be a lower surface of the IGU and/or may face in a downwards direction towards an interior of the building in an installed position of the skylight window. The exposed interior major surface faces in a direction away from the weather shield.

**[0053]** The IGU comprises an exposed exterior major surface positioned oppositely from the exposed interior major surface and facing towards the outside, in an installed position of the skylight window. The exterior major surface may be substantially parallel with and/or may have substantially the same or the same shape and size as the interior major surface of the IGU. A distance between the two major surfaces defines a thickness of the IGU, which distance may be measured in the height dimension.

**[0054]** The IGU may have a rectangular shape and may have further second to fourth peripheral sides that each extends linearly along, potentially along substan-

tially a total extent of, a corresponding respective sash member. The peripheral sides may define a shape of the IGU.

**[0055]** The four frame side members may together form a substantially rectangular shape. Additionally, or alternatively, the four sash side members may together form a substantially rectangular shape. A rectangular shape of the four sash side members may be smaller than a rectangular shape of the four frame sash side members, which may allow the sash to be embedded within the frame.

**[0056]** The weather shield may be provided as a unitary structure, which is detachably attached to the sash. The weather shield may be attached detachably to the sash, providing for access to clean the IGU; this may also be of advantage during installation of the skylight window, e.g. when positioning or attaching the window portion or when attaching roofing felt to cover a potential gap between the frame and the roof structure.

**[0057]** The weather shield is mounted on the window portion to protect it from the elements and preventing rain and other downfall from entering into gaps or slots in the roof or the window portion.

**[0058]** The weather shield may comprise a weather shield pane positioned on an exterior side of the IGU.

**[0059]** The weather shield may comprise a weather shield pane that may be surrounded by a weather shield skirt that may extend on an outer side of all four sides of the frame, i.e. of the respective frame side members. The skirt may be manufactured from or include metal. The weather shield pane may curve upwardly in relation to the window portion or the IGU to allow for rain and snow to slide or flow off of the weather shield pane. Alternatively or additionally, the weather shield pane may be a transparent window pane that may be of glass or hardened glass. The weather shield pane may comprise only one single layer of glazing.

**[0060]** In an embodiment the weather shield may be a weather shield without a sealed gas-filled spacing between the weather shield and the IGU. The weather shield pane can be of glass, hardened glass, clear polymer or other transparent or translucent materials.

**[0061]** The frame may enclose the sash in the closed position of the skylight window.

**[0062]** Respectively associated frame and sash side members may be positioned to be substantially parallel to each other in both the open and closed positions of the skylight window.

**[0063]** The first sash and/or frame side member may extend substantially along an entire length of said first peripheral side or side surface of the IGU.

**[0064]** The first leg may have a height in the height dimension of at least 1.5, 1.8, 2 or 2.2 times a height or thickness of the IGU, where the height of the IGU as mentioned may be defined as a distance between its exposed exterior major surface and its exposed interior major surface. Additionally or alternatively, the first leg may have an inner side surface facing a side surface of the

first peripheral side of the IGU, this inner side surface extending 1.3, 1.5, 1.8 or 2 times the height or thickness of the IGU.

**[0065]** The first sash side member may in general in all embodiments have a substantially uniform cross section along a length of the first sash side member in said longitudinal direction. Alternatively or additionally, the first frame side member may have a substantially uniform cross section along a length of the first frame side member in said longitudinal direction. One or more of the remaining sash and frame side members may similarly have substantially uniform cross sections in the same manner.

**[0066]** Generally, one or more of the frame and/or sash side members may comprise or be made substantially of polymer materials, such as plastic, specifically PVC (polyvinyl chloride), chlorinated PVC, PUR (polyurethane), fibre reinforced PUR such as glassfibre reinforced PUR, and/or wood and/or metal such as aluminium or composites or combinations thereof. The frame and/or sash may have a general hollow core structure with one or more hollows inside spacings or cavities surrounded by thin layers or plates of material, such as plastic or PVC, specifically fiber-reinforced PVC, which plates may extend in the longitudinal direction and may be connected to each other at corners thereof such as to form a shell structure surrounding the spacings. One or more spacings may comprise a filler and/or an insulating and/or stiffening material or member, which may for example comprise or consist of wood and/or a foamed polymer material. The plates of material may be extruded, and may optionally be extruded as one or more separate elements for each frame or sash side member, which are subsequently attached to each other, and a filler material potentially being positioned in the core spacings afterwards. As an alternative, the surrounding material may be moulded around a core of filler material. These structures may provide good strength and insulation properties and may be low-cost in manufacture. Alternatively, the surrounding material or plates may comprise or substantially consist of metal, such as steel and/or aluminium. It is noted that the skylight window according to the invention can be made stronger due to the third leg of the first sash side member, see further below, which may have the advantage that the sash and frame may be made of a less strong, but better insulating material, e.g. PVC instead of steel.

**[0067]** The first leg of the first sash side member may on a surface facing the IGU, which surface may substantially extend in the height dimension, comprise two or more grooves, the first groove being positioned at a first distance from the interior major surface of the IGU, the second groove being positioned at a second distance from the interior major surface of the IGU, which is different from distance between the first groove and the interior major surface of the IGU, the first and second grooves being adapted for receiving a fixation member which can be attached to or snap-locked to either one of

the two grooves, the fixation member abutting the exterior major surface of the IGU so as to hold the IGU along said first peripheral side thereof, especially in the upward direction. Hereby the IGU may be exchanged with an IGU of different thickness by switching the fixation member to the other of the two grooves. In the present invention the IGU can be positioned lower in the window structure, which means that more room may be available for including larger thicknesses of the IGU and more grooves and thus options for IGU thicknesses. The fixation member may be manufactured of or comprise a plastic and/or sealing material and may comprise one or more projections that are adapted to be in abutment with the upper or exterior major surface of the IGU such as to hold this in place against the upper resting surface of the second or third leg in cases where the adherence of the supporting section to the exposed exterior major surface of the IGU is not the substantially only attachment of the first sash side member to the IGU. The fixation member may extend substantially along an entire length (in the longitudinal direction) of the first sash side member and/or the first peripheral side of the IGU. Similar fixation members may be attached to similar grooves of the one, two or three of the other sash side members along the other three peripheral sides of the IGU.

**[0068]** The sash side members may be interconnected at the corners of the respective sash by corner keys. The corner keys may be attached to respective sash side members in hollows thereof. The corner keys may be made substantially of of a rigid and hard material such as metals like aluminium, steel or wood. The corner keys act to prevent sash members from moving out of alignment with interconnected sash members respectively.

**[0069]** A chain drive, hinge or the like may be provided connecting the sash and frame for assisting in opening and closing the skylight window.

**[0070]** In this specification, generally one or more or all individual ones of the legs mentioned herein of the sash and frame members may be provided separately from each other, each leg potentially being attached to adjacent legs. Alternatively, where a leg is described as being attached to another leg, these two legs may be provided integrally or in one piece with each other.

**[0071]** In an embodiment of the present invention, said second leg extends as far as or farther than said secondary leg in said inward direction.

**[0072]** This may improve or further contribute to hiding parts of or the entire window when seen through the IGU from an interior of a building in the installed position of the window.

**[0073]** In an embodiment, said primary leg of said first frame side member extends as far as or farther in said upward direction than the location of said exterior major surface of the IGU.

**[0074]** This allows for positioning the IGU deeper or lower in the window structure. This reduces the area of the sash and frame through which heat energy escapes (or enters) from the interior of the building. Furthermore,

improved light inflow and view through the skylight window are achieved.

**[0075]** The third leg of the first sash side member may provide additional support to the IGU, which is a typically relatively heavy component of the window. This means that it is possible to substantially reduce the strength and/or stiffness of the first and second legs of the first sash side member without compromising structural integrity of the first sash side member. As a consequence, the first and second legs may be made of smaller size, which again allows for positioning the IGU lower in the window structure as well as to use an IGU with a larger planar area, i.e. it extends further to the sides and so increase the relative area of IGU compared to the skylight window. This reduces the area of the sash and frame through which heat energy escapes from (or enters) the interior of the building.

**[0076]** The third leg may be provided in the form of a stiffening and/or strengthening leg, which substantially improves stiffness, strength, structural integrity and/or the like of the first sash side member. Accordingly, the third leg may affect stiffness, strength, moment of inertia and/or like structural properties of the first sash side member, including providing greater resistance to bending. Improved structural properties mean that the sash can hold a larger IGU or an IGU having a plurality of glazing layers.

**[0077]** Thus, by improving the structural properties of the sash in this manner, it has been found that when holding IGUs of substantially the same size and weight as in the prior art, it is possible to decrease the size of other legs of the sash, specifically the first and second legs. The IGU can be placed lower in the skylight window construction, and as such will improve the insulating properties of the skylight window.

**[0078]** Furthermore, due to the improved structural properties of the first sash side member the inventors have realized that inclusion of the third leg need not obstruct entry of light or the view through the IGU. On the contrary, since it is possible to position the IGU lower in the window structure, entry of light and view through the IGU may, in fact, be improved.

**[0079]** The third leg may comprise the only or substantially the only supporting surface or supporting point of the first sash side member resting on the frame in the closed position of the skylight window. Similarly, in one or more of the remaining three sash side members a corresponding third leg may comprise the only or substantially the only supporting surface or supporting point of the respective sash side member resting on the frame in the closed position of the skylight window. This may provide an improved ability to position and center the skylight window during closing thereof. Other contact points or contact surfaces between the sash and frame in the closed position of the skylight window, which contact surfaces are not carrying any substantial amount of the weight of the sash in the closed position of the skylight window, may include sealing members between associ-

ated sash and frame side members. An insignificant amount of a weight of the sash in the closed position of the window can be defined as less than 20, 10, 5, 3, 2 or 1 percent of a total weight of the sash the sash imposed by the first sash side member on the first frame side member. It is preferable that the only contact points between one, two, three or four of the sash side members to the associated frame side member are established by the abutment element(s) and potential sealing members, potentially a hinge and/or a chain drive for moving the sash. The abutment element(s) may be of or comprise an elastic material and/or a plastic material and/or a sealing material. The abutment element may be deformed in the closed position of the skylight window.

**[0080]** In case a rotary hinge and/or a chain drive is included in the skylight window, the rotary hinge and/or chain drive may also establish an indirect contact point between sash and frame, which may also carry part of the weight of the sash in both the closed and especially in the open position of the skylight window.

**[0081]** Alternatively, a lower supporting surface of the second leg may in the closed position of the window rest on a corresponding upper resting surface of the first frame side member. The first leg or the potential fourth leg mentioned further below may also or alternatively comprise a lower supporting surface that rests on a corresponding upper resting surface of the first frame side member in the closed position of the skylight window. The lower supporting surface of the first leg and/or of the second leg and/or of the third leg may be provided by one or more abutment elements attached to or forming part of one or both of the sash and frame. This abutment element(s) may be provided at a corner (corners) of the first sash and/or frame side member.

**[0082]** The side surface extending along said first peripheral side may potentially have an angle to the interior major surface of the IGU of approximately 90 degrees. Generally, each of the first, second and/or third legs may be substantially plate-shaped and/or oblong and/or have a flat shape, potentially so that they together form a step where an upper surface of the second leg may be denoted a step surface.

**[0083]** Generally, the first leg may extend longer, e.g. at least 1.5, 2, 2.5 or 3 times longer, in the height dimension than in the width dimension. Similarly, the second leg may extend longer, e.g. at least 1.5, 2, 2.5 or 3 times longer, in the width dimension than in the height dimension. Similarly, the third leg may extend longer, e.g. at least 1.5, 2, 2.5 or 3 times longer, in the height dimension than in the width dimension. Alternatively or additionally, the second leg may extend longer, e.g. at least 1.5, 2, 2.5 or 3 times longer, in the width dimension than the first leg and/or than the third leg.

**[0084]** Alternatively or additionally, generally, the extent in the length dimension of the first, second and third legs may be substantially equal to or 1 to 1.3 times the extent of the first peripheral side of the IGU in the length dimension. The extents measured also in this context

and in general throughout the present specification may be an overall and/or total and/or largest extent of the leg in question in the relevant direction. Alternatively or additionally, the second leg may be defined as projecting from a surface of the first leg, which surface extends substantially in the height dimension and faces the IGU, and/or the third leg may be defined as projecting from a surface of the second leg, which surface extends substantially in the height dimension and is substantially perpendicular to the IGU. These latter surfaces may be imaginary, i.e. the relevant portions may be integral with each other at said imaginary surfaces. If these surfaces are imaginary, the surfaces may be denoted planes.

**[0085]** Generally, an angle between the first and second legs and/or between the second and third legs may be 70 to 110 degrees or 80 to 100 degrees or substantially 90 degrees. This angle may be measured between a surface of one leg adjacent or contiguous to a surface of the other leg and/or between a overall directions in which the respective legs extend.

**[0086]** Generally, the first leg may be attached to or formed integrally with the second leg, and/or the second leg may be attached to or formed integrally with the third leg.

**[0087]** The third leg may be positioned with a major part thereof being located beneath the first leg.

**[0088]** The lower supporting surface of the third leg may form part of the third leg and/or may be a lower surface of the third leg and/or may extend substantially in the width dimension.

**[0089]** The direction away from said exposed interior major surface of the IGU, in which direction the third leg projects, may extend substantially in the height dimension and/or may extend downwards, i.e. towards an interior the building in an installed position of the skylight window.

**[0090]** In general, in a cross section perpendicular to the length dimension or to the longitudinal direction the first leg and/or second leg and/or third leg may be substantially shaped as a rectangle, e.g. outer surfaces of the individual leg form an overall rectangular shape. However, the first leg may be substantially shaped as a trapezoid or a trapezium, an outer surface of the first leg extending substantially along a surface of the first frame side member (e.g. along a surface of the primary leg of the first frame member, which may be similarly inclined, see further below) being inclined, e.g. with 1 to 10 or 2 to 5 degrees, with respect to the height dimension. This inclination may be towards the second leg and/or may be in an outward and upward direction. An inward direction may generally in this specification be defined as a direction towards a centre of the IGU, and the outward direction may be a direction opposite to the inward direction, which directions extend in the width dimension. The first frame side member may comprise a side surface extending substantially in parallel with the latter side surface of the first leg in the closed position of the window. A surface of the first leg extending along another surface

of the first frame side member (e.g. along an upper surface or the step surface of the secondary leg of the first frame side member, see further below) may extend substantially in the width dimension. A surface positioned opposite from the latter surface of the first leg may be substantially parallel to the latter surface of the first leg in the closed position of the window. Another surface of the first leg, specifically a surface extending next to the side surface of the first peripheral side of the IGU, may connect the two latter surfaces of the first leg and/or may extend substantially in the height dimension. Similarly, the third leg may comprise a side surface facing a surface of the first frame side member and extending substantially in the height dimension, but may extend at an angle of 1 to 10 or 2 to 5 degrees with relation to the height dimension. The first frame side member may comprise a side surface extending substantially in parallel with the latter side surface of the third leg in the closed position of the window. The inclination in this context may be in a direction away from the second leg and/or may be in an outward and upward direction.

**[0091]** Said lower supporting surface of said third leg of the first sash side member and/or the corresponding upper resting surface of the first frame side member may extend substantially in the width dimension.

**[0092]** One or more sealing members may be provided at a corner formed between the second and third legs, this sealing member abutting the first frame side member in the closed position of the skylight window.

**[0093]** In an embodiment of the invention said first sash side member further has a fourth leg projecting from an upper end of said first leg in a direction away from from the IGU. Said direction away from the IGU may be in said width dimension and/or be said outward direction.

**[0094]** The fourth leg may provide a further lower supporting surface which in the closed position of the window rests on a corresponding further upper resting surface of the first frame side member, specifically of the primary leg thereof mentioned further below.

**[0095]** Alternatively or additionally, the fourth leg may in the closed position of the window be positioned above the below mentioned primary leg of the first frame side member. A width of the fourth leg may substantially correspond to a width of this primary leg.

**[0096]** As is the case for the first, second and third legs, the fourth leg may be substantially plate-shaped or have a flat shape so that an upper surface thereof forms a further step surface similar to and potentially extending substantially in parallel with the step surface of the second leg.

**[0097]** Alternatively or additionally, the fourth leg may have an oblong shape in the width dimension and/or may extend longer, e.g. at least 1.5, 2, 2.5 or 3 times longer, in the width dimension than in the height dimension. Alternatively or additionally, the extent in the length dimension of the fourth leg may be substantially equal to or 1 to 1.3 times the extent of the first peripheral side of the IGU in the length dimension. Alternatively or additionally,



the fourth leg may be defined as projecting from a surface of the first leg extending in the height dimension and facing away from the IGU. This surface may be imaginary in the manner described above.

**[0098]** An angle between the first and fourth legs may be 70 to 110 degrees or 80 to 100 degrees or substantially 90 degrees.

**[0099]** The fourth leg is preferably attached to or formed integrally with the first leg.

**[0100]** The fourth leg may extend along, preferably along a substantially entire length of, the first peripheral side of the IGU.

**[0101]** The fourth and second legs may extend substantially in parallel.

**[0102]** In a cross-section perpendicular to the length dimension or to the longitudinal direction the fourth leg may be substantially shaped as a rectangle. However, the fourth leg may be substantially shaped as a trapezoid or a trapezium, a surface of the fourth leg extending substantially along an upper surface of the first frame side member (e.g. along an upper surface of the primary leg of the first frame member, which may be similarly inclined, see further below) being inclined, e.g. with 1 to 10 or 2 to 5 degrees, with respect to the width dimension. This inclination may be in the inward and/or downward direction. The fourth leg may further comprise a first lateral side surface facing and/or attached to the first leg and potentially extending substantially in the height dimension and an opposite, substantially parallel side surface that may face in the outward direction. An upper surface of the fourth leg may extend substantially in the width dimension and may connect the two parallel surfaces thereof.

**[0103]** The fourth leg may have a height in the height dimension less than the thickness of the IGU and/or substantially equal to the height of the second leg.

**[0104]** One or more sealing members may be provided at a corner formed between the fourth and first legs, these sealing members abutting the first frame side member in the closed position of the skylight window. Alternatively or additionally, a sealing element may be attached to the fourth leg or to the first frame side member, the sealing element preferably covering an outwardly facing potential gap or a slot between the fourth leg and the first frame side member in the closed position of the skylight window.

**[0105]** In a development of the embodiment comprising a third leg, the IGU extends from an inner edge of the third leg towards the first leg in the width dimension to farther than half of an accumulated width of the first, second and third legs.

**[0106]** Hereby the IGU extends relatively far in the width dimension, which reduces heat transmission through the frame and sash and thus through the window as explained in the above. As explained, this is made possible due to the provision of the third leg, which allows for thinner first and second (and fourth) legs.

**[0107]** More preferred, the IGU extends from an inner edge of the third leg in the width dimension to farther than

0.6, most preferred farther than 0.7, of said accumulated width of the first, second and third legs.

**[0108]** In another development of the embodiment comprising a third leg, the third leg has an oblong shape in the height dimension.

**[0109]** The oblong shape of the third leg may be defined as the height of the third leg being at least 1.5, 2, 2.5 or 3 times longer than the width thereof. Additionally or alternatively, the third leg may extend in the height dimension 1, 1.5, 2 or 2.5 times a height of the second leg. Additionally or alternatively, the third leg may have a height of 0.3 to 1, 0.3 to 0.8, 0.4 to 0.7 or 0.4 to 0.6 times a height of the first leg. Additionally or alternatively, a height of the third leg may be 0.5 to 1.5, 0.7 to 1.3 or 0.8 to 1.2 times a width of the second leg.

**[0110]** In another embodiment the first frame side member comprises a primary leg with a surface extending next to and along a side surface of said first leg of the first sash side member, said side surface of said first leg facing substantially away from said first peripheral side of the IGU, and a secondary leg extending along a surface of said second leg of said first sash side member, which surface faces substantially away from said interior major surface of the IGU.

**[0111]** In an embodiment, the cross-sectional shape of the first frame side member and the first sash side member may have a stepped profile, where the frame side member may comprise primary, secondary, tertiary or more legs where each leg may be substantially perpendicular to an immediately preceding leg and the immediately following leg, such that a step like structure is formed. Similarly, the first sash side member may comprise a first, second, third or more legs, where each leg may be substantially perpendicular to an immediately preceding leg and the immediately following leg, such that a step like structure is formed. Generally, each of the primary, secondary and/or tertiary legs may be substantially plate-shaped and/or oblong and/or have a flat shape, potentially so that they together form a step where an upper surface of the second leg may be denoted a step surface. Similarly the first, second and/or third legs may be substantially plate-shaped and/or oblong and/or have a flat shape, potentially so that they together form a step where an upper surface of the second leg may be denoted a step surface.

**[0112]** A stepped configuration of adjacent surfaces of the first sash and frame side members may thus be achieved by means of the stepped profile of the first sash side member as described and an associated stepped profile of the first frame side member according to the present embodiment. This stepped configuration may provide a labyrinth like structure between the sash and frame side member, resulting in a less direct path for air, precipitation or dirt to pass between the interior and exterior of the building. The stepped profile also provides the possibility of placing sealing elements along the profile such that sealing is facilitated between two parallel surfaces i.e. a surface of the frame side member and a

parallel sash side member. Furthermore, insulating sealing members may conveniently be positioned between the first sash and frame side members at respective corners of the stepped configurations, e.g. as described in the above. Hereby, insulating and sealing properties of the skylight window may be further improved. This allows the force exerted through the sash corresponding to the weight of the IGU and sash to be utilized in compressing the sealing elements placed between the frame side member and sash, to ensure optimal sealing.

**[0113]** In the embodiment comprising a third leg, the secondary leg of the first frame side member may further comprise a side surface, which may extend substantially in the height dimension, and which faces, is placed next to and/or extends along a side surface of the third leg of the first sash side member. Said side surface of the third leg of the first sash side member may similarly extend substantially in the height dimension and/or may face in the outwards direction. Said two side surfaces may be substantially parallel to each other in the closed position of the window and/or be inclined with 2-10 or 2-5 degrees in relation to the height dimension and/or they may extend in the length dimension and/or along substantially a total extent of the first sash and frame side members in the longitudinal direction.

**[0114]** In the embodiment comprising a third leg, the third leg may have an extent in the height dimension of at least 0.2, 0.3, 0.4 or 0.5 times an extent of the secondary leg in the height dimension.

**[0115]** In a development of the embodiment comprising a third leg, the first frame side member comprises a tertiary leg, which comprises said corresponding upper resting surface of the first frame side member on which said lower supporting surface of said third leg of the first sash side member rests in the closed position of the window.

**[0116]** The tertiary leg may in the closed position of the window be positioned below or immediately below the third leg of the first sash side member. A width of the tertiary leg may be 0.3 to 1 of a width of the third leg.

**[0117]** The tertiary leg may be substantially plate-shaped or have a flat shape so that an upper surface thereof forms a further step surface similar to and potentially extending substantially in parallel with the step surfaces of the primary and secondary legs. This step surface may be positioned beneath the abutment element explained further below.

**[0118]** The tertiary leg may have an oblong shape in the height dimension and/or may extend longer, e.g. at least 1.5, 2, 2.5 or 3 times longer, in the height dimension than in the width dimension. Alternatively or additionally, the extent in the length dimension of the tertiary leg may be substantially equal to or 1 to 1.3 times the extent of the first peripheral side of the IGU in the length dimension. Alternatively or additionally, the tertiary leg may be defined as projecting from a surface of the secondary leg extending in the width dimension and facing inwardly. This surface may be imaginary in the manner as men-

tioned above.

**[0119]** An angle between the secondary and tertiary legs may be 70 to 110 degrees or 80 to 100 degrees or substantially 90 degrees.

**[0120]** The tertiary leg is preferably attached to or formed integrally with the secondary leg.

**[0121]** The tertiary leg may extend along, preferably along a substantially entire length of, the first peripheral side of the IGU.

**[0122]** The tertiary and third legs may extend substantially in parallel in the closed position of the window.

**[0123]** The tertiary leg may project from the secondary leg substantially inwardly and/or in the width dimension.

**[0124]** The tertiary leg may form a third step surface, corresponding to the first and second step surfaces of the primary and secondary legs, respectively, which may be substantially parallel to the first and second step surfaces.

**[0125]** In a cross-section perpendicular to the length dimension or to the longitudinal direction the tertiary leg may be substantially shaped as a rectangle. However, the tertiary leg may be substantially shaped as a trapezoid or a trapezium, an inwardly facing surface of the tertiary leg being inclined, e.g. with 1 to 10 or 2 to 5 degrees, with respect to the height dimension. This inclination may be in the inward and/or the upward direction. The tertiary leg may further comprise a first lateral side surface facing and/or being attached to the secondary leg and potentially extend substantially in the height dimension and an opposite side surface that may face in the inward direction, the latter being the surface that may be inclined in relation to the height dimension. The resting surface or an upper surface of the tertiary leg may extend substantially in the width dimension and may connect the two lateral side surfaces thereof.

**[0126]** The tertiary leg may have a height in the height dimension less than the thickness of the IGU and/or less than that of the first, third, primary and/or secondary leg.

**[0127]** In the development of the embodiment comprising a third leg, an abutment element may be provided as part of said third leg of the first sash side member so that said abutment element provides said lower supporting surface of said third leg, and/or is provided as part of the first frame member so that said abutment element provides said corresponding upper resting surface of the first frame side member on which said lower supporting surface of said third leg rests in the closed position of the skylight window.

**[0128]** The abutment element may extend along substantially a total length of the first frame and/or sash frame side members and/or substantially along a total length of the third leg and/or said lower surface of the third leg, these lengths being in the length dimension.

**[0129]** The abutment element is preferably a separate part attached to remaining parts of the tertiary leg. Furthermore, the abutment element may comprise an abutment surface, which includes or forms the resting surface on which the supporting surface of the third leg rests in

the closed position of the skylight window. The abutment surface may in a position in which the third leg does not rest on it be inclined with an angle of 5 to 25 or 10 to 20 degrees with respect to the height dimension and/or may extend substantially linearly. Such an inclined abutment surface may help positioning or centering the sash in the frame during a closing movement. Accordingly or alternatively, the supporting surface of the third leg of the sash side member, which supporting surface is in abutment with the resting surface of the abutment element in the closed position of the skylight window, may comprise part of an outer side surface of the third leg as well as part of a lower surface of the third leg, these outer and lower surfaces of the third leg forming a lower, outer corner of the third leg. Hereby the third leg and thus the first sash side member are held by the abutment element both in the width dimension (outwardly) and in the height dimension (downwardly). Holding the sash in the width dimension helps centering and embedding the sash in the frame in the closed position of the skylight window, especially if all sash and frame side members are provided with a similar configuration.

**[0130]** In embodiments where the secondary and tertiary legs of the frame side member are provided, the abutment element may form part of the secondary and/or of the tertiary leg of the first frame side member, and/or the abutment element may be attached to and/or abut one side the secondary leg and/or be attached to another part of the tertiary leg.

**[0131]** The abutment element may form a seal covering an opening or slot that would otherwise be provided between the third leg of the first sash side member and the tertiary leg of the first sash frame side member in the closed position of the skylight window.

**[0132]** A similar abutment element may be provided in a similar manner on or forming part of one, two or three of the remaining frame and/or sash side members. In this case, abutment elements with inclined surfaces in the manner described will help positioning and centering of the sash within the frame during closing of the skylight window.

**[0133]** The abutment element(s) may form the only or substantially the only resting point or resting surface of the sash or of one or more of the sash side members on the frame in the closed position of the skylight window. This provides a superior ability to position and center the skylight window during closing thereof. Other contact points between sash and frame in the closed position of the skylight window may include sealing members between associated sash and frame side members, but these sealing members preferably only carry an insignificant amount of the sash in the closed position of the window, i.e. less than 10, 5, 3, 2 or 1 percent. It is preferable that the only direct contact points between one, two, three or four of the sash side members to the associated frame side member are established by the abutment element(s) and potential sealing members. Generally, a sash side member is "associated" with a frame

side member if they lie adjacent to each other in the closed position of the skylight window. In case a rotary hinge and/or a chain drive is/are included in the skylight window, the rotary hinge and/or chain drive may establish one or more indirect contact points or contact areas between sash and frame, which may also carry part of the weight of the sash in both the closed and especially in the open position of the skylight window.

**[0134]** In another embodiment a second, third and/or fourth sash side member is/are substantially similar and/or identical in shape and/or form and/or size and/or structure to the first sash side member.

**[0135]** In another embodiment a second, third and/or fourth frame side member is/are substantially similar and/or identical in shape and/or form and/or size and/or structure to the first frame side member.

**[0136]** In the latter two embodiments, all frame and/or side members, respectively, may have substantially identical cross sectional shapes in a cross section perpendicular to the length dimension associated with the first sash side member. Alternatively or additionally, all frame and/or sash side members, respectively, may be substantially identical to each other.

**[0137]** Thus, two or more of the four respective frame and sash side members may be similar or substantially identical to each other. This makes it cheaper to produce and may allow for optimal movement and positioning of the sash during opening and closing of the skylight window. Also, safe sealing may be provided between the sash and frame, simple mounting may be achieved and the structural properties of the frame and/or sash are the same on all sides of the skylight window.

**[0138]** In case the first sash side member comprises the above described fourth leg, the weather shield may be attached to the fourth leg. In case all four sash side members comprise the above described fourth leg, the weather shield may be attached to each of the fourth legs.

**[0139]** In alternative embodiments, the weather shield may be replaced by a flat window pane, which may be positioned to be substantially parallel to the window portion. In such an embodiment, the window pane acting as weather shield may be of a different size than the remaining IGU panes, by being larger or smaller, in a plane parallel to the interior major surface of the IGU, than the other panes.

**[0140]** In another development of the embodiment comprising a third leg, the first frame side member further comprises a cover leg that covers the third leg in the closed position of the skylight window so as to at least partly or substantially hide the third leg when seen from below the interior major surface of the IGU.

**[0141]** Hereby the third leg, which is typically the only or the most visible element of the first sash side member when seen from inside the building, may be at least partly or completely hidden when seen from inside the building in an installed position of the window.

**[0142]** The cover leg may extend in the longitudinal direction along substantially an entire length of the first

leg and/or the first sash side member.

**[0143]** In the embodiment where the first frame side member comprises a tertiary leg, the cover leg may form part of the tertiary leg or extend from an inward surface of the tertiary leg. The cover leg and the secondary and tertiary legs of the first frame side member may establish a longitudinally extending groove, potentially with the secondary leg and the cover leg defining sides thereof and the tertiary leg defining a bottom thereof, and into which the third leg of the first sash side member is inserted or embedded when the sash moves to the closed position of the skylight window.

**[0144]** In an embodiment the skylight window is installed in or on a flat roof of a building to cover a roof opening of the roof, said exposed interior major surface of the IGU facing an interior of the building.

**[0145]** In an embodiment the skylight window is installed in or on an inclined roof of a building to cover a roof opening of the roof, said exposed interior major surface of the IGU facing an interior of the building.

**[0146]** A flat roof may be defined as a roof with a roof inclination, i.e. an inclination of a roof surface, of less than 5 degrees in relation to horizontal.

**[0147]** An inclined roof may be defined as a roof with a roof inclination, i.e. an inclination of a roof surface, of more than 5 degrees inclination in relation to horizontal.

**[0148]** The skylight window may be positioned so that a major part of or the entire frame and/or the entire sash are positioned above an upper roof surface level.

**[0149]** First and second major surfaces of the IGU may be substantially parallel in the closed position of the window with a plane defined by the roof surface or may have an inclination of less than 1, 2, 3, 4 or 5 degrees to said roof surface plane.

**[0150]** According to a second aspect of the invention, the skylight window comprises:

a window frame having four frame side members, a window sash having four sash side members supporting an insulating glazing unit (IGU) having multiple layers of glazing, said window sash being movable in relation to the window frame between an open and a closed position of the skylight window, and a weather shield attached to the sash so as to protect a window portion of the skylight window, the window portion comprising the sash, frame and IGU, a first of the frame side members being associated with a first of the sash side members, each of said first frame and sash side members extending in a respective longitudinal direction substantially in parallel with a first peripheral side of the IGU, said IGU having an exposed interior major surface for facing an interior of said building in an installed position of the skylight window, said interior major surface extending in an outward direction away from a center of the IGU, an inward direction extending in a direction opposite to said outward direction, said IGU further having an exposed exterior major

surface for facing in an exterior direction which is opposite of said interior of said building in said installed position of the skylight window, said exterior major surface extending in the outward direction, an upward direction being defined as extending away from at a right angle to said exterior major surface of the IGU,

said first frame side member having a primary leg, which in said closed position is positioned next to and extends along an outwardly facing surface of said first peripheral side of the IGU, and a secondary leg, which in said closed position extends next to and along a part of said interior major surface of the IGU, said secondary leg having an interior surface facing in a direction away from the interior major surface of the IGU, which interior surface comprises a lining panel protrusion located lower than the exposed interior major surface of the IGU in the height direction, wherein the lining panel protrusion protrudes away from the IGU, the lining panel protrusion comprising a first surface for abutting an inwardly facing surface of said reveal panel or lining panel when received by said protrusion.

where said first peripheral side of the IGU is located, in said outward direction, beyond said first surface of said lining panel protrusion.

**[0151]** As a result, the major surfaces of the IGU may be bigger in a skylight window according to the invention compared to prior art skylight windows of similar size, fitting a similarly sized skylight window aperture in the roof in which the skylight window is to be installed. Since the IGU more often than not insulates better than the sash and frame, this may provide improved overall insulation properties of the skylight window. Furthermore, the visible area of the total area of the skylight window, which can be seen through, may be increased, which provides improved view through the skylight window as well as increased inflow of daylight.

**[0152]** Furthermore, the positioning of the IGU may contribute to hiding parts of the window when seen through the IGU from an interior of a building in the installed position of the skylight window. E.g. positioning the IGU such that it is the only component extending into the opening in the roof structure visible from the interior of the building.

**[0153]** In an embodiment, the skylight window further comprises a second protrusion next to the first protrusion to create a recess for receiving a lining panel to be installed.

**[0154]** In an embodiment, at least a part of the sealing element extends above and within a periphery of said recess in the height direction. The term "periphery" may be understood as a perimeter.

**[0155]** In an embodiment the sealing element is positioned at or beyond the first surface of the lining panel protrusion in the inward direction.

**[0156]** In an embodiment the skylight window compris-

es a second protrusion next to the lining panel protrusion such that a recess for receiving a reveal panel or lining panel to be installed, is formed between the protrusions.

**[0157]** In an embodiment the first surface of the lining panel protrusion and an inward facing surface of the secondary leg delimit a recess for receiving a reveal panel or lining panel to be installed.

**[0158]** In another embodiment said secondary leg having an interior surface facing in a direction away from the interior major surface of the IGU, which interior surface comprises a recess for receiving an upper part of a reveal panel or lining panel in said installed position of the skylight window, said recess comprising a first surface for abutting an inwardly facing interior surface of said reveal panel or lining panel when received in said recess, where said first peripheral side of the IGU is located, in said outward direction, beyond said first surface of said recess.

**[0159]** Said recess may comprise a second surface positioned opposite from said first surface for abutting an outwardly facing surface of said reveal panel or lining panel when received in said recess. A distance between these first and second surfaces defines a width of the recess, which width usually corresponds to a width of an upper part of said lining panel in order to accommodate the lining panel upper part suitably in the recess. Said first peripheral side of the IGU may extend a distance of at least 0.5, 1, 1.5, 2, 2.5 or 3 times said width of said recess beyond said first surface of said recess.

**[0160]** The first and/or second surface of the recess may extend substantially in the height dimension and may be substantially linear.

**[0161]** The reveal panel or lining panel may alternatively be denoted an aperture panel or a window opening panel. It may serve the purpose of providing improved sealing and insulation towards the interior of the building. It may act as a barrier. It may provide an aesthetically pleasing transition between the skylight window and the roof structure as well as the interior of the building.

**[0162]** In an embodiment, a transparent central area of the IGU extends, in said outward direction, beyond said first surface of said lining panel protrusion.

**[0163]** As is known to the skilled person, IGUs typically comprise a transparent central area surrounded with non-transparent areas at peripheries of the IGU where the glazing panels are attached to each other using sealing members and/or supporting members that typically extend along each peripheral side of the IGU.

**[0164]** In an embodiment, said first peripheral side of the IGU is located at, and a transparent central area of the IGU potentially extends, a distance in said outward direction from said first surface of said lining panel protrusion equal to or above 5, 10, 15, 20, or 25 percent of an extent in the outward direction of the secondary leg between said first surface of said lining panel protrusion and an outwardly outermost surface of said secondary leg.

**[0165]** This increases the relative area of IGU in re-

gards to the skylight window. The IGU is typically the best insulating component of a skylight window, this improves the insulation properties of the skylight.

**[0166]** In an embodiment an upper part of a reveal panel or lining panel is received in said first surface of said lining panel protrusion abutting said inwardly facing surface of said reveal panel or lining panel.

**[0167]** This may have the advantage of improving insulation properties by providing another barrier of material. It may further provide a more aesthetically pleasing transition between the roof structure and the skylight window.

**[0168]** In an embodiment, the first frame side member comprises a lining panel protrusion located lower than the exposed interior major surface of the IGU in the height direction, wherein the interior pane comprises a side surface extending substantially along the first frame and sash side members, wherein the lining panel protrusion protrudes away from the IGU, the lining panel protrusion comprising a first surface for abutting a surface of reveal panel or lining panel so as to position the reveal panel or lining panel, and wherein, in the closed position of the skylight window, the first surface of the lining panel protrusion in a lateral direction extending along the exposed interior major surface of the IGU is positioned farther away from the side surface of the interior pane than the supporting leg.

**[0169]** Such protrusion can help an installer install a lining panel at the skylight window by guiding an upper end of the lining panel into contact with a first side of the protrusion and may further ease the installation by hiding the upper end of said lining panel e.g. if the upper end is not flush with the interior side of the skylight window. The lining panel can be used to hide the skylight frame, for viewers, including insulation elements such as an insulating block and can thus, allow for improving the insulating properties of the skylight window as a whole.

**[0170]** The skylight window may comprise a removable lining panel protrusion and/or recess. The removable lining panel protrusion and/or recess may be separately affixed to the frame and may be a part that is separate from the frame i.e. not an integral part of the frame.

**[0171]** In an embodiment said first sash side member has a first leg, which extends substantially in the upward direction.

**[0172]** This may protect the IGU and provide potential surface for sealing elements to be placed and seal between the first sash and frame side member.

**[0173]** In an embodiment, said first leg extends next to said outwardly facing surface of said first peripheral side of the IGU, and wherein the primary leg in said closed position extends next to and along an outwardly facing surface of said first leg. Hereby, the first leg is positioned between the outwardly facing surface of said first peripheral side of the IGU and the primary leg.

**[0174]** This may have the effect of guiding the sash side member when closing the skylight window. It may further provide a surface for placing an abutment element

for aiding in the positioning of the sash and IGU in the closed position to ensure they are properly positioned in said window in the closed position to ensure optimal sealing. It may also be possible to place sealing elements between the first and primary legs.

**[0175]** Said outwardly facing surface of said first peripheral side of the IGU may extend substantially in the upward direction.

**[0176]** In an embodiment, said first leg does not extend to cover any part of said exterior major surface of said IGU.

**[0177]** This has the advantage of not blocking light from entering through the exterior major surface of the IGU and into the interior of the building. It may thus improve the inflow of light into the interior of the building.

**[0178]** In an embodiment, the first sash side member further comprises a second leg, which may potentially project from a lower end of said first leg so as to extend along part of said interior major surface of the IGU to support the IGU, said second leg potentially resting on an upper abutment surface of said secondary leg in said closed position of said window. The secondary leg may in said closed position extend next to, on an inward side of, and along said second leg of said first sash side member.

**[0179]** This may have the effect of ensuring correct positioning of the sash and IGU in the closed position of the window. The second leg may further protect the IGU. It may also allow further placement of sealing elements to improve sealing and insulation properties.

**[0180]** In an embodiment, said first sash side member further has a third leg projecting from an upper end of said first leg and extending in said outward direction and, optionally, a fourth leg projecting from said third leg and extending substantially in said upward direction and, optionally, a fifth leg projecting from said fourth leg substantially in said outward direction.

**[0181]** The provision of additional legs may allow the physical properties of the different legs to be tailored to their specific purpose, which may be to support the IGU, provide an abutment surface, provide a mounting surface, support a weather shield etc. For example, if a leg is supporting the IGU it may be provided with a higher strength and/or stiffness and/or smaller or larger size compared to other legs. A leg provided to aid the sealing and/or positioning of the sash and IGU may be provided with grooves or the like adapted to accommodate sealing and/or abutment elements.

**[0182]** The weather shield may be attached to said fifth leg.

**[0183]** In an embodiment, said exterior major surface of the IGU is positioned at a distance of less than 80 % of a total height of the first leg from a lower end of said first leg.

**[0184]** This may allow the IGU to be positioned closer to one of the main areas of thermal energy transfer between the exterior and interior of the building i.e. the interface between the exterior and interior of the building.

As the IGU is typically the best insulating component of a window, this may improve the insulation properties of the skylight window. By the IGU being positioned at the lower end of the first leg, it may also provide a more compact skylight window.

**[0185]** In an embodiment said frame and sash side members comprise or are made substantially of one or more plastic polymer materials, preferably said frame side members comprise or are made substantially of polyurethane, and/or preferably said sash side members comprise or are made from a thermoset plastic polymer material comprising fibers.

**[0186]** This may provide a skylight window that is more cost effective to manufacture.

**[0187]** In an embodiment the skylight window is installed potentially in or on a flat or inclined roof of a building to cover a roof opening of the roof, said interior major surface of the IGU facing an interior of the building.

**[0188]** This may improve the light inflow and/or insulation properties of the building.

**[0189]** Said first sash and frame side members may form a first pair of side members, and the remaining three said sash and frame side members similarly may form respective pairs of side members, one or more of which being provided in a manner similar or identical to said first pair of side members as defined in any one of the embodiments disclosed herein. Hereby, the IGU may similarly be extended in one or more of the other three outward directions, which may further add to the above advantages of the invention.

**[0190]** It is preferred that all four sash side members have the structure as described for the first sash side member and that the corresponding or associated four frame side members are also adapted accordingly.

**[0191]** According to a third aspect of the invention, the skylight window comprises:

a window frame having four frame side members, a window sash having four sash side members supporting an insulating glazing unit (IGU) having multiple layers of glazing, said window sash being movable in relation to the window frame between an open and a closed position of the skylight window, and a weather shield attached to the sash so as to protect a window portion of the skylight window, the window portion comprising the sash, frame and IGU, a first of the frame side members being associated with a first of the sash side members, said first frame and sash side members extending in a longitudinal direction along a first peripheral side of the IGU, said IGU having an exposed interior major surface for facing an interior of said building in an installed position of the skylight window, said interior major surface extending in an outward direction away from a center of the IGU, an inward direction extending in a direction opposite to said outward direction, said IGU further having an exposed exterior major surface for facing in an exterior direction which is

opposite of said interior of said building in said installed position of the skylight window, said exterior major surface extending in the outward direction, an upward direction being defined as extending away from at a right angle to said exterior major surface of the IGU,

said first frame side member having a primary leg, which in said closed position is positioned next to and extends along an outwardly facing surface of said first peripheral side of the IGU, and a secondary leg, which in said closed position extends next to and along a part of said interior major surface of the IGU, a height direction extending from the exposed interior major surface towards the exposed exterior major surface,

where said primary leg extends as far as or farther in said upward direction than a location of said exterior major surface of the IGU.

**[0192]** This allows for positioning the IGU deeper or lower in the window structure i.e. closer to an interior of the building in an installed position of the skylight window. This reduces the area of the sash and frame through which heat energy escapes (or enters) from the interior of the building. Furthermore, improved light inflow and view through the skylight window are achieved.

**[0193]** Said primary leg may be plate-shaped and/or may extend substantially in an up-down or vertical direction.

**[0194]** In an embodiment of the present invention, said first sash and/or frame side member(s) provide an inwardly facing interior surface located below the interior major surface of the IGU, an angle formed between said inwardly facing interior surface and said interior major surface of the IGU at an interior corner formed between said surfaces being equal to or less than 110 degrees, preferably equal to or less than 105, 100, 95, 90, 85 or 80 degrees.

**[0195]** This may provide improved inflow of light as the angling of the inwardly facing interior surface may reduce the amount of light blocked

**[0196]** In an embodiment said frame and sash side members comprise or are made substantially of one or more plastic polymer materials, preferably said frame side members comprise or are made substantially of polyurethane, and/or preferably said sash side members comprise or are made from a thermoset plastic polymer material comprising fibers.

**[0197]** This may provide a skylight window that is more cost effective to manufacture.

**[0198]** Preferably said sash side members comprise or are made from HELO, a thermoset plastic polymer material comprising fibers.

**[0199]** In an embodiment, said primary leg extends at least 5, 10, 15, 20, 30, 40, 50, 70, 90, or 100 percent of a distance between said exterior and interior major surface of the IGUs in said upward direction from said exterior major surface of the IGU.

**[0200]** This has the effect of facilitating the IGU being positioned deeper or lower in the skylight window structure, that is closer to an interior of the building in an installed position of the skylight window. This reduces the area of sash and/or frame through which thermal energy may transfer between the interior and the exterior of the building thus improving the insulation properties.

**[0201]** In an embodiment, said first leg extends at least 50, 60, 70, 80, 90 or 100 % of a distance between said exterior and interior major surface of the IGUs in said upward direction from said exterior major surface of the IGU.

**[0202]** In an embodiment said first sash side member has a first leg, which extends substantially in the upward direction.

**[0203]** This may facilitate a deeper or lower mounting of the IGU supported by the first sash side member.

**[0204]** It may also protect the IGU and provide potential surface for sealing elements to be placed and seal between the first sash and frame side member.

**[0205]** In an embodiment, said first leg extends next to said outwardly facing surface of said first peripheral side of the IGU, and wherein the primary leg in said closed position extends next to and along an outwardly facing surface of said first leg. Hereby, the first leg is positioned between the outwardly facing surface of said first peripheral side of the IGU and the primary leg.

**[0206]** This provides a spacing in an upward/downward direction which allows the IGU to be placed deeper or lower in the skylight window structure.

**[0207]** It may also have the effect of guiding the sash side member when closing the skylight window. It may further provide a surface for placing an abutment element for aiding in the positioning of the sash and IGU in the closed position to ensure they are properly positioned in said window in the closed position to ensure optimal sealing. It may also be possible to place sealing elements between the first and primary legs.

**[0208]** Said outwardly facing surface of said first peripheral side of the IGU may extend substantially in the upward direction.

**[0209]** In an embodiment, said first leg does not extend to cover any part of said exterior major surface of said IGU.

**[0210]** This has the advantage of not blocking light from entering through the exterior major surface of the IGU and into the interior of the building. It may thus improve the inflow of light into the interior of the building.

**[0211]** In an embodiment, said first sash side member further has a third leg projecting from an upper end of said first leg and extending in said outward direction and, optionally, a fourth leg projecting from said third leg and extending substantially in said upward direction and, optionally, a fifth leg projecting from said fourth leg substantially in said outward direction.

**[0212]** The provision of additional legs may allow the physical properties of the different legs to be tailored to their specific purpose, which may be to support the IGU,

provide an abutment surface, provide a mounting surface, support a weather shield etc. For example, if a leg is supporting the IGU it may be provided with a higher strength and/or stiffness and/or smaller or larger size compared to other legs. A leg provided to aid the sealing and/or positioning of the sash and IGU may be provided with grooves or the like adapted to accommodate sealing and/or abutment elements.

**[0213]** The weather shield may be attached to said fifth leg.

**[0214]** In an embodiment, said exterior major surface of the IGU is positioned at a distance of less than 80 % of a total height of the first leg from a lower end of said first leg.

**[0215]** This may allow the IGU to be positioned closer to one of the main areas of thermal energy transfer between the exterior and interior of the building i.e. the interface between the exterior and interior of the building. As the IGU is typically the best insulating component of a window, this may improve the insulation properties of the skylight window. By the IGU being positioned at the lower end of the first leg, it may also provide a more compact skylight window.

**[0216]** In an embodiment, said primary leg at a lower end thereof is connected to an outer end of said secondary leg.

**[0217]** This has the effect of providing a frame side member that may be provided in a shaped profile, such as a stepped profile.

**[0218]** In an embodiment, a lower end of said primary leg is positioned below said interior major surface of the IGU.

**[0219]** This may have the effect of providing an abutment surface for the IGU. The abutment surface may be in the form of an abutment element. The primary leg positioned below said interior major surface of the IGU may also provide a surface for the IGU and/or sash to seal against. To this end the primary leg may comprise one or more sealing elements.

**[0220]** In an embodiment, an insulating member, such as a block of insulating foam, is positioned between said first leg and said primary leg.

**[0221]** The insulating member may be positioned in a corner of e.g. approximately 90 degrees formed between the primary and secondary legs.

**[0222]** Said primary leg of the sash member may be positioned right beside the insulating member, i.e. with no further elements between them. Similarly, the above-mentioned potential third leg of the sash member may be positioned right above the insulating member.

**[0223]** The insulating member may extend upwardly from the secondary leg to more than half a height of the primary leg.

**[0224]** In this way insulation properties may be further improved.

**[0225]** In an embodiment the skylight window is installed potentially in or on a flat or inclined roof of a building to cover a roof opening of the roof, said interior major

surface of the IGU facing an interior of the building.

**[0226]** This may improve the light inflow and/or insulation properties of the building.

**[0227]** According to a fourth aspect of the invention, the skylight window comprises:

a window frame having four frame side members, a window sash having four sash side members attached to an insulating glazing unit (IGU) having multiple layers of glazing, said window sash being movable in relation to the window frame between an open and a closed position of the skylight window, and a weather shield attached to the sash so as to protect a window portion of the skylight window, the window portion comprising the sash, frame and IGU, a first of the frame side members being associated with a first of the sash side members, each of said first frame and sash side members extending in a respective longitudinal direction substantially in parallel with a first peripheral side of the IGU, said IGU having an exposed interior major surface for facing an interior of said building in an installed position of the skylight window, said interior major surface extending in an outward direction away from a center of the IGU, an inward direction extending in a direction opposite to said outward direction, said IGU further having an exposed exterior major surface for facing in an exterior direction which is opposite of said interior of said building in said installed position of the skylight window, said exterior major surface extending in the outward direction, an upward direction being defined as extending away from at a right angle to said exterior major surface of the IGU, said first sash side member includes a supporting section which is adhered to said exposed exterior major surface of the IGU.

**[0228]** This removes the need for the first sash side member to be adhered to the exposed interior major surface of the IGU or a peripheral side of the IGU resulting in less material at these locations. Less material along the exposed interior major surface and a peripheral side of the IGU may allow the IGU to be positioned deeper or lower in the window structure, as well as closer to the window frame, which may improve the insulating properties of the skylight as the relative area of the IGU may be increased. An increase in relative area of the IGU may further improve light inflow and view through the skylight. This also reduces the area of sash, and so the likelihood of thermal bridges through which heat energy can escape (or enter) from the interior of the building.

**[0229]** The adherence between the IGU and the supporting section may be the only point of contact between the IGU and the supporting section. Additionally, the adherence between the IGU and the supporting section may be the only point of contact between the IGU and the first sash side member.



**[0230]** In an embodiment according to the present invention, the supporting section carries the IGU in said open position of the skylight window.

**[0231]** This may remove the need for additional supporting sections attached to a peripheral side or exposed interior major surface of the IGU for carrying the IGU. This may have the advantage of enabling the IGU to be carried solely by a supporting section attached to its exposed exterior major surface. A knock-on effect of this may be that no supporting section or sash is required around the peripheral sides or exposed interior major surface of the IGU, allowing for a more compact skylight window with less sash. A more compact skylight window may facilitate a better integration in a roof structure and/or an installation that is more flush with the exterior side of the roof structure, as well as a better view out of the window. A better and/or more flush integration in a roof structure may have the effect of improving the insulation properties as more of the skylight may be embedded in the roof structure. A further advantage may be that there is less or no material around the peripheral sides or along the exposed interior major surface of the IGU with different thermal expansion properties, that have to be taken into account when considering the insulation and/or weatherproofing or sealing properties of the skylight.

**[0232]** The term "carries" may be understood as the supporting section carrying a substantial load exerted on it by the IGU. A substantial load may be 10, 20, 30, 40, 50, 60, 70, 80, 90, 95, 99% or more of the total load exerted by the IGU.

**[0233]** In an embodiment, the supporting section is adhered to said exposed exterior major surface of the IGU by means an adhesive. The adhesive may be silicone based eg. a Silane-terminated polyurethane (SPUR) adhesive or a silyl modified-polymer (SMP) adhesive etc. Additionally or alternatively, the supporting section may be adhered to the exposed exterior major surface by means of suction cups. The suction cups may work by providing at least a partial vacuum. The supporting section may be adhered to the IGU by means of mechanical attachment devices such as screws, fasteners or the like. The mechanical attachment devices may be inserted through one or more layers of glazing of the IGU.

**[0234]** In an embodiment, the adhesive is provided by means of adhesive tape. This may improve the ease of assembly of the skylight as the adhesive tape may be provided in pre-applied state, where a covering strip or the like simply has to be removed from the adhesive tape, when the supporting section is to be attached to the IGU.

**[0235]** In an embodiment, the substantially only attachment of the first sash side member to the IGU is an adherence provided by the supporting section being adhered to said exposed exterior major surface of the IGU. This may provide a skylight where the sash extends only above the exposed exterior major surface of the IGU there is no sash or supporting section extending beyond the exposed exterior major surface of the IGU towards the exposed interior major surface of the IGU. This may

further facilitate the insulation advantages associated with no sash or supporting section attached or extending around the peripheral sides or exposed interior major surface of the IGU explained above. The supporting section may be adhered to the exposed exterior major surface of the IGU through an interior surface of the supporting section. The supporting section may be a non-integral part attached to another part of the first sash side member.

**[0236]** In an embodiment, at least one of the sash side members or frame side members comprises a thermal break.

**[0237]** Additionally or alternatively, the supporting section may constitute or comprise, or be part of a thermal break.

**[0238]** In an embodiment according to the present invention, the supporting section comprises or constitutes a thermal break.

**[0239]** The thermal break may be made from a material of a lower thermal conductivity than other parts of the first sash side member. The thermal break may be a joint joining parts of the sash. This may have the advantage of improving the insulation properties of the skylight as a lower thermal conductivity through the supporting section or sash member may be achieved. Thermal breaks may also be used for interconnecting the window frame and the sash. The thermal break may be substantially made from or comprise a polymer or foam.

**[0240]** In an embodiment according to the present invention, the first sash side member includes a further supporting section provided as a safety device catching the IGU in case said adherence fails in said open position of the skylight window.

**[0241]** This has the advantage of preventing the IGU from taking or causing damage in the case said adherence fails by preventing or stopping a potential fall of the IGU.

**[0242]** The safety device may be provided as a safety clip. The safety device may be mechanically attached to the first sash side member.

**[0243]** In an embodiment according to the present invention, the first sash side member comprises a first leg, said first leg extending only above the exposed exterior major surface of the IGU, where said first leg may be connected to a second leg.

**[0244]** This may have the effect of providing a skylight window with no sash extending along a peripheral side or along the exposed interior major surface of the IGU. This has the effect of allowing the IGU to be placed lower in the skylight window and extend further towards the frame side member of the skylight window compared to when a sash extending along the exposed interior major surface and a peripheral side of the IGU is provided.

**[0245]** In an embodiment according to the present invention, the first sash side member comprises a first leg and the first sash side member may be in the form of a stepped profile.

**[0246]** The stepped profile may provide a labyrinth like

structure between the sash and frame side member, resulting in a less direct path for air, precipitation or dirt to pass between the interior and exterior of the building. The stepped profile also provides the possibility of placing sealing elements along the profile such that sealing is facilitated between two parallel surfaces i.e. a surface of the frame side member and a parallel sash side member. Furthermore, insulating sealing members may conveniently be positioned between the first sash and frame side members at respective corners of the stepped configurations, e.g. as described in the above.

**[0247]** In an embodiment, the skylight window may further comprise a motor-driven actuator comprising an elongated lifting element connecting the frame and the sash for moving the sash between the open position and the closed position, said elongated lifting element having a top end and a first position in which the skylight window is in the closed position and a second position in which the skylight window is in the open position. The top end of the elongated lifting element may abut or be attached to the sash. The motor-driven actuator may be positioned between the IGU and the frame in a direction parallel with the exposed interior major surface of the IGU in the closed position of the skylight window. The motor-driven actuator may be a chain actuator, the elongated lifting element may be a chain, and the top end may be a top end of a top joint of the chain. The lifting element in the closed position may be collapsed, rolled-up, folded-up, telescopically retracted or in another way compacted. The lifting element may be unrolled, unfolded, telescopically extended, or in another way extended in the open position.

**[0248]** The chain actuator may comprise a push-pull chain which can extend and retract to open and close the skylight window. Such a chain may be referred to as a trust chain as it may transmit a push force. The chain may be driven by an electric motor. A reduction gear may be provided. The reduction gear may comprise a worm and/or multiple gear drive. A final sprocket gear may engage the chain. A spindle may be used to drive the chain. The chain actuator may fold the chain when the chain is retracted and stored. The chain may be stored to substantially extend in a storing direction or such that one or more lengths of the chain extend substantially in a storing direction. The chain extending to open the skylight window may extend substantially perpendicularly to the storing direction. The storing direction may be the same as the longitudinal direction, in which case the chain may be stored to substantially extend in the longitudinal direction along a frame side member. This may provide a compact solution.

**[0249]** The chain actuator may be hidden inside a window frame or sash or otherwise arranged out of sight, e.g. outside a periphery of the skylight window. The chain actuator may be arranged in a spacing defined between the sash and the frame in the closed position of the skylight window. Preferably the chain actuator may be arranged inside a frame profile or inside a sash profile. The

chain actuator may comprise an actuator housing. The chain may extend and retract through an opening in the actuator housing. The actuator housing may be an elongated actuator housing. The actuator housing may extend substantially extend in parallel with the storing direction. The chain extending to open the skylight window may extend substantially perpendicularly to the actuator housing. The chain actuator housing may be hinged to the skylight window so the chain can tilt during movement such as extending and/or retracting to open and/or close the skylight window. The chain actuator may be self-locking and support and/or hold the weight of sash and IGU. The chain actuator may also be assisted by a spring to carry some of the weight of sash and IGU. The chain actuator may comprise a locking mechanism and/or brake to lock-up the chain. Besides the compact design a chain actuator may have other advantages. The chain actuator may provide a stable opening force from the very beginning of the opening movement.

**[0250]** A second aspect of the invention concerns a method of manufacture of a skylight window according to the first aspect of the invention, the method comprising the steps of:

applying an adhesive on an interior surface of the supporting section and/or along a periphery of the exposed exterior major surface of the IGU, and bringing said interior surface into contact with the exposed exterior major surface of the IGU so as to adhere the supporting section to the exposed exterior major surface of the IGU.

**[0251]** This provides a skylight with a sash attached to the exposed exterior major surface of the IGU with the advantages as described above for the first aspect of the invention.

**[0252]** The method may further comprise a step of holding said interior surface of the supporting section in contact with the exposed exterior major surface of the IGU until the adhesive has cured.

**[0253]** Additionally or alternatively, a holding element for holding said interior surface of the supporting section in contact with the exposed exterior major surface of the IGU until the adhesive has cured, may be provided. This may be in the form of a different adhesive such as an adhesive tape, suction cups, clamps etc. The holding element adhesive may be a fast curing adhesive which cures faster than the adhesive securing the supporting section to the exposed exterior major surface of the IGU.

**[0254]** Additionally or alternatively, the method may comprise the step of applying the holding element adhesive to said interior surface of the supporting section or the exposed exterior major surface prior to the step of bringing said interior surface into contact with the exposed exterior major surface of the IGU.

**[0255]** A person skilled in the art will appreciate that any one or more of the above embodiments and/or developments and/or options may be combined with each

other to form further embodiments of the present invention.

### Detailed description

**[0256]** In the enclosed drawings, which show non-binding examples of embodiments of the present invention,

Fig. 1 is a perspective view from above of an embodiment of a skylight window according to the present invention installed in a roof,

Fig. 2 is a cross-sectional view showing another embodiment of the first sash side member of the skylight window 1 with a flat weather shield,

Fig. 3 is a cross-sectional view similar to that of Fig. 2 showing an alternative embodiment of a first sash side member of a skylight window 1 with a dome-shape weather shield,

Fig. 4 is a cross-sectional view of a different embodiment of the skylight window 1,

Fig. 5 is a cross-sectional view of a different embodiment of the skylight window 1.

Fig. 6 is a cross-sectional view of a different embodiment of the skylight window 1.

Fig. 7 is a cross-sectional view of a different embodiment of the skylight window 1.

Fig. 8 is a perspective view from above of an embodiment of the skylight window 1 according to the invention installed on a roof, where a part of the skylight window has been removed for the purpose of illustration.

**[0257]** Fig. 1 shows an embodiment of a skylight window 1 according to the present invention installed or positioned substantially horizontally in a flat roof 2 of a building and covering an opening in the roof. The skylight window 1 comprises a weather shield 3 and a window portion 4, which includes a transparent insulating glazing unit 5, abbreviated IGU, a sash 6 supporting the IGU 5, and a frame 7. The weather shield 3 comprises a transparent weather shield pane 8 and a skirt 9, which cover the sash and the IGU.

**[0258]** In this embodiment, both the entire sash 6 and the entire frame 7 are positioned above an upper roof surface, also denoted the exterior roof surface. The skylight window 1 may, however, also be positioned so that a part of the frame 7 and the sash 6 are positioned below the exterior roof surface level.

**[0259]** The flat roof 2 shown here has a roof inclination of less than 5 % in relation to horizontal. The skylight window may however also be installed in an inclined roof.

**[0260]** As is seen in Figs 2-4, the IGU 5 has an exposed interior major surface 5b facing downwards towards an interior of the building in the shown installed position of the skylight window 1 and an exposed exterior major surface 5g facing in the opposite direction towards the weather shielding pane 8 and the exterior. The interior

and exterior exposed major surfaces of the IGU 5 are substantially parallel with a plane defined by the roof surface, i.e. the exterior roof surface level.

**[0261]** The frame 7 comprises four frame side members of which two 10, 11 are visible in Fig. 1, and one 10 is visible in Figs 2-4. Each frame side member is associated with one of four corresponding sash side members of which one 14 is visible in Figs 2-4. The frame side member 10 is associated with the sash side member 14 and both extend a longitudinal direction L along a first peripheral side 5a of the IGU 5. The four frame side members form a substantially rectangular shape and, similarly, the four sash side members form a substantially rectangular shape. In this embodiment each frame side member is positioned at an outer side of a respective associated one of the four sash side members, i.e. on the side facing away from the IGU, so that the sash fits into the frame and the frame 7 encloses the sash 6 in the closed position of the skylight window 1.

**[0262]** The slightly curved weather shield pane 8 as seen in Fig. 1 extends over an entire roof opening (not shown), which opening the skylight window 1 is positioned to cover.

**[0263]** The shield pane 8 is surrounded by the weather shield skirt 9, which extends on an outer side of all four sides of the frame 7, i.e. of the respective frame side members, see Fig. 1.

**[0264]** The frame side member 10 is an embodiment of the first frame side member of the skylight window according to the invention. The sash side member 14 is an embodiment of the first sash side member according to the invention.

**[0265]** The window sash 6 supports the IGU 5 and is connected to the window frame 7 via hinges (not shown) so that it is movable in relation to the frame 7 between an open (not shown) and a closed position of the skylight window 1. The window is shown in the closed position in all of the figures.

**[0266]** Fig. 2 illustrates a cross-section of an example of a skylight window 1 according to the present invention installed in a roof 2 of a building (of which only the roof 2 is shown) and comprising a weather shield 3, in this example in the form of a flat pane. The first sash side member 14 comprises a second leg 15 which in turn comprises a supporting section 72 which is adhered to the exposed exterior major surface 5g of the IGU 5.

**[0267]** In this way, the supporting section 72 carries the IGU 5 in the open position of the skylight window 1. As shown in the Figures, the adherence provided by the supporting section 72 being adhered to the exposed exterior major surface 5g of the IGU 5 may be the substantially only attachment of the first sash side member 14 to the IGU 5. It is, however, also possible that other attachments of the first sash side member 14 to the IGU 5 are provided. Similarly it should be noted that the supporting section 72 need not carry the IGU 5 in the open position of the skylight window 1 and other elements may be provided for this purpose.

**[0268]** An adhesive 74 is provided between the exposed exterior major surface 5g of the IGU 5 and the supporting section 72 to facilitate the adhesion. The adhesive used is a Silane-terminated polyurethane (SPUR), but a silyl modified-polymer (SMP) adhesive or any other suitable adhesive may also be used. In some cases, the adhesive is provided as an adhesive tape. This allows the adhesive tape to be pre-applied to the supporting section 72 with a covering strip remaining on the side meant for adhering to the exposed exterior major surface 5g of the IGU 5, such that the covering strip may simply be removed from the adhesive tape when it is time to adhere the supporting section 72 to the exposed exterior surface of the IGU 5g. This may allow the sash side member(s) to be prepared for adhesion to the IGU in advance of assembly of the skylight window and so allow optimisation of the production and assembly process. In this way sash side members may be provided ready-to-assemble in a kit or packaging e.g. during transportation or storage.

**[0269]** The supporting section 72 constitutes a thermal break and is made of a material with a lower thermal conductivity than the rest of the first sash side member 14. The sash side member may for example be made or substantially made of aluminium and the thermal break of a glass fibre reinforced polyurethane (PUR).

**[0270]** The first sash side member 14 may include a further supporting section (not shown) which is provided as a safety device that will catch the IGU in case the adherence between the supporting section 72 and the IGU 5 fails in the open position of the skylight window 1. The further supporting section may comprise a cushioning element to dampen any impact that may occur.

**[0271]** In the example shown Fig. 2 the first leg 15 of the first sash side member 14 extends only above the exposed exterior major surface 5g of the IGU. The first leg 15 is connected to the second leg 16 as seen in Figs. 2 and 3. The first leg (as seen in the examples) or second leg may further be connected to a third leg third leg 17 which may in-turn be connected to a fourth leg 31.

**[0272]** In Fig. 2 the first frame side member 10 comprises a primary leg 25 with a surface 25b extending next to and along a side surface 15c of the first leg of the sash side member 14, said side surface 15c facing substantially away from the first peripheral side 5a of the IGU 5. The primary leg at a lower end thereof is connected to an outer end of a secondary leg 26. The lower end of the primary leg is positioned below the interior major surface 5b of the IGU 5. A stepped configuration of adjacent surfaces of the first sash side member 14 and first frame side member 10 is thus achieved by means of the stepped configuration of the first sash side member 14 and an associated stepped structure of the first frame side member 10. The potential gap between the first frame and sash side members 10 and 14 respectively is in the form of a labyrinth acting to prevent contaminants, precipitation and/or dirt can pass between the interior and exterior of the building in which the skylight window

1 is installed. The stepped profile further provides the possibility of placing sealing elements at the corners thereof or between the parallel surfaces of the sash and frame side member. In this way the load exerted by the sash 6 through the first sash side member 14 can be utilized to compress a one or more sealing elements placed on the stepped profile and so ensure optimum sealing.

**[0273]** In the examples shown, the frame side member 10 comprises a sealing element 22 located on an upper surface thereof. The sealing element 22 extends along an upper surface of the other three frame side members. The sealing element 22 need not, however, be provided in the form of a single continuous sealing element 22, but may be provided as several separate sealing elements. As can be seen, the exposed interior major surface 5b of the IGU 5 directly abuts the sealing element 22.

**[0274]** As a consequence, there is no need for a sash side member to seal against the sealing element 22 and the sash side member can be omitted beneath the exposed interior major surface 5b of the IGU 5 as in the example shown. With no sash 6 extending along the exposed interior major surface 5b the IGU 5 is positioned deeper in the skylight window 1. With the sash side member 14 attached to the exposed exterior major surface 5g of the IGU 5 it is not necessary for the sash side member 14 to extend along the peripheral side 5a of the IGU 5, which allows the IGU 5 to extend closer to the frame side member 10 providing a larger area of IGU 5 relative to the skylight window 1. This allows more inflow of light into the interior of the building and improves the insulation properties of the skylight window 1 as the area of the IGU 5, which typically has superior insulating properties compared to the other window components, is increased. Also, the IGU 5 is positioned closer to the interior of the building than otherwise, bringing it closer to the main location of thermal energy transfer between the exterior and interior of the building. This further improves the insulation properties as less thermal energy will be transferred through the other components of the skylight window 1 having inferior thermal insulating properties.

**[0275]** In the example shown, it is a periphery of the IGU 5 that abuts the sealing element 22. This, however, need not be the case. It is also possible that a more central part of the IGU 5 abuts the sealing element 22. Although not shown, substantially the entire periphery of the exposed interior major surface 5b of the IGU 5 may abut on the at least one sealing element 22 such that the exposed interior major surface 5b of the IGU 5 abuts a sealing element 22 on its four sides providing a tight seal. The sealing element 22 in the example is a continuous, uninterrupted sealing element 22 extending along an upper surface of the four frame side members.

**[0276]** In the examples shown, the primary leg 25 of the first frame side member 10 extends in a longitudinal direction substantially in parallel with the peripheral side 5a of the IGU 5. The first frame side member 10 further comprises a secondary leg 26 which is connected to the

primary leg 25. The secondary leg 26 here extends along the interior major surface 5b of the IGU 5, substantially perpendicular to the primary leg 25. The sealing element 22 is located on this secondary leg 26 and the exposed interior major surface 5b of the IGU 5 abuts on the sealing element 22. By abutting on the sealing element 22, the element 22 is compressed under the load exerted by the IGU 5 facilitating sealing there between. The secondary leg 26 may further form a lining (not shown) below the exposed interior major surface 5b of the IGU 5 in so doing, improving the insulation and sealing properties of the skylight window 5.

**[0277]** Although not shown, the sash 6 may comprise at least one centering block to prevent the at least one sealing element 22 from carrying substantial load and from being damaged as well as assisting in assuring the sash is positioned correctly in the skylight window 1 in the closed position thereof. The centering block may be made from the same materials as the sash such as polymers like chlorinated PVC etc. or metals like aluminium. The centering block may be positioned substantially halfway along the length of a sash side member. In some cases, each sash side member may comprise a centering block.

**[0278]** As show in Fig. 2 the sealing element 22 is positioned below the first sash side member 22.

**[0279]** In Fig. 2, the second leg 16 projects from a surface 15b of the first leg 15 in the width dimension, which surface 15b extends substantially in the height dimension and a third leg 17 projects from the surface 15c of the first leg 15, which surface 15c extends substantially in the height dimension and is substantially perpendicular to the interior major surface 5b of the IGU.

**[0280]** As shown in Fig. 2, an angle between the first 15 and second 16 legs and between the second and third legs 17 is substantially 90 degrees, respectively.

**[0281]** The first leg 15 is formed integrally with the second leg 16, and the third leg is formed integrally with the first leg 15.

**[0282]** The inner or distal end 16b of the second leg 16 is positioned oppositely from an outer or proximal end 16e of the second leg 16, said outer end 16e being connected to the first leg 15 at a location from which the second leg 16 projects.

**[0283]** The first 15 and a fourth 31 legs project in substantially opposite directions from the second 16 and third leg 17, these opposite directions both being substantially in the height dimension.

**[0284]** In relation to the sash side member 14 as shown in Fig. 2, a length dimension is defined as a dimension in which said longitudinal direction L extends, a height dimension is defined as a direction perpendicular to the length dimension and to the interior major surface of the IGU, and a width dimension is defined as a dimension perpendicular to the height and length dimensions. The width and length dimensions are parallel to the interior major surface of the IGU. The downward direction is the direction in the height dimension towards which the inte-

rior major surface 5b of the IGU 5 faces. The upward direction is a direction opposite to the downward direction. An inward direction is a direction in the width dimension towards a centre of the IGU 5 or towards the opposing sash side member 13 as shown in Fig. 1, and the outward direction is a direction opposite to the inward direction. This also applies to the other figures.

**[0285]** As may be seen, the frame side member 10 in this embodiment comprises an interior surface 10a, which is level with the exterior roof surface of the roof 2. This interior surface 10a faces downwards and comprises a recess 10b, which is an empty spacing that accommodates an upper part or upper end 50a of a reveal panel or lining panel 50 in the installed position of the skylight window 1. The remaining three frame side members are provided with similar recesses accommodating respective similar panels. These panels define the reveal or aperture or light well or light shaft, which extends through the roof 2 so as to cover side surfaces of an opening in the roof, which allows daylight to reach the interior of the building.

**[0286]** The recess 10b comprises a first surface 10c that abuts an inwardly facing surface of the lining panel 50. The IGU extends beyond said first surface 10c of the recess 10 in the width direction so that the peripheral side 5a of the IGU 5 is located on the outer side of the recess in the width direction.

**[0287]** The recess 10b comprises a second surface 10d positioned oppositely from said first surface for abutting an outwardly facing surface of said reveal panel or lining panel when received in said recess. The first and second surfaces 10c, 10d of the recess 10 extend substantially in the height dimension and are substantially linear. A distance between these first and second surfaces defines a width of the recess, which width corresponds to a width of the upper part 50a of the lining panel 50 in order to accommodate the lining panel upper part 50 in the recess 10b.

**[0288]** The weather shield 3 is here provided as a unitary structure, which is separate from but connected to the window portion 4, specifically to the sash 6 so as to move together with the sash 6 during the opening and closing movement thereof. The weather shield 3 is mounted on the window portion 4 for covering and weather protecting the window portion 4 in the installed state of the skylight window 1. The weather shield pane 8 is curved towards the exterior, i.e. upwardly in Fig. 1, in relation to the window portion 4. In other embodiments, a flat pane may be used to for the weather shield 3 as seen in Fig. 2. The weather shield pane 8 is transparent and here comprises only one single layer of glazing made for example of hardened glass.

**[0289]** The first leg 15 projects in the exterior direction away from the exterior major surface 5g of the IGU 5. The direction away from the exterior major surface 5g of the IGU 5, in which direction the first leg 15 projects, extends substantially in the height dimension and extends upwards, i.e. in the exterior direction towards the

exterior the building in the installed position of the skylight window 1.

**[0290]** As seen in Fig. 2, in a cross section perpendicular to the length dimension or longitudinal direction L all legs 15, 16, 17, 25, 26 may each be substantially shaped as a rectangle. In this embodiment the first leg 15 of the sash side member is extending in the height direction, a surface 15c of the first leg 15 in the closed position of the window 1 extending along the surface 25b of the primary leg 25, both surfaces being slightly inclined with about 5 degrees with respect to the height dimension. This inclination is in an outward and upward direction in Fig. 2. The third leg 17 comprises a lower supporting surface 17a facing an upper surface 25c of the primary leg 25 and extends at an angle of about 90 degrees in relation to the height dimension. The surfaces 15c, 25b extend substantially in parallel in the closed position of the window 1.

**[0291]** In this embodiment, all sash and frame side members each have a substantially uniform cross section along a length of these in the longitudinal direction L, except possibly for holes being provided for the attachment of a locking assembly, hinges or the like. Local recesses may also be provided for accommodating hinges and the like.

**[0292]** A third leg 17 projects from an upper end of the first leg 15 in an outwardly direction where a fourth leg 31 projects from an outer end of the third leg 17 in the exterior direction.

**[0293]** The third leg 17 shown in Fig. 2 has an oblong shape in the width dimension so that the width of the third leg 17 is more than 4 times wider than the height thereof. The third leg 17 extends in the width dimension more than the second leg 16. The height of the third leg 17 is about double the height of the second leg 16.

**[0294]** The skylight window 1 is here provided with a curb flange 40 that can be attached and detached to suit the given installation scenario, such as installation in a flat or inclined roof, or installation of two or more skylight windows 1 closely adjacent to each other in which case there may not be room for the curb flange.

**[0295]** The outer side of first frame side member, the outer side facing in the outward direction, is a substantially planar outer surface. The planar outer surface is suitable for attaching or abutting attachments, such as the curb flange shown in Fig. 2. The planar outer surface is perpendicular to the interior side 10a. As is also seen in Fig. 2 a part of the sealing element 22 extends above and within a periphery of the recess 10b in the height direction.

**[0296]** Fig. 3 shows the same cross-sectional view as Fig. 2, but for a different embodiment of the invention. The weather shield 3 is here dome-shaped, whereas it was flat in Fig. 2.

**[0297]** As is seen in Fig. 3, the sash side member 14 has a first leg 15 extending along the first peripheral side 5a of the IGU 5, and a second leg 16 projecting from a lower end 15a of the first leg 15 in the lateral or width

direction inwards underneath the IGU 5.

**[0298]** In Fig. 3 the second leg 16 includes a resting surface 16a on which said interior major surface 5b of the IGU 5 rests. The interior major surface 5b of the IGU 5 abuts a sealing member 78, which is manufactured from a resilient material and extends in the longitudinal direction L over substantially the entire length of the first peripheral side 5a of the IGU 5 or of the second leg 16. The upper resting surface 16a and/or the sealing member 78 may alternatively be moved further to the left in Fig. 3.

**[0299]** In this embodiment, all four sash side members have the structure as described for the sash side member 14 and the corresponding or associated four frame side members have the same structure as the frame side member 10, but this need not always be the case.

**[0300]** In Fig. 3, interior major surface 5b of the IGU 5 abuts a sealing element 22 in the closed position of the window 1, which sealing element 22 is a separately provided element forming part of the frame 7 and which is attached to the remaining parts of the frame 7. This sealing element 22 may be made of a resilient material enabling it to carry some load.

**[0301]** The sealing element 22 shown in Fig. 2 is positioned at the height position of the supporting section 72 of the first sash side member, in the closed position of the skylight window.

**[0302]** In the example shown in Fig. 3, the second leg 16 may comprise the only supporting point of the sash side member 14, which rests on the frame 7 in the closed position of the skylight window 1. Similarly, corresponding second legs of the remaining three sash side members each may comprise only one supporting point for the respective sash side member on the frame 4 in the closed position of the skylight window 1, except for the contact provided by the hinges or an abutment element.

**[0303]** Other contact points or contact surfaces between the sash 6 and frame 7 in the closed position of the skylight window 1, which contact surfaces are not carrying any substantial amount of the weight of the sash 6 (and IGU and weather shield 3) in the closed position of the skylight window 1, may include not shown sealing members between associated sash and frame side members. As is best seen in Fig. 3, the IGU 5 in a conventional manner comprises three layers of glazing 5c, 5d, 5e positioned at a respective distance from each other to form respective spacings or cavities between them. These spacings are in a conventional manner filled with a gas to improve insulation. The lowermost surface 5b constituting the exposed interior major surface is a lower major surface of the lowermost glazing layer 5d. Sealing and supporting members 23, 24 are provided at the peripheral side 5a of the IGU 5 between the layers 5c, 5d, 5e of glazing so that outer sides of the layers 5c, 5d, 5e and the sealing and supporting members 23, 24 define a side or lateral surface 5f of the IGU 5 together with the end surfaces of the glazing layers. This side surface is substantially plane and extends substantially in the height dimension shown in Fig. 3.

**[0304]** The IGU 5 has a rectangular shape and has further second to fourth peripheral sides that each extends along a corresponding respective sash and frame side member in a similar manner as described above for the sash side member 14.

**[0305]** In Fig. 3, the first leg 15 is positioned adjacent to the side surface 5f of the first peripheral side 5a of the IGU 5. The second 16 leg is positioned adjacent to the interior major surface 5b of the IGU 5. The first leg 15 extends along the side surface 5f, the latter having an angle to the interior major surface 5b of the IGU 5 of approximately 90 degrees. The distance in the width dimension between the peripheral side of the IGU 5a and surface 25b of the first frame side member extending substantially in parallel with said peripheral side of the IGU 5a and facing towards the IGU is 20 mm.

**[0306]** As can be seen in Fig. 3, the first leg 15 extends more than 4 times longer in the height dimension than in the width dimension. The extent in the length dimension of the legs 15, 16, 17 is substantially equal to the extent of the first peripheral side 5a of the IGU 5 in the length dimension, but preferably slightly longer in order to allow them to be interconnected at the corners of the sash. The extents measured in this context are a total or largest extent of the leg 15, 16, 17 in question in the relevant dimension.

**[0307]** The first leg 15 extends about 100 % of the distance between said exterior and interior major surface of the IGUs in the height direction from the exterior major surface of the IGU, i.e. having a height which is about twice the thickness of the IGU in the embodiment shown in Fig. 3.

**[0308]** In Fig. 3 the first leg 15 does not extend to cover said exterior major surface of said IGU. No part of the sash 14 and frame 10 extends over the exterior major surface of the IGU 5 in this embodiment. In the latter context, a fixation member 30 mentioned below is not considered part of the sash side member 14.

**[0309]** As seen in Fig. 3, the first leg 15 comprises on the surface 15b three grooves 28, 29, 80 the first groove 28 being positioned at a first distance from the interior IGU plane, the second groove 29 being positioned at a second, smaller distance from the interior major surface of the IGU, while the third groove 80 being positioned at a third, smaller distance from the interior major surface of the IGU. The first, second and third grooves 28, 29, 80 are adapted for receiving the fixation member 30, which can be attached to or snap-locked to either one of the two grooves 28, 29, 80 abutting the exterior major surface of the IGU 5 so as to hold the IGU 5 along said first peripheral side 5a thereof, especially in the upward direction. The fixation member 30 is positioned in the groove 80 in the shown embodiment. Hereby the IGU 5 may be exchanged with an IGU of larger thickness by switching the fixation member 30 to the other groove 29 or 28. The fixation member 30 is manufactured of a plastic and sealing material and comprises a projection adapted to be in abutment with the upper or exterior major surface

5g of the IGU 5 such as to hold this in place against the upper resting surface 16a of the second leg 16. The fixation member 30 extends substantially along an entire length (in the longitudinal direction L) of the first peripheral side 5a of the IGU 5. Similar fixation members are attached to similar grooves of the one, two or three of the other sash side members at the other three peripheral sides of the IGU 5.

**[0310]** A chain drive or the like (not shown) may be provided connecting the sash 6 and frame 7 for assisting in opening and closing the skylight window 1.

**[0311]** In the embodiment shown in Fig. 3, the sash side member 14 has a fourth leg 31 projecting from an upper end of the first leg 15 in the outward direction away from the IGU 5 in the width dimension. The fourth leg 31 is in the closed position of the window 1 positioned above the primary leg 25 of the frame side member 10 as shown in Fig. 3.

**[0312]** In Fig. 3, as is the case for the legs 15, 16, 17, the fourth leg 31 has a flat shape so that an upper surface thereof forms a further upper step surface similar to and potentially extending substantially in parallel with the upper resting surface 16a of the second leg 16.

**[0313]** The fourth leg 31 has an oblong shape in the width dimension and extends more than 4 times longer in the width dimension than in the height dimension. The extent in the length dimension of the fourth leg 31 is substantially equal to about equal to or somewhat longer than the extent of the first peripheral side 5a of the window pane 5 in the length dimension.

**[0314]** In Fig. 3, an angle between the first 15 and fourth 31 leg is substantially 90 degrees.

**[0315]** The fourth leg 31 is formed integrally with the first leg 15.

**[0316]** The fourth and second legs 31, 16 extend or project substantially in parallel.

**[0317]** In the cross section shown in Fig. 3, the fourth leg 31 is substantially shaped as a rectangle, a surface 31 b of the fourth leg 31 extending substantially along an upper surface 25c of the primary leg 25 being parallel to the upper surface 25c.

**[0318]** The fourth leg has an overall or total height in the height dimension less than the thickness of the IGU 5.

**[0319]** The skirt 9 of the weather shield 3 is attached to each of the fourth legs of the four sash side members as seen in Fig. 1.

**[0320]** In Fig. 3, the sealing element 78 is made of an elastic, plastic and sealing material.

**[0321]** Similar sealing elements are provided in a similar manner on the remaining frame side members. The sealing elements form the only or substantially the only resting point or resting surface of the sash 6 (including the IGU 5 and the weather shield 3) on the frame 7 in the closed position of the skylight window 1.

**[0322]** Roofing felt (not shown) may in a conventional manner be positioned to seal between outer surfaces of the frame 7 and of the roof 2. These outer surfaces of the frame 7 are here formed by a curb flange of the frame

7. In Fig. 3 a curb flange 40 is shown, which curb flange 40 has an overall triangular shape and forms part of the frame side member 10. Similar curb flanges are here provided at the remaining frame side members.

**[0323]** In all the above-mentioned figures as well as the following one, the same reference numbers as in Figs 1-3 will be used for features having substantially the same function even if not they are not structurally identical.

**[0324]** Fig. 4 shows a cross-sectional view of the skylight window 1. The weather shield 3 is dome-shaped. The supporting section 72 of the first sash side member may extend further than shown in Fig. 4. It may also comprise a thermal break 75. The thermal break 75 may be made from a material of a lower thermal conductivity than other parts of the first sash side member 12 and is used to reduce any potential thermal bridges from the sash. The supporting section 72 may also comprise a material discontinuity to reduce the heat transfer at this point, hence the thermal break may be used to insulate the specific part of the sash side member. The supporting section may also comprise a fixation element 76, which fixation element 76 acts as support between the IGU and the first sash side member and/or may be made of a material that has insulating properties.

**[0325]** Fig. 5 shows a cross-sectional view of an embodiment of a skylight window 1. Unless otherwise stated in the in the following parts or features of the embodiment shown in Fig. 5 are similar or identical to previous embodiments. In Fig. 5 the IGU 5 is depicted in a schematic manner, which may represent an IGU 5 as shown in any of the previous embodiments. In Fig. 5 the interior surface 10a has a lining panel protrusion 10e protruding away from the IGU 5, with a first surface 10c for abutting a lining or reveal panel (not shown). A first insulation member 81, potentially consisting substantially of extruded polystyrene (EPS), is provided between the primary leg 25 of the first frame side member and the first peripheral side 5a of the IGU 5, in the shown closed position of the skylight window. The first insulation member 81 is in contact with a first 10x and a second surface 10f of the frame side member 10 and is positioned between the first frame side member 10 and the first sash side member 14 in the height direction. Sealing members 14a fastened on the sash seals gaps between the first frame side member 10 and the first sash side member. A cover 80 on the sash creates a funnel like effect for the skylight window, directing light from the exterior towards the interior with an angled surface relative to the height direction. The weather shield 3 is substantially flat and the weather shield comprises a weather shield skirt 9 along the peripheral sides of the weather shield pane 8.

**[0326]** The sealing member 22 is in Fig. 5 provided as a hollow sealing member 22.

**[0327]** In Fig. 6 shows a cross-sectional view of an embodiment of a skylight window 1. Unless otherwise stated in the in the following parts or features of the embodiment shown in Fig. 6 are similar or identical to previous embodiments. The first frame side member 10 shown in Fig.

6 has a hollow shell structure, where cavities are provided within the first frame side member 10. The first frame side member has an integrated curb flange 40 which is provided at an outer side of the first frame side member 10. The first sash side member 14 is also provided as a hollow shell structure.

**[0328]** In Fig. 6, the most exterior IGU pane 5c, having the exterior major surface 5g of the IGU 5, also acts as the weather shield pane 8. Thus, the weather shield is made up of the most exterior pane 5g of the IGU and the weather shield skirts 9. The top pane of the IGU 5c is larger than the other panes of the IGU 5 in the plane of the interior major surface 5b of the IGU. Thus, as can be seen, the most exterior pane 5c extends further in the outward direction than the remaining panes of the IGU 5.

**[0329]** This allows for the IGU 5 to be positioned high, in the height direction, in the skylight window 1 and makes it possible to have the lining panel protrusion 10e above the interior surface 10a, in the height direction, of the first frame side member. Thus, the top end of the lining panel 50 is above interior surface 10a. At the top of the lining panel protrusion 10e, a sealing member 22 abuts to the IGU and hereby hides the first side member 10 for a viewer viewing the skylight window, in an installed position, from the interior towards the exterior. The sash 14 is positioned in a space between the first frame side member 10, the IGU 5 and the weather shield 3. The sealing member 22 is positioned beyond the first surface 10c of the lining panel protrusion 10e, in the inward direction.

**[0330]** Fig. 7 shows an embodiment similar to the one shown in Fig. 6 where the lining panel protrusion 10e is moved close to the IGU 5 distanced by a small sealing element 22. In this embodiment the lining panel 50 extends further into the skylight window, in the exterior direction. This may provide a view of the skylight window, when seen from the interior toward the exterior, where the first frame side member 10 is covered by the lining panel 50, providing a more seamless look. Fig. 8 shows a perspective view from above of an embodiment of the skylight window 1 according to the present invention installed on a roof 2, where a part of the window has been removed for the purpose of illustration. The window frame 7 and the window sash 6 correspond to the ones shown in Fig. 5, unless otherwise stated in the following. The weather shield pane 8 has been removed to provide an unobstructed view. Fig. 8 also shows a screening device 34, which is mounted in a spacing delimited in the width direction W by the first 14 and second sash side members. It is to be understood that the second sash member is substantially identical to the first sash side member 14 so that the exterior sides of the sash side members together define an exterior side of the sash 6 which extends substantially in parallel to the exterior major surface 5g of the IGU 5.

**[0331]** Towards the interior the spacing is delimited in the embodiment of Fig. 8 by the step surface 17c formed by the third leg 17 of the sash side member 14. The step surface 17c thus serves as a screening device



support section extending from the first leg 15. The screening device 34 is here depicted as a roller curtain in which the screening body 36 is a covering cloth, which at least partially rolled up on a collection device 35 in the form of a collection roller in the first non-screening, end position, but which is here shown in a second, screening end position, where it is extended towards the second sash side member for covering the IGU 5. The screening device 34 might, however, also be another type of blind or a shutter. In Fig. 8, also a fixation member 39 is attached to the first sash side member 14 and extending towards the second sash side member. The fixation member 39 contributes to retaining a top casing of the screening device 34 by preventing it from moving upwards, away from the exterior major surface 5g of the IGU.

**[0332]** The first frame side member comprises a lining panel recess 10b for receiving a lining panel (not shown).

## Claims

1. A skylight window (1) for being installed in a roof of a building, the skylight window (1) comprising:

a window frame (7) having four frame side members,  
 a window sash (6) having four sash side members supporting an insulating glazing unit (IGU) having multiple layers of glazing, said window sash being movable in relation to the window frame between an open and a closed position of the skylight window, and  
 a weather shield (3) attached to the sash so as to protect a window portion (4) of the skylight window, the window portion (4) comprising the sash, frame and IGU,  
 each frame side member being associated with a respective sash side member, each of said frame and sash side members extending in a respective longitudinal direction substantially in parallel with a respective peripheral side of the IGU,  
 said IGU having an exposed interior major surface (5b) for facing an interior of said building in an installed position of the skylight window, said interior major surface extending in an outward direction away from a center of the IGU, an inward direction extending in a direction opposite to said outward direction,  
 said IGU further having an exposed exterior major surface (5g) for facing in an exterior direction, which is opposite of said interior of said building in said installed position of the skylight window and extending away from and at a right angle to said exterior major surface of the IGU, said exterior major surface extending in the outward direction, ,

where said weather shield (3) extends across substantially the entire exposed exterior major surface (5g),

said frame side members comprising at least one sealing element (22),

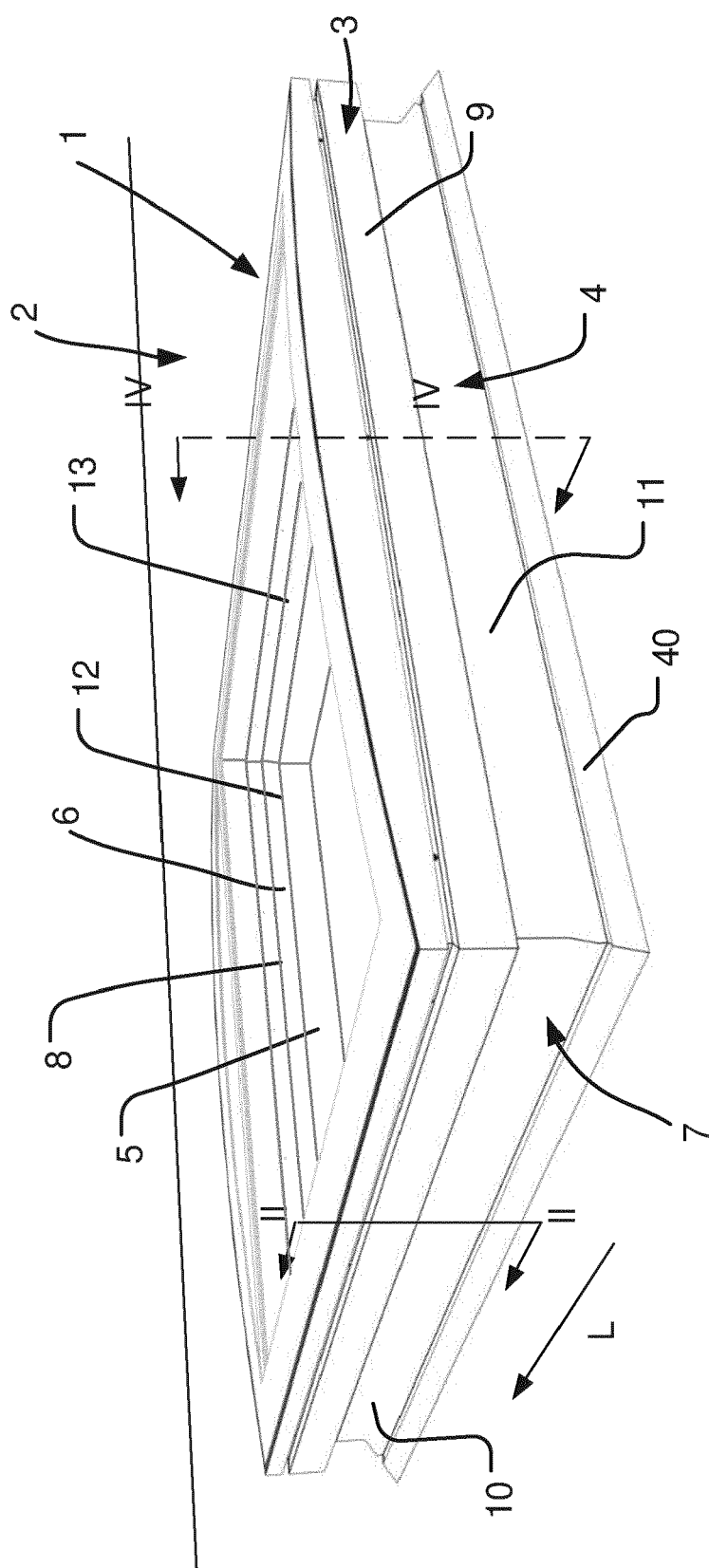
### characterized in

a first frame side member (10) comprises a primary leg (25), which in said closed position extends in the longitudinal direction and in the exterior direction substantially in parallel with a first peripheral side (5a) of the IGU along an outwardly facing surface of the IGU, and a secondary leg (26), which in said closed position extends along a part of the exposed interior major surface of the IGU and substantially in parallel with the interior major surface of the IGU (5g), that said at least one sealing element (22) is provided on the secondary leg (26) of the first frame side member, and

that, in said closed position of the skylight window, said exposed interior major surface (5b) of the IGU abuts on said at least one sealing element (22).

2. A skylight window according to claim 1, wherein, in said closed position of said skylight window, a periphery of the exposed interior major surface of the IGU abuts on said sealing element.
3. A skylight window (1) according to any one of the preceding claims, wherein said at least one sealing element (22) is provided on an exterior surface of the secondary leg (26) of the first frame side member facing in the exterior direction.
4. A skylight window according to any one of the preceding claims, wherein a first sash side member and/or the first frame side member has a stepped profile.
5. A skylight window according to any one of the preceding claims, wherein the sash comprises at least one abutment element to prevent the at least one sealing element from carrying substantial load and/or prevent the at least one sealing element from being damaged.
6. A skylight window according to any one of the preceding claims, wherein said at least one sealing element is positioned on an upper surface of a frame side member, said upper surface facing the exposed interior major surface of the IGU in a closed position of the skylight window.
7. A skylight window according to any one of the preceding claims, wherein the weather shield comprises a transparent or translucent weather shield pane.

8. A skylight window according to any one of the preceding claims, wherein the exterior weather shield comprises a weather shield pane attached to the window frame so as to protect a window portion (4) of the skylight window, the window portion (4) comprising the frame, the sash and the IGU. 5
9. A skylight window according to any one of the preceding claims, where  
said secondary leg has an interior surface facing in a direction away from the interior major surface of the IGU, which interior surface comprises a lining panel protrusion (10e) located lower than the exposed interior major surface of the IGU in the height direction, 10  
wherein the lining panel protrusion protrudes away from the IGU, the lining panel protrusion comprising a  
first surface (10c) for abutting an inwardly facing surface of said reveal panel or lining panel when received by said protrusion, 20  
where said first peripheral side of the IGU is located, in said outward direction, beyond said first surface of said protrusion. 25
10. A skylight window according to claim 9, the skylight window further comprising a second protrusion next to the first protrusion to create a recess (10b) for receiving a lining panel to be installed. 30
11. A skylight window according to claim 10, wherein at least a part of the sealing element extends above and within a periphery of said recess in the height direction. 35
12. A skylight window according to any of claims 9 to 11, wherein the sealing element is positioned at or beyond the first surface (10c) of the lining panel protrusion in the inward direction. 40
13. A skylight window according to any one of the preceding claims for being installed in a roof of a building, the skylight window, wherein  
said primary leg extends as far as or farther in said upward direction as a location of said exterior major surface of the IGU, in the closed position of the skylight window. 45
14. A skylight window according to any one of the preceding claims, where said first sash side member has a first leg (15) connected to a supporting section (72) of the first sash side member supporting the IGU, the first leg extending in said longitudinal direction and extending substantially in a height direction substantially perpendicularly to at least one of said major surfaces of the IGU, said first leg having a thickness in a width direction extending perpendicularly to said length and height directions, 50 55
15. A skylight window according to any one of the preceding claims, wherein the sealing element is positioned at or lower than a position of the sash in the height direction, in the closed position of the skylight window.
- wherein at least a portion of said first leg of the first sash side member is generally plate-shaped, consisting of one single section of substantially solid material having a said thickness less than 1 cm.



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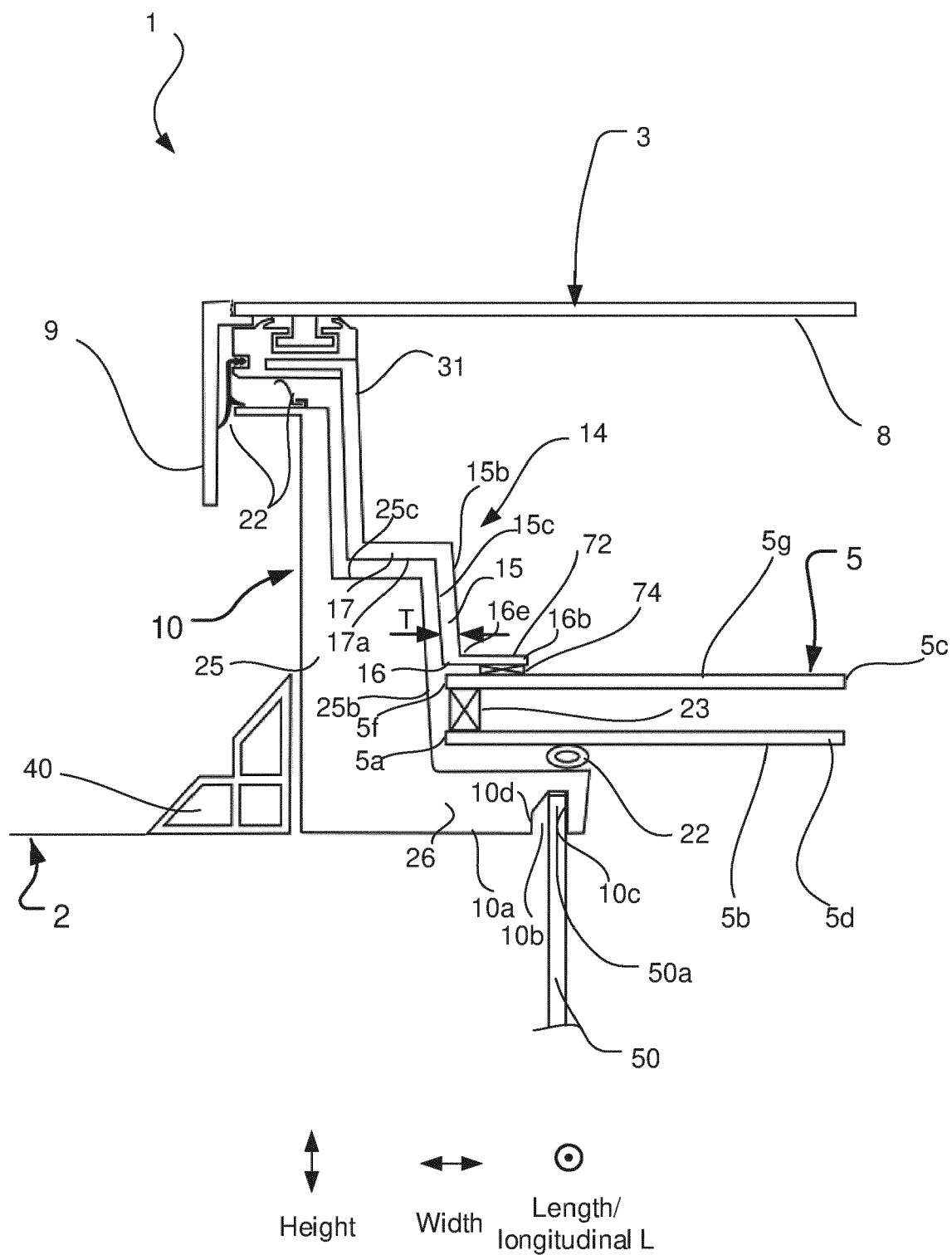


Fig. 2

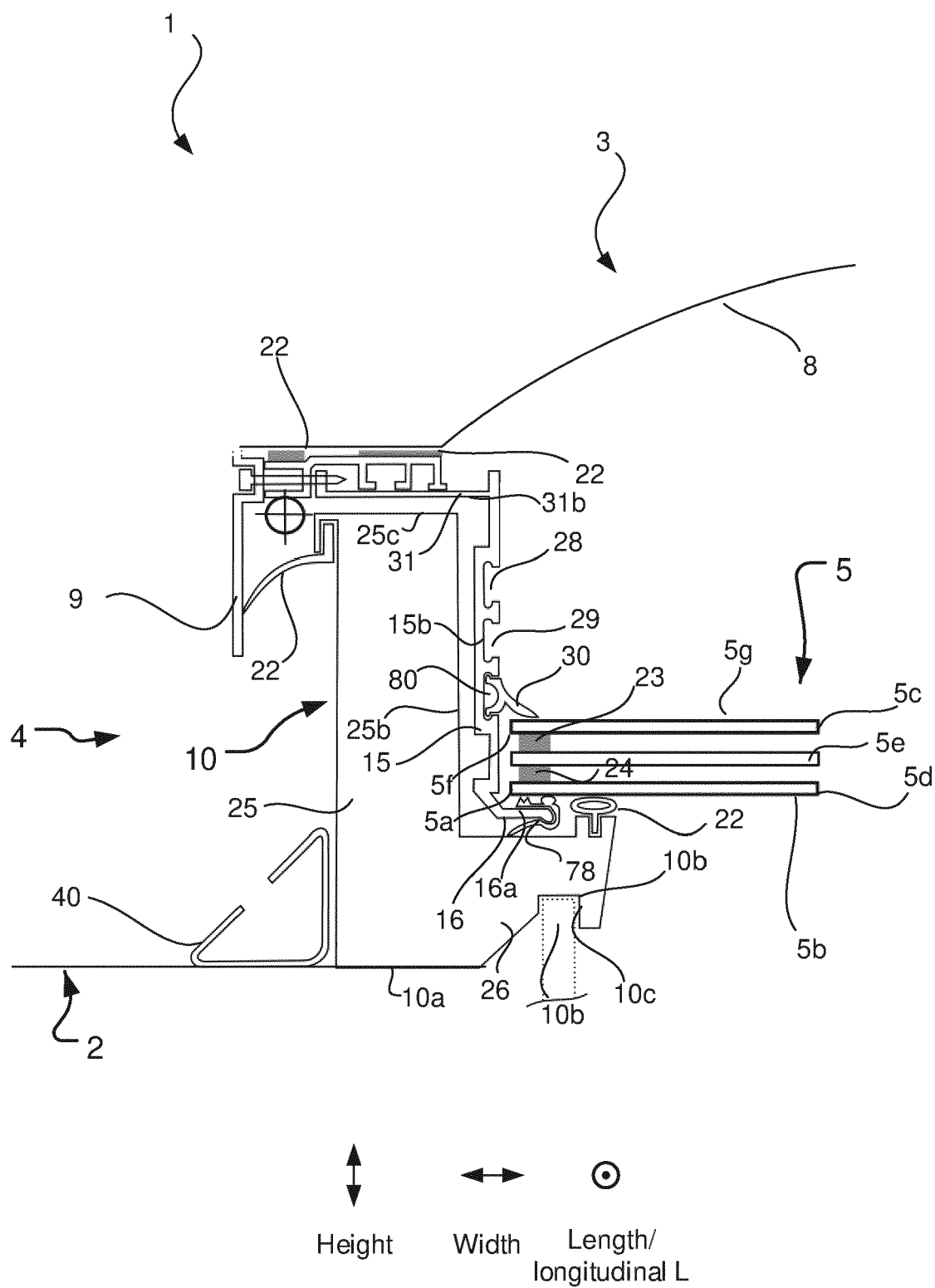


Fig. 3

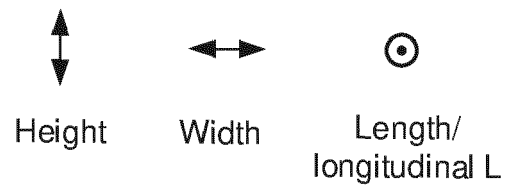
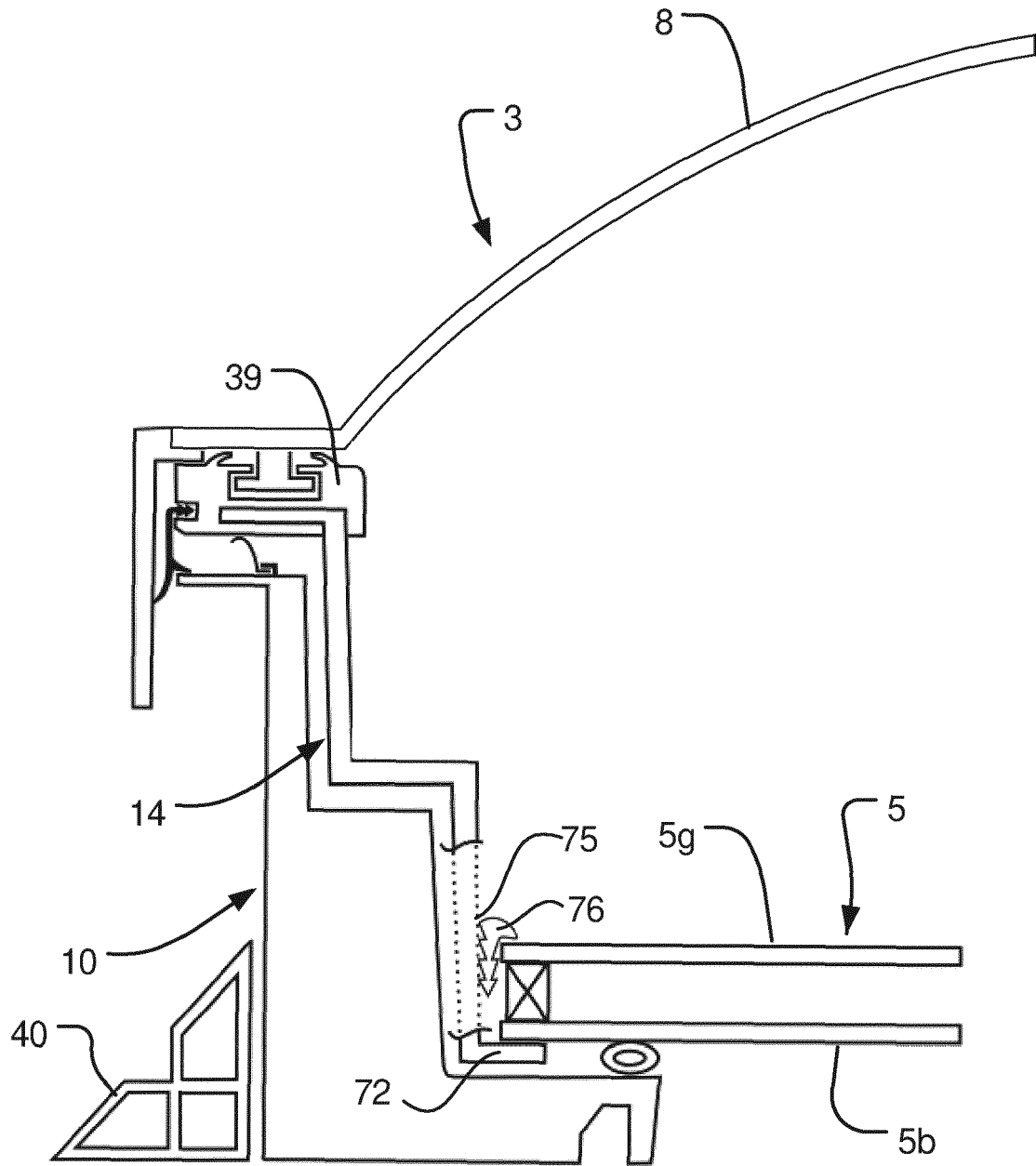
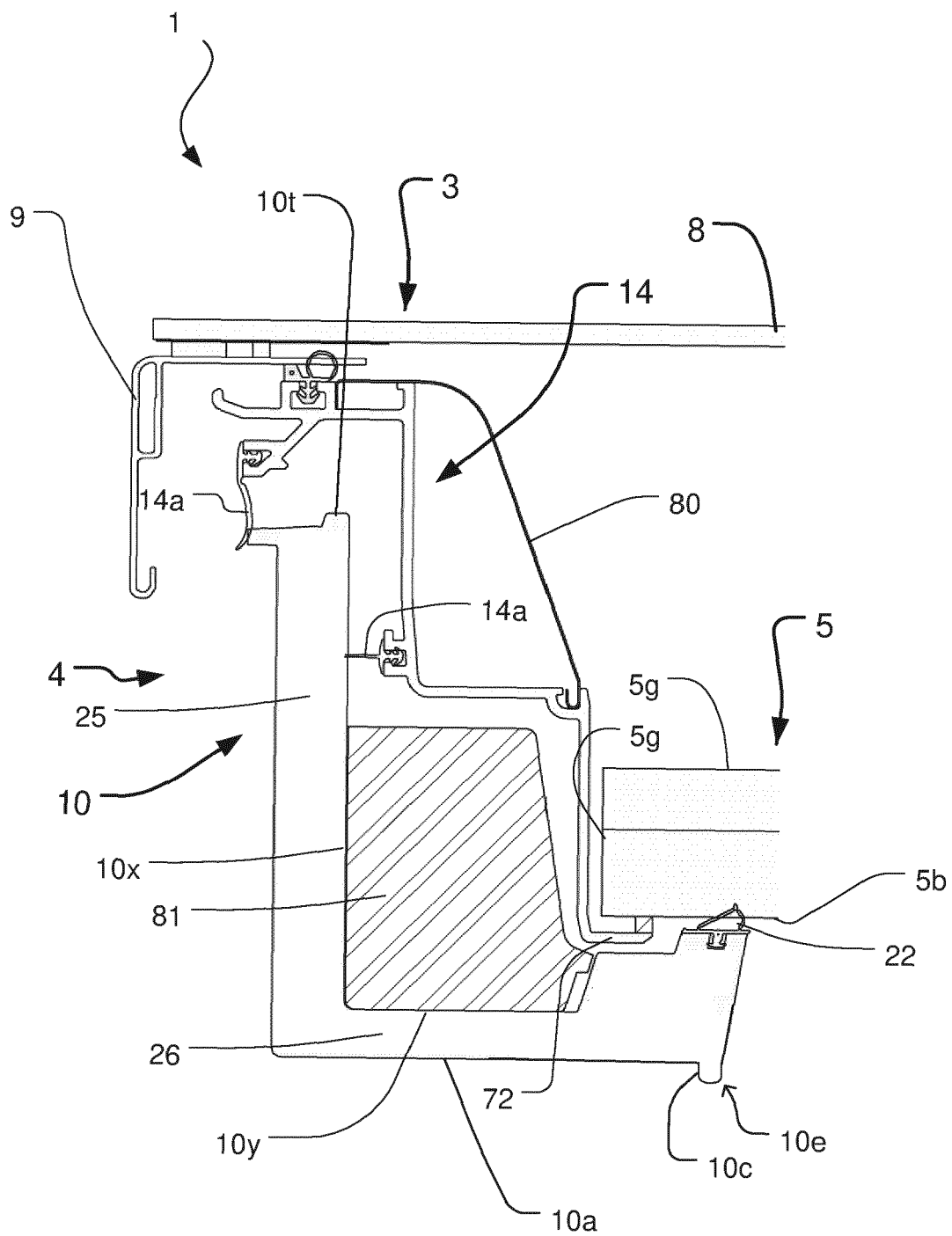





Fig. 4



Height      Width/  
lateral      Length/  
longitudinal L

Fig. 5

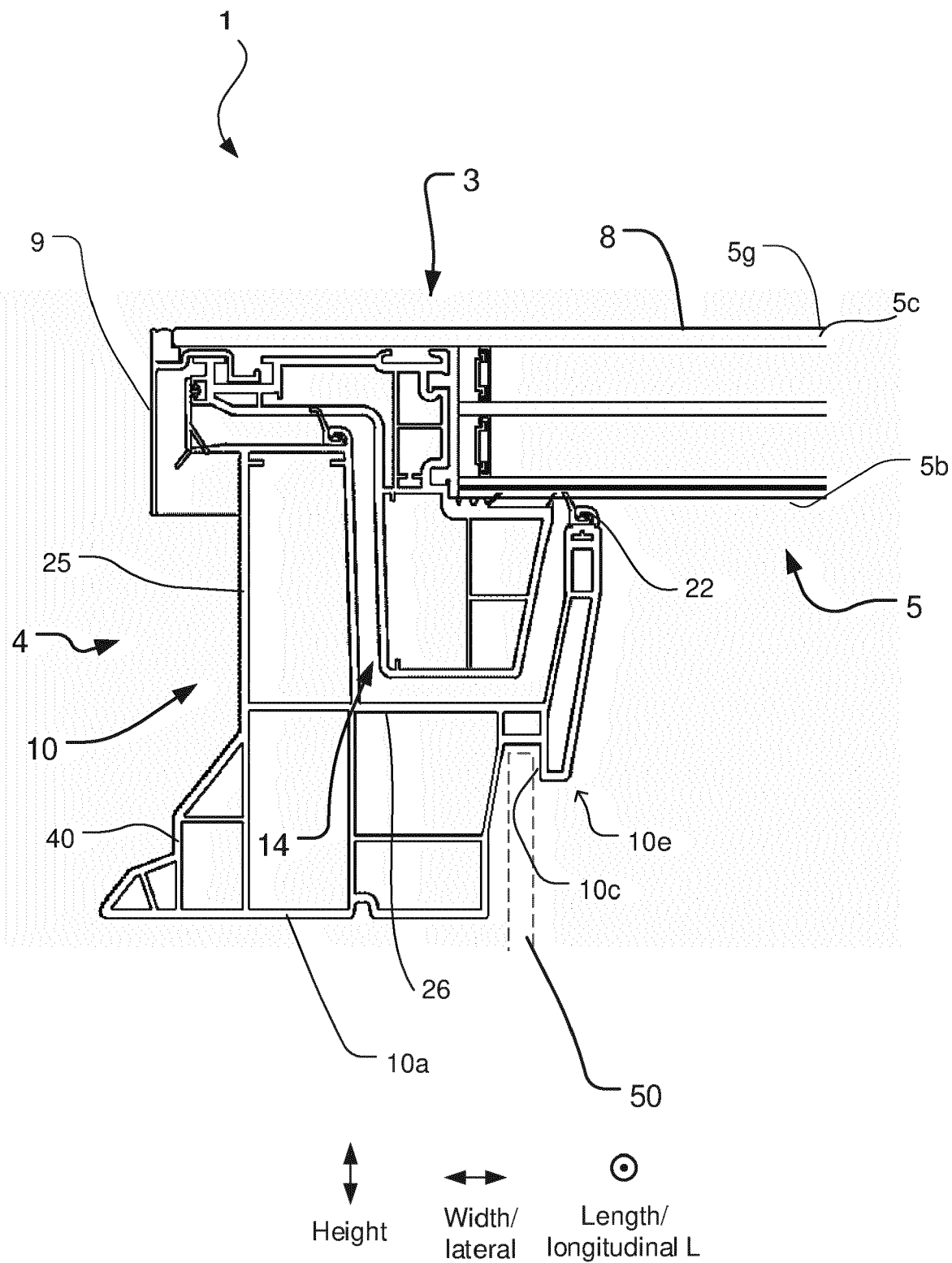


Fig. 6



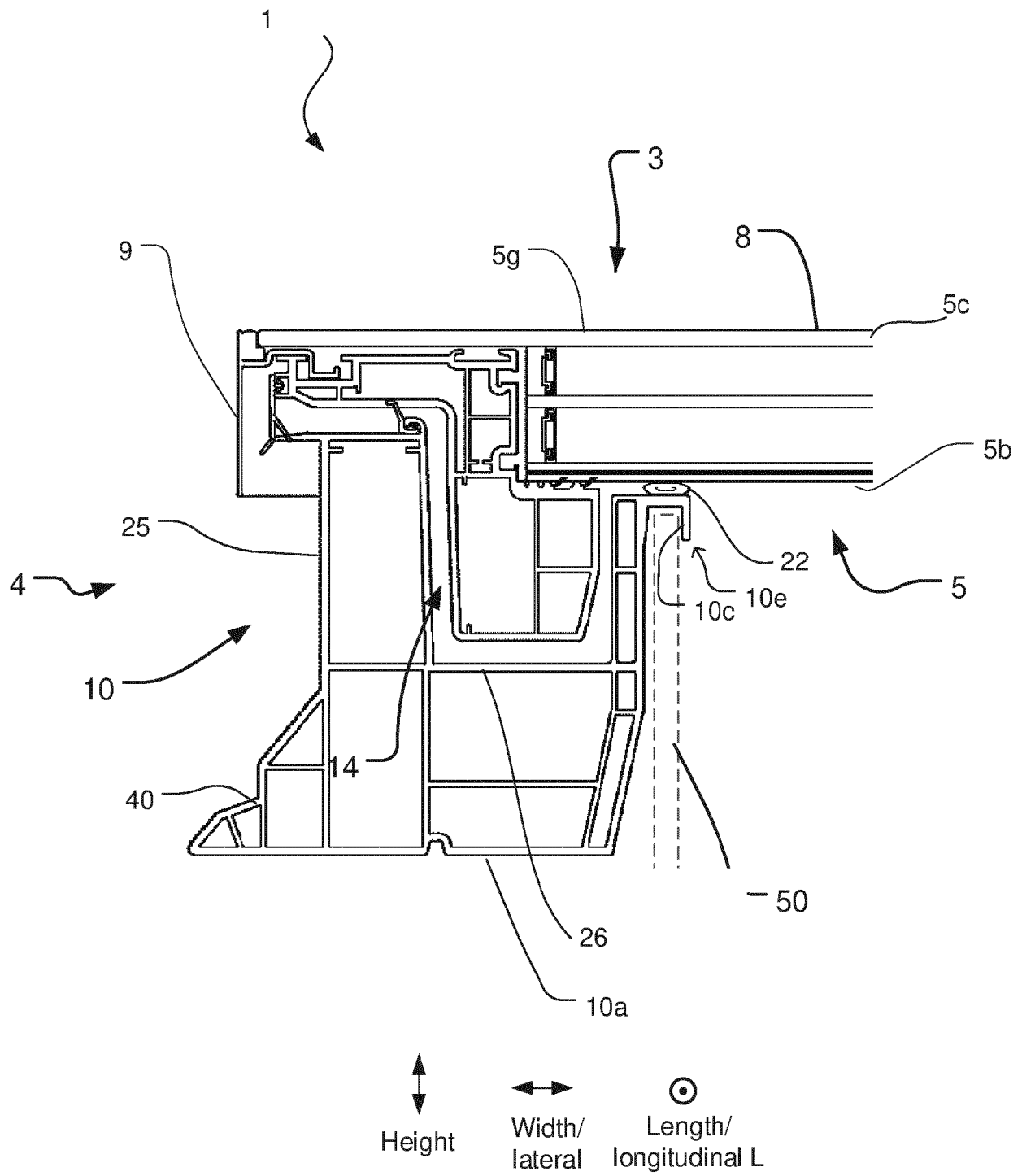


Fig. 7

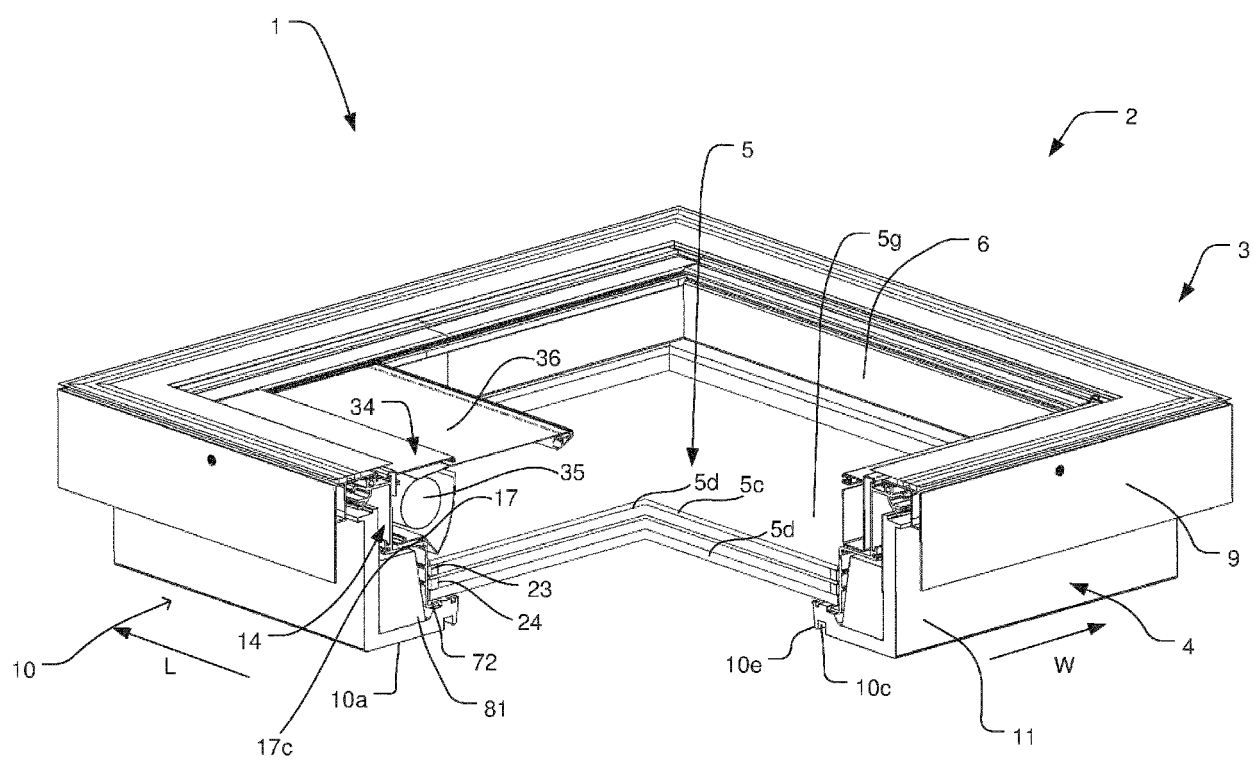


Fig. 8



## EUROPEAN SEARCH REPORT

 Application Number  
 EP 20 15 5243

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 4 972 638 A (MINTER MEARL [US]) 27 November 1990 (1990-11-27) * figures 6-8 *	1-15	INV. E04D13/03
A	WO 02/057563 A1 (VKR HOLDING AS [DK]; LINDGREN CLAES [DK] ET AL.) 25 July 2002 (2002-07-25) * figure 2 *	1-15	
A	GB 2 514 119 A (GLAZING VISION LTD [GB]) 19 November 2014 (2014-11-19) * figure 3 *	1-15	
A	EP 3 346 071 A1 (VKR HOLDING AS [DK]) 11 July 2018 (2018-07-11) * figure 1 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04D E06B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 3 July 2020	Examiner Leroux, Corentine
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

 1  
 EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 20 15 5243

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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03-07-2020

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4972638 A	27-11-1990	CA 2008724 A1	21-10-1990
		US 4972638 A	27-11-1990
-----			
WO 02057563 A1	25-07-2002	CN 1488024 A	07-04-2004
		DE 10295851 T1	24-12-2003
		GB 2388399 A	12-11-2003
		US 2004139669 A1	22-07-2004
		WO 02057563 A1	25-07-2002
-----			
GB 2514119 A	19-11-2014	NONE	
-----			
EP 3346071 A1	11-07-2018	NONE	
-----			

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EPO FORM P0459

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**Patent documents cited in the description**

- WO 2009080026 A1 [0005]