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(54) **SKYLIGHT WINDOW**

(57) A skylight window comprising a window frame, an insulating glazing unit (IGU) and a window sash having, the window frame comprising a primary leg, a secondary leg, and a cover leg wherein the primary leg is positioned outwards in relation to a first peripheral side of IGU, the secondary leg extends in an the inward direction below a part the IGU, the cover leg is positioned inwards in relation to the first peripheral side of the IGU opposite to the primary leg, and the cover leg extends from the secondary leg in the height direction towards the interior major surface of the IGU.

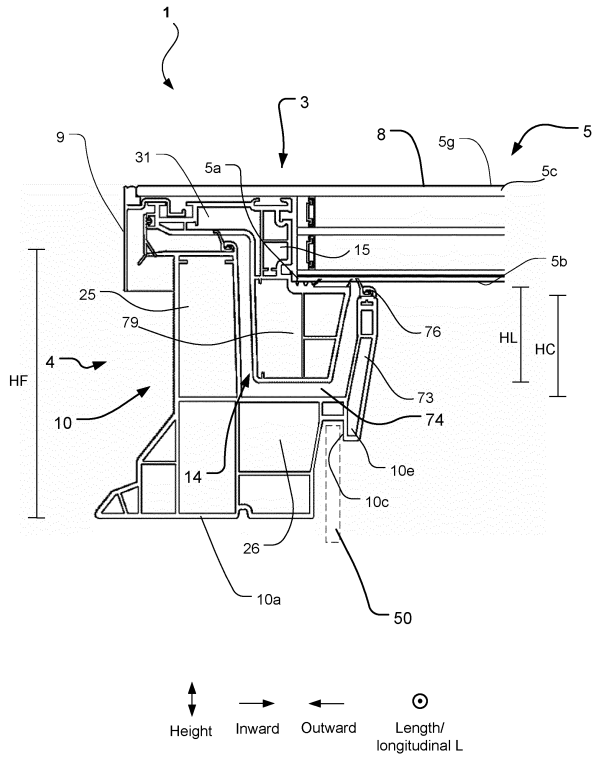

Fig. 3

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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, an insulating glazing unit (IGU) having multiple layers of glazing, and a window sash having four sash side members supporting the IGU, the IGU having an exposed interior major surface for facing an interior of the building in a closed position of the skylight window, the exposed interior major surface being of an interior pane layer of the IGU, said interior pane layer having a periphery and a first peripheral side, 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 respective longitudinal direction substantially in parallel with the first peripheral side of the interior pane layer, in a closed position of the skylight window, a height direction being defined as extending perpendicularly to the interior major surface of the IGU in the closed position of the skylight window, an outward direction and an inward direction extending from the first peripheral side in opposite directions, the outward direction extending away from the IGU perpendicularly to both the longitudinal direction and the height direction and, the inward direction being opposite to the outward direction, the first sash side member comprising a supporting leg, the supporting leg extending below and supporting the exposed interior major surface of the IGU, the first frame member comprising a primary leg and a secondary leg, where, in the closed position of the skylight window, the primary leg is positioned outwards in relation to the first peripheral side of the interior pane layer and extends in the height direction, the secondary leg extending in the inward direction below a part of said interior major surface of the IGU.

Background

[0002] There is often a desire to position one or more 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 roof 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 roof window 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 the horizontal plane. 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] 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 openable window, to the sash of which a dome-shaped weather shield is attached.

[0005] Window sashes of skylight windows have typically comprised box structures comprising hollow spacings inside in the attempt to at the same time provide structural strength and thermal insulation. A typical example of such structures is presented in US2010269426. Windows comprising such sashes have typically a quite rough appearance, and the sash structure limits the view. What is more, these windows are usually associated with high materials and processing costs in terms of manufacturing.

[0006] There is also a general desire to provide skylight windows with higher influx of light and better insulation properties to provide better illumination of the interior of buildings as well as reduce the energy consumption required for illumination, heating and cooling of buildings.

[0007] On this background it may be an object of the invention to provide a skylight window according to the introduction which improves on one or more of these properties.

Summary of the invention

[0008] According to the invention, one or more of these objects are met by a skylight window according to the introduction wherein first frame side member comprises a cover leg, where, in the closed position of the skylight window, the cover leg is positioned inwards in relation to the first peripheral side of the interior pane layer opposite to the primary leg, and where the cover leg extends from the secondary leg in the height direction towards the interior major surface of the IGU.

[0009] Providing the cover leg of the first frame side member may cover the peripheral side of the IGU and the first sash side member when seen from an interior of a building in the installed position of the skylight window. By covering the peripheral side of the IGU and first sash side member, the cover leg may present an inward side of the skylight window, which may contribute to increasing the influx of light, e.g. by providing a uniform surface reflecting light. Covering or hiding parts of the IGU or sash may also allow a wider range of materials to be used for these parts as they will not be exposed, which may in turn lead to simpler manufacturing and/or reduced costs of manufacturing. Furthermore, providing the cover leg and the primary leg of the first frame side member on opposite sides of the first peripheral side of the interior pane layer, may contribute to the thermal insulation properties of the skylight window, at least by providing a further layer of material providing resistance to heat transport and by impeding air flow in the space between the IGU and the first frame side member. The periphery of the IGU is typically more heat conductive than the rest of the IGU due to the direct contact between pane layers, spacers and sealing members. This may provide a po-

tential "cold bridge" at the sash as it is in direct contact with the IGU periphery. By providing the cover leg of the first frame side member, the contact between the supporting leg of the first sash side member and air of the interior of the building is limited, which may improve the thermal insulation properties of the skylight window.

[0010] The invention is herein described in relation to one of the sides of the skylight window, namely the first side of the skylight window, which first side is associated with the first frame side member, the first sash side member and the first peripheral side of the interior pane layer. It is understood that the features described in relation to the first side of skylight window can also apply to the remaining sides of the skylight window.

[0011] The invention is herein described with reference to the longitudinal direction, the height direction and the inwards and outwards directions. The terms exterior and interior are also used, which is understood to be opposite directions in the height direction. Similarly, the inwards and outwards direction may be seen as opposite directions in a lateral direction, which lateral direction is perpendicular to the height and longitudinal directions. In relation to the height directions the terms "lower", "lowermost", and "bottom" along with "upper", "uppermost" or "top" are used to describe positions, which are further toward respectively the interior or the exterior of the building in the installed position of the skylight window. "Lowermost" is thus equivalent to "most interior" and "uppermost" to "most exterior".

[0012] The term IGU is an abbreviation of "Insulating Glazing Unit" and is a concept well-known to the skilled person. The IGU has multiple layers of glass or glazing, which may be denoted as pane layers. The pane layers may define a potentially sealed volume or spacing between them, the spacing potentially comprising an inert gas, an aerogel, or a vacuum. The IGU may in a conventional manner comprise two, three or more pane layers of, i.e. layers of glass, polycarbonate or the like, or glass panels, which may be positioned at a distance from each other to form one or more spacings or cavities between them. This/these spacing(s) may be filled with a gas or may hold a vacuum to improve insulation properties of the IGU. 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. The exposed interior major surface of the IGU is a lower major surface of a lowermost of the pane layers of glazing, which is denoted the interior pane layer. The IGU also has an exterior major surface, which is an upper major surface of an uppermost of the pane layers of glazing, which is denoted the exterior pane layer. The exterior major surface thus faces towards an exterior of the building in the installed position. Sealing and/or supporting members or spacers may be provided at one or more peripheral sides of the IGU between the layers of glazing and may form a so-called spacer frame. The sealing and/or supporting members may distance adjacent layers of glazing from each other and may together with lateral edges of the layers of glazing form respective sides or lateral surfaces of the IGU. These side surfaces may be substantially plane and/or extend substantially in the height direction. The periphery of the IGU is the enclosing boundary of IGU and the peripheral side is a side of such an enclosing boundary. The peripheries of the pane layers of the IGU may have different sizes, such as in the case of a stepped IGU, where one or more pane layers are larger than the others. The first peripheral side is of the interior pane layer of the IGU.

[0013] The supporting leg of the first sash side member extends below and supports the exposed interior major surface, whereby it supports the IGU. The supporting leg may support the IGU by carrying at least part of the weight of the IGU. The supporting leg of the first frame side member may consist of at least all parts of the first sash side member, which is located within the periphery of the interior pane, i.e. the part which is located below and inwards in relation to the first peripheral side of the interior pane layer. In addition, a part of the supporting leg may extend beyond the first peripheral side in the outwards direction. The supporting leg may extend along the entire first peripheral side of the IGU or alternatively along a part of a peripheral side of the IGU.

[0014] The supporting leg may comprise one or more abutment elements for abutting against the exposed interior major surface of IGU and/or the window frame. The supporting leg may comprise one or more sealing elements for sealing against the exposed interior major surface of the IGU and/or or the window frame. The supporting leg may be attached to the exposed interior major surface by an adhesive.

[0015] The window sash supports the IGU and may be movable in relation to the window frame between an open and the closed position of the skylight window. In configurations wherein, the window sash is not movable, the skylight window does not have an open position. The window sash may be made not moveable, i.e. "fixed", by one or more fastening members fastening the window sash to the window frame, whereby an openable and a fixed skylight windows may be made using the same components. Openable skylight windows may comprise a motor driven actuator for moving the window sash between the open and closed positions. The sash may be made movable in relation to the window frame by the sash being side-hung, i.e. being rotatable about an axis extending along one of the frame side members. Generally, by side-hung it is to be understood that the sash moves out from the frame during opening. This is contrary to pivot hung skylights where a part of the sash moves towards the exterior and another part of the sash moves towards the interior during opening. The sash being side-hung may be achieved by using a rotary hinge positioned at a 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

toward the exterior or toward the interior 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. 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. 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.

[0016] The first sash side member may further comprise a second leg. The second leg extends substantially in the height direction next to the periphery of the IGU. The supporting leg may extend from the second leg in the inwards direction. The supporting leg may extend from a lowermost end of the second leg. The supporting leg may extend substantially perpendicularly from the second leg. The first sash side member may further comprise a first leg connected to the second leg of the first sash side member opposite to the supporting leg, i.e. at an uppermost end of the second leg, the supporting leg extending from the lowermost end. The first leg may extend in the outward direction and may connect to a hinge of the skylight window. The first sash side member may be positioned such that the first leg is above the primary leg of the first frame side member, the second leg is in between the primary leg and the first peripheral side of the interior pane layer, and the supporting leg extends below the interior major surface of the IGU. The first leg, second leg and supporting leg of the first sash side member thus forms a stepped structure.

[0017] The first sash side member and/or the first frame side member may comprise one or more thermal breaks. The one or more thermal breaks may be made from a material of a lower thermal conductivity than other parts of the side member. The one or more thermal breaks may be an insert or a joint joining parts of the side member.

[0018] The first frame side member comprises the primary leg, the secondary leg and the cover leg. Each of the legs of the first frame side member may be understood as a branch of the first frame side member. The primary, secondary and cover leg of the first frame side member extend in the longitudinal direction along the first peripheral side of the interior pane layer. The primary leg of the first frame side member may be the most outwardly positioned part of the first frame side member and may define a total height of the first frame side member. The secondary leg extends from the primary leg in the inwards direction such that the secondary leg extends below a part of the interior major surface of the IGU in the closed position of the skylight window. The cover leg extends from the secondary leg in the height direction towards the interior major surface or exterior and thus extends further in the height direction than the secondary leg. Similarly, the primary leg extends in the height direction and thus extends further in the height direction than the secondary leg. The primary leg may be a vertical leg of the first frame side member, secondary leg may be a horizontal leg of the first frame side member and the cover leg may be a further vertical leg of the first frame side member. The primary leg is positioned outwards in relation to the first peripheral side such that an inwardly facing surface of the primary leg is beyond the first peripheral side of the interior pane layer in the closed position of the skylight window. The cover leg is positioned at inwards in relation to the first peripheral side, such that an outwardly facing surface of the cover leg is beyond the first peripheral side of the interior pane layer in the inward direction. The cover leg may be positioned beyond the supporting leg of the first sash side member in the inwards direction. The first frame side member has a bottom surface, which faces the interior of the building in the installed position of the skylight window. The bottom surface of the first frame side member may be the surface on which the frame rests on the roof structure.

[0019] 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 polyvinyl chloride (PVC), chlorinated PVC, polyurethane (PUR), fiber reinforced PUR, such as glass fiber reinforced PUR, pultruded polymers, polyester, and/or glass fiber and/or wood and/or metal, such as steel or aluminum, or composites or combinations thereof.

[0020] In some embodiments, the primary leg of the frame side member extends above the interior major surface of the IGU in the height direction in the closed position of the skylight window. The primary leg may suitably extend above the exterior major surface of the IGU. This may further improve the thermal insulation properties of the window, by covering the peripheral side of the IGU and by the IGU being positioned low in the frame, i.e. further towards the interior of the building.

[0021] In some embodiments, a frame spacing is delimited by the primary leg in the outward direction, the cover leg in the inward direction and the secondary leg toward the interior. The frame spacing may accommodate the supporting leg of the first sash side member in the closed position of the skylight window, and a sealing element may be provided in the frame spacing to seal against the supporting leg. Such a frame spacing may further improve the thermal insulation properties of the skylight window. It may also aid in covering the first sash side member, the supporting leg thereof and/or the peripheral side of the IGU, when viewing from an interior of the building.

[0022] In this embodiment the first frame side member may be said to form a substantially U-shaped structure. The U-shaped structure of the first frame side member refers to the cross-section of the first frame side member. The primary leg and the cover leg are the upright legs of the U-shape and the secondary leg connects the primary leg and the cover leg.

[0023] The cover leg may extend substantially as far as the primary leg of the first frame side member in the height direction, such as within a distance corresponding

to three times the pane layer thickness. Typical pane layer thicknesses may be about 3 mm to 8 mm, commonly 4 mm to 6 mm.

[0024] In some embodiments, the supporting leg of the first sash side member in the closed position of the skylight window is positioned between the primary leg in the outward direction and the cover leg in the inward direction. In this way the supporting leg is covered by the primary leg in the outwards direction and the cover leg in inwards direction. The supporting leg of the first sash side member is thus hidden from view, when viewing from the interior toward the exterior. This may further improve thermal insulation and may limit the exposoure of the sash material to e.g. sunlight especially if the areas of pane layers adjacent to the first sash side member are masked.

[0025] In some embodiments, the cover leg extends along an inward side of the supporting leg of the first sash side member. An outwardly facing surface of the cover leg may be immediately adjacent to the inward side of the supporting leg.

[0026] Provision of the cover leg may be especially advantageous for skylight windows, wherein the first frame side member and/or the first sash side member comprise(s) a hollow box structure, preferably made of an extruded or pultruded plastic material such as a polyvinylchloride plastic. Hollow-box structures may provide bulky frames and sashes which may impede light influx and may present a non-uniform appearance, but by provision of the cover leg the supporting leg of the first sash side member, a uniform surface e.g. for reflecting light and improving light influx is provided. Further, the cover leg may reduce contact between the supporting leg of the sash and the air of the interior of the building thus improving thermal insulation, which may be a particular problem for sashes having a hollow box structure, due to the large surface area of the supporting leg.

[0027] In some embodiments, a most exterior surface of the cover leg is positioned above a most interior surface of the supporting leg in the height direction, in the closed position of the skylight window. The most exterior surface of the cover leg is the surface of the cover leg which occupies the most exterior position in the installed position of the skylight window, it may also be denoted as the top surface of the cover leg. The most interior surface of the supporting leg is the surface of the supporting leg which occupies the most interior position, and it may also be denoted as the bottom surface of the cover leg. In this way the supporting leg is covered by the cover leg.

[0028] In some embodiments, a most exterior surface of the cover leg is located adjacent to the interior major surface of the IGU in the height direction, such that a distance in the height direction between the most exterior surface of the cover leg and the interior major surface of the IGU in the closed position of the skylight window, is less than twice a height of the interior pane layer. Providing the cover leg such that the most exterior surface is adjacent to the interior major surface of the IGU, may further improve the thermal insulation properties of the skylight window and means that the sash will be hidden entirely when the skylight window is seen from the interior. The height of the interior pane layer is the thickness of the pane layer. Preferably the most exterior surface of the cover leg or a sealing element provided thereon is in abutment with the interior major surface of the IGU in the closed position of the skylight window. By the cover leg or such a sealing element being in abutment with the IGU there is no contact between the sealing element of the cover leg and the supporting leg, which may improve thermal insulation and prevent condensation. The cover leg and/or sealing element provided on the cover leg may thus be provided at a distance from the supporting leg, whereby a gap is provided between cover leg, or sealing element provided thereon, and the supporting leg.

[0029] In some embodiments, an inward side surface of the cover leg is inclined in relation to the height direction, such that a proximal end of the inward side surface is further outward than a distal end of the inward side surface, the distal end being the end of the inward side surface which is closest to the IGU. Having an inclined inward side surface may improve the influx of light through the skylight window and/or reflection of light from the inward side surface. It may also provide a smooth transition from the cover leg to a potential lining panel. The inclined inward side surface of the cover leg forms an acute angle with the height direction. The acute angle may generally be less than 45 degrees, such as 5 to 30 degrees, or 5 to 20 degrees.

[0030] In some embodiments, the cover leg comprises a lining panel protrusion.

[0031] The lining panel protrusion is a protrusion provided at the cover leg, which may facilitate the mounting of a lining panel once the skylight window is installed on a roof. Providing the lining panel protrusion at the cover leg, may allow the lining panel to be positioned close to IGU, that is high in the frame. The lining panel protrusion typically defines a lining panel recess together with other parts of the first frame side member, the lining panel recess being configured for receiving a top end of the lining panel. The lining panel protrusion and/or recess may extend along substantially the entire length of the first frame side member. The lining panel protrusion may have a first surface for abutting an inwardly facing surface of the lining panel, so as to position the lining panel. The lining panel protrusion may be provided at the distal end of the of the cover leg, whereby the lining panel in the mounted position will extend far into the frame, close to the IGU. This may provide a skylight window presenting a uniform appearance toward the interior, which may improve light influx. Alternatively, the lining panel protrusion may be provided at the proximal end of the cover leg. The inclined inward side surface of the cover leg may in such a configuration also continue as an inclined inward side surface of the lining panel protrusion, whereby a smooth transition to the lining panel is provided by the cover leg.

[0032] The lining panel protrusion may be positioned beyond the first peripheral side of the interior pane layer in the inward direction.

[0033] In some embodiments, the skylight window further comprises a weather shield attached to the sash or the frame so as to protect a window portion of the skylight window from the elements and preventing rain and other precipitation, said the window portion comprising the sash, the frame, and the IGU. The weather shield comprises a transparent or translucent weather shield pane. It may be of glass or clear polymer and may comprise only one single layer of glazing. The weather shield may be provided as a unitary structure, which is or may be detachably attached to the sash. This may have the effect of 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 joint between the frame and the roof structure.

[0034] 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 substantially flat.

[0035] In a development of the previous embodiments, the weather shield is without a sealed gas-filled spacing between the weather shield pane and the IGU.

[0036] In some embodiments, the exterior pane layer extends further in the outward direction than the interior pane of the IGU. Such an IGU may be denoted a "Stepped IGU". The exterior pane layer may extend as far or further than the first sash side member in the outward direction, whereby the exterior pane layer covers the first sash side member.

[0037] The exterior pane layer may extend as far as or further than a frame top edge of the first frame side member in the outward direction, the frame top edge being an outward edge of an exterior end of the primary leg.

[0038] The second leg of the first sash side member may extend immediately beneath this further part of the exterior pane layer. In such embodiments, the primary leg suitably extends above the interior major surface of the IGU, while the exterior pane layer extends above the primary leg.

[0039] A peripheral area of the exterior pane layer may be masked e.g. with enamel so as to protect part of the window frame and/or window sash and/or a spacer of the IGU from sunlight. The peripheral area may be the part of the exterior pane layer, which covers the window frame and/or window sash, in particular the part of the exterior pane layer which is immediately adjacent to the sash. Such masking may also be applied to peripheral areas of the other pane layers, e.g. the peripheral area of the interior pane layer, which is immediately adjacent to the supporting leg of the first sash side member.

[0040] In some embodiments, wherein the exterior pane layer extends further in the outward direction than the interior pane layer of the IGU, the weather shield pane is the exterior pane layer of the IGU. The weather shield thus forms part of the IGU, and the exterior pane layer of the IGU protects the window portion of the skylight window. The exterior pane layer of the IGU is the most exterior pane layer of the IGU and thus has an exposed exterior major surface. In these embodiments the exterior pane layer covers the sash. The exterior pane layer thus covers and protects the entire window portion and allows rain water or the like to drain off the skylight window, whereby the exterior pane layer serves as a weather shield pane.

[0041] The exterior pane layer may be attached to the window sash by a structural adhesive bond or structural tape. In particular this may be advantageous when the exterior pane layer is the also the weather shield pane. Suitably such adhesive means are applied in between the interior facing surface of the exterior pane layer and the first sash side member, preferably the second leg of the first sash side member.

[0042] In some embodiments, the weather shield pane is provided separately from the IGU. In such an embodiment the weather shield may be provided as a unitary structure, which may be detachably attached to the sash as described above. The separate weather shield may be used in both skylight windows with a stepped IGU and those with an IGU with similarly sized pane layers.

[0043] In some embodiments, the skylight window further comprises a weather shield skirt extending along a peripheral side of the weather shield pane, wherein the weather shield skirt extends toward the interior down to or past the top surface of the primary leg of first frame side member. The first peripheral side of the weather shield pane may be denoted the first peripheral weather shield side. The weather shield skirt preferably surrounds the window frame on an outward 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.

[0044] The weather shield skirt may comprise and L-shape, wherein one leg of the L-shape is attached to the exterior pane of the IGU, such as to the exterior major surface of the IGU or to an interior facing surface of the exterior pane of the IGU. In configurations where the IGU is a stepped IGU, the one leg of the L-shape may be positioned in between the exterior pane layer of the IGU and the first sash side member.

[0045] The top surface of the primary leg may be the most exterior surface of the primary leg which is typically also the most exterior surface of the first frame side member. The top surface may in some configurations be a major, most exterior surface of the primary leg, in case minor protrusions are provided on the primary leg for e. g. locking in sealing elements.

[0046] A sealing element may be provided between the first sash side member and the first frame side member for sealing a gap between the first frame side member and the first sash side member. Additionally, or alternatively sealing element may be provided in between the weather shield skirt and the first frame side member.

[0047] The cover leg may be integrally formed with the first frame side member. The cover leg may alternatively be configured for being attached to the secondary leg of the first frame side member.

[0048] The primary, secondary and cover legs of the first frame side member may be integrally formed. Similarly, the first, second and supporting legs of the first sash side member may be integrally formed.

[0049] An outward side of the first frame side member may comprise an inclined surface, the inclined surface being configured for the mounting of roofing felt. The inclined surface may be of a curb flange. The outward side of the first frame side member may further comprise a planar vertical surface above the inclined surface. The vertical surface is understood to extends substantially in the height direction.

[0050] The height of the supporting leg of the first sash side member is denoted the "supporting leg height", which is defined herein as a total height in the height direction of the supporting leg from a most interior surface of the supporting leg to a most exterior surface of the supporting leg. Typically, both these surfaces are located within the periphery of the interior pane layer of the IGU.

[0051] The height of the cover leg of the first frame side member is denoted the "cover leg height", which is defined herein as a total height in the height direction of the cover leg from the most exterior surface of the cover leg to an exterior facing surface of the secondary leg of the frame side member. As such the cover leg height is typically equivalent to the height of an outwardly facing surface of the cover leg, which outwardly facing surface delimits the frame spacing toward in the inwards direction as previously described. In case of the exterior surface of the secondary leg being irregular, the cover leg height is defined in relation to exterior surface of secondary leg which is adjacent to the cover leg.

[0052] The cover leg height may be greater than the supporting leg height. In this way the cover leg can cover the supporting leg of the first sash side member.

[0053] The height of the first frame side member is denoted the "total frame height", which is defined the total height in the height direction of the first frame side member from a lowermost point of the frame to an uppermost point of the frame. This typically corresponds to the distance between the top surface of the primary leg and a bottom surface first frame side member. The bottom surface of the first frame side member is the surface on which the first frame side member rests on the roof in the installed position of the skylight window.

[0054] The total frame height is typically about 15 cm.

[0055] The supporting leg height may be may be at least 15 % of the total frame height, preferably at least 30 % or 35 % of the total frame height.

[0056] The cover leg height may be at least 15 % of the total frame height, preferably at least 30 % or 35 % of the total frame height. The cover leg height is preferably greater than the supporting leg height.

Detailed Description

[0057] The skylight window according to the invention will now be described in greater detail based on non-limiting exemplary embodiments and with reference to the drawings, where:

FIG. 1 shows a perspective view from above of an embodiment of a skylight window according to the present invention installed in a roof,
FIG. 2 shows a cross-sectional view of a skylight window according to the present invention,
FIG. 3 shows a cross-sectional view of a skylight window according to the present invention where the cover leg has an inclined inward side surface,
FIG. 4 shows a cross-sectional view of a skylight window according to the present invention with a thin supporting leg,
FIG. 5 shows a cross-sectional view of a skylight window according to the present invention with a dome-shaped weather shield pane,
FIG. 6 shows a cross-sectional view of a skylight window according to the present invention with a weather shield which is separate from the IGU, and
FIG. 7 shows a cross-sectional view of a skylight window according to the present invention with a separate cover leg.

[0058] FIG. 1 shows an embodiment of a skylight window 1 according to the present invention installed in a roof 2 of a building and covering an opening (not shown) in the roof 2. The skylight window 1 comprises a weather shield 3 protecting a window portion 4, which includes an IGU 5, a sash 6 supporting the IGU 5, and a frame 7. 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 40 of the frame 7.

[0059] The weather shield 3 is attached to the sash 6 so as to protect the window portion 4 of the skylight window. The weather shield 3 comprises a transparent weather shield pane 8 and a skirt 9, which cover the sash and the IGU entirely. It should be noted that the skylight window 1 in other embodiments does not include the weather shield 3. 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. The weather 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. The first frame side member 10 and a second frame side member 11 is indicated in FIG. 1. The weather shield 3 is a weather shield without a sealed gas-filled spacing between the weather shield pane 8 and the IGU 5.

[0060] In this embodiment, both the entire sash 6 and the entire frame 7 are positioned above an upper roof surface of the roof 2, also denoted the exterior roof sur-

face. The skylight window 1 may, however, also be positioned so that a part of the frame 7 and/or the sash 6 are positioned below the exterior roof surface level.

[0061] The four frame side members are made from extruded or pultruded plastic such as PUR (polyurethane) or PVC (polyvinylchloride), and form a substantially rectangular shape and, similarly, the four sash side members form a substantially rectangular shape. The four sash side members, which may be made of pultruded plastic, support the IGU and the sash is connected to the window frame 7 via hinges (not shown) so that, in a conventional manner, it is movable in relation to the frame 7 between an open (not shown) and a closed position of the skylight window 1. The skylight window 1 is shown in the closed position in all of the figures and the sash may be fixed to the frame so that the window cannot be opened, even though comprising a separate sash.

[0062] The flat roof 2 shown in Fig. 1 has a roof inclination of about 0 degrees in relation to horizontal. The skylight window may, however, also be installed in an inclined roof having a roof inclination of above 0 degrees.

[0063] Cross-sectional views of different embodiments of the invention are shown in Figs. 2-7. These cross-sectional views correspond to a view as seen along line II-II in Fig 1 and show the elements of different skylight windows. Although only a cross-section of one side of each skylight window is shown in Figs 2-7, the embodiments shown in Figs 2-7 are generally similar to the embodiment shown in Fig. 1, e.g. in that they comprise four frame and sash side members and an IGU positioned in a manner similar to what is shown in Fig. 1.

[0064] Turning to FIG. 2, the IGU 5 has multilple layers of glazing among which are the exterior pane layer 5c and the interior pane layer 5d. The interior pane layer 5d has an exposed interior major surface 5b, which faces the interior of the building (not shown), and the exterior pane layer 5c has an exposed exterior major surface 5g. The interior pane layer 5d here consists of multiple sheets of glass. The exterior pane layer 5c extends further in the outward direction than the other pane layers of the IGU 5, and hence the IGU 5 may be denoted a stepped IGU. In this embodiment the exterior pane layer 5c is also the weather shield pane 8 of the weather shield 3, which protects the window portion 4 of the skylight window 1. The exterior pane layer 5c extends slightly further than the frame top edge 10g of the first frame side member and is provided wih a weather shield skirt 9, which extends along the first peripheral side 8a of the weather shield pane 8. The frame top edge 10g is seen to define a periphery at the exterior end of the primary leg 25 of the first frame side member. The weather shield skirt 9 extends further toward the interior than the top surface 10t of the first frame side member 10, whereby it covers the gap inbetween the first frame side member 10 and the first sash side member 14. The weather shield pane 8 and skirt 9 protects the window portion 4 of the skylight window and allows water to drain off the skylight window. Two sealing members 22 are also provided in between the first frame side member 10 and the first sash side member 14.

[0065] The first frame side member 10 and the first sash side member 14 extend in the longitudinal direction along the first peripheral side 5a of the interior pane layer 5d of the IGU. The inwards direction is in FIG. 2 to the right and the outwards direction is to the right.

[0066] Both the first frame side member 10 and first sash side member 14 have a hollow box structure and some or part of the internal cavities thereof may be provided with an insulation material (not shown). The first sash side member 14 is positioned in between the IGU 5 and the first frame side member 10 and has a supporting leg 79. The supporting leg 79 extends in the inward direction below part of the exposed interior major surface 5b of the IGU 5. The supporting leg 79 is thus positioned within the periphery of the interior pane layer 5d. The IGU 5 rests on the supporting leg 79 whereby at least part of the weight of the IGU 5 is carried by the supporting leg. A sealing element may be provied inbetween the supporting leg 79 and the interior pane layer 5c and they may be interconnected by an adhesive. The IGU 5 is also supported by the first sash side member 14 abutting the exterior pane layer 5c, which may similarly be fastened to the first sash side member by way of an adhesive.

[0067] The first frame side member 10 has a primary leg 25 and a secondary leg 26. The primary leg 25 is positioned outwards in relation to the first peripheral side 5a of the interior pane layer 5d, i.e. to the left of the interior pane in the drawing in FIG. 2. The primary leg 25 extends in the height direction and is seen to define the height of first frame side member. The primary leg 25 extends above the interior major surface 5b of the IGU in the height direction. The secondary leg 26 is seen to extend from the primary leg 25 in the inwards direction. The secondary leg 26 extends further inward than the first peripheral side 5a of the interior pane layer 5d and thus the secondary leg extends below a part of the interior major surface 5b of the IGU. The secondary leg is seen to have a bottom surface 10a, which is in abutment with the roof (not shown). The first frame side member 10 also has a cover leg 73, which is positioned inwards in relation to the first peripheral side 5a of the interior pane layer 5d, i.e. to right of the the first peripheral side 5a in FIG. 2. The cover leg 73 is thus opposite the primary leg 25 in relation to the first peripheral edge 5a. The cover leg 73 extends from the secondary leg 26 toward the interior major surface 5b of the IGU, whereby the most exterior surface 73a of the cover leg is adjacent to the interior major surface 5b. When seen from the interior side the sash side member 14 will be entirely hidden behind the cover leg 73.

[0068] The cover leg 73 extends from the secondary leg 26 in the sense that it extends higher than the secondary leg 26 in the height direction.

[0069] A sealing element 76 is provided on the most exterior surface 73a of the cover leg 73 to seal against

the IGU 5. The cover leg 73 extends along the inward side 79b of the supporting leg 79. The most exterior surface 73a of the cover leg is in this case positioned above a most interior surface 791 of the supporting leg, whereby the cover leg 73 covers the supporting leg 79 when seen from the interior of the building. The supporting leg height HL, cover leg height HC, and the frame height HF are also indicated in FIG. 2. In this embodiment the supporting leg height is about 35 % of the total frame height and the cover leg height is about 40 % of the total frame height.

[0070] As shown in FIG. 2, the supporting leg 79 is in the closed position of the skylight window accommodated in a frame spacing 74, the frame spacing being delimited by the primary leg 25, the secondary leg 26 and the cover leg 79. The supporting leg is positioned in between the primary leg 25 and the cover leg. The first frame side member 10 in Fig. 2 is seen to form a substantially U-shaped structure, where the primary leg 25 and the cover leg 73 are the upright legs of the U-shape which are connected by the secondary leg 26.

[0071] In FIG. 2, the cover leg 73 has a lining panel protrusion 10e which forms a lining panel recess together with the cover leg 73. The protrusion 10e is located at the distal end of the cover leg 73. The lining panel protrusion 10e protrudes away from the IGU 5 and has a first surface 10c for abutting a surface of the reveal panel or lining panel 50 so as to position a reveal panel or lining panel (not shown). As the lining panel protrusion 10e is provided on the cover leg 73, a reveal or lining panel will cover the first frame side member 10 to provide a seamless and uniform appareance when viewing through the skylight window 1 from an interior of the building.

[0072] Turning to FIG. 3, which shows a cross-sectional view of a different embodiment of the invention, the cover leg 73 has an inclined inward side surface. Parts of the embodiment of FIG. 3 are identical or similar to the embodiment of FIG. 2 unless otherwise stated in the following. The lining panel protrusion 10e is in this embodiment provided at the proximal end of the cover leg 73, i.e. it is provided at the bottom of the cover leg 73. The lining panel protrusion 10e forms a recess with the secondary leg 26, and the recess is adapted for receiving the lining panel 50. A first surface 10c of the lining panel protrusion is for abutting an inward facing surface of the lining panel 50 in the mounted position of the lining panel.

[0073] The supporting leg 79 extends from the second leg 15 of the first sash side member 14, and the first leg 31 of the first sash side member 14 extends from the opposite end of the of first leg 15 in the outwards direction. The exterior pane layer 5c is attached to the second leg 31 by adhesive means. The first 15, second 31 and supporting leg 79 of the first sash side member 14 is seen to form a stepped structure.

[0074] In FIG. 3 the supporting leg height is about 35 % of the total frame height and the cover leg height is about 40 % of the total frame height.

[0075] Turning to FIG. 4, which shows a cross-sectional view of a different embodiment of the invention, both the supporting leg 79 and the cover leg 73 have a small height compared to the embodiments in Figs 2 and 3. Other parts of the embodiment of FIG. 4 are identical or similar to the previous embodiments unless otherwise stated in the following. The IGU 5 in this embodiment comprises three layers of glazing or pane layers 5c, 5e, 5d in the form of glass panels, positioned at a distance from each other by sealing members 24 located at peripheral sides of the IGU between the layers of glazing to form two spacings 51. These spacings 5l are filled with inert gas to improve insulation. The IGU has an exposed interior major surface 5b facing downwards towards an interior of the building in the shown installed and closed position of the skylight window 1 and an exposed exterior major surface 5g facing in an opposite direction towards an exterior. The exposed interior and exterior major surfaces 5b, 5g of the IGU 5 are substantially parallel with each other and a plane defined by the roof surface 2, i. e. the exterior roof surface level. The interior pane 5d comprises a side surface 5a extending substantially along the first frame and sash side members 10, 14. It should also be noted that the exterior layer of glazing, exterior pane layer 5c, in this embodiment is larger than the other layers 5e, 5d of the IGU 5 and extends farther in the outward direction. This may be denoted a "stepped IGU". The exterior pane layer 5c here serves as a weather shield pane 8 and is provided with the weather shield skirt 9.

[0076] The first frame side member 10 has a total frame height extending in a height direction from a bottom surface 10a of the first frame side member 10 to a top surface 10t of the first frame side member 10. Similarly, the first sash side member 14 having a total sash height in the height direction. The first sash side member 14 further has a supporting leg 79 extending beneath and supporting the exposed interior major surface 5b of the IGU 5. The height of the supporting leg is in this embodiment small compared to that of the hollow box structure used in FIG. 2 and 3. In the embodiments of FIG. 4 the first surface 10c of the lining panel protrusion 10e together with a second surface 10d of the cover leg form the sides of a lining panel recess 10b, which is an empty spacing that accommodates an upper part or upper end of a reveal panel or lining panel 50. As seen in FIG. 4, the entire supporting leg 79 is located within the periphery of the window frame 7 and is substantially solid. The supporting leg 79 constitutes the part of the first sash side member 14 that is located below the exposed interior major surface 5b of the IGU 5 and within the periphery of the interior pane 5d of the IGU 5.

[0077] In FIG. 4 the supporting leg height is about 3 % of the total frame height and the cover leg height is about 20 % of the total frame height.

[0078] Turning to FIG. 5, which shows a cross-sectional view of a different embodiment of the invention, the weather shield pane 8 is here a curved exterior pane layer 5c of the IGU. Parts of the embodiment of FIG. 5

are identical or similar to the previous embodiments unless otherwise stated in the following. In this embodiment the IGU 5 is stepped as the interior pane layer 5d is smaller than the remaining pane layers 5e and 5c. Both the exterior pane layer 5c and what may be denoted an intermediate pane layer 5e extend further than a frame top edge 10g of the first frame side member 10 in the outward direction, and the sealing members 24 are thus not aligned. The exterior pane layer 5c is curved and forms a dome-shape and serves as the weather shield pane 8.

[0079] In FIG. 5 the supporting leg height is about 35 % of the total frame height and the cover leg height is about 40 % of the total frame height.

[0080] Turning to FIG. 6, which shows another embodiment of the invention, wherein the weather shield 3 is provided separately from the IGU 5. Parts of the embodiment of FIG. 6 are identical or similar to the previous embodiments unless otherwise stated in the following. The first frame side member 10 is mirrored compared to the previous embodiments, whereby the outwards direction is to the right and the inwards direction to the left. The first frame side member 10 is in this embodiment not a hollow box structure and is consequently less bulky than the in the previous embodiments. The cover leg 73 is substantially as tall in the height direction as the primary leg 25, i.e. the top surface 73a of the cover leg has substantially the same height position as the top surface 10t of the of the primary leg 25, the top surfaces being the most exterior surfaces of the respective legs. The first frame side member is seen to form a substantially U-shaped structure. The weather shield 3 is here provided separately from the IGU 5, and the weather shield is attached to the first sash side member 14. The cover leg 73 here covers the peripheral side of the skylight window 1 such that the IGU periphery, sash and weather shield periphery is hidden when viewing through the skylight window 1 from an interior of the building. The frame spacing provided in between the cover leg 73 and the primary leg 25 allows for the use of a bulkier sash such as a sash with a hollow box structure. The frame spacing could also house an actuator for moving the sash between the open and the closed position of the skylight window. In FIG. 6 the supporting leg height is about 1 % of the total frame height and the cover leg height is about 80 % of the total frame height.

[0081] Turning to FIG. 7, which shows another embodiment of the invention, wherein the cover leg 73 is provided separately from the first frame side member 10 and is configured to be attached to the secondary leg 26 thereof. Parts of the embodiment of FIG. 7 are identical or similar to the previous embodiments unless otherwise stated in the following. As in FIG. 6 the weather shield 3 is provided separately from the IGU 5. The primary leg 25 of the first frame side member 10 extends above the exterior major surface 5g of the IGU 5. The cover leg 73 is in this embodiment a separate member, i.e. not an integrally formed part of the first frame side member. The cover leg is attached to the secondary leg 26 of the frame side member 10. The cover leg 79 covers the supporting leg 79 of the first sash side member 14 in the closed position of the skylight window 1 so as to hide the supporting leg 73 completely when seen from the interior of the building. The cover leg 73 is seen to provide a barrier for air flow in between the secondary leg 26 and the first sash side member 14. The cover leg 79 and the primary 25 and secondary leg 26 establish a longitudinally extending groove or frame spacing, into which the supporting leg 79 of the sash side member 14 is inserted and embedded when the sash 6 moves to the closed position of the skylight window 1. In this embodiment the exterior surface of the secondary leg is irregular, i.e. it has multiple surfaces positioned differently in the height direction. In this case the cover leg height HL is seen to be the distance between the most exterior surface of the cover leg 73a and an exterior surface of the secondary leg which is adjacent to the cover leg. In FIG. 7 the supporting leg height is about 35 % of the total frame height and the cover leg height is about 40 % of the total frame height.

[0082] While all embodiments shown and described with reference to the drawing have covers leg 73 extending all the way up to the IGU so that a sealing gasket 76 on the cover leg contact the interior major surface 5b of the IGU it is to be understood that embodiments, where the cover leg height HC is smaller so that it does not reach all the way up to the IGU is also within the scope of the invention.

[0083] The following is a list of reference numerals used throughout this specification.

1	Skylight window
2	Roof
3	Weather shield
4	Window portion
5	IGU
5a	First peripheral side
5b	Exposed interior major surface
5c	Exterior pane layer
5d	Interior pane layer
5e	Pane layer
5g	Exposed exterior major surface
6	Sash
7	Frame
8	Weather shield pane
8a	First peripheral weather shield side
9	Weather shield skirt
10	First frame side member
10a	Bottom surface of frame side member
10b	Lining panel recess
10c	First surface
10d	Second surface
10e	Lining panel protrusion
10t	Top surface of frame side member
10g	Frame top edge
13	Second sash side member
14	First sash side member
15	First leg of first sash side member

22	Sealing member
24	Sealing member
25	Primary leg
26	Secondary leg
31	Second leg of the first sash side member
40	Curb flange
50	Reveal panel or lining panel
73	Cover leg
73a	Most exterior surface of cover leg
74	Frame spacing
76	Sealing element
79	Supporting leg
79a	Most interior (top) surface of supporting leg
79b	Inward side of supporting leg
791	Most interior (bottom) surface of the supporting leg
HF	Total frame height
HL	Supporting leg height
HC	Cover leg height

Claims

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

a window frame having four frame side members, an insulating glazing unit IGU (5) having multiple layers of glazing, and a window sash having four sash side members supporting the IGU (5),
the IGU (5) having an exposed interior major surface (5b) for facing an interior of the building in a closed position of the skylight window, the exposed interior major surface (5b) being of an interior pane layer (5d) of the IGU, said interior pane layer (5d) having a periphery and a first peripheral side (5a),
a first of the frame side members (10) being associated with a first of the sash side members (14), said first frame and sash side members (10, 14) extending in a respective longitudinal direction substantially in parallel with the first peripheral side (5a) of the interior pane layer, in a closed position of the skylight window,
a height direction being defined as extending perpendicularly to the interior major surface (5b) of the IGU in the closed position of the skylight window, an outward direction and an inward direction extending from the first peripheral side (5a) in opposite directions, the outward direction extending away from the IGU perpendicularly to both the longitudinal direction and the height direction and, the inward direction being opposite to the outward direction,
the first sash side member (14) comprising a supporting leg (79), the supporting leg (79) extending below and supporting the exposed interior major surface (5b) of the IGU,
the first frame member (10) comprising a primary leg (25) and a secondary leg (26), where, in the closed position of the skylight window, the primary leg (25) is positioned outwards in relation to the first peripheral side (5a) of the interior pane layer (5d) and extends in the height direction, the secondary leg (26) extending in the inward direction below a part of said interior major surface (5b) of the IGU,
first frame side member comprising a cover leg (73), where, in the closed position of the skylight window, the cover leg (73) is positioned inwards in relation to the first peripheral side (5a) of the interior pane layer (5d) opposite to the primary leg (25), and the cover leg (73) extends from the secondary leg (26) in the height direction towards the interior major surface (5b) of the IGU.

2. A skylight window (1) according to claim 1, wherein the primary leg (25) extends above the interior major surface (5b) of the IGU in the height direction, in the closed position of the skylight window.

3. A skylight window (1) according to claim 1 or 2, wherein a frame spacing (74) is delimited by the primary leg (25) in the outward direction, the cover leg (73) in the inward direction and the secondary leg (26) toward the interior.

4. A skylight window (1) according to any one of the preceding claims, wherein the supporting leg (79) of the first sash side member (14) in the closed position of the skylight window is positioned between the primary leg (25) in the outward direction and the cover leg (73) in the inward direction.

5. A skylight window (1) according to any one of the preceding claims, wherein the cover leg (73) extends along an inward side (79b) of the supporting leg (79) of the first sash side member (14).

6. A skylight window (1) according to any one of the preceding claims, wherein the first frame side member (10) and/or the first sash side member (14) comprise(s) a hollow box structure, preferably made of an extruded or pultruded plastic material such as a polyvinylchloride plastic.

7. A skylight window (1) according to any one of the preceding claims, where a most exterior surface (73a) of the cover leg (73) is positioned above a most interior surface (791) of the supporting leg (79) in the height direction, in the closed position of the skylight window.

8. A skylight window (1) according to any one of the preceding claims, where a most exterior surface

(73a) of the cover leg (73) is located adjacent to the interior major surface (5b) of the IGU in the height direction, such that a distance in the height direction between the most exterior surface (73a) of the cover leg and the interior major surface (5b) of the IGU in the closed position of the skylight window, is less than twice a height of the interior pane layer (5d), preferably the most exterior surface (73a) of the cover leg (73) or a sealing element (76) provided thereon is in abutment with the interior major surface (5b) of the IGU in the closed position of the skylight window.

9. A skylight window (1) according to any one of the preceding claims, wherein an inward side surface of the cover leg (73) is inclined in relation to the height direction, such that a proximal end of the inward side surface is further outward than a distal end of the inward side surface, the distal end being the end of the inward side surface which is closest to the IGU.

10. A skylight window (1) according to any one of the preceding claims, wherein the cover leg comprises a lining panel protrusion (10e).

11. A skylight window (1) according to any one of the preceding claims, wherein a cover leg height (HC) is greater than a supporting leg height (HL).

12. A skylight window according to any of the preceding claims, further comprising a weather shield (3) attached to the sash so as to protect a window portion (4) of the skylight window, the window portion comprising the sash, the frame, and the IGU, the weather shield (3) comprising a transparent or translucent weather shield pane (8).

13. The skylight window (1) according to any one of the preceding claims, wherein the exterior pane layer (5c) extends further in the outward direction than the interior pane layer (5b) of the IGU.

14. The skylight window (1) according to claim 12 and 13, wherein the weather shield pane (8) is an exterior pane layer (5c) of the IGU.

15. The skylight window according to any one of claims 12 to 13, wherein the weather shield pane is provided separately from the IGU (5).

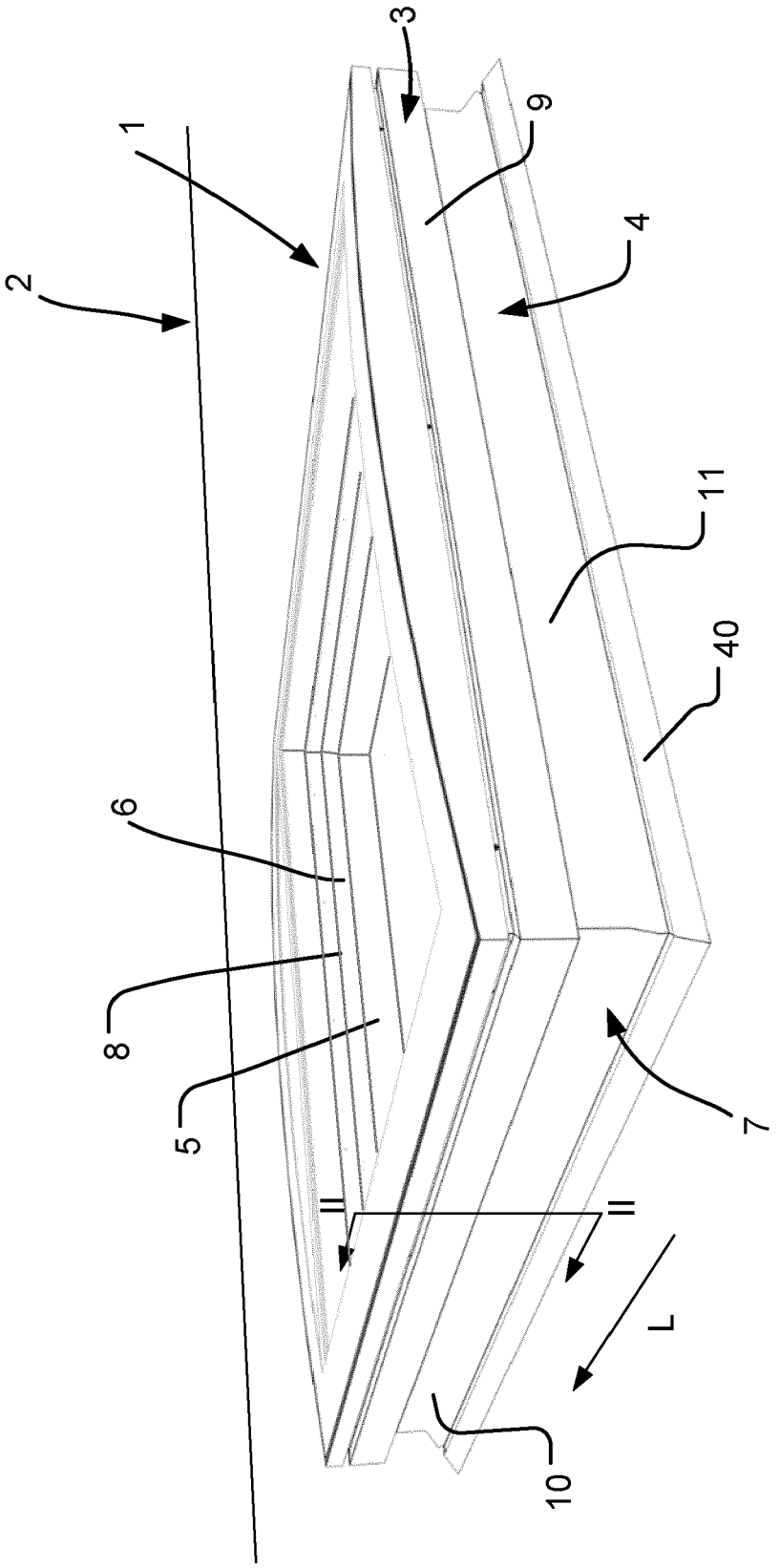

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Fig. 1

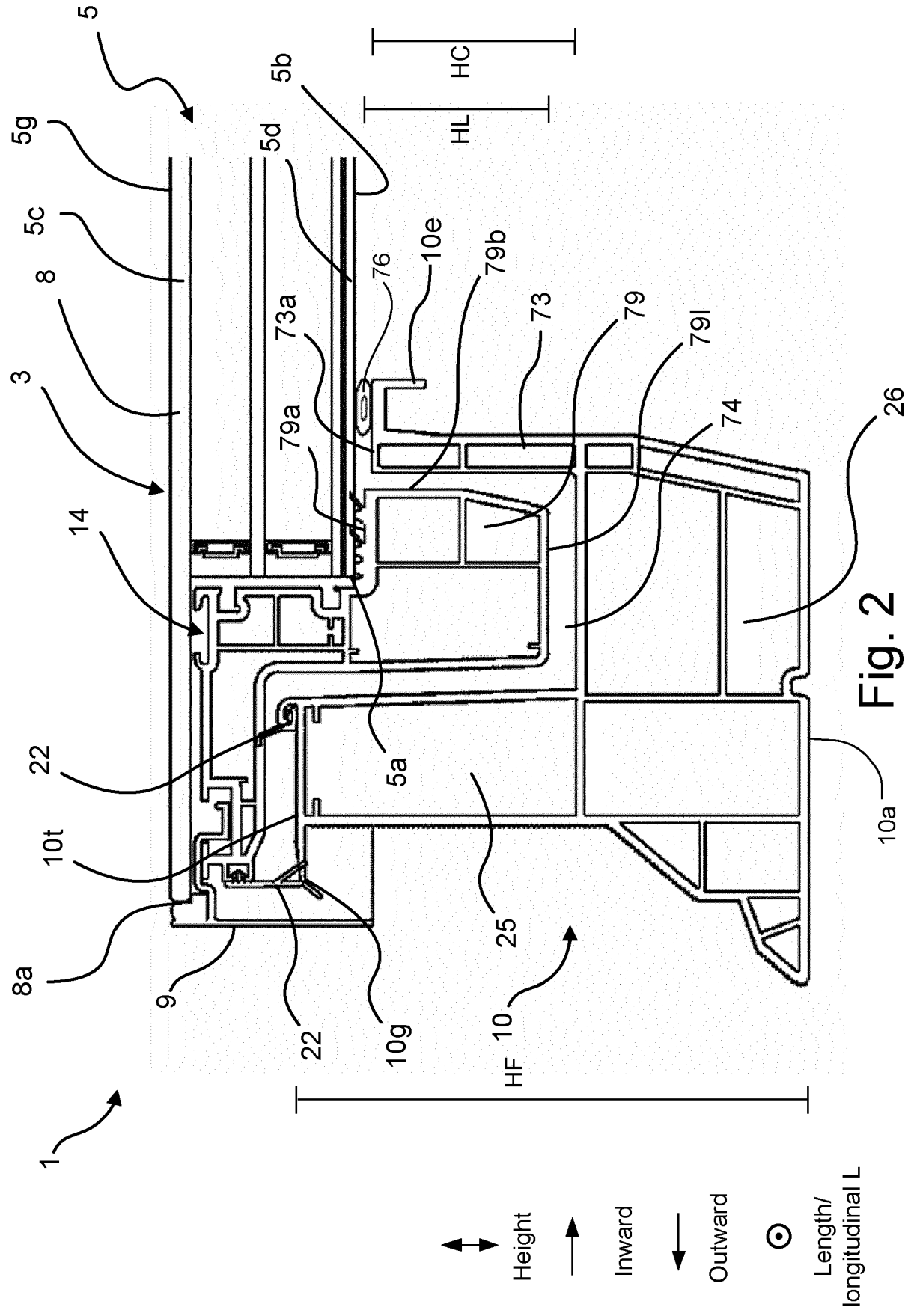
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Fig. 2

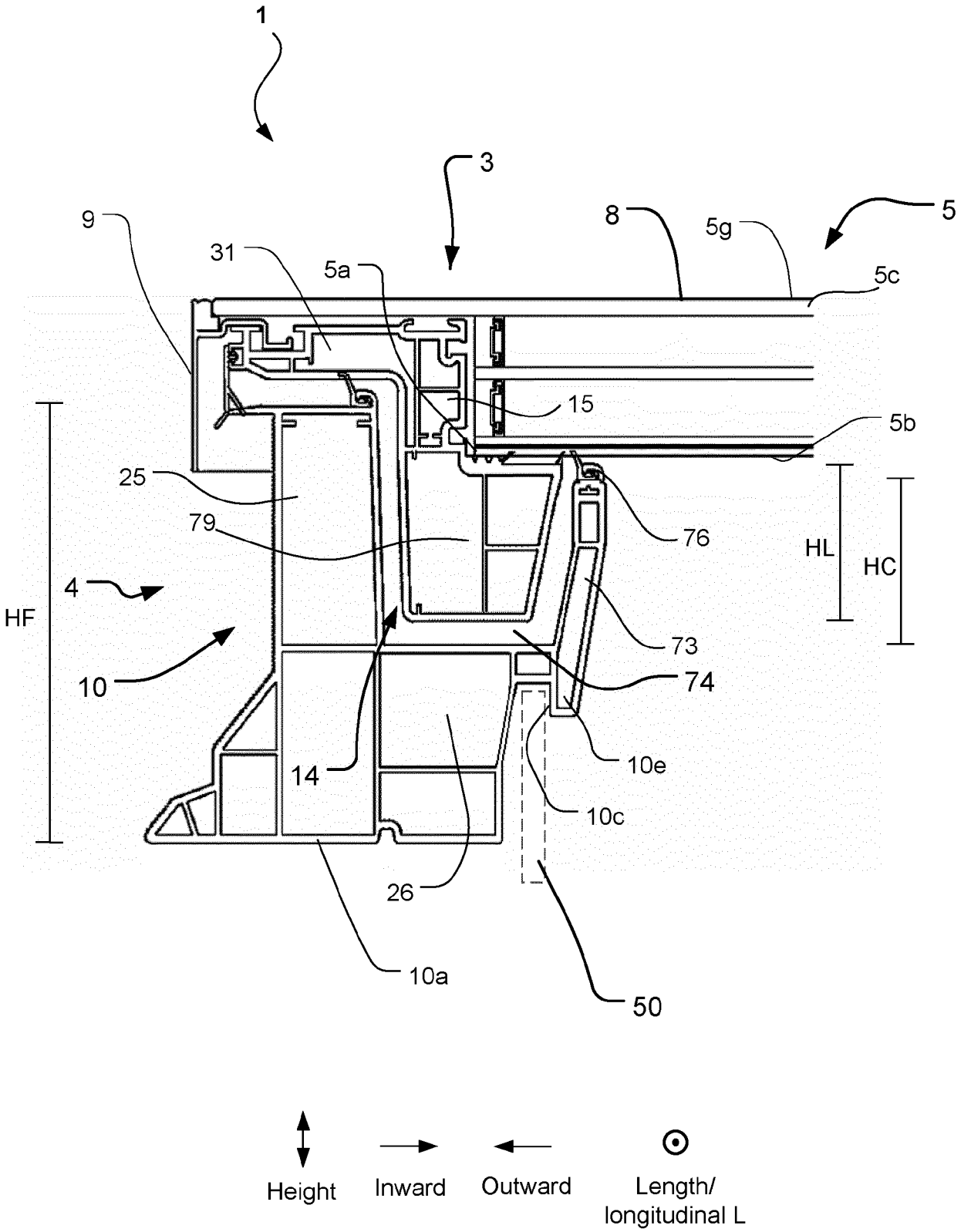
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Fig. 3

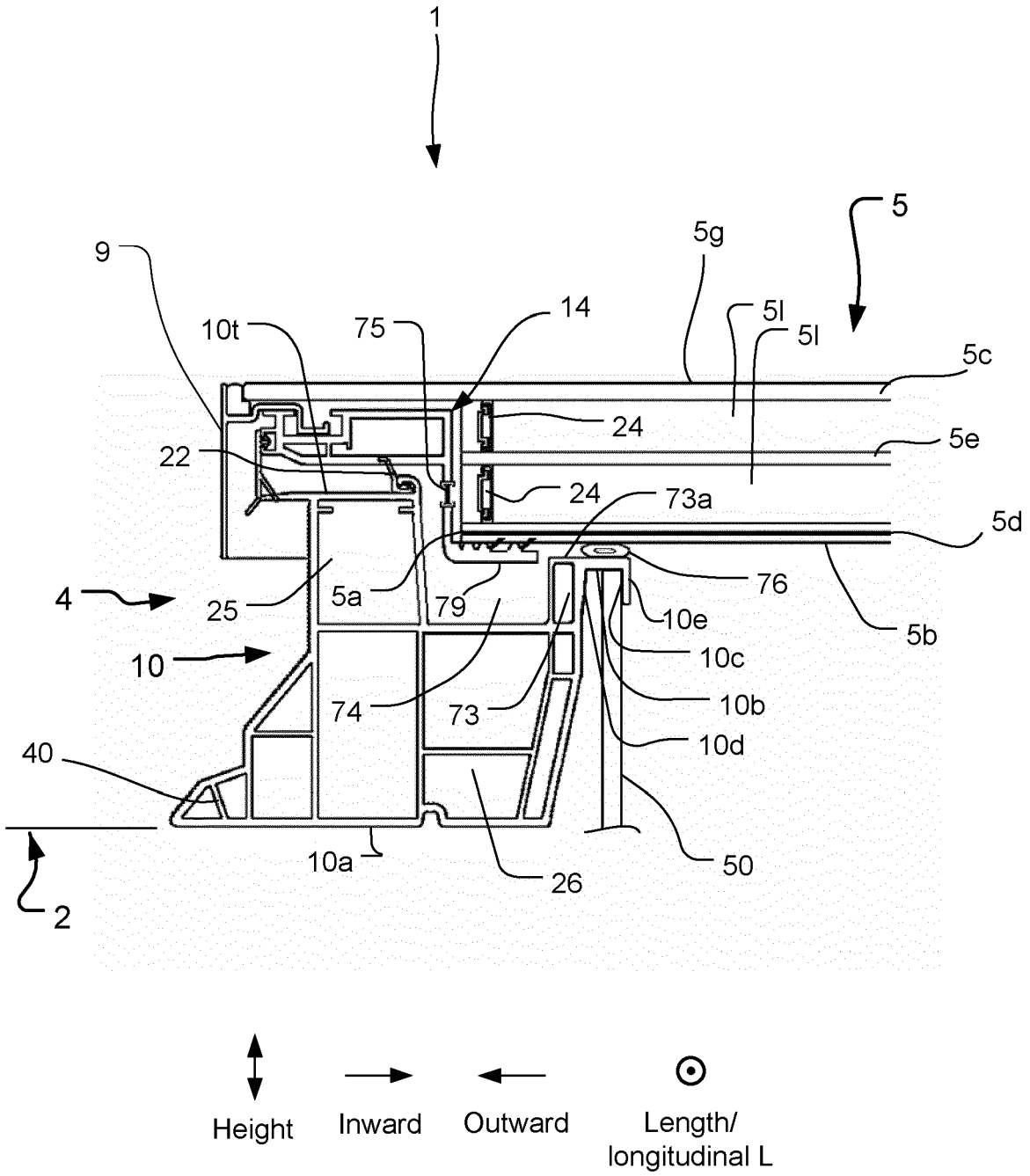
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Fig. 4

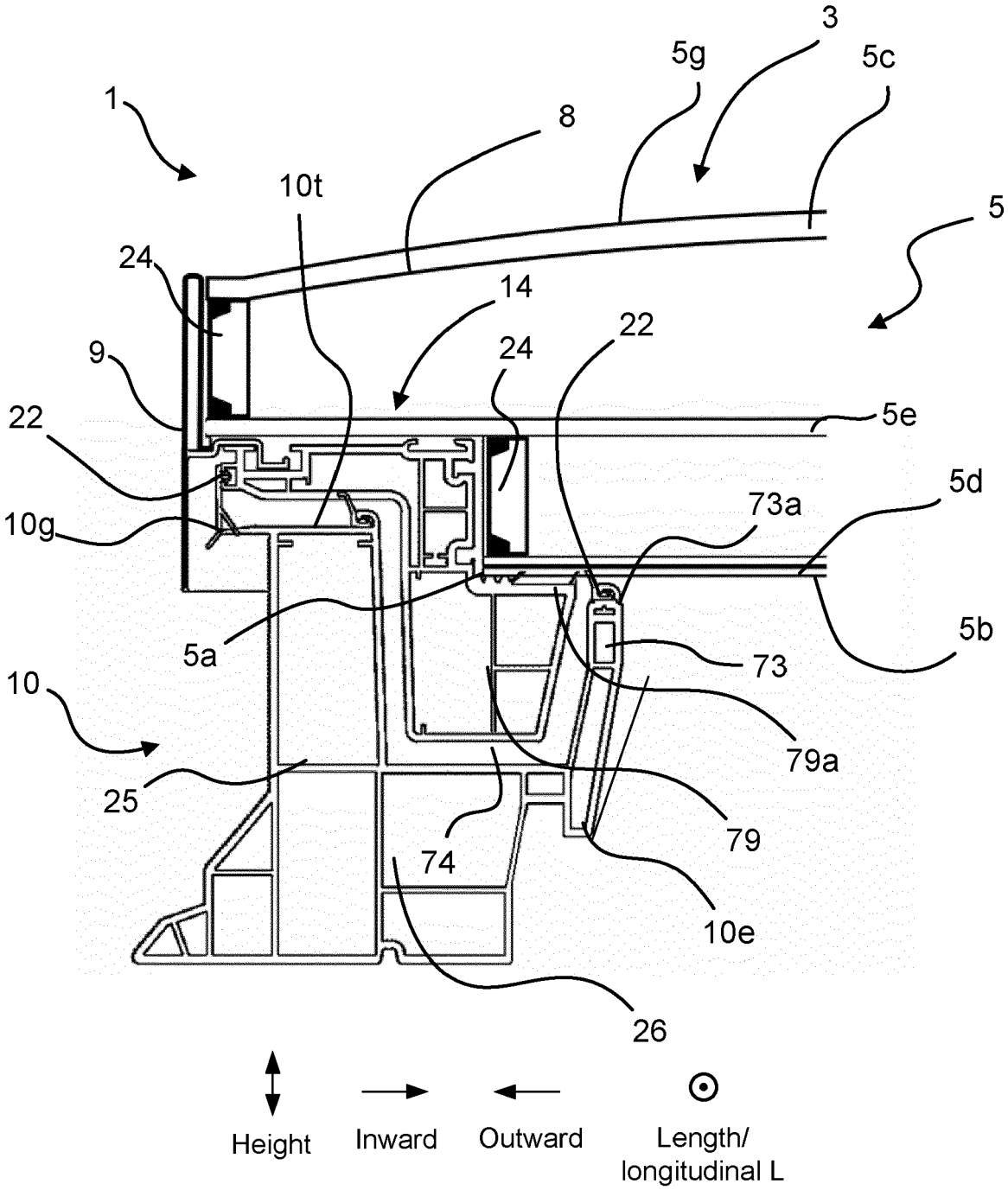
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Fig. 5

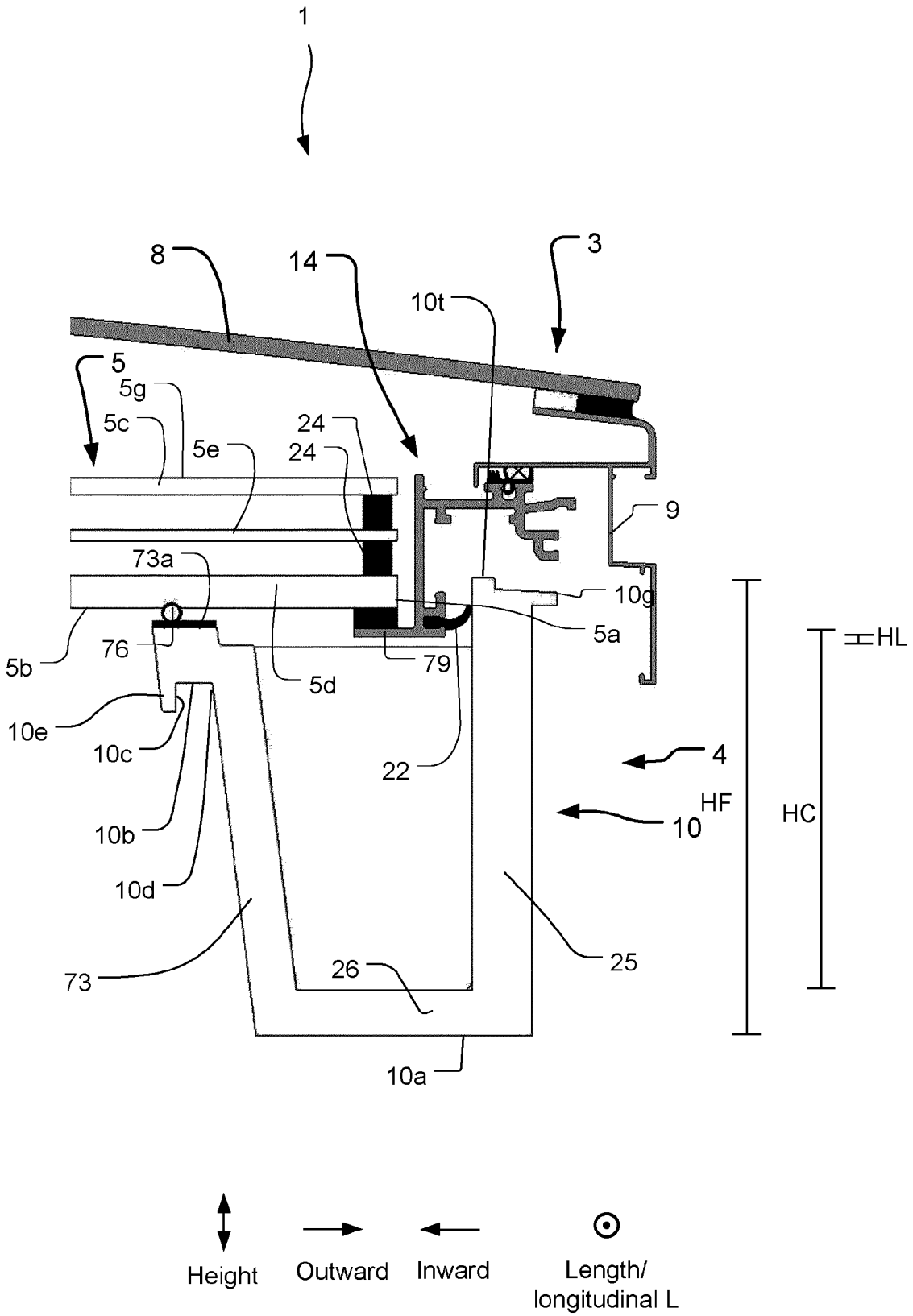
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Fig. 6

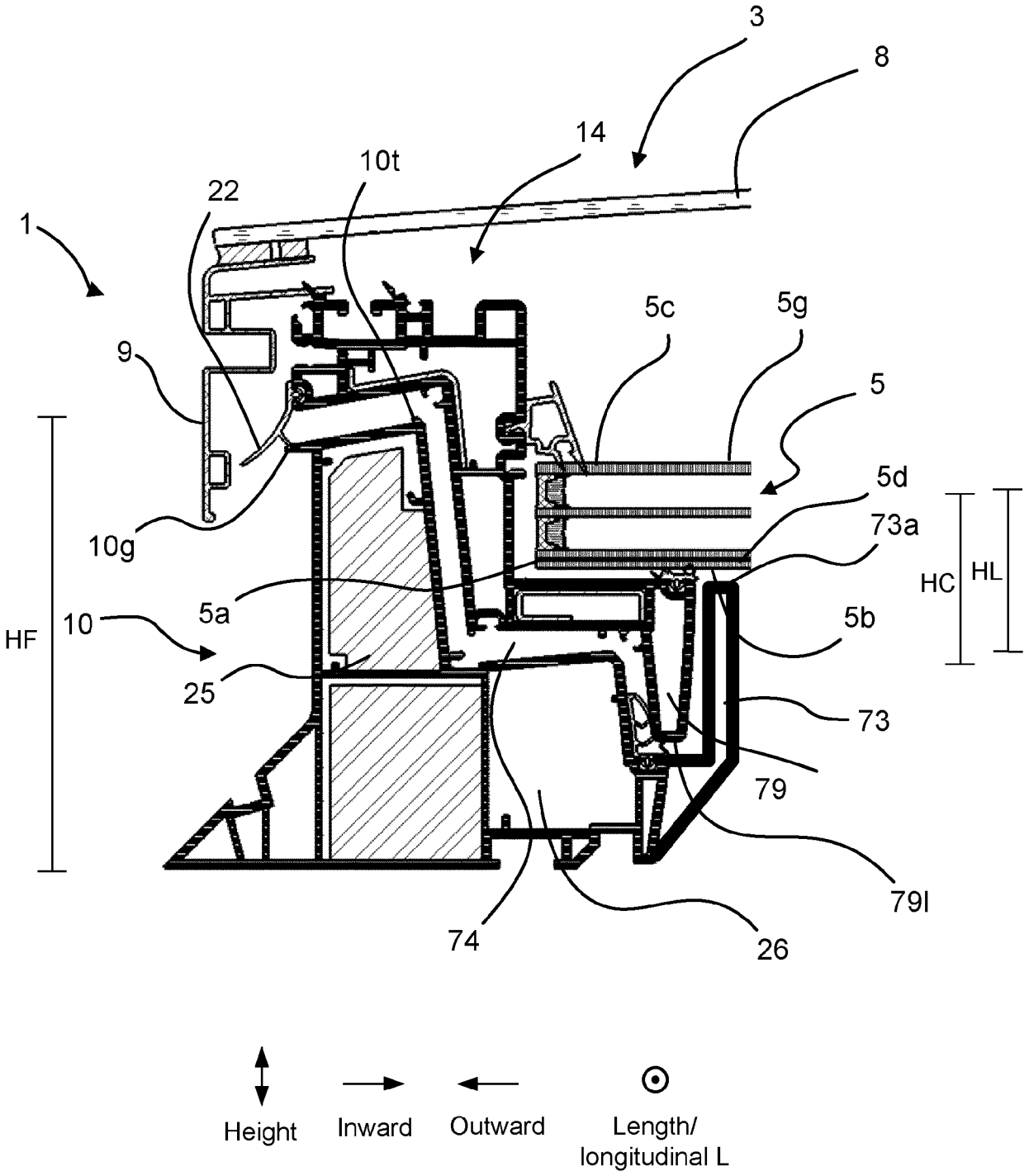
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Fig. 7

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 20 21 0444

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 3 101 195 A1 (FAKRO PP SP Z O O [PL]) 7 December 2016 (2016-12-07) * figure 1 *	1-3,6, 12-14	INV. E04D13/03 ADD. E04D13/035
X	EP 3 396 100 A1 (FLOREK RYSZARD [PL]) 31 October 2018 (2018-10-31) * figures 2-3 *	1-3,6, 12-15	
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