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(54) **A SKYLIGHT WINDOW**

(57) 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, a weather shield, and an IGU, a first sash side member having a total sash height, and said first frame side member having a total frame height, in the height direction, said first frame side member comprising an interior part, the interior part in the closed position of the skylight window extending below the exposed interior major surface of the IGU and being located within the periphery of the interior pane, said interior part of the first frame side member having a total height in the height direction, and said first sash side member comprising a supporting leg extending beneath and supporting the exposed interior major surface of the IGU, the supporting leg having a total height in the height direction.

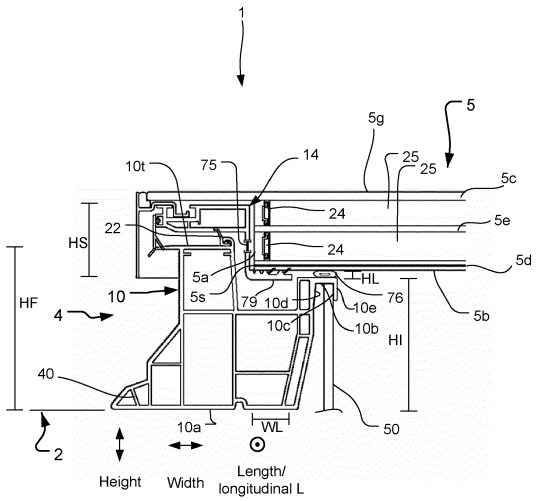

Fig. 2

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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,
a window sash having four sash side members supporting an 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,
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 a respective first peripheral side of the IGU in a closed position of said skylight window,
the IGU having an exposed interior major surface for facing an interior of the building in the closed position of the skylight window, the exposed interior major surface being of an interior pane of the IGU, said interior pane having a periphery, a height direction extending perpendicularly to the interior major surface in the closed position of the skylight window,
the IGU further having an exposed exterior major surface facing in an opposite direction towards an exterior in the closed position of the skylight window, said first sash side member having a total sash height, and said first frame side member having a total frame height, in the height direction,
said first frame side member comprising an interior part, the interior part in the closed position of the skylight window extending below the exposed interior major surface of the IGU and being located within the periphery of the interior pane, said interior part of the first frame side member having a total height in the height direction, and
said first sash side member comprising a supporting leg extending beneath and supporting the exposed interior major surface of the IGU, the supporting leg having a total height in the height direction.

[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 have typically comprised box structures consisting of hollow spacings as an attempt to provide structural support and thermal insulation through cavities. A typical example of such structures is presented in US2010269426. Windows comprising such sashes have typically a quite rough appearance, while limiting the view. What is more, these windows are usually associated with high materials and processing costs in terms of manufacturing the window sash.

[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 in which the insulation properties are improved.

[0008] Furthermore, it may be an object of the invention to provide a skylight window in which a view through the window is improved.

[0009] According to the invention, one or more of these objects may be met by a skylight window according to the introduction and this disclosure.

[0010] In this way the IGU may be mounted lower in the skylight window, i.e. closer to a bottom of the window frame and closer to the interior of the building. A lower mounting of the IGU may increase the relative proportion the IGU takes up of a thermal energy exchange interface between the building and the skylight. The IGU typically has better insulation properties than other components of the skylight window. Therefore, increasing a relative proportion of this thermal energy exchange interface may improve the insulation properties of the skylight window as a whole. Furthermore, a high influx of light and good view through the skylight window may also be achieved as less light and/or view obstructing elements of the skylight window may be positioned between the IGU and the bottom of the window frame.

[0011] A small sash and/or interior part height may further provide more space for an IGU with a larger height, potentially with several or thicker panes of glazing or a higher gas-filled spacing between the panes, which may further improve insulation properties of the skylight window. The insulation properties may also be improved as less thermally conducting sash or frame material may need to be provided. This may also allow for a more compact skylight window, i.e. with a lower total height.

[0012] Throughout this disclosure, the term "total sash height" may be understood as a total height of the sash

in the height direction from a lowermost point of the sash to an uppermost point of the sash. Similarly, the term "total height of the supporting leg" may be understood as a total height in the height direction of the supporting leg from a lowermost point of the supporting leg to an uppermost point of the supporting leg. The "total frame height" may be understood as a total height in the height direction of the frame from a lowermost point of the frame to an uppermost point of the frame. The "total height of the interior part" may be understood as a total height in the height direction of the interior part from a lowermost point of the interior part to an uppermost point of the interior part. The respective lowermost point may be located on or constitute a bottom surface of the respective feature. Similarly, the respective uppermost point may be located on or constitute a top surface of the respective feature.

[0013] The term "total height" can alternatively or additionally be denoted a "largest height". The term "periphery" may be understood as an outer perimeter.

[0014] In an embodiment, the total height of the supporting leg is 40% or less of the total sash height.

[0015] In a development of the previous embodiment, the total height of the supporting leg is 20% or less of the total sash height.

[0016] A total height of the supporting leg of the first sash side member in the height direction may be less than 35%, less than 30%, less than 25%, less than 20%, less than 15%, less than 10%, less than 5%, less than 4%, less than 3.5%, less than 3.16%, less than 2.5%, less than 2%, less than 1.5%, less than 1% less than 1%, less than 0.5%, less than 0.1%, or less than 0.05% of the total sash height.

[0017] The ratio of total supporting leg height to total frame height may be 1:2.25 or more, 2:5 or more, 1:3 or more, 1:4 or more, 1:5 or more, 1:6 or more, 1:7 or more, 1:8 or more, 1:9 or more, 1:10 or more, 1:20 or more, 1:30 or more, or 1:31.6 or more. In this context a ratio of e.g. 1:2 or more means that the total frame height is at least 2 times the total supporting leg height.

[0018] The supporting leg of the first sash side member may have a height in the height direction of less than 8 cm, less than 7 cm, less than 6 cm, less than 5 cm, less than 4 cm, less than 3 cm, less than 2 cm, less than 1 cm, or less than 0.5 cm.

[0019] In an embodiment, the total height of the interior part is 25% or less of the total frame height.

[0020] In a development of the previous embodiment, the total height of the interior part is 15% or less of the total frame height.

[0021] The total height of the interior part may be less than 24%, less than 23%, less than 22%, less than 21%, less than 20%, less than 19%, less than 18%, less than 17%, less than 16%, less than 15%, less than 14%, less than 13%, less than 12%, less than 11%, less than 10%, less than 9%, less than 8%, less than 7%, less than 6%, less than 5%, less than 4%, less than 3%, less than 2%, less than 1%, or less than 0.5% of the total frame height.

[0022] The supporting leg may extend along an entire peripheral side of the IGU and/or along a part of a peripheral side of the IGU. The supporting leg may have a cross-section that is substantially identical to a cross-section of one of or all of further legs of the first sash side member. Alternatively, a cross-section of the supporting leg may be different from one of or all of further legs of the first sash side member.

[0023] The supporting leg may be of a same length and width as one of or all of further legs of the first sash side member. The respective longitudinal direction in which the first sash and frame side members extend, and which is substantially parallel with the first peripheral side of the IGU in the closed position of the skylight window, may define a length direction. A width direction may be defined as a direction that is substantially perpendicular to the height and longitudinal directions.

[0024] The supporting leg may extend beneath only a part of the exposed interior major surface of the IGU. The supporting leg may extend less than 50%, less than 40%, less than 35%, less than 30%, less than 25%, less than 20%, less than 15%, less than 10%, or less than 5% of a total width of the exposed interior major surface in the width direction. A total width of the exposed interior major surface may be a total width extending in the width direction between two points of the exposed interior major surface that have the largest distance between them in the width direction.

[0025] 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.

[0026] The window frame members may generally define an inner opening, each frame member having an inner side facing said inner opening and an outer side facing in an opposite direction of the inner side and away from the inner opening, an interior side for, in an installed position, facing an interior of the building, and an exterior side for facing in an opposite direction of the interior side and away from the interior of the building.

[0027] An outer surface of the first frame side member may be flat and allow the attachment of a curb flange. The curb flange may be a detachably attachable curb flange. The term "detachably attachable" may be understood as the curb flange being attachable and detachable without causing substantial and/or permanent damage to the curb flange or skylight window.

[0028] The entire supporting leg may generally be located inside of the outer and/or the exterior side of the first frame side member. Furthermore, the entire supporting leg may be located inside of the outer sides of the frame side members. The supporting leg may be substantially plate-shaped. The supporting leg may be substantially box-shaped.

[0029] The IGU (Insulated Glazing Unit) 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 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 be a lower major surface of a lowermost of the layers of glazing. Sealing and/or supporting 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.

[0030] The interior pane of the IGU may be a glazing pane. The interior pane may define a bottom of the IGU. The interior pane may constitute a layer of glazing of the IGU. The interior pane may be of substantially the same size as one or more or all other layer(s) of glazing of the IGU. The interior pane or an exterior pane of the IGU may be of a larger size than one or more of the other layer(s) of the glazing of the IGU. The interior pane may be substantially identical to one or more of the other layer(s) of glazing of the IGU. The interior pane may be different to one or more of the other layer(s) of glazing of the IGU. The interior pane may comprise a first side surface extending substantially along the first frame and sash side members. The supporting leg may extend from the first side surface of the interior pane. A total length of the exposed interior major surface may be a total length extending in a lateral direction from the first side surface and to a second opposite side surface of the interior pane or in the width direction.

[0031] The supporting leg may include or consist of all parts of the sash extending beneath the exposed interior major surface of the IGU in the height direction.

[0032] The first sash side member may comprise a second leg. The second leg may extend substantially in the height direction. The second leg may be substantially plate-shaped and/or substantially solid. The supporting leg may extend from the second leg. The supporting leg may extend from a bottom end of the second leg. The supporting leg may extend in the lateral direction from the second leg. The supporting leg may extend substantially perpendicularly from the second leg.

[0033] The sash may be connected to the window frame via one or more hinges. The one or more 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.

[0034] The term "substantially solid" is understood as there being no holes and/or hollow spacings comprised in the material structure and/or holes or cavities on the surface.

[0035] The IGU may comprise an exterior-most layer of glazing of the skylight window. The exterior-most layer of glazing of the skylight window may be an interior or top pane of the IGU. The exposed exterior major surface of the IGU may be the exterior-most layer of glazing of the skylight window. The exterior-most layer of glazing may be substantially identical to the one or more or all other layer(s) of glazing of the IGU.

[0036] 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 glass fibre reinforced PUR, pultruded polymers, polyester, and/or glass fibre and/or wood and/or metal such as steel or aluminium or composites or combinations thereof.

[0037] 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.

[0038] 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 win-

dow 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.

[0039] 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.

[0040] In an embodiment, the skylight window may further comprise a weather shield attached to the sash so as to protect a window portion of the skylight window, the window portion comprising the sash, the frame, and the IGU, the weather shield comprising a weather shield pane. 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 potential gap between the frame and the roof structure. The weather shield may be mounted on the window portion to protect it from the elements and preventing rain and other precipitation from entering into gaps or slots in the roof or the window portion.

[0041] 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 one or more or 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 weather shield pane that may be of glass, hardened or clear polymer. The weather shield pane may be considered as a transparent cover member for protection a window portion. The weather shield pane may comprise only one single layer of glazing, no further layers of glazing besides those of the weather shield potentially being provided in the skylight window. The weather shield pane may be dome-shaped or substantially flat. The weather shield pane may be of glass or of polymer.

[0042] In a development of the previous embodiment, the weather shield is without a sealed gas-filled spacing between the weather shield pane and the IGU.

[0043] In an embodiment, in the closed position of the skylight window, an entirety of the supporting leg is located within a periphery of the window frame. The periphery may be understood as the outer perimeter of the window frame. In this way, the skylight window may be more compact. Additionally or alternatively, the supporting leg may constitute an entirety of a part of the first sash side member located within the periphery of the interior pane of the IGU.

[0044] A further effect may be to allow the supporting leg to be more specifically tailored in terms of structural and material properties to the particular environment and stresses it will be subjected to in use. A majority of the first sash side member may extend above the exposed interior major surface.

[0045] In an embodiment, the supporting leg constitutes an entirety of a part of the first sash side member located below the exposed interior major surface of the IGU.

[0046] In a development of the previous two embodiments, supporting leg has a total supporting leg width extending in a width direction that is substantially perpendicular to the longitudinal direction and to the height direction, and wherein a ratio of the total height of the supporting leg to the total supporting leg width is 1:2 or more.

[0047] The supporting leg may have a total supporting leg height to supporting leg width ratio equal to or more than 1:2, equal to or more than 1:3, equal to or more than 1:4, equal to or more than 1:5, equal to or more than 1:6, equal to or more than 1:7, equal to or more than 1:8, equal to or more than 1:9, equal to or more than 1:10, equal to or more than 1:15, equal to or more than 1:20, equal to or more than 1:25, equal to or more than 1:50, equal to or more than 1:75, or equal to or more than 1:100.

[0048] In this context a ratio of equal to or more than e.g. 1:2 means that the supporting leg width is at least 2 times the total supporting leg height. In an embodiment, the supporting leg is the part of the first sash side member within the periphery of the interior pane of the IGU.

[0049] In an embodiment, the supporting leg is substantially solid. This may have the technical effect of providing a high-strength supporting leg. A further or alternative effect may be that the supporting leg has a low total height.

[0050] In an embodiment, said supporting leg has a

total supporting leg width extending in a width direction that is substantially perpendicular to the longitudinal direction and to the height direction, and wherein a ratio of the total supporting leg width to total sash height ratio is 1:1 or more.

[0051] This may have the technical effect of keeping the sash height low whilst providing good support of the IGU. The supporting leg width to total sash height ratio may be equal to or more than 1:2, equal to or more than 1:3, equal to or more than 1:4, equal to or more than 1:5, equal to or more than 1:6, equal to or more than 1:7, equal to or more than 1:8, be equal to or more than 1:9, equal to or more than 1:10, equal to or more than 1:11, equal to or more than 1:12, equal to or more than 1:13, equal to or more than 1:14, equal to or more than 1:15, equal to or more than 1:16, equal to or more than 1:17, equal to or more than 1:18, equal to or more than 1:19, or equal to or more than 1:20.

[0052] In this context a ratio of equal to or more than e.g. 1:2 means that the total supporting leg width is at least 2 times the total supporting leg height.

[0053] In an embodiment, the first frame side member further 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 a 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.

[0054] The lining panel protrusion may comprise a first surface for abutting an inner surface of said reveal panel or lining panel. The first surface may be located farther away from the side surface of the interior pane than the supporting leg. The first surface may be located more than 5 mm, more than 10 mm, more than 15 mm, more than 20 mm, more than 25 mm, or more than 30 mm farther away from the side surface of the interior pane than the supporting leg.

[0055] 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.

[0056] In an embodiment, the skylight window further comprises a sealing element for abutting the first sash side member in the closed position of the skylight window, said sealing element being located on a side of the first frame side member that faces the sash in the closed position of the skylight window, wherein

the first sash side member is abutting said sealing element in the closed position of the skylight. This may have the effect of providing a good sealing of the skylight window.

[0057] In an embodiment, the first sash side member further comprises 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 first sash side member. The one or more thermal breaks may be an insert or a joint joining parts of the sash. The insert or joint may be a separate part to the first sash side member. The insert or joint may inserted into the first sash side member. The insert or joint may be attached between parts of the first sash side member. Likewise, the other sash side members may comprise one or more thermal breaks. 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 one or more thermal breaks may substantially consist of or comprise a polymer and/or foam.

[0058] In an embodiment, the interior pane comprises a side surface extending substantially along the first frame and sash side members, and wherein in the closed position of the skylight window, the first frame side member is located at least as far as or farther than the supporting leg from the side surface of the interior pane. This may contribute to covering and hiding the supporting leg and/or first sash side member.

[0059] In an embodiment, the total sash height is 70% or more of the total frame height. The total sash height may be more than 75%, more than 80%, more than 85%, more than 90%, more than 95%, more than 100% or more than 105% of the total frame height.

[0060] In an embodiment, the first frame side member comprises a sealing surface facing the exposed interior major surface of the IGU, said sealing surface having a sealing element for abutting the exposed interior major surface of the IGU in the closed position of the skylight window, wherein a lower surface of the supporting leg is positioned substantially at the same height as the sealing surface or above the sealing surface in the height direction. The lower surface of the supporting leg may be an interior surface of the supporting leg and/or may face towards the interior of the building and/or in substantially the same direction as the exposed interior major surface of the interior pane of the IGU. The lower surface may be a lowermost surface of the supporting leg in the height direction in the closed position of the skylight window. The sealing surface may be located within the periphery of the interior pane.

[0061] In an embodiment, the skylight window is installed in a flat roof, which may have an inclination equal to or less than 5 degrees relative to horizontal.

[0062] In an alternative embodiment the skylight is installed in an inclined roof, with an inclination equal to or more than 15 degrees relative to horizontal.

[0063] In another embodiment the skylight is to be in-

stalled in a roof with an inclination between 5 and 15 degrees relative to horizontal.

[0064] 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, on which:

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 without a weather shield,
FIG. 3 shows a similar cross-sectional view of a skylight window according to the present invention, with a total sash height HS of more than 79% of a total frame height HF,
FIG. 4 shows a similar cross-sectional view of a skylight window according to the present invention where a lower surface of the supporting leg is located above a sealing surface of the first frame side member,
FIG. 5 shows a similar cross-sectional view of a skylight window according to the present invention comprising a substantially flat weather shield pane, and
FIG. 6 shows a similar cross-sectional view as in FIG. 2 of skylight window according to the present invention comprising an inclined, flat weather shield pane,
FIG. 7 shows a perspective view from above of an embodiment of the skylight window 1 according to the present invention installed in a roof.

[0065] Similar features in each of the figures have been given the same reference numbers unless otherwise specified.

[0066] 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. 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.

[0067] 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. 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 weather shield 3 is a weather shield without a sealed gas-filled spacing between the weather shield pane 8 and the IGU 5.

[0068] 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 surface. 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.

[0069] 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.

[0070] A cross-sectional view of the invention is shown in Figs. 2-5, the cross-sectional view is along line II-II in Fig 1 and shows the elements of the skylight window. Although only a cross-section of a side of the skylight window is shown in Figs 2-5, the embodiments shown in Figs 2-5 are generally similar to the embodiment shown in Fig. 1, e.g. in that they comprise four frame and sash side members, an IGU, and a weather shield (with the exception of the embodiment shown in Fig. 2 which does not comprise a weather shield) positioned in a manner similar to what is shown in Fig. 1.

[0071] Turning to FIG. 2, which shows another embodiment of the skylight window without a weather shield, the IGU 5 in this embodiment comprises three layers of glazing 5c, 5e, 5d in the form of glass panels, positioned at a distanced 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 further 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 major surface 5b is of an interior pane 5d of the IGU 5. 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 5s extending substantially along the first frame and sash side members 10, 14. It should also be noted that the top layer of glazing 5c in this embodiment is larger than the other layers of glazing 5e, 5d of the IGU 5 and extends farther in the width direction, the layers of glazing however, may be of equal size in other embodiments.

[0072] The frame 7 of FIGS 1 and 2, respectively, comprises four frame side members of which two 10, 11 are visible in FIG. 1, and one 10 is visible in FIG. 2. Each frame side member is associated with one of four corresponding sash side members of which one 14 is visible in FIG. 2.

[0073] The four frame side members made from PUR (polyurethane) form a substantially rectangular shape and, similarly, the four sash side members form a sub-

stantially rectangular shape. In the embodiment of FIG. 2, 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 5, so that the sash fits into the frame 7 and the frame 7 encloses the sash 6 in the shown closed position of the skylight window 1.

[0074] The four sash side members made of pultruded PUR support the IGU 5 which has multiple panes or layers of glazing 5c, 5d, 5e (the interior pane constitutes a layer of glazing of 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 (pivotable) 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. The first sash side member 14 further has a sealing element 76 for abutting the exposed interior major surface 5b of the IGU 5 in the closed position of the skylight window 1.

[0075] The first frame side member 10 is associated with the first sash side member 14, and both of these extend in a respective longitudinal direction L substantially in parallel with a respective first peripheral side 5a of the IGU 5 (i.e. into the drawing) in a closed position of the skylight window 1. In this closed position of the skylight window 1, the first frame side member 10 is located farther from the side surface 5s of the interior pane 5d than the supporting leg 79. This helps covering and hiding the supporting leg 79 and first sash side member 14 when viewing through the window 1 from the interior of a building, thus providing a clean and aesthetic appearance.

[0076] The first frame side member 10 has a total frame height HF 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, the height direction being substantially perpendicular to at least one of the major surfaces 5b, 5g of the IGU 5 in the shown closed position of the skylight window 1. This definition of height direction will be used throughout this description unless stated otherwise. The first frame side member 10 further has an interior part 78 extending below the exposed interior major surface 5b of the IGU and being located within the periphery of the interior pane 5d, said interior part having a total height HI in the height direction. Similarly, the first sash side member 14 having a total sash height HS 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 total height of the supporting leg 79 is denoted HL. The total height of the supporting leg HL in the embodiment show in FIG. 2 is 10% of the total frame height HF.

[0077] The first frame side member 10 further comprises a lining panel protrusion 10e located lower than the exposed interior major surface 5b of the IGU 5 in the height direction. 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 50 as shown in FIG. 2. The reveal or lining panel 50 covering the first frame side member 10 to provide a seamless and clean aesthetic when viewing through the skylight window 1 from an interior of the building.

[0078] In all of the embodiments of FIGS. 2-5, in the closed position of the skylight window, the first surface 10c of the respective protrusion 10e of each embodiment in a lateral direction extending along the exposed interior major surface 5b of the IGU 5 is positioned farther away from the side surface 5s of the interior pane 5d than the supporting leg 79.

[0079] In the embodiments of FIGS. 2-5 the first surface 10c of the lining panel protrusion 10e together with a second surface 10d of the first frame side member 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 in the installed position of the skylight window 1. It should be noted that the skylight window in other embodiments does not comprise a lining panel recess, but may just comprise a lining panel protrusion 10e.

[0080] Furthermore, in the embodiment shown in FIG. 2 a sealing member 22 for abutting the first sash side member 10 in the closed position of the skylight window 1 is located on a side of the first frame side member 14 that faces the sash 6 and abuts the first sash side member 14 in the closed position of the skylight window 1.

[0081] As seen in FIG. 2, 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. The supporting leg 79 also has a width extending in the shown width direction which is perpendicular to the height direction and to the longitudinal direction L and has a ratio of the total height of the supporting leg HL to the total supporting leg width WL of 1:5 and a ratio of the total supporting leg width WL to total sash height HS ratio of 1:2. The total sash height HS is 45% of the total frame height HF and the total height of the interior part HI is 89% of the total frame height HF. The total height of the supporting leg HL in the embodiment shown in FIG. 2 is 7% of the total frame height HF.

[0082] FIG. 3 shows another embodiment of a skylight window 1 according to the invention with a dome-shaped weather shield 3, but it should be noted that this may alternatively be shaped similarly to the weather shield pane 8 and weather shield 3 shown in FIG. 1. In this embodiment, the total sash height HS is 79% of the total frame height HF and the total height of the interior part HI is 24% of the total frame height HF. The total height of the supporting leg HL is 10% of the total frame height HF. The supporting leg 79 has a ratio of the total height of the supporting leg HL to the total supporting leg width WL of 1:4 and a ratio of the total supporting leg width WL to total sash height HS of 1:8. The supporting leg 79

further comprises a sealing element 14b for sealing against the exterior major surface 5g of the IGU 5 and a sealing element 14a for sealing between the supporting leg 79 and the first frame side member 10.

[0083] FIG. 4 shows another embodiment of a skylight window 1 according to the present invention where the first frame side member 10 further comprises a sealing surface 10s facing the exposed interior major surface 5b of the IGU 5, said sealing surface 10s having a sealing element 76 for abutting the exposed interior major surface 5b of the IGU 5 in the closed position of the skylight window 1, where a lower surface 791 of the supporting leg 79 is positioned above the sealing surface 10s in the height direction. In this embodiment the first sash side member 14 further comprises a sealing element 14a for sealing against the first frame side member 10 near the weather shield skirt 9. The IGU 5 in this embodiment comprises only two layers of glazing 5c, 5d distanced by sealing member 24 to form a single spacing 5l comprising vacuum to improve insulation properties. In this embodiment, the total sash height HS is 97% of the total frame height HF and the total height of the interior part HI is 15% of the total frame height HF. The total height of the supporting leg HL is 1% of the total frame height HF. The supporting leg 79 has a ratio of the total height of the supporting leg HL to the total supporting leg width WL of 1:3 and a ratio of the total supporting leg width WL to total sash height HS of 1:10. The supporting leg further comprises a sealing element 14b for sealing against the exposed exterior major surface 5g of the IGU 5. The dome-shaped weather shield 3, may alternatively be shaped similarly to the weather shield pane 8 and weather shield 3 shown in FIG. 1.

[0084] FIG. 5 shows another embodiment of a skylight window 1 according to the present invention, with a substantially flat weather shield 3. The weather shield 3, may alternatively be shaped similarly to the weather shield pane 8 and weather shield 3 shown in FIG. 1. This embodiment further comprises an insulating member 81 made of EPS (Expanded Polystyrene) insulating the skylight window 1 between the first frame side member 10 and the first sash side member 14. The skylight window 1 may similarly comprise insulating members between the other three frame side members and sash side members. In this embodiment, the total sash height HS is 106% of the total frame height HF and the total height of the interior part HI is 23% of the total frame height HF. The total height of the supporting leg HL is 0.3% of the total frame height HF. The supporting leg 79 has a ratio of the total height of the supporting leg HL to the total supporting leg width WL of 1:5 and a ratio of the total supporting leg width WL to total sash height HS of 1:12. As in the embodiment shown in FIG. 4, the first sash side member 14 comprises a sealing element 14a near the weather shield skirt 9 for sealing against the first frame side member 10 to prevent precipitation or debris such as dust or dirt from entering between the sash 6 and frame 7. It further comprises a sealing element 14a located above the insulating member 81. This embodiment of the skylight window also does not comprise a curb flange. A detachable curb flange may however later be attached if required. A curb flange is typically not required when installing the window in an inclined roof, being able to remove or provide the skylight window without a curb flange therefore eases the installation process of the skylight window, particularly in an inclined roof.

[0085] FIG. 6 shows an embodiment that is very similar to the embodiment shown in FIG. 3, but with an inclined, flat weather shield pane 8 and with first sash side member 14 of a lower height. A curb flange may be attached if required. As in the other embodiments, the weather shield pane 8 may alternatively be shaped similarly to the weather shield pane 8 and weather shield 3 shown in FIG. 1. In this embodiment, the total sash height HS is 32% of the total frame height HF and the total height of the interior part HI is 93% of the total frame height HF. The total height of the supporting leg HL is 0.3% of the total frame height HF. The supporting leg 79 has a ratio of the total height of the supporting leg HL to the total supporting leg width WL of 1:4 and a ratio of the total supporting leg width WL to total sash height HS of 1:4.

[0086] FIG. 7 shows a perspective view from above of an embodiment of the skylight window 1 according to the present invention installed in a roof 2, where a part of the window has been removed for illustration purposes. The weather shield pane 8 here has been removed for clarity. A screening device 34, which is mounted in a spacing delimited in the width direction W by the first 14 and second 13 sash side members is also shown. It is to be understood that the second sash member 13 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.

[0087] Towards the interior, the spacing is delimited by the step surface 17c formed by the sash side member 14. The step surface 17c thus serves as a screening device support section. The screening device 34 is here depicted as a roller curtain in which the screening body 36 is a covering cloth, which is 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 13 for covering the IGU 5. The screening device 34 might, however, also be another type of blind or a shutter. A fixation member 39 is also attached to the first sash side member 14 and extends towards the second sash side member 13. 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 5.

[0088] 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	Layer of glazing
5d	Interior pane / layer of glazing
5e	Layer of glazing
5g	Exposed exterior major surface
5s	Side surface
6	Sash
7	Frame
8	Weather shield pane
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
10s	Sealing surface of frame side member
10t	Top surface of frame side member
13	Second sash side member
14	First sash side member
14a	Sealing element
14b	Sealing element
17c	Stepped surface
22	Sealing member
24	Sealing member
34	Screening device
35	Collection device
36	Screening body
39	Fixation member
40	Curb flange
50	Reveal panel or lining panel
75	Thermal break
76	Sealing element
79	Supporting leg
791	Lower surface of the supporting leg
80	Sash covering leg
81	Insulating member
HF	Total frame height
HI	Total frame interior part height
HL	Total supporting leg height
HS	Total sash height
WL	Total supporting leg width
W	Width direction

Claims

1. 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 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,
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 a respective first peripheral side of the IGU in a closed position of said skylight window,
the IGU having an exposed interior major surface for facing an interior of the building in the closed position of the skylight window, the exposed interior major surface being of an interior pane of the IGU, said interior pane having a periphery, a height direction extending perpendicularly to the interior major surface in the closed position of the skylight window,
the IGU further having an exposed exterior major surface facing in an opposite direction towards an exterior in the closed position of the skylight window,
said first sash side member having a total sash height, and said first frame side member having a total frame height, in the height direction,
said first frame side member comprising an interior part, the interior part in the closed position of the skylight window extending below the exposed interior major surface of the IGU and being located within the periphery of the interior pane, said interior part of the first frame side member having a total height in the height direction, and
said first sash side member comprising a supporting leg extending beneath and supporting the exposed interior major surface of the IGU, the supporting leg having a total height in the height direction.

2. A skylight window according to claim 1, wherein the total height of the supporting leg is 40% or less of the total sash height.

3. A skylight window according to claim 1 or 2, wherein the total height of the supporting leg is 20% or less of the total sash height.

4. A skylight window according to any one of the preceding claims, wherein the total height of the interior part is 25% or less of the total frame height.

5. A skylight window according to claim 4, wherein the total height of the interior part is 15% or less of the total frame height.

6. A skylight window according to any of the preceding claims, further comprising a weather shield attached

to the sash so as to protect a window portion of the skylight window, the window portion comprising the sash, the frame, and the IGU, the weather shield comprising a transparent or translucent weather shield pane.

7. A skylight window according to claim 6, wherein the weather shield is without a sealed gas-filled spacing between the weather shield pane and the IGU.

8. A skylight window according to any one of the preceding claims, wherein in the closed position of the skylight window, an entirety of the supporting leg is located within a periphery of the window frame.

9. A skylight window according to any one of the preceding claims, wherein the supporting leg constitutes an entirety of a part of the first sash side member located below the exposed interior major surface of the IGU.

10. A skylight window according to claims 8 and 9, wherein said supporting leg has a total supporting leg width extending in a width direction that is substantially perpendicular to the longitudinal direction and to the height direction, and wherein a ratio of the total height of the supporting leg to the total supporting leg width is 1:2 or more.

11. A skylight window according to any one of the preceding claims, wherein said supporting leg has a total supporting leg width extending in a width direction that is substantially perpendicular to the longitudinal direction and to the height direction, and wherein a ratio of the total supporting leg width to total sash height ratio is 1:1 or more.

12. A skylight window according to any one of the preceding claims, wherein the first frame side member further 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 a 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.

13. A skylight window according to any one of the preceding claims, wherein the interior pane comprises a side surface extending substantially along the first frame and sash side members, and wherein in the closed position of the skylight window, the first frame side member is located at least as far as or farther than the supporting leg from the side surface of the interior pane.

14. A skylight window according to any one of the preceding claims, wherein the total sash height is 70% or more of the total frame height.

15. A skylight window according to any one of the preceding claims, wherein the first frame side member comprises a sealing surface facing the exposed interior major surface of the IGU, said sealing surface having a sealing element for abutting the exposed interior major surface of the IGU in the closed position of the skylight window, wherein a lower surface of the supporting leg is positioned substantially at the same height as the sealing surface or above the sealing surface in the height direction.

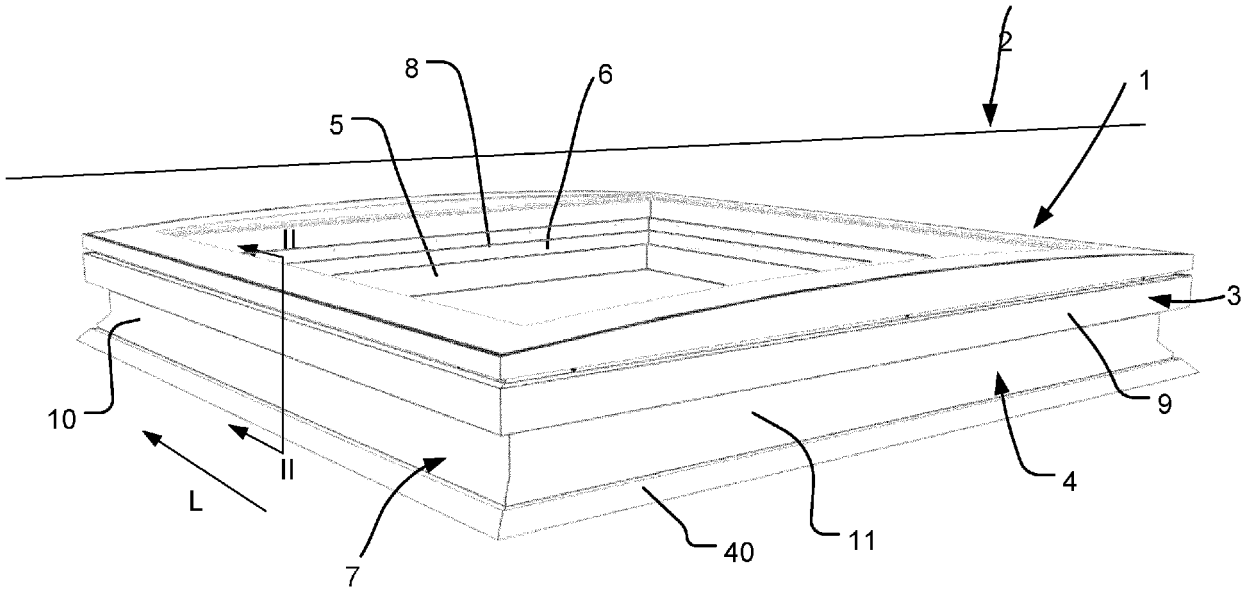

Fig. 1

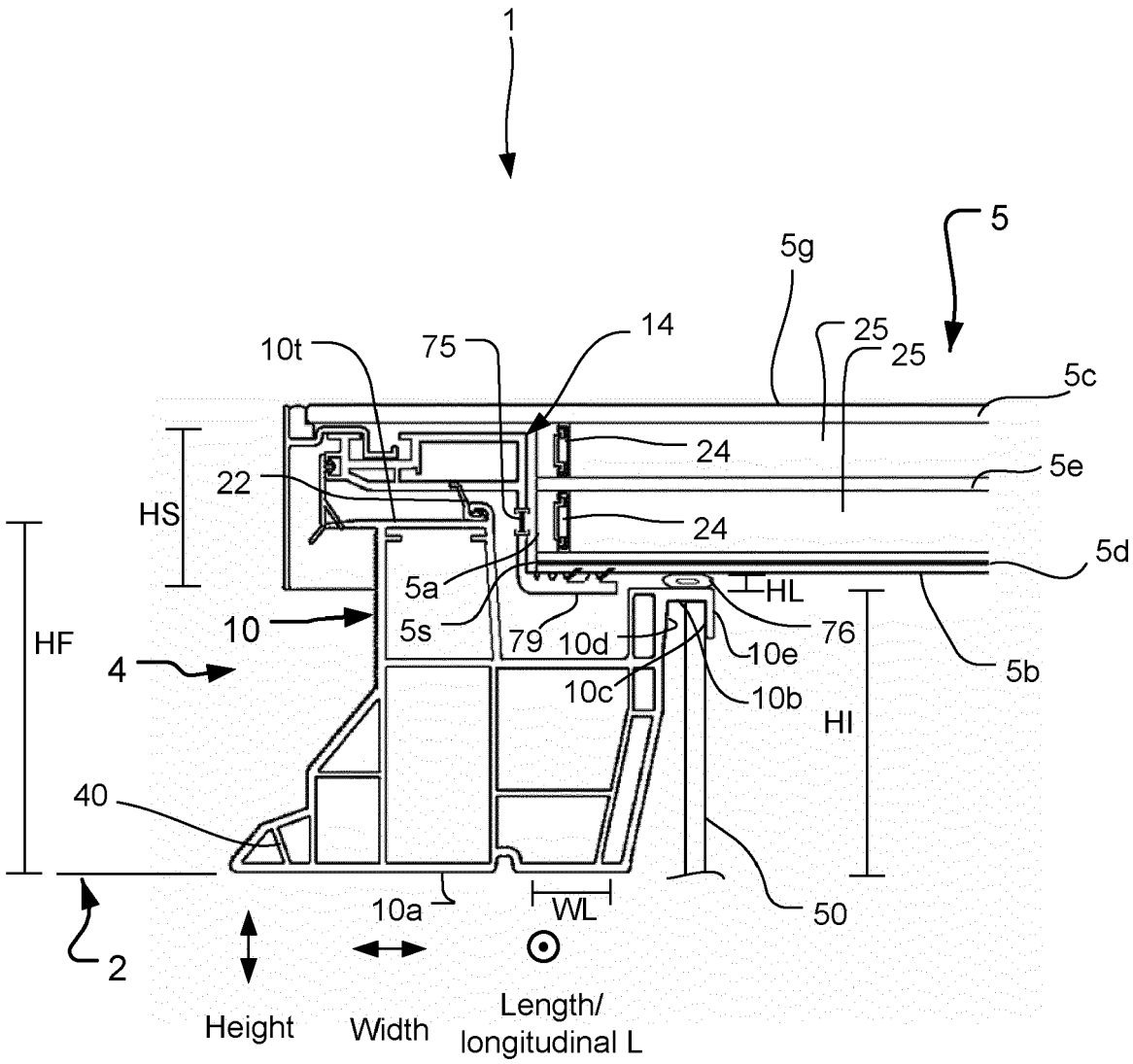
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Fig. 2

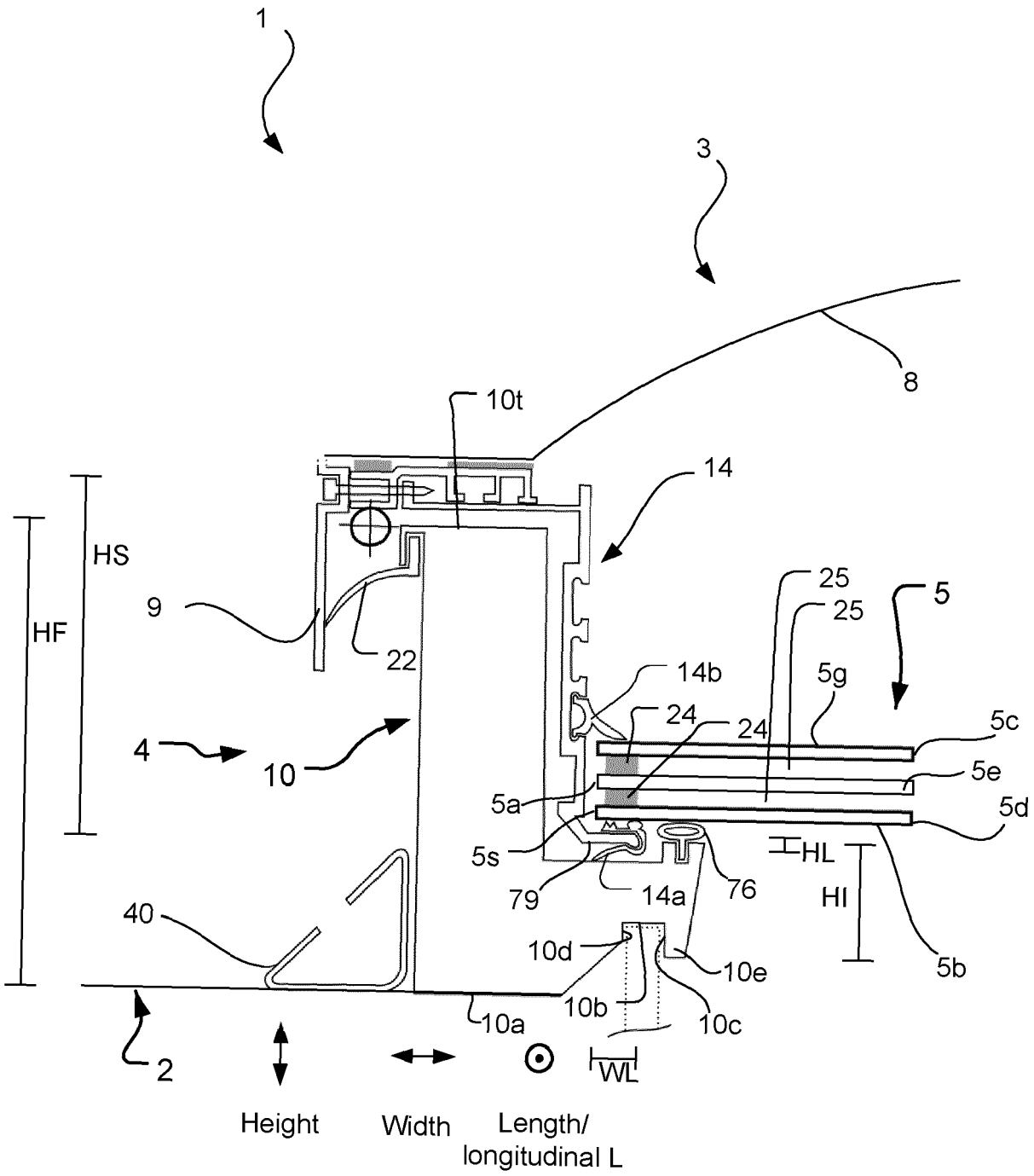
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Fig. 3

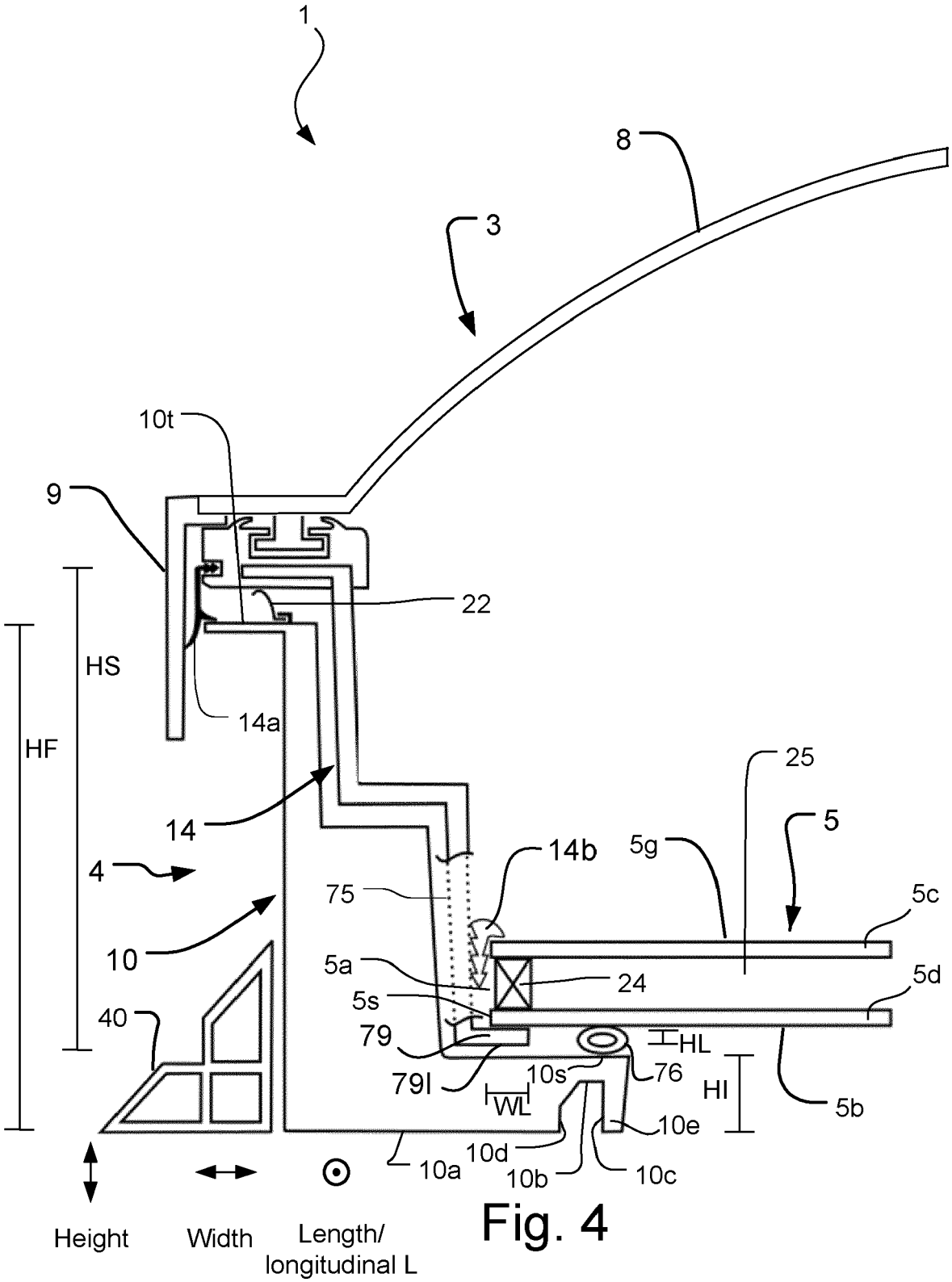
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Fig. 4

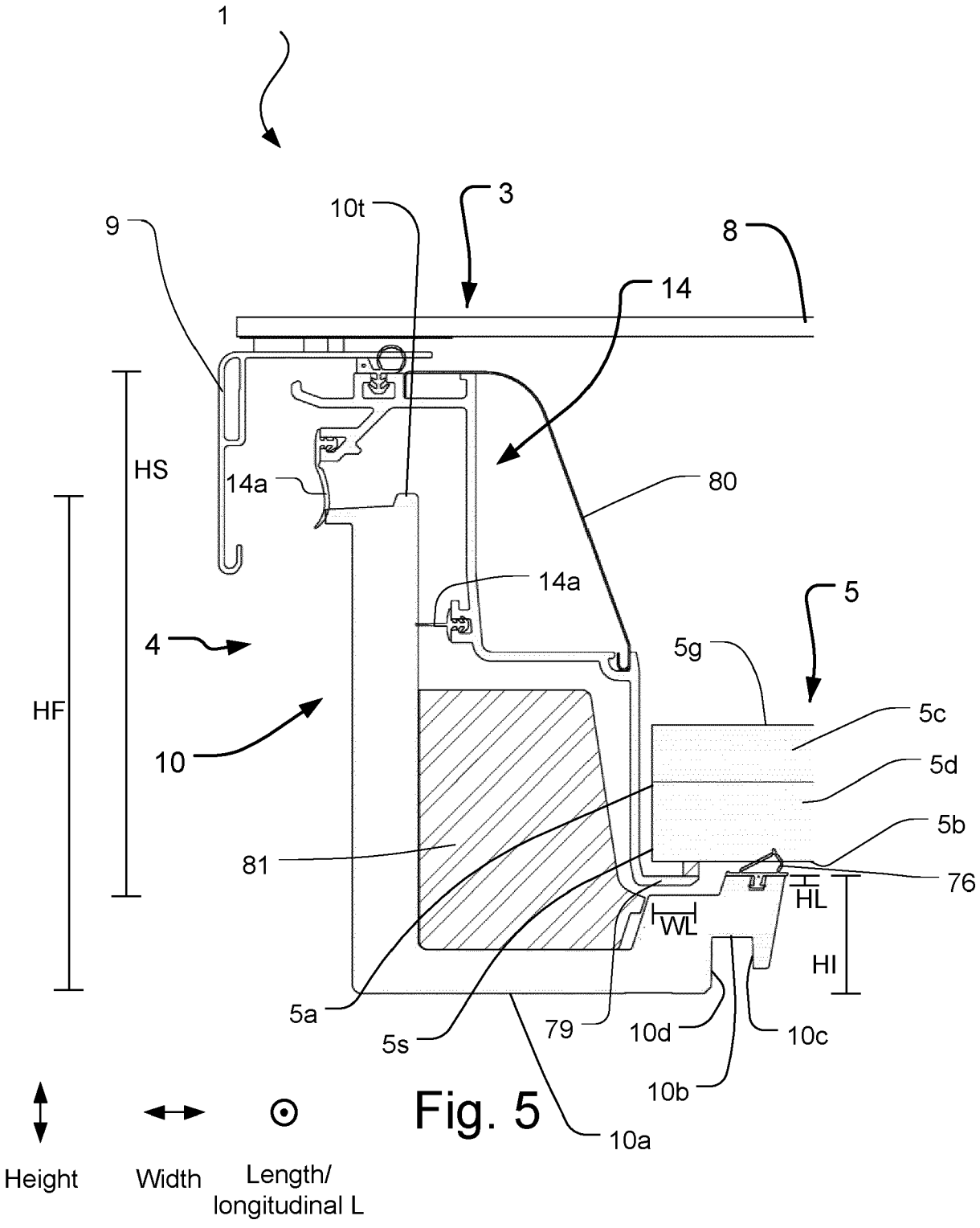
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Fig. 5

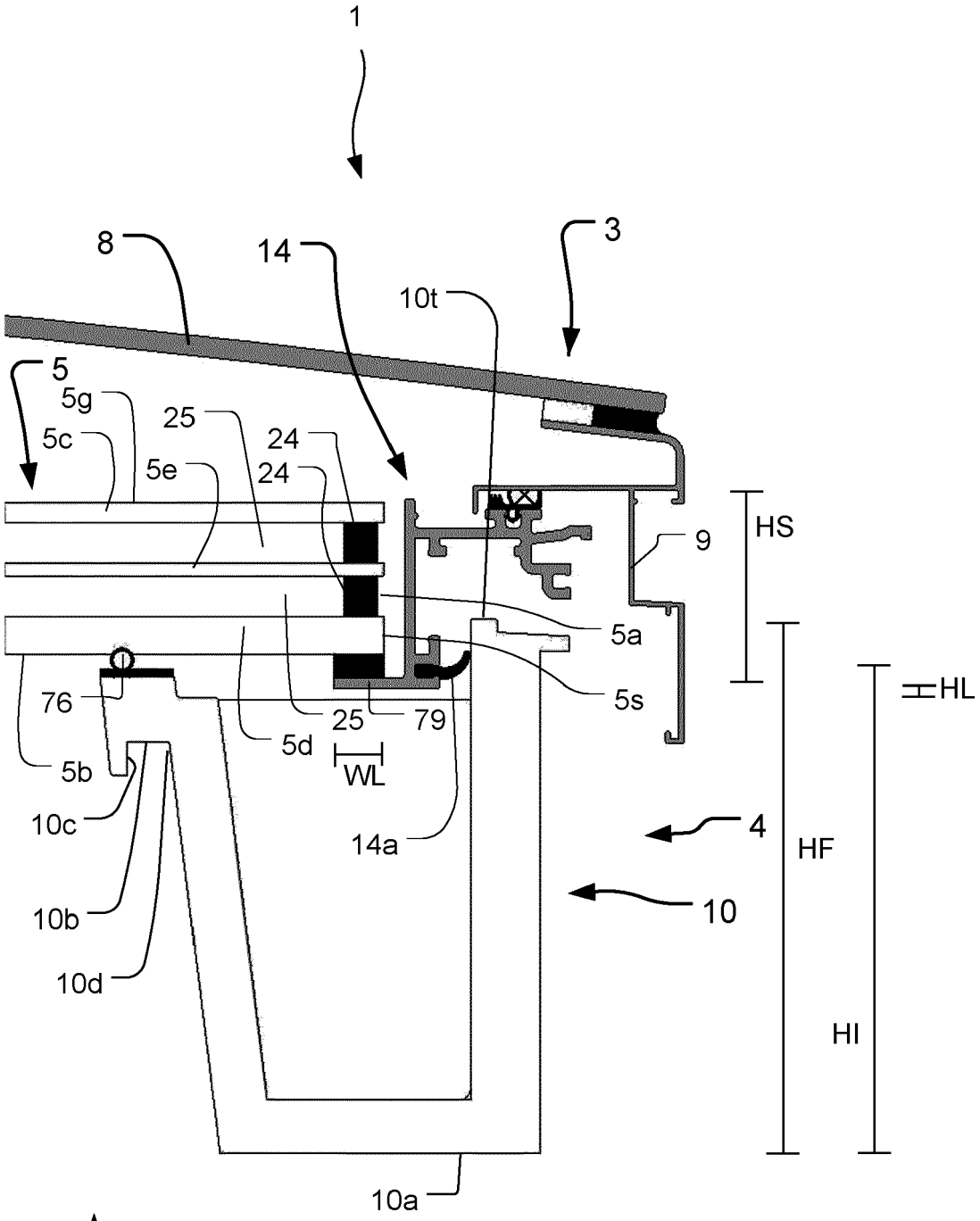
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Fig. 6

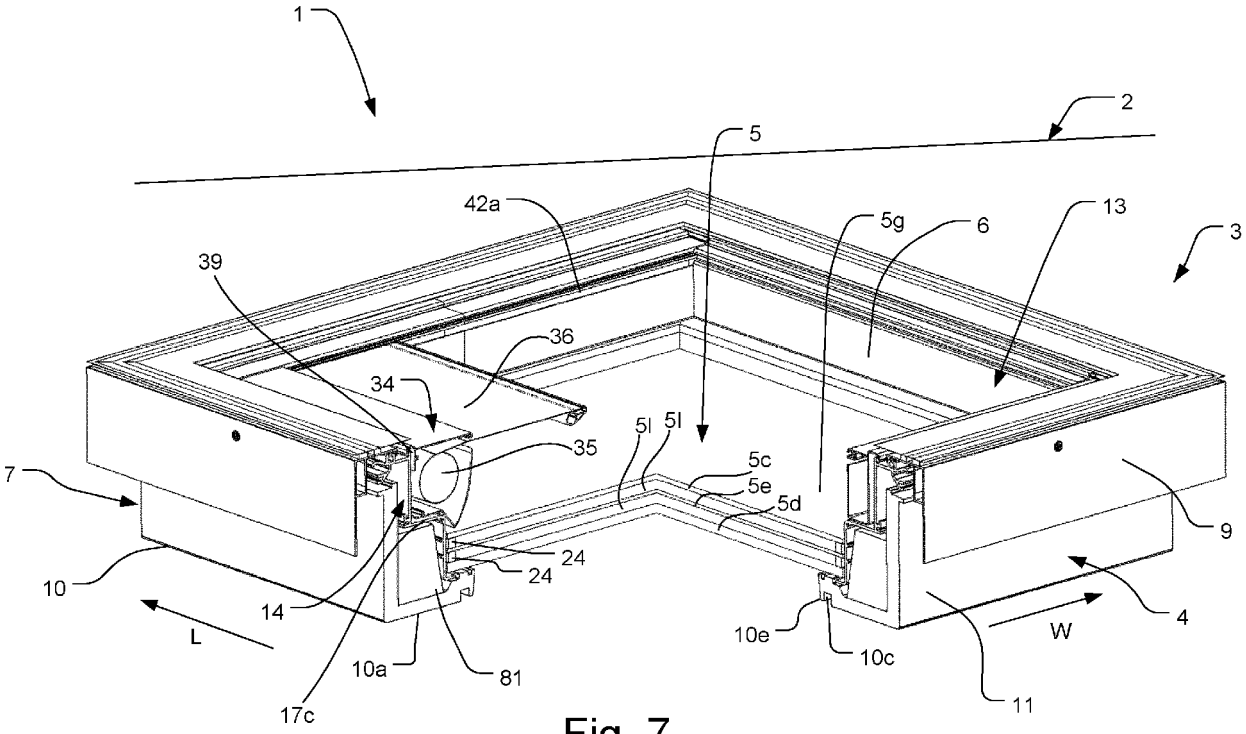
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Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 20 15 5247

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 June 2020	Tran, Kim Lien

CATEGORY OF CITED DOCUMENTS

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17-06-2020

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