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(54) A ROOF WINDOW WITH AN IMPROVED PANE ELEMENT, AND A METHOD OF MANUFACTURING A ROOF WINDOW

(57) In the roof window (10), the exterior sheet (43) of the pane element (40) has an extended portion (43b) which overlaps the bottom sash covering (15). This provides for improved insulation and a visually appealing transition to the roof surface without compromising the tightness of the roof window. Improved protection is obtained by a masking (60) in the extended portion (43b), positioned either on the exterior or the interior face of the exterior sheet (43).

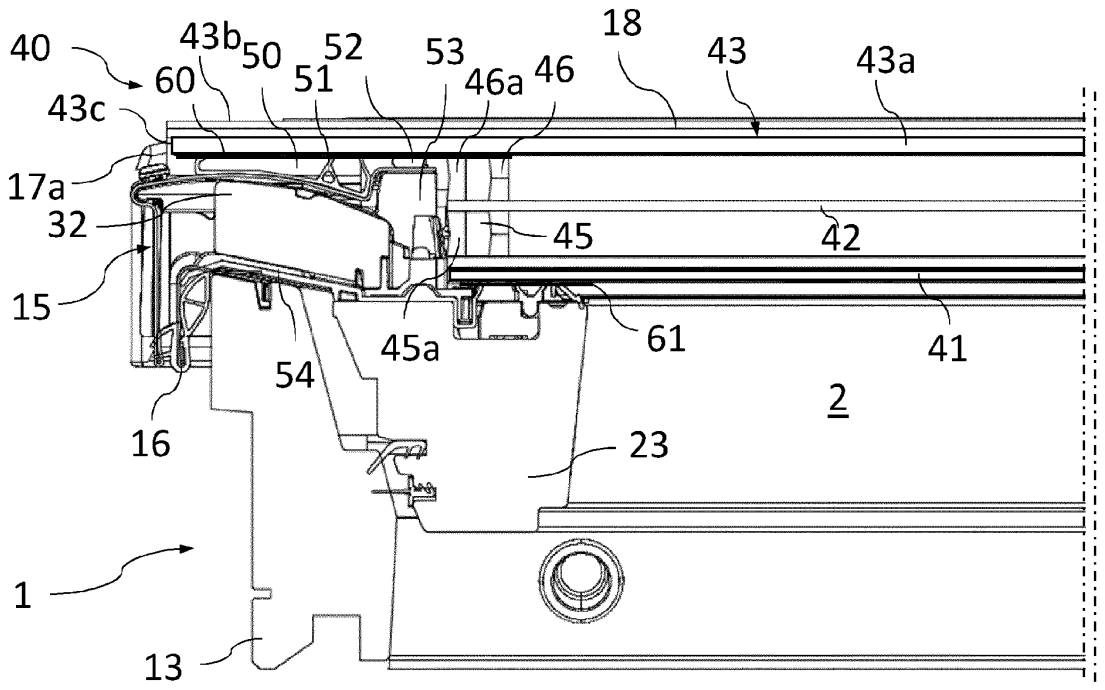

Fig. 5

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Description

Technical Field

[0001] The present invention relates to a roof window defining a length direction and a width direction and comprising a frame, a sash, a pane element comprising at least one interior sheet and an exterior sheet, said pane element being connected to the sash by means of a glazing profile extending in the length direction of the roof window at each side of the pane element, and a set of cover members including a bottom sash covering extending in the width direction of the roof window and connected to the sash to extend over at least the glazing profile and optionally the pane element at each side of the pane element, the sash being pivotally connected to the frame by means of a set of hinges defining a hinge axis located between a top and a bottom of the roof window. The invention furthermore relates to a method of manufacturing a roof window.

Background Art

[0002] When installing windows in a roof, it is first and foremost vital to ensure that the roof window itself is tight, just as the connection between the window frame and the surrounding roofing material needs to be weatherproof. At the same time, the insulation properties of the window need to meet certain standards, and the manufacturing and installation of the roof window need to be carried out cost- and time-efficiently. Today, with increasing focus on design, however, it is also desirable to make the roof window itself and the transition between the roof window and the roof surface visually smooth and of a pleasant appearance in order for the roof including one or more roof windows to attain the overall appearance aimed at.

[0003] These requirements, which are often mutually contradicting, are challenging to meet to a full extent. Examples of prior art roof windows setting out to improve the performance on several of these parameters are found in i.a. EP 2 738 339 A1 and EP 3 128 097 A1. Even though these roof windows have proven to function very well in practice, there is still room for improvement.

Summary of Invention

[0004] With this background, it is therefore an object of the invention to provide a roof window by which it is possible to improve the performance on some parameters without compromising others.

[0005] In a first aspect, this and further objects are achieved with a roof window of the kind mentioned in the introduction which is furthermore characterised in that the exterior sheet of the pane element is provided with an extended portion extending beyond an inner portion to an edge at a distance from an edge of the at least one interior sheet and overlapping the bottom sash covering, that at least one masking is provided to substantially cover the extended portion, and that each glazing profile and each side sash covering has such a length that they extend substantially to the edge of the extended portion of the exterior sheet of the pane element.

[0006] By forming the exterior sheet with an extended portion to overlap the bottom sash covering while at the same time providing a masking covering the extended portion, the bottom sash covering is effectively rendered inconspicuous in a simple manner. In turn, the roof window is given improved insulating properties due and an appealing look as the pane element extends throughout to the bottom of the roof window, thus smoothening the transition to the roof surface, or to another roof window located below in the direction of the roof inclination. Drainage of precipitation is facilitated as water, snow etc. is allowed to simply drip off the edge of the exterior sheet. Furthermore, the extended portion of the exterior sheet functions as an external weather screen for the bottom sash covering such that any fastening means such as screws securing the bottom sash covering to the sash are shielded from the weathering and in turn less exposed to penetration of water and other precipitation. Improved tightness at the sides of the pane element is provided in that the glazing profiles and the side sash coverings form a rim, thus channelling any precipitation over the edge of the exterior sheet.

[0007] The at least one masking may be provided on the interior face and/or on the exterior face of the extended portion of the exterior sheet of the pane element. Providing the masking on the exterior face has a number of advantages, but the masking will be more exposed to wind load and UV radiation. Masking provided on the interior side is not as exposed to wind load, and less exposed to UV radiation.

[0008] The masking preferably has a length substantially corresponding to the width of the extended portion of the exterior sheet of the pane element in the width direction of the roof window, and a width substantially corresponding to the length of the extended portion of the exterior sheet of the pane element in the length direction of the roof window. In this way, the masking covers the entire extended portion of the exterior sheet, thus effectively concealing any subjacent components of the roof window. In an advantageous further development in which the pane element comprises at least one spacer and optionally at least one outer sealant, the masking covers also the at least one spacer and optionally the at least one outer sealant.

[0009] While the invention is in principle applicable to roof windows having a two-layer pane element, with an exterior sheet and one interior sheet, the pane element of a presently preferred embodiment comprises a first and a second interior sheet positioned on the interior side of the exterior sheet, the first and second interior sheets preferably being of substantially identical size and have a common edge, the size of the first and second interior sheets substantially corresponding to the inner portion

of the exterior sheet of the pane element. This configuration improves the insulation properties of the roof window even further.

[0010] In another presently preferred embodiment, the bottom sash covering comprises a main section adjoined by a depending section to one side and a shelf section to the other side, and the main section and the shelf section are located at a distance from the interior side of the extended portion of the pane element such that a gap is formed between the bottom sash covering and the extended portion of the pane element, preferably the main section of the bottom sash covering being curved and having an apex substantially level with the shelf section, more preferably the transition between the main section and the shelf section comprising an inclined bridge section. By this design, features of a traditional roof window have been incorporated into the bottom sash covering of the roof window according to the invention. The gap provided improves the insulation properties of the roof window even further. In addition, this means that manufacturing and storage costs may be reduced, and the installation of external accessories such roller shutters and awnings is facilitated.

[0011] In an advantageous development of this embodiment, at least one seal is provided to span the gap between the bottom sash covering and the extended portion of the pane element. This provides for increased protection against the surroundings and may also contribute to the retention of the pane element to the sash. In such embodiments, the presence of one or more seals between the extended portion of the pane element and the bottom sash covering provides for an excellent lifetime performance of the roof window. This applies in particular in the case of cover members of metal, which is known as a material providing a reliable bonding surface, just as the glass surface of the extended portion of the pane element.

[0012] Preferably, a first seal is provided at the main section and a second seal at the shelf section to span the gap between the bottom sash covering and the extended portion of the pane element. Thus, a two-step sealing action is provided, and different properties may be assigned to the first and the second seal.

[0013] A particularly efficient sealing action is provided by an embodiment, in which the second seal on the shelf section of the bottom sash covering is located close to the edge of the first and second interior sheets and the first seal on the main section of the bottom sash covering is located at a distance from the second seal, near the edge of the extended portion of the exterior sheet of the pane element.

[0014] Each seal may in principle be provided as through-going sealing profiles. However, in a particularly resourceful embodiment, the second seal comprises a plurality of distinct sealing elements, each sealing element having a longitudinal extension substantially smaller than the width of the extended portion of the exterior sheet of the pane element in the width direction of the roof window.

[0015] Additionally, or alternatively, the first seal comprises a sealing profile having a longitudinal extension substantially corresponding to the width of the extended portion of the exterior sheet of the pane element in the width direction of the roof window, the sealing profile preferably comprising a main body, an outer sealing lip and an inner sealing lip.

[0016] In a presently preferred embodiment, the masking is a provided as a coating, preferably as a ceramic coating burned into the glass of the exterior sheet during tempering thereof. This has proven to function particularly well, regardless of whether the masking is on the exterior or the interior face.

[0017] In a development of a presently preferred embodiment, in which the bottom sash covering comprises a main section adjoined by a depending section to one side and a shelf section to the other side, the depending section of the bottom sash covering is provided near the edge of the extended portion of the exterior sheet of the pane element, and wherein the depending section extends below the plane of the at least one interior sheet. This provides for excellent overall tightness of the roof structure.

[0018] In another development, the extended portion of the exterior sheet extends across and beyond the frame bottom member when looking in the plane of the pane element. This also improves the weatherproofing properties of the roof window.

[0019] In a presently preferred embodiment, at least one seal is a structural seal which retains the bottom of the pane element. This provides for a particularly reliable connection of the pane element to the sash. In a further development, which is particularly useful in embodiments in which a set of glazing clips is provided under the bottom sash covering, said at least one structural seal is located at or near said set of glazing clips. This provides for a reliable transmission of any load acting on the pane element to the subjacent glazing clips.

[0020] To increase in particular the appearance of the roof window, but also protection against for instance UV radiation, a secondary masking may be provided on at least one interior sheet of the pane element.

[0021] In a second aspect, a method of manufacturing a roof window is provided.

[0022] Other presently preferred embodiments and further advantages will be apparent from the subsequent detailed description and drawings.

Brief Description of Drawings

[0023] In the following description embodiments of the invention will be described with reference to the schematic drawings, in which

Fig. 1 is a perspective view of a prior art roof window;
Fig. 2 is a cross-sectional side view of a prior art roof window built into a roof structure;

Fig. 3 is a perspective view of an embodiment of a roof window according to the invention;
Fig. 4 is an exploded perspective view of the roof window of Fig. 3;
Fig. 5 is a schematic view substantially corresponding to a cross-section along the line VI-VI in Fig. 3, indicating optional positioning of a primary and secondary masking in an embodiment of the roof window according to the invention;
Fig. 6 is a perspective, sectional view along the line VI-VI in Fig. 3;
Fig. 7 is an exploded partial perspective view, on a larger scale, of details of the lower right-hand corner of the sash of a roof window in an embodiment of the invention;
Fig. 8 is a perspective view of a detail of the roof window in the embodiment of Fig. 7;
Fig. 9 is a partial perspective view, on a larger scale, of the detail of Fig. 8;
Fig. 10 is an exploded partial perspective view, of details of the lower part of the frame of a roof window in an embodiment of the invention;
Fig. 11 is a partial perspective view, on a larger scale, of details of the roof window in Fig. 10;
Fig. 12 is a cross-sectional view of a further embodiment of the roof window according to the invention;
Figs 13 to 15 are partial perspective, partially exploded and sectional views of the lower part of another embodiment of the roof window according to the invention;
Fig. 16 is a partial perspective view of details of a roof window in a still further embodiment of the invention; and
Fig. 17 is a perspective, sectional view substantially corresponding to Fig. 6, of yet another embodiment of the invention.

Description of Embodiments

Figs 1 and 2 - prior art

[0024] Referring initially to Fig. 1 and Fig. 2 in which a prior art roof window 10' is shown, such a roof window 10' comprises a frame 1' configured to be built into roof structure and a sash 2'. The sash 2' is pivotally connected to the frame 1' at a set of hinges 25' Details of the prior art roof window 10' shown in Fig. 2 are described in the above-mentioned EP 3 128 097 A1 to which reference is hereby made. In a manner known per se, the roof window 10' comprises a frame represented by frame bottom member 13' connected to a roof structure 100 and a sash represented by sash bottom member 23'. An insulating element 30' is provided below bottom flashing 14' and bottom frame covering 16', having an abutment side 31' on a ledge 37' facing the frame bottom member 13'. A further insulating element 32' is provided under the bottom sash covering 15'. It is seen how the bottom sash covering 15' overlaps the lower portion of the exterior side of the pane 40'.

Figs 3 to 16 - embodiments of the roof window according to the invention

[0025] Turning now first to Figs 3 to 6, a description of the general configuration of embodiments of a roof window 10 of the present invention will be given. Details not shown or described in detail correspond to the prior art roof window described in the above and/or are readily apparent to the person skilled in the art. In more detail, the roof window 10 defines a length direction and a width direction. In roof windows installed in an inclined roof surface, the length direction is normally parallel to the direction of inclination of the roof. The inclination of the roof typically ranges from 15° to 65°, but the roof window 1 according to the invention may be built into even very low pitch roofs, for instance having an inclination as low as 10°. The width direction is perpendicular to the length direction. The roof window 1 comprises a frame 1, a sash 2, a pane element 40 comprising at least one interior sheet 41, 42 and an exterior sheet 43. Here, two interior sheets 41, 42 are provided. The pane element 40 is connected to the sash 2 by means of a glazing profile 18 extending in the length direction of the roof window at each side of the pane element 40. Thus, a total of two glazing profiles 18 are present here; however, further glazing profiles may in principle be provided also at the top and possibly at the bottom of the sash 2 and pane element 40. A set of cover members includes a bottom sash covering 15 extending in the width direction of the roof window and a side sash covering 17 extending in the length direction of the roof window and connected to the sash 2. Each side sash covering 17 has such a width that it extends over at least the glazing profile 18 and optionally over the pane element 40 at each side of the pane element 40. The width and shape of the side sash covering 17 may in principle be chosen arbitrarily, as long as a suitable overlap is established relative to the glazing profile 18, possibly thus also relative to the associated side edge of the pane element 40. In the embodiment shown, each side sash covering 17 has an end 17a and a side flange 17b. At least the side flange 17b of the side sash covering 17 overlaps the glazing profile 18, which in turn overlaps the pane element 40, i.e. the exterior sheet 43, at the sides thereof.

[0026] The sash 2 is openable relative to the frame 1, which is stationary relative the roof structure. The sash 2 is pivotally connected to the frame 1 by means of a set of hinges 25 defining a hinge axis α located between a top and a bottom of the roof window 10. Normally, the hinge axis α is located approximately in the middle, but other positions including positions closer to the top are conceivable as well. In such fields of application, in which the hinge axis is located somewhere between the middle and the top, an improved lifting performance of the hinge may be desirable. This also applies to roof windows installed in low pitch roofs. One example of a hinge meeting

such requirements is shown and described in Applicant's EP3486413 A1.

[0027] A bottom frame covering 16 is also provided, and two side frame coverings 27, one at either side of the frame 1. The side frame coverings 27, together with the side sash coverings 17, provide protection of the components below and drainage for water and other precipitation. The side sash coverings 17 interact with the frame side coverings 27 in a manner known per se, as they are located in overlapping extension of each other in the closed position of the roof window 10, i.e. when the sash 2 is parallel to the frame 1, and at the same time, opening of the sash 2 relative to the frame 1 is made possible by the particular configuration of the side frame coverings 27 and the sash side coverings 17. An insulating element 32 is present below the bottom frame covering 16. A flashing arrangement is provided as in the prior art, but not shown in the drawings of the embodiments of the invention.

[0028] According to the invention, the exterior sheet 43 of the pane element 40 is provided with an extended portion 43b extending beyond an inner portion 43a to an edge 43c at a distance from an edge 44 of the at least one interior sheet 41, 42 and overlapping the bottom sash covering 15, that at least one masking 60; 260: 360 is provided to substantially cover the extended portion 43b, and that each glazing profile 18 and each side sash covering 17 has such a length that they extend substantially to the edge 43c of the extended portion 43b of the exterior sheet 43 of the pane element 40. Here the first and second interior sheets 41, 42 are of substantially identical shape and have a common edge 44, but other configurations could apply. The extended portion 43b overlaps the bottom sash covering 15, and at least one masking 60 is provided to substantially cover the extended portion 43b. By the term "overlaps" it is understood that the extended portion 43b has such a configuration and such dimensions that its projection shadows the underlying bottom sash covering 15, and any other subjacent components, to at least a large extent. This is qualified by the term "substantially covers", denoting that the majority of the bottom sash covering 15 is hidden below the masking 60, possibly entirely invisible or undiscernible. Also visible in Fig. 5 are spacers 45 and 46 arranged between the first and second interior sheets 41, 42, and between the second interior sheet 42 and the exterior sheet 43, respectively. On the outer side of the spacers 45, 46, respective outer sealants 45a and 46a are present.

[0029] The masking 60 may be provided on the interior face, on the exterior face or both faces of the extended portion 43b of the exterior sheet 43 of the pane element 40. As shown in Fig. 5, the masking 60 is provided on the internal face e.g. inner portion of exterior sheet 43a. The masking 60 may extend to cover the spacers 45, 46 also, and the respective outer sealants 45a, 46a. In such case the spacer 46 may be sealed to the masking 60 rather than to the glazing surface as usually. The term "masking" is to be interpreted as a separate component or treated surface of the exterior sheet 43 of the pane element 40, applied closely and in contact with the exterior sheet 43. The masking 60 may in principle be made in any suitable manner. For example by a film or printing, or enamel or ink. Here, however it is provided as a coating, preferably as a ceramic coating sintered to the glass of the exterior sheet 43 during tempering thereof. A particularly well-functioning coating is the commercially available Ferro System 140. The masking 60 may comprise an aperture for a sensor for example light sensor or rain sensor etc.

[0030] The position and the extension of the masking, or maskings, on the pane element 40 may be chosen depending on a variety of parameters such as material, manufacturing conditions, configuration of other parts of the window, climate zone of the roof window installation etc. Also indicated in Fig. 5 is a secondary masking 61 is provided on interior sheet 41 of the pane element 40. The secondary masking 61 extends up to the position where the sash bottom member 23 no longer covers the interior pane 41.

[0031] In the alternative, second embodiment of Fig. 12, one masking 260 is provided on the internal face of the extended portion 43b of the exterior sheet 43 of the pane element 40. The extension in the length direction is slightly smaller than in the embodiment shown in Fig. 5.

[0032] Referring now to the alternative embodiment of Figs 13 to 15, the masking 360 is provided on the exterior face. Here, it is also shown that the masking 360 has a length L substantially corresponding to the width of the extended portion 43b of the exterior sheet 43 of the pane element 40 and a width W substantially corresponding to the length of the extended portion 43b of the exterior sheet 43 of the pane element 40. The length of the extended portion 43b substantially corresponds to the distance between the edge 44 of the interior sheet(s) 41, 42 and the edge 43c of the extended portion 43b. In practice, roof windows come in various sizes within a predefined size programme, and the length of the extended portion 43b and hence the width W of the masking 60 will be constant for windows of varying sizes and amount to for instance 10 to 15 cm, whereas the width of the extended portion 43b, corresponding to the length W of the masking 60 follows the width of the window size, typically 60 to 120 cm. The length and width indications apply also the embodiments relating to masking 60 and masking 61.

[0033] Referring now also to Figs 7 to 9, the bottom sash covering 15 comprises a main section 151 adjoined by a depending section 152 to one side and a shelf section 155 to the other side, and wherein the main section 151 and the shelf section 155 are located at a distance from the interior side of the extended portion 43b of the pane element 40 such that a gap 50 is formed between the bottom sash covering 15 and the extended portion 43b of the pane element 40. The depending section 152 of the bottom sash covering 15 forms a skirt portion near the edge 43c, which extends below the plane of the interior sheets 41, 42.

[0034] In the embodiment shown, the extended portion 43b of the exterior sheet 43 extends across and beyond the frame bottom member 13 when looking in the plane of the pane element 40.

[0035] In the embodiments shown, at least one seal 51, 52 is provided to span the gap 50 between the bottom sash covering 15 and the extended portion 43b of the pane element 40. A first seal profile 51 is provided at the main section 151 and a second seal 52 at the shelf section 155 to span the gap 50 between the bottom sash covering 15 and the extended portion 43b of the pane element 40.

[0036] As shown in Fig. 7, the second seal of this embodiment comprises a plurality of distinct sealing elements 52, where each sealing element 52 has a longitudinal extension substantially smaller than the width of the extended portion 43b of the exterior sheet 43 of the pane element 40 in the width direction of the roof window. Referring briefly again to Figs 5 and 6, a set of glazing clips 53 is provided under the bottom sash covering 15, and two sealing elements 52 are located at or near each set of glazing clips 53. The number of glazing clips 53 may in principle depend on the width of the roof window 10, but two glazing clips 53 are typically present.

[0037] In the first embodiment, the first seal comprises a sealing profile 51 having a longitudinal extension substantially corresponding to the width of the extended portion 43b of the exterior sheet 43 of the pane element 40 in the width direction of the roof window. The sealing profile 51 comprises a main body 510 configured to be placed on the main section 151 of the bottom sash covering 15. From the main body 510, an outer sealing lip 511 and an inner sealing lip 512 protrude to contact the interior side of the extended portion 43b of the exterior sheet 43 of the pane element 40.

[0038] In the alternative embodiments of Fig. 12 and Figs 13 to 15, the first and second seals are provided as a first sealing profile 251, 351 and a second sealing profile 252, 352. The sealing profiles may in principle take any suitable form, confer the other embodiment of sealing profile 451 of Fig. 16.

[0039] The seals are typically made of reliable sealants, for instance polyurethane and/or silicone sealants. Adhesive tapes and/or gaskets like for example rubber or neoprene gaskets can also be used. The seals 51 and 52 can each employ a different seal so for example the seal 52 may be a structural seal and the seal 51 may be a regular seal. When a seal is structural it bonds to the pane 40 and has a pane retaining effect which makes mechanical fasteners needless. In one example the seal 52 is an adhesive tape and the seal 51 is a gasket.

[0040] The second seal 52 on the shelf section 155 of the bottom sash covering 15 is shown located close to the edge 44 of the first and second interior sheets 41, 42, and the first seal 51 on the main section 151 of the bottom sash covering 15 is located at a distance from the second seal 52, closer to the edge 43c of the extended portion 43b of the exterior sheet 43 of the pane element 40.

[0041] The shape of the bottom sash covering 15 is made to resemble the shape of its prior art counterpart, however with a number of differences to be able to be positioned entirely below the extended portion 43b of the exterior sheet. Hence, the main section 151 of the bottom sash covering 15 is here curved and has an apex 151a substantially level with the shelf section 155.

[0042] Furthermore, the transition between the main section 151 and the shelf section 155 comprises an inclined bridge section 156. On the shelf section 155, two mounting holes 157 are formed to receive fastening means such as screws in order to secure the bottom sash covering 15 to parts of the sash bottom member 23, details not shown. At either longitudinal end of the shelf section 155, a tab 155a is provided. At either longitudinal end of the main section 151, a side section 153 is provided, with an upstanding end section 154, and with respective mounting hole 158 for securing to underlying components of the sash bottom member 23.

[0043] The exploded partial perspective view Fig. 5 shows the side sash covering 17, the glazing profile 18 and a sash profile seal 55, which interact with the bottom sash covering 15. The sash profile seal 55 is shaped to fit the form of the glazing profile 18. The length of the sash profile seal 55 is defined to at least cover a proportion of the area where the glazing profile 18 overlaps with the bottom sash covering 15. In the assembled state the sash profile seal 55 can fill out the interspace between the glazing profile 18 and the bottom sash covering 15 and/or the glazing profile 18 and the side sash covering 17. The bottom sash covering 15 here comprises an upstanding flange 154a provided with a cut-out 159 configured to receive the sash profile seal 55. Details of the sash profile seal 55 may be found in Applicant's WO 2020/094201 A1.

[0044] On the side section 153, an engagement pin 153a is provided and which is configured to interact with a key-hole shaped aperture (not shown) in a resilient flange on the side sash covering 17 to provide a snapping engagement which secures the side sash covering 17 to the sash in a manner known *per se* from Applicant's international publication WO 99/51831 A1.

[0045] While the invention is primarily focused on improvements to the pane element 40 and the sash 2, the embodiment shown in Figs 10 and 11 provide for further improved tightness as well, at the frame 1. Here a bottom frame gasket 58 is shown to interact with the bottom frame covering 16. An end cap 59 is shown for providing a sealing at the bottom corners of the frame 1 The end cap member 59 is present in a left-hand and a mirror-inverted right-hand version.

[0046] Finally, and turning now to Fig. 17, the side sash covering 417 in this embodiment has a slightly different shape compared to the above-described embodiments in that the end of the side sash covering 417 is formed with a separate cover cap 417b.

[0047] The roof window may for instance be manufactured by a method as follows:

A frame, a sash, and a set of cover members including a bottom sash covering are provided, having for instance a configuration substantially as described in the above.

[0048] A pane element is provided by

i) providing at least one interior sheet of predefined width and length dimensions,
ii) providing an exterior sheet with a length dimension exceeding the length of the at least one interior sheet by a predefined distance to define an extending portion,
iii) applying at least one masking on the exterior sheet to cover at least one face of the exterior sheet in at least the defined extending portion,
iv) assembling the pane element by connecting the at least one interior sheet with the exterior sheet.

[0049] During the process of preparing the exterior sheet, any solar control coating is optionally removed, for instance by etching, grinding, laser etc. Subsequently, the masking is applied. As mentioned, the masking may take any suitable form including a film, printing, enamel, ink. The masking is subjected to heat treatment, optionally during tempering.

[0050] The sheets of the pane elements are connected to each other, typically by means of spacers. In the case of two or more interior sheets, these sheets are first connected to each other, and an additional spacer is connected to the relevant interior sheet and to the exterior sheet to provide the assembled pane element, substantially as described in the above.

[0051] Subsequently, the pane element is connected to the sash such that the extended portion of the exterior sheet at least overlaps the bottom sash covering.

[0052] The roof window as described in the above is a sloping roof window configured to be installed in inclined roof surfaces forming an angle of about 15 to 85° with the horizontal.

[0053] The invention is not limited to the embodiments shown and described in the above, but various modifications and combinations may be carried out.

List of reference numerals

Prior art

[0054]

10' roof window
13' frame bottom member
14' bottom flashing
15' bottom sash covering
16' bottom frame covering
23' sash bottom member
25' hinge
30' insulating element (frame)
31' abutment side
32' insulating element (sash)
37' ledge
40' pane
100 roof structure
α hinge axis

Embodiments of the invention

[0055]

10 roof window

13 frame bottom member
15 bottom sash covering
151 main section of bottom sash covering 15
151a apex of main section
152 depending section
153 side section
153a engagement pin
154 upstanding end section
154a upstanding flange section
155 shelf section
155a tab
156 bridge section
157 mounting hole
158 mounting hole
159 cut-out
16 bottom frame covering
17 side sash covering
17a end of side sash covering
17b side flange of side sash covering
18 glazing profile

23 sash bottom member
24 handle
25 hinge

27 side frame covering
32 insulating element (sash)

40 pane element
41 first interior sheet
42 second interior sheet
43 exterior sheet
43a inner portion of exterior sheet
43b extended portion of exterior sheet
43c edge of extended portion
44 edge of interior sheet(s)
45 spacer
45a outer sealant
46 spacer
46a outer sealant

50 gap
51 first seal / sealing profile
510 main body
511 outer sealing lip
512 inner sealing lip
52 second seal / sealing elements

53 glazing clip
54 sash gasket
55 sash profile seal

58 bottom frame gasket
59 end cap

60 masking
L length
W width

251 first sealing profile (second embodiment)
252 second sealing profile (second embodiment)
260 masking (second embodiment)
351 first sealing profile (third embodiment)
352 second sealing profile (third embodiment)
360 masking (third embodiment)
417 side sash covering (other embodiment)
417b separate cover cap
451 first sealing profile (other embodiment)

Claims

1. A roof window (10) defining a length direction and a width direction and comprising
a frame (1),
a sash (2),
a pane element (40) comprising at least one interior sheet (41, 42) and an exterior sheet (43), said pane element (40) being connected to the sash (2) by means of a glazing profile (18) extending in the length direction of the roof window at each side of the pane element (40), and
a set of cover members including a bottom sash covering (15) extending in the width direction of the roof window and a side sash covering (17) extending in the length direction of the roof window and connected to the sash (2) to extend over at least the glazing profile (18) and optionally the pane element (40) at each side of the pane element (40), the sash (2) being pivotally connected to the frame (1) by means of a set of hinges (25) defining a hinge axis (α) located between a top and a bottom of the roof window (10),
characterised in that
the exterior sheet (43) of the pane element (40) is provided with an extended portion (43b) extending beyond an inner portion (43a) to an edge (43c) at a distance from an edge (44) of the at least one interior sheet (41, 42) and overlapping the bottom sash covering (15), that at least one masking (60; 260: 360) is provided to substantially cover the extended portion (43b), and that each glazing profile (18) and each side sash covering (17) has such a length that they extend substantially to the edge (43c) of the extended portion (43b) of the exterior sheet (43) of the pane element (40).

2. A roof window (10) according to claim 1, wherein the at least one masking (60) is provided on the interior face and/or on the exterior face of the extended portion (43b) of the exterior sheet (43) of the pane element (40).

3. A roof window (10) according to claim 1 or 2, wherein the masking (60) has a length (L) substantially corresponding to the width of the extended portion (43b) of the exterior sheet (43) of the pane element (40) in the width direction of the roof window, and a width (W) substantially corresponding to the length of the extended portion (43b) of the exterior sheet (43) of the pane element (40) in the length direction of the roof window.

4. A roof window (10) according to claim 3, wherein the pane element (40) comprises at least one spacer (45, 46) and optionally at least one outer sealant (45a, 46a), and wherein the masking (60) covers also the at least one spacer (45, 46) and optionally the at least one outer sealant (45a, 46a).

5. A roof window (10) according to any one of the preceding claims, wherein the pane element (40) comprises a first and a second interior sheet (41, 42) positioned on the interior side of the exterior sheet (43), the first and second interior sheets (41, 42) preferably being of substantially identical size and have a common edge (44), the size of the first and second interior sheets (41, 42) substantially corresponding to the inner portion (43a) of the exterior sheet (43) of the pane element (40).

6. A roof window (10) according to any one of the preceding claims, wherein the bottom sash covering (15) comprises a main section (151) adjoined by a depending section (152) to one side and a shelf section (155) to the other side, and wherein the main section (151) and the shelf section (155) are located at a distance from the interior side of the extended portion (43b) of the pane element (40) such that a gap (50) is formed between the bottom sash covering (15) and the extended portion (43b) of the pane element (40), preferably the main section (151) of the bottom sash covering (15) being curved and having an apex (151a) substantially level with the shelf section (155), more preferably the transition between the main section (151) and the shelf section (155) comprising an inclined bridge section (156).

7. A roof window (10) according to claim 6, wherein at least one seal (51, 52) is provided to span the gap (50) between the bottom sash covering (15) and the extended portion (43b) of the pane element (40).

8. A roof window (10) according to claim 7, wherein a first seal (51) is provided at the main section (151)

and a second seal (52) at the shelf section (155) to span the gap (50) between the bottom sash covering (15) and the extended portion (43b) of the pane element (40).

9. A roof window (10) according to claims 5 and 8, wherein the second seal (52) on the shelf section (155) of the bottom sash covering (15) is located close to the edge (44) of the first and second interior sheets (41, 42) and the first seal (52) on the main section (151) of the bottom sash covering (15) is located at a distance from the second seal (52), near the edge (43c) of the extended portion (43b) of the exterior sheet (43) of the pane element (40).

10. A roof window (10) according to any one of claims 7 to 9, wherein the second seal comprises a plurality of distinct sealing elements (52), each sealing element (52) having a longitudinal extension substantially smaller than the width of the extended portion (43b) of the exterior sheet (43) of the pane element (40) in the width direction of the roof window.

11. A roof window (10) according to any one of claims 7 to 10, wherein the first seal comprises a sealing profile (51) having a longitudinal extension substantially corresponding to the width of the extended portion (43b) of the exterior sheet (43) of the pane element (40) in the width direction of the roof window, the sealing profile (51) preferably comprising a main body (510), an outer sealing lip (511) and an inner sealing lip (512).

12. A roof window (10) according to any one of the preceding claims, wherein the masking (60) is provided as a coating, preferably as a ceramic coating burned into the glass of the exterior sheet (43) during tempering thereof.

13. A roof window (10) according to any one of claims 6 to 12, wherein the depending section (152) of the bottom sash covering (15) is provided near the edge (43c) of the extended portion (43b) of the exterior sheet (43) of the pane element (40), and wherein the depending section (152) extends below the plane of the at least one interior sheet (41, 42).

14. A roof window (10) according to any one of the preceding claims, wherein the extended portion (43b) of the exterior sheet (43) extends across and beyond the frame bottom member (13) when looking in the plane of the pane element (40).

15. A roof window (10) according to any one of the preceding claims, wherein at least one seal (51, 52) is a structural seal which retains the bottom of the pane element (40).

16. A roof window according to claim 15, wherein a set of glazing clips (53) is provided under the bottom sash covering (15), and wherein said at least one structural seal (52) is located at or near said set of glazing clips (53).

17. A roof window according to any one of the preceding claims, wherein a secondary masking (61) is provided on at least one interior sheet (41, 42) of the pane element (40).

18. A method of manufacturing a roof window comprising the steps of:

providing a frame, a sash, and a set of cover members including a bottom sash covering,
providing a pane element by

i) providing at least one interior sheet of predefined width and length dimensions,
ii) providing an exterior sheet with a length dimension exceeding the length of the at least one interior sheet by a predefined distance to define an extending portion,
iii) applying at least one masking on the exterior sheet to cover at least one face of the exterior sheet in at least the defined extending portion,
iv) assembling the pane element by connecting the at least one interior sheet with the exterior sheet, and

connecting the pane element to the sash such that the extended portion of the exterior sheet at least overlaps the bottom sash covering.

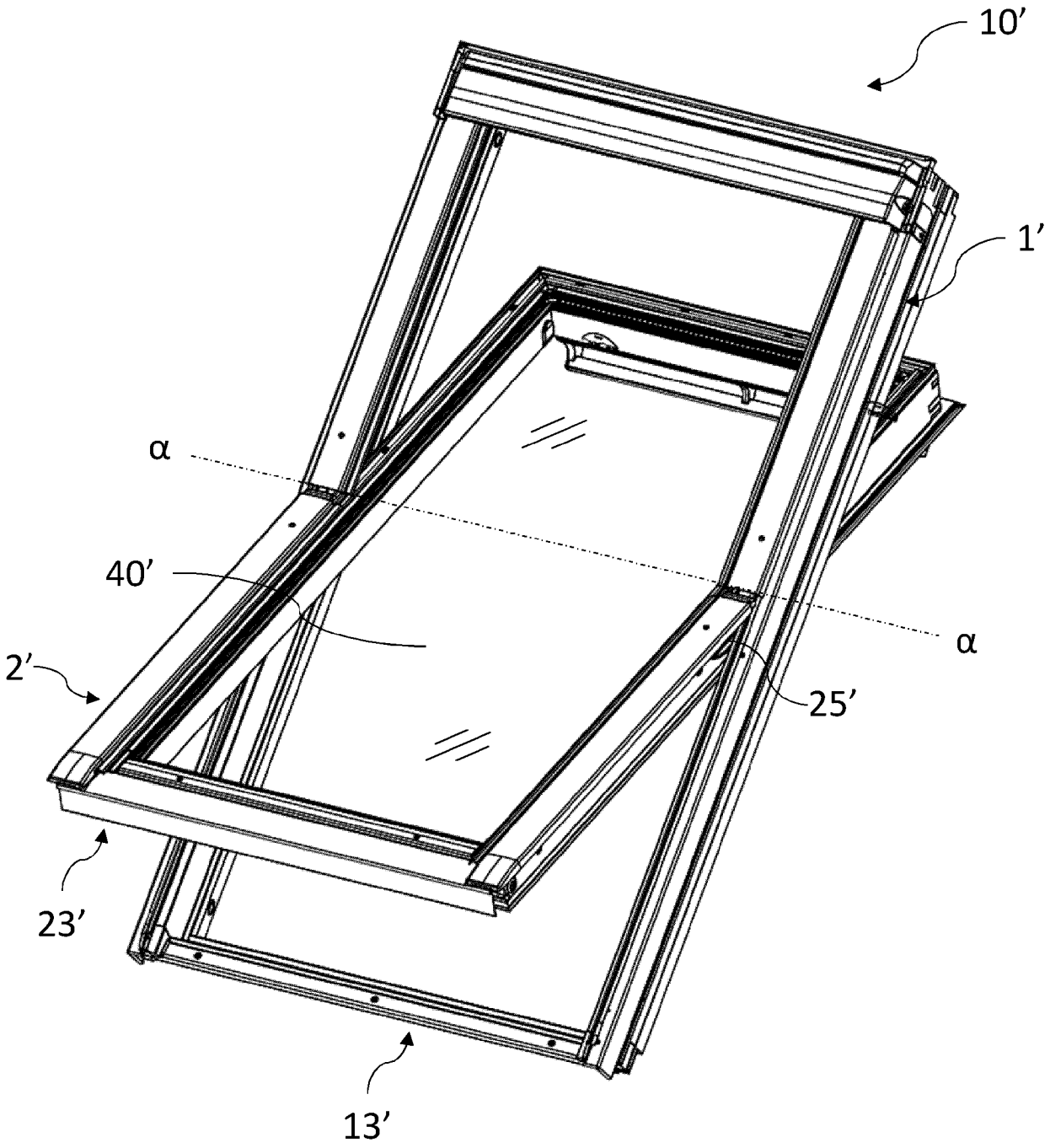


Fig. 1 (PRIOR ART)

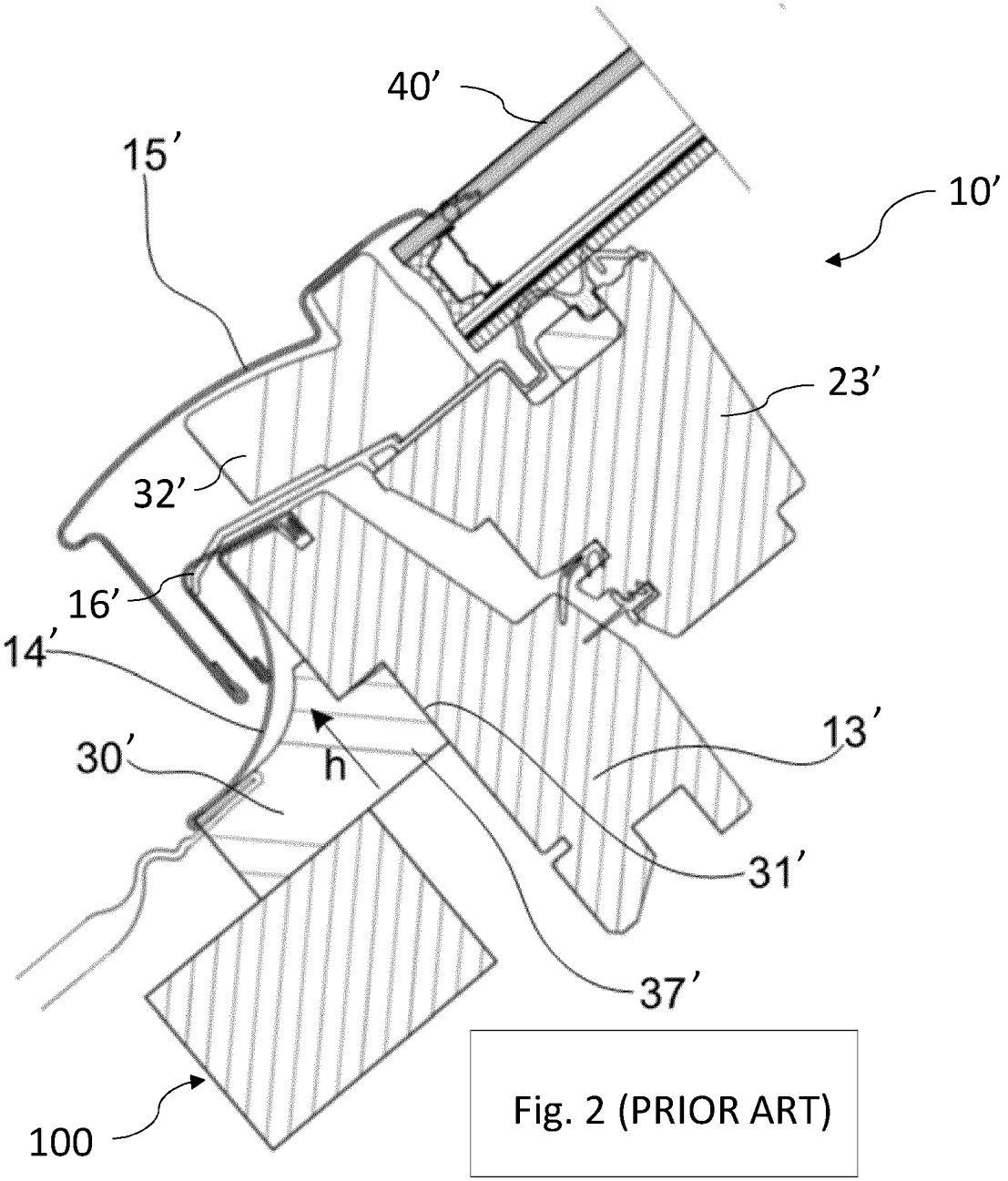


Fig. 2 (PRIOR ART)

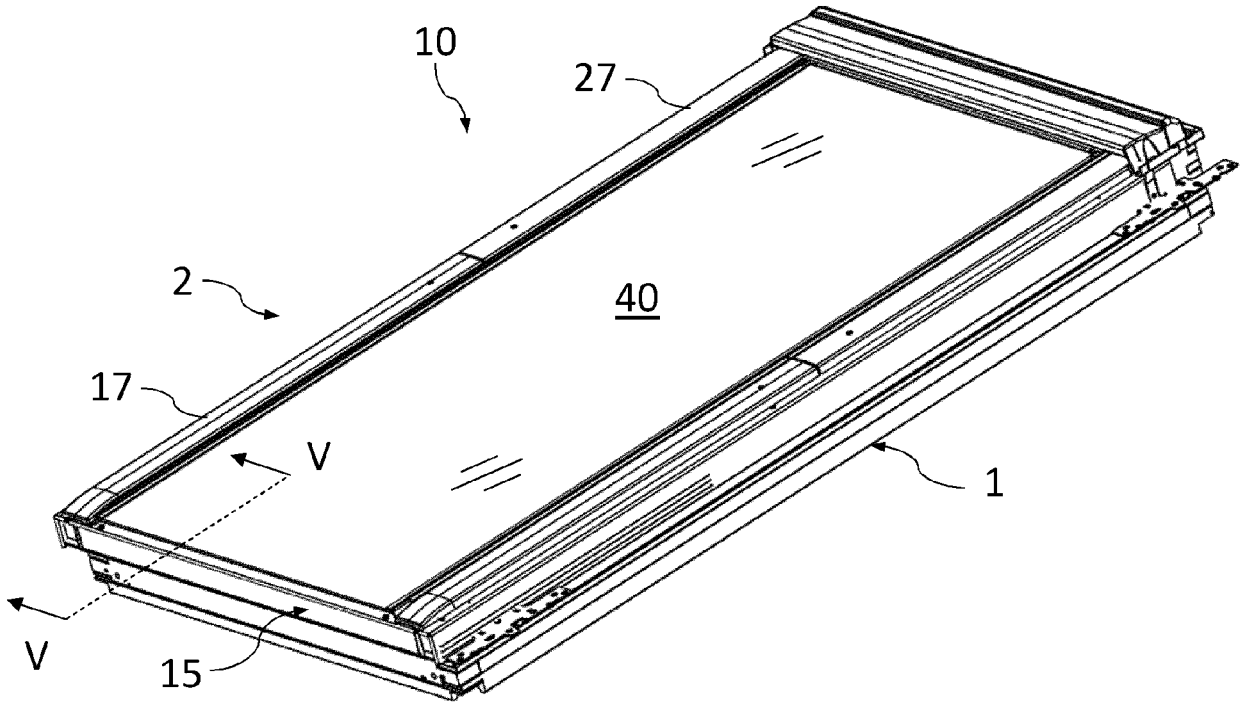


Fig. 3

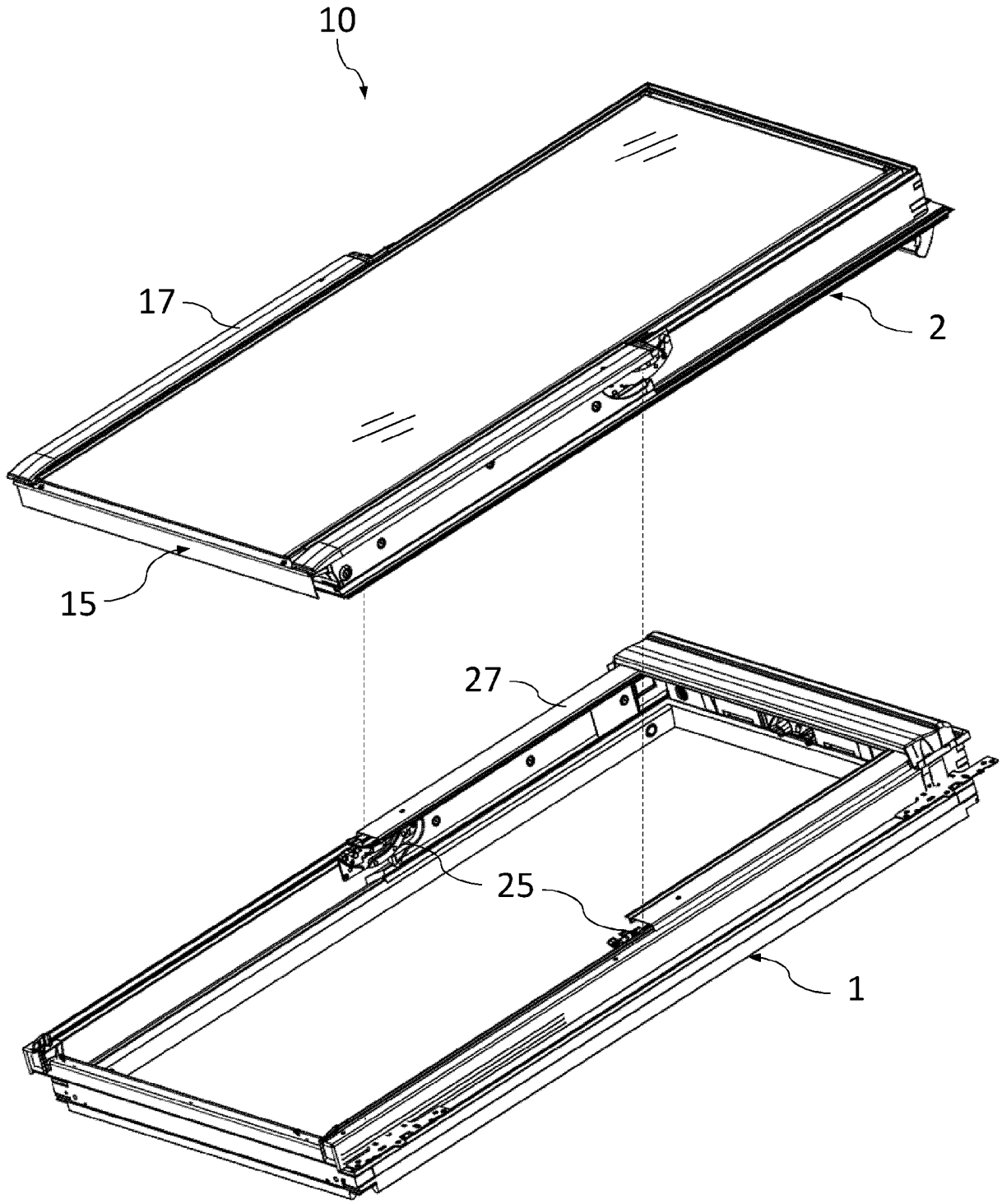


Fig. 4

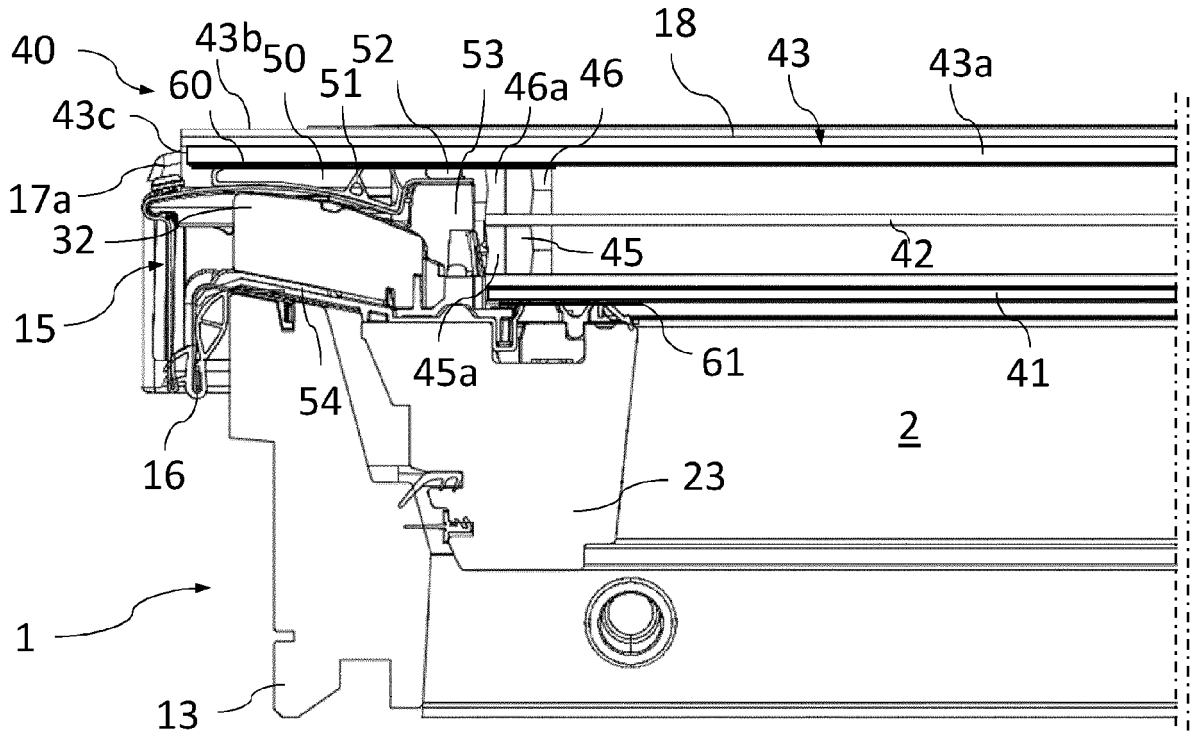
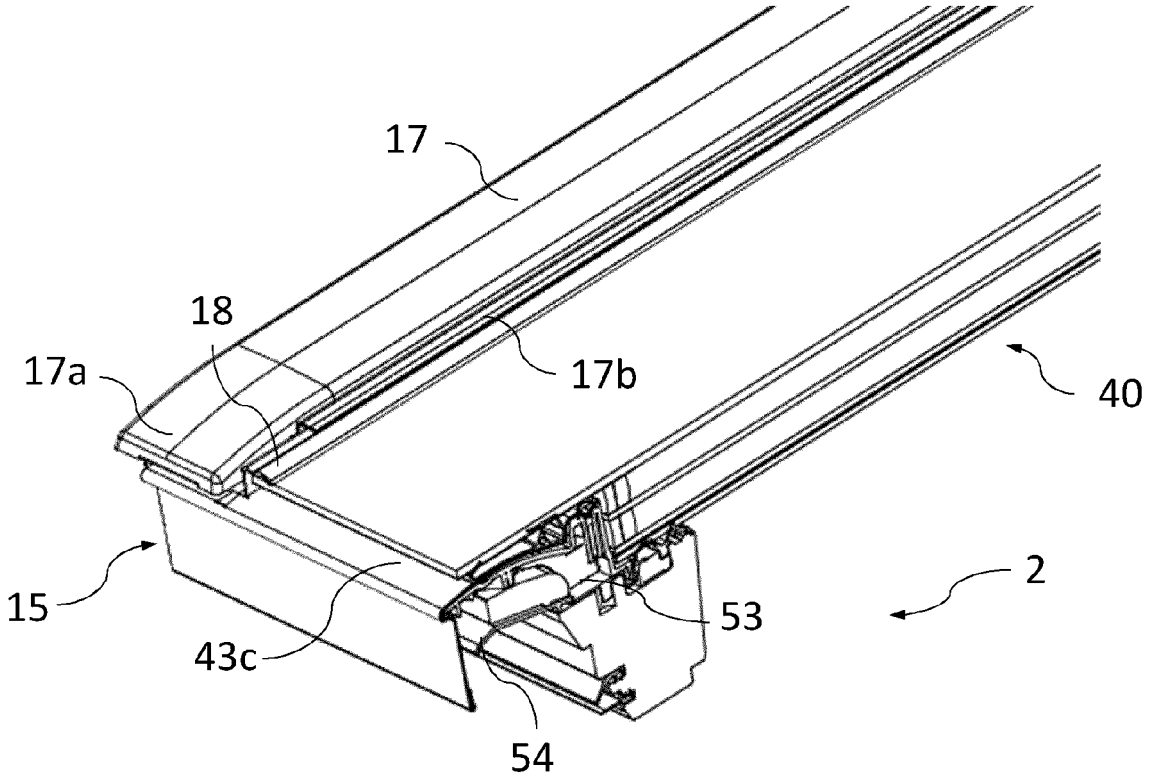

40
43b
50
52
53
18
43
43a
60
51
46a
46
43c
17a
32
45
42
15
61
41
45a
54
2
16
23
1
13

Fig. 5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17a
17b
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15
2
53
43c
54

Fig. 6

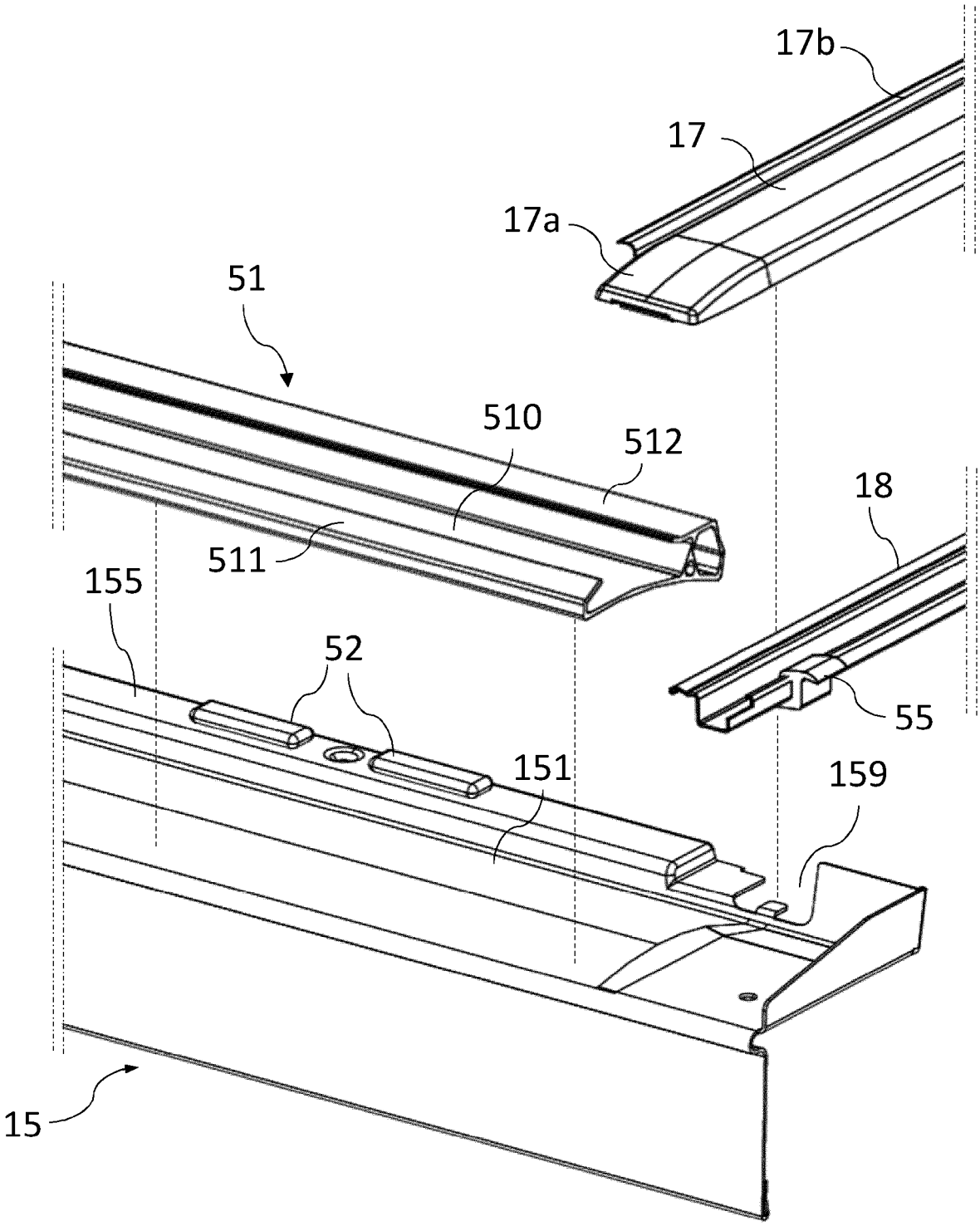

Fig. 7

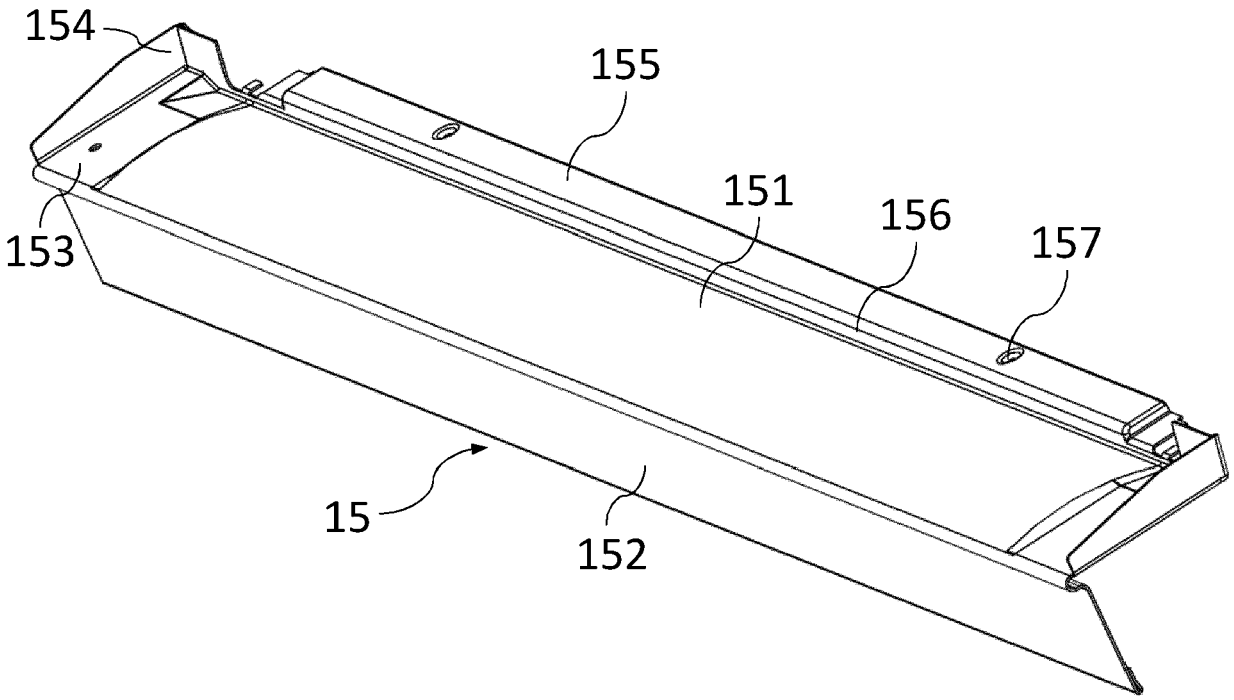
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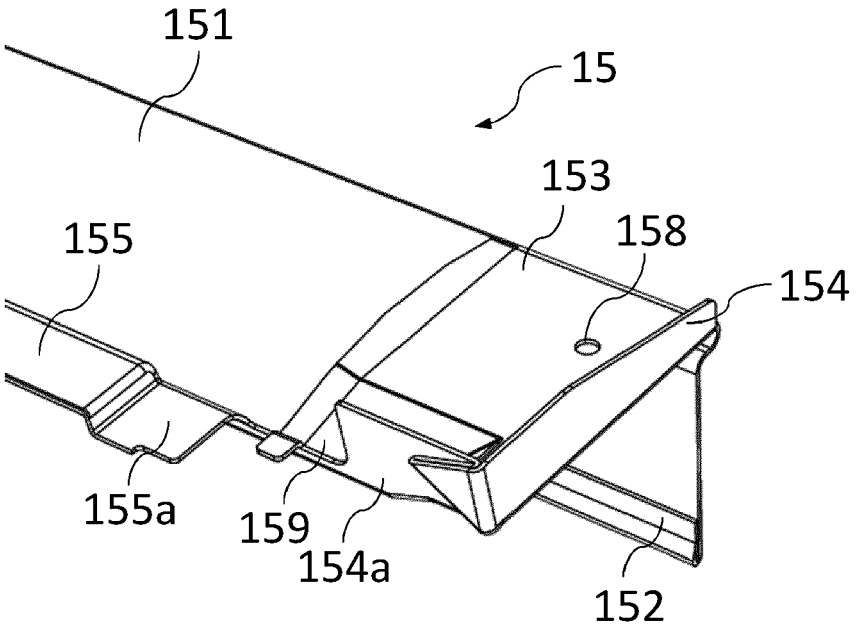
Fig. 8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155a
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154a
152

Fig. 9

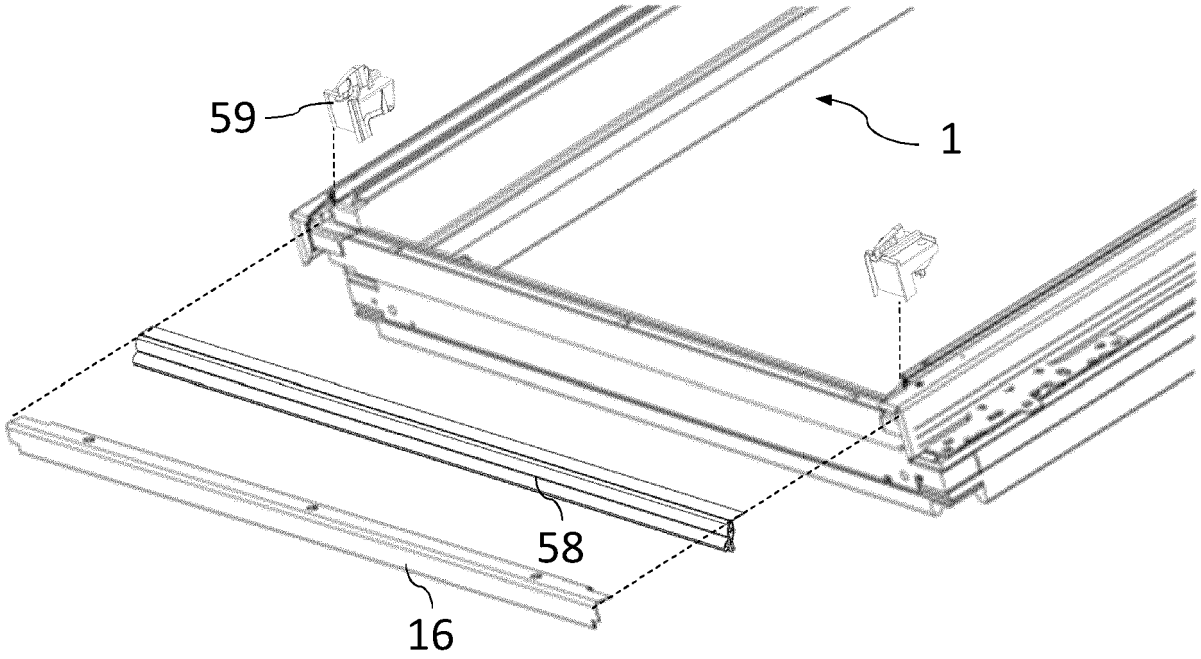


Fig. 10

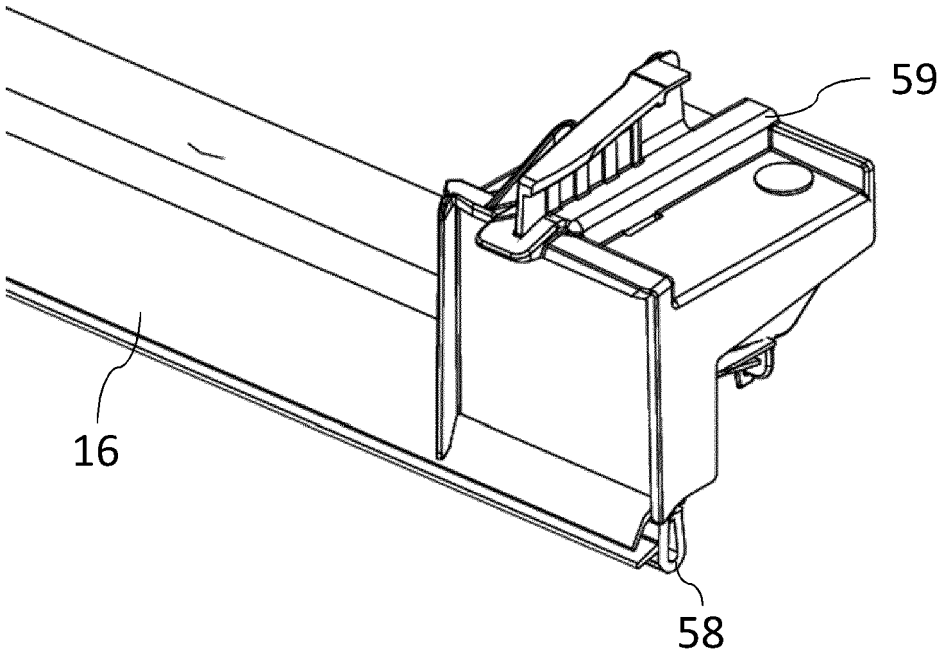
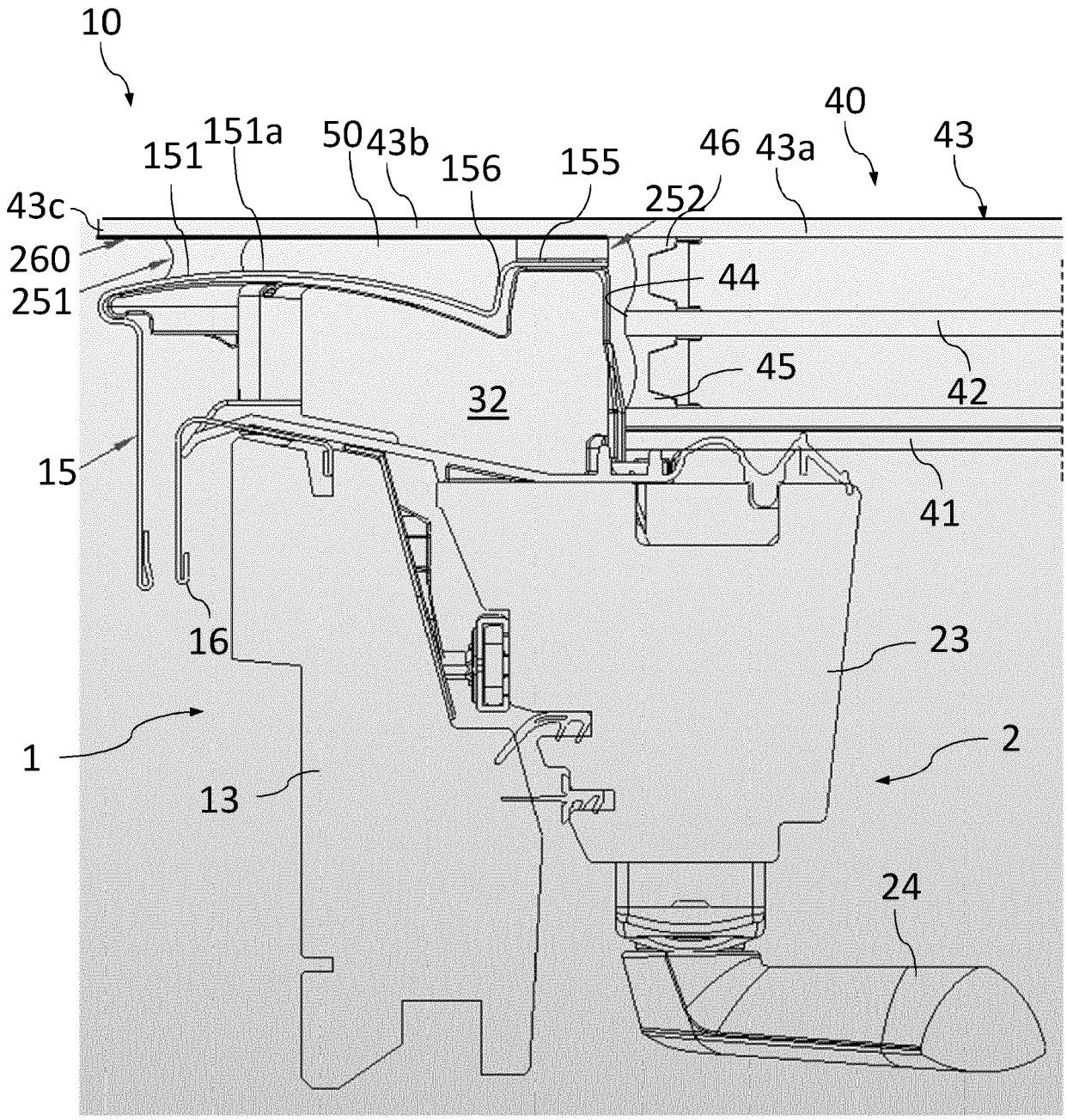


Fig. 11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13
24

Fig. 12

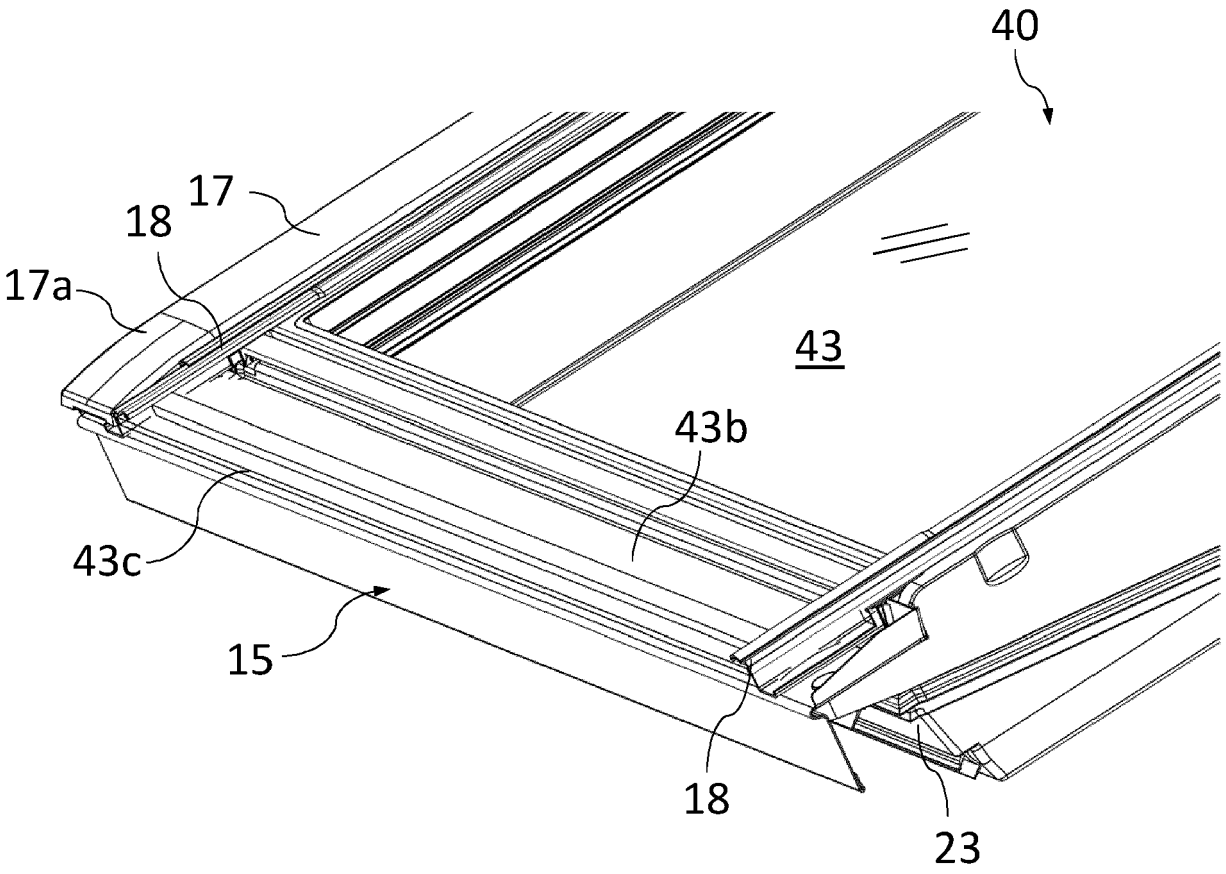

Fig. 13

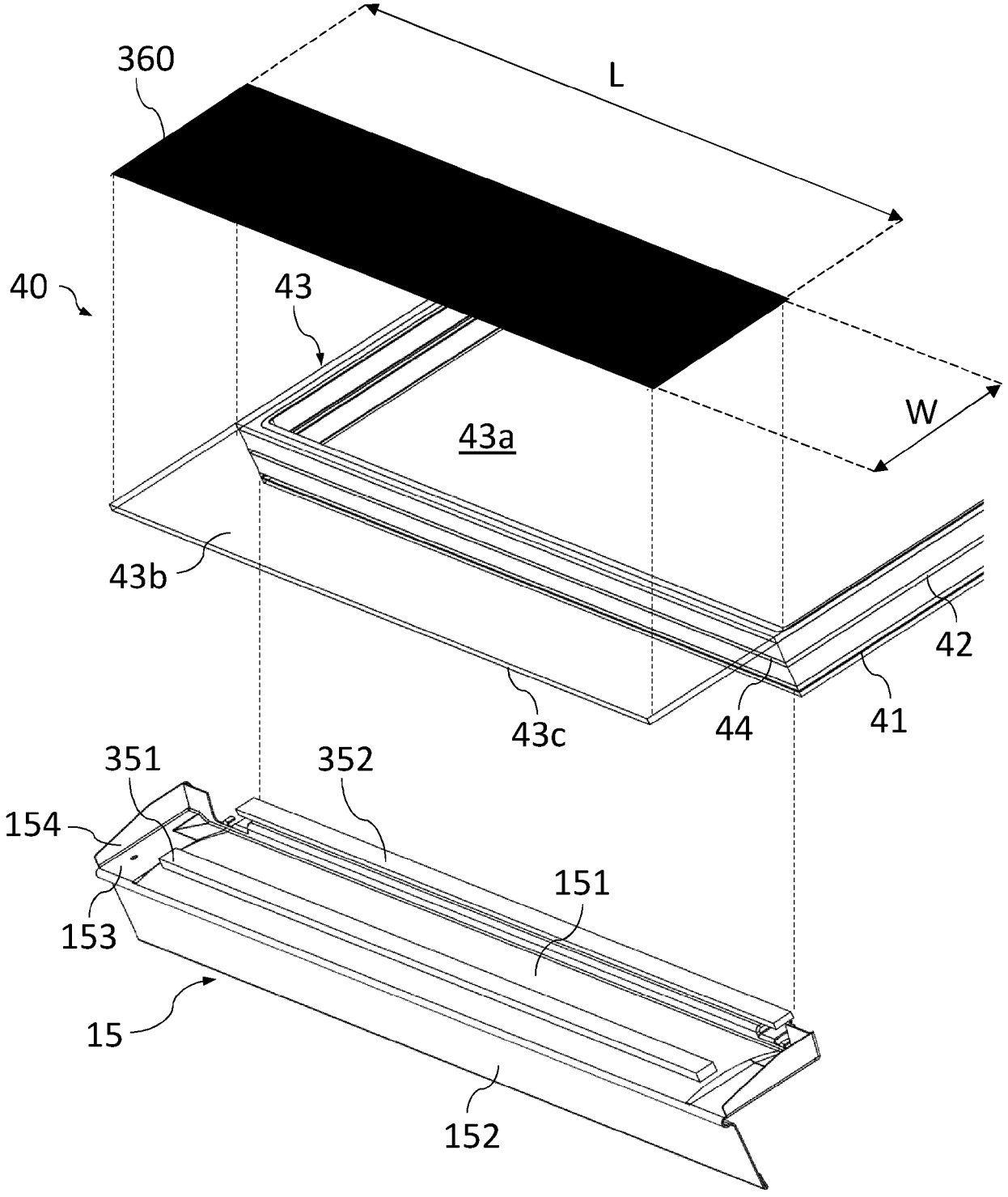

Fig. 14

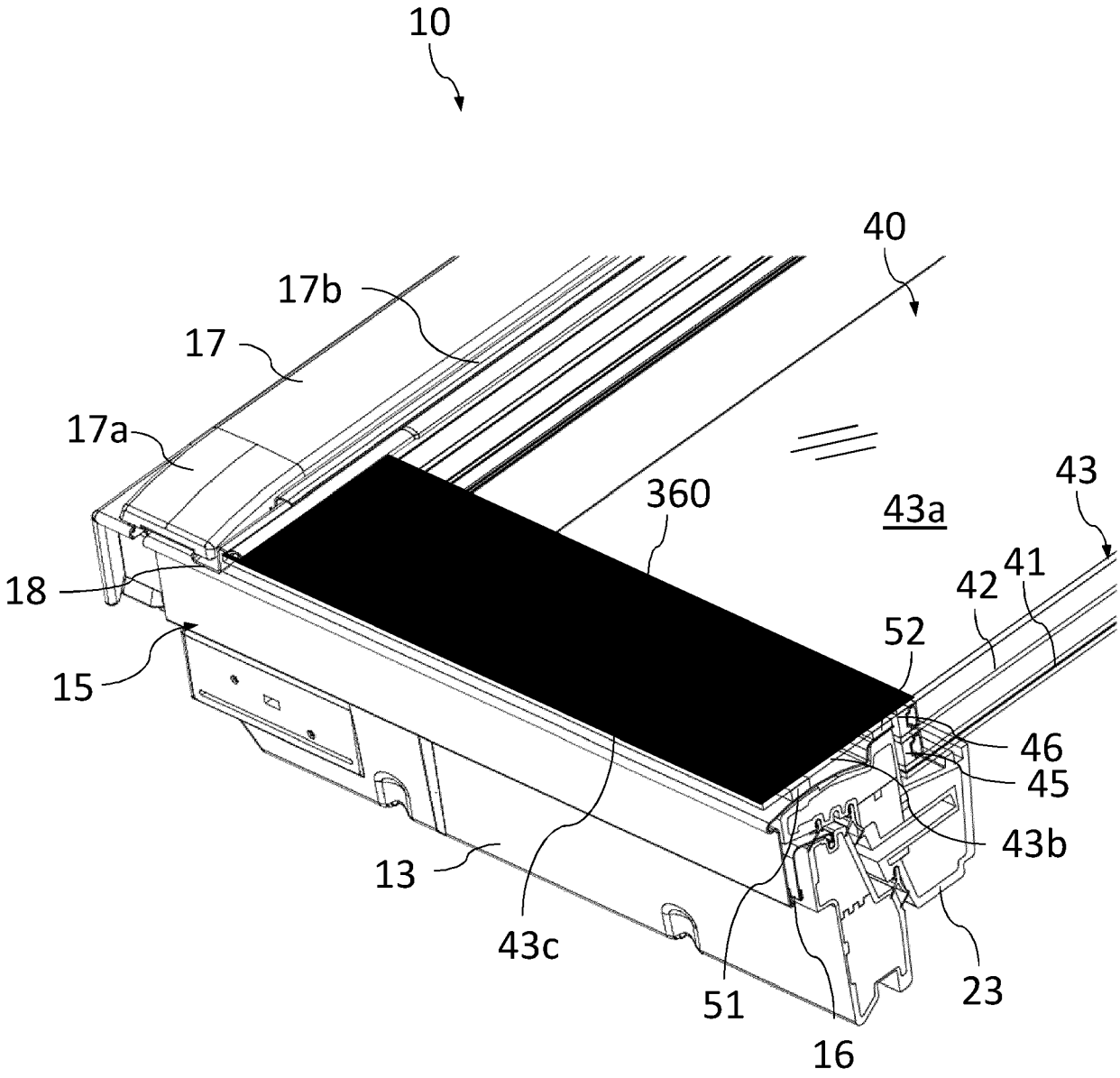

Fig. 15

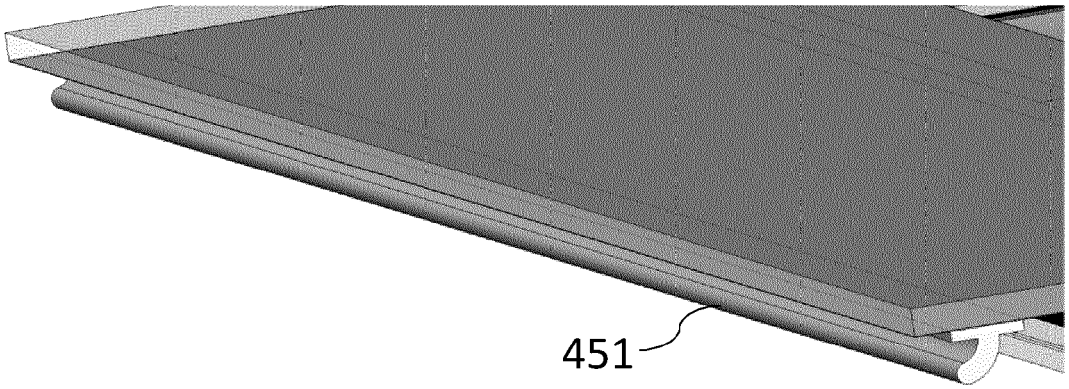

Fig. 16

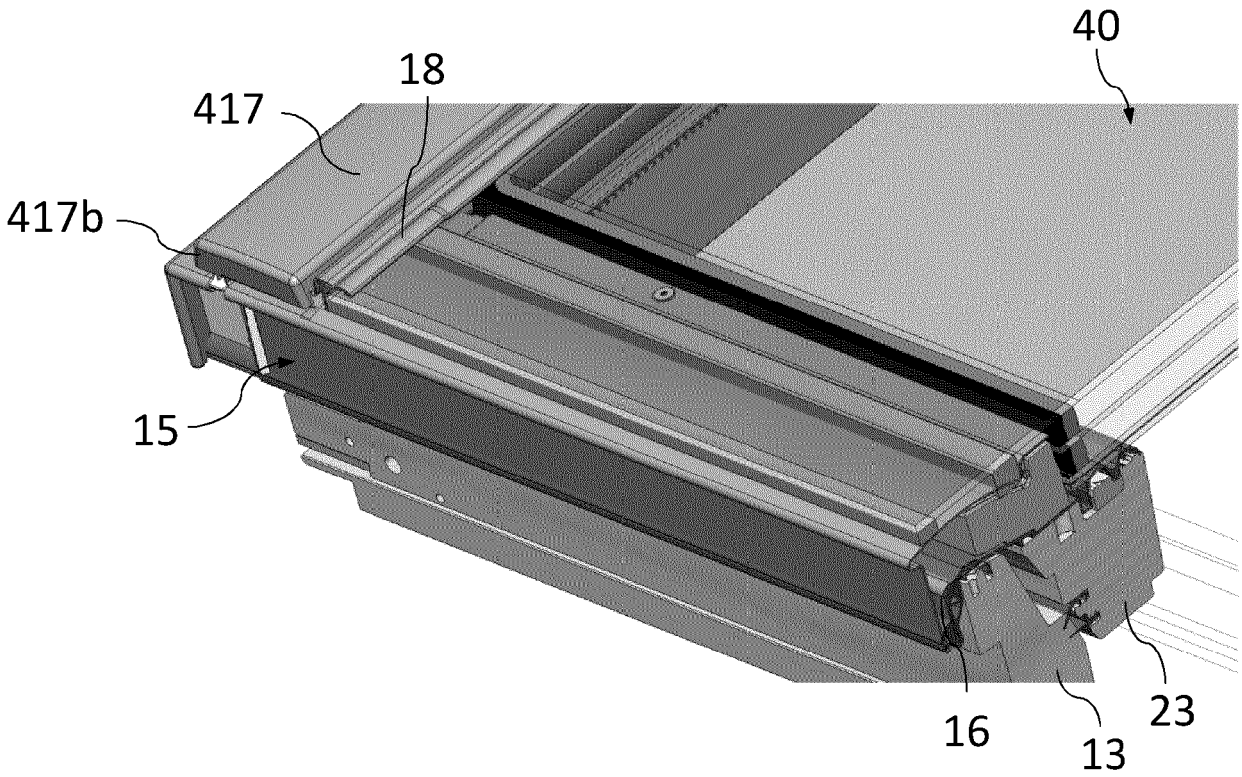

Fig. 17

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EUROPEAN SEARCH REPORT

Application Number
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E04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 February 2021	Tran, Kim Lien

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