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(54) **MOUNTING BRACKET FOR A ROOF WINDOW**

(57) The mounting bracket (7) is adapted for installing a roof window in a roof structure (100), comprising a first bracket leg (71) for fastening to the roof structure and a second bracket leg (72) for fastening to a frame of the roof window. The first bracket leg (71) and the second bracket leg (72) are adjoined by a bend (76) defining a width direction of the mounting bracket (7). The first bracket leg (71) comprises at least one deformation sec-

tion (77) configured to allow the mounting bracket (7) to undergo plastic deformation when the roof window is subjected to a sudden, severe load change such as an impact. The mounting bracket further comprises an additional cut-out (79) provided at the bend (76), said cut-out being surrounded by two transition portions (78) to provide a secondary weakening geometry.

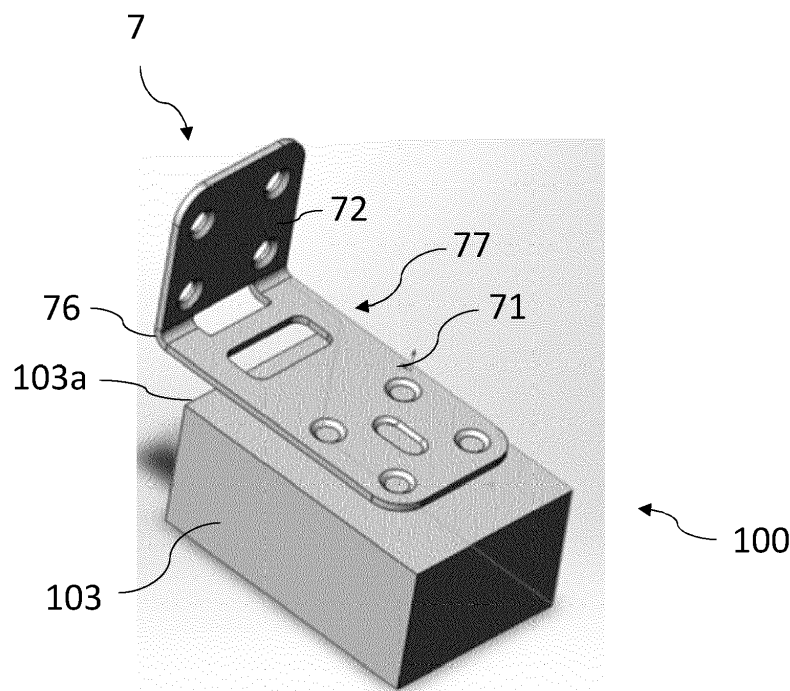


Fig. 5

Description

Technical Field

[0001] The invention relates to a mounting bracket for installing a roof window in a roof structure, comprising a first bracket leg for fastening to the roof structure and a second bracket leg for fastening to a frame of the roof window, said first bracket leg having a length and defining a length direction and said second bracket leg having a height and defining a height direction extending substantially perpendicular to the length direction, adjoined by a bend defining a width direction of the mounting bracket wherein the mounting bracket comprises an additional cut-out provided at the bend, said cut-out being surrounded by two transition portions to provide a secondary weakening geometry.

Background Art

[0002] Installation of roof windows traditionally take place by fittings in the form of mounting brackets fastened to the frame of the window and to the roof structure in which the roof window is to be built in. Windows installed in a roof are subjected to a number of varying load conditions over time. This is most often due to severe weather conditions, but may also be the result of incidents when people are working on the roof surface, e.g. fall accidents. Several efforts have been made to mitigate adverse effects on the roof window in the case of excess loads emanating for instance from impacts or other sudden changes of the load conditions, and various solutions have been suggested in the prior art, including the ones described and shown in published applications Nos EP 1 361 331 A2, US 2008/086960 A1 and KR 20120089053 A.

[0003] A further example is shown in WO 2010/009727 A1, in which the mounting brackets fastening the frame to the roof structure have been made amply stiff so as to be able to hold the window in place even under severe circumstances, such as tough weather. One downside is, however, that when the window is subjected to for instance an impact, the mounting brackets hold, but other parts of the window break and there is a risk that the window is inadvertently opened. This makes the above-described mounting bracket disadvantageous with respect to protection against sudden impacts following for instance a strong wind or incidents when people are working on the roof surface, e.g. fall accidents. To address these problems, Applicant's published international application WO 2017/144064 A1 suggests a modified mounting bracket to absorb the forces during certain load conditions. While this solution has proven to function well, the configuration of the mounting bracket is relatively complex.

Summary of Invention

[0004] The object of the invention is to provide a mounting bracket which provides satisfactory protection in a cost-efficient way and which may furthermore be used with a variety of configurations of the mounting bracket.

[0005] This and further objects is achieved by the first bracket leg comprising at least one deformation section configured to allow the mounting bracket to undergo plastic deformation when the roof window is subjected to a sudden, severe load change such as an impact. By placing one or more deformation sections in the first leg, a simple, yet efficient way of obtaining a committed deformation zone has been found. Thus, in normal use, sufficient load carrying properties are provided by the mounting bracket, while in case of for instance an impact, a controlled deformation is allowed to take place as the first leg is simply allowed to bend in its dedicated deformation section, while the second leg fastened to the frame of the roof window remains largely unaffected. An additional cut-out is provided at the bend, said cut-out being surrounded by two transition portions to provide a secondary weakening geometry.

[0006] While an additional cut-out goes against the traditional configuration of a mounting bracket as having reinforcement means such as folds or ridges at or near the bend, the formation of a cut-out as a secondary weakening geometry improves the protecting properties even further.

[0007] The extension of the cut-out in the bend may in principle have any dimensions as long as a suitable balance is found between load support during normal conditions and controlled deformation in case of a sudden load change. It is advantageous, however, if a main portion of the cut-out is provided in the first leg.

[0008] In one presently preferred embodiment, the deformation section comprises a weakening geometry positioned at a distance from the bend, preferably extending substantially in parallel with the width direction of the mounting bracket. In this way, it is possible to position the weakening geometry at an edge of elements of the roof structure surrounding the roof window to which the mounting bracket is fastened. Typically, such elements includes battens which have been cut to conform to the aperture in the roof surface, but other elements of a roof structure are usable as well, including an edge of a plywood plate serving as roof deck etc. If the roof window is subjected to a sudden load change, the first leg of the mounting bracket will simply bend over around the edge.

[0009] In one further development of this embodiment, the weakening geometry of the deformation section comprises an aperture and two surrounding bridge portions. This provides for a simple way to provide the deformation section.

[0010] Other presently preferred embodiments and further advantages will be apparent from the subsequent detailed description and drawings.

[0011] A feature described in relation to one of the as-

pects may also be incorporated in the other aspect, and the advantage of the feature is applicable to all aspects in which it is incorporated.

Brief Description of Drawings

[0012] In the following description embodiments of the invention will be described with reference to the drawings, in which

Fig. 1 is a perspective view of a roof window for use with mounting brackets of the invention;
Figs 2a to 2c are illustrations showing steps in installation of a roof window with prior art mounting brackets;
Fig. 3 is a partial perspective view of a roof window installed in a roof structure with a mounting bracket in an embodiment of the invention;
Fig. 4 is a perspective view of a mounting bracket in an embodiment of the invention;
Fig. 5 is a perspective view showing the mounting bracket of Fig. 4 fastened to a batten (shown in part) of a roof structure;
Fig. 6 is a view corresponding to Fig. 4 of a mounting bracket in another embodiment of the invention;
Fig. 7 is a cross-sectional view along the line VII-VII of Fig. 6;
Fig. 8 is a top view of the mounting bracket of Fig. 6; and
Fig. 9 is a cross-sectional view along the line IX-IX of Fig. 8.

Description of Embodiments

[0013] In the following detailed description, a preferred embodiment of the present invention will be described. However, it is to be understood that features of the different embodiments are exchangeable between the embodiments and may be combined in different ways, unless anything else is specifically indicated. It may also be noted that, for the sake of clarity, the dimensions of certain components illustrated in the drawings may differ from the corresponding dimensions in real-life implementations.

[0014] It is noted that terms such as "up", "down", "left-hand", "right-hand", "exterior", "interior", "outer", "inner" are relative and refers to the viewpoint in question.

[0015] Referring initially to Fig. 1, a roof window 1 is shown and comprises a number of elements including a frame 2, a sash 3 and a pane 4. In the embodiment shown, the sash 3 is openable relative to the frame 2 around a hinge axis α by means of a set of hinges 5.

[0016] The roof window could also have additional or alternative features relating to the frame, sash and pane etc. It could also be a roof window with a pane encased in a fixed sash, a frame with a sash hinged at another location than a centre axis, including at a top, bottom or side axis. Alternatively or additionally, the frame could

hold a ventilation device, solar panel, insulation frames etc.

[0017] The frame 2 of the roof window 1 comprises, in a manner known per se, a frame top member 21, opposing frame side members 22 and 23, and a frame bottom member 24.

[0018] Turning now to Fig. 3, the frame 2 of the roof window 1 is shown in a mounted condition in a roof structure generally designated 100. Here, the roof structure 100 comprises a number of rafters of which one rafter 101 is shown, on top of which battens 102, 103 are shown as well as an auxiliary batten 104. When installing the roof window in an existing roof structure, battens 102, 103 will typically have been cut to form an appropriate aperture for the frame 2 of the roof window, while auxiliary batten 104 will have been provided and fastened to the rafter 101 and a rafter (or other supporting structure) at the other side of the frame 2. Other components may be present in the roof structure as well. Instead of rafters, roof trusses may be provided, just as a roof deck may be present, for instance in the form of plywood plates.

[0019] A set of four first set mounting brackets 6 is provided to be connected to the frame 2, near the corners of juxtaposed frame side members and frame top/bottom member, namely either to the frame side members 22, 23 (not shown), or to the frame top member 21 and to frame bottom member 24 (as shown). In this way, two different installation levels are obtainable. The first set mounting bracket 6 may have an overall configuration corresponding to the one shown and described in Applicant's EP 2 578 763 B1 (second embodiment, Fig. 5), and be provided with deformation zones as in Applicant's above-mentioned WO 2017/144064 A1, which has matured into EP 3 420 155 B1.

[0020] A mounting bracket 7 according to the invention is provided as part of a second set of mounting brackets. In the embodiment shown, one mounting bracket 7 is fastened to the batten 103 and to the frame side member 22 near the position of the hinge 5. A counterpart mounting bracket is fastened to the opposing frame side member 23. It may be possible to include more mounting brackets 7 in the second set, for instance two mounting brackets 7 at each side in tall roof windows, i.e. roof windows having frame side members of a length of close to 2 m or even longer.

[0021] Referring now briefly to Figs 2a, 2b and 2c, excerpts of an installation manual are shown. Here, the installation situation shown in Fig. 2a corresponds to the installation situation in Fig. 3 with a mounting bracket 7 corresponding to the invention. A counterpart prior art mounting bracket is indicated in Fig. 2c, to the right.

[0022] In Figs 4 and 5, the mounting bracket 7 of Fig. 3 is shown in more detail. A first bracket leg 71 is adapted for fastening to the roof structure and a second bracket leg 72 for fastening to a frame 2 of the roof window 1. The first bracket leg 71 has a length L and defines a length direction and the second bracket leg 72 has a height H and defines a height direction extending sub-

stantially perpendicular to the length direction. The first bracket leg 71 and the second bracket leg 72 are adjoined by a bend 76 defining a width direction of the mounting bracket 7.

[0023] The first bracket leg 71 comprises at least one deformation section configured to allow the mounting bracket 7 to undergo plastic deformation when the roof window is subjected to a sudden, severe load change such as an impact.

[0024] In the embodiment shown, a primary deformation section 77 is provided in the first bracket leg 71. The deformation section 77 comprises a weakening geometry positioned at a distance from the bend 76. Here, the weakening geometry defining the deformation section 77 extends substantially in parallel with the width direction of the mounting bracket 7 as defined by the bend 76.

[0025] As shown, the weakening geometry of the deformation section 77 comprises an aperture 771 and two surrounding bridge portions 772 in the first bracket leg 71 in the embodiment shown.

[0026] The dimensions of the aperture 771 and the surrounding bridge portions 772 may in principle be chosen in any suitable way, as long as a suitable balance is found to ascertain satisfactory load support in normal use and the ability to deform in case of a sudden impact. Suitable dimensions include forming the aperture 771 with a first dimension in the width direction of the mounting bracket 7 of about 40 to 80% of a width W of the first bracket leg 71. A preferred value has been found of about 60% of the width, thus leaving about 20% material in each bridge portion 772.

[0027] Correspondingly, the shape of the aperture 771 may be chosen arbitrarily. It is preferred though that the aperture 771 has an oblong configuration in that the aperture 771 has a second dimension in the length direction of the first bracket leg 71 of the mounting bracket 7 of about 40 to 60% of the first dimension. Suitable values are about 50%.

[0028] In principle, the configuration of the first bracket leg 71 and the second bracket leg 72 may differ from the shown generally rectangular, but in the embodiment shown, the first bracket leg 71 has a uniform width W along its entire length L and the second bracket leg 72 has the same, uniform width along its entire height H.

[0029] In concrete values, the first bracket leg 71 has a length L of 60 to 90 mm, preferably about 75 to 80 mm. The second bracket leg 72 has a height H of about 30 to 60 mm, preferably a height H constituting 40 to 80% of the length L of the first bracket leg 71. The first bracket leg 71 has a width W of about 30 to 60 mm, preferably a width W constituting 40 to 60% of the length L of the first bracket leg 71. In comparison with the prior art mounting bracket of Fig. 2a and Fig. 2c, the length of the first leg 71 of the inventive mounting bracket 7 in the embodiment shown has been reduced by approximately 20 mm.

[0030] Referring in particular to Fig. 5, the batten 103 of the roof structure 100 with the mounting bracket 7 attached to it is shown in more detail. As mentioned in the

above, the batten 103 has been cut such that a gap between an edge 103a of the batten and an outer side of the frame 2 of the roof window 1 is provided in the mounted condition of the roof window 1. Recommendations for the magnitude of this gap are around 20 to 40 mm. In any event, it is recommended that the batten 103 is cut such that it is ensured that the aperture 771 is positioned above the edge 103a of the batten 103. As a rule of thumb, no more than half of the aperture 771 as seen in the length direction of the first leg 71 must be positioned above the batten 103.

[0031] It is preferred that the weakening geometry of the deformation section 77 is positioned at a distance from the bend 76 of about 10 to 30 mm. In this way it is ensured that the weakening geometry of the deformation section 77 is located at or near the edge 103a of the batten 103 (or of another edge in case of other roof structure elements). In the embodiment shown, for a gap of about 20 mm from the edge 103a to the outer side of the frame 2 of the roof window, the aperture 771 in the first leg 71 of the mounting bracket 7 is located such that the edge 103a is located substantially under the centre of the aperture 771.

[0032] In the embodiment shown, a secondary weakening geometry is provided as well, including a cut-out 79 provided at the bend 76. The cut-out 79 is surrounded by two transition portions 78.

[0033] Referring now also to the slightly different embodiment of Figs 6 to 9, it is seen that a main portion of the cut-out 79 is provided in the first leg 71, as is clearly seen when comparing the views of Figs 7 and 8.

[0034] In the embodiments shown, the cut-out 79 has smaller dimensions than the aperture 771.

[0035] Common to both embodiments, the first bracket leg 71 is provided with a first plurality of openings 73 for receiving fastening means, and here also with an oblong hole 75 to receive additional fastening means.

[0036] The oblong hole 75 may be positioned in the centre of the first plurality of openings 73, such that the first plurality of openings is provided symmetrically around the oblong hole 75 as shown in Figs. 3 - 5. Alternatively, the first plurality of openings 73 may be provided asymmetrically around the oblong hole 73, as shown in Figs. 6 and 8, where a part of the first plurality of openings 73 are placed closer towards the bend 76 compared to the embodiments shown in Figs. 3 - 5. By positioning at least one of the holes of the first plurality of holes closer to the bend 76 and thereby having an asymmetrical distribution of the plurality of holes around the oblong hole, a larger portion of the first leg 71 can be fixed to a batten 102. Alternatively, the increased distance between the openings in the first plurality of openings allow at least one opening of the first plurality of openings 73 to be used for fixing to a batten and at least one other opening of the first plurality of opening 73 to be used for fixing to a rafter 101. This may be beneficial in cases where a rafter 101 has been positioned in close proximity to the frame 2.

[0037] Correspondingly, the second bracket leg 72 is provided with a second plurality of openings 74 for receiving fastening means, preferably countersunk.

[0038] As shown in some detail in Figs 7 and 9, the openings 73 and the oblong hole 75 is each provided with a countersink on both sides of the first leg 71. This allows for the mounting bracket 7 to be used with countersinkings both in the shown configuration, with the second leg 72 pointing upwards relative to the first leg 71 as seen in the height direction, and oppositely, i.e. with the second leg 72 pointing downwards. The latter position is used when installing the roof window at a lower installation level than the shown, namely at a position corresponding to the one shown in Fig. 2b for the prior art assembly.

[0039] Since the second bracket leg 72 has the same face facing the outer side of the frame side member in both installation levels, the second plurality of openings 74 need only to be countersunk at one side.

[0040] Differences between the embodiments of Figs 6 to 9 and the previous embodiment include the curvature of rounded corners 71a, 72a of the first and second legs 71, 72.

[0041] The mounting bracket 7 is suitably provided as a part of a metallic material and may be removed from the roof window when uninstalling the roof window. Examples of suitable materials include metal coated structural steels configured for thin-gauge structural applications with satisfying load-bearing capacity and galvanic corrosion protection properties, such as EN10346:2015; S220GD.

[0042] The thickness of the first leg 71 and the second leg 72 typically lies in the range 1 to 4 mm, preferably 1.5 to 3 mm, more preferably about 2 mm; this corresponds to the thickness of the embodiment shown. The tolerances are typically in the magnitude +/- 0.13.

[0043] Suitable coatings include zinc-magnesium alloy coatings having a coating thickness in the range of 15 to 25 µm.

[0044] The mounting bracket 7 could be reused as is after disassembly, when installing another roof window, or be recycled by appropriate environmentally responsible disposal means.

[0045] 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

[0046]

1	roof window
2	frame
21	frame top member
22	frame side member
23	frame side member
24	frame bottom member
3	sash

4	pane
5	hinge
6	first set mounting bracket
7	mounting bracket
5 71	first bracket leg
71a	corner of first bracket leg
72	second bracket leg
72a	corner of second bracket leg
73	first plurality of openings
10 74	second plurality of openings
75	oblong hole
76	bend
77	deformation section
771	aperture
15 772	bridge portions
78	transition portions
79	cut-out
100	roof structure
101	rafter
20 102	batten
103	batten
103a	edge of batten
104	auxiliary batten

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Claims

1. A mounting bracket (7) for installing a roof window (1) in a roof structure (100), comprising a first bracket leg (71) for fastening to the roof structure and a second bracket leg (72) for fastening to a frame (2) of the roof window (1), said first bracket leg (71) having a length (L) and defining a length direction and said second bracket leg (72) having a height (H) and defining a height direction extending substantially perpendicular to the length direction, adjoined by a bend (76) defining a width direction of the mounting bracket (7), wherein the first bracket leg (71) comprises at least one deformation section (77) configured to allow the mounting bracket (7) to undergo plastic deformation when the roof window is subjected to a sudden, severe load change such as an impact, **characterized in that** a cut-out (79) is provided at the bend (76), said cut-out (79) being surrounded by two transition portions (78) to provide a secondary weakening geometry.
2. A mounting bracket (7) according to claim 1, wherein the deformation section (77) comprises a weakening geometry positioned at a distance from the bend (76), preferably extending substantially in parallel with the width direction of the mounting bracket (7).
3. A mounting bracket (7) according to claim 2, wherein the weakening geometry of the deformation section (77) comprises an aperture (771) and two surrounding bridge portions (772).

4. A mounting bracket (7) according to claim 3, wherein the aperture (771) has a first dimension in the width direction of the mounting bracket (7) of about 40 to 80% of a width (W) of the first bracket leg (71), preferably about 60%. 5
5. A mounting bracket (7) according to claim 4, wherein the aperture (771) has a second dimension in the length direction of the first bracket leg (71) of the mounting bracket (7) of about 40 to 60% of the first dimension, preferably about 50%. 10
6. A mounting bracket (7) according to any of the preceding claims, wherein the first bracket leg (71) has a uniform width (W) along its entire length (L), the second bracket leg (72) preferably having the same width, more preferably the second bracket leg (72) has a uniform width along its entire height (H). 15
7. A mounting bracket (7) according to any of claims 2 to 6, wherein the weakening geometry of the deformation section (77) is positioned at a distance from the bend (76) of about 10 to 30 mm. 20
8. A mounting bracket (7) according to any of the preceding claims, wherein the first bracket leg (71) has a length (L) of 60 to 90 mm, preferably about 75 to 80 mm. 25
9. A mounting bracket (7) according to any of the preceding claims, wherein the second bracket leg (72) has a height (H) of about 30 to 60 mm, preferably a height (H) constituting 40 to 80% of the length (L) of the first bracket leg (71). 30
10. A mounting bracket (7) according to any of the preceding claims, wherein the first bracket leg (71) has a width (W) of about 30 to 60 mm, preferably a width (W) constituting 40 to 60% of the length (L) of the first bracket leg (71). 35
40
11. A mounting bracket (7) according to any of the preceding claims, wherein a main portion of the cut-out (79) is provided in the first leg (71). 45
12. A mounting bracket (7) according to any of the preceding claims, wherein the first bracket leg (71) is provided with a first plurality of openings (73) for receiving fastening means, preferably also with an oblong hole (75) to receive additional fastening means. 50
13. A mounting bracket (7) according to claim 12, wherein each opening (73) of said first plurality of openings, and optionally the oblong hole (75), is/are provided with a countersink on both sides of the first leg (71) 55
14. A mounting bracket (7) according to any of the preceding claims, wherein the second bracket leg (72) is provided with a second plurality of openings (74) for receiving fastening means, preferably countersunk.
15. A mounting bracket (7) according to any of the preceding claims, wherein the mounting bracket (7) is provided as a part of a metallic material, preferably as a bent strip of a structural steel, more preferably of a metal coated structural steel having such as EN10346:2015; S220GD.
16. A mounting bracket (7) according to any of the preceding claims, wherein the thickness of the first leg (71) and the second leg (72) lies in the range 1 to 4 mm, preferably 1.5 to 3 mm, more preferably about 2 mm.

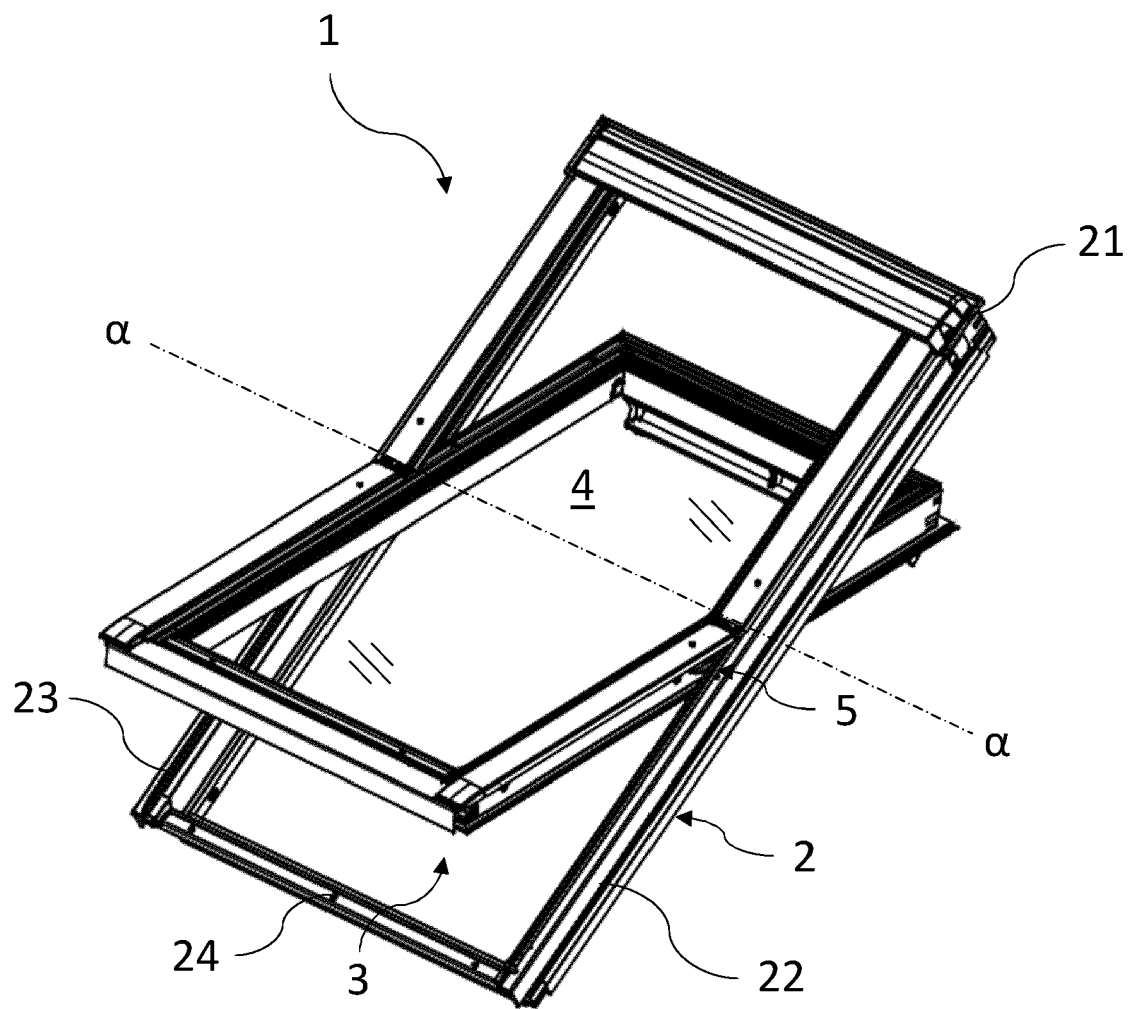


Fig. 1

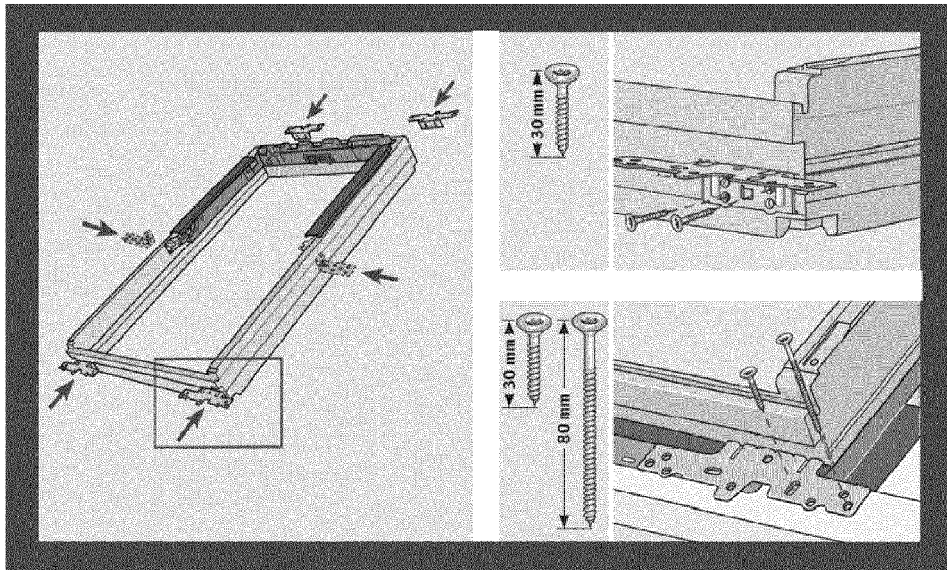


Fig. 2a (PRIOR ART)

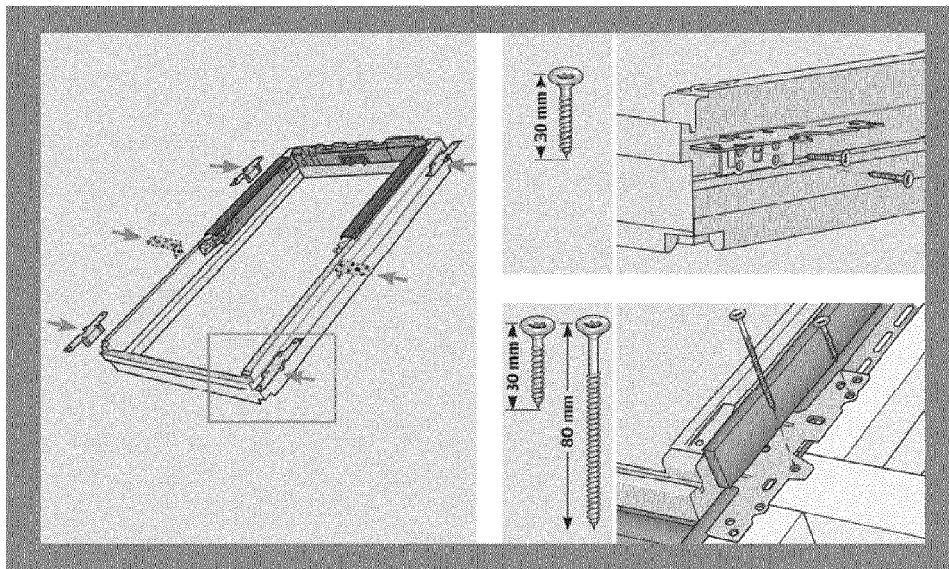


Fig. 2b (PRIOR ART)

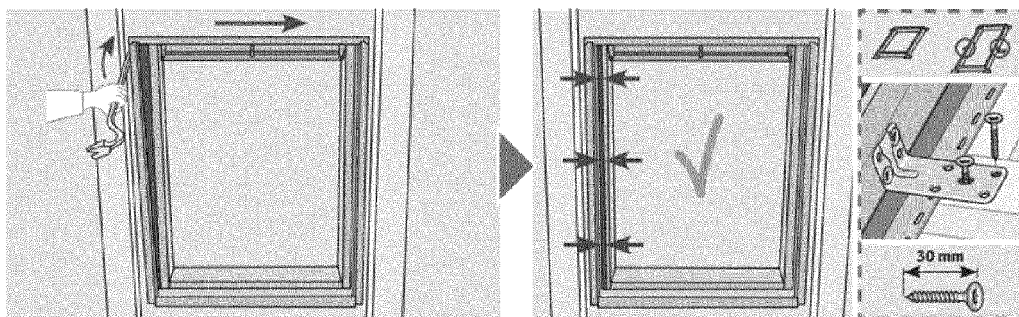


Fig. 2c (PRIOR ART)

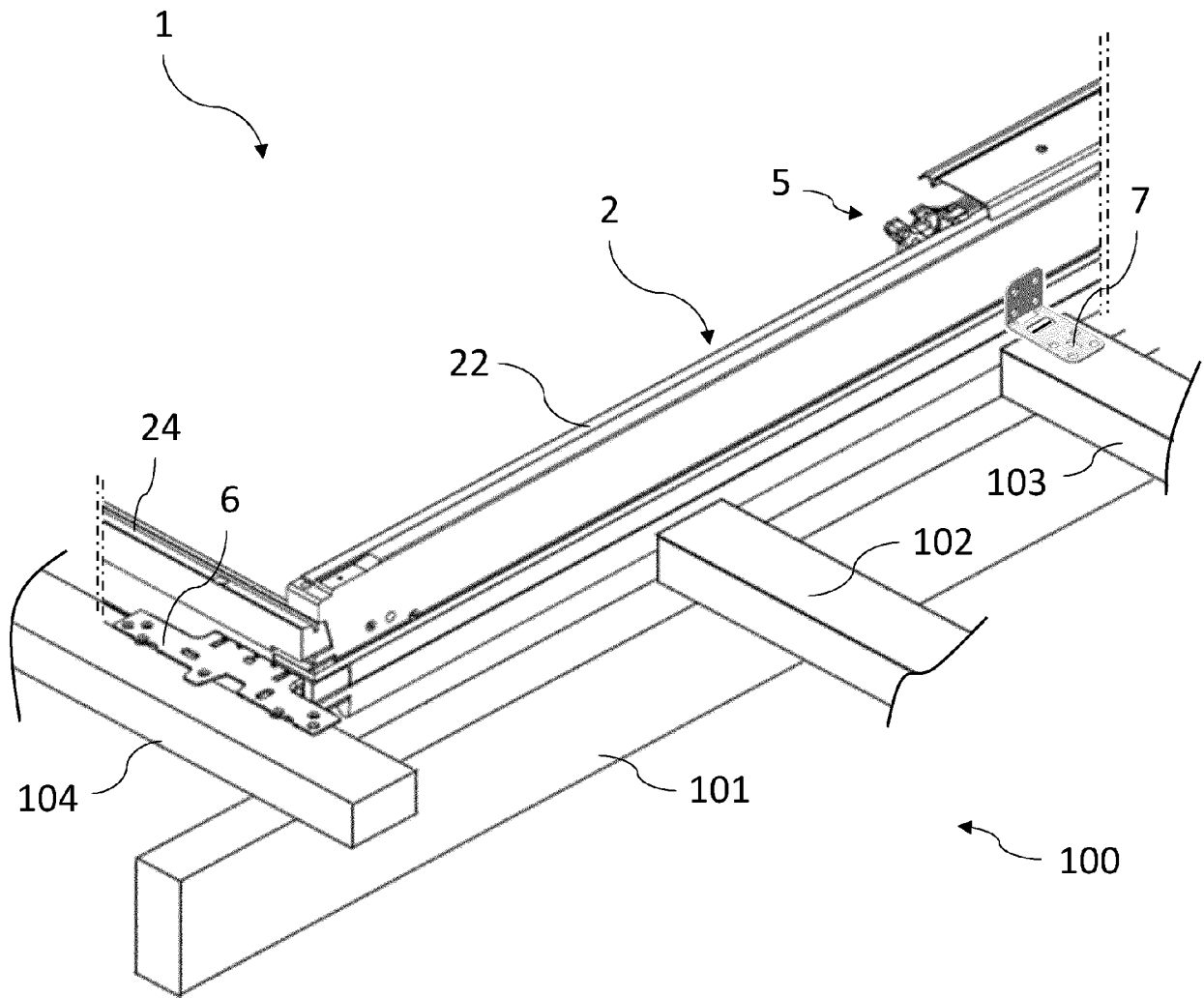


Fig. 3

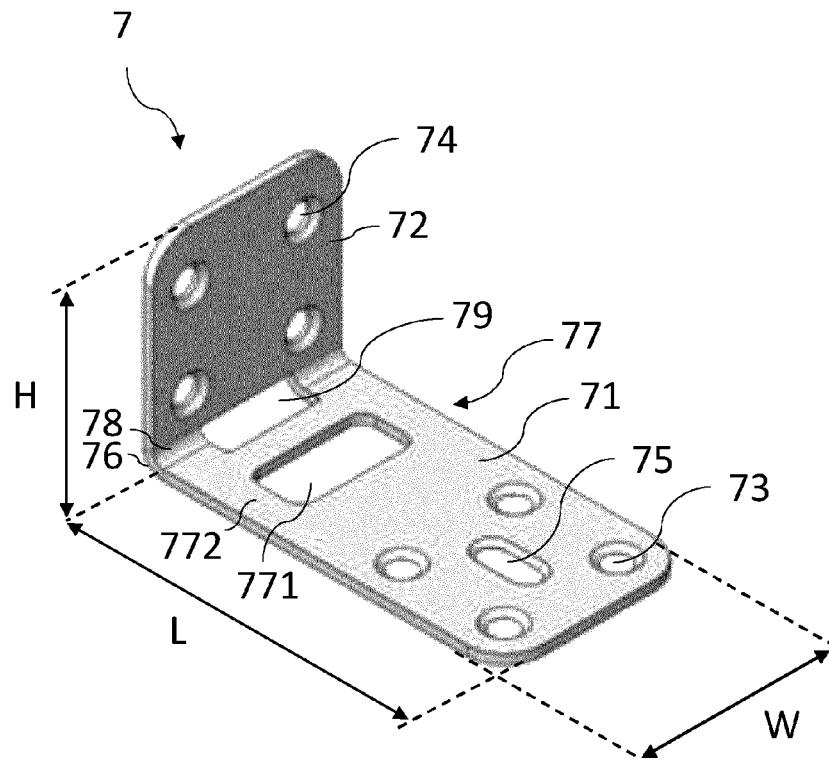


Fig. 4

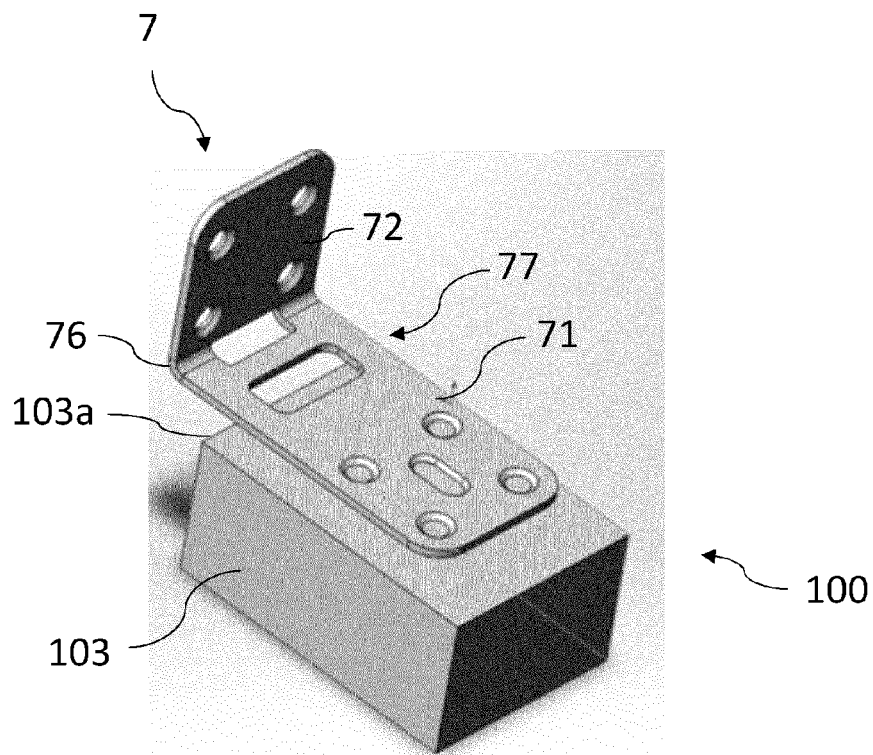
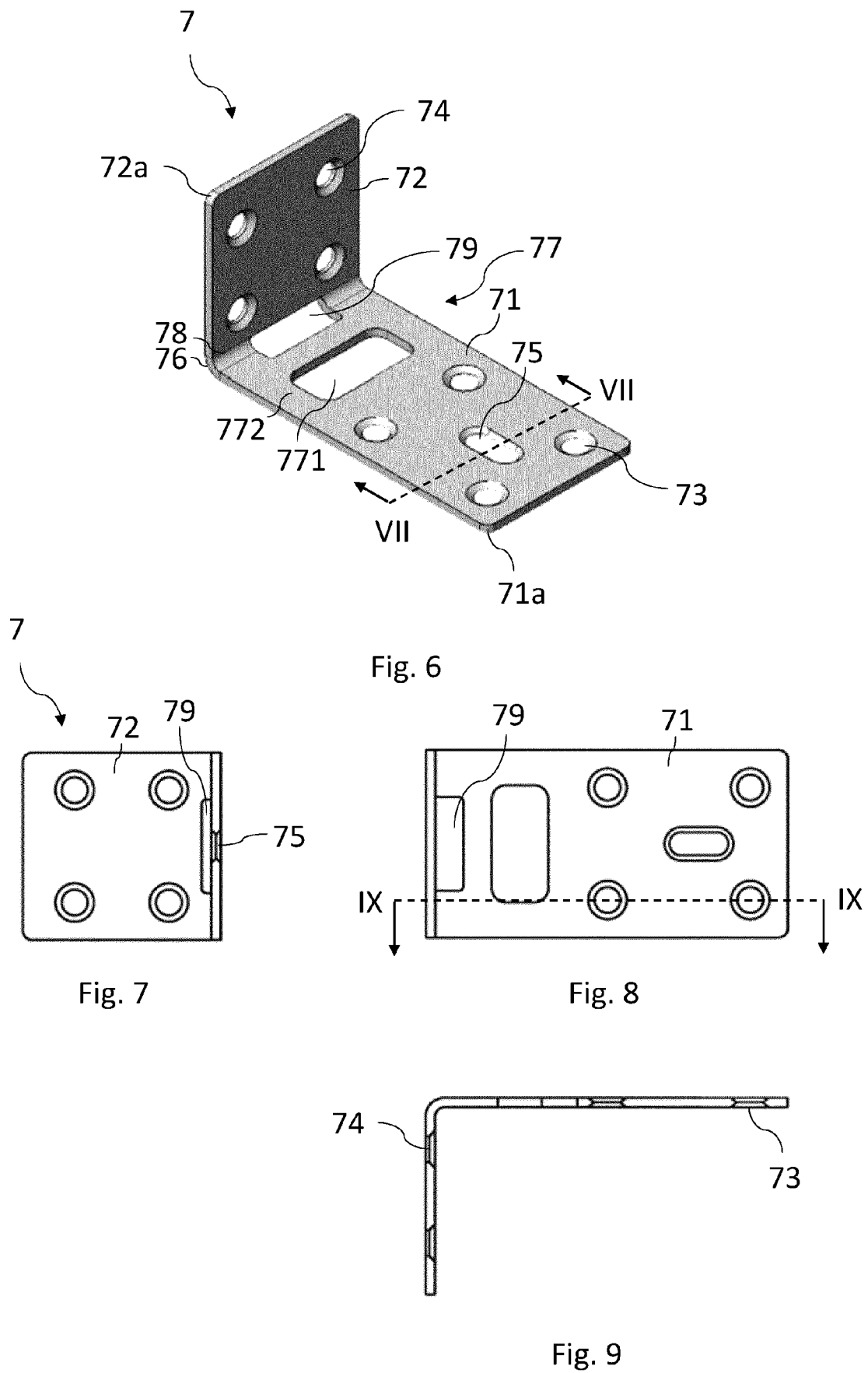


Fig. 5





EUROPEAN SEARCH REPORT

Application Number

EP 22 20 9597

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			TECHNICAL FIELDS SEARCHED (IPC)
			E04D E06B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 March 2023	Examiner Tran, Kim Lien
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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