



(11)

EP 4 253 685 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
04.10.2023 Bulletin 2023/40

(51) International Patent Classification (IPC):
E04D 13/03 ^(2006.01) **E04D 13/035** ^(2006.01)
E05D 7/12 ^(2006.01) **E05D 15/48** ^(2006.01)

(21) Application number: **23166221.4**

(52) Cooperative Patent Classification (CPC):
E04D 13/031; E04D 13/0354; E05D 7/12;
E05D 15/48; E05D 15/40; E05D 2015/487;
E05Y 2600/528; E05Y 2600/53; E05Y 2600/56;
E05Y 2600/626; E05Y 2800/692; E05Y 2800/742;
E05Y 2800/744; E05Y 2900/152

(22) Date of filing: **31.03.2023**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(71) Applicant: **VKR Holding A/S**
2970 Hørsholm (DK)

(72) Inventor: **SKOV, Rasmus Fogelberg**
2970 Hørsholm (DK)

(74) Representative: **AWA Denmark A/S**
Strandgade 56
1401 Copenhagen K (DK)

(30) Priority: **31.03.2022 DK PA202270167**

(54) **ROOF WINDOW WITH A SASH INSTALLATION COMPONENT**

(57) In the roof window, a sash installation component (35) is provided to support the sash (3) in a second

operational condition of the roof window (1). The sash installation component (35) comprises a body portion (351), a frame engagement portion (352) and a plurality of support surfaces (353, 354, 356) for the sash (3).

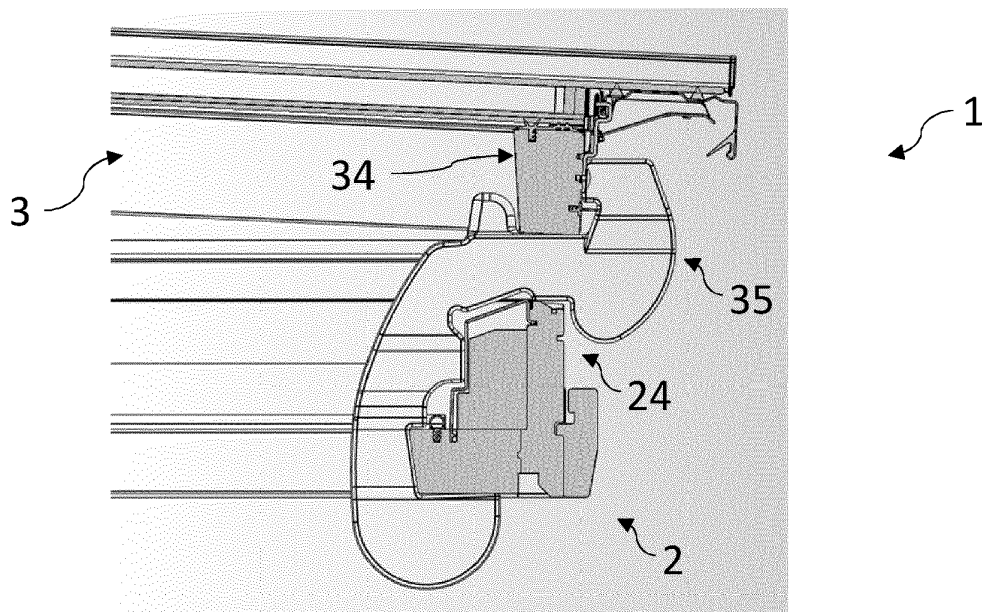


Fig. 28

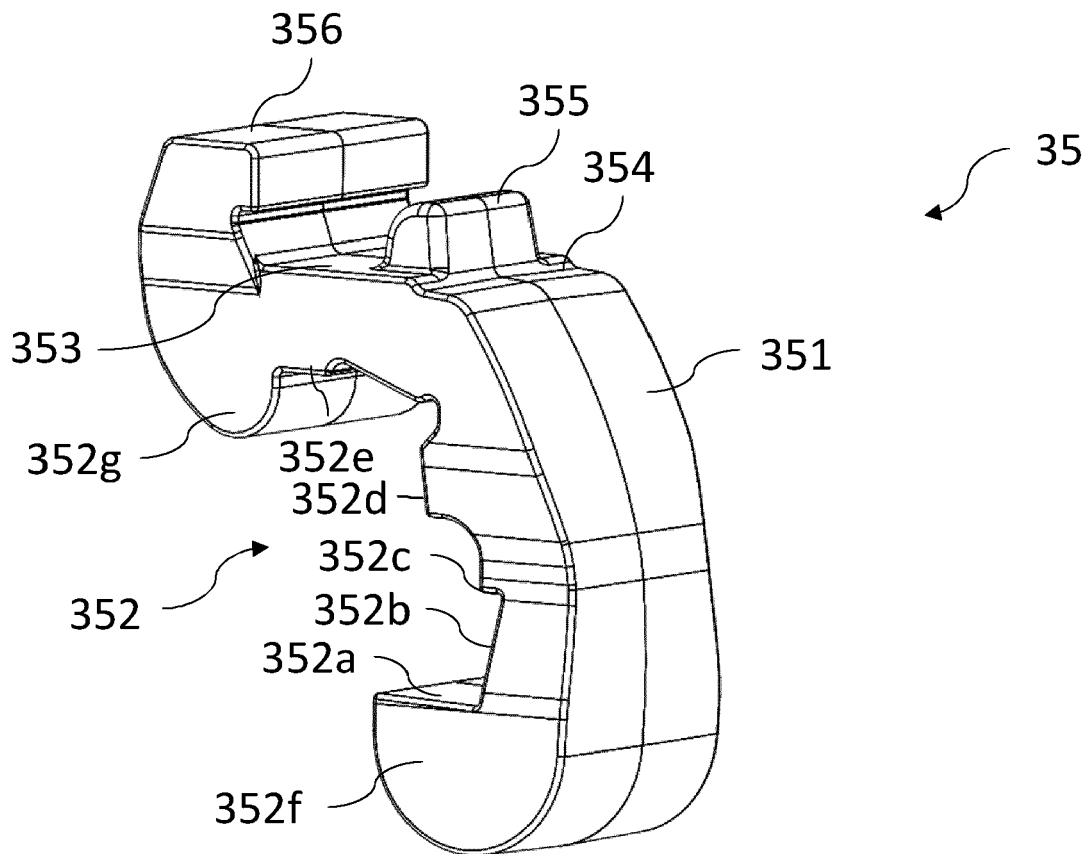


Fig. 29

Description

Technical Field

[0001] The present invention relates to a roof window comprising a frame, a sash, and a pane, in which the frame comprises a set of frame members including a top frame member, two side frame members and a bottom frame member and the sash a set of sash members including a top sash member, two side sash members and a bottom sash member, each frame and sash member defining a longitudinal direction, and in which the roof window (1) furthermore comprises a hinge assembly configured to allow the sash to be tophung about a substantially horizontal first hinge axis in a first operational condition in a mounted condition of the roof window and comprising a hinge unit with a frame hinge part connected to or connectable to at least the top frame member and a sash hinge part connected to at least the top sash member.

Background Art

[0002] Roof windows to be installed in inclined roof surfaces come in a variety of types. When selecting a roof window type for a specific installation location in a building, parameters such as operability, thermal properties, weather-tightness, and suitable finishing to the interior of the building are typically given substantial weight; however, it is also often desired and in some areas in fact necessary to factor in the external appearance as well. This applies in particular when installing roof windows in conservation areas, in which building regulations may demand that the roof windows meet standard or local requirements. Thus, certain requirements apply whether the installation concerns a newly fitted roof window, or to replace an existing window or rooflight as part of a renovation or refurbishment project.

[0003] While the windows or rooflights of past times were typically made of cast iron with single glass pane pieces, separated by one or more cast iron glazing bars, the thermal efficiency left room for improvement. To fulfil the energy performance required by modern day building regulations, conservation roof windows are typically provided with an insulating pane, while at the same time setting out to mimic the look of traditional rooflights.

[0004] In many installation situations it is a further requirement that the conservation roof window is able to be installed with a "low profile", i.e. that the height of the parts of the roof window protruding above the surrounding roofing is as small as possible. This is particularly pronounced in buildings with substantially flat roofing materials, such as slate or shingle. To meet this requirement, most major roof window manufacturers allow installation in at least two levels, thus accommodating the height of various roofing profiles and installation conditions.

[0005] With an ever-increasing awareness of environmental considerations and the wish to reduce or even

eliminate the climate footprint of products, there is furthermore a need for providing products which are more environmentally friendly in terms of manufacturing, supply, installation, and use.

[0006] Taking all of the above requirements into account, it is an ongoing quest to improve fitting and operating assemblies for a roof window for conservation purposes.

Summary of Invention

[0007] With this background, it is an object of the invention to provide a roof window, which is easy to handle and install.

[0008] 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 a sash installation component is provided to support the sash in a second operational condition of the roof window.

[0009] Providing a sash installation component facilitates the installation process, since it is able to free manual support. The sash installation component may be re-used when installing another roof window. Suitable materials include polymeric foam, moulded cardboard, and organic materials.

[0010] The sash installation component makes it possible to perform a stepwise installation of the sash. The installation is facilitated since the sash installation component supports the sash while in the second operational condition, thus freeing the installer to attend to other tasks etc.

[0011] In a presently preferred embodiment, the hinge assembly comprises a coupling unit connected to or connectable to the frame and configured to be connected to the hinge unit in the mounted condition of the roof window, and wherein, in an installation condition of the roof window, the hinge unit is connected to the sash and the coupling unit is connected to the frame. This has the effect that the installation is greatly facilitated, since the frame may be fastened to the roof structure independently of the sash. When engaging the sash with the frame, the sash installation component ensures stability and thus assists the installer.

[0012] In a further development of the presently preferred embodiment, each coupling unit comprises one top frame coupling plate and one side frame coupling plate, and wherein the coupling unit is configured to allow selective coupling of the frame hinge part of the associated hinge unit to the top frame coupling plate and the side frame coupling plate in the first operational condition, and to only the side frame coupling plate in a second operational condition. This improves the installation conditions even further.

[0013] In a mechanically simple and reliable embodiment, the side frame coupling plate comprises a base section connected to an inner side of the side frame member, and wherein the engagement means of the top frame coupling plate comprise a key-hole shaped recess in the

base section of the side frame coupling plate configured to cooperate with a secondary hinge pin to engage and lock the hinge unit to the side frame member in the first operational condition and to allow rotation of the sash about a substantially horizontal second hinge axis in the second operational condition, said secondary hinge pin constituting engagement means of the frame hinge part. In such an embodiment, the engagement with the side frame coupling plate is made particularly simple and easily attained, and at the same time, unintentional release of the engagement is prevented.

[0014] Full flexibility during installation is achieved in an embodiment in which said means are configured to allow decoupling of the hinge unit from the top frame member so as to allow the sash to rotate about the second hinge axis.

[0015] In order to have the roof window prepared for installation in an installation condition of the roof window to facilitate the installation process, the hinge unit is preferably connected to the sash and the coupling unit is connected to the frame.

[0016] Improved flexibility in the installation of the roof window is achieved by an embodiment, in which the sash is configured to assume a side coupling position, a top coupling position, and a service position in the second operational condition.

[0017] In a further development of this embodiment, the sash installation component comprises a body portion, a frame engagement portion and a plurality of support surfaces for the sash. In this way, the configuration of the sash installation component is optimised, since the respective portions may be formed substantially independently of other portions.

[0018] It is particularly advantageous from an installation point of view if the sash installation component comprises three distinct support surfaces, namely a first support surface to support the bottom sash member in the side coupling position, a second support surface to support the bottom sash member in the top coupling position, and a third support surface to support at least one side sash member in the service position.

[0019] A further measure to facilitate installation is provided by an embodiment in which the frame engagement portion is shaped in accordance with a profile of the bottom frame member, preferably including an interior contact section, a first inner contact section, a first exterior contact section, a second inner contact section, and a second exterior contact section, more preferably also an interior end section and an outer end section.

[0020] In order to provide proper distinction between the support surfaces, the first support surface may be separated from the second support surface by a dividing rib. In this way it is ensured that the sash is positioned correctly in view of the process step to be carried out, that is, side coupling, top coupling, or servicing.

[0021] Appropriate support is achieved in an embodiment in which the portion of the sash installation component, in which the third support surface is formed, is wider

than the body portion.

[0022] It is preferred that the sash installation component is made from a material selected from the group comprising: polymeric foam, moulded cardboard, organic materials. The sash installation component may be reused, recycled by appropriate environmentally responsible disposal means, recovered for other uses, or even composted.

[0023] Other presently preferred embodiments and further advantages will be apparent from the subsequent detailed description and drawings.

[0024] A feature described in relation to one of the aspects 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

[0025] 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 in an embodiment of the invention, seen from an interior side;

Fig. 2 is perspective of the roof window of Fig. 1, seen from an exterior side;

Fig. 3 is a perspective cross-sectional view of a side of a roof window in another embodiment, with a mounting bracket, corresponding to a cross-section along the line III-III in Fig. 2;

Fig. 4 is a view corresponding to Fig. 3, with an insulating frame piece shown exploded;

Figs 5 and 6 are perspective views from different angles of the mounting bracket in the embodiment of Figs 3 and 4;

Fig. 7 is a cross-sectional view of a roof window in a further embodiment, corresponding to a cross-section along the line VII-VII in Fig. 2;

Fig. 8 is a view corresponding to Fig. 7, with the sash in an open position;

Fig. 9 is a perspective cross-sectional view of a roof window in an embodiment incorporating an operating assembly, corresponding to a cross-section along the line IX-IX in Fig. 2;

Fig. 10 is a perspective view of a roof window in an embodiment incorporating an operating assembly, seen from an interior side, and in an open position of the sash, in a first operational condition of the roof window;

Fig. 11a is a partial perspective view of the roof window of Fig. 10, seen from an exterior side;

Fig. 11b is a partial perspective sectional view of the frame of the roof window of Fig. 10, together with an insulating frame;

Fig. 12 is a partial perspective view of a roof window in an embodiment incorporating a hinge assembly, with the sash removed and with the hinge assembly

in a position corresponding to an open position of the sash;

Figs 13 and 14 are perspective views from different angles of a hinge unit forming part of the hinge assembly of the embodiment of Fig. 12;

Fig. 15 is an exploded perspective view of a roof window in an embodiment incorporating a hinge assembly;

Fig. 16 is a view corresponding to Fig. 12, with some parts shown exploded;

Figs 17 to 20 are perspective views from different angles of components of a coupling unit forming part of the hinge assembly of the embodiment of Fig. 12; Fig. 21 is a partial perspective views of details of the hinge assembly shown in Fig. 12, some parts of the hinge assembly being removed for better viewing; Figs 22 and 23 are exploded perspective views from different angles of the hinge assembly shown in Fig. 12;

Fig. 24 is a perspective view of a roof window in an embodiment incorporating a sash installation component, seen from an exterior side, in a second operational condition of the roof window and in which the sash is in a side coupling position;

Figs 25 and 26 are partial perspective views of the roof window of Fig. 24;

Fig. 27 is a perspective view of the roof window in the embodiment of Figs 24 to 26, seen from an interior side;

Fig. 28 is a cross-sectional view along the line XXVIII-XXVIII in Fig. 24;

Fig. 29 is a perspective view of the sash installation component in an embodiment of the invention;

Fig. 30 is a view corresponding to Fig. 27, with the sash in a top coupling position;

Fig. 31 is a cross-sectional view corresponding to Fig. 28, but with the sash in the top coupling position;

Fig. 32 is a partial perspective view of the roof window of Fig. 30;

Fig. 33 is a view corresponding to Fig. 27, with the sash in a service position;

Fig. 34 is a cross-sectional view corresponding to Fig. 28, but with the sash in the service position;

Fig. 35 is a perspective view of the roof window of Fig. 33, from another angle;

Fig. 36 is a perspective view of a roof window in an embodiment incorporating an operating assembly and a transportation fitting, seen from an interior side;

Figs 37 and 38 are perspective views from different angles of the transportation fitting in the embodiment of the embodiment of Fig. 36;

Fig. 39 is an exploded partial perspective view of a bottom part of the roof window in the embodiment of Fig. 36, showing the replacement of the transportation fitting with the operating assembly;

Figs 40 to 48c are schematic views showing steps of the installation of an exemplary roof window; and

Figs 49a to 49c and 50a to 50d are photographs of details of an exemplary roof window.

Description of Embodiments

[0026] 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.

[0027] 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. In general, when referred to an exterior side, this relates to a side of a roof window in the mounted condition facing the outdoors or external side of the building. Conversely, an interior side refers to a side facing the internal side of the building, i.e. typically a subjacent room including any light shaft. Terms such as "outwards" and "inwards" are directions generally perpendicular to an interior-exterior direction, taking as its base point a centre of the roof window.

General description of a roof window - Figs 1 and 2

[0028] Referring initially to Figs 1 and 2, a roof window 1 is shown. The roof window 1 is intended to be installed in an inclined roof surface (not shown).

[0029] The roof window 1 comprises a frame 2, a sash 3, and a pane 4. The frame 2 comprises a set of frame members including a top frame member 21, two side frame members 22, 23 and a bottom frame member 24. Correspondingly, the sash 3 comprises a set of sash members including a top sash member 31, two side sash members 32, 33 and a bottom sash member 34. While the frame 2 and sash 3 are described as rectangular structures, some principles of the presented concepts may be applicable to other geometrical shapes as well.

[0030] The pane 4 comprises a number of edge portions generally associated to members of the sash 3 as will be described in further detail below. An exterior pane surface 4e defines a plane of the roof window 1 in an assembled condition of the roof window 1. The assembled condition of the roof window 1 is achieved when main components of the frame 2 and sash 3 have been assembled and the frame 2 and sash 3 are connected to each other, for instance in an installed position when the roof window 1 is ready for use. Correspondingly, an assembled condition of the sash 3 is achieved once main components of the sash 3 have been assembled, and an assembled condition of the frame 2 when main components of the frame 2 are assembled. The term "main components" is to be understood as encompassing primary

parts of the roof window necessary to perform all operational functions, and not including accessories or auxiliary equipment.

[0031] An interior pane surface 4i faces the interior, typically a room of a building subjacent the roof surface in which the roof window 1 is installed. A glazing bar 45 is fitted to the exterior pane surface 4e, and a glazing bar cover 46 is fitted on the interior pane surface 4i. Although less practical, it would also be possible to have a two-part pane with two pane halves divided by a throughgoing glazing bar. In wide roof windows, it is also possible to have more than one glazing bar, for instance two glazing bars dividing the surface of the pane visible from the exterior into three sections.

[0032] In the embodiments shown, the sash 3 is openable relative to the frame 2, to obtain one or more open positions. In such open positions, the sash 3 and pane 4 are moved out of the plane of the roof window 1. As will be described in the following, the sash 3 is shown as being tophung, i.e. during normal use, the sash 3 is rotated about a substantially horizontal hinge axis at or near the top frame member 21 and top sash member 31. It is however conceivable to apply some principles of the presented concepts for roof windows on different types of windows having other opening patterns, or being provided as fixed skylights.

[0033] Further details shown in Figs 1 and 2 include an operating assembly 5, here shown as a manual hand-winder or screwjack. Other operating assemblies may be present as well.

[0034] Also shown is a representative mounting bracket 6 forming part of a plurality of mounting brackets forming a load-transferring connection between the roof window 1 and a surrounding roof structure (not shown). Such a roof structure may include rafters and battens, plywood or other construction materials.

[0035] Finally, an insulating frame 7 is shown. Insulation by an insulating frame is optional and may be provided along only some of the frame members or as shown surrounding all four frame members 21, 22, 23, 24.

[0036] In the following description of various embodiments, elements having the same or analogous function carry the same reference numerals throughout. Suitable variations and modifications will be apparent to the person skilled in the art.

Mounting bracket and roof window with set of mounting brackets - Figs 3 to 6

[0037] Typically, a roof window such as the roof window 1 shown in Figs 1 and 2 is supplied with a set of mounting brackets 6. As indicated, two mounting brackets 6 are fastened to each side frame member 22, 23. In the following, a single mounting bracket 6 will be described, in association with one side frame member 22. The mounting brackets of the set will most often be identical, although variations are possible.

[0038] The mounting bracket 6 comprises a first bracket

leg 61 for fastening to the roof structure and a second bracket leg 62 for fastening to the frame 2 of the roof window 1. To that end, the second bracket leg 62 comprises engagement means to interact with a corresponding receiving structure in an outer side of the side frame member 22 of the frame 2 of the roof window 1. This ensures that the mounting bracket 6 is positioned correctly on the side frame member 22 and facilitates the installation process. The positioning of the mounting bracket 6 may be indicated in both the longitudinal direction and the height direction of the side frame member 22, for instance by suitable markings and/or holes. The first bracket leg 61 of the mounting bracket 6 is connected to the second bracket leg 62 via a bend 614.

[0039] In the embodiment shown, the second bracket leg 62 is provided with a first engagement means 624 in a first section 621 of the second bracket leg 62 and a second engagement means 629 in a second section 626 of the second bracket leg 62.

[0040] Of these two engagement means 624, 629, the second engagement means 629 is configured to assume an inactive position and an active position, of which the active position is shown.

[0041] The first engagement means 624 is configured to be received in one receiving structure of the outer side of the frame member in the mounted condition of the mounting bracket 6 on the frame 2 of the roof window 1, and the second engagement means 629 is configured to be received in another receiving structure of the outer side of the frame member in the mounted condition of the mounting bracket 6 on the frame 2 of the roof window 1 in its active position only. This is shown most clearly in Fig. 4, in which the first engagement means 624 is received in a first outer groove 27, and the second engagement means 629 is received in a second outer groove 27b. At least the side frame members 22, 23 each comprises a plurality of receiving structures at an outer side of the respective side frame member, such that at least one of the receiving structures interacts with the mounting bracket 6 in the mounted condition of the roof window 1. The first outer groove 27 and the second outer groove 27b both extend in the longitudinal direction of the side frame member 22 at a distance from each other in the height direction, the first outer groove 27 being located to the exterior of the second outer groove 27b, as seen in the height direction.

[0042] Reference is briefly made to Fig. 41, showing the mounting bracket 6 in a supply condition, in which the second engagement means 629 is in its inactive position. In this position, i.e. the inactive position of the second engagement means 629, the second section 626 with the second engagement means 629 is accommodated in an aperture 620 in the first section 621.

[0043] To bring the second section 626 with the second engagement means 629 from the position in the aperture 620 to a position in which the second section 626 is located substantially in extension of the first section 621, the second section 626 with the second engagement

means 629 is connected to the first section 621 via a hinge connection 625, such that the second section 626 is configured to be brought from the inactive position to the active position by rotating the second section 626.

[0044] In the embodiment shown, each of the first and second engagement means comprises a flange 624, 629 protruding at substantially right angles from the respective first and second sections 621, 626. Alternative configurations such as discrete spikes are also conceivable.

[0045] In order to fasten the mounting bracket 6 securely to the outer side of the side frame member 22, each of the first and second sections 621 of the second bracket leg 62 comprises one or more openings 622, 623, 627, 628 to receive fastening means in the mounted condition of the mounting bracket 6 on the frame 2 of the roof window 1. Such fastening means typically include screws (not shown).

[0046] As shown in Fig. 5, the first section 621 is provided with an offset 621a. This allows for accommodation of auxiliary equipment including an underroof collar. Details of such auxiliary equipment are described in more detail in Applicant's co-pending patent applications filed on the same date as the present application.

[0047] In order to allow alternative mounting of the mounting bracket 6 at a different height position on the side frame member 22, the second section 626 is provided with an offset 626a matching the offset 621a such that the offset 626a of the second section 626 is located substantially in line with the offset 621a of the first section 621 in the inactive position of the second section 626 of the second bracket leg 62 of the mounting bracket 6.

[0048] Correct positioning in the height direction ensures that fastening means such as screws (not shown) for fastening the second bracket leg 62 to the side frame member 22 may be dimensioned to suitable length and diameter to be received in a sufficient material thickness of the side frame member 22. As shown for instance in Fig. 4, the side frame member 22 has a larger material thickness towards the interior; it is thus suitable to ensure that fastening means are entered into this area.

[0049] Specifically, this is ensured in that at least one opening 622, 628 in each of the first and second section 621, 626 spans the respective offset 621a, 626a. The aperture 620 of the first section 621 spans the bend 614 and the engagement means 629 of the second section 626 is accommodated in the part of the aperture 620 spanning the bend 614 when in the inactive position. The first bracket leg 61 comprises one or more openings 612, 613 to receive fastening means in the mounted condition of the mounting bracket 6 on the frame 2 of the roof window 1 for fastening the mounting bracket 6 to the roof structure.

[0050] As mentioned in the above, the mounting bracket 6 has a supply condition in which the second engagement means 629 is in its inactive position. In order to ensure that the mounting bracket 6 is brought to an installation condition and subsequently mounted in the correct height position, i.e. the one shown in Fig. 4, the sec-

ond section 626 is provided with a protrusion 626b configured to face outwards, away from the outer side of the frame member in the mounted condition when the engagement means 629 of the second section 626 is in its active position, and to face inwards, towards the outer side of the frame member in the mounted condition when the engagement means 629 of the second section 626 is in its inactive position. In this way, the protrusion 626b acts as a guard to prevent that an installer does not bring the second section 626 with the second engagement means 629 to its active position and/or positions the mounting bracket 6 at a more interior position on the side frame member 22, since the protrusion 626b will in that case come into contact with the outer side of the side frame member 22 such that face contact is not possible.

[0051] In the event that it is in fact desired to position the mounting bracket 6 further to the interior in the height direction of the side frame member 22, it is possible to provide a further receiving structure (not shown) in the outer side of the side frame member 22 to accommodate the protrusion 626b of the second section 626 while the first engagement means 624 is received in the second outer groove 27b.

[0052] Also visible in Figs 3 and 4 is an interface unit 8 mounted to the frame 2 and having multiple functions relative to other components of the roof window 1, including acting as sealing towards the sash 3 and for accommodating auxiliary equipment including a covering assembly (not shown) providing a weather-tight transition to the surrounding roofing.

Hinge assembly, first operational condition - Figs 7 to 14

[0053] Referring first to Figs 7 and 8 it is shown that the roof window 1 furthermore comprises a hinge assembly 9.

[0054] The hinge assembly 9 is configured in such a way that it allows the sash 3 to be tophung in a first operational condition corresponding to normal use. That is, during normal use the sash 3 is rotated about a substantially horizontal first hinge axis α at or near the top frame member 21 and top sash member 31 between a closed position and an open position.

[0055] Referring now also to Figs 12 to 14, it is seen that the hinge assembly 9 comprises a hinge unit 91 with a frame hinge part 92 connected to or connectable to at least the top frame member 21, a sash hinge part 93 connected to at least the top sash member 31, and a hinge pin 94 connecting the frame hinge part 92 with the sash hinge part 93.

[0056] The term "connected to" implies that the component in question is in a condition, state or position in which the component in question is in fact connected to a part, whereas "connectable to" is intended to encompass such conditions, states and positions in which the component in question may be connected to the relevant part, but is not necessarily in connection with the part. In the description of Figs 12 to 14, the frame hinge part 92

including any sub-components will be described as being connected to parts of the frame 2. Further below, the possibility of providing the frame hinge part 92 and sub-components as connectable to parts of the frame 2 will be described in more detail.

[0057] The frame hinge part 92 comprises a frame hinge base plate 921 connected to an inner side of the top frame member 21 and provided with a receiving structure 922 for the hinge pin 94 defining the hinge axis, and the sash hinge part 93 comprises a sash hinge base plate 931 connected to an outer side of the top sash member 31 and provided with a receiving structure 932 for the hinge pin 94, such that the hinge unit 91 forms a pin-and-barrel hinge.

[0058] In the embodiment shown, the receiving structure 922 of the frame hinge part 92 forms a two-part barrel, the barrel parts 922a, 922b surrounding a barrel 932 formed by the receiving structure of the sash hinge part 93. A gap is provided between the barrel 932 of the sash hinge part 93 and the barrel parts 922a, 922b to accommodate manufacturing tolerances.

[0059] The frame hinge base plate 921 is substantially parallel to the inner side of the top frame member 21 in the mounted condition, and the sash hinge base plate 931 is substantially parallel to the frame hinge base plate 921 in the closed position of the sash 3.

[0060] Furthermore, the receiving structure 922 of the frame hinge part 92 is connected to the frame hinge base plate 921 via an inclined section 923, and the receiving structure 932 of the sash hinge part 93 is connected to the sash hinge base plate 931 via an inclined section 933, such that the first hinge axis α is offset outwards relative to the base plate 921 of the frame hinge part 92.

[0061] Although not shown in these drawing figures, the hinge assembly 9 may comprise a set of hinge units 91 connected to or connectable to top corners of the frame 2 and sash 3, such that one hinge unit 91 is connected to top corners of the top frame member 21 and one side frame member 22, and the top sash member 31 and one side sash member 32, and another, preferably mirror-inverted, hinge unit is connected to or connectable to top corners of the top frame member 21 and the other side frame member 23, and the top sash member 31 and the other side sash member 33.

[0062] While each hinge unit 91 could in principle be connected only to the top frame member 21 and top sash member 31, the embodiment shown provides for connection also to the adjoining side frame member and side sash member as well. Thus, the frame hinge base plate 921 is connected to a frame hinge side flange 924, here in a one-piece integral connection, and the frame hinge side flange 924 is connected to an inner side of the side frame member 22. Some portions of the frame hinge base plate 921 and the frame hinge side flange 924 are offset from other portions, but in general, the frame hinge side flange 924 extends substantially perpendicularly to the frame hinge base plate 921 from a transition section 924a to a free end section 924b.

[0063] Correspondingly, the sash hinge base plate 931 is connected to a sash hinge side flange 934, preferably in a one-piece integral connection, and wherein the sash hinge side flange 934 is connected to an inner side of a side sash member 32. As for the frame hinge portion 92, the sash hinge side flange 934 generally extends substantially perpendicularly to the sash hinge base plate 931 from a transition section 934a to a free end section 934b, but some portions may be offset from other portions.

[0064] At the free end section 924b of the frame hinge side flange 924, a secondary hinge pin 927 is provided (shown in Fig. 14). In this way, the hinge assembly 9 provides for means to allow the sash 3 to be rotated about a substantially horizontal second hinge axis β at a distance from the top frame member 21 and top sash member 31.

[0065] The hinge assembly 9 thus makes it possible to put the roof window 1 in a second operational condition in which a plurality of additional open positions are achievable. As will be described further on in the description, means are provided to allow decoupling of the frame hinge base plate 921 from the top frame member 21 so as to allow the sash 3 to rotate about the second hinge axis β .

[0066] In order to ensure that the movement of the sash 3 is restricted, the hinge unit 91 may be provided with opening restricting means. In the embodiment shown, two independent opening restricting means are present, but other configurations including only one opening restricting means are conceivable.

[0067] A first opening restrictor 925 is provided by an arm 9251 rotatably connected to a sash or frame member, and the arm 9251 comprises a track 9253 engaging with a pin 9254 on a frame or sash member. The arm 9251 is rotatably connected to the sash hinge side flange 934 in a rotatable joint 9252, and wherein the pin 9254 interacting with the track 9253 is provided on the frame hinge side flange 924.

[0068] A second opening restricting means is foreseen in that an abutment notch 9255 is provided on the frame hinge side flange 924 and configured to cooperate with a stop pin 971g provided at the side frame member 22, in the embodiment shown on a side frame coupling plate 97 (Fig. 19) to be described in more detail below. The stop pin could alternatively be provided on the side frame member 22 itself.

[0069] While the coupling of the frame hinge part 92 to the top and side frame members by means of a coupling unit 95 will be described under a separate heading below, the connection between the sash hinge part 93 and the top and side sash members is less complicated: The sash hinge part 93 comprises a plurality of fastening means to allow connection of the sash hinge part 93 to the sash 3, preferably comprising one or more holes 935 in the sash hinge base plate 931, one or more holes 937 in a sash hinge side flange 934 and/or a spigot 938 in the sash hinge side flange 934. The top sash member

31 and side sash members 32, 33 comprise suitable receiving means (not shown).

[0070] Further details visible in the figures describing the first operational condition of the roof window include guiding elements 22g (see Fig. 8) and 32g (see Fig. 11), which ascertain that the sash 3 is aligned relative to the frame 2 when closing the sash such that any skewness occurring in the open position of the sash 3 is eliminated.

[0071] Details of the insulating frame 7 are also shown in these figures; these include a top piece 71, side pieces 72, 73, and a bottom piece 74. In the embodiments shown, each such insulation frame piece comprises a protrusion 78 to be received in the outer side of the respective frame member, and an indentation 75 to interact with auxiliary equipment in the form of an underroof collar described in more detail in Applicant's co-pending patent applications filed on the same date as the present application. With particular reference to Fig. 11b, a recess 76 is shown which makes place for the mounting bracket 6 to be mounted on the side frame member 23 of the frame 2, and a folding line 77 which allows folding back of part of the side piece 73 of the insulating frame 7 to allow access to the outer side of the side frame member 23. At least the side pieces 72, 73 of the insulating frame 7 are provided with such recesses 76 and folding lines 77 at or near the location of the intended positions of the mounting brackets 6 of the set of mounting brackets supplied with the roof window 1.

[0072] Finally, a number of features visible in the figures but not immediately related to the present invention include the configuration of members of the sash 3, namely to include a profile element, an intermediate element and an inner element, and of the bottom frame member 24 including an outer piece 24a, a separate inner piece 24b, a cover 24c and an insulating piece 24d. Details of the configuration are described in more detail in Applicant's co-pending patent application filed on the same date as the present application. Exemplary elements include a profile element 31a, intermediate element 31b and inner element 31c of the top sash member 31, profile element 32a, intermediate element 32b and inner element 32c of the side sash member 32, and profile element 34c and inner element 34c of the bottom sash member 34. A screening mounting bracket 32s is visible in Figs 7 and 8, by which it is possible to install an interior screening device (not shown) in the sash 3 to provide screening of the pane 4.

Operating assembly and transportation fitting - Figs 9 to 11b and 36 to 39

[0073] During normal use, i.e. when the roof window 1 has been installed, and a user wishes to put the sash 3 in a ventilating position, the opening, closing and parking may be carried out by the assistance of an operating assembly, for instance as the shown manual handwinder or screwjack constituting the operating assembly 5.

[0074] Referring first to Fig. 9, the operating assembly

5 comprises a sash fitting 55, a spindle part 52 with a spindle 521 connected to a socket fitting 51 via a nut part 53, and a handle 522, the sash fitting 55 being connected to the bottom sash member 34 and the socket fitting 51 being connected to the bottom frame member 24 in a mounted condition of the operating assembly, such that upon rotation of the spindle part 52 relative to the nut part 53, the bottom sash member 34 is moved relative to the bottom frame member 24.

10 **[0075]** In the embodiment shown, in which the roof window 1 defines a supply condition which is suitable for packaging and transportation, the sash fitting 55 is connected to the bottom sash member 34 of the roof window 1 whereas the spindle part 52 with the nut part 53 and the socket fitting 51 are provided separately from the roof window 1.

15 **[0076]** The nut part 53 comprises a nut ring 531 connected to a set of flanges 512 protruding from a base plate 511 of the socket fitting 51, here by means of a set of bolts 532.

20 **[0077]** The operating assembly 5 furthermore comprises a split 56 associated to the sash fitting 55, the split 56 being displaceable between an active position in which it is in engagement with a set of openings 553 in a set of flanges 552 protruding from a base plate 551 of the sash fitting 55 and an inactive position to reveal a reception gap between the flanges 552 of the sash fitting 55.

25 **[0078]** The spindle part 52 comprises an end portion 54 configured to cooperate with the sash fitting 55 in the mounted condition.

30 **[0079]** Referring now also to Fig. 39, the end portion 54 of the spindle part 52 is provided with an opening 541 configured to cooperate with the split 56 in the mounted condition.

35 **[0080]** The socket fitting 51 is provided with at least one guide protrusion 514 configured to be accommodated in at least one corresponding guiding hole 24g of the bottom frame member 24 in the mounted condition of the operating assembly 5.

40 **[0081]** As shown in Fig. 36, in the supply condition of the roof window 1, a transportation fitting 57 is connected to the sash fitting 55 and to the bottom frame member 24 such that the sash 3 is held stationary relative to the frame 2.

45 **[0082]** Referring now also to Figs 37 and 38, the transportation fitting 57 comprises a base portion 571 configured to abut an inner side of the bottom frame member 24 and an anchor portion 572 with an aperture 573 cooperating with the split 56 associated with the sash fitting 55 in the supply condition of the roof window 1, said anchor portion 572 extending substantially perpendicularly to the base portion 570.

50 **[0083]** The transportation fitting 57 comprises an inclined portion 574 forming a transition between the base portion 571 and the anchor portion 572.

55 **[0084]** In order to ensure correct positioning of the transportation fitting 57, the base portion 571 is provided with at least one guide protrusion 575 cooperating with

at least one corresponding guiding hole 24g of the bottom frame member 24 in the supply condition of the roof window 1.

[0085] To retain the stationary relationship between the sash 3 and frame 2, the base portion 571 is provided with a hole 576 configured to receive fastening means such as a screw to provide the connection of the transportation fitting 57 to the bottom frame member 24.

Coupling unit - Figs 15 to 23

[0086] In the following, the coupling unit 95 of the hinge assembly 9 will be described in some detail.

[0087] The coupling unit 95 is configured to allow selective coupling of at least the frame hinge part 92 of the hinge unit 91 to the top frame member 21 and optionally to one of the side frame members 22, 23. In the following, the hinge unit 91 will be described as comprising both the frame hinge base plate 921 and the frame hinge side flange 924, and the coupling unit 95 will be described as comprising both a top frame coupling plate 96 and a side frame coupling plate 97. Alternative configurations are conceivable.

[0088] To render the selective coupling possible, the frame hinge part 92 is provided with engagement means 926, 927 to cooperate with the top frame coupling plate 96 and the side frame coupling plate 97, respectively, such that the frame hinge base plate 921 of each hinge unit 91 of the hinge assembly 9 is connectable to the top frame coupling plate 96 and the frame hinge side flange 924 is connectable to the side frame coupling plate 97.

[0089] The top frame coupling plate 96 comprises a base section 961 connected to an inner side of the top frame member 21. The top frame coupling plate 96 is connected to the top frame member 21 by means of a plurality of fastening means including at least one spigot 961c on the base section 961 and two bolt elements functioning also as engagement pins 962, 963 of the engagement means of the top frame coupling plate 96. In this case, each engagement pin 962, 963 cooperates with an insert nut 982, 983 on the outer side of the top frame member 21. To accommodate the top frame coupling plate 96, the top frame member 21 comprises a hinge assembly receiving milling 29a and a set of openings 29c, 29e of which openings 29e are through-going openings, or through-holes.

[0090] In the embodiment shown, the engagement means 926 of the frame hinge part 92 provided on the frame hinge base plate 921 comprise a set of receiving recesses including two abutment recesses 926a, 926b to interact with counterpart engagement means on the top frame coupling plate 96 to align the hinge unit 91 relative to the coupling unit 95 in the longitudinal direction of the top frame member 21, preferably also to act as a stop for the hinge unit 91 in the direction towards the interior and in the inwards direction relative to the inner side of the top frame member 21. Here, the counterpart engagement means comprise two engagement pins 962,

963 protruding inwards relative to the base section 961 and relative to the inner side of the top frame member 21.

[0091] A further engagement means of the top frame coupling plate 96 comprise a hook element 964 comprising an arm 964a with a hook 964b and connected to the base section 961 in a rotational joint 964c. The hook element 964 is configured to cooperate with a nook section 926d of a lock recess 926c) formed in the frame hinge base plate 921 and forming part of the set of receiving recesses constituting the engagement means 926 of the frame hinge part 92 to lock the hinge unit 91 relative to the coupling unit 95 in the direction towards the exterior.

[0092] The hook element 964 is biased towards a locking position in which the hook 964b is lodged in the nook section 926d of the lock recess 926c. Here, the bias is provided by a spring 964e accommodated with one end in a spring-receiving opening 964d in the arm 964a and with another end in a spring-receiving opening in the base section 961, such that the spring 964e passes through an opening 961a allowing movement of the spring 964e during movement of the hook element 964 from the locking position to an unlocking position in which the hook 964b is free of the nook section 926d.

[0093] The engagement means of the frame hinge part 92 provided on the frame hinge side flange 924 are constituted by the secondary hinge pin 927 to lock the hinge unit 91 to the side frame member 22 in the first operational condition and to allow rotation of the sash 3 in the second operational condition.

[0094] By forming each coupling unit 95 with one top frame coupling plate 96 and one side frame coupling plate 97, the coupling unit 95 allows selective coupling of the frame hinge part 92 of the associated hinge unit 91 to the top frame coupling plate 96 and the side frame coupling plate 97 in the first operational condition, and to only the side frame coupling plate 97 in the second operational condition.

[0095] The side frame coupling plate 97 comprises a base section 971 connected to the inner side of the side frame member 22, and the engagement means of the top frame coupling plate 96 comprise a key-hole shaped recess 971r in the base section 971 of the side frame coupling plate 97. The key-hole shaped recess is configured to cooperate with a secondary hinge pin 927 to engage and lock the hinge unit 91 to the side frame member 22 in the first operational condition and to allow rotation of the sash 3 about the substantially horizontal second hinge axis β in the second operational condition.

[0096] The secondary hinge pin 927 comprises an enlarged head and a shaft, and the key-hole shaped recess 971r comprises an entry opening 971ra allowing entry of the head of the secondary hinge pin 927 and a narrowed track section 971rb allowing entry of the shaft but preventing withdrawal of the head of the secondary hinge pin 927, as shown in Fig. 19.

[0097] In order to guide the secondary hinge pin 927 into the key-hole shaped recess, the entry opening 971ra comprises a recessed section 971c.

[0098] Once the secondary hinge pin 927 has entered the key-hole shaped recess 971r, it is locked by means of a biased lock element 972 on the side of the base section 971 facing the inner side of the side frame member 22. The biased lock element 972 comprises a connection section 972a and a resilient end section 972b with an opening 972c allowing entry of the head of the secondary hinge pin 927. In order to release the locked engagement, the resilient end section 972b is provided with a release tab 972d, which may be manipulated manually.

[0099] The side frame coupling plate 97 is connected to the side frame member 22 by means of a plurality of fastening means including at least one spigot 971e on the base section 971 and at least one opening 971f for fastening means such as screws 981. To receive the side frame coupling plate 97, the side frame member 22 comprises a hinge assembly receiving milling 29b and a set of openings 29d, 29f.

Hinge assembly, second operational condition and sash installation component - Figs 24 to 35

[0100] Turning now to Figs 24 to 35, possible movement patterns and positions of the sash 3 in the second operational condition will be described. Three positions will be described, namely a side coupling position corresponding to the position in which the sash 3 with the hinge unit 91 is first coupled to the frame 2 in that the frame hinge side flange 924 is brought into engagement with the side frame coupling plate 97, a top coupling position corresponding to the position in which the sash 3 with the hinge unit 91 is ready to be brought into engagement with the top frame coupling plate 96, and a service position, in which a clearing is created between the top sash member 31 and the top frame member 21. It is self-evident that the sash 3 may assume other positions in the second operational condition.

[0101] To protect the components of the roof window 1 and to facilitate the coupling, a sash installation component 35 is provided to support the sash 3 during installation and use.

[0102] Referring in particular to Fig. 29, the sash installation component 35 comprises a body portion 351, a frame engagement portion 352 and a plurality of support surfaces 353, 354, 356 for the sash 3.

[0103] In the embodiment shown, the sash installation component 35 comprises three distinct support surfaces.

[0104] Of these support surfaces, a first support surface 353 supports the bottom sash member 34 in the side coupling position. The side coupling position is shown in Figs 24 to 28, and the abutment between the first support surface 353 and the bottom sash member 34 is shown most clearly in the cross-sectional view of Fig. 28.

[0105] A second support surface 353 supports the bottom sash member 34 in the top coupling position shown in Figs 30 to 32. As is apparent, the sash 3 has been

moved closer to the top frame member 31 and thus, the hinge unit 91 is in closer proximity to the top frame coupling plate 96. In this position, it is possible to bring the recesses 926a and 926b over the engagement pins 962, 963, and the hook element 964 is moved into engagement with the lock recess 926c until the hook 964b is lodged in the nook 926d. If the engagement is indeed carried out, the roof window 1 is in its first operational condition and may be taken into normal use.

[0106] If the first operational condition has been reached, and it is desired to obtain the service position, the hinge unit 91 is first disengaged from the top frame coupling plate 96 by releasing the hook element 964, for instance by applying a suitable tool.

[0107] Once the disengagement has been carried out and the roof window 1 is in its second operational condition, the sash installation component 35 is arranged at the longitudinal ends of the bottom frame member 24. In this way, it is possible to allow a third support surface 356 to support the side sash member or members 22, 23. To provide adequate support, the portion of the sash installation component 35, in which the third support surface 356 is formed, is wider than the body portion 351.

[0108] To ensure safe retention of the sash installation component 35 on the bottom frame member 24, the frame engagement portion 352 is shaped in accordance with a profile of the bottom frame member 24, such that the dimensions of the engagement portion 352 match the contours and dimensions of the bottom frame member 23. In the embodiment shown, an interior contact section 352a, a first inner contact section 352b, a first exterior contact section 352c, a second inner contact section 352d, and a second exterior contact section 352e are provided. Additionally, an interior end section 352f and an outer end section 352g are provided.

[0109] Finally, the first support surface 353 is separated from the second support surface 354 by a dividing rib 355.

[0110] Two sash installation components 35 are suitably provided together with the roof window 1 in its supply condition. While not preferred, it is also possible to provide support of the sash 35 by a single sash installation component 35, just as more than two may be provided, for instance in the case of wide roof windows.

Installation method - Figs 40 to 50d

[0111] In the following, an exemplary method of installing the roof window 1 in a roof structure (not shown) will be described. It is understood that various steps may be carried out differently, or in a different order.

[0112] Fig. 40 shows the roof window 1 when mounted in a roof structure (not shown) and in a position of normal use, i.e. in the first operational condition allowing opening of the sash 3 relative to the frame 2. When mounted, the roof window 1 is surrounded by underroofing and flashing assemblies (not shown) providing a weather-tight transition to a surrounding roofing. Details of the configuration

of such assemblies are described in more detail in Applicant's co-pending patent applications filed on the same date as the present application.

[0113] In the following description, the installation steps will be described only briefly. For a detailed description of the interaction between components, reference is made to the relevant sections in the above description of embodiments.

[0114] The roof window 1 with the frame 2, sash 3, and pane 4 are provided in a supply condition. Depending on the conditions on the installation site, the roof window 1 is typically supplied in a packaging which is opened in proximity to the building, in which the roof window 1 is to be installed, possibly inside a room of the building. One example of an unpacking situation is shown in Fig. 41a. To ease handling of the sash 3, a set of suction disc tools 36 is provided; however, it is also possible to handle the roof window 1 manually without tools, or craning with or without suction disc tools, cf. Figs 46 and 47.

[0115] It is noted that in the shown embodiment, the insulation frame 7 is connected to the frame 2 in the supply condition. The principles of the present invention are however also applicable to roof windows in which the insulation frame 7 is supplied separately, or without an insulation frame altogether.

[0116] The operating assembly 5 is supplied with only some components fastened to the sash 3, while others are supplied separately. In case the transportation fitting 57 is present, such transportation fitting 57 is removed.

[0117] Following unpacking, the sash 3 is opened relative to the frame 2. The hinge unit 91 of the hinge assembly 9 is disengaged from the coupling unit 95 as shown in Figs 41c to 41f until the sash 3 is detached from the frame 2.

[0118] The sash 3 with the hinge unit 91 is placed at a suitable location awaiting further handling. This allows easy handling and subsequent installation of the frame 2 in the roof structure. In preparation of the installation, the mounting brackets 6 need to be fastened to the frame 2.

[0119] The set of mounting brackets 6 is typically provided separately, for instance in a separate packaging within the roof window packaging. As indicated in Figs 42 and 43, each mounting bracket 6 is brought from its supply condition to the installation condition.

[0120] Subsequently, access to the frame 2 is provided by swinging portions of the insulating frame 7 to reveal the outer side of the side frame members as outlined in Fig. 44a. Once the mounting bracket 6 has been fastened as outlined in Figs 44b and 44c, the portions of the insulating frame 7 are repositioned as shown in Fig. 44d.

[0121] Installation of the frame 2 takes place by positioning the frame 2 in the opening provided and fastening the mounting brackets 6 to the subjacent roof structure. Underroofing and flashing assemblies are installed as prescribed.

[0122] When the frame 2 is in its appropriate place, the sash installation components 35 are positioned on the

bottom frame member and the sash 3 lifted into the opening of the frame 2, resting on one of the sash installation components 35 as shown in Fig. 45a. The sash 3 is placed in the side coupling position on the sash installation components 35 as shown in Fig. 45c and each hinge unit 91 is engaged with the respective side frame coupling plate at either side of the frame 2 and sash 3 as indicated in Fig. 45d.

[0123] The sash 3 is then moved into the top coupling position on the sash installation components 35 as shown in Fig. 45 and each hinge unit 91 then engaged with the respective top frame coupling plate as shown in Fig. 45f.

[0124] In case the roof window 1 has been craned into position including suction disc tools 36 as shown in Fig. 47, the tools 36 may be removed from the interior of the building by placing the sash 3 in the service position shown in Fig. 48b. As mentioned in detail above, this operation requires disengagement of the hinge units 91 from the top frame coupling plates of the coupling units 95 and positioning of the sash installation components 35 at the ends of the bottom frame member as shown in Fig. 48a. Once the service opening between the frame and sash has been established, an installer or other person may gain access to the exterior of the sash and remove the tools.

[0125] It is understood that the service position may be established at any time during use of the roof window.

[0126] Finally, a series of photographs of details of an actual roof window is shown in Figs 49a to 49c and 50a to 50d.

[0127] In general, components of the roof window are easily disassembled and each component may in principle be reused, be recycled by appropriate environmentally responsible disposal means, or the material be recovered for other uses.

List of reference numerals

[0128]

- | | |
|-----|--|
| 1 | roof window |
| 2 | frame |
| 21 | top frame member |
| 22 | side frame member |
| 22g | guiding element (frame) |
| 23 | side frame member |
| 24 | bottom frame member |
| 24a | outer piece of bottom frame member |
| 24b | separate inner piece of bottom frame member |
| 24c | cover |
| 24d | insulating piece |
| 24g | guiding hole |
| 27 | first outer groove |
| 27b | second outer groove |
| 29a | hinge assembly receiving milling (in top frame member) |

	29b hinge assembly receiving milling (in side frame member)		521 spindle
	29c opening		522 handle
	29d opening		53 nut part
	29e through-going opening	5	531 nut ring
	29f opening		532 bolts
			54 end portion
3	sash		541 opening
			55 sash fitting
	31 top sash member	10	551 base plate of sash fitting
	31a profile element of top sash member		552 flanges of sash fitting
	31b intermediate element		553 openings
	31c inner element		56 split
	32 side sash member		57 transportation fitting
	32a profile element of side sash member	15	571 base portion
	32b intermediate element		572 anchor portion
	32c inner element		573 aperture
	32g guiding element (sash)		574 inclined portion
	32s screening mounting bracket		575 guide protrusion
	33 side sash member	20	576 hole
	34 bottom sash member	6	mounting bracket
	34a profile element of bottom sash member		
	34c inner element		61 first bracket leg
	35 sash installation component		612 opening
	351 body portion	25	613 opening
	352 frame engagement portion		614 bend
	352a interior contact section		62 second bracket leg
	352b first inner contact section		620 aperture
	352c first exterior contact section		621 first section
	352d second inner contact section	30	621a offset
	352e second exterior contact section		622 opening
	352f interior end section		623 opening
	352g outer end section		624 engagement means / flange
	353 first support surface (side coupling position)		625 hinge connection
	354 second support surface (top coupling position)	35	626 second section
	355 dividing rib		626a offset
	356 third support surface (service position)		626b protrusion
	36 suction disc tool		627 opening
4	pane	40	628 opening
			629 engagement means / flange
	41 exterior sheet	7	insulating frame
	41a extended portion		
	42 interior sheet		71 top piece of insulating frame
	43 additional interior sheet	45	72 side piece of insulating frame
	45 glazing bar		73 side piece of insulating frame
	46 glazing bar cover element		74 bottom piece of insulating frame
	4e exterior surface of pane		75 indentation
	4i interior surface of pane	50	76 recess
			77 folding line
5	operating assembly		78 protrusion
	51 socket fitting	8	interface unit
	511 base plate of socket fitting		
	512 flanges of socket fitting	55	9 hinge assembly
	513 holes		
	514 guide protrusion		91 hinge unit
	52 spindle part		92 frame hinge part

921 frame hinge base plate
 922 receiving structure for hinge pin
 922a barrel part
 922b barrel part
 923 inclined section 5
 924 frame hinge side flange
 924a transition section
 924b free end section α
 925 opening restricting means / first opening restric-
 tor 10 β
 9251 arm
 9252 rotatable joint
 9253 track
 9254 pin
 9255 abutment notch
 926 engagement means of frame hinge part
 926a abutment recess
 926b abutment recess
 926c lock recess
 926d nook section of lock recess 20
 927 secondary hinge pin
 93 sash hinge part
 931 sash hinge base plate
 932 receiving structure for hinge pin / barrel
 933 inclined section 25
 934 sash hinge side flange
 934a transition section
 934b free end section
 935 hole
 936 protrusion 30
 937 hole
 938 spigot 94 hinge pin
 95 coupling unit
 96 top frame coupling plate
 961 base section 35
 961a opening
 961b spring-receiving opening in base section 961
 961c spigot
 962 first engagement pin
 963 second engagement pin 40
 964 hook element
 964a arm
 964b hook
 964c rotational joint
 964d spring-receiving opening 45
 964e spring
 97 side frame coupling plate
 971 base section
 971c recessed section
 971d fastening pin (for biased lock element 972) 50
 971e spigot
 971f opening
 971g stop pin (for abutment notch 9255)
 971r key-hole shaped recess
 971ra entry opening 55
 971rb narrowed track portion
 972 biased lock element
 972a connection section

972b resilient end section
 972c opening
 972d release tab
 981 screw
 982 insert nut
 983 insert nut

α first hinge axis

10 β second hinge axis

Claims

- 15 1. A roof window (1) comprising a frame (2), a sash (3), and a pane (4), in which

the frame (2) comprises a set of frame members including a top frame member (21), two side frame members (22, 23) and a bottom frame member (24) and the sash (3) comprises a set of sash members including a top sash member (31), two side sash members (32, 33) and a bottom sash member (34), each frame and sash member defining a longitudinal direction, and in which

the roof window (1) furthermore comprises a hinge assembly (9) configured to allow the sash (3) to be tophung about a substantially horizontal first hinge axis (α) in a first operational condition in a mounted condition of the roof window (1) and comprising a hinge unit (91) with a frame hinge part (92) connected to or connectable to at least the top frame member (21) and a sash hinge part (93) connected to at least the top sash member (31),

characterised in that

a sash installation component (35) is provided to support the sash (3) in a second operational condition of the roof window (1).

2. A roof window according to claim 1, wherein the sash installation component (35) comprises a body portion (351), a frame engagement portion (352) and a plurality of support surfaces (353, 354, 356) for the sash (3).

3. A roof window according to claim 2, wherein the sash installation component (35) comprises three distinct support surfaces, namely a first support surface (353) to support the bottom sash member (34) in a side coupling position, a second support surface (353) to support the bottom sash member (34) in a top coupling position, and a third support surface (356) to support at least one side sash member (22, 23) in a service position.

4. A roof window according to any one of claims 2 or

3, wherein the frame engagement portion (352) is shaped in accordance with a profile of the bottom frame member (24), preferably including an interior contact section (352a), a first inner contact section (352b), a first exterior contact section (352c), a second inner contact section (352d), and a second exterior contact section (352e), more preferably also an interior end section (352f) and an outer end section (352g).

5. A roof window according to claim 3 or 4, wherein the first support surface (353) is separated from the second support surface (354) by a dividing rib (355).
6. A roof window according to any one of claims 3 to 5, wherein the portion of the sash installation component (35), in which the third support surface (356) is formed, is wider than the body portion (351).
7. A roof window according to any one of the preceding claims, wherein the hinge assembly (9) comprises means to allow the sash (3) to be rotated about a substantially horizontal second hinge axis (β) at a distance from the top frame member (21) and top sash member (31) to provide a plurality of additional open positions in the second operational condition.
8. A roof window according to claim 1, wherein the hinge assembly (9) comprises a coupling unit (95) connected to or connectable to the frame (2) and configured to be connected to the hinge unit (91) in the mounted condition of the roof window (1), and wherein, in an installation condition of the roof window (1), the hinge unit (91) is connected to the sash (3) and the coupling unit (95) is connected to the frame (2).
9. A roof window according to any one of the preceding claims, wherein the sash installation component (35) is made from a material selected from the group comprising: polymeric foam, moulded cardboard, organic materials.

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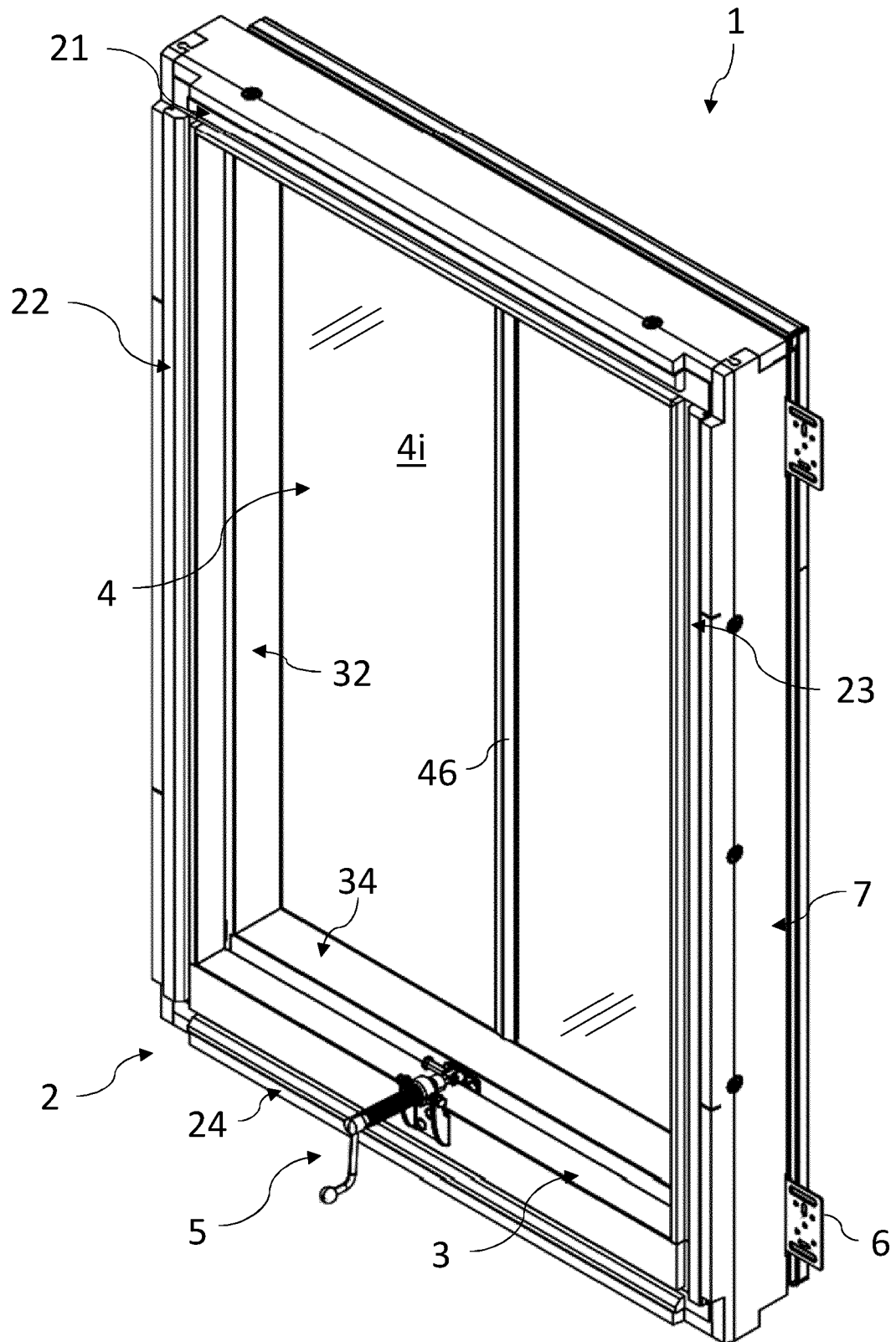


Fig. 1

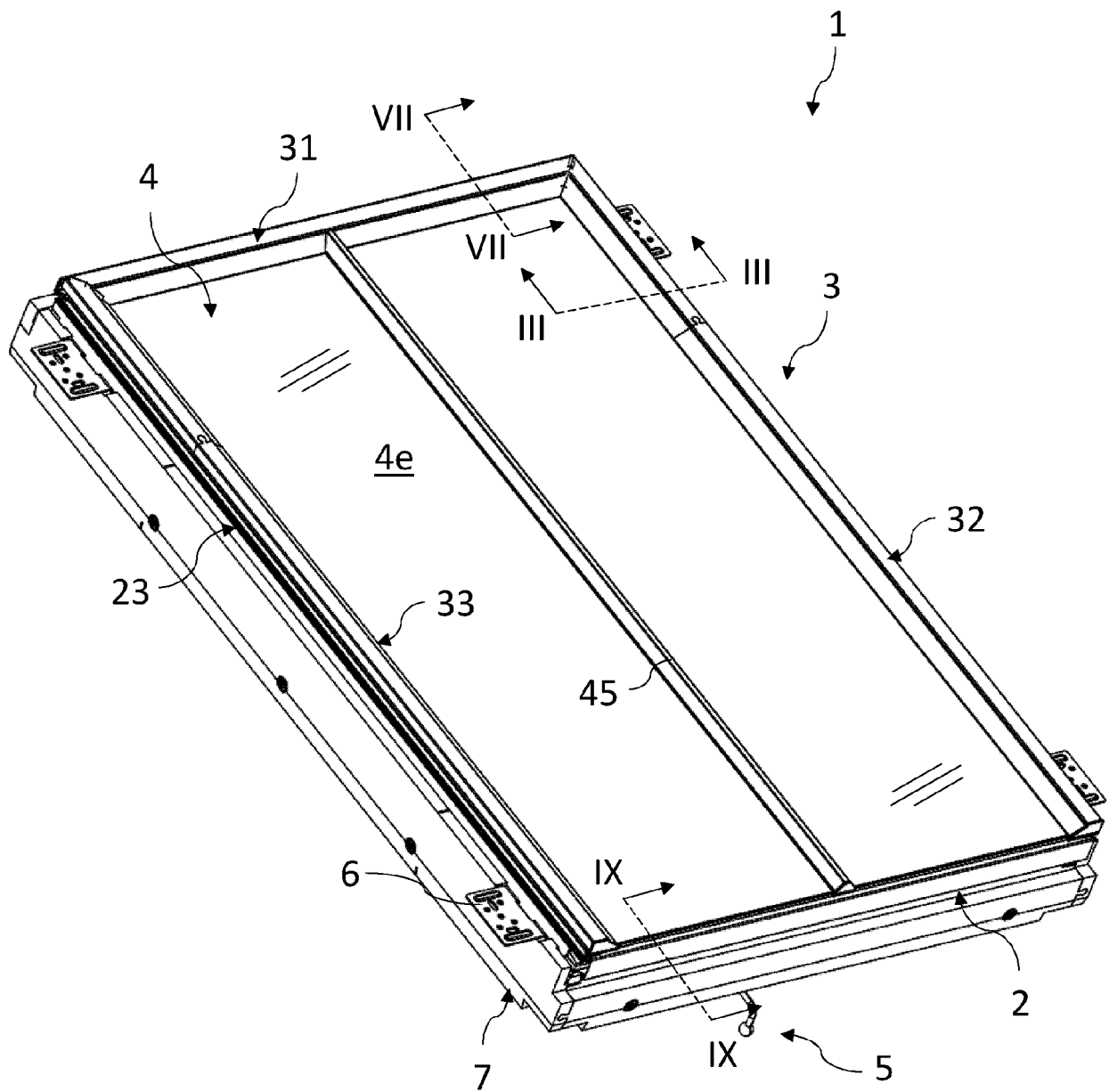


Fig. 2

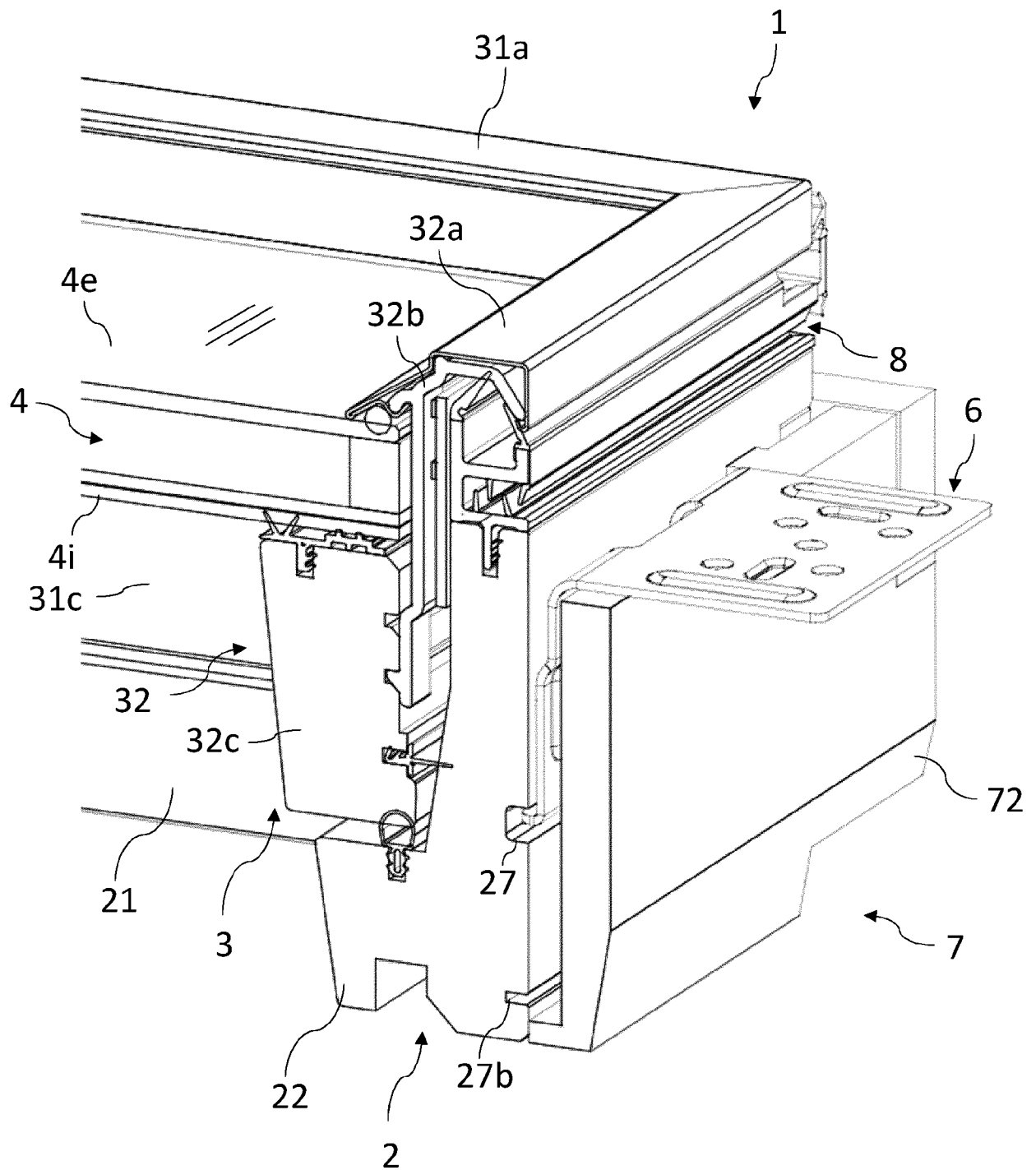


Fig. 3

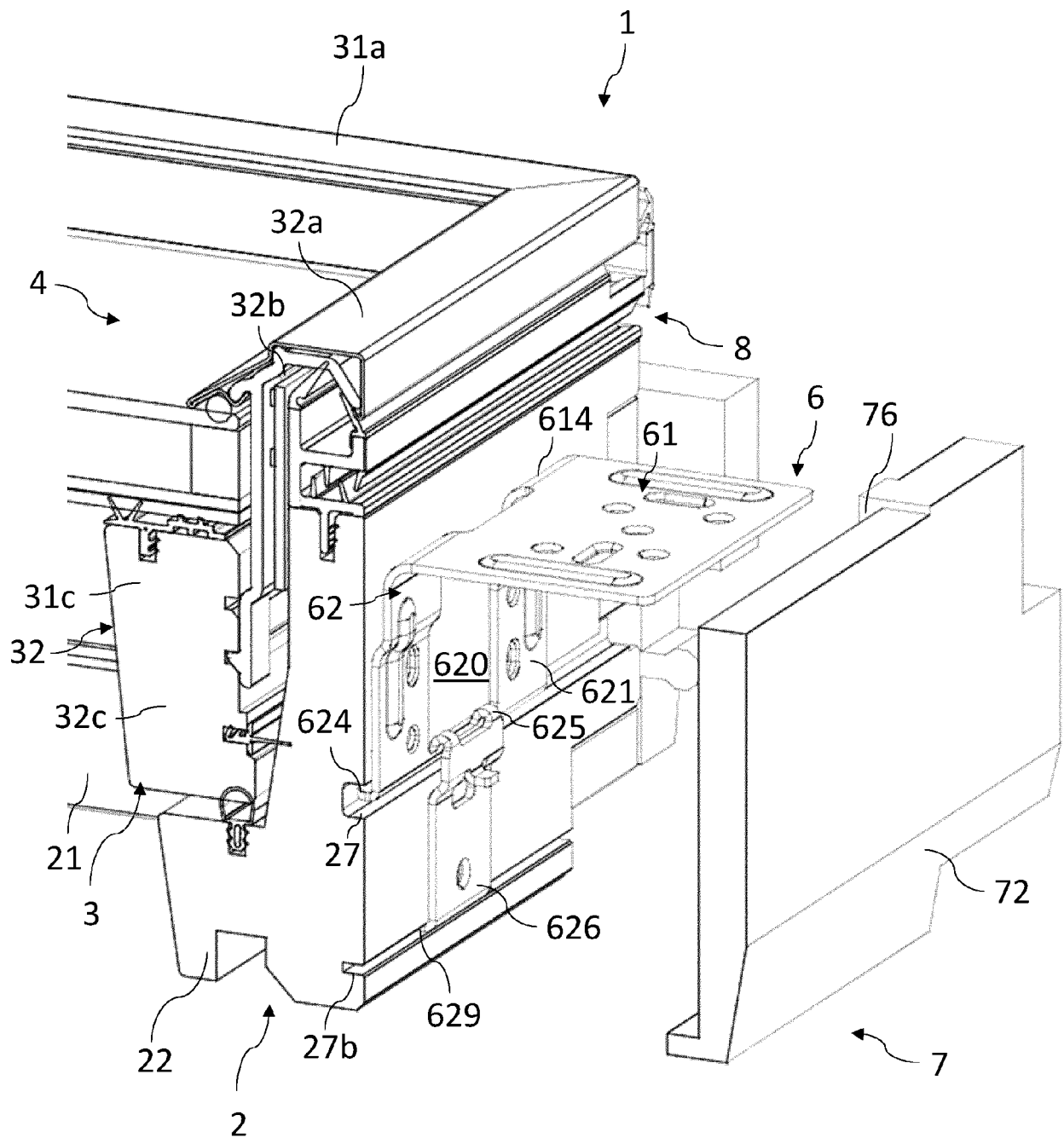


Fig. 4

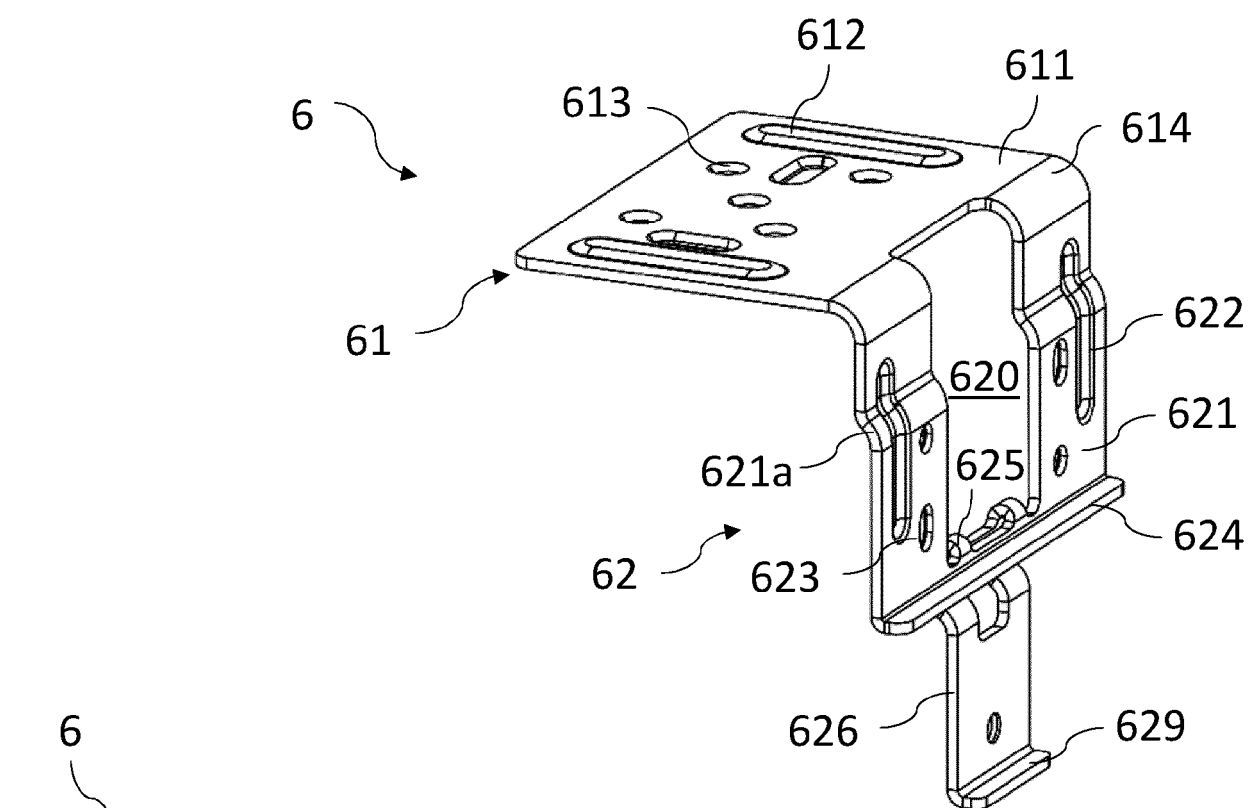


Fig. 5

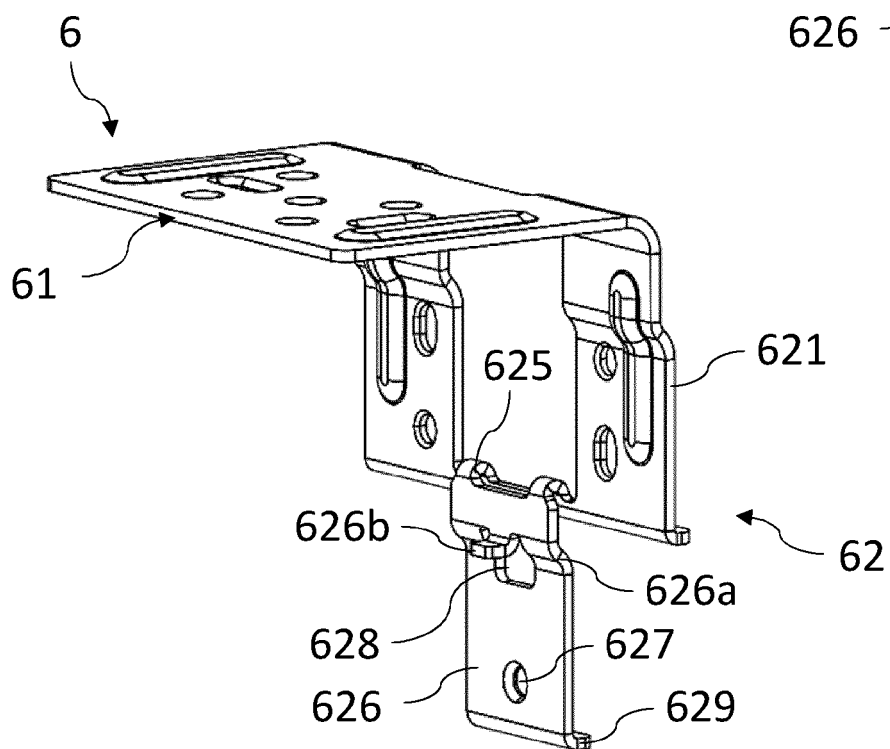


Fig. 6

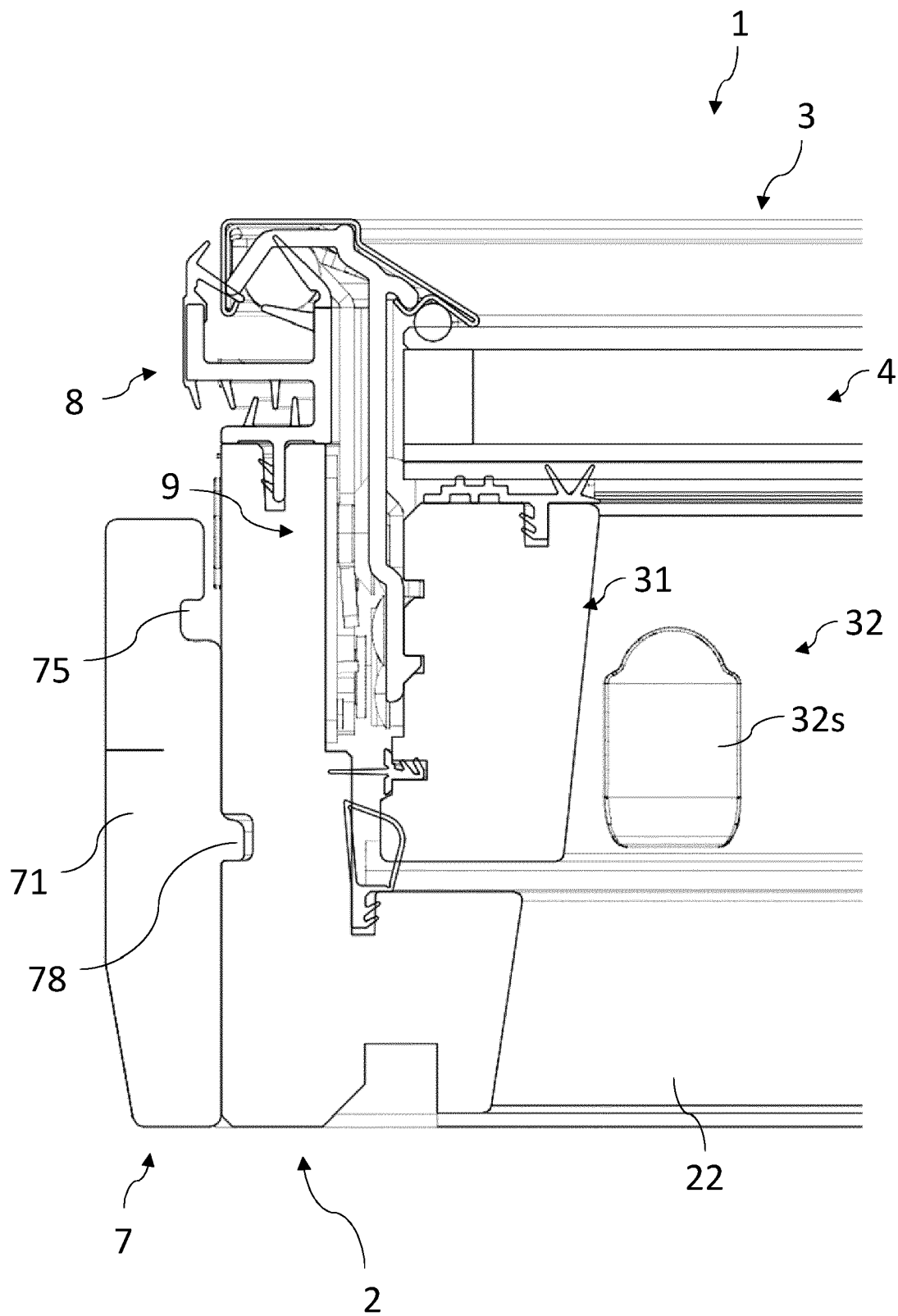


Fig. 7

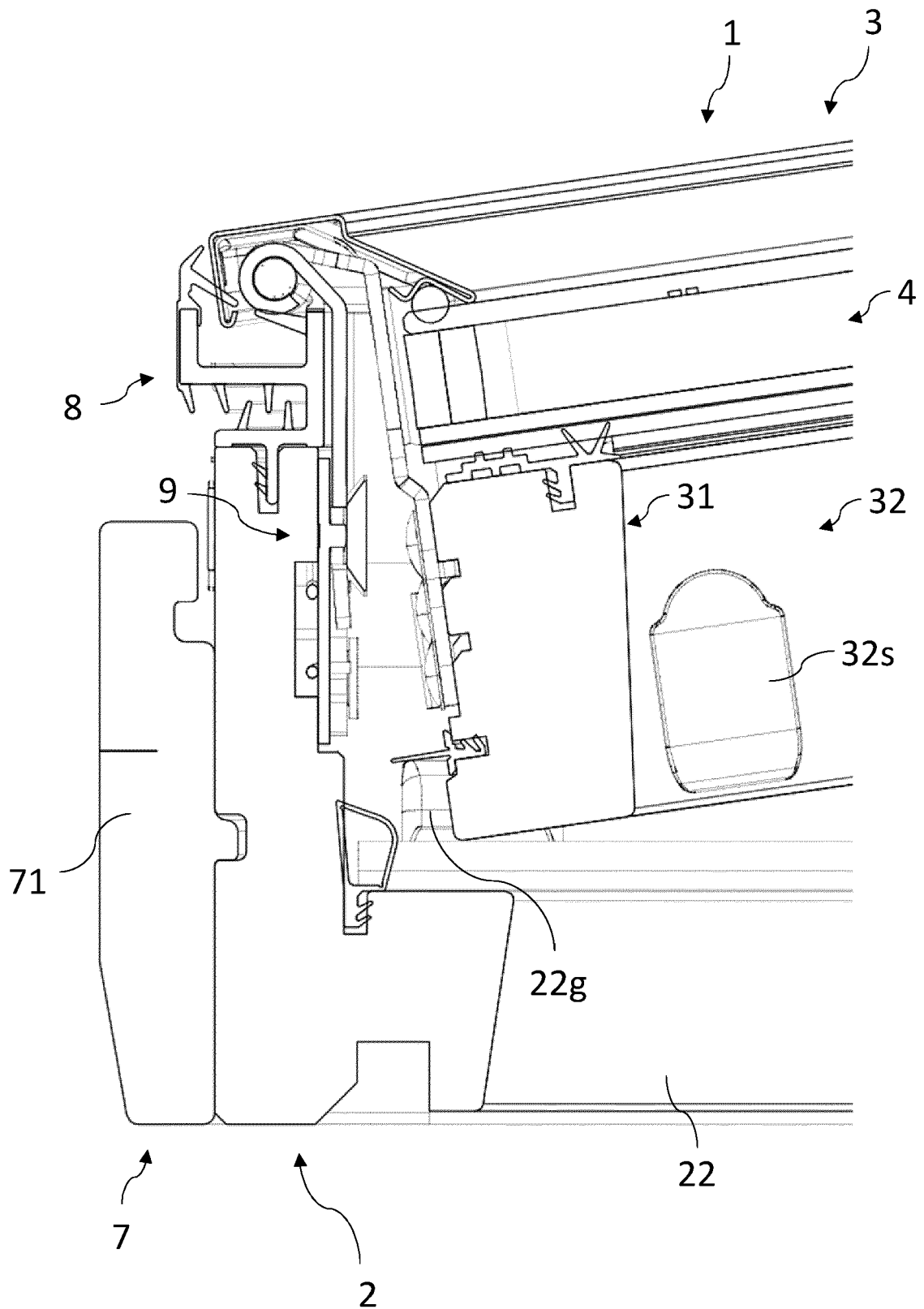


Fig. 8

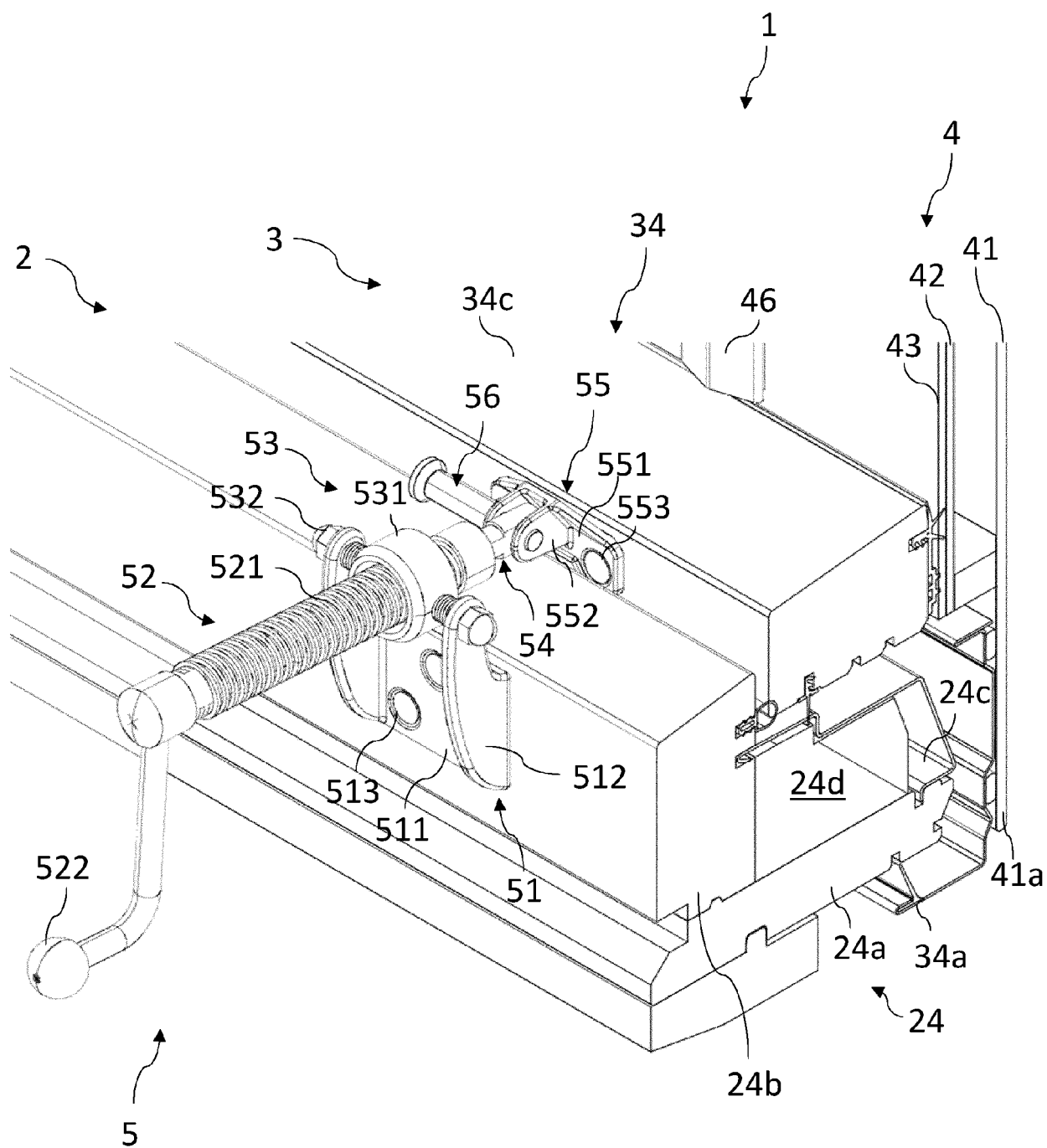


Fig. 9

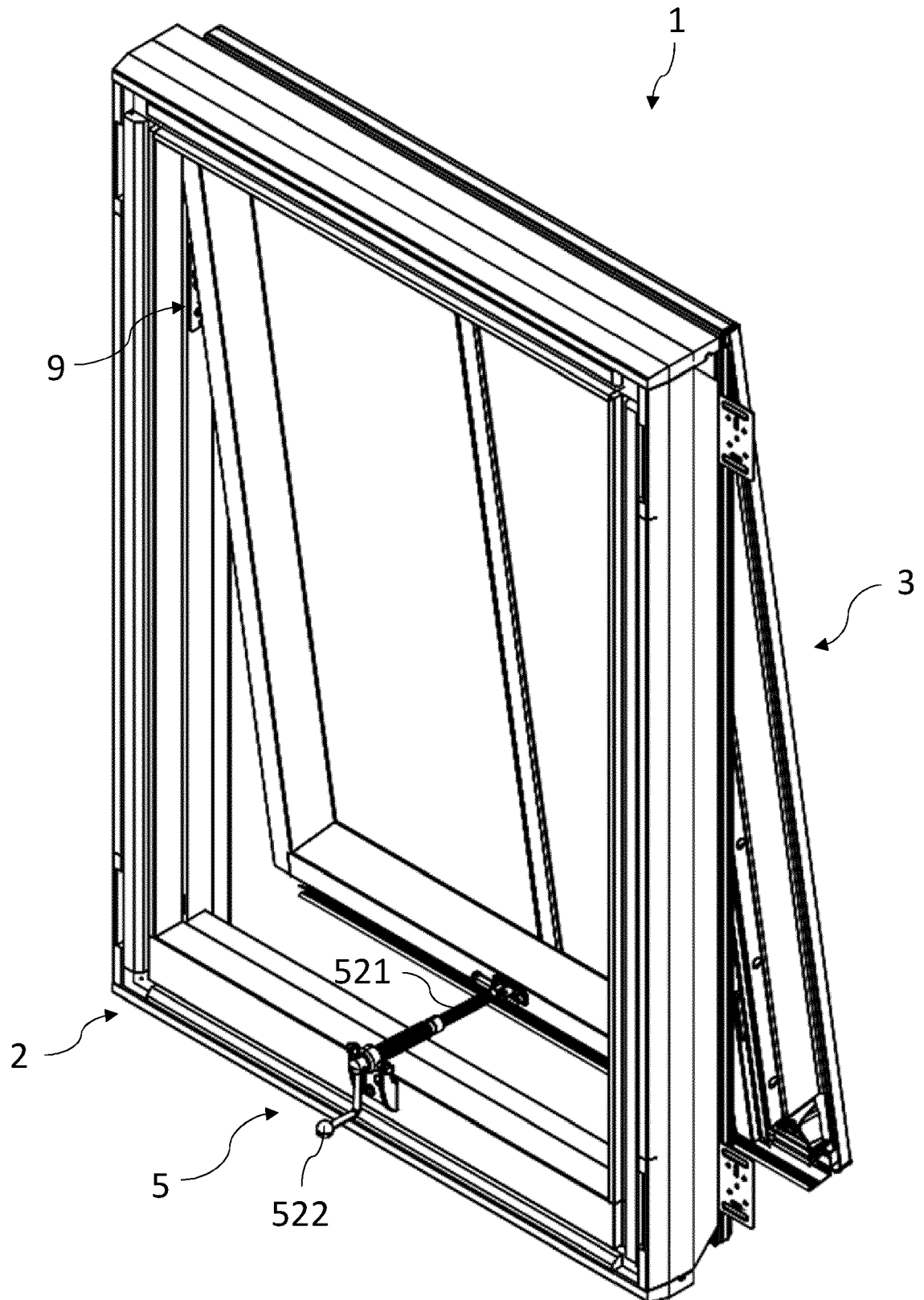


Fig. 10

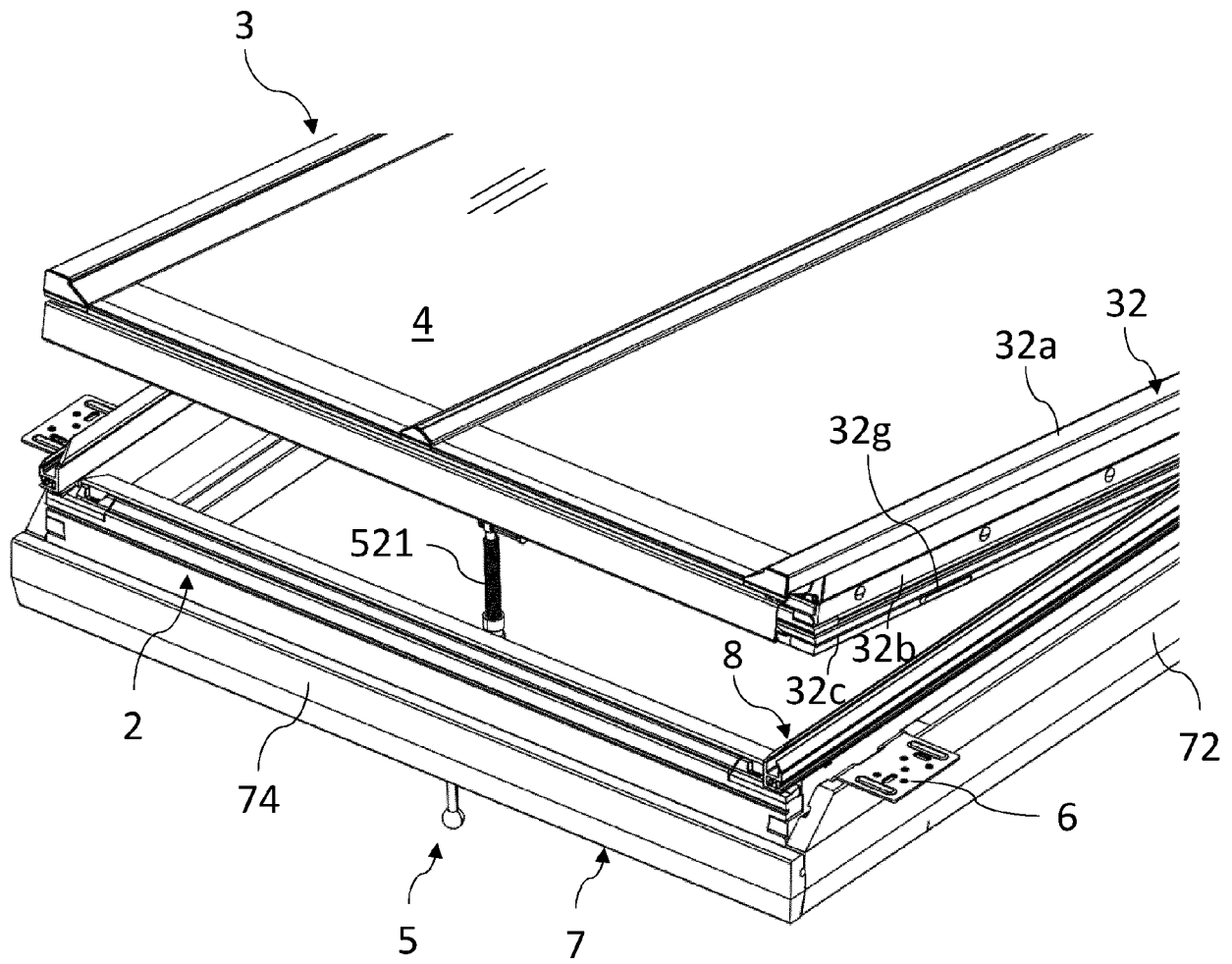


Fig. 11a

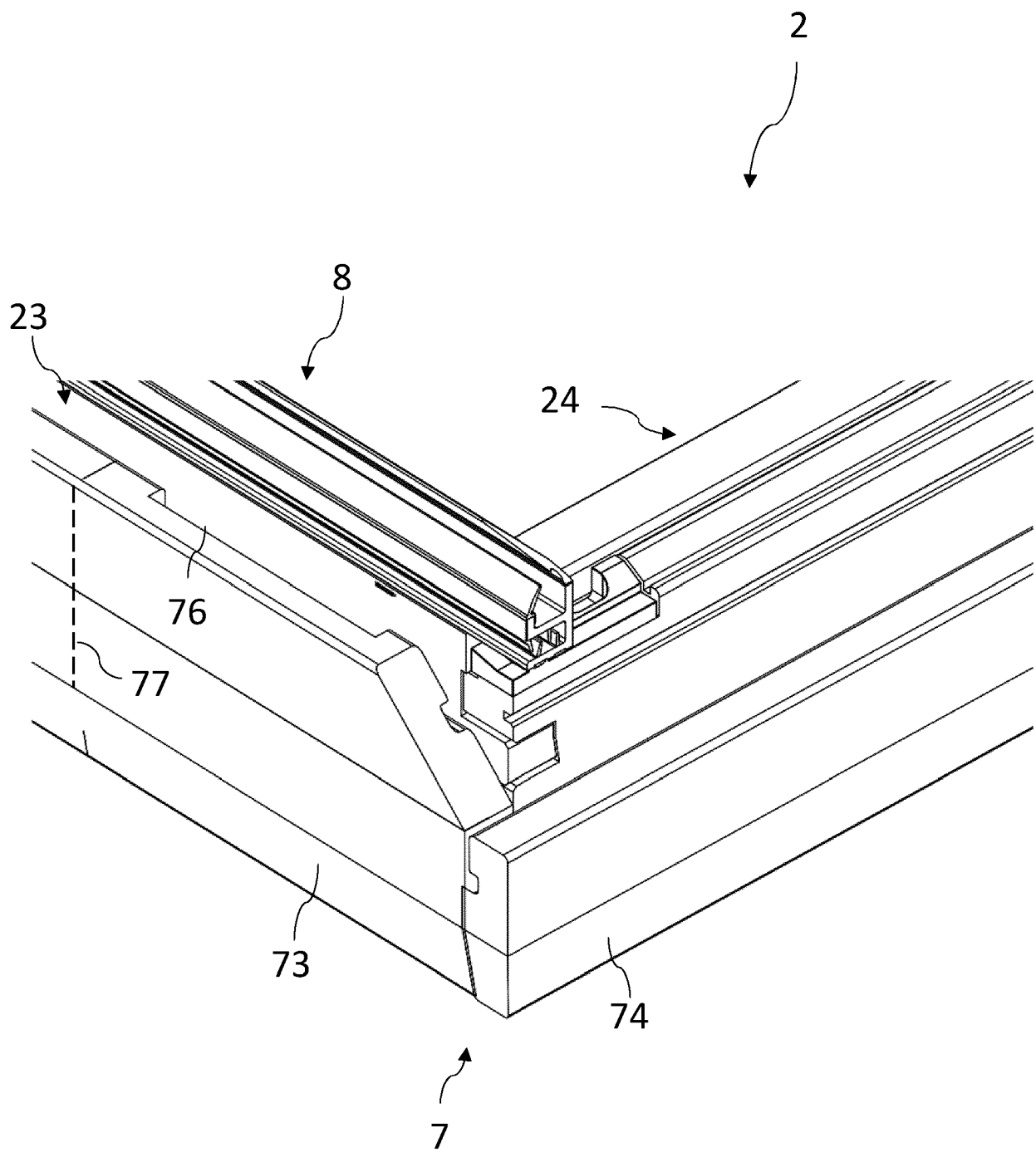


Fig. 11b

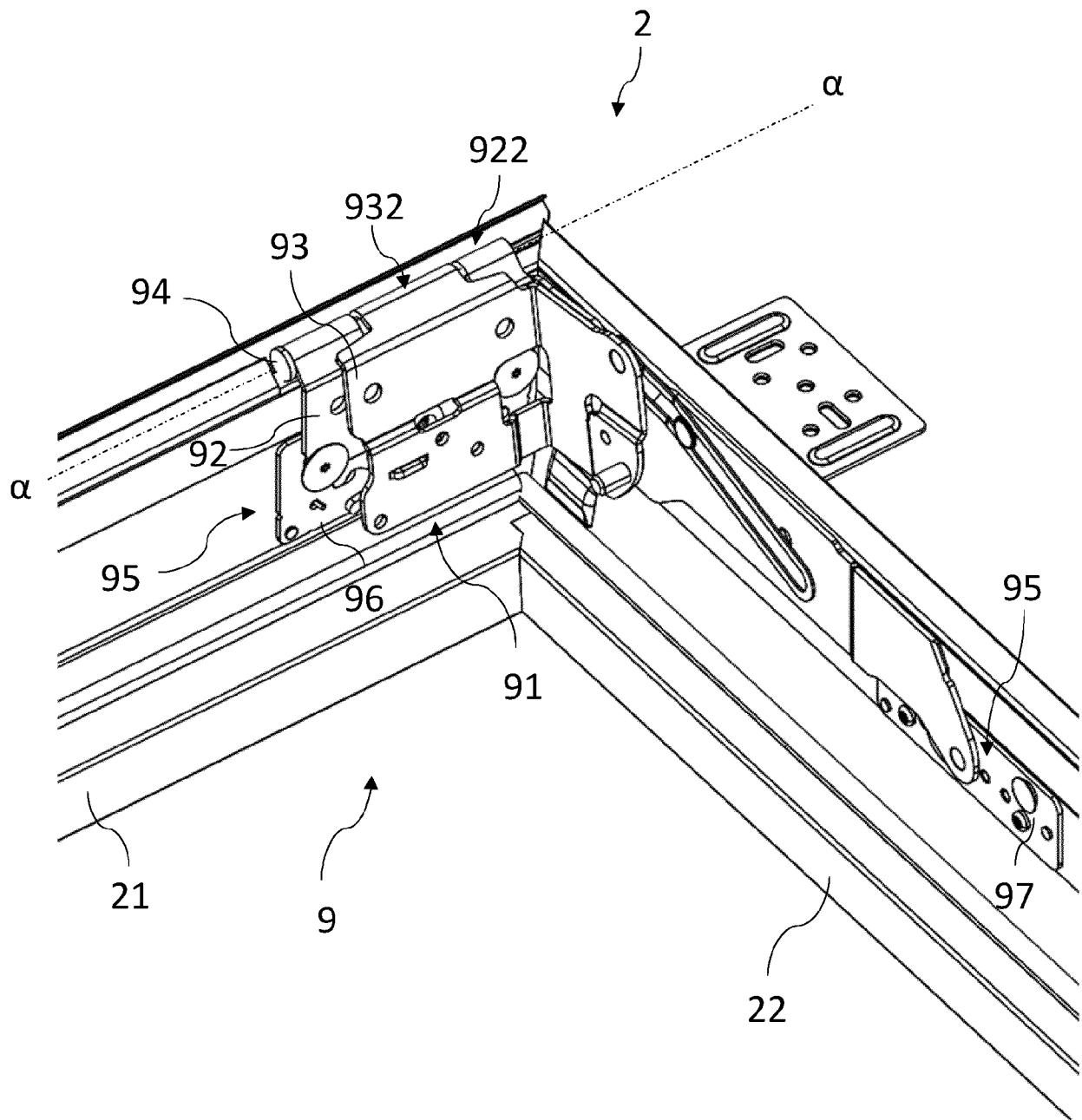


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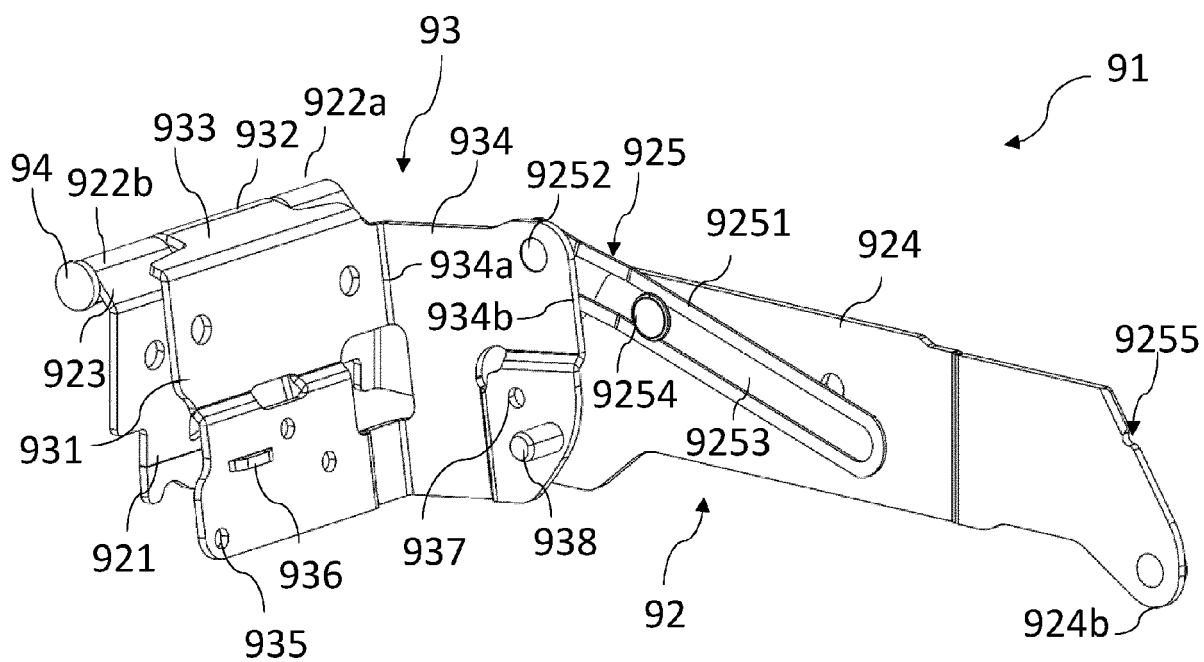


Fig. 13

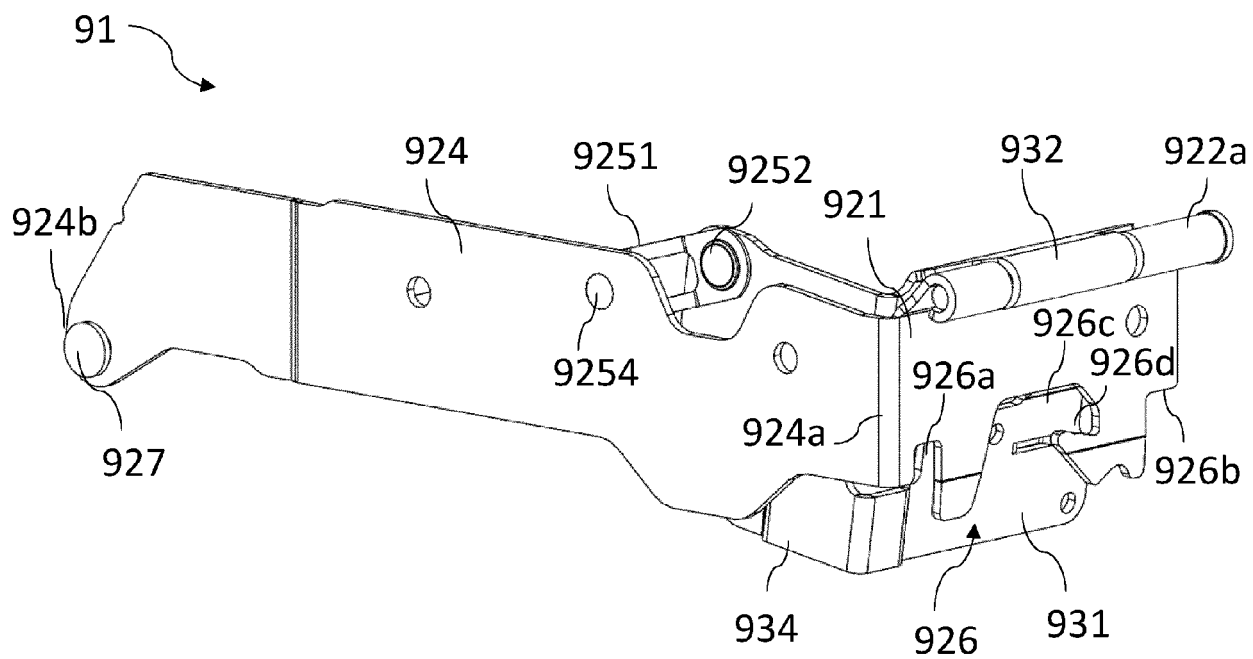


Fig. 14

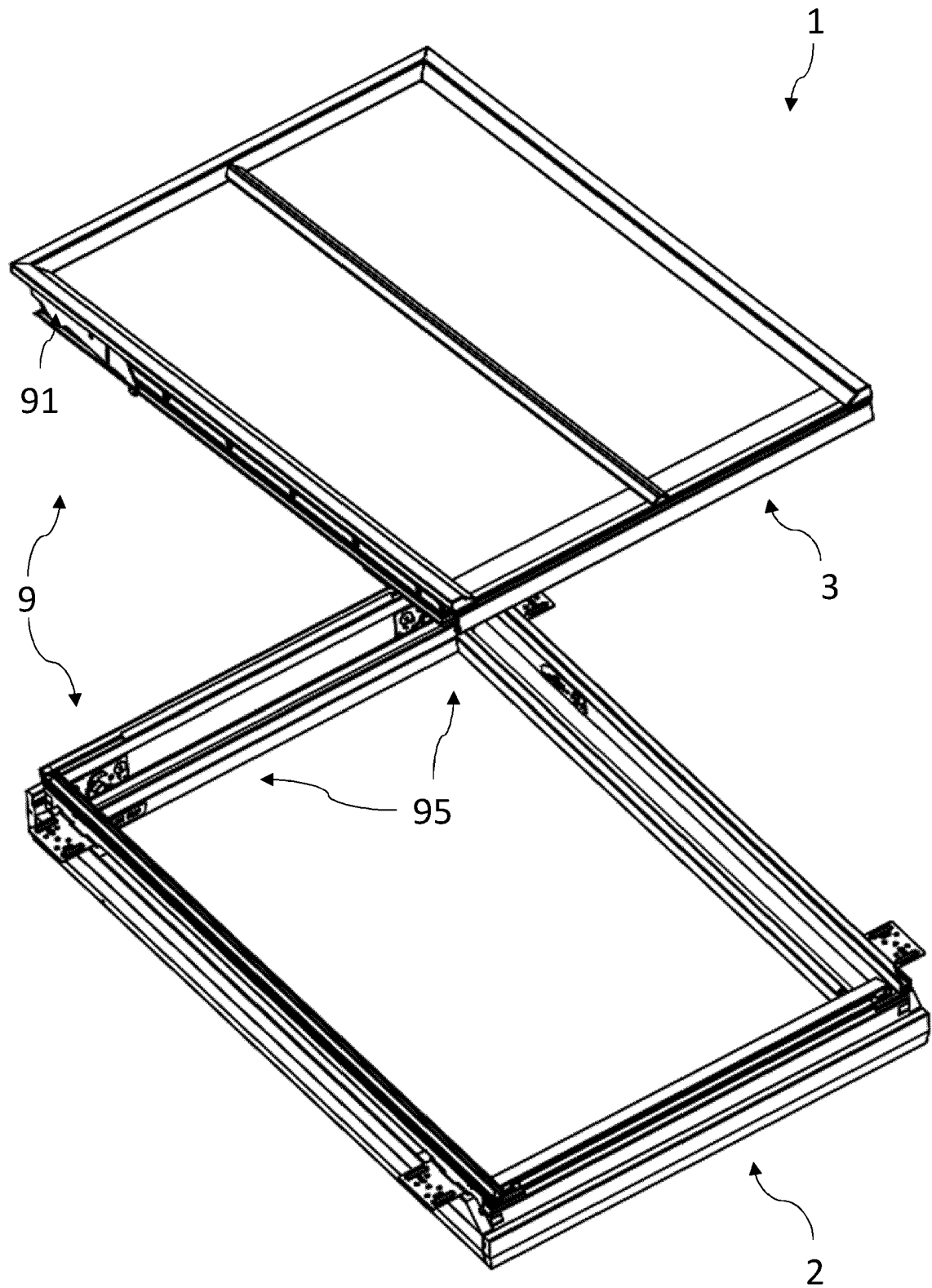


Fig. 15

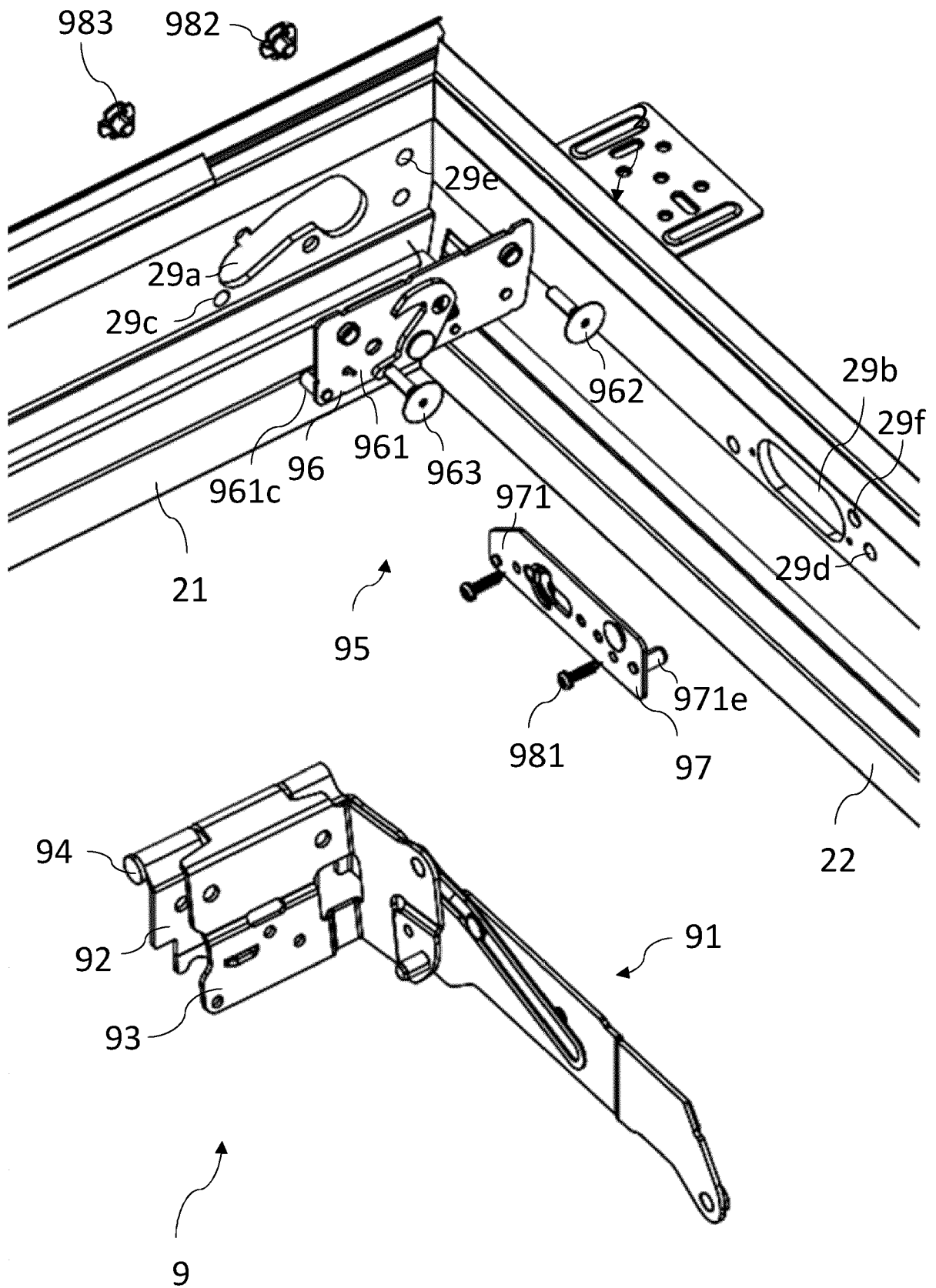


Fig. 16

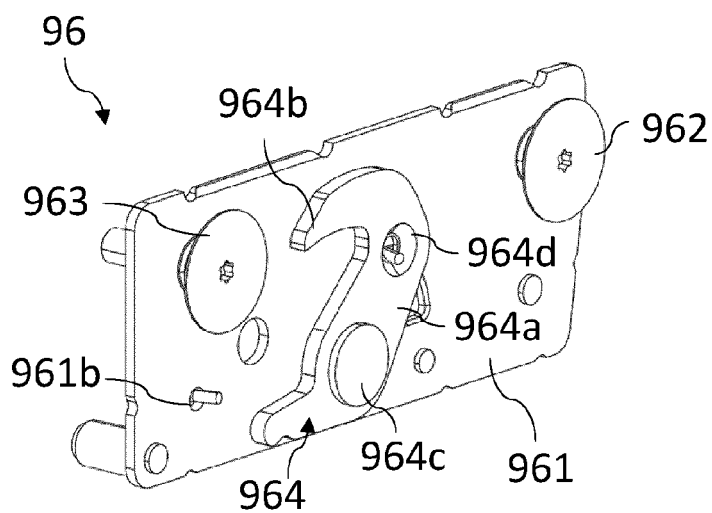


Fig. 17

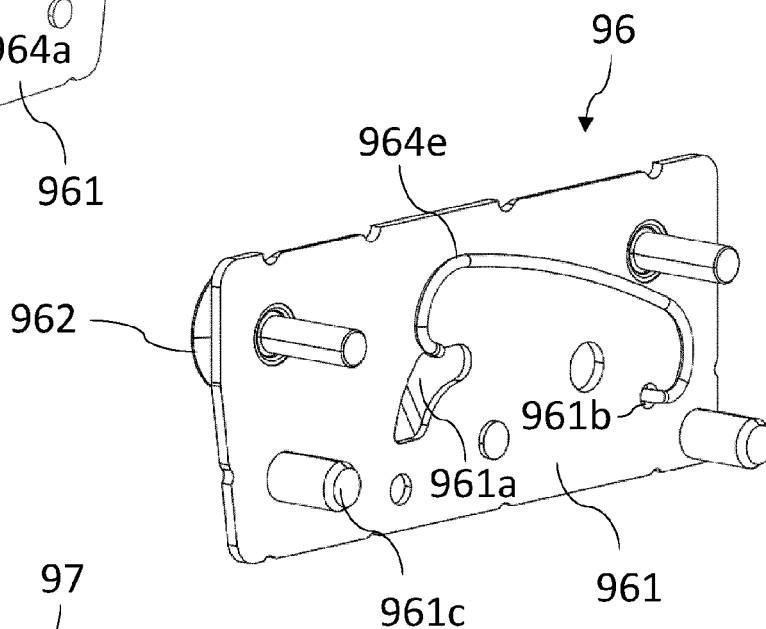


Fig. 18

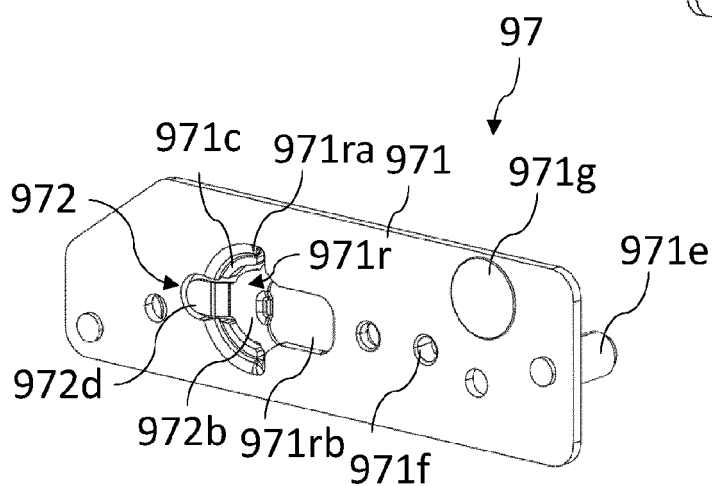


Fig. 19

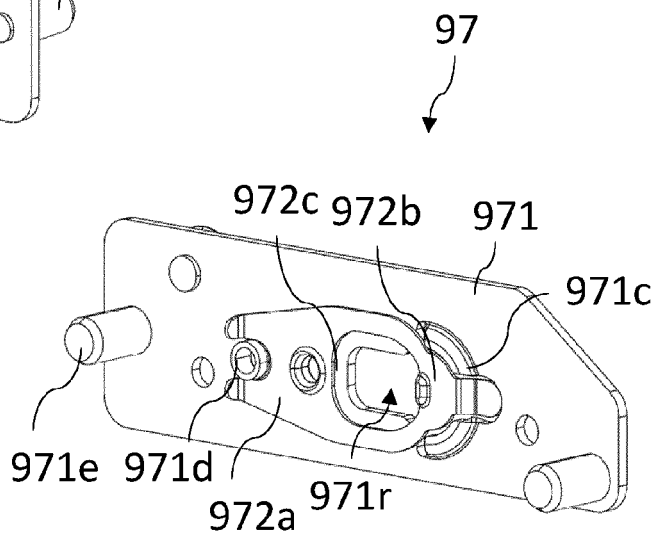


Fig. 20

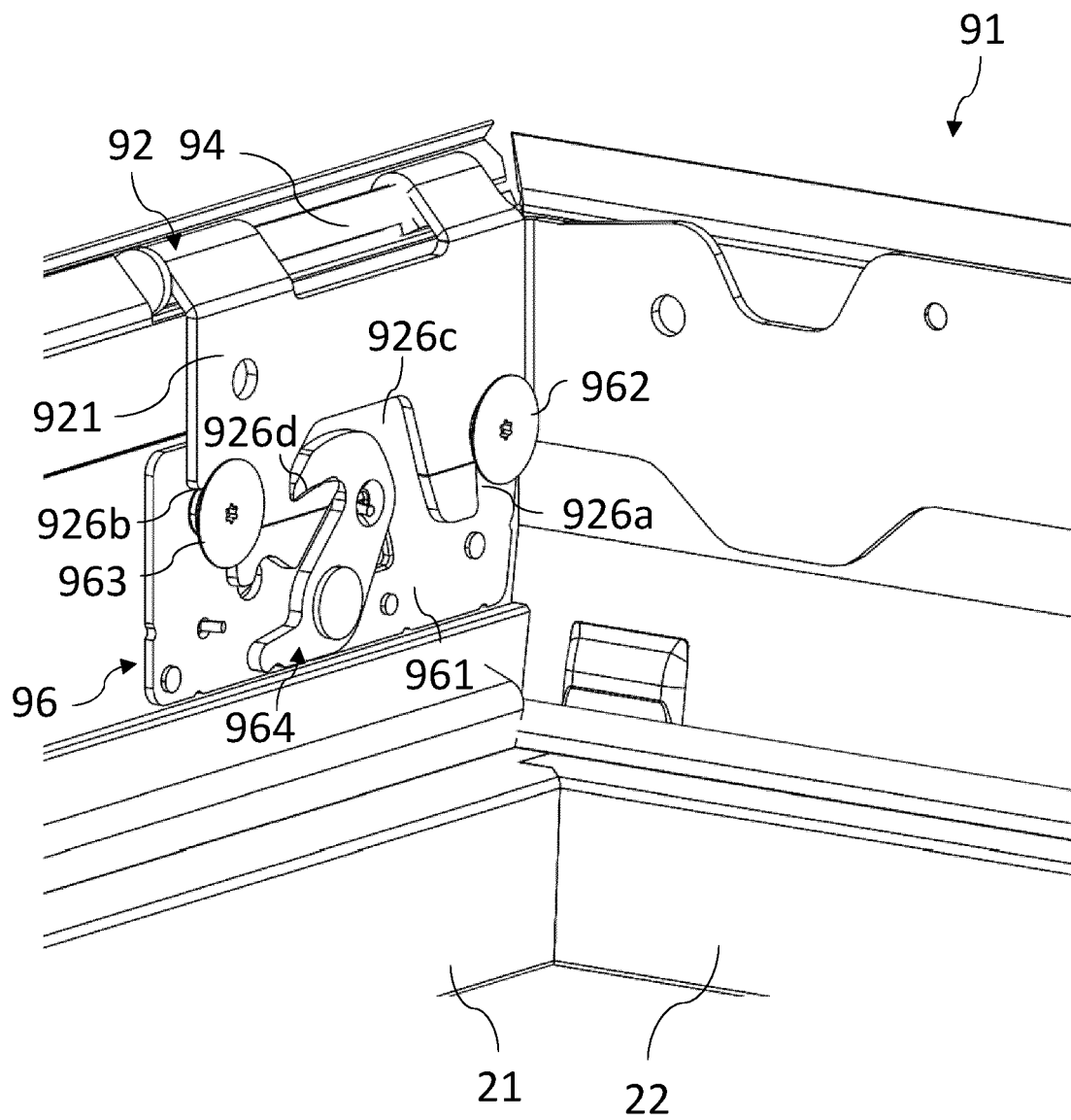


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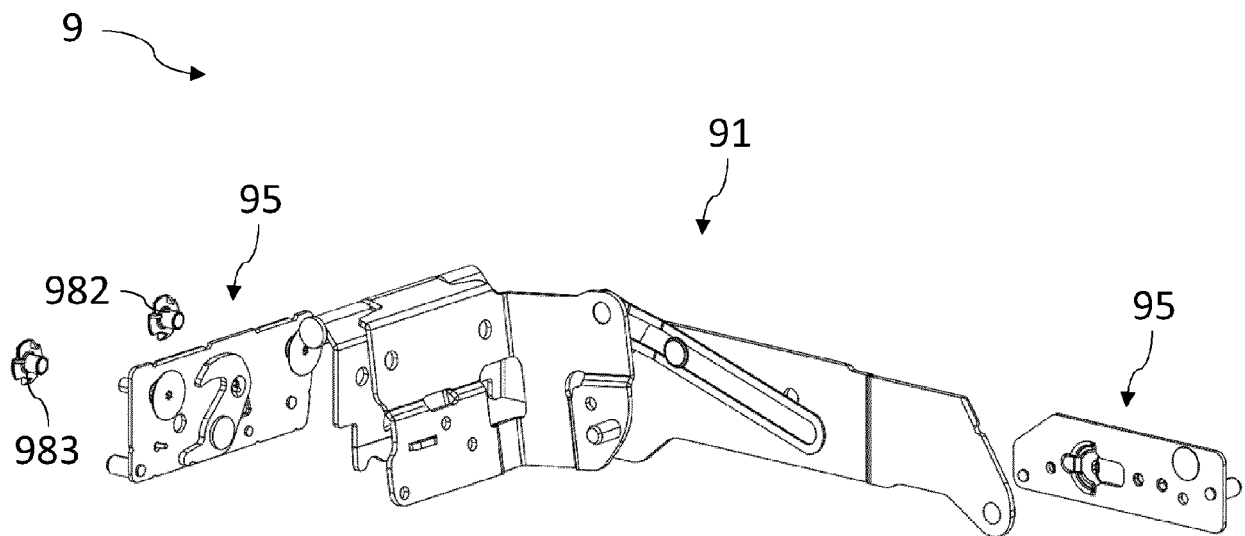


Fig. 22

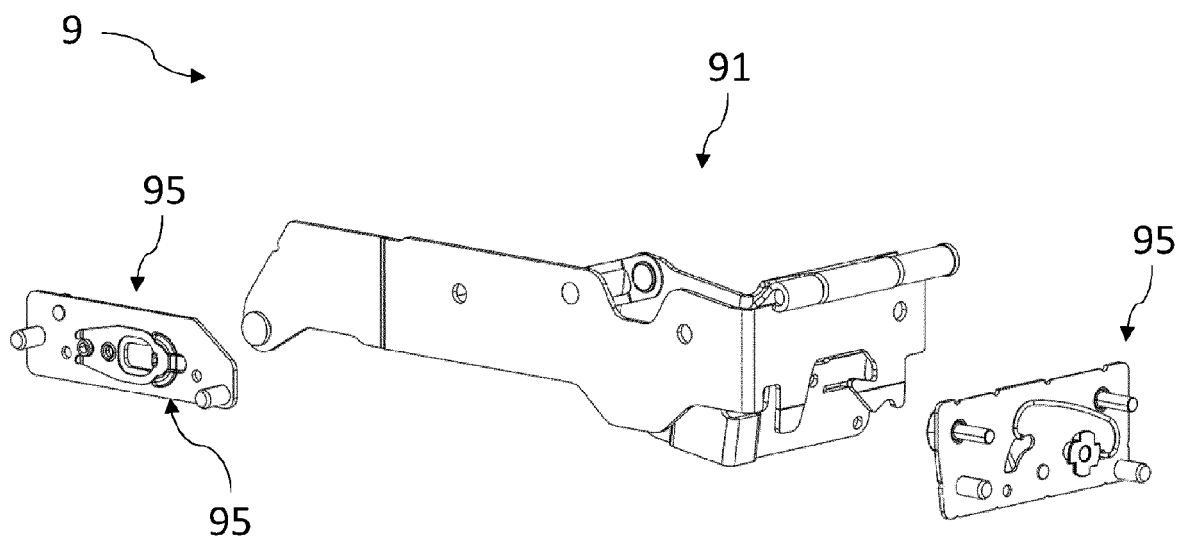


Fig. 23

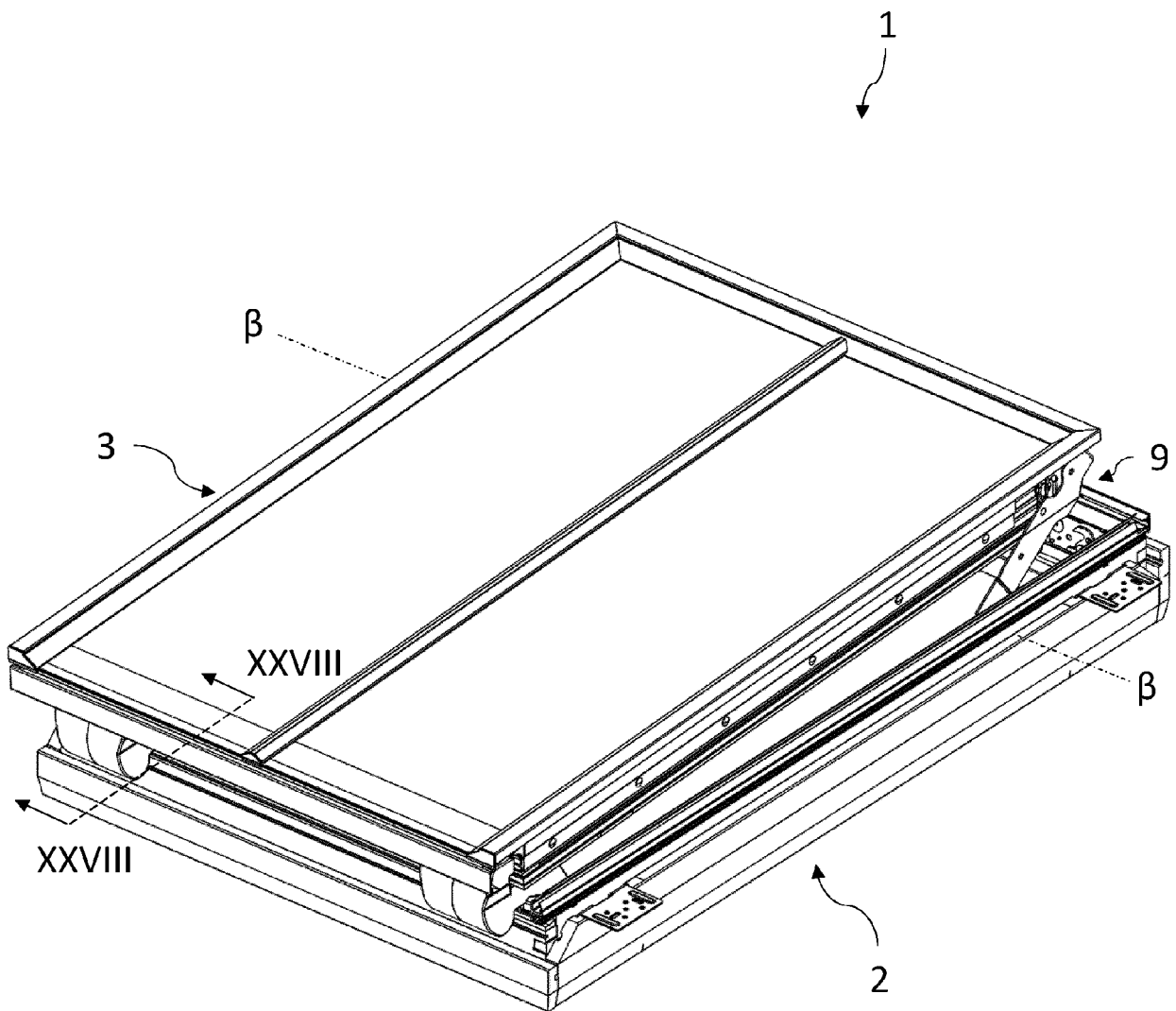


Fig. 24

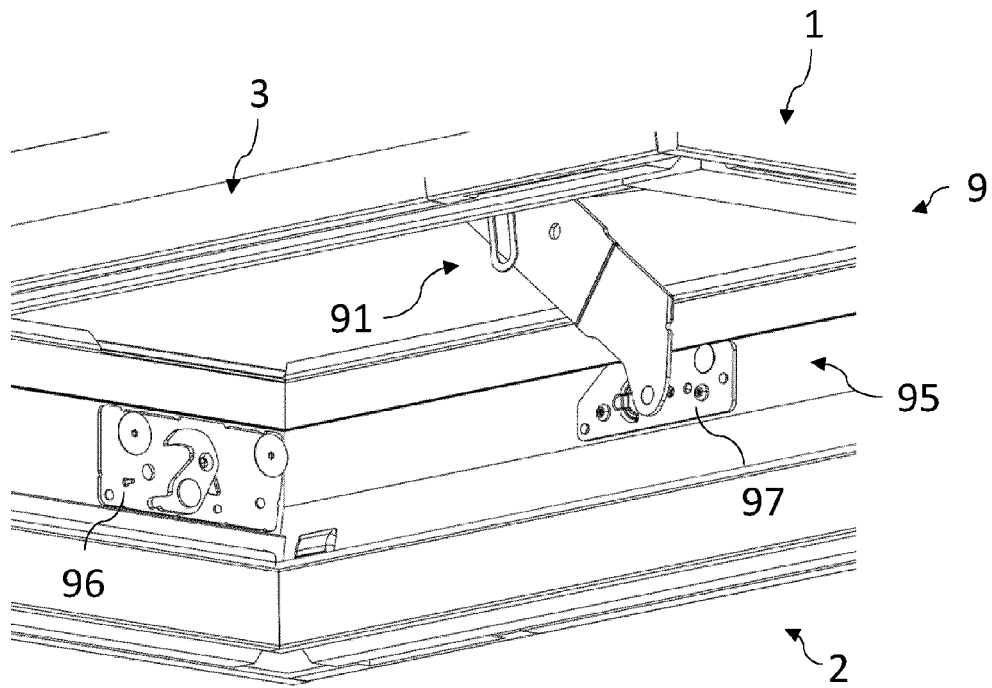


Fig. 25

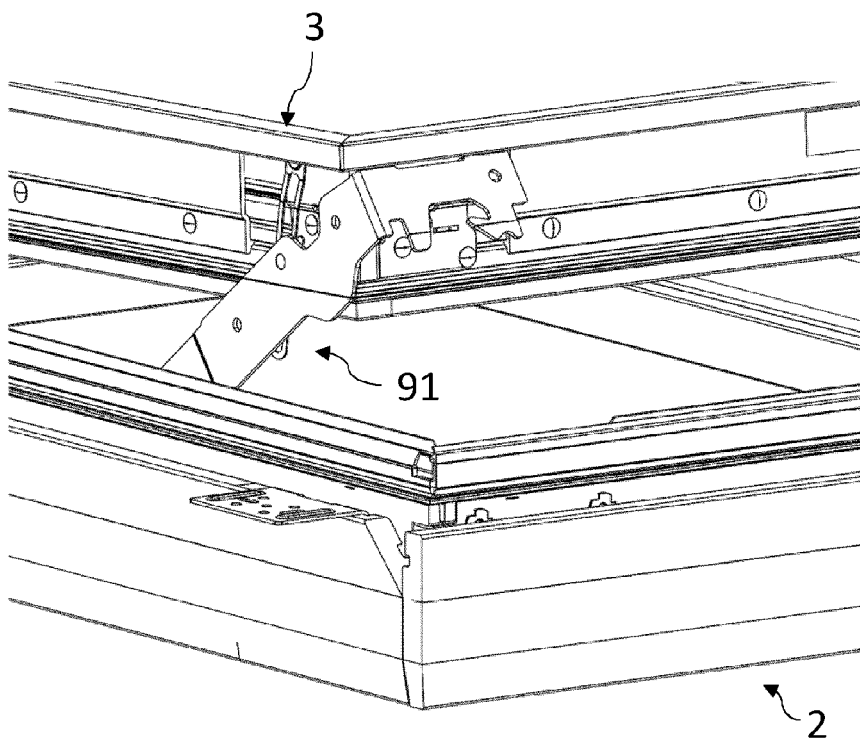


Fig. 26

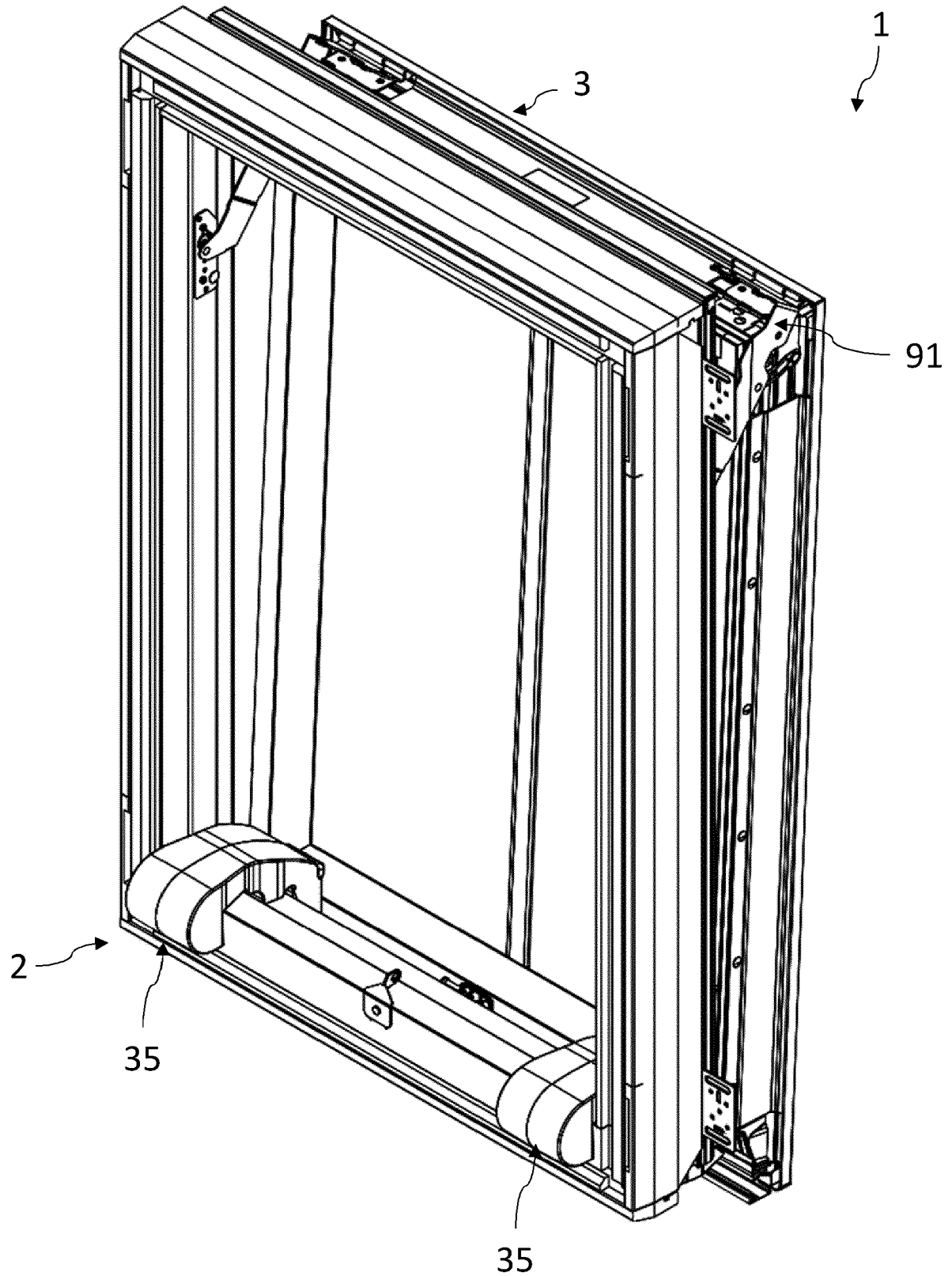


Fig. 27

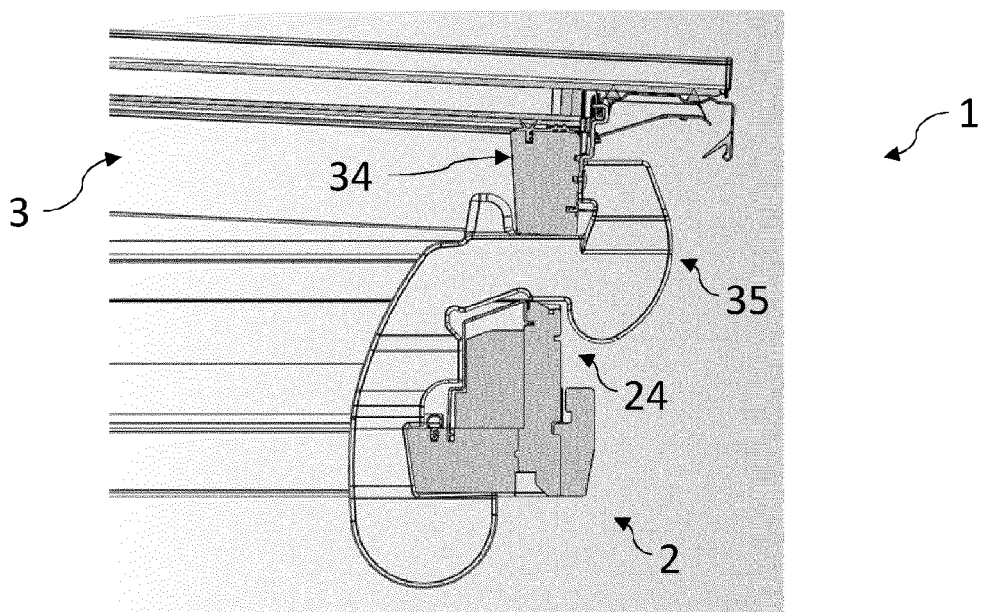


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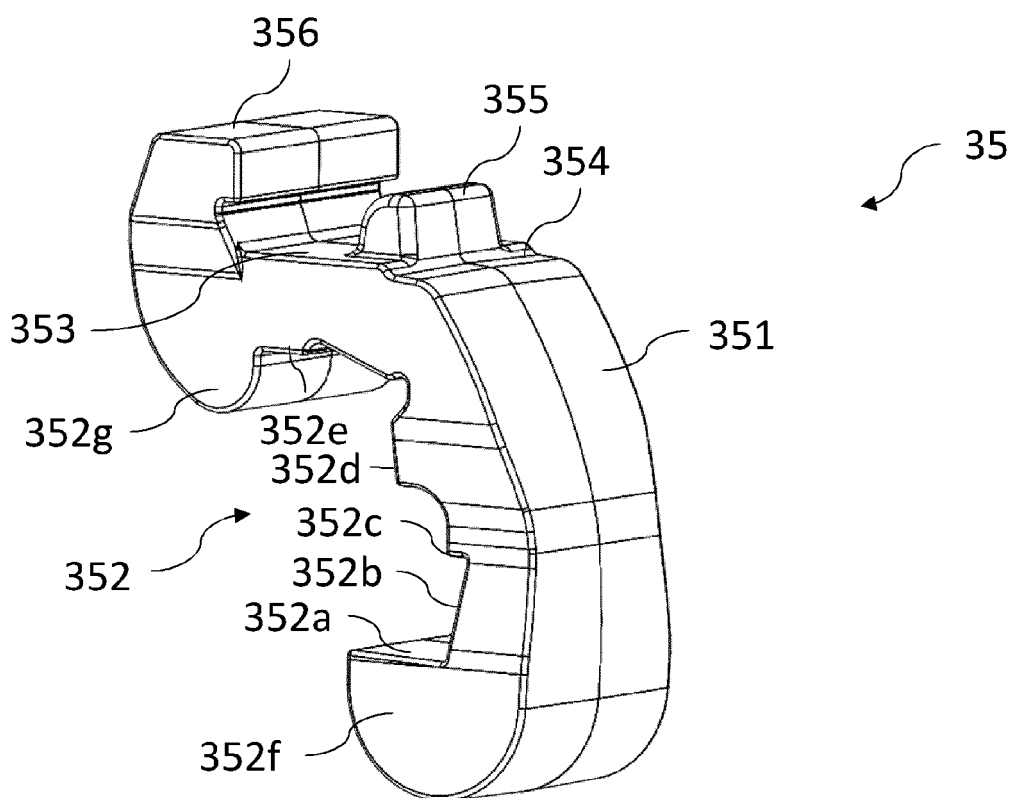


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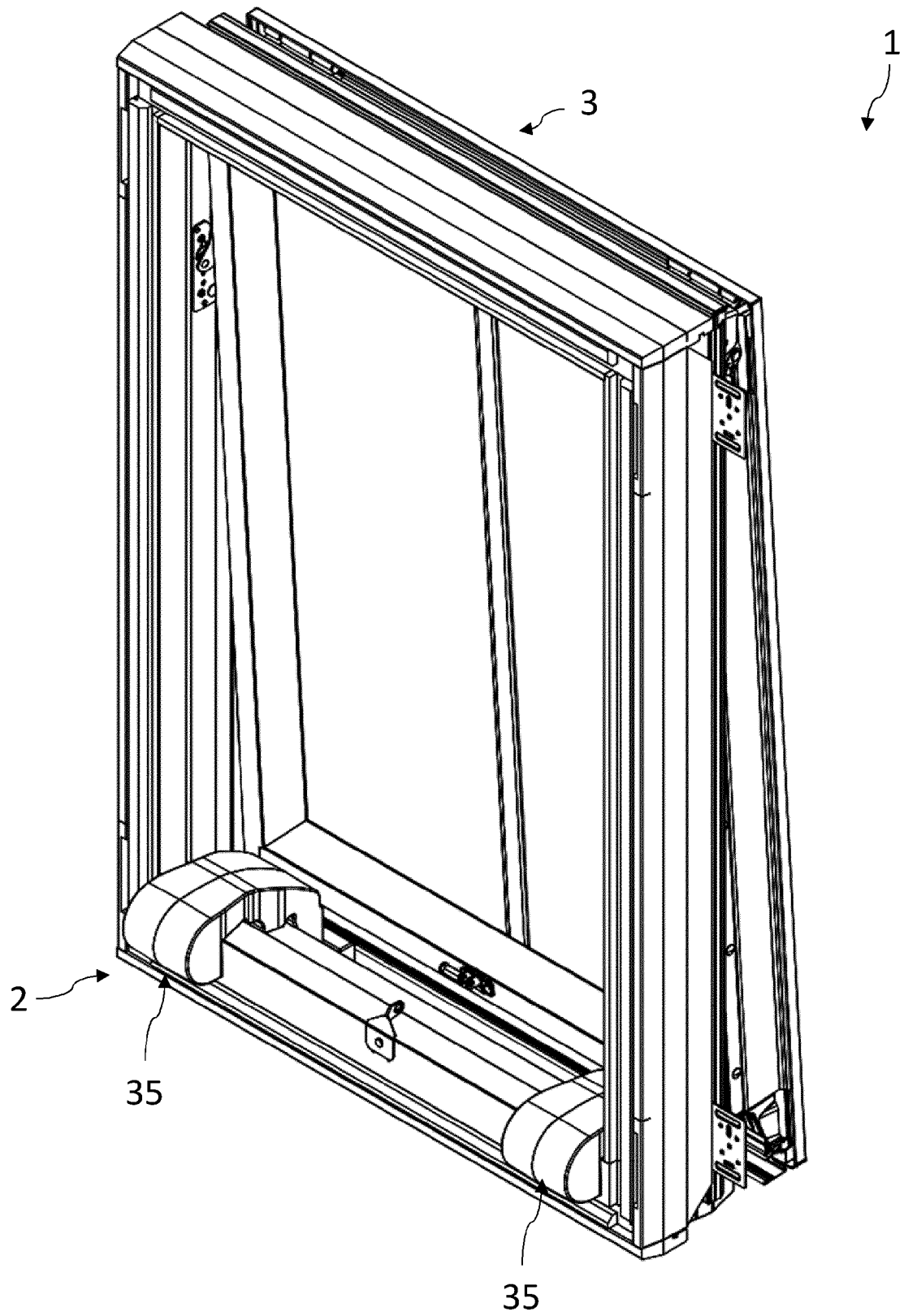


Fig. 30

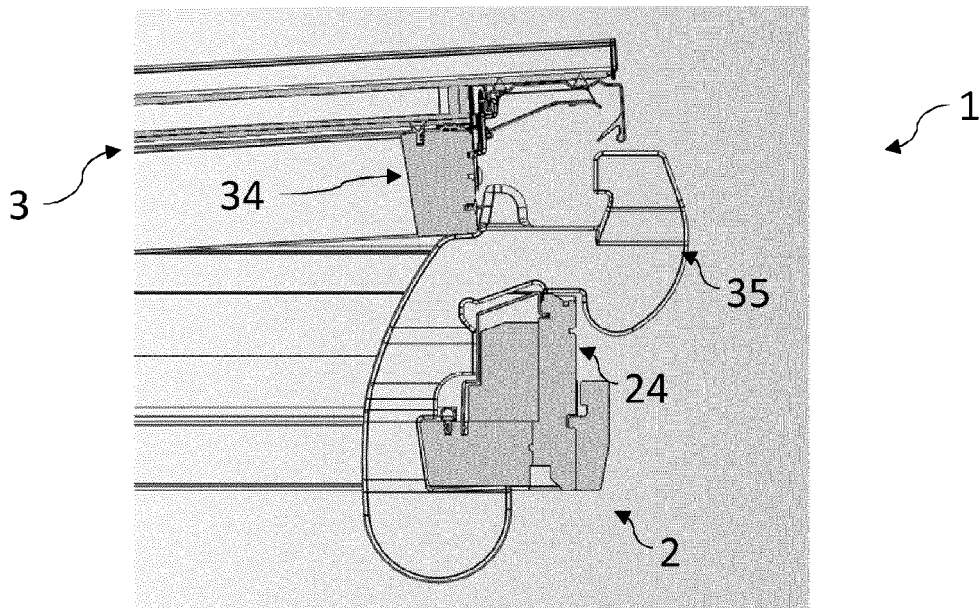


Fig. 31

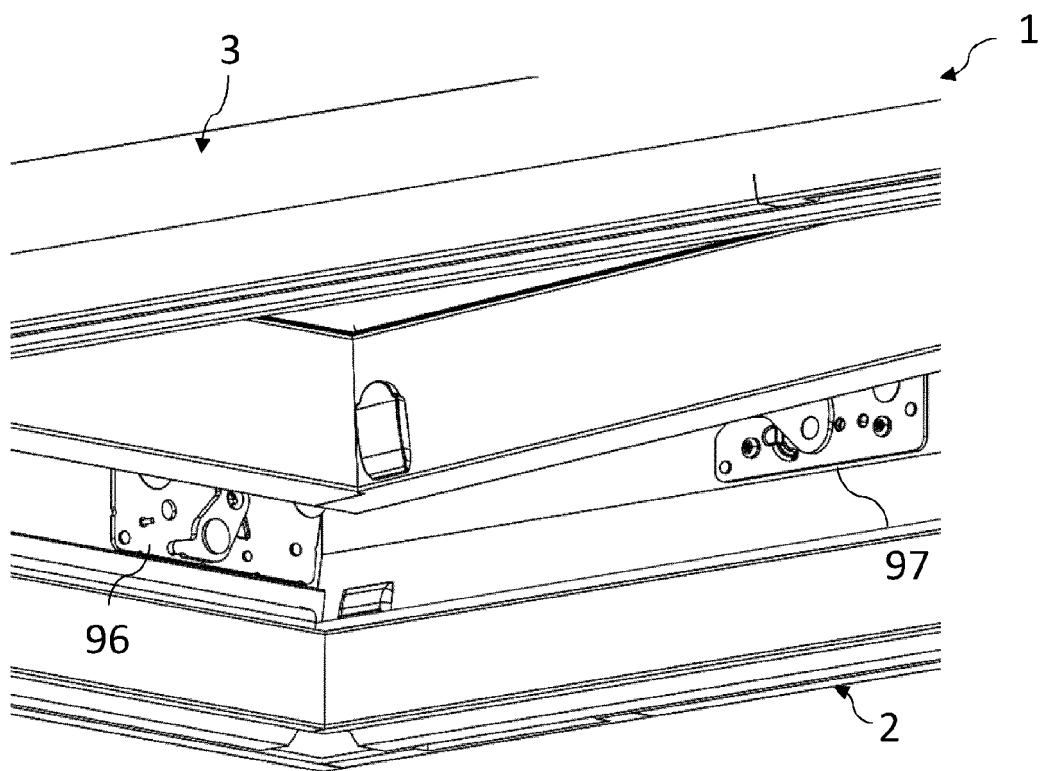


Fig. 32

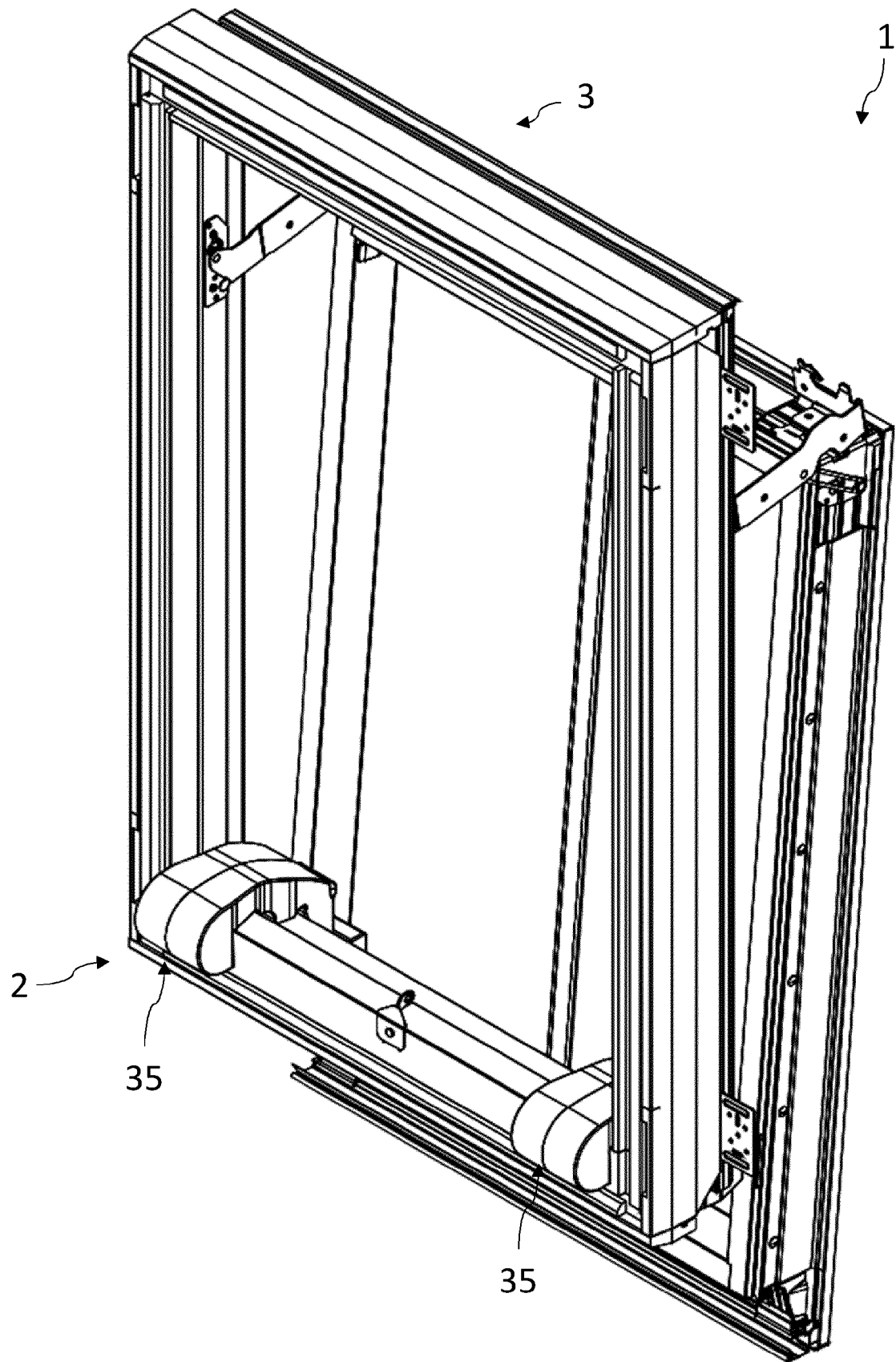


Fig. 33

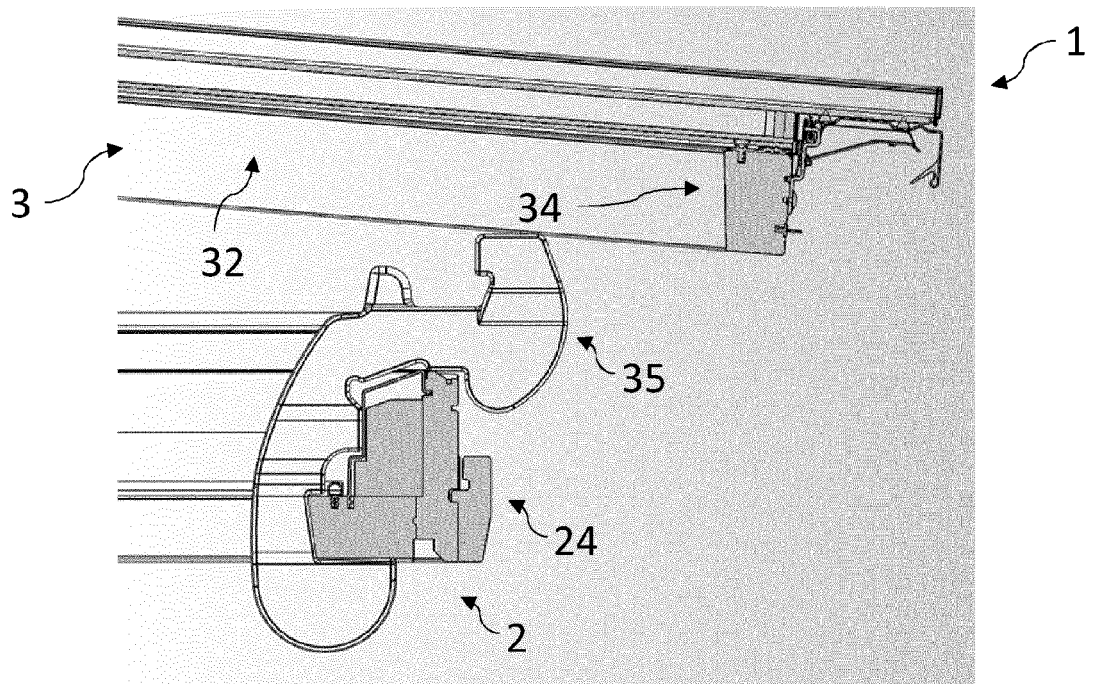


Fig. 34

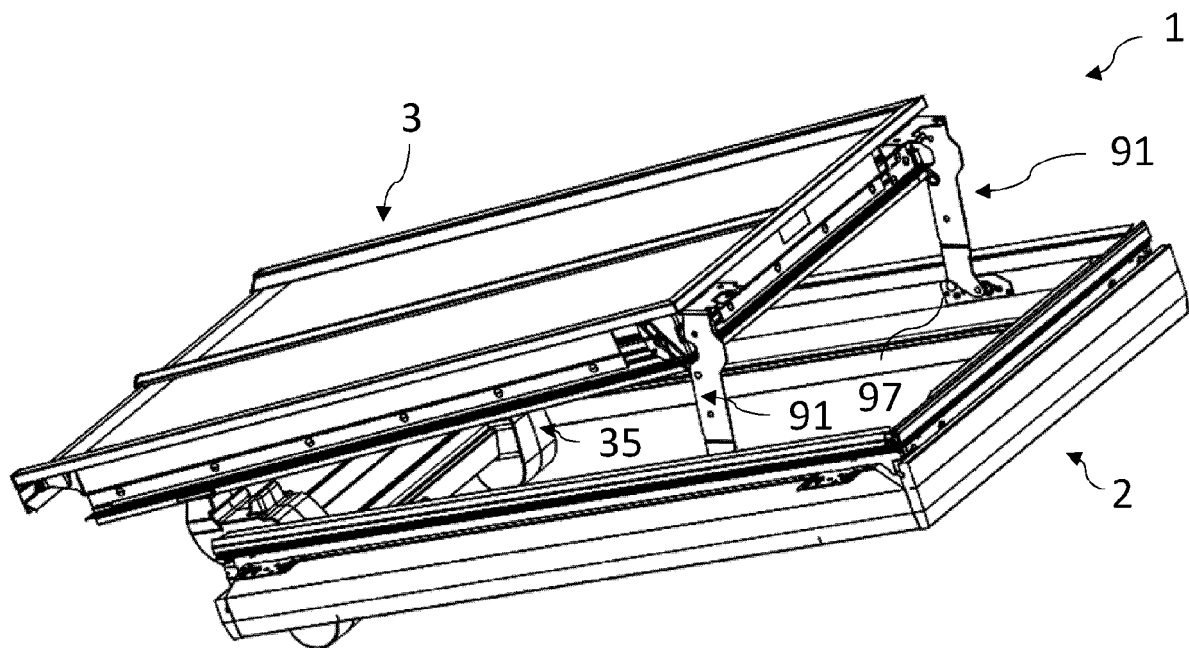


Fig. 35

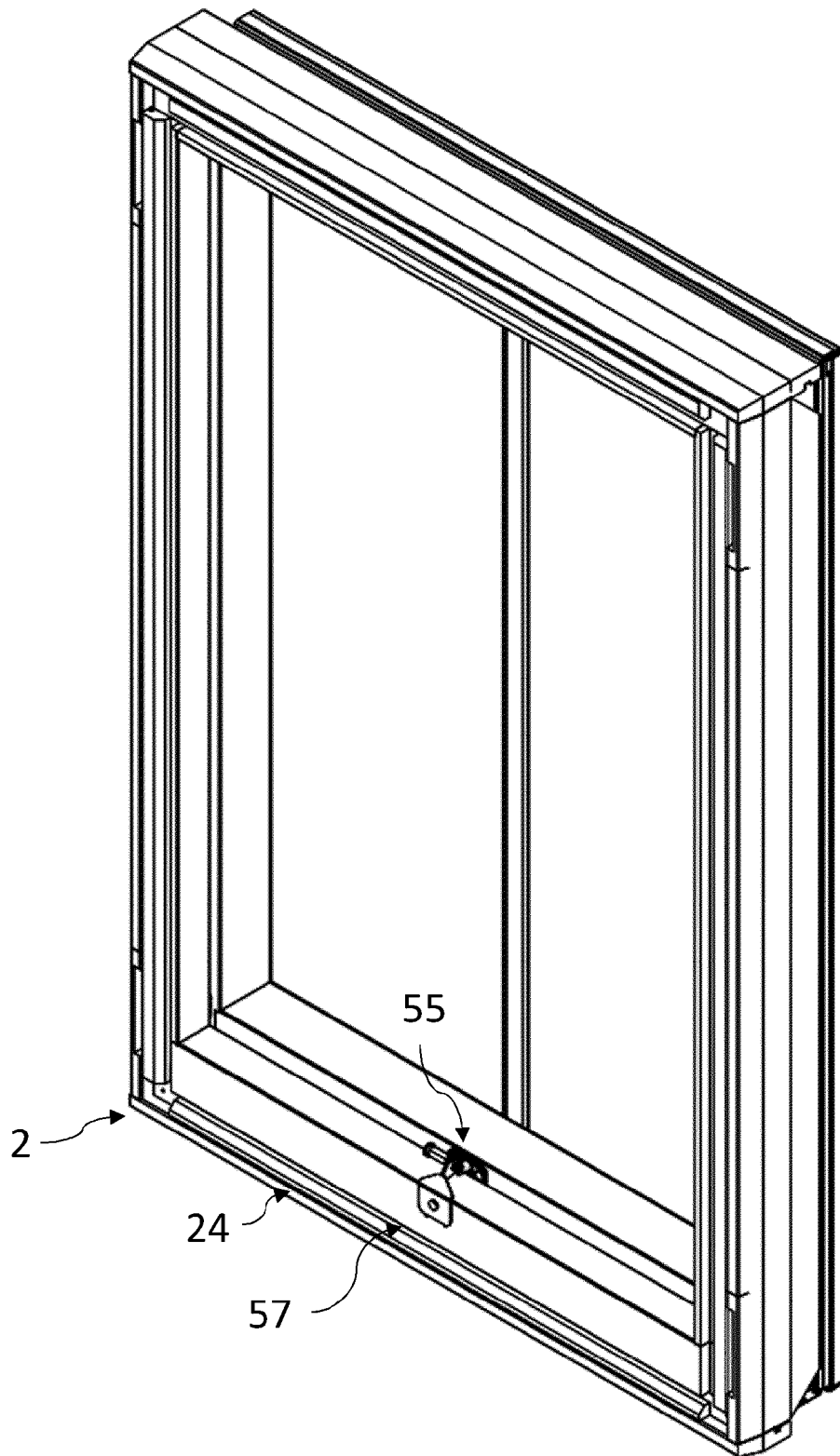


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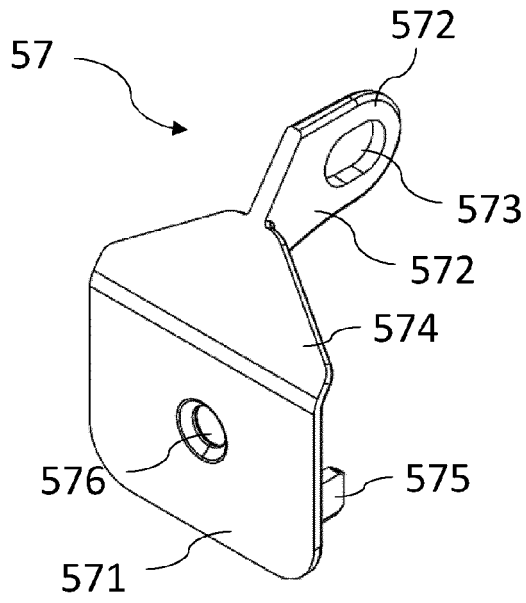


Fig. 37

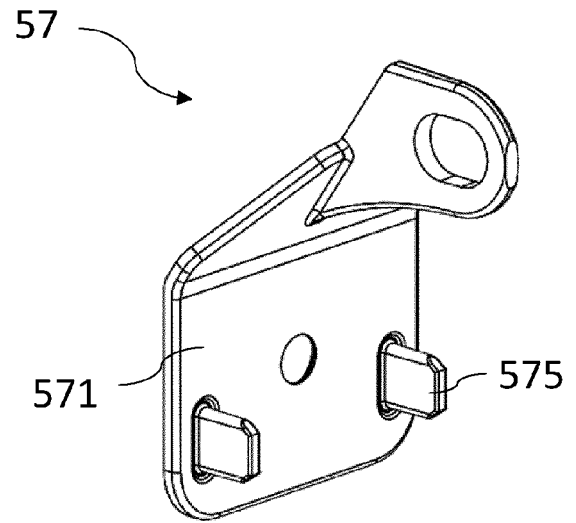


Fig. 38

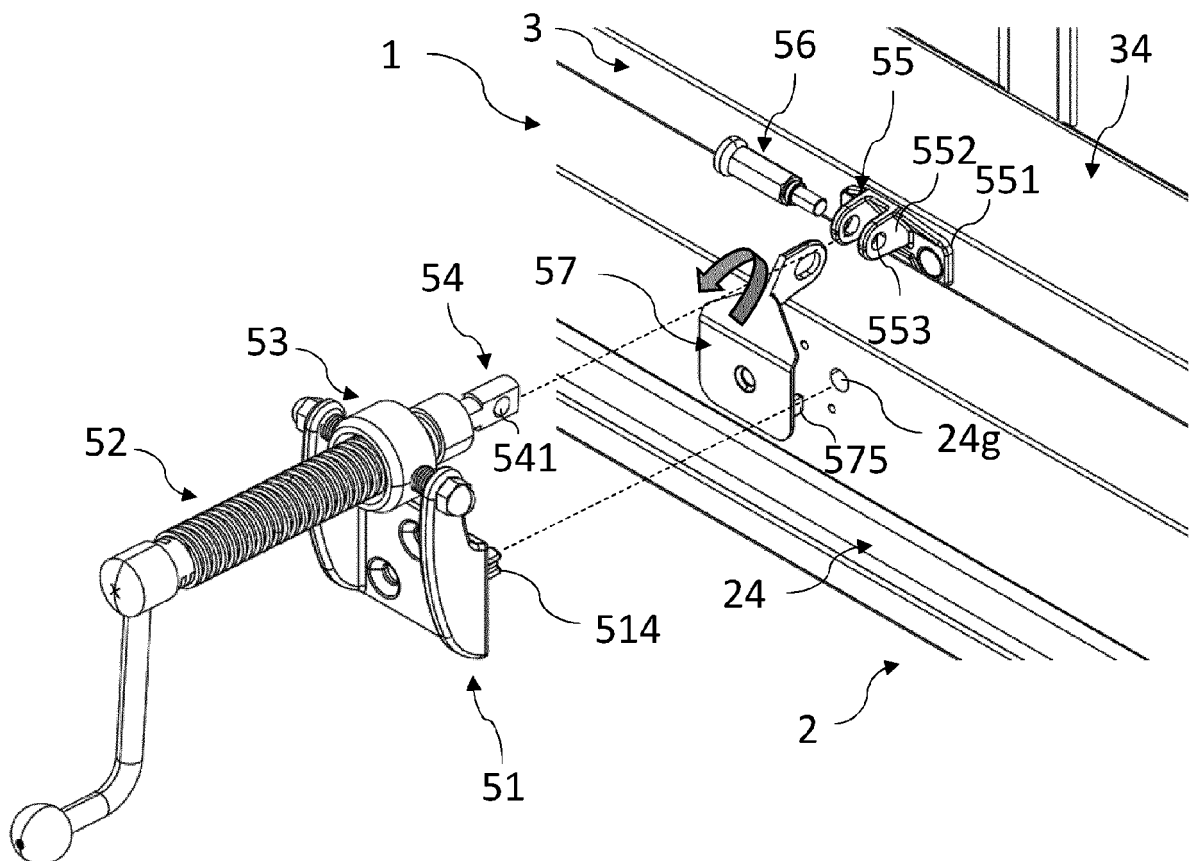


Fig. 39



Fig. 40

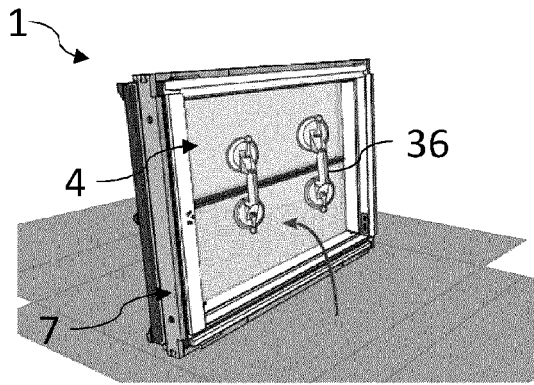


Fig. 41a

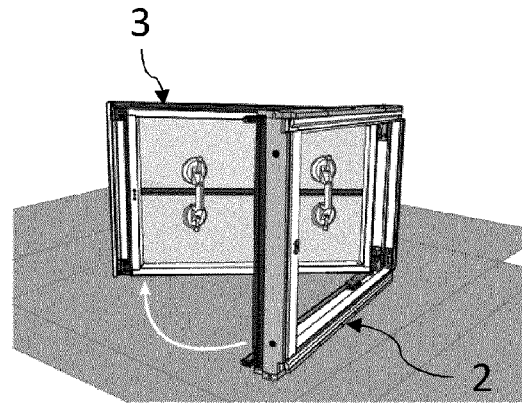


Fig. 41b

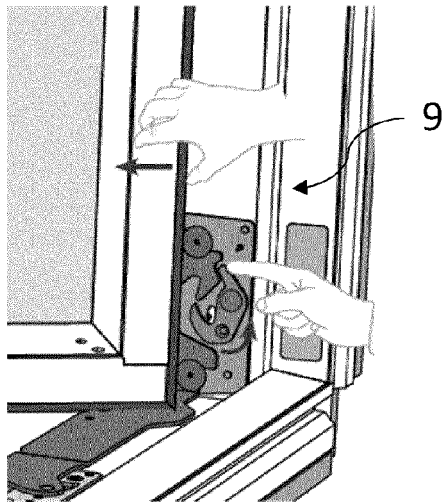


Fig. 41c

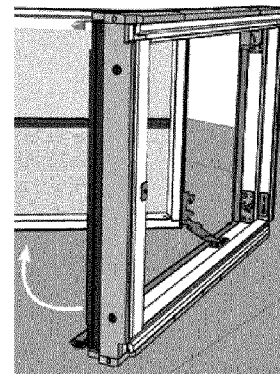


Fig. 41d

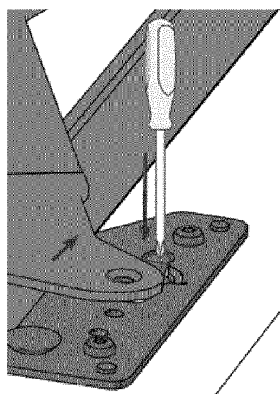


Fig. 41e

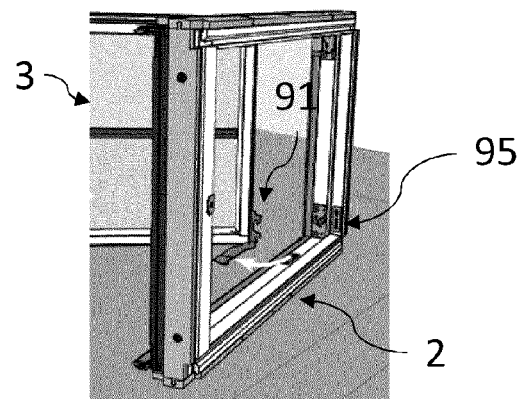


Fig. 41f

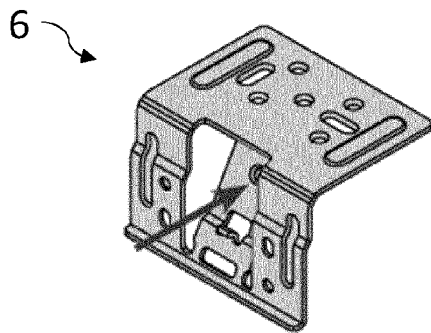


Fig. 42

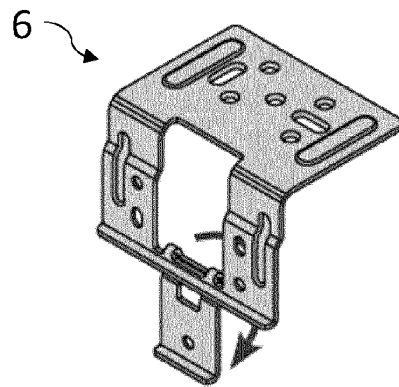


Fig. 43

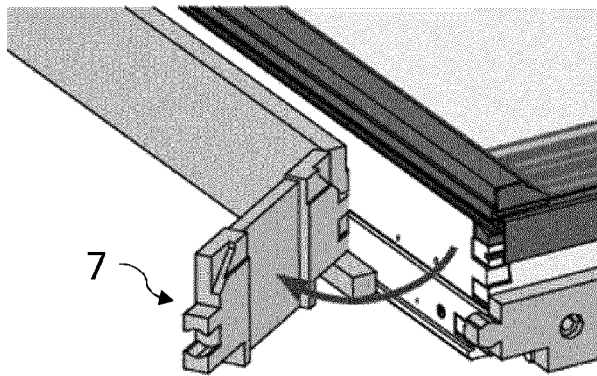


Fig. 44a

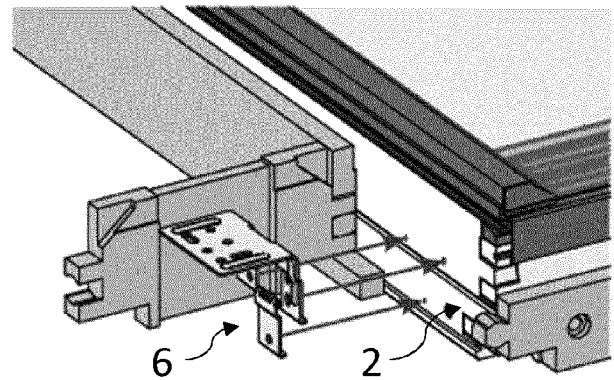


Fig. 44b

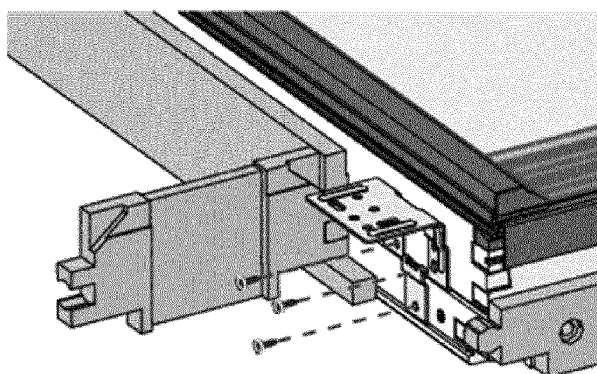


Fig. 44c

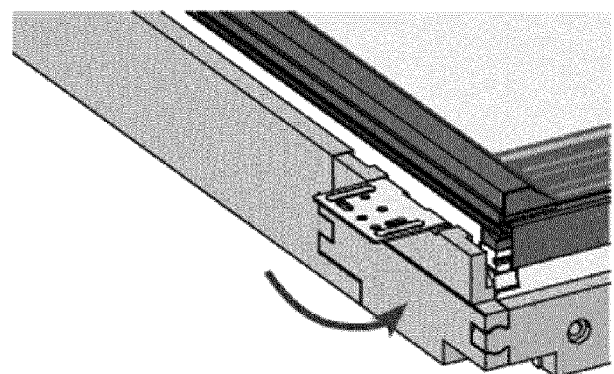


Fig. 44d

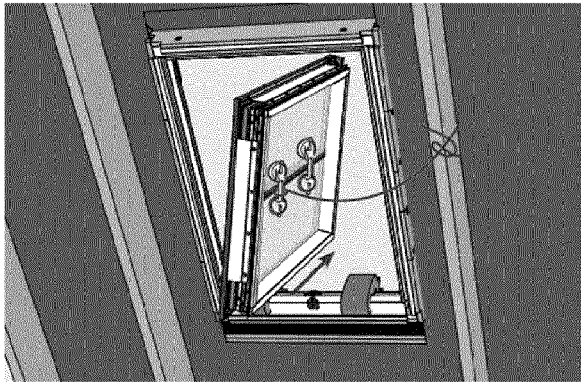


Fig. 45a

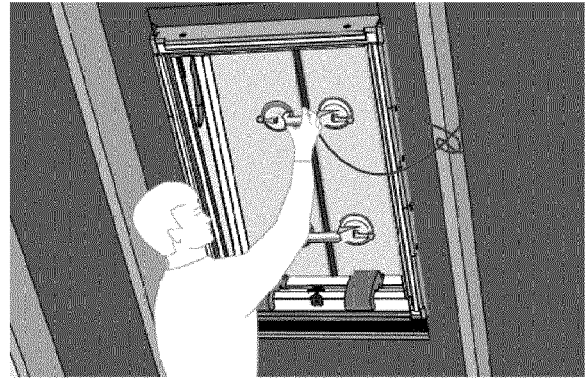


Fig. 45b

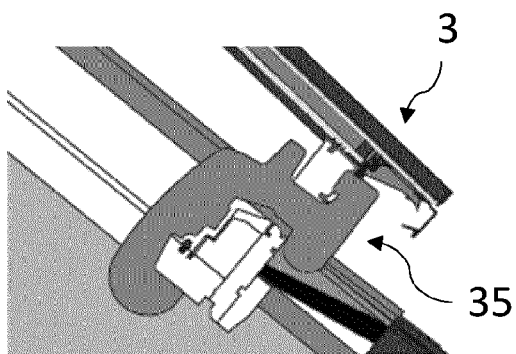


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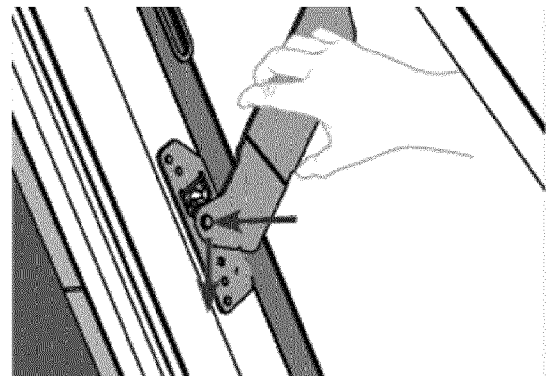


Fig. 45d

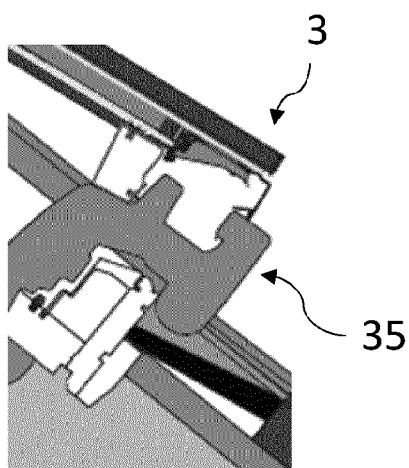


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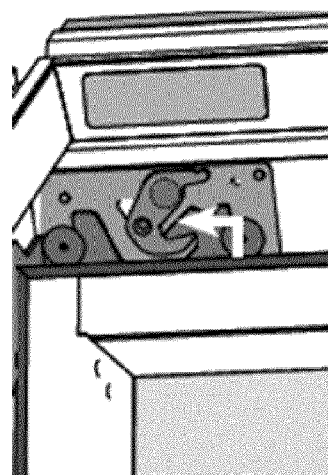


Fig. 45f

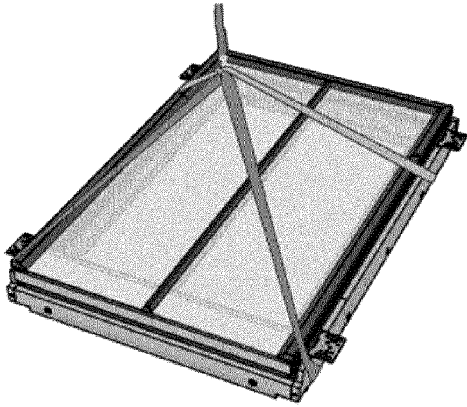


Fig. 46

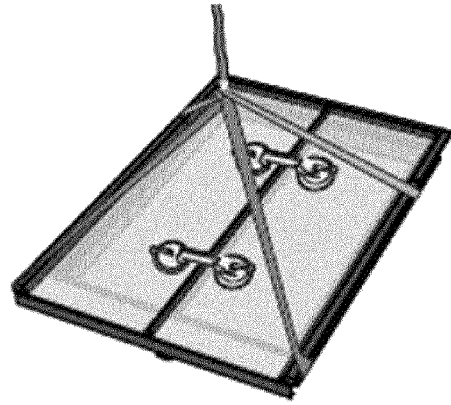


Fig. 47

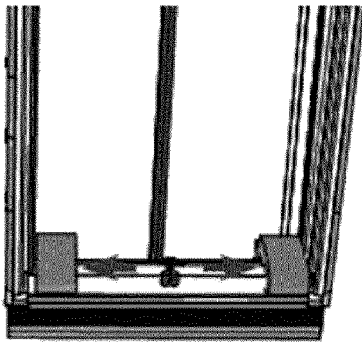


Fig. 48a

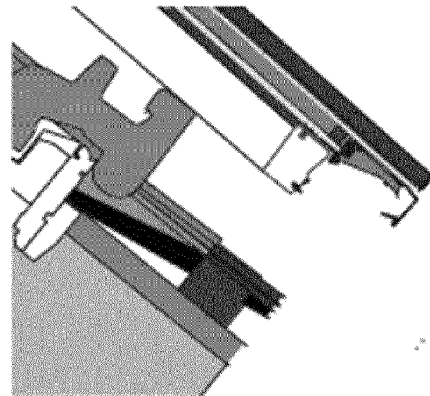


Fig. 48b

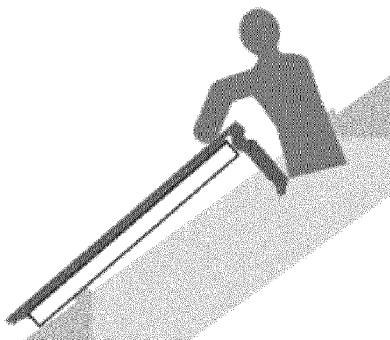


Fig. 48c

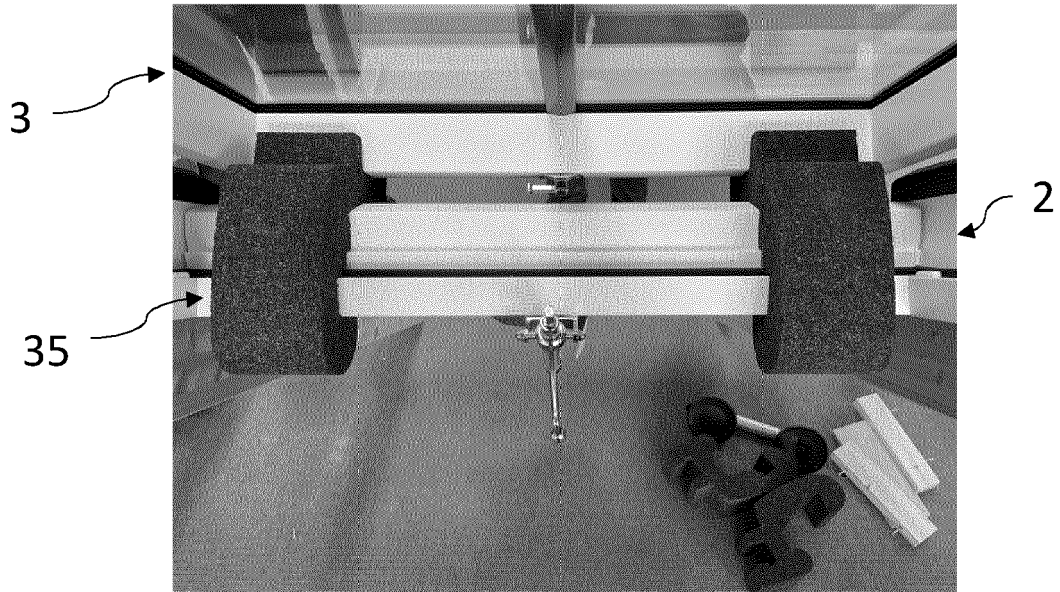


Fig. 49a



Fig. 49b

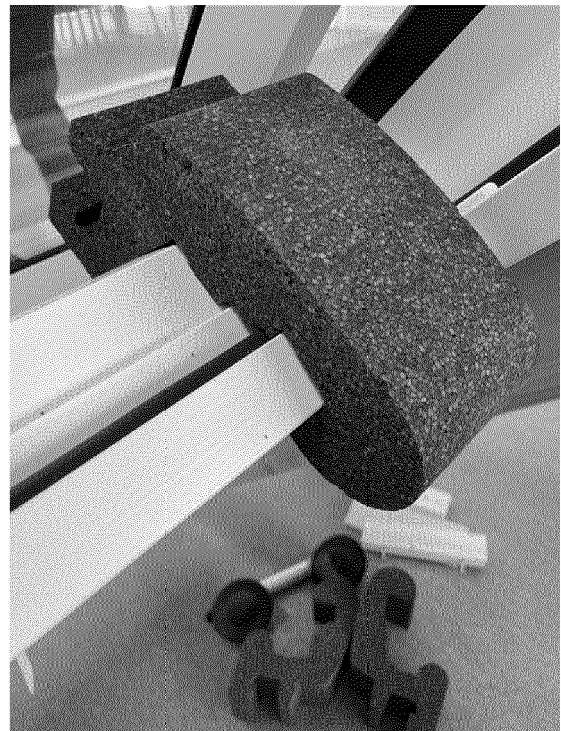


Fig. 49c

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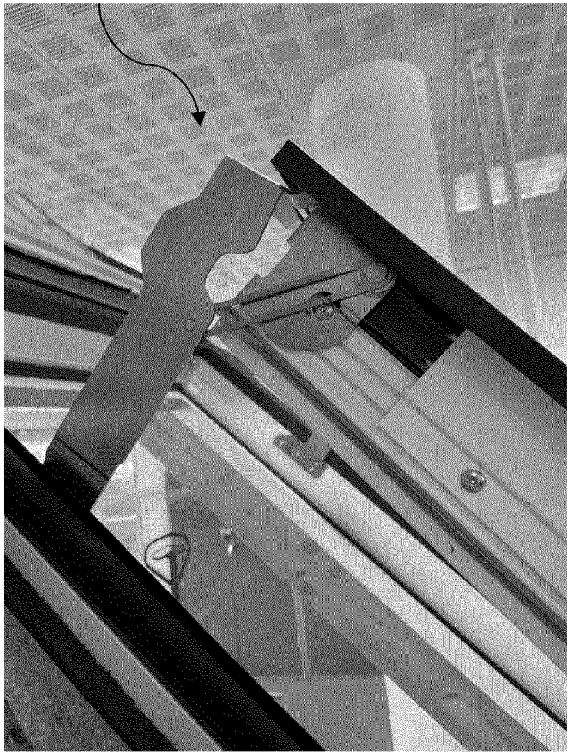


Fig. 50a

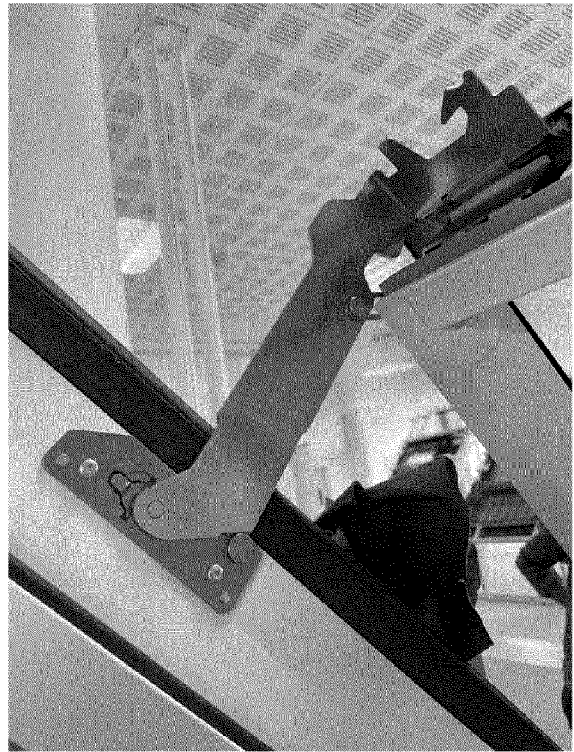


Fig. 50b



Fig. 50c



Fig. 50d



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Application Number

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X	DE 201 14 210 U1 (LUFAPAK GMBH VERPACKUNGEN [DE]) 3 January 2002 (2002-01-03) * abstract; figures *	1,2,7	
X	EP 2 327 852 A2 (PUSCA HERWIG [AT]) 1 June 2011 (2011-06-01) * paragraph [0014]; figures *	1,2,9	
A	WO 2014/001499 A1 (SIGU BVBA [BE]) 3 January 2014 (2014-01-03) * abstract; figures *	1-9	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04D E05D E05C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 30 June 2023	Examiner Witasse-Moreau, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
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The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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