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(54) **A ROOF WINDOW ARRANGEMENT COMPRISING A PLURALITY OF SASH STRUCTURES AND A COMMON FRAME, AND INCLUDING A COVERING ASSEMBLY, AND METHOD OF MANUFACTURING SUCH A ROOF WINDOW ARRANGEMENT**

DACHFENSTERANORDNUNG MIT MEHREREN FLÜGELSTRUKTUREN UND EINEM GEMEINSAMEN RAHMEN UND MIT EINER ABDECKUNGSANORDNUNG SOWIE VERFAHREN ZUR HERSTELLUNG EINER SOLCHEN DACHFENSTERANORDNUNG

AGENCEMENT DE FENÊTRE DE TOIT COMPRENANT UNE PLURALITÉ DE STRUCTURES DE CHÂSSIS ET UN CADRE COMMUN ET COMPRENANT UN ENSEMBLE DE RECOUVREMENT ET PROCÉDÉ DE FABRICATION D'UN TEL AGENCEMENT DE FENÊTRE DE TOIT

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## Description

### Technical Field

**[0001]** The present invention relates to a roof window arrangement comprising a plurality of window units in a side-by-side configuration and a covering assembly including a set of coverings for each window unit, each window unit comprising at least one pane-carrying frame and a pane. The invention furthermore relates to a method of manufacturing a roof window arrangement.

### Background Art

**[0002]** Roof windows to be installed in inclined roof surfaces come in a variety of types, and are either installed as stand-alone window units, in which all sides of the roof window borders on the roofing, or in configurations in which several window units are built together to combine into larger arrays providing a larger light influx into a room of a building, and in which only outer sides of the outermost window units border on the surrounding roofing.

**[0003]** Typical configurations of twin or quadruple roof window arrangements installed side-by-side and/or above each other, respectively, are shown and described in Applicant's published international application WO 2004/055291 A1 and European patent No. EP 1 581 706 B1. The window units are typically standard roof windows in which the right side frame member of the left-hand window unit is located adjacent to the left side frame member of the right-hand window unit, and/or the bottom frame member of the upper window unit is located adjacent to the top frame member of the lower window unit. In a roof structure comprising rafters and battens, at least one rafter and a number of battens will typically need to be removed to provide a sufficiently large aperture in the roof surface and roof structure, specially designed gap trimmers are normally mounted between the window units and fastened to the roof structure in order to ensure sufficient strength and support for the roof window arrangement.

**[0004]** In a more elaborate roof window arrangement, shown and described in Applicant's German utility model registration No. 20 2018 100 516 and European patent No. EP3406818B1. In the latter document, corresponding to commercial counterpart VELUX® Dormer, two rows of each three window units are connected to a respective frame structure positioned at an obtuse angle relative to each other such that the roof window arrangement protrudes from the roof surface.

**[0005]** CZ 280 295 B6 shows another example of a roof window arrangement.

**[0006]** The standard roof windows constituting the window units of the prior art roof window arrangements are installed with a relatively small distance between adjacent side frame members, typically about 18 mm, which leaves sufficient space for trimmers etc. Common to all of the above roof window arrangements is that the win-

dow units are protected from the weather by means of a covering assembly comprising a combination of flashing, cover and cladding elements which provide a weather-tight transition to the surrounding roofing and ensure tightness around each window unit and between adjacent window units. Even though the prior art covering assemblies function well, they are dependent on a relatively large number of tailor-made components that must be manufactured, stored, transported, and assembled at the building site.

### Summary of Invention

**[0007]** With this background, it is therefore an object of the invention to provide a roof window arrangement which is more simple and cost-effective.

**[0008]** In a first aspect, this and further objects are achieved with a roof window arrangement according to claim 1.

**[0009]** By providing a roof window arrangement with the characteristics of claim 1, a simpler configuration is achieved. Easier assembly of the roof window is provided, since fewer coverings need to be installed. With this configuration, multiple windows may be mounted easily as one. This leads to easier installation, as well as reduced manufacturing costs due to the fewer coverings required.

**[0010]** The configuration may lead to a flexible roof window arrangement, where the roof windows can open independently from each other. Furthermore, this solution may enable thinner frames which improve the aesthetic appearance of the window and do not obstruct the outdoor view. It may also improve the daylighting conditions inside the room as the net glazing area may be increased.

**[0011]** The provision of a separate bottom sash covering allows for enhanced tightness of the system while retaining the flexibility in the construction of the roof window arrangement.

**[0012]** In an embodiment, at least one window unit may comprise at least one side frame covering configured to function as a covering of a neighbouring window unit. This facilitates the easier assembly of the roof window arrangement. The side frame covering may comprise a snap lock part, which may allow for an easy mounting providing a snap effect.

**[0013]** According to the invention, three window units are comprised including a first window unit with a pane-carrying frame in the form of an openable sash with a top member, two side members, and a bottom member, a second window unit with a fixed pane-carrying frame with a top member, two side members, and a bottom member, as well as a third window unit with a pane-carrying frame in the form of an openable sash with a top member, two side members, and a bottom member, such that the second window unit is positioned between the first window unit and the third window unit. This enables a compact arrangement of three windows.

**[0014]** According to an embodiment, the set of cover-

ings associated to the second window unit may comprise two side frame coverings configured to function as a covering of the first window unit and the third window unit, preferably also a separate bottom pane-carrying frame covering. This minimizes the number of elements required for the roof window arrangement.

**[0015]** According to the invention, the set of coverings associated to the first window unit and the third window unit each comprises two side sash coverings, of which the one side sash covering closest to the second window unit is configured to function as a covering of the second window unit. This helps achieve a flexible roof window arrangement, where openable and/or fixed windows may be enabled.

**[0016]** In another embodiment, the set of hinges of each of the first window unit and the third window unit may comprise two sash hinge parts connected to the respective openable sash. Two frame hinge parts may be provided on the second window unit to act as a respective counterpart to the sash hinge part of the first window unit and the third window unit, respectively. This provides a stable and robust arrangement. Other types of fasteners, such as latches, toggle clamps, case fittings, may also be comprised.

**[0017]** According to the invention, a common frame may be provided to act as a single, stationary frame of all of the plurality of window units in side-by-side configuration, said common frame being configured to be built into a roof surface. Reduced manufacturing costs and frame profiles may be achieved due to the utilization of one single common frame for all the window units.

**[0018]** Still according to the invention, the covering assembly comprises a top casing and two side frame coverings connected to the common frame.

**[0019]** The common frame is provided with two frame hinge parts for the openable window units. This may allow for an openable window unit offering a flexible window solution.

**[0020]** In another embodiment, the covering assembly may comprise a top casing connected to the common frame and spanning all three window units, a first side frame covering and a fourth side frame covering connected to the common frame, a second side frame covering and a third side frame covering connected to the second window unit, and two side sash coverings connected to each of the first window unit and third window unit. Preferably each of the window units may be provided with a separate bottom sash or pane-carrying frame covering, more preferably also secondary side frame coverings and a secondary bottom frame covering. This embodiment may allow a more versatile solution with different possibilities of arranging the window units.

**[0021]** The side frame coverings may act as claddings to the side sash coverings. The side frame coverings may be fixed, while the side sash coverings may comprise an openable portion that is tilted.

**[0022]** In an embodiment, at least one tower fitting may be connected to the second window unit to provide sup-

port for the top casing. Each tower fitting may comprise at least one screw tower and engagement means to engage with the second window unit. Tower fittings allow for a stable and secure connection to the window units.

5 The screw tower may fixate and orientate the tower fitting on the second window unit. In an alternative embodiment, the tower fitting is a snap anchor fitting configured to co-operate with a snap lock part connected to the top casing. Other types of fittings may also be used, such as simpler clips or locks. Alternatively, the tower fitting may com-

10 prise both a snap anchor fitting and a screw tower fitting. **[0023]** In another embodiment, the second window unit may comprise two frame members connected to the pane-carrying frame.

15 **[0024]** In some embodiments, the two frame members of the second window unit may extend between the top and the bottom of the common frame, preferably such that each frame member has a surplus length relative to the pane-carrying frame in order to allow accommodation of an end portion within the common frame. This leads to a more stable and robust connection with the common frame.

20 **[0025]** In other embodiments, each tower fitting may comprise a base with two upstanding screw towers and the engagement means may comprise two legs depending from the base and configured to straddle a frame member of the second window unit, preferably also an opening in the base to allow the introduction of fastening means. An easier assembly of the window units may thus be achieved.

25 **[0026]** In an embodiment, at least one cap member may be connected to the second window unit to provide a sealing at the bottom of the second window unit and the neighbouring first window unit and third window unit.

30 Each cap member may comprise at least one flange to form a transition between the second window unit and the respective neighbouring first window unit and third window unit and engagement means to engage with the second window unit. A more tight connection among the plurality of the window units is thus provided allowing for a safe roof window arrangement.

35 **[0027]** Alternatively, each cap member may comprise a base from which the flange protrudes, an end portion depending from the base, and wherein the engagement means may comprise a leg depending from the base, a shoulder portion configured to abut a frame member of the second window unit, and a trough formed between an upstanding portion and the flange to interact with components of the second window unit. The components preferably may include a part of a bottom pane-carrying frame covering and a glazing bead. More preferably the cap member may comprise a first sealing portion and a second sealing portion configured to abut a frame member of the second window unit. This allows for a water tight arrangement, creating a sealing between the cap member and the window. The flange may allow the guidance of water away from the window. The flange may also be provided with a side wing, which may be formed

as a protrusion being adjacent to the base. The side wing may create a seal between the cap member and the window and prevent water and/or wind from running and/or blowing into the construction along the flange. The flange may further comprise a front tower and/or a front wing, which may block water and/or wind from blowing into the construction. The cap member may also comprise a side tower being located adjacent to the second sealing portion, which may act as a wind breaker. The side tower may also act as a fixation between the cap member and the window improving the sealing. The cap member may comprise a top sealing flap, which may be provided adjacent to the upstanding portion. The top sealing flap may create a right angle with the upstanding portion and may comprise a guide tower. The guide tower may give stiffness to the top sealing flap and prevent wrong mounting of the gasket of the pane-carrying frame bottom member relative to the cap member. The cap member may comprise a side skirt extension adjacent to the leg, which may be dependent from the shoulder portion.

**[0028]** In another embodiment, a frame hinge part may be connected to a respective frame member of the second window unit to act as a respective counterpart to the sash hinge part of the first window unit and the third window unit, respectively. A frame hinge part may be connected to the common frame to act as a respective counterpart to the sash hinge part of the first window unit and the third window unit, respectively. Thus, a stable and robust connection between the neighbouring window units is provided.

**[0029]** In some embodiments, the ratio between a second thickness of the combined thicknesses of a side member of the pane-carrying frame and the associated frame member of the second window unit as defined between an edge of the pane and an outer circumference of the frame member, and a corresponding thickness of a side member of the sash of the neighbouring first window unit or third window unit may lie in the range 1.2 to 2, preferably between 1.25 and 1.75, more preferably around 1.5. Alternatively, the ratio may lie in the range 1 to 1.2.

**[0030]** In some embodiments, a distance between panes of neighbouring windows may lie in the range 50 to 100 mm, more preferably around 75 mm.

**[0031]** In another embodiment, the sum of the first thickness and the second thickness may be about 90 to 99% of the distance between the panes. The overall appearance of the roof window arrangement may be slimmer, enhancing the view towards the exterior.

**[0032]** In an embodiment, the second side frame covering and the third side frame covering connected to the second window unit each have a width which may be larger than a predefined width of the first side frame covering and a fourth side frame covering connected to the common frame, preferably about 20 to 100% larger, more preferably about 50% larger. The width may also be 10 to 20% larger.

**[0033]** In principle, the advantages of shared coverings

apply to any number of juxtaposed window units, starting from only two and up to an entire array of for instance 10 window units. However, in a presently preferred embodiment, said plurality of window units comprises three window units including a first window unit with a pane-carrying frame in the form of an openable sash with a top member, two side members, and a bottom member, a second window unit with a fixed pane-carrying frame with a top member, two side members, and a bottom member, and a third window unit with a pane-carrying frame in the form of an openable sash with a top member, two side members, and a bottom member, such that the second window unit is positioned between the first window unit and the third window unit, wherein a common frame is provided to act as a single, stationary frame of all of the plurality of window units in side-by-side configuration, said common frame being configured to be built into a roof surface, and wherein the openable sash of the first window unit and of the third window unit, and the fixed pane-carrying frame of the second window unit are provided as substantially identical standard components, the second window unit comprising fixing means to fixate the pane-carrying frame to the common frame. Thus, in combination with the advantages of shared coverings, this embodiment provides for the additional advantage of using standard component sashes, together with a common frame. This has a positive impact on costs and resources for manufacture, storage, transport, and installation perspectives.

**[0034]** In a second aspect, a method of manufacturing a roof window arrangement is provided.

**[0035]** Other presently preferred embodiments and further advantages will be apparent from the subsequent detailed description and drawings.

### Brief Description of Drawings

**[0036]** In the following description embodiments of the invention will be described with reference to the schematic drawings, in which

Fig. 1 is an isometric view of a roof window arrangement in an embodiment of the invention;

Fig. 2 is a perspective view of a covering assembly in an embodiment of the roof window arrangement of the invention;

Fig. 3 is a perspective view, on a larger scale, of a top casing of the covering assembly of Fig. 2;

Fig. 4 is an isometric view of a frame of the roof window arrangement of Fig. 1;

Fig. 5 is an exploded isometric view of three window units of the roof window arrangement of Fig. 1;

Fig. 6 is a perspective view of a frame of a roof window arrangement in an embodiment of the invention;

Fig. 7 is a perspective view of a fixed window unit of a roof window arrangement in an embodiment of the invention;

Fig. 8 is a sectional view, on a larger scale, of the

window unit of Fig. 7;

Fig. 9 is a sectional view, on a still larger scale, of the window unit of Figs 7 and 8 installed as a neighbouring window unit to an openable window unit of a roof window arrangement in an embodiment of the invention;

Fig. 10 is a perspective view of an openable window unit of a roof window arrangement in an embodiment of the invention;

Fig. 11 is a partial perspective view of another openable window unit of a roof window arrangement in an embodiment of the invention;

Fig. 12 is a partial perspective cross-sectional view of the upper part of the roof window arrangement in an embodiment of the invention;

Fig. 13 is a partial perspective view of the lower part of a roof window arrangement in an embodiment of the invention, with some details removed for clear reading;

Fig. 14a is an exploded partial perspective view of the roof window arrangement of Fig. 12, with some details removed for clear reading;

Fig. 14b is an end view of a side frame covering in an embodiment of the invention;

Fig. 15 is a partial perspective view of the upper part of a roof window arrangement in an embodiment of the invention, with some details removed for clear reading;

Fig. 16 is a partial perspective view, on a larger scale of the roof window arrangement of Fig. 15;

Fig. 17a is a perspective view, on a still larger scale, of a tower fitting of the roof window arrangement of Figs 15 and 16;

Figs 17b and 17c are perspective views of a tower fitting, from different angles, in an alternative embodiment of the invention;

Fig. 18 is a partial perspective view of the lower part of a roof window arrangement in an embodiment of the invention, with some details removed for clear reading;

Figs 19 and 20 are perspective views, from different angles, of a cap member of the roof window arrangement of Fig. 18;

Fig. 21 is a perspective sectional view of the lower part of a roof window arrangement in an embodiment of the invention; and

Figs 22 to 25 are perspective views, from different angles, of a cap member in alternative embodiments of the roof window arrangement according to the invention;

Fig. 26 is a partial perspective view of the lower part of a roof window arrangement in an embodiment of the invention, with some details removed for clear reading; and

Fig. 27 is a partial perspective view, on a still larger scale, of a detail of the roof window arrangement of Fig. 26.

## Description of Embodiments

**[0037]** In the figures of the drawings, embodiments of a roof window arrangement according to the invention are shown.

**[0038]** Referring initially to Fig. 1, a roof window arrangement 1 is presented, comprising a plurality of window units 21, 22, 23 configured side-by-side, and as seen from the interior of a room of a building with a roof surface (not shown), in which the roof window arrangement 1 is installed. In the embodiment shown, three window units 21, 22, 23 are present, but other configurations are conceivable. For instance, two window units or any other number may be provided in the roof window arrangement. Each window unit 21, 22, 23 comprises a pane-carrying frame 211, 221, 231 and a pane 214, 224, 234. A common frame 10 acts as a single, stationary frame of all of the plurality of window units 21, 22, 23 in side-by-side configuration. The common frame 10 is configured to be built into the roof surface and connected to the underlying roof structure by means of a set of fittings represented by mounting bracket 3.

**[0039]** A covering assembly generally designated 5 is shown as well. The covering assembly 5 provides covering for each window unit as will be described in further detail below.

**[0040]** Fig. 2 shows an embodiment of the covering assembly 5. The covering assembly 5 may be used in the roof window arrangement 1 of Fig. 1. In the embodiment shown, the covering assembly 5 comprises a top casing 510, a first side frame covering 511, a second side frame covering 512, a third side frame covering 513, and a fourth side frame covering 514. Furthermore, four side sash coverings 5211, 5212, 5231, 5232 are provided, and three separate bottom sash or pane-carrying frame covering 5213, 5223, 5233 in the embodiment shown. The covering assembly 5 may comprise further elements as well, including secondary frame coverings, and flashing elements.

**[0041]** Referring now also to Figs 3 to 20, the top casing 510 of the covering assembly 5 in the embodiment shown is configured to be connected to a frame top member 11 of the common frame 10 and spanning all three window units 21, 22, 23 in the mounted condition. The first side frame covering 511 is connected to one frame side member 12 and the fourth side frame covering 514 is connected to another frame side member 13 of the common frame 10. A frame top member 11 extends between the frame side members 12, 13 at the top of common frame 10 as defined by the mounted condition of the roof window arrangement 10, and a frame bottom member 14 at the bottom.

**[0042]** The dimensions of the window units forming part of the roof window arrangement may be chosen in accordance with specific installation conditions, including the area of the room of the building, the available roof surface etc. In the below configuration with three window units, the overall outer measures of the common frame

amount to a width wf of ca. 1840 mm and a height hf of 1180 mm, whereas three windows having the same size panes would have required a combined width about 2160 mm. Thus, the same pane area requiring only about 85% of the width of three windows installed side-by-side.

**[0043]** In another configuration, a roof window arrangement comprising two window units having a larger individual width is considered; whereas two ordinary roof windows built in side-by-side would have required a combined width of 1740 mm, a roof window arrangement according to the invention would require only about 1496 mm, thus amounting to about 86% of width of two ordinary roof windows.

**[0044]** In the embodiment shown in these figures, the three window units 21, 22, 23 have the following configuration:

The first window unit 21 has a pane-carrying frame in the form of an openable sash 211 with a top member 2111, two side members 2112 and 2113, and a bottom member 2114, the second window unit 22 has a fixed pane-carrying frame 221 with a top member 2211, two side members 2212, 2213, and a bottom member 2214, and a third window unit 23 has a pane-carrying frame in the form of an openable sash 231 with a top member 2311, two side members 2312 and 2313, and a bottom member 2314. The second window unit 22 is positioned between the first window unit 21 and the third window unit 23.

**[0045]** The openable sash 211, 231 of the first and third window units 21 and 23 opens about a hinge axis a (shown in Fig. 10) defined by a set of hinges 212, 213, 232, 233. The hinges may be of any suitable kind, here shown as pivot hinges as for instance disclosed in Applicant's EP 1 038 083 B1, EP 1 781 883 B1, EP 2 770 146 A1 and EP 2 770 149 A1, or as a so-called pantograph hinge as described in Applicant's -pending international application WO 2017/076416 A1. The set of hinges of each of the first window unit 21 and the third window unit 23 comprises two sash hinge parts 212, 213, 232, 233 connected to the respective openable sash 211, 231.

**[0046]** In the embodiment shown, the openable sash 211, 231 of the first window unit 21 and the third window unit 23 and the fixed pane-carrying frame 221 of the second window unit 22 are provided as substantially identical standard components. In order to provide the openable functionality of the first and third window units, and to increase the stability of the common frame, the second window unit 22 comprises fixing means to fixate the pane-carrying frame 221 to the top member 11 and the bottom member 14 of the common frame 10.

**[0047]** The second side frame covering 512 and the third side frame covering 513 are connected to the second window unit 22 as shown in Fig. 7, and two side sash coverings 5211, 5212 and 5231, 5232 are connected to a respective one of the first window unit 21 and third window unit 23. Each of the window units 21, 22, 23 is provided with a respective separate bottom sash or pane-carrying frame covering 5213, 5223, 5233.

**[0048]** At least one of the side frame coverings 512, 513, 5212, 5231 of a set of coverings associated to one window unit 22, 21, 23 functions as a covering of that one window unit 22, 21, 23 and of a neighbouring window unit 21, 23, 22. All in all, four coverings are used rather than six (three times two) for each of the side sash coverings and the side frame coverings.

**[0049]** In the embodiment shown, the set of coverings associated to each window unit 21, 23 comprises two side sash coverings 5211, 5212 and 5231, 5232 to cover a lower portion of the respective sash 211, 231 from the hinges and downwards. A separate bottom sash covering 5213, 5233 is also shown. The side sash coverings 5211, 5212 and 5231, 5232 are configured to function as a covering of a neighbouring window unit, here of the second window unit 22 interposed between the first window unit 21 and the third window unit 23.

**[0050]** The covering assembly 5 here also comprises secondary side frame coverings 531, 532 and a secondary bottom frame covering 533. As mentioned in the above, flashing elements (not shown) may be provided to ensure a weather-tightness transition to the surrounding roofing.

**[0051]** In the embodiment shown, the fixing means of the second window unit 22 comprises two frame members 225, 226 connected to the pane-carrying frame 221. The two frame members 225, 226 of the second window unit 22 extend between the top and the bottom of the common frame 10, such that each frame member 225, 226 has a surplus length relative to the pane-carrying frame 221 in order to allow accommodation of an end portion within the common frame 10.

**[0052]** The frame hinge part 222, 223 is connected to a respective frame member 225, 226 of the second window unit 22 to act as a respective counterpart to the sash hinge part 213, 232 of the first window unit 21 and the third window unit 23, respectively. A frame hinge part 112, 113 is connected to the respective side members 12, 13 of the common frame 10 to act as a respective counterpart to the sash hinge part 212, 233 of the first window unit 21 and the third window unit 23, respectively.

**[0053]** With particular reference to Fig. 9, it is illustrated how the window unit of Figs 7 and 8 is installed as a neighbouring window unit to an openable window unit of a roof window arrangement. The ratio  $t2 : t1$  between a second thickness  $t2$  of the combined thicknesses of a side member 2213 of the pane-carrying frame 221 and the associated frame member 225 of the second window unit 22 which is defined as between an edge of the pane 224 and an outer circumference of the frame member 225, and a corresponding thickness  $t1$  of a side member 2312 of the sash 231 of the neighbouring first window unit or third window unit 23 lies in the range 1.2 to 2. The most preferred values of this range are between 1.25 and 1.75, and even more preferably around 1.5. A distance dp between panes 224, 234 of neighbouring windows lies in the range 50 to 100 mm, more preferably around 75 mm. The sum of the first thickness  $t1$  and the second

thickness  $t_2$  is about 90 to 99% of the distance  $d_p$  between the panes

As shown in Fig. 12 and Fig. 14b, the second side frame covering 512 and the third side frame covering 513 connected to the second window unit 22 both have a width which is larger than a predefined width of the first side frame covering 511 and a fourth side frame covering 514 connected to the common frame 10. This width is preferably about 20 to 100% larger, more preferably about 50% larger.

**[0054]** In principle, these side frame coverings 512, 513 may take any suitable shape. However, for practical and aesthetic reasons, a substantially symmetrical design is preferred, for instance as shown in more detail in Fig. 14b, in which the side frame covering 512 is shown with a centre portion 5120 and a right-hand and a left-hand groove 5121 and 5122, respectively, which are located near the edge of the respective pane of the first and second window units 21 and 22. A snap lock part 5123 is fastened to the underside of the side frame covering 512. The snap lock part 5123 may for instance be formed as in the embodiment of Applicant's international published application WO 2013/050043 A1. It is noted that such snap lock parts may be provided also on other components of the covering assembly 5.

**[0055]** Correspondingly, the gasket present at the sides of the window units could have an increased width relative to the gasket width of an ordinary window. This applies in particular to the gaskets present at the sides of the second window unit 22, which are exposed when the sash of the respective first and/or third window units 21 and 23 are open. In Fig. 7, an extra-wide gasket 2252 is indicated on the frame member 225 of the second window unit 22. Further details of this gasket are shown in Figs 26 and 27.

**[0056]** Referring to Figs 13 and 14a, details of the fixing of the second window unit 22 to the common frame 10 will be described. The frame top member 11 is provided with two apertures 1021 and 1022 to receive the frame members 225 and 226 (not visible in Fig. 14). Here, frame member 225 comprises a protrusion 2251. Other details in Fig. 14a include a striking plate 103 for cooperating with locking means (not shown) of the first window unit 21, and an insulating element 109. These measures are well known to the skilled person. At the bottom of the roof window arrangement 1, similar or other fixing means may be present. In the embodiment shown, spacers 1023 are provided on the frame bottom member 14 for abutment of the bottom member 2214 in the mounted condition.

**[0057]** Returning again to the covering assembly, Fig. 15 illustrates the upper part of the roof window arrangement, wherein a set of tower fittings 54 is connected to the second window unit 22 to provide support for the top casing 510.

**[0058]** As illustrated in Fig. 17a, each tower fitting 54 comprises one screw tower 544, 545 and engagement means 542, 543, 546 to engage with the second window unit 22. Each tower fitting 54 comprises a base 541 with

two upstanding screw towers 544, 545 and the engagement means comprise two legs 542, 543 depending from the base 541 and configured to straddle a frame member 225, 226 of the second window unit 22, and an opening 546 in the base 541 to allow the introduction of fastening means as shown in Fig. 16.

**[0059]** An alternative tower fitting 54 is shown in Figs 17b and 17c, in which a snap anchor tower 547 is provided. The snap anchor tower 547 is configured to cooperate with a snap lock part (not shown) fastened to the top casing 510. The snap lock part may for instance have a configuration corresponding to the snap lock part 5123 connected to the side frame covering 512 of Fig. 14b. A set of tower fittings 54 and snap lock parts may be arranged over the width of the roof window arrangement. The tower fitting 54 of Fig. 17b has a base 541 intended to abut a window unit of the roof window arrangement. In the embodiment shown, one tower fitting 54 is intended to abut the frame member 225, 226 of the second window unit 22, but additional or alternative positions are conceivable. An opening 546 is provided in the base 541 for receiving fastening means, here represented by a screw. In order to operate the snap lock part (not shown), for instance to release the snap lock, an access opening 549 is provided, to give access to releasing the snap lock part interacting with a snap lock edge 5481 shown in Fig. 17c.

**[0060]** Fig. 18 shows the lower part of the roof window arrangement and the provision of a cap member 56. Figs 19 and 20 show the cap member 56 of the roof window arrangement in more detail, which is connected to the second window unit 22 providing a sealing at the bottom of the second window unit 22 and the respective neighbouring first window unit 21 and third window unit 23. The cap member 56 is present in a left-hand and a mirror-inverted right-hand version. In the following, the cap member 56 at the transition between the second window unit 22 and the first window unit 21 will be described. Fig. 21 shows a perspective sectional view from another angle, showing the interaction between the cap member 56 and the bottom pane-carrying frame covering 5223.

**[0061]** In the embodiment shown, the cap member 56 comprises one flange 564 to form a transition between the second window unit 22 and the neighbouring first window unit 21 and engagement means to engage with the second window unit 22. Similar means may be provided at the other side. The position of the cap member 56 and flange 564 are also shown in Fig. 7. In one embodiment, the bottom covering 5223 of the pane-carrying frame of the second window unit 22 could from the outset be produced with side flanges, which are removed and replaced by the flange 564 of the cap member 56 at the respective end. The cap member 56 comprises a base 561 from which the flange 564 protrudes, an end portion 563 depending from the base 561, a first leg 562 and a second leg 574. The engagement means comprise the base 561, the first leg 562 and the second leg 574 are configured to abut the frame member 225. The cap member 56 is in the embodiment shown slid on the frame

member 225 such that an entire end portion of the end member 225 is surrounded by the engagement means 561, 562, 563, 574. In the embodiment shown, the frame member 225 is provided with an end portion (not shown in detail) with a lower height relative to the remaining portion of the frame member 225. In order to accommodate the cap member 56 on the remaining portion of the frame member 225, a shoulder portion 565 is provided such that the shoulder portion 565 is located at a higher level than the base 561 and is connected to the base 561 via a step portion 5651. The cap member 56 also comprises a first bottom sealing flap 568 and a second bottom sealing flap 569 configured to abut the secondary bottom frame covering 533 of the covering assembly 5. Since the secondary bottom frame covering 533 in the embodiments shown is through-going, i.e. extends the full width of the three window units, the first and second bottom sealing flaps 568 and 569 abut the same element, thus providing a particularly tight connection. A trough 567 is formed between an upstanding portion 566 and the flange 564 to interact with components of the second window unit 22, including a part 5223a of the bottom pane-carrying frame covering 5223 and a glazing bead 5224, as shown in Fig. 18. A sealing rib 570 is comprised in the trough 567 to enable a water tight connection. A top sealing flap 572 is also comprised in the cap member 56, which is adjacent to the upstanding portion 566. As shown in Fig. 21, the top sealing flap 572 abuts the bottom pane-carrying frame covering 5223 in the mounted condition. The upstanding portion 566 of the trough 567 also comprises a guide tower 571 which provides stiffness to the top sealing flap 572. The flange 564 further comprises a front tower 573 at one end of it, which acts as blocking water and/or wind from blowing into the construction. The front tower 573 thus substantially blocks the slit formed between the bottom pane-carrying frame covering 5223 and the adjacent bottom sash covering 5213, when the first window unit 21 is in the closed position. Also visible in Fig. 21 are a gasket 2215 of the bottom member 2214 of the pane-carrying frame 221 of the second window unit 22 and an insulating element 2216. The gasket 2215 and the insulating element 2216 are known per se and are described in more detail in Applicant's German utility model DE 20 2012 009 491 U1. Thus, the top sealing flap 572 provides a seal between the cap member 56 and the bottom pane-carrying frame covering 5223, and the guide tower 571 ensures correct mounting of the gasket 2215 relative to the cap member 56.

**[0062]** Referring now to Figs 22 to 24, a further embodiment of the cap member 56 is shown. Only differences relative to the embodiment described in connection with Figs 18 to 21 will be described in detail. Thus, in the embodiment shown, parts are provided to assist in blocking water or wind, and/or improve the mechanical performance of the cap member 56: a side tower 5741 is provided on the second leg 74. A first and a second side wing 5641 and 5642 are provided on the flange 564. A front wing 5631 is provided on the end portion 563 of

the cap member 56. On the underside of the cap member 56, a fixation tower 5611 is present as shown in Fig. 24.

**[0063]** Referring to Fig. 25, an alternative embodiment of the cap member 56 is shown. Here, the second leg 574 has an extension portion 5742 and a rear rib 5743, both of which contributing to improving the sealing properties of the cap member 56.

**[0064]** Figs. 26 and 27 show an alternative embodiment of the roof window arrangement, making use of a particular configuration of the gasket 2252 indicated schematically in Fig. 7. The gasket 2252 extends between the lower end of the glazing bead 5224 of the second window unit 22 and up to a position at or near the frame hinge part 222 and provides a main sealing surface 2252a towards the side sash covering 5212 to block water entering into the window construction. The gasket 2252 is furthermore formed with a depending leg 2252b extending inwards from the main sealing surface 2252a and provided with an internal sealing profiling 2252c. Finally, an engagement flange 2252 is provided for engagement with the glazing bead 5224 and the right-hand side of which interacts with the cap member 56. Also visible in Fig. 26 is a glazing bead 5214 of the first window unit 21.

**[0065]** The invention is not limited to the embodiments shown and described in the above, but various modifications and combinations may be carried out within the scope defined by the appended claims.

#### 30 List of reference numerals

##### **[0066]**

|      |                            |
|------|----------------------------|
| 1    | roof window arrangement    |
| 10   | common frame               |
| 11   | frame top member           |
| 12   | frame side member          |
| 13   | frame side member          |
| 14   | frame bottom member        |
| 1021 | aperture                   |
| 1022 | aperture                   |
| 1023 | spacer                     |
| 103  | striking plate             |
| 109  | insulating element         |
| 112  | frame hinge part (left)    |
| 113  | frame hinge part (right)   |
| 21   | first window unit          |
| 211  | pane-carrying frame / sash |
| 2111 | top member                 |
| 2112 | side member                |
| 2113 | side member                |
| 2114 | bottom member              |
| 212  | sash hinge part (left)     |
| 213  | sash hinge part (right)    |
| 214  | pane                       |
| 218  | ventilation flap           |



|    |                                                                        |          |                                     |
|----|------------------------------------------------------------------------|----------|-------------------------------------|
| 22 | second window unit                                                     |          | 533 secondary bottom frame covering |
|    | 221 pane-carrying frame                                                |          | 54 tower fitting                    |
|    | 2211 top member                                                        |          | 541 base                            |
|    | 2212 side member                                                       |          | 542 leg                             |
|    | 2213 side member                                                       | 5        | 543 leg                             |
|    | 2214 bottom member                                                     |          | 544 first screw tower               |
|    | 2215 gasket of bottom member of pane-carrying frame                    |          | 545 second screw tower              |
|    | 2216 insulating element                                                |          | 546 opening                         |
|    | 222 frame hinge part (left)                                            | 10       | 547 snap anchor tower               |
|    | 223 frame hinge part (right)                                           |          | 548 entry opening                   |
|    | 224 pane                                                               |          | 5481 snap lock edge                 |
|    | 225 frame member (left)                                                |          | 549 access opening                  |
|    | 2251 protrusion on frame member                                        |          | 55 support element                  |
|    | 2252 extra-wide gasket                                                 | 15       | 56 cap member                       |
|    | 2252a main sealing surface                                             |          | 561 base                            |
|    | 2252b depending leg                                                    |          | 5611 fixation tower                 |
|    | 2252c internal sealing profiling                                       |          | 562 first leg                       |
|    | 2252d engagement flange                                                |          | 563 end portion                     |
|    | 226 frame member (right)                                               | 20       | 5631 front wing                     |
|    |                                                                        |          | 564 flange                          |
|    |                                                                        |          | 5641 first side wing                |
| 23 | third window unit                                                      |          | 5642 second side wing               |
|    | 231 pane-carrying frame / sash                                         |          | 565 shoulder portion                |
|    | 2311 top member                                                        |          | 5651 step portion                   |
|    | 2312 side member                                                       | 25       | 566 upstanding portion              |
|    | 2313 side member                                                       |          | 567 trough                          |
|    | 2314 bottom member                                                     |          | 568 first bottom sealing flap       |
|    | 232 sash hinge part (left)                                             |          | 569 second bottom sealing flap      |
|    | 233 sash hinge part (right)                                            |          | 570 sealing rib                     |
|    | 234 pane                                                               | 30       | 571 guide tower                     |
|    | 238 ventilation flap                                                   |          | 572 top sealing flap                |
|    |                                                                        |          | 573 front tower                     |
| 3  | mounting bracket                                                       |          | 574 second leg                      |
|    |                                                                        |          | 5741 side tower                     |
| 5  | covering assembly                                                      | 35       | 5742 extension portion              |
|    | 510 top casing                                                         |          | 5743 rear rib                       |
|    | 511 first side frame covering                                          |          |                                     |
|    | 512 second side frame covering                                         | hf       | height of frame                     |
|    | 5120 centre portion                                                    |          |                                     |
|    | 5121 right-hand groove                                                 | 40       | wf                                  |
|    | 5122 left-hand groove                                                  |          | width of frame                      |
|    | 5123 snap lock part                                                    |          | hwu                                 |
|    | 513 third side frame covering                                          |          | height of window unit               |
|    | 514 fourth side frame covering                                         |          | wwu                                 |
|    | 5211 side sash covering (first window unit)                            |          | width of window unit                |
|    | 5212 side sash covering (first window unit)                            | 45       |                                     |
|    | 5213 bottom sash covering (first window unit)                          | $\alpha$ | hinge axis                          |
|    | 5214 glazing bead (first window unit)                                  | da       | distance (from top to hinge axis)   |
|    | 5223 bottom pane-carrying frame covering (second window unit)          | 50       | dp                                  |
|    | 5223a part of bottom pane-carrying frame covering (second window unit) |          | distance (between panes)            |
|    | 5224 glazing bead                                                      | t1       | first thickness                     |
|    | 5231 side sash covering (third window unit)                            | t2       | second thickness                    |
|    | 5232 side sash covering (third window unit)                            | 55       |                                     |
|    | 5233 bottom sash covering (third window unit)                          |          |                                     |
|    | 531 secondary side frame covering                                      |          |                                     |
|    | 532 secondary side frame covering                                      |          |                                     |

## Claims

1. A roof window arrangement (1) comprising a plurality of window units (21, 22, 23) in a side-by-side configuration and a covering assembly (5) including a set of coverings for each window unit, each window unit comprising at least one pane-carrying frame (211, 221, 231) and a pane (214, 224, 234),

wherein at least one covering (512, 513, 5212, 5231) of a set of coverings associated to one window unit (22, 21, 23) is configured to function as a covering of that one window unit (22, 21, 23) and of a neighbouring window unit (21, 23, 22), and

wherein at least one window unit (21, 23) of the roof window arrangement comprises a pane-carrying frame in the form of an openable sash (211, 231) which opens about a fixed hinge axis ( $\alpha$ ) defined by a set of hinges (212, 213, 232, 233), and wherein the set of coverings associated to each said at least one window unit (21, 23) comprises two side sash coverings (5211, 5212, 5231, 5232) to cover a lower portion of the sash (211, 213) from the hinges and downwards, and a separate bottom sash covering (5213, 5233), at least one of said side sash coverings (5211, 5212, 5231, 5232) being configured to function as a covering of a neighbouring window unit (22),

wherein said plurality of window units comprises three window units (21, 22, 23) including a first window unit (21) with a pane-carrying frame in the form of an openable sash (211) with a top member (2111), two side members, and a bottom member, a second window unit (22) with a fixed pane-carrying frame (221) with a top member (2211), two side members (2212, 2213), and a bottom member (2214), and a third window unit (23) with a pane-carrying frame in the form of an openable sash (231) with a top member (2311), two side members (2312), and a bottom member, such that the second window unit (22) is positioned between the first window unit (21) and the third window unit (23),

wherein said fixed hinge axis is located between the top member (2211) and the bottom member (2214) of the frame (221), and

wherein a common frame (10) is provided to act as a single, stationary frame of all of the plurality of window units (21, 22, 23) in side-by-side configuration, said common frame (10) being configured to be built into a roof surface and comprising a top member (11), two side members (12, 13) and a bottom member (14),

wherein the covering assembly comprises a top casing (510) and two side frame coverings (511, 514) connected to the common frame (10), and

wherein the common frame (10) is provided with two frame hinge parts (112, 113) for the openable window units (21, 23).

2. A roof window arrangement according to claim 1, wherein at least one window unit (22) comprises at least one side frame covering (512, 513) configured to function as a covering of a neighbouring window unit (21, 23).

3. A roof window arrangement according to claim 1, wherein the set of coverings associated to the second window unit (22) comprises two side frame coverings (513, 514) configured to function as a covering of the first window unit (21) and the third window unit (23), preferably also a separate bottom pane-carrying frame covering (5223), and preferably

wherein the set of coverings associated to the first window unit (21) and the third window unit (23) each comprises two side sash coverings (5211, 5212, 5231, 5232), of which the one side sash covering (5212, 5231) closest to the second window unit (22) is configured to function as a covering of the second window unit (22), more preferably

wherein the set of hinges of each of the first window unit (21) and the third window unit (23) comprises two sash hinge parts (212, 213, 232, 233) connected to the respective openable sash (211, 231), and wherein two frame hinge parts (222, 223) are provided on the second window unit (22) to act as a respective counterpart to the sash hinge part (213, 232) of the first window unit (21) and the third window unit (23), respectively.

4. A roof window arrangement according to claim 1, wherein the covering assembly comprises the top casing (510) connected to the common frame (10) and spanning all three window units (21, 22, 23), a first side frame covering (511) and a fourth side frame covering (514) connected to the common frame (10), a second side frame covering (512) and a third side frame covering (513) connected to the second window unit (22), and two side sash coverings (5211, 5212, 5231, 5232) connected to each of the first window unit (21) and third window unit (23), preferably each of the window units (21, 22, 23) is provided with a separate or common bottom sash or pane-carrying frame covering (5213, 5223, 5233), more preferably also secondary side frame coverings (531, 532) and a secondary bottom frame covering (533).

5. A roof window arrangement according to claim 4, wherein at least one tower fitting (54) is connected to one of said window units to provide support for the top casing (510), each tower fitting (54) compris-

ing at least one mounting tower (544, 545; 547) and engagement means (542, 543, 546; 541; 546) to engage with the window unit, said mounting tower being a screw mounting tower (544, 545) or a snap anchor tower (547).

6. A roof window arrangement according to any one of claims 4 to 5, wherein at least one window unit (22) is provided with fixing means to interact with the frame top member (11) and the frame bottom member (14), preferably

wherein the fixing means are associated to the second window unit (22) and comprises two frame members (225, 226) connected to the pane-carrying frame (221), preferably wherein the two frame members (225, 226) of the second window unit (22) extend between the frame top member (11) and the frame bottom member (14) of the common frame (10), preferably such that each frame member (225, 226) has a surplus length relative to the pane-carrying frame (221) in order to allow accommodation of an end portion within the common frame (10), more preferably wherein each tower fitting (54) comprises a base (541) with two upstanding screw towers (544, 545) and the engagement means comprise two legs (542, 543) depending from the base (541) and configured to straddle a frame member (225, 226) of the second window unit (22), preferably also an opening (546) in the base (541) to allow the introduction of fastening means.

7. A roof window arrangement according to any one of claims 4 to 6, wherein at least one cap member (56) is connected to the second window unit (22) to provide a sealing at the bottom of the second window unit (22) and the neighbouring first window unit (21) and third window unit (23), each cap member (56) comprising at least one flange (564) to form a transition between the second window unit (22) and the respective neighbouring first window unit (21) and third window unit (23) and engagement means (561, 562, 563, 565, 566, 567, 574) to engage with the second window unit (22), preferably

wherein each cap member (56) comprises a base (561) from which the flange (564) protrudes, an end portion (563) depending from the base (561), a first leg (562) and a second leg (574), the engagement means comprising the base (561), the first leg (562), the second leg (574), and the end portion (563) being configured to abut a frame member (225, 226) of the second window unit (22), the first leg (562) preferably depends from the base (561) and the second leg (574) being preferably formed as an ex-

tension of the flange (564), and wherein the cap member (56) more preferably comprises a shoulder portion (565) connected to the base (561) via a step portion (5651) and configured to abut a frame member (225, 226) of the second window unit (22), more preferably wherein a trough (567) is formed between an upstanding portion (566) and the flange (564) to interact with components of the second window unit (22), said components including a part (5223a) of a bottom pane-carrying frame covering (5223) and a glazing bead (5224), the trough (567) preferably comprising a sealing rib (570), a guide tower (571) and a top sealing flap (572), preferably wherein said cap member (56) also comprises a first bottom sealing flap (568) and a second bottom sealing flap (569) configured to abut a secondary bottom frame covering (533) of the covering assembly (5), and more preferably wherein at least one side tower (5741) is provided on the second leg (74) and/or at least one side wing (5641, 5642) is provided on the flange (564) and/or at least one front wing (5631) is provided on the end portion (563) of the cap member (56).

8. A roof window arrangement according to any one of claims 6 to 7 when dependent on claim 3, wherein a frame hinge part (222, 223) is connected to a respective frame member (225, 226) of the second window unit (22) to act as a respective counterpart to the sash hinge part (213, 232) of the first window unit (21) and the third window unit (23), respectively, and a frame hinge part (112, 113) is connected to the common frame (10) to act as a respective counterpart to the sash hinge part (212, 233) of the first window unit (21) and the third window unit (23), respectively, preferably

wherein the ratio ( $t_2 : t_1$ ) between a second thickness ( $t_2$ ) of the combined thicknesses of a side member (2213) of the pane-carrying frame (221) and the associated frame member (225) of the second window unit (22) as defined between an edge of the pane (224) and an outer circumference of the frame member (225), and a corresponding thickness ( $t_1$ ) of a side member (2312) of the sash (231) of the neighbouring first window unit or third window unit (23) lies in the range 1.2 to 2, preferably between 1.25 and 1.75, more preferably around 1.5, preferably wherein a distance ( $dp$ ) between panes (224, 234) of neighbouring windows lies in the range 50 to 100 mm, more preferably around 75 mm, more preferably

wherein the sum of the first thickness ( $t_1$ ) and the second thickness ( $t_2$ ) is about 90 to 99% of

the distance (dp) between the panes.

9. A roof window arrangement according to any one of claims 4 to 8, wherein the second side frame covering (512) and the third side frame covering (513) connected to the second window unit (22) each have a width which is larger than a predefined width of the first side frame covering (511) and a fourth side frame covering (514) connected to the common frame (10), preferably about 20 to 100% larger, more preferably about 50% larger. 5
10. A roof window arrangement according to any one of the preceding claims, wherein the openable sash (211, 231) of the first window unit (21) and of the third window unit (23), and the fixed pane-carrying frame (221) of the second window unit (22) are provided as substantially identical standard components, the second window unit (22) comprising fixing means to fixate the pane-carrying frame (221) to the top member (11) and the bottom member (14) of the common frame (10). 10 15 20
11. A method of manufacturing a roof window arrangement according to claim 10, comprising the steps of: 25
  - providing three pane-carrying frames as substantially standard components,
  - providing a common frame,
  - providing one of the pane-carrying frames with fixing means configured to interact with the common frame and designating this unit the second window unit, and 30
  - designating each of the other pane-carrying frames the first and the third window unit, respectively. 35

## Patentansprüche

1. Dachfensteranordnung (1), umfassend eine Vielzahl von Fenstereinheiten (21, 22, 23) in einer nebeneinander angeordneten Auslegung und eine Abdeckungsanordnung (5), die einen Satz von Abdeckungen für jede Fenstereinheit umfasst, wobei jede Fenstereinheit wenigstens einen scheibentragenden Rahmen (211, 221, 231) und eine Fensterscheibe (214, 224, 234) umfasst, 40
  - wobei wenigstens eine Abdeckung (512, 513, 5212, 5231) aus einem Satz von Abdeckungen, die einer Fenstereinheit (22, 21, 23) zugeordnet sind, dazu ausgelegt ist, als eine Abdeckung dieser einen Fenstereinheit (22, 21, 23) und einer benachbarten Fenstereinheit (21, 23, 22) zu fungieren, und 50
  - wobei wenigstens eine Fenstereinheit (21, 23) der Dachfensteranordnung einen scheibentragen-

genden Rahmen in Form eines zum Öffnen geeigneten Fensterflügels (211, 231) umfasst, der sich um eine feste Scharnierachse ( $\alpha$ ) öffnet, die durch einen Satz von Scharnieren (212, 213, 232, 233) definiert ist, und wobei der Satz von Abdeckungen, die jeder wenigstens einen Fenstereinheit (21, 23) zugeordnet sind, zwei seitliche Fensterflügelabdeckungen (5211, 5212, 5231, 5232) umfasst, um einen unteren Abschnitt des Fensterflügels (211, 213) ab den Scharnieren nach unten abzudecken, und eine separate untere Fensterflügelabdeckung (5213, 5233) umfasst, wobei wenigstens eine der seitlichen Fensterflügelabdeckungen (5211, 5212, 5231, 5232) dazu ausgelegt ist, als eine Abdeckung einer benachbarten Fenstereinheit (22) zu fungieren, wobei die Vielzahl von Fenstereinheiten drei Fenstereinheiten (21, 22, 23), die eine erste Fenstereinheit (21) mit einem scheibentragenden Rahmen in Form eines zum Öffnen geeigneten Fensterflügels (211) mit einem oberen Element (2111), zwei seitlichen Elementen und einem unteren Element, eine zweite Fenstereinheit (22) mit einem festen scheibentragenden Rahmen (221) mit einem oberen Element (2211), zwei seitlichen Elementen (2212, 2213) und einem unteren Element (2214) und eine dritte Fenstereinheit (23) mit einem scheibentragenden Rahmen in Form eines zum Öffnen geeigneten Fensterflügels (231) mit einem oberen Element (2311), zwei seitlichen Elementen (2312) und einem unteren Element enthalten, auf eine solche Weise umfasst, dass sich die zweite Fenstereinheit (22) zwischen der ersten Fenstereinheit (21) und der dritten Fenstereinheit (23) befindet, wobei sich diese feste Scharnierachse zwischen dem oberen Element (2211) und dem unteren Element (2214) des Rahmens (221) befindet und wobei ein gemeinsamer Rahmen (10) so vorgesehen ist, dass er als ein einzelner, feststehender Rahmen für alle aus der Vielzahl von Fenstereinheiten (21, 22, 23) in einer nebeneinander angeordneten Auslegung fungiert, wobei der gemeinsame Rahmen (10) dazu ausgelegt ist, in eine Dachfläche eingebaut zu werden und ein oberes Element (11), zwei seitliche Elemente (12, 13) und ein unteres Element (14) umfasst, wobei die Abdeckungsanordnung eine obere Verkleidung (510) und zwei seitliche Rahmenabdeckungen (511, 514), die mit dem gemeinsamen Rahmen (10) verbunden sind, umfasst und wobei der gemeinsame Rahmen (10) mit zwei Rahmenscharnierteilen (112, 113) für die zum Öffnen geeigneten Fenstereinheiten (21, 23)

versehen ist.

2. Dachfensteranordnung nach Anspruch 1, wobei wenigstens eine Fenstereinheit (22) wenigstens eine seitliche Rahmenabdeckung (512, 513) umfasst, die dazu ausgelegt ist, als eine Abdeckung einer benachbarten Fenstereinheit (21, 23) zu fungieren. 5
3. Dachfensteranordnung nach Anspruch 1, wobei der Satz von Abdeckungen, die der zweiten Fenstereinheit (22) zugeordnet sind, zwei seitliche Rahmenabdeckungen (513, 514) umfasst, die dazu ausgelegt sind, als eine Abdeckung der ersten Fenstereinheit (21) und der dritten Fenstereinheit (23), vorzugsweise auch als separate untere Abdeckung (5223) des scheibentragenden Rahmens zu fungieren, und 10  
wobei vorzugsweise der Satz von Abdeckungen, die der ersten Fenstereinheit (21) und der dritten Fenstereinheit (23) zugeordnet sind, jeweils zwei seitliche Fensterflügelabdeckungen (5211, 5212, 5231, 5232) umfasst, von denen die eine seitliche Fensterflügelabdeckung (5212, 5231), die am nächsten zu der zweiten Fenstereinheit (22) gelegen ist, dazu ausgelegt ist, als eine Abdeckung der zweiten Fenstereinheit (22) zu fungieren, und 25  
wobei insbesondere der Satz von Scharnieren der ersten Fenstereinheit (21) und der dritten Fenstereinheit (23) jeweils zwei Fensterflügel-scharnierteile (212, 213, 232, 233) umfasst, die mit dem jeweiligen zum Öffnen geeigneten Fensterflügel (211, 231) verbunden sind, und wobei zwei Rahmenscharnierteile (222, 223) so an der zweiten Fenstereinheit (22) vorgesehen sind, dass sie als jeweiliges Gegenstück zu dem Fensterflügelscharnierteil (213, 232) der ersten Fenstereinheit (21) beziehungsweise der dritten Fenstereinheit (23) fungieren. 30  
4. Dachfensteranordnung nach Anspruch 1, wobei die Abdeckungsanordnung die obere Verkleidung (510), die mit dem gemeinsamen Rahmen (10) verbunden ist und sich über alle drei Fenstereinheiten (21, 22, 23) erstreckt, eine erste seitliche Rahmenabdeckung (511) und eine vierte seitliche Rahmenabdeckung (514), die mit dem gemeinsamen Rahmen (10) verbunden sind, eine zweite seitliche Rahmenabdeckung (512) und eine dritte seitliche Rahmenabdeckung (513), die mit der zweiten Fenstereinheit (22) verbunden sind, und zwei seitliche Fensterflügelabdeckungen (5211, 5212, 5231, 5232), die jeweils mit der ersten Fenstereinheit (21) und der dritten Fenstereinheit (23) verbunden sind, umfasst, wobei die Fenstereinheiten (21, 22, 23) vorzugsweise jeweils mit einer separaten oder gemeinsamen unteren Flügel- oder unteren zu dem scheibentragenden Rahmen gehörenden Abdeckung 35  
40  
45  
50  
55

(5213, 5223, 5233), insbesondere auch mit sekundären seitlichen Rahmenabdeckungen (531, 532) und einer sekundären unteren Rahmenabdeckung (533) versehen sind.

5. Dachfensteranordnung nach Anspruch 4, wobei wenigstens ein Turmbeschlag (54) mit einer der Fenstereinheiten verbunden ist, um eine Unterstützung für die obere Verkleidung (510) bereitzustellen, wobei jeder Turmbeschlag (54) wenigstens einen Befestigungsturm (544, 545; 547) und Eingriffsmittel (542, 543, 546; 541; 546) umfasst, um mit der Fenstereinheit einzugreifen, wobei es sich bei dem Befestigungsturm um einen Schraubbefestigungsturm (544, 545) und einen Schnappankerturm (547) handelt.
6. Dachfensteranordnung nach einem der Ansprüche 4 bis 5, wobei wenigstens eine Fenstereinheit (22) mit Befestigungsmitteln versehen ist, um mit dem oberen Rahmenelement (11) und dem unteren Rahmenelement (14) zusammenzuwirken,  
wobei vorzugsweise die Befestigungsmittel der zweiten Fenstereinheit (22) zugeordnet sind und zwei Rahmenelemente (225, 226) umfassen, die mit dem scheibentragenden Rahmen (221) verbunden sind,  
wobei sich vorzugsweise die zwei Rahmenelemente (225, 226) der zweiten Fenstereinheit (22) zwischen dem oberen Rahmenelement (11) und dem unteren Rahmenelement (14) des gemeinsamen Rahmens (10) erstrecken, vorzugsweise auf eine solche Weise, dass jedes Rahmenelement (225, 226) eine Überlänge relativ zu dem scheibentragenden Rahmen (221) aufweist, um zu ermöglichen, dass ein Endabschnitt innerhalb des gemeinsamen Rahmens (10) aufgenommen werden kann,  
wobei insbesondere jeder Turmbeschlag (54) eine Basis (541) mit zwei aufrechten Schraubtürmen (544, 545) umfasst und die Eingriffsmittel zwei Schenkel (542, 543), die von der Basis (541) herunter hängen und dazu ausgelegt sind, ein Rahmenelement (225, 226) der zweiten Fenstereinheit (22) zu überspannen, vorzugsweise auch eine Öffnung (546) in der Basis (541) umfassen, um das Einführen von Befestigungsmitteln zu ermöglichen.
7. Dachfensteranordnung nach einem der Ansprüche 4 bis 6, wobei wenigstens ein Abdeckelement (56) mit der zweiten Fenstereinheit (22) verbunden ist, um eine Dichtung unten an der zweiten Fenstereinheit (22) und der benachbarten ersten Fenstereinheit (21) und dritten Fenstereinheit (23) bereitzustellen, wobei jedes Abdeckelement (56) wenigstens einen Flansch (564) umfasst, um einen Übergang zwi-

schen der zweiten Fenstereinheit (22) und der jeweiligen benachbarten ersten Fenstereinheit (21) und dritten Fenstereinheit (23) zu bilden, und Eingriffsmittel (561, 562, 563, 565, 566, 567, 574) umfasst, um mit der zweiten Fenstereinheit (22) einzugreifen,

wobei vorzugsweise jedes Abdeckelement (56) eine Basis (561), von der der Flansch (564) vorsteht, einen Endabschnitt (563), der von der Basis (561) herunter hängt, einen ersten Schenkel (562) und einen zweiten Schenkel (574) umfasst, wobei die Eingriffsmittel, die die Basis (561), den ersten Schenkel (562), den zweiten Schenkel (574) und den Endabschnitt (563) umfassen, dazu ausgelegt sind, an einem Rahmenelement (225, 226) der zweiten Fenstereinheit (22) anzuliegen, wobei der erste Schenkel (562) vorzugsweise von der Basis (561) herunter hängt und der zweite Schenkel (574) vorzugsweise als eine Verlängerung des Flansches (564) ausgebildet ist, und wobei das Abdeckelement (56) insbesondere einen Schulterabschnitt (565) umfasst, der über einen Stufenabschnitt (5651) mit der Basis (561) verbunden ist und dazu ausgelegt ist, an einem Rahmenelement (225, 226) der zweiten Fenstereinheit (22) anzuliegen,

wobei insbesondere eine Mulde (567) zwischen einem aufrechten Abschnitt (566) und dem Flansch (564) gebildet ist, um mit Komponenten der zweiten Fenstereinheit (22) zusammenzuwirken, wobei die Komponenten einen Teil (5223a) der unteren zu dem scheintragenden Rahmen gehörenden Abdeckung (5223) und eine Glashaltleiste (5224) umfassen, wobei die Mulde (567) vorzugsweise eine Dichtungsrippe (570), einen Führungsturm (571) und eine obere Dichtungslasche (572) umfasst, wobei vorzugsweise das Abdeckelement (56) außerdem eine erste untere Dichtungslasche (568) und eine zweite untere Dichtungslasche (569) umfasst, die dazu ausgelegt ist, an einer sekundären unteren Rahmenabdeckung (533) der Abdeckungsanordnung (5) anzuliegen, und wobei insbesondere wenigstens ein seitlicher Turm (5741) an dem zweiten Schenkel (74) vorgesehen ist und/oder wobei wenigstens ein seitlicher Flügel (5641, 5642) an dem Flansch (564) vorgesehen ist und/oder wobei wenigstens ein vorderer Flügel (5631) an dem Endabschnitt (563) des Abdeckelements (56) vorgesehen ist.

8. Dachfensteranordnung nach einem der Ansprüche 6 bis 7, bei Abhängigkeit von Anspruch 3, wobei ein Rahmenscharnierteil (222, 223) mit einem jeweiligen Rahmenelement (225, 226) der zweiten Fenstereinheit (22) verbunden ist, um als ein jeweiliges Gegenstück zu dem Fensterflügelscharnierteil (213,

232) der ersten Fenstereinheit (21) beziehungsweise der dritten Fenstereinheit (23) zu fungieren, und wobei ein Rahmenscharnierteil (112, 113) mit dem gemeinsamen Rahmen (10) verbunden ist, um als ein jeweiliges Gegenstück zu dem Fensterflügelscharnierteil (212, 233) der ersten Fenstereinheit (21) beziehungsweise der dritten Fenstereinheit (23) zu fungieren,

wobei vorzugsweise das Verhältnis ( $t_2 : t_1$ ) zwischen einer zweiten Dicke ( $t_2$ ) der kombinierten Dicken eines seitlichen Elements (2213) des scheintragenden Rahmens (221) und des zugehörigen Rahmenelements (225) der zweiten Fenstereinheit (22), wie zwischen einem Rand der Fensterscheibe (224) und einem Außenumfang des Rahmenelements (225) definiert, und einer entsprechenden Dicke ( $t_1$ ) eines seitlichen Elements (2312) des Fensterflügels (231) der benachbarten ersten Fenstereinheit oder dritten Fenstereinheit (23) im Bereich von 1,2 bis 2, vorzugsweise zwischen 1,25 und 1,75, insbesondere bei ungefähr 1,5 liegt,

wobei vorzugsweise ein Abstand ( $dp$ ) zwischen den Fensterscheiben (224, 234) von benachbarten Fenstern im Bereich von 50 bis 100 mm, insbesondere bei ungefähr 75 mm liegt,

wobei insbesondere die Summe der ersten Dicke ( $t_1$ ) und der zweiten Dicke ( $t_2$ ) ungefähr 90 bis 99% des Abstands ( $dp$ ) zwischen den Fensterscheiben beträgt.

9. Dachfensteranordnung nach einem der Ansprüche 4 bis 8, wobei die zweite seitliche Rahmenabdeckung (512) und die dritte seitliche Rahmenabdeckung (513), die mit der zweiten Fenstereinheit (22) verbunden sind, jeweils eine Breite aufweisen, die größer als eine vorgegebene Breite der ersten seitlichen Rahmenabdeckung (511) und einer vierten seitlichen Rahmenabdeckung (514), die mit dem gemeinsamen Rahmen (10) verbunden sind, vorzugsweise ungefähr 20 bis 100% größer, insbesondere ungefähr 50% größer ist.

10. Dachfensteranordnung nach einem der vorhergehenden Ansprüche, wobei der zum Öffnen geeignete Fensterflügel (211, 231) der ersten Fenstereinheit (21) und der dritten Fenstereinheit (23) und der feste scheintragende Rahmen (221) der zweiten Fenstereinheit (22) als im Wesentlichen identische standardmäßige Komponenten vorgesehen sind, wobei die zweite Fenstereinheit (22) Befestigungsmittel umfasst, um den scheintragenden Rahmen (221) an dem oberen Element (11) und dem unteren Element (14) des gemeinsamen Rahmens (10) zu befestigen.

11. Verfahren zum Herstellen einer Dachfensteranord-

nung nach Anspruch 10, umfassend die folgenden Schritte:

Bereitstellen von drei scheibentragenden Rahmen als im Wesentlichen standardmäßige Komponenten, 5  
Bereitstellen eines gemeinsamen Rahmens, Versehen eines der scheibentragenden Rahmen mit Befestigungsmitteln, die dazu ausgelegt sind, mit dem gemeinsamen Rahmen zusammenzuwirken, und Kennzeichnen dieser Einheit als zweite Fenstereinheit, und 10  
Kennzeichnen jedes der anderen scheibentragenden Rahmen als erste beziehungsweise dritte Fenstereinheit. 15

## Revendications

1. Agencement de fenêtre de toit (1) comprenant plusieurs unités de fenêtre (21, 22, 23) dans une configuration côte à côte et un ensemble de recouvrement (5) comprenant un ensemble de recouvrements pour chaque unité de fenêtre, chaque unité de fenêtre comprenant au moins un cadre porteur de vitre (211, 221, 231) et une vitre (214, 224, 234), 20  
  
dans lequel au moins un recouvrement (512, 513, 5212, 5231) d'un ensemble de recouvrements associés à une unité de fenêtre (22, 21, 23) est configuré pour fonctionner comme recouvrement de cette unité de fenêtre (22, 21, 23) et d'une unité de fenêtre voisine (21, 23, 22), et 30  
dans lequel au moins une unité de fenêtre (21, 23) de l'agencement de fenêtre de toit comprend un cadre porteur de vitre sous la forme d'un châssis ouvrable (211, 231) qui s'ouvre autour d'un axe de charnière fixe (a) défini par un ensemble de charnières (212, 213, 232, 233), et 40  
dans lequel l'ensemble de recouvrements associés à chacune desdites au moins une unité de fenêtre (21, 23) comprend deux recouvrements de châssis latéraux (5211, 5212, 5231, 5232) pour recouvrir une partie inférieure du châssis (211, 213) à partir des charnières et vers le bas, et un recouvrement de châssis inférieur séparé (5213, 5233), au moins un de ces recouvrements de châssis latéraux (5211, 5212, 5231, 5232) étant configuré pour fonctionner comme 50  
recouvrement d'une unité de fenêtre voisine (22),  
dans lequel ladite pluralité d'unités de fenêtre comprend trois unités de fenêtre (21, 22, 23) comprenant une première unité de fenêtre (21) 55  
comportant un cadre porteur de vitre sous la forme d'un châssis ouvrable (211) avec un élément supérieur (2111), deux éléments latéraux et un

élément inférieur, une deuxième unité de fenêtre (22) comportant un cadre porteur de vitre fixe (221) avec un élément supérieur (2211), deux éléments latéraux (2212, 2213) et un élément inférieur (2214), et une troisième unité de fenêtre (23) comportant un cadre porteur de vitre sous la forme d'un châssis ouvrant (231) avec un élément supérieur (2311), deux éléments latéraux (2312) et un élément inférieur, de sorte que la deuxième unité de fenêtre (22) est positionnée entre la première unité de fenêtre (21) et la troisième unité de fenêtre (23), dans lequel ledit axe de charnière fixe est situé entre l'élément supérieur (2211) et l'élément inférieur (2214) du cadre (221), et dans lequel un cadre commun (10) est prévu pour servir de cadre unique et fixe à l'ensemble de la pluralité d'unités de fenêtre (21, 22, 23) en configuration côte à côte, ledit cadre commun (10) étant configuré pour être encastré dans une surface de toit et comprenant un élément supérieur (11), deux éléments latéraux (12, 13) et un élément inférieur (14), dans lequel l'ensemble de recouvrement comprend un boîtier supérieur (510) et deux recouvrements de cadre latéraux (511, 514) reliés au cadre commun (10), et dans lequel le cadre commun (10) est pourvu de deux pièces de charnières de cadre (112, 113) pour les unités de fenêtre ouvrables (21, 23).

2. Agencement de fenêtre de toit selon la revendication 1, dans lequel au moins une unité de fenêtre (22) comprend au moins un recouvrement de cadre latéral (512, 513) configuré pour fonctionner comme recouvrement d'une unité de fenêtre voisine (21, 23).
3. Agencement de fenêtre de toit selon la revendication 1, dans lequel l'ensemble de recouvrements associés à la deuxième unité de fenêtre (22) comprend deux recouvrements de cadre latéraux (513, 514) configurés pour fonctionner comme recouvrement de la première unité de fenêtre (21) et de la troisième unité de fenêtre (23), de préférence également un recouvrement de cadre porteur de vitre inférieur séparé (5223), et de préférence

dans lequel les ensembles de recouvrements associés à la première unité de fenêtre (21) et à la troisième unité de fenêtre (23) comprennent chacun deux recouvrements de châssis latéraux (5211, 5212, 5231, 5232), dont le recouvrement de châssis latéral (5212, 5231) le plus proche de la deuxième unité de fenêtre (22) est configuré pour fonctionner comme un recouvrement de la deuxième unité de fenêtre (22), plus préférentiellement

- dans lequel l'ensemble de charnières de chacune de la première unité de fenêtre (21) et de la troisième unité de fenêtre (23) comprend deux pièces de charnière de châssis (212, 213, 232, 233) reliées au châssis ouvrable respectif (211, 231), et dans lequel deux pièces de charnière de cadre (222, 223) sont prévues sur la deuxième unité de fenêtre (22) pour agir comme contrepartie respective de la pièce de charnière de châssis (213, 232) de la première unité de fenêtre (21) et de la troisième unité de fenêtre (23), respectivement.
4. Agencement de fenêtre de toit selon la revendication 1, dans lequel l'ensemble de recouvrement comprend le boîtier supérieur (510) relié au cadre commun (10) et recouvrant les trois unités de fenêtre (21, 22, 23), un premier recouvrement de cadre latéral (511) et un quatrième recouvrement de cadre latéral (514) reliés au cadre commun (10), un deuxième recouvrement de cadre latéral (512) et un troisième recouvrement de cadre latéral (513) reliés à la deuxième unité de fenêtre (22), et deux recouvrements de châssis latéraux (5211, 5212, 5231, 5232) reliés à la première unité de fenêtre (21) et à la troisième unité de fenêtre (23), de préférence chacune des unités de fenêtre (21, 22, 23) est pourvue d'un recouvrement de châssis ou de cadre porteur de vitre inférieur séparé ou commun (5213, 5223, 5233), de préférence également des recouvrements de cadre latéraux secondaires (531, 532) et un recouvrement de cadre inférieur secondaire (533).
5. Agencement de fenêtre de toit selon la revendication 4, dans lequel au moins un raccord de tour (54) est relié à l'une desdites unités de fenêtre pour fournir un support au boîtier supérieur (510), chaque raccord de tour (54) comprenant au moins une tour de montage (544, 545; 547) et des moyens d'engagement (542, 543, 546; 541; 546) pour s'engager avec l'unité de fenêtre, ladite tour de montage étant une tour de montage à vis (544, 545) ou une tour d'ancrage à enclenchement (547).
6. Agencement de fenêtre de toit selon l'une quelconque des revendications 4 à 5, dans lequel au moins une unité de fenêtre (22) est dotée de moyens de fixation pour interagir avec l'élément supérieur de cadre (11) et l'élément inférieur de cadre (14), de préférence
- dans lequel les moyens de fixation sont associés à la deuxième unité de fenêtre (22) et comprennent deux éléments de cadre (225, 226) reliés au cadre porteur de vitre (221), de préférence
- dans lequel les deux éléments de cadre (225, 226) de la deuxième unité de fenêtre (22) s'étendent entre l'élément supérieur de cadre (11) et l'élément inférieur de cadre (14) du cadre commun (10), de préférence de manière à ce que chaque élément de cadre (225, 226) a une longueur excédentaire par rapport au cadre porteur de vitre (221) afin de permettre le logement d'une partie d'extrémité dans le cadre commun (10), plus préféablement
- dans lequel chaque raccord de tour (54) comprend une base (541) avec deux tours de vis verticaux (544, 545) et les moyens d'engagement comprennent deux jambes (542, 543) dépendant de la base (541) et configurées pour chevaucher un élément de cadre (225, 226) de la deuxième unité de fenêtre (22), de préférence également une ouverture (546) dans la base (541) pour permettre l'introduction des moyens de fixation.
7. Agencement de fenêtre de toit selon l'une quelconque des revendications 4 à 6, dans lequel au moins un élément de capuchon (56) est relié à la deuxième unité de fenêtre (22) pour assurer l'étanchéité au bas de la deuxième unité de fenêtre (22) et de la première unité de fenêtre (21) et de la troisième unité de fenêtre (23) voisines, chaque élément de capuchon (56) comprend au moins une bride (564) pour former une transition entre la deuxième unité de fenêtre (22) et la première unité de fenêtre (21) et la troisième unité de fenêtre (23) voisines respectives et des moyens d'engagement (561, 562, 563, 565, 566, 567, 574) pour s'engager dans la deuxième unité de fenêtre (22), de préférence
- dans lequel chaque élément de capuchon (56) comprend une base (561) de laquelle la bride (564) fait saillie, une partie d'extrémité (563) dépendant de la base (561), une première jambe (562) et une deuxième jambe (574), les moyens d'engagement comprenant la base (561), la première jambe (562), la deuxième jambe (574) et la partie d'extrémité (563) étant configurés pour venir en butée contre un élément de cadre (225, 226) de la deuxième unité de fenêtre (22), la première jambe (562) dépend de préférence de la base (561) et la deuxième jambe (574) est de préférence formée comme une extension de la bride (564), et dans lequel l'élément de capuchon (56) comprend de préférence une partie d'épaulement (565) reliée à la base (561) par une partie étagée (5651) et configurée pour venir en butée contre un élément de cadre (225, 226) de la deuxième unité de fenêtre (22), plus préféablement
- dans lequel un creux (567) est formé entre une partie verticale (566) et la bride (564) pour interagir avec les composants de la deuxième unité de fenêtre (22), lesdits composants comprenant une partie (5223a) d'un recouvrement de cadre



- porteur de vitre inférieur (5223) et une pareclose (5224), le creux (567) comprenant de préférence une nervure d'étanchéité (570), une tour de guidage (571) et un rabat d'étanchéité supérieur (572), de préférence
- 5 dans lequel ledit élément de capuchon (56) comprend également un premier rabat d'étanchéité inférieur (568) et un deuxième rabat d'étanchéité inférieur (569) configurés pour venir en butée contre un recouvrement de cadre inférieur secondaire (533) de l'ensemble de recouvrement (5), et plus préférablement
- 10 dans lequel au moins une tour latérale (5741) est prévue sur la deuxième jambe (74) et/ou au moins une aile latérale (5641, 5642) est prévue sur la bride (564) et/ou au moins une aile avant (5631) est prévue sur la partie d'extrémité (563) de l'élément de capuchon (56).
8. Agencement de fenêtre de toit selon l'une quelconque des revendications 6 à 7 lorsqu'elle dépend de la revendication 3, dans lequel une pièce de charnière de cadre (222, 223) est reliée à un élément de cadre respectif (225, 226) de la deuxième unité de
- 20 fenêtre (22) pour agir en tant que contrepartie respective de la pièce de charnière de châssis (213, 232) de la première unité de fenêtre (21) et de la troisième unité de fenêtre (23), respectivement, et une pièce de charnière de cadre (112, 113) est reliée au cadre commun (10) pour agir comme contrepartie
- 25 respectue de la pièce de charnière de châssis (212, 233) de la première unité de fenêtre (21) et de la troisième unité de fenêtre (23), respectivement, de préférence
- 30 dans lequel le rapport ( $t_2 : t_1$ ) entre une deuxième épaisseur ( $t_2$ ) des épaisseurs combinées d'un élément latéral (2213) du cadre porteur de vitre (221) et de l'élément de cadre associé (225) de la deuxième unité de fenêtre (22), défini entre un bord de la vitre (224) et une circonférence
- 35 extérieure de l'élément de cadre (225), et une épaisseur correspondante ( $t_1$ ) d'un élément latéral (2312) du châssis (231) de la première unité de fenêtre ou de la troisième unité de fenêtre voisine (23) se situe dans la plage de 1,2 à 2, de préférence entre 1,25 et 1,75, plus préférablement autour de 1,5, de préférence
- 40 dans lequel une distance ( $dp$ ) entre les vitres (224, 234) de fenêtres voisines est comprise entre 50 et 100 mm, de préférence autour de 75 mm, plus préférablement
- 45 dans lequel la somme de la première épaisseur ( $t_1$ ) et de la deuxième épaisseur ( $t_2$ ) représente environ 90 à 99 % de la distance ( $dp$ ) entre les vitres.
- 55

9. Agencement de fenêtre de toit selon l'une quelcon-

que des revendications 4 à 8, dans lequel le deuxième recouvrement de cadre latéral (512) et le troisième recouvrement de cadre latéral (513) reliés à la deuxième unité de fenêtre (22) ont chacun une largeur supérieure à une largeur prédéfinie du premier recouvrement de cadre latéral (511) et d'un quatrième recouvrement de cadre latéral (514) reliés au cadre commun (10), de préférence une largeur supérieure d'environ 20 à 100 %, plus préférablement une largeur supérieure d'environ 50 %.

10. Agencement de fenêtre de toit selon l'une quelconque des revendications précédentes, dans lequel le châssis (211, 231) de la première unité de fenêtre (21) et de la troisième unité de fenêtre (23), et le cadre porteur de vitre fixe (221) de la deuxième unité de fenêtre (22) sont fournis en tant que composants standard sensiblement identiques, la deuxième unité de fenêtre (22) comprenant des moyens de fixation pour fixer le cadre porteur de vitre (221) à l'élément supérieur (11) et à l'élément inférieur (14) du cadre commun (10).
11. Procédé de fabrication d'un agencement de fenêtre de toit selon la revendication 10, comprenant les étapes suivantes :

la fourniture de trois cadres porteurs de vitre en tant que composants sensiblement standard, la mise en place d'un cadre commun, la dotation de l'un des cadres porteurs de vitre d'un moyen de fixation configuré pour interagir avec le cadre commun et la désignation de cette unité comme deuxième unité de fenêtre, et la désignation de chacun des autres cadres porteurs de vitre comme étant respectivement la première et la troisième unité de fenêtre.

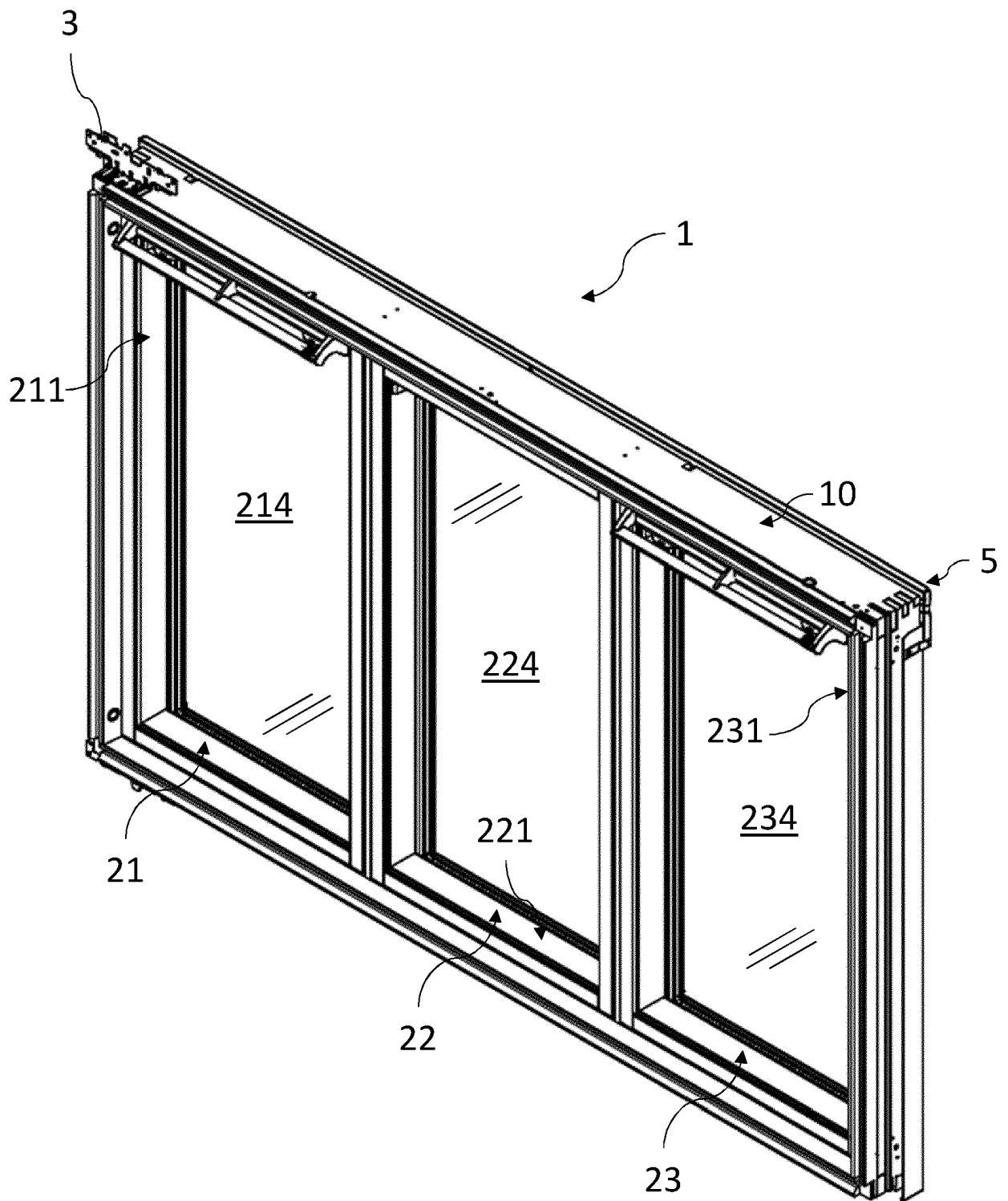


Fig. 1

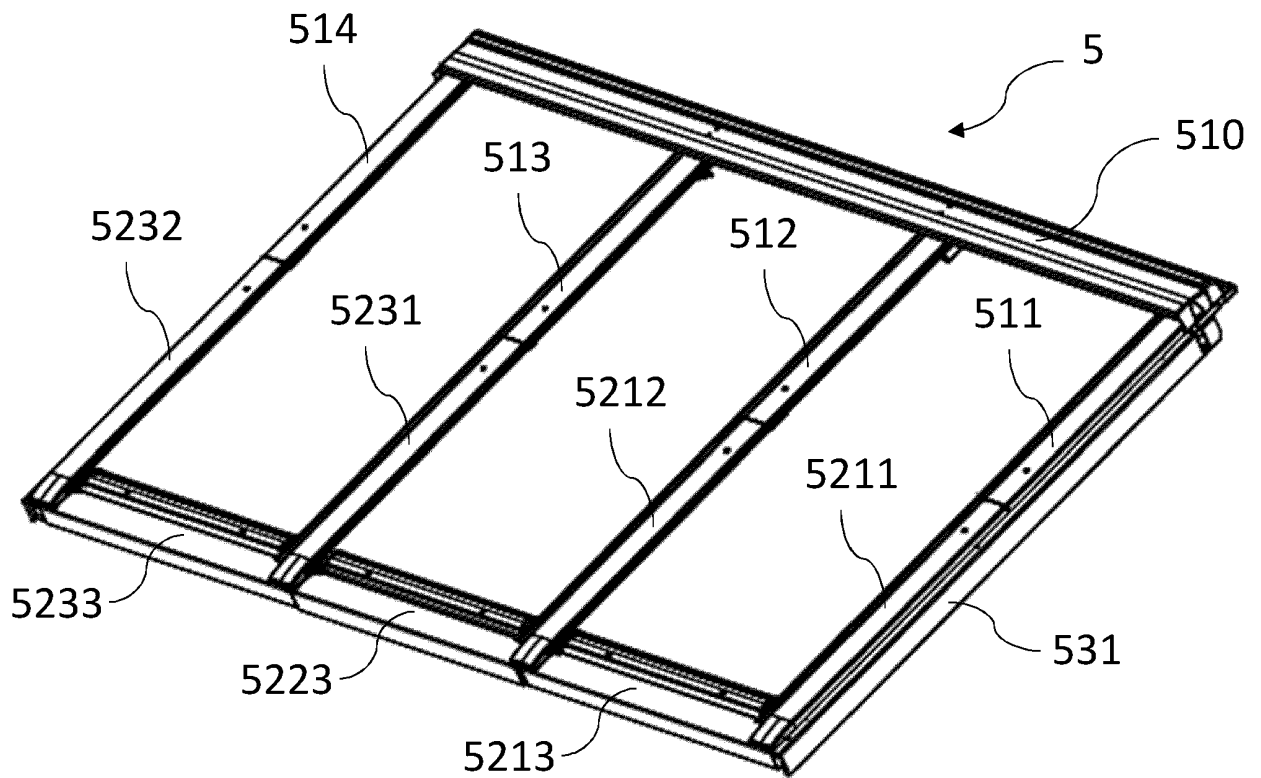


Fig. 2

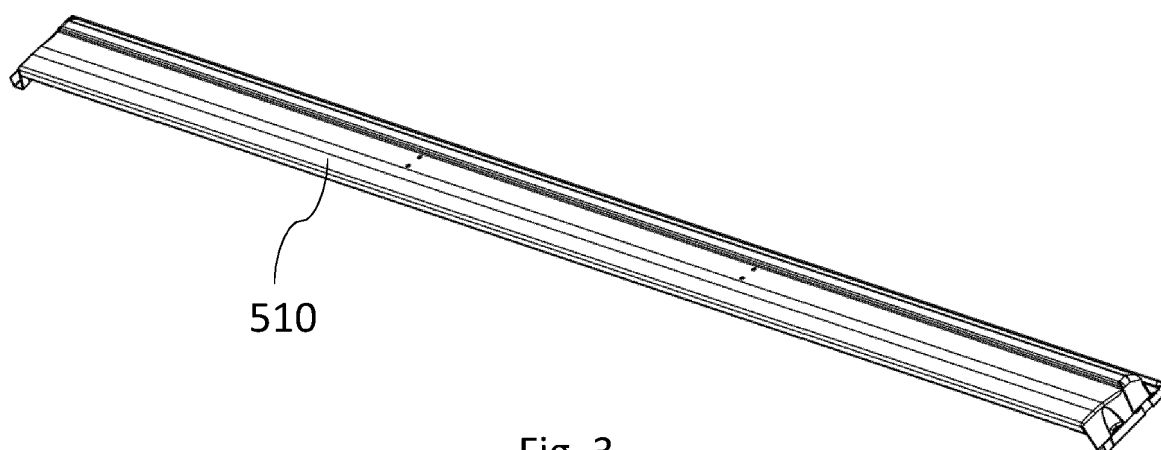


Fig. 3

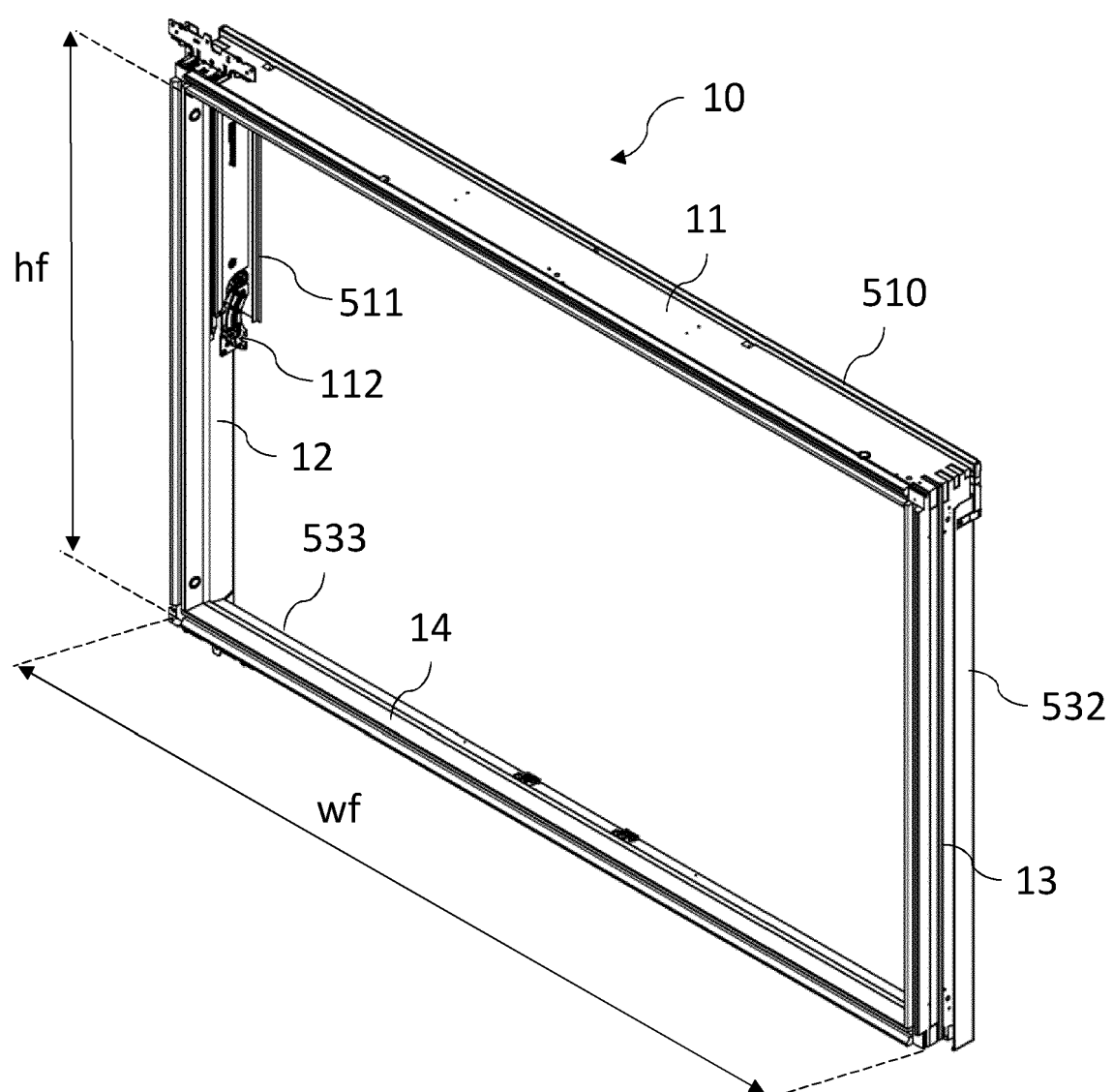


Fig. 4

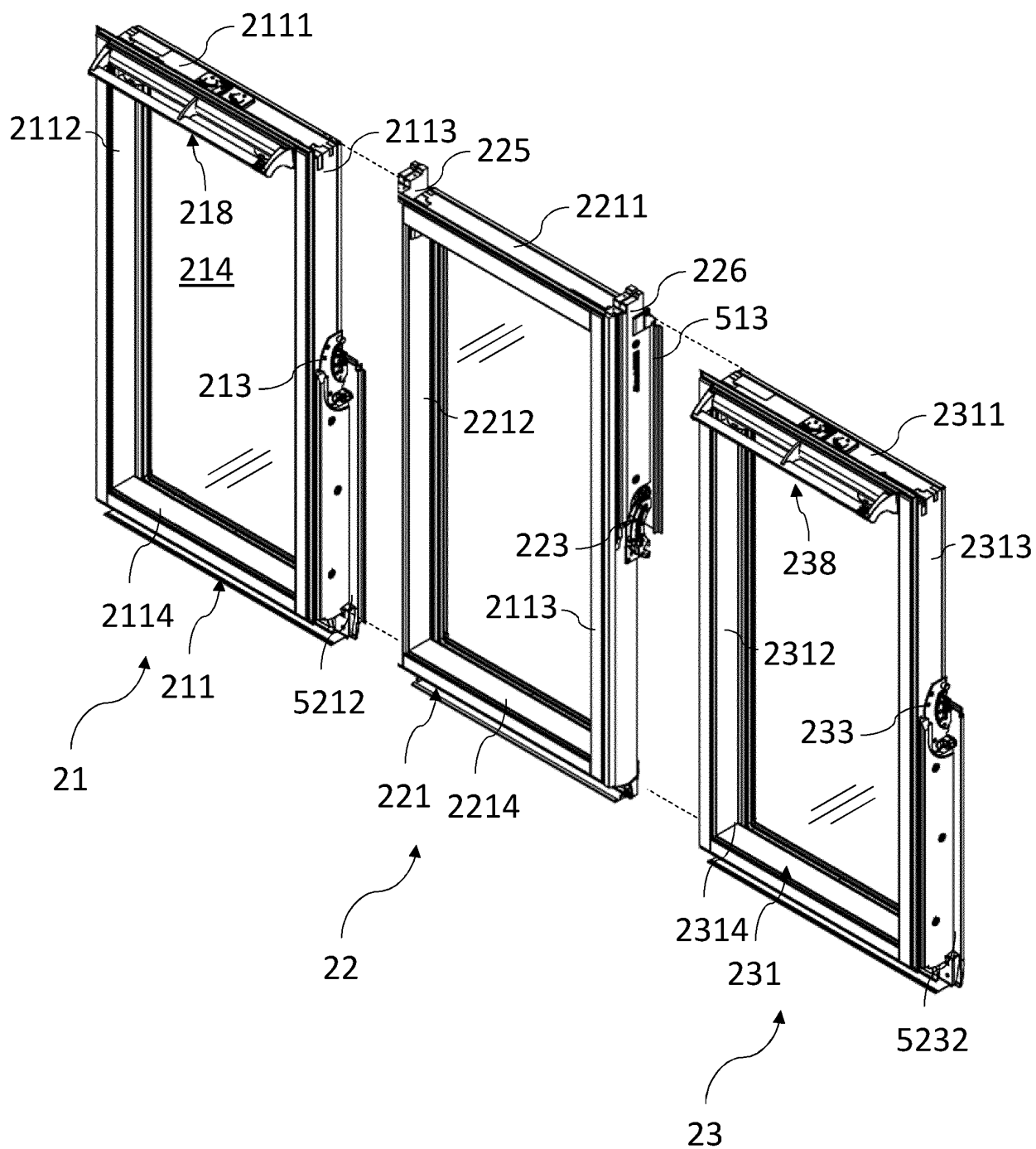


Fig. 5

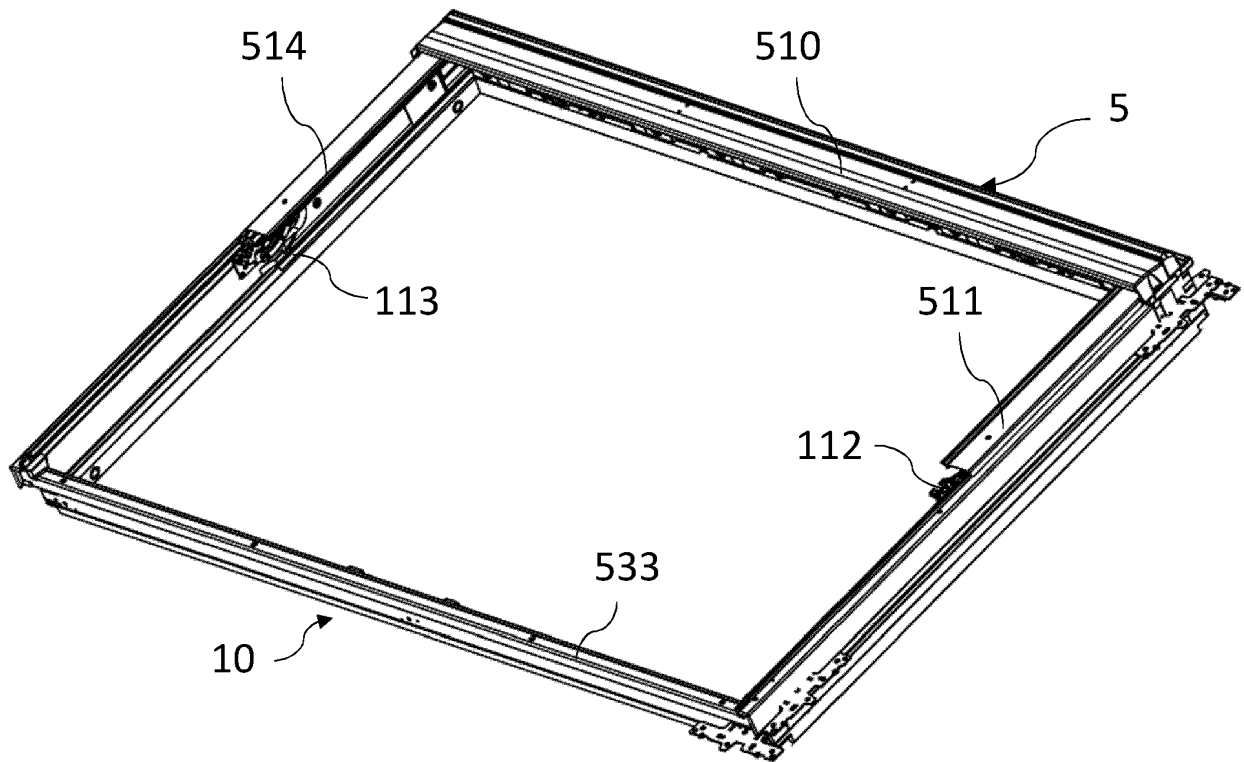


Fig. 6

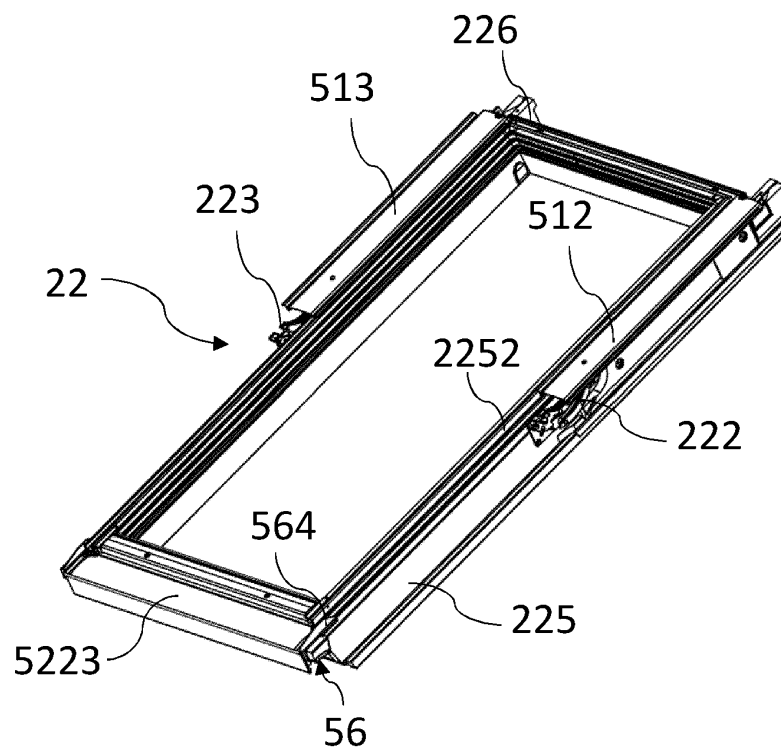


Fig. 7

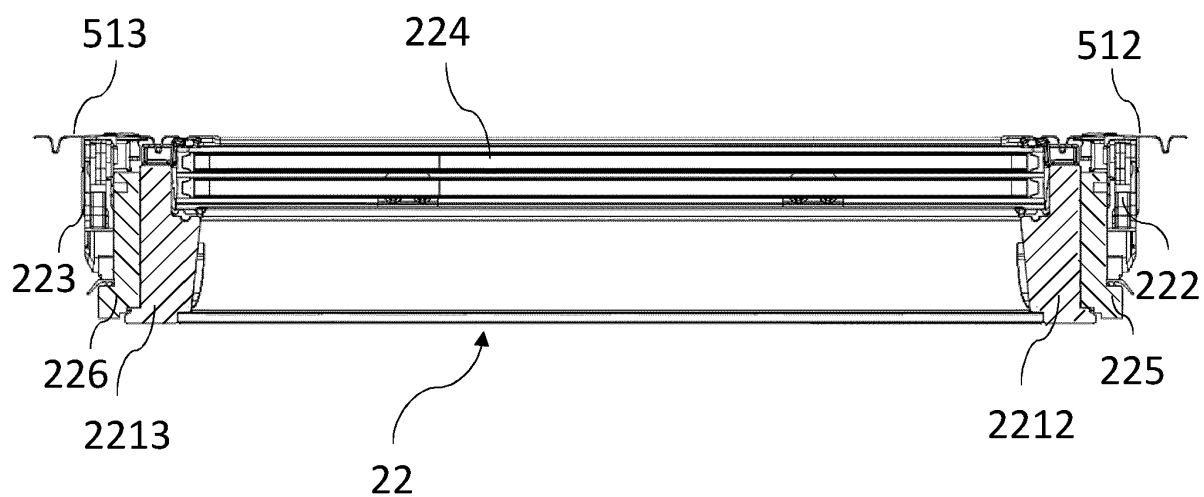


Fig. 8

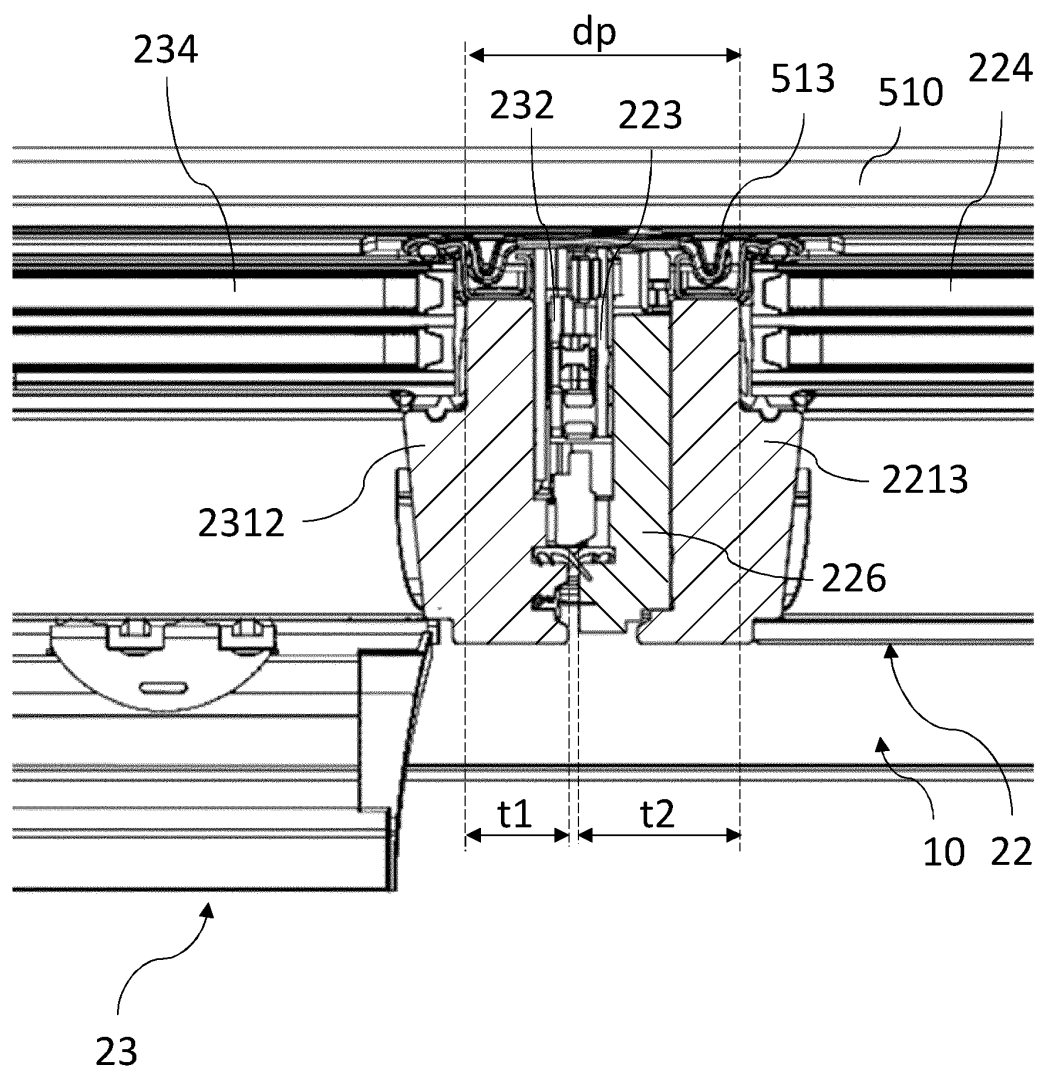


Fig. 9

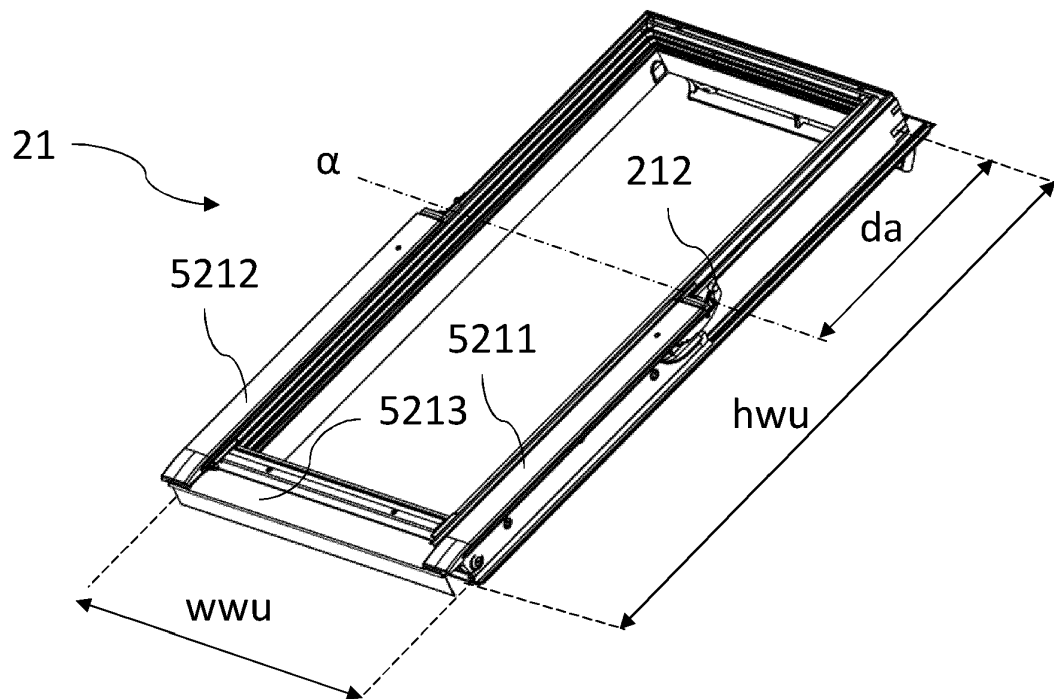


Fig. 10

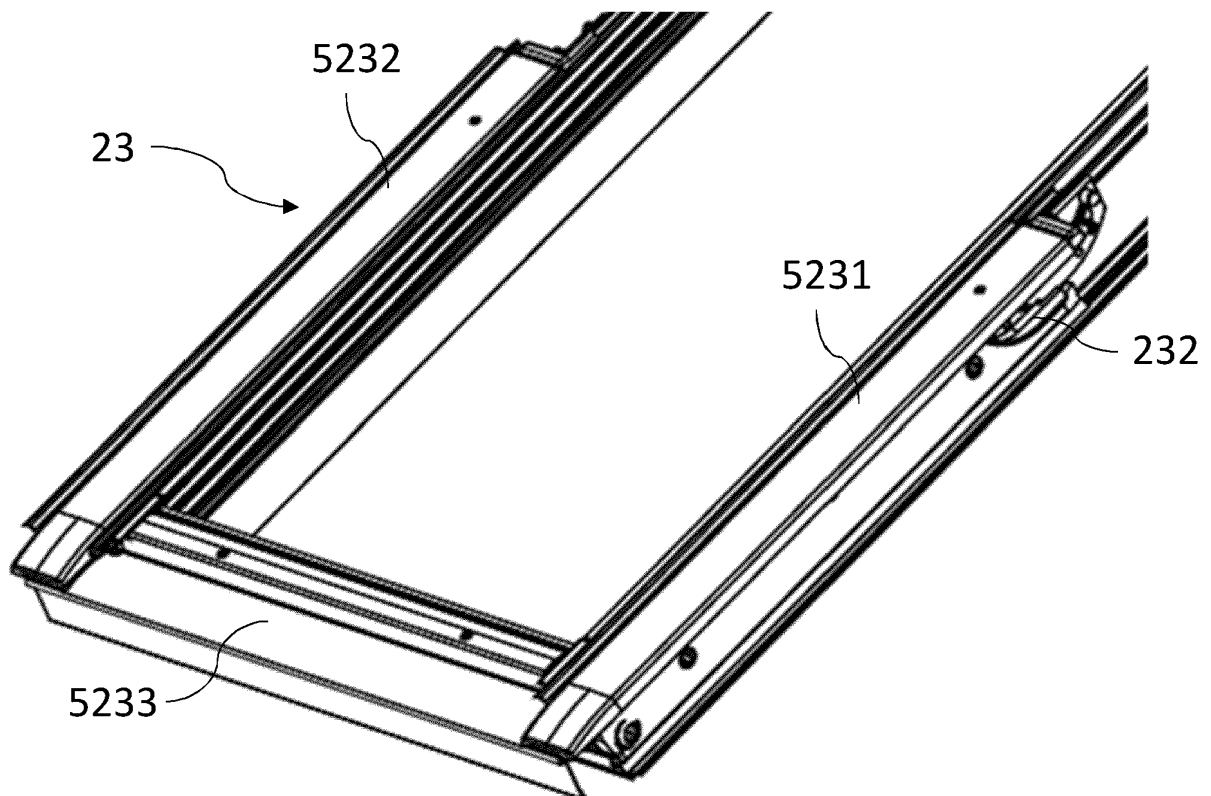


Fig. 11



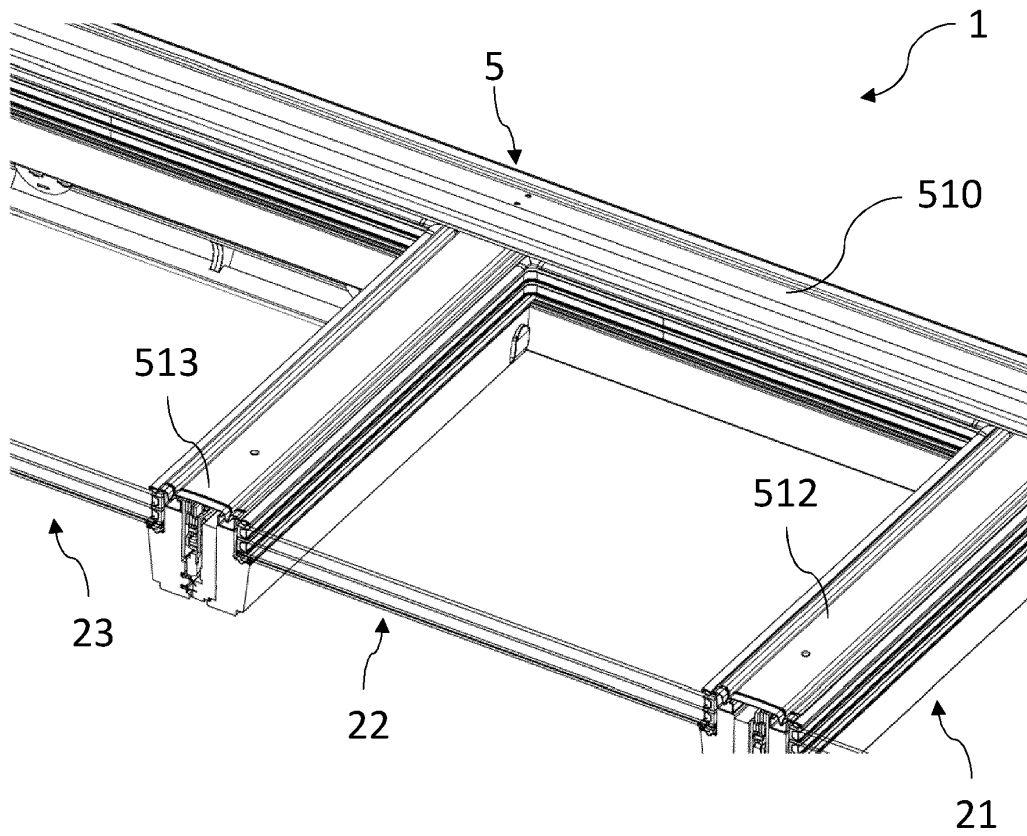


Fig. 12

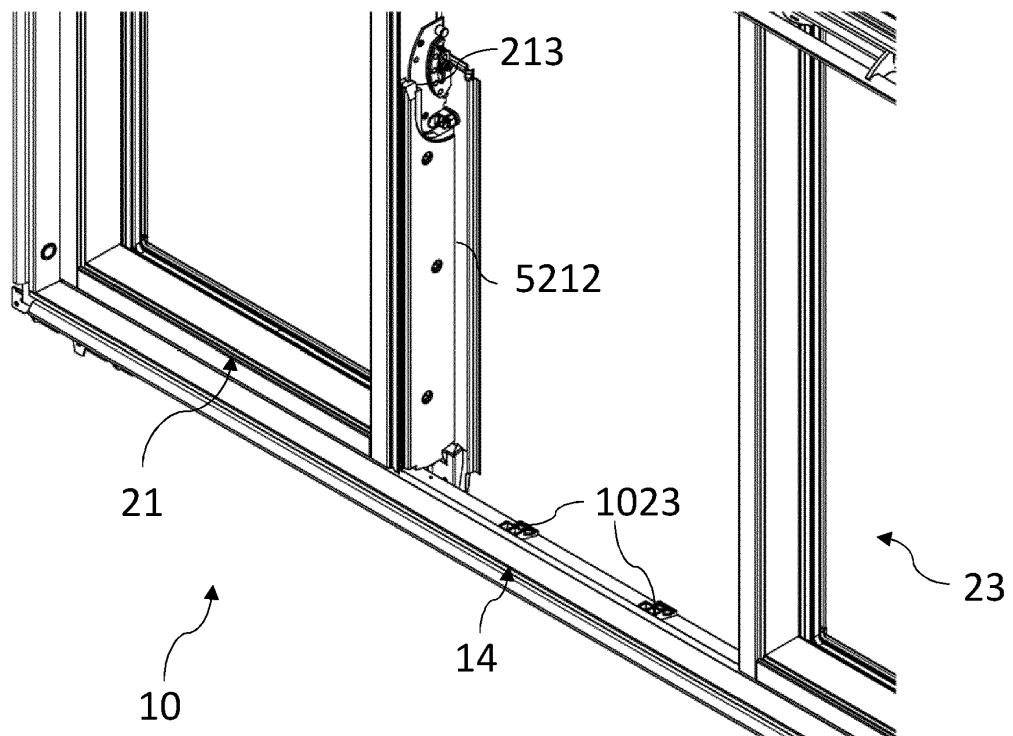


Fig. 13

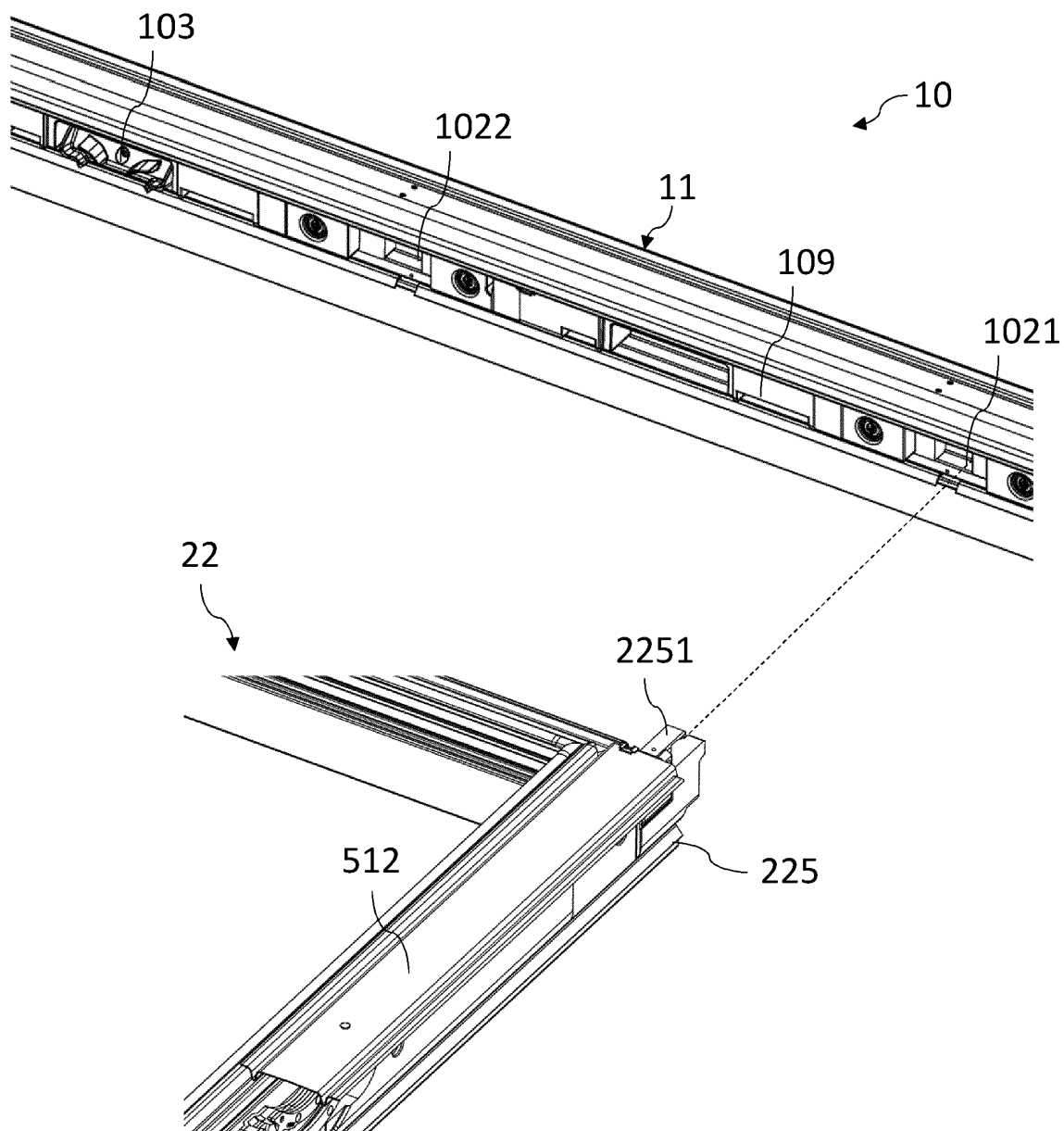


Fig. 14a

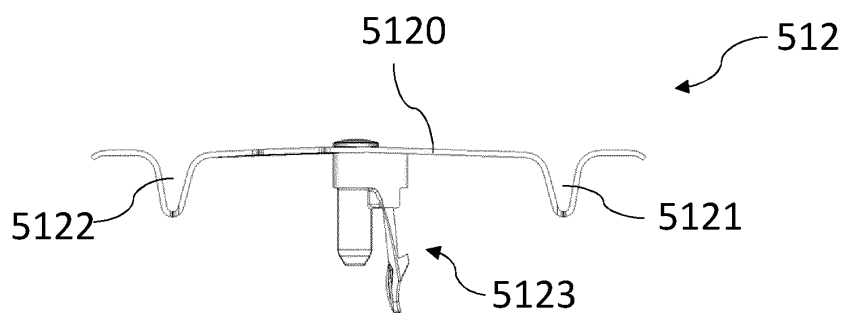


Fig. 14b

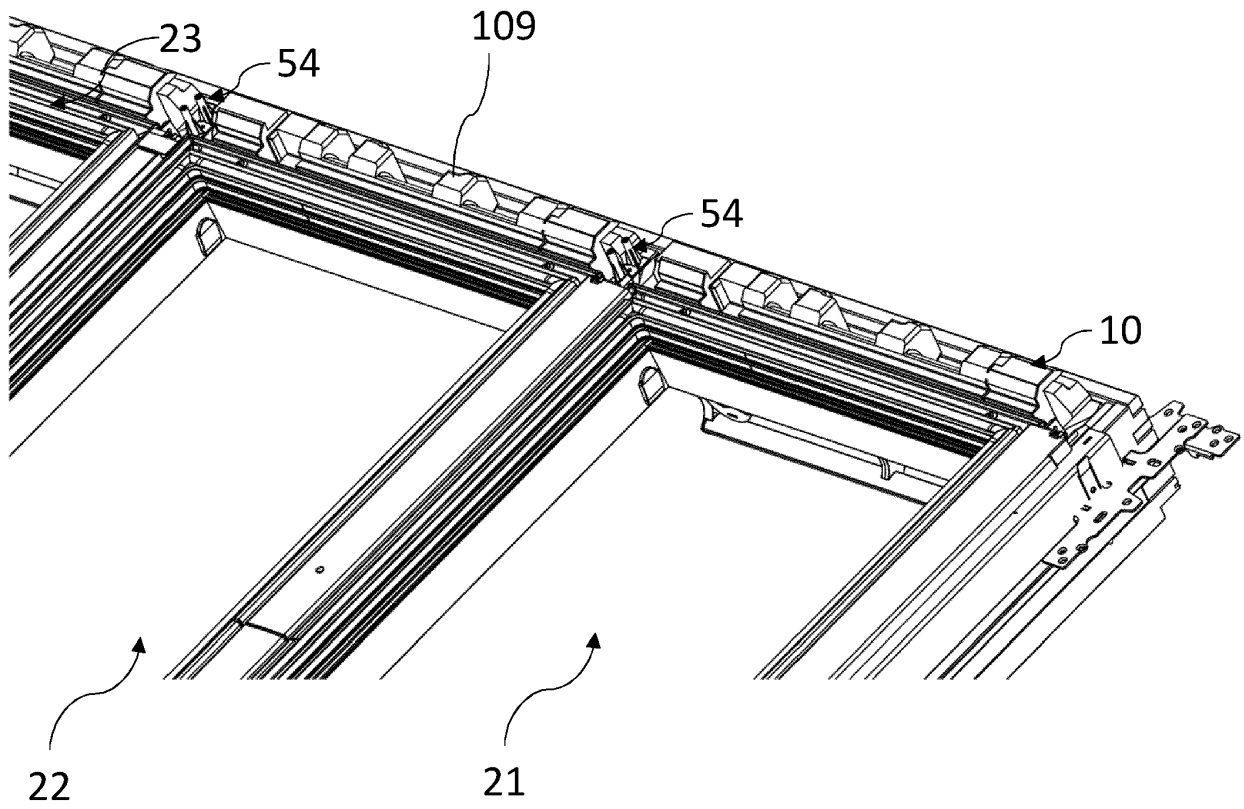


Fig. 15

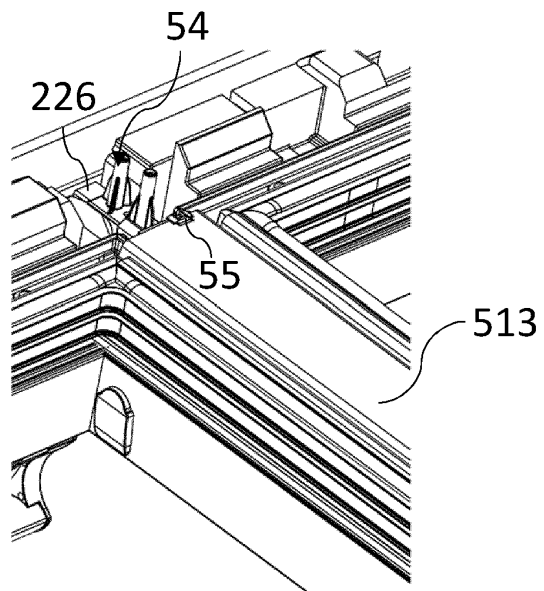


Fig. 16

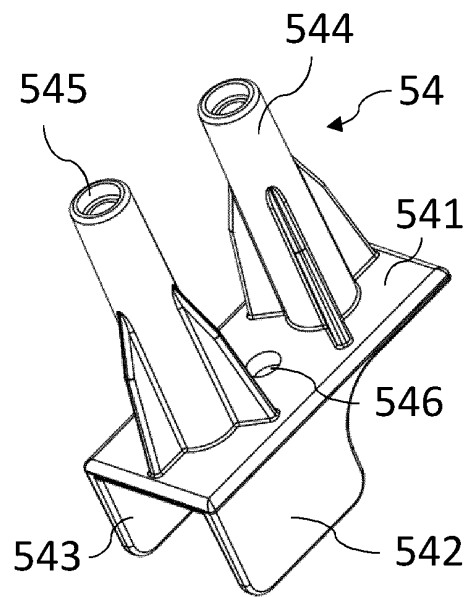


Fig. 17a

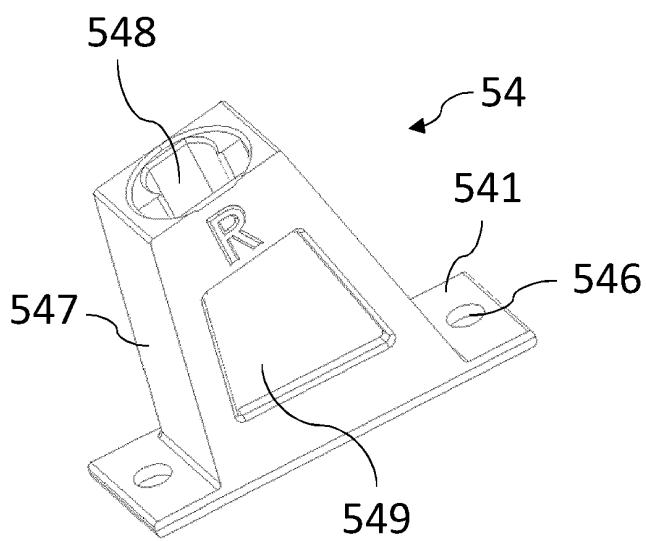


Fig. 17b

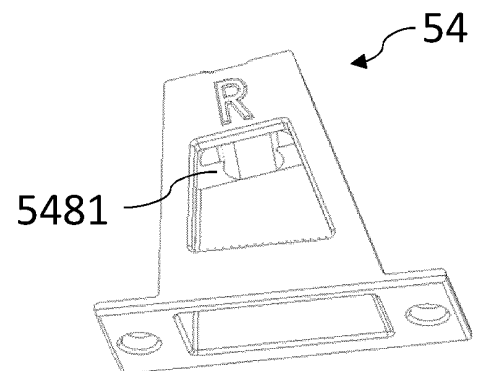


Fig. 17c

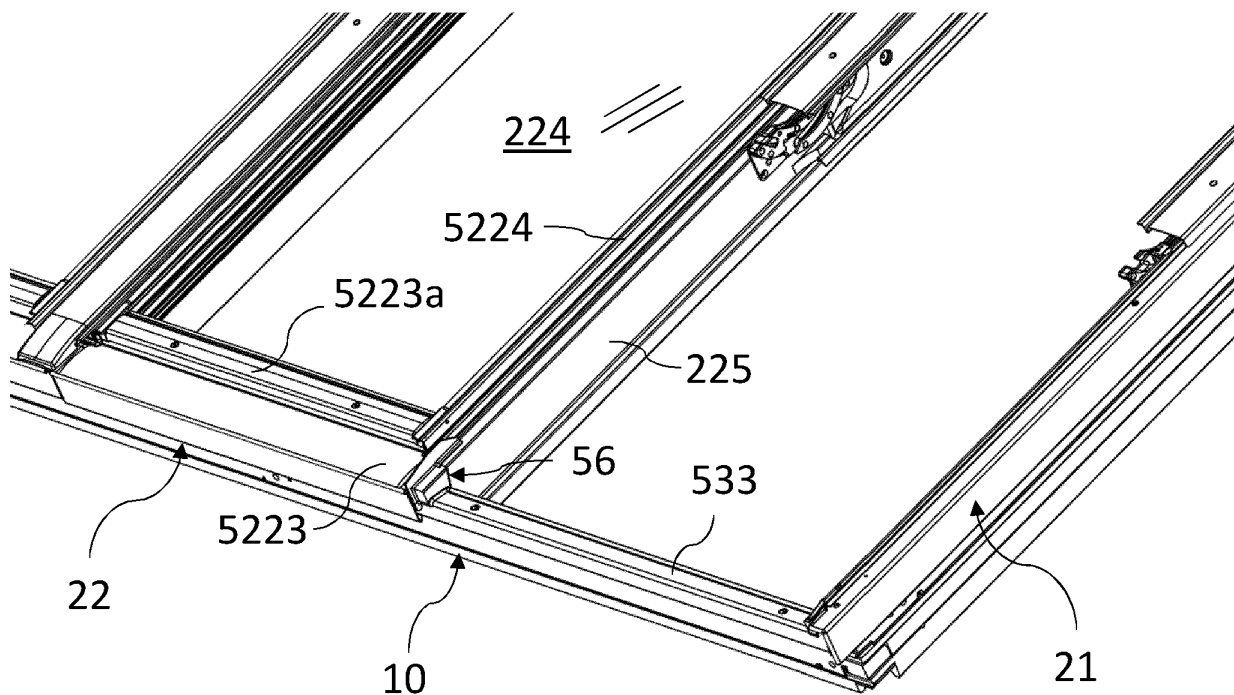


Fig. 18

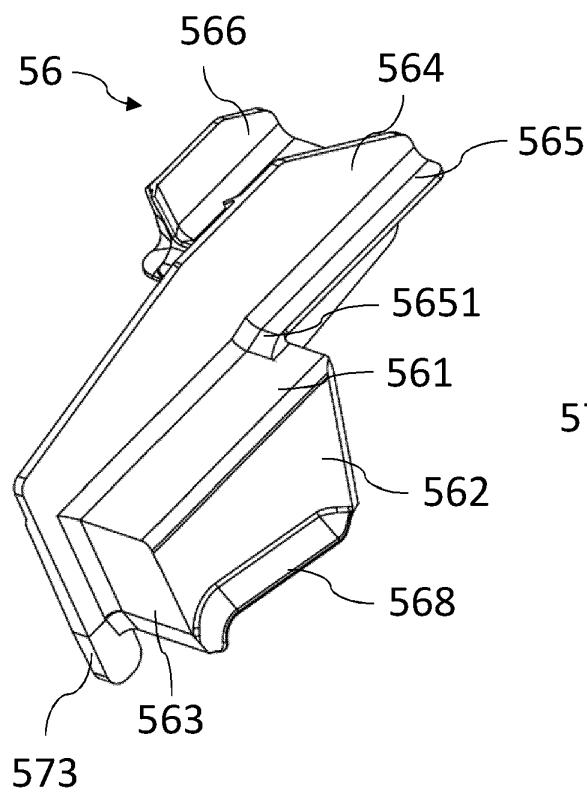


Fig. 19

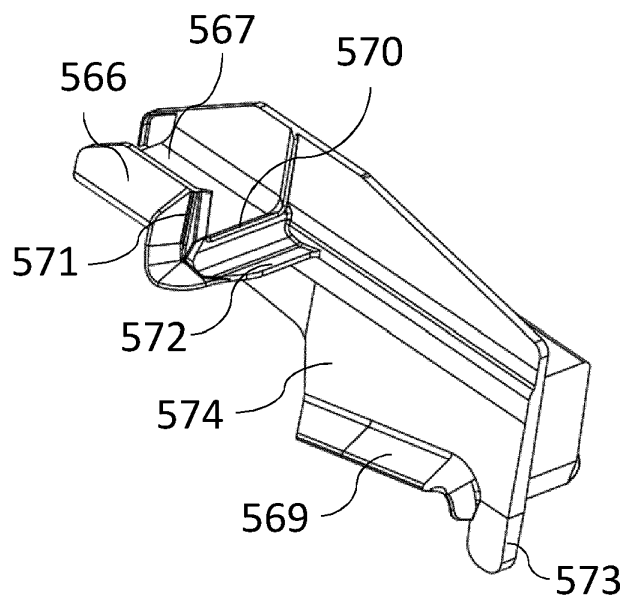


Fig. 20

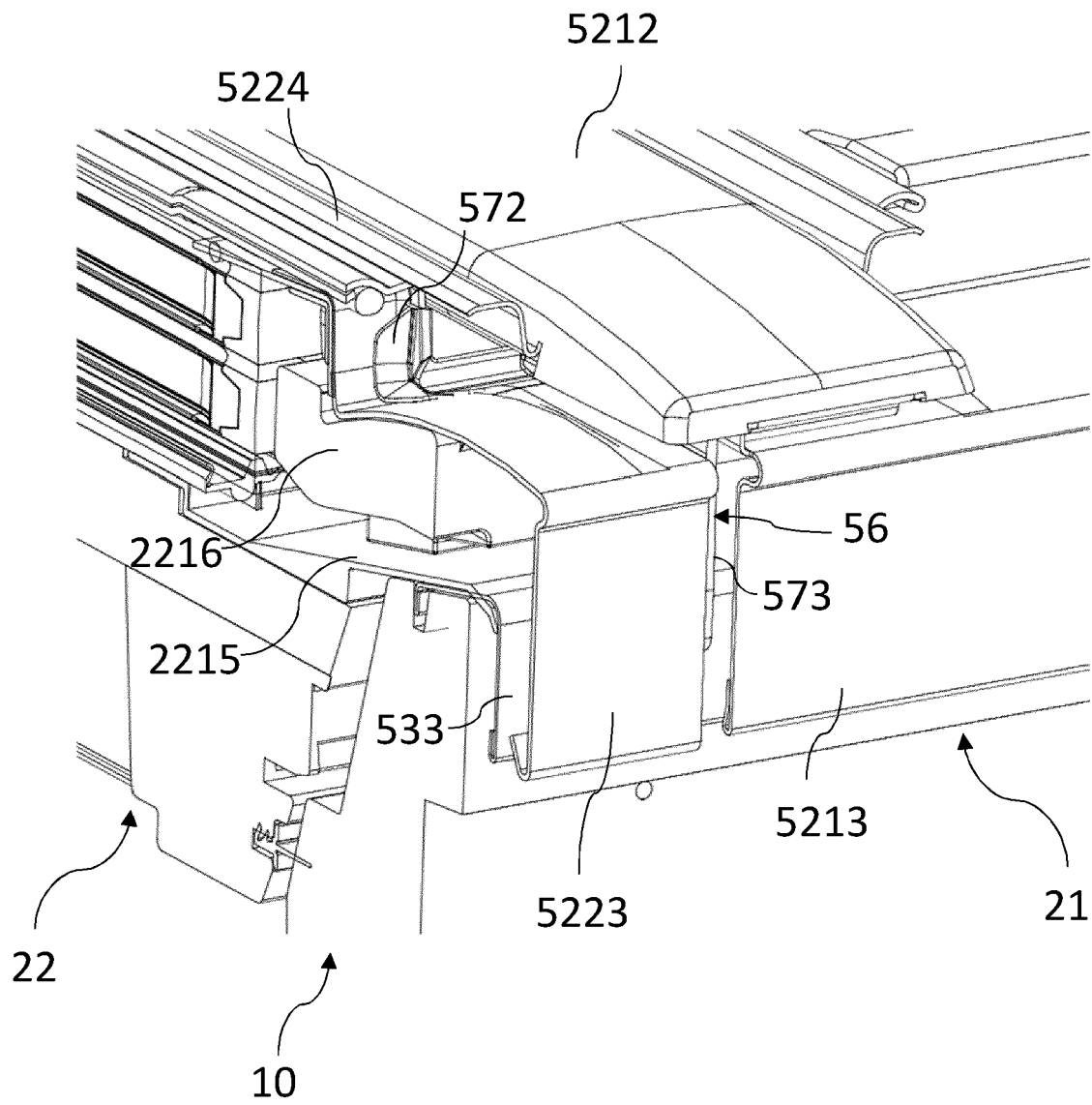


Fig. 21

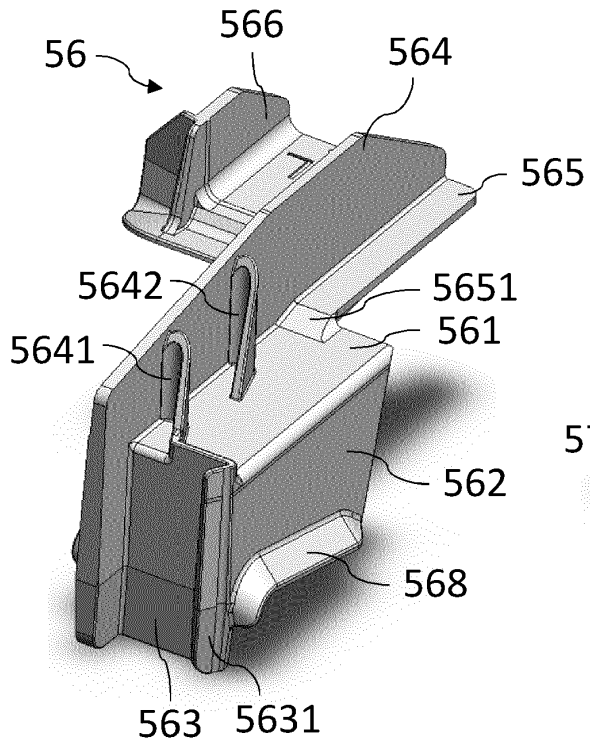


Fig. 22

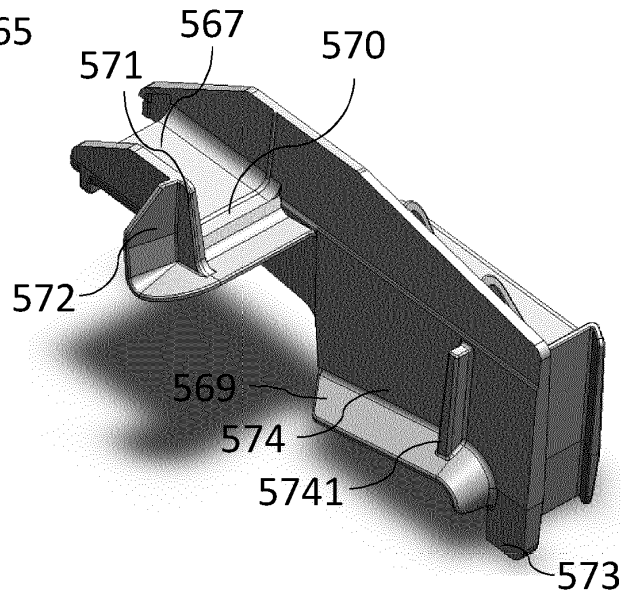


Fig. 23

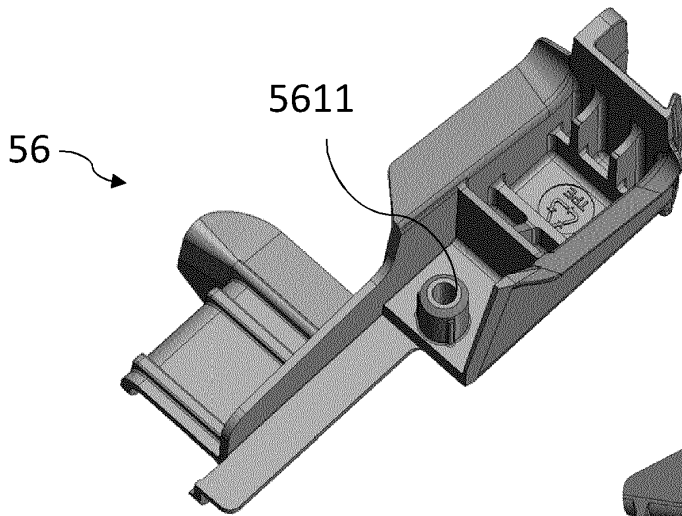


Fig. 24

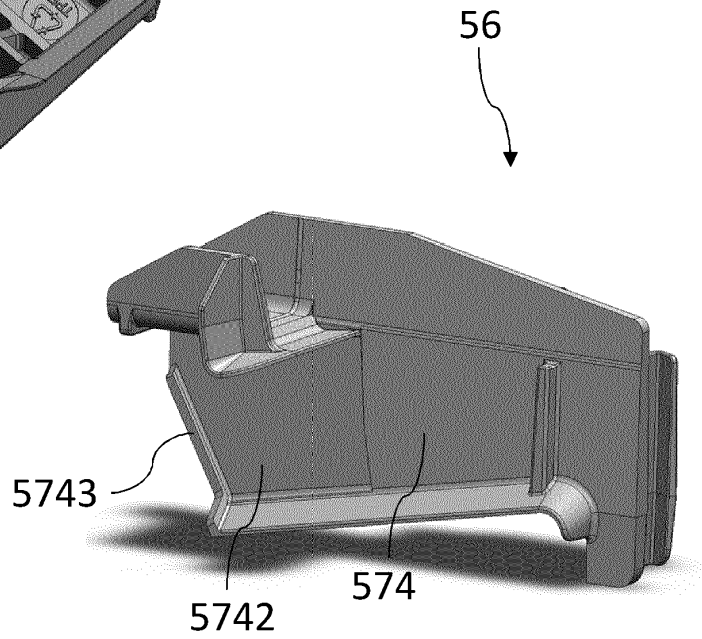


Fig. 25

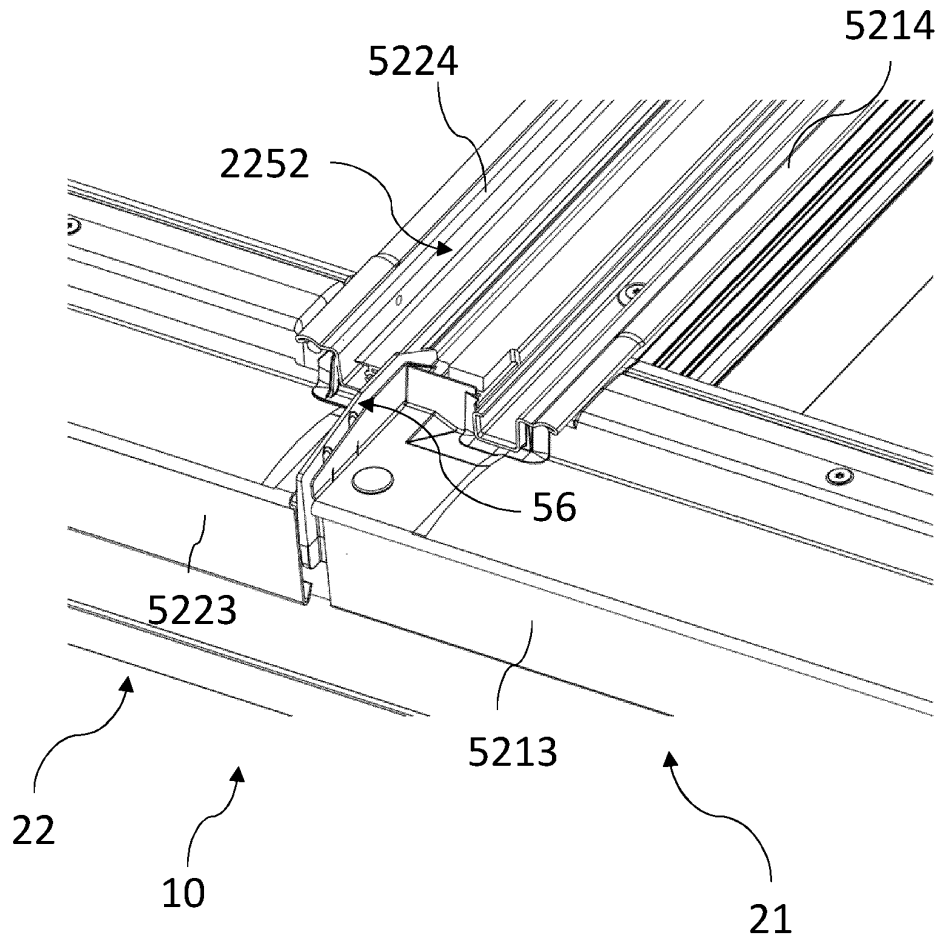


Fig. 26

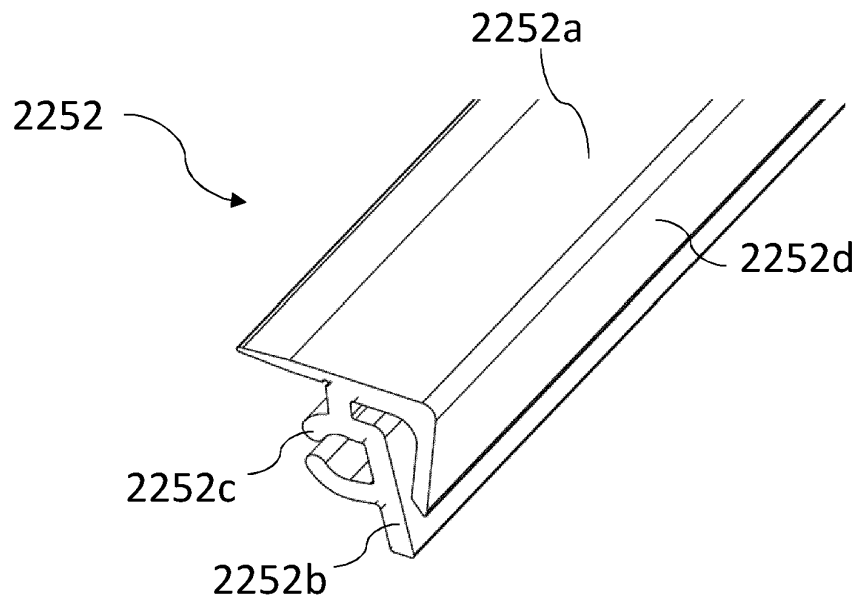


Fig. 27



**REFERENCES CITED IN THE DESCRIPTION**

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