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(54) A DISTANCE KEEPER FOR USE WHEN STACKING ROOF WINDOWS, A STACK OF ROOF WINDOWS, AND A METHOD FOR STACKING ROOF WINDOWS

(57) A distance keeper (3, 3', 3") for use when stacking roof windows (2, 2', 2", 2‴) having an engagement section (31) configured for engaging a frame of a first roof window and a support section (32) configured for supporting a frame (21) of second roof window (2, 2") stacked on top of the first roof window (2, 2'). The support section comprises a projecting part, which is configured for insertion in a groove (23) of the second window frame. For stacking roof windows the following steps are performed: providing a first roof window; arranging a plurality of distance keepers on the frame of the first roof window by bringing the engagement section (31) into engagement with the frame and so that the support section is located vertically above said frame; and arranging a second roof window such that it is supported by the support sections (32) and so that the projecting parts project into a groove (23) of the second roof window.

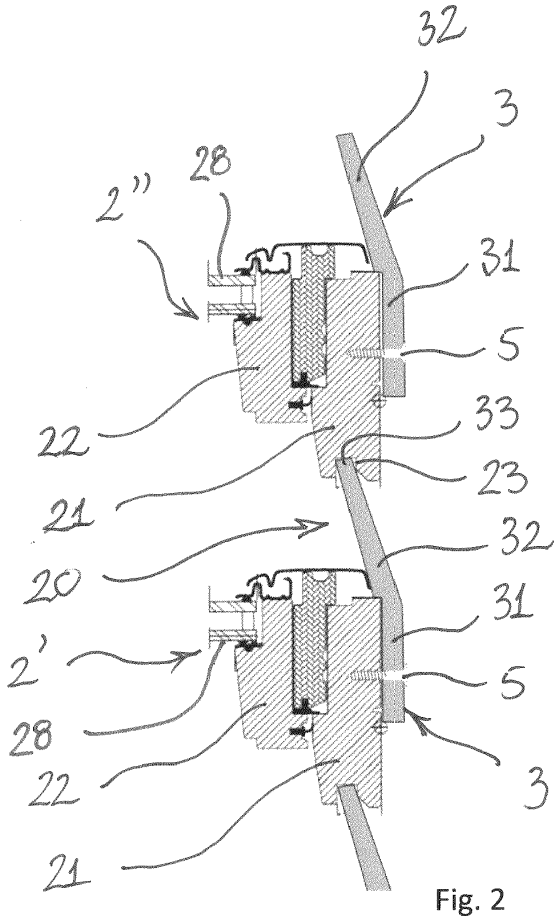

Fig. 2

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Description

Technical Field

[0001] The present invention relates to a distance keeper for use when stacking roof windows, which are not individually packed, for storage or transportation, a stack of roof windows made with such distance keepers, and to a method for stacking roof windows.

Background Art

[0002] While façade windows are typically stored and delivered in an upright position, where they rest on a bottom member of the frame, roof windows are typically provided with covering members sticking out from and sometimes over the perimeter of the roof window, which would easily be damaged if the roof windows were arranged in this way. Roof windows are therefore typically supplied in stacks, where windows are oriented horizontally with one window in arranged on top of another. The roof windows may be separated by blocks of a shock absorbing material, typically expanded polystyrene (EPS). Sheets of plastic, paper, or cardboard may also be arranged between roof windows of the stack to prevent direct contact, which might lead to damage on sensitive parts, such as panes and covering members. This way of stacking is, however, only suitable for stacking a few roof windows as the load affecting particularly the pane of the lowermost roof window of the stack will otherwise become too high. In stacks including many roof windows, the mounting brackets, which are later to be used for attaching the roof windows to a roof structure, are typically attached already at the site of manufacture and can be used for carrying the stacked roof windows. Battens, corner blocks and/or like distance keepers are then arranged along the outer sides of the roof window frames so that they may support the mounting brackets. This, however, results in that the total outer dimensions of the stack of roof windows become considerably larger than when using blocks of a shock absorbing material arranged between the roof windows, and that may be disadvantageous during storage and transportation. Moreover, both ways of stacking require a substantial amount of packaging material to ensure a proper protection of the roof windows and stability of the stack.

Summary of Invention

[0003] With this background, it is an object of the invention to provide a distance keeper for use when stacking roof windows and a method for stacking roof windows, which allow a plurality of windows to be stacked safely on top of each other with a minimal material consumption. A further object is to achieve a stack with minimal outer dimensions in order to take up no more space than necessary.

[0004] In a first aspect of the invention, this and further objects are achieved with a distance keeper having an engagement section configured for engaging a frame of a first roof window and a support section configured for supporting a frame of a second roof window stacked on top of the first roof window, where said engagement section defines a first end of the distance keeper and said support section defines a second end of the distance keeper, a height axis of the distance keeper extending between a first plane defined by the first end and a second plane defined by the second end, said first and second planes being parallel to each other and perpendicular to the height axis, and where the support section comprises a projecting part, which extends along the height axis and which is configured for insertion in a groove of the frame of the second window.

[0005] The groove of the frame of second window may be a lining panel reception groove provided in a face of the frame of a roof window configured for facing towards the interior of a building in the mounted state. When making an opening in a roof structure to accommodate a roof window it will leave an opening surface in the roof structure extending from the exterior side of the roof structure to the interior side of the roof structure, and lining panels are normally used for covering this opening surface. The edge of a lining panel, which is most exterior in the mounted state is inserted in the lining panel reception groove, thereby achieving a precise positioning of the lining panel and avoiding the formation of a gap between the edge of the lining panel and the frame of the roof window.

[0006] Throughout this text "interior" is used to indicate that something is intended to be facing towards the interior of a building in the mounted state, "exterior" is used to indicate that something is intended to be facing towards the exterior in the mounted state, i.e. opposite the interior, "inner" is used to indicate that something is intended to be facing a frame opening delimited by the frame of a roof window, and "outer" is used to indicate that something is intended to be facing away from the frame opening.

[0007] By providing a distance keeper, which is configured for engaging directly with the frame of a roof window and having a support section configured to be inserted in a groove of the second window frame, force can be transmitted directly from one frame to another via the distance keeper. This means that there is no longer a need for having mounting brackets mounted on the frames during storage and transportation of the roof windows, which may reduce the overall size of the stack of roof windows and thus for example allow the use of fewer or smaller trucks for supplying the same amount of roof windows. Furthermore, the panes of the roof windows will no longer need to carry any load and the need for arranging blocks of absorbing material on the pane will thus be reduced or eliminated. This means that the spaces between roof windows of the stack becomes available for accommodating other items, such as insulating elements, which may in itself result in savings on packaging, storage, and transportation. Moreover, the fact that the

support section projects into the groove hinders sideways movement of the second roof window, thus contributing to the stability of the stack.

[0008] The projecting part may be a projection, such as a flange or a pin, but a free edge of a plate-shaped member may also constitute the projecting part. The reference to the projecting part extending along the height axis does not entail that it has to extend in parallel with the height axis, only that it must project in the overall direction of the height axis. An angling of at least one surface of the projecting part in relation to the height axis may even be advantageous as it may help guide the projecting part into the groove when the second roof window is arranged on top of the first roof window.

[0009] In one embodiment at least a part of said support section is off-set in relation to said engagement section along a width axis extending perpendicular to the height axis. This allows the support section to project into the space between the first and second roof windows, while the engagement section is located at an outer side of the frame of the first roof window.

[0010] In one embodiment, the engagement section is plate-shaped having a first major surface and a second major surface, where said first major surface is configured for being attached to an outer side of the frame of the first roof window, said outer side facing away from a frame opening delimited by the frame, and where the second major surface is configured for facing away from the frame of the first roof window.

[0011] The outer side of roof window frame is usually not visible in the mounted state, where the roof window is embedded in a roof structure. Attaching the engagement section to this surface thus does not involve any considerable risk of damaging the appearance of the roof window. Furthermore, the outer side of the frame is typically used for the attachment of mounting brackets and the attachment of the distance keeper will therefore not lead to structural damage either.

[0012] Using a plate-shaped engagement section extending along an outer side of the frame, i.e. in parallel with the height axis of the finished stack of roof windows, means that the presence of the distance keepers will only involve a minimal increase of the overall dimensions of the stack, if any, while having a relatively big contact area with the frame of the first roof window.

[0013] In one embodiment, the projecting part of the support section is a flange extending along a length axis, which is perpendicular to the height axis and the width axis, over substantially the entire length of the distance keeper. When this elongate projecting part is inserted in the groove, it not only allows force to be distributed over the entire length of the distance keeper, but also contributes to the stability of the stack by preventing the distance keeper from turning in relation to the second roof window.

[0014] In another embodiment, the support section comprises two projecting parts, which are spaced apart from each other along a length axis, which is perpendicular to the height axis and the width axis. This provides the same advantages with respect to the stability of the stack as described above but may involve more concentrated loads if the two projecting parts have a smaller total contact area with the roof window. This embodiment may for example be advantageous if wishing to reduce the material consumption for making the distance keeper or to make room for other items.

[0015] In one embodiment, the engagement section comprises a plate member and the support section is made from a profile member attached to the plate member. This allows the distance keeper to be made from standard components, such as plywood and a wooden list, which are interconnected by glue, thereby keeping costs low. The plate member and the profile member may be provided as longer members, which are interconnected and then cut into a plurality of distance keepers, the length possibly depending on the size of the roof windows to be stacked. If making the distance keepers from a polymer, the plate member and the profile member may be made by coextrusion and cut to length.

[0016] The choice of material for the distance keeper may depend on several factors, such as strength, stiffness, and price, but the possibility for reuse and recycling may also be of importance. It is presently considered advantageous to make the distance keeper from wood or wood-based material(s) as these have both a low carbon footprint and a low weight-to-strength ratio. It is, however, also possible to use a combination of different materials to achieve desired characteristics, one example being the combination of a wood-base plate for the engagement section and a metal profile for the support section.

[0017] The dimensions of the distance keeper may depend on several factors, including the choice of material(s) and the needed strength and stiffness, but it must be ensured that the projecting part on the support section can be inserted in the groove. It is presently preferred that the projecting part on the support section has a width measured along the width axis of 20 mm or less, preferably 15 mm or less.

[0018] In one embodiment, the engagement section and/or the support section are provided with inclined guide surfaces. Such surfaces may help guide the second roof window into place by engaging with the frame and deflecting it towards its intended position. Inclined guide surfaces may form a funnel guiding a projection on the frame of the second roof window into a recess in the distance keeper.

[0019] In a second aspect of the invention the above and further objects of the invention are achieved with a stack of roof windows comprising at least two roof windows, each comprising a frame, comprising a plurality of frame members defining a frame opening and frame plane, where a second roof window is arranged on top of a first roof window, where a distance keeper of the type described above engages the frame of the first roof window, where the support section is arranged between the frame of the first roof window and the frame of the

second roof window and supporting the frame of the second roof window, where the projecting part on the support section projects into a groove of the frame of the second roof window, such as a lining panel reception groove, and where the height axis of the distance keeper extends perpendicular to the frame planes. It is to be understood that the height axis of the distance keeper(s) will be parallel to the height axis of the stack.

[0020] By stacking the roof windows in this way, the load of the second roof window and any roof windows stacked on top of it can be transferred to the frame of the first roof window via the distance keepers, and the distance keepers will further provide stability to the stack by preventing the second roof window from moving in relation to the first roof window in a horizontal direction.

[0021] In one embodiment, the distance keeper is attached to an outer side of the frame of the first roof window, said outer side facing away from the frame opening.

[0022] In one embodiment, the frames of the roof windows are rectangular, each comprising a top member, a bottom member, and two side members extending between the top and bottom members, four distance keepers are used, two at each side member of the frame of the first roof window. This provides for a combination of strength and stability of the stack with a minimal material consumption for the distance keepers. It is presently considered advantageous that the distance keepers are arranged at a distance from the top and bottom members of the frame constituting approximately 10-25% of the total length of the side members of the frame.

[0023] If using distance keepers having a length constituting 50% or more of the length the frame member of the first window on which they are to be arranged, it may be sufficient to use two distance keepers, one on each side of the first roof window or one at the top and one at the bottom of the first roof window.

[0024] In case of very large roof windows, it may be advantageous or even necessary to provide additional distance keepers at the side members of the frame of the first roof window and/or at the top and bottom members of the frame, the optimal positioning depending on the dimensions of the roof windows. It may also be advantageous or necessary to provide additional distance keepers if the distance keepers are made from relatively weak material or with a weak structure, thus distributing loads over a higher number of distance keepers each carrying a smaller load.

[0025] If the stack includes a high number of roof windows, or if the roof windows are particularly heavy, for example due to being provided with three- or four-layer panes, it may be advantageous or even necessary to provide additional and/or stronger distance keepers at the lower tiers of the stack, where the accumulated loads are the highest.

[0026] A stack of roof windows including roof windows of different sizes is within the scope of the invention and it may then be necessary to adapt the positioning of the distance keepers to provide optimal support for all roof windows. As an example, a pair of smaller roof windows having substantially the same length as the width of a larger roof window may be arranged on top of the larger roof window so that their top and bottom frame members extend above and along the side members of the frame of the larger roof window. Distance keepers arranged at the side members of the frame of the larger roof window will then be inserted in the grooves in the top and bottom members of the frames of the smaller roof windows.

[0027] In a third aspect of the invention the above and further objects of the invention are achieved with a method for stacking roof windows each comprising a frame, said frame comprising a plurality of frame members defining a frame opening and each having an outer side facing away from a frame opening, said method resulting in the formation of a stack of roof windows and comprising the steps of:

providing a first roof window,

arranging a plurality of distance keepers on the frame of the first roof window by bringing an engagement section of each distance keeper into engagement with the frame and so that a support section of each distance keeper is located vertically above said frame, and

arranging a second roof window on top of the first roof window such that it rests on and is supported by the support sections of the distance keepers and so that projecting parts on the support sections project into at least one groove of the frame of the second roof window.

[0028] Several advantages of stacking roof windows in this way have been described above with reference to the first and second aspect of the invention, and it is to be understood that advantages and embodiments described with reference to one aspect of the invention also apply to the other aspects of the invention unless otherwise stated.

[0029] During the stacking of the roof windows, the projecting parts on the support sections may further contribute to a safe stacking of the roof windows by ensuring that the roof windows are properly aligned. If this is not the case, at least one of the projecting parts will not be inserted in the groove, possibly resulting in the second roof window not being level, and it being visible that the second roof window has not been arranged correctly.

[0030] In one embodiment, each distance keeper is attached to the frame of the first roof by means of screws, nails, staples or like fasteners.

[0031] In one embodiment, the distance keeper is provided with one or more corner flaps configured for be folded around a corner of the frame of the first and/or second roof window where a side member of the frame meets the top or bottom member of the frame. Such a corner flap may protect the corner, contribute to positioning of the distance keeper, and/or contribute to stability of the stack.

[0032] The method may further comprise adding at least one of:

a batten extending across the stack of roof windows, said batten extending from a distance keeper on one side of the stack to a distance keeper on an opposite side of the stack,
a brace having a first end attached at a first point of attachment to one roof window of the stack or to a distance keeper and a second end attached at a second point of attachment to another roof window of the stack or to another distance keeper, said first and second points of attachment being located at a distance from each other along a frame plane and at a distance from each other along the height axis,
a top cover covering the top of the stack of roof windows,
a bottom cover arranged underneath the first roof window,
a side cover arranged to cover the side of the stack of roof windows,
a corner protection member extending over the height of the stack along the height axis,
a strap extending over or around the stack of roof windows,
a wrapping extending around the stack of roof windows, and
a cushioning arranged to protect at least one roof window of the stack.

[0033] A batten may contribute to the stability of the stack and may be used for supporting roof window related products arranged on top of the stack. Such roof window related products may for example be insulating material or flashing assemblies, possibly contained in cardboard boxes. Distance keepers supporting a batten may be a different configuration than the other distance keepers of a stack of roof windows, for example extending higher above the roof window to which they are attached to prevent the batten from contacting the roof window.

[0034] A brace may stabilize the stack by providing resistance to torsion and possibly also to displacement along the height axis, longitudinal axis and/or width axis, thereby potentially reducing the loads on the distance keepers during handling and transportation of the stack of roof windows.

[0035] A top cover may protect the roof windows from precipitation, dust etc. and from contact with other items.

[0036] A bottom cover may protect the roof windows moisture and dirt, and if the stack is built on a pallet or the like, the bottom cover may serve to prevent direct contact between the lowermost roof window of the stack and a pallet, thus potentially preventing abrasive damage.

[0037] A side cover may protect the side of the stack of roof windows, protecting the roof windows from damage and hindering that dirt enters between the roof windows of the stack. If the roof windows are provided with mounting brackets, the mounting brackets may be protected by the side cover and prevented from damaging other items arranged adjacent to the stack of roof windows.

[0038] A strap preferably extends substantially along the height axis on both sides of the stack and across the top of the stack, but it may also be inclined with respect to the height axis. It is also possible to use two or more staps each extending from the uppermost roof window of the stack to the lowermost roof window of the stack, or between distance keepers, or from a pallet or the like on which the stack is built to a roof window or to a distance keeper. A strap may also extend all the way around the stack, possible passing underneath or through a pallet on which the stack is built. A strap may stabilize the stack by keeping roof windows and distance keepers in tight contact with each other, and possibly also keeping the stack in tight contact with a pallet supporting the stack.

[0039] A wrapping may stabilize the stack in substantially the same way as a strap. It provides a more general and less local fixation and provides a protection of the roof windows from dirt and, depending on the material used for the wrapping, possibly also from precipitation.

[0040] A strap or a wrapping may also serve to fixate other items to the stack.

[0041] A cushioning may be used for protection of the roof windows by preventing impact damage and/or by keeping a strap or the like in place, thereby preventing abrasive damage. As an example, when using straps, a cushioning may be provided on each of the uppermost distance keepers so that the straps may pass over these cushionings and be prevented from damaging the edges of the frame of the uppermost roof window of covering members on the frame. As another example, cushioning may be provided on top of the uppermost roof window and/or underneath the lowermost roof window of the stack to prevent direct contact with other items.

[0042] A corner protection member extending over the height of the stack at corners of the frame of the roof window where frame members meet may stabilize and/or protected the stack. Corner protection members may also be used for covering mounting brackets. Corner protection members may be kept in place by means of staps, wrapping or an adhesive.

[0043] In one embodiment, a groove or a visual indication in/on the distance keeper is aligned with a groove or a visual indication in/on the frame of the first roof window when arranging a distance keeper on the frame of the first roof window. In this way, correct positioning of the distance keeper on the frame may be ensured. The grooves may be grooves serving other purposes, such as positioning or guiding fasteners used for attachment of the distance keeper or attachment of mounting brackets to the frame of the roof window. A visual indication may be a line or other pattern printed, painted, or embossed on the distance keeper and/or the frame of the roof window, but may also be a joint between materials, such as a joint between a strip of insulating material in-

tegrated in the frame of the roof window and the remaining parts of the frame. It is also possible to align for example the lowermost edge of the distance keeper with a groove or a visual indication in/on the frame, thereby achieving a similar effect.

[0044] Depending on the material used for the distance keepers and their strength, the distance keepers may be either discarded together with other packing material, preferably for recycling, or they may be reused several times. The likelihood of the distance keepers actually being returned should be taken into consideration when contemplating the use of highly durable and/or expensive materials, whereas distance keepers made from wood, wood-based, or paper-based materials will have a low climate footprint even if not reused.

Brief Description of Drawings

[0045] In the following description, embodiments of the invention will be described with reference to the schematic drawings, in which

Fig. 1 is a perspective view of a stack of roof windows;
Fig. 2 is a cross-sectional view in a stack of roof windows showing only one side of the stack,
Figs 3-10 are cross-sectional views corresponding substantially to Fig. 2 but showing other embodiments,
Figs 11-14 are perspective views of stacks of roof windows,
Fig. 15 is a cross-sectional view corresponding substantially to Fig. 2 but showing also an insulating element,
Fig. 16 is a perspective view of a stack of roof windows with pre-mounted underroof collars, and
Fig. 17 is a photo of mounting brackets attached to a distance keeper,
Fig. 18 corresponds to Fig. 13 but with additional items,
Fig. 19 is a perspective view of a stack of roof windows,
Fig. 20 is a perspective view of a pallet with a bottom cover and three bottom distance keepers,
Fig. 21 shows a cross-section of the bottom distance keepers in Fig. 20,
Fig. 22 is a perspective view of a stack of roof windows with side covers,
Fig. 23 shows the detail marked XXIII in Fig. 22 without the side cover,
Fig. 24-25 are perspective views of the distance keeper used in Fig. 17,
Fig. 26-27 are perspective views of another embodiment of the distance keeper,
Fig. 28 is a cross-sectional view corresponding substantially to Fig. 2 but showing another embodiment,
Fig. 29-30 are perspective views of the distance keeper used in Fig. 28,
Fig. 31-33 are cross-sectional views corresponding substantially to Fig. 2 but showing other embodiments, and
Fig. 34-35 are perspective views of the distance keeper used in Fig. 33.

Description of Embodiments

[0046] Referring initially to Fig. 1, a stack 1 of six roof windows 2 stacked using distance keepers 3 is shown. Each roof window is shown as a box, but it is to be understood that this is only for illustration purposes as the details of the construction of the roof window is not of consequence to the present invention. At the bottom of each window another box 4 illustrates that associated components, such as insulating elements, covering members or a box containing smaller parts, such as mounting brackets, can be arranged in or project into the spaces between the roof windows.

[0047] Fig. 2 shows a cross-section corresponding to the one indicated by the line II-II in Fig. 1, but where the uppermost window of the stack and the top members of the frame 21 and sash 22 of the windows have been left out.

[0048] As may be seen, each distance keeper 3 is plate-shaped and has an angled shape with an engagement section 31 engaging an outer side of the frame 21 of a first roof window 2' and a support section 32 projecting into the space 20 between the frame of the first roof window 2' and the frame of the second roof window 2". The engagement section 31 is attached to an outer side of the frame 21 of the first roof window 2' by means of screws 5 (only one of which are visible for each distance keeper in Fig. 2), and the distal edge 33 of the support section 32 projects into a lining panel reception groove 23 of the frame 21 of the second roof window 2". The support section 32 supports the second roof window 2" by transferring the load of the second roof window and any items arranged on it to the frame 21 of the first roof window 2'.

[0049] The distance keepers 3 in Fig. 2 can for example be made of polymer or metal by extrusion or moulding.

[0050] Alternative embodiments of the distance keeper 3 are shown in Figs 3-10, where Figs 5-9 show embodiments configured for use at side members 211 of the frames of roof window, and Fig 10 shows an embodiment configured for use at top members 212 of the frames. In these figures as well as in the following, the same reference numbers will be used as in Figs 1 and 2 for items having substantially the same function, even if they are not structurally identical.

[0051] The distance keeper shown in Fig. 3 has the same overall shape as those in Fig. 2 but is composes of two plate-members, which have been interconnected, one plate member 31' constituting the engagement section and the other 32' constituting the support section. This distance keeper can for example be made of plywood or fibreboard.

[0052] Fig. 3 further shows a first plane F1 defined by

the distal end of the engagement section and a second plane F2 defined by the distal end of the support section, both planes being parallel to the planes defined by the frames of the roof windows of the stack. The height axis H extends between these planes and is shown common to all of Figs 3-8.

[0053] Fig. 4 shows a structurally different embodiment, where the engagement section 31 comprises two engagement parts 34, 35 configured for engagement with the first roof window 2'. The first engagement part 34 engages with an exterior surface 24 of the frame 21 of the first roof window 2' and the second engagement part 35 engages with a glazing profile 25 on the sash 22 of the first roof window 2'. In this embodiment the support section 32 extends over the entire length of the distance keeper thus forming a flange.

[0054] The engagement section 31 does not project over the outer dimensions of the roof window frames 21 and thus this distance keeper does not influence on the overall width and depth of the stack.

[0055] If made from a polymer or metal, this distance keeper may for example be made by extrusion or moulding. If made from wood or a wood-based material, it may for example be made by milling. It is also possible to make this distance keeper from a paper-based material such as multilayer corrugated cardboard.

[0056] The embodiments in Figs 5-8 all comprise a plate member 31' constituting the engagement section and a profile member 32' attached to the plate member constituting the support section.

[0057] In Figs 5, 7, and 8 the profile member 32' is of a massive cross-section, made for example by a wooden list attached to the plate member 31' by glue, and is shaped so that it matches the inner shape of the lining panel reception groove 23. This provides a good contact with the frame 21 of the second window 2" and thus adds stability to the stack. Furthermore, it may facilitate stacking.

[0058] In Fig. 6, the profile member 32' is a metal profile having three legs. A first leg 32a is attached to the plate member and a second leg 32b projects into the lining panel reception groove 23, thus serving the same function as the profile members in Figs 5, 7, and 8. The third leg 32c provides additional engagement with the frame of the first roof window 2' by engaging with an exterior surface 24 of the frame 21 and hooking into a recess 26, thereby hindering a mutual displacement of the windows in the width direction W and adding stability to the stack.

[0059] Figs 7 and 8 show two distance keepers arranged above each other. In Fig. 7 the plate members 31 constituting the engagement sections are dimensioned to provide a good engagement with the frame 21 of the first roof window 2' and overlap the frame 21 of the second roof window 2" thereby providing a stabilisation of the stack in the width direction W. A gap 30 between the engagement sections 31 of the two distance keepers makes room for example for straps (not shown) used to fixate the stack or for insulating members (not shown) attached to the frames. In Fig. 8, the plate member 31' is higher than in the other figures, its height hd in the direction of the height axis H corresponding to the sum of the height hf of the frame of a roof window and the distance d between the roof windows. This means that distance keepers 3 arranged above each other in the stack will abut on each other, which may add to the stability of the stack.

[0060] Turning now to Figs 9 and 10 showing two distance keepers 3 made from a laminated material, such as plywood or multilayer corrugated cardboard, the one in Fig. 9 corresponding in structure to the one in Figs 5 and 7.

[0061] These distances keepers 3 may be made from a block of material by milling, for example starting from a plywood board. This, however, results in a lot of waste as the removed material does not find many practical uses. It may therefore be advantageous to cut each layer from a sheet of material and to join them into the desired shape of the distance keeper 3. To build the distance keeper in Fig. 9 this would require one large piece constituting the layer 36a, two medium size pieces constituting the layers 36b, 36c, and two smaller pieces constituting the layers 36d, 36e. To build the distance keeper 3 in Fig. 10, which is configured for use between top members 212 of the frames, four medium size pieces constituting the layers 36f, 36g, 36h, 36i, and three small pieces constituting the layers 36j, 36k, 361 would be required. Pieces 36g, 36h, 36i are of the same size and shape as pieces 36b, 36c and it is contemplated that all distance keepers 3 could potentially be made from standard pieces, which are combined in different ways to achieve the desired geometry of each distance keeper.

[0062] To achieve the desired strength and stiffness of the distance keepers, different layers may be made from different material, or pieces of a non-homogenous material may be arranged in different orientations in different layers.

[0063] As is seen in Fig. 10 the distance keepers 3 are sized so that the space 20 between the roof windows accommodates the handlebar 27. In traditional individual packaging of centre-hung roof windows with a handlebar of the type shown in Fig. 10, the handlebar 27 is arranged in a transport position, where it extends towards the pane 28 of the roof window so that it takes up less space and is protected from damage. This could also be done here, but it is presently considered advantageous not to have to move the handle into and out of the transport position and, as described above, the space between the roof windows of the stack can be used for accommodating other items, such as insulating elements.

[0064] A stack 1 of two windows 2 stacked using the distance keepers in Figs 5 and 10 is shown in Fig. 11. As may be seen the distance keepers 3' arranged at the side members 211 of the frames 21 of the windows 2', 2" are of a limited length along the length axis L, while the distance keepers 3" arranged that the top members 212 of the frames extend along the entire length of the

top members. The outermost layer 36f of the distance keeper 3" is provided with corner flaps 37 (only one of which is visible), which is configured for being bend around the corner of the roof window and attached to a side member 211 of a frame to protect the corner, to stabilize the stack, and/or to help keep the distance keeper 3" in place. The remaining layers 36g-36l may all extend over the entire length of the top members 212 of the frames, or one or more of them may be shorter. It is for example possible to provide layers 36j, 36k, 361 only locally so that one or more local projections engaging with the lining panel reception groove 23 is provided, while layers 36g, 36h, 36i are providing continuous support over the entire length of the top members 212.

[0065] A stack 1 of two windows stacked using the distance keepers in Figs 9 and 10 is shown in Fig. 12. The distance keeper 3" is arranged such that the top members 212 of the frames extend along the entire length of the top members and has corner flaps 37 as described with reference to Fig. 11. The distance keeper 3' arranged at the side members 211 of the frames 21 here has a length along the length axis L corresponding to approximately 80% of the length of the side members, leaving a section free at each corner. The free section makes room for the corner flaps 37, but it would also be possible to attach the corner flaps to the outer surface of the distance keeper 3'. Such free sections may also facilitate handling of the stack. As described with reference to Fig. 11 the support section of the distance keeper 3' or parts of it may be provided only locally.

[0066] Stacks 1 of roof windows 2 of different dimensions are shown in Figs 13-14, the lower roof windows of these stacks being larger than roof windows arranged on top of them.

[0067] In Fig. 13 the two larger windows are stacked using three distance keepers 3 at each side, while only two distance keepers are used at each side for carrying the smaller windows, the method of stacking thus being substantially as described above with reference to the other figures.

[0068] In Fig. 14 battens 6 have been arranged on the distance keepers 3 attached to the lowermost roof window 2', spanning from one side of the roof window to the other, and these battens support the next window 2‴ of the stack. Additional means, such as straps or brackets (not shown), will be needed to keep the two uppermost windows in place on the battens. The battens are preferably provided with recesses or grooves (not shown) matching the geometry of the support sections of the distance keepers 3 and may then be kept in place on the distance keepers solely by gravity and the weight of the roof windows arranged on top of them. The space 60 available on top of the battens next to the smaller windows may be used for accessories to the roof windows, such as flashing kit or insulation.

[0069] Fig. 18 shows a stack 1 of roof windows 2 similar to that in Fig. 13, only with mounting brackets 9 provided on each roof window.

[0070] Battens 6 have been provided as described with reference to Fig. 14, only extending over the uppermost roof window of the stack. In this case boxes 83 containing flashing assemblies for use when installing the roof windows in a roof have been arranged on top of the battens 6.

[0071] Straps 72 are attached to the lowermost roof window of the stack 1 and extend up along the side of the stack, passing over the distance keepers 3 and the battens 6 and down along the opposite side of the stack back down to the lowermost roof window of the stack. In this way, the straps 72 keep the roof windows 2 in tight engagement with the distance keepers and keep the battens in place.

[0072] Another embodiment is shown in Fig. 19, where the stack 1 of roof windows is arranged on a pallet 71, and where the straps 72 extend from the pallet. In this case the straps extend through openings in the pallet, thus strapping the stack 1 of roof windows and the pallet 71 to each other, but the straps could also be attached to the pallet in the same way as to the lowermost roof window in Fig. 18.

[0073] The stack 1 of roof windows in Fig. 19 is further provided with braces 73 extending diagonally across each side of the stack 1 of the roof windows and being attached to at least the uppermost and the lowermost roof window of the stack, for example by means of screws. The braces provide stability to the stack.

[0074] Still further the stack 1 in Fig. 19 is provided with a top cover 74 and a bottom cover 75 that is provided between the stack and the pallet 71. The top and bottom covers are made from cardboard and protect the roof windows during handling, transportation, and storage of the stack. The top cover particularly protects the stack from dirt and precipitation, and the bottom cover particularly protects the lowermost roof window of the stack from abrasive damage.

[0075] Another of supplementary means for reducing the risk of abrasive damage to the lowermost roof window of the stack is to provide bottom distance keepers 76 on the pallet 71 or on the bottom cover 75 as shown in Fig. 20. In this embodiment the bottom distance keepers 76 have the cross-sectional shape shown in Fig. 21 with an engagement section 761 used for engagement with the pallet and a support section 762 configured for projecting into a groove of the frame of the lowermost roof window of the stack as described with reference to the support section 32 of the distance keepers 3 above. If the bottom distance keepers are attached to the pallet, for example by means of nails or screws, they may also contribute to keeping the stack 1 in place on the pallet 71. Depending on the height of the bottom distance keepers 76 the space between the lowermost window and the pallet can be used for accommodating other items, such as insulating elements, and room may be provided for a handlebar of the lowermost roof window as described with reference to Fig. 10.

[0076] Fig. 22 shows another embodiment of a stack 1 of roof windows, where side covers 77 are arranged to

cover the sides of the stack, thereby protecting the mounting brackets 9 (no visible in Fig. 20). The side covers are kept in place by straps 72, which may replace or supplement the straps 72 shown in Figs 18-19.

[0077] As shown in Fig. 23, showing the detail marked XXIII in Fig. 22, only without the side cover, a cushioning 78, here in the form of a block of a paper-based honeycomb material, may be provided between the uppermost distance keeper 3 and the strap 72. In this way the strap is kept at a distance from the roof window, thus preventing it from damaging the roof window.

[0078] In Fig. 22 and 23, the distance keepers 3 used are of the type shown in Figs 2-3, allowing insulating elements 81 to be attached to the window frames 21 as also shown in cross-section in Fig. 15. The insulating elements 81 may be attached to the frames either before or after stacking. This allows the insulating elements to be pre-mounted on the roof window at delivery, reducing the risk of them being forgotten during mounting of the roof windows in a roof structure, and the insulating elements may also contribute to protecting the roof windows during handling, storage and transportation. Similar advantages may be achieved by pre-mounting other items, such as the rolled-up underroof collars 82 shown in Fig. 16, which may for example be embodied as described in the applicant's co-pending European patent application no. EP21164312.7.

[0079] The cushioning 78 in Fig. 23 also protects the insulating elements 81 by keeping the straps at a distance from them but, depending on the material used for the insulating elements, it would also be possible to use them for protection of the roof window(s), the insulating elements thus also serving as cushioning.

[0080] The distance keepers themselves may also be used for carrying accessories to the roof window, one example being shown in Fig. 17, where mounting brackets 9 are attached to a distance keeper 3 of the type shown in Fig. 3 made from plywood. When the mounting brackets are to be used, the screw 91 is simply removed.

[0081] A distance keeper of the same overall design as the distance keeper used in Fig. 3 is shown in Fig. 24-25, the only difference being that the distance keeper in Fig. 24-25 is provided with an inclined guide surface 321, the function of which will be described below with reference to Fig. 28-30.

[0082] All of the distance keepers in Fig. 3, 17 and 24-25 have a groove 312 extending along the length axis L, and as seen in Fig. 17 the screw 91 used for attaching the distance keeper to the frame 21 of the roof window is inserted into this groove. The groove 312 serves as an indication where to insert the screw or a like fastener, and due to its longitudinal extent it may receive any desired number of fasteners. As also seen in Fig. 3 and 17, the groove 312 in the distance keeper 3 is aligned with a groove 213 in the frame 21 of the roof window, said groove being configured for attachment of mounting brackets 9 as seen in Fig. 10 and Fig. 19. Both grooves 312, 213 may serve to guide the fastener 5 during insertion, and as seen in Fig. 17 the alignment may serve as a visual indication that the distance keeper 3 is in the intended position relative to the frame 21 of the roof window.

[0083] While the distance keepers 3 shown in Fig. 3, 17 and 24-25 are particularly suited for being made from one or more wood-based materials, a structurally similar distance keeper 3 suitable for being made from metal or polymer, for example by moulding or drawing, is shown in Fig. 26-27. As may be seen, the overall shape of the distance keepers in Fig. 24-25 and Fig. 26-27 is the same, but the distance keeper in Fig. 26-27 consists of a shell, and the groove 312 has been replaced with three holes 313 for receiving screws or like fasteners. The hollow shell-shape of the distance keeper 3 in Fig. 26-27 means that the material consumption is kept at a minimum, but it requires the use of a relatively strong material, which may not be easily penetrated by a screw or like fastener, hence the holes 313.

[0084] Further embodiments of the distance keeper 3 are shown in Figs 28-35.

[0085] In Fig. 28-30 a distance keeper 3 bearing strong resemblance to those in Fig. 5 and Fig. 7 is shown. The differences lies in that the plate member serving as engagement section 31 extends slightly higher above the profile member serving as support section 32, thus providing stability to the stack, and in that the plate member and the profile member are provided with inclined guide surfaces 311, 321, which may help guide the frame 21 of the roof window into position. Other features of the distance keeper are described with reference to Fig. 5 and 7.

[0086] The distance keepers 3 in Fig. 31 and 32 are made from a sheet material, such as stainless steel bent into shape or a polymer shaped by extrusion. The distance keeper in Fig. 31 functions substantially as those in Fig. 2 and Fig. 3, being attached to the outer side of the frame 21 of the roof window, whereas the distance keeper in Fig. 32 has a concave engagement section 31 configured for riding on a projecting section 214 of the frame 21 of the first roof window 2'. The distance keeper in Fig. 32 can thus only be used with roof windows where the frames have a shape allowing their frames to engage with the concave engagement section, whereas the distance keeper in Fig. 31 can be used with a wider range of roof windows, only requiring that they have a groove suitable for receiving the support section 32.

[0087] The distance keeper 3 in Fig. 33-35 is made from stainless steel by bending, but could in principle also be made from another metal or from a polymer by moulding. As seen in Fig. 33 this embodiment resembles that in Fig. 6, except for the second leg 32b and the third leg 32c having slightly different shapes and being formed by flanges bent out from the body forming the engagement section 31 instead of from a separate profile member. In the embodiment shown in Fig. 33-35 the flange forming the second leg 32b is bent downwards and the flange forming the third leg 32c is bent upwards, i.e. to-

wards each other, but the flange forming the third leg 32c could also have been formed by an upwards bend.

List of reference numerals

[0088]

1	Stack
2	Roof window
2'	First roof window
2"	Second roof window
2‴	Roof window
20	Space
21	Frame
211	Frame Side member
212	Frame Top member
213	Groove
214	Projecting section
215	Frame bottom member
22	Sash
23	Lining panel reception groove
24	Exterior surface
25	Glazing profile
26	Recess
27	Handle bar
28	Pane
3	Distance keeper
3'	Distance keeper
3"	Distance keeper
30	Space
31	Engagement section
31'	Plate member
311	Guide surface
312	Groove
313	Hole
32	Support section
32'	Profile member
32a-c	Leg of profile member
321	Guide surface
33	Distal edge
34	First engagement part
35	Second engagement part
36a-l	Layer of distance keeper
37	Corner flap
4	Associated components
5	Screw
6	Batten
60	Space
71	Pallet
72	Strap
73	Brace
74	Top cover
75	Bottom cover
76	Bottom distance keeper
77	Side cover
78	Cushioning
81	Insulating element
82	Underroof collar
83	Box containing flashing assembly
9	Mounting brackets
91	Screw
H	Height axis
W	Width axis
L	Length axis
hd	Height of distance keeper
hf	Height of frame
F1	First plane
F2	Second plane

Claims

1. A distance keeper (3, 3', 3") for use when stacking roof windows (2, 2', 2", 2"'), said distance keeper having an engagement section (31) configured for engaging a frame (21) of a first roof window (2, 2') and a support section (32) configured for supporting a frame (21) of a second roof window (2, 2") stacked on top of the first roof window (2'), where said engagement section defines a first end of the distance keeper and said support section defines a second end of the distance keeper, a height axis (H) of the distance keeper extending between a first plane (F1) defined by the first end and a second plane (F2) defined by the second end, said first and second planes being parallel to each other and perpendicular to the height axis, and where the support section (32) comprises a projecting part, which extends along the height axis (H) and which is configured for insertion in a groove (23) of the frame (21) of the second window (2, 2").

2. A distance keeper (3, 3', 3") according to claim 1, where at least a part of said support section (32) is off-set in relation to said engagement section (31) along a width axis (W) extending perpendicular to the height axis (H).

3. A distance keeper (3, 3', 3") according to one or more of the preceding claims, where the engagement section (31) is plate-shaped having a first major surface and a second major surface, where said first major surface is configured for being attached to an outer side of the frame (21) of the first roof window (2, 2'), said outer side facing away from a frame opening delimited by the frame (21), and where the second major surface is configured for facing away from the frame (21) of the first roof window (2, 2').

4. A distance keeper (3, 3', 3") according to one or more of the preceding claims, where the projecting part of the support section (32) is a flange extending along a length axis (L), which is perpendicular to the height axis (H) and the width axis (W), over substantially the entire length of the distance keeper.

5. A distance keeper (3, 3', 3") according to one or more of the preceding claims, where the support section (32) comprises two projecting parts, which are spaced apart along a length axis (L), which is perpendicular to the height axis (H) and the width axis (W).

6. A distance keeper (3, 3', 3") according to one or more of the preceding claims, where the engagement section (31) comprises a plate member and where the support section (32) is made from a profile member attached to the plate member.

7. A distance keeper (3, 3', 3") according to one or more of the preceding claims, where the engagement section (31) and/or the support section (32) are provided with inclined guide surfaces (311, 321).

8. A distance keeper (3, 3', 3") according to one or more of the preceding claims, wherein the distance keeper is made from wood-based material(s).

9. A stack (1) of roof windows (2, 2', 2", 2"') comprising at least two roof windows each comprising a frame (21) comprising a plurality of frame members defining a frame opening and frame plane, where a second roof window (2, 2") is arranged on top of a first roof window (2, 2') so that their frame planes extend in parallel to each other, where a distance keeper (3, 3', 3") according to one or more of the preceding claims engages the frame (21) of the first roof window (2, 2'), where the support section (32) is arranged between the frame (21) of the first roof window (2, 2') and the frame (21) of the second roof window (2, 2") and supporting the frame of second roof window, where the projecting part on the support section (32) projects into a groove (23) of the frame of the second roof window (2, 2"), and where the height axis (H) of the distance keeper extends perpendicular to the frame planes.

10. A stack (1) of roof windows (2, 2', 2", 2"') according to claim 9, where the distance keeper is attached to an outer side of the frame (21) of the first roof window (2, 2'), said outer side facing away from the frame opening.

11. A stack (1) of roof windows (2, 2', 2", 2‴) according to claim 9 or 10, where the frames (21) of the roof windows are rectangular, each comprising a top member (212), a bottom member (215), and two side members (211) extending between the top and bottom members, and where four distance keepers are used, two at each side member of the frame (21) of the first roof window (2, 2').

12. A method for stacking roof windows (2, 2', 2", 2‴) each comprising a frame (21), said frame comprising a plurality of frame members defining a frame opening and each having an outer side facing away from a frame opening, said method resulting in the formation of a stack (1) of roof windows and comprising the steps of:

providing a first roof window (2, 2'),
arranging a plurality of distance keepers (3, 3', 3") on the frame (21) of the first roof window (2, 2') by bringing an engagement section (31) of each distance keeper into engagement with the frame and so that a support section (32) of each distance keeper is located vertically above said frame, and
arranging a second roof window (2, 2") on top of the first roof window (2, 2') such that it rests on and is supported by the support sections (32) of the distance keepers and so that projecting parts on the support sections project into a groove (23) of the frame of the second roof window.

13. A method according to claim 12 further comprising adding at least one of:

a batten (6) extending across the stack (1) of roof windows (2, 2', 2", 2"'), said batten extending from a distance keeper (3, 3', 3") on one side of the stack (1) to a distance keeper on an opposite side of the stack,
a brace (73) having a first end attached at a first point of attachment to one roof window of the stack or to a distance keeper and a second end attached at a second point of attachment to another roof window of the stack or to another distance keeper, said first and second points of attachment being located at a distance from each other along a frame plane and at a distance from each other along the height axis (H),
a top cover (74) covering the top of the stack of roof windows,
a bottom cover (75) arranged underneath the first roof window,
a side cover (77) arranged to cover the side of the stack of roof windows,
a corner protection member extending over the height of the stack along the height axis (H),
a strap (72) extending over or around the stack of roof windows,
a wrapping extending around the stack of roof windows, and
a cushioning (78) arranged to protect at least one roof window of the stack.

14. A method according to claim 12 or 13 where, when arranging a distance keeper (3, 3', 3") on the frame (21) of the first roof window (2, 2'), a groove (312) or a visual indication in/on the distance keeper is

aligned with a groove (213) or a visual indication in/on the frame.

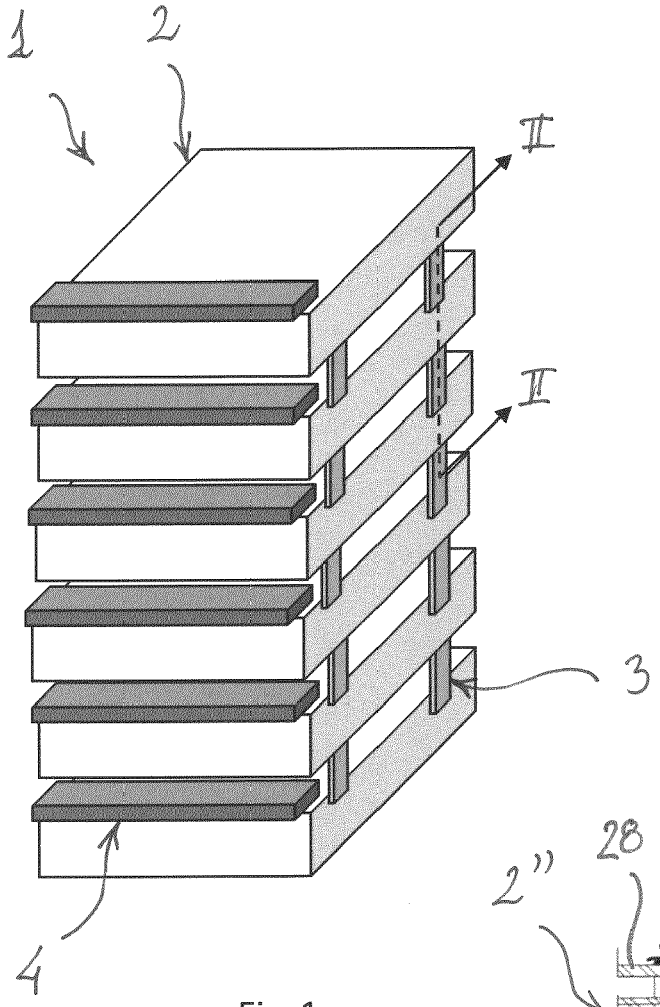

Fig. 1

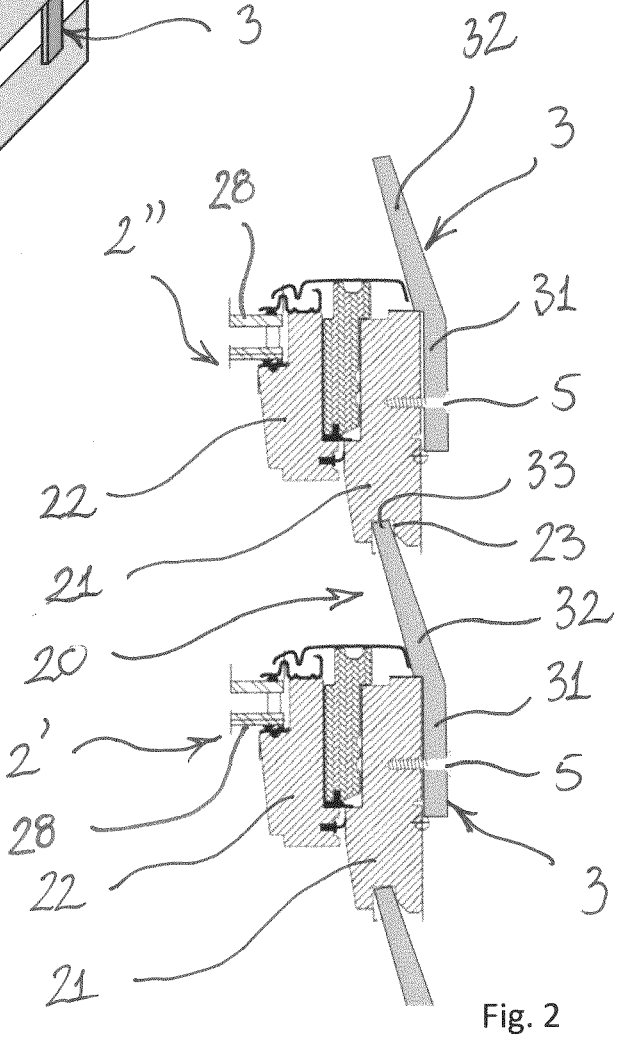

Fig. 2

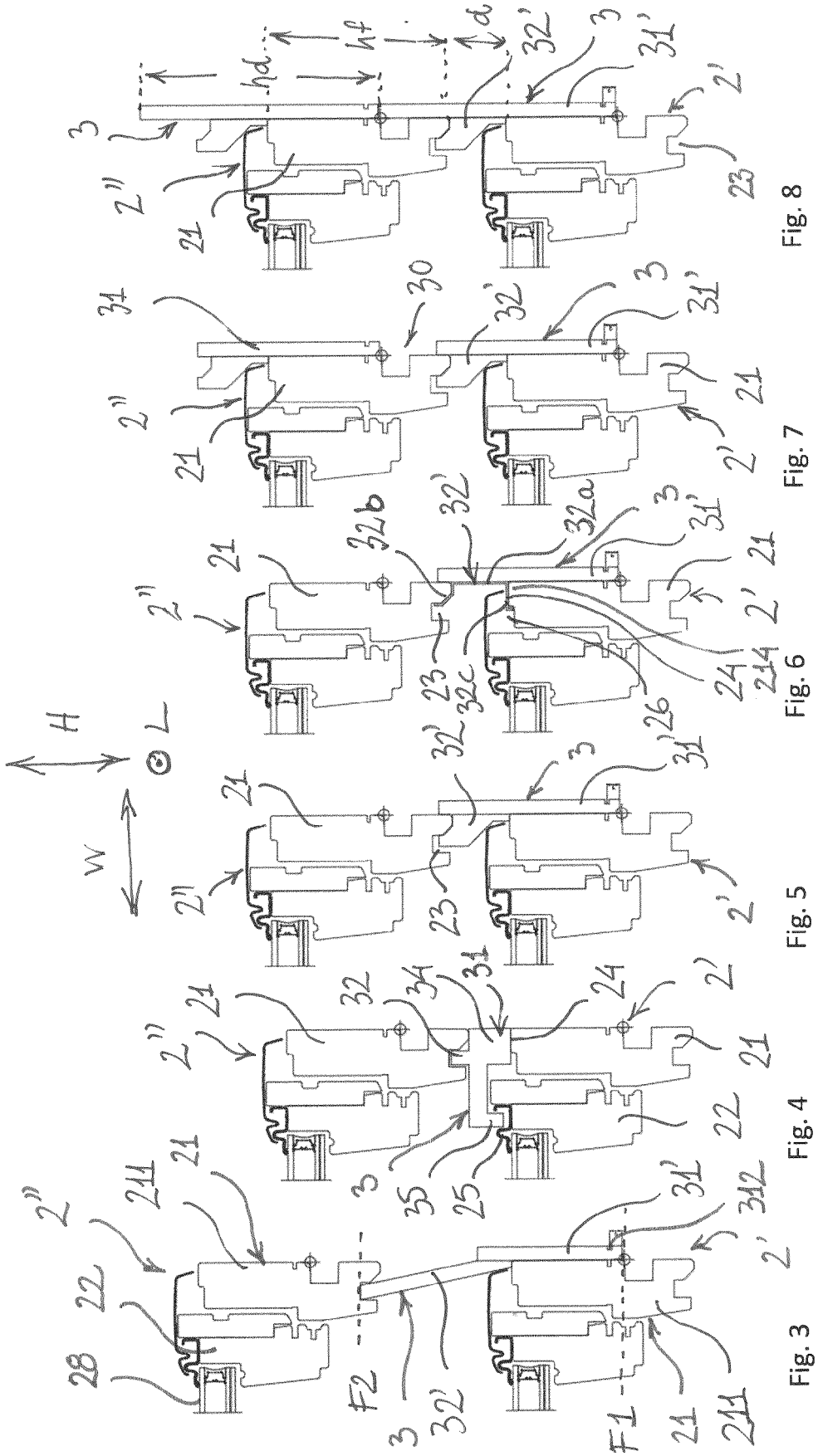

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

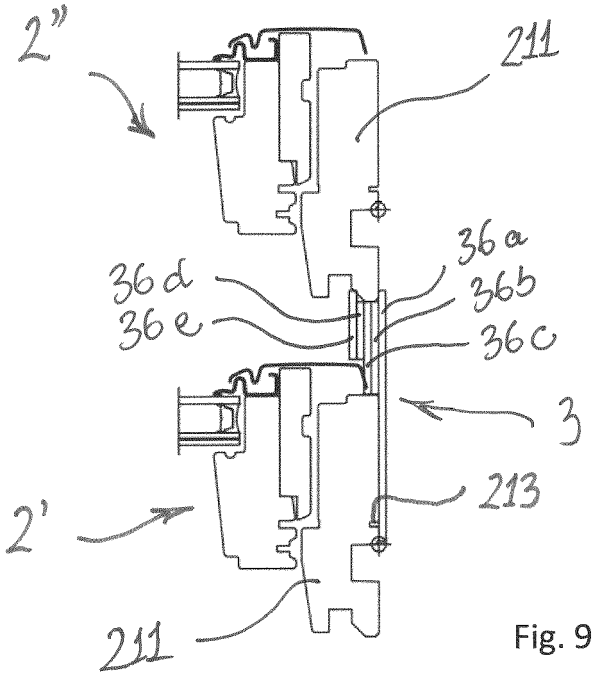
2"
211
36a
36d
36b
36e
36c
3
213
2'
211

Fig. 9

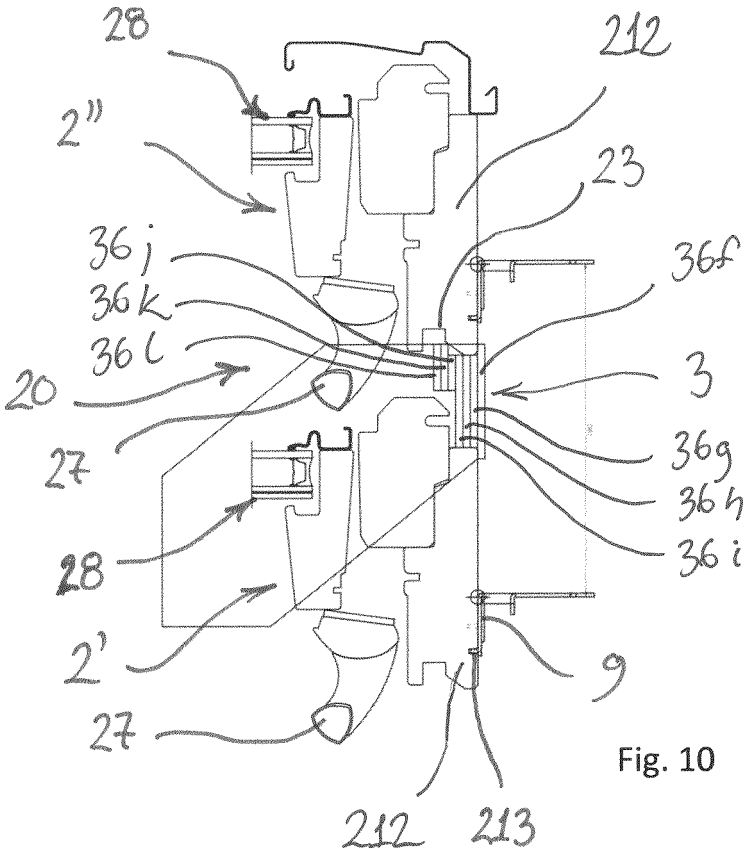
28
212
2"
23
36j
36f
36k
36l
20
3
27
36g
36h
28
36i
2'
9
27
212
213

Fig. 10

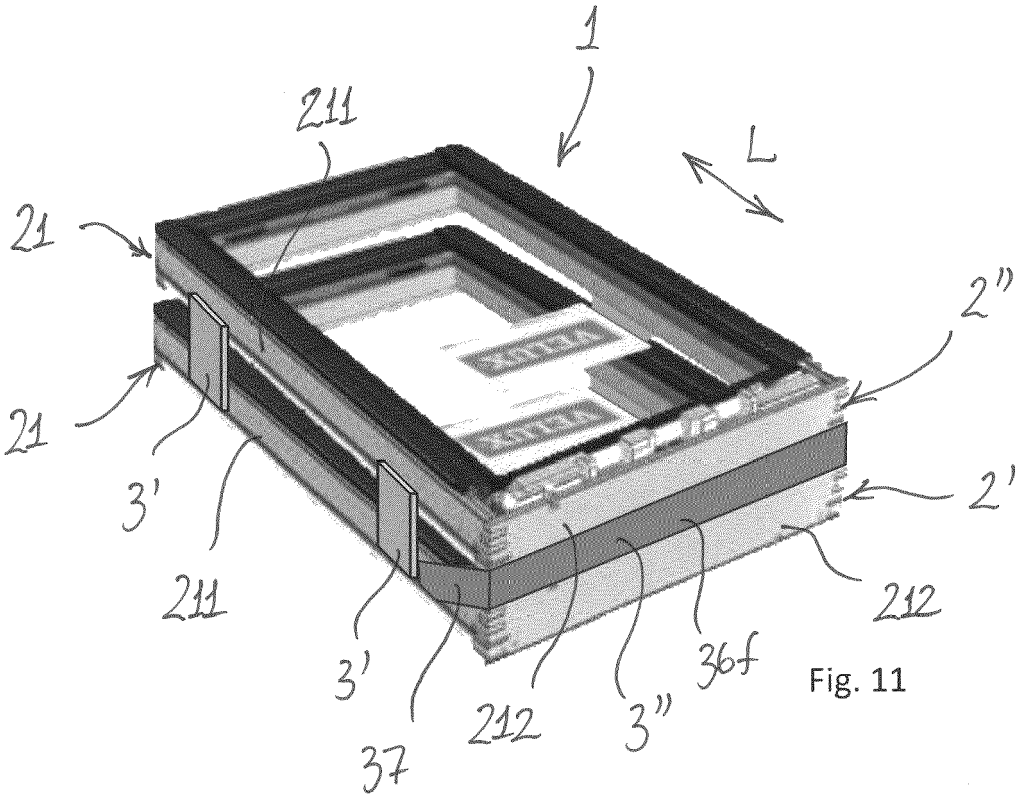
1
211
L
21
2"
21
2'
3'
211
212
3'
36f
212
3"
37

Fig. 11

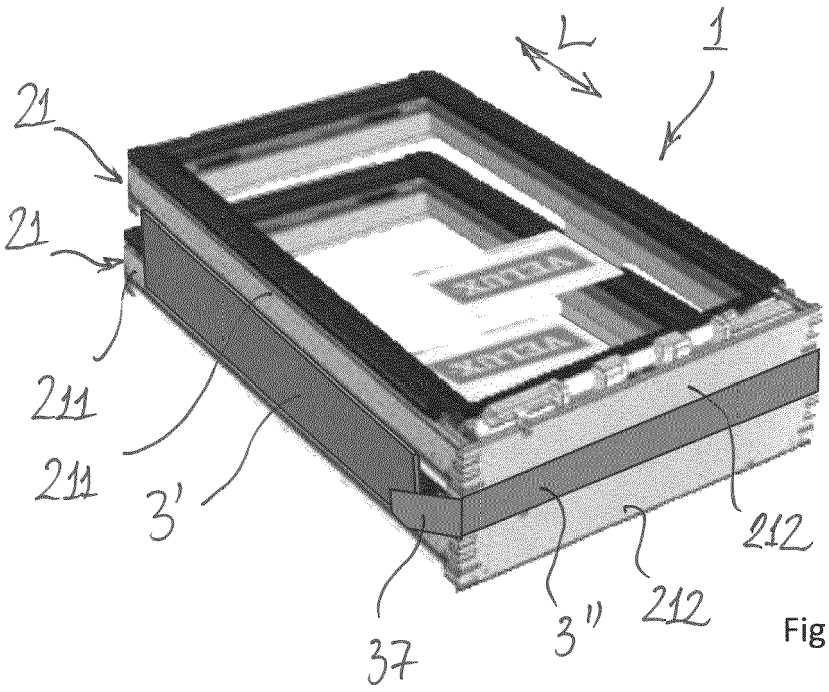
L
1
21
21
211
211
3'
212
212
3"
37

Fig. 12

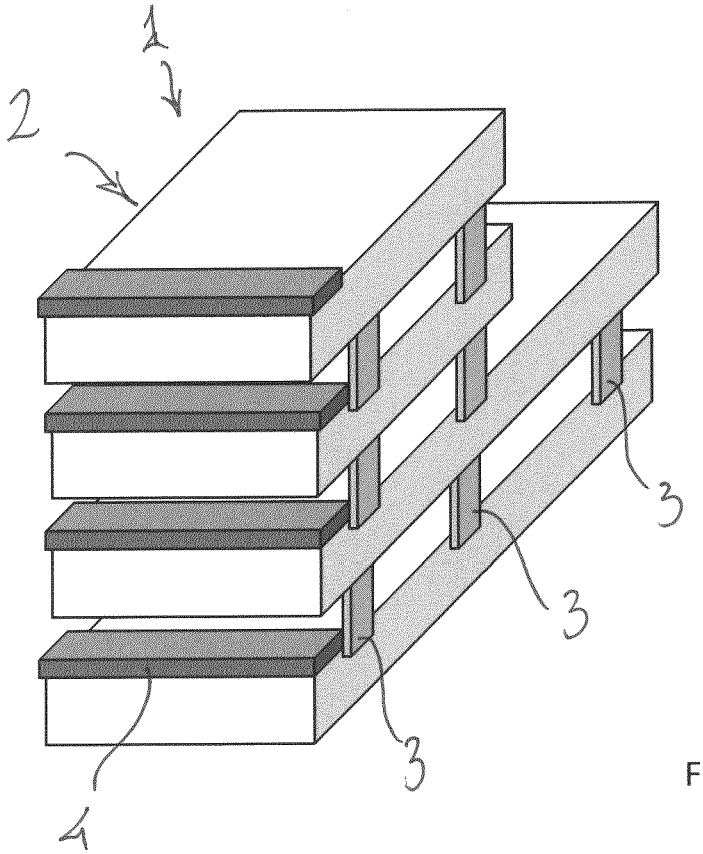

Fig. 13

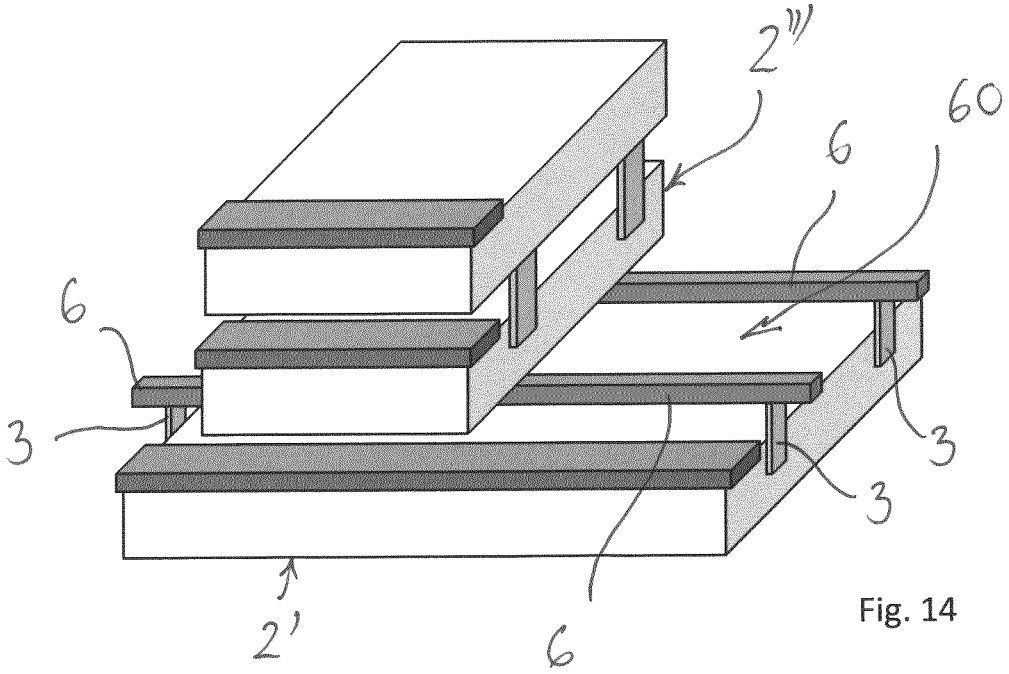

Fig. 14

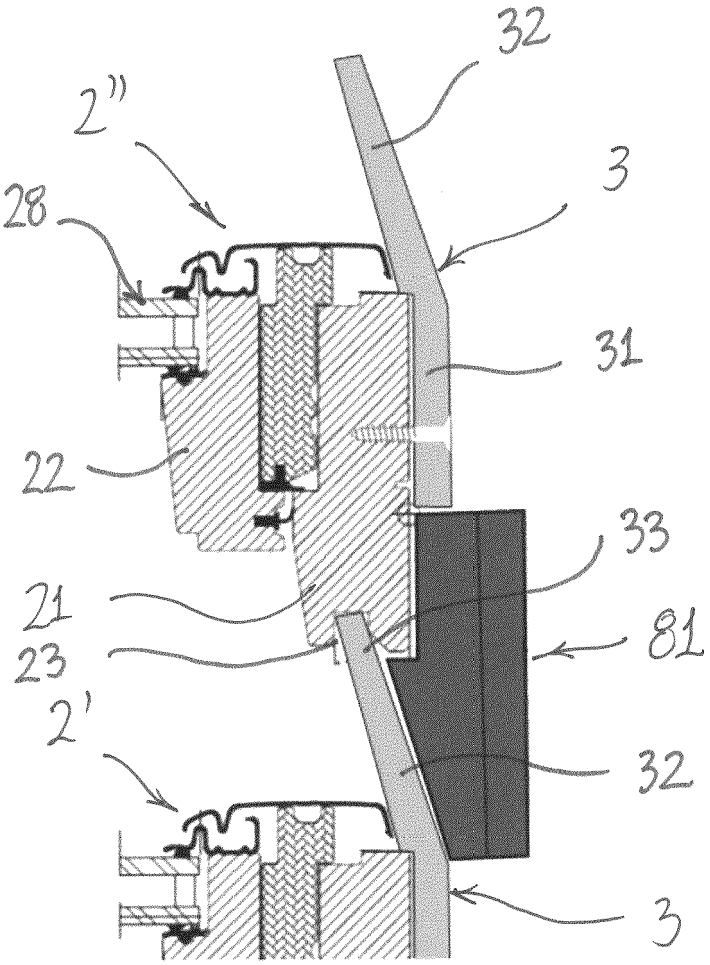

Fig. 15

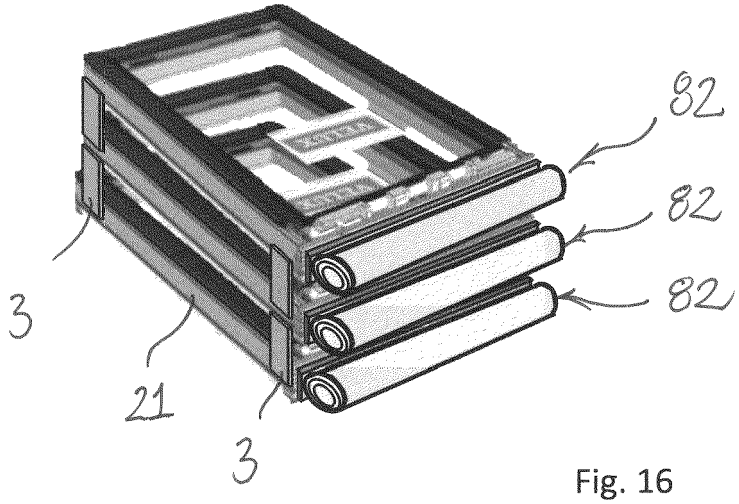

Fig. 16

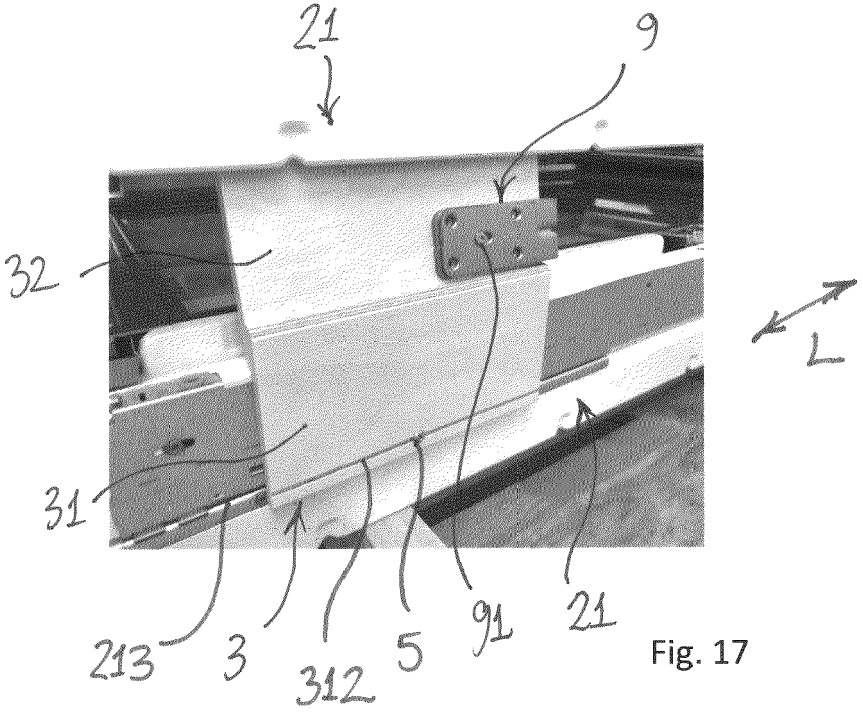

Fig. 17

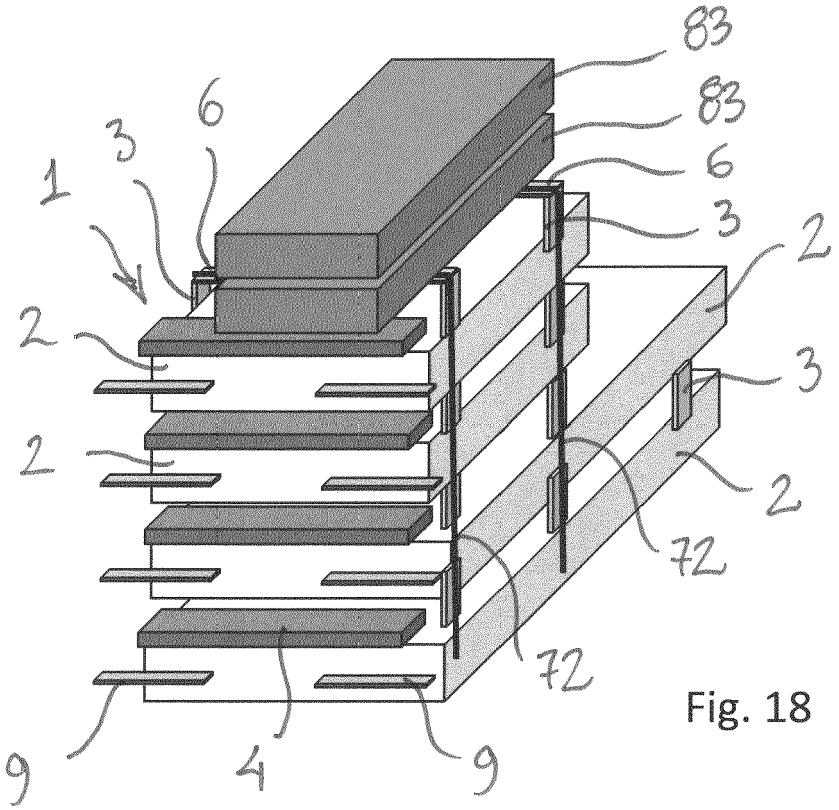

Fig. 18

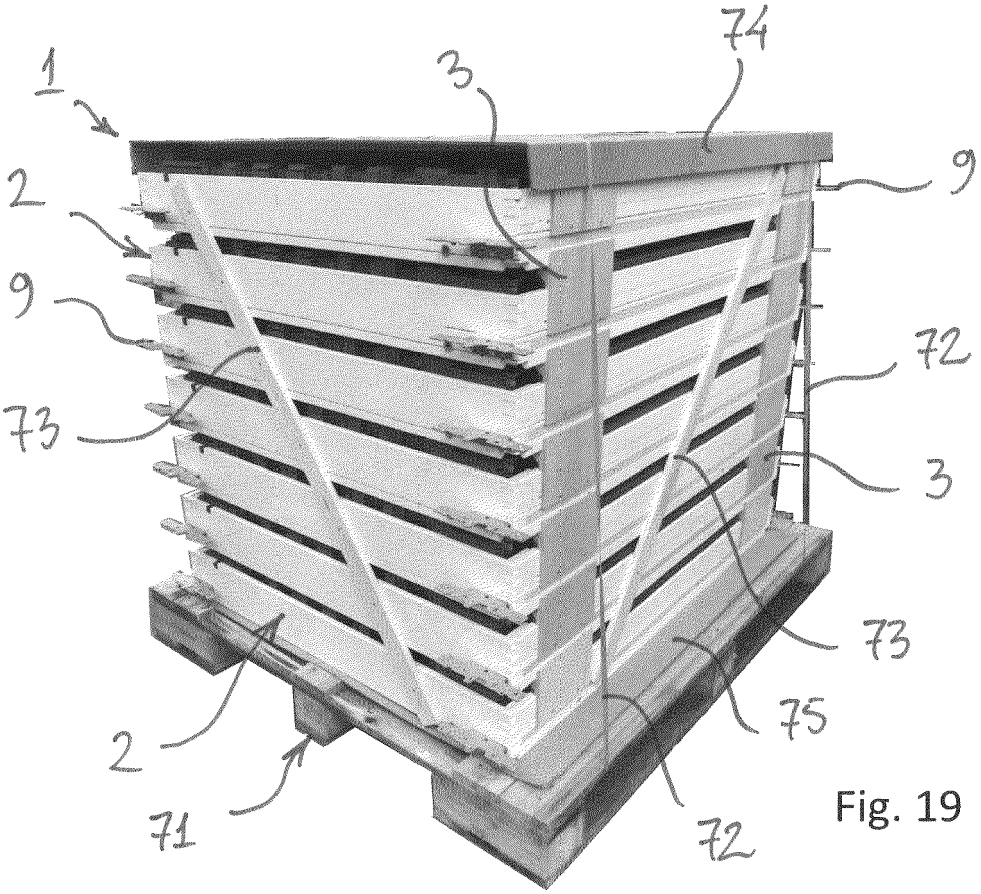

Fig. 19

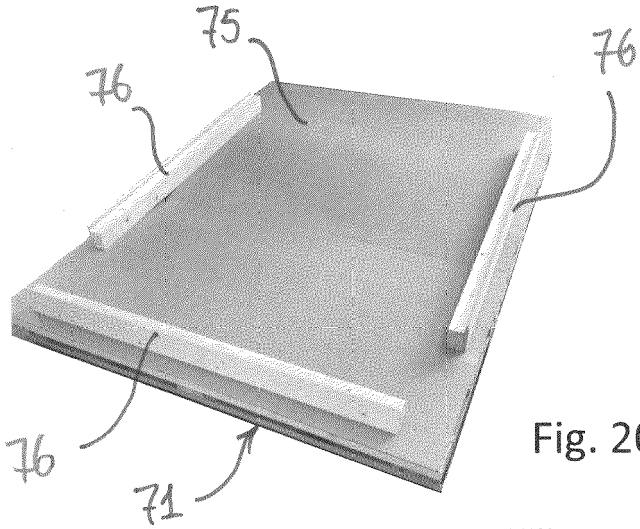

Fig. 20

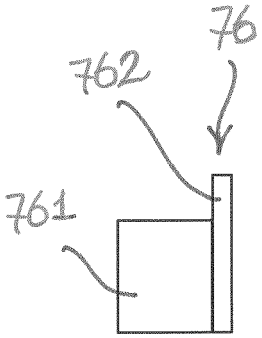

Fig. 21

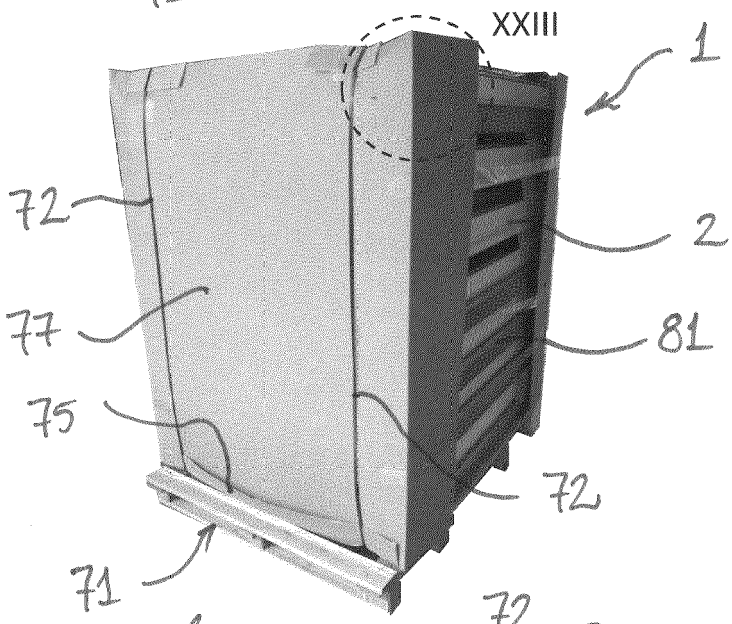

Fig. 22

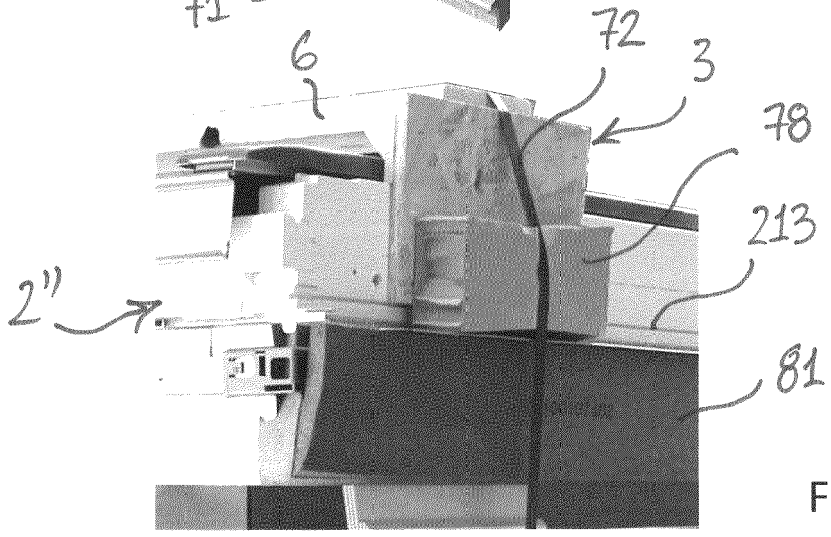

Fig. 23

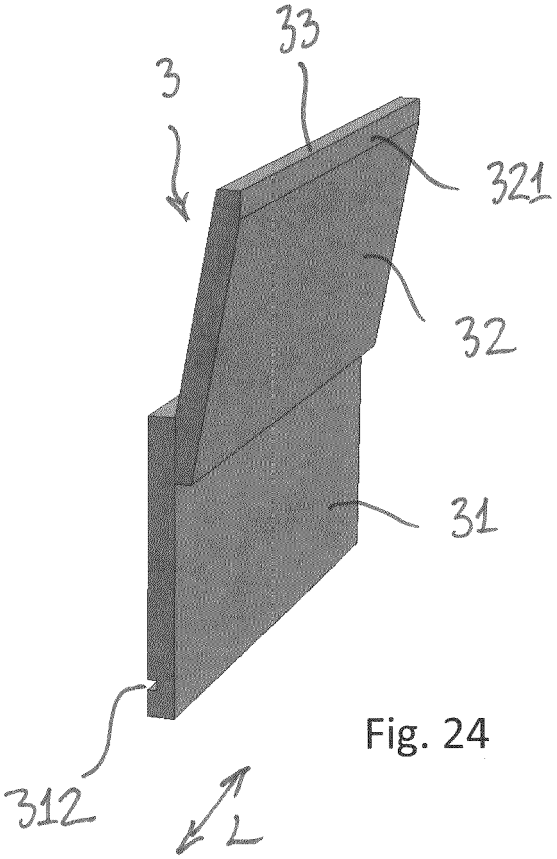

Fig. 24

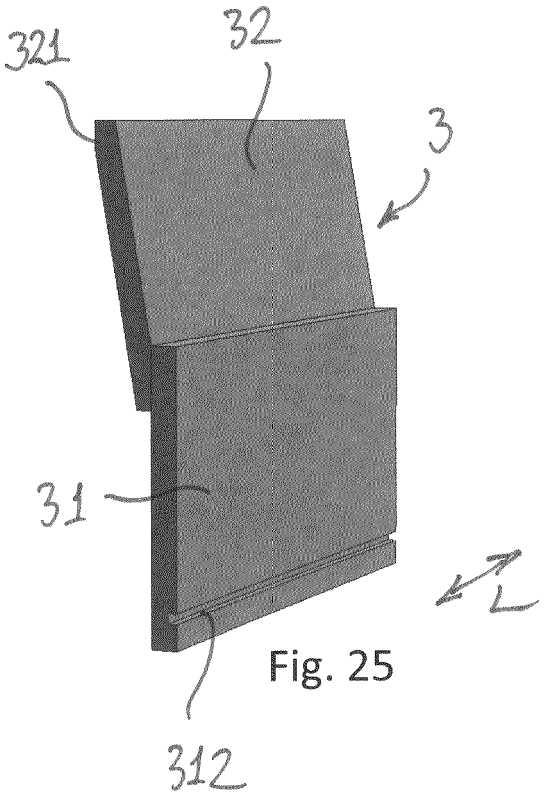

Fig. 25

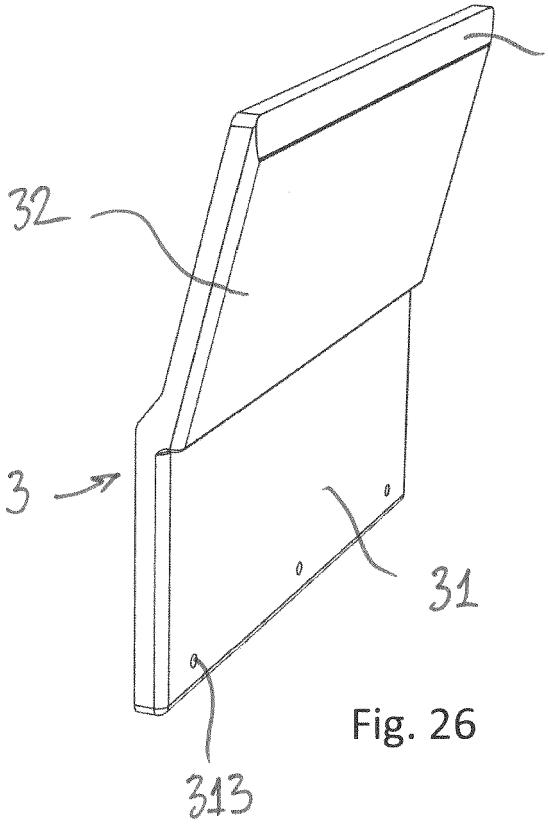

Fig. 26

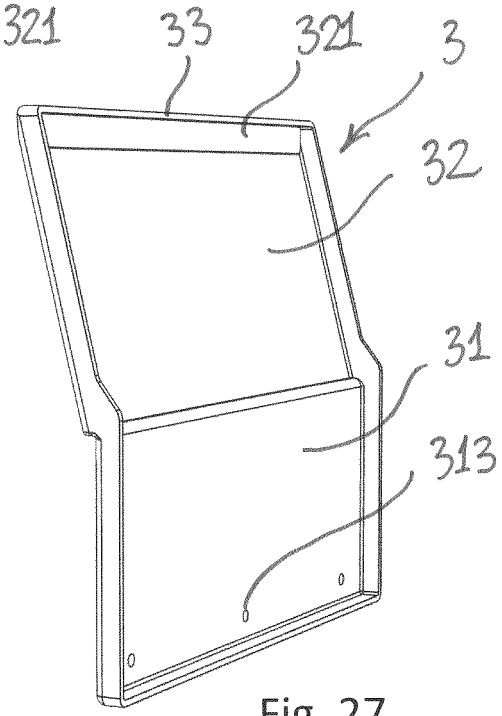

Fig. 27

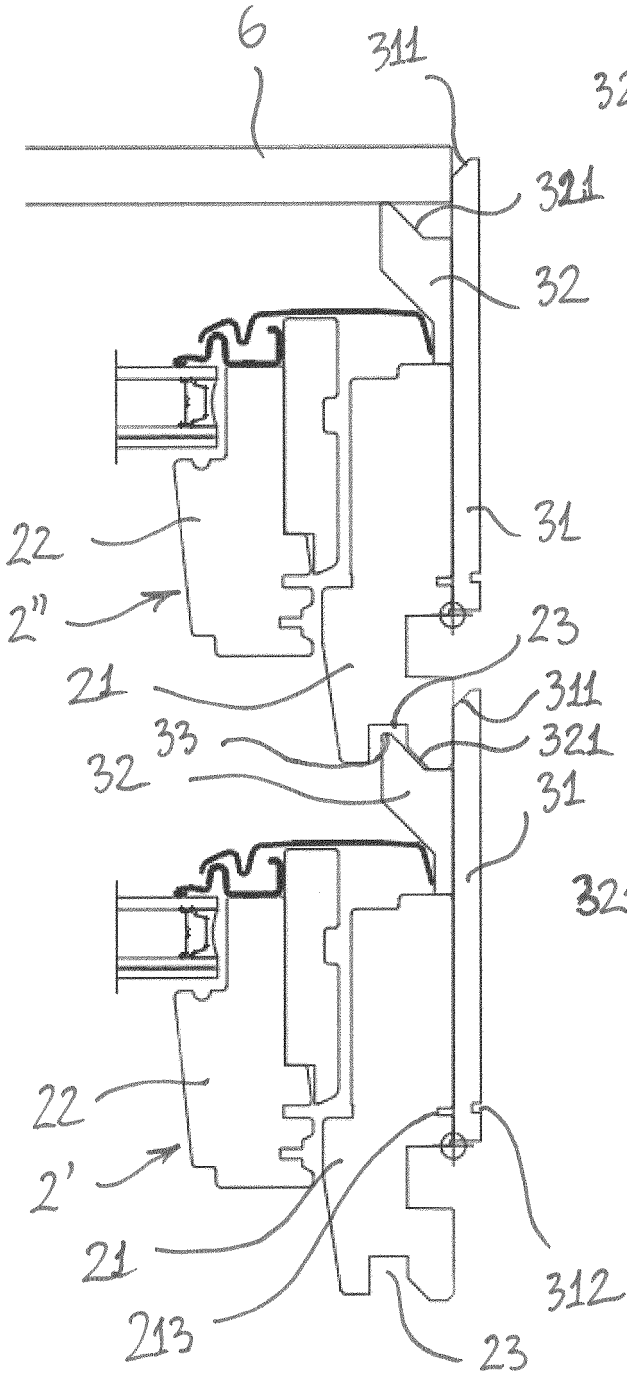

Fig. 28

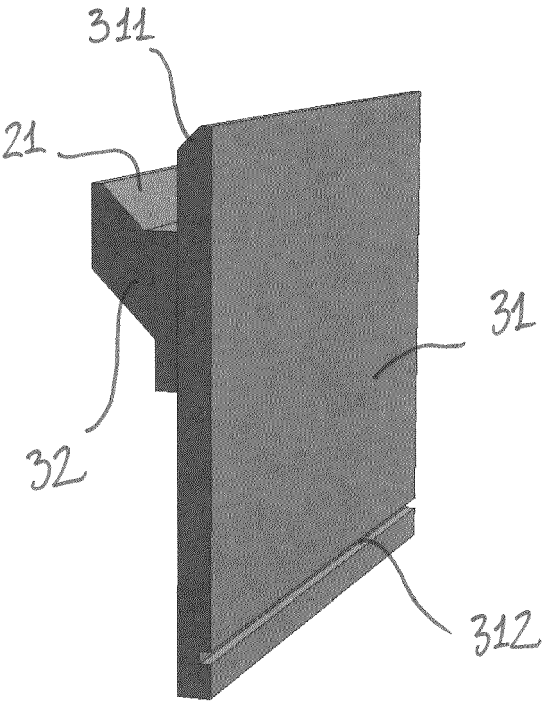

Fig. 29

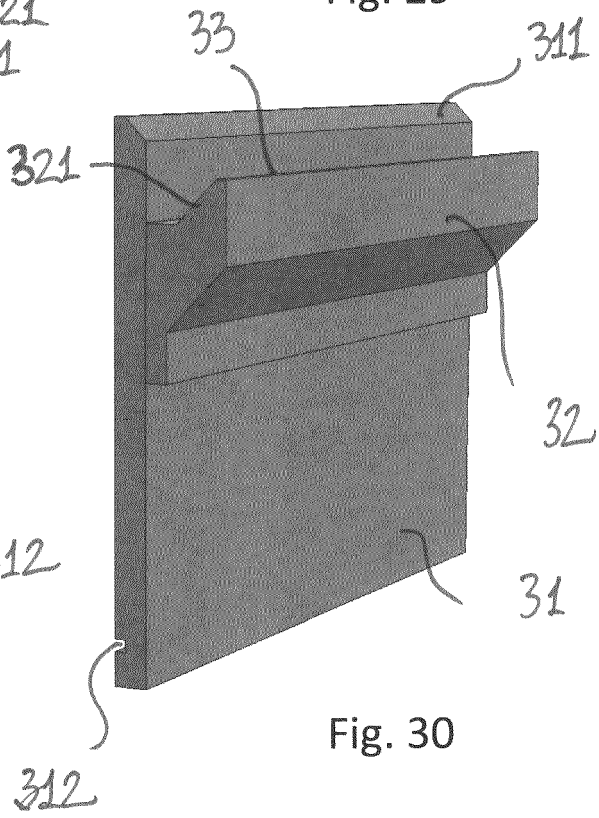

Fig. 30

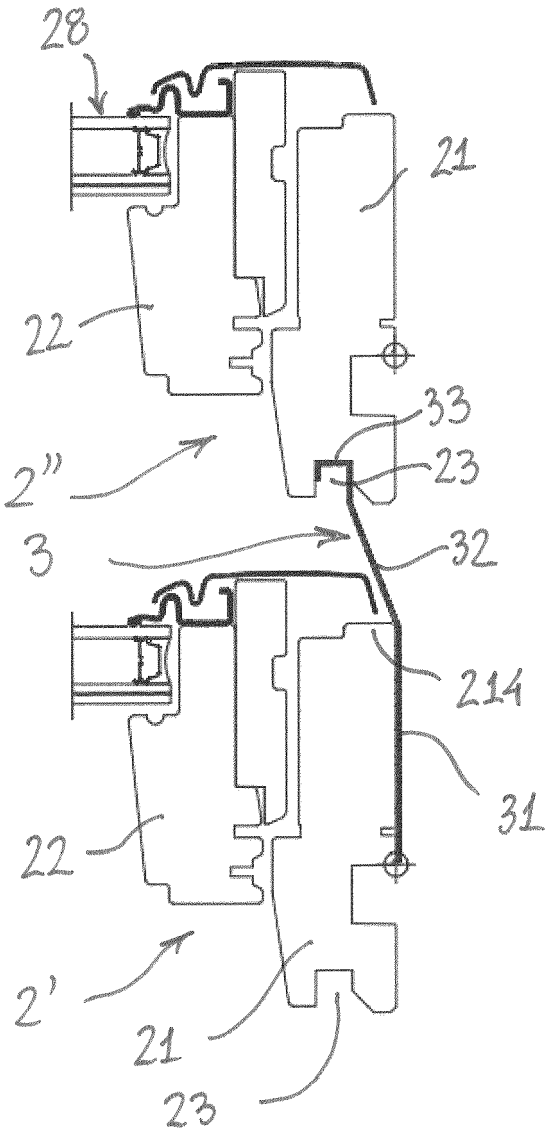

Fig. 31

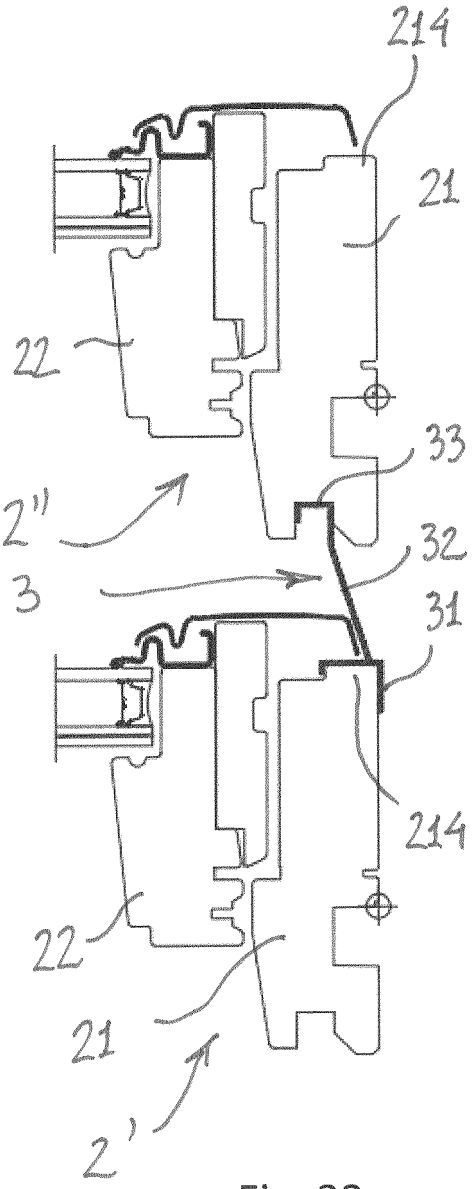

Fig. 32

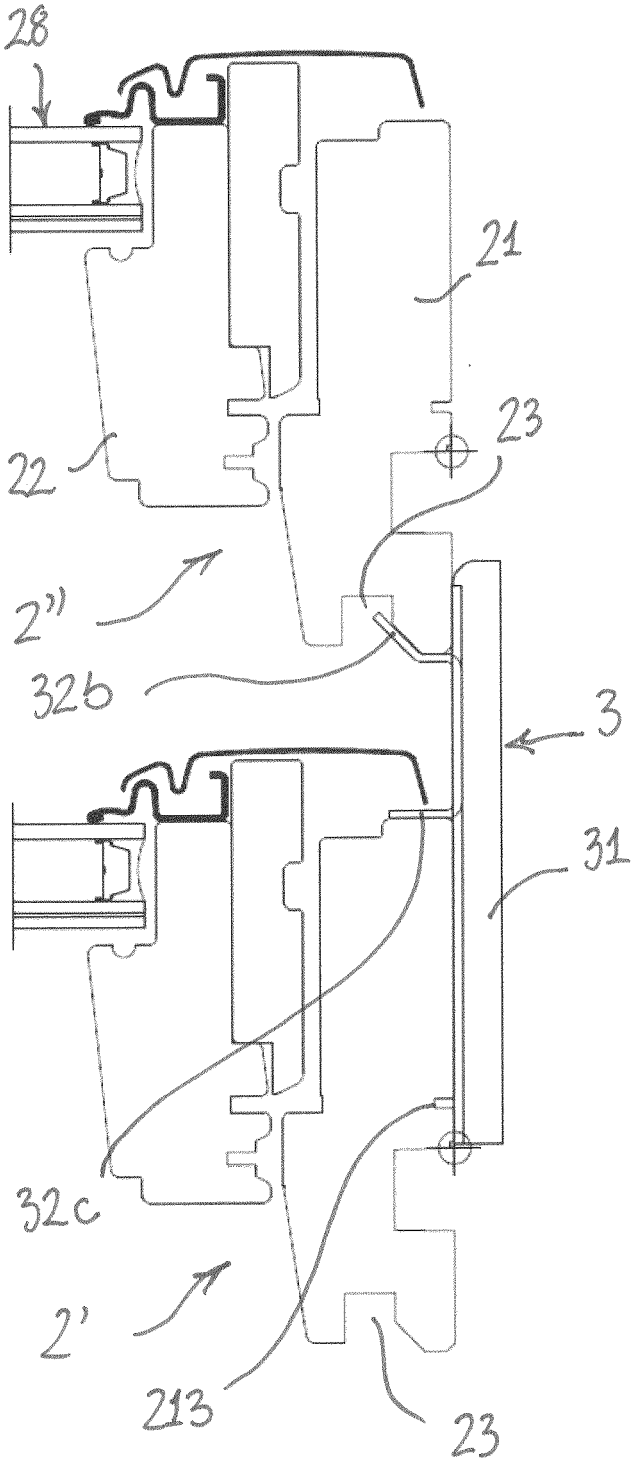

Fig. 33

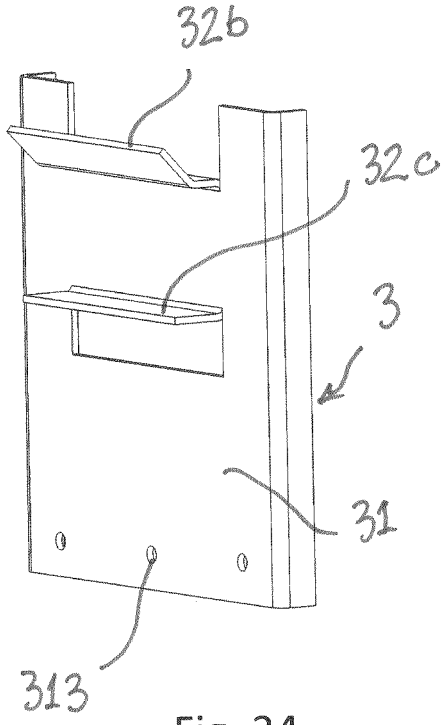

Fig. 34

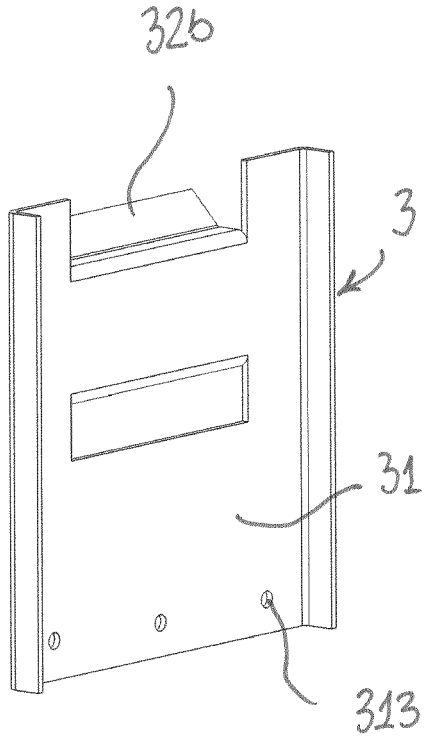

Fig. 35

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EUROPEAN SEARCH REPORT

Application Number
EP 22 18 1283

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 103 06 484 A1 (PRIMA BAU UND DAEMMSYSTEME GES [AT]) 26 August 2004 (2004-08-26)	1-8	INV. B65D85/48 B65D71/00
A	* figures 1a-3 * * paragraph [0027] - paragraph [0038] *	9-14	
X	US 5 544 455 A (DEBLOCK DAVID A [US]) 13 August 1996 (1996-08-13)	1-8	
A	* column 2, line 37 - column 5, line 65 * * figures 1-5 *	9-14	
X	WO 02/057563 A1 (VKR HOLDING AS [DK]; LINDGREN CLAES [DK] ET AL.) 25 July 2002 (2002-07-25)	1-8	
A	* page 7, line 23 - page 31, line 11 * * figures 1-23 *	9-14	

TECHNICAL FIELDS SEARCHED (IPC)

B65D
E04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 November 2022	Rodriguez Gombau, F

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