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(54) **An insulating member comprising two elements of different material and a method for insulating a window in an inclined roof structure with this insulating member**

Dämmblock bestehend aus zwei Elementen aus unterschiedlichem Material und Verfahren zur Isolierung eines Dachfensters mit diesem Dämmblock

Élément isolant avec deux éléments du materiaux différents et procédé pour isoler une fenêtre dans une structure de toit inclinée avec cet élément

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Description

[0001] The present invention relates to an insulating member for use between a window and a load-bearing structure, to a window including such an insulating member, to a roof structure including such a window and to a method of insulating a window using such an insulating member.

[0002] The insulating member is intended primarily for use with windows mounted in an inclined roof structure comprising a load-bearing structure including a plurality of battens arranged on the load-bearing structure and a roofing material arranged on the battens. The joint between the window and the roof structure is sealed by means of a flashing frame, which may be a unitary frame, but which is usually composed of a number of flashing members. The flashing has a first leg lying substantially in the plane of the roof between the battens and the roofing and a second leg extending at an angle with respect to the first leg and lying substantially parallel to the outer side of the window.

[0003] EP-A1-0679773 discloses a window of this type, where an insulating member constitutes the upper outer part of the window frame. In this way the section of the window frame, which is above the rafters, and thus also above the roof insulation in the mounted state of the window, is insulated towards the exterior. This provides for far better properties with regards to insulation than when using a traditional all-wooden frame. The total frame width is, however, relatively large, which entails that the ratio of dimensions between the effective pane area contributing to letting light into the building and the size of the hole, which must be made in the roof, is relatively small.

[0004] Another way of achieving an insulation of a roof window is known for example from EP-B1-1706557, where an insulating frame is applied on the outer side of the window, and from PL-B1-205441, where additional insulation is part of the flashing. These solutions suffer from the disadvantage that a gap corresponding in size to the height of the battens and counter battens is present between the additional insulation and the roof insulation. This gap is usually filled manually with a deformable insulating material such as mineral wool, but it is also possible to provide supplementary insulating frames as taught in EP-B1-1706557. EP 2 182 132 A2 and EP 1 550 777 A1 disclose also insulating members for insulation of skylights.

[0005] The latter solution to the problem is very efficient but necessitates the removal of the ends of the battens closest to the window to make room for the insulating frame(s) and the mounting of combinations of insulating frames implies a risk of erroneous mounting. The risk of faulty work also exists when using mineral wool, since craftsmen are often tempted to skip this work or do it without applying the necessary care.

[0006] It is therefore the object of the invention to provide for easy insulation of windows, where the insulation properties are improved without necessitating a smaller effective pane area.

[0007] This object is achieved with an insulating member as defined in claim 1. The compressible insulating material of the second insulating element is capable of adapting to the shape of the load-bearing structure. This means that it is not necessary to cut away the ends of the battens and the window can be made so that its frame corresponds in the size to the hole in the roof. The compressible insulating material will give way and make room for the battens, while filling out the space between them, and will similarly adapt to other variations in the roof structure. This leads to an efficient insulation all the way down to the rafters, counter battens or underroof depending on the construction of the roof.

[0008] If the second insulating element is simply a strip of compressible insulating material, the compression above the battens will tend to pull the sections of the second insulating element neighbouring the batten away from the window frame. This has a negative impact on the insulating properties and might potentially course a displacement of the entire insulating member. In that case the second insulating element should therefore be attached to the window frame or the batten, preferably at level with the upper side of the batten.

[0009] To increase the ability of the second insulating element to adapt to the roof structure and solve the problems associated with using a simple strip of insulation material described above, the second insulating element is made from a slit material. The slits are arranged so that they extend in the height direction from the lower side and preferably in a plane, which is substantially perpendicular to a length axis of the insulating member. Such slits allow different sections of the insulating material to be displaced in relation to each other and allow one section to be fully compressed above a batten, while the neighbouring section is fully expanded and following the sides of the batten all the way down.

[0010] Likewise, slits extending from the lower side and in a plane, which is substantially parallel to a length axis of the insulating member, the ability of the second insulating element to fill out the space, which is often found between the end of a batten and the window frame, is increased.

[0011] It is of course also possible to have two sets of intersecting slits. This will provide optimal adaptability, but also involves a more complicated manufacturing process and hence makes the product more expensive. Likewise, weakening sections may be provided instead of the slits, said weakening sections, which form a series of weak walls in the material, being broken in appropriate places when the material is compressed. If choosing to use such a more complex material, it is preferred that slits and/or weakening sections are arranged so that they do not form straight lines through the material. When the material is compressed, such lines may be opened and thus form thermal bridges having a negative impact on the insulating properties. Using several second insulating

members arranged close to one another still further from the window frame and having different or off-set patterns of slits and/or weakening sections is an effective way of preventing such lines.

[0012] For achieving optimal insulation the second insulating element should be at least as high as the batten. In typical European roof structures the battens are from 14 to 38 mm thick and it is therefore preferred that the second insulating element has a height seen in the height direction of 20-60 mm, preferably 50 mm. Even thicker battens do occur, examples being those of 45 mm used in Denmark and those of 60 mm used in some Swiss and Austrian buildings. To accommodate these, the second insulating element should have a height of 70-75 mm and slits of 60-65 mm, but as these sizes are rarely used it is presently considered advantageous to provide a specialized product of increased height for these purposes.

[0013] The dimensionally stable insulating material is located at the upper and most exposed part of the window, which may be subject to weather-induced loads and impacts originating from traffic on the roof, for instance in connection with maintenance work. Apart from being able to withstand these factors, the use of a dimensionally stable material allows for the attachment and support of flashing members and it may also contribute to the load-bearing properties of the window. The first insulating element may even be made so sufficiently strong that it can transfer the weight of the window to the rafter, making traditional mounting brackets for anchoring the window to the load-bearing structure unnecessary.

[0014] Another advantage of using a first insulating element of a dimensionally stable insulating material is that such materials are generally less sensitive to moisture and heat, which are factors having greater influence at the upper outer side than at the lower side, where the second insulating element is located.

[0015] The special properties of the second insulating elements are particularly useful at those sides of the window, which are arranged at an angle to the battens. Second insulating elements may therefore be provided only at the sides of rectangular windows and not at the top and bottom. Likewise, different insulating frame pieces may have different second insulating elements depending on their intended use, an example being that the second insulating element may be reduced in size at the bottom of the window.

[0016] The insulating members may be delivered and mounted individually and it is even possible to make them in situ by interconnecting the first and second insulating members by hand. Particularly the task of providing a proper interconnection at the corners of the window will, however, be relatively cumbersome. It may therefore be advantageous to deliver pre-assembled frames or sets of frame components, especially when intended for use on windows of standardized sizes.

[0017] In this, the use of the insulating member is described with relation to a roof window, but it will be understood that it may also be used for insulating façade windows etc. whenever these are mounted in an uneven structure.

[0018] The fastening means may be any suitable means for connecting the insulating member to the window or the load-bearing structure so that it is kept close alongside the window. Examples are adhesives, such as a pressure sensitive adhesive applied during manufacture, a hot-melt adhesive applied in situ or a double sided tape applied to the first insulating element with a cover foil to be removed immediately prior to attachment. Other examples are nails driven through the first insulating element and into the window frame or load-bearing structure, or brackets attached to the first insulating member, possibly being embedded in the material thereof. Still further examples are interlocking means with matching members on the window or load-bearing structure, which could be simply a recess matching a corresponding projection on the window frame or load-bearing structure, but which might also be a hook and loop system like Velcro®.

[0019] When using brackets, these may serve as mounting brackets for transferring loads from the window to the load-bearing structure, but this makes heavy demands on the properties of the material used for the first insulating element and is therefore rarely expedient. Instead the window will be attached directly to the load-bearing structure in a traditional manner using a separate set of mounting brackets. In this case the first and/or second insulating elements may be provided with recesses accommodating at least a part of the mounting brackets. Some types of mounting brackets are post-fitted at the installation site and the recesses may therefore be provided as tear-away parts of the insulating frame pieces or provided with plugs when not in use. This also allows for a wider of use of the insulating frame pieces, since they may be designed for use in windows demanding many brackets and still be used in windows demanding fewer brackets, a suitable number of recesses being prepared in each case.

[0020] Other elements to be attached to the window or to the load-bearing structure in the close vicinity of the window may also be provided as part of the insulating member, examples being flashing members, sealing strips, vapour barriers and underroof collars. These are preferably attached to the first insulating member by means of an adhesive, but mechanical means such as staples may also be employed as well as several other means readily imaginable to the skilled person.

[0021] Vapour barriers and underroof collars are made from relatively wide sheets of material, which may be difficult to handle if delivered in the intended state of use. It is therefore preferred that these are provided in a folded state, where they are located along the side of the insulating member, so that they do not project below the lower side of the insulating member. A small projection may, however, be acceptable as long as it does not interfere with the mounting of the insulating member. Once the insulating member has been attached in its intended po-

sition, any vapour barriers and underroof collars may be unfolded to their position of use and a separate attachment of these at the window frame is no longer necessary.

[0022] The advantageous properties of the second insulating element described above may also be utilized at other places, e.g. at the joint between the flashing and the roofing. It is customary to provide a sealing element made from a compressible insulating material and attached to the first leg of the flashing member on the side facing the roofing. See for example WO03/048478. This prevents birds, leaves, precipitation etc. to enter underneath the roofing, which is particularly important when using tiles or like roofing materials of irregular shape. By using a sealing element, which is substantially identical to the second insulating element, the number of different components needed for the manufacture of the window is kept at a minimum and the excellent capability for adaptation described above may be utilized once more.

[0023] In the following the window according to the present invention will be described in further detail with reference to embodiments shown on the accompanying drawing, where:

Fig. 1 depicts a window mounted in an inclined roof,
Fig. 2 is a cross-sectional perspective view of the side of a window according to the invention mounted in a roof structure,
Fig. 3 shows the window in Fig. 2 seen from the side,
Fig. 4, new is a cross-sectional view of the bottom of a window according to the invention mounted in a roof structure,
Fig. 5 is a cross-sectional view of a second embodiment of the side of a window according to the invention,
Fig. 6 shows the joint between flashing and roofing at the top of the window, and
Fig. 7 is a cross-sectional view of a third embodiment of the side of a window according to the invention.

[0024] Like reference numbers will be used throughout the drawing for parts having similar or analogous function, but this is not to be taken as an indication that such parts found in different figures are necessarily identical.

[0025] A roof window 1 mounted in an inclined roof 2 is shown in Fig. 1. Here, the roofing 3 is of a flat type, but as will be explained later with reference to the other figures, other types of roofing may also be used.

[0026] The window comprises a window frame having a plurality of frame pieces. In order to provide a weathertight transition between the window and the surrounding roofing, these are covered by a number of flashing members 11-14, cover members 21-24 and cladding members 31-34 and are therefore not visible in Fig. 1. In all of the embodiments shown in the drawing, the window is rectangular and the window frame comprises four frame pieces, where only the right-hand frame piece 41 only is visible in Fig. 2, the bottom frame piece 42 in Fig. 4 and the lefthand frame piece 43 in Fig. 5. The window furthermore comprises a window sash 5, which is openable with respect to the window frame.

[0027] Each cover member 21-24, although of different configuration, has a first leg for covering the upper side of the corresponding frame piece and a second leg covering a part of the outer side of the frame piece. Throughout the description the term "inner side" is used about the side of window frame pieces, insulating members etc. which faces the opening in the window frame, while the term "outer side" is used about a side facing away from the opening. Likewise, the term "upper side" is used to indicate a side facing upwards in the mounted position, i.e. towards the exterior of a building, and the term "lower side" is used to indicate a side facing downwards, i.e. towards the interior of a building.

[0028] In the embodiment shown, the flashing frame includes four flashing members 11-14, each having a first leg lying substantially in the plane of the roof and a second leg extending at an angle with respect to the first leg covering a part of the outer side of the frame piece and being partly overlapped by the second leg of the corresponding cover member. At the intersection between adjoining flashing members, the flashing members may be connected with each other in any suitable manner, e.g. by folding, welding or by any other method and the same applies to the cover members. In Fig. 1 the flashing members are shown with integrated corner sections, but it is also possible to provide a plurality of separate flashing corner members for connection of adjoining flashing members. Water gathered at the top of the window is led down along the sides of the window and further down to the roofing below the window via a skirt 15 in a manner known per se. Here the flashing is composed of several members, but a unitary flashing may of course also be utilized, just as the number and arrangement of cladding and covering members may vary.

[0029] Figs. 2 and 3 show simplified views in cross-sectional perspective as indicated by the line II-II in Fig. 1 and from the side, respectively, where the window is represented only by the right-hand frame piece 41 and where roofing and flashing have been removed to lay open the roof structure 20 and the insulation.

[0030] In the embodiment shown the roof structure 20 is composed of a series of rafters 6, only one of which is shown, an underroof 7 clamped between the rafter and a counter batten 8 above each rafter, and finally a series of battens 9 arranged perpendicularly to the rafters and counter battens.

[0031] The window 1 may be secured to the load-bearing rafters or the counter battens by means of traditional mounting brackets (not shown) provided at the side frame member or at the corners between adjoining frame pieces.

[0032] An insulating member 10 according to the invention comprising a first insulating element 101 and a second insulating element 102 is attached to the outer side of the window frame piece 41 by means of screws

103 and it is further attached to the battens 9 by means of a bracket 104. In this way the attachment of the insulating member 10 will contribute to the attachment of the window itself and if the first insulating element 101 is sufficiently strong, traditional mounting brackets may be left out entirely. The more usual situation, however, will be that the insulating member 10 is attached either to the window frame piece 41 or to the battens 9 instead of to both as depicted here.

[0033] The bracket 104 on the insulating member 10 is depicted as an L-profile extending over the entire length of the insulating member. This substantially eliminates the risk of erroneous mounting, since the bracket 104 will not be misplaced in relation to the battens 9, and provides strength and stiffness, but it is also possible to use smaller brackets located at each or some of the battens.

[0034] In an even more simple embodiment, the first insulating element 101 is simply provided with an adhesive 109 (see Fig. 5) on the side facing the window frame piece 41. In this way the insulating member may be attached either before or after mounting of the window, which is kept in place using traditional mounting brackets.

[0035] The second insulating element 102 extends from the lower side of the first element to the upper side of the counter battens 8 and has been compressed above the battens 9. According to European building traditions most battens have a height h of 14-38 mm depending amongst others on the type of roofing used. To be able to adapt to this, the second insulating is made with a height of 50 mm. Larger sizes may, however, occur. According to the invention, the second insulting element 102 is provided with slits 105 allowing different sections of the element to be compressed independently. These slits should of course be at least as deep as the height h of the battens, here 40 mm.

[0036] Referring now to Fig. 7, the second insulating element may also fill out a space between the end of the batten and the window frame and even extend underneath the window frame. To achieve this, the second insulating member may be provided with slits (not shown) extending substantially parallel to a length axis of the insulating member or a combination of slits both perpendicular and parallel to the length axis. Slits at other angles are of course also a possibility and so is the use of any other material allowing different sections to move independently. An example could be a honeycomb structure, where the different cells are interconnected by relatively weak walls that can be easily broken, thereby allowing the cells to move in relation the each other.

[0037] Regardless of the orientation of the slits, there is a risk that the compression results in the one or more slits in the material next to a batten or other projection being pulled slightly open. This provides a direct channel through the insulation, which of course affects the insulating properties negatively. It is therefore considered advantageous to use a material having several series of slits or weak walls, which are off-set in relation to each other, so that any opening formed will be non-straight, preferably forming a labyrinth. This may be achieved with complex patterns of cuts and/or weak walls. It is, however, also possible to provide two or more separate second insulating elements arranged side-by-side, one at the window frame and another on the outer side of the insulating member, and with slits/walls off-set in relation to each other.

[0038] In the embodiment shown in Figs. 2, 3 and 5, the first insulating member 101 has a height of approximately 90 mm, which allows for the window to be mounted relatively high in the roof. If it is desired to have the window mounted deeper in the roof, the height of the first insulating member should be reduced and it may therefore be provided lines or other markings indicating where to cut or with tear-off means. It is of course also possible to use a smaller height and leave the uppermost part of the frame un-insulated when mounting the window in a high position. This is, however, less preferred since it will not only make the window less well insulated but also entail a complication of the total shape of the window with insulation, which may complicate mounting, particularly of the flashing and covering members.

[0039] The upper side of the insulating member 10 need not be flush with the upper side of the window frame and it may advantageously be made with a small inclination, for example 15 degrees, away from the window frame in order to facilitate drainage as shown in Fig. 5.

[0040] It is also possible to use a first insulating element 101 of a triangular cross-sectional shape (not shown), so that its width is zero at the level for the upper side of the window frame, or of a more complex shape, for example with an upper half having a curved outer side. The shape should, however, not be made unnecessarily complicated as this will usually influence the shape of flashing and covering members.

[0041] In the above the first and second insulating elements have been described as being located one above the other. It is, however, to be understood that one or both may be provided with projecting parts extending along the other, so that for example a projecting part of the first insulating element 101 is sandwiched between the window frame and the second insulating element 102.

[0042] The insulating members 10 may in principle have any extent in the longitudinal direction, but it is advantageous if the insulating member extends over substantially the entire length of the corresponding window frame piece.

[0043] As may be seen in Fig. 4 there is not much space for insulation at the bottom of a typical roof window and in this embodiment the first insulating element has therefore been left out entirely.

[0044] As described above, the window can be secured to the underlying roof structure by means of mounting brackets, which are typically angular and attached to the side pieces of the window frame by means of a first leg. In order to accommodate this leg, the insulating members may, at least at the side pieces, be provided with recesses. One possible design of forming such re-

cesses is that the inner side of the insulating member, is provided with a number of weakening lines in the height direction. The weakening lines may e.g. be provided as perforations extending to a predetermined depth in the width direction of the insulating member. It is to be understood that a corresponding section of the material of the insulating member is only fastened to the remaining section thereof along these weakening lines. A suitable distance between the weakening lines is chosen such that one or two sections of material between adjacent weakening lines are torn away in order to provide a recess to accommodate the first leg of the mounting bracket. It is of course also conceivable to form the insulating element without potential recesses, and to form the recesses manually. Eventually, the insulating frame may be used without recesses altogether.

[0045] The first and second insulating elements 101, 102 may be made from polyethylene (PE) foam, which combines advantages with regards to handling, price and environmental consideration, but any other suitable material may be used, including polypropylene (PP), polyvinylchloride (PVC), expanded polystyrene (EPS), extruded polystyrene (XPS) or mineral wool. Using the same material of a difference density or different surface characteristics for both the first and the second insulating element has the advantage that the two elements will have substantially the same properties and do not tend to degrade each other chemically, but combinations of materials are also within the scope of the invention.

[0046] If using a material suitable for extrusion, the insulating elements 101, 102 may e.g. be produced as a coherent string of extruded material that is cut into appropriate lengths. These pieces of material may then be attached to each other in pairs so as to serve as first and second insulating elements, respectively, but depending on the material(s) used it is also possible to coextruded them.

[0047] The insulating members 10 can be simply attached at each side of the window frame but it is preferred that they are interconnected to form an insulating frame. This may be done using any kind of joint, e.g. mitred joints, and the frame may be made in situ or delivered in the assembled state. It is also possible to provide a unitary insulating frame made from a single insulating member, which has been bent into shape.

[0048] Other elements may also be included in the insulating member according to the invention as shown in Fig. 5. One example is the sealing strip 106 for sealing the joint between the upper sides of the first insulating element 101 and the frame 43 or for sealing directly against the pane (not shown). Such a sealing strip 106 can be co-extruded, added using a caulking gun, attached using a pressure sensitive glue or in any other suitable manner.

[0049] Other examples are attachment means for attachment of an underroof 7, an underroof collar 71 or a vapour barrier 72. In Fig. 5 the vapour barrier 72 is attached by means of an adhesive 107 and the underroof collar 71 is attached in a groove 108. Here, the groove is made in the first insulating element and is relatively narrow so that it clamps the edge of the underroof collar by the resilience of the material. The groove could, however, also have been made in the joint between the first 101 and second 102 insulating elements and/or the clamping effect could have been achieved by forcing a string, rod or list (not shown) into the groove as will be readily conceivable to the skilled person.

[0050] The underroof collar 71 and/or vapour barrier 72 could also have been integrated in the insulating member. In one embodiment the first 101 and second 102 insulating elements are made separately and interconnected by a gluing process where also the underroof collar and vapour barrier are attached in the glue joint. Another option is to embed the edge thereof in the material of one of the insulating members.

[0051] Having the underroof collar 71 and vapour barrier 72 in their position of use as depicted in Fig. 5 when mounting the insulating member 10 would make the work relatively difficult, since particularly the vapour barrier would tend to get in the way. It is therefore preferred that, in the state of delivery, the underroof collar 71 and vapour barrier 72 are in a folded state, where they lay along the outer and inner sides of the insulating member, respectively, and do not project below the lower side thereof. Once the insulating member 10 have been attached, the underroof collar and vapour barrier are unfolded to the position shown in Fig. 5, where the bends represent longitudinal folds. It is of course also possible to provide the underroof collar and/or vapour barrier in a rolled up state.

[0052] At the top of the window, the roofing 3, which is here tiles, overlaps the top flashing member 14, which is partially cut away in Fig. 6, so that water is led from the roofing above the window 1 via the flashing and back onto the roofing below the window. When using tiles or like roofing materials the top flashing member is usually provided with a tile support on which the lower ends of the tiles rest so that they are kept level with the tiles in the same row next to the window. This tile support may be embodied in the same way as the insulating member 10 according to the invention, but mounted upside-down as shown in Fig. 6. The dimensionally stable material 101', which is here attached to the top flashing member 14, has a height corresponding substantially to the height of the battens and works in substantially the same way as a traditional tile support. Cutting lines or tear-off means may be provided for allowing an easy adaptation of the height.

[0053] The compressible material 102' on top, which is facing with the slits 105' upwards, is able to adapt to the shape of the roofing material so that snow, bird etc. is prevented from coming up underneath the roofing. Fig. 6 shows how tiles depress sections of the compressible material, while leaving other sections substantially unaffected. It will be understood that the height of the compressible material should correspond at least to the dept of the hollows found in the roofing material in order to

work properly and that this height may differ from that of the second insulating element 102 described above. It is of course also possible to use a material without slits, particularly when using tiles which represent relatively soft curves.

[0054] A similar effect may be achieved at the side members of the flashing, but here there is usually no need for elevating the roofing material, and the dimensionally stable material may therefore be left out entirely.

[0055] Sealing members for use between the roofing material and the flashing members as described above is preferably attached to the flashing members in the state of delivery, but may also be post-fitted. In the latter case or when using a fully or partially unitary flashing, the top and side sealing members may be made as one coherent member. Attachment may be achieved using double sided tape or any other suitable means for attachment. It may, however, be advantageous that the sealing members are attached using the same means for attachment as those used for attaching the insulating members and/or for interconnecting the first and second insulating members, particularly when using sealing members identical to the second insulating element.

[0056] The invention should not be regarded as being limited to the embodiments shown. On the contrary, various modifications and combinations will be within the scope of the appended claim.

Claims

1. An insulating member (10) for use between a window (1) and a load-bearing structure (2,6,8,9,20), comprising:

   a first insulating element (101) made from a dimensionally stable insulating material,
   a second insulating element (102) made from a compressible insulating material, and
   fastening means (103,104,109) for fastening the insulating member to the window or the load-bearing structure,
   where the first and second insulating elements (101,102) are interconnected so that, in use, the orientation of the insulating elements is such that the first insulating element (101) is on top of the second insulating element (102), the side of the first insulating element facing away from the second insulating element defining an upper side of the insulating member and the side of the second insulating element facing away from the first insulating element defining an lower side of the insulating member, wherein a height direction is defined as a direction extending from said lower side to said upper side, and
   where said fastening means (103,104,109) is attached to the first insulating element,
   characterized in that the second insulating element (102) is made from a slit material with slits (105) extending in said height direction from said lower side.

2. An insulating member according to claim 1, where the fastening means (103,104,109) is chosen from the group consisting of: adhesives, double sided tapes, nails, brackets, recesses or similar interlocking means matching members on the window or load-bearing structure.

3. An insulating member according to any of the preceding claims, **characterized in that** the second insulating element (102) has a height in the height direction of 20-60 mm, preferably 50 mm.

4. An insulating member according to any of the preceding claims, **characterized in that** the first and/or second insulating element (101,102) is provided with at least one recess for accommodating a mounting bracket or the like arranged on the window or load-bearing structure.

5. An insulating member according to claim 4, **characterized in that** the at least one recess is provided as tear-away parts of the insulating member or provided with a plug when not in use.

6. An insulating member according to any of the preceding claims, further comprising one or more elements (11,12,13,14,71,72,106) chosen from the group consisting of: flashing members, sealing strips, vapour barriers and underroof collars.

7. An insulating member according to claim 6, **characterized in that** a vapour barrier (72) and/or an underroof collar (71) is provided in a folded state.

8. A window (1) for installation in an inclined roof surface, comprising
   a window frame comprising a plurality of window frame pieces (41,42,43), each window frame piece having an upper side, a lower side, an inner side and an outer side, a height direction being defined by a direction extending from the lower side to the upper side, and
   an insulating frame comprising a plurality of insulating frame pieces formed from insulating members (10) according to any of the preceding claims,
   where the insulating frame pieces are located adjacent to the outer side of corresponding window frame pieces, with the first insulating elements (101) above the second insulating elements (102) seen in said height direction, so that the first insulating elements form an upper side of the insulating frame and the second insulating elements form a lower side of the insulating frame.

9. A window according to claim 8, **characterized in that** the window frame is rectangular and comprises a top piece, a bottom piece (42) and two side pieces (41,43) and that second insulating elements (102) are present only at side pieces of the window frame.

10. A window according to claim 8 or 9, **characterized in that** different insulating frame pieces have different second insulating elements (102).

11. An inclined roof structure comprising a window (1) according to any of claims 8-10 and further comprising a load-bearing structure (2,6,8,9,20) including a plurality of battens (9), and a roofing material (3) arranged on the battens, wherein a flashing frame is arranged to seal a joint between the window and the roof structure, said flashing frame including flashing members (11,12,13,14) having a first leg lying substantially in the plane of the roof between the battens and the roofing and a second leg extending at an angle with respect to the first leg and lying substantially parallel to the outer side of the window frame.

12. An inclined roof structure according to claim 11, where at least one flashing member (11,12,13,14) is attached to a first insulating element (101).

13. A method for insulating a window (1) in an inclined roof structure (2,20), said window having a window frame comprising a plurality of window frame pieces (41,42,43) and each window frame piece having an upper side, a lower side, an inner side and an outer side, a height direction being defined by a direction extending from said lower side to said upper side, said roof structure (2,20) including a load-bearing structure (6,8,9), wherein at least one insulating member (10) comprising a first upper insulating element (101) made from a dimensionally stable insulating material being interconnected to a second lower insulating element (102) made from a compressible insulating material with slits (105) extending in said height direction from a lower side of said second lower insulating element (102), is arranged along the outer side of at least one window frame piece, such that the first insulating element is on top of the second insulating element when seen in said height direction,
where the second insulating element (105) is brought into contact with the underlying roof structure (2,6,8,9,20) and is locally compressed by any projections thereon, and
where the insulating member(s) (10) is/are fastened to the window (1) or the load-bearing structure (2,6,8,9,20) by means of a fastening means (103,104,109) attached on the first insulating element.

14. A method according to claim 13, where a vapour barrier (72) and/or an underroof collar (71) is extended from a folded state, where it is located substantially alongside the first and/or second insulating element (101,102), to an unfolded state where it projects below the lower side of the insulating member (10).

Patentansprüche

1. Dämmteil (10) zur Verwendung zwischen einem Fenster (1) und einer lasttragenden Struktur (2, 6, 8, 9, 20), aufweisend:

ein erstes Dämmelement (101), das aus einem formstabilen Dämmmaterial hergestellt ist,
ein zweites Dämmelement (102), das aus einem komprimierbaren Dämmmaterial hergestellt ist, und
Befestigungsmittel (103, 104, 109) zum Befestigen des Dämmteils an dem Fenster oder an der lasttragenden Struktur,
wobei die ersten und zweiten Dämmelemente (101, 102) so miteinander verbunden sind, dass im Gebrauch die Orientierung der Dämmelemente derart ist, dass das erste Dämmelement (101) oben auf dem zweiten Dämmelement (102) ist, wobei die Seite des ersten Dämmelements, die von dem zweiten Dämmelement abgewandt ist, eine Oberseite des Dämmteils definiert und die Seite des zweiten Dämmelements, die von dem ersten Dämmelement abgewandt ist, eine Unterseite des Dämmteils definiert,
wobei eine Höhenrichtung als eine Richtung definiert ist, die sich von der Unterseite zu der Oberseite erstreckt, und
wobei die Befestigungsmittel (103, 104, 109) an dem ersten Dämmelement angebracht sind,
dadurch gekennzeichnet, dass das zweite Dämmelement (102) aus einem geschlitzten Material mit Schlitzen (105) hergestellt ist, die sich ausgehend von der Unterseite in der Höhenrichtung erstrecken.

2. Dämmteil nach Anspruch 1, wobei die Befestigungsmittel (103, 104, 109) aus der Gruppe gewählt sind, die umfasst:

Haftmittel, doppelseitige Klebebänder, Nägel, Klammern, Aussparungen oder ähnliche Gegenstücke für Verriegelungsmittel an dem Fenster oder an der lasttragenden Struktur.

3. Dämmteil nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das zweite Dämmelement (102) eine Höhe in der Höhenrichtung von 20 - 60 mm, vorzugsweise 50 mm aufweist.

4. Dämmteil nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das erste und/oder das zweite Dämmelement (101, 102) mit wenigstens einer Aussparung zur Aufnahme einer an dem Fenster oder an der lasttragenden Struktur angebrachten Montageklammer oder dergleichen versehen ist.

5. Dämmteil nach Anspruch 4, **dadurch gekennzeichnet, dass** die wenigstens eine Aussparung als Abreißteile des Dämmteils vorgesehen ist oder mit einem Stopfen versehen ist, wenn die Aussparung nicht in Gebrauch ist.

6. Dämmteil nach einem der vorhergehenden Ansprüche, ferner aufweisend ein oder mehrere Elemente (11, 12, 13, 14, 71, 72, 106) ausgewählt aus der Gruppe aufweisend: Eindeckelemente, Dichtstreifen, Dampfsperren und Unterdachkragen.

7. Dämmteil nach Anspruch 6, **dadurch gekennzeichnet, dass** eine Dampfsperre (72) und/oder ein Unterdachkragen (71) im gefalteten Zustand bereitgestellt ist.

8. Fenster (1) zur Montage in einer geneigten Dachfläche, aufweisend:

einen Fensterrahmen mit einer Anzahl an Fensterrahmenstücken (41, 42, 43), wobei jedes Fensterrahmenstück eine Oberseite, eine Unterseite, eine Innenseite und eine Außenseite aufweist, wobei eine Höhenrichtung durch eine Richtung definiert ist, die sich von der Unterseite zu der Oberseite erstreckt, und
einen Dämmrahmen mit einer Anzahl an Dämmrahmenteilen, die aus Dämmteilen (10) nach einem der vorhergehenden Ansprüche gebildet sind,
wobei die Dämmrahmenteile benachbart zu der Außenseite entsprechender Fensterrahmenteile angeordnet sind, wobei die ersten Dämmelemente (101) in der Höhenrichtung über den zweiten Dämmelementen (102) liegen, so dass die ersten Dämmelemente eine Oberseite des Dämmrahmens und die zweiten Dämmelemente eine Unterseite des Dämmrahmens bilden.

9. Fenster nach Anspruch 8, **dadurch gekennzeichnet, dass** der Fensterrahmen rechteckig ist und ein oberes Teil, ein unteres Teil (42) und zwei seitliche Teile (41, 43) aufweist und dass die zweiten Dämmelemente (102) nur an den seitlichen Teilen des Fensterrahmens vorhanden sind.

10. Fenster nach Anspruch 8 oder 9, **dadurch gekennzeichnet, dass** verschiedene Dämmrahmenteile unterschiedliche zweite Dämmelemente (102) aufweisen.

11. Geneigte Dachstruktur mit einem Fenster (1) nach einem der Ansprüche 8 bis 10 und ferner aufweisend eine lasttragende Struktur (2, 6, 8, 9, 20) mit einer Anzahl von Leisten (9), und Dachmaterial (3), das auf den Leisten angeordnet ist,
wobei ein Eindeckrahmen eingerichtet ist, eine Verbindung zwischen dem Fenster und der Dachstruktur abzudichten, wobei der Eindeckrahmen Eindeckelemente (11, 12, 13, 14) mit einem ersten Schenkel, der im Wesentlichen in der Ebene des Daches zwischen den Leisten und der Bedachung liegt, und einem zweiten Schenkel, der sich in einem Winkel zum ersten Schenkel erstreckt und im Wesentlichen parallel zu der Außenseite des Fensterrahmens liegt, aufweist.

12. Geneigte Dachstruktur nach Anspruch 11, wobei wenigstens ein Eindeckelement (11, 12, 13, 14) an einem ersten Dämmelement (101) angebracht ist.

13. Verfahren zum Dämmen eines Fensters (1) in einer geneigten Dachstruktur (2, 20), wobei das Fenster einen Fensterrahmen mit einer Anzahl an Fensterrahmenteilen (41, 42, 43) aufweist und wobei jedes Fensterrahmenteil eine Oberseite, eine Unterseite, eine Innenseite und eine Außenseite aufweist, wobei eine Höhenrichtung durch eine Richtung definiert ist, die sich von der Unterseite zu der Oberseite erstreckt,

wobei die Dachstruktur (2, 20) eine lasttragende Struktur (6, 8, 9) aufweist,
wobei wenigstens ein Dämmteil (10) ein erstes oberes Dämmelement (101) aufweist, das aus einem formstabilen Dämmmaterial hergestellt und mit einem zweiten unteren Dämmelement (102) verbunden ist, das aus einem komprimierbaren Dämmmaterial mit Schlitzen (105) hergestellt ist, die sich ausgehend von der Unterseite des zweiten Dämmelements (102) in der Höhenrichtung erstrecken,
wobei das Dämmteil entlang der Außenseite wenigstens eines Fensterrahmenteils angeordnet wird, so dass das erste Dämmelement in der Höhenrichtung oben auf dem zweiten Dämmelement ist,
wobei das zweite Dämmelement (105) in Kontakt mit der darunter liegenden Dachstruktur (2, 6, 8, 9, 20) gebracht wird und lokal durch Vorsprünge auf der Dachstruktur komprimiert wird, und
wobei das (die) Dämmteil(e) durch Befestigungsmittel (103, 104, 109), die an dem ersten Dämmelement befestigt sind, an dem Fenster (1) oder der lasttragenden Struktur (2, 6, 8, 9, 20) befestigt wird (werden).

14. Verfahren nach Anspruch 13, wobei eine Dampfsperre (72) und/oder ein Unterdachkragen (71) entfaltet wird, wobei die Dampfsperre (72) und/oder der Unterdachkragen (71) im gefalteten Zustand im Wesentlichen entlang des ersten und/oder des zweiten Dämmelements (101, 102) verläuft und im entfalteten Zustand unter der Unterseite des Dämmteils (10) vorsteht.

Revendications

1. Organe isolant (10) destiné à être utilisé entre une fenêtre (1) et une structure porteuse (2, 6, 8, 9, 20), comprenant :

un premier élément isolant (101) réalisé en un matériau isolant stable dimensionnellement,
un second élément isolant (102) réalisé en un matériau isolant compressible, et
des moyens de fixation (103, 104, 109) pour fixer l'organe isolant à la fenêtre ou à la structure porteuse,
où les premier et second éléments isolants (101, 102) sont reliés de sorte que, en utilisation, l'orientation des éléments isolants soit telle que le premier élément isolant (101) soit par-dessus le second élément isolant (102), le côté du premier élément isolant orienté à l'opposé du second élément isolant définissant un côté supérieur de l'organe isolant et le côté du second élément isolant orienté à l'opposé du premier élément isolant définissant un côté inférieur de l'organe isolant, dans lequel une direction de hauteur est définie comme une direction s'étendant dudit côté inférieur audit côté supérieur, et où lesdits moyens de fixation (103, 104, 109) sont attachés au premier élément isolant,
caractérisé en ce que le second élément isolant (102) est réalisé en un matériau fendu avec des fentes (105) s'étendant dans ladite direction de hauteur depuis ledit côté inférieur.

2. Organe isolant selon la revendication 1, où les moyens de fixation (103, 104, 109) sont choisis dans le groupe constitué : d'adhésifs, de rubans double face, de clous, des supports d'attache, d'évidements ou de moyens d'encastrement similaires appariant des organes sur la fenêtre ou la structure porteuse.

3. Organe isolant selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le second élément isolant (102) a une hauteur dans la direction de hauteur de 20 à 60 mm, de préférence de 50 mm.

4. Organe isolant selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le premier et/ou le second élément isolant (101, 102) est pourvu d'au moins un évidement pour recevoir un support de montage ou similaire agencée sur la fenêtre ou la structure porteuse.

5. Organe isolant selon la revendication 4, **caractérisé en ce que** l'au moins un évidement est prévu sous forme de parties détachables de l'organe isolant ou pourvu d'un bouchon lorsqu'il n'est pas en utilisation.

6. Organe isolant selon l'une quelconque des revendications précédentes, comprenant en outre un ou plusieurs éléments (11, 12, 13, 14, 71, 72, 106) choisis dans le groupe constitué : d'organes de solin, de bandes d'étanchéité, de pare-vapeur et de colliers de sous-toiture.

7. Organe isolant selon la revendication 6, **caractérisé en ce qu'**un pare-vapeur (72) et/ou un collier de sous-toiture (71) est prévu dans un état plié.

8. Fenêtre (1) pour une installation dans une surface de toit inclinée, comprenant

un cadre de fenêtre comprenant une pluralité de pièces de cadre de fenêtre (41, 42, 43), chaque pièce de cadre de fenêtre ayant un côté supérieur, un côté inférieur, un côté interne et un côté externe, une direction de hauteur étant définie par une direction s'étendant du côté inférieur au côté supérieur, et
un cadre isolant comprenant une pluralité de pièces de cadre isolant formées à partir d'organes isolants (10) selon l'une quelconque des revendications précédentes,
où les pièces d'organe isolant sont situées adjacentes au côté externe de pièces de cadre de fenêtre correspondantes, avec les premiers éléments isolants (101) par-dessus les seconds éléments isolants (102) vue dans ladite direction de hauteur, de sorte que les premiers éléments isolants forment un côté supérieur du cadre isolant et les seconds éléments isolants forment un côté inférieur du cadre isolant.

9. Fenêtre selon la revendication 8, **caractérisée en ce que** le cadre de fenêtre est rectangulaire et comprend une pièce haute, une pièce basse (42) et deux pièces de côté (41, 43) et **en ce que** des seconds éléments isolants (102) sont présents uniquement au niveau des pièces de côté du cadre de fenêtre.

10. Fenêtre selon la revendication 8 ou 9, **caractérisée en ce que** des pièces de cadre isolant différentes ont des seconds éléments isolants différents (102).

11. Structure de toit inclinée comprenant une fenêtre (1) selon l'une quelconque des revendications 8 à 10 et

comprenant en outre une structure porteuse (2, 6, 8, 9, 20) comportant une pluralité de voliges (9), et un matériau de toiture (3) agencé sur les voliges, dans laquelle
un cadre de solin est agencé pour assurer l'étanchéité d'une jointure entre la fenêtre et la structure de toit, ledit cadre de solin comportant des organes de solin (11, 12, 13, 14) ayant une première patte se trouvant sensiblement dans le plan du toit entre les voliges et la toiture et une seconde patte s'étendant en formant un angle par rapport à la première patte et se trouvant sensiblement parallèle au côté externe du cadre de fenêtre.

12. Structure de toit inclinée selon la revendication 11, où au moins un organe de solin (11, 12, 13, 14) est attaché à un premier élément isolant (101).

13. Procédé pour isoler une fenêtre (1) dans une structure de toit inclinée (2, 20), ladite fenêtre ayant un cadre de fenêtre comprenant une pluralité de pièces de cadre de fenêtre (41, 42, 43) et chaque pièce de cadre de fenêtre ayant un côté supérieur, un côté inférieur, un côté interne et un côté externe, une direction de hauteur étant définie par une direction s'étendant dudit côté inférieur audit côté supérieur, ladite structure de toit (2, 20) comportant une structure porteuse (6, 8, 9),
dans lequel au moins un organe isolant (10) comprenant un premier élément isolant supérieur (101) réalisé en un matériau isolant stable dimensionnellement relié à un second élément isolant inférieur (102) réalisé en un matériau isolant compressible avec des fentes (105) s'étendant dans ladite direction de hauteur depuis un côté inférieur dudit second élément isolant inférieur (102), est agencé le long du côté externe d'au moins une pièce de cadre de fenêtre, de sorte que le premier élément isolant soit par-dessus le second élément isolant lorsque vue dans ladite direction de hauteur,
où le second élément isolant (105) est amené en contact avec la structure de toit sous-jacente (2, 6, 8, 9, 20) et est localement compressé par toute saillie dessus, et
où l'organe ou les organes isolants (10) est/sont fixé(s) à la fenêtre (1) ou à la structure porteuse (2, 6, 8, 9, 20) au moyen d'un moyen de fixation (103, 104, 109) attaché sur le premier élément isolant.

14. Procédé selon la revendication 13, où un pare-vapeur (72) et/ou un collier de sous-toiture (71) est étendu depuis un état plié, où il est situé sensiblement le long du premier et/ou du second élément isolant (101, 102), à un état déplié où il fait saillie en dessous du côté inférieur de l'organe isolant (10).

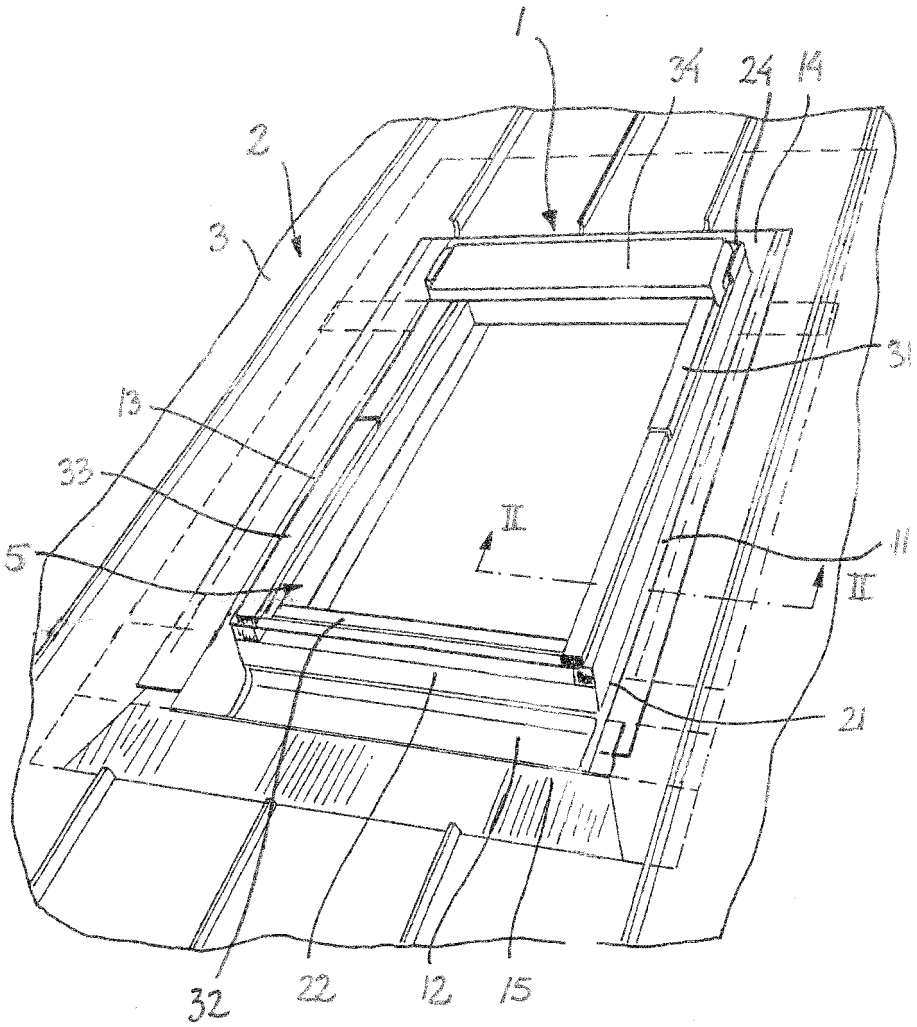


FIG. 1

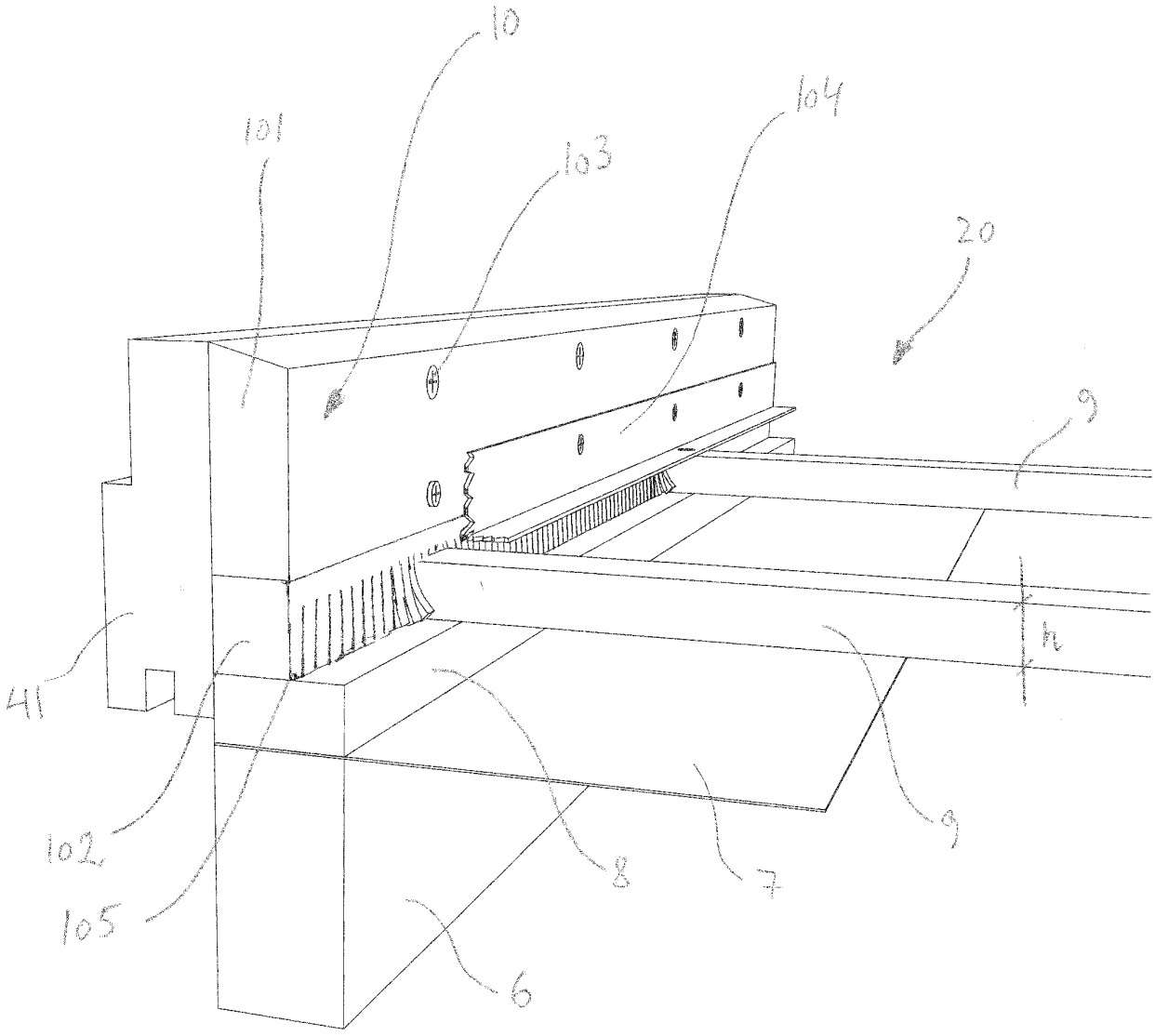


FIG. 2

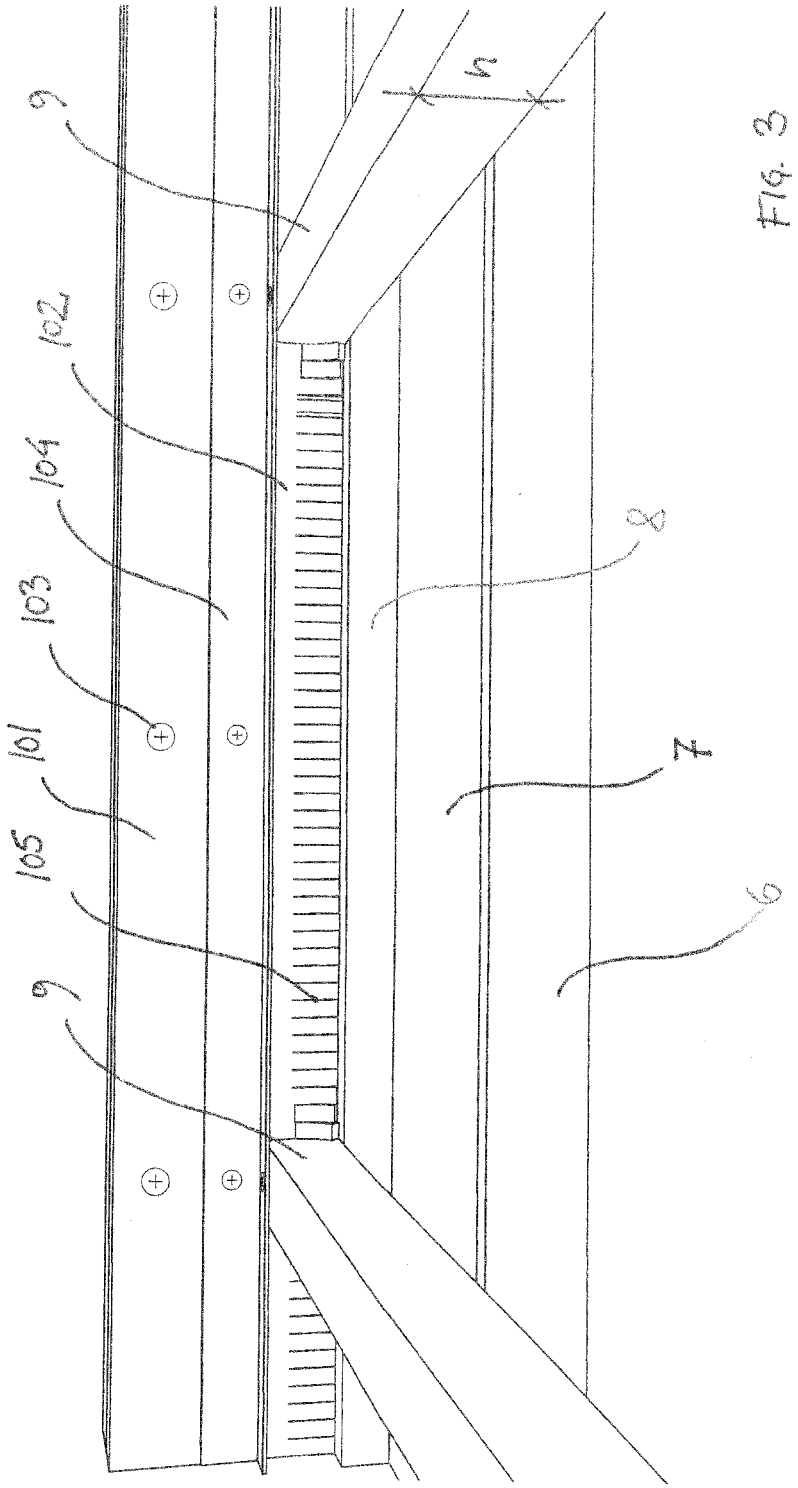


FIG. 3

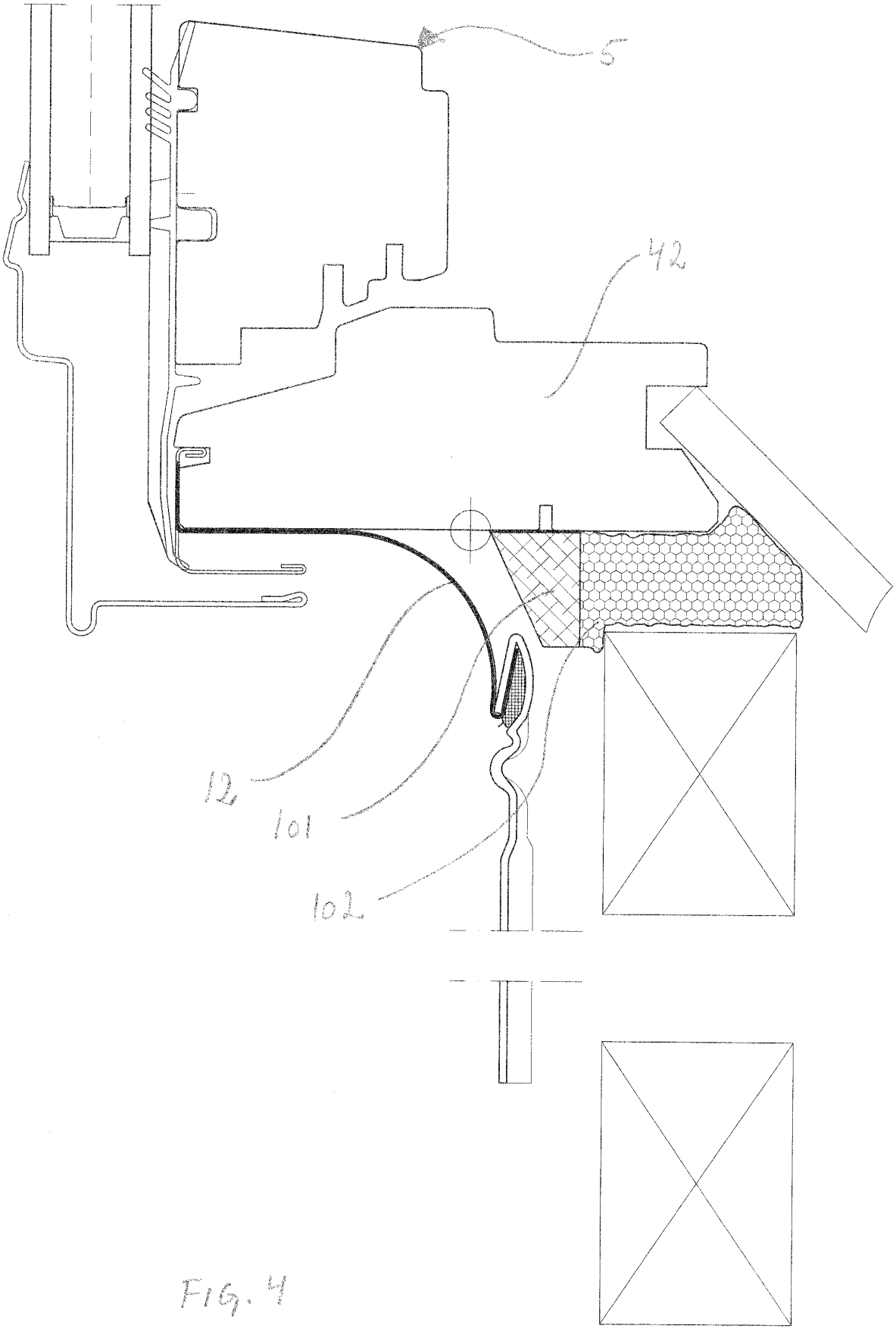


FIG. 4

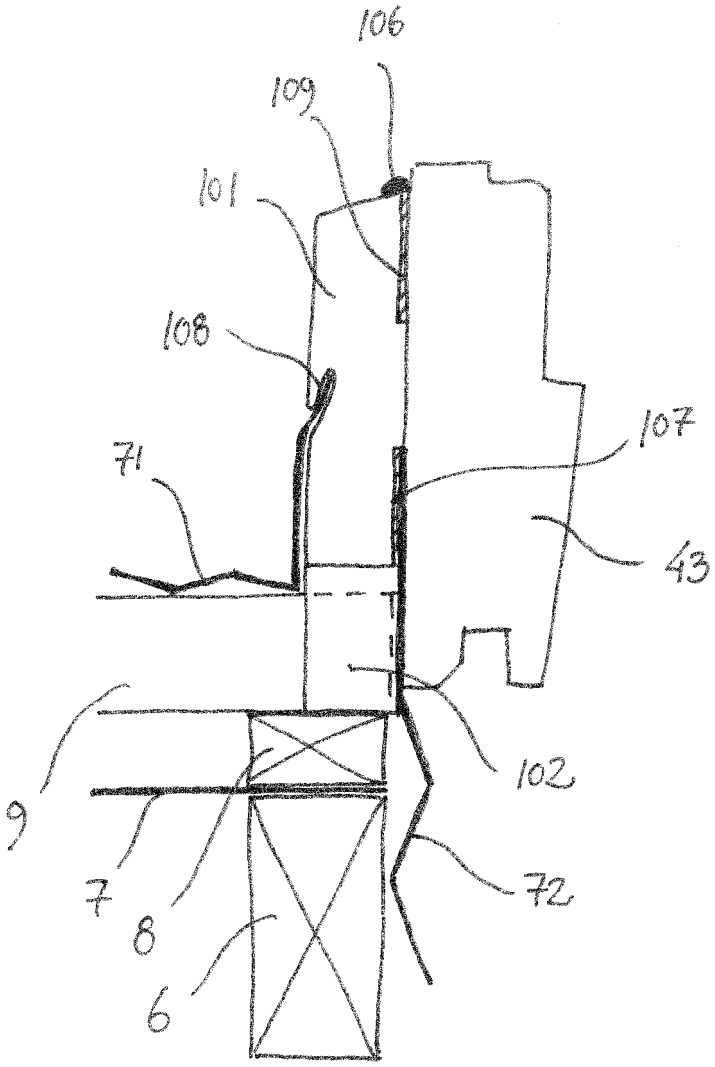


FIG. 5

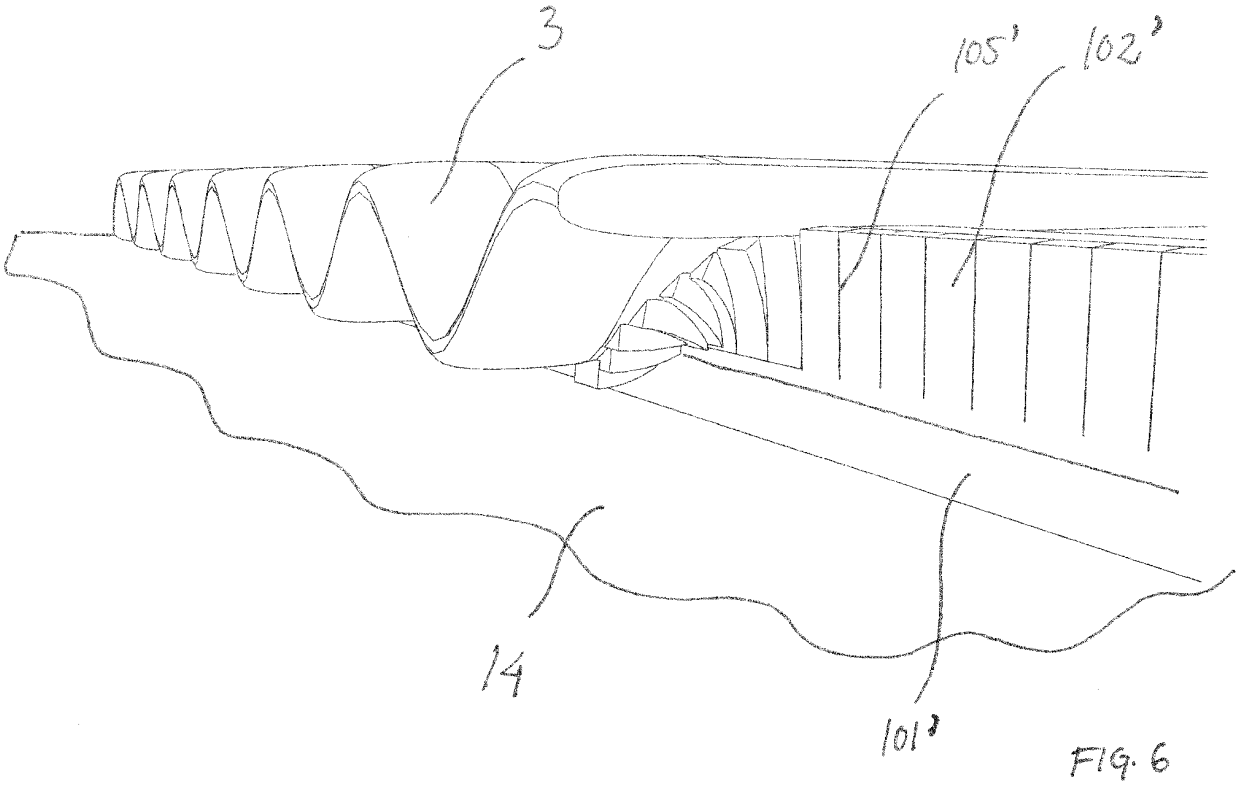


FIG. 6

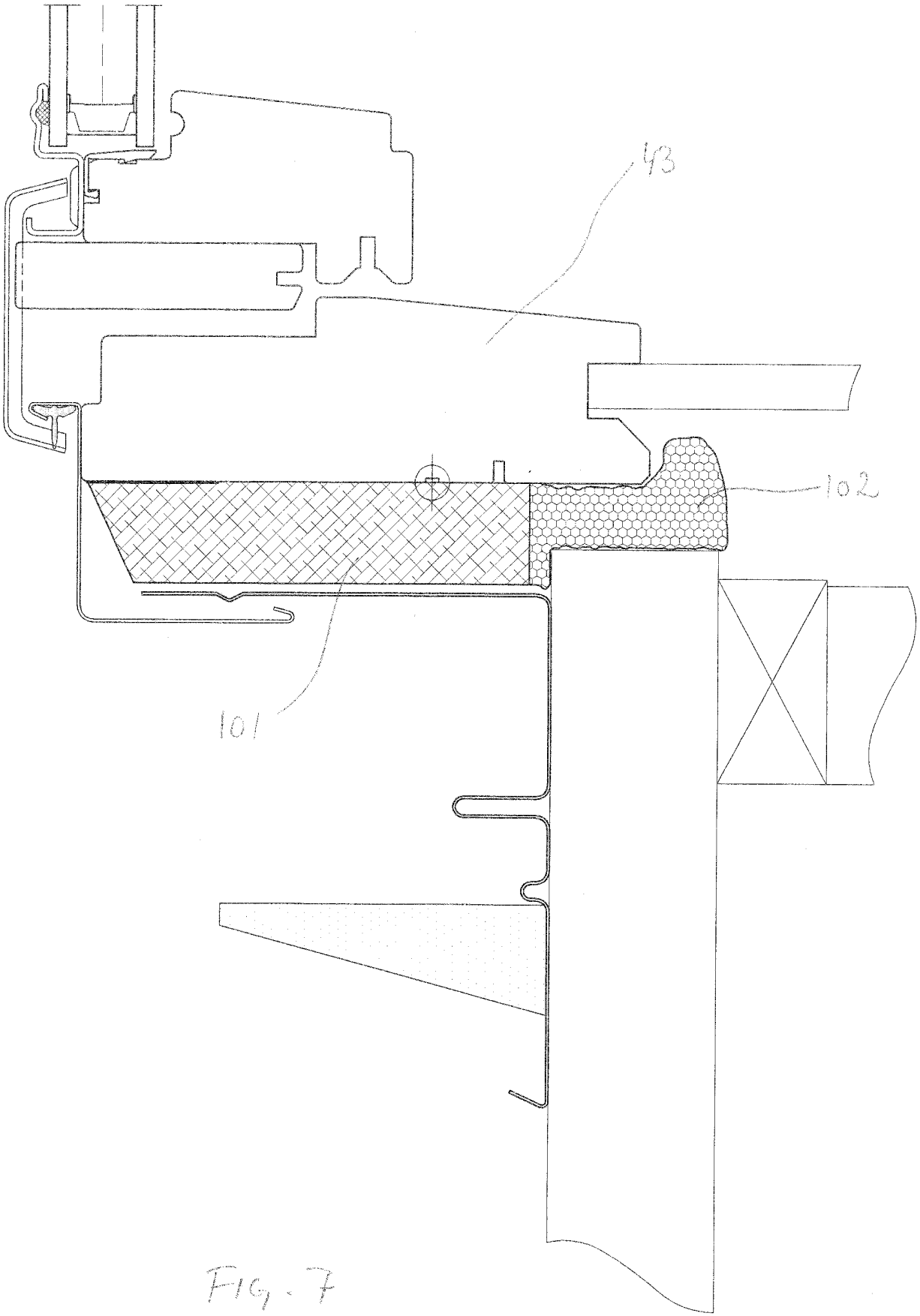


Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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