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(54) **A window with sound dampening and/or insulating members**

(57) A window, such as a roof window, comprising a frame (1), a sash (2), a pane (6;106;206;306), a weather and sound proofing system including covering, sealing and dampening members (31,32,33,34,35,36,41,42, 43,44). Two or more sound dampening and/or insulating members (81-89; 181-189;281-289)) are provided at the interior side of the spacing (9) between the sash and frame of the window and two or more sound dampening and/or insulating members (61-64,71-78, 91,92; 161-164,171-178,165,166;261-264,271-278,265,266; 379) are provided at the interior side of the spacing (9). The dampening and/or insulating member(s) are preferably made from rubber or foam.

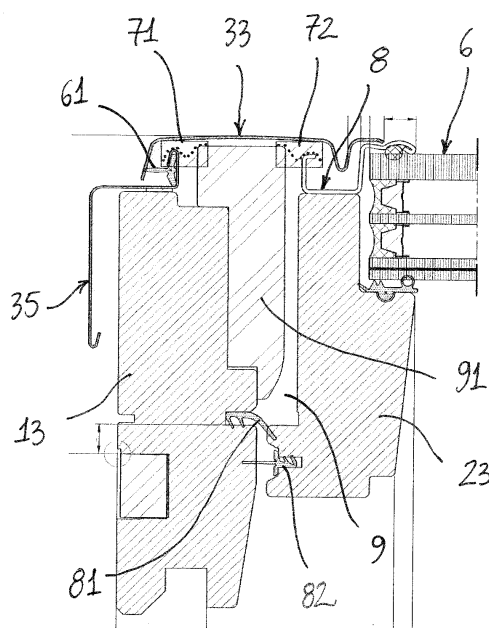


Fig. 2

Description

[0001] The present invention relates to a window, such as a roof window, comprising a frame, a sash, a pane and a weather and sound proofing system including covering, sealing and dampening members, where a spacing between the frame and the sash allows the window to be opened, and where an interior side is intended to face the interior of a building in the mounted state of the window and an exterior side is intended to face the exterior of the building. In such a window the frame normally comprises a frame top member, a frame bottom member and two frame side members, the sash comprises a sash top member, a sash bottom member and two sash side members, and the covering comprises a frame top covering member, frame side covering members, a frame bottom covering member, sash side covering members and a sash bottom covering member.

[0002] Over the years, there have been countless attempts to adapt the design of windows to achieve a better sound insulation and sound dampening. I.e. to prevent external sound such as traffic noise from reaching the interior of the building and to reduce the sound generated by wind or when precipitation hits the exterior side of the window. These factors have been taken into account in the construction of the windows, particularly the panes, and the provision of improved sealings and thermal insulation has in many cases also contributed to improved sound insulation.

[0003] It has also been suggested to cover the window whenever the noise caused by precipitation becomes too loud, e.g. with a rubber roller blind as in DE19635463. This latter method, however, requires either a manual activation or the incorporation of a motor and a sound or precipitation sensor. In EP2055860 the applicant therefore suggested to reduce the sound generated when precipitation hits the covering by providing the interior side of covering members with an adhesive tape.

[0004] It is, however, the object of the invention to provide a window, where the sound dampening and insulating properties are improved even further without increasing the costs of the window considerably or making it more difficult to operate the window.

[0005] This object is met by a window of the kind mentioned in the introduction, where two or more sound dampening and/or insulating members are provided at the interior side of the spacing between the frame and the sash and where two or more sound dampening and/or insulating members are provided at the exterior side of the spacing.

[0006] Such a system of dampening and/or insulating members has proven to provide an excellent balance between on the one hand improved acoustic properties and on the other hand price and complexity of the window.

[0007] Depending on the physical properties of the spacing and the design of the dampening and/or insulating members different advantages may be provided. If the spacing is relatively wide the dampening and/or in-

sulating member may simply keep noise from penetrating into the spacing. If it is relatively narrow it may prevent the generation of noise caused by direct physical contact or the transmission of sound from one part to the other.

5 This of course also applies if similar dampening and/or insulating members are attached to the covering members, in which case the dampening and/or insulating members may contribute to changing the acoustic properties of the covering member itself and/or reduce noise generated by wind affecting the covering by changing the surface characteristics of the covering, e.g. by closing off openings therein. Often the design of the window and the dampening and/or insulating members will allow them to serve several of these purposes.

10 **[0008]** Depending on their intended use, the dampening and/or insulating members are preferably made from rubber or a foam material, which provides good sound insulation and dampening without adding unduly to the weight of the window. An elastic foam, which can be compressed and substantially regain its original shape when released, such as ethylene propylene (EPDM) or nitrile (NBR), is preferred for many types of dampening and/or insulating members, but dimensionally stable foams such as expanded polystyrene (EPS) may also be applies. Polyurethane (PUR) foam may be made to suit both purposes. Foam dampening and/or insulating members may be applied either in a soft, semi-liquid or liquid form, so that they adhere to the window, or be applied by means of an adhesive or glue.

20 **[0009]** Other materials, such as mineral wool, may also be applied or used for at least some of the dampening and/or insulating members, but due care should be taken that the material used is durable and capable of withstanding the climate conditions prevailing with respect to the covering of a roof window.

25 **[0010]** In one embodiment a first and a second exterior side dampening and/or insulating member are attached to each of the side covering members, which cover the spacings between side members of the sash and side members of the frame on the exterior side. They are arranged to extend along the side members of the sash and the frame and in parallel with those so that in the closed state of the window the first exterior side dampening and/or insulating member is preferably in contact with a frame side covering member and the second exterior side dampening and/or insulating member is preferably in contact with a glazing profile overlapping the small space between a sash side member and the pane. Advantageously, each of these dampening and/or insulating members, which preferably constitutes a strip of material, extends over substantially the entire length of the side covering member, e.g. from the hinge axis to the top or bottom of the window, but one or both of them may be interrupted, e.g. to allow mutually overlapping movement of different covering members during opening and closing of the window. In this respect it is noted, that a top-hung window will normally include two sash side covering members arranged one at each side of the window

and extending from the sash top member to the sash bottom member. The side dampening and/or insulating members will be arranged on these. A centre-hung window on the other hand may be said to include four side covering members, two above the hinge axis and two below. The two side covering members above the hinge axis are attached to the frame, only covering the sash in the closed state of the window, whilst the two side covering members below the hinge are attached to the sash and only covers the frame side members when the window is closed, and are normally referred to as claddings. Finally also dual function roof windows which is a type of windows having the capability to rotate both as a top-hung window and a centre-hung window would also include four sash side covering members, but with this type of window the upper side coverings would be attached to an intermediate frame member.

[0011] The side dampening and/or insulating members not only prevent external noise from reaching the spacing between the frame and the sash and hence the interior of the building, they also prevent direct contact between the side covering member and other parts of the window and may provide longitudinal support for the side covering member. This may help prevent the generation of rattling noise from the covering during heavy winds. Furthermore, particularly the dampening and/or insulating member arranged furthest from the pane will prevent wind from penetrating underneath the side covering member, thus preventing howling noises.

[0012] In addition or as alternatives to the first and second exterior side dampening and/or insulating members described above, dampening and/or insulating members used at the sides of the window on the exterior side may be chosen from the group comprising:

a first exterior frame dampening and/or insulating member attached to an exterior face of a frame side covering member and arranged to be in contact with a side covering member in the closed state of the window,

a first exterior sash dampening and/or insulating member attached to a glazing profile that overlaps a narrow space between the sash and the pane, said first exterior sash dampening and/or insulating member being attached to a leg of the glazing profile projecting towards the exterior so that it is positioned at least partially between the glazing profile and a covering member,

a first exterior frame dampening and/or insulating member arranged on the side frame member and filling an exterior part of the spacing between the side frame member and the side sash member, and a first exterior sash dampening and/or insulating member arranged on the side sash member and filling an exterior part of the spacing between the side frame member and the side sash member.

[0013] The first exterior frame dampening and/or insu-

lating member is located close to the position of the first exterior side dampening and/or insulating members and may thus either serve as an alternative thereto or protect it from external factors such as water and UV radiation.

[0014] The first exterior sash dampening and/or insulating member may be in direct contact with the side covering member or with a second side dampening and/or insulating member arranged on the side covering member as mentioned above. It may thus be either an alternative or a supplement to the second side dampening and/or insulating member as described for the first exterior frame dampening and/or insulating member above. The first exterior sash dampening and/or insulating member may extend underneath the glazing profile to also isolate the glazing profile, which is typically made of metal, from the sash.

[0015] The first exterior frame dampening and/or insulating member and the first exterior sash dampening and/or insulating member are intended to close off the exterior opening of the spacing wholly or partly. They may extend up to the side covering members. A centre-hung window will typically include both of these types of dampening and/or insulating members, one on each side of the hinge axis, whereas it will usually be more expedient to have only one of the them extending over the entire length of the sides in a top-hung window.

[0016] Dampening and/or insulating members for use at the bottom of the window on the exterior side include:

a third exterior sash dampening and/or insulating member attached to the sash bottom member and overlapping the exterior side of the frame bottom member in the closed state of the window, a fourth exterior sash dampening and/or insulating member attached to an interior face of a sash bottom covering member at an edge facing away from the pane and arranged to be in contact with a frame bottom covering member in the closed state of the window,

a fifth exterior sash dampening and/or insulating member attached to an exterior face of the sash bottom member underneath a sash bottom covering member, and

a sixth and seventh exterior sash dampening and/or insulating member attached to the sash bottom member and contacting the frame bottom member in the closed state of the window.

[0017] The third exterior sash dampening and/or insulating member is usually made of rubber or plastic and preferably extends from below the pane to over the outer side of the frame bottom member thus covering the exterior opening of the spacing entirely and thus stopping airborne sound.

[0018] The fourth exterior sash dampening and/or insulating member is primarily provided to prevent sound from entering between the covering members, as the traditional overlap between covering members have proven

to provide a highly satisfactory water and wind proofing. It may be attached to the covering member by adhesion or by folding the edge of the covering member over the dampening and/or insulating member so that it is held by friction. The mode of attachment may also be used for other dampening and/or insulating members of similar type.

[0019] The fifth exterior sash dampening and/or insulating member is preferably arranged close to the pane, so that it fills a space between the lower rim of the pane, the sash bottom covering member and the sash bottom member. As this space is usually dimensionally stable, this dampening and/or insulating member may be made from a material with no or limited elasticity, such as expanded polystyrene.

[0020] The sixth and seventh exterior sash dampening and/or insulating member are preferably attached to a part of the sash bottom member projecting of the frame bottom member, making the spacing substantially parallel to the pane. One or more gasket-like dampening and/or insulating members at this section of the spacing will not only help prevent the ingress of sound but may also prevent the generation of noise due to wind affecting the spacing.

[0021] Dampening and/or insulating members for use at the top of the window on the exterior side include:

a third exterior frame dampening and/or insulating member is attached to an interior face of a frame top covering member and arranged to be in contact with the sash, the pane or a glazing profile in the closed state of the window,

a fourth exterior frame dampening and/or insulating member is arranged between a frame top covering member and a frame top member,

a fifth exterior frame dampening and/or insulating member arranged on the top frame member and filling an exterior part of the spacing between the top frame member and the top sash member,

a sixth exterior frame dampening and/or insulating member arranged on the top frame member or a fourth exterior frame dampening and/or insulating member if present and contacting the top sash member in the closed state of the window,

a seventh exterior frame dampening and/or insulating member arranged on the frame top covering and facing the sash top member or the glazing profile in the closed state of the window,

an eighth exterior frame dampening and/or insulating member arranged on a seventh exterior frame dampening and/or insulating member and contacting the sash top member or the glazing profile in the closed state of the window,

a first exterior sash dampening and/or insulating member attached to a glazing profile that overlaps a narrow space between the sash and the pane, said first exterior sash dampening and/or insulating member being attached to a leg of the glazing profile pro-

jecting towards the exterior so that it is positioned at least partially between the glazing profile and a covering member.

[0022] The third exterior frame dampening and/or insulating member primarily prevents external noise from reaching the interior of the building, but may also influence the acoustic properties of the covering member as described for the side dampening and/or insulating members above.

[0023] The fourth exterior frame dampening and/or insulating member primarily reduces noise generated when water hits the frame top covering member and may be made from a non-elastic foam material.

[0024] The fifth exterior frame dampening and/or insulating member is preferably a block of non-elastic foam and fills out an exterior part of the spacing, which might otherwise be occupied by accessories such as an integrated roller shutter.

[0025] The sixth exterior frame dampening and/or insulating member is preferably made from rubber or rubber foam and seals of the spacing at the exterior side, thus primarily preventing the ingress of sound.

[0026] The seventh and eighth exterior frame dampening and/or insulating member serves substantially the same purpose as the sixth exterior frame dampening and/or insulating member, but are arranged further towards the exterior.

[0027] Dampening and/or insulating members for use along the sides of the window at the interior side include:

a first interior frame dampening and/or insulating member arranged at the interior side of the spacing on the inner side of a frame side member or a member attached thereto and facing an opposing sash side member, and

a first and a second interior sash dampening and/or insulating member each arranged at the interior side of the spacing on the inner side of a sash side member and facing an opposing frame side member.

[0028] These dampening and/or insulating members, which are preferably rubber gaskets, are preferably arranged relatively close to each other and extending along the side members of the sash and/or the frame. In case of a centre-hung window, it is presently preferred to have two dampening and/or insulating members on the sash below the hinge axis, where as one is provided on the frame above the hinge axis to provide for optimal operation of the window. For the same reason and to provide a continuous dampening and/or insulation, one end of the first interior frame dampening and/or insulating member may also be attached to the hinge, or a separate dampening and/or insulating member on the hinge may be used.

[0029] At the bottom the window preferably includes a third and a fourth interior sash dampening and/or insulating member arranged at the interior side of the spacing

on the inner side of a sash bottom member and facing an opposing frame bottom member. These dampening and/or insulating members correspond in function to the first and second interior sash dampening and/or insulating member described above.

[0030] Dampening and/or insulating members for use at the top of the window on the interior side include:

a second and a third interior frame dampening and/or insulating member arranged at the interior side of the spacing on the inner side of a frame top member and facing an opposing sash top member,
a fifth interior sash dampening and/or insulating member arranged at the interior side of the spacing on the inner side of a sash top member, on a ventilation flap or on a member attached to the ventilation flap, and facing an opposing frame top member,
a sixth interior sash dampening and/or insulating member attached directly or indirectly to a ventilation flap on a side thereof facing the spacing between the sash and the frame top members, possibly serving as a basis for the attachment a fifth interior sash dampening and/or insulating member, and
a seventh interior sash dampening and/or insulating member arranged between a sixth interior sash dampening and/or insulating member and a ventilation flap and substantially covering the entire surface of the ventilation flap facing the spacing.

[0031] When using a ventilation flap, the spacing between the sash and frame is usually relatively wide and it may therefore be advantageous to provide extra sound dampening and/or insulation. The sixth and seventh interior sash dampening and/or insulating members serve this purpose. If using both at the same time, they will usually be made of different materials having different dampening and/or insulating properties.

[0032] To provide a continuous dampening and/or insulation each dampening and/or insulating member preferably extends over substantially the entire length of the frame member, sash member, covering member or glazing profile to which it is attached, or up to another dampening and/or insulating member arranged at the same level on another member of the window.

[0033] The second and a third interior frame dampening and/or insulating member corresponds in function to the first interior frame dampening and/or insulating member and the fifth interior sash dampening and/or insulating member corresponds to the first and fourth interior sash dampening and/or insulating member. When these dampening and/or insulating members and third interior sash dampening and/or insulating member are arranged in the same two planes, they may thus form continuous dampening and/or insulation extending all the way around the window.

[0034] Though described as separate embodiments above it is to be understood that the dampening and/or insulating members may be combined in different ways

and that a window including all of them will display the best properties with respect to sound.

[0035] The dampening and/or insulating member(s) may be attached by adhesion or gluing, by being held in a recess in a frame member or sash member, or by being clamped in a fold or recess in a covering member. The mode of attachment depends amongst others on the material used for the dampening and/or insulating member and for the member to which it is attached. It is to be understood that though not explicitly stated the modes of attachment of the different kinds of the dampening and/or insulating members described will also apply to other dampening and/or insulating members of similar design as will be readily understood by the skilled person.

[0036] Specific embodiments of the invention will now be discussed by way of example and with reference to the appended figures, where:

Fig. 1 is a perspective view of a window according to the invention seen from above and from the exterior in the open state of the window,

Fig. 2 is a cross-sectional view of the side of a window above the hinge axis along the line II-II in Fig. 1 but in the closed state of the window,

Fig. 3 is a cross-sectional view of the side of a window below the hinge axis along the line III-III in Fig. 1 but in the closed state of the window,

Fig. 4 is a cross-sectional view of the bottom of a window along the line IV-IV in Fig. 1 but in the closed state of the window,

Fig. 5 is a cross-sectional view of the top of a window along the line V-V in Fig. 1 but in the closed state of the window,

Figs 6-9 correspond to Figs 2-5 but showing a second embodiment of the window,

Figs 10-13 correspond to Figs 2-5 but showing a third embodiment of the window, and

Fig. 14 shows a glazing profile with a glazing profile dampening and/or insulating member in a cross-sectional view.

[0037] Fig. 1 schematically depicts a centre-hung roof window with a frame 1, including a frame top member 11, a frame bottom member 12 and two frame side members 13,14, and a sash 2, including a sash top member 21, a sash bottom member 22 and two sash side members 23,24. The window further comprises a covering, here illustrated by a frame top covering member 31, a frame bottom covering member 32, a sash bottom covering member 42 and four side covering members, two of which 33,34 are attached to the frame above the hinges 5 and two of which are attached to the sash 43,44 below the hinges. The purpose of the covering is of course to shield the window from the impact of the weather, especially preventing water and snow from penetrating directly into the spacing 9 between the frame and the sash. So normally the covering is attached to either the frame or the sash and extends in width starting from the frame

side covering and over to the sash glazing profile so that the spacing is fully covered. The window is opened by means of the handle bar 26 which is connected to a locking assembly (not shown) via a ventilation flap 25. This window is only intended to illustrate the invention, which also includes other types of windows, such as top-hung windows and dual function windows, and/or windows having different configurations of for example the covering or the hinges.

[0038] In the embodiment shown in Figs 2 and 3 two strips 71,72 of elastic foam serve as first and second exterior side dampening and/or insulating members, respectively. Both strips are shown in the uncompressed state in full line and in the compressed state in dotted lines. The strip 71, which is furthest from the pane 6, is pressed against upwards projecting legs of frame side covering members 35,36, and the strip 72, which is closest to the pane 6, is pressed against a glazing profile 8, which is holding the pane to the sash and covers the small space between the sash side member 23,24 and the pane 6. The strips thus close off the spacing between the frame and the sash at the exterior side of the window, both at the inner side facing the pane and at the outer side facing away from the pane.

[0039] Both strips 71,72 also engage insulating members 91, 92, 93 arranged between the sash and frame side members 13,23,14,24 and filling out the space otherwise occupied by the hinges, thus providing an even better sealing of the exterior side of the spacing. Above the hinge axis the insulating member 91, which serves as a second exterior frame dampening and/or insulating member is attached to the frame as shown in Fig. 2, while the insulating members 92 below the hinge axis are attached to the sash and serves as a second exterior sash dampening and/or insulating member supplement by an additional insulating member 93. Such insulating members are not found in Figs 6-7 and 9-10.

[0040] As may be seen the provision of the strips 71,72 not only closes off the spacing between the sash and the frame but also provides a very good support for the side covering members 33,44. They therefore both contribute to reducing the noise generated in the window itself when affected by weather and to preventing external noise from reaching the interior of the building.

[0041] It is presently preferred that the first and second exterior side dampening and/or insulating members 71,72 on the side coverings 33,34,43,44 are continuous strips of material, but it is of course also possible to use discontinuous dampening and/or insulating members such as a row of dots of material or shorter sections of material arranged at predefined intervals. Such intervals may for example be defined by acoustic factors such as the self-oscillation frequency of the side coverings members. Alternating sections of different materials or material having different density may also be used. Likewise it is to be understood that the exterior side dampening and/or insulating members 71,72 do not need to have a solid rectangular cross-section as shown here, but that

they may be formed in other ways providing a satisfactory combination of elasticity and insulating properties, such as for example with a circular cross-section making the strip or a section thereof substantially tube-shaped, trapezoid formed with the smaller portion facing away from the covering or the dampening and/or insulating members may be formed with a hollow core thereby allowing the dampening and/or insulating members to be compressed and deformed during use without compromising their ability to insulate. These considerations also apply to the other dampening and/or insulating members described herein, which are or may be subject to compression during normal use of the window.

[0042] Next to the first exterior side dampening and/or insulating member 71 is a gasket 61 serving as a first exterior frame dampening and/or insulating member and tightening the gap between the side covering 33 and the frame side covering 35. This gasket protects the first exterior side dampening and/or insulating member 71 from the weather and provides additional sound dampening and/or insulation. Below the hinge axis the foam strip 71 will move away from the gasket 61 together with the sash when the window is opened, but above the hinge axis, as represented by Fig 2, the gasket 61 and the foam strip 71 might in principle be integrated in a single dampening and/or insulating member.

[0043] Two other kinds of dampening and/or insulating members are found at the bottom of the window between the frame bottom covering member 32 and the sash bottom covering member 42 as shown in Fig. 4. One is a gasket-like strip 73 serving as a fourth exterior sash dampening and/or insulating member, while the other is a block of insulating material 74 serving as a fifth exterior sash dampening and/or insulating member.

[0044] The gasket-like strip member 73 is clamped in a fold on the edge of the sash bottom covering member 42 facing away from the pane 6 and has an angled shaped allowing its free end or tongue to engage the exterior side of the frame bottom covering member 32. In this way this dampening and/or insulating member 73 closes off the space between the bottom covering members 32,42 and thus keeps out external noise. As will be readily seen by the skilled person, this dampening and/or insulating member will be affected by the mutual movement of the bottom covering members, which occurs during opening and closing of the window, and must therefore be made of an elastic material, preferably rubber.

[0045] The block of material 74 arranged on the sash bottom member 22 underneath the sash bottom covering member 42 and serving as fifth exterior sash dampening and/or insulating member on the other hand will not be affected by this movement and can therefore be made from a non-elastic material. As may be seen, the shape of the block is adapted to the shape of the sash bottom covering member so that it substantially covers the distance between the sash bottom member and the sash bottom covering member. This not only provides sound insulation but potentially also a support for the sash bot-

tom covering member 42 which may contribute to preventing vibrations and deformation thereof. In the embodiments in Figs 8 and 12 the sash bottom member are of different configuration, which does not leave room for such a dampening and/or insulating member.

[0046] Underneath the fifth exterior sash dampening and/or insulating member 74 is a wide strip-shaped member 62 serving as a third exterior sash dampening and/or insulating member. It extends from below the pane 6, where it seals the joint between the pane and sash bottom member 22, over the spacing between the sash and frame bottom members 12, 22 and over the frame bottom covering 32. It thus effectively closes off the spacing at the exterior side and serves as a support for the fifth exterior sash dampening and/or insulating member 74. Projections and bends helps keep the third exterior sash dampening and/or insulating member 62 in place in relation to the sash, frame and pane and may also contribute to a correct positioning of the fifth exterior sash dampening and/or insulating member 74. As the third exterior sash dampening and/or insulating member 62 may also be used for draining away condensation collecting at the interior side of the pane in a manner known per se, it is preferably made from a continuous sheet of plastic or rubber.

[0047] Turning now to Fig. 5 two further dampening and/or insulating members are found at the top of the window, both being arranged in abutment against the interior side of the frame top covering 31. One 75 is arranged above the glazing profile 8 serving as a third exterior frame dampening and/or insulating member and the other 76 above the frame member 11 serving as a fourth exterior frame dampening and/or insulating member, thus in principle corresponding to the exterior side dampening and/or insulating members 71, 72 on the side coverings with regards to many of their functions.

[0048] In the embodiment shown, the main body of the third exterior frame dampening and/or insulating member 75, which is made from a non-compressible foam material, is not in direct contact with the glazing profile 8, but provided with an intermediate gasket system 63, 64 in order to provide an optimal combination of insulation, strength and stiffness with the elasticity needed to allow the window to open. It would, however, also be possible to use a simpler strip of elastic foam as described for the exterior side dampening and/or insulating members 71, 72 above.

[0049] The fourth exterior frame dampening and/or insulating member 76 does not need to be elastic, except what is needed for it to follow the movement of the covering caused by thermal expansion etc., and is therefore preferably made from expanded polystyrene or the like. It is attached to the interior face of the covering, which forms the bottom of the gutter 37, when the window is mounted in an inclined roof, and which will therefore be affected by rain and melt water. The fourth exterior frame dampening and/or insulating member 76 will reduce the transition of sound produced when the water hit the cov-

ering and flows along the gutter.

[0050] The insulating member 77, which is provided as a part of the frame top member 11 and serving as a fifth exterior frame dampening and/or insulating member, closes off the spacing 9 towards the exterior and serves as a seat for a gasket 78 serving as a sixth exterior frame dampening and/or insulating member sealing against the sash member 21.

[0051] Attached to the third exterior frame dampening and/or insulating member 75 is a seventh exterior frame dampening and/or insulating member 63 and an eighth exterior frame dampening and/or insulating member 64 in the form of two strip-like members. The eighth exterior frame dampening and/or insulating member 64 is here a rubber gasket while the seventh exterior frame dampening and/or insulating member 63 is here made of a dimensionally stable material, but they may in principle be made from the same material and/or integrated in a single dampening and/or insulating member. The seventh and eighth exterior frame dampening and/or insulating members 63, 64 closes off the space, which might otherwise be found between the frame top covering and the glazing profile or sash top member and allows the third exterior frame dampening and/or insulating member 75 to be of a very simple design. It would, however, also be possible to integrate all three of them in a single member or to use only one or two of them.

[0052] At the interior side the spacing between the frame 1 and the sash 2 is closed off by a set of sealing gaskets all the way around the window. At the sides above the hinge axis a first gasket 81 serving as a first interior frame dampening and/or insulating member is provided on the frame side member 13 and a second gasket 82 serving as a first interior sash dampening and/or insulating member is provided on the sash side member 23 as shown in Fig. 2. The first gasket 81 extends only to the hinge, whereas the second gasket 82 extends over substantially the entire length of the sash side member. A third gasket 83 serving as a second interior sash dampening and/or insulating member extends on the sash side member 24 substantially from the hinge to the sash bottom member and is located at the same level as the first gasket 81 as may be seen by comparing Figs 2 and 3.

[0053] Turning now to Figs 4 and 5 similar sets of gaskets 84, 85, 86, 87 are provided at the top and the bottom of the window. At the bottom a third and fourth interior sash dampening and/or insulating member 84, 85 are located on the sash bottom member 22, and at the top a second interior frame dampening and/or insulating member 86 is provided on the frame top member 11 and a fifth interior sash dampening and/or insulating member 87 on the sash top member 21. The third interior sash dampening and/or insulating members 84 and the second interior frame dampening and/or insulating member 86 in Figs 4 and 5 are located at substantially the same level as the first interior frame dampening and/or insulating member 81 and second interior sash dampening

and/or insulating members 83 so that together they form a substantially continuous sealing of the spacing between the frame and the sash all the way around the window. Likewise the fourth and fifth interior sash dampening and/or insulating members 85,87 are substantially at level with the first interior sash dampening and/or insulating member 82 in the closed state of the window.

[0054] All of the seven gaskets 81,82,83,84,85,86,87 mentioned above are of the type having a projecting tongue, which engages the opposite member of the sash or frame when the window is closed. In the drawing, they are shown in their non-deformed state, but it is to be understood that the tongue will be bent due to the contact with the sash or frame member. As an example the tongue 851 on the fourth interior sash dampening and/or insulating member 85 will be bent upwards and lie tightly against the surface of the frame bottom member 12 facing the spacing in the closed state of the window as indicated by the dotted line in Fig. 4.

[0055] At the top the window is provided with further dampening and/or insulating members 88,89 as illustrated in Fig. 5. A block 88 of a dimensionally stable insulating material serving as a sixth interior sash dampening and/or insulating member is arranged to project from the ventilation flap 25 into the spacing between the sash and the frame top members 11,21 in the closed state of the window. This block closes off the spacing almost entirely and serves as a seat for the fifth interior sash dampening and/or insulating member 87, which comes into contact with the frame top member 11. In this embodiment, a strip of an elastic foam material 89 is interposed between the actual ventilation flap 25 and the foam block 88 and project between the ventilation flap and the sash top member 11. This strip 89 thus provides a resilient support for the foam block 88 and seals the small space between the ventilation flap and the sash top member. The combination of elastic and dimensionally stable material allows a particularly good sound dampening and/or insulation and the elasticity of the strip allows a relatively tight fit between the foam block and the surfaces of the sash and frame top members 11,21.

[0056] Figs 6-9 correspond to Figs 2-5 but show details of a different window. To reflect this, features having the same or similar functionality as in Figs 2-5 have been given the same reference numbers but with 100 added. Likewise, features in Figs 10-13, which show details of a third embodiment of a window, have been given the same numbers but with 200 added, and in Fig. 14, which shows a fourth embodiment, 300 has been added.

[0057] In Figs 8 and 12 alternative exterior sash dampening and/or insulating members in the form of a two gaskets 165,265 and 166,266 serving as a sixth and seventh exterior sash dampening and/or insulating member, respectively, are shown on a part of the sash bottom member 122,222 projecting over the frame bottom member 112,212. The gaskets are attached by being pressed into grooves in the sash bottom member. Here each sash bottom member 122,222 is provided with three grooves,

but only two are provided with gaskets. This allows the gaskets to be arranged in different positions depending on demand or the addition of an additional gasket. As may be seen by comparing Figs 8 and 12, the gaskets may be of different configurations with tongues or tube-shaped sections engaging the frame bottom member 112,212. When using two gaskets as in Figs 8 and 12 it is preferred that the innermost gasket engages the frame bottom member directly, whereas the outermost gasket engages the frame bottom covering 132,232.

[0058] In Figs 9 and 13 the sixth interior sash dampening and/or insulating members 188,288 are of different designs than in Fig. 5. In Fig. 9 the block of material used in Fig. 5 is replaced by two strips of material engaging the sash top member 121 and the frame top member 111, respectively, thereby saving material and potentially making room for other components such as a locking assembly. In Fig. 13 the block of material is replaced by a U-shaped member arranged with one leg against the ventilation flap 225, the base of the U against the frame top member 211 and the second leg projecting across the spacing to the sash top member 221. To have sufficient strength this embodiment is preferably made from plastic and the insulating properties are provided by the closed space delimited by the U and the sash top member.

[0059] In Fig. 10 an intermediate frame member 227 is provided between the sash and the frame side members 213,223 and the first interior frame dampening and/or insulating member 281 is attached thereto. This first interior frame dampening and/or insulating member 281 is of a double-sided configuration so that it seals both the spacing between the intermediate frame and the main frame side member 213 and between the intermediate frame and the sash side member 223.

[0060] In Fig. 13 the frame top member is two-part 211,211' to provide a dual function window, which can be operated both as a top-hung and as a centre-hung window in a manner known per se and the second interior frame dampening and/or insulating member 286 is provided with additional tongues allowing it to also seal the space between these two frame top members.

[0061] Turning now to Fig. 14, which shows a detail of the side sash member corresponding to a section of Fig. 2, 6 or 10, the glazing profile 308 is provided with a glazing profile dampening and/or insulating member 379 in the form of a rubber strip, e.g. of ethylene propylene (EPDM) or nitrile (NBR). As may be seen, this dampening strip embraces the glazing profile and has a flange 379' projecting over the leg projecting away from the sash member 323. This flange prevents direct contact and hinders the transmission of heat between the side covering (not shown in Fig. 14) and the glazing profile. The glazing profile dampening and/or insulating member may be used as an alternative or supplement to the side dampening and/or insulating member 72. Moreover, as the glazing dampening and/or insulating member 379 extends over the entire width of the glazing profile 308, it

provides dampening and insulation between the pane 306 and sash member 323, and thus minimized the transmission of sound from the pane to the sash.

[0062] In Figs 2-5 the members of the frame 1 and the sash 2 are made of wooden members, while those in Figs 6-13 are made of cast polyurethane (PUR) with core members of plywood, wood and insulating material, but they may also be made from extruded member of plastic or metal.

[0063] Furthermore, the pane 6, 106, 206 shown in Figs 2-13 comprise three layers of glass, such panes having particularly good sound insulating properties, but two-layer panes 306 as in Fig. 14 may also be utilized.

[0064] In the embodiments shown, the window is centre-hung in that the sash 2 is connected to the frame 1 by a pivot hinge 5 (see Fig. 1) provided between side members of the frame 1 and sash 2, respectively, to be openable by tilting the sash 2 of the window about the pivot hinge axis defined by the pivot hinge. The pivot hinge comprises two parts, namely a frame part and a sash part. The hinges used are preferably of the type described in the applicant's earlier patent applications W09928581 and GB1028251, where a curved member and a tap on one hinge parts travels in a curved guide track in the other during opening and closing of the window. The radius of curvature entails that when using such hinges, the hinge axis lies at a small distance above the actual hinge parts and as the sash frame is turned first the curved member and then the tap comes out of the track. In combination this provides a pattern of movement which allows easy operation of a centre-hung window and allows the sash frame to be turned substantially entirely around. In the embodiment in Figs 10-13 the window is, however, also provided with an addition set of hinges and lifting device of the type described in the applicant's earlier patent applications EP148895 and EP733146 allowing it to be operated as a top-hung window in a manner known to the skilled person.

[0065] The invention is not delimited to the embodiments described in the above and shown in the drawings but various modifications and combinations may be carried out without departing from the scope of the claims.

Claims

1. A window, such as a roof window, comprising a frame (1), a sash (2), a pane (6;106;206;306) and a weather and sound proofing system including covering members (31,32,33,34,35,36,41,42,43,44; 131,132,133, 135,136, 142,144; 231,232,233,235,236,242,244), sealing members and dampening members, where a spacing (9) between the frame and the sash allows the window to be opened, and where an interior side is intended to face the interior of a building in the mounted state of the window and an exterior side is intended to face the exterior of the building, **characterized in that** two or more sound dampening and/or

sound insulating members (81,82,83,84,85,86,87, 88,89; 181,182,183,184,185,186,187,188,189; 281, 282,283,284,285,286,287,288,289) are provided at the interior side of the spacing between the frame and the sash, and that two or more sound dampening and/or insulating members (61,62,63,64,71,72,73, 74,75,76,77,78, 91,92; 161,163,164,165,166,171, 172,173,175,176,177,178; 261,263,264,265, 266, 271,272,273,275,276,277,278; 379) are provided at the exterior side of the spacing.

2. A window according to claim 1, where at least one damper (61,62,63,64,71,72,73,74,75,76,77,78,81, 82,83,84,85,86,87,88,89,91,92; 161,163,164,165, 166,171,172,173,175,176,177,178,181,182,183,18 4,185,186,187,188,189; 261,263,264,265,266,271, 272,273,275,276,277,278, 281,282, 283,284,285, 286,287,288,289;379) is made from a foam material.
3. A window according to claim 1 or 2, comprising side covering members (33,34,43,44;133,144;233,244), which cover the spacing (9) between side members (23,24;123,124;223,224) of the sash and side members (13,14;113,114;213,214) of the frame, and where a first and a second exterior side dampening and/or insulating member (71,72; 171,172;271,272) are attached to each of the side covering members, these dampening and/or insulating members extending in parallel with length direction of the side members of the sash and the frame and being arranged so that in the closed state of the window the first exterior side dampening and/or insulating member (71;171;271) is in contact with a frame side covering member (35,36;135,136;235,236) and the second exterior side dampening and/or insulating member (72;172;272) is in contact with a glazing profile (8;108;208;308) overlapping the narrow space between a sash side member and the pane.
4. A window according to any of the preceding claims, including at least two dampening and/or insulating members chosen from the group comprising:

a first and a second exterior side dampening and/or insulating members (71,72;171,172;271, 272) each attached to a side covering member (33,34,43,44;133,144;233,244) as in claim 3, a first exterior frame dampening and/or insulating member (61;161;261) attached to an exterior face of a frame side covering member (35; 135;235) and arranged to be in contact with a side covering member (33,34,43,44;133,144; 233,244) in the closed state of the window, a first exterior sash dampening and/or insulating member (379) attached to a glazing profile (8;108;208;308) that overlaps a narrow space between the sash (2) and the pane (6;106;206;306), said first exterior sash damp-

- ening and/or insulating member being attached to a leg of the glazing profile projecting towards the exterior so that it is positioned at least partially between the glazing profile and a covering member,
- a first exterior frame dampening and/or insulating member (91) arranged on the side frame member (13,14;113,114;213,214) and filling an exterior part of the spacing (9) between the side frame member (13,14;113,114;213,214) and the side sash member (23,24;123,124;223,224;323), and
- a first exterior sash dampening and/or insulating member (92) arranged on the side sash member (23,24;123,124;223,224;323) and filling an exterior part of the spacing (9) between the side frame member (13,14;113,114;213,214) and the side sash member (23,24;123,124;223,224;323).
5. A window according to any of the preceding claims, including at least two dampening and/or insulating members chosen from the group comprising:
- a third exterior sash dampening and/or insulating member (62) attached to the sash bottom member (22) and overlapping the exterior side of the frame bottom member (12) in the closed state of the window,
- a fourth exterior sash dampening and/or insulating member (73,173,273) attached to an interior face of a sash bottom covering member (42,142,242) at an edge facing away from the pane (6;106;206;306) and arranged to be in contact with a frame bottom covering member (32,132,232) in the closed state of the window,
- a fifth exterior sash bottom dampening and/or insulating member (74) attached to an exterior face of the sash bottom member (22) underneath a sash bottom covering member (42), and
- a sixth and seventh exterior sash dampening and/or insulating member (165,265;166,266) attached to the sash bottom member (122;222) and contacting the frame bottom member (112;212) in the closed state of the window.
6. A window according to any of the preceding claims, including at least two dampening and/or insulating members chosen from the group comprising:
- a third exterior frame dampening and/or insulating member (75;175;275) attached to an interior face of a frame top covering member (31;131;231) and arranged to be in contact with the sash (2), the pane (6;106;206;306) or a glazing profile (8;108;208;308) in the closed state of the window,
- an fourth exterior frame dampening and/or insulating member (76;176;276) arranged between a frame top covering member (31;131;231) and a frame top member (11,111,211),
- a fifth exterior frame dampening and/or insulating member (77,177,277) arranged on the top frame member and filling an exterior part of the spacing (9) between the top frame member and the top sash member,
- a sixth exterior frame dampening and/or insulating member (78;178;278) arranged on the top frame member (11;111;211,211') or the fourth exterior frame dampening and/or insulating member (77;177;277) and contacting the top sash member (21;121;221) in the closed state of the window,
- a seventh exterior frame dampening and/or insulating member (63;163;263) arranged on the frame top covering (31 ;131 ;231) and facing the sash top member (21;121;221) or the glazing profile (8;108;208;308) in the closed state of the window,
- an eighth exterior frame dampening and/or insulating member (64;164;264) arranged on the seventh exterior frame and contacting the sash top member (21;121;221) or the glazing profile (8;108;208;308) in the closed state of the window, and
- a first exterior sash dampening and/or insulating member (379) attached to a glazing profile (8;108;208;308) that overlaps a narrow space between the sash (2) and the pane (6;106;206;306), said first exterior sash dampening and/or insulating member being attached to a leg of the glazing profile projecting towards the exterior so that it is positioned at least partially between the glazing profile and a covering member.
7. A window according to any of the preceding claims, including at least two dampening and/or insulating members chosen from the group comprising:
- a first interior frame dampening and/or insulating member (81 ;181 ;281) arranged at the interior side of the spacing on the inner side of a frame side member (13,14;113,114;213,214) or a member attached thereto and facing an opposing sash side member (23,24;123,124;223,224;323), and
- a first and a second interior sash dampening and/or insulating member (82,83;182,183;282,283) each arranged at the interior side of the spacing on the inner side of a sash side member (23,24;123,124;223,224;323) and facing an opposing frame side member (13,14;113,114;213,214).
8. A window according to any of the preceding claims,

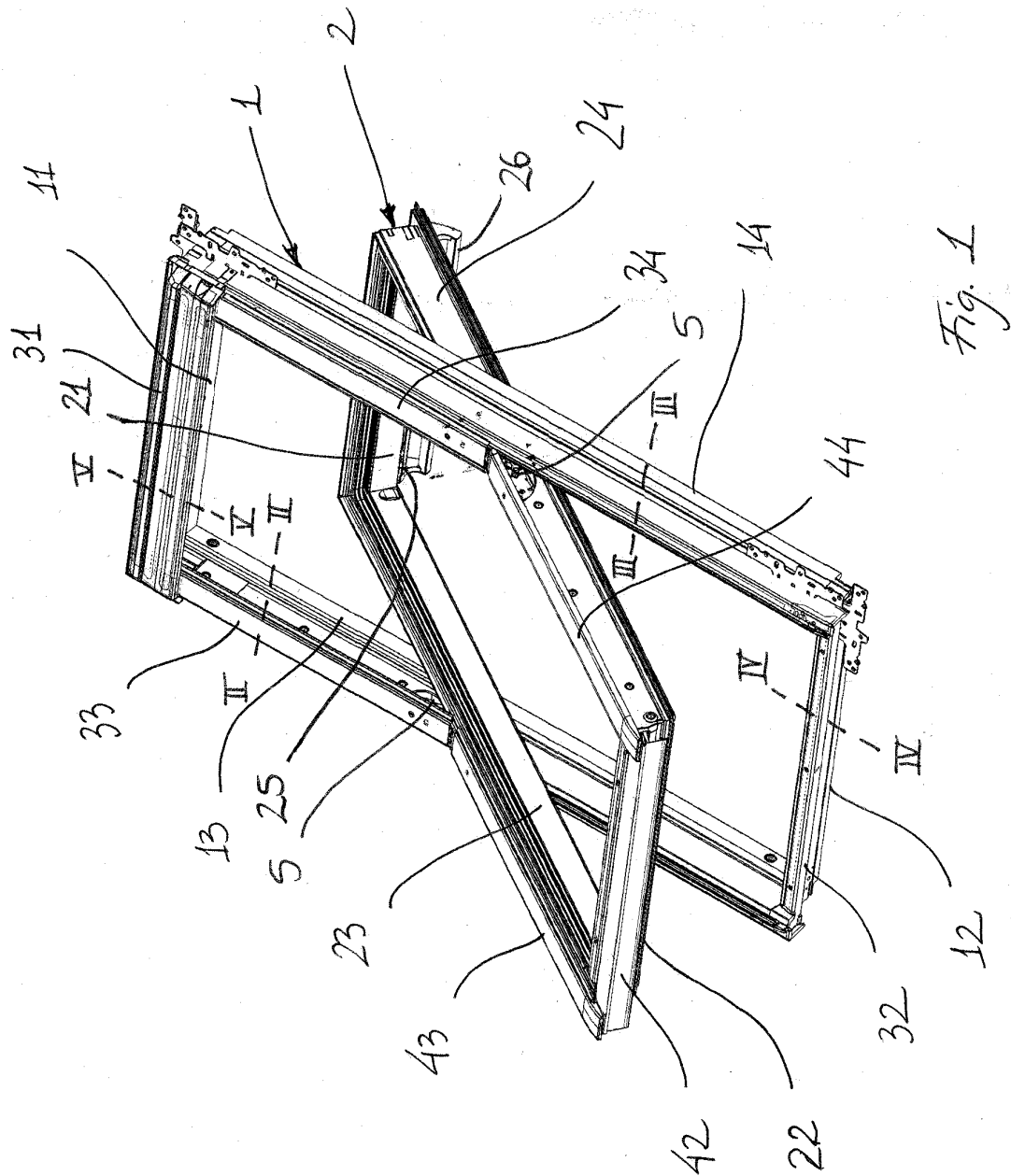
including a third and a fourth interior sash dampening and/or insulating member (84,85;184,185;284,285) arranged at the interior side of the spacing on the inner side of a sash bottom member (22;122;222) and facing an opposing frame bottom member(12;112;212). 5

9. A window according to any of the preceding claims, including at least two dampening and/or insulating members chosen from the group comprising: 10

a second and a third interior frame dampening and/or insulating member (86;186;286) arranged at the interior side of the spacing on the inner side of a frame top member (11;111;211) and facing an opposing sash top member (21;121;221), 15
 a fifth interior sash dampening and/or insulating member (87;187;287) arranged at the interior side of the spacing on the inner side of a sash top member (21;121;221), on a ventilation flap (25;125;225) or on a member attached to the ventilation flap, and facing an opposing frame top member(11;111;211), 20
 a sixth interior sash dampening and/or insulating member (88;188;288) attached directly or indirectly to a ventilation flap (25;125;225) on a side thereof facing the spacing between the sash and the frame top members, possibly serving as a basis for the attachment a fifth interior sash dampening and/or insulating member (87;187;287), and 25
 a seventh interior sash dampening and/or insulating member (89;189;289) arranged between a sixth interior sash dampening and/or insulating member (88;188;288) and a ventilation flap (25;125;225) and substantially covering the entire surface of the ventilation flap facing the spacing. 30
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10. A window according to any of the preceding claims, where each dampening and/or insulating member (61,62,63,64,71,72,73,74,75,76,77,78, 81,82,83,84, 85,86,87,88,89,91,92;161,163,164,165,166,171,172,173,175, 176,177,178,181,182,183,184,185,186, 187,188,189; 261,263,264,265,266, 271,272,273, 275,276,277,278, 281,282,283,284,285,286,287, 288,289;379) extends over substantially the entire length of the frame member, sash member, covering member or glazing profile to which it is attached. 45
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11. A window according to any of the preceding claims, where the dampening and/or insulating member(s) (61,62,63,64,71,72,73,74,75,76,77,78,81,82,83,84, 85,86,87,88,89,91,92;161,163,164,165,166,171, 172,173,175,176,177,178,181,182,183,184,185,186,187,188,189; 261,263, 264,265,266,271,272, 273,275,276,277,278,281,282,283,284,285,286, 287, 288,289;379) is/are attached by adhesion or gluing, by being held in a recess in a frame member or sash member, or by being clamped in a fold or recess in a covering member. 55



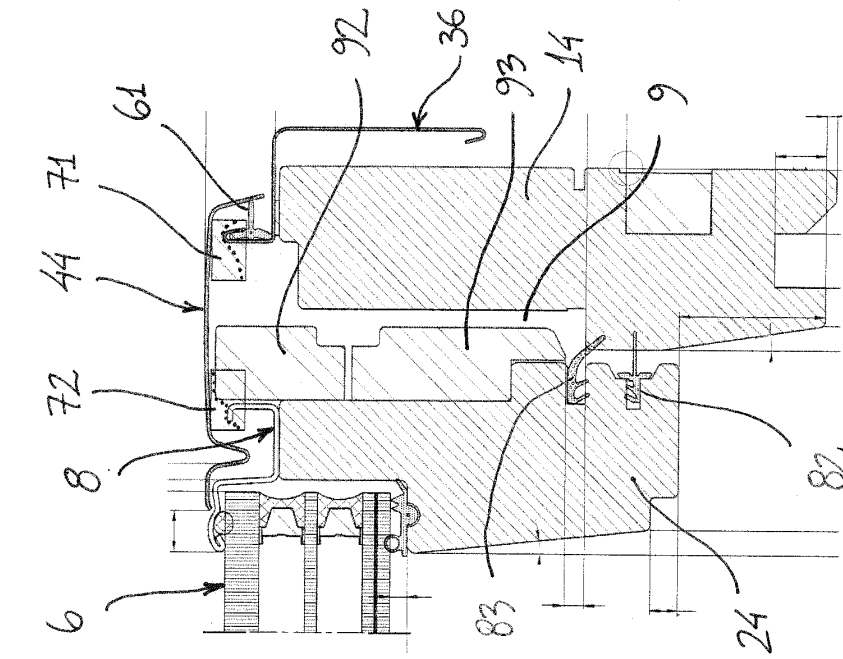


Fig. 2

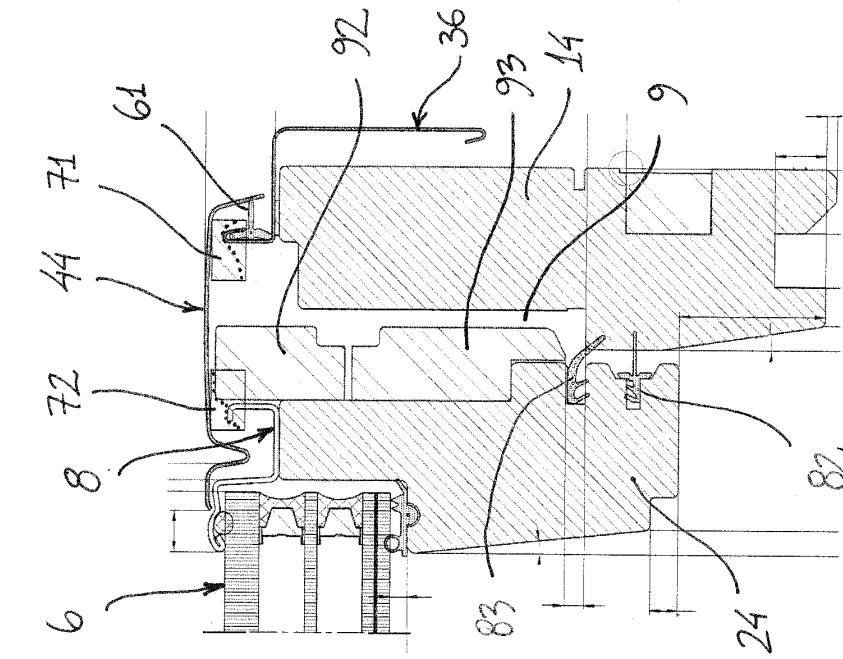
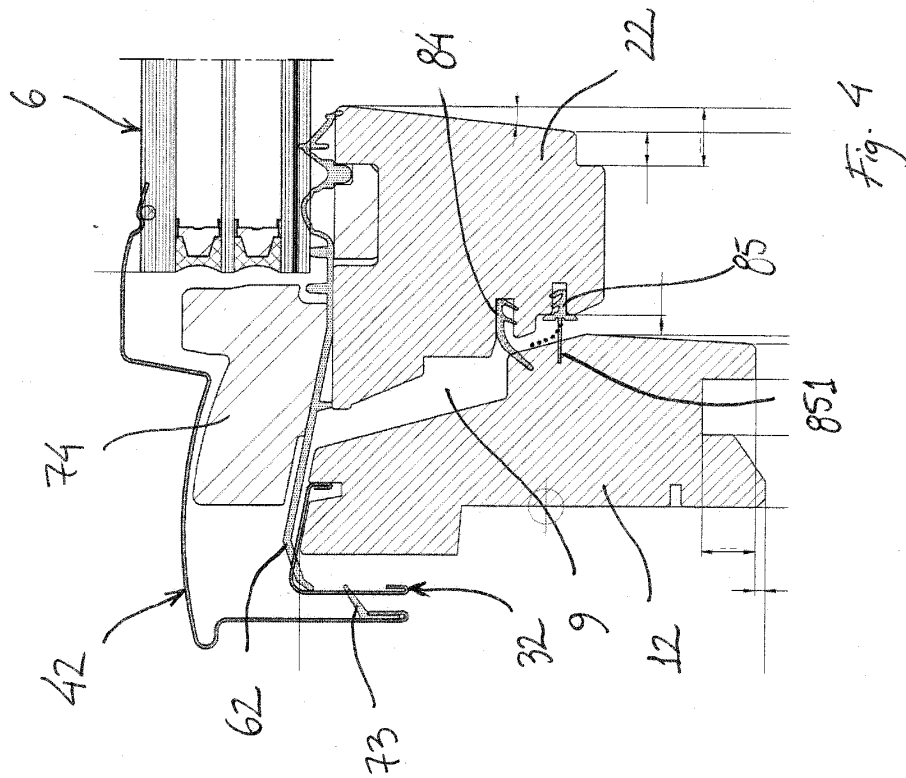
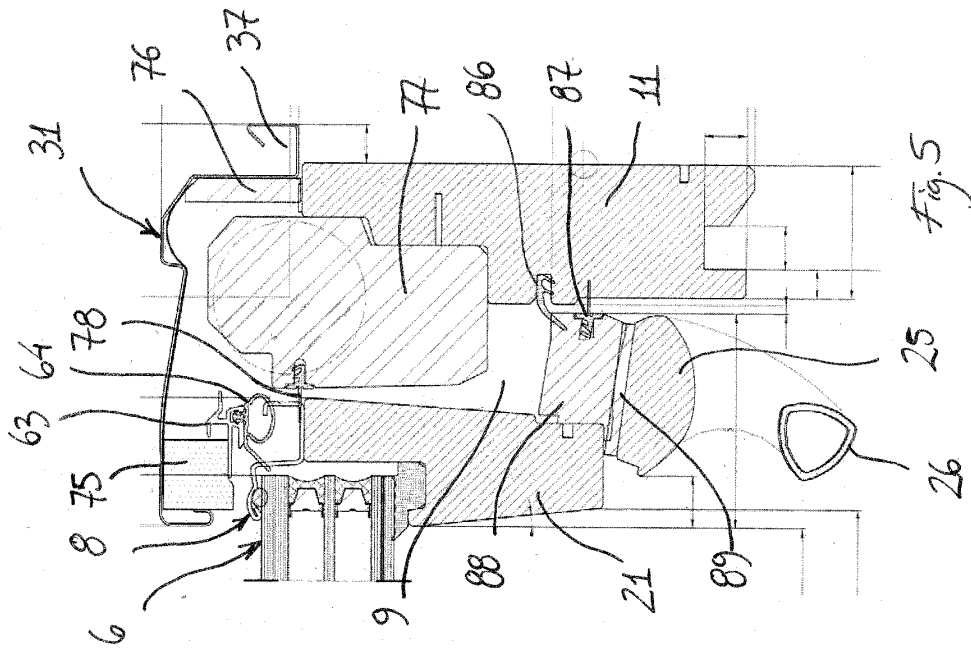


Fig. 3



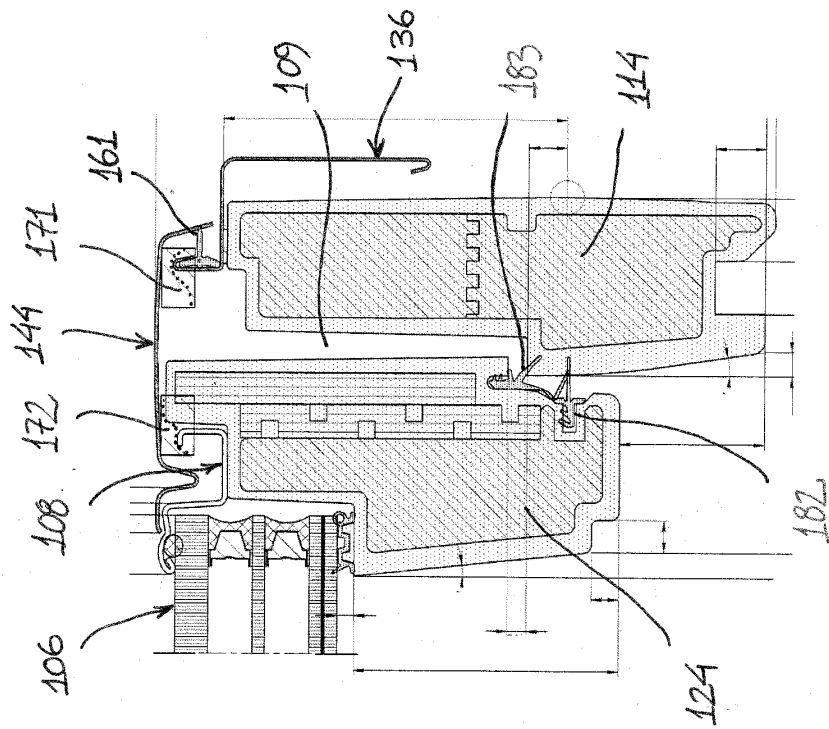


Fig. 6

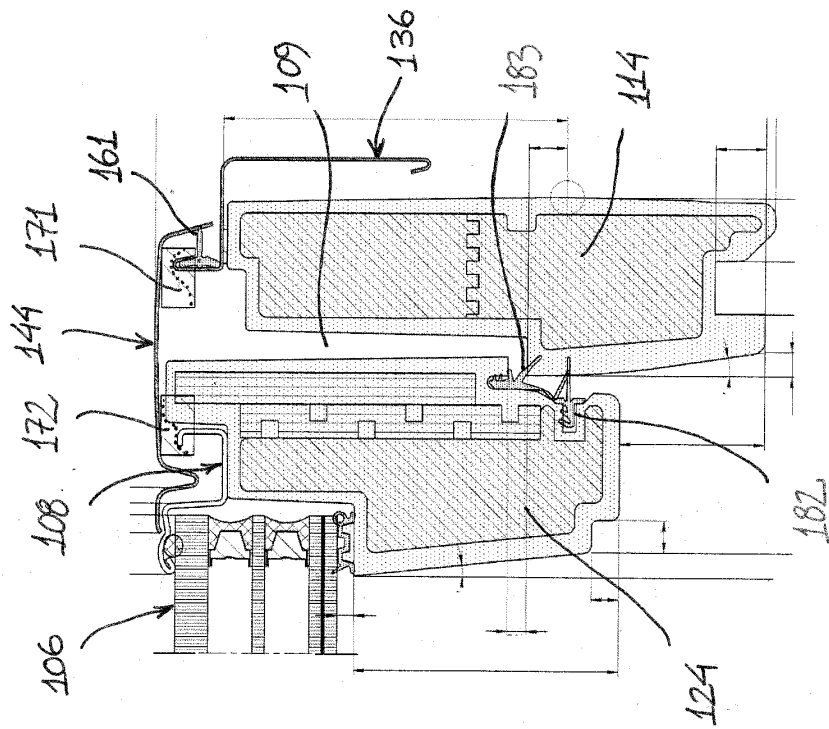
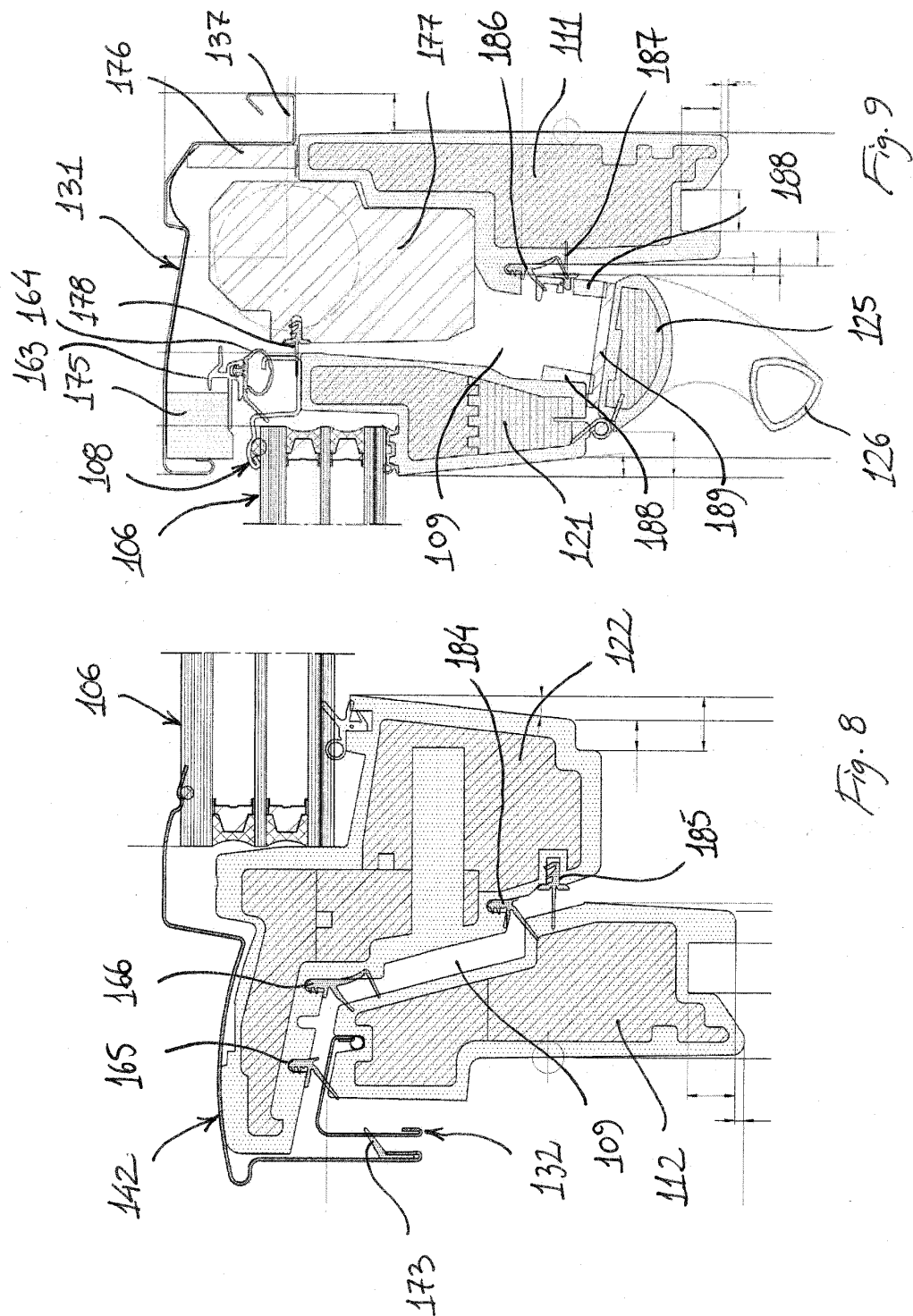


Fig. 7



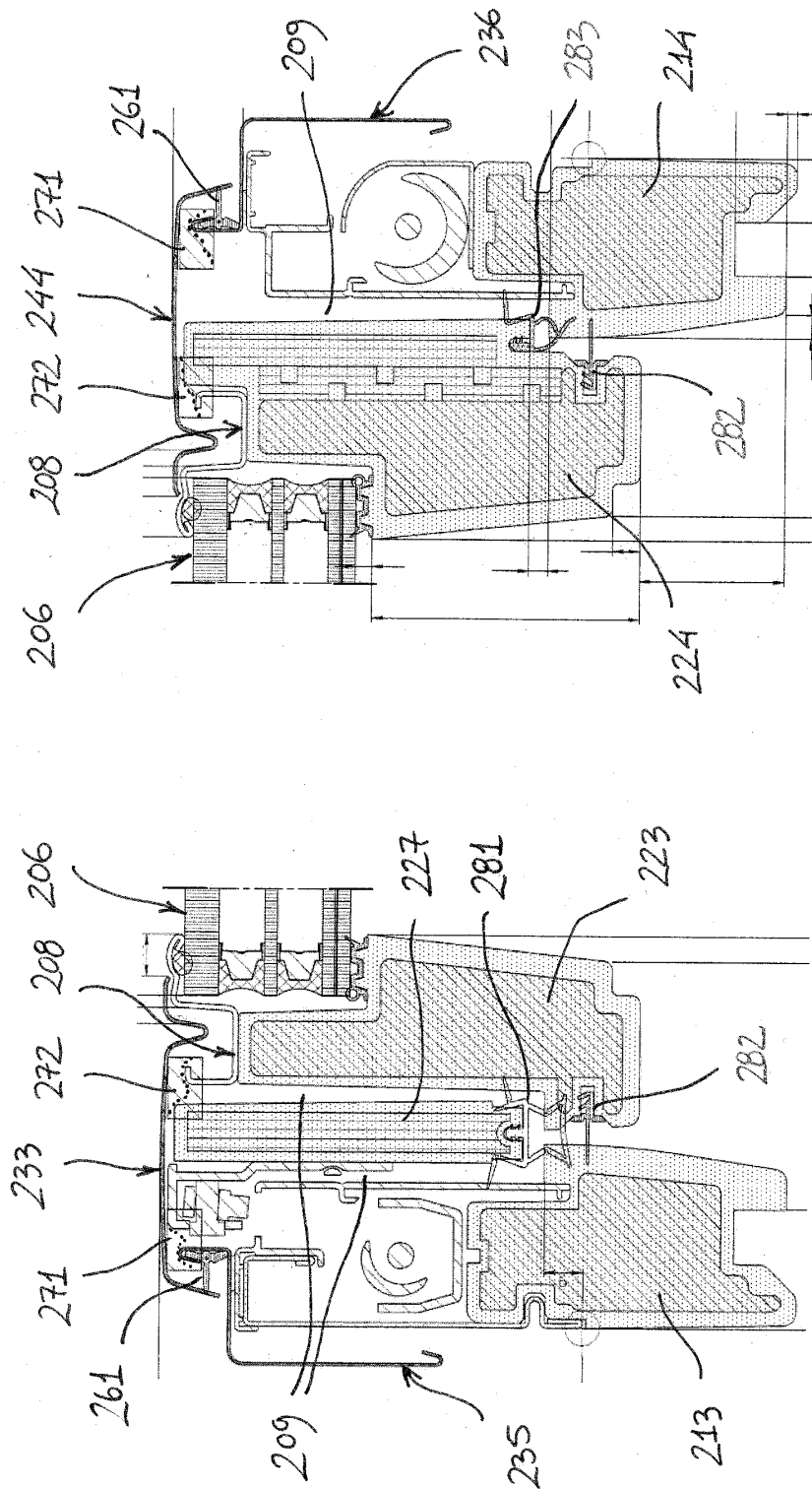
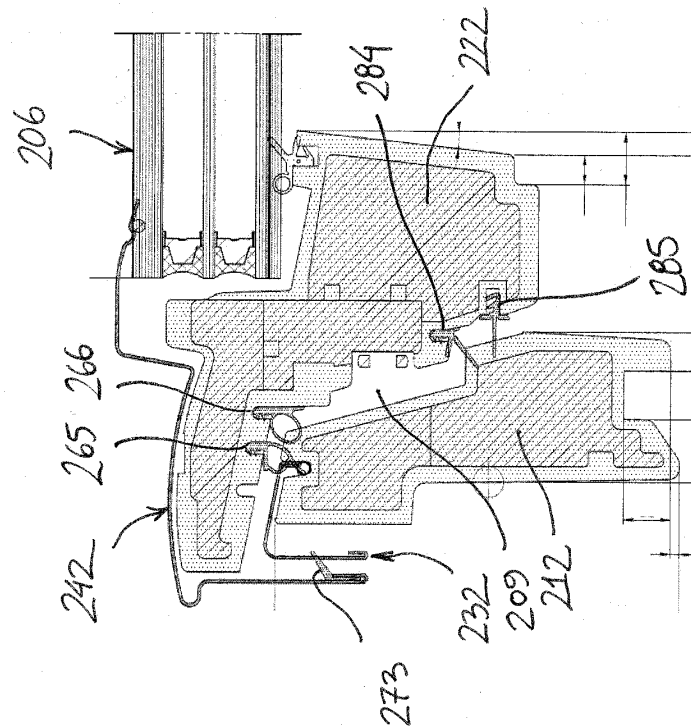
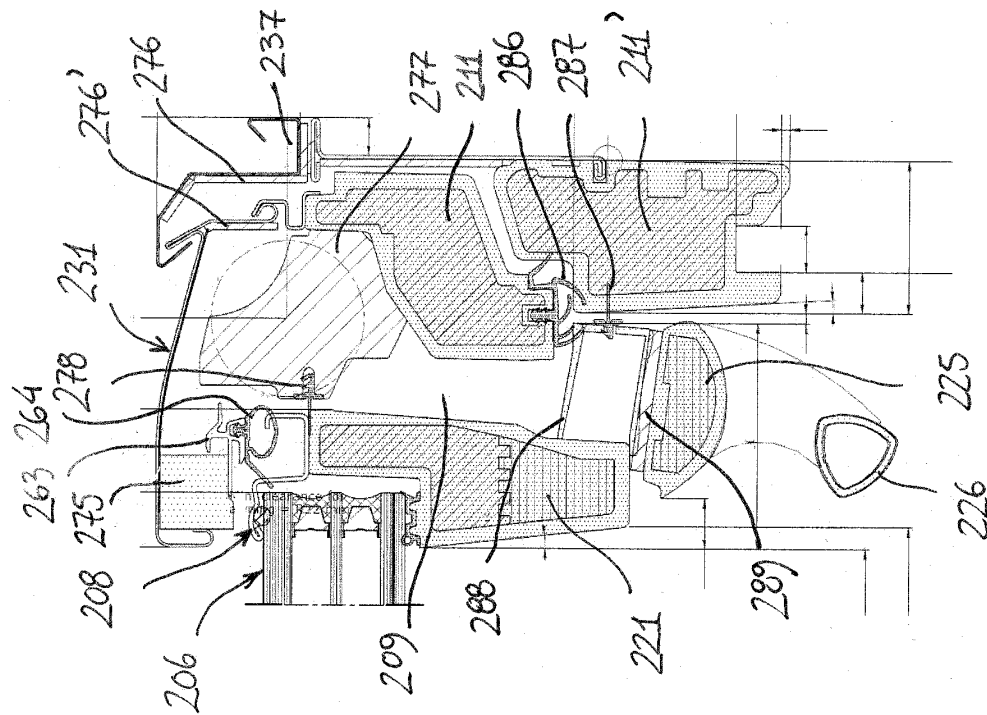


Fig. 11

Fig. 10



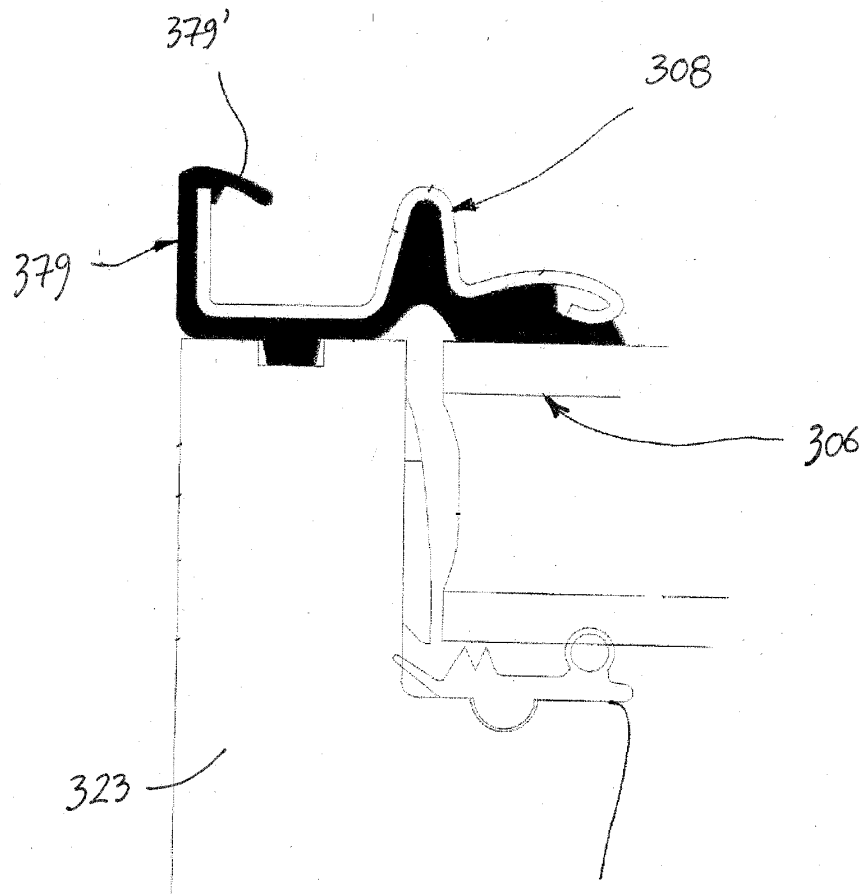


Fig. 14



EUROPEAN SEARCH REPORT

Application Number
EP 13 16 4506

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			E06B E04D
Place of search		Date of completion of the search	Examiner
Munich		26 July 2013	Merz, Wolfgang
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26-07-2013

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