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(54) INSERT FOR AN ARCHITECTURAL OPENING

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Description

TECHNICAL FIELD

[0001] The invention relates to an insert for an architectural opening.

BACKGROUND

[0002] Inserts for architectural openings such as windows and doors may be used to provide a screen for protection against insects, whilst maintaining air flow and passage of light through the architectural opening.

[0003] The inserts are often rectangular shaped corresponding to rectangular shaped architectural openings, and comprise four elongated frame parts provided perpendicular to adjacent elongated parts.

[0004] To prevent such an insert from being pushed through the opening, the insert may comprise an extended section which is wider than the architectural opening.

[0005] WO2017136894A1 discloses a screen assembly including a sheet of meshlike screen material having an edge portion, a frame assembly including a plurality of elongate frame members assembled to define an opening which is at least partially closed by said sheet of screen material and wherein at least one of said elongate frame members includes at least one elongate slot to receive an edge portion of the screen material therein.

[0006] DE102008030726A1 discloses an insect protection device for insertion into a frame of a door or window, comprising a frame window, comprising a frame with an insect screen or fabric and angled flaps on the upper and lower sides of the frame, which each have a fastening limb fixed to the frame, and a fastening leg fixed to the frame.

SUMMARY

[0007] The present invention aims amongst others to provide an insert for an architectural opening with increased ease of transportation and/or assembly. The invention is defined by an insert for an architectural opening, according to claim 1.

[0008] A first aspect provides an insert for an architectural opening, comprising a first elongated frame part, a second elongated frame part connected at an angle relative to the first elongated frame part, wherein the first elongated frame part and the second elongated frame part span an insert plane. The insert further comprises a first hinging part comprising a hinging body and an extended member extending substantially perpendicularly from the hinging body at a distal end thereof. In this insert, the first hinging part is at a proximal end hingeably provided relative to the first elongated frame part and the first hinging part is arranged to be hingeable around a first hinge axis parallel to the elongation direction of the first elongated frame part between a first position wherein the hinging body is oriented at an angle less than 90

degrees relative to a plane parallel to the insert plane, and a second position wherein the hinging body is oriented substantially perpendicular to the insert plane.

[0009] The insert according to the first aspect is characterised in that the insert further comprises a second hinging part comprising a second hinging body and an extended member extending substantially perpendicularly from the second hinging body at a distal end of the second hinging part, and in that the second hinging part is at a proximal end hingeably provided relative to the third elongated frame part and the second hinging part is arranged to be hingeable around a second hinge axis parallel to the elongation direction of the first elongated frame part between: a first position wherein the second hinging body is oriented at an angle less than 90 degrees relative to a plane parallel to the insert plane, and a second position wherein the second hinging body is oriented substantially perpendicular to the insert plane.

[0010] Two objects being hingeable relative to one another may mean that there is a physical hinge between the two objects, such a hinge film, flexure bearing, living hinge, or any other type of hinge. Another definition of two objects being hingeable relative to one another is that the two objects are interlocked such that one of the two objects may perform a hinging motion relative to the other object. Note that interlocked need not imply that the two objects are mechanically connected or fastened to one another. A hinging axis of a hinging object does not need to remain stationary during hinging, but may instead shift during the hinging of the hinging object. Preferably, all shifted hinging axes are at least substantially parallel to one another and thus preferably the hinging is a one degree of freedom rotation.

[0011] Two elongated frame parts spanning a plane is defined as two vectors representing the elongation directions of the elongated frame parts spanning a plane. Since the second elongated frame part is connected at an angle relative to the first elongated frame part, the plane is a 2D plane between the two vectors representing the two elongation directions. The insert plane does not need to be a physical object, but may instead be an imagined plane - not to be confused with the imaginary plane as in the complex plane used in conjunction with the real plane- used to define orientations of components of the insert.

[0012] With the first hinging part in the first position, the insert may be in a transport or manufacturing position. In such a position, the first hinging part is confined within a depth of the first elongated frame part. The volume occupied by the insert, when drawing a box around the outer extremities of the insert, has a certain width, depth, and thickness. This depth is larger with the first hinging part in the second position compared to the depth of the insert with the first hinging part in the first position. When an insert comprises a plurality of hinging parts, all hinging parts need to be in the second position to achieve the fully reduced volume.

[0013] With the first hinging part in the second position,

the insert may be in an insertable position, ready to be inserted into the architectural opening. Thus, when a user wants to insert the insert after having transported or manufactured the insert according to the first aspect, the user is required to hinge the first hinging part and additional hinging parts from the first position to the second position.

[0014] The insert may comprise more than two frame parts. More in particular, the insert may comprise a third elongated frame part and a fourth elongated frame part, wherein ends of the elongated frame parts are connected to form a rectangle, and the third elongated part is provided parallel to the first elongated frame part at an opposite side of the insert. An insert may comprise frame parts shaped and interconnected such that they correspond with any architectural opening shape and size, such as a square, rectangle, or any other shape formed by substantially straight edges.

[0015] The insert may comprise any number of hinging parts. For example, the number of hinging parts may correspond with the number of frame parts when every frame part is provided with a hinging part. In other examples of inserts, only some of the frame parts are provided with a hinging part. For example, only two frame parts may be provided with a hinging parts, wherein these frame parts provided with the hinging parts may be parallel to one another, perpendicular to one another, or may be any other combination of frame parts. In further examples, only three, four, five, or any other number of frame parts may be provided with a hinging part.

[0016] The extended member of the first hinging part may comprise a resilient material. Furthermore, the extended member may be a rimpled member. When resilient, and optionally rimpled, a thickness of the extended member may decrease when a force is applied substantially perpendicular to the thickness. Such a decreased thickness may be advantageous when the extended member is to be provided between the architectural opening and for example a window or door, wherein closing the window or door in the opening may provide the force to decrease the thickness of the extended member.

[0017] In embodiments of the insert, the first hinging part may comprise a hinging hook protrusion at the proximal end, the first elongated frame part may comprise a frame hook protrusion at a side of the first elongated frame part facing away from the insert plane, and the hinging hook protrusion may be arranged to hook into the frame hook protrusion when the first hinging part is in the second position.

[0018] The ability of the hinging hook protrusion to be hooked into the frame hook protrusion may provide an interlocking hingeability of the first hinging part relative to the first frame part.

[0019] When the hinging hook protrusion is hooked into the frame hook protrusion, the first hinging part may be locked into the second position. To increase the force required to unhook the hinging hook protrusion from the frame hook protrusion, the frame hook protrusion and the hinging hook protrusion may both comprise a thick-

ened end section.

[0020] When the first elongated frame part comprises the frame hook protrusion, the first elongated frame part may comprise a frame flange extending out of the first elongated frame part away from and substantially parallel to the insert plane, and the frame flange and the frame part hook protrusion may define a frame part cavity arranged to accommodate at least part of the hinging hook protrusion.

[0021] When the first elongated frame part is provided with the frame part cavity, and when the first hinging part is provided partially into the frame part cavity, the first hinging part may in the second position be positioned such that an outer dimension such as the width of the insert does not, or at least does not significantly, increase by virtue of all of the first hinging part except for the extended member.

[0022] In embodiments of the insert, the frame flange may comprise a protrusion extending substantially perpendicular relative to the insert plane towards or into the frame part cavity, and the first hinging part may comprise an indentation shaped complementary to the protrusion, such that in the second position of the first hinging part, the protrusion may be accommodated in the indentation.

[0023] The protrusion abutting the indentation may form a locking mechanism for locking the first hinging part at least substantially in the second position. When the protrusion is accommodated in the indentation, a force may be required to move the protrusion out of the indentation, the force acting as a locking force which may be advantageous for example when inserting the insert into the architectural opening. If no or insufficient locking force is present to keep the first hinging part in the second position during handling of the insert, the first hinging part may undesirably hinge back into the first position due to for example gravity, and/or the inertia and/or the moment of inertia of the first hinging part.

[0024] When the first elongated frame part comprises the frame flange, the frame flange may be resiliently hingeable from the first elongated frame part around an axis parallel to the first elongation direction, the first hinging part may comprise an abutment adjacent to the indentation, and the abutment may be arranged to, when the first hinging part is hinged between the first position and the second position, resiliently hinge the frame flange.

[0025] The combination of the abutment and the resilientness of at least part of the frame flange may increase the amount of force required to hinge the first hinging part starting from the second position towards the first position. As such, the locking force keeping the first hinging part in the second position may be increased.

[0026] The first elongated frame part and the second elongated frame part may comprise a screen connection module for connecting a screen to such that the screen may be provided substantially parallel to the insert plane. As such, the screen may cover the entire area spanned between the frame parts of the insert.

[0027] The first elongated frame part may comprise a plug cavity as the screen connection module in a side of the first elongated frame part which is parallel to the insert plane, wherein the plug cavity is arranged to receive a plug and part of the screen.

[0028] The first elongated frame part may comprise one or more plug cavity flanges extending into the plug cavity when comprising the plug cavity as the screen connection module.

[0029] The insert may comprise the screen connected to the screen connection module. The screen may be arranged to block at least one of insects, other animals, people, light, sound, an air flow, any other object which may pass through an architectural opening, or any combination thereof.

[0030] A second aspect provides a kit of parts, comprising an insert according to any of the embodiments as disclosed in this description, and an obstruction element, comprising an obstructing protrusion arranged to be pressed into the frame part cavity of the first elongated frame part between the frame part hook protrusion and the first hinging part when the first hinging part is in the second position.

[0031] The obstruction element may further comprise a curved resilient member. The curved resilient member may have a convex side arranged to be pointing away from the insert plane, when the obstruction protrusion is pressed into the frame part cavity of the first elongated frame part between the frame part hook protrusion and the first hinging part when the first hinging part is in the second position.

[0032] The kit of parts may further comprise a plug arranged to be inserted into the screen connection module of the first elongated frame part.

[0033] Further aspects of the invention may provide an obstruction element according to any of the disclosed embodiments, and/or a plug according to any of the disclosed embodiments.

[0034] When an insert according to the first aspect comprises more hinging parts other than the first hinging part, these other hinging parts may be formed according to any of the embodiments of the first hinging parts. The hinging parts comprised by a single insert may be of different embodiments comprising different combinations of the optional features as disclosed in this description. Similarly, any frame part comprised by the insert may be embodied as any of the embodiments of the first elongated frame part as described in this description. Different elongated frame parts comprised by an insert may be embodied as different embodiments comprising different combinations of the optional frame part features as disclosed in this description.

BRIEF DESCRIPTION OF THE FIGURES

[0035] The various aspects and embodiments thereof will now be discussed in conjunction with figures. In the figures:

Fig. 1A shows a schematic view of an insert for an architectural opening with hinging parts in a second position;

Fig. 1B shows a schematic view of an insert for an architectural opening with hinging parts in a first position;

Fig. 2 shows a section view of an assembly of the insert in the architectural opening;

Fig. 3 shows a section view of part of an embodiment of an insert;

Fig. 4 shows a section view of part of an embodiment of the insert provided with an obstruction element;

Fig. 5A shows another embodiment of the insert; and Fig. 5B shows the embodiment of Fig. 5A with the hinging part in another position.

DETAILED DESCRIPTION

[0036] Fig. 1A shows a schematic view of an insert 100 for an architectural opening, comprising a first elongated frame part 10, and a second elongated frame part 20 connected at an angle relative to the first elongated frame part 10. The insert 100 further comprises a third elongated frame part 30 provided opposite to the first elongated frame part 10, and a fourth elongated frame part 40 provided opposite of the second elongated frame part 20. In this embodiment of the insert 100, the four elongated frame parts are interconnected at their ends and provided at 90 degree angles relative to adjacent frame parts to form a rectangular insert 100.

[0037] As such, the first elongated frame part 10 and the third elongated frame part 30 share a first elongation direction 12, and the second elongated frame part 20 and the fourth elongation frame part 40 share a second elongation direction 22. Starting from the first frame part 10, arrow 111 points towards to the insert plane 110.

[0038] In the embodiment of the insert 100 of Figs. 1A and 1B, the frame parts comprise bevelled ends of approximately 45 degrees. As such, a mitre joint may be used for interconnecting the frame parts. Other joints may be used as well.

[0039] The four elongated frame parts 10, 20, 30, 40 constrain an insert plane 110. The insert plane 110 is spanned by the first elongated frame part 10 and the second elongated frame part 20, and is constrained by the third elongated frame part 30 and the fourth elongated frame part 40.

[0040] The hinging parts 11, 21, 31 respectively comprise a first extended member 14, second extended member 24 and third extended member 34.

[0041] The insert 100 further comprises a first hinging part 11 hingeably provided relative to the first elongated frame part 30, a second hinging part 21 hingeably provided relative to the second elongated frame part 20 and a third hinging part 31 provided hingeably relative to the third elongated frame part 30. The first hinging part 11 is hingeable over a first hinge axis 13, which is substantially parallel to the first elongation direction 12 and positioned

near a bottom side 101 of the insert 100. The second hinging part 21 is hingeable over a second hinge axis 23, which is substantially parallel to the second elongation direction 22, the second elongation direction 22 being the elongation direction of the second elongated frame part 20. The third hinging part 31 is hingeable over a third hinge axis 33, which is parallel to the first elongation direction 12 and positioned near a top side 102 of the insert 100.

[0042] Note that a hinge axis of any hinging part may be provided anywhere between the top side 102 and the bottom side 101 of the insert 100. For example is the second hinge axis 23 positioned near the middle between the top side and the bottom side of the insert 100.

[0043] For simplicity, only three hinging parts are shown in the embodiment of the insert of Fig. 1A. It may be appreciated that the fourth elongated frame part 40 may also be provided with a hinging part in a similar manner as the second elongated frame part 20. This hinging part will also have a hinge axis substantially relative to the second elongation direction 22.

[0044] In Fig. 1A, the hinging parts 11, 21, 31 are in the second position. With the hinging parts 11, 12, 13 in this second position, the insert 100 has a certain depth d.

[0045] For comparison, Fig. 1B shows a schematic view of the insert 100 of Fig. 1A with the hinging parts in the first position. Note that the second hinging part 21 is drawn as a dotted line in Fig. 1B as it is now positioned behind the second elongated frame part 20 in this view.

[0046] With the hinging parts in this different position, the insert 100 has a certain depth d', which is significantly less than depth d corresponding to the hinging parts in the second position. The depth d' may for example be half the size of depth d, although other ratios between d and d' are envisioned as well.

[0047] The reduced volume occupied by the insert 100 as shown in the Fig. 1B may be advantageous when transporting the insert 100. A further advantage when the hinging parts are in the first position is that a substantially flat surface is provided at the top side 102 of the insert 100. This may be advantageous, for example, in the manufacturing process of the insert 100.

[0048] If the hinging parts 11, 12, 13 would not be hingeable but instead fixed to their corresponding frame parts 10, 20, 30, the insert 100 would have to be manufactured and transported in the arrangement as shown in Fig. 1A. Note that the parts 11, 12, 13 may embodied as relatively thin and long parts, which may be prone to breaking off when they cannot hinge.

[0049] Fig. 2 shows a section view of an assembly 200 of an embodiment of the insert 100 inserted via an insert direction 201 into a window frame 210 (hatched) as an architectural opening. The window frame 210 has a width w. The assembly 200 further comprises a turn- and tilt window 202, schematically drawn in Fig. 2.

[0050] To be able to be inserted into the window frame 210 in the insert direction 201, the first elongated frame part 10 and third elongated frame part 30 are positioned

at a distance from each other smaller than the width w. To prevent the insert 100 from being inserted too far into the window frame 210 and potentially falling out of the frame 210, a distal end of first extended member 14 is provided at a distance greater than width w from a distal end of the third extended member 34.

[0051] A screen 50 may be provided between the frame parts of the insert 100, such that when the insert 100 is inserted in the window frame 210 a barrier is provided to block for example bugs or insects from passing through the window frame 210. The screen 50 is held in the insert 10 by means of plugs 73.

[0052] When the window 202 is closed, the window 202 may abut the extended members 14, 34. Embodiments of the insert 100 may be inserted into existing combinations of window frames 210 and tilt and turn windows 202, which may not have been arranged for receiving an insert at all. As such, it may be advantageous to provide the extended members 13, 34 as thin as possible, or at least resilient such that a thickness of the extended members 13, 34 may be reduced when pressed between the window 202 and the window frame 210.

[0053] The function of obstructing elements obstructing elements 81 will be elaborated on in conjunction with the description of Fig. 4.

[0054] Fig. 3 shows a section view of part of an embodiment of the insert 100, showing in particular an embodiment of the first elongated frame part 10 and an embodiment of the first hinging part 11 hingeably provided relative to the first elongated frame part 10 at a proximal end of the first hinging part 11. The first hinging part 11 is shown here in the first position, wherein a distal end 17 of the first hinging part 11 does not extend below the top side 102 of the first elongated frame part 10.

[0055] In Fig. 3, the first elongation direction 12 points into the paper. Arrow 111 points towards the insert plane 110 (not shown in Fig. 3), and thus also points towards the third elongated frame part 30 of the insert 100, which is for conciseness and clarity of Fig. 3 not shown.

[0056] The first hinging part 11 is an exemplary embodiment of a hinging part, and comprises a hinging body 16 and the first extended member 14 as rimpled extended member extending substantially perpendicularly from the hinging body 16 at a distal end 17 of the first hinging part 11. The first hinging part 11 further comprises, at its proximal end, a hinging hook protrusion 18. By virtue of the first extended member 14 being rimpled, it may at least partially be prevented that the first extended member 14 sticks to the part of the architectural opening 210 to which it abuts when the insert 100 is inserted into the architectural opening 210. This may be advantageous when removing the insert 100 from the architectural opening.

[0057] In particular embodiments, the first hinging part 11 comprising the hinging body 16 and the first extended member 14 may be manufactured as a single component using a co-extrusion process. For example, a thermoplastic material may be co-extruded with an elastomer material to respectively form the hinging body 16 and the

first extended member 14.

[0058] The first elongated frame part 10 as shown in Fig. 3 comprises a frame hook protrusion 51 at a side of the first elongated frame part 10 facing away from the insert plane 110, i.e. in the direction opposite to direction 111.

[0059] When the first hinging part 11 is provided with the hinging hook protrusion 18 and the first elongated frame part 10 is provided with the frame hook protrusion 51, the first hinging part 11 may be hingedly connected to the first elongated frame part 11 by hooking the hinging hook protrusion 18 into the frame hook protrusion 51.

[0060] One or both of the frame hook protrusion 51 and the hinging hook protrusion 18 may comprise a thickened end section 52 for increasing the locking force for locking the first hinging part 11 in the second position by means of a snap fit connection, as will be elaborated on in conjunction with Fig. 4.

[0061] The first elongated frame part 10 may comprise a frame flange 62 extending out of the first elongated frame part 10 away from the insert plane 110 and substantially parallel to the insert plane 110, i.e. in a direction opposite to the arrow 111. The frame flange 62 and the frame part hook protrusion 51 may define a frame part cavity 56 arranged to accommodate at least part of the hinging hook protrusion 18.

[0062] When an embodiment of a frame part comprises the frame flange 62 and the frame part cavity 56, the frame flange 62 may comprise a protrusion 63 extending substantially perpendicular relative to the insert plane 110 towards the frame part cavity 56. The first hinging part 10 may comprise an indentation 64 shaped complementary to the protrusion 63. Alternatively, the first hinging part 11 may comprise the protrusion 63 and the frame flange 62 may then comprise the indentation 64. When the first hinging part 11 is in the second position, the protrusion 63 may be accommodated in the indentation 64 providing a clamped connection between the first hinging part 11 and the first elongated frame part 10, which connection may substantially prevent the first hinging part 11 from leaving the second position and hinging towards the first position, as will be shown in Fig. 4.

[0063] To allow the protrusion 63 to be accommodated into the indentation 64, at least part of the frame flange 62 may be resiliently hingeable from the first elongated frame part 10 around an axis parallel to the first elongation direction 12. An abutment 65 may be provided adjacent to the indentation 64 on the first hinging part 11.

[0064] Any of the frame flange 62, protrusion 63, and indentation 64 may extend over the entire elongated length of the first frame part 10, but any of the frame flange 62, protrusion 63, and indentation 64 may alternatively also be provided intermittently across at least part of the elongated length of the first frame part 10.

[0065] After being transported and/or manufactured, embodiments of the insert 100 may be set up for insertion into the architectural opening 210 as follows. The first hinging part 11 is inserted into the cavity 56 by inserting

the hinging hook protrusion 18 into the cavity 56. Alternatively, the first hinging part 11 may be slid into the cavity 56 over the first elongation direction 12.

[0066] Next, the first hinging part 11 is hinged towards the second position. During this hinging action, the hinging hook protrusion 18 hooks into the frame part hook protrusion 51. If the first hinging part 11 is provided with the abutment 65 and the frame part 10 is provided with the protrusion 63, at some point during the hinging between the first position and the second position the abutment 65 will collide with the protrusion 63.

[0067] If the protrusion 63 is arranged as a resilient member, the hinging movement will subsequently cause the protrusion 63, and at least part of the frame flange 62 with it, to deflect away from the frame cavity 56 creating space for the abutment 65 to enter the frame cavity 56. When hinged even further, at some point, the protrusion 63 will fall into the indentation 64 and the protrusion 63, and the frame flange 62 with it, will deflect back to their original position. A similar process may be performed for any other frame parts 10,20,30,40 and corresponding hinging parts 11,21,31 comprised by the insert 100 to end up with an insert 100 with all hinging parts in the second position.

[0068] If the abutment 65 is arranged as a resilient abutment, the hinging movement will cause the abutment 65 to make way for the protrusion 63. When hinged even further, at some point, the protrusion 63 moves away from the abutment 65 into the indentation 64 and the abutment 65 will substantially return into its original shape.

[0069] When the insert 100 is used to provide a screen, such as the insert screen 50, the first elongated frame part 10, as one of the frame parts comprised by the insert 100, may comprise a screen connection module 71 module for connecting the screen to such that the screen may be provided substantially parallel to the insert plane 110.

[0070] The screen connection module 71 may be arranged as a plug cavity 72 provided in the first elongated frame part 10. The plug cavity 72 may be provided in the top side 101 of the first elongated frame part 10 as a side of the first elongated frame part 10 which is parallel to the insert plane 110. The plug cavity 72 is arranged to receive a plug 73 and part of a screen 50, as will be elaborated on further in conjunction with Fig. 4. The screen connection module 71 of an insert 100 may be provided in one or more of the frame parts 10, 20, 30, 40.

[0071] It is noted that Fig. 3 shows a combination of different features in a single embodiment of the first elongated frame part 10 as an elongated frame part. Different embodiments of frame parts comprising one or more features as described in combination with the embodiment of Fig. 3 are envisioned as well.

[0072] Fig. 4 shows an embodiment of the first hinging part 11 in the second position relative to the first elongated frame part 10.

[0073] In the embodiment of the insert 100 as shown in Fig. 4, a part of the screen 50 is clamped under the

plug 73 provided in the plug cavity 72. Such a plug 73 may be arranged as a discrete plug, or as an elongated plug profile which may have a length up to the length the first elongated frame part 10 has in the first elongation direction 12. When the plug 73 has a length in the first elongation direction 12 smaller than half the length of the first elongated frame part 10 in the first elongation direction 12, a plurality of plugs 73 may be used to clamp the screen 50 into the plug cavity 72 of the first frame part 10.

[0074] For clamping the plug 73 into the plug cavity 72, the first elongated frame part 10 may comprise a plug cavity flange 74 extending into the plug cavity 72. Alternatively or additionally, the plug 73 may be oversized relative to the plug cavity 72 and comprise a resilient material arranged to be compressed when the plug 73 is provided into an undersized plug cavity 72.

[0075] In embodiments of the insert 100, the screen 50 may be spanned between any combination of the first elongated frame part 10, the second elongated frame part 20, the third elongated frame part 30, and the fourth elongated frame part 40, between respective screen connection modules comprised by the respective elongated frame parts.

[0076] To aid in fixating the first hinging part 11 in the second position relative to the first frame member 10, the insert 100 as shown in Fig. 4 is provided with an obstructing element 81 comprising an obstructing protrusion 82 arranged to be at least partially pressed in to the frame part cavity 56 between the frame part hook protrusion 51 and the first hinging part 11. The obstruction element 81 may be an elongated element with its elongation direction parallel to the first elongation direction 12 when pressed into the frame part cavity 56. Alternatively, a plurality of obstructing elements 81 may be provided along the first elongation direction 12.

[0077] The obstruction element 81 may comprise a resilient curved member 83 with a convex side 84 pointed away from direction 111. When a force is applied to the resilient curved member 83 from a direction substantially parallel to the direction 111, the curved member 83 may be at least partially straightened. Such a force may be applied to the curved member 83 when the insert 100 is being inserted into the architectural opening 210. Referring back to Fig. 2, one may see that the curved member 83 may act as a stop to prevent movement of the insert 100 relative to the architectural opening 210 in a direction opposite to the insert direction 201.

[0078] As can be seen in Fig. 4, the shape of the first hinging part 11 may be such that, when the first hinging part 11 is in the second position relative to the first elongated frame part, the width of the insert 100, excluding the extended member 14 or any other extended member 24, 34 comprised by the insert 100 is not increased by the first hinging body 16. By virtue of this, the insert 100 including the first hinging body 16 is insertable through the width w of the architectural opening.

[0079] Alternatively or additionally to locking the hinging part 11 in the second position, the hinging part 11

and the first frame part 10 may both be provided with a through hole, wherein the through holes align when the hinging part 11 is in the second position. This allows a pin as an example of a locking device to be provided extending through both through holes, which may prevent hinging of the first hinging part 11 relative to the first frame part 10. Other ways of locking the first hinging part 11 in the second position may be envisioned as well, such as using different kinds of locking, fastening or connecting elements, such as screws, glue, nuts and bolts, any other fastening element, or any combination thereof.

[0080] As may be seen in Fig. 4, the first frame part 10 may be constrained within a certain width z . The first hinging part 11 may be constructed such that when in the second position, only the extended member 14 extends beyond the width z of the frame part 10. This in turn may allow or aid in the insertion of the insert 100 into the architectural opening 200.

[0081] Figs. 5A and 5B show another embodiment of part of the insert 100 showing an embodiment of first elongated frame part 10 as an elongated frame part, and an embodiment of the first hinging part 11 as a hinging part in respectively the first position and the second position.

[0082] In the embodiment of Figs. 5A and 5B, the hinging hook protrusion 18 comprises at its end a hinging hook tip 81 with a width y' . The first frame part 10 further comprises a blocking protrusion 83 extending into the frame cavity 56 such that a width y is provided between the blocking protrusion 83 and a frame part hook tip 82. When the width y' of the hinging hook tip 81 is larger than the width y between the blocking protrusion 83 and the frame part hook tip 82, the hinging hook part 18 may be constrained in the frame part cavity 56.

[0083] To hook the hinging hook part 18 behind the frame hook protrusion 51, the hinging hook tip 83 may be inserted such that the width y' is provided at an angle relative to width y . Additionally or alternatively, one or both of the hinging hook tip 81, the blocking protrusion 83, and the frame part hook tip 82 may comprise a resilient material arranged to be elastically deformed during insertion of the hinging hook part 18 in the frame cavity 56 through the space between the blocking protrusion 83 and the frame part hook tip 82.

[0084] Any elongated element may be manufactured using an extrusion or pultrusion process, and may therefore have a substantially constant crosssection. As such, the elements may comprise aluminium, a polymer, a fibre reinforced plastic or any other material suitable for extrusion or pultrusion.

[0085] In summary, architectural openings may be retrofitted with inserts comprising a screen for blocking insects from passing through the architectural opening. To fit into the opening, the insert may require a plurality of thin flanges, which because of their minor thickness may be prone to breaking during manufacturing, transportation or installation of the insert. The thin flanges in an insert according to the present invention are provided in

a hingeable part, which may during manufacturing and transportation be hinged in a first orientation such that the thin flanges are less prone to breaking. During installation, the hingeable part may be hinged into a second orientation and locked into place, for example using a snap fit connection and/or additional locking elements.

[0086] At least some of the various aspects and embodiments thereof discussed above may be summarised by means of the following numbered embodiments:

In the description above, it will be understood that when an element such as layer, region or substrate is referred to as being "on" or "onto" another element, the element is either directly on the other element, or intervening elements may also be present. Also, it will be understood that the values given in the description above, are given by way of example and that other values may be possible and/or may be strived for.

[0087] Furthermore, the invention may also be embodied with less components than provided in the embodiments described here, wherein one component carries out multiple functions. Just as well may the invention be embodied using more elements than depicted in the Figures, wherein functions carried out by one component in the embodiment provided are distributed over multiple components.

[0088] It is to be noted that the figures are only schematic representations of embodiments of the invention that are given by way of non-limiting examples. For the purpose of clarity and a concise description, features are described herein as part of the same or separate embodiments, however, it will be appreciated that the scope of the invention may include embodiments having combinations of all or some of the features described as defined by the claims. The word 'comprising' does not exclude the presence of other features or steps than those listed in a claim. Furthermore, the words 'a' and 'an' shall not be construed as limited to 'only one', but instead are used to mean 'at least one', and do not exclude a plurality.

[0089] A person skilled in the art will readily appreciate that various parameters and values thereof disclosed in the description may be modified and that various embodiments disclosed and/or claimed may be combined without departing from the scope of the invention as defined by the claims.

[0090] It is stipulated that the reference signs in the claims do not limit the scope of the claims, but are merely inserted to enhance the legibility of the claims.

Claims

1. An insert (100) for an architectural opening, comprising:

- a first elongated frame part (10);
- a second elongated frame part (20) connected at an angle relative to the first elongated frame part, wherein the first elongated frame part and

the second elongated frame part span an insert plane (110);

- a third elongated frame part (30) and a fourth elongated frame part (40), wherein ends of the elongated frame parts are connected to form a rectangle, and the third elongated part is provided parallel to the first elongated frame part at an opposite side of the insert;

- a first hinging part (11) comprising a first hinging body (16) and an extended member (14) extending substantially perpendicularly from the first hinging body at a distal end of the first hinging part,

wherein the first hinging part (11) is at a proximal end hingeably provided relative to the first elongated frame part (10) and the first hinging part is arranged to be hingeable around a first hinge axis (13) parallel to an elongation direction (12) of the first elongated frame part between:

- a first position wherein the first hinging body is oriented at an angle less than 90 degrees relative to a plane parallel to the insert plane; and
- a second position wherein the first hinging body is oriented substantially perpendicular to the insert plane;

characterised in that the insert further comprises a second hinging part (31) comprising a second hinging body and an extended member (34) extending substantially perpendicularly from the second hinging body at a distal end of the second hinging part,

and wherein the second hinging part (31) is at a proximal end hingeably provided relative to the third elongated frame part (30) and the second hinging part is arranged to be hingeable around a second hinge axis (33) parallel to the elongation direction of the first elongated frame part between:

- a first position wherein the second hinging body is oriented at an angle less than 90 degrees relative to a plane parallel to the insert plane; and
- a second position wherein the second hinging body is oriented substantially perpendicular to the insert plane.

2. Insert according to claim 1, wherein the extended member (14) of the first hinging part comprises a resilient material.

3. Insert according to any of the preceding claims, wherein:

- the first hinging part comprises a hinging hook

- protrusion (18) at the proximal end;
- the first elongated frame part comprises a frame hook protrusion (51) at a side of the first elongated frame part facing away from the insert plane; and
 - the hinging hook protrusion is arranged to engage with the frame hook protrusion when the first hinging part is in the second position.
4. Insert according to claim 3, wherein the frame hook protrusion and the hinging hook protrusion both comprise a thickened end section (52).
5. Insert according to claim 3 or 4, wherein:
- the first elongated frame part comprises a frame flange (62) extending out of the first elongated frame part away from and substantially parallel to the insert plane; and
 - the frame flange and the frame part hook protrusion define a frame part cavity (56) arranged to accommodate the hinging hook protrusion.
6. Insert according to claim 5, wherein:
- the frame flange comprises a protrusion (63) extending substantially perpendicular relative to the insert plane towards the frame part cavity;
 - the first hinging part comprises an indentation (64) shaped complementary to the protrusion; and
 - in the second position of the first hinging part, the protrusion is accommodated in the indentation.
7. Insert according to claim 6, wherein:
- the frame flange (62) is resiliently hingeable from the first elongated frame part over an axis parallel to the elongation direction of the first elongated frame part;
 - the first hinging part comprises an abutment (65) adjacent to the indentation; and
 - the abutment is arranged to, when the first hinging part is hinged between the first position and the second position, resiliently hinge the frame flange.
8. Insert according to any of the preceding claims, wherein the first elongated frame part and the second elongated frame part comprise a screen connection module (71) for connecting a screen (50) to such that the screen may be provided substantially parallel to the insert plane.
9. Insert according to claim 8, wherein the first elongated frame part comprises a plug cavity (72) as part of the screen connection module in a side of the first elongated frame part which is parallel to the insert plane, and wherein the plug cavity is arranged to receive a plug (73) and part of the screen (50).
10. Insert according to any of the previous claims, wherein, in first position of the first hinging part, the distal end of the first hinging part lies in the insert plane.
11. Insert according to any of the previous claims, wherein the elongate frame parts have a thickness perpendicular to the insert plane, thus forming a further insert plane spaced from the insert plane at substantially the thickness and, in the first position of the first hinging part, the distal end of the first hinging part lies in the insert plane or the further insert plane.
12. Insert according to claim 11, wherein the elongate frame parts have a thickness perpendicular to the insert plane, thus forming a further insert plane spaced from the insert plane at substantially the thickness and, the first hinge axis is provided near a first of the insert plane and the further insert plane and, in the first position of the first hinging part, the distal end of the first hinging part lies in a second of the insert plane or the further insert plane.
13. Kit of parts, comprising:
- an insert (100) according to any of the claims 5-9 or claims dependent thereon;
 - an obstruction element (81), comprising an obstructing protrusion (82) arranged to be pressed into the frame part cavity of the first elongated frame part between the frame part hook protrusion and the first hinging part when the first hinging part is in the second position.
14. Kit of parts according to claim 13, wherein the obstruction element further comprises a curved resilient member (83).
15. Kit of parts according to claim 14, wherein the curved resilient member has a convex side (84) arranged to be pointing away from the insert plane when the obstruction protrusion is pressed into the frame part cavity of the first elongated frame part between the frame part hook protrusion and the first hinging part when the first hinging part is in the second position.

Patentansprüche

1. Einsatz (100) für eine architektonische Öffnung, der umfasst:
- ein erstes längliches Rahmenteil (10);
 - ein in einem Winkel relativ zum ersten längli-

chen Rahmenteil verbundenes zweites längliches Rahmenteil (20), wobei das erste längliche Rahmenteil und das zweite längliche Rahmenteil eine Einsatzebene (110) überspannen;

- ein drittes längliches Rahmenteil (30) und ein viertes längliches Rahmenteil (40), wobei die Enden der länglichen Rahmentile verbunden sind, um ein Rechteck zu bilden, und das dritte längliche Teil parallel zu dem ersten länglichen Rahmenteil an einer gegenüberliegenden Seite des Einsatzes bereitgestellt ist;

- ein erstes Scharnierteil (11), das einen ersten Scharnierkörper (16) und ein verlängertes Element (14) umfasst, das sich im Wesentlichen senkrecht von dem ersten Scharnierkörper an einem distalen Ende des ersten Scharnierteils erstreckt,

wobei das erste Scharnierteil (11) an einem proximalen Ende relativ zu dem ersten länglichen Rahmenteil (10) schwenkbar bereitgestellt ist und das erste Scharnierteil so angeordnet ist, dass es um eine erste Scharnierachse (13) parallel zu einer Längsrichtung (12) des ersten länglichen Rahmentails schwenkbar ist zwischen:

- einer ersten Position, in der der erste Scharnierkörper in einem Winkel von weniger als 90 Grad relativ zu einer Ebene parallel zur Einsatzebene ausgerichtet ist; und
- einer zweiten Position, in der der erste Scharnierkörper im Wesentlichen senkrecht zur Einsatzebene ausgerichtet ist;

dadurch gekennzeichnet, dass der Einsatz ferner ein zweites Scharnierteil (31) umfasst, das einen zweiten Scharnierkörper und ein verlängertes Element (34) umfasst, das sich im Wesentlichen senkrecht von dem zweiten Scharnierkörper an einem distalen Ende des zweiten Scharnierteils erstreckt, und wobei das zweite Scharnierteil (31) an einem proximalen Ende relativ zu dem dritten länglichen Rahmenteil (30) schwenkbar bereitgestellt ist und das zweite Scharnierteil so angeordnet ist, dass es um eine zweite Scharnierachse (33) parallel zu der Längsrichtung des ersten länglichen Rahmentails schwenkbar ist zwischen:

- einer ersten Position, in der der zweite Scharnierkörper in einem Winkel von weniger als 90 Grad relativ zu einer Ebene parallel zur Einsatzebene ausgerichtet ist; und
- einer zweiten Position, in der der zweite Scharnierkörper im Wesentlichen senkrecht zur Einsatzebene ausgerichtet ist.

2. Einsatz nach Anspruch 1, wobei das verlängerte Element (14) des ersten Scharnierteils aus einem elastischen Material besteht.

5 3. Einsatz nach einem der vorhergehenden Ansprüche, wobei:

- das erste Scharnierteil einen Scharnierhakenvorsprung (18) am proximalen Ende aufweist;
- das erste längliche Rahmenteil einen Rahmenhakenvorsprung (51) an einer von der Einsatzebene abgewandten Seite des ersten länglichen Rahmentails umfasst; und
- der Scharnierhakenvorsprung so angeordnet ist, dass er in den Rahmenhakenvorsprung eingreift, wenn sich das erste Scharnierteil in der zweiten Position befindet.

20 4. Einsatz nach Anspruch 3, wobei der Rahmenhakenvorsprung und der Scharnierhakenvorsprung beide einen verdickten Endabschnitt (52) umfassen.

5. Einsatz nach Anspruch 3 oder 4, wobei:

- das erste längliche Rahmenteil einen Rahmenflansch (62) umfasst, der sich aus dem ersten länglichen Rahmenteil weg von und im Wesentlichen parallel zu der Einsatzebene erstreckt; und
- der Rahmenflansch und der Rahmenteilhakenvorsprung einen Rahmenteilhohlraum (56) definieren, der so angeordnet ist, dass er den Scharnierhakenvorsprung aufnimmt.

35 6. Einsatz nach Anspruch 5, wobei:

- der Rahmenflansch einen Vorsprung (63) umfasst, der sich im Wesentlichen senkrecht relativ zu der Einsatzebene in Richtung des Hohlraums des Rahmentails erstreckt;
- das erste Scharnierteil eine Vertiefung (64) aufweist, die komplementär zu dem Vorsprung geformt ist; und
- in der zweiten Position des ersten Scharnierteils der Vorsprung in der Vertiefung untergebracht ist.

7. Einsatz nach Anspruch 6, wobei:

- der Rahmenflansch (62) von dem ersten länglichen Rahmenteil um eine Achse parallel zur Längsrichtung des ersten länglichen Rahmentails elastisch schwenkbar ist;
- das erste Scharnierteil ein an die Vertiefung angrenzendes Widerlager (65) umfasst; und
- das Widerlager so angeordnet ist, dass der Rahmenflansch elastisch geschwenkt wird, wenn das erste Scharnierteil zwischen der ers-

ten Position und der zweiten Position geschwenkt wird.

8. Einsatz nach einem der vorhergehenden Ansprüche, wobei das erste längliche Rahmenteil und das zweite längliche Rahmenteil ein Gitterverbindungsmodul (71) zum Verbinden eines Gitters (50) umfassen, so dass das Gitter im Wesentlichen parallel zur Einsatzebene bereitgestellt werden kann.

9. Einsatz nach Anspruch 8, wobei das erste längliche Rahmenteil einen Stopfenhohlraum (72) als Teil des Gitterverbindungsmoduls in einer Seite des ersten länglichen Rahmentails, die parallel zur Einsatzebene verläuft, umfasst und wobei der Stopfenhohlraum so angeordnet ist, dass er einen Stopfen (73) und einen Teil des Gitters (50) aufnehmen kann.

10. Einsatz nach einem der vorhergehenden Ansprüche, wobei in der ersten Position des ersten Scharnierteils das distale Ende des ersten Scharnierteils in der Einsatzebene liegt.

11. Einsatz nach einem der vorhergehenden Ansprüche, wobei die länglichen Rahmentile eine Dicke senkrecht zur Einsatzebene aufweisen, wodurch eine weitere Einsatzebene gebildet wird, die von der Einsatzebene im Wesentlichen durch die Dicke beabstandet ist, und in der ersten Position des ersten Scharnierteils das distale Ende des ersten Scharnierteils in der Einsatzebene oder der weiteren Einsatzebene liegt.

12. Einsatz nach Anspruch 11, wobei die länglichen Rahmentile eine Dicke senkrecht zur Einsatzebene aufweisen, wodurch eine weitere Einsatzebene gebildet wird, die von der Einsatzebene im Wesentlichen durch die Dicke beabstandet ist, und die erste Scharnierachse in der Nähe einer Ersten der Einsatzebene und der weiteren Einsatzebene bereitgestellt ist, und in der ersten Position des ersten Scharnierteils das distale Ende des ersten Scharnierteils in einer Zweiten der Einsatzebene oder der weiteren Einsatzebene liegt.

13. Teilesatz, der umfasst:

- einen Einsatz (100) nach einem der Ansprüche 5 bis 9 oder davon abhängigen Ansprüchen;
- ein Sperrelement (81), das einen Sperrvorsprung (82) umfasst, der so angeordnet ist, dass er in den Rahmenteilhohlraum des ersten länglichen Rahmentails zwischen dem Rahmenteilhakenvorsprung und dem ersten Scharnierteil gedrückt wird, wenn sich das erste Scharnierteil in der zweiten Position befindet.

14. Teilesatz nach Anspruch 13, wobei das Sperrele-

ment ferner ein gebogenes elastisches Element (83) umfasst.

15. Teilesatz nach Anspruch 14, wobei das gekrümmte elastische Element eine konvexe Seite (84) aufweist, die so angeordnet ist, dass sie von der Einsatzebene weg zeigt, wenn der Sperrvorsprung in den Rahmenteilhohlraum des ersten länglichen Rahmentails zwischen dem Rahmenteilhakenvorsprung und dem ersten Scharnierteil gedrückt wird, wenn sich das erste Scharnierteil in der zweiten Position befindet.

Revendications

1. Insert (100) d'ouverture architecturale, comprenant :

- une première partie de structure allongée (10) ;
- une deuxième partie de structure allongée (20) connectée sous un certain angle par rapport à la première partie de structure allongée, dans lequel la première partie de structure allongée et la deuxième partie de structure allongée couvrent un plan d'insert (110) ;
- une troisième partie de structure allongée (30) et une quatrième partie de structure allongée (40), dans lequel les extrémités des parties de structure allongée sont connectées pour former un rectangle, et la troisième partie de structure allongée est disposée parallèle à la première partie de structure allongée au niveau d'un bord opposé de l'insert ;
- une première partie articulée (11) comprenant un premier corps articulé (16) et un élément déployé (14) s'étendant de manière sensiblement perpendiculaire à partir du premier corps articulé au niveau d'une extrémité distale de la première partie articulée, dans lequel la première partie articulée (11) est à une extrémité proximale prévue de manière articulée par rapport à la première partie de structure allongée (10) et la première partie articulée est agencée pour pouvoir s'articuler autour d'un premier axe d'articulation (13) parallèle à une direction d'élongation (12) de la première partie de structure allongée entre :

- une première position dans laquelle le premier corps articulé est orienté sous un angle inférieur à 90 degrés par rapport à un plan parallèle au plan d'insert ; et
- une seconde position dans laquelle le premier corps articulé est orienté sensiblement perpendiculaire au plan d'insert ;

caractérisé en ce que l'insert comprend en outre une seconde partie articulée (31) qui com-

- prend un second corps articulé et un élément déployé (34) s'étendant de manière sensiblement perpendiculaire à partir du second corps articulé au niveau d'une extrémité distale de la seconde partie articulée, et dans lequel la seconde partie articulée (31) est à une extrémité proximale prévue de manière articulée par rapport à la troisième partie de structure allongée (30) et la seconde partie articulée est agencée pour pouvoir s'articuler autour d'un second axe d'articulation (33) parallèle à la direction d'élongation de la première partie de structure allongée entre :
- une première position dans laquelle le second corps articulé est orienté sous un angle inférieur à 90 degrés par rapport à un plan parallèle au plan d'insert ; et
 - une seconde position dans laquelle le second corps articulé est orienté sensiblement perpendiculaire au plan d'insert.
2. Insert selon la revendication 1, dans lequel l'élément déployé (14) de la première partie articulée comprend un matériau élastique.
 3. Insert selon l'une quelconque des revendications précédentes, dans lequel :
 - la première partie articulée comprend un crochet d'articulation protubérant (18) à l'extrémité proximale ;
 - la première partie de structure allongée comprend un crochet de structure protubérant (51) au niveau d'un côté de la première partie de structure allongée qui fait face en s'éloignant du plan d'insert ; et
 - le crochet d'articulation protubérant est agencé de façon à venir en prise avec le crochet de structure protubérant lorsque la première partie articulée se trouve dans la seconde position.
 4. Insert selon la revendication 3, dans lequel le crochet de structure protubérant et le crochet d'articulation protubérant comprennent tous deux une section extrémité épaissie (52).
 5. Insert selon la revendication 3 ou 4, dans lequel
 - la première partie de structure allongée comprend une bride de structure (62) qui s'étend hors de la première partie de structure allongée à partir du plan d'insert, et sensiblement parallèle à celui-ci ; et
 - la bride de structure et le crochet protubérant de la partie de structure, définissent une cavité de partie de structure (56) agencée de façon à recevoir le crochet d'articulation protubérant.
 6. Insert selon la revendication 5, dans lequel :
 - la bride de structure comprend une protubérance (63) qui s'étend de manière sensiblement perpendiculaire par rapport au plan d'insert vers la cavité de partie de structure ;
 - la première partie articulée comprend un renforcement (64) qui présente une forme complémentaire de celle de la protubérance ; et
 - dans la seconde position de la première partie articulée, la protubérance est reçue dans le renforcement.
 7. Insert selon la revendication 6, dans lequel :
 - la bride de structure (62) peut s'articuler de manière élastique à partir de la première partie de structure allongée sur un axe parallèle à la direction d'élongation de la première partie de structure allongée ;
 - la première partie articulée comprend une butée (65) adjacente au renforcement ; et
 - la butée est agencée de façon à articuler de manière élastique la bride de structure lorsque la première partie articulée est articulée entre la première position et la seconde position.
 8. Insert selon l'une quelconque des revendications précédentes, dans lequel la première partie de structure allongée et la deuxième partie de structure allongée comprennent un module de connexion d'écran (71) pour connecter un écran (50) de telle sorte que l'écran puisse être disposé de manière sensiblement parallèle au plan d'insert.
 9. Insert selon la revendication 8, dans lequel la première partie de structure allongée comprend une cavité de fiche (72) en tant qu'élément du module de connexion d'écran dans un côté de la première partie de structure allongée qui est parallèle au plan d'insert, et dans lequel la cavité de fiche est agencée de façon à recevoir une fiche (73) et une partie de l'écran (50).
 10. Insert selon l'une quelconque des revendications précédentes, dans lequel, dans la première position de la première partie articulée, l'extrémité distale de la première partie articulée se situe dans le plan d'insert.
 11. Insert selon l'une quelconque des revendications précédentes, dans lequel les parties de structure allongée présentent une épaisseur perpendiculaire au plan d'insert, en formant ainsi un autre plan d'insert espacé du plan d'insert, sensiblement au niveau de l'épaisseur et, dans la première position de la première partie articulée, l'extrémité distale de la première partie articulée se situe dans le plan d'insert.

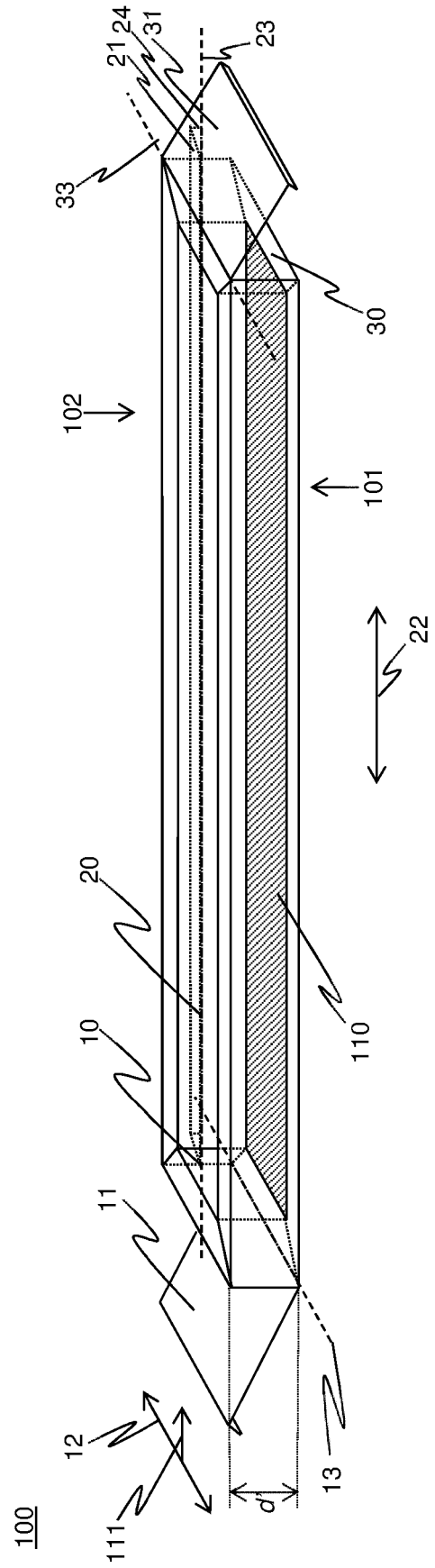
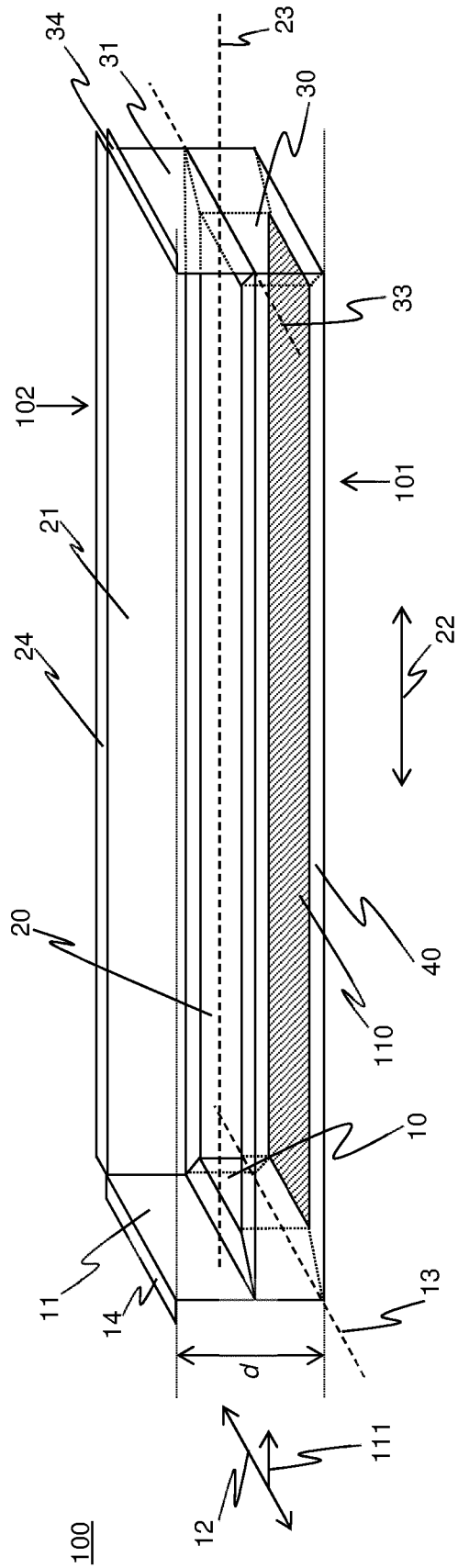
ou dans l'autre plan d'insert.

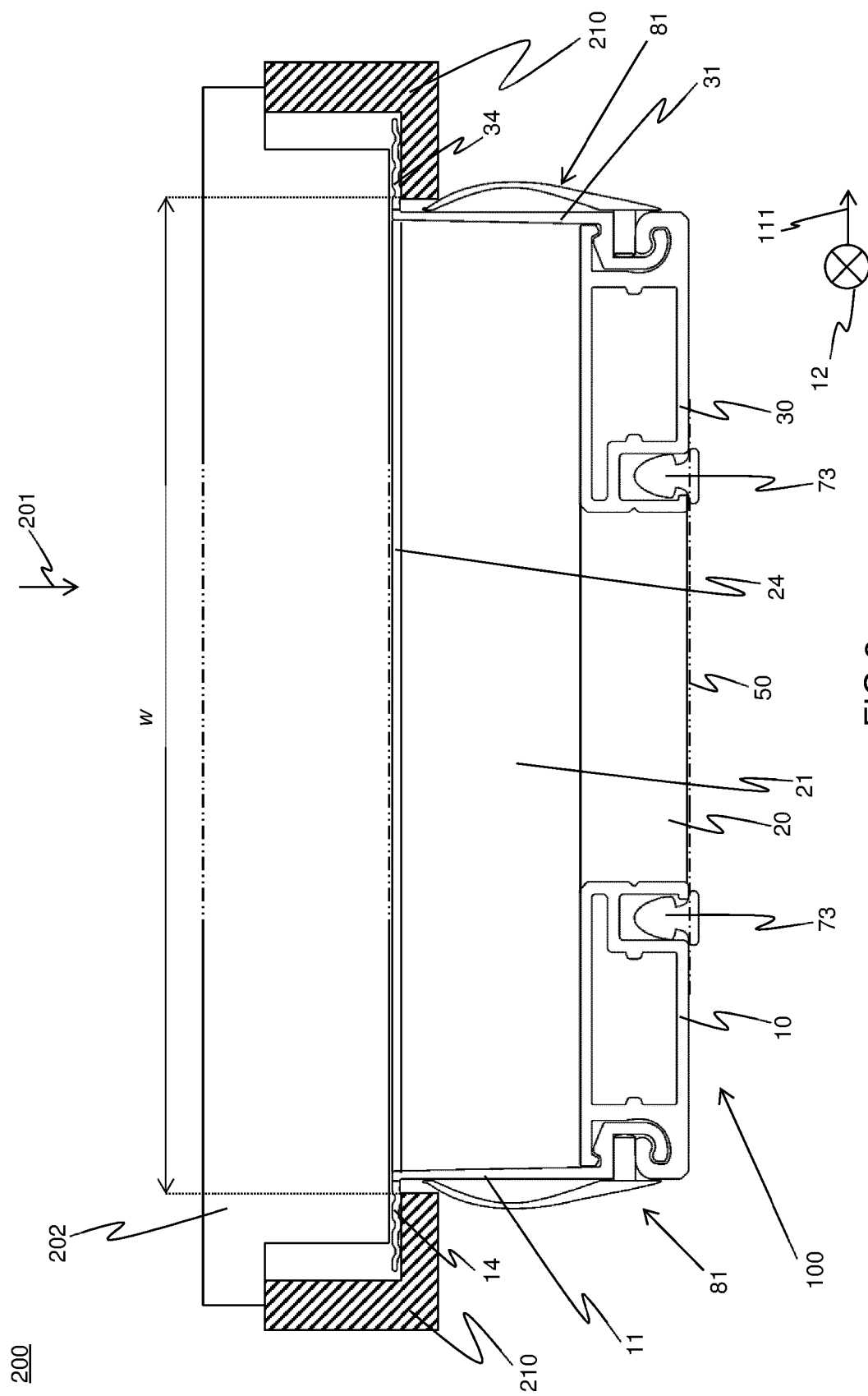
- 12.** Insert selon la revendication 11, dans lequel les parties de structure allongée présentent une épaisseur perpendiculaire au plan d'insert, en formant ainsi un autre plan d'insert espacé du plan d'insert, sensiblement au niveau de l'épaisseur, et le premier axe d'articulation est disposé à proximité d'un premier du plan d'insert et de l'autre plan d'insert et, dans la première position de la première partie articulée, l'extrémité distale de la première partie articulée se situe dans le second du plan d'insert et de l'autre plan d'insert. 5 10
- 13.** Ensemble de pièces, comprenant : 15
- un insert (100) selon l'une quelconque des revendications 5 à 9, ou selon les revendications qui s'y rapportent ;
 - un élément obstruant (81), comprenant une protubérance d'obstruction (82) agencée de façon à pouvoir être pressée dans la cavité de la partie de structure de la première partie de structure allongée, entre le crochet protubérant de la partie de structure, et la première partie articulée, lorsque la première partie articulée se trouve dans la seconde position. 20 25
- 14.** Ensemble de pièces selon la revendication 13, dans lequel l'élément obstruant comprend en outre un élément élastique incurvé (83). 30
- 15.** Ensemble de pièces selon la revendication 14, dans lequel l'élément élastique incurvé présente un côté convexe (84) agencé de façon à se diriger en s'éloignant du plan d'insert, lorsque la protubérance d'obstruction est pressée dans la cavité de la partie de structure de la première partie de structure allongée, entre le crochet protubérant de la partie de structure, et la première partie articulée, lorsque la première partie articulée se trouve dans la seconde position. 35 40

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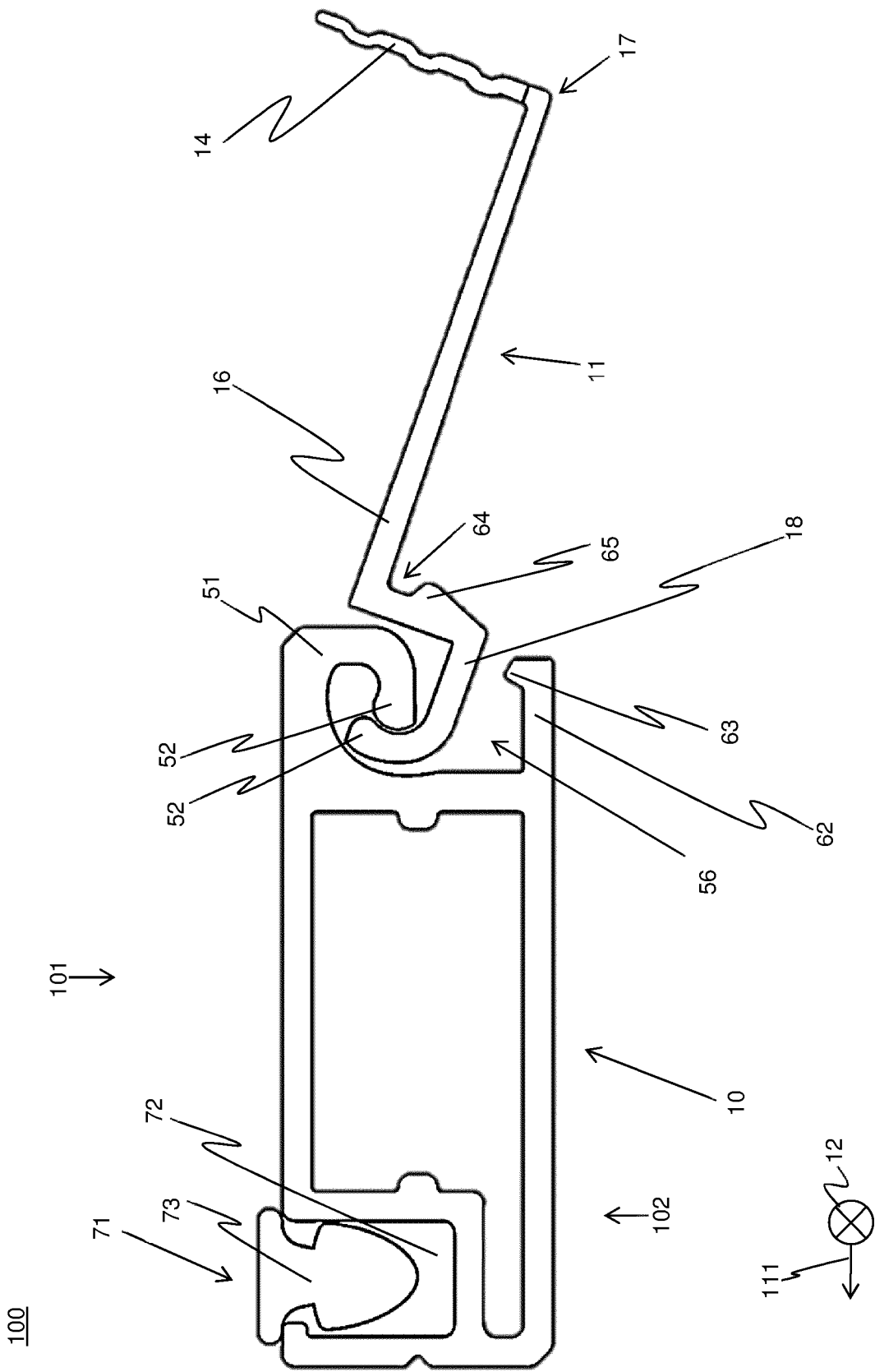
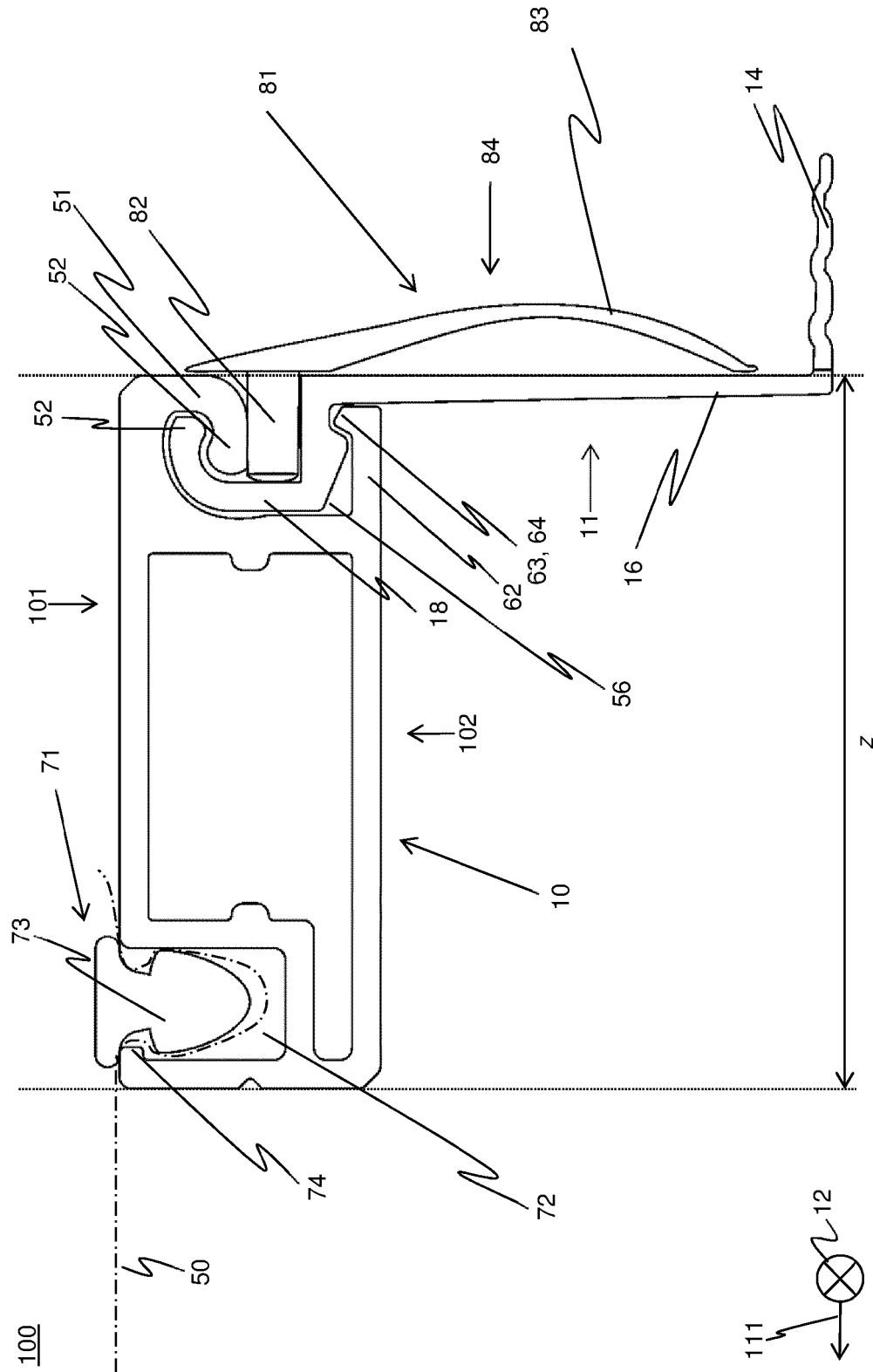


FIG 3



100

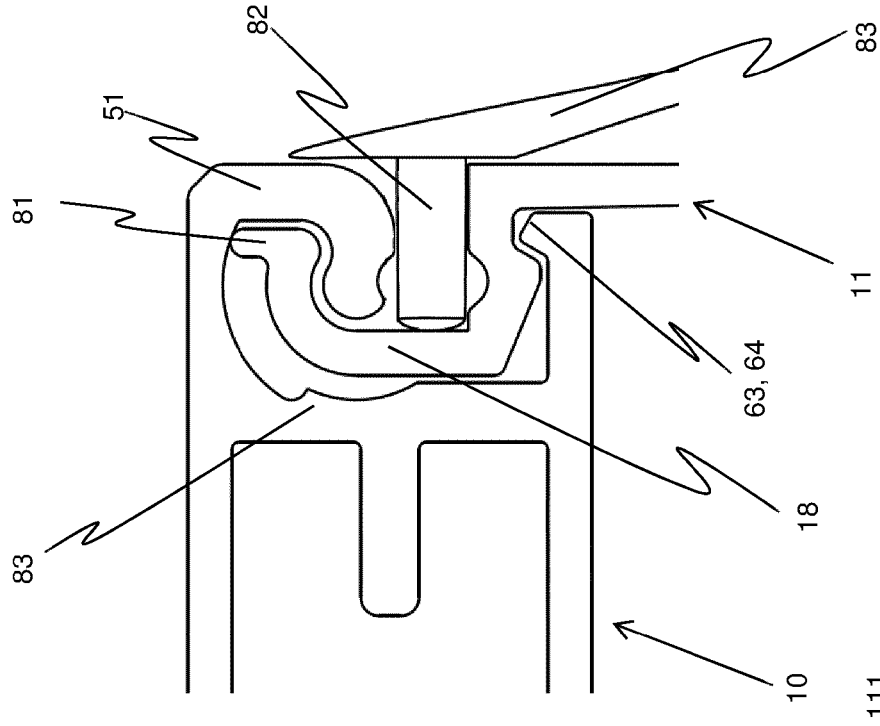


FIG 5B

100

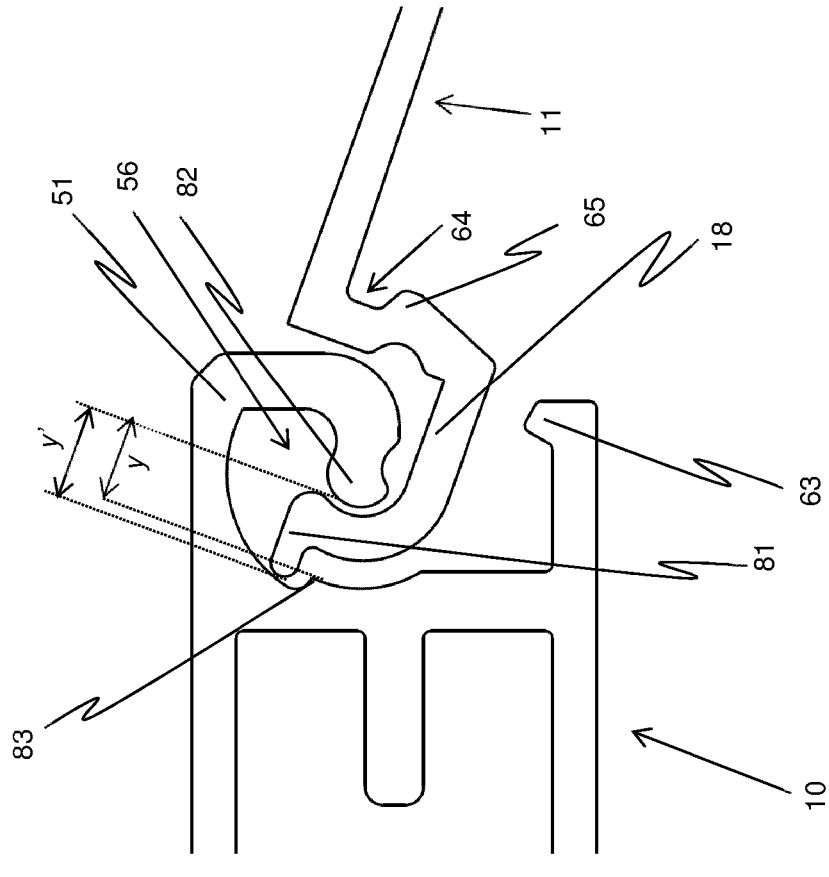


FIG 5A

REFERENCES CITED IN THE DESCRIPTION

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