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(54) A METHOD OF MAKING A WINDOW FRAME UNIT WITH A PANE

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Description

[0001] The invention relates to a method of making a window frame unit, where the frame comprises a top member, a bottom member and two side members and carries a pane comprising at least two sheet elements, and where the frame comprises one or more functional elements.

[0002] This principle is known from traditional windows, where a insulating pane is attached to a frame by means of glazing profile. The frame members may be made from wood, plastic, aluminium profiles or combinations thereof and functional elements such as hinges, gaskets etc. are attached to the frame.

[0003] It has also been attempted to use a moulded plastic frame, where the pane is attached to the frame during the moulding step as is described for example in FR-A-1381137 and FR-A-2340439.

[0004] Formerly, window manufacturers were relatively locally orientated making windows particularly adapted for local traditions and climate conditions. In recent years the manufacture of windows have, however, become a much more international business and manufacturers thus have to face much more diversified demands, not only as regards insulating properties but also with respect to functional features such as the positioning of hinges and brackets, appearance etc.

[0005] It is therefore the object of the invention to provide a method of making a window frame unit, which allows for a greater flexibility in the manufacture of windows, so that they may be tailored for use under different conditions or for different requirements.

[0006] This is achieved with a method according to claims 1 to 10 and a window frame unit according to claims 11 to 15.

[0007] As the window frame unit is composed from two or more individual unit layers, each of which may carry different functional elements, it is possible to achieve a large number of combinations of functional features by combining different unit layers. According to the invention at least one functional element is a hinge or a mounting bracket for interconnection to a load-bearing structure and at least one functional element is insulating material. If one frame part carries the hinges, while another comprises insulating material, it is possible to provide two windows with the same hinge type but insulated for use in different climate zones.

[0008] In this context, that term "functional element" covers all imaginable elements capable of giving the unit layer a needed property. This may be in the form of elements attached to or embedded wholly or partially in the frame part as well as particular designs of the frame part itself giving it the wanted properties or functional elements may be attached to the sheet elements. Examples of functional elements are insulation, gaskets, reinforcement, hinges, mounting brackets for interconnection to a load-bearing structure, brackets or rails for screening devices, drains, operating means, control means, wiring,

a sensor, a photovoltaic element, a dirt repelling surface etc.

[0009] The material of the frame parts may be any mouldable material, but as polyurethane (PUR) has been used in window for decades and has proven to have excellent durability, this material is preferred. It is, however, to be understood that different frame parts may be made from different materials and that other materials such as wood or aluminium may be attached to the moulding material either during the moulding step or subsequently. This for example allows a frame with a wooden surface facing the interior of the building, giving the visual impression of an all-wooden window.

[0010] Depending on the choice of material for the frame parts it may be necessary to provide some kind of reinforcement of one or more frame parts. This particularly applies to those frame parts serving a load-bearing function such as those carrying hinges, but the reinforcement may also serve to receive screws and like fastening means if the frame part is made from a relatively brittle or otherwise fragile material.

[0011] The frame part will often embrace the edge of the sheet element, so that the frame material adheres to the sheet element on both sides as well as on the edge face. In some cases it will, however, be advantageous that the frame part is only in contact with one side of the sheet element.

[0012] The interconnection between the unit layers is preferably achieved by gluing or welding the frame parts to each other, but may also be achieved by mechanical means. Also, it may be necessary to provide an interconnection between the sheet element of one unit layer and the frame part of another. This may also be achieved by gluing, but mechanical means has the advantage of being less sensitive to elevated temperatures and thus safer in the event of fire.

[0013] The sheet elements carried by the different frame parts form a multi-layer pane when the unit layers are arranged on top of each other. For some uses the closed space between the sheet elements will provide sufficient insulation properties, but as this is rarely the case it is preferred that the method further comprises the following step:

e) the space between two neighbouring sheet elements is evacuated and possibly filled with an insulating gas, such as Ar, Kr or Xe.

[0014] This of course requires that the space, i.e. the connection between the unit layers, is sufficiently tight. For this purpose the frame parts or sheet elements may be provided with a proofing or sealing, e.g. in the form of a caulking compound being disposed on the respective surfaces before they are being brought into contact with each other.

[0015] Traditional insulating panes comprise two or more layers of glass, but in this the pane also may comprise different types of sheet elements. This allows the provision of a large number of different pane types, ranging from traditional glass insulating panes over combina-

tions of glass and polycarbonat sheets to transparent sheet elements combined with non-transparent ones. Non-transparent sheet elements may for example be glass sheets covered with photo-voltaic films, making them non-transparent from one or both sides.

[0016] In some cases the provision of the functional elements may necessitate that one or more sections of one or more frame parts are given certain dimensions, for example if a frame part must include a relatively large amount of insulating material. In such cases, different frame parts may be made with different overall thicknesses in a direction perpendicular to the plane of frame.

[0017] In other cases the need for extra material in the frame part will be only local, e.g. to increase the amount of insulation where it is particularly needed, or it will be expedient to provide one or more frame part sections with recesses, e.g. to give room for the mounting of hinges or brackets. To meet these requirements, at least one frame part may be made with a cross-sectional profile seen in a plane perpendicular to the plane of the frame, which varies along the length of the top section, the bottom section and/or at least one side section.

[0018] Likewise, different frame parts may be given different lengths and/or widths so that one frame part projects over another, e.g. provide an overlap between a stationary frame and a sash.

[0019] In this, the term "frame" is used to indicate a frame shaped structure surrounding the pane. This structure may serve either as a sash in an openable window or be connected directly to the supporting structure in the building thus serving to transmit all loads from the pane to the load-bearing structure. It is, however, also possible to provide only non-bearing functional elements on the frame according to the invention and to then connect it to another load-bearing frame. In this way it possible to provide a relatively slim frame, which is connected to another for the formation of a sash or stationary frame unit. The term "stationary frame" is used for a structure carrying a sash.

[0020] Throughout this text the terms "interior" and "exterior" is used to indicate the orientation, when the window is mounted in a building, i.e. the interior side of a component is the side facing the interior of the building. Similarly, the terms "inner" and "outer" is used in relation to the frame parts to indicate whether a particular component faces into the space defined by the frame or away from this, i.e. the outer side of a frame part section is the one facing away from the sheet element.

[0021] In the following, the invention will be described in more detail with reference to the drawing, where:

Fig. 1a and 1b shows a first frame part with a first sheet element seen in a perspective view and in a cross-sectional view, respectively,

Fig. 2a and 2b shows a second frame part with a second sheet element seen in a perspective view and in a cross-sectional view, respectively,

Fig. 3a and 3b shows a third frame part with a third

sheet element seen in a perspective view and in a cross-sectional view, respectively, and

Fig. 4 shows the three frame parts of Figs. 1-3 stacked on top of each other and seen in a cross-sectional view.

[0022] An example of a frame unit intended for an opening centre-hung window, where it will serve as a sash mounted in a stationary frame, is shown in Figs. 1a and 1b. In these, as well as in the other figures, dimensions in the vertical direction have been exaggerated to make details appear clearer. Typical thicknesses of a sheet element will be 3-6 mm when using glass or glass-like materials, but much smaller dimensions are possible for example if employing films, which may be as thin as 0,05 mm. The thickness of the frame part will typically be 8-16 mm when using glass and the like, but may be down to a few millimetres when using a film. Length and width of the sheet element and frame part will depend on the intended use of the window and will only rarely influence on the thicknesses.

[0023] The frame unit in Figs. 1a and 1b comprises a frame part 1 and a sheet element 2. At the upper half, i.e. the top section 11 and the upper halves of the side sections 12,13, and at the bottom section 14 the frame part is relatively slim having only the dimensions necessary to carry the sheet element. In contrast thereto, the lower halves of the side sections are relatively wide. This extra width allows the incorporation of insulating material 15 within the frame part sections as is shown in Fig. 1b. The insulating material may be expanded polystyrene (EPS), a foam of polyurethane (PUR) or any other suitable material. In Fig. 1b the insulating material constitutes approximately one third of the thickness of the frame part, but it is to be understood that the proportions of the different materials may vary.

[0024] Moreover, the increased width of the lower halves of the side sections 12,13 will allow this frame part to project over the stationary frame, in which it is mounted, leading to better insulating properties of the window as a whole. The embodiment shown in Fig. 1a is particularly suited for use in centre-hung windows, where the uppermost half of the sash turns inwards when window is opened. If in stead making a top-hung window the projections may be continued up to the top of the side sections. Moreover, the bottom section 14 may of course also be made wider and include insulating material.

[0025] Other functional elements such as reinforcing elements may also be embedded in the frame part just as described for the insulating material. The reinforcing elements may for example be wooden slats intended to receive screws holding hinges and other functional elements or metal profiles serving to provide strength and stiffness.

[0026] Figs. 2a and 2b shows another example of a frame part 3 carrying a sheet element 4. Hinge means illustrated as pins 35 have been embedded in the material of the frame part for optimum attachment and transmittal

of forces. Alternatively, they could have been attached to the surface of the frame part by means of glue or mechanical means such as screws. Also, more complex hinge structures could be used, in which case two or more smaller pins thereon could be embedded in the material of the frame part, possibly supplemented by a subsequent mechanical fixing by means of screw or the like.

[0027] A third frame part 5 intended for use as the interior layer of a frame unit for an openable window is shown in Figs. 3a and 3b. This frame part is provided with two different functional elements in the form of gaskets 55 on the outer side of the side sections 52,53 and of mounting brackets 56 for roller blinds or the like on the inner side of the side sections.

[0028] The gaskets 55 are intended for being in engagement with the stationary frame (not shown) when the window is closed, thereby providing a water and air tight connection between the sash and the stationary frame. Here, the gaskets are shown only on the side members 52,53, but, as will be obvious to skilled persons, similar gaskets may also be present on the bottom and top sections 51,54 all depending on the design of the stationary frame and the sash.

[0029] Mounting brackets 56 for roller blinds etc. come in many different designs and may be situated at different positions on the frame part 5. The illustration as a rectangular unit situated at a small distance from the top section 54 is thus not to be regarded as more than an example.

[0030] In Figs. 3a and 3b the mounting brackets 56 have been illustrated as projecting from the surface of the frame part, but it may also be embedded in the material of the frame part. The surface of the embedded bracket may be exposed or covered by a thin layer of the frame part material, which may be penetrated upon mounting of a screening or the like, either by the device itself or means of appropriate tools. It opting to the covered embedment, the bracket may be arranged such that the surface of the frame part appears totally smooth or an indication of its location may be provided in the form a small depression in the surface.

[0031] If intending to provide the window with electronically operated screening devices (not shown), mounting brackets may be provided or combined with electric connectors. Wiring (not shown) may be provided by printing on the sheet element or may be embedded in the frame part 5, either during moulding or by subsequently being drawn through a duct therein. Similar brackets, wiring etc. may of course also be provided in other frame parts if desiring to arrange screening devices or the like in between sheet elements or at the exterior side of the window.

[0032] Embedded wiring may also be used as hot wires for heating areas of the window frame unit, which are prone to condensation.

[0033] In the above, each functional element has been associated with one particular unit layer, but it is to be understood, that a functional element may overlap a

neighbouring unit layer and even be attached thereto once the respective unit layers has been arranged on top of each other. This may for example be relevant with insulating material, flashings, claddings, coverings and the like.

[0034] If the attachment of the frame part to the sheet element should fail or if the interconnection between unit layers is not sufficiently tight, water may penetrate into the space between sheet elements leading to condensation. In addition, the ingress of water may deteriorate the sealing on insulating panes. It may therefore be advantageous to provide one or more frame parts with drains (not shown) to allow the water to escape. Also, absorbing materials may be used to keep water away, possibly in combination with drains.

[0035] Another problem associated with a possible failure in the connections between frame parts and sheet elements or between unit layers is that it may cause a sheet element or an entire unit layer to come loose. This may pose a danger to people passing by or staying in the building and is particularly relevant when relying on materials, which becomes soft under the influence of the heat from a fire. To meet this challenge the window frame unit could be provided with mechanical means (not shown) embracing all of the unit layers and keeping them together. These means should of course be made from a material, which is not sensitive to heat. Such means could also be embedded in the material of the frame parts and/or sheet elements. If interconnected with hinges or otherwise linked to the load-bearing structure they could even serve to secure the entire window frame unit thereto.

[0036] A fire proofing of the frame material good of course also be achieved by adding a suitable fire-retardant to the material.

[0037] The frame parts in Figs. 2a and 3a have uniform dimensions along the entire periphery of the sheet elements 2,4, but this is not a necessity. It will for example be possible to combine the features of the first and second frame parts 1,3, such that one frame part has both insulation and hinges. Similarly, the transmittal of forces from the sash to the stationary frame (not shown) via the hinges could necessitate larger dimension of the side sections of the frame part carrying the hinges.

[0038] The finished frame unit produced by stacking the three unit layers in Figs. 1-3 is shown in Fig. 4. As may be seen, all three sheet elements have the same width and so does the inner openings of the three frame parts, but in other embodiments these dimensions may vary. In this way it will be possible to provide a pane with an exterior sheet element overlapping the others so that weather sensors, photovoltaic element or the like may be mounted on the exterior sheet element without being visible from the inside of the building.

[0039] As mentioned above, the different frame parts may vary in length, width and/or height. This may also result in an embodiment as shown in Fig. 5. Here, the middle frame part 37 is somewhat smaller than the ex-

terior 17 and interior 57 frame parts and these have been given a cross-sectional shape of an L. In the assembled state the exterior and interior frame parts contact each other on the outer side of the frame, embracing the middle frame part so that it is isolated from the ambient. This allows the use of non-weather resistant or otherwise fragile materials for the middle frame part, e.g. insulating foam. Another possibility would be the use of an absorbing agent serving to keep the spaces between the sheet elements dry.

[0040] Between the three frame parts 17,37,57 is a space 38 which may serve as a drain allowing any water penetrating into the space between the sheet elements to be drained off. If using the embodiment of Fig. 5 only in the top and side members of the frame, whereas the bottom section is embodied as shown in Fig. 4, any water penetrating into the space between the sheet elements would then be drained down along the sides of the frame and allowed to escape at the bottom section of the frame.

[0041] A similar draining effect could be achieved by forming the middle frame part from a draining material or the space 38 could be used as a buffer allowing an absorbing agent to expand when wetted.

[0042] Here, the respective frame parts embrace the edges of all three sheet elements, leading to a relatively large distance between the sheet elements. If it is desired to minimize this distance, the frame part may be in contact with only one side of the sheet element, the other thus coming into contact with the neighbouring frame part.

[0043] Not all frame parts need carry sheet elements, they may also serve simply as distance keepers, insulating inserts or carriers for functional elements. The manufacture of such frame parts will of course have to be adapted accordingly, but will generally be simpler than the manufacture of frame parts with sheet elements. Similarly, sheet elements with no frame part may be arranged between unit layers.

[0044] Interconnection of the unit layers is advantageously achieved by gluing or welding, but it is of course also possible to simply drive screws through the material of one frame part and into another, in which case it may be necessary to provide a sealing strip or layer (not shown) between the frame parts. Clamps or brackets may also be used.

[0045] The frame unit is made by moulding the frame parts 1,3,5 onto the edges of the sheet elements 2,4,6. This may be done either in by traditional moulding, by extrusion, by softening pre-made profiles and pressing the sheet element into them or by any other technique known to the skilled person.

[0046] To improve the interconnection with the frame parts the sheet elements may be primed, e.g. by abrading the surface or by applying a suitable coating, which may have adhere to the frame material, provide a chemical bind therewith or simply provide a surface structure to which the frame material will adhere.

[0047] When using traditional moulding or extrusion, polyurethane (PUR) is the preferred material for the

frame parts, the reason being that this material have proven exceptionally well suited for use in windows and has acceptable environmental characteristics. Other materials such as PVC may, however, also be used.

5 **[0048]** As for the sheet elements, these may be pane-type elements or films for providing screening or serving as photovoltaic elements.

10 **[0049]** Pane-type elements will typically be monolithic glass elements made for example from annealed glass, tempered glass, laminated glass, wired glass or figured or patterned glass. Other materials such as polycarbonate or Plexiglas (also known as Perspex) may, however, also be used, for example to decrease the weight of the pane.

15 **[0050]** The sheet elements may have coatings on one or both sides and the cavity between them may be filled with aerogel, dry air, gas such as Ar, Kr or Xe, or with gas mixtures suitable for improving the insulating properties of the pane by reducing its U value. When using a gas-filling it will often be necessary to first evacuate the space to be filled and it is of course also possible to simply create a vacuum between the sheet elements, leaving the filling out. When using a configuration with three or more sheet elements, the different spaces may be filled differently or one may be filled while another is left with the ambient air or evacuated.

25 **[0051]** In the description above the frame parts have been the only thing keeping the sheet elements at an appropriate distance from each other, but it is to be understood that it is also possible to use traditional spacer profiles as are known from conventional insulating panes, possibly in combination with appropriate proofing materials. This may be particularly relevant when using a gas filling between sheet elements, as materials suitable for the frame parts will not all be sufficiently gas tight.

30 **[0052]** An increased gas-tightness may also be achieved by providing the surfaces of the frame parts facing the space with a gas-proof coating or covering, as is for example known from WO86/05541.

35 **[0053]** The sheet elements used in most windows are arranged in parallel to each other, as is also the case in Fig. 4, but non-parallel arrangements have been proven to increase the sound-insulating properties. It may therefore be advantageous to arrange one or more sheet elements at an angle to the plane of the frame part, in which they are mounted. In a three-layer pane as shown in the drawing, the desired effect may for example be achieved by angling the second sheet element, while keeping the first and third sheet elements in parallel with the planes of their respective frame parts or vice versa.

40 **[0054]** In this the window frame unit has been described as forming a load bearing sash for a window, but it is to be understood that it may also be connected directly to the load bearing structure of the building, in which case the hinges 35 should be replaced by mounting brackets.

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Claims

1. A method of making a window frame unit, where the frame comprises a top member, a bottom member and two side members and carries a pane comprising at least two sheet elements (2,4,6), and where the frame comprises one or more functional elements, said method comprising the following steps:

a) at least two frame parts (1,3,5) each comprising a top section (11), a bottom section (14) and two side sections (12,52,13,53) are made by moulding,

b) at least one sheet element (2, 4, 6) is attached to each of said at least two frame parts (1,3,5) during the moulding step, thereby forming a unit layer,

c) at least one functional element is attached to each of said two frame parts (1,3,5) during or after the moulding thereof, and

d) the at least two unit layers are superposed and interconnected so that the top sections (11,51), bottom sections (14,54) and side sections (12,52,13,53) of the frame parts (1,3,5) form the top member, bottom member and side members of the frame, respectively,

characterized the functional element attached to one of said at least two frame parts (1, 3, 5) is a hinge (35) or a mounting bracket for interconnection to a load-bearing structure and that the other functional element attached to the other of said at least two frame parts (1,3,5) is insulating material (15).

2. A method according to claim 1, where at least one of the frame parts (1,3,5) serves as a functional element.

3. A method according to claim 1 or 2, where at least one functional element is chosen from the following group: Insulation (15), gaskets (55), hinges (35), mounting brackets for interconnection to a load-bearing structure, brackets (56) or rails for screening devices, operating means, control means, wiring, a sensor, a photovoltaic element, a dirt repelling surface.

4. A method according to according to any of the preceding claims, where the frame parts (1,3,5) are made from polyurethane (PUR).

5. A method according to any of the preceding claims, where the interconnection of the unit layers is achieved by gluing or welding.

6. A method according to any of the preceding claims, further comprising the following step:
e) the space between two neighbouring sheet ele-

ments (2,4,6) is evacuated and possibly filled with an insulating gas, such as Ar, Kr or Xe.

7. A method according to according to any of the preceding claims, where at least one sheet element (2,4,6) is made from glass and/or where at least one sheet element (2,4,6) is made from polycarbonate.

8. A method according to according to any of the preceding claims, where at least two frame parts (1,3,5) are made with different overall thicknesses in a direction perpendicular to the plane of frame.

9. A method according to according to any of the preceding claims, where at least one frame part (1,3,5) is made with a cross-sectional profile seen in a plane perpendicular to the plane of the frame, which profile varies along the length of the top section (11,51), the bottom section (14,54) and/or at least one side section (12,52,13,53).

10. A method according to according to any of the preceding claims, where at least two frame parts (1,3,5) are made with different lengths and/or widths.

11. A window frame unit made by a method according to any one of claims 1-10, with a frame comprising a top member, a bottom member and two side members and carrying a pane comprising at least two sheet elements (2,4,6), and where the frame comprises one or more functional elements, said window frame comprising:

at least two frame parts (1,3,5) each comprising a top section (11,51), a bottom section (14,54) and two side sections (12,52,13,53) made by moulding,

at least one sheet element (2, 4, 6) attached to each of said at least two different frame parts (1,3,5) by the adhesion of the material of the respective frame parts (1,3,5),

at least one functional element attached to each of said at least two frame parts (1,3,5), thereby forming unit layers, and

where the at least two unit layers are superposed and interconnected so that the top sections (11,51), bottom sections (14,54) and side sections (12,52,13,53) of the frame parts (1,3,5) form of the top member, bottom member and side members of the frame, respectively, wherein the functional element attached to one of said at least two frame parts (1, 3, 5) is a hinge (35) or a mounting bracket for interconnection to a load-bearing structure and wherein the other functional element attached to the other of said at least two frame parts (1,3,5) is insulating material (15).

12. A window frame unit according to claim 11, where a frame parts (1,3,5) serves as a functional element.
13. A window frame unit according to claim 11 or 12, where at least one functional element belongs to the following group: Insulation (15), gaskets (35), hinges, mounting brackets for interconnection to a load-bearing structure, brackets (56) or rails for screening devices, operating means, control means, wiring, a sensor, a photovoltaic element, a dirt repelling surface.
14. A window frame unit according any of claims 11-13, where a vacuum and/or an insulating gas, such as Ar, Kr or Xe, is present in the space between two neighbouring sheet elements (2,4,6).
15. A window frame unit according to any of claims 11-14, where the cross-sectional profile of a frame part (1,3,5) in a plane, which is perpendicular to the plane of the frame, varies along the length of the top section (11,51), the bottom section (14,54) and/or at least one side section (12,52,13,53).

Patentansprüche

1. Verfahren zur Herstellung einer Fensterrahmeneinheit, wobei der Rahmen ein oberes Glied, ein unteres Glied und zwei Seitenglieder umfasst und eine Scheibe trägt, umfassend mindestens zwei Flächenelemente (2, 4, 6), und wobei der Rahmen ein oder mehrere funktionale Elemente umfasst, wobei das Verfahren die folgenden Schritte umfasst:
- a) Formen von mindestens zwei Rahmenteilen (1, 3, 5), die jeweils einen oberen Abschnitt (11), einen unteren Abschnitt (14) und zwei Seitenabschnitte (12, 52, 13, 53) umfassen,
- b) Befestigen mindestens eines Flächenelements (2, 4, 6) an jedem der mindestens zwei Rahmenteile (1, 3, 5) während des Formungsschritts, wodurch eine Lageneinheit gebildet wird,
- c) Befestigen mindestens eines funktionalen Elements an jedem der beiden Rahmenteile (1, 3, 5) während des oder nach dem Formen(s) davon, und
- d) Übereinanderlagern und Miteinanderverbinden der mindestens zwei Lageneinheiten, derart, dass die oberen Abschnitte (11, 51), die unteren Abschnitte (14, 54) und die Seitenabschnitte (12, 52, 13, 53) der Rahmenteile (1, 3, 5) das obere Glied, das untere Glied bzw. die Seitenglieder des Rahmens bilden,
- dadurch gekennzeichnet, dass**
- das an einem der mindestens zwei Rahmenteile (1, 3, 5) befestigte funktionale Element ein

Scharnier (35) oder eine Montagehalterung zum Verbinden mit einer lasttragenden Struktur ist und dass das an dem anderen der mindestens zwei Rahmenteile (1, 3, 5) befestigte andere funktionale Element Isoliermaterial (15) ist.

2. Verfahren nach Anspruch 1, wobei mindestens einer der Rahmenteile (1, 3, 5) als ein funktionales Element dient.
3. Verfahren nach Anspruch 1 oder 2, wobei mindestens ein funktionales Element aus der folgenden Gruppe ausgewählt ist: Isolierung (15), Dichtungen (55), Scharniere (35), Montagehalterungen zur Verbindung mit einer lasttragenden Struktur, Halterungen (56) oder Schienen für Abschirmungsvorrichtungen, Betätigungsmittel, Steuermittel, Verdrahtung, ein Sensor, ein photovoltaisches Element, eine schmutzabweisende Oberfläche.
4. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Rahmenteile (1, 3, 5) aus Polyurethan (PUR) hergestellt sind.
5. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Verbindung der Lageneinheiten durch Kleben oder Schweißen erreicht wird.
6. Verfahren nach einem der vorhergehenden Ansprüche, das ferner den folgenden Schritt umfasst:
- e) Evakuieren des Raums zwischen zwei benachbarten Flächenelementen (2, 4, 6) und gegebenenfalls Füllen mit einem Isoliergas, wie zum Beispiel Ar, Kr oder Xe.
7. Verfahren nach einem der vorhergehenden Ansprüche, wobei mindestens ein Flächenelement (2, 4, 6) aus Glas hergestellt ist und/oder wobei mindestens ein Flächenelement (2, 4, 6) aus Polycarbonat hergestellt ist.
8. Verfahren nach einem der vorhergehenden Ansprüche, wobei mindestens zwei Rahmenteile (1, 3, 5) mit einer verschiedenen Gesamtdicke in einer senkrecht zu der Ebene des Rahmens verlaufenden Richtung hergestellt sind.
9. Verfahren nach einem der vorhergehenden Ansprüche, wobei mindestens ein Rahmenteil (1, 3, 5) mit einem Querschnittsprofil, gesehen in einer senkrecht zu der Ebene des Rahmens verlaufenden Ebene, hergestellt ist, wobei das Profil entlang der Länge des oberen Abschnitts (11, 51), des unteren Abschnitts (14, 54) und/oder mindestens eines Seitenabschnitts (12, 52, 13, 53) variiert.
10. Verfahren nach einem der vorhergehenden Ansprüche, wobei mindestens zwei Rahmenteile (1, 3, 5)

mit verschiedenen Längen und/oder Breiten hergestellt werden.

11. Durch ein Verfahren nach einem der Ansprüche 1-10 hergestellte Fensterrahmeneinheit, wobei der Rahmen ein oberes Glied, ein unteres Glied und zwei Seitenglieder umfasst und eine Scheibe trägt, umfassend mindestens zwei Flächenelemente (2, 4, 6), und wobei der Rahmen ein oder mehrere funktionale Elemente umfasst, wobei der Fensterrahmen Folgendes umfasst:

mindestens zwei durch Formen hergestellte Rahmenteile (1, 3, 5), die jeweils einen oberen Abschnitt (11, 51), einen unteren Abschnitt (14, 54) und zwei Seitenabschnitte (12, 52, 13, 53) umfassen, mindestens ein Flächenelement (2, 4, 6), das an jedem der mindestens zwei verschiedenen Rahmenteile (1, 3, 5) durch die Adhäsion des Materials der jeweiligen Rahmenteile (1, 3, 5) befestigt ist, mindestens ein funktionales Element, das an jedem der mindestens zwei Rahmenteile (1, 3, 5) befestigt ist, wodurch Lageneinheiten gebildet werden, und wobei die mindestens zwei Lageneinheiten übereinandergelagert und miteinander verbunden sind, derart, dass die oberen Abschnitte (11, 51), die unteren Abschnitte (14, 54) und die Seitenabschnitte (12, 52, 13, 53) der Rahmenteile (1, 3, 5) das obere Glied, das untere Glied bzw. die Seitenglieder des Rahmens bilden, wobei das an einem der mindestens zwei Rahmenteile (1, 3, 5) befestigte funktionale Element ein Scharnier (35) oder eine Montagehalterung zum Verbinden mit einer lasttragenden Struktur ist und wobei das an dem anderen der mindestens zwei Rahmenteile (1, 3, 5) befestigte andere funktionale Element Isoliermaterial (15) ist.

12. Fensterrahmeneinheit nach Anspruch 11, wobei ein Rahmenteil (1, 3, 5) als ein funktionales Element dient.

13. Fensterrahmeneinheit nach Anspruch 11 oder 12, wobei mindestens ein funktionales Element zu der folgenden Gruppe gehört: Isolierung (15), Dichtungen (35), Scharniere, Montagehalterungen zur Verbindung mit einer lasttragenden Struktur, Halterungen (56) oder Schienen für Abschirmungsvorrichtungen, Betätigungsmittel, Steuermittel, Verdrahtung, ein Sensor, ein photovoltaisches Element, eine schmutzabweisende Oberfläche.

14. Fensterrahmeneinheit nach einem der Ansprüche 11-13, wobei in dem Raum zwischen zwei benachbarten Flächenelementen (2, 4, 6) ein Vakuum

und/oder ein Isoliergas, wie zum Beispiel Ar, Kr oder Xe vorhanden ist.

15. Fensterrahmeneinheit nach einem der Ansprüche 11-14, wobei das Querschnittsprofil eines Rahmentails (1, 3, 5) in einer Ebene, die senkrecht zu der Ebene des Rahmens verläuft, entlang der Länge des oberen Abschnitts (11, 51), des unteren Abschnitts (14, 54) und/oder mindestens eines Seitenabschnitts (12, 52, 13, 53) variiert.

Revendications

1. Procédé de fabrication d'un encadrement de fenêtre, l'encadrement comprenant un élément supérieur, un élément inférieur et deux éléments latéraux et portant un carreau comprenant au moins deux éléments en feuille (2, 4, 6), et l'encadrement comprenant au moins un élément fonctionnel, ledit procédé comprenant les étapes suivantes :

a) au moins deux parties d'encadrement (1, 3, 5) comprenant chacune une section supérieure (11), une section inférieure (14) et deux sections latérales (12, 52, 13, 53) sont réalisées par moulage,

b) au moins un élément en feuille (2, 4, 6) est fixé à chacune desdites au moins deux parties d'encadrement (1, 3, 5) pendant l'étape de moulage, formant ainsi une couche unitaire,

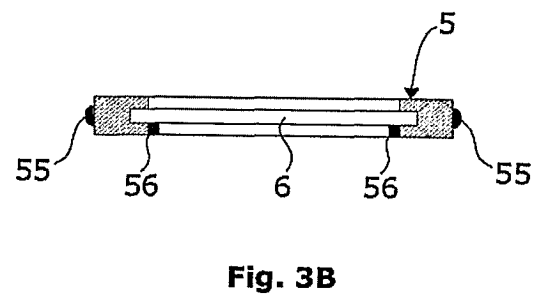
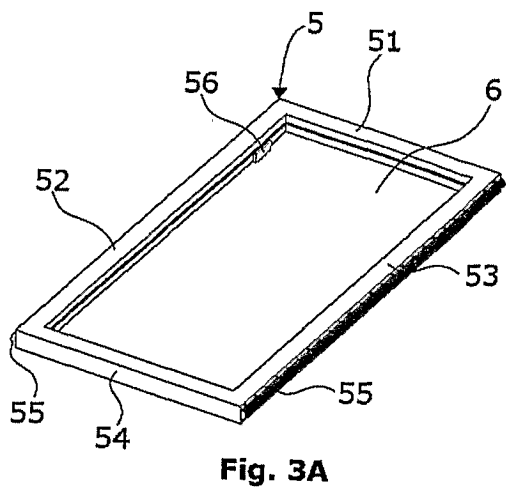
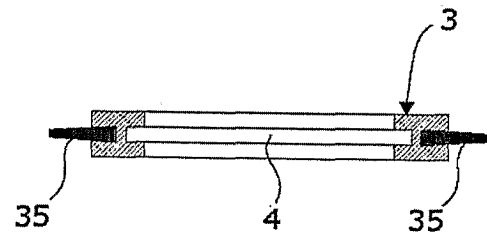
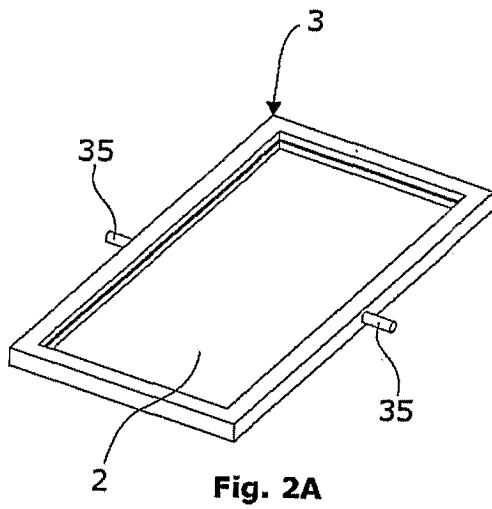
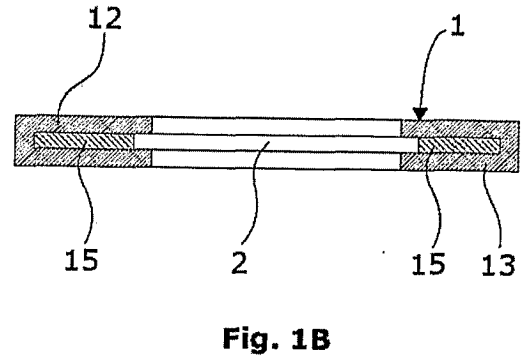
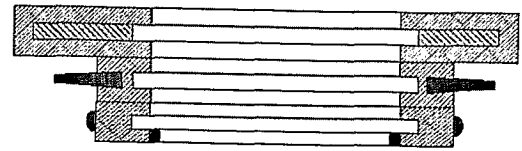
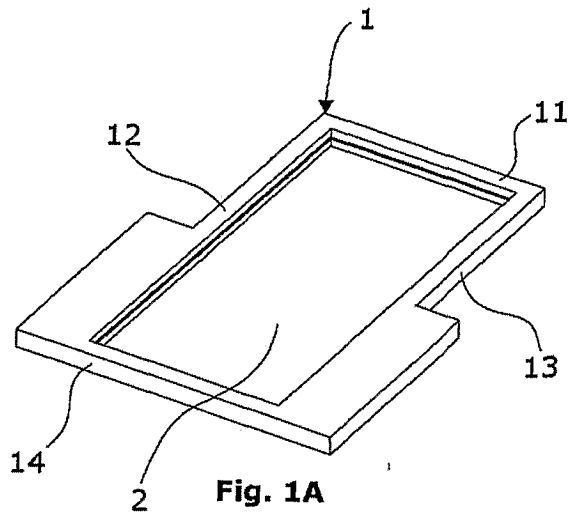
c) au moins un élément fonctionnel est fixé à chacune desdites deux parties d'encadrement (1, 3, 5) pendant ou après le moulage de celles-ci, et

d) les au moins deux couches unitaires sont superposées et interconnectées de sorte que les sections supérieures (11, 51), les sections inférieures (14, 54) et les sections latérales (12, 52, 13, 53) des parties d'encadrement (1, 3, 5) forment respectivement l'élément supérieur, l'élément inférieur et les éléments latéraux de l'encadrement, **caractérisé en ce que** l'élément fonctionnel fixé à l'une desdites au moins deux parties d'encadrement (1, 3, 5) est une charnière (35) ou un support de montage pour l'interconnexion à une structure porteuse et que l'autre élément fonctionnel fixé à l'autre desdites au moins deux parties d'encadrement (1, 3, 5) est un matériau isolant (15).

2. Procédé selon la revendication 1, au moins une des parties d'encadrement (1, 3, 5) servant d'élément fonctionnel.

3. Procédé selon la revendication 1 ou 2, au moins un élément fonctionnel étant choisi dans le groupe suivant : isolation (15), joints (55), charnières (35),

- supports de montage pour l'interconnexion à une structure porteuse, supports (56) ou rails pour dispositifs d'écran, moyen d'exploitation, moyen de commande, câblage, capteur, élément photovoltaïque, surface anti-salissures. 5
4. Procédé selon l'une quelconque des revendications précédentes, les parties d'encadrement (1, 3, 5) étant en polyuréthane (PUR). 10
5. Procédé selon l'une quelconque des revendications précédentes, l'interconnexion des couches unitaires étant réalisée par collage ou soudage. 15
6. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre l'étape suivante : e) l'espace entre deux éléments en feuille (2, 4, 6) voisins est évacué et éventuellement rempli d'un gaz isolant, tel que Ar, Kr ou Xe. 20
7. Procédé selon l'une quelconque des revendications précédentes, au moins un élément en feuille (2, 4, 6) étant en verre et/ou au moins un élément en feuille (2, 4, 6) étant en polycarbonate. 25
8. Procédé selon l'une quelconque des revendications précédentes, au moins deux parties d'encadrement (1, 3, 5) étant réalisées avec des épaisseurs globales différentes dans une direction perpendiculaire au plan d'encadrement. 30
9. Procédé selon l'une quelconque des revendications précédentes, au moins une partie d'encadrement (1, 3, 5) étant réalisée avec un profil transversal vu dans un plan perpendiculaire au plan de l'encadrement, lequel profil variant sur la longueur de la section supérieure (11, 51), de la section inférieure (14, 54) et/ou d'au moins une section latérale (12, 52, 13, 53). 35
10. Procédé selon l'une quelconque des revendications précédentes, au moins deux parties d'encadrement (1, 3, 5) étant réalisées avec des longueurs et/ou des largeurs différentes. 40
11. Encadrement de fenêtre réalisé par un procédé selon l'une quelconque des revendications 1 à 10, avec un encadrement comprenant un élément supérieur, un élément inférieur et deux éléments latéraux et portant un carreau comprenant au moins deux éléments en feuille (2, 4, 6), et l'encadrement comprenant au moins un élément fonctionnel, ledit encadrement de fenêtre comprenant : 45
- au moins deux parties d'encadrement (1, 3, 5) comprenant chacune une section supérieure (11, 51), une section inférieure (14, 54) et deux sections latérales (12, 52, 13, 53) réalisées par moulage, 50
- au moins un élément en feuille (2, 4, 6) fixé à chacune desdites au moins deux parties d'encadrement (1, 3, 5) différentes par l'adhérence du matériau des parties d'encadrement (1, 3, 5) respectives, 55
- au moins un élément fonctionnel fixé à chacune desdites au moins deux parties d'encadrement (1, 3, 5), formant ainsi des couches unitaires, et les au moins deux couches unitaires étant superposées et interconnectées de sorte que les sections supérieures (11, 51), les sections inférieures (14, 54) et les sections latérales (12, 52, 13, 53) des parties d'encadrement (1, 3, 5) forment respectivement l'élément supérieur, l'élément inférieur et les éléments latéraux de l'encadrement, l'élément fonctionnel fixé à l'une desdites au moins deux parties d'encadrement (1, 3, 5) étant une charnière (35) ou un support de montage pour l'interconnexion à une structure porteuse et l'autre élément fonctionnel fixé à l'autre desdites au moins deux parties d'encadrement (1, 3, 5) étant un matériau isolant (15) .
12. Encadrement de fenêtre selon la revendication 11, une partie d'encadrement (1, 3, 5) servant d'élément fonctionnel.
13. Encadrement de fenêtre selon la revendication 11 ou 12, au moins un élément fonctionnel appartenant au groupe suivant : isolation (15), joints (35), charnières, supports de montage pour l'interconnexion à une structure porteuse, supports (56) ou rails pour dispositifs d'écran, moyen d'exploitation, moyen de commande, câblage, capteur, élément photovoltaïque, surface anti-salissures.
14. Encadrement de fenêtre selon l'une quelconque des revendications 11 à 13, un vide et/ou un gaz isolant, tel que Ar, Kr ou Xe, étant présent dans l'espace entre deux éléments en feuille (2, 4, 6) voisins.
15. Encadrement de fenêtre selon l'une quelconque des revendications 11 à 14, le profil transversal d'une partie d'encadrement (1, 3, 5) dans un plan, qui est perpendiculaire au plan de l'encadrement, variant sur la longueur de la section supérieure (11, 51), de la section inférieure (14, 54) et/ou d'au moins une section latérale (12, 52, 13, 53).



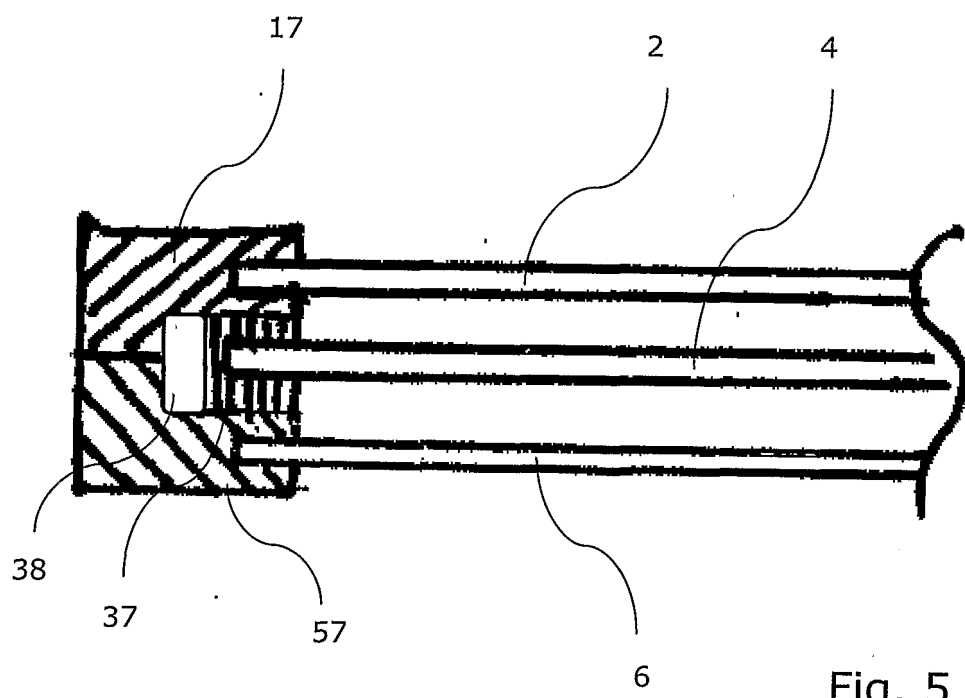


Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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