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(54) **STRAIGHT CONNECTOR FOR INSULATED GLASS FRAMES**

(57) The subject of the invention is a straight connector for insulated glass frames with a U-shaped cross-section, comprising a longitudinal base (1) and two side walls (2a, 2b) perpendicular to the base (1), wherein a plurality of side projections (3) are arranged on the outer surfaces of the side walls (2a, 2b), which are inclined towards the center of the outer surfaces of the side walls (2a, 2b), wherein the side walls (2a, 2b) on the upper surface have grooves (4) between which there are tabs (5), wherein transverse humps (6) extending along the widths of the side walls (2a, 2b) are arranged on the upper surfaces of the tabs (5).

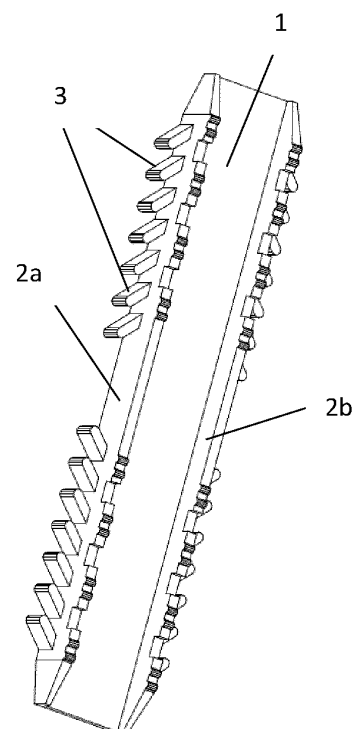


Fig. 1a

Description

[0001] The present invention relates to a straight connector for insulated glass frames, which is used in the field of window joinery, for joining the profiles of insulated glass frames at an angle of 180°.

[0002] Insulated glass frames are one of the key components of windows currently installed in buildings. The insulated glass frame is placed between the two glass panes of the window, so that the desired distance between the glass sheets is obtained. The individual profiles composing the insulated glass frame can be connected by, for example, bending, welding or a plug-in connector.

[0003] Angular and straight connectors for insulated glass frames are known in the art. It is essential that the connector is robust, easy to assemble and forms a permanent connection between the individual profiles of the insulated glass frame.

[0004] The Polish utility model PL65674Y1 discloses a straight connector for insulated glass. This connector has a U-shaped cross section and comprises a central wall and two side walls. Additionally, the disclosed connector is provided with resilient wedge hooks and buffer hooks which are positioned on the side wall and are inclined with respect to the plane thereof. On the central wall, along its entire length, longitudinal embossments stiffening the connector structure are located on both sides of the longitudinal axis. In addition, transverse humps in the form of recesses with a depth equal to the depth of the longitudinal embossments are arranged in the central wall of the connector on both sides of the central axis. The transverse humps contact their bottom with the inner surface of the joined window profiles, thus preventing the desiccant absorbent from entering the space between the window profile and the outer surface of the middle wall.

[0005] US patent document US2004088943A1 discloses a plug-in connector for hollow spacer frame profiles. The plug-in connector comprises a plurality of lateral retaining elements on its side walls, which have the shape of hooked projections shaped by recesses made in the side walls. The retaining elements are arranged one after the other in the direction of plugging, wherein they can be extended at a different distance from the surfaces of the side walls. The retaining elements are thus preferably arranged at different levels so as to engage at different points in the hollow space of the spacer frames.

[0006] US patent US2007022700A1 discloses a spacer system with a connector for insulated glass of a hot melt material. In the present solution, the spacer glass connector is inserted into the empty internal space of the spacer profile body, and these two elements are joined together at least partially by fusion. The connector is provided with hook-like projections arranged on its outer surface, which are inclined in the direction opposite to the insertion direction into the profile. In addition, the projec-

tions are resilient such that during insertion they flex in the direction opposite to the insertion direction. The end of the connector has a conical shape and the front projections have a lower height in relation to the other projections, which facilitates the introduction of the element into the profile. The cross section of the connector is substantially coincident with the cross section of the spacer profile into which the element is introduced.

[0007] The technical problem faced by the present invention is to propose a straight connector for insulated glass frames that will be characterized by high strength, especially in the central area of the connector. Moreover, it is desirable that the connector is resistant to bending and ensures that the connection of the frames will maintain straightness (no deformation of the course of the joined profiles). In addition, it is desirable that the stresses generated during the assembly of the connector in the frame do not cause cracks in the longitudinal frames. Moreover, it is desirable that the tightness of the connection between the frame and the connector is maintained so that the hygroscopic material located inside the frame profile does not spill out. It is also desirable that the connector inserted into the frame is placed at the appropriate depth of the frame and does not lock in an undesirable position.

[0008] The subject of the invention is a straight connector for insulated glass frames with a U-shaped cross-section, comprising a longitudinal base and two side walls perpendicular to the base, wherein a plurality of side projections are arranged on the outer surfaces of the side walls, which are inclined towards the center of the outer surfaces of the side walls, characterized in that the side walls on the upper surface have grooves between which there are tabs, wherein transverse humps extending along the widths of the side walls are arranged on the upper surfaces of the tabs.

[0009] In a preferred embodiment of the invention, the transverse humps have a cross-section in the shape of a circle segment, ellipse segment, triangle, rectangle, polygon, trapezoid or transverse humps are cylinder-shaped structures extending perpendicular to the upper surface of the tabs.

[0010] In a further preferred embodiment of the invention, the angle of inclination of the side projections relative to the external surfaces of the respective side walls is in the range from 20° to 80°.

[0011] In a further preferred embodiment of the invention, the thickness of the side projection decreases towards its outer end.

[0012] Preferably, on the upper surface of the base, the straight connector has a cross-reinforcement.

[0013] Equally preferably, at least one side projection located closest to the transverse axis of the straight connector takes the form of a sealing projection.

[0014] Even more preferably, the width of the sealing projection decreases towards its outer end.

[0015] In a preferred embodiment of the invention, a longitudinal recess is provided on the lower surface of the

base.

[0016] In a further preferred embodiment of the invention, at least one securing projection is arranged on each outer surface of the side walls, in the central area of the side walls.

[0017] In a further preferred embodiment of the invention, the securing projection has the shape of substantially a ring slice.

[0018] Preferably, the ends of the straight connector taper in an outward direction.

[0019] Equally preferably, the straight connector is symmetrical with respect to a plane perpendicular to the base of the straight connector, defined by the transverse axis of the straight connector.

[0020] The straight connector for the insulated glass frames according to the invention provides a permanent connection of the insulated glass frames on straight sections of profiles. The presence of wider at the base side projections on the outer surfaces of the side walls and the sealing projections ensures a tight and durable connection, so that the hygroscopic material does not spill out from the inside of the frame profile. Thanks to the fact that the upper surfaces of the side walls of the connector are equipped with grooves and tabs, and additional transverse convex humps are present on the tabs, the connection after the heat treatment is additionally reinforced, durable and the resulting frame is not susceptible to cracking. The fact that the side walls at their ends are truncated from the side of their upper surface further ensures that the insertion of the connector into the insulated glass frames is easy so that the connector does not hook against the edges of the opening in the frame. Insertion of the frame connector and setting it to the required depth, i.e. to a depth corresponding to half the length of the frame connector, ensures the presence of a securing projection on each outer surface of the side walls. Thanks to the presence of an X-shaped reinforcement located on the upper surface of the connector base, the bending strength of the connector is increased and protection against cracking of the connector (especially in its central area) is provided during the transport of complex frames. A recess with a rectangular cross-section arranged on the longitudinal axis on the lower surface of the base significantly reduces the stresses that arise during the assembly of the connector, and thus prevents the longitudinal cracking of the frame.

[0021] The solution of the present invention is set forth in the following embodiments and illustrated in the drawings, wherein Fig. 1a shows an axonometric view of a straight connector according to the first embodiment, Fig. 1b shows a side view of a straight connector according to a first embodiment, Fig. 2a shows an axonometric view of the straight connector according to the second embodiment, Fig. 2b shows a side view of a straight connector according to a second embodiment, Fig. 3a shows an axonometric view of the straight connector according to the third embodiment, Fig. 3b shows a side view of the straight connector according to the third embodiment,

while Fig. 3c shows an axonometric view from the bottom of the straight connector of Fig. 3a.

Example 1.

[0022] The first embodiment of the straight connector for the insulated glass frames of the present invention is illustrated in an axonometric view in Fig. 1a and in a side view in Fig. 1b. As shown in the figures, the straight connector has a U-shaped cross-section and comprises a longitudinal base 1 and two side walls 2a, 2b perpendicular to the base.

[0023] A plurality of side projections 3 are arranged on the outer surfaces of the side walls 2a, 2b, which are inclined towards the center of the outer surfaces of the side walls 2a, 2b. The side projections 3 are arranged in two rows of two on each of the respective side walls 2a, 2b. In this embodiment, there are seven side projections 3 in each row. The number of side projections 3 does not constitute a limitation to the invention and in alternative embodiments, there may be more, for example ten side projections 3 or less, for example six side projections 3, provided that a permanent and stable connection of the straight connector to the frame is maintained. The number of lateral projections 3 is closely related to the length of the straight connector, i.e. the longer the straight connector, the more lateral projections 3 there are in a row. The angle of inclination of the side projections 3 relative to the external surfaces of the respective side walls 2a, 2b is 30° in this embodiment. The angle of inclination of the lateral projections 3 does not constitute a limitation to the invention and in alternative embodiments may be smaller or larger and be, for example, 20°, 42°, 47°, 50°, 65°, 80°. Additionally, the thickness of each side projection 3 decreases towards its outer end. That is, its thickness is greater at its inner end (at the base of the lateral projection 3) than at its outer end. The inner end is that which is in contact with the outer surface of the side wall 2a, 2b. The outer end is the one that faces towards the outside of the straight connector. The distance between the individual side projections 3 is from 0 to 1.5 mm, however, this does not constitute a limitation to the invention and in alternative embodiments, this value may be larger or smaller provided that the high resistance to cracking and breaking of the straight connector and the permanent connection of the straight connector to the frame are maintained. In the present embodiment, the side projections 3 in each row are spaced apart by a fixed distance, however, in alternative embodiments, it is possible to use a heterogeneous distance between the adjacent side projections 3, for example, this distance may increase from the end of the straight connector towards its center.

[0024] As shown in Fig. 1b, the side walls 2a, 2b on the upper surface have grooves 4, between which there are tabs 5. Transverse humps 6 extending along the widths of the side walls 2a, 2b are arranged on the upper surfaces of the tabs 5. In this embodiment, the cross section of the humps 6 has the shape of a circle segment. However, the

shape of the cross-section of the humps 6 is not a limitation of the invention and in alternative implementations it may take the form of e.g. an ellipse, triangle, rectangle, polygon, trapezoid or other segment, provided that the connection of the insulated glass frames will be durable and the resulting frame will not be susceptible to cracking. An alternative embodiment of the invention provides for the use of humps 6 in the form of rollers extending perpendicular to the upper surface of the tabs 5, upwards from the upper surface of the tabs 5.

[0025] Further, both ends of the straight connector taper in an outward direction such that the width of the base 1 is smaller at its outward ends than in the central area of the straight connector. Additionally, the height of the side walls 2a, 2b also decreases towards their outer ends.

[0026] The straight connector according to the invention is symmetrical with respect to a plane perpendicular to the base 1 of the connector, defined by the central transverse axis of the straight connector.

Example 2.

[0027] The second embodiment of the straight connector for the insulated glass frames according to the invention is shown in Fig. 2a and Fig. 2b in views analogous to the first example. In general, the design of the straight connector according to the second embodiment is substantially the same as the design of the straight connector shown in the first example, therefore, the corresponding design elements will not be repeated for the sake of clarity of this disclosure.

[0028] In the present embodiment, the straight connector further comprises, on the upper surface of the base 1, a cross-reinforcement 7 in the form of two crossed longitudinal supports.

[0029] In addition, on each side wall 2a, 2b, the side projection 3 located closest to the transverse axis of the straight connector in each row takes the form of a sealing projection 8. The connector is thus provided with four sealing projections 8. The width of the sealing projection 8 decreases towards its outer end. The inner end of the sealing projection 8 has a width equal to the height of the respective side wall 2a, 2b.

Example 3.

[0030] The third embodiment of the straight connector for the insulated glass frames according to the invention is shown in Fig. 3a - 3c. In general, the design of the straight connector for insulated glass frames according to the third embodiment is substantially the same as the design of the straight connector shown in the first and second examples, therefore, the corresponding design elements will not be repeated for the sake of clarity of this disclosure.

[0031] In this embodiment, a longitudinal recess 9 is provided on the lower surface of the base 1 that extends

in the region of the longitudinal axis of the straight connector.

[0032] In addition, two securing projections 10 are arranged on each outer surface of the side walls 2a, 2b, in the central area of the side walls 2a, 2b, respectively, so that the straight connector is equipped with four securing projections 10. Each of the securing projections has the shape of essentially a ring slice. The securing projections 10 with their outer ends are also directed towards the center of the outer surfaces of the side walls 2a, 2b.

List of reference signs:

[0033]

- 1 - base,
- 2a, 2b - side wall,
- 3 - side projection,
- 4 - groove,
- 5 - tab,
- 6 - hump,
- 7 - cross-reinforcement,
- 8 - sealing projection,
- 9 - longitudinal recess,
- 10 - securing projection.

Claims

1. A straight connector for insulated glass frames with a U-shaped cross-section, comprising a longitudinal base (1) and two side walls (2a, 2b) perpendicular to the base (1), wherein a plurality of side projections (3) are arranged on the outer surfaces of the side walls (2a, 2b), which are inclined towards the center of the outer surfaces of the side walls (2a, 2b), **characterized in that** the side walls (2a, 2b) on the upper surface have grooves (4) between which there are tabs (5), wherein transverse humps (6) extending along the widths of the side walls (2a, 2b) are arranged on the upper surfaces of the tabs (5).
2. The straight connector for the insulated glass frames according to claim 1, **characterized in that** the transverse humps (6) have a cross-section in the shape of a circle segment, ellipse segment, triangle, rectangle, polygon, trapezoid or transverse humps (6) are cylinder-shaped structures extending perpendicular to the upper surface of the tabs (5).
3. The straight connector for the insulated glass frames according to claim 1 or 2, **characterized in that** the angle of inclination of the side projections (3) relative to the external surfaces of the respective side walls (2a, 2b) is in the range from 20° to 80°.
4. The straight connector for the insulated glass frames

according to any one of claims 1 to 3, **characterized in that** the thickness of the side projection (3) decreases towards its outer end.

5. The straight connector for the insulated glass frames according to any one of claims 1 to 4, **characterized in that it** has a cross-reinforcement (7) on the upper surface of the base (1). 5
6. The straight connector for the insulated glass frames according to any one of claims 1 to 5, **characterized in that** at least one side projection (3) located closest to the transverse axis of the straight connector takes the form of a sealing projection (8). 10
7. The straight connector for the insulated glass frames according to claim 6, **characterized in that** the width of the sealing projection (8) decreases towards its outer end. 15
8. The straight connector for the insulated glass frames according to any one of claims 1 to 7, **characterized in that** a longitudinal recess (9) is provided on the lower surface of the base (1). 20
9. The straight connector for the insulated glass frames according to any one of claims 1 to 8, **characterized in that** at least one securing projection (10) is arranged on each outer surface of the side walls (2a, 2b), in the central area of the side walls (2a, 2b). 25
10. The straight connector for the insulated glass frames according to claim 9, **characterized in that** the securing projection (10) has the shape of essentially a ring slice. 30
11. The straight connector for the insulated glass frames according to any one of claims 1 to 10, **characterized in that** its ends taper in an outward direction. 35
12. The straight connector for the insulated glass frames according to any one of claims 1 to 11, **characterized in that it** is symmetrical with respect to a plane perpendicular to the base (1) of the straight connector, defined by the transverse axis of the straight connector. 40

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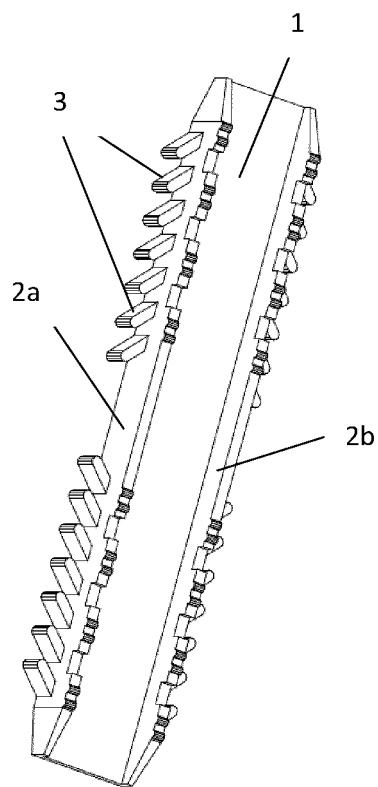


Fig. 1a

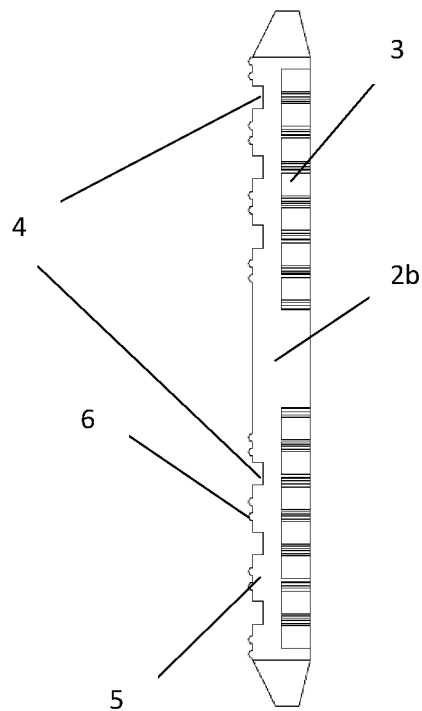


Fig. 1b

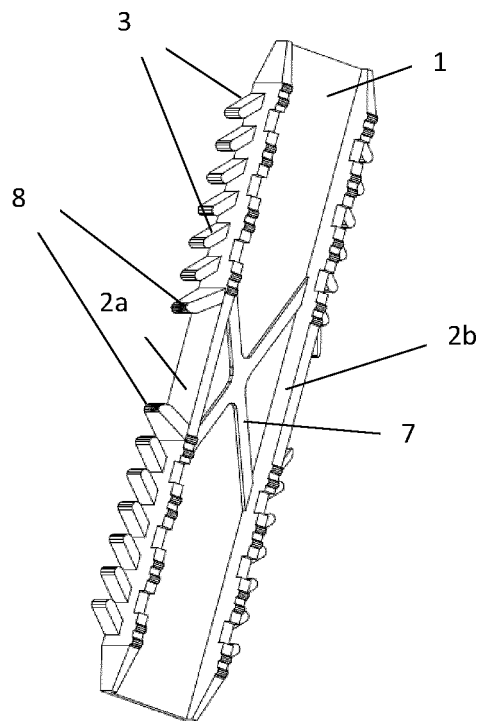


Fig. 2a

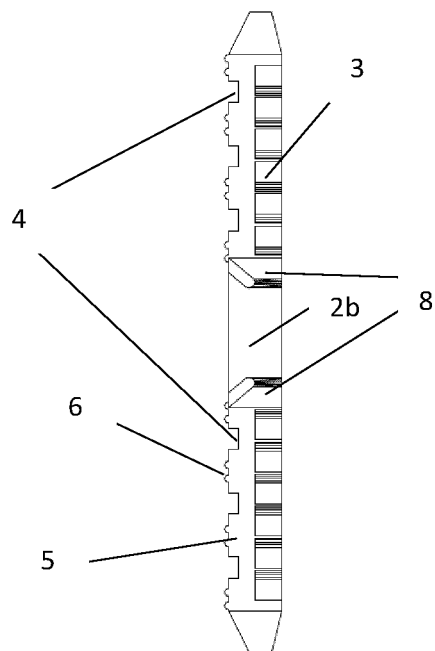


Fig. 2a

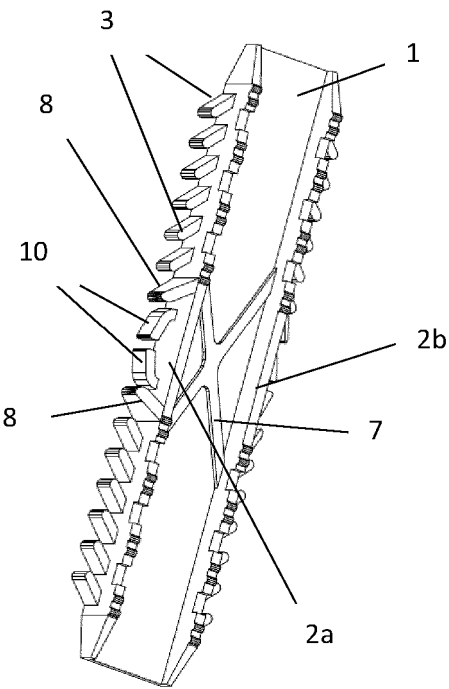


Fig. 3a

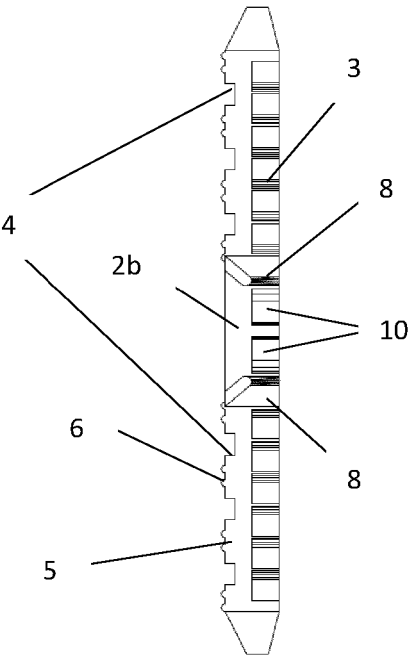


Fig. 3b

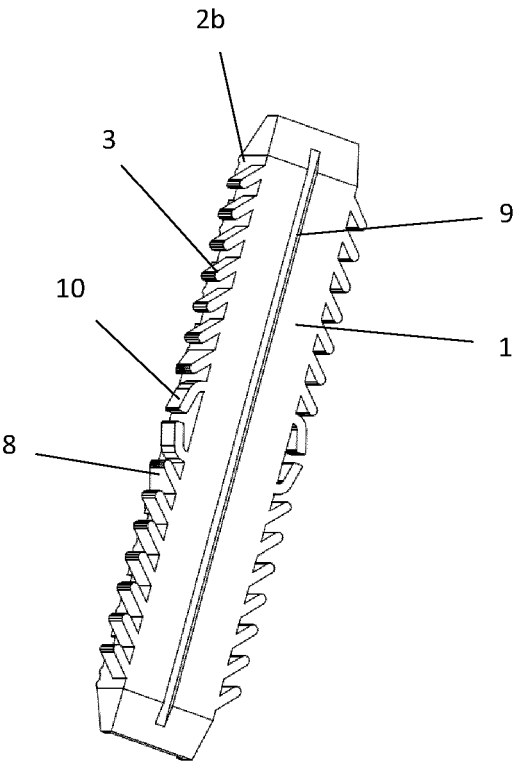


Fig. 3c



EUROPEAN SEARCH REPORT

Application Number

EP 24 18 6469

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Y	* figures 1-3,6,9 * * paragraph [0022] - paragraph [0036] * -----	5,7-10	
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		20 September 2024	Blancquaert, Katleen
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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