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(58) Field of Search:
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(54) Title of the Invention: **Panel retention system**
Abstract Title: **Roofing glazing bar**

(57) The glazing bar assembly, includes a glazing bar profile element which has a stalk 2 element, and laterally extending respective base elements 3 for supporting a surface of a panel edge, the panels being retained by overlying wing elements 12, 13 configured to cooperate with the stalk 2 and base 3 elements in holding the edge of a panel. The base elements may have upper and lower base webs connected by side walls forming a quadrilateral box-section or tubular form base of twin walled or double skinned form with improved structural strength. The wing elements may have an upstanding component 14 comprising a side wall portion 15 of a closed section and an upwardly extending web 25. Fasteners may extend through the upwardly extending web to fix the wings to the stalk. A cladding system for covering the roof or walls of a building using panels, of glass, plastics or other fabrication material includes the glazing bar assembly which holds the panels in an edge to edge abutting relationship and exhibits improved properties with regard to blast mitigation.

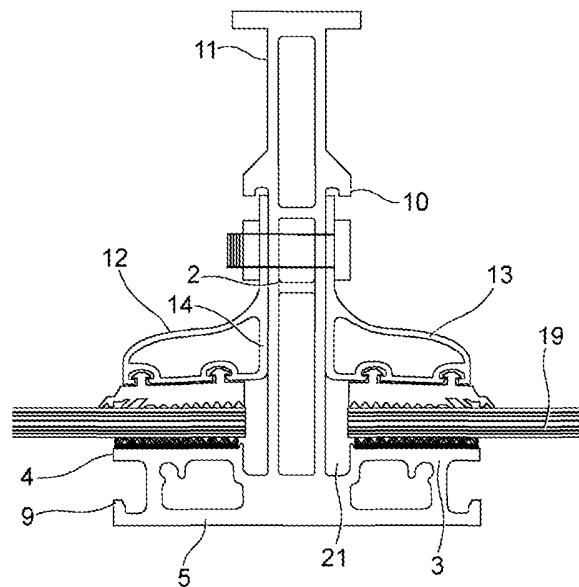


Fig. 5

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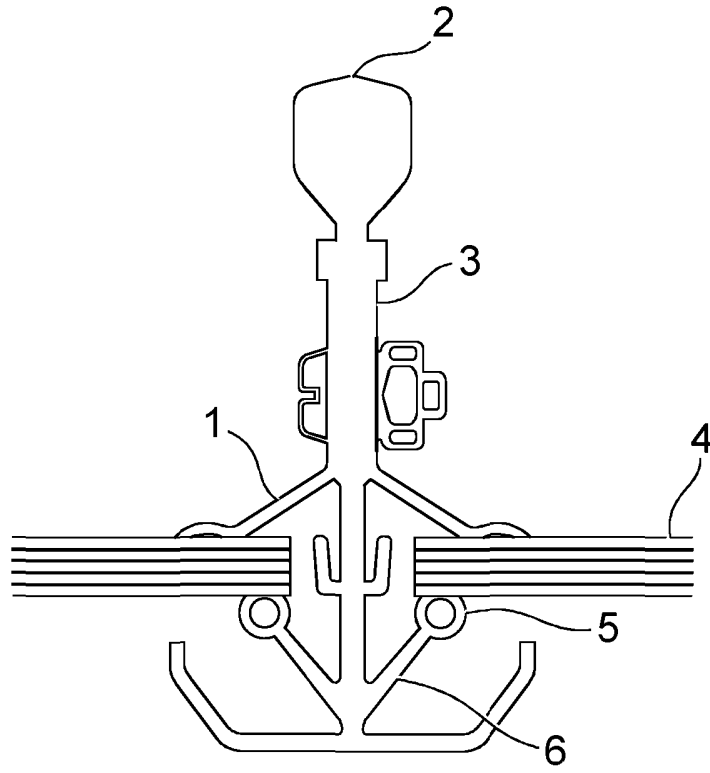


Fig. 1

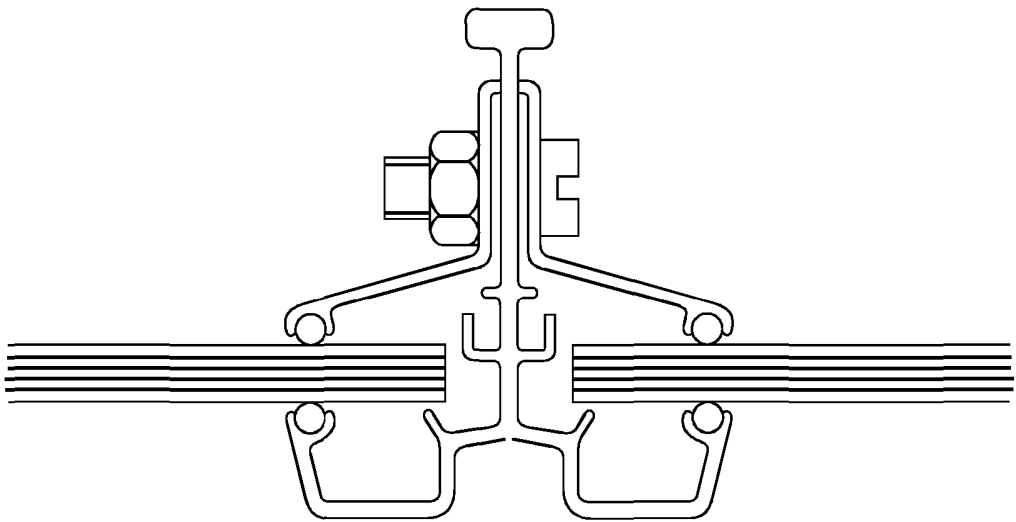
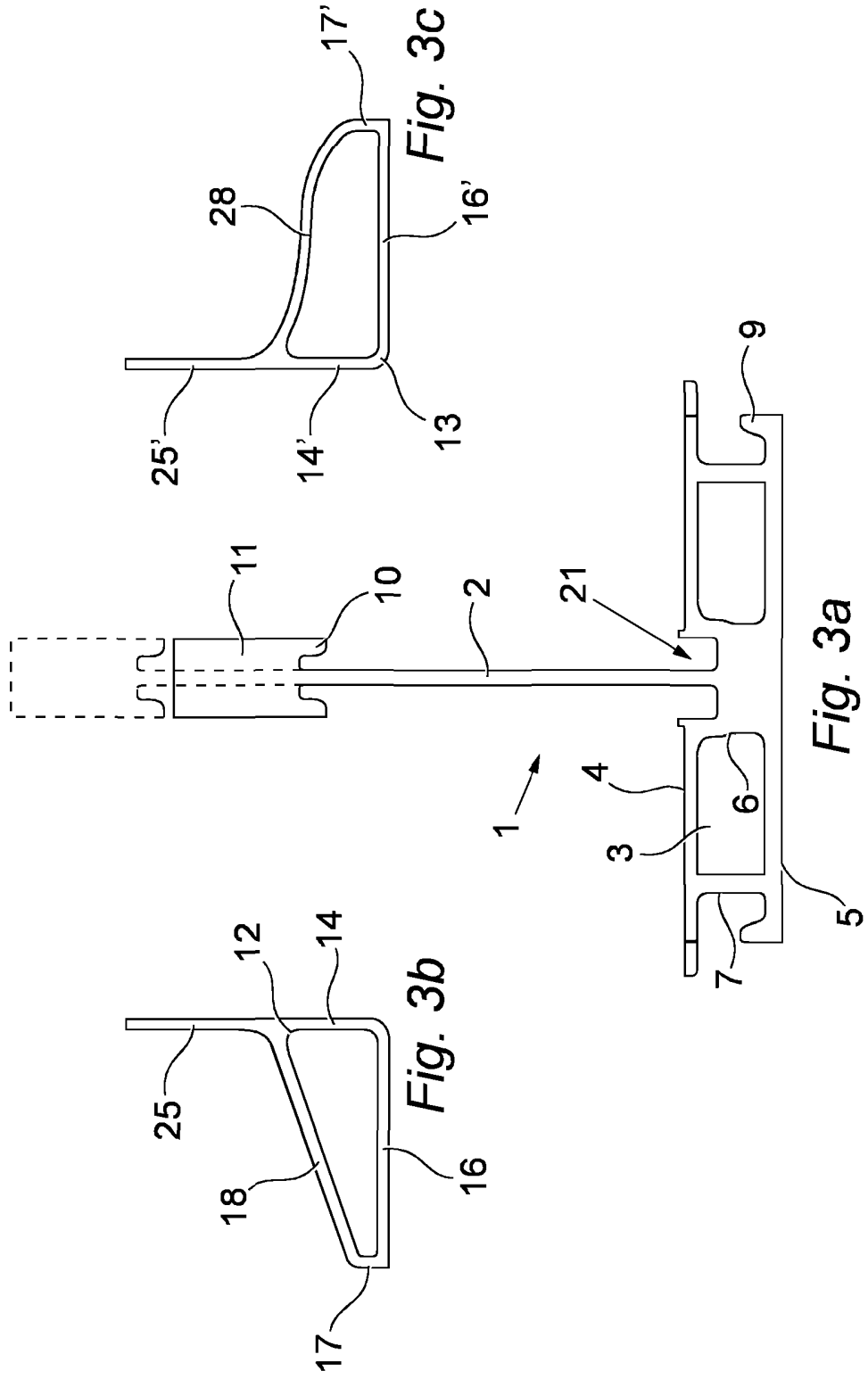


Fig. 2



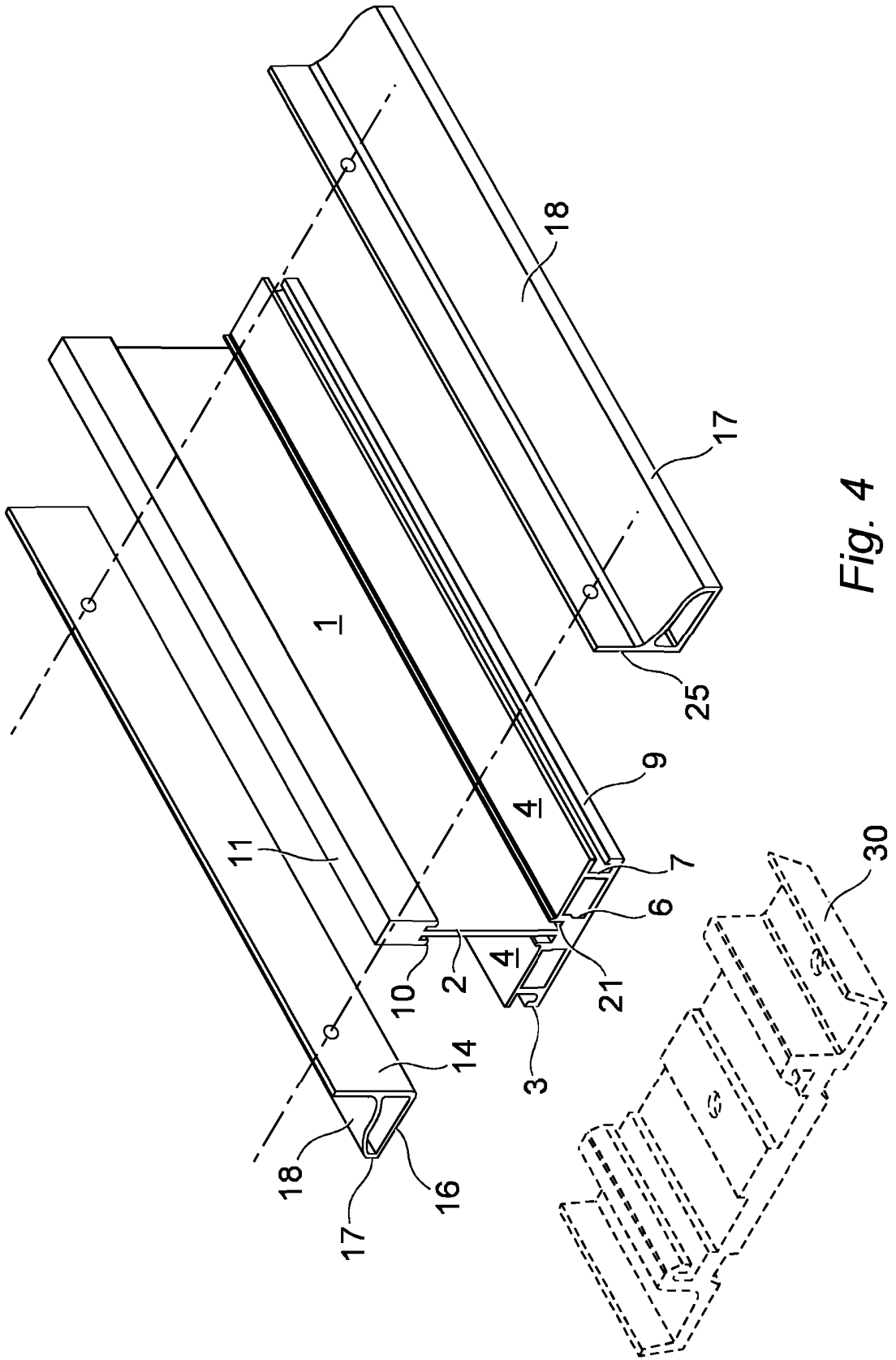


Fig. 4

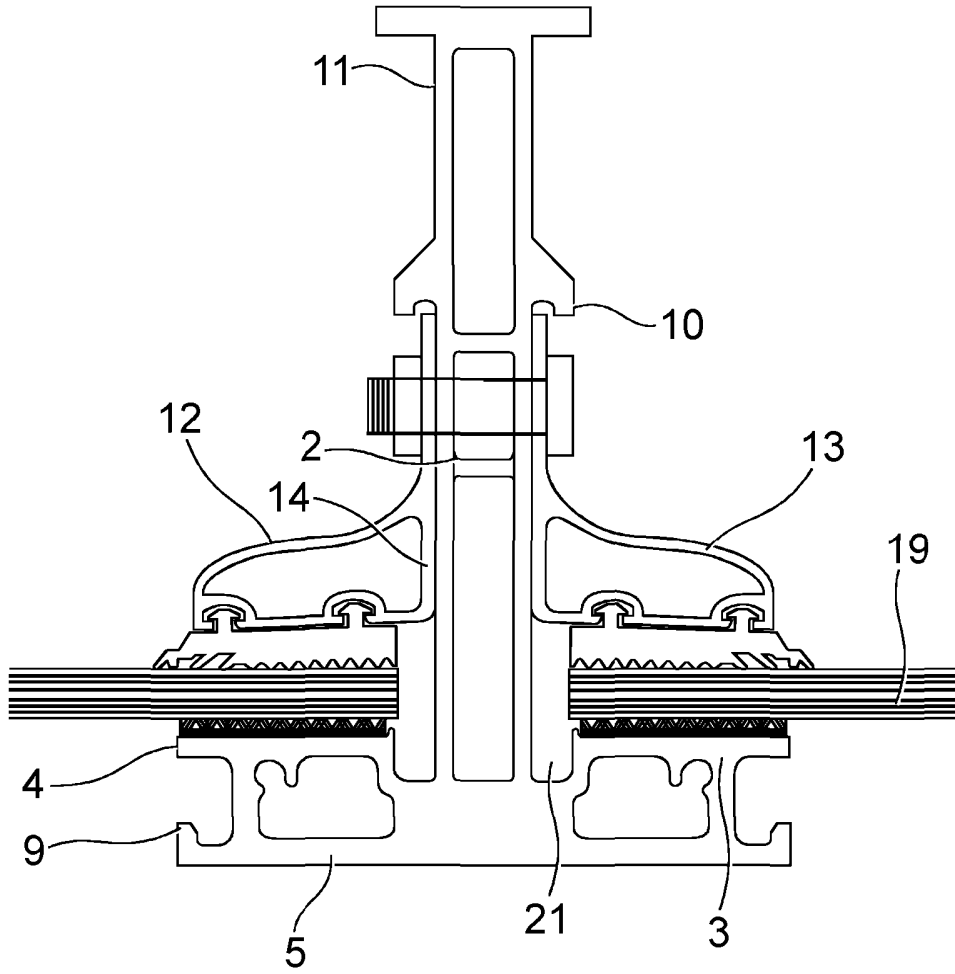


Fig. 5

Panel Retention System

Field of the Invention

This invention relates to a system for covering a structure such as the roof or walls of a building using panels, typically rectilinear panels, which may
5 be of glass, plastics or other fabrication material. In particular the invention provides structural components for the system which when assembled offer improved properties with regard to blast mitigation.

Background to the Invention

The architecture of buildings has developed towards adoption of extensive
10 areas of cladding applied over a light structural skeleton and many city centres have numerous "high-rise" developments with extensive glazed roof areas and cladding. This offers many advantages in terms of the ability to use prefabricated components in modular structures which offer flexibility and versatility in construction. This trend also enables energy
15 targets to be addressed by admitting more natural light to buildings by use of glass and polycarbonate glazing panels in roofing, facade and curtain walling applications. Unfortunately some elements of society have taken advantage of these modern designs and turned them to their own purposes by unforeseen activities which manifest as a threat to public
20 safety. In recent years the consequences of using an extensively glazed fabric envelope in the circumstances where such elements of society expose the structures to explosive blasts has been realised. At any one incident the primary event may kill or maim a small number of persons due to direct exposure and confrontation with a blast, but significantly more
25 people suffer injury or loss of life because of injuries received due to fragmentation of damaged envelope and fabric, especially glass shards explosively distributed by the blast. Accordingly, mitigation of glass hazard upon exposure to such extraordinary blast events is now a primary consideration in building design. Where possible, the ability to provide for

retrofit of blast mitigation measures especially in high density population focus centres, such as office blocks, government buildings, sports stadiums, bus stations and train stations is becoming a priority.

5 Most extensively glazed structures use a dry glazing method reliant upon use of the so-called “patent glazing bar”, examples of which can be seen in the literature e.g. Building construction handbook, 6th Ed (2006) by R. Chudley, Roger Greeno, at page 494.

10 The original “patent glazing bar” has been modified and adapted to modern requirements e.g. with respect to use of aluminium as the preferred material instead of steel, and finishing with powder coating techniques.

Reference may be made to British Standard BS5516: 2004 for additional information on basic requirements for such glazing bars.

15 British patent number 1,234,711 describes a dry-glazing assembly extrusion comprising an extruded member with wing parts for contacting panes of glass for use in the construction of greenhouses or glass roofs.

Summary of the Invention

20 According to the present invention there is provided a glazing bar assembly for use in connecting panels in an edge to edge abutting relationship, the assembly comprising (i) a glazing bar having an upstanding stalk element, and laterally extending base elements adapted to support a surface of a panel edge, (ii) wing elements configured to cooperate with the upstanding stalk and laterally extending base elements in holding an edge of a panel, wherein the laterally extending base
25 elements have upper and lower base webs connected by side walls. In this way a double skinned base support for panels is formed. The connection of the upper and lower base webs with side walls provides a quadrilateral box-section or tubular form base with improved structural

strength. This structure has been found to offer increase resistance to forces arising from an explosive blast.

In embodiments, the double skinned base may be of rectangular or trapezoidal cross-section.

5 The wing elements similarly are preferred to have a closed section form, having connected lateral and upstanding components. At least one lateral component and one upstanding component may be disposed at an angle wherein the internal angle between them is greater than 90 degrees. Typically that internal angle will be less than 100 degrees, preferably less
10 than 95 degrees. In this way a certain amount of grip or pressure may be exerted through the assembly of the angled wing surface upon a panel placed against a laterally extending base element of the glazing bar.

The upstanding components of the wing elements may be of differing height dimensions, whereby a laterally extending component connected
15 between the upstanding component elements slopes directly therebetween to form an inclined planar surface. The planar surface in variants of the invention is substituted by a curved surface, e.g. concave, convex, undulating or sinusoidal forms.

One of the upstanding components may have a web portion extending
20 upwardly beyond a point meeting with a laterally extending component in order to provide means for fastening the wing to the stalk below its head using a suitable fastener, e.g. a screw, nut and bolt etc.

The wing elements may have one upstanding component of significantly greater height than the other upstanding component which may be or
25 relatively negligible height to provide a wing element portion of generally triangular section, consisting of an upright and lateral side with a third curved surface of one of the aforesaid forms connected therebetween.

In a preferred embodiment, the stalk of the glazing bar has a flanged head wherein the flanges are dependent from the head to restrain lifting of the wing elements when operatively assembled therewith.

5 The height of the stalk can be predetermined to suit the thickness of the edges of the panels to be accommodated between the wings and the laterally extending base elements in assembly of the panels to be connected.

10 The glazing bar typically may be formed as an aluminium extrusion to form the profile of the stalk and laterally extending base elements, but other materials than aluminium may be chosen.

Typically, the assembly will include auxiliary components such as fasteners and seals such as EDPM gaskets, and glazing tapes where necessary.

15 The panels to be connected are typically of glass, e.g. laminated blast resistant glass, or a synthetic glazing material but in principle any panel can be connected using the assembly described herein. Connection of single, double, triple etc. glazing units is contemplated.

Description of the Drawings

20 The invention will now be further described by way of illustration with reference to the accompanying drawings in which:

Figure 1 is a section through a horizontal butt joint in a two-edge glazing system using a typical glazing bar conforming to BS 5516-1:2004;

Figure 2 is a section through a glazing bar of a known commercially available type also for use in a horizontal butt joint;

Figure 3a is a section through a glazing bar of the present invention, showing in dashed line optional dimension variations in stalk height, and base width;

Figure 3b is a section through a closed channel triangular-form wing for use with a glazing bar as shown in Figure 4a;

Figure 3c is a section through an alternative closed channel wing for use with a glazing bar as shown in Figure 4a;

Figure 4 is an exploded perspective view of a glazing bar assembly showing respective left and right wings on either side of the glazing bar profile and in dashed lines a fastening shoe not being part of the invention; and

Figure 5 is a section through a glazing bar of the present invention, showing a variation in stalk form, and presence of glazing panels, gaskets and tapes.

15 Description of Embodiments

Referring to Figure 3a a glazing panel connection assembly includes a glazing bar **1** which has a substantially inverted **T**-section profile consisting of an upstanding stalk element **2**, and laterally extending base elements **3** with an upper surface **4** adapted to support a surface of a panel edge (not shown). An opposite lower surface **5** and connecting side surfaces **6, 7** form a closed box profile section **8**.

The upper surface **4** has sufficient width selected to provide support to a panel to be connected by the assembly. The lower surface **5** has an upturned lip **9** which may be used in connection of a fixing shoe of a generally known type for the purposes of fixing the glazing assembly to a structure e.g. a roof purlin.

The stalk **2** has flanges **10** depending from the head **11**, and lengthwise channels **21** on either side along the bar.

Wing elements **12**, or **13** in opposite handed pairs are provided of a configuration designed to cooperate with the upstanding stalk 2 and laterally extending base elements 3 in holding an edge of a panel (not shown).

- 5 Each wing comprises an upstanding component **14**, having a side wall portion **15** and an upwardly extending web 25, a first laterally extending component **16** angled with respect to the upstanding component at an internal angle greater than 90 degrees and usually less than 95 degrees, and a second laterally extending component **18** that is inclined with
- 10 respect to the upstanding component 14. The first laterally extending component 16 is connected to the inclined laterally extending component 18 by a short upstanding component **17** to form a closed box section. The freely extending web 25 provides for fastening of the wing 12 or 13 to the stalk 2 of the glazing bar.
- 15 In use panels e.g. glazing sheets, are laid upon and presented to the stalk 2 upon the surface 4 of the base element 3 in an abutting relationship on either side of the stalk 2. The wings of the chosen design are presented suitably oriented to the stalk and bear upon the panel edges. Glazing tape and gaskets may be used as appropriate during the assembly for the
- 20 usual purposes. When the assembly is made up suitable fasteners can be used to retain the wings in position and to secure the glazing bar with respect to a fastening shoe **30** of a type normally used to fix the glazing bar to a structure such as a roof purlin.

- 25 In variants of the embodiment described, the height of the stalk 2 is altered to permit use with panels of differing thickness, e.g. single, double or triple glazing etc. The design of the wings may also be varied such that the inclined laterally extending component 18 may be curved as in shown in

Fig. 3c (28) where similar components to those shown in Fig. 3b are marked thus 14', 17', 25'.

In a further variant of the embodiment described above, and now shown in Fig. 5, the stalk is double skinned to form an upstanding box section, but otherwise the glazing bar is the same as the embodiment first described, and like parts have the same numerals as used in Figs. 3a, 3b, 3c. A glazing panel **19** is shown on either side of the double skin stalk together with glazing gasket and tape in position between the surface 4 of the base element 3 and the wing elements 12, 13.

10 The invention finds utility in addressing the need for blast mitigation in extensive glazing envelope design, and has shown superior resistance when compared with traditional designs.

Claims:

1. A glazing bar assembly for use in connecting panels in an edge to edge abutting relationship, the assembly comprising (i) a glazing bar having an upstanding stalk element, and laterally extending base elements adapted to support a surface of a panel edge, (ii) wing elements configured to cooperate with the upstanding stalk and laterally extending base elements in holding an edge of a panel, wherein the laterally extending base elements have upper and lower base webs connected by side walls.
5
2. A glazing bar assembly as claimed in claim 1, wherein the laterally extending base elements form a double skinned base support for panels.
3. A glazing bar assembly as claimed in claim 1 or claim 2, wherein the upper and lower base webs with side walls form a quadrilateral box-section or tubular form base.
10
4. A glazing bar assembly as claimed in claim 2, or claim 3, wherein the double skinned base is of rectangular or trapezoidal cross-section.
5. A glazing bar assembly as claimed in any one of the preceding claims, wherein the wing elements have a closed section form having connected lateral and upstanding components.
15
6. A glazing bar assembly as claimed in claim 5, wherein at least one lateral component and one upstanding component are disposed at an angle wherein the internal angle between them is greater than 90 degrees.
20
7. A glazing bar assembly as claimed in claim 5, wherein at least one lateral component and one upstanding component are
25

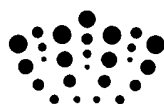
disposed at an angle wherein the internal angle between them is less than 100 degrees.

- 5
8. A glazing bar assembly as claimed in claim 5, wherein at least one lateral component and one upstanding component are disposed at an angle wherein the internal angle between them is less than 95 degrees.
- 10
9. A glazing bar assembly as claimed in any one of claims 5 to 8, wherein the upstanding components of the wing elements are differing height dimensions, whereby a laterally extending component connected between the upstanding component elements slopes directly therebetween to form an inclined planar surface.
- 15
10. A glazing bar assembly as claimed in any one of claims 5 to 8, wherein the upstanding components of the wing elements are differing height dimensions, whereby a laterally extending component connected between the upstanding component elements slopes directly therebetween to form an inclined curved surface configured as a concave, convex, undulating or sinusoidal form.
- 20
11. A glazing bar assembly as claimed in any one of claims 5 to 10, wherein one of the upstanding wing components has a web portion extending upwardly beyond a point meeting with a laterally extending component in order to provide means for fastening the wing to the stalk below its head using a suitable
- 25
- fastener.
12. A glazing bar assembly as claimed in any one of claims 5 to 11 wherein the wing elements has one upstanding component of significantly greater height than the other upstanding component to provide a wing element portion of generally triangular section,

consisting of an upright and lateral side with a third inclined curved surface configured as a concave, convex, undulating or sinusoidal form connected therebetween.

- 5 **13.** A glazing bar assembly as claimed in any one of the preceding claims, wherein the stalk of the glazing bar has a flanged head wherein the flanges are dependent from the head to restrain lifting of the wing elements when operatively assembled therewith.
- 10 **14.** A glazing bar assembly as claimed in any one of the preceding claims, wherein the glazing bar has a substantially inverted T-section profile consisting of an upstanding stalk element with a head, and laterally extending base elements with an upper surface adapted to support a surface of a panel edge, and an opposite lower surface and connecting side surfaces forming a closed box profile section, wherein the lower surface has an upturned lip, and the stalk has flanges depending from the head, and lengthwise channels on either side along the bar, and wing elements in opposite handed pairs of a configuration designed to cooperate with the upstanding stalk and laterally extending base elements in holding an edge of a panel, each wing comprising an upstanding component, having a side wall portion and an upwardly extending web, a first laterally extending component angled with respect to the upstanding component at an internal angle greater than 90 degrees and less than about 95 degrees, and a second laterally extending component that is inclined with respect to the upstanding component, wherein the first laterally extending component is connected to the inclined laterally extending component by a short upstanding component to form a closed box section and the upwardly extending web providing for fastening of the wing to the stalk of the glazing bar.
- 15
- 20
- 25
- 30

15. A glazing bar assembly substantially as hereinbefore described with reference to and as shown in any one of Figs. 3a, 3b, 3c and 4 of the accompanying drawings.
- 5 16. A method of fastening a glazing panel to a structure such as a roof purlin, the method comprising providing at least one glazing bar assembly as claimed in any one of the preceding claims, and glazing panels, laying the glazing panels upon a surface of the base element so as to present an edge thereof to the stalk in an abutting relationship on either side of the stalk, presenting 10 wing elements appropriately oriented to the stalk and to bear upon the panel edges, applying fasteners to retain the wings in position.
- 15 17. A cladding system for covering a structure such as a roof or walls of a building with structural components which when assembled offer improved properties with regard to blast mitigation, wherein the structural components comprise a plurality of similar panels, typically rectilinear panels, of glass, plastics or other fabrication material and a plurality of glazing bar assemblies as claimed in any one of claims 1 to 15, and 20 auxiliary components such as fasteners, seals and glazing tapes.



Application No: GB1010645.8

Examiner: Eleanor Wade

Claims searched: 1 to 17

Date of search: 21 October 2010

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X,Y	X:1-8,13,17 Y:9,16	DE29604633 U OVER see figures
Y	1-9,16,17	EP1818471 A TEGTMEIER see figures showing wing elements
Y	1-4,13,16,17	GB839491 A HENRY HOPE AND SONS see figures showing wing elements
Y	1-4,13,17	GB1470766 A WARNER see figures showing wing elements
Y	1-9,13,16,17	WO2005/003484 A ULTRAFRAME see figures showing double skinned base member
Y	1-9,13,16,17	DE29509327 U WITTENAUER see figures showing double skinned base member
Y	1,2,13,16,17	WO00/17466 A ULTRAFRAME see figures showing double skinned base member

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

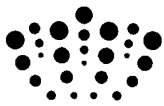
Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

Worldwide search of patent documents classified in the following areas of the IPC

E04D

The following online and other databases have been used in the preparation of this search report



EPODOC, WPI

International Classification:

Subclass	Subgroup	Valid From
E04D	0003/08	01/01/2006