

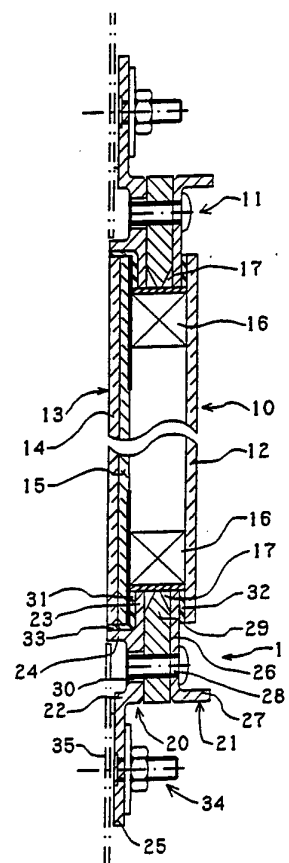


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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**(54) Title:** GLAZING ASSEMBLY**(57) Abstract**

A glazing assembly for use in the flush glazing of vehicles comprises a double glazed unit (10) having two sheets of glass (12, 13) secured together and maintained in spaced parallel relationship by spacing means (16), and frame means (11) extending around at least part of the periphery of the unit and including portions adhesively connected, adjacent the edges of the two sheets of glass, to the surfaces of the sheets which face one another.



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GLAZING ASSEMBLY

This invention relates to a glazing assembly.

5       A glazing assembly according to the invention has been devised in relation to the flush glazing of railway vehicles, wherein the surface of the window glass on the exterior of the vehicle is required to be flush or substantially flush with the surrounding surface of the  
10       vehicle body. More particularly, the invention relates to a glazing assembly incorporating a double glazed unit, which may be a sealed unit, comprising two sheets of glass secured together and maintained in a spaced parallel relationship by a spacing means provided peripherally of  
15       the unit. Although we refer herein to railway vehicles, it is to be understood that the invention is applicable more broadly to vehicles generally and possibly even to installations of glazing other than in vehicles.

20       Conventionally, a sealed double glazed unit has its spacing means provided at the edge of the unit. The spacing means usually comprises a spacing element secured to the two sheets of glass by a suitable adhesive and a sealant so as to prevent penetration of moisture to the  
25       space between the sheets of glass, and may incorporate a desiccant to absorb any moisture which may be present between the sheets. Such a conventional double glazed unit is not readily adaptable for flush glazing, since it requires to be held by a frame engaging both the  
30       oppositely facing external surfaces of the two sheets of glass. The presence of a frame member engaging the surface of the sheet of glass which is at the exterior of the vehicle when installed means that completely flush glazing is not possible. It remains necessary, however,  
35       for some connection to be established to both sheets of

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glass of the unit: to provide an adhesive connection, for example, to only the sheet of glass which is at the interior of the vehicle when installed does not provide sufficient security for a glazing installation in a railway vehicle. An adhesive connection to both sheets of glass in a double glazed unit can be achieved in a so-called "stepped" unit in which the sheets of glass are of different sizes from one another, but such stepped glass units are difficult to handle and lead to a reduced area for vision in a vehicle window. Further, such stepped units may be non-preferred by the manufacturers of sealed double glazed units.

Accordingly it is an object of the present invention to provide a glazing assembly which may enable a double glazed unit to be used in a flush glazing installation.

According to a first aspect of the present invention, there is provided a glazing assembly for use in the flush glazing of vehicles, comprising a double glazed unit having two sheets of glass secured together and maintained in spaced parallel relationship by spacing means, and frame means extending around at least part of the periphery of the unit and including portions adhesively connected, adjacent the edges of the two sheets of glass, to the surfaces of the sheets which face one another.

In the context of this specification the term "glass" or like term includes any glazing material, for example, laminated glass, toughened glass and plastics glazing material.

When installed in a vehicle, e.g. a railway vehicle, with the frame means of the glazing assembly secured to the structure of the vehicle adjacent an aperture therein,

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the fully flush glazed condition may advantageously be achieved because the frame means need not extend beyond the outer surface of the glass sheet at the exterior of the vehicle. Preferably, the glazing assembly is arranged  
5 such that the frame means does not extend beyond the outer surface of the glass sheet of the assembly which is an outwardly facing sheet in use. Additionally, the requirement for security for both sheets of glass in the glazing assembly is met, since the frame means has an  
10 adhesive connection to both such sheets.

Preferably, the frame means has an adhesive connection with an edge face of at least one of the sheets of glass. More preferably, said frame means has an  
15 adhesive connection with an edge face of both sheets of glass.

Said frame means preferably extends around substantially the entire periphery of the unit.  
20

Said frame means preferably includes attachment means for attaching the glazing assembly to a vehicle framework.

Said spacing means is preferably provided at or  
25 adjacent the periphery of the unit.

The double-glazed unit may be a sealed unit.

Two constructions of glazing assembly according to  
30 preferred embodiments of the invention are described hereafter. In the first, where the frame means extends around at least part of the periphery of the double glazed unit, the spacing means of the unit is disposed away from the edge of the unit, so that a rebate is defined between  
35 edge portions of the two sheets of glass. The portions of

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the frame means are adhesively secured to the facing surfaces of the sheets of glass in such rebate.

5 The portions of the frame means respectively adhesively connected to the surfaces of the two sheets of glass in the rebate may be structurally separate frame elements, secured to one another by suitable fastening means with the interposition of packing elements suitably dimensioned to accord with the distance by which the two  
10 sheets of glass are spaced from one another.

In the second embodiment of the invention described hereafter, the frame means itself constitutes at least part of the spacing means between the two sheets of glass  
15 in the double glazed unit.

The first embodiment may have the advantage that a manufacturer of double glazed units can provide such a unit in which the spacing means between the two sheets of  
20 glass is, compared with a conventional double glazed unit, displaced inwardly from the edge of the unit to leave the rebate between the two sheets of glass at the edge, but otherwise is as conventional double glazed units. Then the frame means can be fitted to the double glazed unit,  
25 possibly by a different manufacturer from that manufacturing the double glazed unit. Where the frame means comprises structurally separate portions adhesively connected to the two sheets of glass, different glass thicknesses can be accommodated by varying the thickness  
30 of the bonding material by which the adhesive connections to the sheets of glass are established, and different dimensions of the air gap between the two sheets of glass can be accommodated by use of packing elements of different dimensions between the two frame portions. The  
35 sizes of the sheets of glass in the double glazed unit may

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be identical to one another, thereby eliminating the need for "stepped" glass units in which the sheets of glass are of different sizes from one another.

5           The second embodiment may have the advantage that the frame means is incorporated in the double glazed unit at time of manufacture, resulting in economies. As the frame means and double glazed unit are permanently connected to one another, the potential for water leaks is reduced,  
10 whilst the strength of the glazing assembly is increased. Overall window weight is reduced, whilst the vision area of a window compared with the area of the aperture to which it fits in a vehicle can be increased.

15           According to a second aspect of the present invention, there is provided a method of manufacturing a glazing assembly comprising a double glazed unit having two sheets of glass, the method comprising:

          maintaining two sheets of glass in spaced parallel  
20 relationship; and

          adhesively connecting adjacent the edges of the surfaces of the sheets which face one another a frame means which extends around at least part of the periphery of the unit.

25           According to another aspect of the present invention, there is provided a glazing assembly when fitted to a vehicle.

30           According to a further aspect of the invention, there is provided a method of glazing a vehicle, the method comprising fitting a glazing assembly according to said first aspect or a glazing assembly manufactured according to said second aspect, to the vehicle.

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The invention will now be described by way of example with reference to the accompanying drawings, in which :-

Figure 1 is a section through a window incorporating  
5 a first embodiment of glazing assembly according to the invention;

Figure 2 is a section through part of a window incorporating further embodiments of glazing assembly  
10 according to the invention;

Figures 3,4 and 5 are sections through parts of windows incorporating yet further embodiments of glazing assembly according to the invention.

15

Referring firstly to Figure 1 of the drawings, this shows a window which incorporates a glazing assembly comprising a sealed double glazed unit indicated generally at 10 and a frame means extending peripherally of the  
20 double glazed unit 10, the frame means being indicated generally at 11. The double glazed unit 10 comprises a first sheet of glass 12 and a second sheet of glass 13 which as illustrated is a laminated sheet comprising two individual glass layers 14, 15 secured together by a thin  
25 transparent layer of adhesive. Instead of laminated glass, the sheet 13 could be of toughened glass, or even a plastics glazing material. Similarly, the sheet 12 could be of any appropriate glazing material. The two sheets 12, 13 are secured to one another in spaced  
30 parallel relationship, there being spacing means extending peripherally of the two sheets. The spacing means, indicated generally at 16 and of conventional construction, is disposed slightly inwardly of the unit 10 from the peripheral edge thereof so as to define a  
35 peripheral rebate 17 around the unit.

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The frame means indicated generally at 11 extends around at least part of the, and preferably the entire, periphery of the unit. It comprises elongate elements which extend lengthwise of the edges of the unit and, in the typical case of a window which is generally rectangular in outline, either are bent to extend around the corners of the double glazed unit if it has rounded corners or are joined at such corners if it has angular corners. As seen in the cross-section of Figure 1, the frame means comprises a first frame element 20 and a second frame element 21. The first frame element 20 has a relatively thick body portion 22, an L-section portion comprising limbs 23, 24 at right angles to one another, and a flange 25 extending from the body portion 22 opposite the limb 23. The second frame element 21 is of L-shape in cross-section, comprising a limb 26 and a shorter limb 27 at right angles thereto. The frame elements 20, 21 are spaced from one another with the limbs 23, 26 thereof substantially parallel to one another, and are secured in such spaced relationship by fasteners 28 extending therebetween and through packing elements 29 provided at spaced intervals lengthwise of the frame elements. As illustrated the fastener 28 is a headed screw which extends through an aperture in the limb 26 of the frame element 21, through an aperture in the packing element 29, and engages a threaded insert 30 provided in the body 22 of the frame element 20. The frame elements 20, 21 may be extrusions of an aluminium alloy, or other suitable material.

30

The limbs 23, 26 of the frame elements extend into the rebate 17 at the edge of the double glazed unit, and are secured by adhesive to the surfaces of the glass sheets of the unit facing one another within such rebate. The limb 23 is secured to the surface of the inner sheet

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15 of the laminated glass sheet 13, and the limb 26 is secured to the facing surface of the glass sheet 12. A suitable adhesive/sealant effecting such securement is indicated at 31, 32 respectively, and the adhesive/sealant  
5 31 also extends as indicated at 32 so that the limb 24 is secured to the edges of the two layers 14, 15 of glass in the laminated glass sheet 13. The limb 24 ends flush with the outermost surface of the laminated glass sheet 13.

10 The limb 25 of the frame element 20 provides for attachment of the glazing assembly by fasteners, as indicated at 34, to the structure of a vehicle surrounding a window aperture in the body thereof. The outer body panel surrounding such aperture is indicated in chain-  
15 dotted lines at 35, and it will be noted that the outer surface of the laminated glass sheet 13 lies flush with the outer surface of such body panel.

Thus the glazing assembly above described provides  
20 for flush glazing with no protruding frame parts, whilst at the same time providing a secure fixing of the double glazed unit with an adhesive connection to both sheets of glass 12, 13 thereof.

25 In manufacture of the glazing assembly above described, the two frame elements 20, 21 would be secured to the double glazed unit, after which the fasteners 28 would be inserted through the frame elements and through the packing elements positioned as required to provide a  
30 strong and rigid frame for the glazing assembly.

Different thicknesses of the sheets of glass in the double glazed unit may be accommodated by using different thicknesses of the adhesive/sealant substance 31, 32, 33.  
35 For different thicknesses of the air gap between the

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sheets of glass in the double glazed unit, packing elements 29 of different thickness may be used.

Referring now to Figure 2 of the drawings, this shows in cross-section part of a window incorporating glazing assemblies according to the invention. The cross-section is through a transom of a window provided between a fixed lower, glazed panel indicated generally at 50, and a pivotably openable glazed vent 51 at the upper part of the window. The glazing assembly forming the panel 50 comprises a sealed double glazed unit having two sheets of glass 52, 53 respectively disposed at the outside and inside of a vehicle in which the window is installed or is to be installed, the sheets of glass 52, 53 being maintained in spaced parallel relationship by a spacing means 54 around the periphery thereof which in this embodiment also constitutes a peripheral frame means for the glazing assembly. Thus the spacing means 54 comprises an element of extruded metal such as aluminium alloy, such element comprising a somewhat H-section body portion which extends between the glass sheets 52, 53 and flange portions 55, 56 extending in opposite directions therefrom beyond the edges of the glass sheets. The glass sheets are secured to the frame element 54 by adhesive/sealant as indicated at 57, 58 such adhesive/sealant being provided not only between the facing surfaces of the glass sheets and the body portion of the frame element 54 but also between the edge faces of the glass sheets and flange portions of the frame element. A holder 59 for a desiccant material is disposed between the glass sheets inwardly of the frame element 54. As is the case in the embodiment of Figure 1, the sheets of glass 52, 53 may be of any appropriate type of glass, or alternatively of other glazing material.

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The upper, openable, vent 51 comprises a glazing assembly with a sealed double glazing unit comprising glass sheets 59, 60 secured together in spaced parallel relationship and spacing means which is also a peripheral frame element 61. The frame element 61 comprises a body portion 62 which extends between the glass sheets 59, 60 and is secured thereto by adhesive/sealant 63, 64, and further comprises portions facing edge faces of the glass sheets and secured thereto by the adhesive/sealant. A receptacle 65, e.g. of aluminium or of a flexible material, for a desiccant material is incorporated between the glass sheets above the body portion 62 of the frame element 61. The frame element 61 includes a formation 66 which has hinging engagement with a formation 67 provided on a transom member 68 which is fitted above the limbs 55, 56 of the frame element 54 of the lower fixed glazed panel 50 of the window. An over-centre spring means 69 controls the hinging of the vent 51.

Figure 3 shows the arrangement which may be provided at the lowermost edge of the glazing assembly 50 of Figure 2. In Figure 3, the sheets 52, 53 of glass are shown secured together to form a sealed double glazed unit by a peripheral spacing/frame element 70 and by suitable adhesive/sealant. The peripheral frame element 70 differs from that shown at 54 in Figure 2 in that it has a limb 71 terminating in a flange 72 extending generally parallel to the sheet of glass 53, instead of the limb 56 shown in Figure 2. Opposite the limb 71, the frame element has a limb 73 extending to end flush with the outer surface of the glass sheet 52. The flange 72 is secured by fasteners as indicated at 74 to a mounting element 75 which provides for attachment of the glazing assembly, by fasteners such as bolts as indicated at 76 to a part of a vehicle framework 77 surrounding a window aperture therein. A

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vehicle body panel is indicated in broken lines at 78, and it will again be noted that the outer surface of the glass sheet 52 is flush with the outer surface of the body panel 78.

5

Figures 4 and 5 of the drawings show assemblies which in principle are the same as that shown in Figure 3, but with differences in the form of the peripheral frame/spacing element as that indicated at 70 in Figure 3.

10 In Figure 4, the glass sheets of the sealed double glazed unit are more widely spaced than in Figure 3, and hence the frame element 70 has a somewhat wider body portion than in the Figure 3 embodiment. The body portion, as shown at 80, again is H-section but since it is wider than

15 in Figure 2 the desiccant material may be incorporated in a recess provided by the H-section, as shown at 81.

In Figure 5, the glass sheets of the double glazed unit are more closely spaced than in Figures 3 and 4, and

20 so instead of an H-section body portion of the frame element lying therebetween, there is a single limb 90 therebetween. Otherwise, the attachment of the glazing assembly to the vehicle structure surrounding the window aperture is the same in Figures 4 and 5 as in Figure 3.

25

Although described with reference to Figures 2-5 of the drawings in relation to a window assembly which includes a pivotally openable vent, the embodiments of the invention illustrated may be applied to other forms of

30 window including vents openable in other ways, or windows which are not openable. Analogously the embodiment of Figure 1 may be applied to windows of other configuration, possibly openable.

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The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or  
5 process for attaining the disclosed result, as appropriate, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

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CLAIMS

1. A glazing assembly for use in the flush glazing of vehicles, comprising a double glazed unit having two  
5 sheets of glass secured together and maintained in spaced parallel relationship by spacing means, and frame means extending around at least part of the periphery of the unit and including portions adhesively connected, adjacent the edges of the two sheets of glass, to the surfaces of  
10 the sheets which face one another.
2. An assembly according to Claim 1, the assembly being arranged such that the frame means does not extend beyond the outer surface of the glass sheet of the assembly which  
15 is an outwardly facing sheet in use.
3. An assembly according to Claim 1 or Claim 2, wherein the frame means has an adhesive connection with an edge face of at least one of the sheets of glass.  
20
4. An assembly according to any preceding claim, wherein said frame means has an adhesive connection with an edge face of both sheets of glass.
- 25 5. An assembly according to any preceding claim, wherein said frame means extends around substantially the entire periphery of the unit.
6. An assembly according to any preceding claim, wherein  
30 said frame means includes attachment means for attaching the glazing assembly to a vehicle framework.
7. An assembly according to any preceding claim, wherein said spacing means is provided at or adjacent the  
35 periphery of the unit.

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8. An assembly to any preceding claim, wherein the double glazed unit is a sealed unit.

9. An assembly according to any preceding claim, wherein  
5 the spacing means of the unit is disposed away from the edge of the unit, so that a rebate is defined between edge portions of the two sheets of glass.

10. An assembly according to Claim 9, wherein the  
10 portions of the frame means are adhesively secured to the facing surfaces of the sheets of glass in said rebate.

11. An assembly according to Claim 9 or Claim 10, wherein  
15 the portions of the frame means respectively adhesively connected to the surfaces of the two sheets of glass in the rebate are structurally separate frame elements, secured to one another by fastening means with the interposition of packing elements suitably dimensioned to  
20 accord with the distance by which the two sheets of glass are spaced from one another.

12. An assembly according to any of Claims 1 to 8,  
25 wherein the frame means itself constitutes at least part of the spacing means.

13. A method of manufacturing a glazing assembly  
comprising a double glazed unit having two sheets of glass, the method comprising:

maintaining two sheets of glass in spaced parallel  
30 relationship; and

adhesively connecting adjacent the edges of the  
surfaces of the sheets which face one another a frame  
means which extends around at least part of the periphery  
of the unit.

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14. A method according to Claim 13, the glazing assembly being as described in any of Claims 1 to 12.

15. A glazing assembly according to any of Claims 1 to 12  
5 when fitted to a vehicle.

16. A method of glazing a vehicle, the method comprising fitting a glazing assembly according to any of Claims 1 to 12 or a glazing assembly manufactured according to the  
10 method of Claim 13 or Claim 14, to the vehicle.

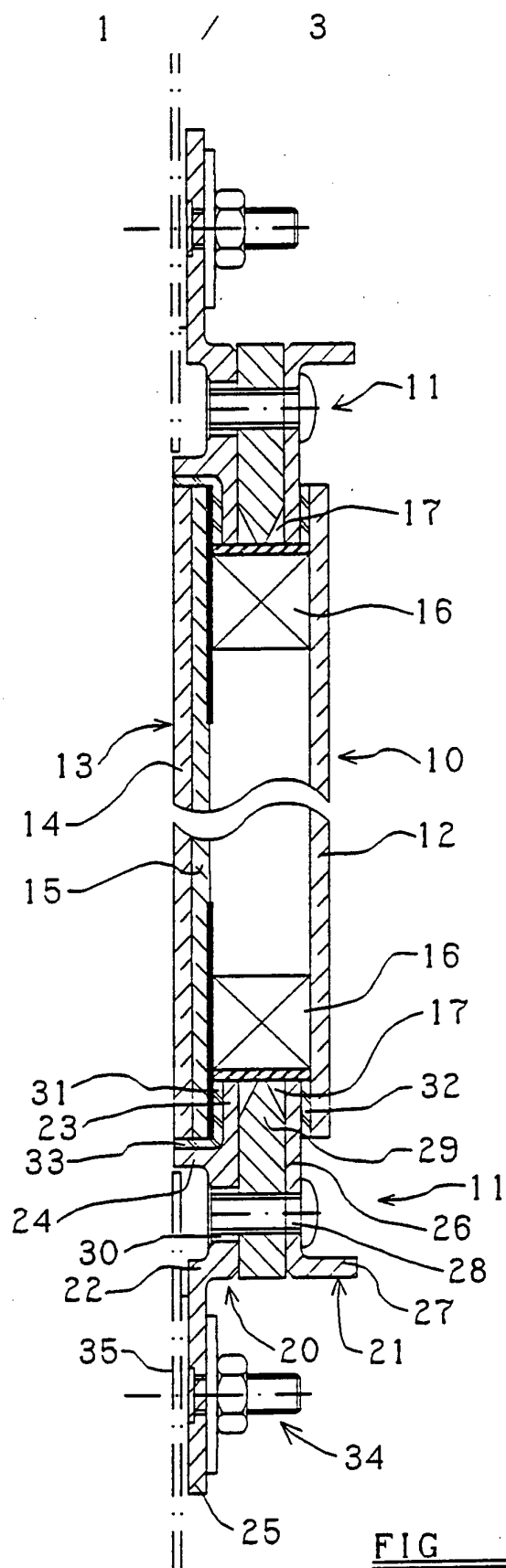


FIG 1

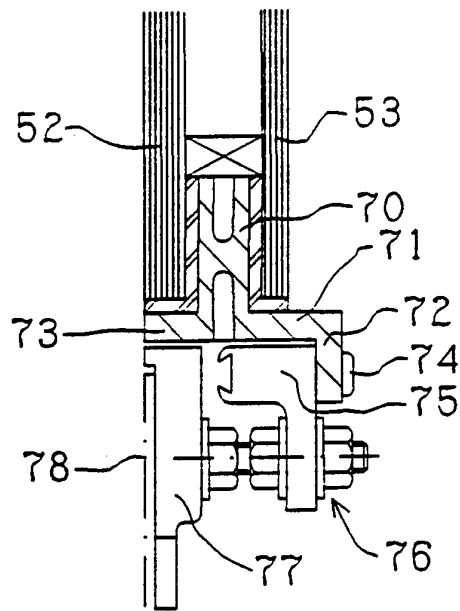
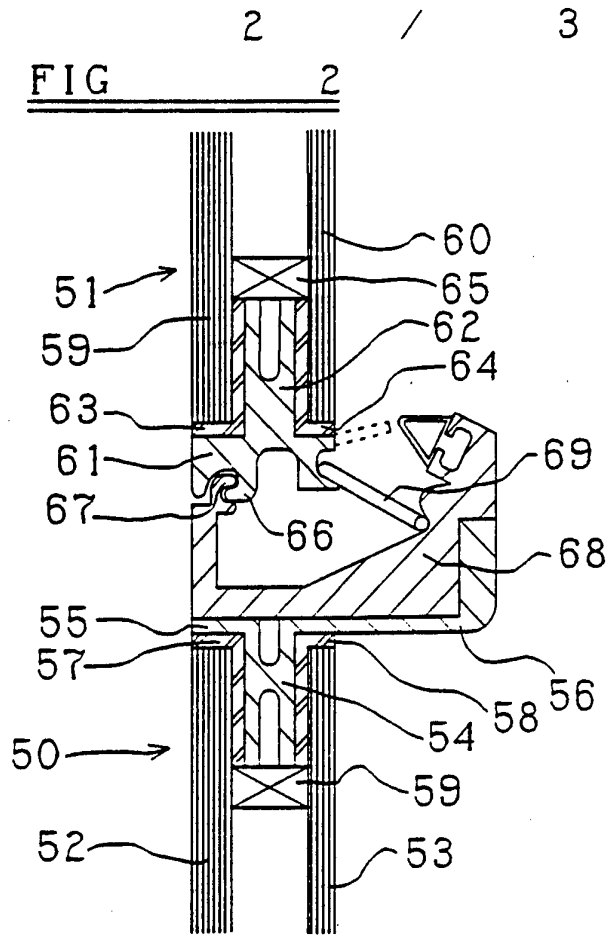


FIG 3

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FIG 4

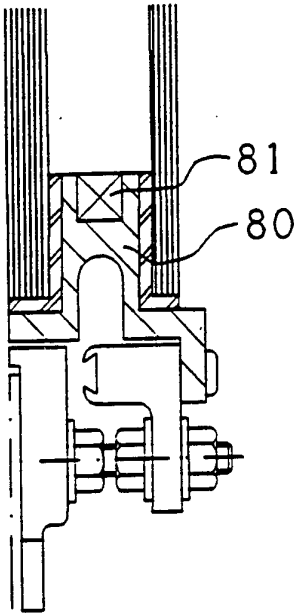
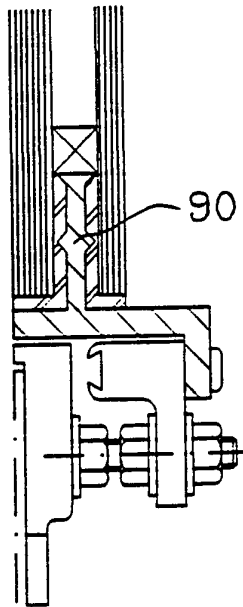


FIG 5



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 93/02031

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 5 B61D25/00 B60J1/10 E06B3/54

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 5 B61D B60J E06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                                      | Relevant to claim No.     |
|------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------|
| X          | EP,A,0 144 620 (MESSERSCMITT - BÖLKOW - BLOHM GMBH) 19 June 1985<br>see page 3, line 16 - page 4, line 3;<br>figure 2   | 1                         |
| A          | ---                                                                                                                     | 2-6,8,<br>10,11,<br>13,16 |
| X          | EP,A,0 114 257 (MESSERSCMITT - BÖLKOW - BLOHM GMBH) 1 August 1984<br>see page 5, line 11 - page 6, line 30;<br>figure 1 | 1                         |
| A          | ---                                                                                                                     | 2-6,8,<br>10,11,<br>13,16 |
|            | ---<br>-/--                                                                                                             |                           |

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Date of the actual completion of the international search

12 January 1994

Date of mailing of the international search report

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Name and mailing address of the ISA

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# INTERNATIONAL SEARCH REPORT

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                | Relevant to claim No. |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A          | <p>EP,A,0 241 665 (MESSERSCMITT - BÖLKOW - BLOHM GMBH) 21 October 1987<br/> see page 6, line 25 - page 10, line 28;<br/> figures 1-3</p> <p style="text-align: center;">-----</p> | 1,13,16               |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 93/02031

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)                                        | Publication<br>date                          |
|-------------------------------------------|---------------------|-------------------------------------------------------------------|----------------------------------------------|
| EP-A-0144620                              | 19-06-85            | DE-A- 3344180<br>JP-A- 60143117                                   | 13-06-85<br>29-07-85                         |
| EP-A-0114257                              | 01-08-84            | DE-A- 3301757<br>DE-A- 3323238<br>DE-A- 3375990<br>JP-A- 59140121 | 02-08-84<br>10-01-85<br>21-04-88<br>11-08-84 |
| EP-A-0241665                              | 21-10-87            | DE-A- 3612073                                                     | 22-10-87                                     |