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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) **Railway vehicle with improved window assembly and corresponding window assembly mounting method**

(57) A railway vehicle comprising a vehicle body (102) having a body outer side (B) facing the railway vehicle's surroundings (O), and a window assembly (100) mounted in the vehicle body (102), said window assembly (100) including a window pane (114) with a pane outer side (124) facing the railway vehicle's surroundings (O), and a window frame (116) with a pane outer side securing part (128) securing the pane outer side (124) and a frame mounting part (132) connecting the window frame (116) to the vehicle body (102), said window pane (114) being mounted in said window frame (116), characterised in that said pane outer side securing part (128) and said frame mounting part (132) are both shifted towards the railway vehicle's interior (I) with respect to said body outer side (B), and by a frame covering device (156) covering, from the railway vehicle's surroundings (O), otherwise exposed sections (168, 170) of the pane outer side securing part (128) and of the connection (106) between the frame mounting part (132) and the vehicle body (102).

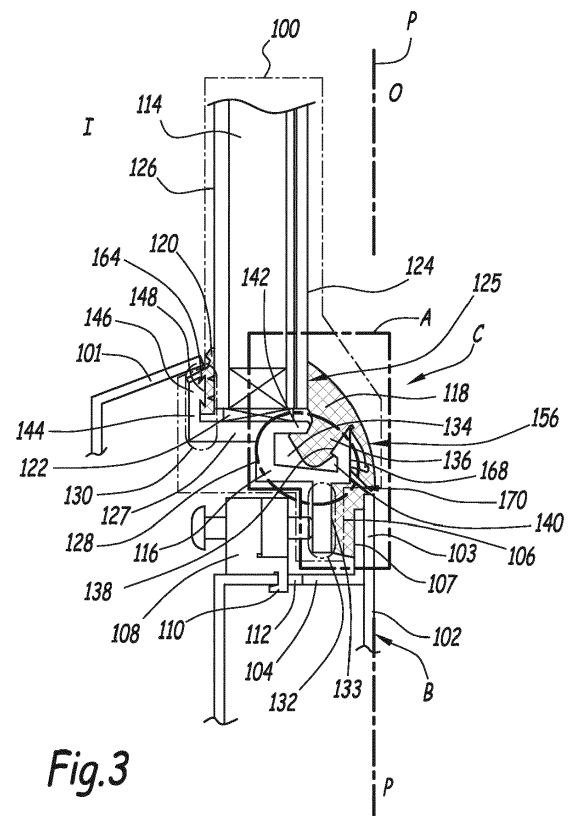


Fig.3

Description

[0001] The present invention relates to a railway vehicle comprising:

- a) a vehicle body having a body outer side facing the railway vehicle's surroundings; and
- b) a window assembly mounted in the vehicle body, said window assembly including:

- i) a window pane with a pane outer side facing the railway vehicle's surroundings; and
- ii) a window frame with a pane outer side securing part securing the pane outer side and a frame mounting part connecting the window frame to the vehicle body, said window pane being mounted in said window frame.

[0002] Such a railway vehicle is known and has been manufactured and sold by the Applicant as a regional train class under the name Coradia Continental. A cross-sectional detail of the interface between a window assembly and the vehicle body of this train class is shown in Figure 1. The surroundings of the train are identified by the letter O, and the interior of the train by the letter I. A window assembly 2 consists of a safety glass window pane 4, a window frame 6 receiving the window pane 4, and rubber seals 8 and 10 surrounding the window pane 4. Window frame 6 has a mounting web 12, which is glued via an adhesive layer 14 to the vehicle body 16. Window frame 6 also has an outer side 18 that is exposed to the train's surroundings O.

[0003] A drawback of this known configuration is that the outer side 18 of the window frame 6 and the adhesive layer 14 can be seen from the outside O of the train. This means that the frame's outer side 18 and the adhesive layer 14 must be fine finished to ensure an acceptable appearance. Furthermore, since these two elements 14, 18 are also accessible from the outside O of the train, they are often vandalised or damaged. Accordingly, the whole window assembly 2 must be frequently dismantled from the vehicle body 16 to be cleaned, repaired or even replaced.

[0004] The same problems occur with the Applicant's regional train class Coradia Polyvalent. A cross-sectional detail of the interface between a window assembly and the vehicle body of this train class is shown in Figure 2. Unlike in Figure 1, in this known configuration, the window frame 6 is attached to the vehicle body 16 by a screw coupling 20. Again, window frame 6 has an outer side 18 that can be viewed and accessed from the outside O of the train.

[0005] In view of the above, it is one object of the invention to provide a railway vehicle with a window assembly that is better protected against damage or vandalism.

[0006] Another object of the invention is to provide a railway vehicle with a window assembly that needs little

fine finishing at the end of its installation.

[0007] A further object of the invention is to provide a railway vehicle with a window assembly and window pane that can be easily and quickly replaced.

[0008] These objects are achieved with a railway vehicle as defined above, characterized in that said pane outer side securing part and said frame mounting part are both shifted towards the railway vehicle's interior with respect to said body outer side; and by a frame covering device covering, from the railway vehicle's surroundings, otherwise exposed sections of the pane outer side securing part and of the connection between the frame mounting part and the vehicle body.

[0009] By setting the window frame's pane outer side securing part and frame mounting part back towards the interior of the railway vehicle, and by covering those parts, the window frame is completely hidden from the vehicle's surroundings. Thus, it is no longer necessary to fine finish the window frame. On top of that, the risk of damage or vandalism to the window frame is reduced.

[0010] According to preferred embodiments, the inventive railway vehicle comprises one, several or all of the following features, in all technically feasible combinations:

- said frame covering device is movable between an open and closed position, said frame covering device preferably being a flexible sealing lip;
- said window assembly further includes a pane outer side securing member securing the window pane's outer side and cooperating with said pane outer side securing part;
- said frame covering device extends from said pane outer side securing member;
- said pane outer side securing member is a flexible clamping frame pressed against an outer rim of the window pane's outer side;
- said pane outer side securing member includes a clamping protrusion press fitted into said pane outer side securing part;
- the pane outer side securing part comprises a channel extending within the window frame, said channel being preferably open to the railway vehicle's surroundings;
- said clamping protrusion is press fitted into said channel;
- said pane outer side securing part comprises a slanting surface supporting and counteracting forces acting on the window pane;
- at least one clamp clamping the frame mounting part against the vehicle body;
- the frame mounting part is a web extending around the window frame's periphery;
- said window frame is glued to the vehicle body via said frame mounting part;
- said window pane has a pane inner side facing the railway vehicle's interior, and said window frame further comprises a pane inner side securing part, said

pane inner side securing part preferably cooperating with a flexible seal.

[0011] The invention also pertains to a method of mounting a window assembly into the vehicle body of a railway vehicle, the method comprising the following steps:

a) providing a window assembly including:

- i) a window pane with a pane outer side for facing the railway vehicle's surroundings;
- ii) a window frame with a pane outer side securing part securing the pane outer side and a frame mounting part for mounting the window frame to the vehicle body, said window pane being mounted in said window frame ; and
- iii) a frame covering device for covering, from the railway vehicle's surroundings, otherwise exposed sections of the pane outer side securing part and of the mounting connection between the frame mounting part and the vehicle body, the frame covering device being in an open position;

b) applying an adhesive to one side of said frame mounting part;

c) pressing the adhesive covered side of the frame mounting part against a corresponding adherend of the vehicle body;

d) clamping the frame mounting part against said adherend;

e) bringing the frame covering device into a closed position; and

f) curing the adhesive.

[0012] Preferably, the frame mounting part is unclamped once the adhesive has cured.

[0013] A preferred embodiment of the invention will now be explained in detail with reference to the accompanying drawings, wherein:

Figures 1 and 2 illustrate the interface between the window frames and the vehicle body of prior art railway vehicles;

Figure 3 is a cross-sectional detail showing the interface between a window frame and the vehicle body according to the invention;

Figure 4 shows the detail A of Figure 3;

Figures 5 to 7 illustrate the window frame mounting method of the invention;

Fig. 8 shows the removal of the window frame in case of damage according to the invention; and

Fig. 9 shows the removal of the window pane in case of damage according to the invention.

[0014] With reference to Figure 3, there is shown a window assembly 100 that is mounted in a cut-out C of

a vehicle body 102 of a railway vehicle. Preferably, the railway vehicle is a passenger coach, such as a passenger coach of a regional or suburban train. The surroundings of the passenger coach are identified by the letter O, and the interior of the passenger coach by the letter I. An interior trim panel 101 may be located in the passenger coach's interior I and connected to window assembly 100.

[0015] Window assembly 100 is delimited by the chain-dotted line in Figure 3. Vehicle body 102 has a body outer side B facing the railway vehicle's surroundings O. Vehicle body 102 also has a connecting flange 103 and an angular support sheet 104. Connecting flange 103 defines the border of the cut-out C. Window assembly 100 is attached to connecting flange 103 via a layer 106 of adhesive. Adhesive layer 106 preferably runs around the entire periphery of window assembly 100. Adhesive layer 106 is in contact with an adherend 107 located on the connecting flange 103.

[0016] A clamp 108 may clamp window assembly 100 against connecting flange 103. Preferably, there are four such clamps 108 securing window assembly 100 to vehicle body 102. However, any number of clamps 108 may be used. Clamp 108 has a fastening member 110 fastening the clamp 108 to the angular support sheet 104. Preferably, the fastening member is a hook 110 that is inserted in a corresponding fastening hole 112 of the angular support sheet 104.

[0017] Window assembly 100 comprises a security glass window pane 114, a window frame 116 accommodating the window pane 114, a pane outer side securing member 118, a pane inner side securing member 120, and a window pane bearing 122 arranged inside window frame 116, between window frame 116 and window pane 114.

[0018] Window pane 114 has a pane outer side 124 and a pane inner side 126. The pane outer side 124 has an outer rim 125.

[0019] Window frame 116 comprises a main body 127, a pane outer side securing part 128, a pane inner side securing part 130, and a frame mounting part 132.

[0020] The frame mounting part is preferably a web 132 extending around the window frame's outer periphery. Web 132 is clamped by the clamp 108 against the connecting flange 103. Web 132 has a web outer side 133 that acts as an adherend.

[0021] The pane outer side securing part 128 comprises a channel 134 extending within the window frame 116. Channel 134 has a slot 136 opening channel 134 to the railway vehicle's surroundings O. One side of the slot 136 consists of a slanting bearing surface 138. Channel 134 also includes a holding undercut 140 and a holding flange 142.

[0022] It will be noted that, according to the invention, the pane outer side securing part 128 and the frame mounting part 132 are both shifted towards the railway vehicle's interior I with respect to said body outer side B. In other words, the whole window frame 116 is spaced

towards the inside I with respect to an imaginary vertical plane P defined by body outer side B.

[0023] The pane inner side securing part 130 comprises a securing rib 144 with a free end 146. Securing rib 144 projects from the window frame main body 127. The free end 146 of securing rib 144 is provided with a fastening element 148. Preferably, the fastening element 148 has a dovetail cross-section.

[0024] With reference to Figure 4, pane outer side securing member 118 comprises a main body 150, a clamping protrusion 152, an abutment surface 154, and a frame covering device 156. Preferably, the pane outer side securing member is an integral flexible clamping frame 118, made for example of rubber. The abutment surface 154 is pressed against the outer rim 125 of the window pane's outer side 124. Hence, the pane's outer side 124 is secured against outward displacement by the abutment surface 154.

[0025] The clamping protrusion 152 includes a web-like base 158 supporting a clamping lip 160. Clamping lip 160 is enlarged compared to the base 158. Clamping lip 160 has a generally triangular cross-sectional shape. The base 158 is fitted into the slot 136. The clamping lip 160 is press fitted into channel 134. The undercut 140 and the holding flange 142 keep the clamping lip 160 in position inside channel 134.

[0026] As indicated by arrow F in Figure 4, an outer side 162 of the base 158 abuts on the slanting bearing surface 138. Hence, outward forces acting on the window pane 114 are transmitted via the rubber clamping frame 118 to the bearing surface 138 supporting said forces. Accordingly, the window pane 114 is securely held in place.

[0027] The frame covering device is preferably a flexible sealing lip 156. Sealing lip 156 extends from the clamping frame's main body 150. As can be seen in Figure 3, sealing lip 156 covers an otherwise exposed section 168 of the pane outer side securing part 128 from the vehicle's surroundings O. Frame covering device 156 also covers an otherwise exposed section 170 of the adhesive layer 106, adhesive layer 106 being the connection between the frame mounting part 132 and the vehicle body 102. Frame covering device 156 is movable between an open position P1 shown e.g. in Figures 5 and 6, and a closed position P2 shown e.g. in Figure 4. In particular, frame covering device 156 is pivotable between the open and closed position around the clamping frame's main body 150. In the open position P1, frame covering device 156 is spaced apart from window frame 116. In the closed position P2, frame covering device 156 rests on window frame 116, namely its pane outer side securing part 128.

[0028] The pane inner side securing member is preferably a flexible sealing frame 120, which is pressed against the outer periphery of the window pane's inner side 126. Sealing frame 120 has a fastening slot 164 accommodating fastening element 148.

[0029] Reference is now made to Figures 5 to 7 in order

to describe the method according to the invention of mounting window assembly 100 into the vehicle body 102.

[0030] One starts with a preassembled window assembly 100 whose sealing lip 156 is in the open position P1. Then, as shown in Figure 5, a bead 166 of adhesive is applied to the outer side 133 of the frame mounting web 132 of the preassembled window assembly 100. Next, the window assembly 100 is positioned with respect to the vehicle body's cut-out C. Then, as shown in Figure 6, the adhesive covered outer side 133 of frame mounting web 132 is pressed against the corresponding adherend 107 of the vehicle body's connecting flange 103. Thereby, an adhesive layer 106 is formed, which secures the window assembly 100 to the vehicle body 102. As a next step shown in Figure 7, the frame mounting web 132 is clamped against the connecting flange 103 using one or more clamps 108. The clamps 108 help in achieving and maintaining the window assembly's final position. Also, the sealing lip 156 is pivoted into the closed position P2 so that it covers the exposed sections 168, 170 of window frame 116 and adhesive layer 106. Once the adhesive has cured, the mounting is complete. After mounting, the clamps 108 are preferably removed, but may also remain for increased security.

[0031] As can be seen in Figure 8, the removal of window assembly 100 e.g. for maintenance is done by pivoting the sealing lip 156 from the closed position P2 to the open position P1, cutting through the adhesive layer 106 (cf. the letter T indicated the cut) and, if applicable, removing the one or more clamps 108.

[0032] The removal of the window pane 114 is done by simply detaching the clamping frame 118 (cf. Fig. 9). Accordingly, in the present invention, the window pane 114 can be removed from the outside O of the railway vehicle. This makes the replacement of a damaged window pane easier and quicker.

40 Claims

1. A railway vehicle comprising:

- a) a vehicle body (102) having a body outer side (B) facing the railway vehicle's surroundings (O); and
- b) a window assembly (100) mounted in the vehicle body (102), said window assembly (100) including:

- i) a window pane (114) with a pane outer side (124) facing the railway vehicle's surroundings (O); and
- ii) a window frame (116) with a pane outer side securing part (128) securing the pane outer side (124) and a frame mounting part (132) connecting the window frame (116) to the vehicle body (102), said window pane

(114) being mounted in said window frame (116),

characterised:

- **in that** said pane outer side securing part (128) and said frame mounting part (132) are both shifted towards the railway vehicle's interior (I) with respect to said body outer side (B); and
 - by a frame covering device (156) covering, from the railway vehicle's surroundings (O), otherwise exposed sections (168, 170) of the pane outer side securing part (128) and of the connection (106) between the frame mounting part (132) and the vehicle body (102).
2. The railway vehicle of claim 1, wherein said frame covering device (156) is movable between an open (P1) and closed (P2) position, said frame covering device (156) preferably being a flexible sealing lip.
 3. The railway vehicle of claim 1 or 2, wherein said window assembly (100) further includes a pane outer side securing member (118) securing the window pane's outer side (124) and cooperating with said pane outer side securing part (128).
 4. The railway vehicle of claim 3, wherein said frame covering device (156) extends from said pane outer side securing member (118).
 5. The railway vehicle of claim 3 or 4, wherein said pane outer side securing member (118) is a flexible clamping frame pressed against an outer rim (125) of the window pane's outer side (124).
 6. The railway vehicle of any one of claims 3 to 5, wherein said pane outer side securing member (118) includes a clamping protrusion (152) press fitted into said pane outer side securing part (128).
 7. The railway vehicle of any one of the previous claims, wherein the pane outer side securing part (128) comprises a channel (134) extending within the window frame (116), said channel (134) being preferably open to the railway vehicle's surroundings (O).
 8. The railway vehicle of claims 6 and 7, wherein said clamping protrusion (152) is press fitted into said channel (134).
 9. The railway vehicle of any one of the previous claims, wherein said pane outer side securing part (128) comprises a slanting surface (138) supporting and countering forces acting on the window pane (114).

10. The railway vehicle of any one of the previous claims, further comprising at least one clamp (108) clamping the frame mounting part (132) against the vehicle body (102).

11. The railway vehicle of any one of the previous claims, wherein the frame mounting part (132) is a web extending around the window frame's periphery.

12. The railway vehicle of any one of the previous claims, wherein said window frame (116) is glued to the vehicle body (102) via said frame mounting part (132).

13. The railway vehicle of any one of the previous claims, wherein said window pane (114) has a pane inner side (126) facing the railway vehicle's interior (I), and wherein said window frame (116) further comprises a pane inner side securing part (130), said pane inner side securing part preferably cooperating with a flexible seal (120).

14. A method of mounting a window assembly (100) into the vehicle body (102) of a railway vehicle, the method comprising the following steps:

a) providing a window assembly (100) including:

- i) a window pane (114) with a pane outer side (124) for facing the railway vehicle's surroundings (O);
- ii) a window frame (116) with a pane outer side securing part (128) securing the pane outer side (124) and a frame mounting part (132) for mounting the window frame (116) to the vehicle body (102), said window pane (114) being mounted in said window frame (116); and
- iii) a frame covering device (156) for covering, from the railway vehicle's surroundings (O), otherwise exposed sections (168, 170) of the pane outer side securing part (128) and of the mounting connection (106) between the frame mounting part (132) and the vehicle body (102), the frame covering device (156) being in an open position (P1);

b) applying an adhesive (166) to one side (133) of said frame mounting part (132);

c) pressing the adhesive covered side (133) of the frame mounting part (132) against a corresponding adherend (107) of the vehicle body (102);

d) clamping the frame mounting part (132) against said adherend (107);

e) bringing the frame covering device (156) into a closed position (P2); and

f) curing the adhesive.

15. The method of claim 14, wherein the frame mounting part (132) is unclamped once the adhesive has cured.

Amended claims in accordance with Rule 137(2) EPC.

1. A railway vehicle comprising:

a) a vehicle body (102) having a body outer side (B) facing the railway vehicle's surroundings (O); and

b) a window assembly (100) mounted in the vehicle body (102), said window assembly (100) including:

i) a window pane (114) with a pane outer side (124) facing the railway vehicle's surroundings (O);

ii) a window frame (116) with a pane outer side securing part (128) securing the pane outer side (124) and a frame mounting part (132) connecting the window frame (116) to the vehicle body (102), said window pane (114) being mounted in said window frame (116); and

iii) a frame covering device (156) covering, from the railway vehicle's surroundings (O), otherwise exposed sections (168, 170) of the pane outer side securing part (128) and of the connection (106) between the frame mounting part (132) and the vehicle body (102),

characterised in that said pane outer side securing part (128) and said frame mounting part (132) are both shifted towards the railway vehicle's interior (I) with respect to said body outer side (B), and

in that said frame covering device (156) is movable between an open (P1) and closed (P2) position.

2. The railway vehicle of claim 1, wherein said frame covering device (156) is a flexible sealing lip.

3. The railway vehicle of claim 1 or 2, wherein said window assembly (100) further includes a pane outer side securing member (118) securing the window pane's outer side (124) and cooperating with said pane outer side securing part (128).

4. The railway vehicle of claim 3, wherein said frame covering device (156) extends from said pane outer side securing member (118).

5. The railway vehicle of claim 3 or 4, wherein said pane

outer side securing member (118) is a flexible clamping frame pressed against an outer rim (125) of the window pane's outer side (124).

6. The railway vehicle of any one of claims 3 to 5, wherein said pane outer side securing member (118) includes a clamping protrusion (152) press fitted into said pane outer side securing part (128).

7. The railway vehicle of any one of the previous claims, wherein the pane outer side securing part (128) comprises a channel (134) extending within the window frame (116), said channel (134) being preferably open to the railway vehicle's surroundings (O).

8. The railway vehicle of claims 6 and 7, wherein said clamping protrusion (152) is press fitted into said channel (134).

9. The railway vehicle of any one of the previous claims, wherein said pane outer side securing part (128) comprises a slanting surface (138) supporting and countering forces acting on the window pane (114).

10. The railway vehicle of any one of the previous claims, further comprising at least one clamp (108) clamping the frame mounting part (132) against the vehicle body (102).

11. The railway vehicle of any one of the previous claims, wherein the frame mounting part (132) is a web extending around the window frame's periphery.

12. The railway vehicle of any one of the previous claims, wherein said window frame (116) is glued to the vehicle body (102) via said frame mounting part (132).

13. The railway vehicle of any one of the previous claims, wherein said window pane (114) has a pane inner side (126) facing the railway vehicle's interior (I), and wherein said window frame (116) further comprises a pane inner side securing part (130), said pane inner side securing part preferably cooperating with a flexible seal (120).

14. A method of mounting a window assembly (100) into the vehicle body (102) of a railway vehicle, the method comprising the following steps:

a) providing a window assembly (100) including:

i) a window pane (114) with a pane outer side (124) for facing the railway vehicle's surroundings (O);

ii) a window frame (116) with a pane outer side securing part (128) securing the pane outer side (124) and a frame mounting part (132) for mounting the window frame (116)

to the vehicle body (102), said window pane (114) being mounted in said window frame (116); and

iii) a frame covering device (156) for covering, from the railway vehicle's surroundings (O), otherwise exposed sections (168, 170) of the pane outer side securing part (128) and of the mounting connection (106) between the frame mounting part (132) and the vehicle body (102), the frame covering device (156) being in an open position (P1);

b) applying an adhesive (166) to one side (133) of said frame mounting part (132);

c) pressing the adhesive covered side (133) of the frame mounting part (132) against a corresponding adherend (107) of the vehicle body (102);

d) clamping the frame mounting part (132) against said adherend (107);

e) bringing the frame covering device (156) into a closed position (P2); and

f) curing the adhesive.

15. The method of claim 14, wherein the frame mounting part (132) is unclamped once the adhesive has cured.

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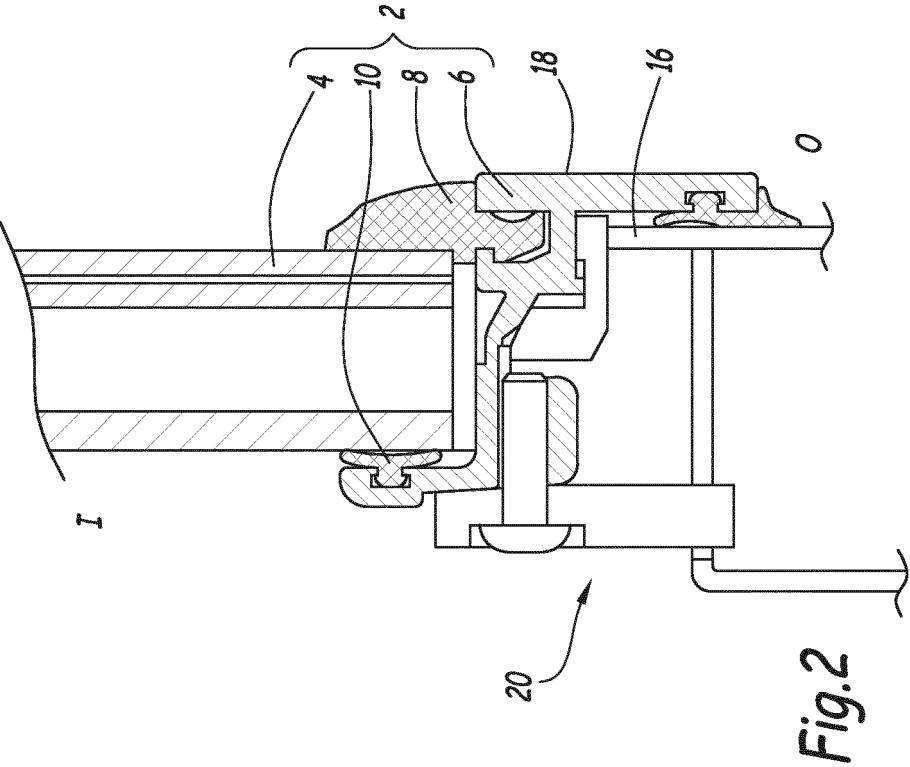
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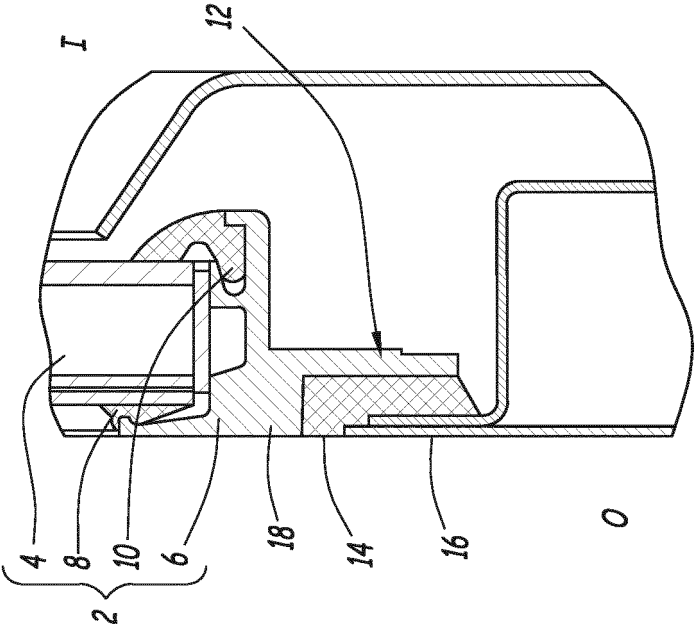
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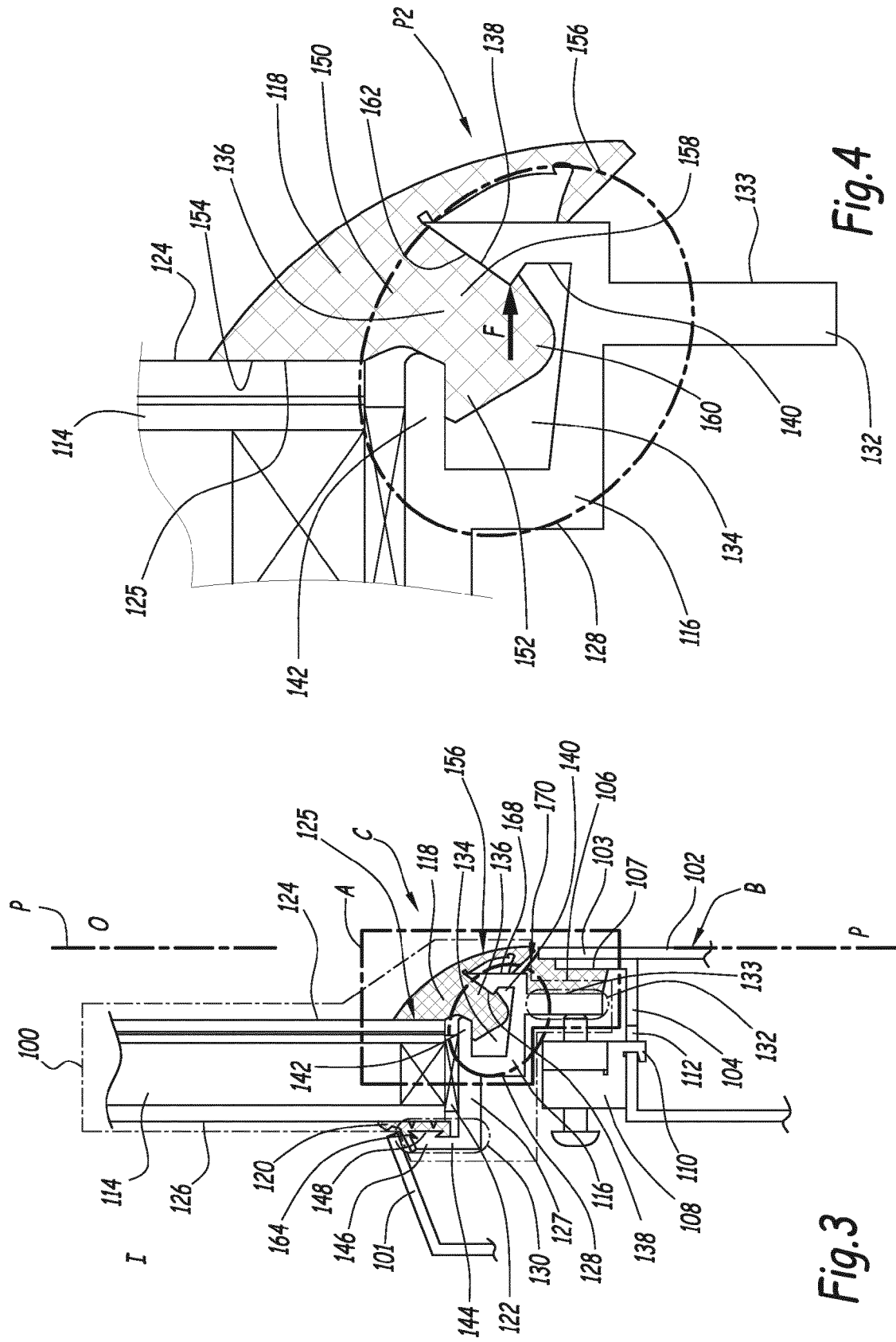
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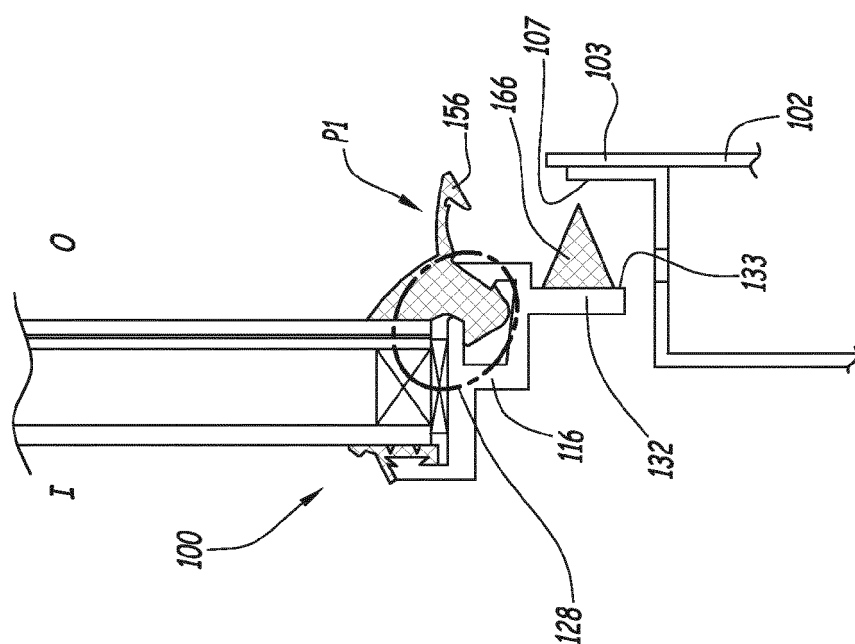
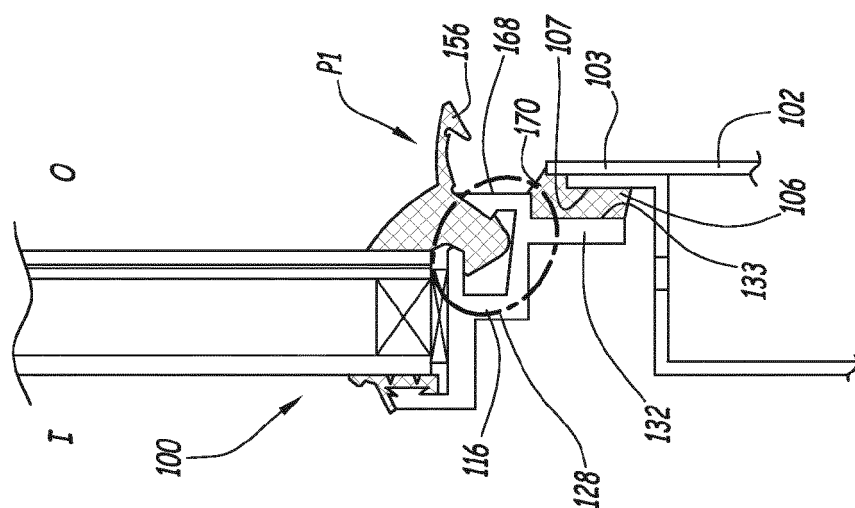
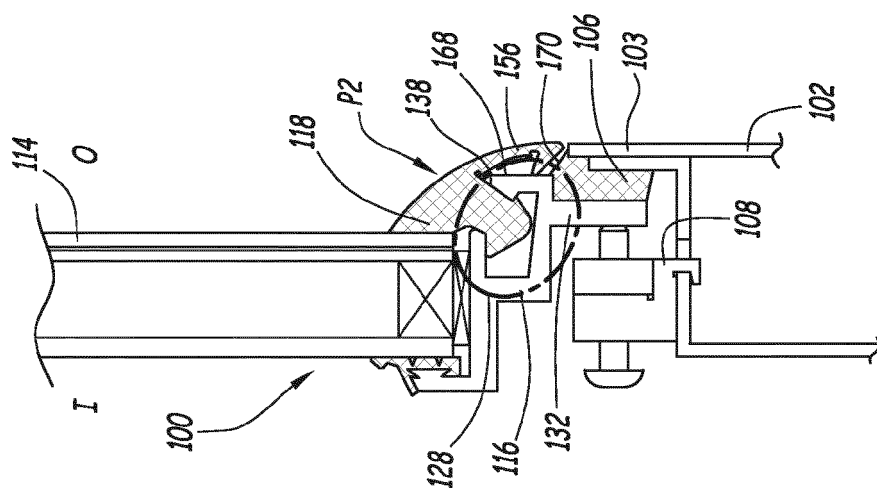


Prior Art



Prior Art





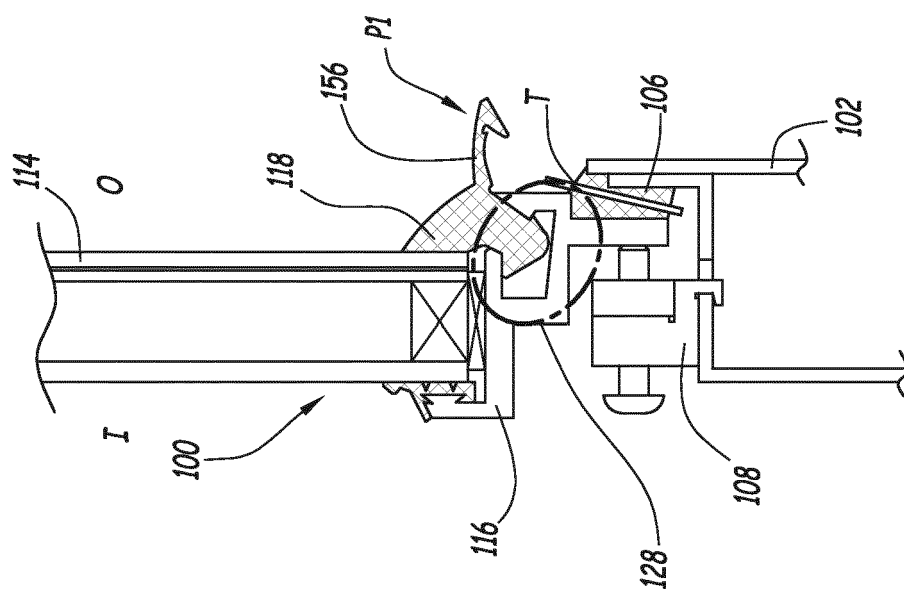


Fig. 8

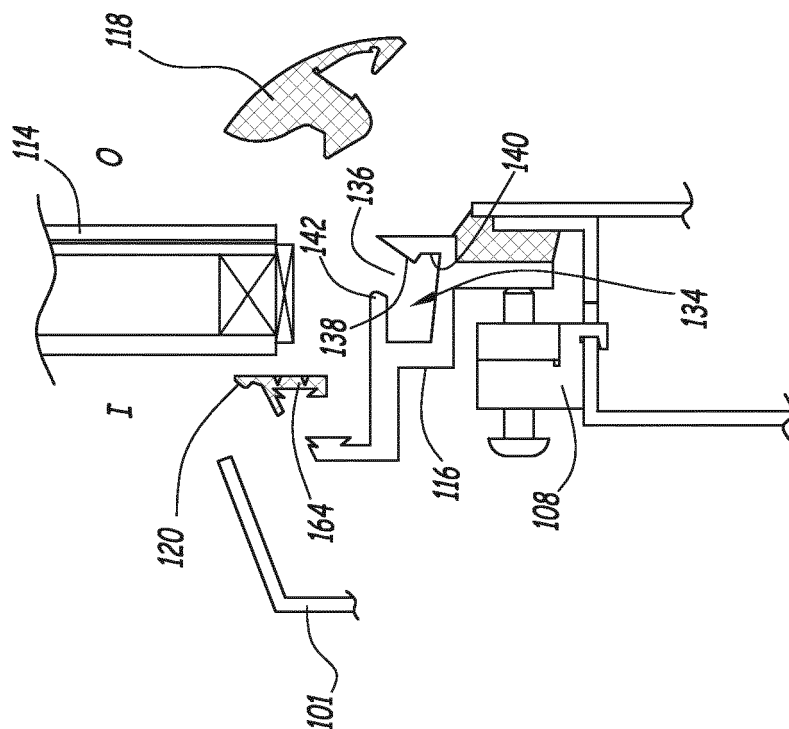


Fig. 9



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 Application Number
 EP 14 30 6948

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 20 May 2015	Examiner Schultze, Yves
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document 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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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 14 30 6948

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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