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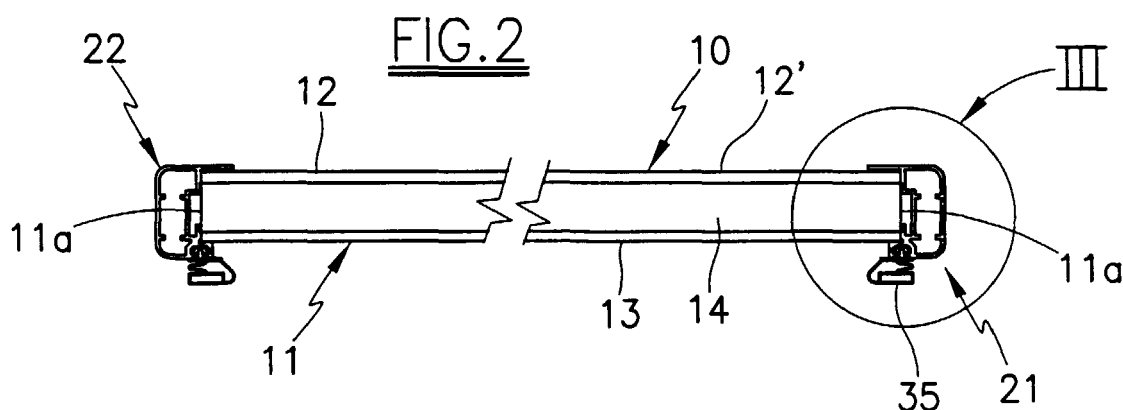
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(54) **Transparent closure door for refrigerator cabinets and method for its construction**

(57) The door comprises a glazed panel with at least two spaced-apart parallel transparent sheets (12, 13) rigidly joined together by an interposed perimetral spacer (15) extending along the entire perimetral edge of the sheets to close the interspace (14) defined by the sheets; the door comprises a first profiled element (21, 121) extending along one side of the glazed panel, to

which it is rigidly fixed, and having at least one corridor (31, 131) for containing the means for securing the hinge to the cabinet structure (9); the panel (11) is fixed to the cabinet structure only by means of said profiled element (21, 121) and is supported only by this, without the aid of any rigid whole frame enclosing the panel.



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Description

[0001] This invention relates to a transparent closure door for refrigerator cabinets, and a method for its construction.

[0002] Those refrigerator cabinets, typically for commercial use, which also act as display cabinets for the refrigerated products contained in them (cakes, ice-creams, frozen food, etc.) are usually provided with transparent front doors both enabling the contained products to be seen and providing thermal insulation. These doors usually comprise a transparent panel (often known as a thermopan) formed from at least two spaced-apart parallel transparent sheets (usually of glass) rigidly joined together by an interposed perimetral spacer extending along the entire perimetral edge of the sheets and closing the interspace defined by the sheets.

[0003] The panel is inserted into a rigid frame which is hinged to the cabinet structure. The frame is formed from four profiled elements joined rigidly together at their corners to form a frame of sufficient rigidity and strength to support its own weight and that of the panel and the other mechanical stresses which it is subjected to during use. The frame hence acts as a structural element the purpose of which is to resist mechanical stresses, whereas the panel only has a curtain-wall function, ie to close the mouth of the cabinet.

[0004] An object of this invention is to simplify the construction of said doors and to achieve an enhanced appearance.

[0005] Moreover, if it is required to form a door with a curved surface, a cylindrical curved transparent sheet is placed in front of the panel, its vertical sides being fixed to the vertical sides of the frame.

[0006] The interspace defined by the curved sheet and the panel front surface cannot be sealed hermetically mainly because of the presence of the spacer which inevitably possesses air seepage points. Because of this, the air present in the interspace can easily form condensate on those sheet surfaces with which it comes into contact.

[0007] The invention also proposes to overcome this drawback, within the framework of a solution offering good appearance.

[0008] These and further objects are attained by the invention as characterised in the claims.

[0009] The invention is based on the fact of comprising a first profiled element extending along one side of the glazed panel, to which it is rigidly joined, and having at least one corridor for containing the means for connecting the hinge to the cabinet structure. The glazed panel is secured to the cabinet structure only via said profiled element and is supported only by this latter, without the aid of any rigid whole frame enclosing the panel.

[0010] The invention is described in detail hereinafter with the aid of the accompanying figures, which

show one embodiment thereof by way of non-limiting example.

Figure 1 is a general perspective view of the door of the invention, applied to a refrigerator cabinet.

Figure 2 is a section on the plane II-II of Figure 1.

Figure 3 is an enlarged detail of Figure 2.

Figure 4 is a section on the plane IV-IV of Figure 1.

Figure 5 is a general perspective view of a second embodiment of the door of the invention, applied to a refrigerator cabinet.

Figure 6 is a section on the plane VI-VI of Figure 5.

Figure 7 is an enlarged detail of Figure 6.

Figure 8 is a section on the plane VIII-VIII of Figure 5.

Figure 9 is an enlarged detail of Figure 8.

Figure 10 is a perspective view of one of the closure elements 152.

[0011] Reference will firstly be made to the embodiment shown in Figures 1-4.

[0012] The door, indicated overall by 10 in Figures 1-4, comprises a glazed panel 11 with two transparent sheets 12 and 13, typically of glass or of other transparent material. Most such panels comprise two transparent sheets, however the panel of the invention can comprise a larger number of sheets. The sheets can also be of special material, such as heated glass, low-emissivity glass, reflecting glass, etc.

[0013] The two sheets 12 and 13 are parallel and spaced apart to define an air interspace 14. Between them there is interposed a perimetral spacer 15 in contact with the mutually facing inner faces of the sheets and extending along the entire perimetral edge of the sheets. The spacer 15 is joined to both the sheets 12 and 13 and acts as a means for securing them together. In cooperation with the sheets it also defines and closes the interspace 14. The sheets 12 and 13 are joined together and to the perimetral spacer 15 by a synthetic resin-based adhesive 17, which usually covers the outer side 15a of the perimetral spacer 15.

[0014] In the embodiment shown in Figures 1-4, the edges 12a and 13a of the sheets 12 and 13 and the outer side 15a of the spacer 15 are positioned substantially in the same plane and are covered by the adhesive layer 17. This characteristic is repeated on the four sides of the panel 11 and produces for the panel 11 four edges 11a which are narrow and flat.

[0015] In full view, the front surface of the panel 11

is defined by the outwardly facing surface 12' of the front sheet 12.

[0016] According to the invention, a first profiled element 21 is provided, extending along one side of the panel and fixed rigidly to this side.

[0017] The cross-section through the profiled element 21 (see Figure 3) possesses two coplanar inner surfaces 32 and 33 which are positioned in contact with the edge 11a of the panel 11, and in particular with the layer 17, and are fixed to this by interposed adhesive.

[0018] The cross-section through the profiled element 21 also possesses a lower corridor 34 for receiving by insertion a usual gasket element 35 for sealing the door 10, when closed, against the front edge of the refrigerator cabinet structure 9. Specifically, when seen in cross-section the gasket 35 possesses an appendix 36 with a dovetail profile which is snap-inserted into the lower corridor 34. In its upper part (see Figure 3) the cross-section through the profiled element 21 possesses a fin 37 which covers a narrow strip of the front surface 12' (that visible) of the panel 11, close to the edge of this latter.

[0019] The cross-section through the profiled element 21 also defines a corridor 31 for containing the means, of known type not shown in the figures, for securing the hinge to the cabinet structure 9. For example, drilled blocks can be suitably inserted and fixed in this corridor in the vicinity of the two ends of the profiled element 21, to receive in their holes the hinge pins 38 of vertical axis (one of these pins is shown in Figure 1), fixed to the cabinet structure 9 to define the vertical axis about which the door 10 rotates. To the side of the corridor 31 there is provided a second corridor 42 into which usual electrical resistance elements can be inserted to be fed with current to heat the panel 11 (to prevent condensation on its glazed surfaces).

[0020] When mounted on the cabinet structure, the panel 11 is secured to it only via the profiled element 21 and is supported only by this latter. In particular, the panel 11 is supported without the aid of any rigid whole frame enclosing and supporting the panel 11, as instead happens in the known art. According to the invention, the panel is fixed along one edge to the profiled element 21, which is itself hinged to the cabinet structure, it being the panel itself which resists those static stresses (in particular its own weight) and dynamic stresses to which it is subjected during use.

[0021] Advantageously, respective profiled elements are also positioned on and secured to the other sides of the panel 11 (those not constrained to the cabinet structure 9) and are supported only by this latter. In particular, a second profiled element 22 is positioned on the vertical side opposite that on which the first profiled element 21 is positioned, two profiled elements 23 and 24 being positioned on the upper and lower horizontal sides of the panel 11.

[0022] The second profiled element 22 has the same cross-section as the first profiled element 21. In

particular, it possesses a corridor 34 to receive by insertion the appendix 36 of the gasket 35. The profiled element 22 can also be fixed by usual means to a usual handle 7 for operating the door.

[0023] The horizontal profiled elements 23 and 24 (see Figure 4) are mutually identical but are shallower than the two profiled elements 21 and 22. Their function is mainly the aesthetic one of covering the upper and lower edge of the panel 11 and to carry the gasket 35. For this purpose they both possess a fin 39 which covers a narrow strip of the front surface 12' (the visible surface) of the panel along its horizontal edge. They also both comprise a corridor 41 for receiving the appendix 36 of the gasket 35 by insertion.

[0024] The gasket 35 is in one piece in the form of a rectangular rim (composed of four longitudinal elements joined together at their corners), which extends along the entire perimeter of the panel 11 and is fixed to it by means of said corridors 34 and 41.

[0025] The four profiled elements 21-24 are not joined together (this would be in any event pointless from the mechanical stress resistance aspect), and are supported by the panel 11.

[0026] As it is not necessary to provide a rigid frame in the form of joined-together profiled elements to support the panel 11, in that the profiled elements carried by the panel are joined only to the panel itself, the door construction is greatly simplified.

[0027] Moreover the profiled elements can be made with smaller dimensions, in particular with regard to the width of the perimetral rim which they define on the front surface 12', with consequent improvement in the general appearance of the door.

[0028] The door of the invention can be manufactured by the following method, offering further advantages in door manufacture. To assemble the panel 11, the sheets 12 and 13 are placed together with the spacer 15 interposed, then a synthetic resin-based adhesive is distributed over the outer side 15a of the perimetral spacer 15 and along the edge 12a and 13a of the sheets 12 and 13 respectively. This adhesive is such that it adheres to the sheets and spacer, and then hardens to define the panel edge 11a.

[0029] As soon as possible after the adhesive is in place, and in any event before the resin has completely hardened, the first profiled element 21 is positioned on the relative panel edge 11a in contact with the resin layer 17, so that when hardening has occurred the profiled element 21 has been joined to the panel by said resin.

[0030] An adhesive suitable for the aforescribed purpose is a polysulphide based two-component resin, for example a known resin with the brand name of "THIOKOL".

[0031] Advantageously, before said resin placed on the panel outer edges 11a has hardened, all the profiled elements 21-24 are positioned on their respective sides of the panel in contact with the resin 17, so that when

said hardening has occurred said profiled elements 21-24 have been joined to the panel 11 by said resin.

[0032] This method further simplifies door manufacture.

[0033] The door of the invention could also be manufactured by a different method, for example by gluing the first profiled element 21 and the other possible elements to the panel 11 using traditional techniques, after the resin 17 has hardened.

[0034] With reference to the embodiment shown in Figures 5-10, the door, indicated overall by 110, comprises a glazed panel 11 identical to that heretofore described, ie with two transparent sheets 12 and 13, one front and the other rear, typically of glass or of other transparent material.

[0035] The two sheets 12 and 13 are parallel and spaced apart to define an air interspace 14. Between them there is interposed a perimetral spacer 15 in contact with the mutually facing inner faces of the sheets and extending along the entire perimetral edge of the sheets. The spacer 15 is joined to both the sheets 12 and 13 and acts as a means for securing them together. In cooperation with the sheets it also defines and closes the interspace 14. The sheets 12 and 13 are joined together and to the perimetral spacer 15 by a synthetic resin-based adhesive 17, which usually covers the outer side 15a of the perimetral spacer 15.

[0036] The edges 12a and 13a of the sheets 12 and 13 and the outer side 15a of the spacer 15 are positioned substantially in the same plane. This characteristic is repeated on the four sides of the panel 11 and produces for the panel 11 four edges 11a which are narrow and flat.

[0037] In full view, the front surface of the panel 11 is defined by the outwardly facing surface 12' of the front sheet 12.

[0038] This embodiment of the invention comprises a curved transparent sheet 151 with vertical generating lines, which is positioned in front of the front surface of the panel 111 and has its own rear concave surface 151" in contact with the panel front surface (defined by the front surface 12' of the front sheet 12) along the two front vertical corners 511 of this latter. In the preferred embodiment, shown in the figures, the curved sheet 151 has a greater width than the panel 111 and projects laterally beyond said front vertical corners 511 thereof, with which its rear surface 151" makes contact.

[0039] Along the lines of contact between the surface 151" and the corners 511 there are positioned seams 155 of adhesive arranged to seal these lines and to join the panel and the curved sheet together.

[0040] Two circular segment-shaped closure elements, namely an upper one 152 and a lower one 153, are provided along the upper horizontal side and lower horizontal side of the door 110 to upperly and lowerly close the interspace defined by the panel front sheet and the curved sheet.

[0041] In detail, said elements 152, 153 each con-

sist of a solid having two circular segment-shaped identical opposite flat bases 156, a rear flat face 157 and an arched face 158, which matches the curvature of the curved sheet 151. The rear face 157 is positioned in contact with the front surface 12' of the panel 11 and sealed thereagainst by a seam 161 of sealing adhesive, the face 158 being positioned in contact with the rear surface 151" of the curved sheet 151 and sealed thereagainst by a seam 162 of sealing adhesive.

[0042] Between the panel 11 and the curved sheet 151 there remains defined an interspace 154 which is hermetically sealed along its sides by the seams 155 and at its top and bottom by the elements 152 and 153.

[0043] The elements 152 and 153 possess an internal cavity 159 in which hygroscopic substances are contained to maintain the air present in the interspace 154 dry. In this case the elements 153 are provided with holes in that base 156 facing the interior of the interspace 154, to connect the cavity 159 to the interspace.

[0044] As in the first embodiment, there is again provided a first profiled element 121 extending along one side of the glazed panel 11 and fixed rigidly to this side.

[0045] The cross-section through this profiled element 121 (see Figure 7) possesses two inner surfaces 132 and 133 which are positioned in contact with the edge 11a of the panel 11, and in particular with the layer 17, and are fixed to this by interposed adhesive.

[0046] The cross-section through the profiled element 121 also possesses a lower corridor 134 for receiving by insertion a usual gasket element 135 for sealing the door 110, when closed, against the front edge of the refrigerator cabinet structure 9. Specifically, when seen in cross-section the gasket 135 possesses an appendix 136 with a dovetail profile which is snap-inserted into the lower corridor 134. In its upper part (see Figure 7) the cross-section through the profiled element 121 possesses a fin 137 which covers a narrow strip of the front surface 151' (that visible convex surface) of the curved sheet 151, close to the vertical edge of this latter.

[0047] The corridor 131 is arranged to contain the means, of known type not shown in the figures, for securing the hinge to the cabinet structure 9. For example, drilled blocks can be suitably inserted and fixed in the corridor 131 in the vicinity of the two ends of the profiled element 121, to receive in their holes the hinge pins 138, of vertical axis (one of these pins is shown in Figure 5), fixed to the cabinet structure 9 to define the vertical axis about which the door 110 rotates. To the side of the corridor 131 there is provided a second corridor 142 into which usual electrical resistance elements can be inserted to be fed with current to heat the panel 11 (to prevent condensation on its glazed surfaces).

[0048] When mounted on the cabinet structure, the panel 11 is secured to it only via the profiled element 121 and is supported only by this latter.

[0049] Advantageously, respective profiled ele-

ments are also positioned on and secured to the other sides of the panel 11 (those not constrained to the cabinet structure 9) and are supported only by this latter. In particular, a second profiled element 122 is positioned on the vertical side opposite that on which the first profiled element 121 is positioned, two profiled elements 123 and 124 being positioned on the upper and lower horizontal sides of the panel 11.

[0050] The second profiled element 122 has the same cross-section as the first profiled element 121. In particular, it possesses a corridor 134 to receive by insertion the appendix 136 of the gasket 135. The profiled element 122 can also be fixed by usual means to a usual handle 7 for operating the door.

[0051] The horizontal profiled elements 123 and 124 (see Figure 8) are mutually identical and cover only the upper edge of the panel 11. Their function is mainly to carry the gasket 135. For this purpose they both comprise a corridor 141 for receiving the appendix 136 of the gasket 135 by insertion.

[0052] The gasket 135 is in one piece in the form of a rectangular rim (composed of four longitudinal elements joined together at their corners), which extends along the entire perimeter of the panel 11 and is fixed to it by means of said corridors 134 and 141.

[0053] The four profiled elements 121-124 are not joined together (this would be in any event pointless from the mechanical stress resistance aspect), and are supported by the panel 11.

[0054] The door of this embodiment can also be constructed by the aforescribed method.

[0055] In the embodiment shown in Figures 5-10, the curved sheet 151 has a greater height than the panel 11 and projects upwards and downwards beyond its upper and lower sides. The projecting portion covers the profiled elements 123 and 124 positioned on the horizontal sides of the panel. The result is that the panel 11 is completely covered on its front by the curved sheet 151 to achieve a refined appearance.

[0056] Numerous modifications of a practical and applicational nature can be made to the invention, but without leaving the scope of the inventive idea as hereinafter claimed.

Claims

1. A transparent closure door for refrigerator cabinets, comprising a glazed panel with at least two spaced-apart parallel transparent sheets (12, 13) rigidly joined together by an interposed perimetral spacer (15) extending along the entire perimetral edge of the sheets to close the interspace (14) defined by the sheets, characterised by comprising a first profiled element (21, 121) extending along one side of the glazed panel, to which it is rigidly fixed, and having at least one corridor (31, 131) for containing the means for securing the hinge to the cabinet structure (9), the panel being fixed to the cabinet struc-

ture only by means of said profiled element (21, 121) and being supported only by this, without the aid of any rigid whole frame enclosing the panel.

2. A door as claimed in claim 1, characterised by comprising respective profiled elements (22, 23, 24, 122, 123, 124) which are positioned on and secured to those sides of the panel not constrained to the cabinet structure (9), they being supported only by the panel, and having fixed to them a gasket element (35, 135) for sealing the door, when closed, against the cabinet structure (9).
3. A door as claimed in claim 1, characterised in that the glazed panel possesses a narrow flat lateral edge (11a, 111a), the profiled element being joined by adhesive to said lateral edge.
4. A door as claimed in claim 1, characterised in that the profiled element possesses coplanar surfaces (32, 33, 132, 133) which make contact with the panel edge (11a, 111a), and are fixed thereto by interposed adhesive, its cross-section being shaped in such a manner as to insertedly receive the gasket element (35, 135) for sealing the door, when closed, against the cabinet structure (9).
5. A door as claimed in claim 1, characterised by comprising, to the side of the corridor (31, 131), a second corridor (42, 142) into which usual electrical resistance elements can be inserted to be fed with current to heat the panel (11).
6. A method for constructing the door claimed in claim 1, in which the panel sheets (12, 13) are joined together and to the perimetral spacer (15) by a layer (17) of synthetic resin adhesive spread over the outer side of the perimetral spacer to adhere to the transparent sheets (12, 13) and to the spacer (15), characterised by firstly assembling the glazed panel by placing the sheets (12, 13) and the perimetral spacer (15) together and spreading the synthetic resin (17) over the outer side of the spacer, then before the resin has hardened placing the first profiled element (21, 121) on the relative side of the panel in contact with the resin, so that when hardening has occurred the profiled element (21, 121) has been joined to the panel by means of said resin.
7. A door construction method as claimed in claim 6, characterised in that said adhesive is a polysulphide based two-component adhesive.
8. A door construction method as claimed in claim 6, characterised in that, before said resin (17) spread over the panel edges (11a) has hardened, all the profiled elements (21-24, 121-124) are placed on

the respective sides of the panel, in contact with the resin (17), so that when hardening has occurred said profiled elements (21-24, 121-124) have been joined to the panel by means of said resin.

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9. A transparent curved-surface closure door for refrigerator cabinets, as claimed in claim 1, characterised by comprising a curved transparent sheet (151) with vertical generating lines, which is positioned in front of the panel front surface (12') and has its own concave surface in contact with this front surface (12') along the two front vertical corners (511) of this latter, along the lines of contact there being positioned seams (155) of adhesive arranged to seal said lines and to join the panel and the curved sheet together. 10
10. A door as claimed in claim 9, characterised by comprising two circular segment-shaped closure elements (152, 153) provided along the upper horizontal side and lower horizontal side of the door to upperly and lowerly close the interspace (154) defined by the panel front sheet (12) and the curved sheet (151). 20
11. A door as claimed in claim 9, characterised in that said closure elements (152 and 153) possess an internal cavity (159) containing hygroscopic substances able to maintain the air present in the interspace (154) dry, the elements (153) being provided with holes facing the interior of the interspace (154) to connect the cavity (159) to the interspace. 25 30
12. A door as claimed in claim 9, characterised in that each of said closure elements (152, 153) possesses a rear flat face (157) positioned in contact with and sealed to the front surface (12') of the panel (11), and an arched face (158) which matches the curvature of the curved sheet (151) and is positioned in contact with and sealed to its rear surface (151"). 35 40
13. A door as claimed in claim 9, characterised in that the curved sheet (151) has a width greater than the panel and projects laterally beyond those front vertical corners (511) of the panel with which its rear surface makes contact. 45
14. A door as claimed in claim 9, characterised in that the curved sheet (151) has a height greater than the panel and projects upwards and downwards beyond the upper and lower sides of the panel. 50
15. A door as claimed in claim 9, characterised by comprising a first profiled element (121) extending along a vertical side of the glazed panel, to which it is rigidly fixed, and having at least one corridor (131) for containing the means for securing the 55

hinge to the cabinet structure (9), the panel being fixed to the cabinet structure only by means of said profiled element (121) and being supported only by this, without the aid of any rigid whole frame enclosing the panel.

16. A door as claimed in claim 15, characterised by comprising, to the side of the corridor (131), a second corridor (142) into which usual electrical resistance elements can be inserted to be fed with current to heat the panel (111).
17. A door as claimed in claim 15, characterised by comprising, in addition to said first profiled element, respective profiled elements (122, 123, 124) which are positioned on and secured to those sides of the panel not constrained to the cabinet structure (9), they being supported only by the panel, and having fixed to them a gasket element (135) for sealing the door, when closed, against the cabinet structure (9).

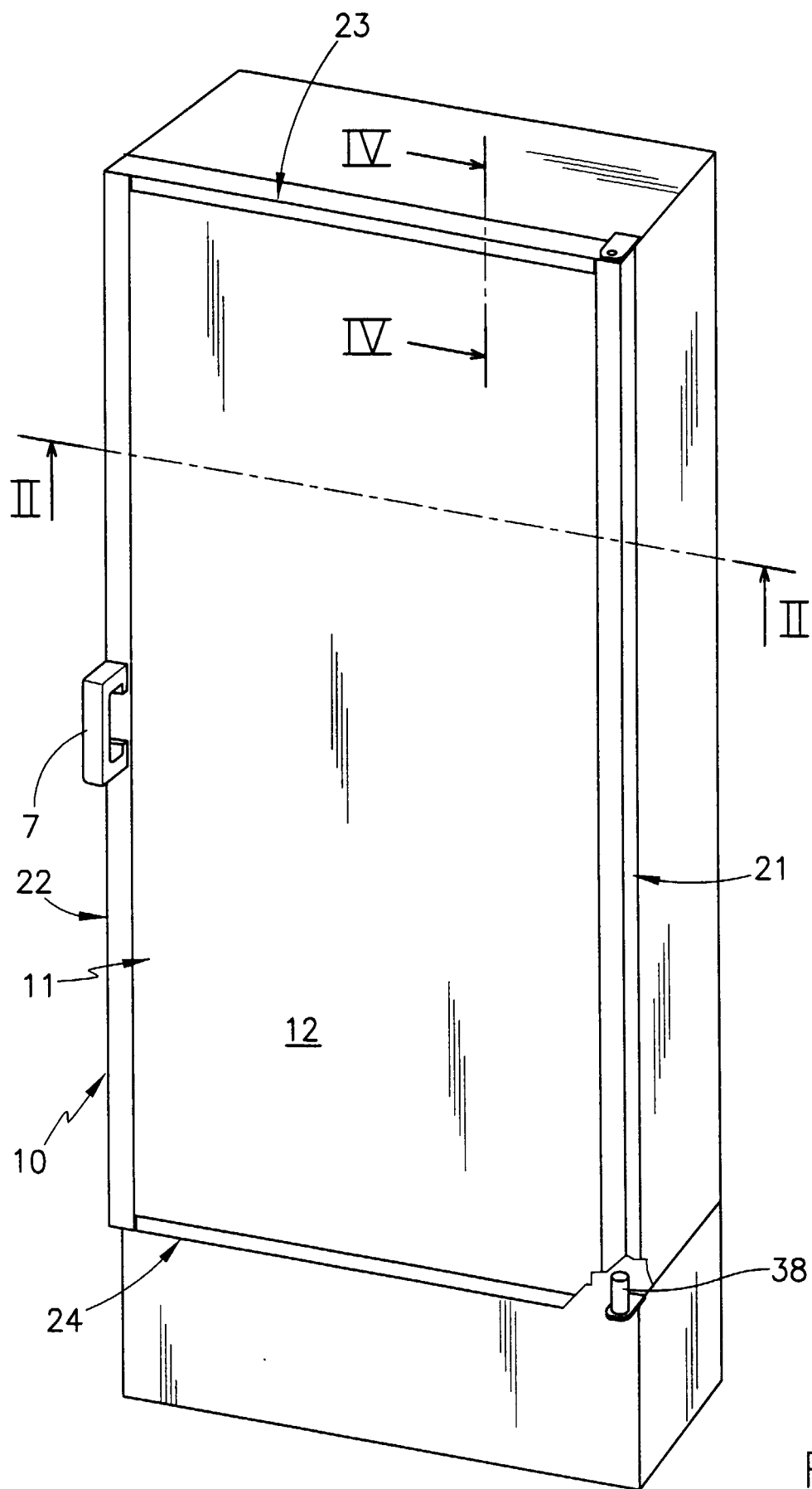
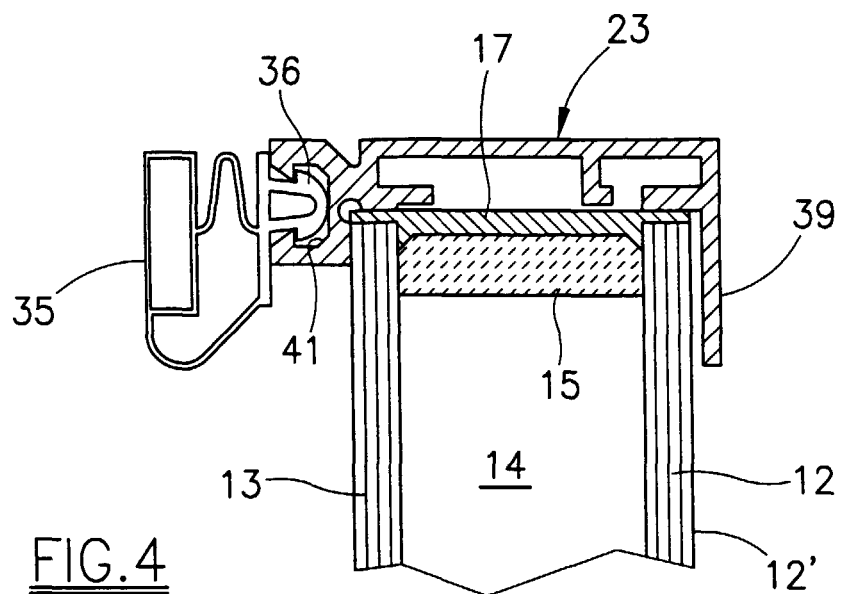
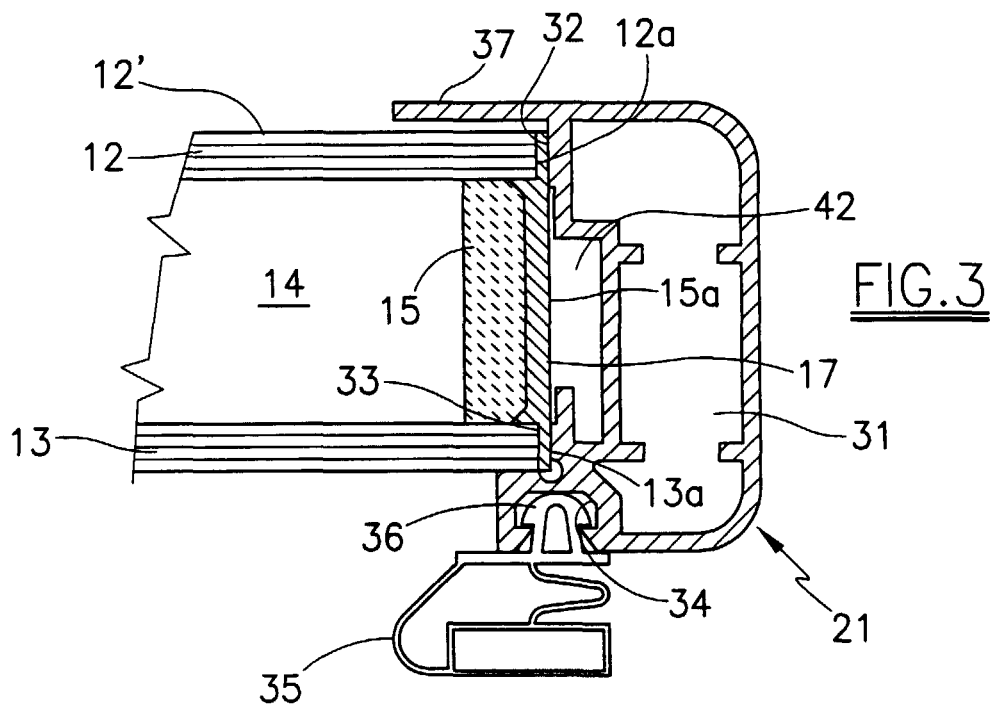
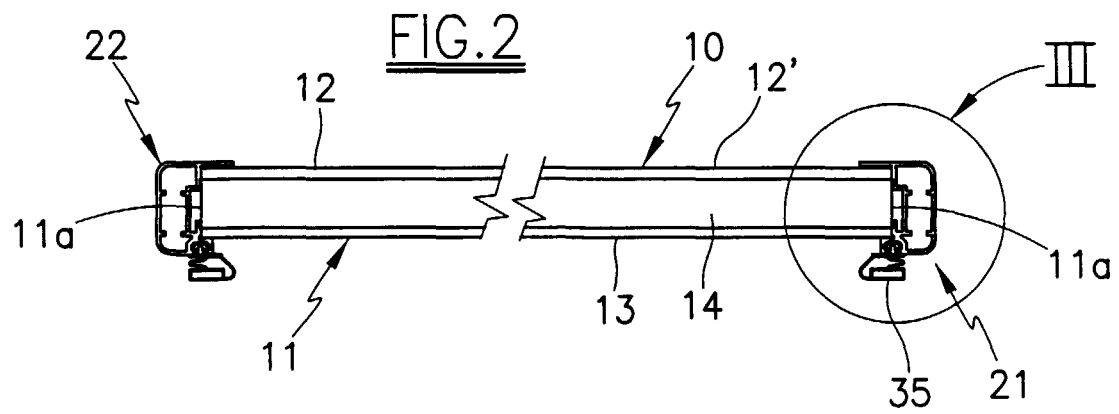


FIG. 1



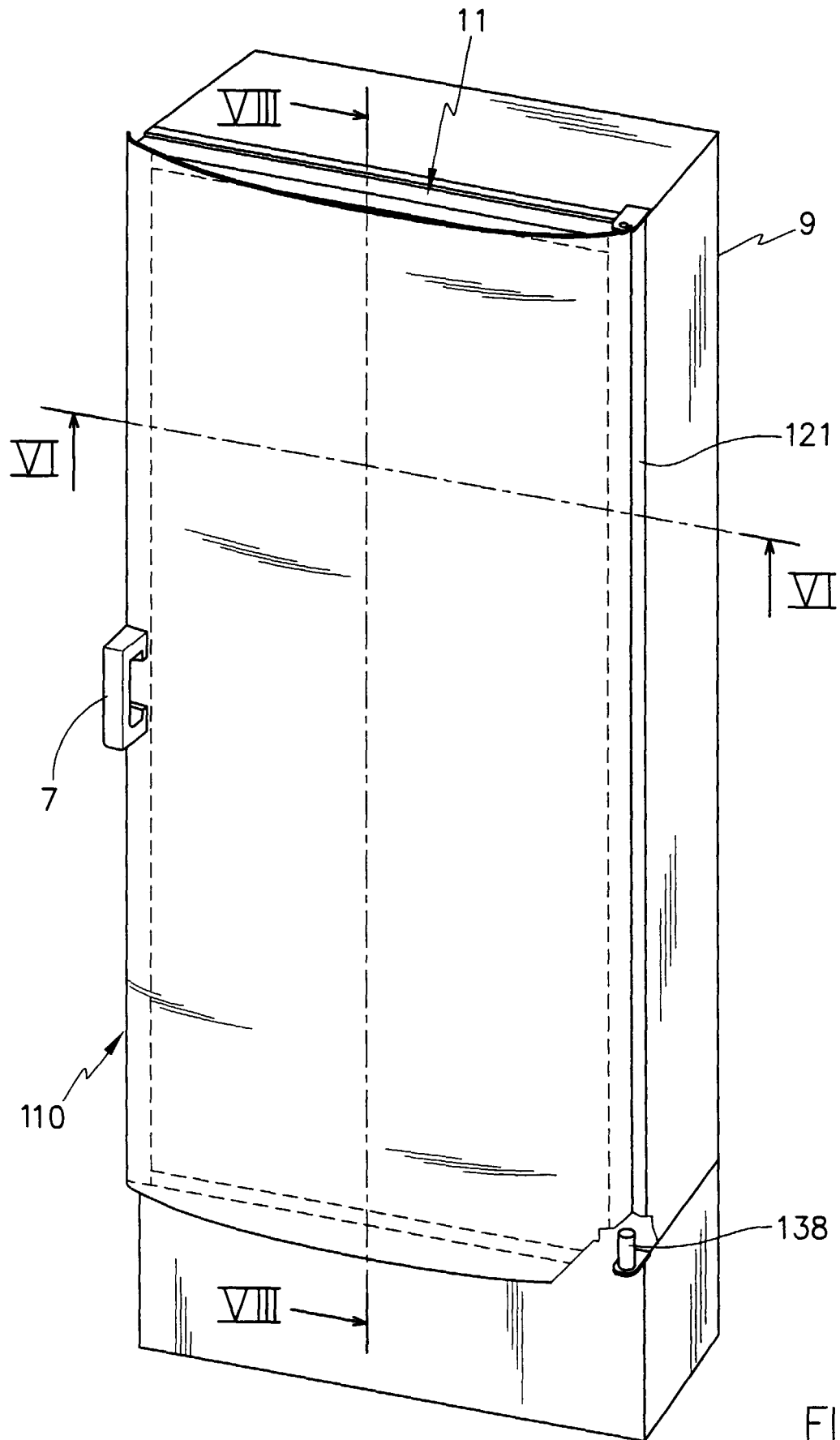


FIG.5

