



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.09.2011 Bulletin 2011/37

(51) Int Cl.:
F24H 9/02 (2006.01)

(21) Application number: **10002310.0**

(22) Date of filing: **05.03.2010**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA ME RS

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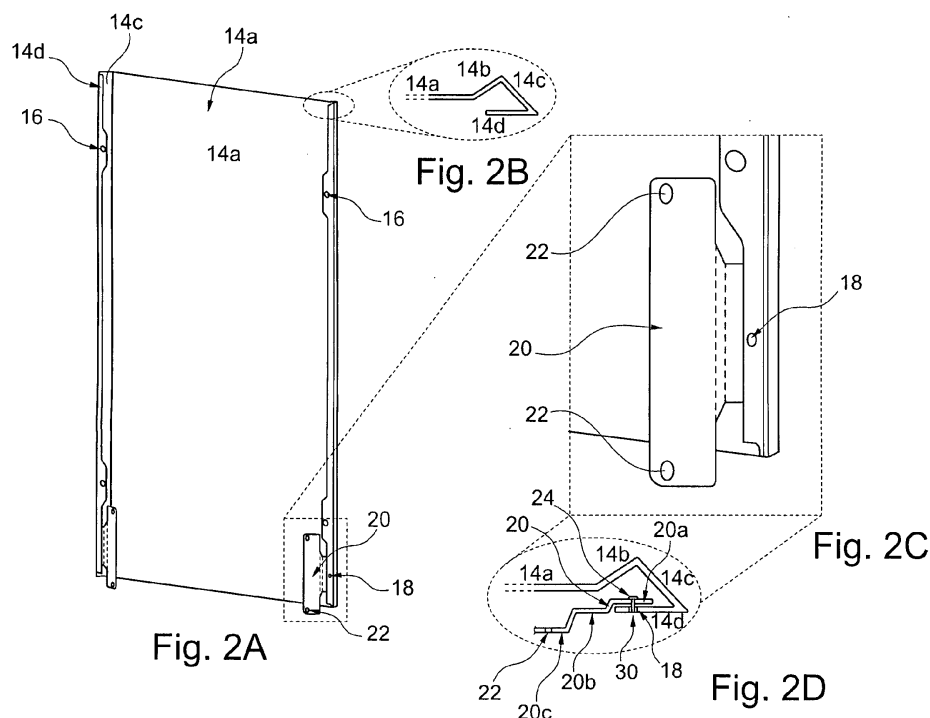
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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) **Enclosure for heating system unit**

(57) An enclosure, particularly for a heating system unit or a combined heating/cooling system unit, the enclosure comprising a frame (12) and a plurality of exterior panels (13, 14, 15), wherein at least one exterior panel (13, 14, 15) is provided with at least three fixing points

(12, 16) each adapted to be engaged with a corresponding fixing point (17) on the frame (12) and wherein each of at least two fixing points (22) is provided on a plastically deformable alignment part (20) attached to the panel (13, 14, 15).



Description

Field of the invention

[0001] The present invention relates to an enclosure comprising a frame and a plurality of exterior panels attached thereto, and more specifically to an enclosure for a heating system unit or a combined heating/cooling system unit, preferably for domestic, industrial or commercial space heating and/or cooling.

Background of the invention

[0002] When providing a heating system to a dwelling, office, factory or other structure there is a necessity to provide an enclosure for components of the heating system which may otherwise be exposed. Such an enclosure may be necessary on technical grounds, for example to prevent users from inappropriately interacting with the components of the heating system, on safety grounds, for example to isolate component parts from inappropriate interaction, or on aesthetic grounds, for example to conceal unsightly apparatus from occupants of the structure.

[0003] It is conventional to attach such panels to a frame within which the components to be obscured are located. Furthermore, it is conventional to provide fixing points on the frame and to provide corresponding fixing points on the panel so that during installation components can be located within the frame and then exterior panels attached to the frame to enclose the components.

[0004] However, for reasons of economy it is generally preferable to manufacture the panels as separate, mass-produced parts which the installer will provide to the frame during installation. In order to ensure a good fit, the fixing points on the frame should correspond exactly with the fixing points on the panel, otherwise a poor fit will result. The consequences of a poor fit can include difficulty in installing the panel, misalignment between a panel and a neighbouring panel, difficulty in later removing the panel for the purposes of maintenance, and potentially damage to either the panel or the frame during installation or subsequent removal. Misalignment or damage can lead to further problems, such as inadequate environmental sealing of an enclosure, for example to exclude dust.

Summary of the invention

[0005] According to a first aspect of the present invention, there is provided an enclosure for a heating system unit or a combined heating/cooling system unit, the enclosure comprising a frame and a plurality of exterior panels wherein at least one exterior panel is provided with at least three fixing points each adapted to be engaged with a corresponding fixing point on the frame and wherein each of at least two fixing points is provided on a plastically deformable alignment part attached to the panel.

[0006] Plastically deformable, in the present case, refers to a requirement wherein the alignment part may be plastically (non-elastically, or substantially permanently) deformed by application of manual force to the panel or the part.

[0007] The invention provides a solution to the problem of allowing mass-produced exterior panels to be applied to mass-produced frames to provide an enclosure for a heating system unit reliably and easily, even in the case where manufacturing tolerances in production of either part may be poor.

[0008] In preferable embodiments, there may be four or more fixing points, at least two of which are provided on a single plastically deformable alignment part, or on independent plastically deformable alignment parts, attached to the panel. The fixing points may be arranged to define a rectangle or trapezium, and the at least two fixing points may preferably between them define one side of the rectangle or trapezium.

[0009] A preferable embodiment of the first aspect of the present invention is provided wherein the alignment part, is arranged to pivot in a plane parallel to that defined by the panel and has the fixing point located at a position other than at the pivot point.

[0010] Such an embodiment enables a wider variety of manufacturing tolerances to be accommodated.

[0011] A preferable embodiment of the first aspect of the present invention is provided wherein the alignment part comprises a plate-shaped portion having a hole through which a fixing element can be introduced to engage the fixing point of the frame with the fixing point of the alignment part.

[0012] Such an embodiment enables ease of both manufacturing and installation.

[0013] A preferable embodiment of the first aspect of the present invention is provided wherein the alignment part is pivotable to be engaged with a fixing point of the frame at a location beyond the boundary of the panel.

[0014] Such an embodiment enables the panel to be easily installed and removed while concealing the fixture.

[0015] A preferable embodiment of the first aspect of the present invention is provided wherein the alignment part is deformable to adjust an angle and/or a width of a gap between the said panel and an adjacent panel.

[0016] Such an embodiment enables adjustment of the panel to improve aesthetic appearance and sealing capability of the enclosure.

[0017] A preferable embodiment of the first aspect of the present invention is provided wherein the alignment part is pivotable to adjust an angle and/or a width of a gap between the said panel and an adjacent panel.

[0018] Such an embodiment also enables alternative or additional adjustment of the panel to improve aesthetic appearance and sealing capability of the enclosure.

[0019] A preferable embodiment of the first aspect of the present invention is provided wherein at least two opposite edges of the panel are formed as reflex portions, being portions folded back from the exterior surface of

the panel, each defining a fixing plate having at least one fixation point thereon.

[0020] Such an embodiment enables simplicity in manufacturing while preserving a uniform external appearance. By folding back edges of the panel as fixing plates, fixtures remain behind the outermost surface of the panel and neither protrude nor afford the possibility of snagging.

[0021] A preferable embodiment of the first aspect of the present invention is provided wherein each alignment part is pivotably engaged with the respective fixing plate on a side of the fixing plate being interior to the reflex portion.

[0022] Such an embodiment reduces the profile of the exterior panel while preserving ease of fitting.

[0023] According to a second aspect of the present invention, there is provided a method of assembling the enclosure for the heating system unit defined by Claim 1, the method comprising the steps of engaging the at least two fixing points of the panel with corresponding fixing points of the frame; and applying force to the panel to plastically deform the alignment part to bring the panel into a desired position.

[0024] The second aspect of the invention also provides a solution to the problem of allowing mass-produced exterior panels to be applied to mass-produced frames to provide an enclosure for a heating system unit reliably and easily, even in the case where manufacturing tolerances in production of either part may be poor.

[0025] A preferable embodiment of the second aspect of the present invention is provided wherein the alignment part is arranged to pivot in a plane defined by the panel and has the fixing point located at a position other than at the pivot point, the method further comprising the step of applying force to the panel to pivot the alignment part to bring the panel into a desired position.

[0026] Such an embodiment enables a wider variety of manufacturing tolerances to be accommodated.

[0027] A preferable embodiment of the second aspect of the present invention is provided wherein each fixing point of the respective alignment parts is engaged with the frame at a position beyond the boundary of the panel.

[0028] Such an embodiment enables the panel to be easily installed and removed while concealing the fixture.

[0029] A preferable embodiment of the second aspect of the present invention is provided wherein the alignment part is plastically deformed to adjust an angle and/or a width of a gap between the said panel and an adjacent panel.

[0030] Such an embodiment enables adjustment of the panel to improve aesthetic appearance and sealing capability of the enclosure.

[0031] A preferable embodiment of the second aspect of the present invention is provided wherein the alignment part is pivoted to adjust an angle and/or a width of a gap between the said panel and an adjacent panel.

[0032] Such an embodiment also enables alternative or additional adjustment of the panel to improve aesthetic

appearance and sealing capability of the enclosure.

Description of the accompanying Drawings

[0033] For a better understanding of the present invention, and to show how the same may be carried into effect, reference will now be made, by way of example only, to the accompanying Drawings, in which:

Fig. 1A shows an enclosure for a heating system unit being an embodiment of the present invention; Fig. 1B shows a detail of the embodiment of Fig. 1A; Fig. 2A shows an example of an exterior panel suitable for incorporation into the embodiment of Fig. 1A; Fig. 2B shows a cross-section of the circled portion of Fig. 2A; Fig. 2C shows an enlargement of detail from Fig. 2A, and particularly shows an alignment part suitable for use in embodiments of the present invention; Fig. 3A is a plan view of an alignment part suitable for use in embodiments of the present invention; Fig. 3B is a cross-section of the alignment part of Fig. 3A.

Detailed Description

[0034] Figure 1A shows an enclosure for a heating system unit, being one embodiment of the present invention. The heating system unit 10 comprises a frame 12 (not visible) within which components of the heating system unit may be located, and a number of exterior panels 13, 14, 15 mounted thereto to screen the enclosed components from exterior access and view.

[0035] Visible in Figure 1A are a hexagonal top panel 15 and rectangular side panels 13 and 14. Figure 1A shows a substantially cuboid geometry, but of course, the geometry in Figure 1A is merely exemplary and the heating system unit could equally well be provided with a larger number of exterior panels in a different arrangement, as required by the installation space, the frame structure and the configuration of components to be located inside. The side panels, certainly, need not be rectangular, but might be generally trapezoidal, for example, and panels 13 and 14 need not be identical. The enclosure need certainly not be closed on all sides, for example if designed to be installed against a wall. Dimensions are entirely within the ability of the skilled designer to select based on the forces the enclosure is to resist and the apparatus it is to enclose.

[0036] In the embodiment of Figure 1A, the panels of the frame are formed of sheet metal, for example stainless steel, and are coated with a thin laminate of plastic film or enamel to provide and preserve surface finish. However, the choice of materials is within the freedom of the designer and, for example, the panels might equally well be fabricated from plastic, for example ABS. Similarly, in the present embodiment the frame is made of bent and welded sheet steel, although tubular aluminium

alloy or steel space-frame construction as well as other materials are possible.

[0037] Figure 1B shows a close-up of the boxed region on Figure 1A, showing the junction between the panel 14 and panel 13. In the present embodiment, panel 14 and panel 13 are formed with surface portions 14a and 13a, transition portions 14b and 13b, and junction portions 14c and 13c. Aesthetically, it is desirable that the gap between elements 14c and 13c, once installed, be configured and maintained to be uniform, narrow, and well aligned along its length.

[0038] Figure 1C shows a view of the enclosure of Figure 1A with panels 13 and 14 removed. Panel 15 remains mounted, and clearly visible is frame 12 surrounding the components within. Notable are frame fixing points 17, whose function will become clear from the following description.

[0039] Figure 2A shows a view of panel 14 in an unmounted condition, showing the reverse, i.e. that portion which is not externally facing when the panel is mounted. The panel exhibits a reflex portion 14d, folded back on itself away from the exterior surface of the panel and defining a fixing plate over its surface. This configuration is shown more clearly in profile in Figure 2B, where transition portions 14b and 14c link 14a to 14d to form the reflex structure. The reflex portion/fixing plate 14d has formed therein conventional fixing points 16. These fixing points correspond to frame fixing points 17 and are configured to engage therewith. In the present embodiment, these are formed as holes to accommodate an engagement member therein. Such might be a spring clip or hook, while other options, such as press-studs to engage corresponding recesses in the frame, are possible. Desirably, the fixing method does not involve elements visible from the exterior of the enclosure when the panel is mounted.

[0040] Also formed in the fixing plate are holes 18 to which deformable alignment part 20 is attached. A larger view of this arrangement may be found in Figure 2C, which enlarges the boxed area of Figure 2A. As can be seen in Figure 2C, alignment part 20 is attached on an interior portion of the reflex portion 14d and is itself provided with hole 22 which provides another fixing point for engagements to the frame. Alignment part 20 is attached to fixing panel 14d in a pivotable manner around the axis of hole 18. This could be achieved, for example, by means of a rivet, a self-tapping screw or a nut-and-bolt fixture. A cross-section of the panel and the alignment part is shown in Figure 2D. Here, the pivotable fixture is provided by means of a nut-end-bolt arrangement 30 passing through hole 18 in fixing panel 14d and through hole 24 provided in alignment part 20.

[0041] It can also be seen in Figure 2D that alignment part 20 is constructed in a stepped configuration with step portions 20a, 20b and 20c, hole 22 being formed in step portion 20c so as to project rearwardly to the panel beyond the plane defined by opposed fixing portions 14d. Of course, other configurations of alignment part 20 will

be selected by the skilled person to fulfil manufacturing and design requirements.

[0042] Figure 3A and 3B respectively show plan and cross-section views of alignment part 20. As will be seen, it is important that alignment part 20 be deformable, and to this end, in the present embodiment it is formed from sheet steel. The stepped portions 20a, 20b and 20c, in the present embodiment formed by bending sheet metal, allow the part to be deformed along bend lines 20d and 20e to achieve a variety of configurations during installation.

[0043] It is to be noted that alignment part 20 is preferably to be formed with mirror symmetry through hole 24 such that two holes 22 are equidistant from hole 24 and equiangular from the line of symmetry, such that holes 22 and hole 24 form an isosceles triangle. Such a configuration is advantageous for manufacturing efficiency as the same alignment part can be applied to opposite sides of the frame by means of a 180 degree rotation about hole 24 to form a mirror-image configuration.

[0044] It will now be taught how panel 14 may be attached to frame 12 to form the enclosure 10. In the present instance, it is assumed that panel 13 has already been applied to frame 12, however, the sequence of engaging the panels can be varied within the requirements of the installer.

[0045] Firstly, fixing points 16 are engaged with corresponding fixing points 17 on the frame. If the fixing points on the frame are hooks, fixing points 16 may be hooked over to engage the panel with the frame. If the fixing points are press-studs, the panel can merely be pressed onto the frame. In practice, the choice of fastener used is within the choice of the designer.

[0046] Then, the fixing points 22 on alignment part 20 are brought into alignment with further corresponding fixing points on the frame, not shown on the Figures but located towards the lower end of the appropriate face of the frame. As each fixing point 22 is located at a portion of alignment part 20 which projects beyond the boundary of the panel 14, these points remain easily accessible to the installer during this portion of the installation. However, even though the fixing points 22 present themselves below the lowermost edge of panel 14, because the fixing plates 16 are provided as reflex portions the fixing points are not visible when viewed from an oblique angle, for example by a person in a standing position.

[0047] As the alignment part is pivotable about pivot point 18, the part may be adjusted by rotation to align with imperfectly located holes on the frame. In the present embodiment, as can be seen in Figure 3A, fixing point 22 are provided as elliptical holes to better accommodate manufacturing variation. Either or both of these techniques may be applied simultaneously to cope with the widest range of manufacturing imperfections.

[0048] Once fixing points 22 are aligned with the corresponding fixing points on the frame, a fastener may be employed to engage each fixing point 22 with the corresponding fixing point on the frame. In the present em-

bodiment, a self-tapping screw is contemplated to provide this engagement. Press-studs, bolts or other fasteners are entirely within the selection of the skilled designer.

[0049] Once each hole 22 on each of the two alignment parts 20 visible in Figure 2A has been aligned with and engaged with the corresponding fixing points on the frame, force may be applied to the panel as a whole both to pivot the alignment part about their respective pivot points, thereby rotating the panels about an axis perpendicular to the face of the panel 14a, and force may also be provided in a direction perpendicular to the surface of the panel, for example along the lowermost edge of the panel shown in Figure 2A, to tilt the panel bringing the lowermost edge of the panel away from or towards the frame. In applying such force, as the alignment parts are plastically deformable, they will bend to accommodate the application of force and the re-orientation of the panel as the installer requires.

[0050] The installer is consequently able, having located the panel in position and fixed it via the fixing points 16 and 22 to the frame 12, to adjust the orientation and position of the panel once fixed to achieve a uniform narrow gap between panel 14 and a neighbouring panel, e.g. panel 16.

[0051] Of course, the invention is not limited to the specific configuration described above, and many variations will be easily contemplated by those skilled in the art. For example, the precise geometries shown in the above embodiment need not be adhered to, neither in shape of panel, configuration of fixing part, or overall shape of enclosure. Specifically, the concept of providing a fixing point to an exterior panel on a deformable alignment part to solve the problem of overcoming manufacturing inaccuracies while providing the ability for the installer to adjust the panel after it has been fixed to the frame may be implemented in a wide variety of forms and contexts.

[0052] Those skilled in the art will no doubt build on their specialist background knowledge when considering the above disclosures, factoring into their consideration of the present disclosure the specialist knowledge that they have narrow in experience in this field. Evidently, engineers from other corporations will have their own design history and preferred ways of implementing the teachings set out above. The claims that follow should be seen to define the present inventive concept and should not be seen as directed explicitly to the illustrated embodiments, nor should they be seen as limited to mechanical equivalents of features shown in the illustrated embodiment.

[0053] Accordingly, the present invention is not to be limited by the above disclosure, but should be considered to encompass all modifications, adaptations and variations which remain within the scope of the appended claims.

Claims

1. An enclosure, particularly for a heating system unit

or a combined heating/cooling system unit, the enclosure comprising a frame (12) and a plurality of exterior panels (13, 14, 15)

wherein at least one exterior panel (13, 14, 15) is provided with at least three fixing points (12, 16) each adapted to be engaged with a corresponding fixing point (17) on the frame (12)

and wherein each of at least two fixing points (22) is provided on a plastically deformable alignment part (20) attached to the panel (13, 14, 15).

2. An enclosure for a heating system unit as defined in claim 1, wherein the alignment part (20), is arranged to pivot in a plane parallel to that defined by the panel (13, 14, 15) and has the fixing point (22) located at a position other than at the pivot point (18).

3. An enclosure for a heating system unit as defined in claim 2, wherein the alignment part (20) is pivotable to be engaged with a fixing point (17) of the frame (12) at a location beyond the boundary of the panel (13, 14, 15).

4. An enclosure for a heating system unit as defined in claim 2 or 3, wherein the alignment part (20) is pivotable to adjust an angle and/or a width of a gap between the said panel (13, 14, 15) and an adjacent panel.

5. An enclosure for a heating system unit as defined in any preceding claim, wherein the alignment part (20) comprises a plate-shaped portion having a hole (18, 22?) through which a fixing element (24) can be introduced to engage the fixing point (17) of the frame (12) with the fixing point (22) of the alignment part (20).

6. An enclosure for a heating system unit as defined in any preceding claim, wherein the alignment part (20) is deformable to adjust an angle and/or a width of a gap between the said panel (13, 14, 15) and an adjacent panel.

7. An enclosure for a heating system unit as defined in any preceding claim, wherein at least two opposite edges of the panel (13, 14, 15) are formed as reflex portions (14d), being portions folded back from the exterior surface of the panel (13, 14, 15), each defining a fixing plate having at least one fixation point thereon.

8. An enclosure for a heating system unit as defined in claim 7, wherein each alignment part (20) is pivotably engaged with the respective fixing plate on a side of the fixing plate being interior to the reflex portion (14d).

9. A method of assembling the enclosure defined in

any preceding claim, the method comprising the steps of engaging two fixing points (16, 22) of the panel (13, 14, 15) with corresponding fixing points (17) of the frame (12); and applying force to the panel (13, 14, 15) to plastically deform the alignment part (20) to bring the panel (13, 14, 15) into a desired position.

10. The method of Claim 9, wherein the alignment part (20) is arranged to pivot in a plane defined by the panel (13, 14, 15) and has the fixing point (22) located at a position other than at the pivot point (18), the method further comprising the step of applying force to the panel (13, 14, 15) to pivot the alignment part (20) to bring the panel (13, 14, 15) into a desired position.
11. The method of claim 10, wherein the alignment part (20) is pivoted to adjust an angle and/or a width of a gap between the said panel (13, 14, 15) and an adjacent panel.
12. The method of any one of claims 9 to 11, wherein each fixing point (22) of the respective alignment parts (20) is engaged with the frame (12) at a position beyond the boundary of the panel (13, 14, 15).
13. The method of any one of claims 9 to 12, wherein the alignment part (20) is plastically deformed to adjust an angle and/or a width of a gap between the said panel (13, 14, 15) and an adjacent panel.

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

1. An enclosure, particularly for a heating system unit or a combined heating/cooling system unit, the enclosure comprising a frame (12) and a plurality of exterior panels (13, 14, 15) wherein at least one exterior panel (13, 14, 15) is provided with at least three panel fixing points (12, 16) each adapted to be engaged with a corresponding frame fixing point (17) on the frame (12) and **characterised in that** each of at least two of the at least three panel fixing points (22) is provided on a plastically deformable alignment part (20) attached to the panel (13, 14, 15), said plastically deformable alignment part being configured such that force may be applied to the panel when engaged with the frame to plastically deform the alignment part to bring the panel into a desired position.

2. An enclosure for a heating system unit as defined in claim 1, wherein the alignment part (20) is arranged to pivot in a plane parallel to that defined by the panel (13, 14, 15) and has the panel fixing point

(22) located at a position other than at the pivot point (18).

3. An enclosure for a heating system unit as defined in claim 2, wherein the alignment part (20) is pivotable to be engaged with a frame fixing point (17) of the frame (12) at a location beyond the boundary of the panel (13, 14, 15).

4. An enclosure for a heating system unit as defined in claim 2 or 3, wherein the alignment part (20) is pivotable to adjust an angle and/or a width of a gap between the said panel (13, 14, 15) and an adjacent panel.

5. An enclosure for a heating system unit as defined in any preceding claim, wherein the alignment part (20) comprises a plate-shaped portion having a hole (18, 22) through which a fixing element (24) can be introduced to engage the frame fixing point (17) of the frame (12) with the panel fixing point (22) of the alignment part (20).

6. An enclosure for a heating system unit as defined in any preceding claim, wherein the alignment part (20) is deformable to adjust an angle and/or a width of a gap between the said panel (13, 14, 15) and an adjacent panel.

7. An enclosure for a heating system unit as defined in any preceding claim, wherein at least two opposite edges of the panel (13, 14, 15) are formed as reflex portions (14d), being portions folded back from the exterior surface of the panel (13, 14, 15), each defining a fixing plate having at least one fixation point thereon.

8. An enclosure for a heating system unit as defined in claim 7, wherein each alignment part (20) is pivotably engaged with the respective fixing plate on a side of the fixing plate being interior to the reflex portion (14d).

9. A method of assembling the enclosure defined in any preceding claim, the method comprising the steps of engaging two panel fixing points (16, 22) of the panel (13, 14, 15) with corresponding frame fixing points (17) of the frame (12); and applying force to the panel (13, 14, 15) to plastically deform the alignment part (20) to bring the panel (13, 14, 15) into a desired position.

10. The method of Claim 9, wherein the alignment part (20) is arranged to pivot in a plane defined by the panel (13, 14, 15) and has the panel fixing point (22) located at a position other than at the pivot point (18), the method further comprising the step of applying force to the panel (13, 14, 15) to pivot the

alignment part (20) to bring the panel (13, 14, 15) into a desired position.

11. The method of claim 10, wherein the alignment part (20) is pivoted to adjust an angle and/or a width of a gap between the said panel (13, 14, 15) and an adjacent panel. 5

12. The method of any one of claims 9 to 11, wherein each panel fixing point (22) of the respective alignment parts (20) is engaged with the frame (12) at a position beyond the boundary of the panel (13, 14, 15). 10

13. The method of any one of claims 9 to 12, wherein the alignment part (20) is plastically deformed to adjust an angle and/or a width of a gap between the said panel (13, 14, 15) and an adjacent panel. 15

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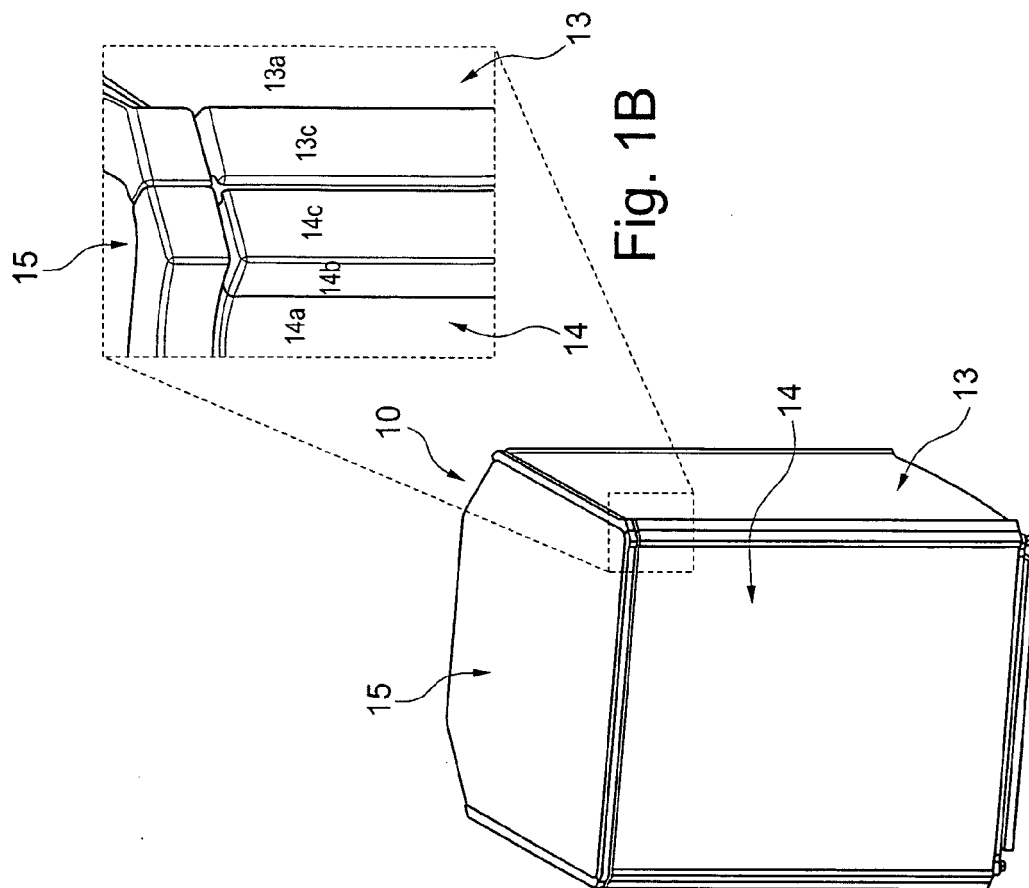


Fig. 1A

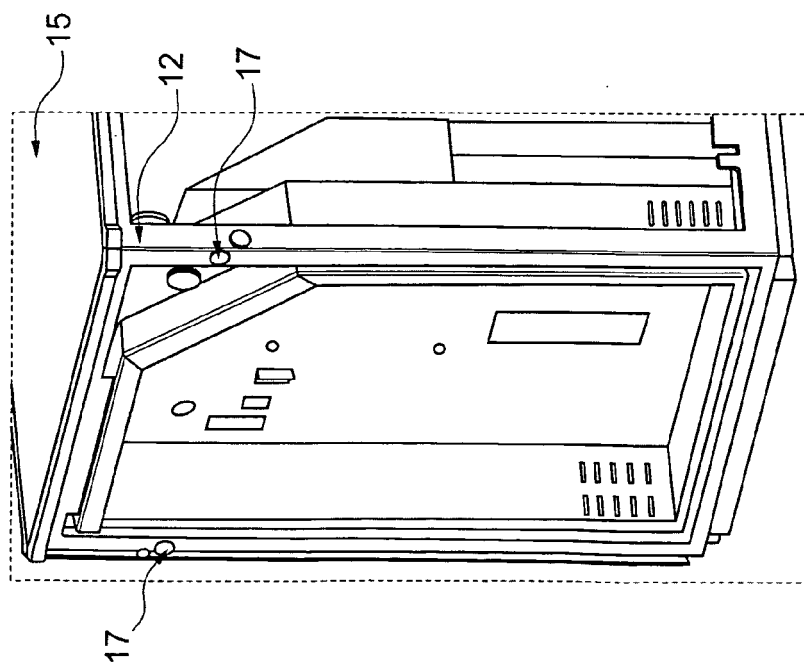
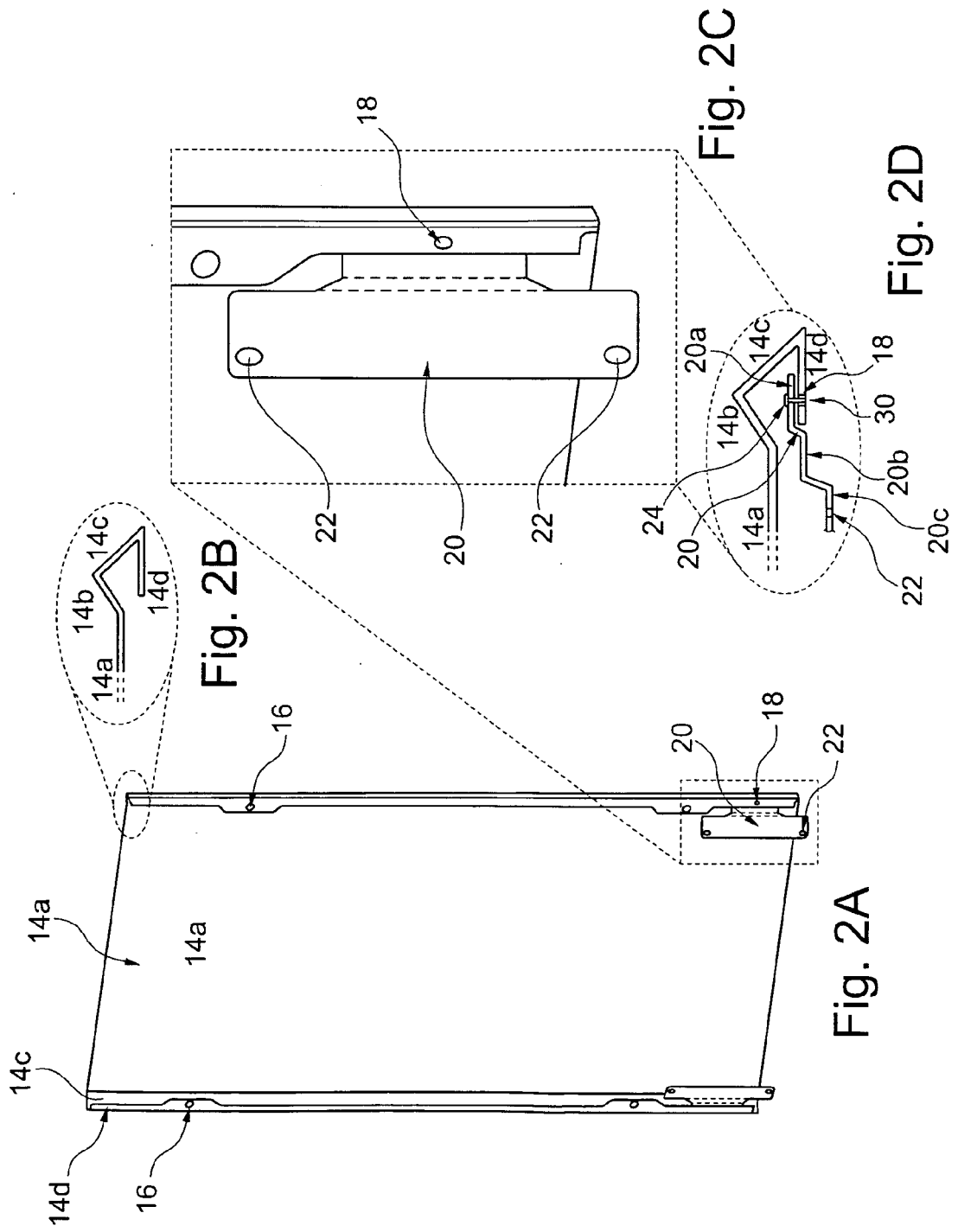


Fig. 1C



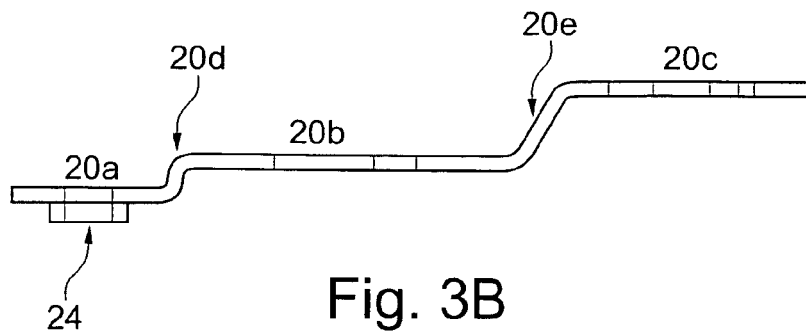


Fig. 3B

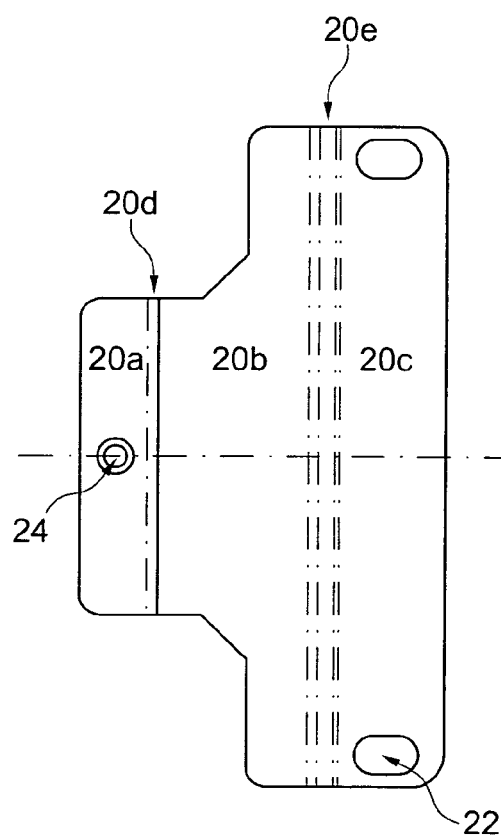


Fig. 3A



EUROPEAN SEARCH REPORT

Application Number
EP 10 00 2310

DOCUMENTS CONSIDERED TO BE RELEVANT			
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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 13 August 2010	Examiner Schwaiger, Bernd
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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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 00 2310

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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