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(54) A WALL PANEL ASSEMBLY

(57) A wall panel assembly is provided for a modular building unit. The wall panel assembly is formed from a wall panel with inner and outer wall panel members and defining an opening therethrough for a window assembly therein. The opening defines a plurality of opening edge faces extending around said opening, and at least one connecting member extends at least partially along each opening edge face and defines a substantially planar upper mounting surface at least partially covering the respective opening edge face for mounting a window assembly thereon.

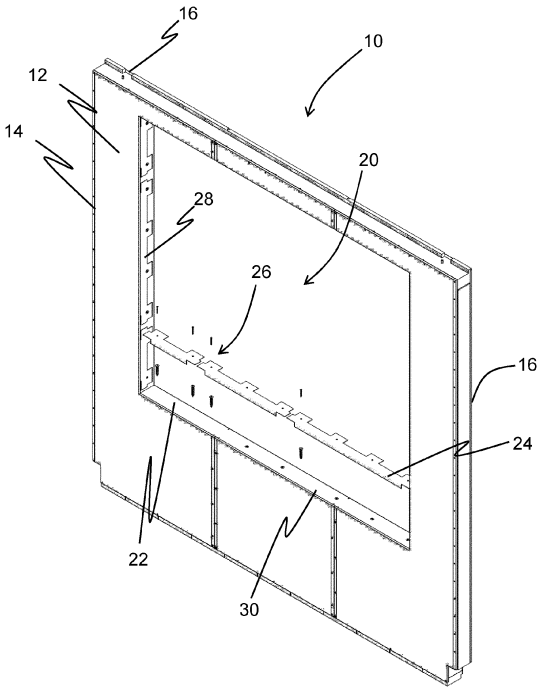

FIG. 1

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Description

FIELD

[0001] The present teachings relate to a wall panel assembly, a modular building unit, and to a method of mounting a window assembly to a wall panel assembly.

BACKGROUND

[0002] Modular buildings are prefabricated buildings that are formed from one or more modular units. These modular building units are manufactured in a factory away from the building site, and then transported to the building site so as to be assembled into a modular building. The modular building units are constructed so as to be capable being attached side-by-side, end-to-end, or stacked, which enables modular buildings to be produced having a variety of shapes and styles using a single repeatable modular building unit.

[0003] Each modular building unit is typically formed from a floor assembly, a roof assembly and one or more wall panel assemblies. In order to provide a habitable space, one or more wall panel assemblies of the modular building unit may be provided with an opening such that a window assembly can be mounted to the wall panel assembly. Traditional arrangements for mounting windows to modular wall panels can be complex, and so time consuming, to install. Moreover, known arrangements for mounting window to modular wall panels require the windows to be clamped between inner and outer faces of the wall panels, which may limit the thickness of the of the wall panel assembly.

[0004] The installation or mounting of window assemblies to wall panel assemblies in known modular building units can be

[0005] The present teachings seek to overcome or at least mitigate one or more problems associated with the prior art.

SUMMARY

[0006] According to a first aspect, there is provided a wall panel assembly for a modular building unit, the wall panel assembly comprising: a wall panel comprising first and second wall panel members defining a space therebetween, and an opening through the first and second wall panel members for receiving a window assembly therein, wherein the opening defines a plurality of opening edge faces extending around said opening; at least one connecting member extending at least partially along each opening edge face; and a mounting arrangement mounting each connecting member to a respective opening edge face, wherein each connecting member comprises a substantially planar mounting surface at least partially covering the respective opening edge face for mounting a window assembly thereon.

[0007] This arrangement enables a window assembly to be mounted to the inner edge of an opening rather than being clamped between the inner and outer faces of the wall panel. This has been found to facilitate mounting of a window assembly to a wall panel assembly regardless of the thickness of the wall panel to which the window is to be mounted. Additionally, the use of the connecting members has been found to increase the speed at which the window assembly can be installed. Moreover, the use of connecting member has been found to help to reduce thermal bridging between the first and second wall panel members.

[0008] Each connecting member may be spaced apart from the first and/or second wall panel members.

[0009] This arrangement helps to reduce thermal bridging between the first and second wall panel members, and so through the wall panel assembly.

[0010] Each connecting member may comprise an elongate body defining first and second opposing elongate edges, and the first and second elongate edges may be spaced apart from the first and second wall panels.

[0011] This arrangement helps to reduce thermal bridging between the first and second wall panel members.

[0012] The first elongate edge may be spaced apart from the first wall panel member by a distance in the range 1-9mm, optionally in the range 2-8mm, optionally in the range 3-7mm, optionally in the range 4-6mm, for example approximately 5mm.

[0013] This arrangement may help to reduce thermal bridging between the first and second wall panel members.

[0014] The wall panel may comprise an insulating material extending between the first and second wall panel members, such that said insulating material defines the opening edge faces.

[0015] This arrangement mounts the connecting members onto an insulating material, which helps to reduce thermal bridging between the first and second wall panel members.

[0016] The insulating material may be a substantially rigid insulating material, for example a substantially rigid insulating foam material.

[0017] The insulating material may comprise polyurethane, for example a polyurethane foam, and/or polyisocyanurate, for example a polyisocyanurate foam.

[0018] The insulating material may provide structural support to the wall panel, e.g. to the first and second wall panel members.

[0019] The insulating material may act as a structural support member of the wall panel.

[0020] Each connecting member may comprise an elongate body defining first and second opposing elongate edges, and the second elongate edge may be castellated so as to define a plurality of enlarged regions and at least one reduced diameter region.

[0021] This arrangement helps to reduce thermal bridging between the first and second wall panel members.

[0022] The mounting arrangement may comprise an aperture through each connecting member in each enlarged region for receiving a fastener therethrough to mount the connecting member to the respective opening edge face.

[0023] This arrangement helps to reduce thermal bridging between the first and second wall panel members.

[0024] The mounting arrangement may comprise an anchor embedded in each respective edge face that is arranged to align with a corresponding aperture.

[0025] This arrangement facilitates placement, attachment and securing of the connecting members on the edge faces of the openings.

[0026] The enlarged regions may be spaced apart from the elongate ends of each connecting member.

[0027] This arrangement helps to reduce thermal bridging between adjacent connecting members, and so between the first and second wall panel members.

[0028] The mounting arrangement may comprise a male connector on the connecting member or opening edge face and a female connector on the other of the connecting member or of the opening edge face.

[0029] This arrangement facilitates placement and attachment of the connecting members on the edge faces of the openings.

[0030] The male connector may be provided on each connecting member and the female connector is provided on each opening edge face.

[0031] The female connector may be provided as an elongate groove on each opening edge face, and the male connector may be provided as an elongate rib extending from an underside of the connecting member so as to be received in the elongate groove.

[0032] This arrangement facilitates placement and attachment of the connecting members on the edge faces of the openings.

[0033] The dimensions of the groove may conform to the dimensions of the rib.

[0034] This helps to reduce or prevent relative movement between the connecting member and the wall panel.

[0035] Each connecting member may comprise an elongate body defining first and second opposing elongate edges, and the elongate rib may be provided in the form of an arm extending from the first elongate edge of the connecting member.

[0036] The groove may be spaced apart from the first wall panel member by a distance in the range 1-9mm, optionally in the range 2-8mm, optionally in the range 3-7mm, optionally in the range 4-6mm, for example approximately 5mm.

[0037] This arrangement helps to ensure a minimum spacing between the first edge of the connecting member and the first wall panel which helps to reduce thermal bridging between the first and second wall panel members.

[0038] The elongate rib may extend along an elongate length of the connecting member and may terminate a distance away from opposing ends of said connecting member.

[0039] This arrangement helps to reduce thermal bridging between the first and second wall panel members.

[0040] The mounting arrangement may comprise a plurality of apertures through each connecting member for receiving a fastener therethrough to mount the connecting member to the edge face, and the mounting arrangement may comprise an anchor embedded in each respective edge face that is arranged to align with a corresponding aperture.

[0041] This arrangement facilitates placement and attachment of the connecting members on the edge faces of the openings.

[0042] Each anchor may be embedded in the respective edge face so as to be substantially flush with said edge face.

[0043] This arrangement facilitates placement and attachment of the connecting members on the edge faces of the openings.

[0044] When each edge face comprises a plurality of connecting members mounted thereto, adjacent connecting members may be spaced apart, for example equally spaced apart.

[0045] This arrangement helps to reduce thermal bridging between adjacent connecting members, and so between the first and second wall panel members.

[0046] Each connecting member may be formed from sheet material, for example a sheet metal material, for example sheet steel.

[0047] The mounting surface may comprise an adhesive material thereon for mounting a window assembly in the opening.

[0048] The provision of a mounting surface/arrangement that does not require any tools to connect the window assembly to the connecting members has been found to increase the speed at which the window assembly can be installed.

[0049] The wall panel assembly may comprise a window assembly mounted in the opening via the connecting members.

[0050] The first wall panel member may be intended to be externally facing.

[0051] The second wall panel member may be intended to be an internal wall panel member.

[0052] The second wall panel member may be a plasterboard.

[0053] According to a second aspect, there is provided a modular building unit comprising: a floor assembly; a roof assembly; and at least one wall panel assembly according to the first aspect extending between the floor assembly and the roof assembly.

[0054] According to a third aspect, there is provided a connecting member, comprising: a body of planar configuration; a mounting arrangement for mounting the connecting member to an edge face of an opening of a wall

panel; and a mounting surface intended to be arranged to face into the opening for mounting a window assembly thereon.

[0055] According to a fourth aspect, there is provided a method of mounting a window assembly to a wall panel assembly, the method comprising: providing a wall panel comprising first and second spaced wall panel members defining inner and outer surfaces of the wall panel; providing an opening through the first and second wall panel members to define a plurality of opening edge faces extending around said opening; arranging at least one connecting member on each edge face such that each connecting member extends at least partially along each respective edge face and a mounting surface faces into the opening; mounting each connecting member to the respective edge face via a mounting arrangement; and mounting a window assembly to the plurality of mounting surfaces defined by the plurality of connecting members.

[0056] The method may comprise the step of applying adhesive to the mounting surfaces prior to mounting the window assembly to the plurality of mounting surfaces.

[0057] Arranging the connecting members on each edge face may comprise forming at least one groove on each edge face and inserting a projecting member of each connecting member into a respective groove.

BRIEF DESCRIPTION OF THE DRAWINGS

[0058] Embodiments will now be described with reference to the accompanying drawings, in which:

Figure 1 is an isometric view of a wall panel assembly according to an embodiment;
Figure 2 is a schematic cross sectional side view of a part of the wall panel assembly of Figure 1;
Figure 3 is an isometric schematic view of a connecting member of the wall panel assembly of Figure 1;
Figure 4 is a plan view of the connecting member of Figure 3; and
Figure 5 is an isometric view of a modular building formed from modular building units.

DETAILED DESCRIPTION OF EMBODIMENT(S)

[0059] Referring firstly to Figure 1, a wall panel assembly is illustrated and indicated generally at 10. The wall panel assembly 10 forms part of a modular building unit, as is discussed in more detail below.

[0060] The wall panel assembly 10 includes a wall panel 12. The wall panel 12 is formed from first 14 and second 16 wall panel members defining a space therebetween. The first wall panel member 14 may be intended to be external facing when installed on a modular building unit. The second wall panel member 16 may be intended to be an internal wall panel member in use, i.e. when constructed as a part of a modular building unit. The second wall panel member 16 may be a plasterboard. The wall panel 12 includes an opening 20 therethrough for receiving a window assembly (not shown) therein. Put another way, an opening extends through the first and second wall panel members 14, 16, said opening for receiving a window assembly therein.

[0061] The opening 20 defines four opening edge faces 22 extending around the opening 20. The opening 20 may be substantially square or rectangular. In some arrangements, the opening may be positioned at a lateral edge and/or upper edge of the wall panel such that the wall panel may only define two or three opening edge faces 22.

[0062] The wall panel assembly 10 includes at least one connecting member 24 positioned on each opening edge face 22. Each connecting member 24 extends at least partially along each respective opening edge face 22. The wall panel assembly 10 includes a mounting arrangement 26 to mount each connecting member 24 to a respective opening edge face 22. Each connecting member 24 has a substantially planar mounting surface 28 at least partially covering the respective opening edge face 22 for mounting a window assembly thereon. In this way, a window assembly can be mounted to the inner edge of an opening of a wall panel rather than being clamped between the inner and outer faces of the wall panel.

[0063] The connecting member or members 24 may be arranged so as to be spaced apart from the opposing ends of the opening edge face 22 to which it is mounted. The connecting member or members 24 may be arranged so as to be equally spaced apart from the opposing ends of the opening edge face 22 to which it is mounted. As is illustrated, each opening edge face 22 may be provided with a plurality of connecting members 24 mounted thereto. Adjacent connecting members 24 on the same or adjacent opening edge faces 22 may be spaced apart so as to reduce thermal bridging between adjacent connecting members. In arrangements including a plurality of connecting members 24 on each opening edge face 22, the connecting members 24 may be equally spaced apart. It will be appreciated that the number of connecting members 24 provided on each application, and the elongate length of the connecting members 24 may be varied to suit the application. In some arrangements, it will be understood that only a single connecting member 24 may be provided on each opening edge face 22.

[0064] The wall panel 12 includes an insulating material 30 extending between the first and second wall panel members 14, 16. Put another way, the space between the first and second wall panel members 14, 16 is at least partially filed, for example entirely filled, with an insulation material 30. It will be appreciated that the insulating material may be provided as a panel that is positioned between the wall panel members 14, 16 or may be either injected or poured into the spacing between the first and second wall panel members 14, 16 to create a composite wall panel 12.

[0065] In this way, the insulating material 30 defines

the opening edge faces 22 and the connecting members 24 a mounted onto the insulating material 30. This has been found to help reduce thermal bridging between the first and second wall panel members 14, 16.

[0066] The insulating material 30 may be a substantially rigid insulating material. It will be understood that the term 'rigid' is intended to mean that the insulating material has sufficient structural strength to support the connecting member(s) 24 and the window assembly to be mounted thereto. Moreover, it will be understood that the term 'rigid' is intended to mean that the insulating material acts as a structural support for the wall panel 12 and contributes to the racking strength of the wall panel 12. This may provide a more stable surface on which to mount the connecting members 24. The insulating material such as insulating foam material, for example a rigid insulating foam material. It will be appreciated that any suitable insulating material may be used, such as polyurethane, for example a polyurethane foam, polyisocyanurate, for example a polyisocyanurate rigid foam, or any other suitable insulating material. The insulating foam may have a density of 38-45 kg/m^3. It will be appreciated that the density of the foam may be adjusted depending on the thickness of the insulating material.

[0067] Referring now to Figures 2 to 4, each connecting member 24 includes a body 32 of substantially planar configuration. It will be appreciated that the connecting member 24 may be formed from a sheet material, for example a sheet metal material. The connecting member 24 may be formed from sheet steel or aluminium.

[0068] As discussed above, the wall panel assembly 10 includes a mounting arrangement to mount the connecting members 24 to the wall panel 12. The mounting arrangement includes at least one aperture 34 extending through each connecting member 24. Each aperture 34 is configured for receiving a fastener 36 therethrough to mount the connecting member 24 to the respective opening edge face 22.

[0069] The mounting arrangement may also be provided with an anchor 38. The apertures 34 in the connecting members 24 are each aligned with an anchor 38 such that the fastener 36 extends through the aperture 34 and into the anchor 38. The use of an anchor 38 improves the mounting of the connecting member 24 to the wall panel 12. Each anchor 38 is embedded in the respective opening edge face 22 so as to be substantially flush with said edge face 22. This enables the connecting members 24 to be positioned substantially flat on the opening edge face 22, which facilitates mounting of a window assembly to the connecting members 24.

[0070] The mounting arrangement may also include corresponding male and female connectors on the connecting member 24 and the opening edge face 22. In the illustrated arrangement, a male connector 40 is provided on the connecting member 24 and a corresponding female connector 42 is provided on the opening edge face 22. It will be appreciated that the male connector may be provided on the opening edge face 22 and the female connector may be provided on the connecting member 24 in alternative arrangements.

[0071] In the illustrated arrangement, the male connector 40 is provided on each connecting member 24 in the form of an elongate rib 40. The elongate rib 40 extends along an elongate length of the connecting member 40 and terminates a distance away from opposing ends of said connecting member. The female connector 42 is provided as an elongate groove 42 on each opening edge face 22. The elongate rib 40 extends from an underside of the connecting member 24 so as to be received in the elongate groove 42. It will be appreciated that the dimensions of the groove 42 may conform to the dimensions of the rib 40 to facilitate placement and alignment of the connecting members 24 on the opening edge faces 22.

[0072] Each connecting member 24 is provided in the form of an elongate body of planar configuration. The body defines first and second opposing elongate edges 44, 46 and opposing longitudinal ends 48, 50 of the connecting member 24. The first and second elongate edges 44, 46 are spaced apart from the first and second wall panel members 14, 16. The first elongate edge 44 may be spaced apart from the first wall panel member 14 by a distance in the range 1-9mm, 2-8mm, 3-7mm,4-6mm, for example approximately 5mm. The second elongate edge 46 may be spaced apart from the second wall panel member 16 by any suitable distance, for example in the range 10-20mm or approximately 15m, and it will be understood that this distance may vary to suit the application and the wall panel 12 to which the connecting member 24 is mounted.

[0073] The elongate rib 40 is provided in the form of an arm extending from the first elongate edge 44 of the connecting member 24. In alternative arrangements, the rib 40 may extend from any part of the underside of the connecting member 24. In the present arrangement, the groove 42 is spaced apart from the first wall panel member 14 by a distance in the range 1-9mm, 2-8mm, 3-7mm, 4-6mm, for example approximately 5mm. When the rib 40 is provided at the first elongate edge 44 of the connecting member 24, this arrangement of the groove 44 helps to ensure a minimum spacing between the first edge 44 of the connecting member 24 and the first wall panel member 14, which in turn helps to reduce thermal bridging between the first and second wall panel members 14, 16.

[0074] As is shown in Figures 3 and 4, each connecting member 24 includes a castellated edge. The second elongate edge 42 is castellated so as to define a plurality of enlarged regions 52 and at least one reduced diameter region 54.

[0075] Each aperture 34 is provided on an enlarged region 52 of the connecting member 24. It will be appreciated that each connecting member 24 may be provided with a corresponding number of enlarged regions 52 and apertures 34, although in some arrangements only the enlarged regions adjacent to the ends 48, 50 of the connecting member 24 may be provided with an aperture 34

therethrough. The enlarged regions 52 are spaced apart from the elongate ends 48, 50 of each connecting member 24. The arrangement of the enlarged regions 52 and reduced diameter region 54 have been found to reduce thermal bridging through the wall panel 12.

[0076] The mounting surface 28 may be provided with an adhesive material 56 thereon for mounting a window assembly in the opening 20. The provision of a mounting surface/arrangement that does not require any tools to connect the window assembly to the connecting members has been found to increase the speed at which the window assembly can be installed.

[0077] A method of mounting a window assembly to a wall panel assembly 10 will now be discussed.

[0078] Initially, a wall panel 12 is formed or assembled from first and second spaced apart wall panel members 14, 16 having an opening therethrough. The first and second wall panel members 14, 16 define inner and outer surfaces of the wall panel 12.

[0079] Forming the opening 20 through the first and second wall panel members 14, 16 defines a plurality of opening edge faces 22 extending around said opening 20.

[0080] The wall panel 12 may be at least partially filed, for example entirely filled, with an insulation material 30 in the space between the first panel members 14, 16. In this way, the insulating material 30 may define the opening edge faces 22.

[0081] A connecting member 24 is arranged on each edge face 22 such that each connecting member 24 extends at least partially along each respective edge face 22 such that a mounting surface 28 of the connecting member 24 at least partially covers the opening edge face 22.

[0082] An elongate groove 42 may be cut into each opening edge face 22 so as to be configured to receive a corresponding rib 40 of each connecting member 24.

[0083] Each connecting member 24 is then mounted to the respective edge face 22 via a mounting arrangement.

[0084] Adhesive is then applied to each of the mounting surfaces 28. A window assembly is then to the plurality of mounting surfaces defined by the plurality of connecting members 24.

[0085] Referring now to Figure 5, a modular building unit is illustrated and indicated generally at 100. The modular building unit 100 includes a wall panel assembly 10.

[0086] The modular building unit 100 has a floor assembly including a base frame 102. The floor assembly also includes a floor panel (not shown) supported on the base frame 102. The modular building unit 100 has a roof assembly including a roof frame 104. The roof assembly includes a roof panel 106 supported on the roof frame 104. Although not illustrated, the upper surface of the roof panel 106 may be pitched in order to facilitate drainage of rain water off the roof panel 106.

[0087] The modular building unit 100 is substantially rectangular in shape, and includes four side walls substantially enclosing the modular building unit 100. At least one of the side walls may be formed from a wall panel assembly as described with reference to Figures 1 to 4. In alternative arrangements, one or more of the side walls may be omitted, for example to enable two or more modular building units 100 to be assembled together to form a modular building assembly.

[0088] Although the teachings have been described above with reference to one or more preferred embodiments, it will be appreciated that various changes or modifications may be made without departing from the scope as defined in the appended claims.

Claims

1. A wall panel assembly for a modular building unit, the wall panel assembly comprising:

   a wall panel comprising first and second wall panel members defining a space therebetween, and an opening through the first and second wall panel members for receiving a window assembly therein, wherein the opening defines a plurality of opening edge faces extending around said opening;
   at least one connecting member extending at least partially along each opening edge face; and
   a mounting arrangement mounting each connecting member to a respective opening edge face,
   wherein each connecting member comprises a substantially planar mounting surface at least partially covering the respective opening edge face for mounting a window assembly thereon.

2. The wall panel assembly according to claim 1, wherein each connecting member is spaced apart from the first and/or second wall panel members.

3. The wall panel assembly according to claim 1 or claim 2, wherein each connecting member comprises an elongate body defining first and second opposing elongate edges, and wherein the first and second elongate edges are spaced apart from the first and second wall panels, optionally by a distance in the range 1-9mm, optionally by a distance in the range 2-8mm, optionally by a distance in the range 3-7mm, optionally by a distance in the range 4-6mm, for example approximately 5mm.

4. The wall panel assembly according to any preceding claim, wherein the wall panel comprises an insulating material extending between the first and second wall panel members, such that said insulating material defines the opening edge faces.

5. The wall panel assembly according to claim 4, wherein the insulating material is a substantially rigid insulating material, for example a substantially rigid insulating foam material.

6. The wall panel assembly according to any preceding claim, wherein each connecting member comprises an elongate body defining first and second opposing elongate edges, and wherein the second elongate edge is castellated so as to define a plurality of enlarged regions and at least one reduced diameter region; optionally, wherein the mounting arrangement comprises an aperture through each connecting member in each enlarged region for receiving a fastener therethrough to mount the connecting member to the respective opening edge face; optionally, wherein the mounting arrangement comprises an anchor embedded in each respective edge face that is arranged to align with a corresponding aperture.

7. The wall panel assembly according to any preceding claim, wherein the mounting arrangement comprises a male connector on the connecting member or opening edge face and a female connector on the other of the connecting member or of the opening edge face.

8. The wall panel assembly according to claim 7, wherein the male connector is provided on each connecting member and the female connector is provided on each opening edge face.

9. The wall panel assembly according to claim 8, wherein the female connector is provided as an elongate groove on each opening edge face, and the male connector is provided as an elongate rib extending from an underside of the connecting member so as to be received in the elongate groove; optionally, wherein the dimensions of the groove conform to the dimensions of the rib, and/or wherein each connecting member comprises an elongate body defining first and second opposing elongate edges, and wherein the elongate rib is provided in the form of an arm extending from the first elongate edge of the connecting member, and/or wherein the elongate rib extends along an elongate length of the connecting member and terminates a distance away from opposing ends of said connecting member.

10. The wall panel assembly according to any preceding claim, wherein the mounting arrangement comprises a plurality of apertures through each connecting member for receiving a fastener therethrough to mount the connecting member to the edge face, and wherein the mounting arrangement comprises an anchor embedded in each respective edge face that is arranged to align with a corresponding aperture.

11. The wall panel assembly according to any preceding claim, wherein the mounting surface comprises an adhesive material thereon for mounting a window assembly in the opening.

12. A modular building unit comprising:

a floor assembly;
a roof assembly; and
at least one wall panel assembly according to any preceding claim extending between the floor assembly and the roof assembly.

13. A connecting member, comprising:

a body of planar configuration;
a mounting arrangement for mounting the connecting member to an edge face of an opening of a wall panel; and
a mounting surface intended to be arranged to face into the opening for mounting a window assembly thereon.

14. A method of mounting a window assembly to a wall panel assembly, the method comprising:

providing a wall panel comprising first and second spaced wall panel members defining inner and outer surfaces of the wall panel;
providing an opening through the first and second wall panel members to define a plurality of opening edge faces extending around said opening;
arranging at least one connecting member on each edge face such that each connecting member extends at least partially along each respective edge face and a mounting surface faces into the opening;
mounting each connecting member to the respective edge face via a mounting arrangement; and
mounting a window assembly to the plurality of mounting surfaces defined by the plurality of connecting members.

15. The method according to claim 14, comprising the step of applying adhesive to the mounting surfaces prior to mounting the window assembly to the plurality of mounting surfaces, and/or wherein arranging the connecting members on each edge face comprises forming at least one groove on each edge face and inserting a projecting member of each connecting member into a respective groove.

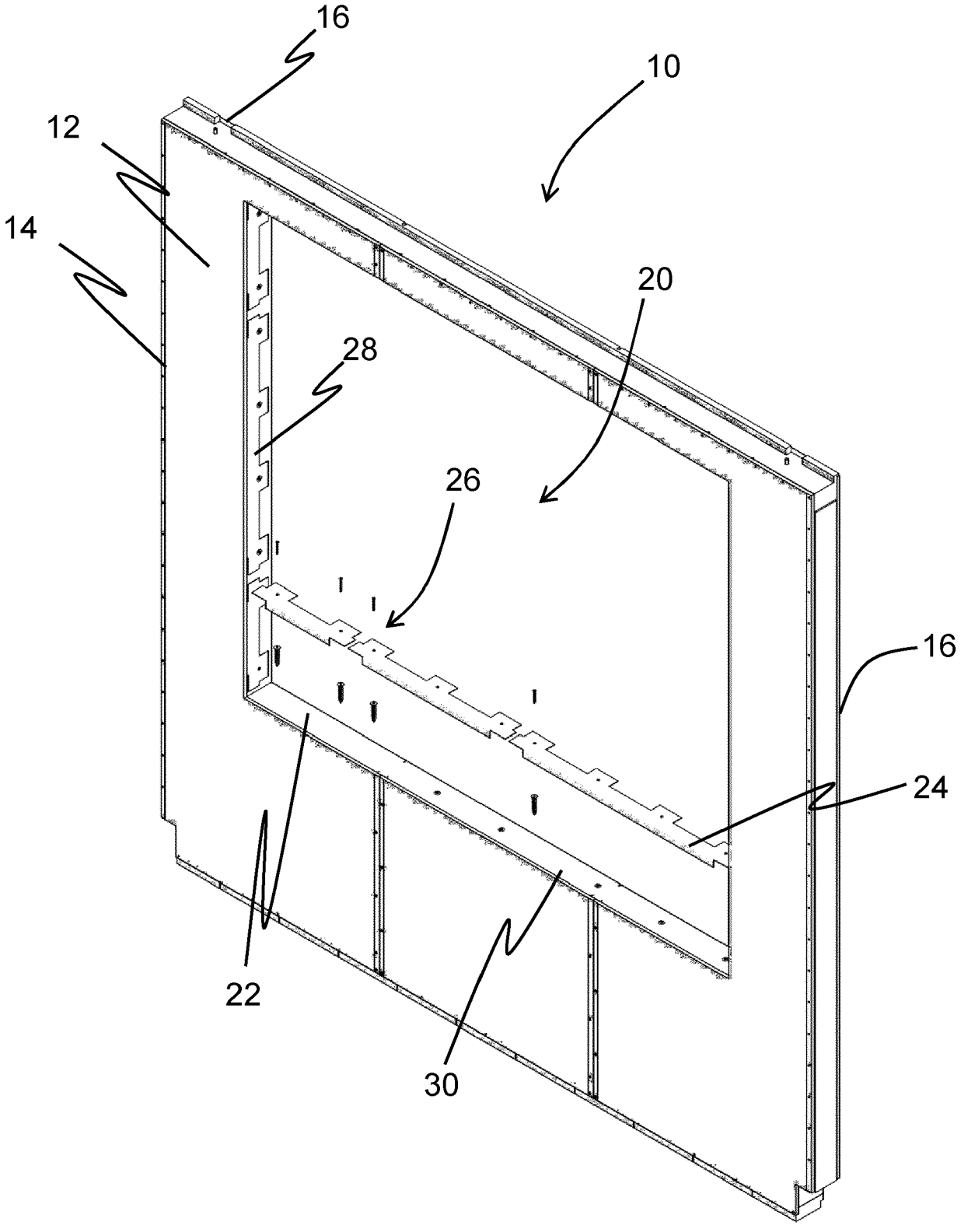

FIG. 1

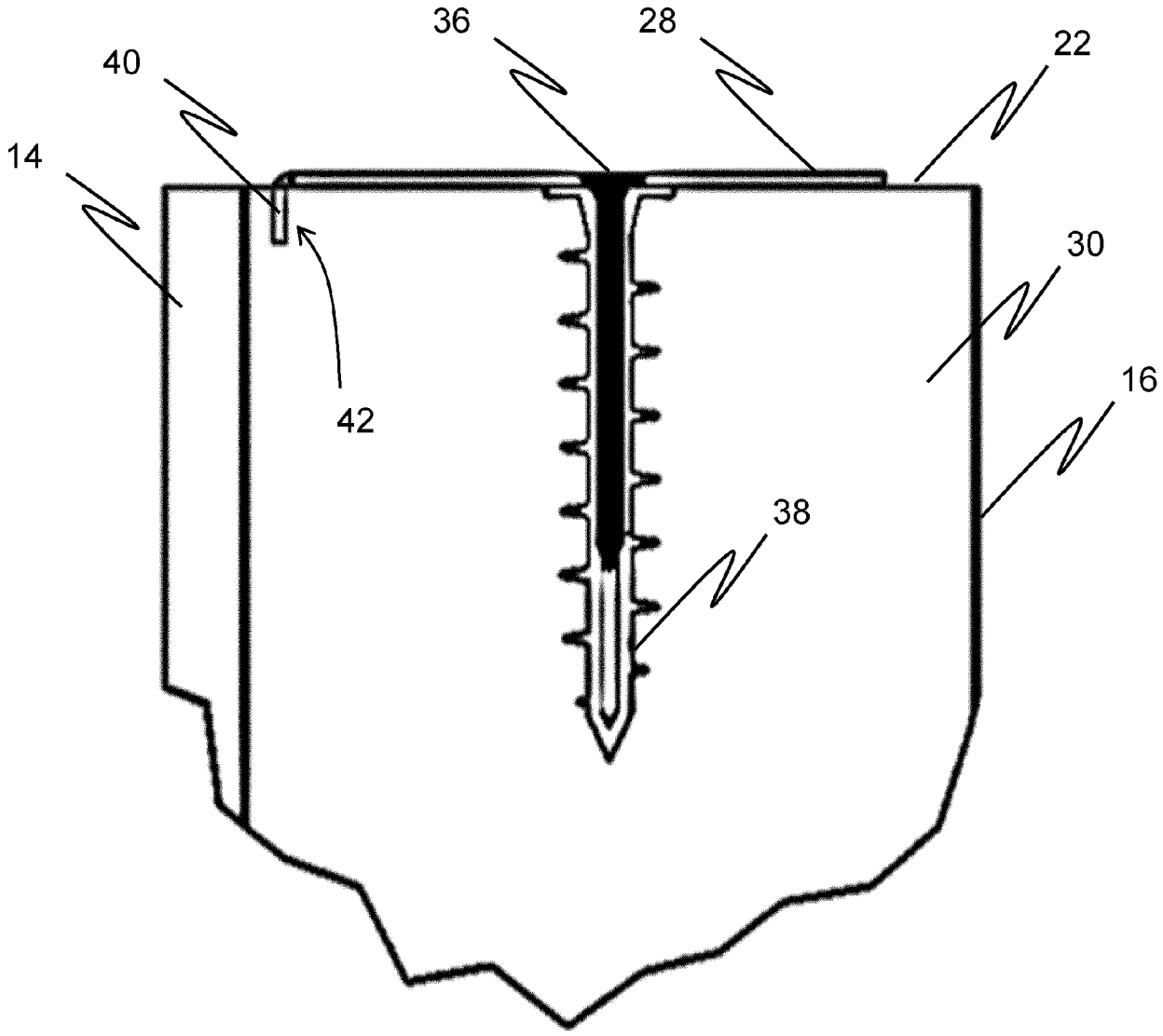

FIG. 2

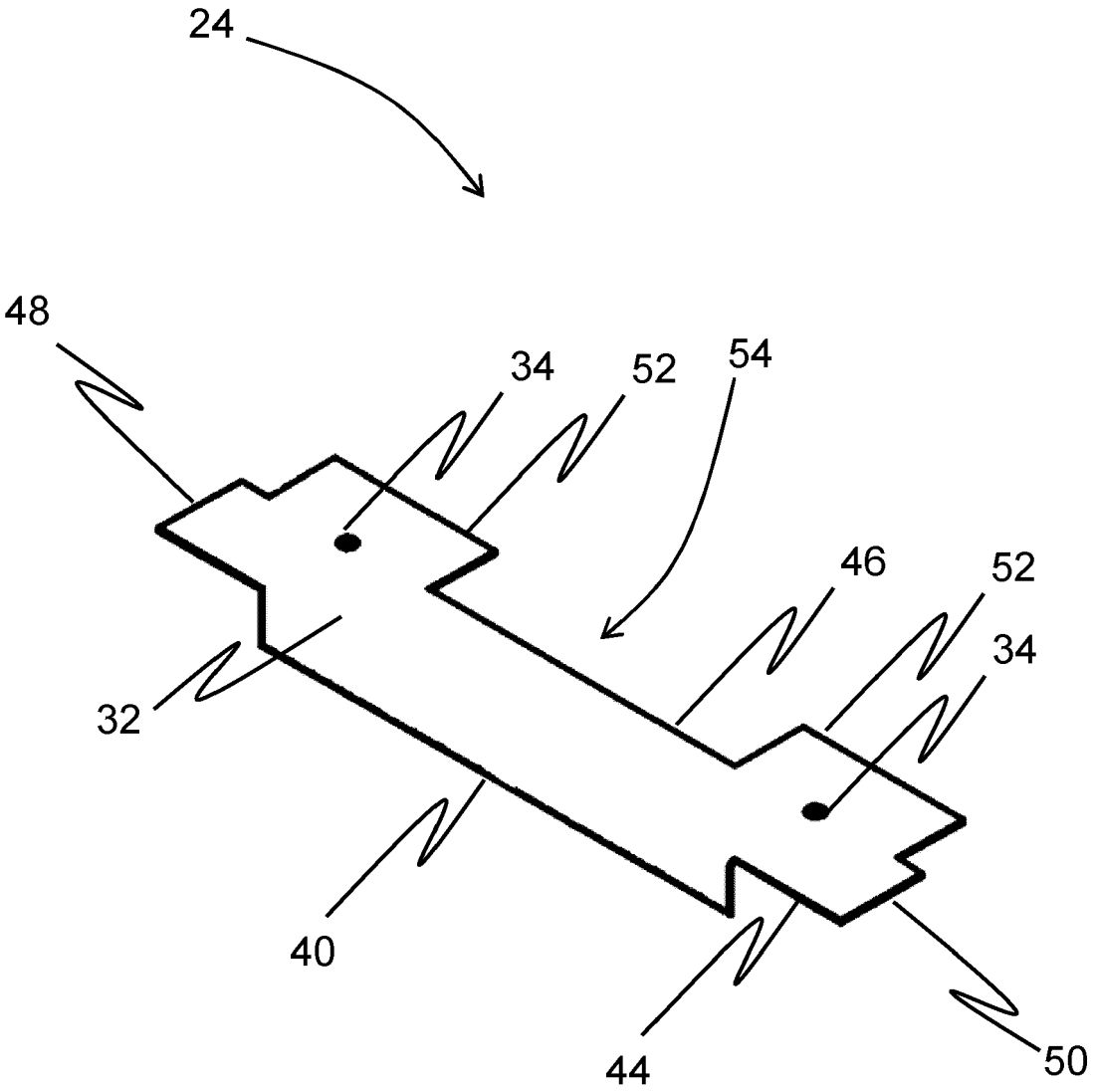

FIG. 3

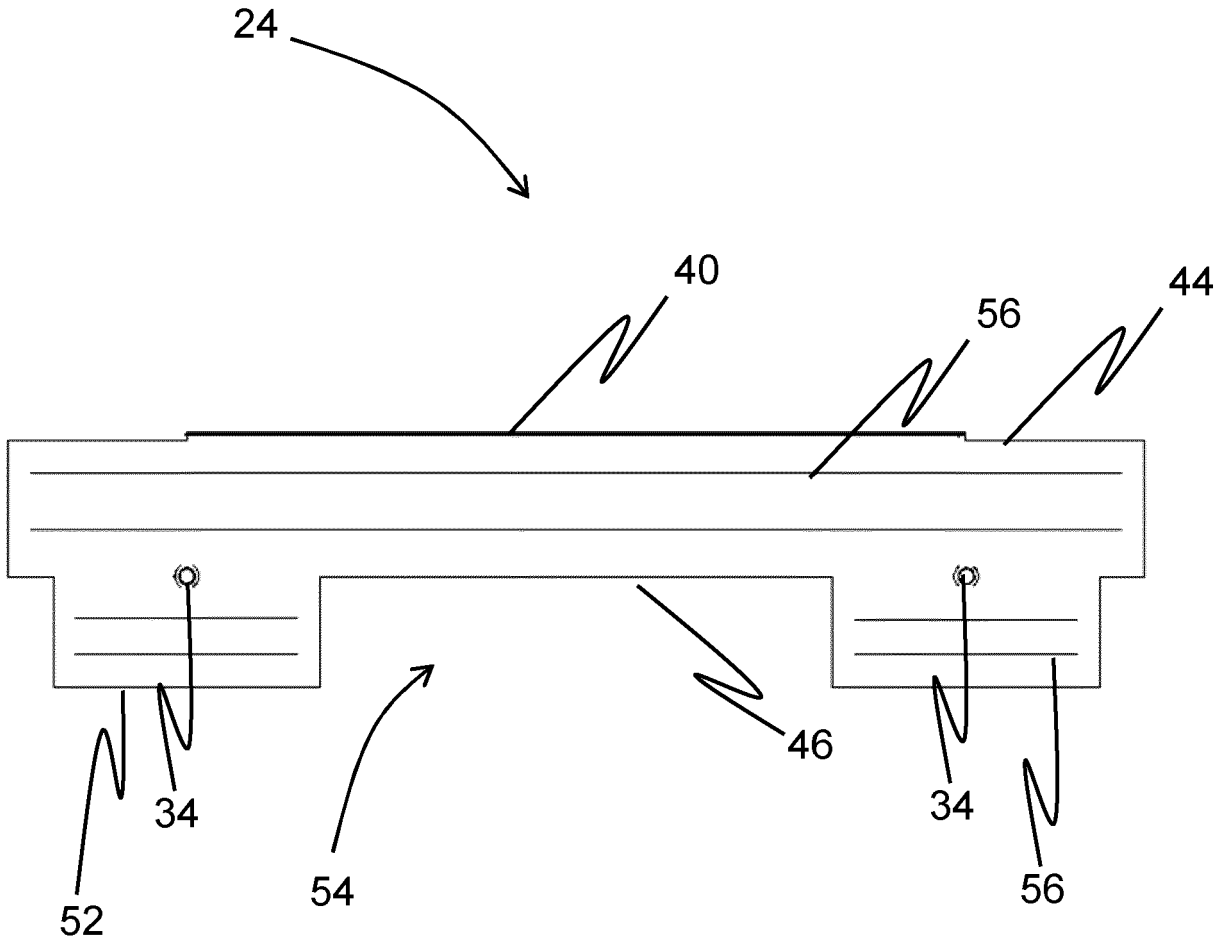

FIG. 4

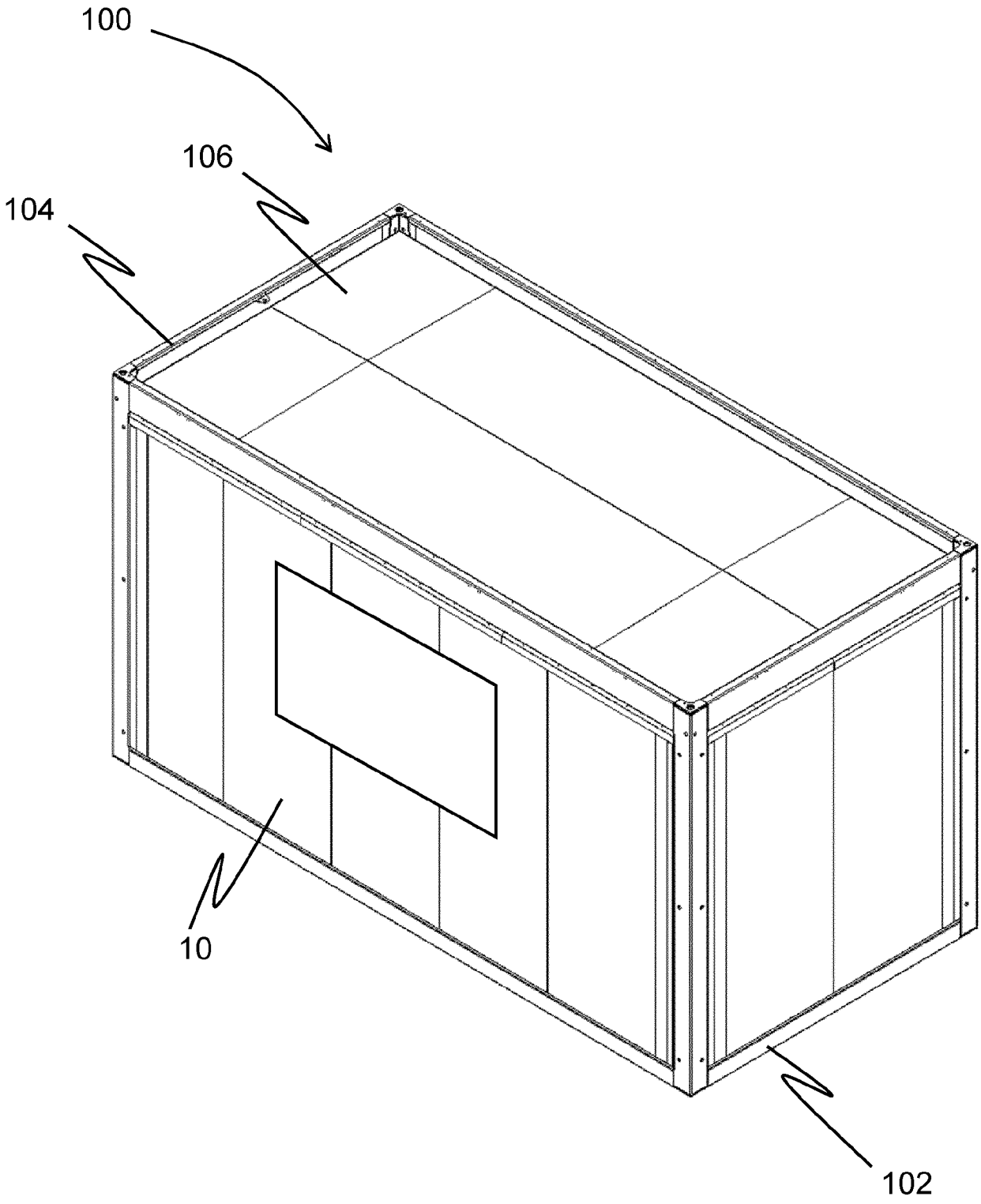

FIG. 5

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 23 17 5501

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

E04B
E04C
E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 October 2023	López-García, G

CATEGORY OF CITED DOCUMENTS

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