(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 803 780 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
19.11.2014 Bulletin 2014/47

(51) Int Cl.:
E04C 2/24 *(2006.01)*

(21) Application number: **14168376.3**

(22) Date of filing: **14.05.2014**

(84) Designated Contracting States:
AL 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 RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **14.05.2013 GB 201308646**

(71) Applicant: **Keystone Lintels Limited**
County Tyrone (GB)

(72) Inventor: **Coyle, Sean**
Cookstown, Tyrone BT80 9DG (GB)

(74) Representative: **Hanna, John Philip et al**
Hanna IP
4th Floor
58 Howard Street
Belfast BT1 6PJ (GB)

(54) **A reinforced building panel**

(57) A laminated panel having an insulating core sandwiched between a pair of outside rigid boards, the panel having reinforcing members being adapted to reduce mechanical deformation of a perimeter of the laminated panel. The panel has integrally formed reinforcing members. The reinforcing members are contained substantially within the boundary defined by the outer peripheral surface of the panel.

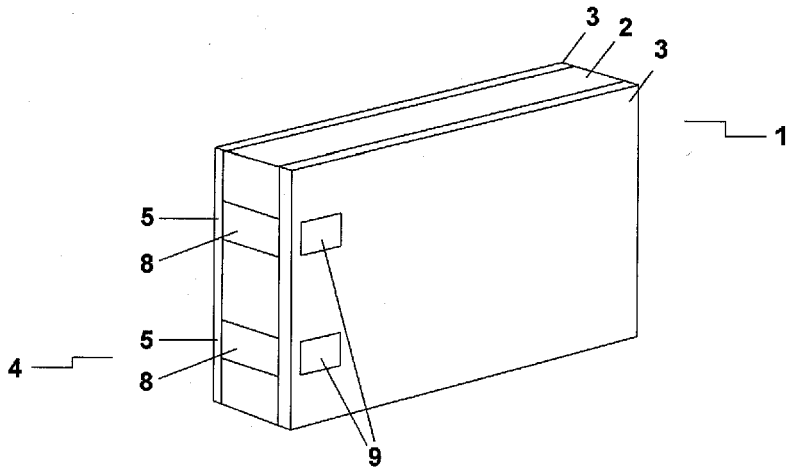

Figure 1

EP 2 803 780 A2

Description

[0001] The present invention relates to a reinforced building panel suitable for use during jointing of building panels and in particular to reinforced laminated panel.

[0002] Laminated building panels and in particular structural insulated panels (SIP's) have gained in popularity and market share over the last number of years. These strong, lightweight, and highly efficient building panels are generally constructed from a thermal insulating core, formed from a material such as polyurethane foam, sandwiched between two rigid outer panels such as orientated strand boards (OSB's), which are generally wood flakes or strands bonded together with resins, binders, and waxes. SIP panels have greater strength in terms of both axial loading and cracking than conventional timber framing, are relatively simple to build with and provide extremely good thermal insulation.

[0003] One type of jointing of panels provides a jointing arrangement between two adjacent panels where no cavities are routered out of the insulating core of the abutting edges. The two similar panels have two mutually opposing end faces abutted together and the jointing arrangement has mechanical coupling members for externally bridging at least part of the interface between the two panels on either or both opposing main planar surfaces of the panels. Where the mechanical coupling members bridge the abutting edges of the panels, the mechanical coupling members have to be hammered or pressed onto the outer boards. Therefore, when the mechanical fixing members are fastened to the outside boards of the laminated panels bridging the gap there between, the edges of the rigid outer panels carrying the bridging fasteners tend to collapse in on the less rigid insulating core. This causes structural deformation of the edges and the boards deforming in this way would also have a detrimental effect on the structural performance of the jointed panel. It also results in slight misalignment allowing small gaps in the seal between the edges of the panels reducing their thermal efficiency. This is a weak point with this new type of jointing of laminated panels in view of new building regulations focusing on the thermal efficiency of all building products in an effort to reduce carbon emissions for all domestic and commercial dwellings.

[0004] It is an object of the present invention to obviate or mitigate the problem of mechanical deformation and thermal efficiency reduction at a joint between laminated panels due to compression of the perimeter of adjacent panels by hammering or pressing on mechanical fixings.

[0005] Accordingly, the present invention provides a laminated panel having an insulating core sandwiched between a pair of outside rigid boards, the laminated panel having reinforcing means being adapted to reduce mechanical deformation of a perimeter of the laminated panel.

[0006] Advantageously, the reinforcing means prevents mechanical deformation along a perimeter of the laminated panel and/or along a perimeter of an opening defined in the laminated panel under compressive loading such as forces being applied to the perimeter of a laminated panel during jointing with another laminated panel using bridging members with no internal splines.

[0007] Ideally, the laminated panel has integrally formed reinforcing means.

[0008] Preferably, the reinforcing means are contained substantially within the boundary defined by the outer peripheral surface of the panel.

[0009] Ideally, the reinforcing means of the panel does not span the gap between adjacent joined panels.

[0010] Preferably, the reinforcing means is located on or between the outer rigid boards.

[0011] Ideally, the reinforcing means is disposed within a portion of the space normally occupied by the insulating core. Advantageously, the reinforcing means provides a strut effect to resist the compressive forces applied during the application of mechanical fixings bridging the gap between adjacent panels.

[0012] Ideally, the reinforcing means is located between the outer rigid boards spaced apart along the length of the panel at or about a location where mechanical bridging members are attachable.

[0013] Preferably, the reinforcing means is located proximal to the edge of the laminated panel.

[0014] In a first embodiment, the reinforcing means is integrally formed with the insulating core.

[0015] In the first embodiment, the reinforcing means is integrally formed with the insulating core during manufacture.

[0016] In the first embodiment, the reinforcing means comprises a more densely formed portion or region of material formed from the same material as the insulating core.

[0017] In the first embodiment, the reinforcing means comprises a more densely formed portion of the insulating core spanning between the mutually opposing internal surfaces of the outer rigid boards acting as a strut.

[0018] In the first embodiment, the reinforcing means comprises a plurality of spaced apart more densely formed portions of the insulating core spanning between the mutually opposing internal surfaces of the outer rigid boards proximal to one or more edges of the laminated panel.

[0019] In the first embodiment, the reinforcing means comprises a plurality of spaced apart more densely formed portions of the insulating core spanning between the mutually opposing internal surfaces of the outer rigid boards proximal to one or more edges of the laminated panel at or about a location where mechanical bridging members are attachable.

[0020] In a second embodiment, the reinforcing means comprises separate reinforcing members located between the mutually opposing internal surfaces of the outer rigid boards.

[0021] In the second embodiment, the reinforcing means comprises separate reinforcing members located between the mutually opposing internal surfaces of the

outer rigid boards at least partially embedded in the insulating core.

[0022] In the second embodiment, the reinforcing members comprise metal or metal alloy members located between the mutually opposing internal surfaces of the outer rigid boards.

[0023] In this second embodiment, the reinforcing members are spaced apart blade like members. Advantageously, the blades can be readily embedded into the insulating core, which can be useful for retrofitting reinforcing members on site.

[0024] In this second embodiment, the plurality of spaced apart reinforcing members can be mounted on a support plate.

[0025] In the second embodiment, the reinforcing members are located between the mutually opposing internal surfaces of the outer rigid boards spaced apart along the length of the panel.

[0026] In the second embodiment, the reinforcing members are located between the mutually opposing internal surfaces of the outer rigid boards spaced apart along the length of the panel at or about a location where mechanical bridging members are attachable.

[0027] In the second embodiment, the reinforcing members are struts spaced apart along the length of the panel spanning between the mutually opposing internal surfaces of the outer rigid boards.

[0028] In the second embodiment, the reinforcing members located between the mutually opposing internal surfaces of the outer rigid boards are located proximal to the edges of the laminated panel.

[0029] In a third embodiment, the reinforcing means is provided by one or more wooden members located between mutually opposing internal surfaces of the outer rigid boards.

[0030] In a fourth embodiment, the reinforcing means comprises a strip or cap mounted along all or a part of one or more edges of one or both rigid outer boards.

[0031] Ideally, the strip or cap is metal or metal alloy.

[0032] Preferably, the strip or cap is manufactured from steel.

[0033] Ideally, the strip or cap is pre-stressed. Advantageously, this allows greater compressive forces to be applied to the edges of the panels during jointing of the panel with other panels before the edges of the laminated panels will mechanically deform. Advantageously, this means that the risk of harm to the integrity of the seal between adjacent panels is significantly reduced during jointing, either in a factory or on site.

[0034] Preferably, the cap has a c-channel cross section.

[0035] Ideally, the channel is formed for receiving all or a part of one or more edges of the rigid outer board.

[0036] Alternatively, caps having different cross sections such as T-shaped cross sections or L-shaped cross sections can be used.

[0037] Ideally, the metal or metal alloy cap or strip is pressed onto the edge of the outer rigid board during manufacture of the laminated panel.

[0038] Ideally, the reinforcing means is located on the panels proximal to or at the exact same location where mechanical bridging members are to be applied.

[0039] It will of course be appreciated that the reinforcing means can be manufactured or formed from any material with sufficient strength to prevent mechanical deformation of the edges of the panel.

[0040] Accordingly, the present invention provides a jointing arrangement between two adjacent laminated panels, the two panels having two mutually opposing end faces abutted together, the jointing arrangement comprising mechanical coupling means for externally bridging at least part of the interface between the two panels on either or both opposing main planar surfaces of the panels, each individual panel having reinforcing means being adapted to reduce mechanical deformation of a perimeter of the laminated panel.

[0041] It will of course be appreciated that each of the additional features commencing with preferably or ideally appendable to the main laminated panel statement of invention on page 2, lines 5 to 8 are equally appendable to the jointing arrangement statement of invention immediately preceding this paragraph, separately or in any combination thereof.

[0042] Preferably, the jointing arrangement is provided between two adjacent structural insulated panels, the two adjacent structural insulated panels having two mutually opposing end faces abutted together.

[0043] Ideally, the two adjacent panels having two mutually opposing end faces abutted together so the two adjacent panels are in substantial alignment.

[0044] Ideally, the end faces of the panel extend between the two main planar surfaces of the panel.

[0045] Ideally, the mechanical coupling means is a plate member, most preferably a flat plate member.

[0046] Preferably, the plate member has means for penetrating the outer boards.

[0047] Ideally, the penetration means are spikes formed integral to the plate member.

[0048] Alternatively, the plate member has holes formed there through.

[0049] Advantageously, the holes allow fixing members to pass through the plate member and into the panels.

[0050] Preferably, the fixing members clamp the plate member to the outer planar surface of the panel.

[0051] Ideally, the fixing members are nails.

[0052] Alternatively, the fixing members are screws.

[0053] Alternatively, the plate member is adhesively bonded to the main planar surfaces of the panels.

[0054] Preferably, multiple plate members are fixably attached across either or both interfaces.

[0055] Advantageously, the plurality of plate members provide sufficient structural integrity to the jointing arrangement.

[0056] Ideally, flat plate member is metallic.

[0057] Preferably, the plate member is steel.

[0058] Ideally, the interface joint is sealed with a sealant.

[0059] Preferably, the sealant is expanding foam.

[0060] The invention will now be described with reference to the accompanying drawings which show by way of example only one embodiment of a laminated panel and a jointing arrangement in accordance with the invention. In the drawings:

Figure 1 is a perspective view of a first embodiment of reinforcing arrangement on a laminated panel;
Figure 2 is a perspective view of a second embodiment of reinforcing arrangement on a laminated panel;
Figure 3 is a detail perspective view of a second embodiment of reinforcing arrangement;
Figure 4 is a perspective view of a third embodiment of reinforcing arrangement on a laminated panel; and
Figure 5 is a perspective view of a jointing arrangement using any of the embodiments of reinforcing arrangement with mechanical bridging members.

[0061] Referring initially to Figures 1 to 4, there is shown a reinforcing arrangement for a laminated panel 1 indicated generally by the reference numeral 4. Each panel 1 having an insulating core 2 sandwiched between a pair of outside rigid boards 3. Each individual panel 1 having reinforcing arrangement 4 being adapted to reduce mechanical deformation of a perimeter of the laminated panel 1.

[0062] Advantageously, the reinforcing arrangement 4 prevents mechanical deformation along the outer perimeter 5 of the laminated panel 1 or along a perimeter of an opening, not shown, defined in the laminated panel 1 under compressive loading such as forces being applied to the edges 5 of the laminated panel 1 during jointing with another laminated panel 1 using bridging members 38, see Figure 5, with no internal splines. Each individual panel 1 has an integrally formed reinforcing arrangement 4. The reinforcing arrangements 4 are contained substantially within the boundary defined by the outer peripheral surface of the panel 1. The reinforcing arrangement 4 of each panel 1 does not span the gap between adjacent joined panels 1, see Figure 5. The reinforcing arrangement 4 is located on the outer rigid boards 3, see Figure 4, or between the outer rigid boards 3, see Figures 1 and 2. The reinforcing arrangement 4 is disposed within a portion of the space normally occupied by the insulating core 2, see Figures 1 and 2. Advantageously, the reinforcing arrangement 4 provides a strut effect to resist the compressive forces applied during the application of mechanical fixings 38 bridging the gap between adjacent panels 1.

[0063] In a first embodiment illustrated in Figure 1, the reinforcing arrangement 4 is integrally formed with the insulating core 2. The reinforcing arrangement 4 is integrally formed with the insulating core 2 during manufacture. The reinforcing arrangement 4 is a more densely formed portion or region of material 8 formed from the same material as the insulating core 2. The reinforcing arrangement 4 has the more densely formed portion 8 of the insulating core 2 spanning between the mutually opposing internal surfaces of the outer rigid boards 3 performing as a strut. The reinforcing arrangement 4 has two spaced apart more densely formed portions 8 of the insulating core 2 spanning between the mutually opposing internal surfaces of the outer rigid boards 3 proximal to the edges of both outer rigid boards 3 of the laminated panel 1 at or about a location 9 where mechanical bridging members 38 are to be attached.

[0064] In a second embodiment shown in Figure 2, the reinforcing arrangement 4 has separate reinforcing members 14 located between the mutually opposing internal surfaces of the outer rigid boards 3. The reinforcing arrangement 4 has the separate reinforcing members 14 located between the mutually opposing internal surfaces of the outer rigid boards 3 and embedded in the insulating core 2. The reinforcing members 14 are metal or metal alloy members 14 located between the mutually opposing internal surfaces of the outer rigid boards 3. One example of separate reinforcing members 14 are spaced apart blade like members 15 as shown in Figure 3. Advantageously, the blades 15 can be readily embedded into the insulating core 2 by tapping them in with a hammer or pressing them in, which can be useful for retrofitting reinforcing members 14 of this type on site. The plurality of spaced apart reinforcing members 14 are mounted on a support plate 16. The reinforcing members 14 are located between the mutually opposing internal surfaces of the outer rigid boards 3 spaced apart along the length of the panel 1 at or about a location where mechanical bridging members 38 are attachable. These reinforcing members 14 are struts spaced apart along the length of the panel 1 spanning between the mutually opposing internal surfaces of the outer rigid boards 3.

[0065] In a fourth embodiment shown in Figure 4, the reinforcing arrangement 4 is eight metal or metal alloy caps 21 mounted along a part of four edges 5 of both rigid outer boards 3.

[0066] The caps 21 are metal or metal alloy and preferably the caps are manufactured from steel. The caps 21 are pre-stressed. Advantageously, this allows greater compressive forces to be applied to the edges 5 of the panels 1 during jointing of the panel 1 with other panels 1, see Figure 5 discussed below, before the edges 5 of the laminated panels 1 will mechanically deform. Advantageously, this means that the risk of harm to the integrity of the seal between adjacent panels 1 is significantly reduced during jointing, either in a factory or on site.

[0067] The cap 21 has a c-channel cross section formed for receiving part of the edges 5 of the rigid outer boards 3. Alternatively, caps having different cross sections such as T-shaped cross sections or L-shaped cross sections can be used. The metal or metal alloy caps 21 or strips are pressed onto the edge 5 of the outer rigid board 3 during manufacture of the laminated panel. The

reinforcing arrangements 4 are located on the panels 1 proximal to or at the exact same location where mechanical bridging members 38 are to be applied.

[0068] It will of course be appreciated that the reinforcing means can be manufactured or formed from any material with sufficient strength to prevent mechanical deformation of the edges of the panel.

[0069] Referring now to Figure 5, there is shown a jointing arrangement indicated generally by the reference numeral 31 between two laminated panels 32 having an opposing end face 36 of each laminated panel 32 abutted together defining an interface 35. An arrangement 38 for mechanically coupling the two laminated panels 32 together is provided by a member 38 for externally bridging the interface 35. The member 38 mechanically couples the main planar surfaces 34 of the abutted panels 32 together along at least part of the interface 35 between the two panels 32 on either or both opposing main planar surfaces 34 of the panels 32. The opposing abutted end faces 36 extend between the two main planar surfaces 34 of each panel 32. The plate member 38 is a flat plate member 38 for coupling the main planar surfaces 34 of the panels 32 together along at least part of the interface 35. The main planar surfaces 34 can be externally coupled along the entirety of the interface 35 between the two panels 32, on either or both opposing main planar surfaces 34 of the panels 32. The flat plate member 38 is a member capable of externally bridging the interface 35 between two panels 32 once the end faces 36 are abutted together. The flat plate member 38 has integral spikes 39 for penetrating the outer boards of panels 32. The flat plate member 38 is formed from steel and the interface joint is sealed with a suitable sealant (not shown).

[0070] The method for joining the panels 32 comprises abutting two panels 32 together about their end faces 36 between their two main planar surfaces 34 and externally bridging the interface with mechanical coupling members 38 which couple the main planar surfaces 34 of the panels 32 together along at least part of the interface 35 between the two panels 32 on either or both opposing main planar surfaces 34 of the panels 32. The flat plate 38 is spiked onto the main planar surfaces 34 of the panels 32. The joint 35 is further sealed using a suitable sealant (not shown). A framing end member 11 can be attached to an end face 36 of the panel 32 using flat plate 38 in the same way as it is used to form a joint at the interface 35.

[0071] In relation to the detailed description of the different embodiments of the invention, it will be understood that one or more technical features of one embodiment can be used in combination with one or more technical features of any other embodiment where the transferred use of the one or more technical features would be immediately apparent to a person of ordinary skill in the art to carry out a similar function in a similar way on the other embodiment.

[0072] In the preceding discussion of the invention, unless stated to the contrary, the disclosure of alternative values for the upper or lower limit of the permitted range of a parameter, coupled with an indication that one of the said values is more highly preferred than the other, is to be construed as an implied statement that each intermediate value of said parameter, lying between the more preferred and the less preferred of said alternatives, is itself preferred to said less preferred value and also to each value lying between said less preferred value and said intermediate value.

[0073] The features disclosed in the foregoing description or the following drawings, expressed in their specific forms or in terms of a means for performing a disclosed function, or a method or a process of attaining the disclosed result, as appropriate, may separately, or in any combination of such features be utilised for realising the invention in diverse forms thereof as defined in the appended claims.

Claims

1. A laminated panel having an insulating core sandwiched between a pair of outside rigid boards, the laminated panel having reinforcing means being adapted to reduce mechanical deformation of a perimeter of the laminated panel.

2. A laminated panel as claimed in claim 1, wherein the laminated panel has integrally formed reinforcing means.

3. A laminated panel as claimed in claim 1 or claim 2, wherein the reinforcing means are contained substantially within the boundary defined by the outer peripheral surface of the panel.

4. A laminated panel as claimed in any one of the preceding claims, wherein the reinforcing means is located on or between the outer rigid boards.

5. A laminated panel as claimed in any one of the preceding claims, wherein the reinforcing means is disposed within a portion of the space normally occupied by the insulating core.

6. A laminated panel as claimed in any one of the preceding claims, wherein the reinforcing means is located between the outer rigid boards spaced apart along the length of the panel at or about a location where mechanical bridging members are attachable.

7. A laminated panel as claimed in any one of the preceding claims, wherein the reinforcing means is located proximal to the edge of the laminated panel.

8. A laminated panel as claimed in any one of the preceding claims, wherein the reinforcing means is integrally formed with the insulating core.

9. A laminated panel as claimed in any one of the preceding claims, wherein the reinforcing means comprises a more densely formed portion of the insulating core spanning between mutually opposing internal surfaces of the outer rigid boards acting as a strut.

10. A laminated panel as claimed in any one of the claims 1 to 7, wherein the reinforcing means comprises separate reinforcing members located between mutually opposing internal surfaces of the outer rigid boards.

11. A laminated panel as claimed in claim 10, wherein the reinforcing members are spaced apart blade like members.

12. A laminated panel as claimed in claim 10 or claim 11, wherein the reinforcing members are struts spaced apart along the length of the panel spanning between mutually opposing internal surfaces of the outer rigid boards.

13. A laminated panel as claimed in any one of the preceding claims, wherein the reinforcing means comprises a strip or cap mounted along all or a part of one or more edges of one or both rigid outer boards.

14. A laminated panel as claimed in claim 13, wherein the strip or cap is pre-stressed.

15. A jointing arrangement between two adjacent laminated panels, the two panels having two mutually opposing end faces abutted together, the jointing arrangement comprising mechanical coupling means for externally bridging at least part of the interface between the two panels on either or both opposing main planar surfaces of the panels, each individual laminated panel having reinforcing means being adapted to reduce mechanical deformation of a perimeter of the laminated panel.

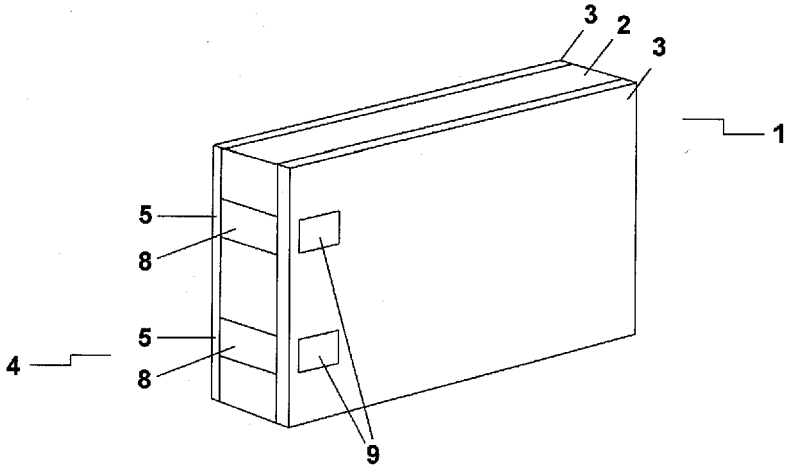

Figure 1

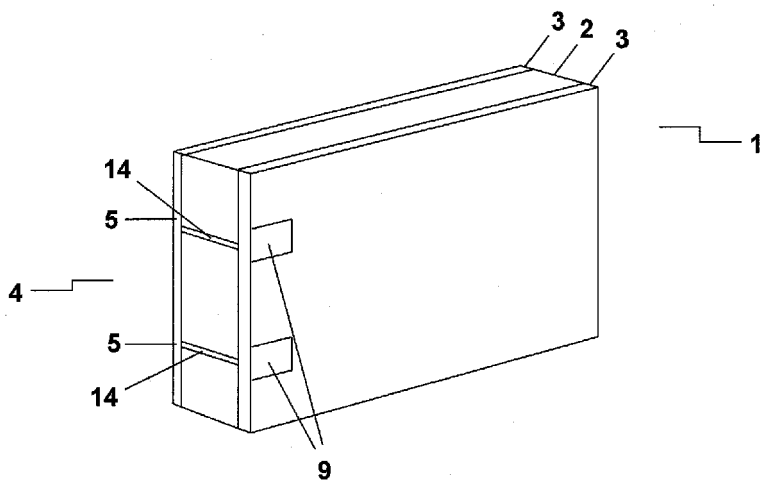

Figure 2

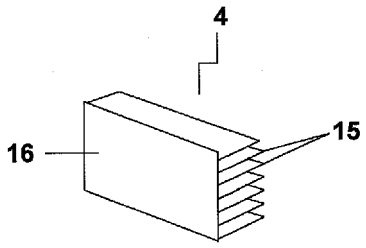

Figure 3

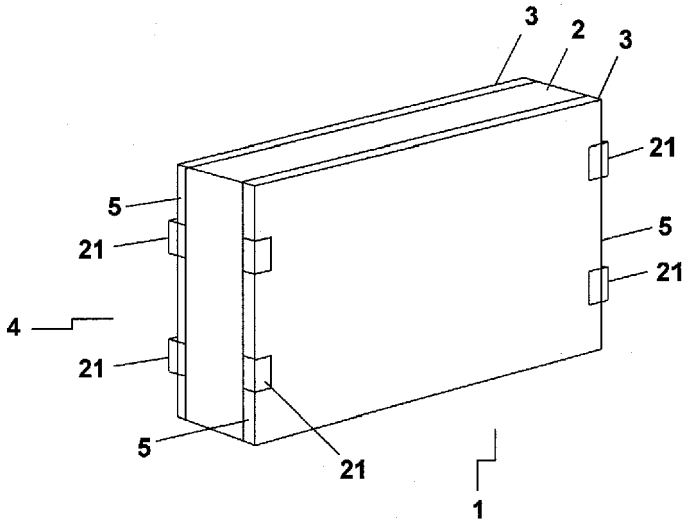

Figure 4

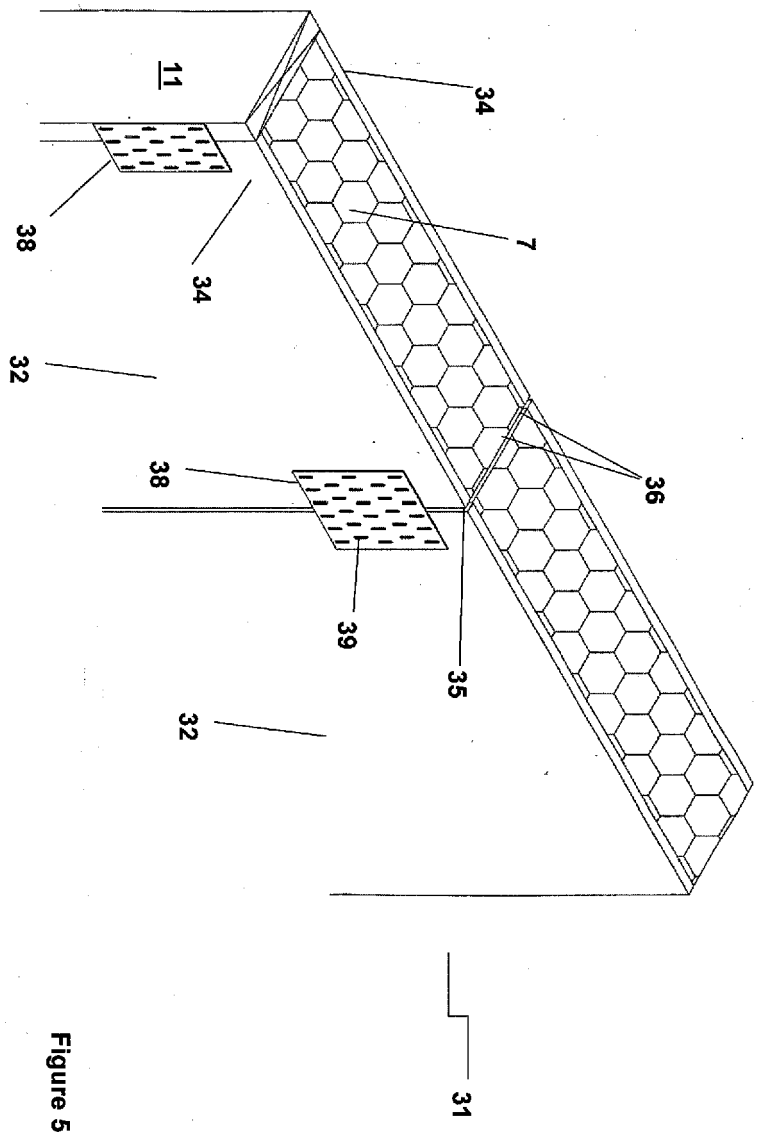

Figure 5