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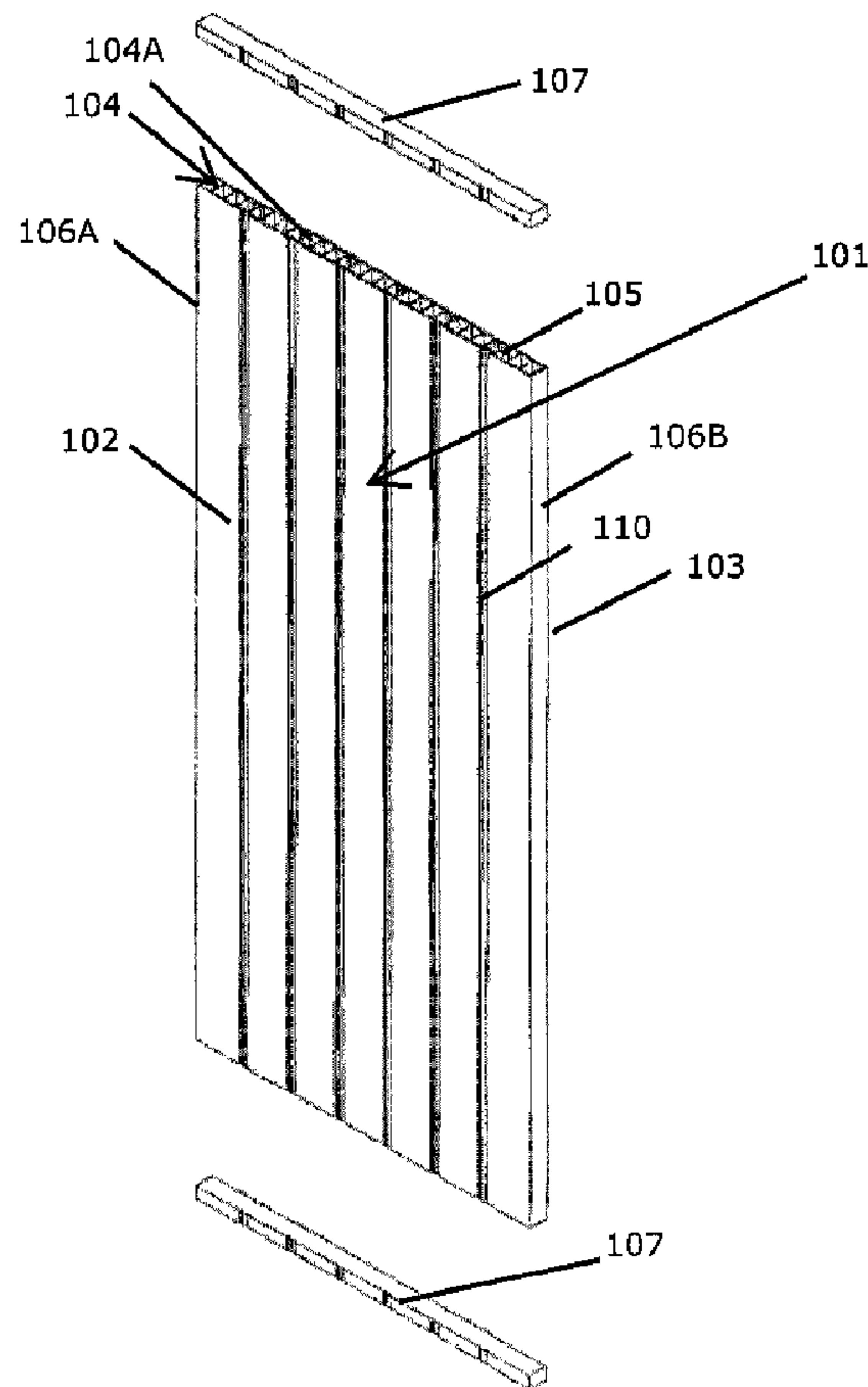
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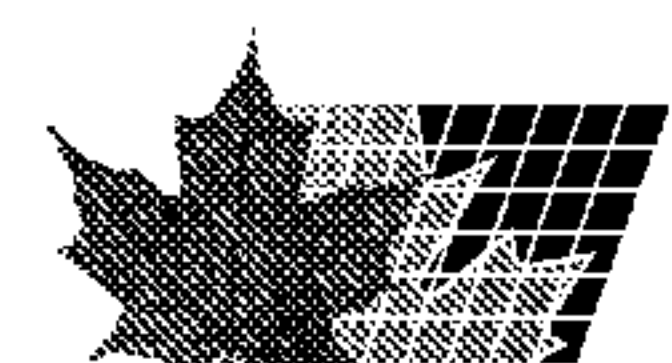
(54) **Titre : UN DISPOSITIF DE FERMETURE ET UN PROCEDE DE FABRICATION ASSOCIE**

(54) **Title: A CLOSURE MEMBER AND THE METHOD OF MAKING THE SAME**



(57) **Abrégé/Abstract:**

A closure member of a preferred configuration and the method of making the same. The closure member has a board with a major axis and two panels to sandwich a hollow interior that is partitioned by a plurality of ribs positioned at intervals within the hollow



(57) Abrégé(suite)/Abstract(continued):

interior, the hollow interior is delimited in a first direction by a pair of opposite end walls. The hollow interior is accessible in a second direction which is substantially traverse to the first direction, and at least one of the two panels is textured during the formation of the board to form a textured outer surface of the closure member, or the hollow interior is filled with a preferred reinforcement means.

ABSTRACT

A closure member of a preferred configuration and the method of making the same. The closure member has a board with a major axis and two panels to sandwich a hollow interior that is partitioned by a plurality of ribs positioned at intervals within the hollow interior, the hollow interior is delimited in a first direction by a pair of opposite end walls. The hollow interior is accessible in a second direction which is substantially traverse to the first direction, and at least one of the two panels is textured during the formation of the board to form a textured outer surface of the closure member, or the hollow interior is filled with a preferred reinforcement means.

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A CLOSURE MEMBER AND THE METHOD OF MAKING THE SAME

The present invention relates to a closure member and the method of making the same, for example particularly, but not
5 exclusively, a door formed by extrusion.

BACKGROUND OF THE INVENTION

A closure member includes a door which is a movable
10 structure used to close off an entrance, typically consisting of a panel that swings on hinges or that slides or rotate. Conventional doors with relatively high mechanical or structural strength are usually heavy and expensive to produce. The production of such a door involves
15 numerous steps including trimming, edge beveling, sanding etc. Decorating or modifying such a door with desirable shape and patterns would involve time-consuming shaping method with considerable wastage.

20 For example, to enhance the structural or mechanical strength of such a conventional wooden door after it is formed would be undesirable if not impossible. The type of wood that offers the preferred strength should be selected at the outset, before the door is built. It may also be
25 difficult to adapt the door to suit a specific entrance of awkward shape and dimension after the door is made.

The invention seeks to eliminate or at least to mitigate such shortcomings by providing a new or otherwise improved
30 closure member and a method of making the same.

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It is an objective of the present invention to provide a decorated door that is inexpensive to make. The door is flexible and adaptable to versatile applications.

- 5 It is another objective of the present invention to provide a reliable process of forming a decorated door making use of known technology with predictable and controllable production costs.

10 SUMMARY OF THE INVENTION

According to the invention, there is provided a closure member of a preferred configuration, comprising a board having a major axis and two panels sandwiching a hollow
15 interior that is partitioned by a plurality of ribs positioned at intervals therein, the hollow interior is delimited in a first direction by a pair of opposite end walls, wherein the hollow interior is accessible in a second direction which is substantially traverse to the first
20 direction, and at least one of the two panels is textured during the formation of the board to form a textured outer surface of the closure member.

Preferably, the pair of opposite end walls forms the left
25 and right side walls of the closure member.

More preferably, the hollow interior is closed off in the second direction by a cover.

30 Yet more preferably, the cover includes an insertion insertable into the hollow interior of the board.

Preferably, the panels, the ribs and the opposite end walls

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are formed by extrusion.

Advantageously, the panels, the ribs and the opposite end walls are integrally formed as one piece.

5

More advantageously, the hollow interior is filled with a preferred reinforcement means.

10 In a second aspect of the invention there is provided a closure member of a preferred configuration, comprising a board having a major axis and two panels sandwiching a hollow interior that is partitioned by a plurality of ribs positioned at intervals, the hollow interior is delimited in a first direction by a pair of opposite end walls, wherein
15 the hollow interior is occupied by reinforcement means.

Preferably, the hollow interior is partitioned at intervals to form discrete elongate spaces that extends along the major axis.

20

It is preferable that discrete elongate space is filled with the reinforcement means which is preformed into an elongate piece and dimensioned to be fitted into the discrete elongate space for enhancing the tensile strength of the
25 board.

Preferably, the elongate piece is made of a material selected from a group consisting of wood, plastic and metal.

30 More preferably, the insertion is insertable into an end portion of the discrete elongate space to prevent access to the hollow interior.

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Yet more preferably, the ribs extend parallel to the major axis in the hollow interior, and are closer apart in a region adjacent at least one of the end walls of the board than those in a region at or adjacent the centre of the board.

Advantageously, at least one of the panels is textured by way of having one or more grooves thereon.

It is advantageous that texture on the panel is formed together with the rest of the overall closure member by way of extrusion.

It is preferable that at least one of the panels is decorated with a decoration fixed to thereto.

More preferably the decoration is press fit into the groove.

It is preferable that at least one of the panels is textured by way of having one or more shaped grooves thereon which are formed together with the rest of the overall closure member by way of extrusion, and the decoration includes a base having a shape corresponding to that of the groove and is attached to the groove.

More preferably, the panel includes an aperture for accommodating a part of the decoration, the decoration includes a deformable anchor for insertion into the aperture when compressed and thereafter for abutting an underside of the panel when expanded.

It is preferable that both of the panels have apertures formed at corresponding position for accommodating

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respective decoration which are provided with a coupler for inter-engagement between the panels.

Advantageously, the decoration is fixed to the panel by a
5 two part coupler, with one part being provided on an inner side of the panel coupling with another part being provided on an outside of the panel.

Preferably, the board includes an aperture which extend
10 across the hollow interior and beyond the panels to form a through hole for accommodating a window with frame therein.

In a third aspect of the invention there is provided a method of forming a closure member as discussed above
15 comprising the step of forming a board by way of extrusion, the board has a major axis and two panels sandwiching a hollow interior that is partitioned by a plurality of ribs positioned at intervals, the hollow interior is delimited in a first direction by a pair of opposite end walls, texturing
20 at least one of said panels during the formation of the board by way of rolling a textured roller 200 thereon.

Preferably, the ribs and the pair of opposite end walls are integrally formed by way of extrusion.

25

More preferably, the hollow interior is partitioned at intervals to form discrete elongate spaces extending along the major axis.

30 In a fourth aspect of the invention there is provided a method of forming a closure member as claimed in any one of claims 1 to 25 comprising the step of forming a board by way of extrusion, the board has a major axis and two panels

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sandwiching a hollow interior that is partitioned by a plurality of ribs positioned at intervals to form discrete elongate spaces, the hollow interior is delimited in a first direction by a pair of opposite end walls, filling at least one of the discrete elongate spaces with reinforcement means

Preferably, the step of texturing at least one of said panels during the formation of the board by way of rolling a textured roller 200 thereon.

10

More preferably, the discrete elongate space is filled with the reinforcement means which is preformed into an elongate piece and dimensioned to be fitted into the discrete elongate space, the reinforcement means enhances the tensile strength of the board.

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Yet more preferably, the method further including the step of closing off the hollow interior by a cover.

It is preferably that the cover includes an insertion insertable into the hollow interior of the board.

Preferably the insertion is insertable into an end portion of the discrete elongate space to prevent access to the hollow interior

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It is advantageous that the method further comprising the step of decorating the panel by a decoration.

Advantageously, the step of decorating the panel by a decoration involve fixing the decoration to the panel by a two part coupler, with one part being provided on an inner side of the panel coupling with another part being provided

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on an outside of the panel.

It is preferable that the method further comprising the step of providing an aperture on the board, wherein the aperture
5 extends across the hollow interior and beyond the panels to form a through hole for accommodating a window and frame therewith.

Preferably, the panel has at least one groove formed with
10 the rest of the board by way of extrusion.

More preferably, the panel has at least one depression formed by rolling over the panel a textured roller 200 with at least one protrusion.

15

Yet more preferable that the step of decorating the panel by a decoration involve providing a shaped groove to the panel during extrusion, and attaching a decoration with a shape corresponding to shape of the groove.

20

Preferably the step of decorating the panel by a decoration involves drilling an aperture on the panel, providing a decoration with a deformable anchor, compressing the anchor for insertion into the aperture and expanding the anchor for
25 abutment with an underside of the panel.

It is preferable that the step of decorating the panel by a decoration involves drilling corresponding apertures on each panel, providing a decoration, which has two parts couplable
30 by way of a coupler, fixing the parts of the decoration to respective aperture on respective panel, and inter-engaging the coupler between the panels.

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In a further aspect of the invention, there is provided a closure member of a preferred configuration, comprising a board having a major axis and two panels sandwiching a hollow interior that is partitioned by a plurality of ribs positioned at intervals, the hollow interior is delimited in a first direction by a pair of opposite end walls, wherein the plurality of ribs includes first rib that extend parallel to the major axis in the hollow interior and at least one second rib that extends traverse to the major axis in the hollow interior.

Preferably, the hollow interior is occupied by reinforcement means.

Preferably, wherein the second rib contributes to an overall thermal transmission (U value) of the closure member by increasing a thermal resistance (R value).

More preferably, the thermal resistance is a sum of thermal resistance in each layer of material in the closure member.

BRIEF DESCRIPTION OF DRAWINGS

The invention will now be more particularly described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a first embodiment of a door according to the invention;

Figure 2 is an enlarged cross sectional view taken along width of the door in Figure 1;

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Figure 3A is a perspective view of a second embodiment of a door according to the invention;

5 Figure 3B is an enlarged cross sectional view taken across length of the door in Figure 3A showing part of that door;

Figure 4A and 4B are perspective view of a third embodiment of a door according to the invention;

10

Figure 4C is an enlarged cross-sectional view of a part of the door in Figure 4A taken along line A-A';

15 Figure 5A is a perspective view of a further embodiment of a door according to the invention;

Figure 5B is a cross-sectional view of a part of the door in Figure 5A;

20 Figure 6 is an enlarged perspective cross sectional view of the door in Figure 1 with reinforcement means;

Figure 7 is a perspective view of an extrusion process for production of the door in Figure 1; and

25

Figure 8 is a cross-sectional view of a part of the door in Figure 1 with decorations press fit into a groove formed by way of extrusion with the rest of the door. NEW

30 Figure 9A is a perspective exploded view of a further embodiment of a door according to the invention;

Figure 9B is a cross sectional view taken along length of

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the door in Figure 9A;

Figure 10 is an enlarged view of a part of the cross sectional view in Figure 9B;

5

Figure 11A is a perspective exploded view of another embodiment of a door according to the invention;

Figure 11B is an enlarged cross-sectional view taken along length of the door in Figure 11A showing part of the door;

10

Figure 12A is a front view of the door in Figures 9A and 9B with decorative accessories;

Figure 12B is a perspective view of the door in Figure 12A;

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Figure 12C is an enlarged cross-sectional view of the door in Figures 12A and 12B showing first and second arrangements of the decorative accessories on the door;

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Figure 12D is an enlarged cross-sectional view of a part of the door in Figures 12A and 12B showing a third arrangement of the decorative accessory on the door;

Figure 13A is a front view of a further embodiment of a door according to the invention;

25

Figure 13B is a perspective view of the door in Figure 13A;

Figure 13C is an enlarged cross-sectional view of the door in Figures 13A and 13B showing a part of the door;

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DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Referring to Figures 1 to 13C of the drawings, there is shown a closure member 100 in the form of, for example, a door. The closure member 100 is useful in closing off a space such as a room.

The closure member 100 is a piece of board-like structure 101 which is preferably a single piece formed by extrusion to create a door of a fixed cross-sectional profile. The board 101 includes a front panel 102 and a rear panel 103 spaced apart to form a hollow interior 104. The hollow interior 104 is maintained by the presence of one or more ribs 105 and two end walls 106A and 106B at the left and right ends of the board 101. All these features are preferably integrally formed in a single extrusion step.

The hollow interior 104 is partitioned by the ribs 105. In one embodiment, as shown in Figure 1, the ribs 105 are evenly distributed across width of the board 101 and extend along length of the board 101 to define a plurality of elongated discrete spaces 104A that extend along length of the board 101. In a preferred embodiment, each of the elongated discrete spaces is about 3.4 inch wide and extends along the entire length of the board 101.

Referring to Figure 1, the front and rear panels 102 and 103 are textured. As can be seen in Figures 7 and 8, some of the textures are formed together with the rest of the door in a single extrusion step. For example, it is possible to form shaped groove 110 and shaped depression/sink 108 on the front and/or rear panels 102 and 103 in a single extrusions step by using a specific die.

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The groove 110 may be of a preferred cross-sectional shape, for example pleated or W-shaped, as can be seen in Figure 8.

Accessories may be fit into the grooves or depression 110.

- 5 The accessory includes a decorative surface 114A provided on top of a complementarily shaped seat 114B that fits into the W-shaped groove and is adhered thereto by adhesive.

- 10 Other textures are formed when the material on the front and rear panels 102 and 103 are soft and are able to adopt pattern on a textured roller 200. The textured roller 200 rolls over an outer surface of the front or rear panel 102 or 103 to create the corresponding and preferred texture, for example, the textured roller 200 may have a number of
- 15 protrusions which press onto the outer surface of the panel 102 or 103 to create the same number of depressions 110 in a preferred configuration complementary to the shape of the protrusions on the roller 200. This would be a simple one step process. Another example would be to apply textured
- 20 wood patterns on the panel 102 or 103. A roller 200 with textured wood patterns will be used to roll over the outer surface of the front and/or rear panels 102 and/or 103 to create the corresponding wood patterns thereon.

- 25 The board 101 is sealed off on the left and right sides by the side walls 106A and 106B. These side walls 106A and 106B may be a rib 105 or is thickened to provide extra tensile strength.

- 30 The upper and lower ends of the board 101 are opened. This allows reinforcement means to enter the hollow interior 104 for increasing the tensile strength of the board 101. The hollow interior 104 is closed off by top and bottom covers

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107. In the preferred embodiment, the top and bottom covers 107 are of same construction. It includes at least one insertion/protrusion extending from an inner side of a cover plate. An outer side of the cover plate provides a smooth
5 finishing when the cover 107 is placed onto the board 101. The insertion is shaped and dimensioned to be inserted into an end portion of the elongate discrete spaces 104A. Friction holds the cover 107 in place. Preferably a seal is provided between the cover and the board 101 such that the
10 door is waterproof. The seal may be an adhesive. When viewed from outside the closure member 100, the covers 107 flush with the board 101 to form a smooth and clean finishing.

In another embodiment, independent insertions are provided
15 to be inserted to respective end portion of the elongate discrete spaces and a cover plate is applicable over free ends of the insertion to provide a tidy and smooth finishing.

As shown in Figure 1, the cover 107 may well be a bar to be
20 adhered to the top of the board 101 and the ribs 104.

During extrusion, the die is designed to produce a sink 108 on the outer surface of the front panel 102 of the board 101 as shown in Figure 3A. This sink 108 is configured to
25 accommodate a decorative plate 109. Adhesive may be applied to adhere the decorative plate 109 to the sink 108. The horizontal grooves 205 may be formed by way of extrusion or by a roller 200 with corresponding protruding rim thereon.

30 The upper and lower ends of the board 101 may be sealed off or covered by top and bottom covers 107.

In a further embodiment, it is possible to have the front

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and rear panels 102 and 103 polished for direct printing of visual texture e.g. wood-like finishing onto the panels 102 and 103.

5 As shown in Figures 4A and 4B, a portion of the board 101 is removed by way of cutting or milling to form an aperture 111. The aperture 111 may be a glazed window fitted with window frame/bead 112. In this specific embodiment, the aperture is of a diamond shape at an upper portion of the panels 102 and
10 103. The aperture 111, hence the window may be of any shape and any size within the ambit of the panels 102 and 103. One or more decorative ornaments may be fixed to the panel 102 or 103. These decorative ornaments can be coupled to the panel 102 or 103 by conventional means.

15

Figures 5A and 5B shows a door with decorative studs 114 there on. These studs 114 may be provided on one panel 102 or both panels 103 in corresponding positions. The studs 114 may be configured to be press fit into apertures 201 opened
20 on the panels 102 and/or 103, preferably by way of drilling, after the board 101 is formed from extrusion. The studs 114 may have a base with resiliently deformable anchor 202 allowing it to be pushed through the aperture 201 by compressing the anchor 202. Once passed the aperture 201,
25 the anchor 202 is allowed to expand and abuts an inner side of the panel 102/103. Alternatively, as can be seen in Figure 5B, two studs 114A are provided at corresponding positions on the panels 102 and 103 respectively by insertion into apertures opened by way of drilling after
30 extrusion. Each pair of studs 114A are couple-able with one another by way of a coupler 203 provided at the bases of the studs 114A. The coupler 203 includes a female coupler 203B and a male coupler 203A provided on the studs 114A

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respectively. The coupler as shown in Figure 5B is only a preferred embodiment and may be replaced by any conventional coupler. The base of the male coupler 203A includes a resiliently deformable anchor which is pressed through an opening in the female coupler 203B by deformation. The anchor is allowed to expand and occupies the space behind the opening in the female coupler 203B and abut the two flanges that defines the opening in the female coupler 203B to prevent disengagement of the coupler 203.

One or more shaped groove 110 is provided on the panel 102 and/or 103. This is formed with the rest of the board 101 by way of extrusion. Instead of drilling or milling holes or apertures on the panels 102 and 103 which constitute permanent damages, a stud 114 with a base having a shape that correspond to the shape of the groove 110 may be used provided for fixing, more preferably adhering, to the groove 110 of the board 101. Adhesive may be used for adhesion.

Referring to Figure 6, the board 101 may be customized for use in different conditions. For example, the door may be strengthened for use as a front door of a house which is always up against wind, rain and possibly snow. To increase the impact strength, tensile strength and flexural strength of the door, reinforcement means 113 may be inserted into respective elongate discrete spaces 104A. Different materials with different properties may be inserted into different spaces 104A. For example, wood may be inserted into the spaces 104A immediately next to and adjacent the side ends 106A and 106B to provide support for the lock assembly. Wood is easy to maneuver. Stronger reinforcement means 113 may be used to fill the spaces 104A closer to the centre of the board 101 for increasing the impact, tensile

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and flexural strength. These reinforcement means 113 are of a specific configuration and dimension to be fitted into the spaces 104A. They are secured to the hollow interior 104 by adhesive. Other conventional means may also be used. The
5 reinforcement means 113 may be strips of wood insertable into respective spaces 104A.

It is also possible to adhere fire resistant plates onto the front and/or rear panel 102 and/or 103 to increase the fire
10 resistance of the door 100.

If weight is a concern, lighter reinforcement means 113 may be used. The door 100 may also be used within reinforcement means 113.
15

The door 100 is customized by using different reinforcement means 113. Even the board 101 may be made of a preferred polymer.

20 The reinforcement means 113 may be chunks of wood, plastic or metal moulded into specific shape, a reinforcement frame or any type of solid or liquid material that eventually solidifies.

25 The common material used in extrusion to form the board 101 would be PVC. As the interior 104 is hollow, less PVC is used comparing to a board 101 with a solid interior. The door 100 should be more environmental friendly and the overall cost would be lowered. If strength is a concern,
30 then as mentioned above, the door may be customized by filling the spaces 104A with preferred material.

In another embodiment, the number of ribs 105 at an end

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region of the interior 104 adjacent the end wall 106A or 106B is greater than the number of ribs 105 at a centre region of the interior 104. The increased number of ribs 105 increases the strength of that region of the board 101 for supporting a door lock assembly to be placed in a hole formed on the board 101 by way of e.g. drilling.

The method of making the aforementioned board 101 includes the step of forming the board 101 by way of extrusion. Closing off the left and right side ends of the board 101 by providing end walls 106A and 106B. This step may be completed during the extrusion. A textured roller 200 is applied to the board 101 to press and create corresponding texture on the front and/or rear panels 102 and/or 103. Two covers 107 are provided to close off the upper and lower ends of the board 101. If needed, decorations 114 in the form of e.g. a stud 114 may be assembled to a predrilled hole on the front or rear panel 102/103. The stud 114 may be held in place by a conventional coupling mechanism as shown in Figures 5A and 5B Alternatively studs may adhered onto the panel 102/103.

Referring to Figures 9A and 9B, there is provided a further embodiment of door 100 which includes a board 101 with two sets of ribs, namely first and second ribs 105 and 105A. The first ribs 105 extend parallel to the opposite end walls 106A and 106B of the board 101 across the hollow interior 104. The second rib 105A is a panel that extend in a direction traverse to or perpendicular to the opposite end walls 106A and 106B. Basically it is in the form of a further panel sandwiched between and spaced from the panels 102 and 103. This further panel 105A is preferably smaller in dimension when compared to the panels 102 and 103. Its

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dimension may vary depends on need which is usually a balance between the required of structural strength versus cost. The first and second ribs 105 and 105A define a plurality of elongated discrete spaces 104A that extend
5 along length of the board 101.

As can be seen in Figures 9B and 10, the second rib 105A intersects with a number of first ribs 105 and as they are integrally formed, the integral intersection adds to the
10 overall structural strength of the board 101. As such it may not be necessary to introduce the reinforcement means 113 into the elongated discrete spaces 104A therebetween. A higher structural strength of the board 101 is achieved by using less material when compared to introducing
15 reinforcement means 113 to each of the elongated discrete spaces 104A between the first ribs 105 when the second rib 105A is not available.

As noticeable in Figure 9B, the second rib 105A does not
20 extend to the last three first ribs 105 adjacent the end walls 106A and 106B. Reinforcement means 113 are introduced into the respective elongated discrete spaces 104A to increase the structural strength as well as the density at those regions of the board 101 for supporting the
25 installation of hinged joints and the latch of the door 100.

After the insertion of the reinforcement means 113, the board 101 is covered at the top and bottom by respective covers 107. These covers may include protrusions at
30 corresponding positions for insertion into the elongated discrete spaces 104A in the hollow interior 104.

Grooves 110 may be introduced to the panels 102 and 103 when

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the board 101 is formed by way of extrusion. Basically all the ribs 105 and 105A as well as the grooves 110 are formed in a single step of extrusion.

5 Referring to Figure 11A and 11B, shaped depression/sink 108 on the front and rear panels 102 and 103 is formed with the board 101 along with the grooves 110 and the ribs 105 and 105A in a single extrusions step by using a specific die. A decorative plate 109 may be fitted to the depression/sink
10 108 and be fixed thereto with the use of a binding agent such as adhesive. When the hollow interior 104 is partitioned by first and second ribs 105 and 105A, the cross-sectional size of the elongated discrete spaces 104A between the second rib 105A and the depression/sink 108 is
15 smaller than that of the spaces 104A between the rear panel 103 and the second rib 105A.

The covers 107 for the door 100 in Figures 11A and 11B also include the corresponding depression/sink 108 on its front
20 and/or rear surface. In other words, the decorative plate 109 extends to the covers 107 to provide a continuous and unitary decorative outer surface.

Figures 12A to 12D show a door with decorative studs 114
25 there on.

Figure 12C shows two embodiments of the stud 114. These studs 114 may be provided on one panel 102 or both panels 103 in corresponding positions. The studs 114 may be
30 configured to be press fit into apertures 201 opened on the panels 102 and/or 103 preferably by way of drilling or milling or cutting after the board 101 is formed from extrusion. The studs 114 may have a base with a resiliently

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deformable anchor 202. As the anchor is deformable, it can be compressed and pushed through the aperture 201. Once passed the aperture 201, the anchor 202 is allowed to expand and abuts an inner side of the panel 102/103.

5

Where there is a second rib 105A, as shown in the left of the Figure 12C the stud 114 may include two anchors 202A and 202B. Two apertures 201A and 201B are opened on the panel 102 and the second rib 105A respectively. The anchors 202A and 202B are provide along a stem of the stud 114 and are spaced apart. When the stud 114 is forced into the aperture 201A, both anchors 202A and 202B are forced through. The anchor 202B went further and is forced through the aperture 201B on the second rib 105A. The apertures 201A and 201B has different diameters hence the anchors 202A and 202B have different sizes. Once the anchors 202A and 202B pass the respective apertures 201A and 201B by deformation, they expand and abut an inner surface of the panel 102 and the second rib 105A respectively for anchorage.

20

In a different embodiment, as can be seen in the right of Figure 12C, two studs 114A are provided at corresponding positions on respective panels 102 and 103 by insertion into apertures 201 opened by way of drilling after extrusion. Each pair of studs 114A are couple-able with one another by way of a coupler 203 provided at the base of the stud 114A. The coupler 203 includes a female coupler 203B and a male coupler 203A provided on the free end of the base of the respective stud 114. The coupler as shown in Figure 5B is only a preferred embodiment and may be replaced by any conventional coupler. The apertures 201 on the panels 102 and 103 and the second rib 105A are aligned and of the same size. On each stud 114 behind the coupler there is an anchor

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202. The anchor is a resiliently deformable anchor 202 that is forced through the aperture 201 by deformation to allow the coupler 203 on the corresponding studs 114 to engage in the interior 104. Once pass the aperture 201, the anchor 202
5 of the corresponding studs 114 expands and abuts respective inner wall of the panels 102 and 103. The male and female couplers 203A and 203B are snap fitted to couple.

Referring to Figure 12D, the decorative stud 214A may be
10 fitted to the groove 110. The stud 214A has a shaped/pleated base 214B which complement the shape of the groove 110. The base may be placed in the groove 110 and is fixed thereto by a binding agent such as an adhesive.

15 As shown in Figures 13A, 13B and 13C, a portion of the board 101 is removed by way of cutting or milling to form the aperture 111. The aperture 111 may be fitted with a window and the window frame/bead 112 as shown in Figure 13C. The window beads 112 are snap fit to the aperture 111 while
20 sandwiching a glass or decorative panel.

The thermal transmission (U value) of the door 100 is represented by the following mathematical formula:

$$U = 1/R = k/d$$

25

It is apparent from the above formula that an increase in the thermal resistance (R value) decreases the U value.

A R value of a door 100 is a sum of the R_i value in each
30 layer of material in which thermal transmission occurs:

$$R = \sum R_i$$

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and the U value can be represented by the following formula:

$$U = 1/\Sigma R_i$$

- 5 The R_i value is an average value of an upper resistance limit R_u and lower resistance limited R_L of a particular layer in which thermal transmission occurs:

$$R_i = (R_u + R_L)/2$$

10

And the U value may be represented by the following formula:

$$U = 1/\Sigma[(R_u + R_L)/2]_i$$

- 15 Based on the above, one may be able to conclude that the R value of the door 100 increases with the number of layers through which thermal transmission occurs.

20 The presence of a second rib 105A in the door 100 increases the number of layers through which thermal transmission occurs, hence increases the R value of the door 100. By increasing the R value of the door 100, the U value of the door 100 decreases. It may be concluded that a door 100 with the second rib 105A would have lower thermal transmission
25 ability than a door without such second rib 105A. The door 100 with a second rib 105A is more capable in maintaining a stable temperature within a space with the door 100 closed. For example, the door 100 with a second rib 105A may be more suitable for use as the main door to resist the
30 environmental temperature fluctuation.

In more detail, in a door 100 without the second rib 105A, heat within the door 100 may be transmitted through two

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different paths. The maximum layers of thermal transmitter would be three. Heat is transmitted through the front panel 102, rib 105 and the rear panel 103, or through the front panel 102, air and the rear panel 103.

5

In a door 100 with the second rib 105A, heat may be transmitted in two different paths. The first path includes three layers and the second includes five layers of thermal transmitters i.e. the front panel 102, air, the second rib 105A, air and the rear panel 103. As the R value of such a door 100 is greater than the R value of the door 100 without the second rib 105A, the U value of the door 100 with second rib 105A is lower. As such, the door 100 with the second rib 105A is more heat resisting than that without it.

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The invention has been given by way of example only, and various other modifications of and/or alterations to the described embodiment may be made by persons skilled in the art without departing from the scope of the invention as specified in the appended claims.

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CLAIMS

1. A closure member of a preferred configuration, comprising:
a board having a major axis and two panels sandwiching
5 a hollow interior that is partitioned by a plurality of ribs
positioned at intervals therein, the hollow interior is
delimited in a first direction by a pair of opposite end
walls,
wherein the hollow interior is accessible in a second
10 direction which is substantially traverse to the first
direction, and at least one of the two panels is textured
during the formation of the board to form a textured outer
surface of the closure member.
- 15 2. The closure member as claimed in claim 1, wherein the
pair of opposite end walls forms the left and right side
walls of the closure member.
3. The closure member as claimed in claim 2, wherein the
20 hollow interior is closed off in the second direction by a
cover.
4. The closure member as claimed in claim 3, wherein the
cover includes an insertion insertable into the hollow
25 interior of the board.
5. The closure member as claimed in any one of claims 1 to
4, wherein the panels, the ribs and the opposite end walls
are formed by extrusion.
- 30 6. The closure member as claimed in claim 5, wherein the
panels, the ribs and the opposite end walls are integrally
formed as one piece.

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7. The closure member as claimed in any one of claims 1 to 6, wherein the hollow interior is filled with a preferred reinforcement means.

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8. A closure member of a preferred configuration, comprising:

a board having a major axis and two panels sandwiching a hollow interior that is partitioned by a plurality of ribs positioned at intervals, the hollow interior is delimited in a first direction by a pair of opposite end walls, wherein the hollow interior is occupied by reinforcement means.

9. The closure member as claimed in any one of claims 1 to 8, wherein the hollow interior is partitioned at intervals to form discrete elongate spaces that extends along the major axis.

10. The closure member as claimed in claim 9, wherein a discrete elongate space is filled with the reinforcement means which is preformed into an elongate piece and dimensioned to be fitted into the discrete elongate space for enhancing the tensile strength of the board.

25

11. The closure member as claimed in claim 10, wherein the elongate piece is made of a material selected from a group consisting of wood, plastic and metal.

12. The closure member as claimed in claim 9 when dependent on claim 4, wherein the insertion is insertable into an end portion of the discrete elongate space to prevent access to the hollow interior.

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13. The closure member as claimed in any one of claims 1 to 12, wherein the ribs extend parallel to the major axis in the hollow interior, and are closer apart in a region
5 adjacent at least one of the end walls of the board than those in a region at or adjacent the centre of the board.

14. The closure member as claimed in any one of claims 1 to 13, wherein the plurality of ribs includes first rib that
10 extend parallel to the major axis in the hollow interior and at least one second rib that extends traverse to the major axis in the hollow interior.

15. The closure member as claimed in claim 14, wherein the
15 first and second ribs intersect within the hollow interior to form a plurality of intersections for enhancing structural strength of the closure member.

16. The closure member as claimed in claim 15, wherein the
20 first and second ribs are integrally formed by extrusion.

17. The closure member as claimed in any one of claims 1 to 16, wherein at least one of the panels is textured by way of having one or more grooves thereon.
25

18. The closure member as claimed in any one of claims 1 to 17, wherein texture on the panel is formed together with the rest of the overall closure member by way of extrusion.

30 19. The closure member as claimed in any one of claims 1 to 18, wherein at least one of the panels is decorated with a decoration fixed thereto.

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20. The closure member as claimed in claim 19, when dependent on claim 18 or claim 17, wherein the decoration is press fit into the groove.

5 21. The closure member as claimed in any one of claims 1 to 20, wherein at least one of the panels is textured by way of having one or more shaped grooves thereon which are formed together with the rest of the overall closure member by way of extrusion, and the decoration includes a base having a
10 shape corresponding to that of the groove and is attached to the groove.

22. The closure member as claimed in claim 19, wherein the panel includes an aperture for accommodating a part of the
15 decoration, the decoration includes a deformable anchor for insertion into the aperture when compressed and thereafter for abutting an underside of the panel when expanded.

23. The closure member as claimed in any one of claims 19
20 to 21 when dependent on any one of claims 14 to 16, wherein the second rib includes an aperture for accommodating a part of the decoration, the decoration includes a deformable anchor for insertion into the aperture when compressed and thereafter for abutting an underside of the second rib when
25 expanded.

24. The closure member as claimed in claim 23, wherein the aperture on the second rib is aligned with the aperture on the panel and the decoration includes two deformable anchor
30 for insertion into the respective aperture.

25. The closure member as claimed in claim 19, the decoration is fixed to the panel by a two part coupler, with

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one part being provided on an inner side of the panel coupling with another part being provided on an outside of the panel.

5 26. The closure member as claimed in any one of claims 1 to 25, wherein the board includes an aperture which extend across the hollow interior and beyond the panels to form a through hole for accommodating a window with frame therein.

10 27. A method of forming a closure member as claimed in any one of claims 1 to 26 comprising the step of:

forming a board by way of extrusion, the board has a major axis and two panels sandwiching a hollow interior that is partitioned by a plurality of ribs positioned at intervals, the hollow interior is delimited in a first direction by a pair of opposite end walls,

15 texturing at least one of said panels during the formation of the board by way of rolling a textured roller 200 thereon.

20

28. The method as claimed in claim 27, wherein the panels, the ribs and the pair of opposite end walls are integrally formed by way of extrusion.

25 29. The method as claimed in any one of claims 27 to 28, wherein the hollow interior is partitioned at intervals to form discrete elongate spaces extending along the major axis.

30 30. A method of forming a closure member as claimed in any one of claims 1 to 29 comprising the step of:

forming a board by way of extrusion, the board has a major axis and two panels sandwiching a hollow interior that is partitioned by a plurality of ribs positioned at

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intervals to form discrete elongate spaces, the hollow interior is delimited in a first direction by a pair of opposite end walls,

filling at least one of the discrete elongate spaces
5 with reinforcement means

31. The method as claimed in claim 30 further including the step of texturing at least one of said panels during the formation of the board by way of rolling a textured roller
10 200 thereon.

32. The method as claimed in any one of claims 30 to 31 wherein the discrete elongate space is filled with the reinforcement means which is preformed into an elongate
15 piece and dimensioned to be fitted into the discrete elongate space, the reinforcement means enhances the tensile strength of the board.

33. The method as claimed in any one of claims 30 to 32,
20 further including the step of closing off the hollow interior by a cover.

34. The method as claimed in claim 33, wherein the cover includes an insertion insertable into the hollow interior of
25 the board.

35. The method as claimed in claim 34, wherein the insertion is insertable into an end portion of the discrete elongate space to prevent access to the hollow interior
30

36. The method as claimed in any one of claims 30 to 35 further comprising the step of decorating the panel by a decoration.

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37. The method as claimed in claim 36, wherein the step of decorating the panel by a decoration involve fixing the decoration to the panel by a two part coupler, with one
5 part being provided on an inner side of the panel coupling with another part being provided on an outside of the panel.

38. The method as claimed in any one of claims 30 to 37 further comprising the step of providing an aperture on the
10 board, wherein the aperture extends across the hollow interior and beyond the panels to form a through hole for accommodating a window and frame therewith.

39. The method as claimed in any one of claims 30 to 38,
15 wherein the panel has at least one groove formed with the rest of the board by way of extrusion.

40. The method as claimed in any one of claims 30 to 39, wherein the panel has at least one depression formed by
20 rolling over the panel a textured roller 200 with at least one protrusion.

41. The method as claimed in claim 40, wherein the step of decorating the panel by a decoration involve providing a
25 shaped groove to the panel during extrusion, and attaching a decoration with a shape corresponding to shape of the groove.

42. The method as claimed in claim 41, wherein the step of decorating the panel by a decoration involves drilling an
30 aperture on the panel, providing a decoration with a deformable anchor, compressing the anchor for insertion into the aperture and expanding the anchor for abutment with an underside of the panel.

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43. The method as claimed in claim 42, wherein the step of decorating the panel by a decoration involves drilling corresponding apertures on each panel, providing a
5 decoration, which has two parts couplable by way of a coupler, fixing the parts of the decoration to respective aperture on respective panel, and inter-engaging the coupler between the panels.

10 44. A closure member of a preferred configuration, comprising:

a board having a major axis and two panels sandwiching a hollow interior that is partitioned by a plurality of ribs positioned at intervals, the hollow interior is delimited in
15 a first direction by a pair of opposite end walls,

wherein the plurality of ribs includes first rib that extend parallel to the major axis in the hollow interior and at least one second rib that extends traverse to the major axis in the hollow interior.

20

45. The closure member as claimed in claim 44, wherein the hollow interior is occupied by reinforcement means.

46. The closure member as claimed in claim 44 wherein the
25 second rib contributes to an overall thermal transmission (U value) of the closure member by increasing a thermal resistance (R value).

47. The closure member as claimed in claim 46, wherein the
30 thermal resistance is a sum of thermal resistance in each layer of material in the closure member.

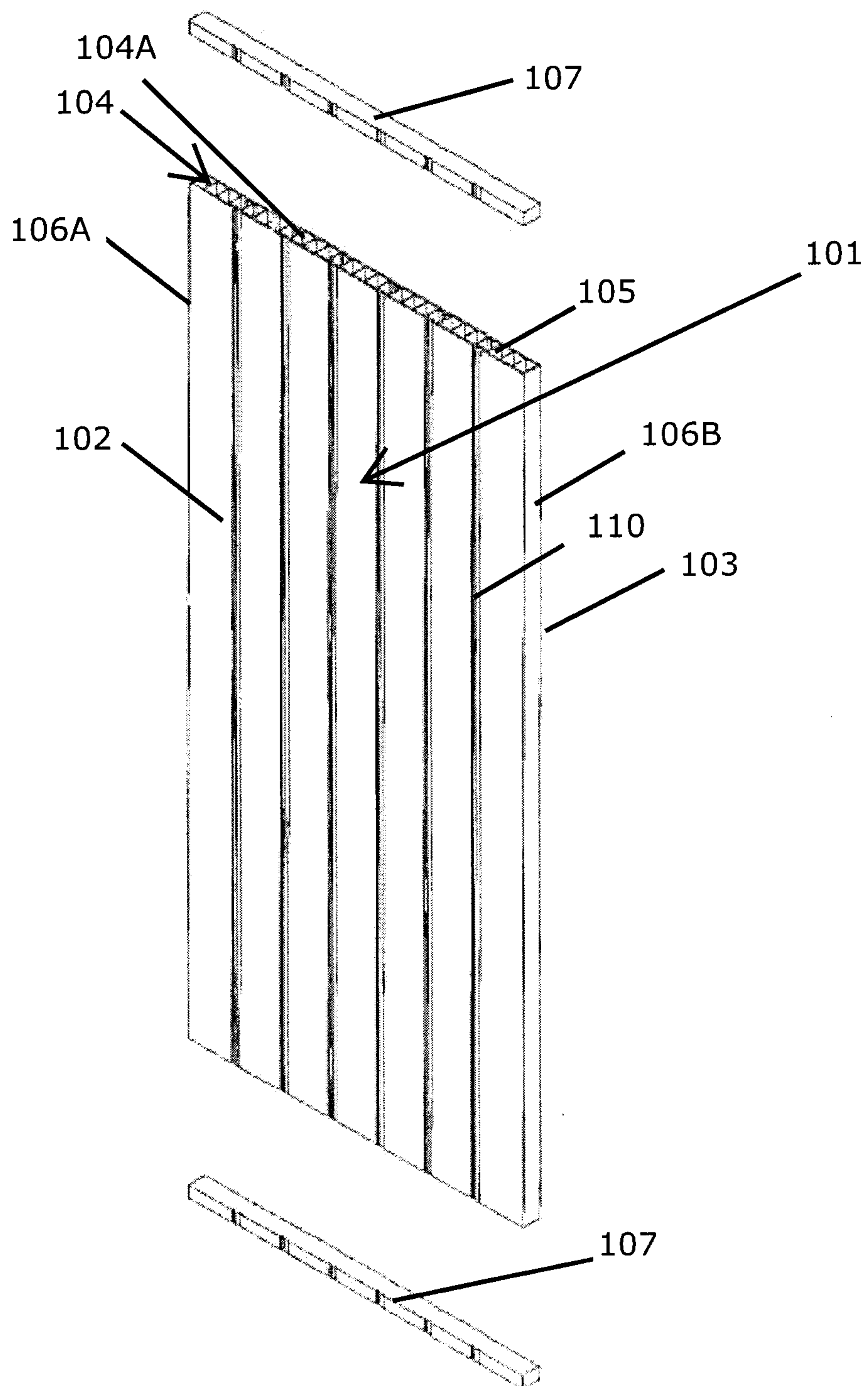


Figure 1

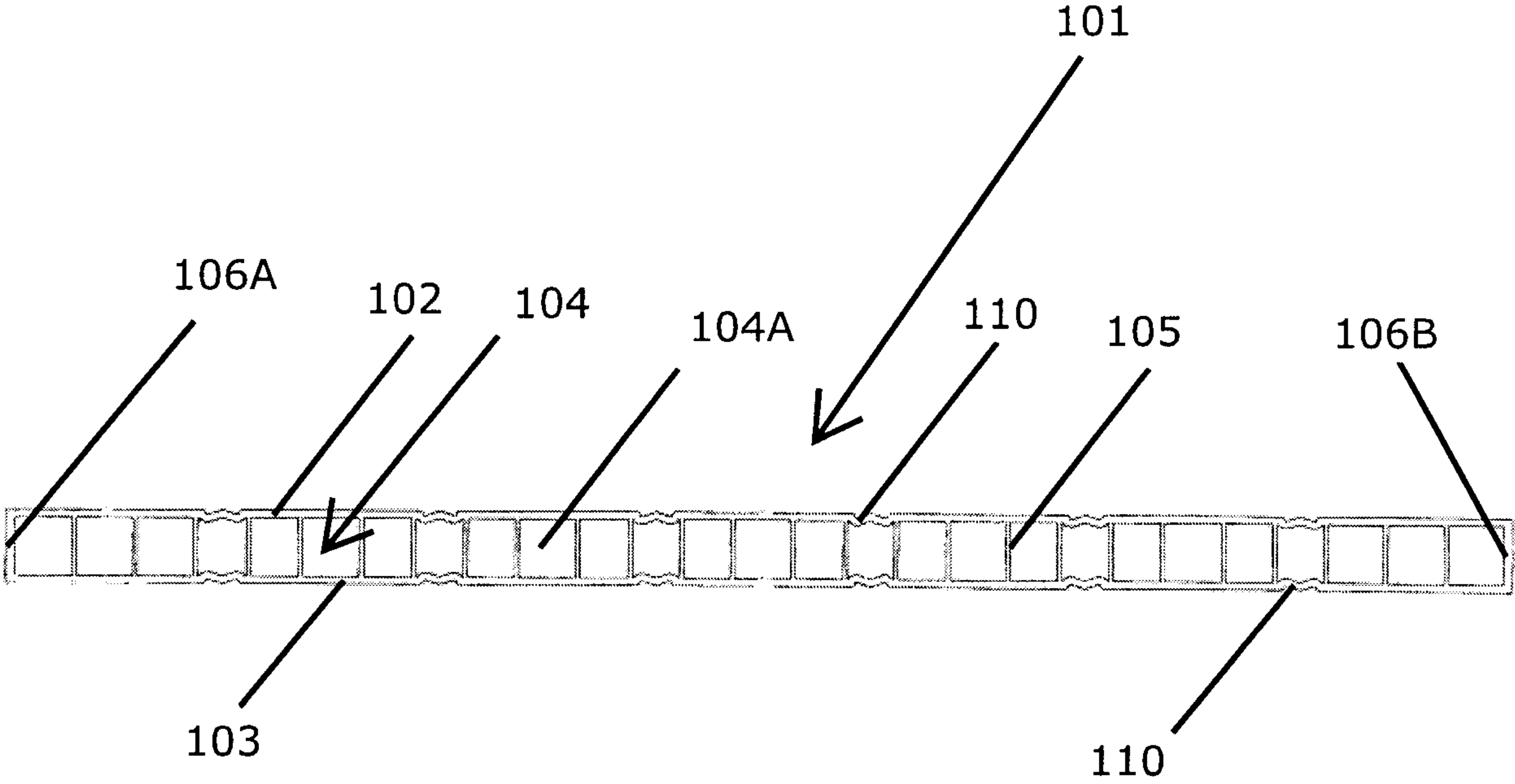


Figure 2

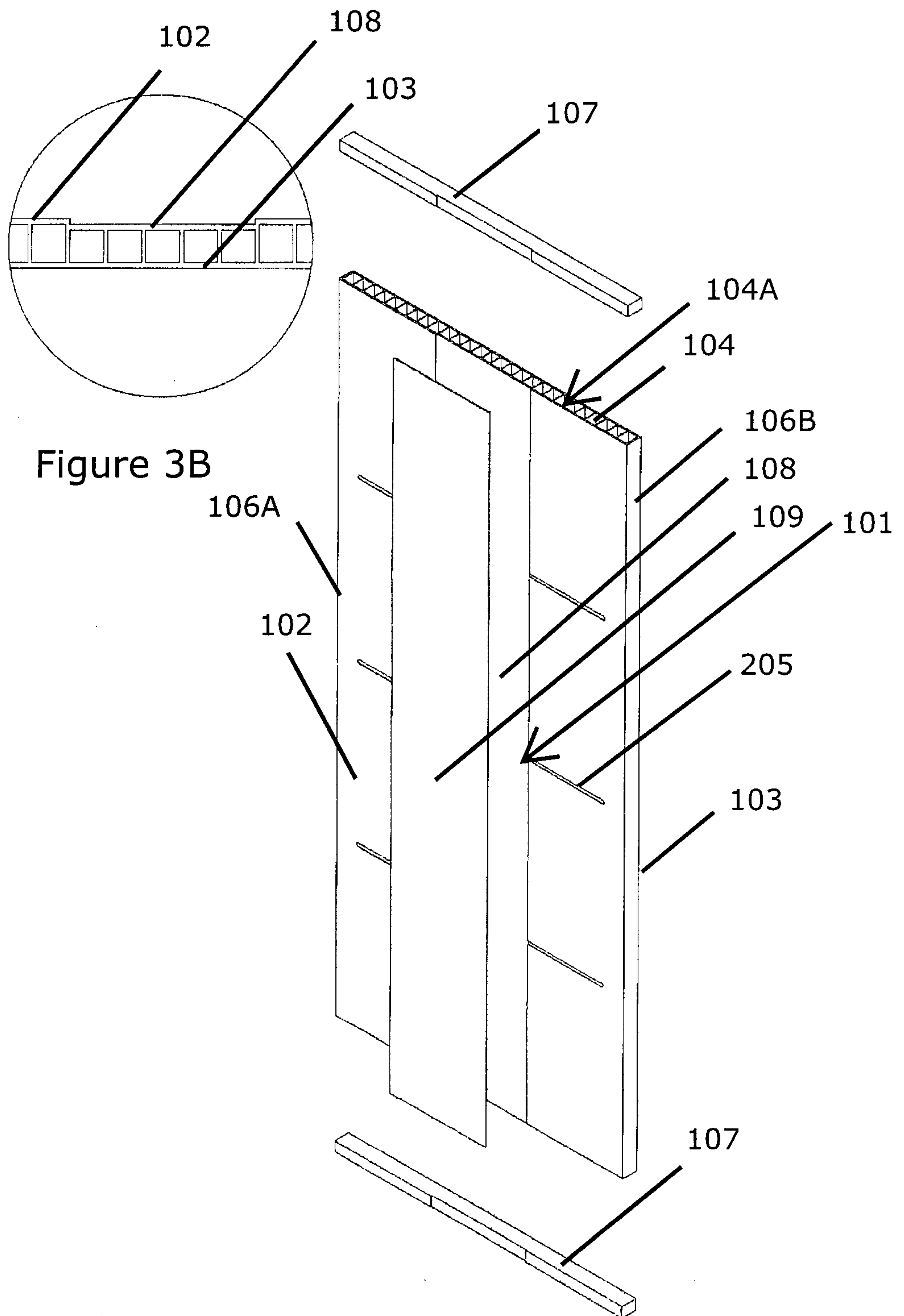


Figure 3A

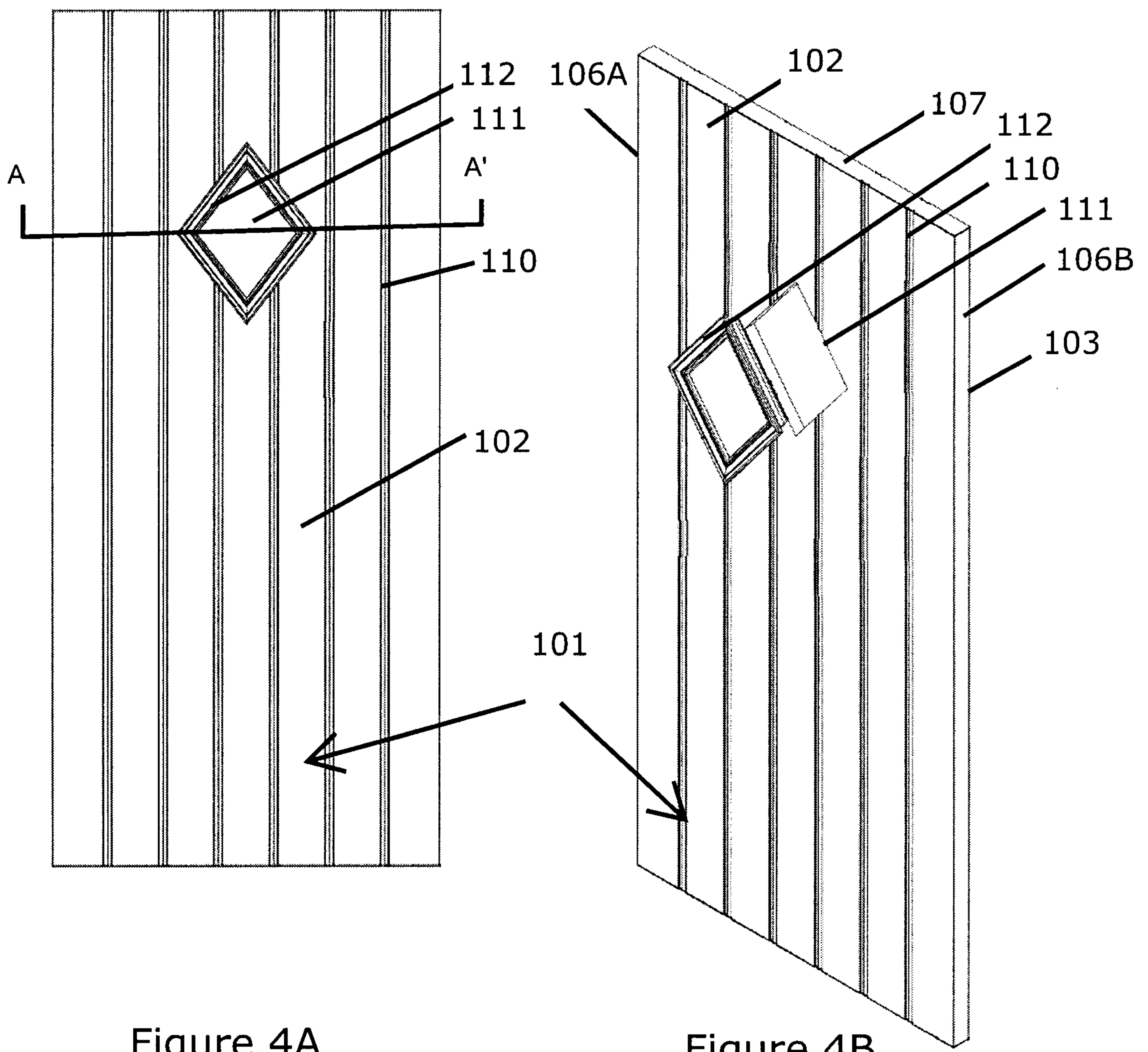


Figure 4A

Figure 4B

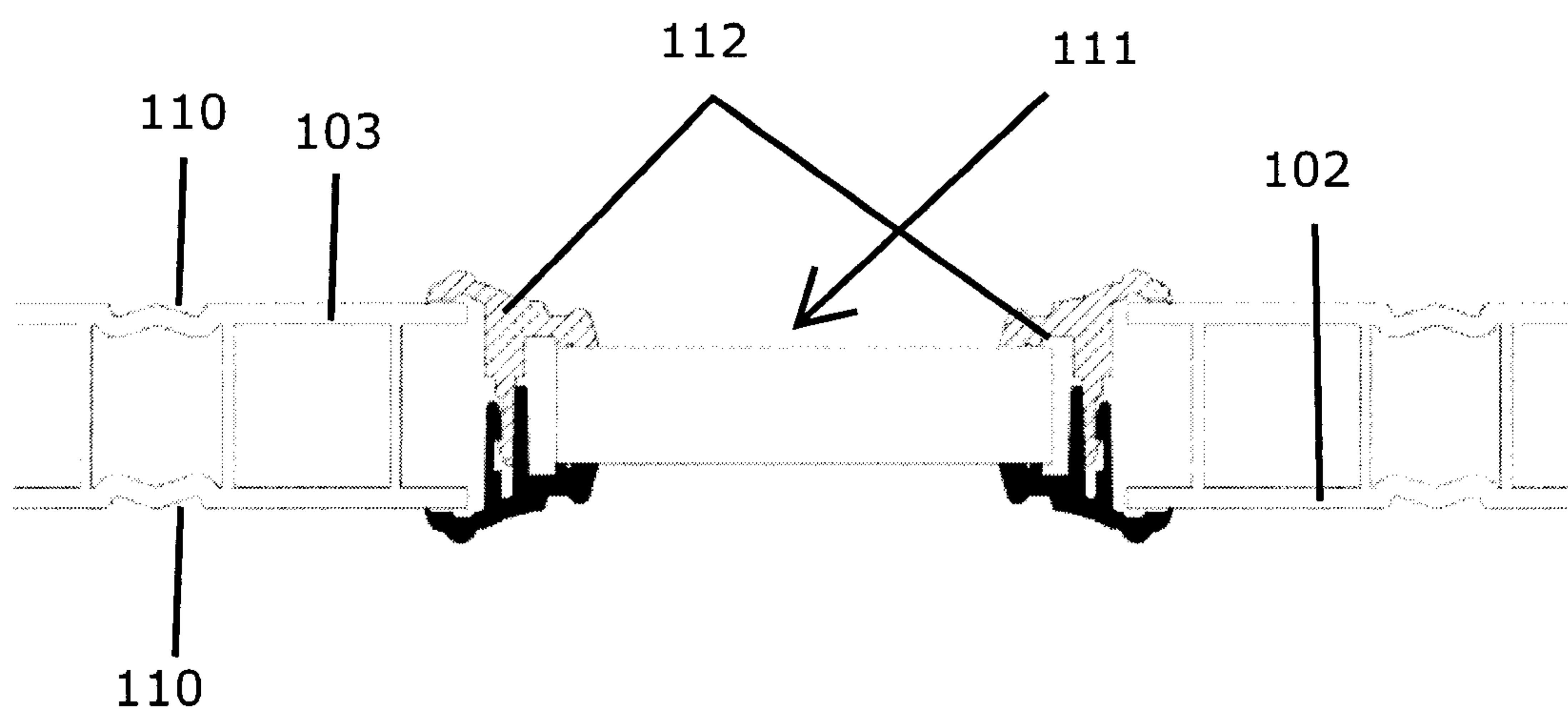


Figure 4C

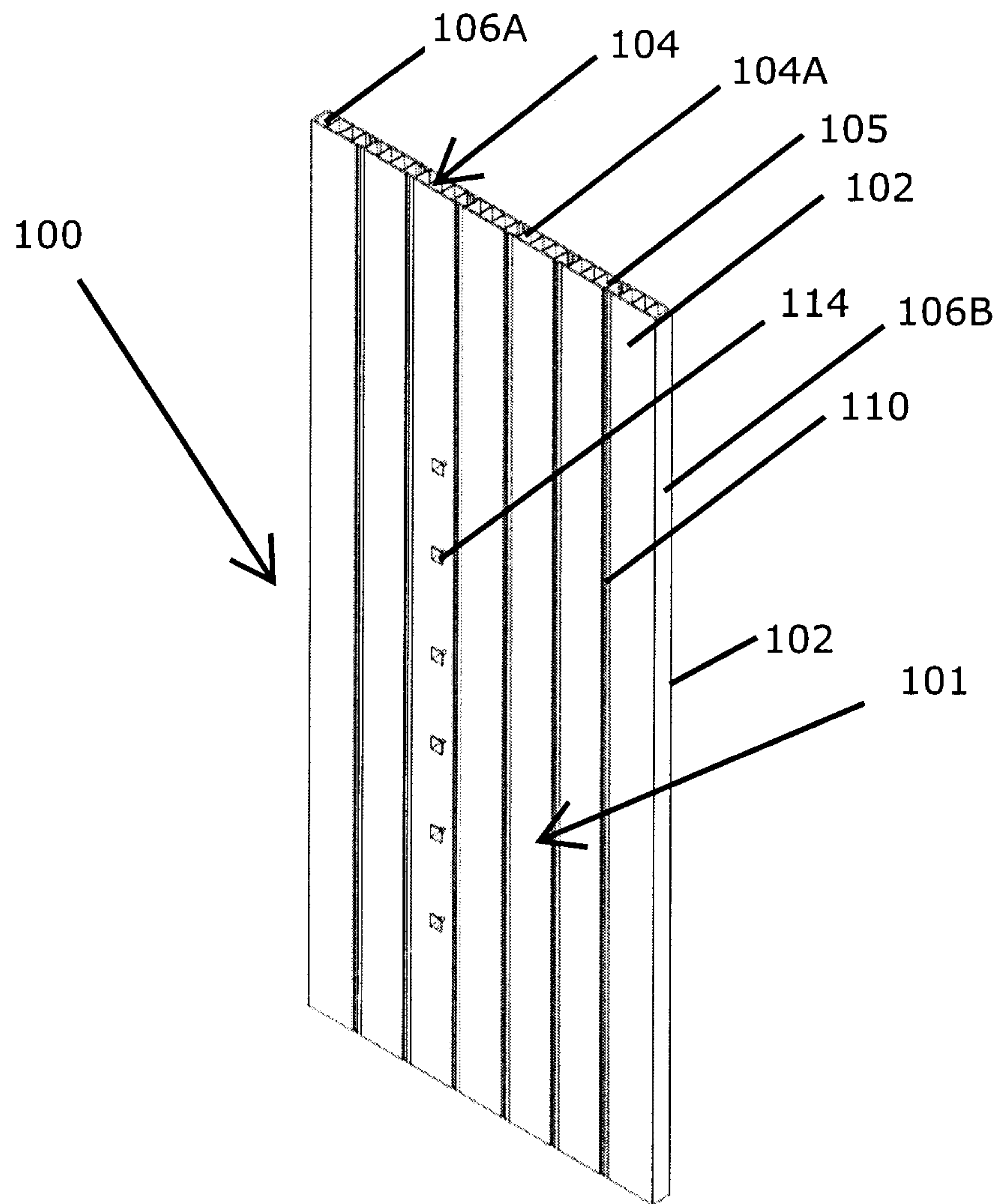


Figure 5A

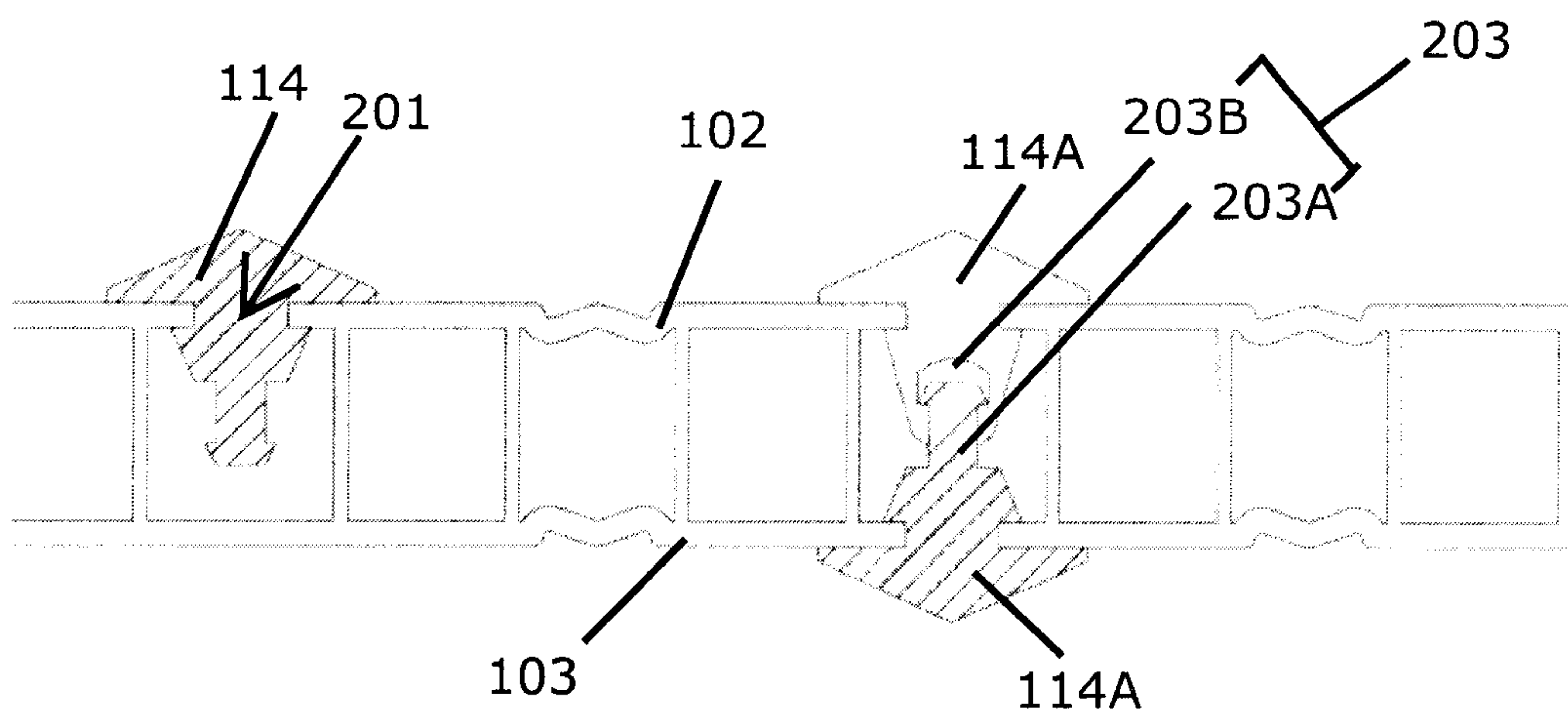


Figure 5B

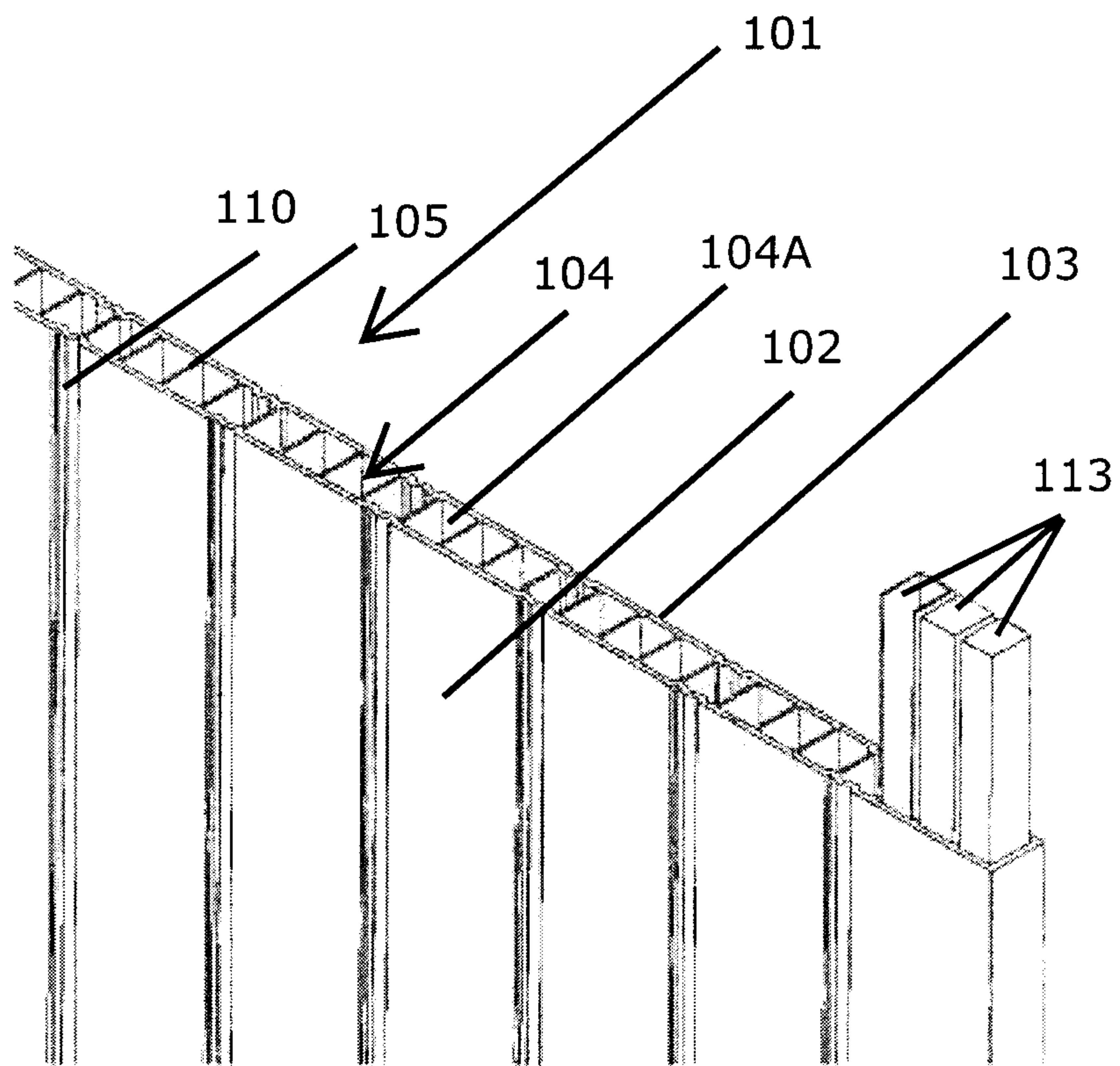


Figure 6

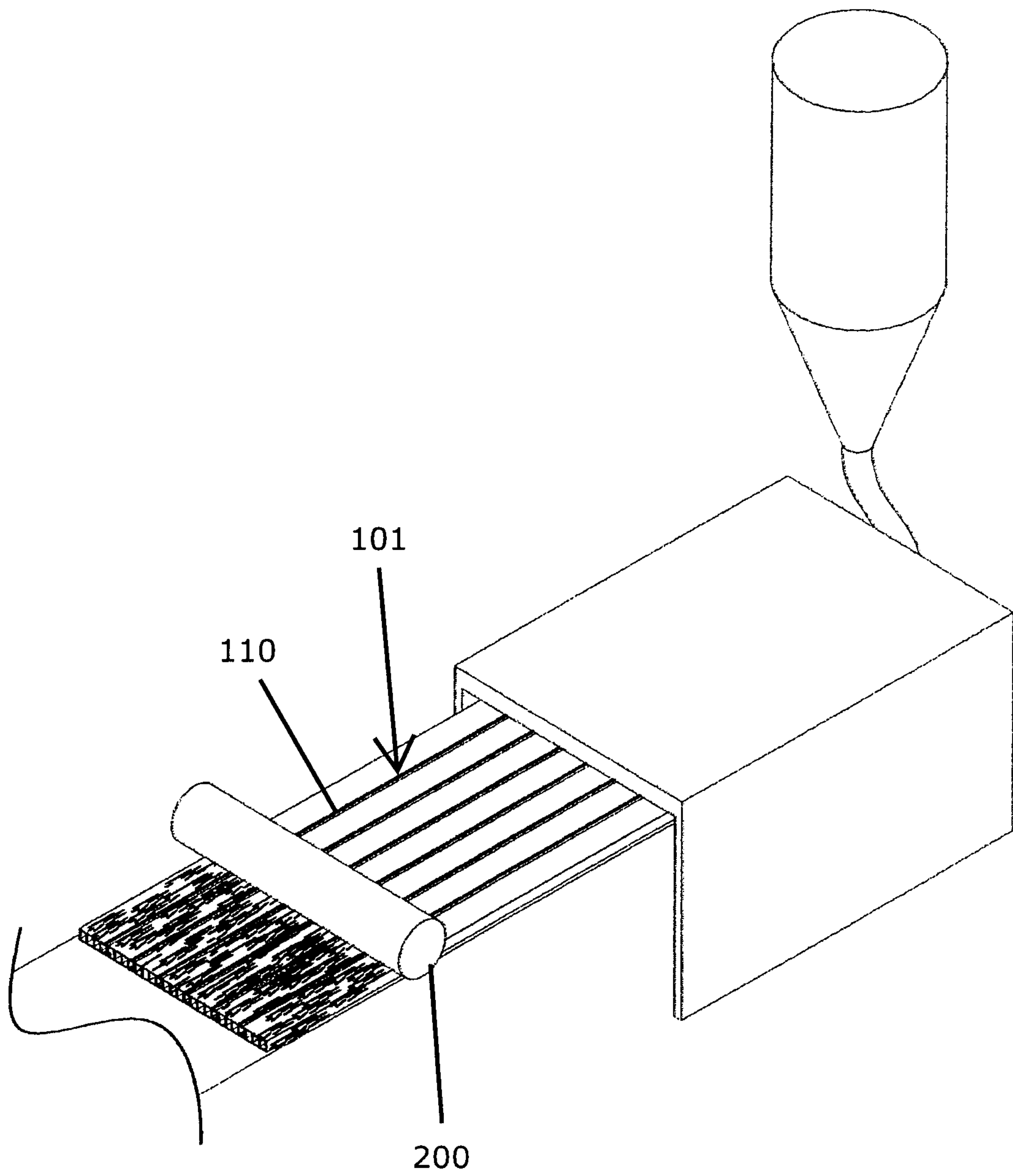


Figure 7

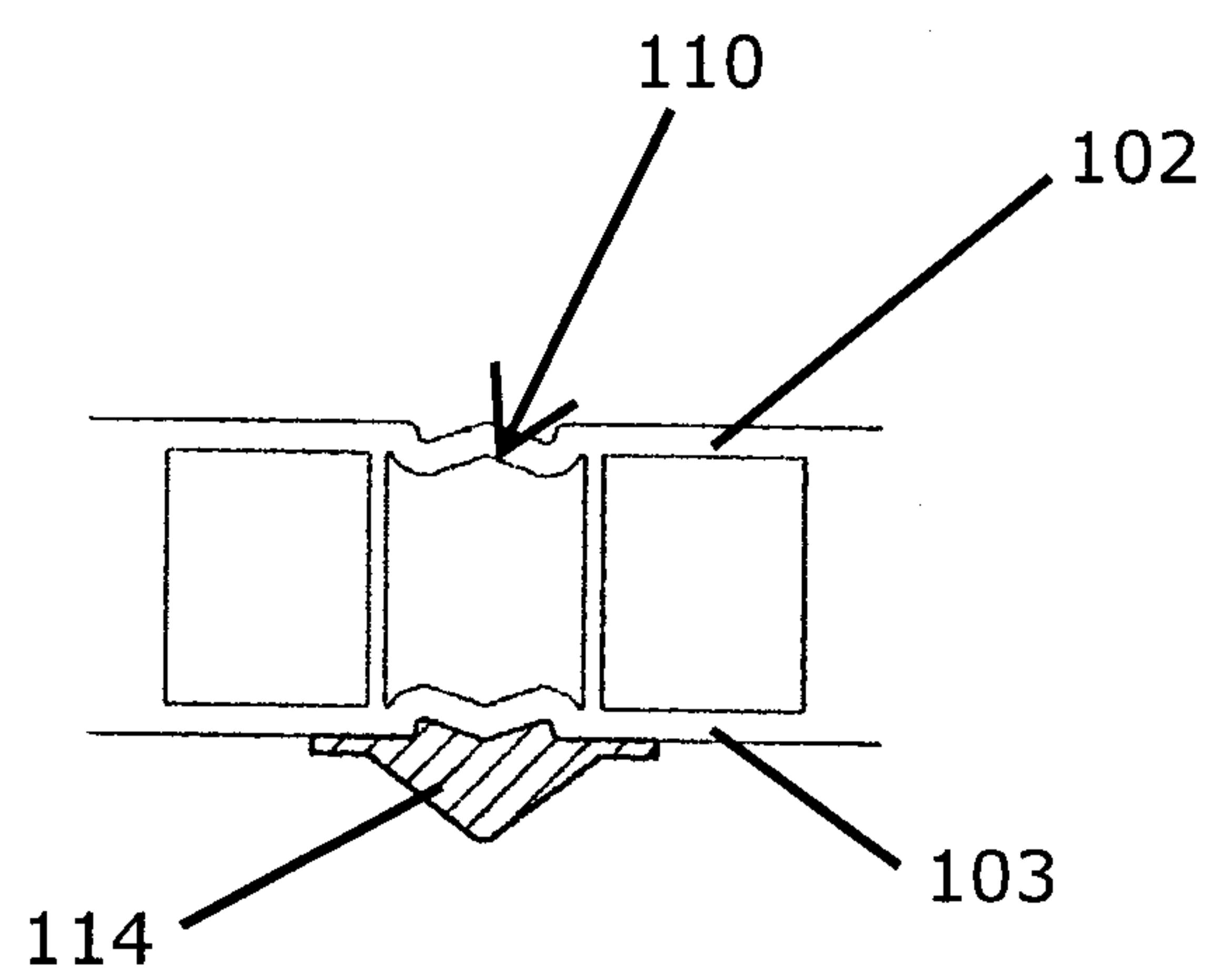


Figure 8

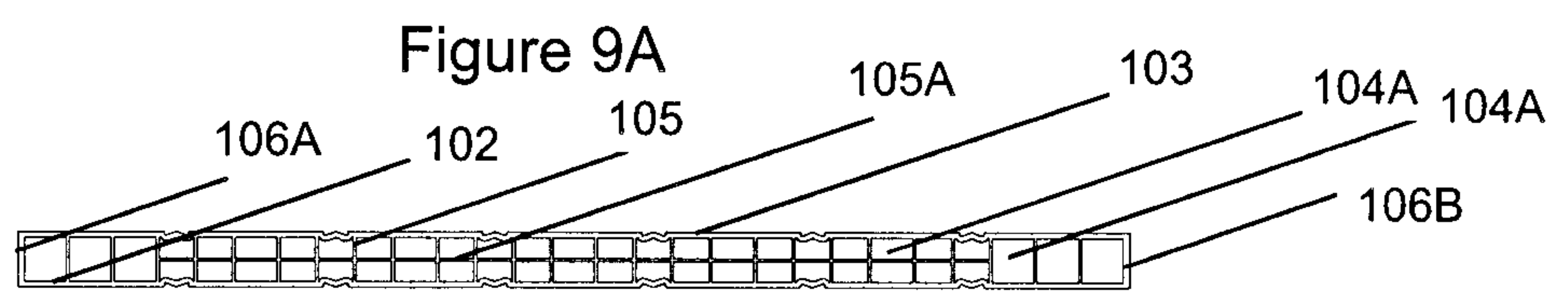
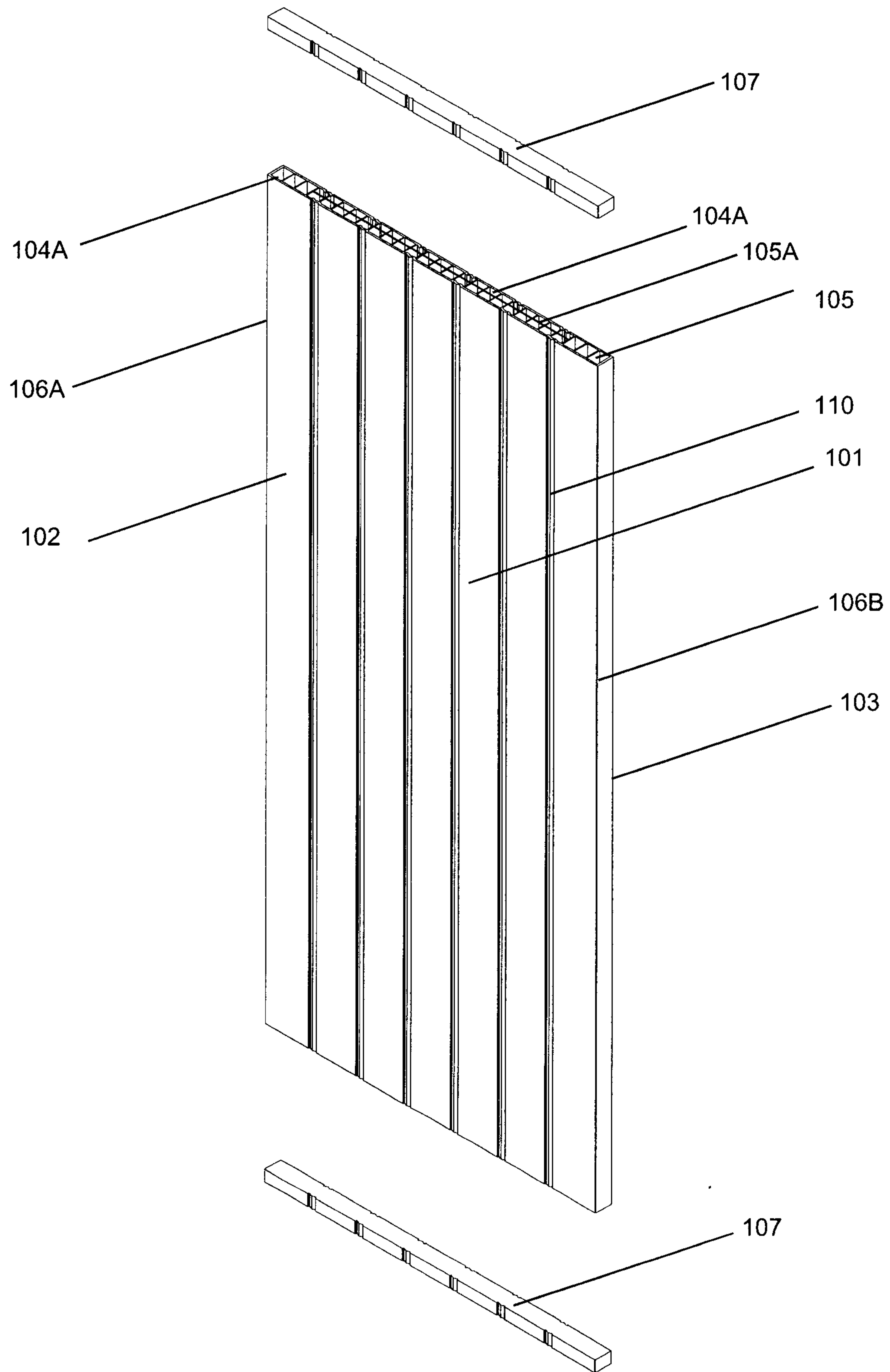


Figure 9B

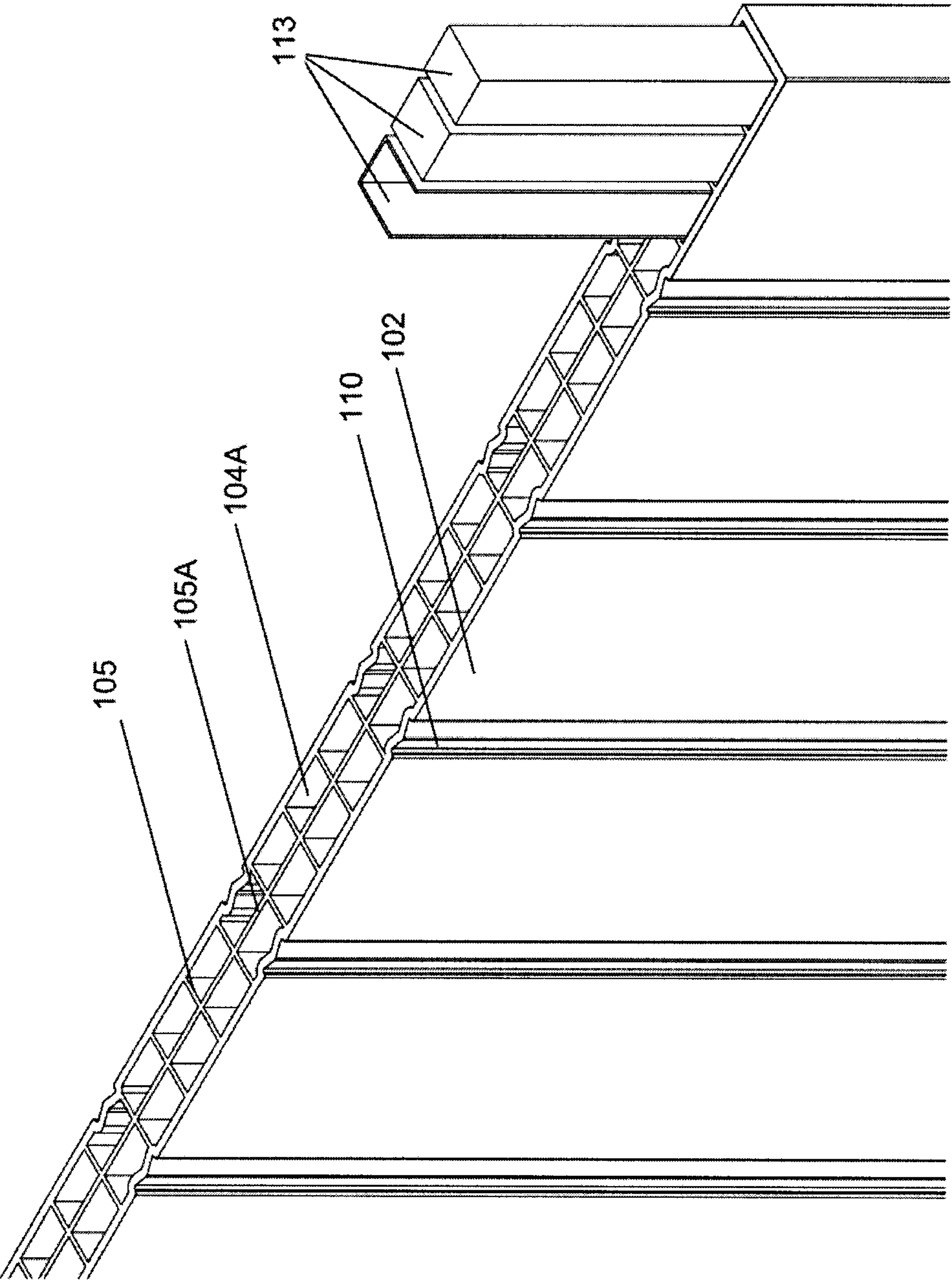
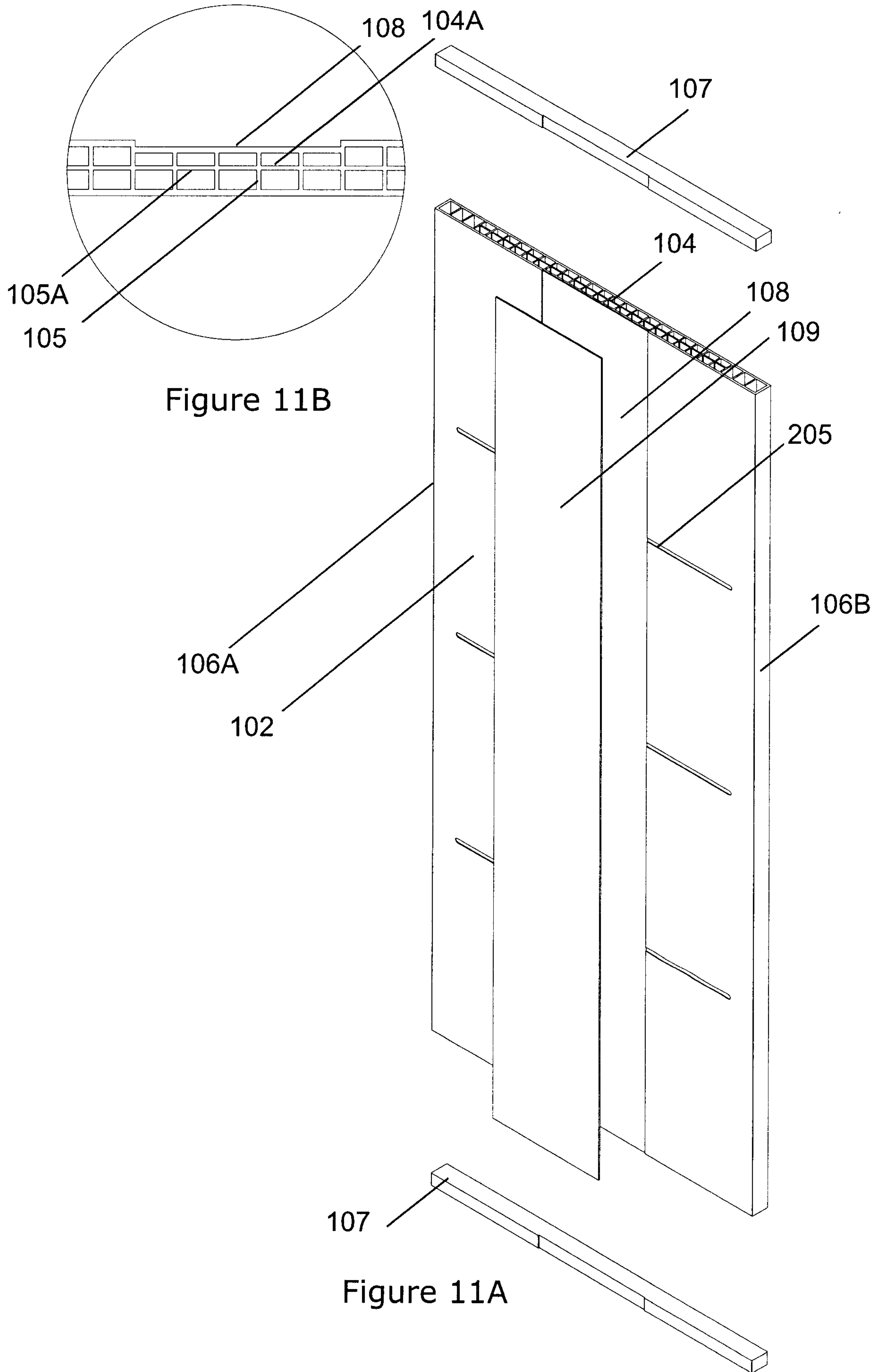


Figure 10



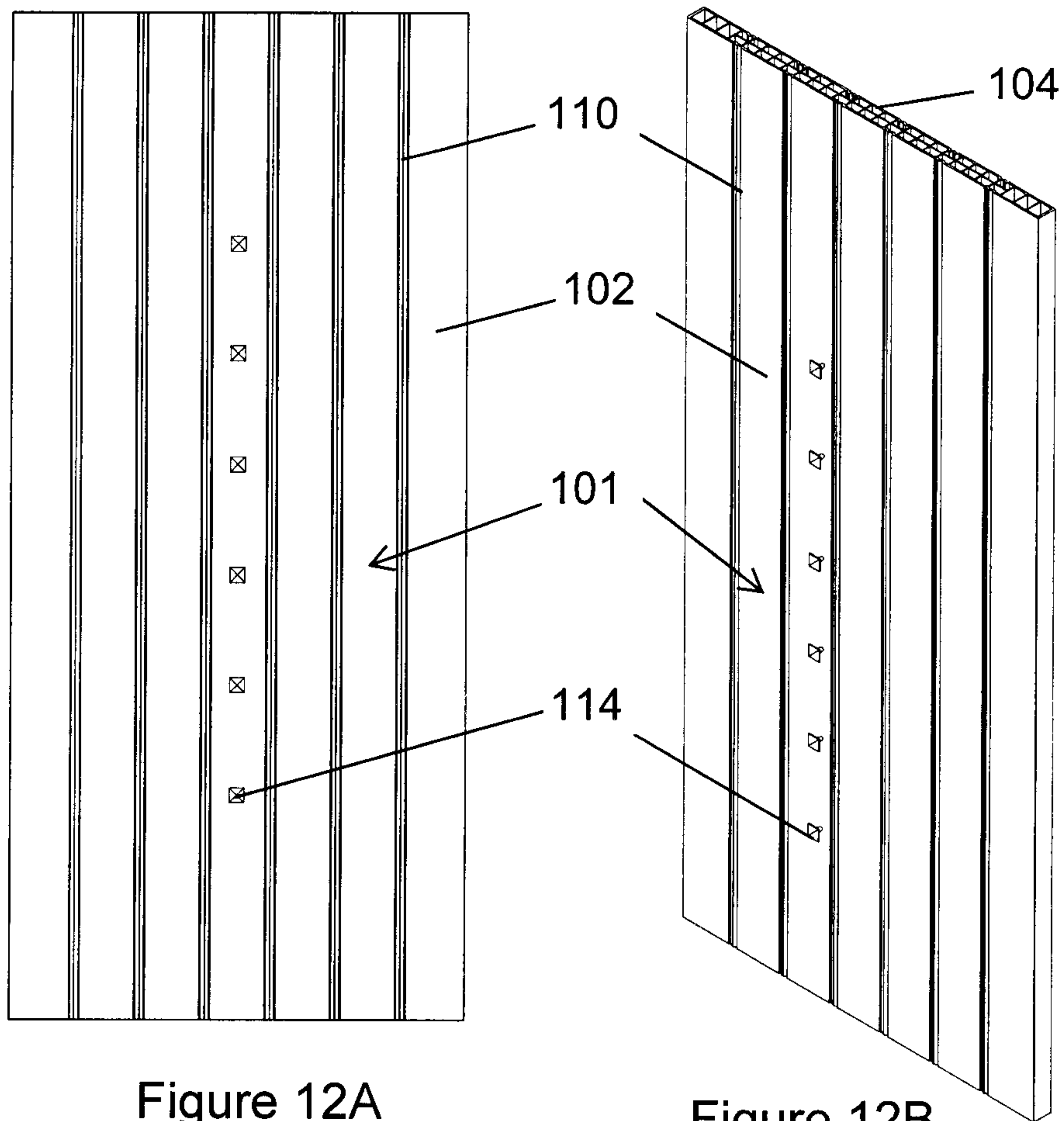


Figure 12A

Figure 12B

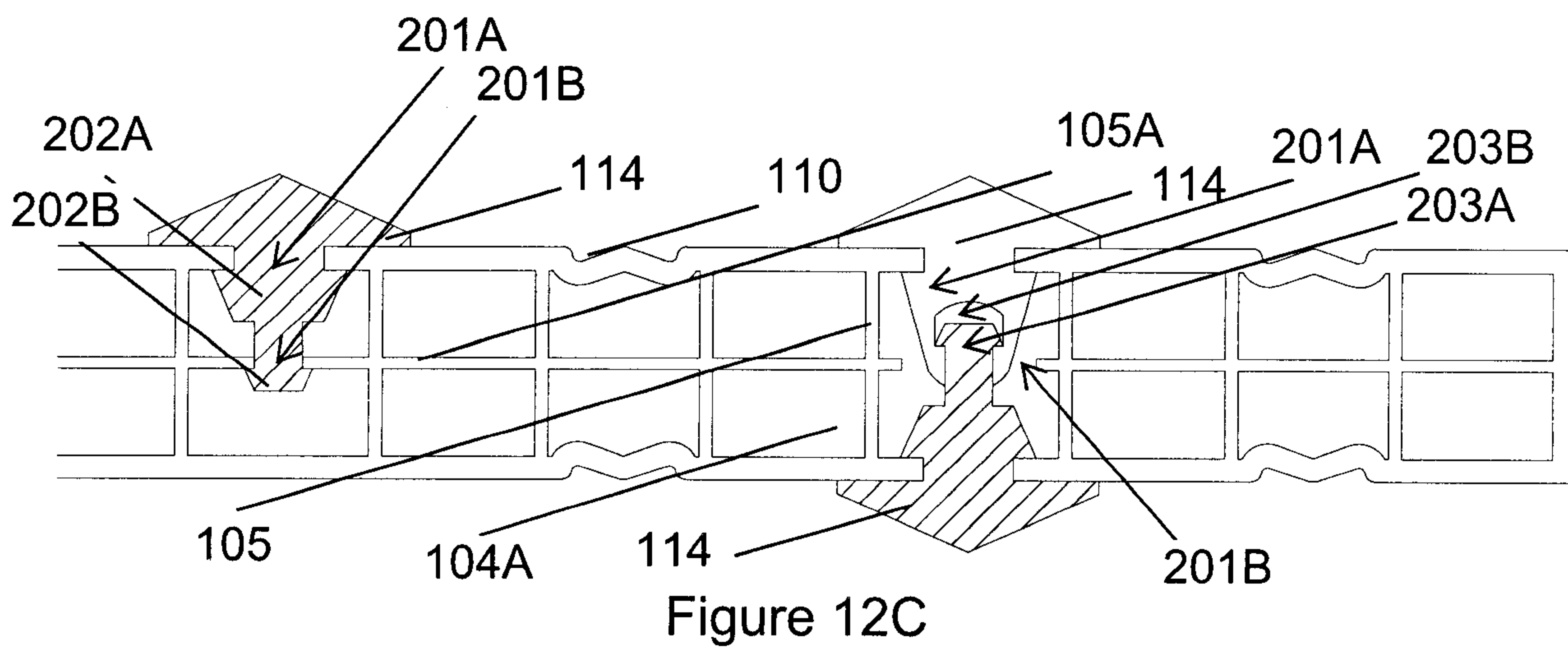


Figure 12C

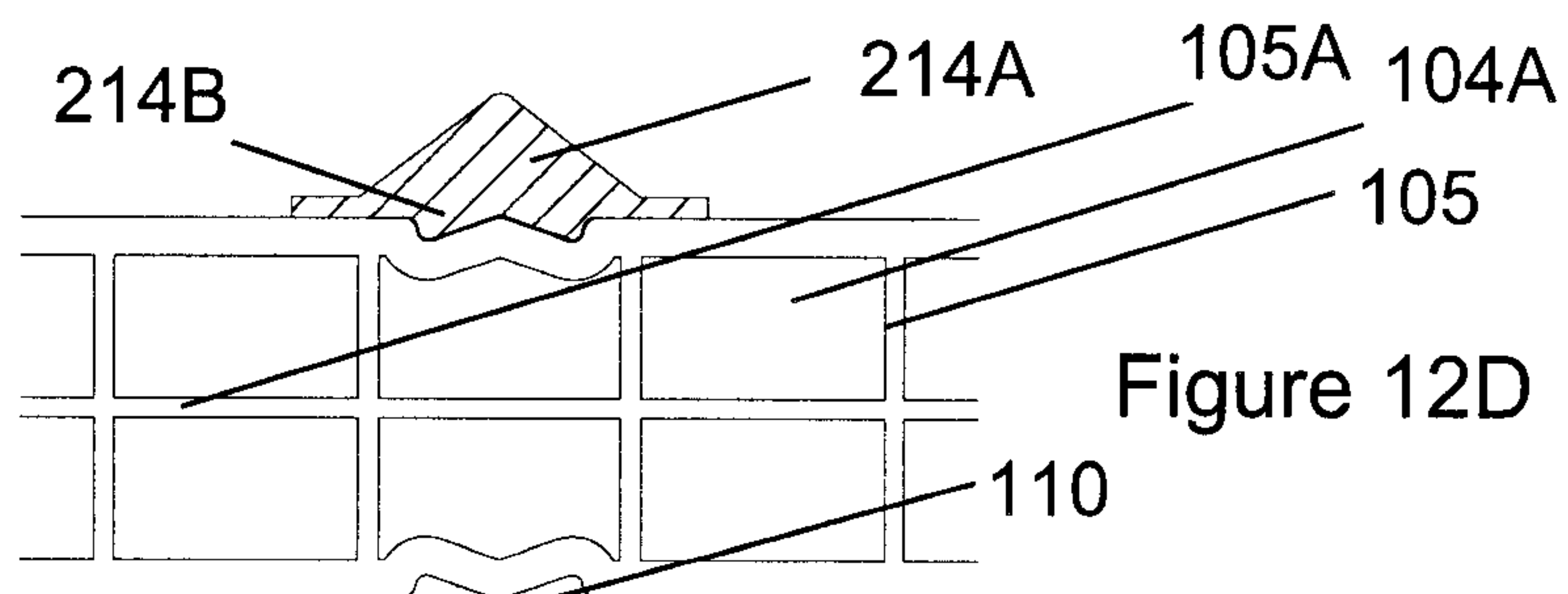


Figure 12D

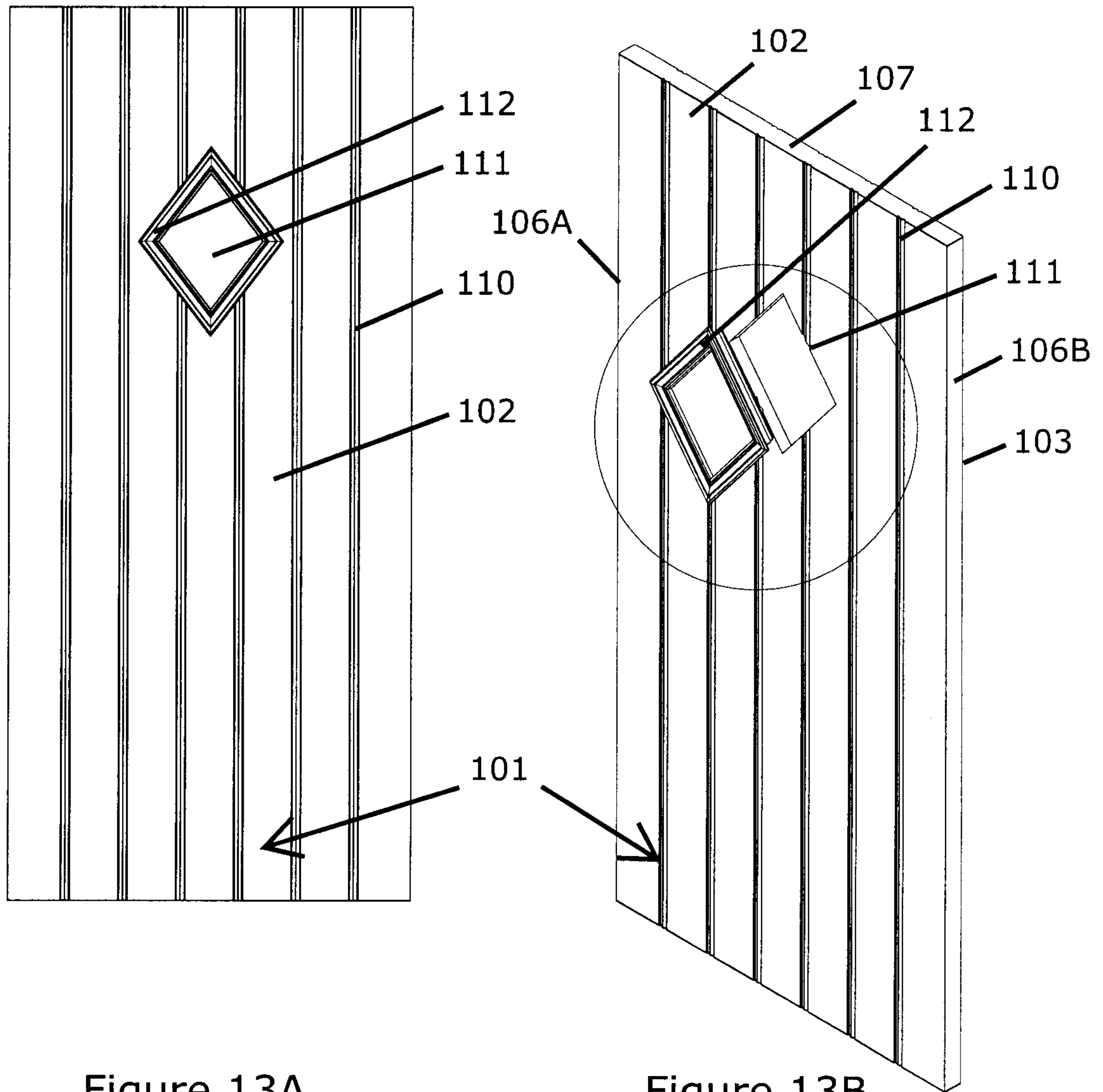


Figure 13A

Figure 13B

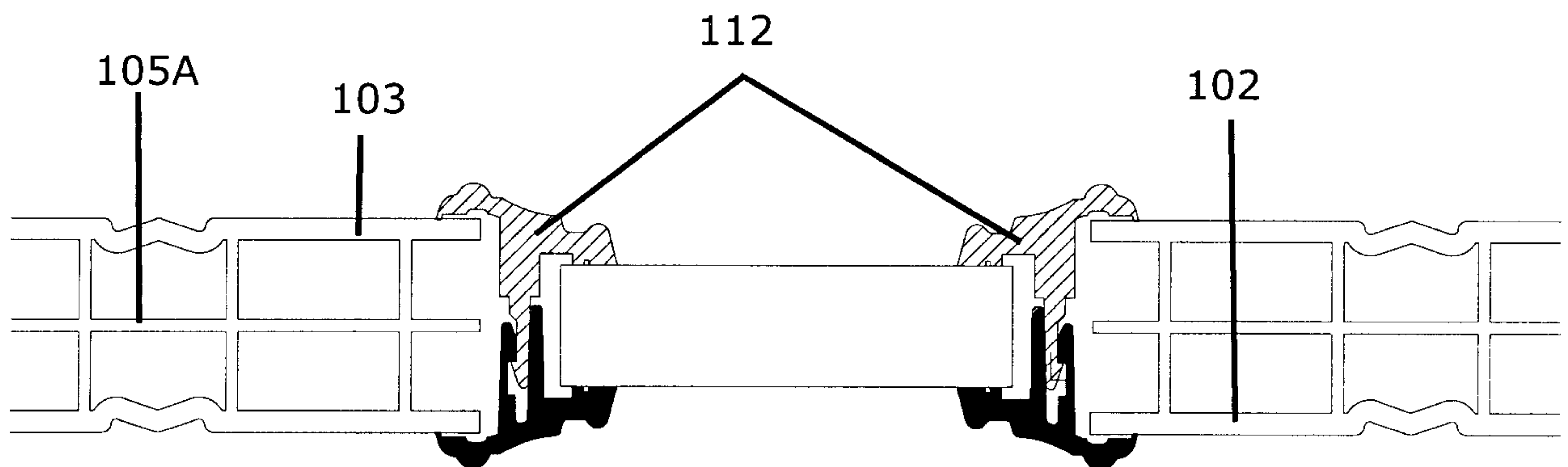


Figure 13C

