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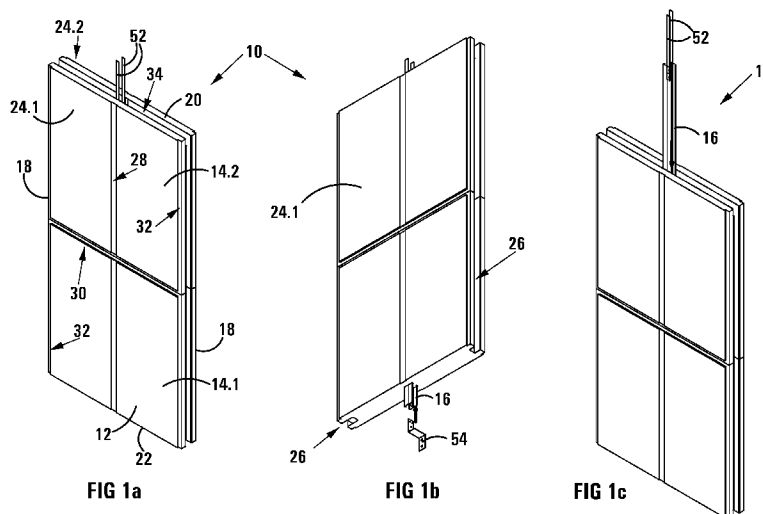
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(54) Title: A METHOD OF CONSTRUCTING A WALL ARRANGEMENT, A WALL ARRANGEMENT, AND A MODULAR WALL SYSTEM



(57) Abstract: The invention relates to a method of constructing a wall arrangement, the method including constructing, in situ, a core of a wall arrangement from a modular wall system comprising a plurality of prefabricated core elements and then spray-applying rendering to vertical faces defined by the core. The core elements include at least one wall panel, and, optionally, posts, etc. Each core element includes a body made of a lightweight material, e.g. expanded polystyrene. The wall panel includes a substantially rectangular body defining two operatively vertically disposed opposite side edges and at least one column member extending at least substantially between operative top and bottom edges of the body in a passage defined in the body. The invention also extends to a wall system including core elements, as referred to, for forming a core of a wall arrangement and to a wall arrangement constructed in accordance with the method.

**A METHOD OF CONSTRUCTING A WALL ARRANGEMENT, A WALL
ARRANGEMENT, AND A MODULAR WALL SYSTEM**

5 THIS INVENTION relates to a method of constructing a wall arrangement, to a modular wall system suitable for use in the method, and to a wall arrangement.

Reference will be made herein to aggregate. Such a reference is sufficiently broad to include sand, e.g. sharp sand.

10

According to a first aspect of the invention there is provided a method of constructing a wall arrangement, the method including:

constructing, in situ, a core of a wall arrangement from a modular wall system comprising a plurality of prefabricated core elements, the core elements including at least one wall panel including a substantially rectangular body defining two operatively
15 vertically disposed opposite side edges, an operative top edge, an operative bottom edge, and two opposite faces, these faces forming part of a plurality of vertical faces of the core; and

spray-applying to at least some of the faces of the core, including at least one of
20 the faces of the wall panel, a cementitious material base slurry to form a base rendering layer.

The spray-applying may be performed using a spray applicator apparatus of a known type. One such applicator is disclosed in Republic of South Africa Patent No.
25 2003/5932.

The base slurry may have a cement:sand ratio of not below 1:4.

The base slurry may have a cement:sand ratio of between 1:3 and 1:4.

30

The base slurry may have a water:cement ratio of less than 0.45.

The base slurry may include an admixture for enhancing sprayability. The admixture may be one of a polymer and a plasticizer. The weight of the admixture may be between 0.5% and 2% of the weight of the cement.

- 5 The base rendering layer may have a thickness of between 4mm and 10mm.

The base slurry may include aggregate. The method may include partially penetrating some of the aggregate into the core by the spray-applying to enhance bonding between the base rendering layer and the core. This will clearly only apply in the case of the core defining a face made of a material, e.g. expanded polystyrene, permitting penetration into it of sand or aggregate in the slurry for the base rendering layer. Preferably the combination of the sand (e.g. an angular grained sand such as one sometimes referred to as "sharp sand") or aggregate type and the spray velocity is selected so as to ensure penetration of some of the sand or aggregate into a face of the core during spray-application. Such penetration causes mechanical bonding between the base rendering layer and the core, in addition to chemical bonding by the cement in the layer.

The method may include applying over the base rendering layer cementitious material cover slurry to define at least one cover rendering layer. The cover slurry may have a cement:sand ratio of between 1:4 and 1:5. The cover slurry may be applied by means of a suitable spray applicator apparatus.

The cover slurry may include a water retentive agent. The water retentive agent may be between 40g and 150g polypropylene fibres per 50kg cement.

The method may include providing a reinforcement mesh in the cover rendering layer. The reinforcement mesh may be one of a steel mesh, a woven polypropylene mesh, and a woven glassfibre strand mesh.

30 The at least one cover rendering layer may include a final rendering layer having a cement:sand ratio of between 1:5 and 1:7.

The at least some of the faces of the core may include two such faces on opposite sides of the core so that the spray-applying defines two opposite base rendering layers. The

method may include providing an arrangement of tie means, each extending through the core, to bind the opposite base rendering layers together.

5 The method may include defining two opposite grooves in the respective opposite faces and filling the grooves with rendering to define opposite reinforcing bands in the respective grooves. The grooves may be dovetail grooves. The method may include encapsulating reinforcement in the rendering in each groove. The reinforcement may be one of a steel mesh strip and a woven alkali resistant glass fibre mesh strip.

10 The method may include installing a ring beam, supported on the core.

The body of the wall panel may be made of a material having a density of below 500kg/m^3 .

15 The body of the wall panel may be made of a synthetic polymeric material. The synthetic polymeric material may be one of expanded polystyrene and extruded polystyrene.

20 The body of the wall panel may be factory cut into a required shape using suitable cutting equipment.

The body of the wall panel may include a lower body part and an upper body part, the two body parts defining between them an operatively horizontally disposed joint. Alternatively, the body may be a single piece unit.

25

The body of the wall panel may define along at least a part of the length of each of its opposite side edges an interlock formation for operatively providing interlock of the edge with an adjacent core element. Each interlock formation may define a laterally open groove, the wall system including an elongate jointing member of which one side is receivable in the groove in a configuration in which the other side projects from the groove and is receivable in such a groove defined by the adjacent core element.

30

The body of the wall panel may define, in at least one of its faces, two opposite recesses, each extending along at least a part of the length of one of its opposite side

edges, for receiving a side half of a reinforcement strip for operatively bridging a joint with an adjacent core element.

5 The wall panel may include at least one column member, which is received within a passage defined in the body of the panel, which is disposed parallel to and spaced apart from both side edges, and which extends at least substantially between the operative top and operative bottom edges of the body. The column member may be a concrete element. Alternatively, the column member may be a steel element. The passage may be between and spaced apart from the opposite faces of the body of the
10 wall panel.

The column member, where provided, of the wall panel may define at its operative top securing means for securing to another structural member. The column member may, alternatively or additionally, define at its operative bottom securing means for securing
15 to another structural member.

The at least one column member of the wall panel may include two spaced apart column members.

20 The wall panel may define along its operative top edge a recess or groove for accommodating a length of ring beam.

The core elements may include a first type post, the first type post including a body defining a side edge extending along a height of the first type post and the side edge
25 defining an interlock formation for operatively providing interlock with an adjacent core element. The first type post may include at least one column member received in a groove defined along an opposite side edge of the body of the first type post. The column member of the first type post may be one of a concrete element and a steel element. The body of the first type post may be made of a synthetic polymeric material.

30

The core elements may include a T-post including a body defining a generally T-shaped cross-section and three side edges, each extending along an operative height of the body and defining along its length an interlock formation for operatively providing interlock with an adjacent core element. The T-post may include at least one column

member received within a passage defined in its body. The column member of the T-post may be one of a concrete element and a steel element. The body of the T-post may be made of a synthetic polymeric material.

- 5 The core elements may include an L-post including a body defining a generally L-shaped cross-section and two side edges, each extending along a height of the body and defining along its length an interlock formation for operatively providing interlock with an adjacent core element. The L-post may include at least one column member received within a passage defined in its body. The column member of the L-post may be
10 one of a concrete element and a steel element. The body of the L-post may be made of a synthetic polymeric material.

The core elements may include an upper infill panel for spanning over an opening, the upper infill panel including a generally rectangular body defining an operative bottom
15 edge for operatively defining an upper boundary of an opening. The upper infill panel may include a lintel in its operative bottom edge.

The core elements may include a window infill panel for underlying a window, the window infill panel including a generally rectangular body defining an operative top
20 edge, for operatively defining a lower boundary of a window opening, and an operative bottom edge. The window infill panel may include a sill element in the operative top edge.

According to a second aspect of the invention there is provided a wall arrangement
25 constructed in accordance with the method of the first aspect of the invention.

According to a third aspect of the invention there is provided a modular wall system suitable for use in a method, in accordance with the first aspect of the invention, the wall system including a plurality of prefabricated core elements, the core elements including
30 at least one wall panel including:

a core comprising a plurality of prefabricated core elements, the core elements including at least one wall panel including a substantially rectangular body defining two operatively vertically disposed opposite side edges, an operative top edge, an operative bottom edge, and two opposite faces; and

at least one column member, which is received within a passage defined in the body, which is disposed parallel to and spaced apart from both side edges, and which extends at least substantially between the operative top and operative bottom edges.

- 5 The core elements of the wall system of the third aspect of the invention may include, in addition to the wall panel, also other core elements such as at least one of a first type post, a T-post, an L-post, an upper infill panel, and a window infill panel, essentially as defined above in relation to the method of the first aspect of the invention. Features of such core elements may be as defined above in relation to the method of the first aspect of the invention and such definition does not warrant repetition here.

According to a fourth aspect of the invention, there is provided a wall arrangement including:

- 15 a core constructed from a modular wall system, in accordance with the third aspect of the invention; and
a cementitious material base rendering layer applied to each of a plurality of vertical faces of the core.

The wall arrangement may include at least one cementitious material base rendering layer applied to the base rendering layer.

The Applicant believes that the invention offers the following benefits:

- 25 Rapid and easy on-site construction of a wall arrangement, as the core elements used in the method typically will be factory made.

Strength.

Durability.

Fire safety.

An aesthetically pleasing appearance.

- 30 Good thermal insulation properties, due to thermal insulating properties of the materials of the core elements and the avoidance of thermal bridges between opposite sides of a wall, as sometimes occurs via steel components in alternative systems.

The spacing of column members in the core is independent of the width of the wall panels, the number of column members per wall panel being variable according to operational requirements.

The invention is described below by way of non-limiting examples, with reference to and as illustrated in the accompanying diagrammatic drawings. In the drawings:

Figures 1a, 1b, and 1c show three axonometric views of an embodiment of a wall panel, which is a core element of a modular wall system, in accordance with the third aspect of the invention, suitable for use in a method of constructing a wall arrangement, in accordance with the first aspect of the invention;

Figures 2a, 2b, and 2c show, respectively, an axonometric view, a side view, and a top view of a lower body part of the wall panel of Figure 1;

Figures 3a, 3b, and 3c show, respectively, an axonometric view, a side view, and a top view of an upper body part of the wall panel of Figure 1;

Figures 4a and 4b show, respectively, an axonometric view and a cross-section of a column member of the wall panel of Figure 1;

Figures 5a and 5b show, respectively, an axonometric view and a cross-section of a column member, which is an alternative to that of Figures 4;

Figures 6a, 6b, and 6c show three axonometric views of a wall panel, which is an alternative to that of Figures 1;

Figures 7a and 7b show two exploded axonometric views of a window panel including core elements of the wall system, the core elements including two first type posts, a window infill panel, and an upper infill panel;

Figure 8 shows an assembled axonometric view of the window panel of Figures 7;

Figure 9 shows an assembled axonometric view of a door panel including core elements similar to those of the window panel of Figure 8, except the window infill panel;

Figure 10 shows an axonometric view of a T-post, which is a core element of the wall system;

Figures 11a and 11b show an axonometric view and a top view, respectively, of a lower body part of the body of Figure 10;

Figures 12a and 12b show an axonometric view and a top view, respectively, of an upper body part of the body of Figure 10;

Figure 13 shows an axonometric view of an L-post, which is a core element of the wall system;

Figures 14a and 14b show an axonometric view and a top view, respectively, of a lower body part of the body of Figure 13;

Figures 15a and 15b show an axonometric view and a top view, respectively, of an upper body part of the body of Figure 13;

5 Figure 16 shows an exploded axonometric view of an arrangement including core elements of the wall system, including three wall panels, as shown in Figure 1, and a T-post, as shown in Figure 10, the arrangement including also a floor slab (partially shown) and ring beam elements;

Figure 17 shows an axonometric assembled view of the wall system of Figure 16;

10 Figures 18, 19, and 20 show construction steps in a method, in accordance with the first aspect of the invention, of constructing a wall arrangement, in accordance with both the second aspect and fourth aspect of the invention, the method including the use of core elements of the wall system and applying rendering;

Figure 21 shows a partial section at XXI-XXI in Figure 20;

15 Figure 22 shows a partial section at XXII-XXII in Figure 20;

Figure 23 shows a partial section at XXIII-XXIII in Figure 20;

Figure 24 shows an axonometric assembled view of an arrangement including a floor slab (partially shown), ring beam elements, and a wall system, in accordance with the third aspect of the invention, the system including two wall panels, as shown in Figure 1, a T-post as shown in Figure 10, and a first type post as shown in Figures 7;

20 Figure 25 shows a detail of fixing of a column member of the wall panel of Figure 1 to the floor slab of Figure 16;

Figure 26 shows an axonometric view of a further embodiment of a wall panel, which is a core element of a wall system, in accordance with the third aspect of the invention, suitable for use in a method of constructing a wall arrangement, in accordance with the first aspect of the invention;

Figure 27 shows an axonometric exploded view of the wall panel of Figure 26;

Figure 28 shows a top view of the wall panel of Figure 27;

Figure 29 shows an axonometric view of a T-post, which is a core element of the last-mentioned wall system;

30 last-mentioned wall system;

Figure 30 shows a top view of the T-post of Figure 29;

Figure 31 shows an axonometric view of an L-post, which is a core element of the last-mentioned wall system;

Figure 32 shows a top view of the L-post of Figure 31;

Figure 33 shows an exploded axonometric view of an arrangement including core elements of the last-mentioned wall system, including three wall panels, as shown in Figure 26, and a T-post as shown in Figure 29, the arrangement including also a floor slab (partially shown) and reinforcement bars for a ring beam;

5 Figure 34 shows an axonometric assembled view of the arrangement of Figure 33;

Figure 35 shows an exploded axonometric view of an arrangement including another wall system, in accordance with the third aspect of the invention, including three core elements in the form of wall panels, and a matching T-post, the arrangement
10 including also a floor slab (partially shown) and reinforcement bars for a reinforced concrete ring beam;

Figure 36 shows an axonometric assembled view of the arrangement of Figure 35;

Figures 37a and 37b show an operative side view and an operative top view,
15 respectively, of another embodiment of a wall panel, which is a core element of a wall system, in accordance with the third aspect of the invention;

Figure 38 shows an axonometric view of an arrangement including another embodiment of a wall system, in accordance with the third aspect of the invention, including three wall panels, as shown in Figures 37a and 37b, a matching T-post, and a
20 cast concrete ring beam, the arrangement including also a floor slab (partially shown) and ring beam elements;

Figures 39a and 39b show two axonometric views of another embodiment of a wall panel, which is an embodiment of a wall system, in accordance with the third aspect of the invention;

25 Figures 40a and 40b show two axonometric views of yet another embodiment of a wall panel, which is a core element of a wall system, in accordance with the third aspect of the invention;

Figures 41a and 41b show two axonometric views of a T-post, which is a core element of a wall system, in accordance with the third aspect of the invention;

30 Figures 42a and 42b show two axonometric views of an L-post, which is a core element of a wall system, in accordance with the third aspect of the invention;

Figure 43a and 43b show an exploded axonometric view and an assembled axonometric view, respectively, of a door panel comprised of core elements of a wall

system, in accordance with the third aspect of the invention, the door panel including a steel lintel;

Figures 44a and 44b show an exploded axonometric view and an assembled axonometric view, respectively, of a door panel which is an alternative to that of Figures 43;

Figures 45a and 45b show an exploded and an assembled bottom axonometric view of a window panel which is comprised of core elements of a wall system, in accordance with the third aspect of the invention; and

Figure 46 shows a partial section of a wall of a wall arrangement constructed in accordance with the method of the first aspect of the invention, showing partial penetration of aggregate in a rendering layer into a face of a core element of the wall arrangement.

In Figures 1a, 1b, and 1c, a wall panel, which is a core element of a wall system, in accordance with the third aspect of the invention, is designated generally by the reference numeral 10.

The wall panel 10 includes a substantially rectangular body 12, comprising a lower body part 14.1, an upper body part 14.2, and a column member 16. The body 12 is made of a synthetic polymeric material, say expanded polystyrene. It has a density of, say, 200kg/m³. In alternative embodiments of such a wall panel (see e.g. Figures 39), a body similar in shape to the body 12 may be a single piece body instead of a two-piece body. In certain instances, size limitations of expanded polystyrene cutting equipment may induce opting for a two-piece body. Expanded polystyrene was selected for the lower body part 14.1 and the upper body part 14.2 *inter alia* for its light weight, good thermal insulation properties, ease of cutting, and low cost. In alternative embodiments of such a wall panel (not shown), the bodies may be made of any other suitable material, e.g. extruded polystyrene, but typically a material having a density of less than 500kg/m³, *inter alia* for ease of handling.

30

The wall panel 10 typically is factory assembled, i.e. prefabricated.

The body 12 defines two operatively vertically disposed opposite side edges 18, an operative top edge 20, and an operative bottom edge 22. The body 12 defines along

each of its side edges 18 a groove 26, thus defining interlock formations providing for interlock with an adjoining core member via a jointing member, as will be described below.

5 The body 12 defines two opposite faces 24.1 and 24.2. In the face 24.1, it defines the following grooves, of which the purpose will be revealed in the remainder of this description:

a shallow central dovetail groove 28, say 10mm deep, parallel to the side edges 18;

10 a shallow central dovetail groove 30, say 10mm deep, perpendicular to the side edges 18;

two opposite shallow half dovetail grooves or recesses 32 along the respective edges 18; and

a deep central groove 34 along the operative top edge 20.

15

In the face 24.2, the body 12 defines an arrangement of grooves mirroring that defined in the face 24.1, as described above.

20 The body 12 also defines therethrough an operatively vertically disposed central passage (see reference numeral 36 in Figures 2c and 3c), accommodating the column member 16 in a snug sliding fit.

25 With reference to Figures 2a, 2b, and 2c, the lower body part 14.1 defines along an operative top edge thereof an interlock formation in the form of a tongue 38. The cross-section of a passage 36 defined through the lower body part 14.1 is clearly visible in Figure 2c.

30 With reference to Figures 3a, 3b, and 3c, the upper body part 14.2 defines, along an operative bottom edge thereof, a tapered groove 40, complementary to the tongue 38 shown in Figure 2a, and, along its operative top edge, the groove 34.

With reference to Figures 4a and 4b, the column member 16 is a composite member including two cold rolled steel studs 42, secured to each other by suitable welding, or

mechanical fixings, e.g. self drilling self fixing screws or rivets, in a back-to-back arrangement.

5 In Figures 5a and 5b, a column member, which can serve as an alternative to the column member 16, is designated generally by the reference numeral 44. The column member 44 comprises a cold rolled steel channel 46 and a cold rolled steel stud 48 secured together by welding or mechanical fixings e.g. self drilling self fixing screws or rivets, to define a boxed section. Such a column member can serve in a wall panel equivalent to the wall panel 10 of Figures 1, but having a passage defined through its
10 body shaped for receiving the element 44 in a snug sliding fit.

In Figures 6a, 6b, and 6c, a wall panel that can serve as an alternative to the wall panel 10 of Figures 1, is designated generally by the reference numeral 50. The wall panel 50 includes certain features that are similar to those of the wall panel 10 of Figures 1. A
15 description of similar features will generally not be repeated here and such features, where designated here, are designated again by the same reference numerals as before.

Instead of the single column member 16 of the wall panel 10, the wall panel 50 has
20 dual, spaced apart column members 16, each at approximately a quarter width of the wall panel 50 from a side edge thereof. The number of such column members in a wall panel will be determined by load bearing capacity requirements.

With reference again to Figures 1a, 1b, and 1c, the element 16 has secured to its
25 operative top securing means in the form of two steel hoops 52 and to its operative bottom securing means in the form of a foundation fixing bracket 54.

In Figures 7a and 7b, a window panel of a wall system, in accordance with the third aspect of the invention, is designated generally by the reference numeral 57. The
30 window panel 57 includes two first type posts, each being a core element of the wall system and designated generally by the reference numeral 58. The first type posts 58 are identical and one of them will now be described. The first type post 58 includes an expanded polystyrene body 60, comprised of a lower body part and an upper body part, defining a side edge 61. The side edge 61 has a groove 26 defined therein, identical to

the groove 26 of the wall panel 10 of Figure 1. The side edge 61 thus defines an interlock formation identical to and compatible with that of the wall panel 10 of Figures 1. The first type post 58 defines along an opposite edge thereof a dovetail groove into which a column member 64 has been precast.

5

Still in Figures 7a and 7b, the window panel 57 includes also an upper infill panel, which is a core element of the wall system, designated generally by the reference numeral 66. The upper infill panel 66 is for spanning over an opening, which may be either a window or a door opening. The upper infill panel 66 includes a generally rectangular expanded polystyrene body 68 defining an operative bottom edge 70, operatively defining an upper boundary of an opening. Within edge 70, the body 68 defines a dovetail groove within which a reinforced concrete lintel 71 has been precast. The infill panel 66 includes certain further features that are similar to those of the wall panel 10 of Figures 1. A description of similar features will generally not be repeated here and such features, where designated here, are designated again by the same reference numerals as before.

10

15

Still in Figures 7a and 7b, the window panel 57 includes also a window infill panel, which is a core element of the wall system, designated generally by the reference numeral 72. The window infill panel 72 includes an expanded polystyrene body 73 defining an operative top edge 74 which has a dovetail groove defined along its length and which has a concrete sill element 76 precast into the groove.

20

Figures 7 also show certain jointing members 78, made of expanded polystyrene, which fit into the respective grooves 26, as will be shown subsequently.

25

In Figure 8, an assembled arrangement of the core elements shown in Figures 7 defines the window panel 57. The window panel 57 defines a window 82 and is interchangeable with the wall panel 10 of Figure 1.

30

In Figure 9, an assembled arrangement of core elements defines a door panel, designated generally by the reference numeral 84. The door panel 84 includes an upper infill panel 66 and two first type posts 58. The upper infill panel 66 and the first type posts 58 are identical to those of the window panel 57 of Figure 8, as described above,

and are not described again. The door panel 84 defines a door opening 86. The door panel 84 is also interchangeable with the wall panel 10 of Figure 1.

In Figure 10, a T-post, which is a core element of the wall system, is designated generally by the reference numeral 87. It includes a body 88, comprising a lower body part 90.1 and an upper body part 90.2, both made of expanded polystyrene. The body 88 defines three side edges 18 identical to the side edges 18 of the wall panel 10 of Figure 1. It defines also at its operative top two grooves 34, in a T-arrangement, each corresponding to the groove 34 of the wall panel 10 of Figure 1.

With reference to Figures 11a and 11b, the lower body part 90.1 defines at its top a T-shaped tongue arrangement 92, which fits snugly into a complementary groove arrangement (not clearly shown) defined at the operative bottom end of the upper body part 90.2 to make up the body 88. The lower body part 90.1 defines therethrough also two passages 36, each identical in cross-section to the passage 36 of the wall panel 10 of Figure 1.

With reference to Figure 12b, the upper body part 90.2 defines therethrough two passages 36 corresponding to those of the lower body part 90.1 of Figures 11.

With reference again to Figure 10, although hidden from view by the body 88, the T-post 87 includes also two column members such as the column member 16 (see Figures 4) that have been slid into the respective two passages 36 (see Figures 11b and 12b) defined through the body 88.

In Figure 13, an L-post, which is a core element of a wall system in accordance with the third aspect of the invention, is designated generally by the reference numeral 94. It includes a body 96, comprising a lower body part 98.1 and an upper body part 98.2, both made of expanded polystyrene. The lower body part 98.1 is shown in more detail in Figures 14a and 14b and the upper body part 98.2 in Figures 15a and 15b.

Further features of the L-post 94 are analogous to those of the T-post 87 of Figure 10 and, as such, are not described in detail herein. Suffice it to say that, in the L-post 94,

two column members such as the column member 16 (see Figures 4) are received the respective passages 36 (see Figures 14b and 15b) to define the L-post.

In Figure 16, a wall system, in accordance with the third aspect of the invention, is designated generally by the reference numeral 100 and includes:

- 5 three wall panels 10;
- the T-post 87 of Figure 10, including two column members 16;
- expanded polystyrene jointing members 78;
- ring beam elements in the form of steel channel elements 104; and
- 10 ring beam connectors 106.

As an alternative to the steel channel elements 104, other suitable profile elements may be used, e.g. I-beam elements.

- 15 The wall system 100 is to be assembled on a floor slab 108, which is partially shown. It is particularly to be assembled as a part of a bigger wall arrangement, the remainder of which is not shown. Such an arrangement typically will include also L-posts 94, as shown in Figure 13, and two column members 16 as shown in Figures 4.

- 20 In Figure 17, the wall system 100 is shown assembled. Each of the jointing members 78 is received within a passage (see Figure 24) defined at a joint defined between an edge of a wall panel 10 and an adjoining edge of the T-post 87, thus interlocking the two edges (see Figure 22). The respective channel elements 104 have been interconnected via the ring beam connectors 106 via rivets or self drilling self fixing screws 110, of
- 25 which only some are shown. As such, the channel elements 104 and the connectors 106 now define a ring beam arrangement 112. The ring beam arrangement 112 has been sunk into the arrangement of grooves 34 defined along the operative top edges of the wall panels 10 and the T-post 87. The ring beam arrangement 112 is tied to the respective column members 16 of the panels 10 via the hoops 52. Some hoops 52 are
- 30 still standing upright and are reserved for securing roof elements to the column members 16. The column members 16 are secured to the floor slab 108 via their brackets 54 (see Figure 1b).

The wall system 100 clearly now defines, between each two adjacent core elements, a vertical dovetail groove 114 comprised of two half dovetail grooves of the abutting core elements.

5 In Figure 18, welded steel mesh, woven polypropylene mesh, or alkali resistant glassfibre strand mesh reinforcement strips 116 have been inserted into, particularly along and across, all the grooves 28, 30, and 114. Wire ties 118 (see Figures 22 and 23) have been forced through the expanded polystyrene of the respective core elements 10 and 87 along the grooves 114 and 30, at a spacing of roughly 200mm, to
10 tie the mesh reinforcement strip in each groove and its counterpart together. The mesh reinforcement strips in the grooves 28 have been tied to the column member 16 behind the groove via screws 119 (see Figure 21).

In Figure 19, all the grooves 28, 30, and 114 of Figure 18 have been filled with a
15 suitable rendering material, in this example a fibre reinforced cementitious rendering material having a fibre length of 19mm, but this length may be varied. As such, a grid of reinforced cementitious material bands is formed on each face defined by the wall arrangement, including:

horizontal bands 122 in the grooves 30, at mid-height of the wall panels;
20 vertical bands 124 in the grooves 28 centrally in the wall panels 10; and
vertical bands 126 in the grooves 114 across the joints between adjoining core elements.

It would be desirable to spray the rendering material into these joints allowing for a
25 mechanical bond between the rendering material and the core material, which can then be levelled into the dovetail joint by hand.

Each of the bands 122, 124, and 126 has a mirror image counterpart on the opposite face of the core element concerned. These serve as reinforcing bands resisting bending
30 of the respective walls, as will become apparent below.

The Applicant believes that the reinforcing bands 122, 124, and 126 may significantly increase the bending resistance of walls including the wall system 100, including its

resistance to lateral forces. Such reinforcing bands may as well be used with other types of wall systems including lightweight core elements.

With reference particularly to Figure 20, after the bands 122, 124, and 126 of Figure 19 have cured sufficiently, the faces of the core elements 10 and 87 are rendered, as follows, in accordance with the method of the first aspect of the invention:

A base rendering layer 128, made of a base slurry in the form of a cementitious fibre reinforced material, is applied to the core elements 10 and 87.

A reinforcement mesh 129, made of woven polypropylene or of woven glassfibre strand mesh with an alkali-resistant coating, is placed against the base rendering layer 128.

A cover rendering layer 130, made of a cover slurry in the form of a cementitious fibre reinforced material, is applied to the layer 128 and encapsulates the mesh 129.

A cover rendering layer, which is a final rendering layer, 132, made of a cover slurry in the form of a cementitious fibre reinforced material, is applied to the layer 130.

The base rendering layer 128 is applied as a slurry using a suitable spray applicator apparatus, the slurry preferably having a cement:sand ratio of between 1:3 and 1:4. The spray applicator apparatus may be of a known type, e.g. that disclosed in Republic of South Africa Patent No. 2003/5932.

The slurry may have a water:cement ratio of less than 0.45. Preferably for the slurry, coarse sand is used, e.g. sand sometimes referred to as "sharp sand". The combination of the sand type or aggregate type and the spray velocity is selected so as to ensure partial penetration of some of the sand or aggregate into the face during spray-application. Such penetration of the sand or aggregate into the face causes mechanical bonding between the base rendering layer and the core, in addition to chemical bonding by the cement in the layer. The base rendering layer 128 in this example has a thickness of between 6mm and 8mm.

Such partial penetration of aggregate or sand is shown in Figure 46, by way of example of a part of the face 24.1 of the body 12 of the wall panel 10. Some granules of aggregate or sand 131 in the rendering layer 128 are partially penetrated into the body 12 through the face 24.1 to yield the mechanical bonding.

The cover rendering layers 130 and 132 also are applied as cover slurry using a suitable spray applicator apparatus.

The cementitious material for the layer 130 may have a cement:sand ratio of between 1:4 and 1:5, although it is not limited to this range.

The cementitious material for the layer 132 may have a cement:sand ratio of between 1:5 and 1:7, although it is not limited to this range.

The cementitious material of at least one of the rendering layers 128, 130, and 132 may include a water retentive agent. In this case, the Applicant proposes the use of about 45g polypropylene fibres per 50kg cement, although alternatives exist.

The cementitious material of at least one of the rendering layers 128, 130, and 132 may, alternatively or additionally, include at least one admixture, such as a polymer or a plasticizer, for enhancing sprayability.

The final rendering layer 132 may be skimmed using a suitable trowel, straight edge, or the like.

Each rendering layer or layer may have a fibre length of about 6mm, but this length may be varied.

- 5 Once all the core elements of the assembled wall system 100 have been rendered using the layers described above, a wall arrangement 134 (shown semi-completed in Figure 20), in accordance with both the second and fourth aspects of the invention, is defined by the combination of the wall system, comprising mainly core elements, and the rendering layers. The wall system 100 now defines a core of the wall arrangement
- 10 134.

It will be appreciated that in such a wall arrangement, the rendering layers are very variable, both in terms of number of layers and of the material used.

Figure 21 shows how the mesh reinforcement strips 116 are secured to the column member 16 via the screws 119. The bands 124 are reinforced by the mesh reinforcement strips 116. The bands 124, being interconnected via the screws 119 and the column member 16, act similarly to the flanges of an I-beam to resist bending of the wall about a horizontal axis parallel to the wall, with such bending inducing tension in the one band and compression in the other. The bands 124 therefore have a significant stiffening and strengthening effect on the wall.

Figure 22 shows a joint defined between the upper and lower bodies 14.1 and 14.2 of a wall panel 10. Due to the shape of the joint, passage of water through the joint is inhibited. Figure 22 shows also how the mesh reinforcement strips 116 on opposite sides of the joint are tied together via the wire ties 118. The bands 122 are reinforced by the mesh reinforcement strips 116. The bands 122, being interconnected via the ties 118, act similarly to the flanges of an I-beam to resist bending of the wall about a vertical axis parallel to the wall, with such bending inducing tension in the one band and compression in the other. The bands 122 therefore have a significant stiffening and strengthening effect on the wall.

Figure 23 shows a joint defined between two wall panels 10, the joint including jointing members 78. It shows also how the mesh reinforcement strips 116 on opposite sides of the joint are tied together via the wire ties 118. The bands 126 are reinforced by the mesh reinforcement strips 116. The bands 126, being interconnected via the ties 118, act similarly to the flanges of an I-beam to resist bending of the wall about a horizontal axis parallel to the wall, with such bending inducing tension in the one band and compression in the other. The bands 126 therefore have a significant stiffening and strengthening effect on the wall.

Figure 24 merely shows how a buttress may be defined in a wall 140 using a T-post 87 (see Figure 16) and a first type post 58 (see Figure 7a).

Figure 25 shows how the column member 16 of the wall panel 10 may be fixed to the floor slab 108 via a bracket 54 (see Figure 1b) and two fasteners 141. The same may apply to the column members of other core elements.

In Figure 26, a wall panel, which is a core member of another embodiment of a wall system, in accordance with the third aspect of the invention, is designated generally by the reference numeral 142. The wall panel 142 includes many features that are identical or similar to features of the wall panel 10 of Figure 1. Similar features generally are not described again and some of them are designated by the same reference numerals as before.

With reference to Figures 27 and 28, each of the lower body part 14.1 and the upper body part 14.2 has a dovetail groove 144 defined into its one face along the operative height of the body, midway between opposite side edges of the body. A reinforcement member 146, in the form of a reinforcement bar, is placed in the continuous dovetail groove 144 defined by fitting the upper body part 14.2 on top of the lower body part 14.1. The reinforcement bar 146 has a bracket 148 secured to its operative underside for securing the reinforcement bar to a floor slab.

With reference to Figures 26 to 28, with the reinforcement bar 146 inside the groove 144 and a steel mesh reinforcement strip 116 (see Figure 26) inserted into a dovetail groove 30 defined between the bodies 14.1 and 14.2, concrete 150 is cast into the groove, typically with the wall panel 142 horizontally disposed and the groove 144 facing upwards. As such, a reinforced concrete column member 152 is defined in the wall panel 142.

With reference to Figure 26, a threaded end 154 of the reinforcement bar 146 protrudes from the upper body part 14.2 within a groove 34 defined in its top. This threaded end will, in the installed configuration of the wall panel 142 as a part of a wall arrangement, in accordance with the second aspect of the invention, serve to secure a ring beam to the column member 152.

An alternative type wall panel (not shown) of the wall system may include more than one operatively vertically disposed reinforced concrete element, all spaced apart from the side edges of the panel.

Figures 29 and 30 show, respectively, an axonometric view and a top view of a T-post 156 matched to the wall panel 142 of Figure 26. The T-post 156 includes a reinforced concrete column member 152 identical to that of the wall panel 142.

- 5 Similarly, Figures 31 and 32 show, respectively, an axonometric view and a top view of an L-post 158 matched to the wall panel 142 of Figure 26. The L-post 158 includes a reinforced concrete column member 152 identical to that of the wall panel 142.

10 Figure 33 shows an exploded view of a wall system 160, in accordance with the third aspect of the invention, including three wall panels 142, a T-post 156, and jointing members 78.

15 A reinforced concrete ring beam arrangement will be formed in the grooves 34 defined in the operative top edges. For this purpose, reinforcement bars 162 will be placed in the grooves 34.

Figure 34 shows the wall system 160 assembled and a concrete ring beam arrangement 164 cast into the grooves 34 (see Figure 33) and the operative top edges of the wall panels 142 and the T-post 156.

20

As an alternative to a concrete ring beam arrangement 164, a steel ring beam arrangement may be used with the wall system 160.

25 Further steps in a method of constructing a wall arrangement, in accordance with the first aspect of the invention, from the wall system 160 will be analogous to that of the wall system 100 of Figures 16 to 20, as described above, and will not be repeated here.

30 Figure 35 shows yet another embodiment of a wall system, in accordance with the third aspect of the invention, designated by the reference numeral 166. The wall system 166 includes wall panels 167 that are similar to, but thinner than, the wall panel 142 of Figure 26. The wall panels 167 include reinforced concrete column members 168 that are of smaller cross-sectional area than the reinforced concrete column member 152 of the wall panel 142. As such, the load bearing capacity of these column members 168 is

lower than that of the column members 152. Jointing members 78 in the form of MASONITE strips are used with the wall panels 142.

5 The wall panels 167 define lateral recesses 170 along their operative top edges, each recess exposed across the width of one face of the body of the panel concerned, for accommodating a length of ring beam element 172. The reinforcement bar of each column member 168 defines a threaded end for securing a ring beam element to it using a matching nut.

10 Figure 36 shows a steel ring beam arrangement 174, assembled from steel ring beam elements 172, secured to the concrete elements 168 via nuts 176.

15 The wall system 166 includes many features that are similar to those of the wall system 160 of Figures 33 and 34. A description of similar features will generally not be repeated here and such features, where designated here, are designated again by the same reference numerals as before.

20 Further steps in a method of constructing a wall arrangement, in accordance with the first aspect of the invention, from the wall system 166 will be analogous to that of the wall system 100 of Figures 16 to 20, as described above, and will not be repeated here.

25 As an alternative to the steel beam arrangement 174, a concrete ring beam arrangement may have been cast on the wall system 166, using shuttering suitable for the purpose.

In Figures 37a and 37b, another embodiment of a wall panel, which is a core element of a wall system, in accordance with the third aspect of the invention, is designated generally by the reference numeral 170.

30 The wall panel 170 includes certain features that are similar to those of the wall panel 142 of Figures 26 to 28. A description of similar features will generally not be repeated here and such features, where designated here, are designated again by the same reference numerals as before.

The body of the wall panel 170 defines therethrough two operatively vertically disposed, spaced apart, square cross-section passages 172, centred between opposite faces of the wall panel 170. Into each passage 172, a concrete column member 174 has been factory cast after positioning centrally in the passage a reinforcement member 176,
5 similar to the reinforcement member 146 of Figure 27 but having an end length that is bent at a right angle to the remainder of the member to define a lap/bond length 177. Centring of each reinforcement member 176 in the corresponding passage 172 may be ensured using suitable spacers (not shown) in the passage.

10 The concrete column members 174 may be cast with the body of the panel 170 in a vertical orientation. As an alternative to casting the concrete column members 174 in the body of the panel 170, they could be cast separately in moulds and then inserted, particularly slid, into the respective passages 172.

15 In Figure 38, a partially completed wall system, in accordance with the third aspect of the invention, is designated generally by the reference numeral 178. The wall system 178 includes many features that are similar to those of the wall system 160 of Figures 33 and 34. A description of similar features will generally not be repeated here and such features, where designated here, are designated again by the same reference numerals
20 as before.

The wall system 178 includes three wall panels 170 such as that of Figures 37 and a matching T-post 180.

25 A reinforced concrete ring beam arrangement 164 has been cast into the grooves 34 defined in the operative tops of the panels 170 and corresponding grooves defined in the top of the T-post 180. Each lap/bond length 177 of a reinforcement member 176 of a column member 174 of each panel 170 inside the groove 34 of the panel provides a bond between the column member and the ring beam arrangement 164, the length 177
30 particularly being lapped or spliced with a horizontal reinforcement member 162 in the beam arrangement.

Loading to be imposed on the reinforced concrete ring beam arrangement 164, including roof loading, will be transferred via the reinforced column members 174 and

the brackets 148 of these members to the floor 108 or foundations under the wall system.

5 In Figures 39a and 39b, another embodiment of a wall panel, which is a core element of a wall system, in accordance with the third aspect of the invention, is designated generally by the reference numeral 200. The wall panel 200 is an equivalent of the wall panel 10 of Figures 1. The wall panel 200 includes features that are similar or identical to features of the wall panel 10 and already described above. A description of these features is not repeated here and some such features are again designated by the
10 same reference numerals as before.

The wall panel 200 includes a body 201 which is made of a single piece of expanded polystyrene, as opposed to the two piece body 12 of the panel 10.

15 In Figures 40a and 40b, another embodiment of a wall panel, which is a core element of a wall system, in accordance with the third aspect of the invention, is designated generally by the reference numeral 202. The wall panel 202 is an equivalent of the wall panel 50 of Figures 6. The wall panel 202 includes features that are similar or identical to features of the wall panel 10 and already described above. A description of these
20 features is not repeated here and some such features are again designated by the same reference numerals as before.

The wall panel 202 includes a body 203 which is made of a single piece of expanded polystyrene, as opposed to the two piece body of the panel 50.
25

In Figures 41a and 41b, another embodiment of a T-post, which is a core element of a wall system, in accordance with the third aspect of the invention, is designated generally by the reference numeral 204. The T-post 204 is an equivalent of the T-post 87 of Figure 10. The T-post 204 includes features that are similar or identical to features of
30 the T-post 87 of Figure 10 already described above. A description of these features is not repeated here and some such features are again designated by the same reference numerals as before.

The T-post 204 includes a body 205 which is made of a single piece of expanded polystyrene, as opposed to the two piece body 88 of the T-post 87.

5 In Figures 42a and 42b, another embodiment of an L-post, which is a core element of a wall system, in accordance with the third aspect of the invention, is designated generally by the reference numeral 208.

10 The L-post 208 is an equivalent of the L-post 94 shown in Figure 13. The L-post 208 includes features that are similar or identical to features of the L-post 94 and already described above. A description of these features is not repeated here and some such features are again designated by the same reference numerals as before. The L-post 208 includes a body 209 which is made of a single piece of expanded polystyrene, as opposed to the two piece body 96 of the L-post 94.

15 Figures 43a and 43b show an embodiment of a door panel, designated generally by the reference numeral 210, which is an alternative to the door panel 84 of Figure 9. The door panel 210 includes features that are similar or identical to features of the core elements already described above. A description of these features is not repeated here and some such features are again designated by the same reference numerals as before.
20

The door panel 210 includes two first type posts 58, each including a steel column member 212 received within a passage defined in the post. It includes also a steel lintel 214 received within a groove defined in an operative bottom edge of the panel 66 and
25 secured to the column members 212 via riveted brackets 216.

Figures 44a and 44b show a door panel, designated by the reference numeral 218, which is similar to the door panel 210 of Figures 43, but it includes no lintel 214. The requirement of a lintel is determined by a required load bearing capacity of the infill
30 panel 66. The column members 212 fit through respective passages 213 defined through the upper infill panel 66.

Figures 45a and 45b show a window panel 220. The window panel 220 includes features that are similar or identical to features of the door panel 210 and core elements

already described above. A description of these features is not repeated here and some such features are again designated by the same reference numerals as before.

The window panel 220 includes also a window infill panel 222 defining slots 224 for
5 receiving respective bottom end portions of the column members 212.

Figure 46 is discussed above.

Clearly, the configuration of a wall system, in accordance with the third aspect of the
10 invention, and that of a wall arrangement, in accordance with the second and fourth
aspects of the invention, are highly variable and, as such, the invention extends to any
wall system or wall arrangement including the essential features of, respectively, a wall
system or a wall arrangement, as defined herein, as such. The same applies *mutatis*
15 *mutandis* to a method of constructing a wall arrangement, in accordance with the first
aspect of the invention.

CLAIMS:

1. A method of constructing a wall arrangement, the method including:
constructing, in situ, a core of a wall arrangement from a modular wall system
5 comprising a plurality of prefabricated core elements, the core elements including at least one wall panel including a substantially rectangular body defining two operatively vertically disposed opposite side edges, an operative top edge, an operative bottom edge, and two opposite faces, these faces forming part of a plurality of vertical faces of the core; and
10 spray-applying to at least some of the faces of the core, including at least one of the faces of the wall panel, a cementitious material base slurry to form a base rendering layer.
2. A method as claimed in claim 1, in which the base slurry has a cement:sand ratio
15 of not below 1:4.
3. A method as claimed in claim 1, in which the cement:sand ratio is between 1:3 and 1:4.
- 20 4. A method as claimed in any of the preceding claims, in which the base slurry has a water:cement ratio of less than 0.45.
5. A method as claimed in any of the preceding claims, in which the base slurry includes an admixture for enhancing sprayability.
25
6. A method as claimed in claim 5, in which the admixture is one of a polymer and a plasticizer.
7. A method as claimed in any of claims 5 to 6, in which the weight of the admixture
30 is between 0.5% and 2% of the weight of the cement.
8. A method as claimed in any of the preceding claims, in which the base rendering layer has a thickness of between 4mm and 10mm.

9. A method as claimed in any of the preceding claims, in which the base slurry includes aggregate, the method including partially penetrating some of the aggregate into the core by the spray-applying to enhance bonding between the base rendering layer and the core.

5

10. A method as claimed in any of the preceding claims, the method including applying over the base rendering layer cementitious material cover slurry to define at least one cover rendering layer.

10

11. A method as claimed in claim 10, in which the cover slurry has a cement:sand ratio of between 1:4 and 1:5.

12. A method as claimed in any of claims 10 to 11, in which the cover slurry is applied by means of a suitable spray applicator apparatus.

15

13. A method as claimed in any of claims 10 to 12, in which the cover slurry includes a water retentive agent.

20

14. A method as claimed in claim 13, in which the water retentive agent is between 40g and 150g polypropylene fibres per 50kg cement.

15. A method as claimed in any of claims 10 to 14, the method including providing a reinforcement mesh in the cover rendering layer.

25

16. A method as claimed in claim 15, in which the reinforcement mesh is one of a steel mesh, a woven polypropylene mesh, and a woven glassfibre strand mesh.

30

17. A method as claimed in any of claims 10 to 16, in which the at least one cover rendering layer includes a final rendering layer having a cement:sand ratio of between 1:5 and 1:7.

18. A method as claimed in any of the preceding claims, in which the at least some of the faces of the core include two such faces on opposite sides of the core so that the spray-applying defines two opposite base rendering layers.

19. A method as claimed in claim 18, which includes providing an arrangement of tie means, each extending through the core, to bind the opposite base rendering layers together.

5

20. A method as claimed in any of claims 18 to 19, which includes defining two opposite grooves in the respective opposite faces and filling the grooves with rendering to define opposite reinforcing bands in the respective grooves.

10

21. A method as claimed in claim 20, in which the grooves are dovetail grooves.

22. A method as claimed in any of claims 20 to 21, which includes encapsulating reinforcement in the rendering in each groove.

15

23. A method as claimed in claim 22, in which the reinforcement is one of a steel mesh strip and a woven alkali resistant glass fibre mesh strip.

24. A method as claimed in any of the preceding claims, which includes installing a ring beam, supported on the core.

20

25. A method as claimed in any preceding claim, in which the body of the wall panel is made of a material having a density of below 500kg/m³.

26. A method as claimed in any of the preceding claims, in which the body of the wall panel is made of a synthetic polymeric material.

25

27. A method as claimed in claim 26, in which the synthetic polymeric material is one of expanded polystyrene and extruded polystyrene.

30

28. A method as claimed in any of claims 25 to 27, in which the body of the wall panel is factory cut into a required shape using suitable cutting equipment.

29. A method as claimed in any of the preceding claims, in which the body of the wall panel includes a lower body part and an upper body part, the two body parts defining between them an operatively horizontally disposed joint.

5 30. A method as claimed in any of the preceding claims, in which the body of the wall panel defines along at least a part of the length of each of its opposite side edges an interlock formation for operatively providing interlock of the edge with an adjacent core element.

10 31. A method as claimed in claim 30, in which each interlock formation defines a laterally open groove, the wall system including an elongate jointing member of which one side is receivable in the groove in a configuration in which the other side projects from the groove and is receivable in such a groove defined by the adjacent core element.

15 32. A method as claimed in any of the preceding claims, in which the body of the wall panel defines, in at least one of its faces, two opposite recesses, each extending along at least a part of the length of one of its opposite side edges, for receiving a side half of a reinforcement strip for operatively bridging a joint with an adjacent core element.

20 33. A method as claimed in any of the preceding claims, in which the wall panel includes at least one column member, which is received within a passage defined in the body of the panel, which is disposed parallel to and spaced apart from both side edges, and which extends at least substantially between the operative top and operative
25 bottom edges of the body.

34. A method as claimed in claim 33, in which the column member is a concrete element.

30 35. A method as claimed in claim 33, in which the column member is a steel element.

36. A method as claimed in any of claims 33 to 35, in which the passage is between and spaced apart from the opposite faces of the body of the wall panel.

37. A method as claimed in any of claims 33 to 36, in which the column member defines at its operative top securing means for securing to another structural member.

38. A method as claimed in any of claims 33 to 37, in which the column member
5 defines at its operative bottom securing means for securing to another structural member.

39. A method as claimed in any of claims 33 to 38, in which the at least one column member include two spaced apart column members.

10

40. A method as claimed in any of the preceding claims, in which the wall panel defines along its operative top edge a recess or groove for accommodating a length of ring beam.

15 41. A method as claimed in any of the preceding claims, in which the core elements include a first type post, the first type post including a body defining a side edge extending along a height of the first type post and the side edge defining an interlock formation for operatively providing interlock with an adjacent core element.

20 42. A method as claimed in claim 41, in which the first type post includes at least one column member received in a groove defined along an opposite side edge of the body of the first type post.

25 43. A method as claimed in claim 42, in which the column member of the first type post is one of a concrete element and a steel element.

44. A method as claimed in any of claims 41 to 43, in which the body of the first type post is made of a synthetic polymeric material.

30 45. A method as claimed in any of the preceding claims, in which the core elements include a T-post including a body defining a generally T-shaped cross-section and three side edges, each extending along an operative height of the body and defining along its length an interlock formation for operatively providing interlock with an adjacent core element.

46. A method as claimed in claim 45, in which the T-post includes at least one column member received within a passage defined in its body.

5 47. A method as claimed in claim 46, in which the column member of the T-post is one of a concrete element and a steel element.

48. A method as claimed in any of claims 45 to 47, in which the body of the T-post is made of a synthetic polymeric material.

10

49. A method as claimed in any of the preceding claims, in which the core elements include an L-post including a body defining a generally L-shaped cross-section and two side edges, each extending along a height of the body and defining along its length an interlock formation for operatively providing interlock with an adjacent core element.

15

50. A method as claimed in claim 49, in which the L-post includes at least one column member received within a passage defined in its body.

20 51. A method as claimed in claim 50, in which the column member of the L-post is one of a concrete element and a steel element.

52. A method as claimed in any of claims 49 to 51, in which the body of the L-post is made of a synthetic polymeric material.

25 53. A method as claimed in any of the preceding claims, in which the core elements include an upper infill panel for spanning over an opening, the upper infill panel including a generally rectangular body defining an operative bottom edge for operatively defining an upper boundary of an opening.

30 54. A method as claimed in claim 53, in which the upper infill panel includes a lintel in its operative bottom edge.

55. A method as claimed in any of the preceding claims, in which the core elements include a window infill panel for underlying a window, the window infill panel including a

generally rectangular body defining an operative top edge, for operatively defining a lower boundary of a window opening, and an operative bottom edge.

56. A method as claimed in claim 55, in which the window infill panel includes a sill
5 element in the operative top edge.

57. A wall arrangement constructed in accordance with a method as claimed in any of the preceding claims.

10 58. A modular wall system suitable for use in a method as claimed in any of claims 1 to 56, the wall system including a plurality of prefabricated core elements, the core elements including at least one wall panel including:

a core comprising a plurality of prefabricated core elements, the core elements including at least one wall panel including a substantially rectangular body defining two
15 operatively vertically disposed opposite side edges, an operative top edge, an operative bottom edge, and two opposite faces; and

at least one column member, which is received within a passage defined in the body, which is disposed parallel to and spaced apart from both side edges, and which extends at least substantially between the operative top and operative bottom edges.

20

59. A wall system as claimed in claim 58, in which the body of the wall panel is made of a material having a density of below 500kg/m³.

60. A wall system as claimed in any of claims 58 to 59, in which the body of the wall
25 panel is made of a synthetic polymeric material.

61. A wall system as claimed in claim 60, in which the synthetic polymeric material is one of expanded polystyrene and extruded polystyrene.

30 62. A wall system as claimed in any of claims 58 to 61, in which the body of the wall panel is factory cut into a required shape using suitable cutting equipment.

63. A wall system as claimed in any of claims 58 to 62, in which the body of the wall panel includes a lower body part and an upper body part, the two body parts defining between them an operatively horizontally disposed joint.

5 64. A wall system as claimed in any of claims 58 to 63, in which the body of the wall panel defines along at least a part of the length of each of its opposite side edges an interlock formation for operatively providing interlock of the edge with an adjacent core element.

10 65. A wall system as claimed in claim 64, in which each interlock formation defines a laterally open groove, the wall system including an elongate jointing member of which one side is receivable in the groove in a configuration in which the other side projects from the groove and is receivable in such a groove defined by the adjacent core element.

15 66. A wall system as claimed in any of claims 58 to 65, in which the body of the wall panel defines, in at least one of its faces, two opposite recesses, each extending along at least a part of the length of one of its opposite side edges, for receiving a side half of a reinforcement strip for operatively bridging a joint with an adjacent core element.

20 67. A wall system as claimed in any of claims 58 to 66, in which the wall panel includes at least one column member, which is received within a passage defined in the body of the panel, which is disposed parallel to and spaced apart from both side edges, and which extends at least substantially between the operative top and operative
25 bottom edges of the body.

68. A wall system as claimed in claim 67, in which the column member is a concrete element.

30 69. A wall system as claimed in claim 67, in which the column member is a steel element.

70. A wall system as claimed in any of claims 67 to 69, in which the passage is between and spaced apart from the opposite faces of the body of the wall panel.

71. A wall system as claimed in any of claims 67 to 70, in which the column member defines at its operative top securing means for securing to another structural member.

5 72. A wall system as claimed in any of claims 67 to 71, in which the column member defines at its operative bottom securing means for securing to another structural member.

10 73. A wall system as claimed in any of claims 67 to 72, in which the at least one column member include two spaced apart column members.

15 74. A wall system as claimed in any of claims 58 to 73, in which the wall panel defines along its operative top edge a recess or groove for accommodating a length of ring beam.

20 75. A wall system as claimed in any of claims 58 to 74, in which the core elements include a first type post, the first type post including a body defining a side edge extending along a height of the first type post and the side edge defining an interlock formation for operatively providing interlock with an adjacent core element.

25 76. A wall system as claimed in claim 75, in which the first type post includes at least one column member received in a groove defined along an opposite side edge of the body of the first type post.

30 77. A wall system as claimed in claim 76, in which the column member of the first type post is one of a concrete element and a steel element.

78. A wall system as claimed in any of claims 75 to 77, in which the body of the first type post is made of a synthetic polymeric material.

79. A wall system as claimed in any of claims 58 to 78, in which the core elements include a T-post including a body defining a generally T-shaped cross-section and three side edges, each extending along an operative height of the body and defining along its

length an interlock formation for operatively providing interlock with an adjacent core element.

80. A wall system as claimed in claim 79, in which the T-post includes at least one
5 column member received within a passage defined in its body.

81. A wall system as claimed in claim 80, in which the column member of the T-post is one of a concrete element and a steel element.

10 82. A wall system as claimed in any of claims 79 to 81, in which the body of the T-post is made of a synthetic polymeric material.

83. A wall system as claimed in any of claims 58 to 82, in which the core elements include an L-post including a body defining a generally L-shaped cross-section and two
15 side edges, each extending along a height of the body and defining along its length an interlock formation for operatively providing interlock with an adjacent core element.

84. A wall system as claimed in claim 83, in which the L-post includes at least one
20 column member received within a passage defined in its body.

85. A wall system as claimed in claim 84, in which the column member of the L-post is one of a concrete element and a steel element.

86. A wall system as claimed in any of claims 83 to 85, in which the body of the L-post
25 is made of a synthetic polymeric material.

87. A wall system as claimed in any of claims 58 to 86, in which the core elements include an upper infill panel for spanning over an opening, the upper infill panel including a generally rectangular body defining an operative bottom edge for operatively
30 defining an upper boundary of an opening.

88. A wall system as claimed in claim 87, in which the upper infill panel includes a lintel in its operative bottom edge.

89. A wall system as claimed in any of claims 58 to 88, in which the core elements include a window infill panel for underlying a window, the window infill panel including a generally rectangular body defining an operative top edge, for operatively defining a lower boundary of a window opening, and an operative bottom edge.

5

90. A wall system as claimed in claim 89, in which the window infill panel includes a sill element in the operative top edge.

91. A wall arrangement including:

10 a core constructed from a modular wall system as claimed in any of claims 58 to 90; and

a cementitious material base rendering layer applied to each of a plurality of vertical faces of the core.

15 92. A wall arrangement as claimed in claim 91, the arrangement including at least one cementitious material base rendering layer applied to the base rendering layer.

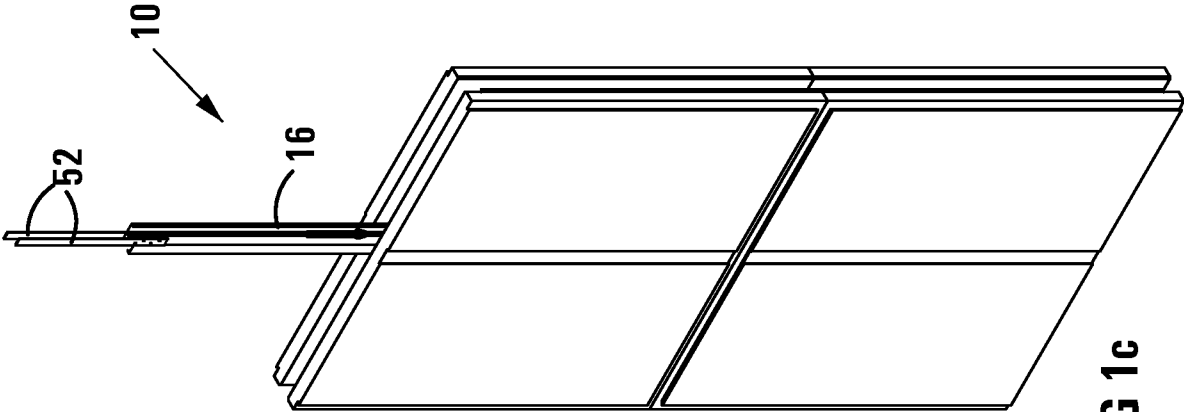


FIG 1c

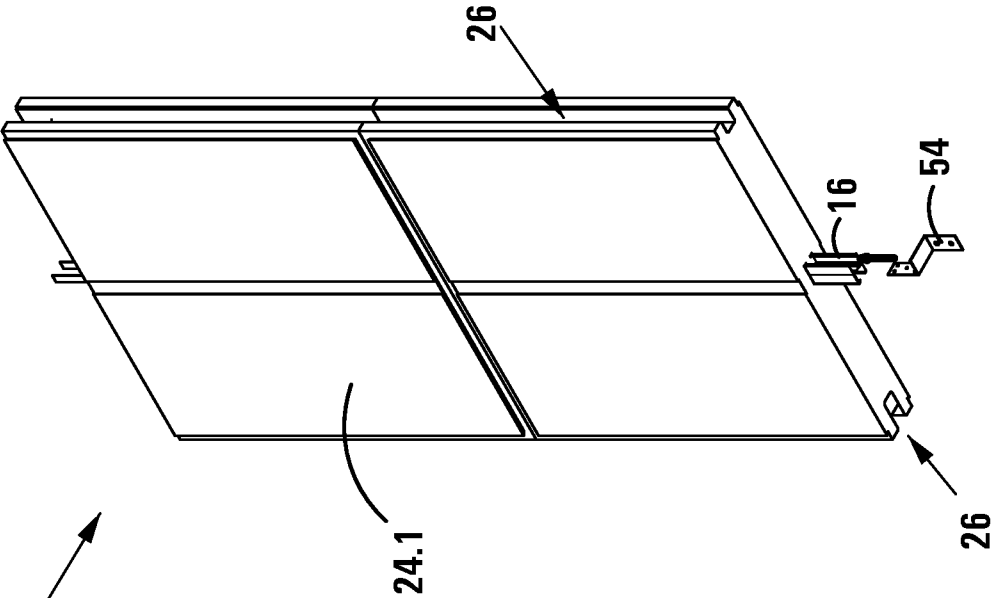


FIG 1b

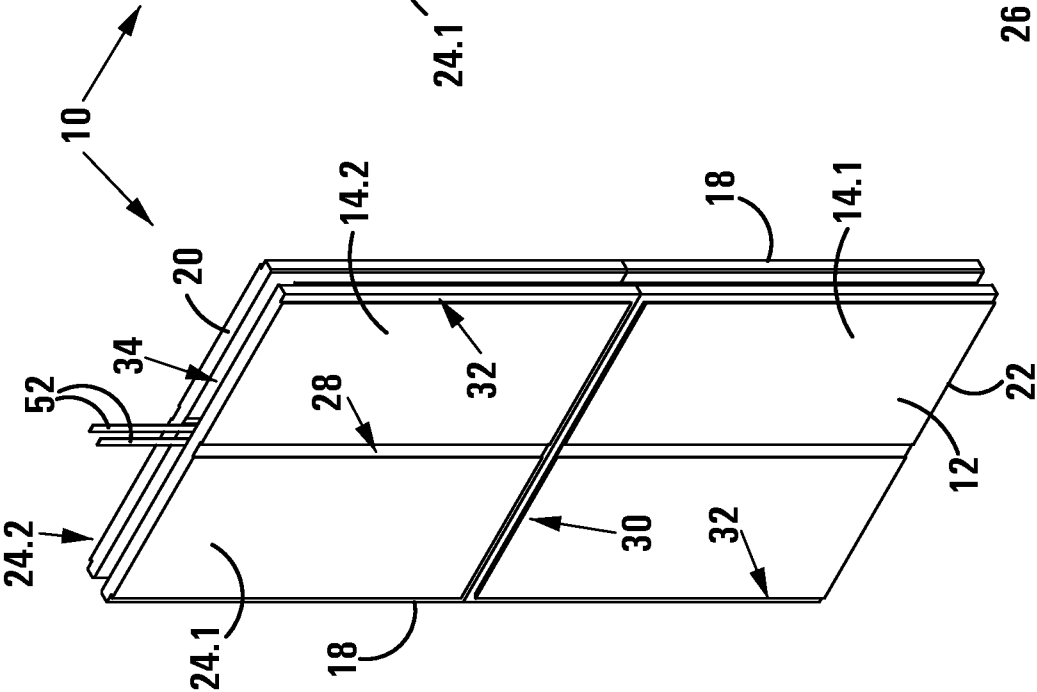
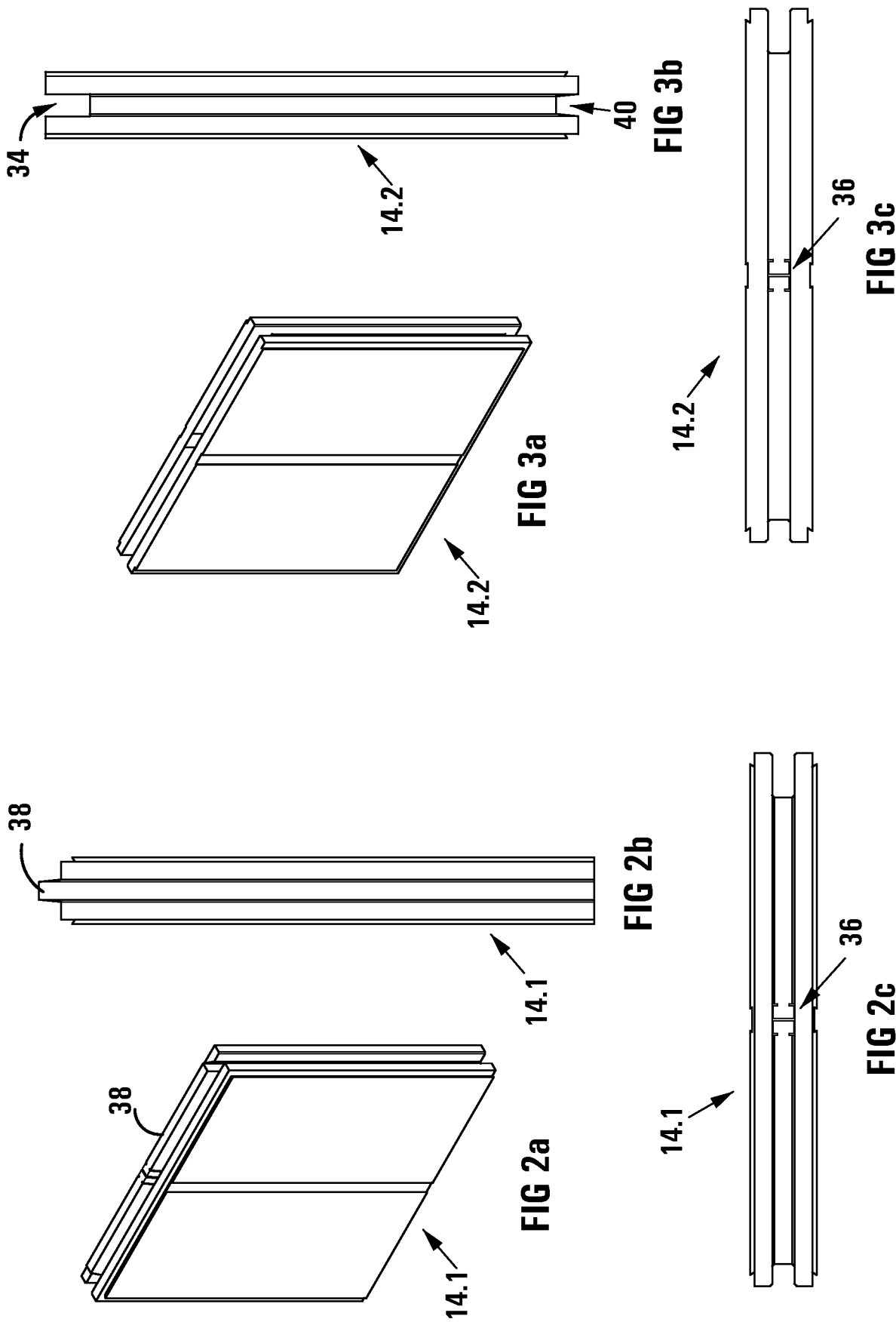


FIG 1a



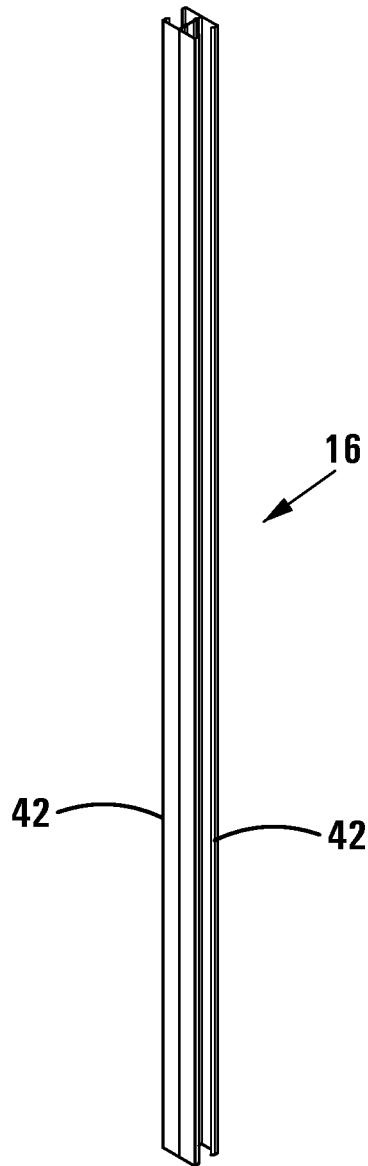


FIG 4a

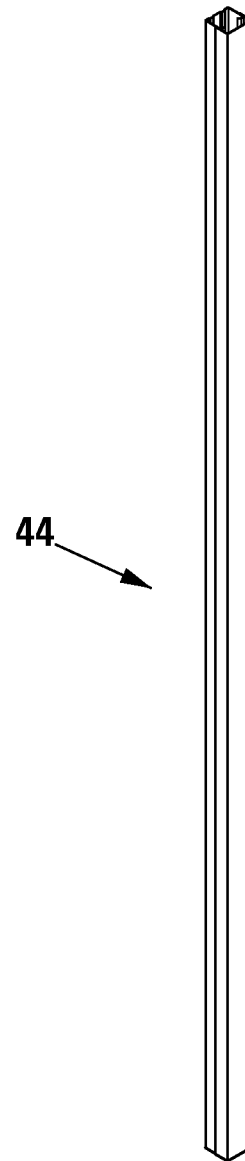


FIG 5a

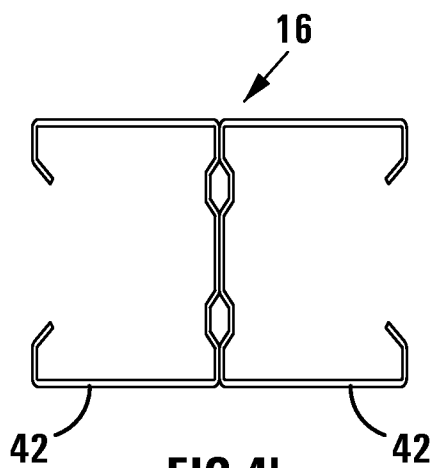


FIG 4b

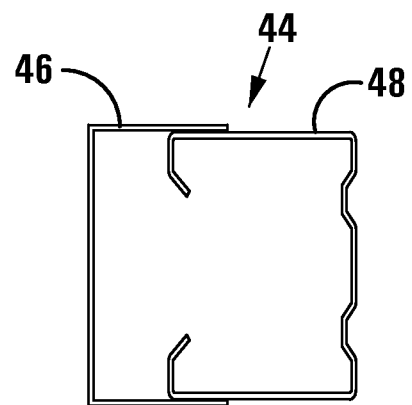
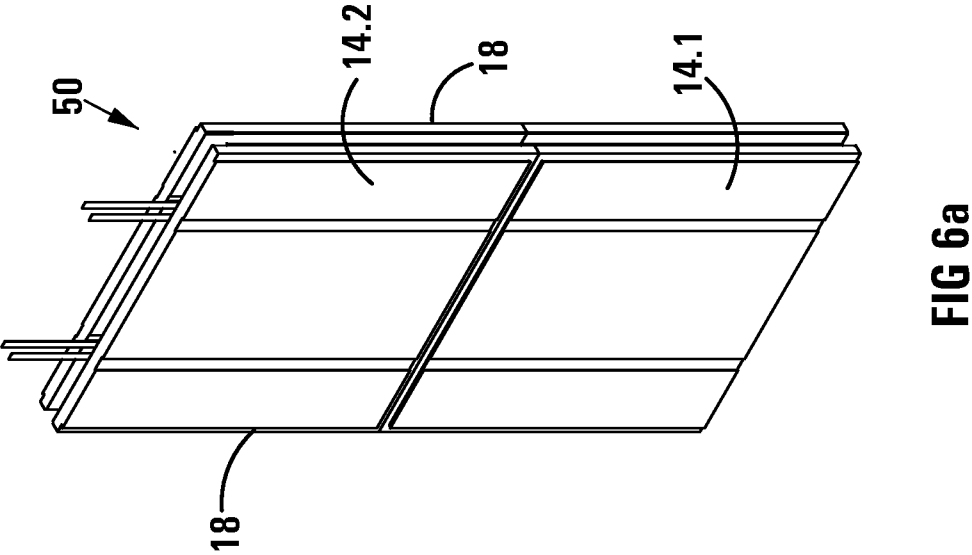
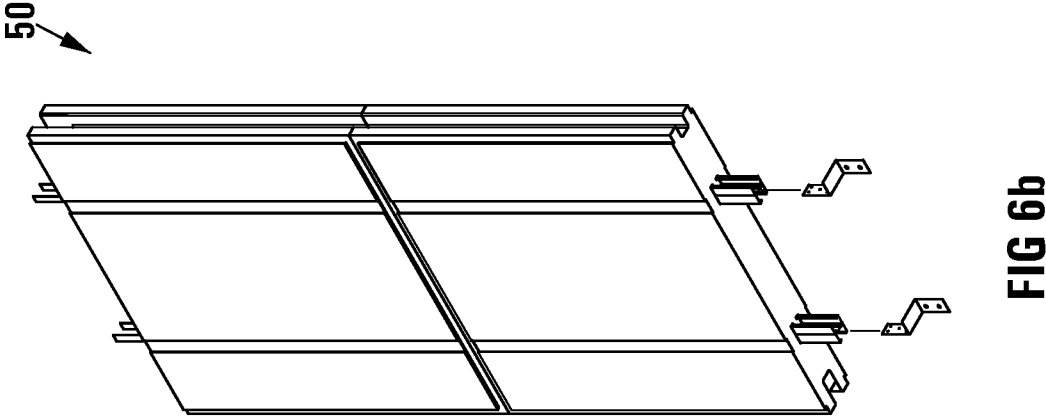
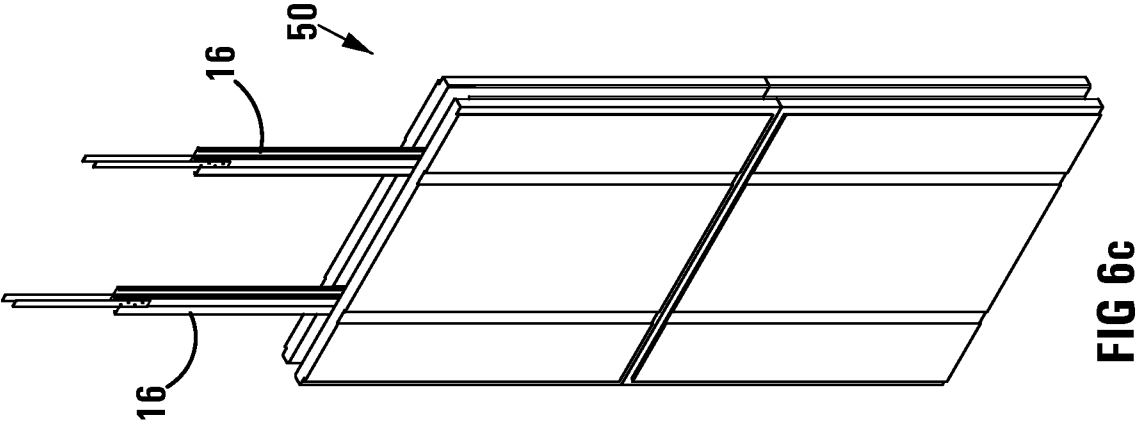


FIG 5b



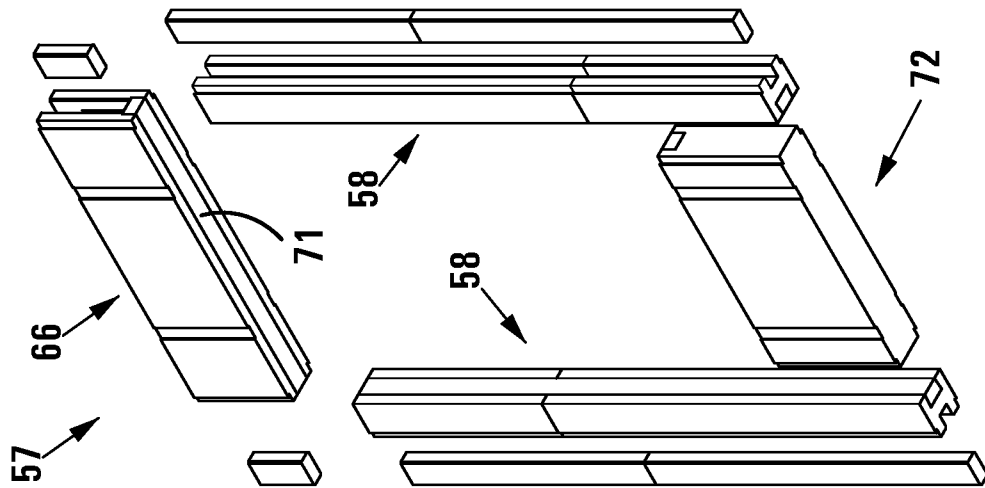


FIG 7b

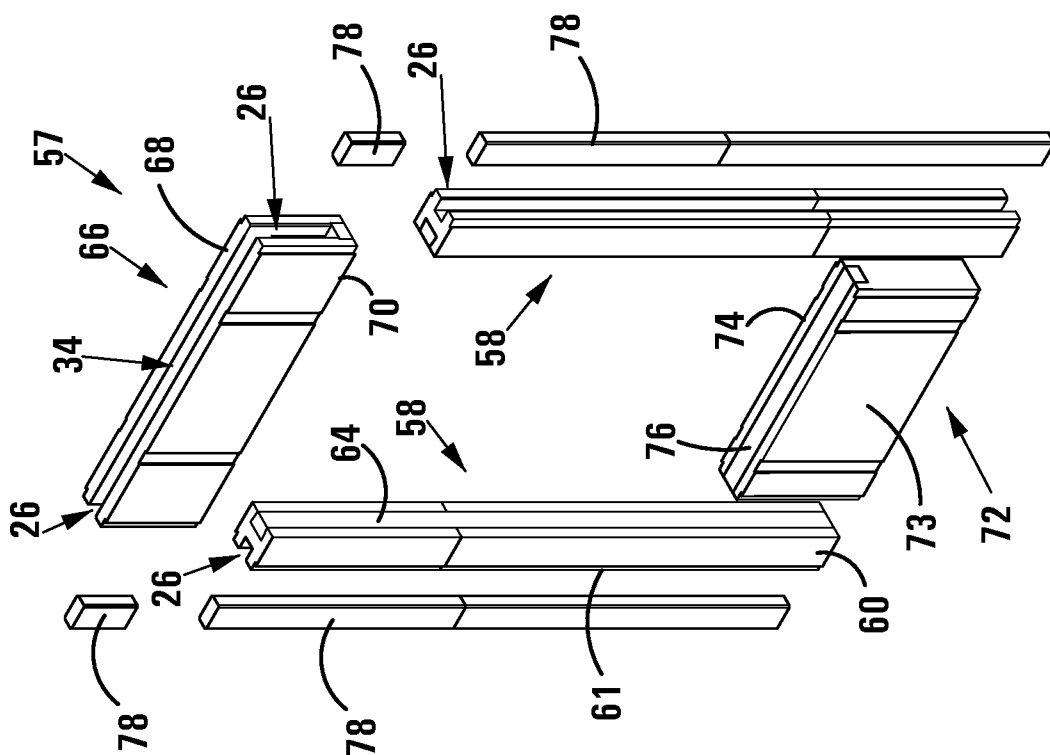
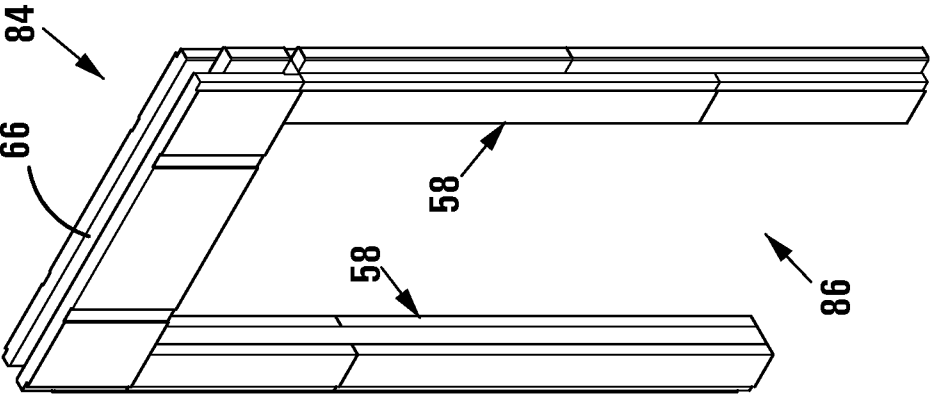
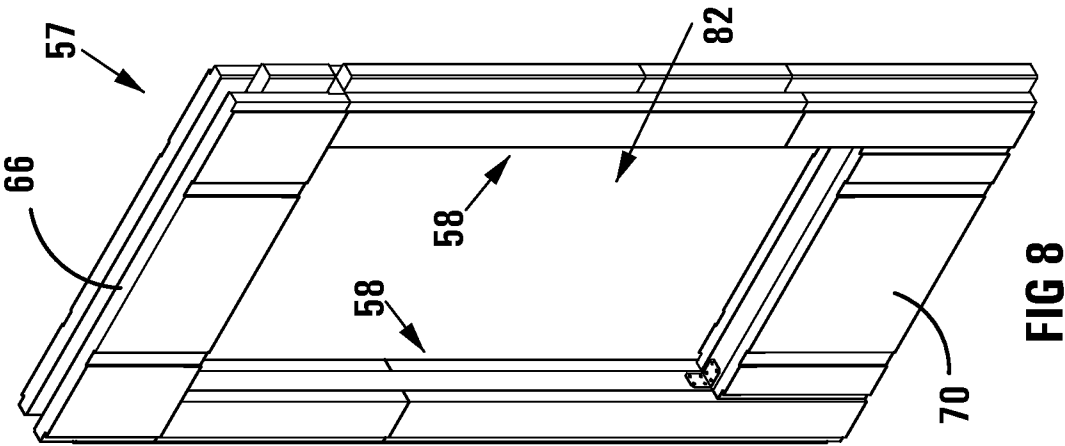


FIG 7a



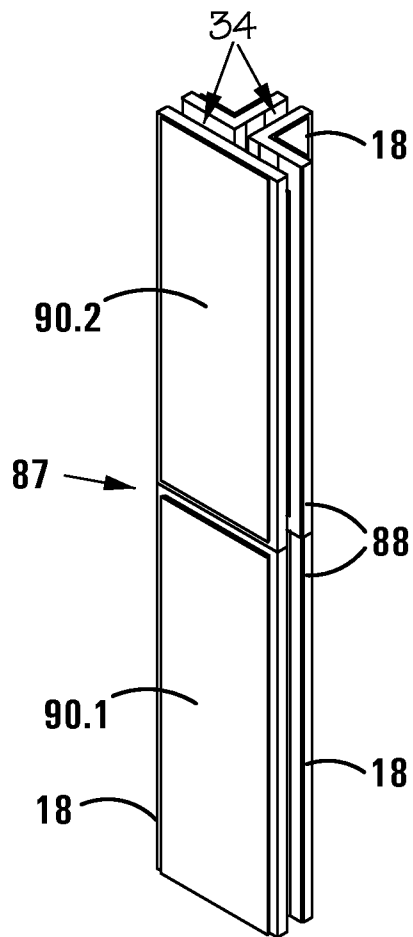


FIG 10

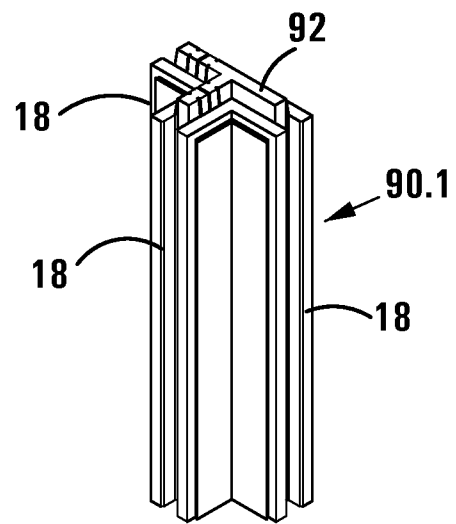


FIG 11a

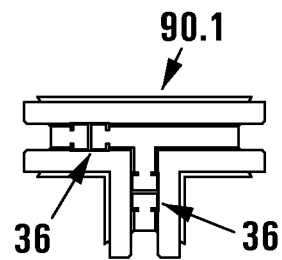


FIG 11b

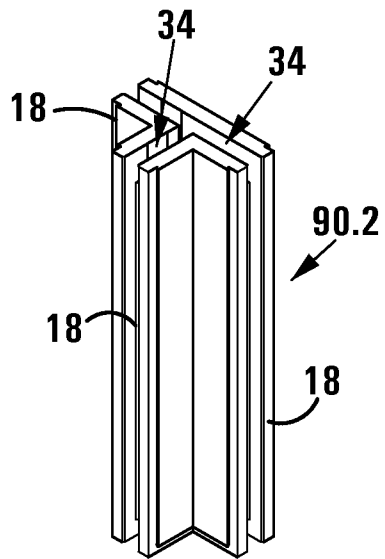


FIG 12a

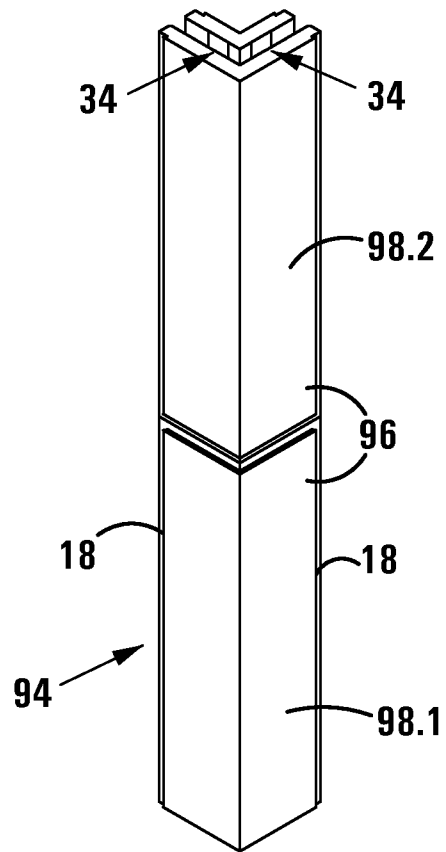


FIG 13

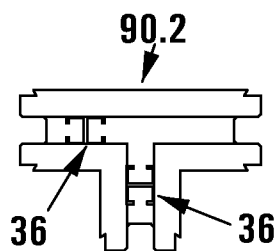


FIG 12b

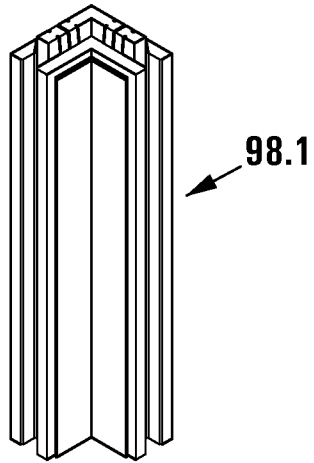


FIG 14a

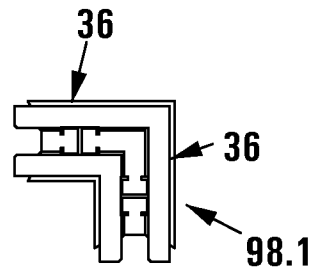


FIG 14b

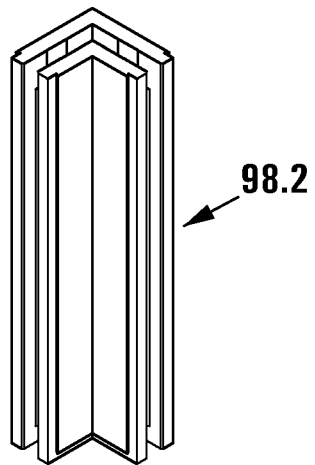


FIG 15a

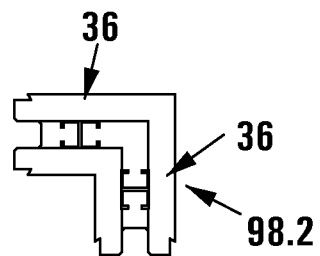


FIG 15b

10/33

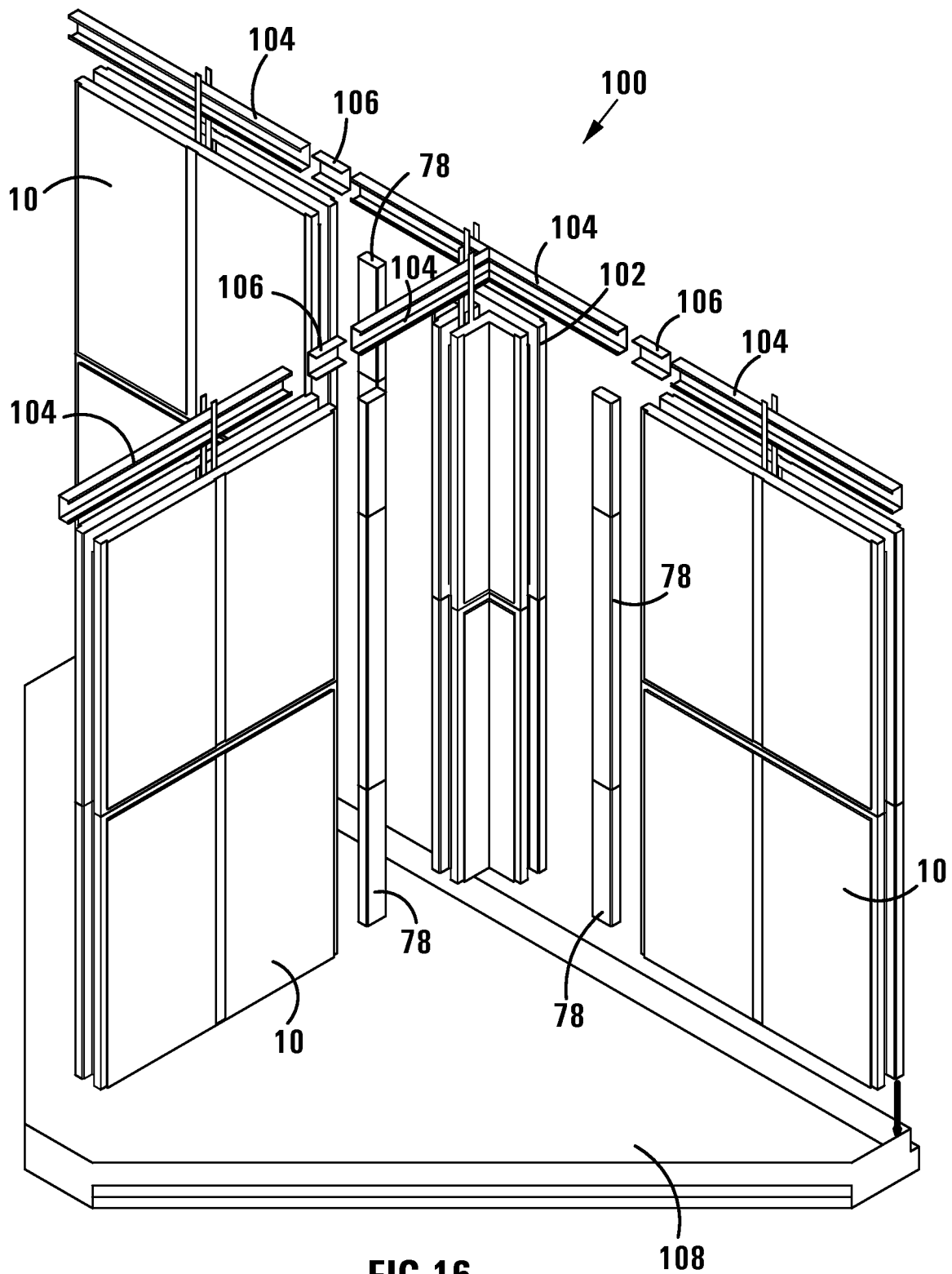


FIG 16

11/33

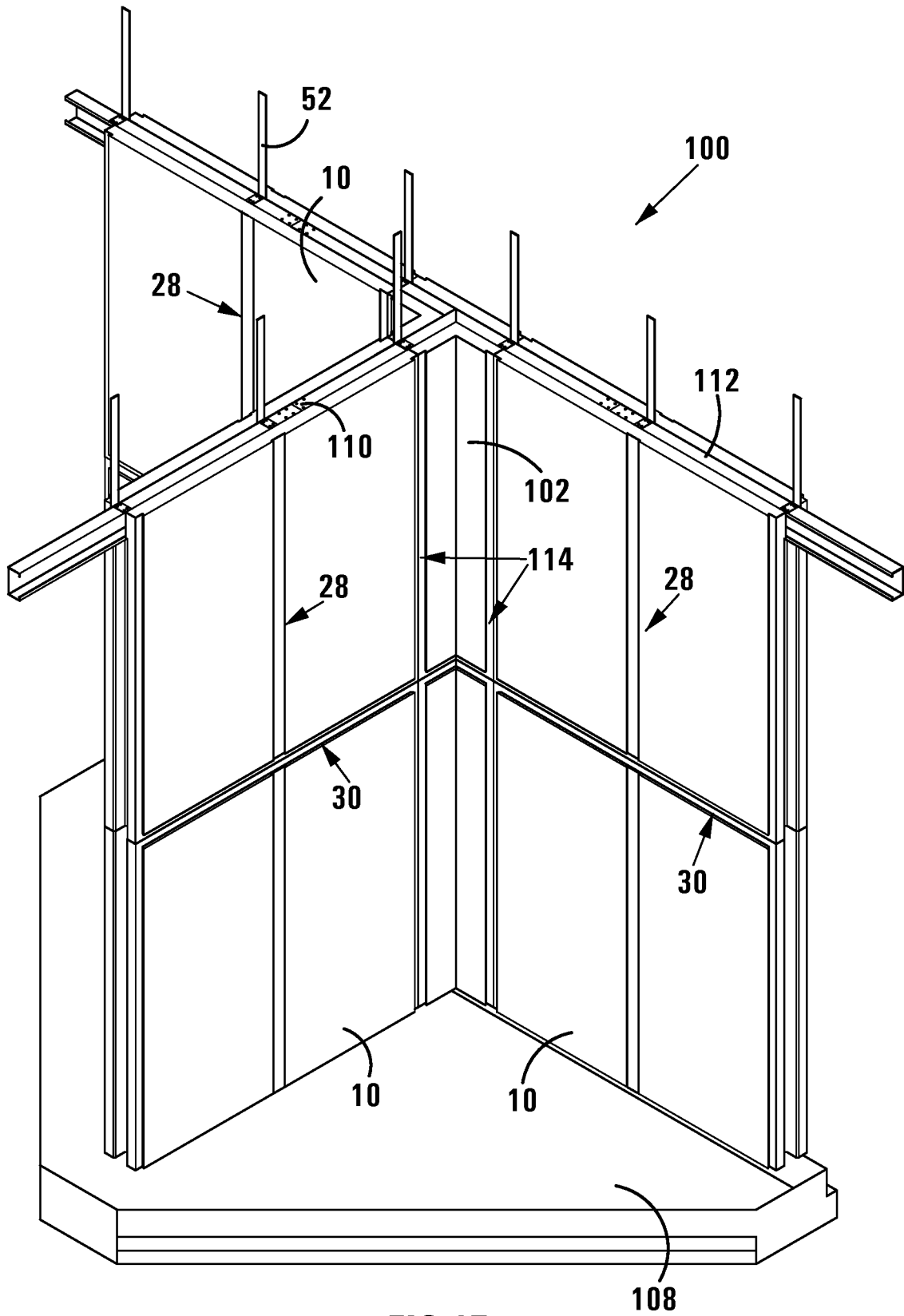
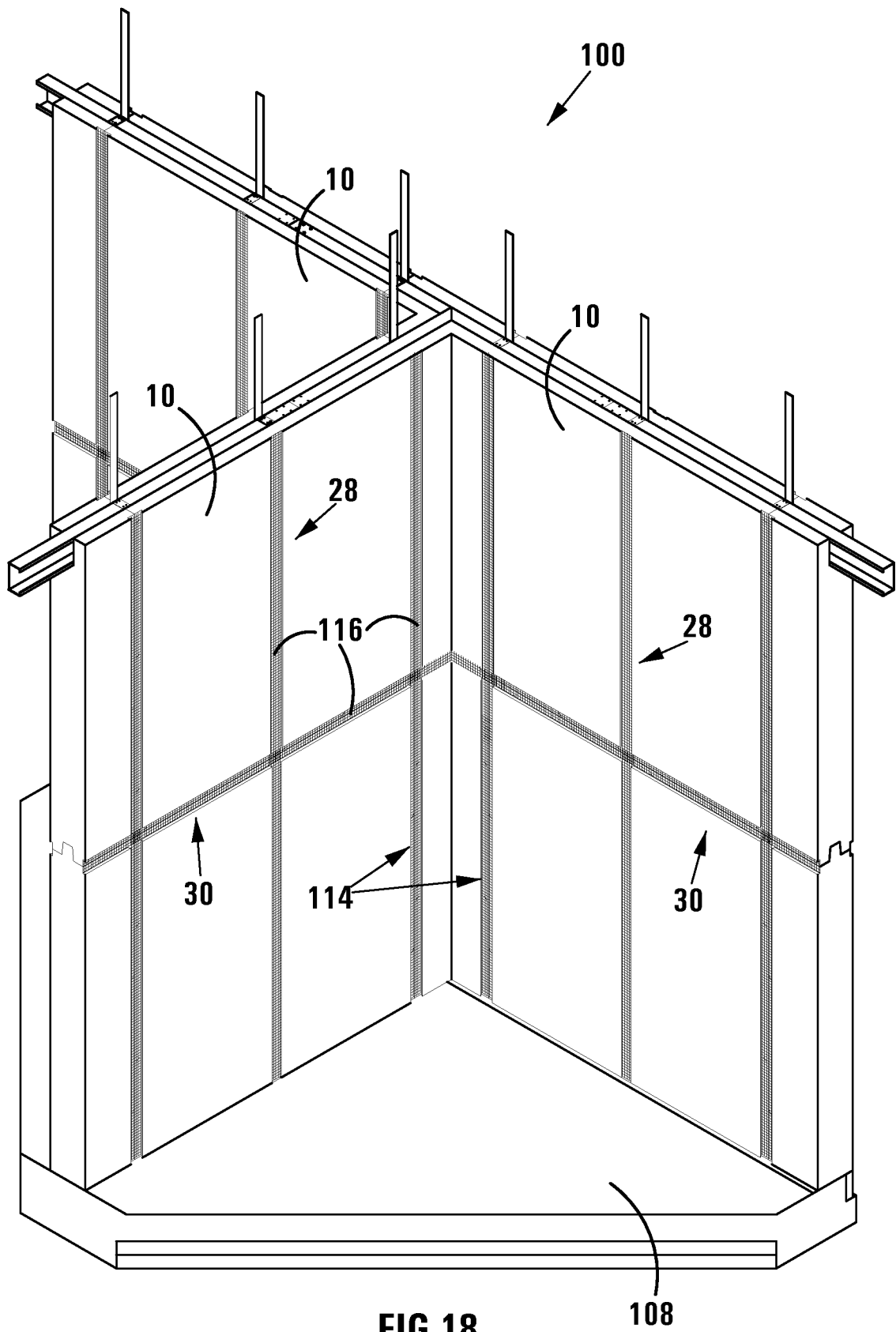


FIG 17

12/33



13/33

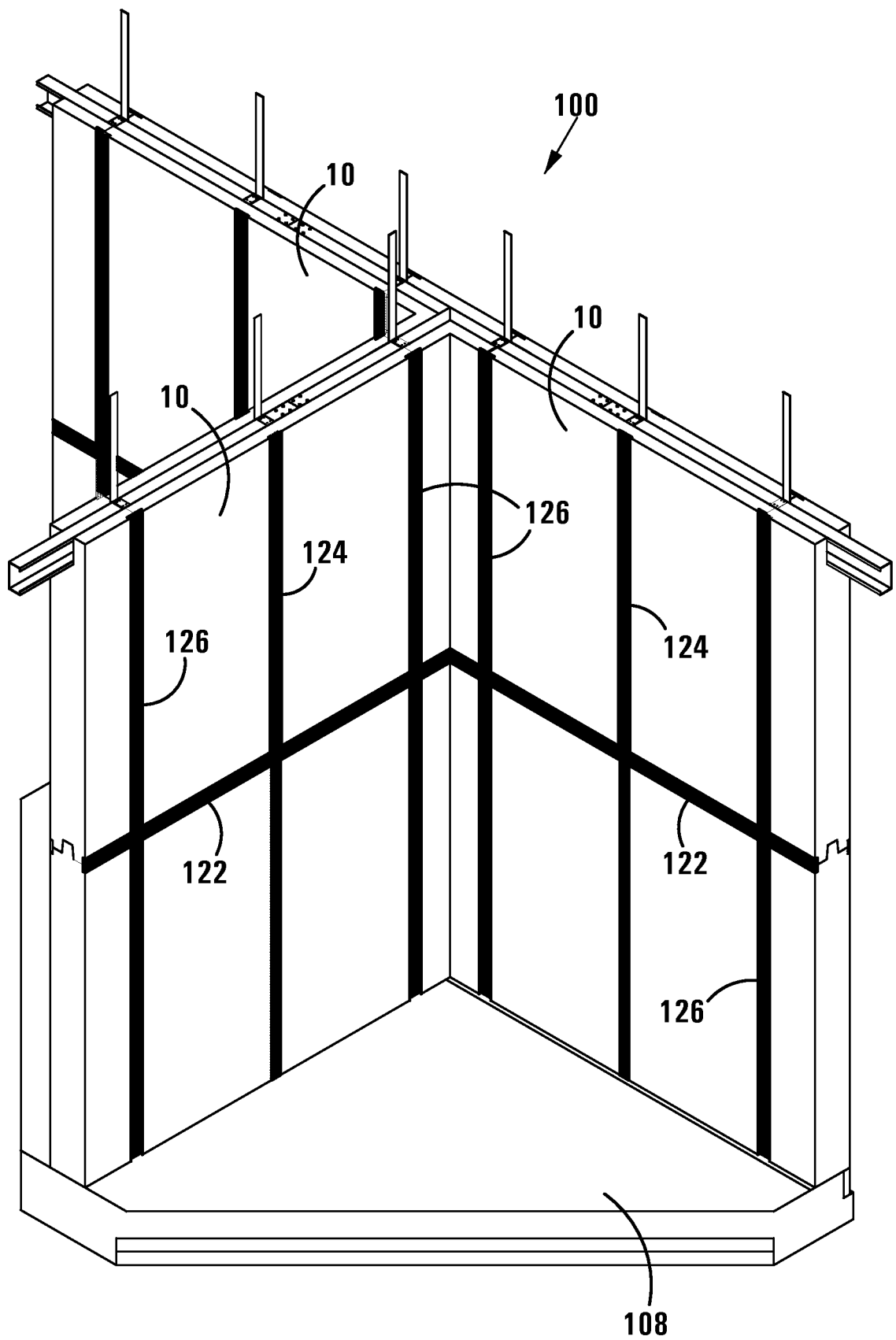
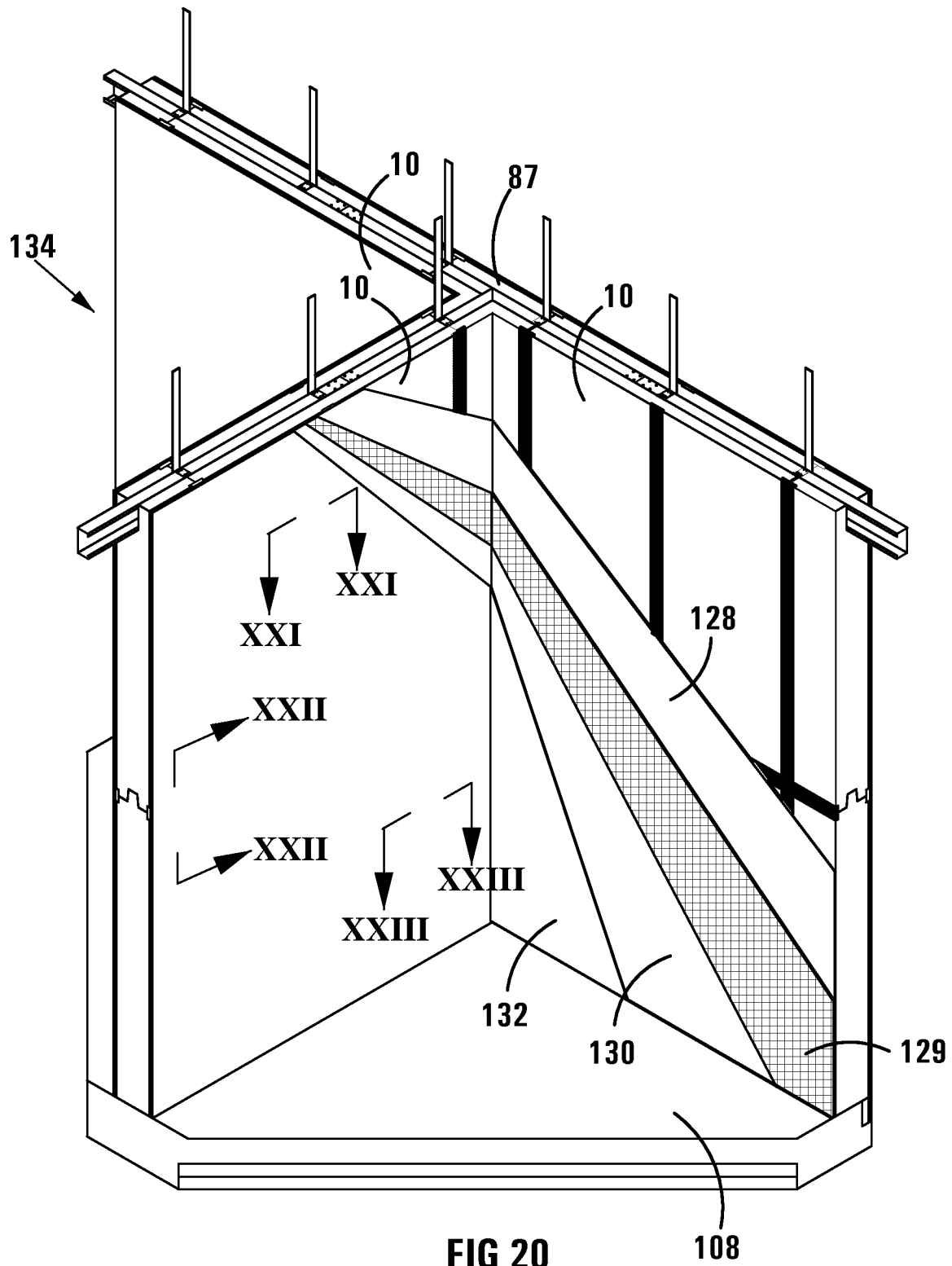


FIG 19



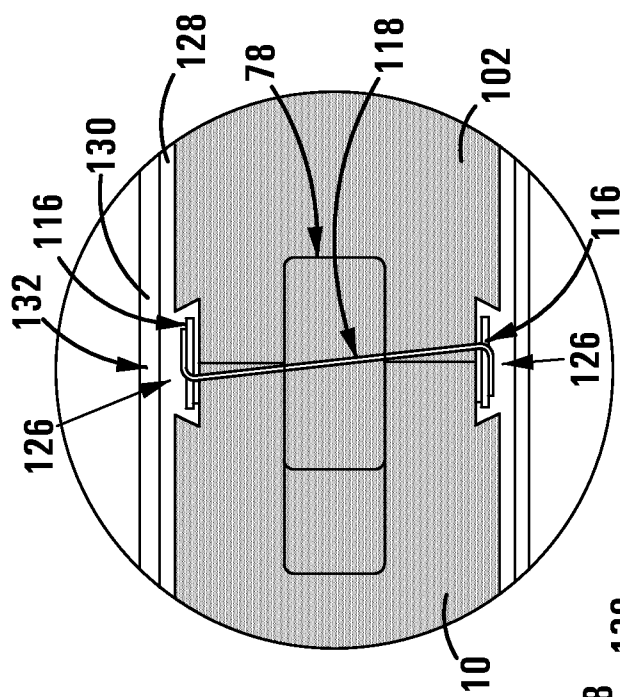


FIG 23

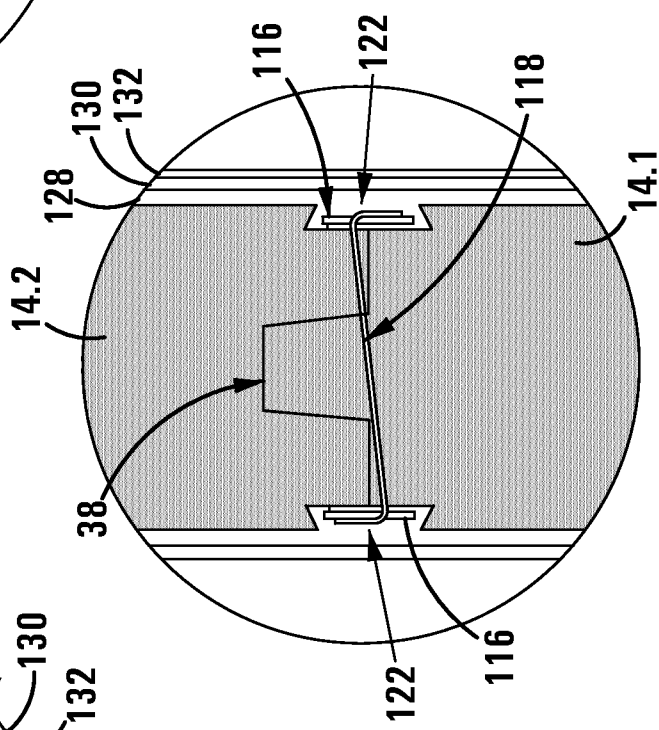


FIG 22

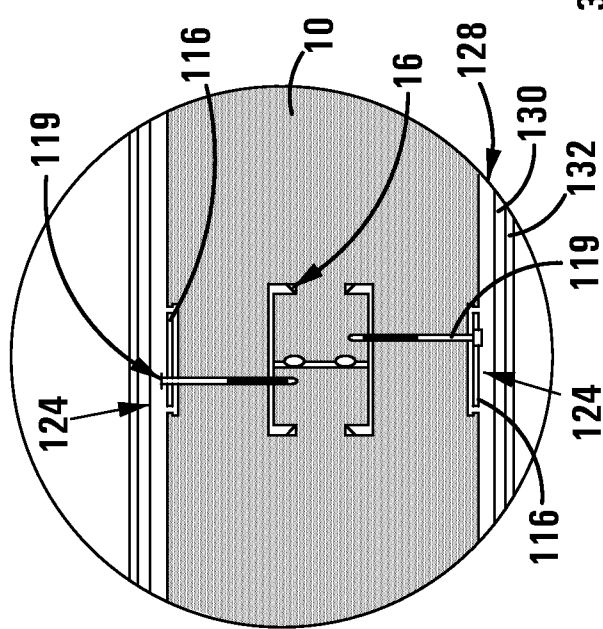
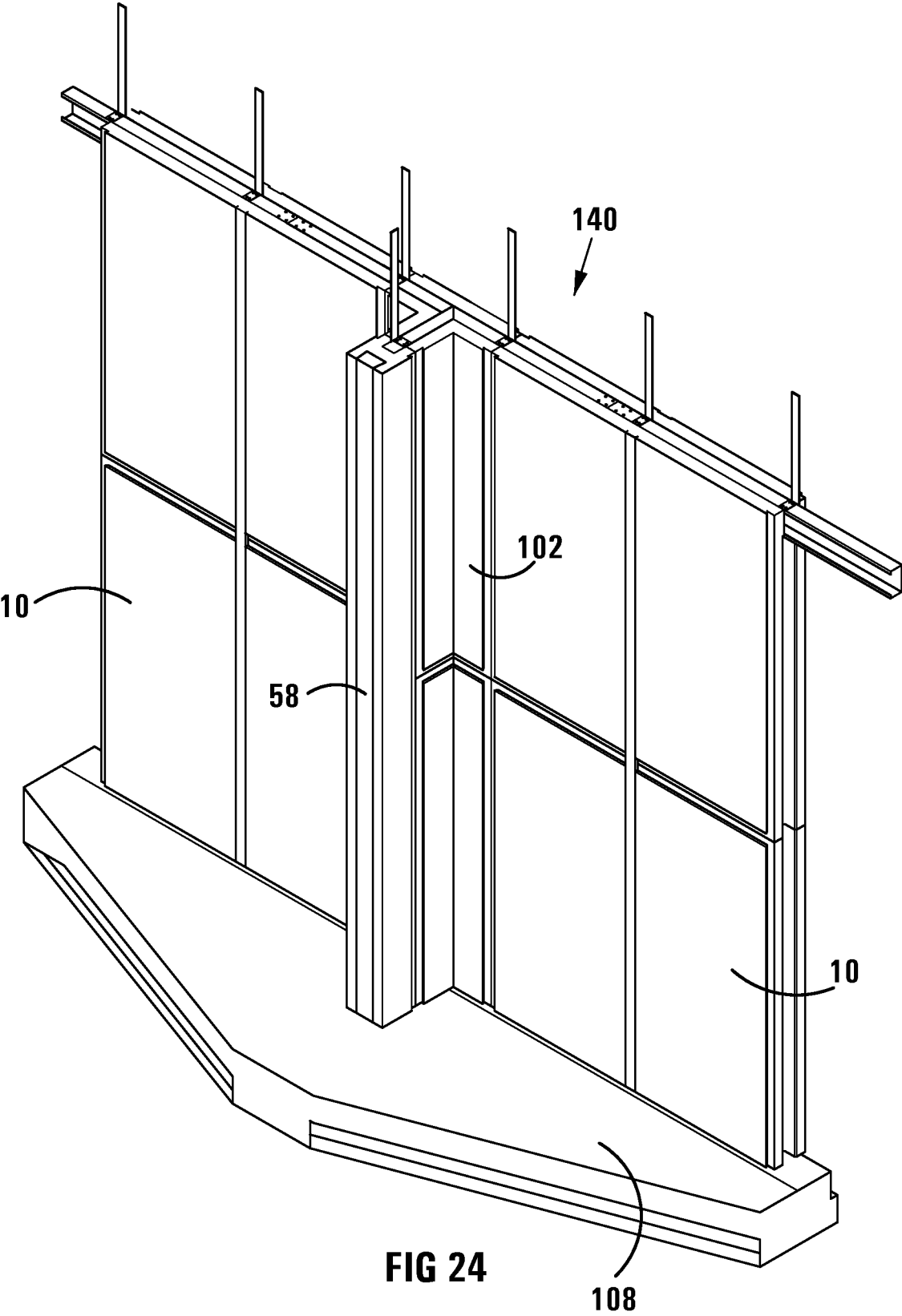


FIG 21



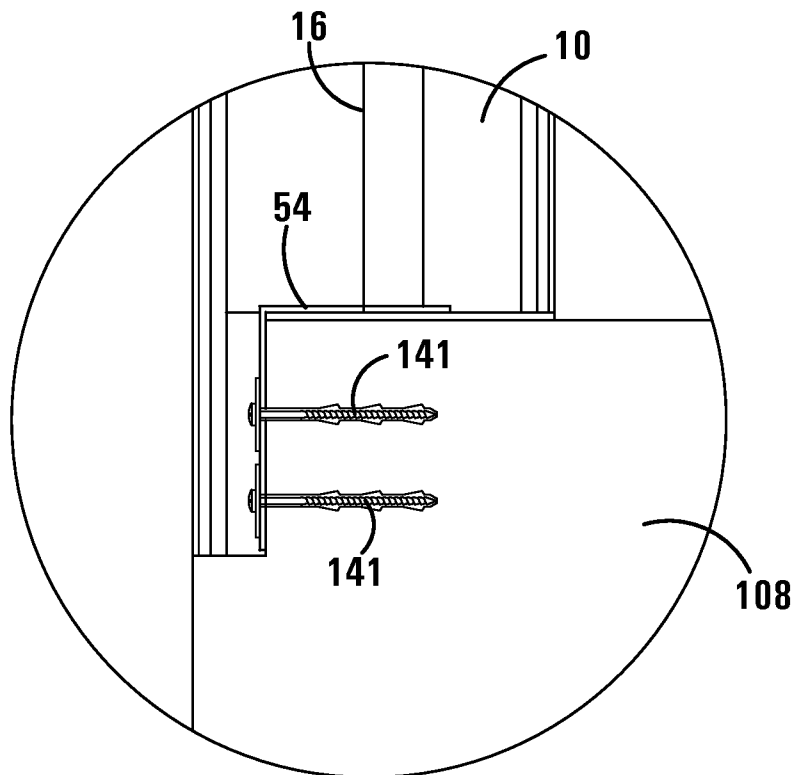


FIG 25

18/33

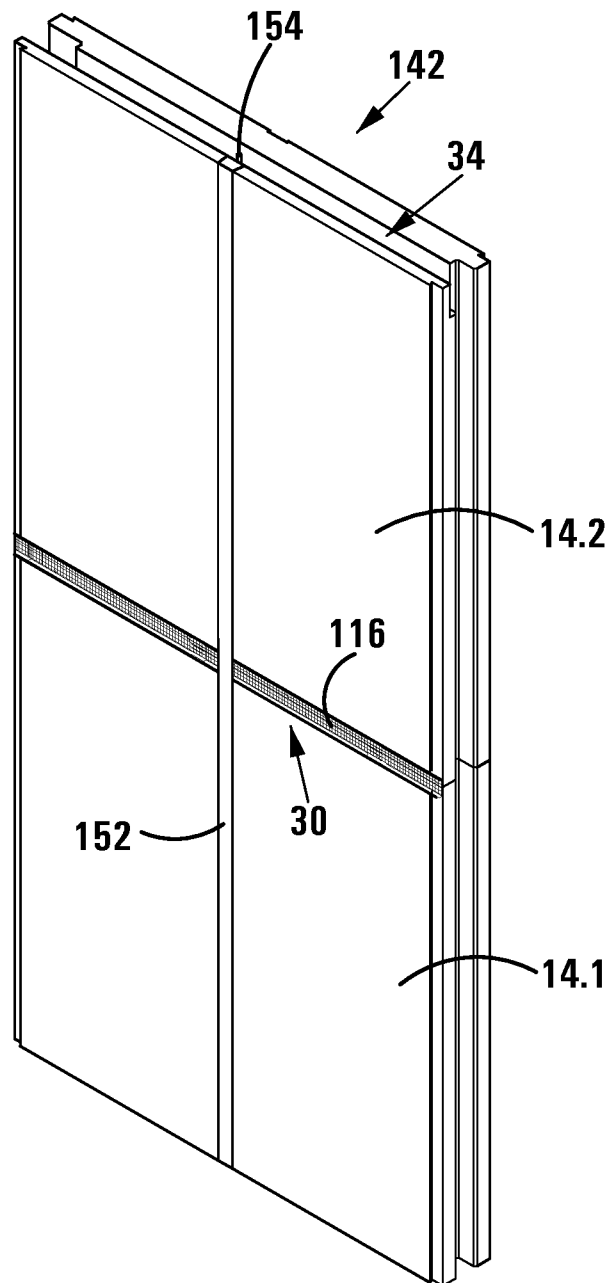


FIG 26

19/33

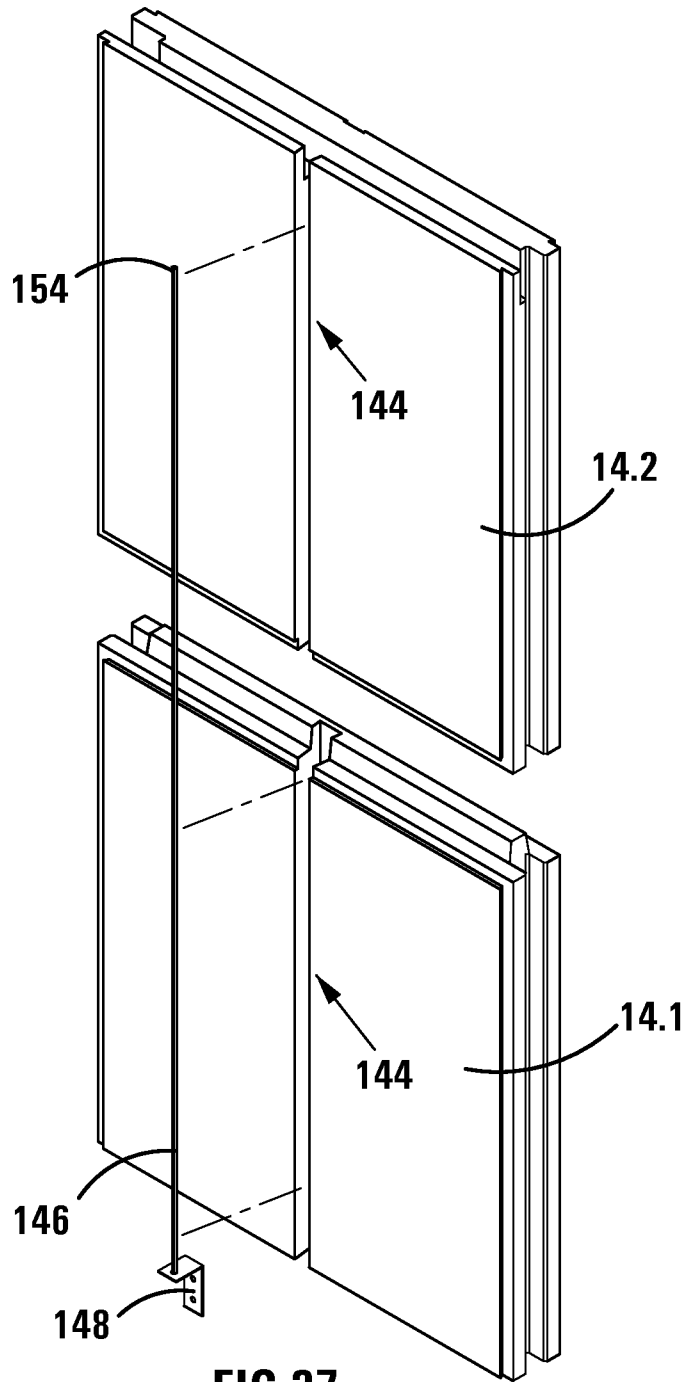


FIG 27

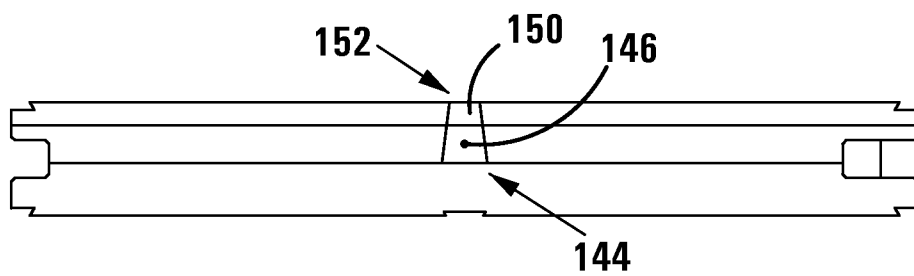


FIG 28

20/33

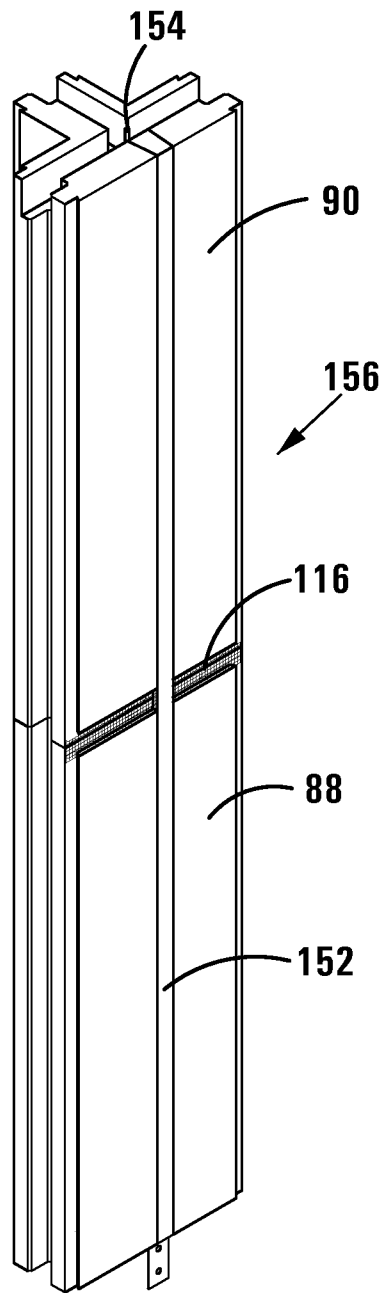


FIG 29

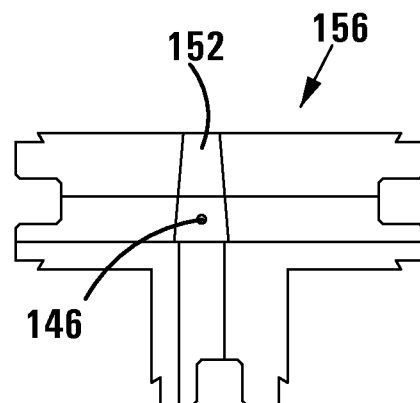


FIG 30

21/33

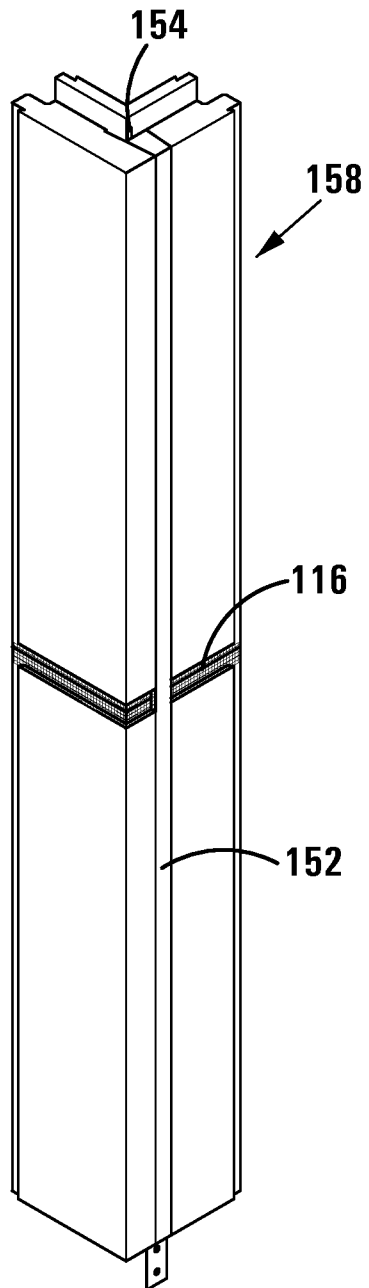


FIG 31

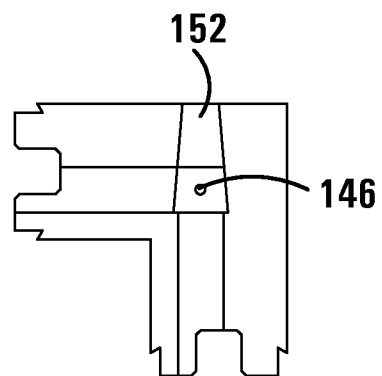


FIG 32

22/33

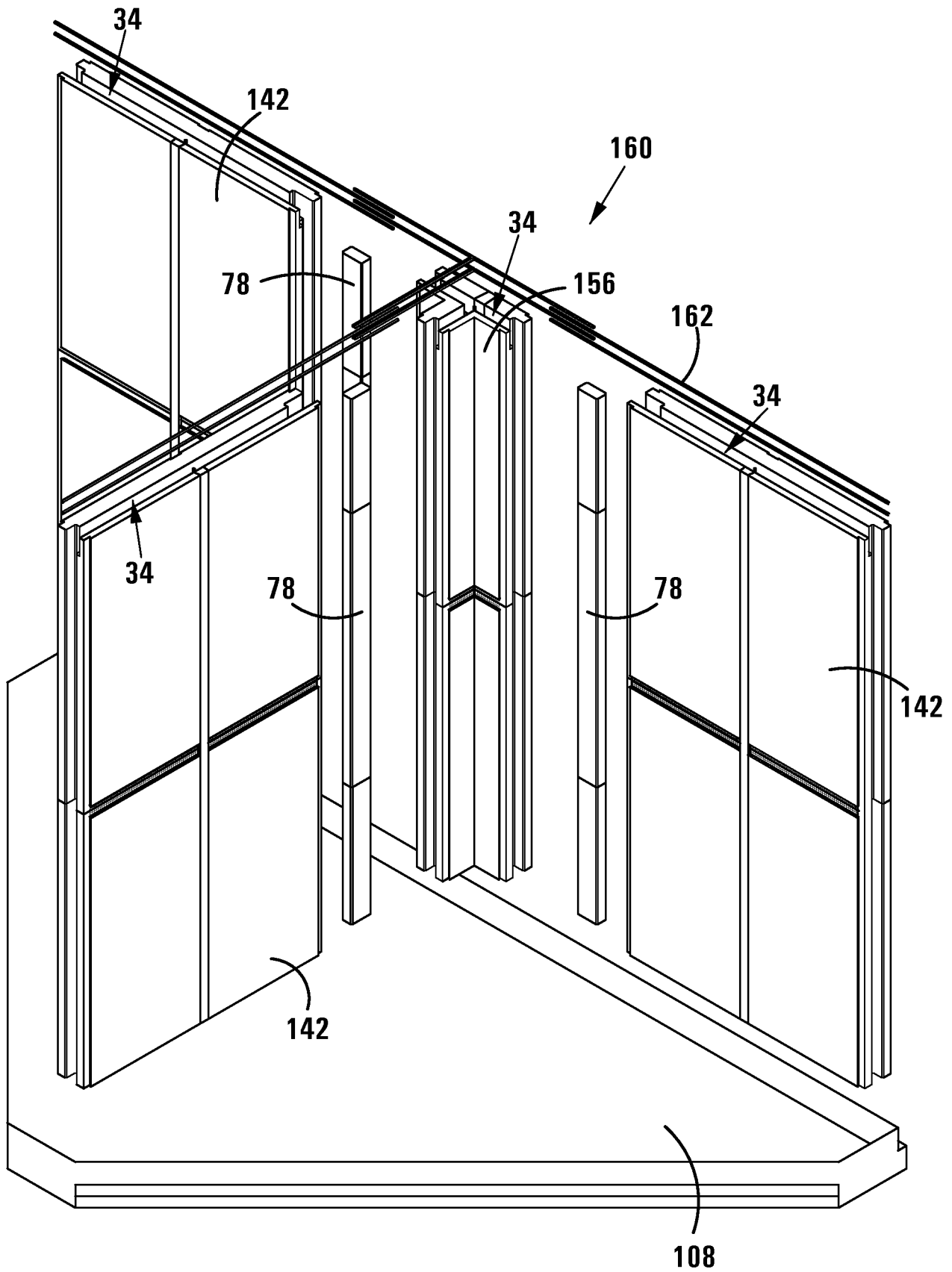


FIG 33

23/33

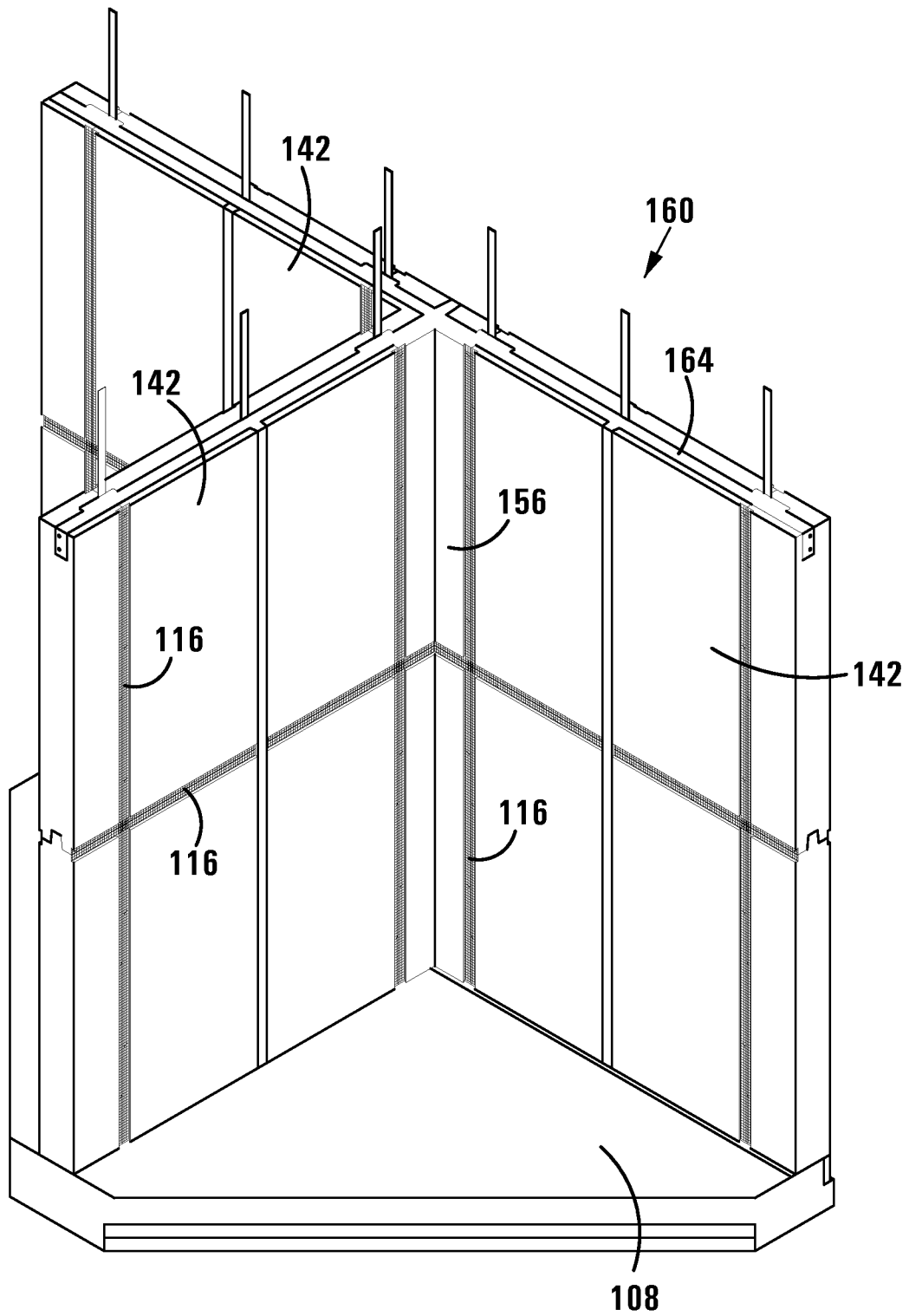
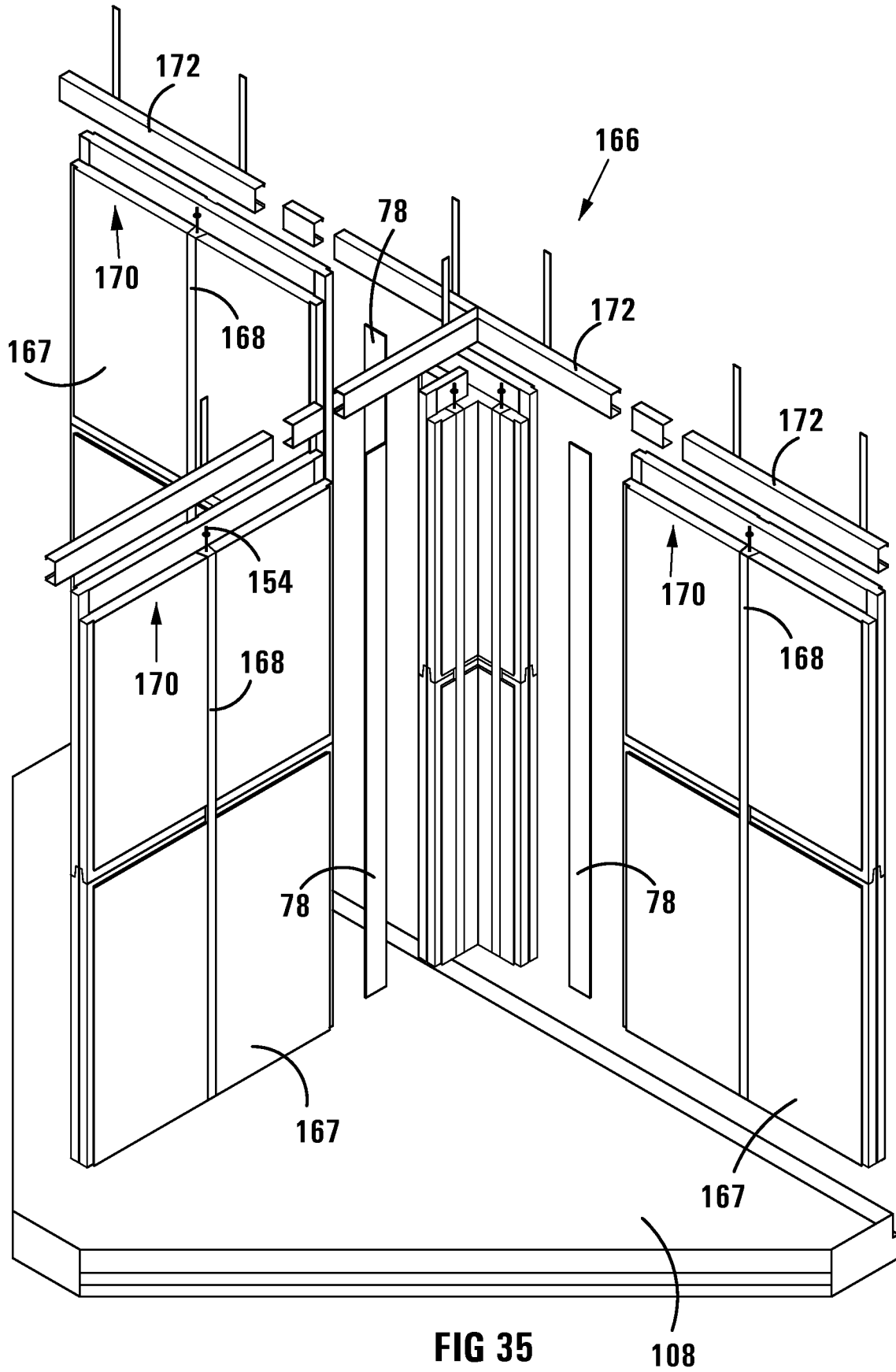


FIG 34

24/33



25/33

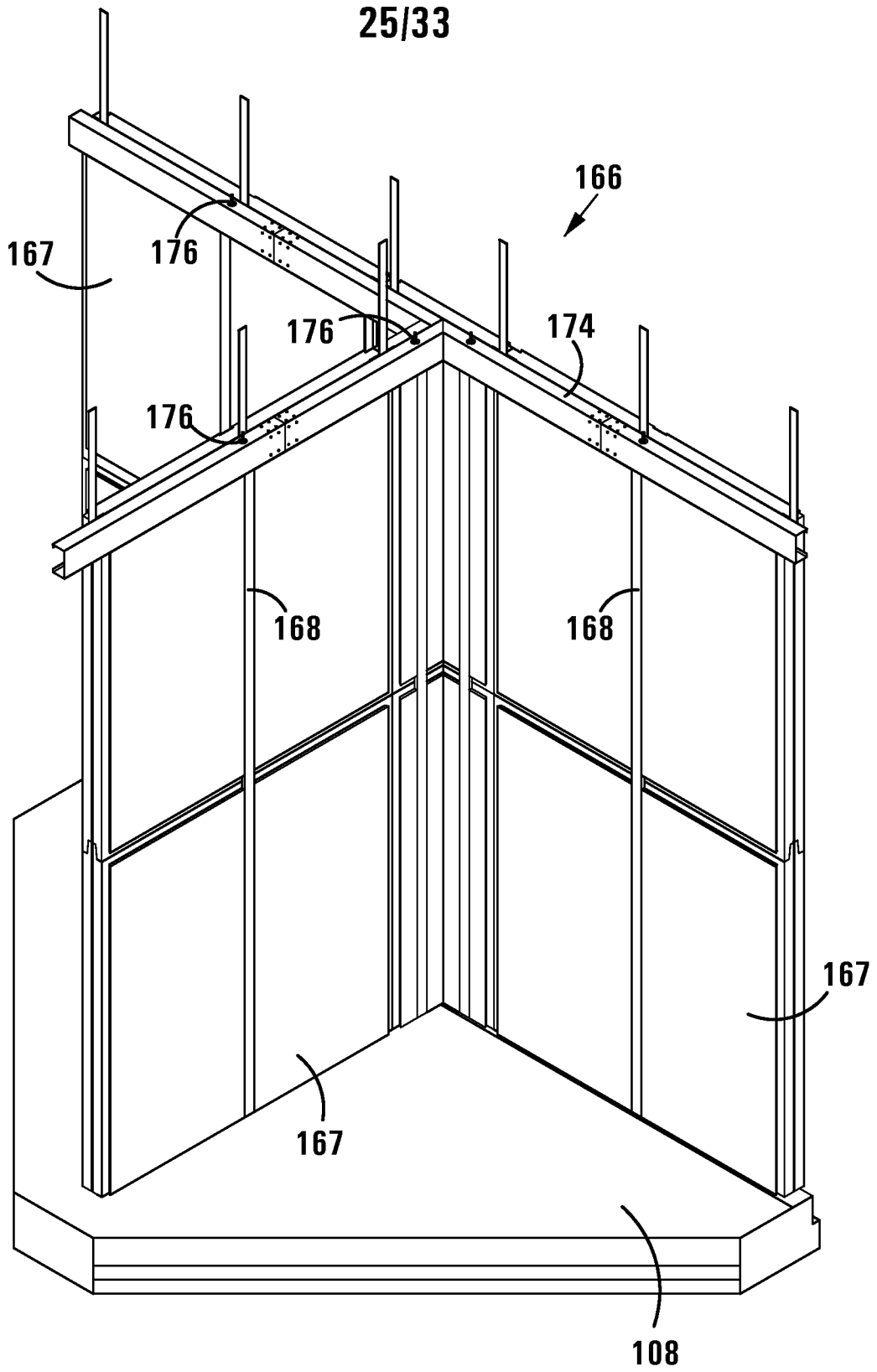


FIG 36

26/33

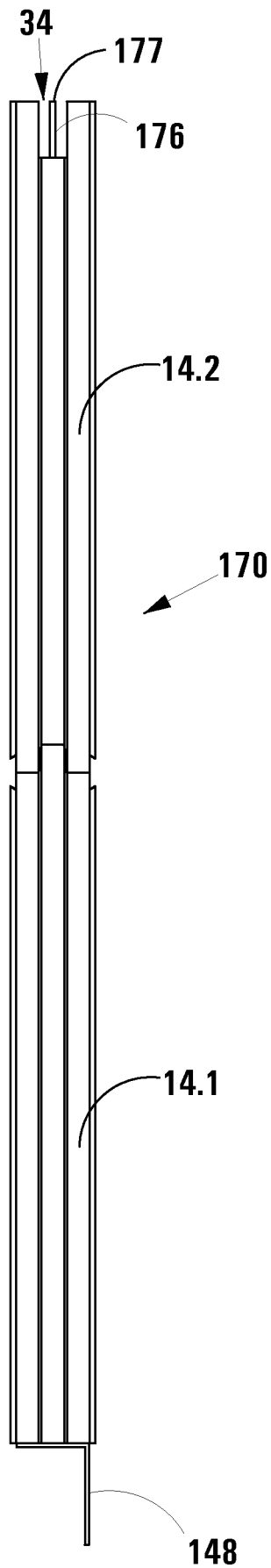


FIG 37a

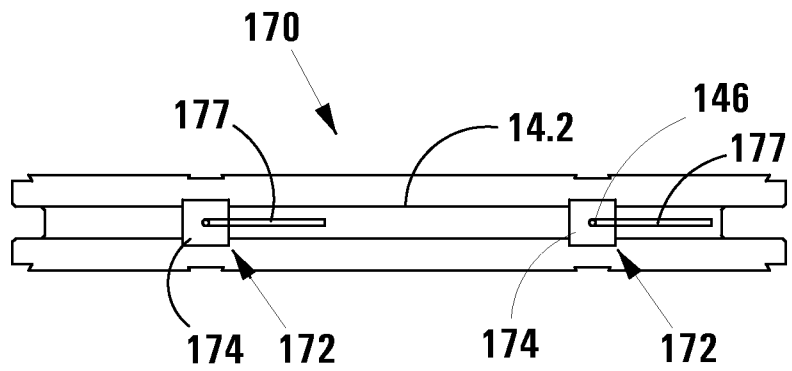


FIG 37b

27/33

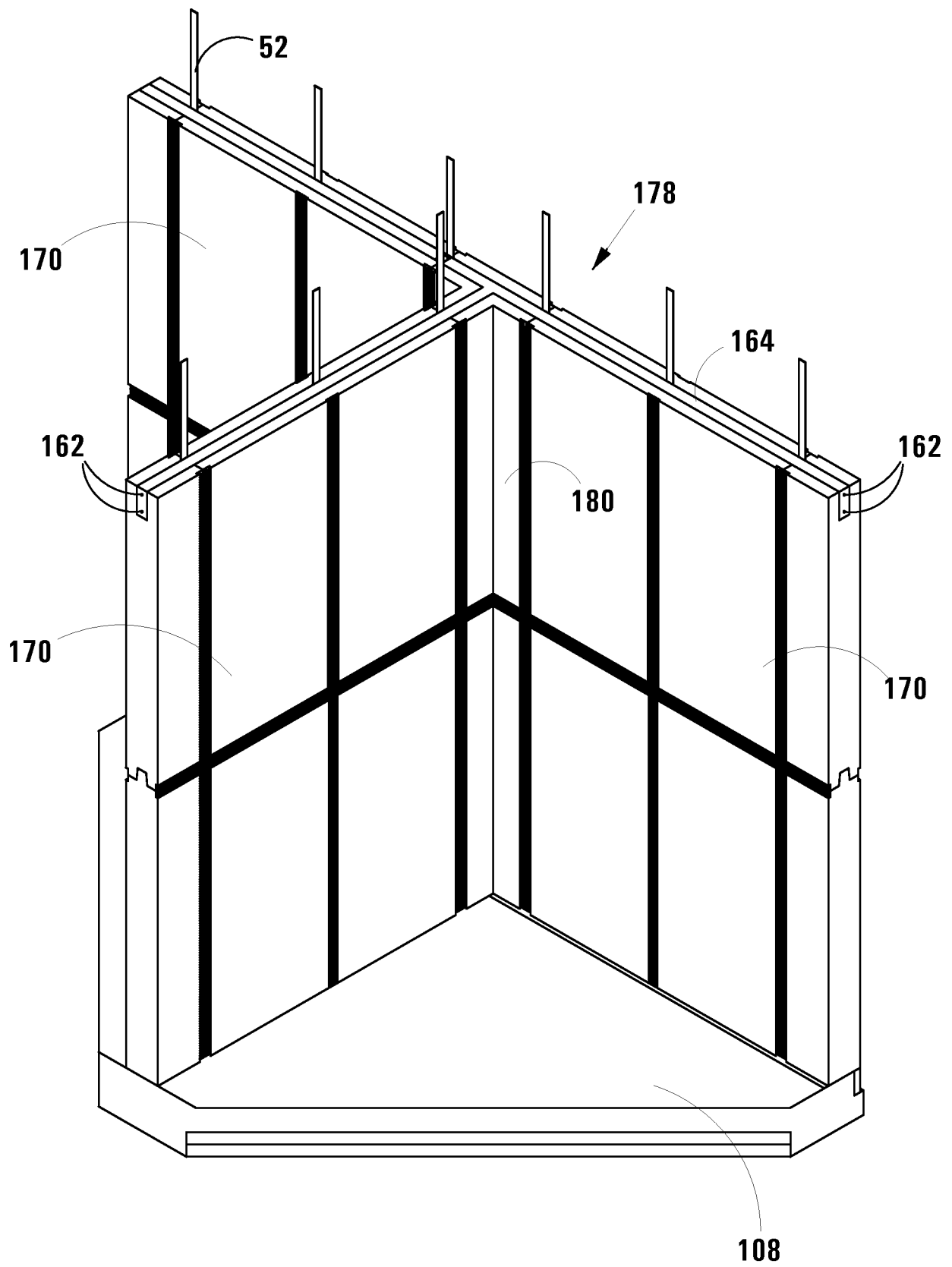


FIG 38

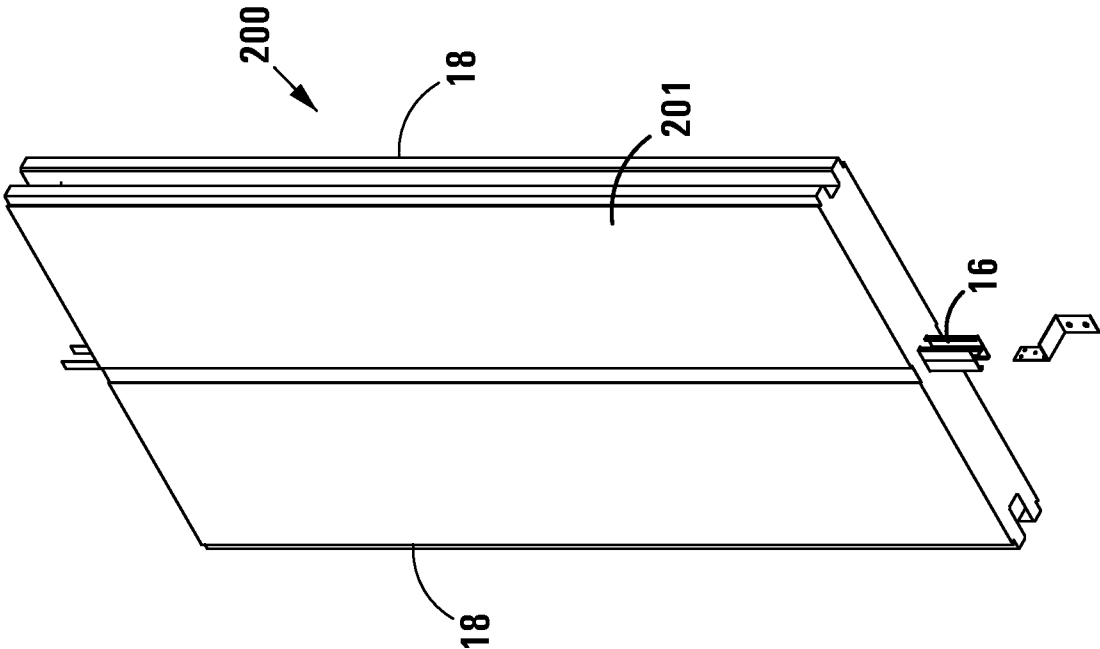


FIG 39a

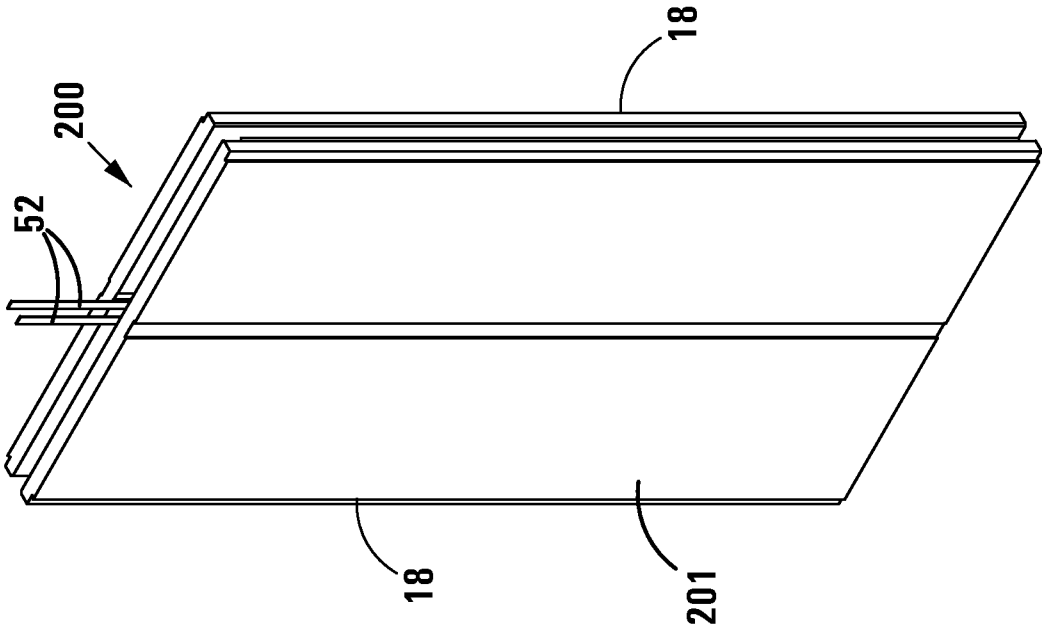
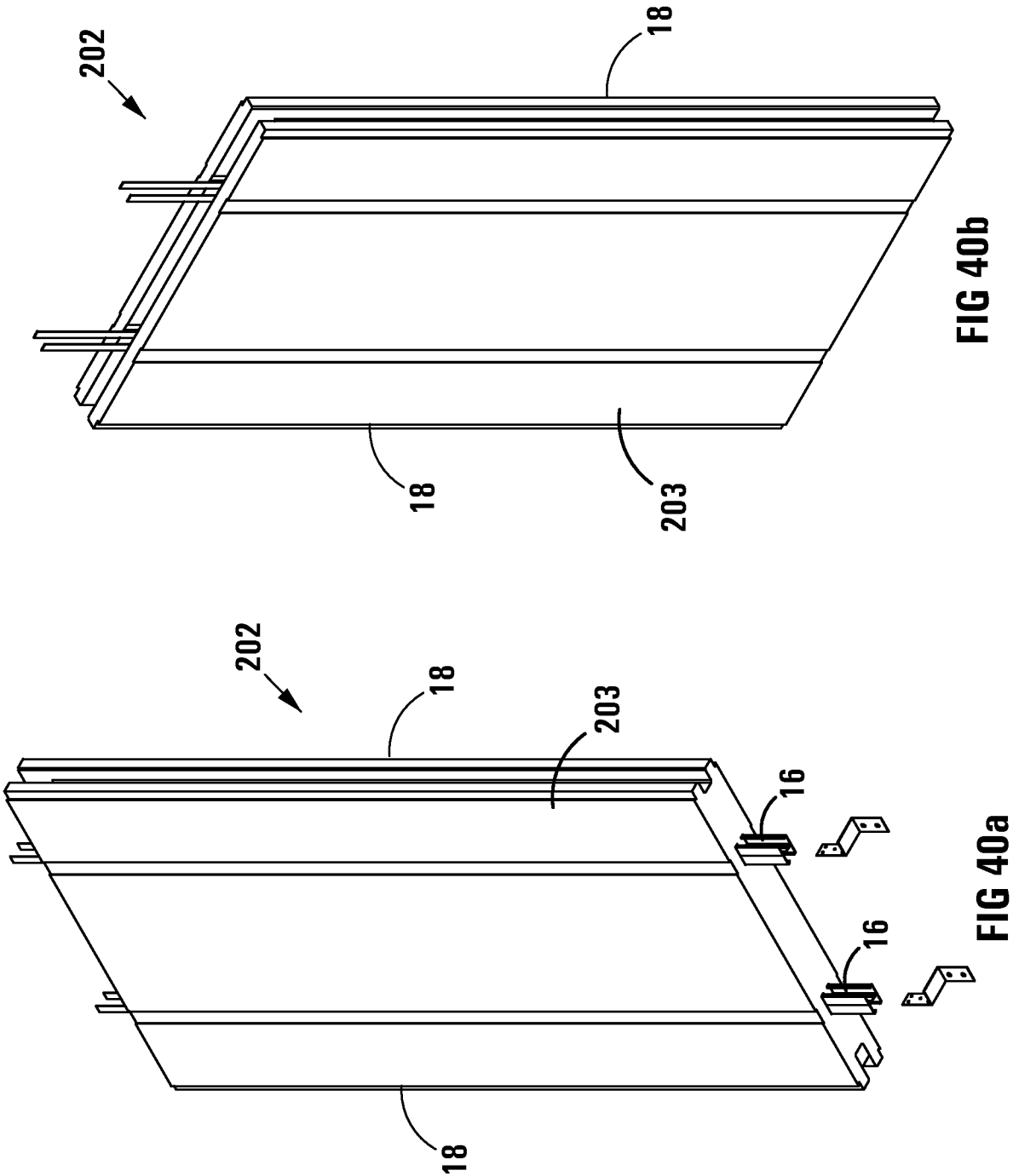
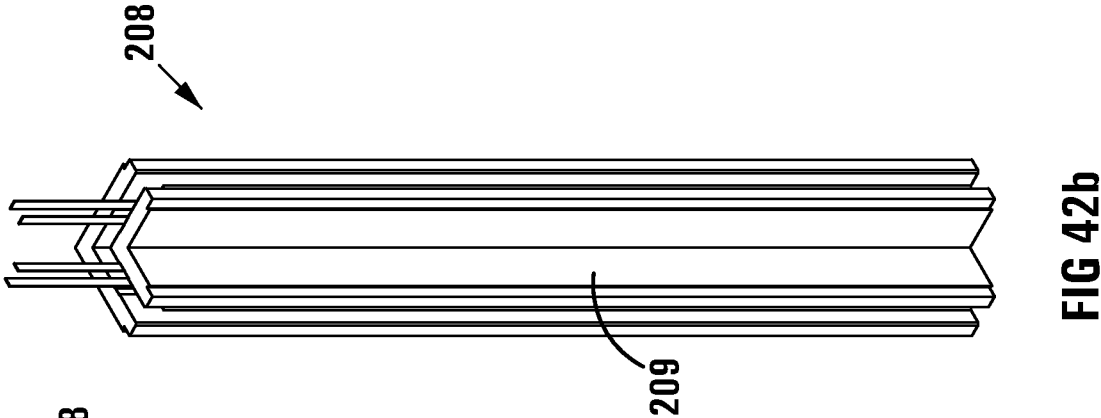
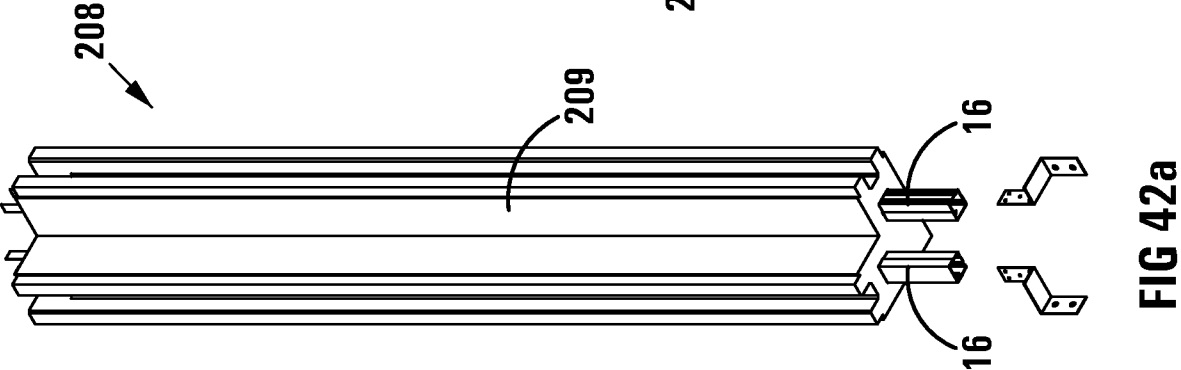
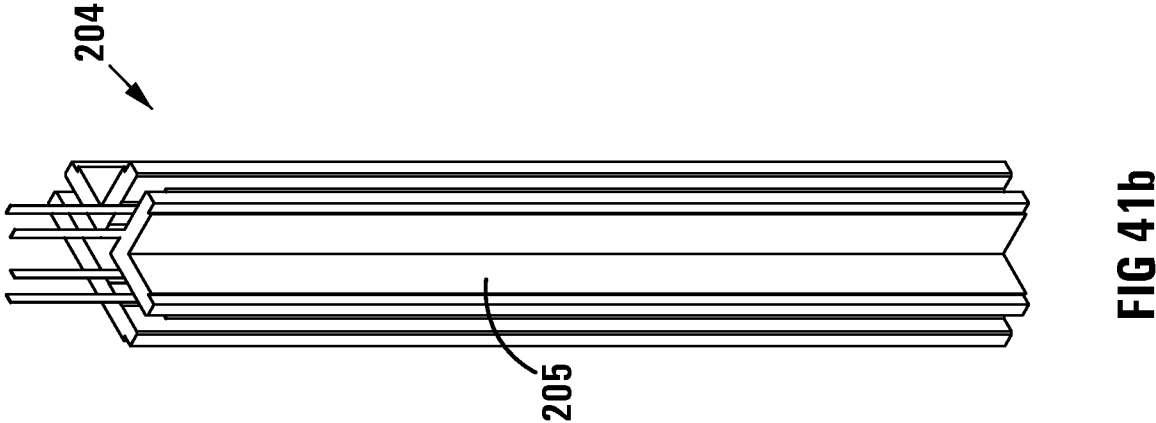
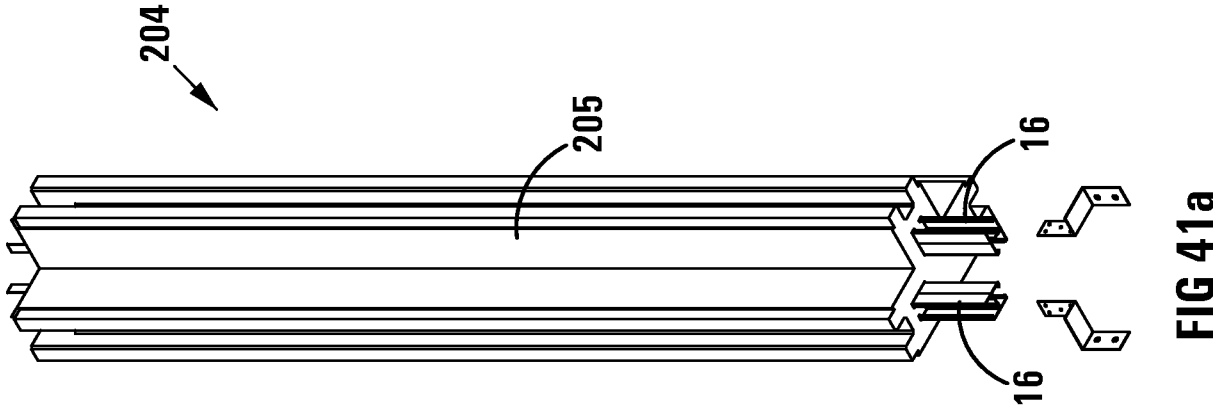
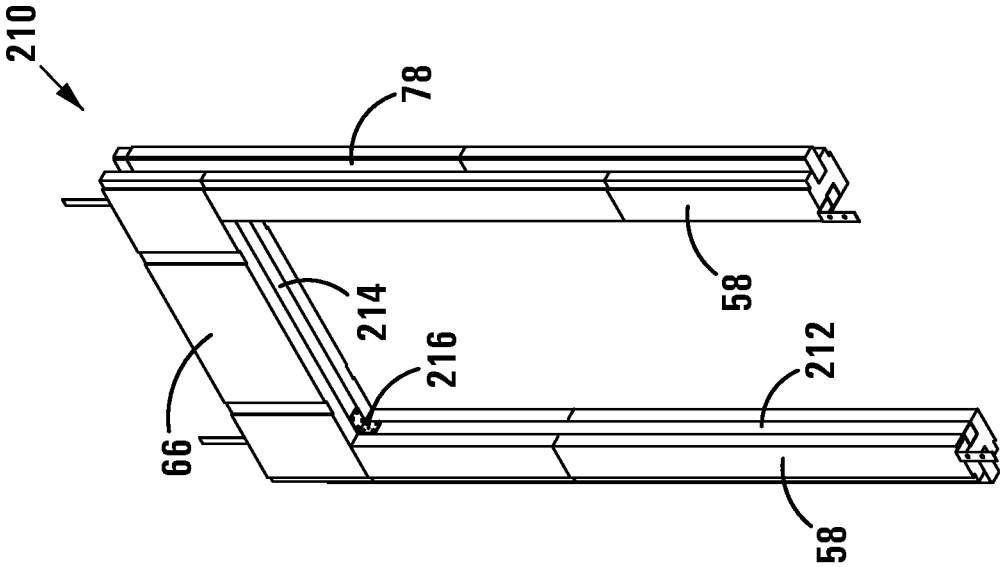
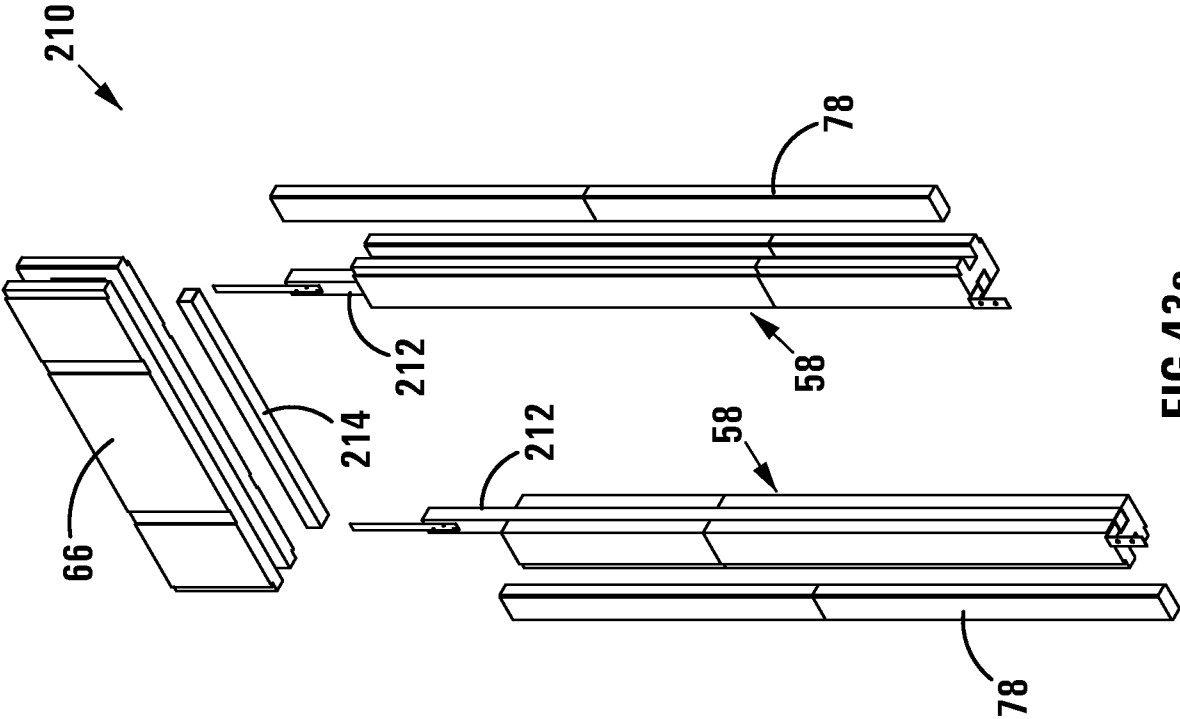
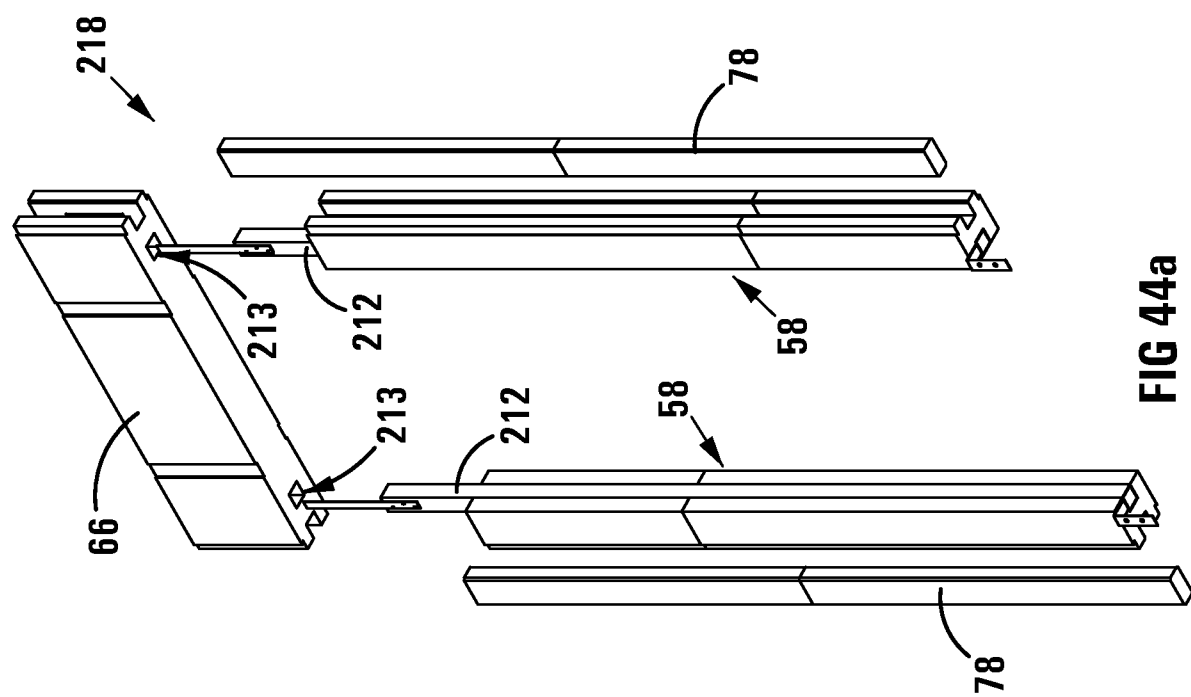
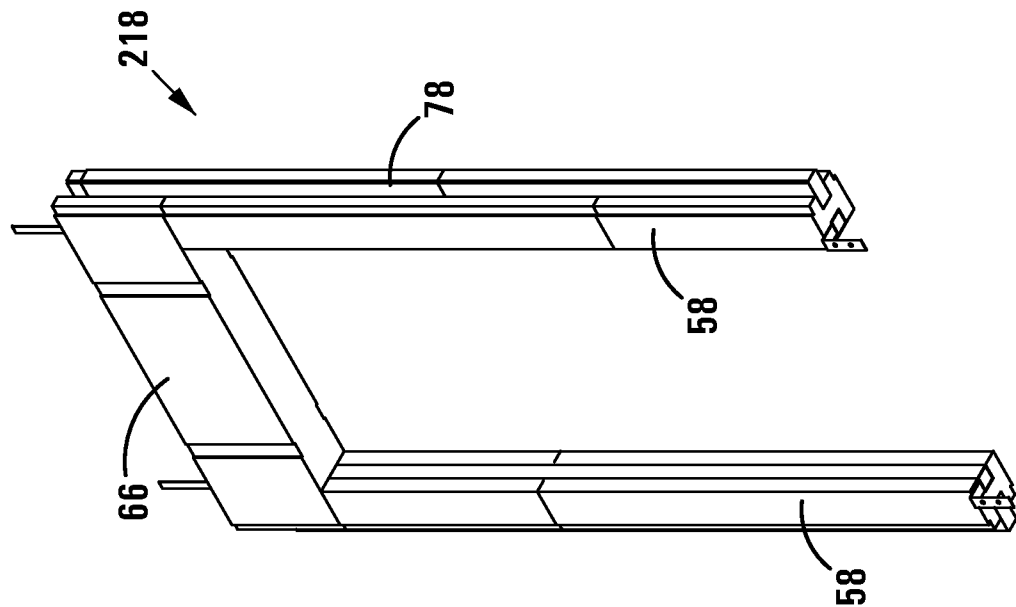


FIG 39b









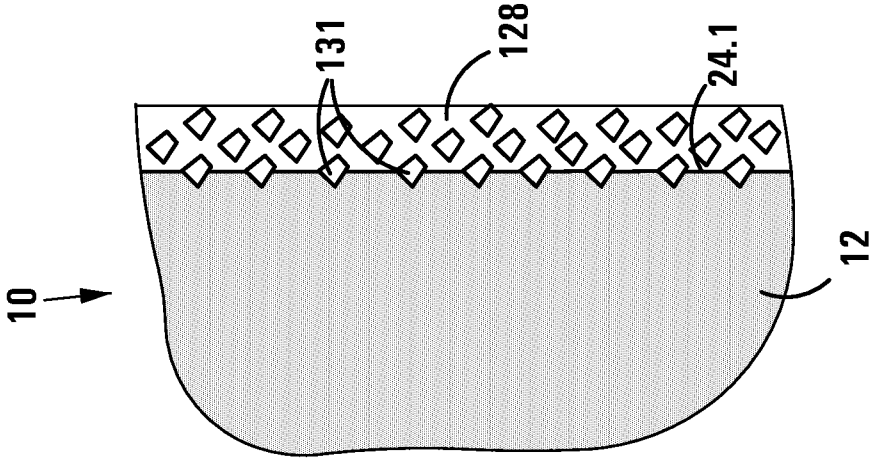


FIG 46

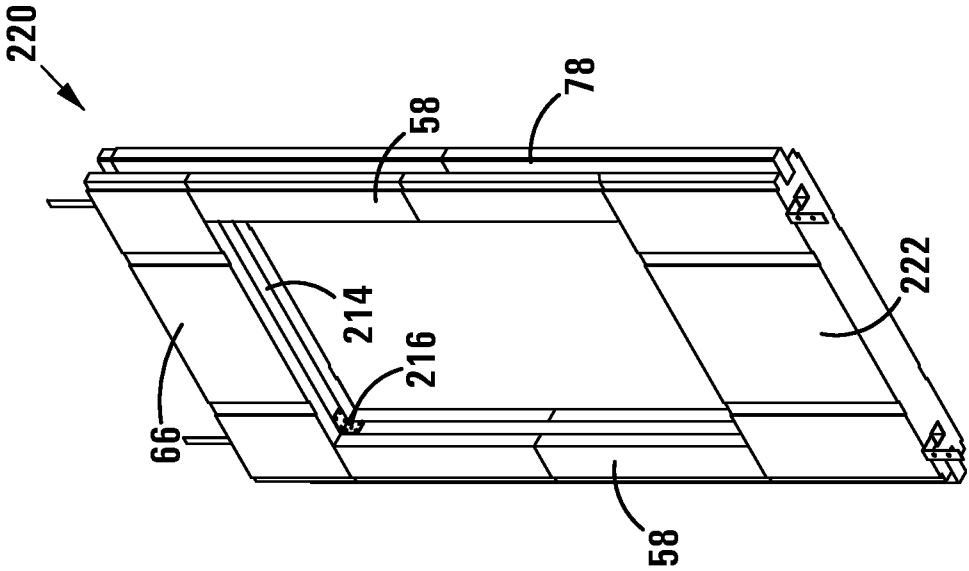


FIG 45b

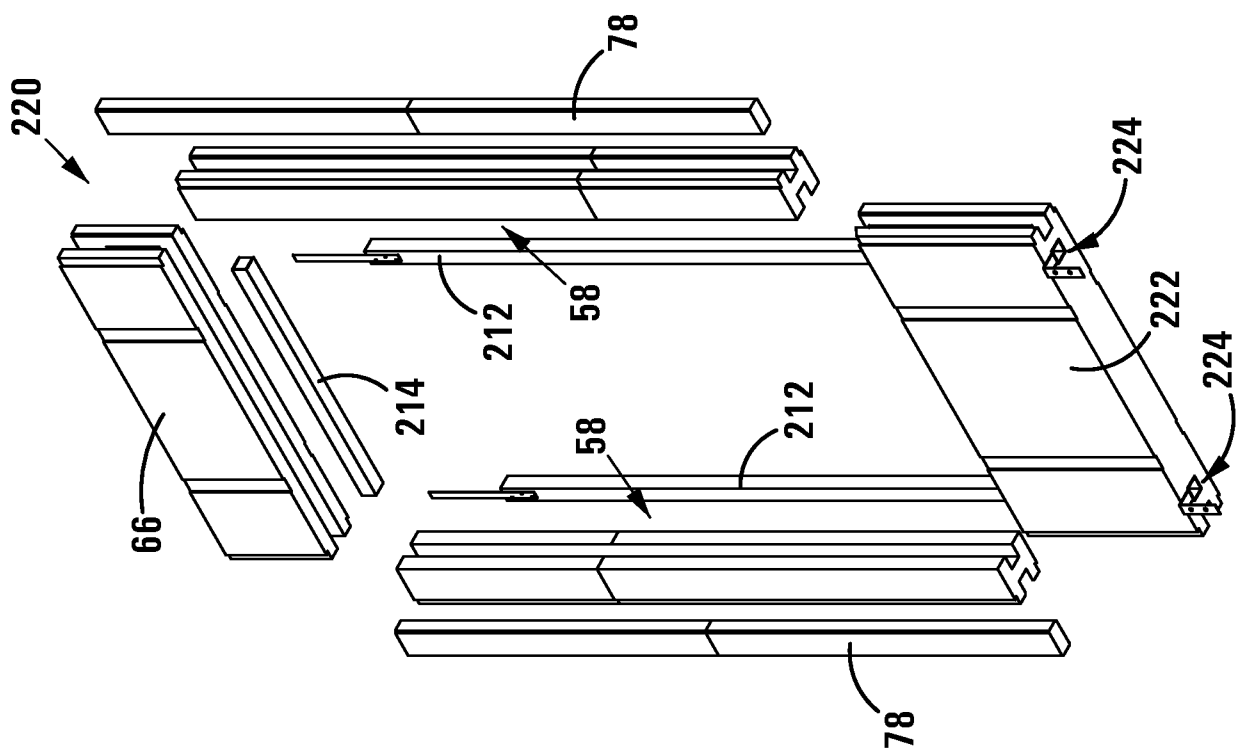


FIG 45a