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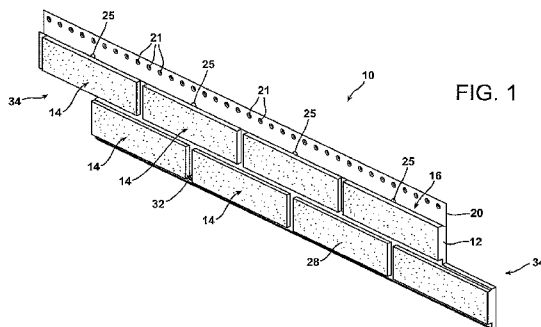
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(54) Title: PREFABRICATED WALL PANEL WITH INTERLOCKING STRUCTURE



(57) Abstract: A prefabricated wall panel (10) has a precast body (12) including at least one decorative design element (14). In addition, the wall panel includes a mounting element (16) having a first end (18) embedded in the precast body and a second end (20) projecting from the precast body. A interlocking structure (36,40) is provided along at least two opposing edges of the wall panel to insure proper alignment and interconnection when two or more wall panels are installed together on a support substrate.

## PREFABRICATED WALL PANEL WITH INTERLOCKING STRUCTURE

### CROSS REFERENCE TO RELATED APPLICATION

The present invention claims priority to U.S. Patent Application serial no. 12/026,876 filed on 6 February 2008 and entitled "Prefabricated Wall Panel with Tongue and Groove Construction", the entirety of which is incorporated by reference herein.

### BACKGROUND

[0001] Prefabricated or cast veneer wall panels have been developed as a quick and efficient way to provide a masonry appearance for a building while simplifying construction and lowering construction cost. The design elements of prefabricated wall panels typically simulate brick, stone, tile and other masonry building components or materials commonly used in the construction of buildings. Examples of prefabricated wall panels are disclosed in U.S. Patents 3,142,938 to Eberhardt, 4,669,238 to Kellis et al, 5,379,561 to Saito and 5,673,529 to Treister et al, in published U.S. Patent Application Serial No. 2007/0137128 to Viau et al and in Co-pending Patent Application Serial No. 11/647,751 owned by the Assignee of the present invention.

[0002] Prefabricated wall panels are typically made from reinforced construction materials such as fiberglass reinforced concrete. Prefabricated wall panels made from such reinforced materials are resistant to damage to handling during packaging, shipping and installation. However, further improvements in durability to decrease loss due to breakage are still desired. The present invention relates to a prefabricated wall panel incorporating a mounting element to enhance durability and provide significantly improved handling characteristics as well as tongue and groove construction to simplify installation.

### SUMMARY

[0003] In accordance with the embodiments of the present invention improved prefabricated wall panels are provided. The prefabricated wall panel comprises a precast body including at

least one decorative design element and a mounting element including a first end embedded in the precast body and a second end projecting from the precast body. An interlocking structure is provided along at least two opposing edges of the prefabricated wall panel to ensure proper alignment and interconnection when at least two of the prefabricated wall panels are positioned together to complete a wall.

[0004] In accordance with one possible embodiment of the present invention, the interlocking structure comprises a cooperating tongue and groove arrangement.

[0005] In accordance with yet another possible embodiment of the present invention, the interlocking structure includes alternating tongues staggered in two rows.

[0006] In accordance with yet another possible embodiment of the present invention, the interlocking structure comprises a cooperating hook and slot arrangement.

[0007] In still another possible embodiment of the present invention, the interlocking structure comprises edge grooves and an interconnecting pin received in those grooves to hold the adjacent wall panels in proper position. In any of these possible embodiments, the interlocking structure is provided along at least two opposing edges of the precast body.

[0008] In accordance with yet another aspect of the present invention, a wall panel system is provided comprising a prefabricated wall panel, a starter strip and a trim element.

[0009] In the following description there is shown and described several different embodiments of the invention, simply by way of illustration of some of the modes best suited to carry out the invention. As it will be realized, the invention is capable of other different embodiments and its several details are capable of modification in various, obvious aspects all without departing from the invention. Accordingly, the drawings and descriptions will be regarded as illustrative in nature and not as restrictive.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The accompanying drawings incorporated herein and forming a part of the specification, illustrate several aspects of the present invention and together with the description serve to explain certain principles of the invention. In the drawings:

[0011] Figure 1 is a front perspective view of a prefabricated wall;

[0012] Figure 2 is a cross-sectional view of the prefabricated wall panel illustrated in Figure 1;

[0013] Figure 3 is a partially schematical and cross sectional view illustrating the mounting of two wall panels, one above the other, along a support substrate such as a wall stud;

[0014] Figures 4A-4D are fragmentary front elevational views of four different mounting elements used in the prefabricated wall panel of the present invention;

[0015] Figures 5A-5G are schematical sectional views illustrating several different embodiments of the wall panel of the present invention;

[0016] Figure 6 is a cross sectional view of the mold in which the wall panel of Figures 1 and 2 are formed;

[0017] Figure 7A is a perspective view of an alternative embodiment of a wall panel incorporating an interlocking structure comprising alternating tongues staggered in two rows;

[0018] Figure 7B is an end elevational view showing the interconnection of two wall panels of the type illustrated in Figure 7A;

[0019] Figure 8 is an end elevational view showing another alternative embodiment of wall panel incorporating a cooperating tongue and groove arrangement wherein the entire tongue and groove arrangement is formed in the precast body of the wall panel;

[0020] Figure 9 is an end elevational view of yet another embodiment incorporating two cooperating grooves and a separate pin or biscuit as the interlocking structure;

[0021] Figure 10 is an end elevational view of yet one more alternative embodiment incorporating cooperating hooks and slots as the interlocking structure;

[0022] Figures 11A and 11B are respective end elevational and front elevational views of a starter strip that forms a part of the present wall panel system;

[0023] Figures 12A and 12B are respective end elevational views of the hinged trim element that forms another part of the present wall panel system.

[0024] Figure 13 is a schematical illustration of two panels overlying a starter strip against a framed wall of a building;

[0025] Figure 14 is a schematical view illustrating a trim element provided between a panel and a window or wall; and

[0026] Figure 15 is a schematical view illustrating a trim element provided between a panel and a fascia or soffit of a building.

#### DETAILED DESCRIPTION

[0027] Reference is now made to Figure 1 illustrating a prefabricated wall panel 10. Such a wall panel 10 may be used as a wall cladding for a building. Further applications include but are not limited to the construction of a fireplace surround or an outdoor living component such as a decorative wall or grill surround.

[0028] The prefabricated wall panel 10 comprises a precast body 12 including at least one decorative design element 14. As illustrated the design element 14 comprises two rows of overlapping brick with four brick in each row. It should be appreciated that substantially any other masonry material known in the art may be simulated including bricks of different sizes, stones of the same or different sizes and shapes, tiles of different sizes and shapes and the like.

[0029] The precast body 12 is made from a cast material such as concrete, reinforced concrete, gypsum, fiber reinforced gypsum, polymer modified gypsum, reinforced cementitious material and mixtures thereof. Typically the cast material reinforcement comprises fibers selected from glass fibers, carbon fibers, mineral fibers, natural fibers, polymer fibers and mixtures thereof. Where glass fibers are used they may be of the E-glass or AR-glass type which exhibits some alkali resistance.

[0030] As best illustrated in Figures 1 and 2, the prefabricated wall panel 10 also includes a mounting element, generally designated by reference numeral 16. The mounting element 16 may be made from any suitable a material including, but not limited to, wood, concrete, cellulose fiber board, polymer material, composite material, metal, plastic, reinforced plastic, thermoplastic, fiber composite, reinforced wood, steel, corrosion-resistant steel, aluminum, stainless steel, zinc, copper and combinations thereof. The corrosion-resistant steel may take any number of forms including, but not limited to, galvanized, galvalume, Gavalume<sup>TM</sup> brand, tin coating, chromium coating, nickel coating, phosphorous coating, magnesium coating, copper coating, zinc coating, weathering steels (i.e., alloys of steel with small additions of copper, aluminum, nickel and/or phosphorous), polymer coatings and paint.

[0031] Polymer materials useful for the making of the mounting element 16 include various thermoplastic and thermoset resins including but not limited to polyolefins, polyesters, polyvinylchloride, polypropylene, polyethylene, polyamide, epoxy, vinyl ester, acrylic, polystyrene, ABS, melamine and mixtures thereof. Composite materials used to make the mounting element 16 may include a reinforcing material and a matrix binder. Appropriate reinforcing materials useful in the present invention include but are not limited to glass fibers, natural fibers, mineral fibers, basalt fibers, carbon fibers, kenaf fibers, jute fibers, hemp fibers, E-glass fibers, C-glass fibers, R-glass fibers, S-glass fibers, ECR-glass fibers, AR-glass fibers and mixtures thereof. It should be appreciated that substantially any type of glass fiber may be used for reinforcement fibers. Glass fibers appropriate for use in the present invention may be loose chopped strand or glass mat and include those available under the trademark ADVANTEX. Matrix binder materials useful for this purpose include but are not limited to polyolefins, polyesters, polyvinylchloride, polypropylene, polyethylene, polyamide, epoxy, vinyl ester and mixtures thereof.

[0032] As best illustrated in Figure 2, the mounting element 16 includes a first end 18 that is embedded in the precast body 12 and a second end 20 that projects from the precast body. This may be accomplished by positioning the mounting element 16 so that the first end 18 projects into the mold cavity in which the body 12 is cast. After positioning the mounting element 16, the cast material is sprayed, injected or otherwise added to the mold. The cast material of the body 12 covers the front and the rear major faces of the first end 18 of the mounting element 16. When set, the body 12 securely holds the mounting element 16 in position. In some embodiments, the first end 18 includes a series of spaced keying holes 17. These holes 17 fill with the cast material and ensure that the mounting element 16 is firmly seated and secured in the cast body 12 once the material sets.

[0033] As illustrated in Figures 1 and 2, the second end 20 of the mounting element 16 projects upwardly from the top edge of the precast body 12. In the illustrated embodiment, the mounting element 16 includes a transition section 22 connecting the first end 18 with the second end 20. In one embodiment, the transition section 22 forms an included angle of between 0° and about 180°. In another embodiment, as illustrated in Figure 2, the transition section 22 forms an included angle of between about 130° and about 140° or about 135° with the first end 18.

[0034] As further illustrated in Figures 1, 2 and 3 the second end 20 of the mounting element 16 may include a series of protrusions 21. The protrusion 21 may take the form of dimples, slots, ribs or any other structure that provides a set back means and can receive a nail or fastener. In the illustrated embodiment, the protrusion 21 is a dimple. The dimples 21 project away from the front face 28 of the wall panel 10. The dimples 21 function to provide an air space A between the wall panel 10 and the sheathing S or other building substrate to which the wall panel 10 is fastened. The wall panel 10 is fastened or secured to the sheathing S by means of fasteners such as nails or screws F that are received and pass through the recessed apertures 23 provided along the second end 20 of the mounting element 16.

[0035] In some examples, each dimple 21 has an interior diameter of between approximately 0 and approximately 7.6 centimeters. In other examples, each dimple 21 has an interior diameter of between about 2.5 and about 7.6 centimeters. In yet other examples, each dimple 21 has an interior diameter of between about 2 to about 5 centimeters. In further examples, each dimple 21 has an interior diameter of between about 1.0 and about 1.6 centimeters.

[0036] Each dimple also has any suitable depth. For example, each dimple 21 may have a depth of between approximately 0.30 and approximately 0.60 centimeters. The aperture 23 in each dimple 21 may have any suitable dimensions. For example, the aperture 23 may have a diameter of about 0.3175 centimeters. Further, the aperture 23 may be concentrically received in the bottom of the dimple 21. In some examples, the diameter of the dimple 21 allows the head of a fastener, such as a roofing nail, to fit inside the dimple where it will not interfere with the mounting of the next panel. The aperture 23 ensures the centering of the nail in the dimple. The bottom wall of the dimple 21 may also be slightly curved as illustrated. The size and shape of the dimple 21 ensures that the dimple does not collapse or become embedded in the underlying sheathing during installation of the wall panel 10. In this way good ventilation is provided between the wall panel and the underlying sheathing to which it is mounted as discussed in detail below.

[0037] In order to complete a wall, it is generally necessary to vertically and horizontally stack a series of prefabricated wall panels 10. In some examples, each additional row of wall panels 10 is offset with respect to the previous row by the staggered ends 34 (see Fig. 1) provided on the panels. As each succeeding wall panel 10 in each succeeding row is added (see

Figures 2 and 3), an interlocking structure in the form of a tongue and groove arrangement ensures proper placement and greatly simplifies installation. In other examples, the panels may have a square, rectangular, or other suitable shape with no staggered ends.

[0038] More specifically, each wall panel 10 includes a groove 36 formed between the precast body 12 and the front face of the second end 20 of the mounting element 16. The groove 36 is provided in or along the first or top edge 38 of the precast body 12. In the illustrated embodiment, a cooperating tongue 40 is formed by the second or bottom edge of the precast body 12. In alternative embodiments, the tongue 40 could be formed by a metal backer or other similar structure. During installation, the tongue 40 on one wall panel 10 is precisely sized and shaped to be received in the cooperating groove 36 on the underlying wall panel 10. This interconnection ensures proper registration between wall panels 10 during installation. Further, the tongue and groove connection between the wall panels 10 functions to support the wall panel being added in proper position until fasteners F can be positioned in the support substrate S through the recessed apertures 21 to hold the panel in place. If desired, grout is then provided in the grout areas 32 between the design elements 14 on all of the wall panels 10 in order to complete the installation. Weep holes 25 are provided at spaced locations in the second end 18 of the mounting element 16 adjacent the transition section 22. These weep holes 25 allow water to drain from the groove 36. In the illustrated embodiment, a weep hole 25 is provided at the center of each design element 14. In another embodiment, the weep hole 25 may not be at the center of each design element 14.

[0039] As best illustrated in Figures 4A-4D, the mounting element 16 may take a number of forms. As illustrated in Figures 1, 2, 3 and 4A, the first end 18 and second end 20 may both be made from a solid piece of material. Alternatively, as illustrated in Figure 4B, the two ends 18, 20 may both be made from a mesh material (i.e. any perforated material), such as, galvanized steel, aluminum and/or copper. In this embodiment, no weep holes 25 or recessed apertures 21 are provided. It should be appreciated, however, that weep holes 25 and recessed apertures 21 may be provided if desired. As yet another alternative, Figure 4C illustrates an embodiment wherein the first end 18 is made from a mesh material and the second end 20 is made from a solid material. In contrast, Figure 4D illustrates an embodiment where the first end 18 is made from a solid material and the second end 20 is made from a mesh material.

[0040] The use of mesh material instead of solid material serves a number of advantages. Good strength is obtained yet less material is used thereby reducing costs of production. Where the first end 18 is made of mesh material, the interlocking of the mounting element 16 in the precast body 12 is enhanced. This is because the cast material is received in and passes through each of the openings in the mesh to provide a most secure interconnection.

[0041] Alternative embodiments for the wall panel 10 are illustrated in Figures 5A-5G. In figure 5A, the first end 18 of the mounting element 16 is long enough to extend nearly to the end of the tongue 40. This provides added strength to the precast body 12. In this embodiment, the first end 18 of the mounting element 16 is made from solid material including a few spaced keying holes 17 for receiving cast material. In the embodiment illustrated in Figure 5B, the first end 18 is made from mesh material.

[0042] Figure 5C illustrates a wall panel 10 incorporating a mounting element 16 with a second end 20 constructed from mesh material and an extended first end 18 constructed from solid material but incorporating several keying holes 17. Figure 5D illustrates yet another alternative embodiment wherein the entire mounting element 16 is made from mesh material including the first end 18. In Figures 5C and 5D, the mounting element 16 is illustrated as being formed from a double layer of mesh material. This provides added strength to the mounting element 16.

[0043] Figures 5E-5G illustrates additional alternative embodiments. In figure 5E, the mounting element 16 is made from two separate pieces. It will be understood that it could be made of three, four or more pieces if desired. The first piece 16a of the mounting element includes a first end 18 embedded in the precast body 12 and extending in a first plane  $P_1$ , a second end 20 projecting from the precast body 12 and extending in a second plane  $P_2$  and a transition section 22 connecting the first and second ends 18 and 20. As further illustrated, the first end may include a keying hole 17 that receives the cast material to ensure that the first piece of the mounting element 16a is securely held in position by the precast body. The second end 20 includes at least one dimple or other aperture 21 as described above. In addition, the transition section 22 includes a slot 70.

[0044] As further illustrated in Figure 5E, a second mounting element 16b forms a tab 72 projecting from a second edge of the precast body 12. The second piece of the mounting element

16b, like the first piece of the mounting element 16a, may include a keying hole 17 to receive cast material and ensure it is securely held in the precast body 12. As illustrated, the slot 70 and the tab 72 both extend in a third plane  $P_3$  between the first and second planes  $P_1$ ,  $P_2$ . Accordingly, a second wall panel 10 may be added to a first wall panel 10 previously secured to a substrate by aligning and inserting the tabs 72 on the second wall panel into the slots 70 on the first wall panel. Thus, the slots and tabs 70,72 function like the tongue and grooves 40,36 on the embodiments in Figures 1 and 2 to align and secure wall panels 10 together.

[0045] Figure 5F shows yet another alternative embodiment of the slot and tab 70,72 construction. In this embodiment the mounting element 16 is a single piece incorporating a series of keying holes 17 to allow it to be firmly secured in the precast body 12. This single piece mounting element 16 provides additional strength to the precast body 12.

[0046] In the additional embodiment illustrated in Figure 5G, a single piece mounting element 16 is again illustrated incorporating the slot 70 and groove 72 connection system. Unlike the embodiment illustrated in Figure 5F, in the embodiment illustrated in Figure 5G, a portion 74 of the mounting element 16 embedded in the precast body 12 is made from a mesh material.

[0047] A mold 50 for forming a wall panel 10 is illustrated in Figure 6. The mold 50 comprises a mold body 52 formed from an elastomeric material such as silicone, urethane, polyurethane, and/or latex. The mold body 52 includes a mounting element support surface 54, a mold cavity 56 and a dimensional flap 58 overlying a portion of the mold cavity that forms the tongue 40. Sufficient casting material may be added to the mold 50 above a lowermost surface 39 of the dimensional flap 58 to insure the groove 36 is formed to proper shape. More specifically, the mounting element support surface 54 is provided along a first edge 60 of the mold cavity 56 while the dimensional flap 58 is provided along a second opposite edge 62 of the mold cavity.

[0048] The wall panel 10 is produced by positioning a mounting element 16 onto the support surface 54 with the first end 18 extending into the mold cavity 56 and the second end 20 extending from the mold cavity. Casting material may be added to the mold cavity 56 before and/or after positioning the mounting element 16 onto the support surface 54. This may be done

by injecting, spraying or any other means known in the art. During this step, the first end 18 of the mounting element 16 is embedded in the casting material.

[0049] The method also includes the step of forming the tongue 40 in the mold cavity 56 from casting material captured under the dimensional flap 58. Still further, the method includes forming the groove 36 in the mold 50 between the precast body 12 and the second end 20 of the mounting element 16. After allowing the cast material to set, the wall panel 10 is removed from the mold 50. This may be done by stretching the mold body 52 to free the tongue 40 from under the dimensional flap 58. It will be understood that the method and mold may be modified to produce the alternate embodiments illustrated in Figures 5A-5G, 7A, 7B and 8-10.

[0050] Alternative interlocking structures are illustrated in Figures 7A, 7B, 8, 9 and 10. In all of these embodiments, the mounting element is identified by reference numeral 16, the precast body is identified by reference numeral 12 and the design element is identified by reference numeral 14. The mounting elements 16 illustrated do not include dimples 21 as described above and illustrated in Figures 2 and 3. In the embodiment illustrated in Figures 7A and 7B, each wall panel 100 includes alternating tongues staggered in two rows across the top and bottom edges 106, 108 of the wall panel. When two panels 100 are vertically stacked as illustrated in Figure 7B, the two rows of tongues 102 on each panel mate to lock the bottom of the top panel into the top of the bottom panel. This keeps the panels 100 in proper alignment and position, preventing the bottom of any upper panel from lapping the top of any lower panel. It should also be understood that more than two rows of tongues and corresponding grooves may be provided.

[0051] Figure 8 illustrates yet another alternative embodiment of wall panel 200 wherein the upper edge 202 includes a groove 204 and the bottom edge 206 includes a cooperating tongue 208. In this embodiment, the groove 204 and tongue 208 are both fully formed in the precast body 210 of the wall panel 200. Figure 8 shows how two wall panels 200 are interconnected using the cooperating groove 204 and tongue 208 to locate, align and support the panels in position when constructing a wall.

[0052] Reference is now made to Figure 9 illustrating yet another embodiment of wall panel 300 wherein the upper and lower edges 302, 304 of the wall panel each include a groove 306. A separate pin or biscuit 308 having a cross sectional area adapted to be received in the aligned

grooves 306 of the upper and lower edges 302, 304 completes the inner connection of these two wall panels 300.

[0053] Figure 10 illustrates yet another embodiment of wall panel 400 of the present invention. In this embodiment the top edge or margin 402 includes a slot 404 while the bottom edge or margin 406 includes a cooperating hook 408. When the two wall panels 400 are interconnected, the hook 408 of one panel 402 is received in the slot 404 of the other panel in order to locate, align and support the wall panels 400 in position when forming a wall.

[0054] It will be understood that the side of the wall panels discussed herein may contain any suitable interlocking structures. For example, the sides may have discontinuous tongue and groove portions that cooperate with tongue and groove portions on adjacent panels.

[0055] In accordance with yet another aspect of the present invention, a wall panel system is provided. The wall panel system includes a prefabricated wall panel 10, 100, 200, 300 or 400 as illustrated in, for example, Figures 1, 7A, 8, 9 and 10, a starter strip 500 as illustrated in Figures 11A and 11B and a trim element 600 as illustrated in Figures 12A and 12B. The starter strip 500 includes a securing leg 502, a support shelf 504, a channel 506 between the securing leg and the support shelf and a stabilizing lug 508. Weep holes 507 are provided at spaced locations along the bottom of the channel 506. Spaced apertures 510 are provided in the securing leg 502. These apertures 510 receive fasteners (not shown) for securing the starter strip 500 to an underlying substrate or support such as the sheathing of a building. When properly mounted to the sheathing, the face 512 of the securing leg 502 abuts the sheathing as does the end 514 of the stabilizing lug 508. Once the starter strip 500 is properly anchored to the sheathing, a wall panel 10, 100, 200, 300, 400 is positioned against the face 516 of the securing leg with the lower most edge of the wall panel received and held in the channel 506. In one possible embodiment the support shelf 504 underlies and supports the design elements 14 of the wall panel 10.

[0056] The trim element 600 includes a substantially j-shaped body 602 including a mounting leg 604 and a covering leg 606. The covering leg 606 includes a first portion 608 connected to the mounting leg 604 and a second portion 610 connected to the first portion 608 by an optional hinge 612. This allows the second portion 610 of the covering leg 606 to be moved out of the way during installation of wall panels. It will be understood that the body 602 may have any other suitable shape. It will be further understood that the covering leg 606 may be

made to be flexible in any suitable manner at any suitable location to allow an installer to more easily fit a panel into the trim element.

[0057] In use, the trim element 600 is connected to a substrate such as wall sheathing by positioning the face 614 of the mounting leg 604 against the sheathing and securing the trim element in position by means of fasteners (not shown) received in spaced apertures 616 provided in the mounting leg 604. The wall panel 10, 100, 200, 300, 400 is then positioned against the face 618 of the mounting leg 604 and the second portion 610 of the covering leg 606 is pivoted about the optional hinge 612 from the position illustrated in Figure 12B into the position illustrated in Figure 12A. This hinged movement of the second portion 610 serves to form a wall panel holding channel 620 about the end of the wall panel 10, 100, 200, 300, 400 so as to provide an aesthetically pleasing surface. As illustrated, one or more drain holes 622 may be provided in the first portion 608 of the covering leg 606 to allow moisture to drain from the channel 620.

[0058] In one possible application a minimum of one layer of grade D building paper or other water resistive barrier (WRB) material is installed over the sheathing or substrate provided on wood framing. Next vertical framing locations are marked with, for example, a pencil or chalk line. It may also be helpful to mark horizontal framing locations in areas around windows, doors and wall terminations. After this, the installer determines and marks the starting point for installation of the wall panel system. In one application the system must maintain a clearance from grade of a minimum of four inches over soil or two inches over a hard surface such as paving or concrete. It is critical that the starting line be a level line and positioned so that the appropriate clearance from grade is achieved.

[0059] Next the installer verifies that the intended starting line provides an equal height distance to overhang, trim or cladding. Once the starting location has been determined, the user tacks or tapes WRB material up and marks on the sheathing. The chalk line or pencil line is then extended across the entire surface to be covered. The user then installs the starter strip 500 to extend perfectly level along the starting point line. This is completed by using fasteners such as roofing nails or screws that are received in the spaced apertures 510. Additional fasteners may be added to ensure that the channel 506 does not easily pull away from the sheathing along the bottom edge. The WRB material is then lapped over the securing leg 502. In this position, the

WRB material directs any moisture away from the sheathing and toward the channel 506 from which that moisture can drain from the weep holes 507.

[0060] Next the trim element 600 is installed at desired locations around windows, doors and the like. As with the starter strip 500, discussed above, the trim element 600 is secured in place on the sheathing by providing fasteners at spaced locations in the apertures 616. As the starter strip 500 and trim element 600 are subject to expansion and contraction with temperature change, the user should allow clearance of, perhaps,  $\frac{1}{4}$  inch at all stops or at material abut joints. The fasteners are placed in the center of the elongated apertures 510, 616 and driven straight into the sheathing. The fasteners are not nailed tight. Instead a slight clearance is maintained between the fastener head and the starter strip 500 and trim element 600 so as to more freely allow for expansion and contraction.

[0061] Once the starter strips 500 and trim elements 600 are properly mounted the wall panels 10, 100, 200, 300, 400 are installed. Generally, corner panels are installed before flat panels. Panels 10, 100, 200, 300, 400 are installed from bottom to top and lapped in single fashion so that each seats properly. Further the panels 10, 100, 200, 300, 400 are staggered from one row to the next to avoid alignment of vertical joints. Fasteners F are driven straight and flush and panels and corners are installed level and plum.

[0062] More specifically, a flat wall panel 10, 100, 200, 300, 400 is positioned with the bottom edge (e.g. Tongue 40, 102 or 208 or tab 72) in the channel 506 of the starter strip 500 and the mounting element 16 up. The wall panel 10, 100, 200, 300, 400 is then fastened in position using fasteners F. In one possible embodiment, two fasteners F must penetrate the framing of the building and end fasteners must be located within three inches of the end of the panel 10, 100, 200, 300, 400 for optimum anchoring. The next wall panel 10, 100, 200, 300, 400 is then positioned into the channel 506 next to the first panel. The installer then slides the second panel to nest edge to edge with the first panel and fasteners F are installed as previously described. The installer continues down the wall repeating this procedure until the end is reached. The next course of panels is then started with a half panel immediately above the first course of wall panels 10, 100, 200, 300, 400.

[0063] Figure 13 illustrates the starter strip 500 mounted to the framed wall W of a building. Two panels 700, 700' are mounted to the wall W above the starter strip 500. Note how the

tongue 702 on the lowermost panel 700 is received in the channel 506 while the design element 704 is supported on the shelf 504. Also note how the WRB material M laps over the top of the securing leg 502 so that moisture is directed into the channel 506 and then drained away through the weep hole 507.

[0064] Figure 14 illustrates a trim element 600 mounted on a framed wall S of a building between a panel 700 and a window or end wall W'. Note how the end 706 of the panel 700 is received in the wall panel holding channel 620 formed by the legs 604 and 606.

[0065] Figure 15 illustrates a trim element 600 mounted on a framed wall W of a building between a panel 700 and a fascia or soffit S. In this application, the top margin 708 of the panel 700 is received and held in the channel 620 formed by the legs 604, 606.

[0066] The foregoing description of the various embodiments of the present invention have been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed. Modifications or variations are possible in light of the above description. For example, in the illustrated embodiments, the apertures 23 for receiving a fastener are provided in the protrusion 21. In alternative embodiments, such apertures 23 may be provided substantially anywhere in the body 12. As another example, the illustrated embodiment of Figure 5E includes a mounting element 16 with a first end 18 extending in a first plane P<sub>1</sub> and a second end 20 extending in a second plane P<sub>2</sub> where the planes P<sub>1</sub> and P<sub>2</sub> are parallel to one another. The mounting element 16 could include ends that extend in planes that are not parallel to one another.

[0067] Still further, while the interlocking structures 102, 104, 204, 208, 306, 404, 408 are illustrated in only the top and bottom edges of the panels 100, 200, 300, 400 in Figures 7A, 7B, 8A, 8B, 9 and 10, it should be appreciated that like interlocking structures could be provided in the end or side edges so that the panels interlocked together end-to-end in the same manner if desired. In addition, while the panels 10 in Figure 1 are elongated with staggered ends 34, it should be appreciated that they could assume most any shape. For example, the panels 10 could be rectangular or square with straight, not staggered ends.

What is Claimed:

1. A prefabricated wall panel, comprising:  
a precast body including at least one decorative design element;  
a mounting element including a first end embedded in said precast body and a second end projecting from said precast body; and  
an interlocking structure provided along at least two opposing edges of said prefabricated wall panel to insure proper alignment and interconnection when at least two of said prefabricated wall panels are positioned together to complete a wall.
2. The wall panel of claim 1, further including at least one protrusion in said second end and at least one keying hole in said first end of said mounting element.
3. The wall panel of claim 2, wherein said protrusion has an interior diameter of between approximately 0 and approximately 7.6 centimeters.
4. The wall panel of claim 3, wherein said protrusion has a depth of between approximately 0.30 and approximately 0.6 centimeters.
5. The wall panel of claim 4, further including at least one weep hole in said mounting element.
6. The wall panel of claim 5, wherein said first end of said mounting element extends in a first plane and said second end of said mounting element extends in a second plane wherein said second plane is substantially parallel to said first plane.
7. The wall panel of claim 6, wherein said mounting element further includes a transition section that connects said first end to said second end and transitions between said first and second planes.

8. The wall panel of claim 7, wherein said mounting element is made from a material selected from wood, concrete, cellulose fiberboard, polymer material, composite material, metal, plastic, reinforced plastic, thermoplastic, fiber composite, reinforced wood, steel, corrosion-resistant steel, aluminum, stainless, steel, zinc, copper, and combinations thereof.
9. The wall panel of claim 8, wherein said mounting element is formed as a solid sheet, as a mesh or as a combination thereof.
10. The wall panel of claim 1, wherein said precast body is made from a material selected from a group consisting of concrete, fiber reinforced concrete, gypsum, fiber reinforced gypsum, polymer modified gypsum, other cementitious materials and mixtures thereof.
11. The wall panel of claim 10, wherein said precast body includes reinforcing fibers selected from a group of fibers consisting of glass fibers, carbon fibers, mineral fibers, natural fibers, polymer fibers, E-glass fibers, AR-glass fibers and mixtures thereof.
12. The wall panel of claim 1, wherein said interlocking structure comprises a cooperating tongue and groove arrangement.
13. The wall panel of claim 1, wherein said interlocking structure includes alternating tongues and grooves staggered in two rows.
14. The wall panel of claim 1, wherein said interlocking structure comprises a cooperating hook and slot arrangement.
15. The wall panel of claim 1, wherein said interlocking structure comprises edge grooves and an interconnecting pin received in said grooves.
16. The wall panel of claim 1, wherein said interlocking structure is provided along at least two opposing edges of said precast body.
17. The wall panel of claim 16, wherein said interlocking structure comprises a cooperating tongue and groove arrangement.

18. The wall panel of claim 16, wherein said interlocking structure includes alternating tongues and grooves staggered in two rows.
19. The wall panel of claim 16, wherein said interlocking structure comprises a cooperating hook and slot arrangement.
20. The wall panel of claim 16, wherein said interlocking structure comprises edge grooves and an interconnecting pin received in said grooves.
21. A wall panel system, comprising:  
a prefabricated wall panel;  
a starter strip; and  
a trim element;  
said wall panel system being characterized by said prefabricated wall panel including;  
a precast body including at least one decorative design element;  
a mounting element including a first end embedded in said precast body and a second end projecting from said precast body; and  
an interlocking structure provided along at least two opposing edges of said prefabricated wall panel to insure proper alignment and interconnection when at least two of said prefabricated wall panels are positioned together to complete a wall.
22. The wall panel system of claim 21, wherein said starter strip includes a securing leg and a channel.
23. The wall panel system of claim 22, wherein said trim element includes a substantially J-shaped body including a mounting leg, a covering leg and a wall panel holding channel.

FIG. 1

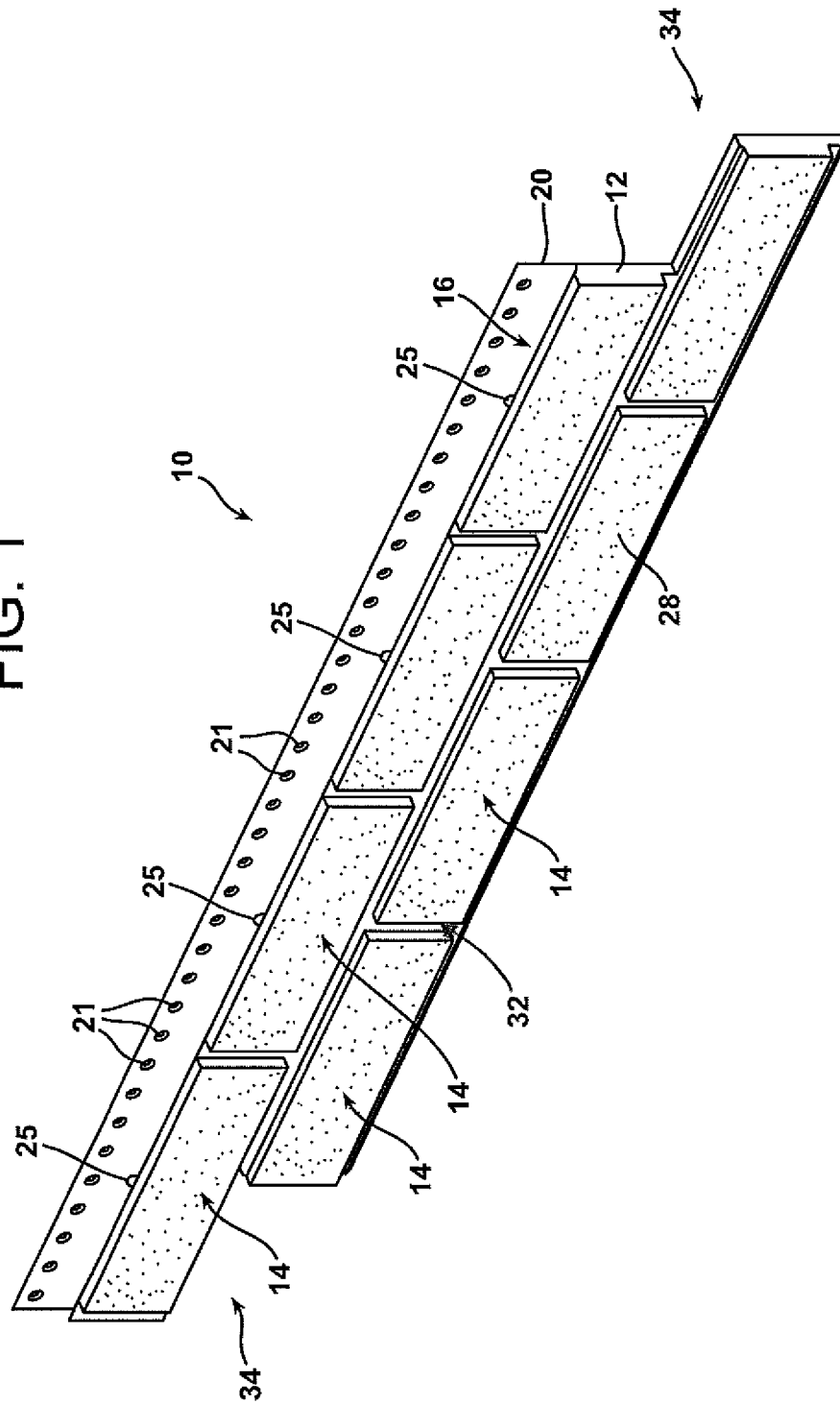


FIG. 2

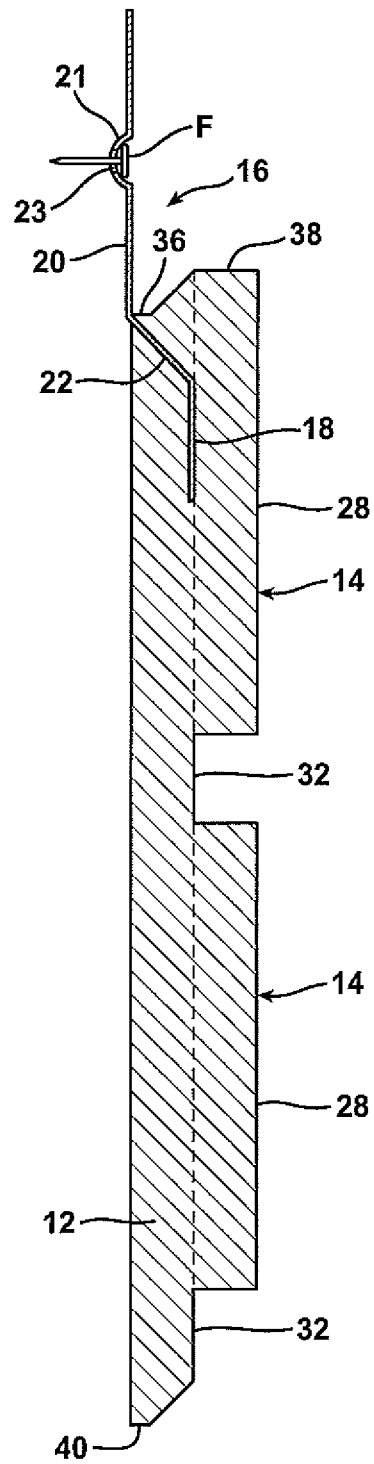


FIG. 3

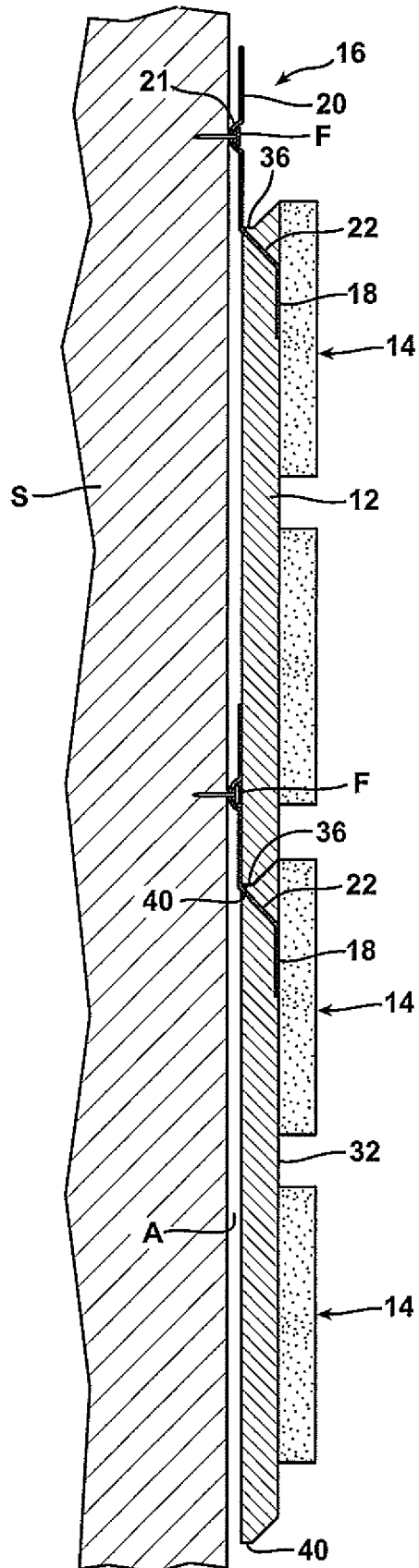


FIG. 4A

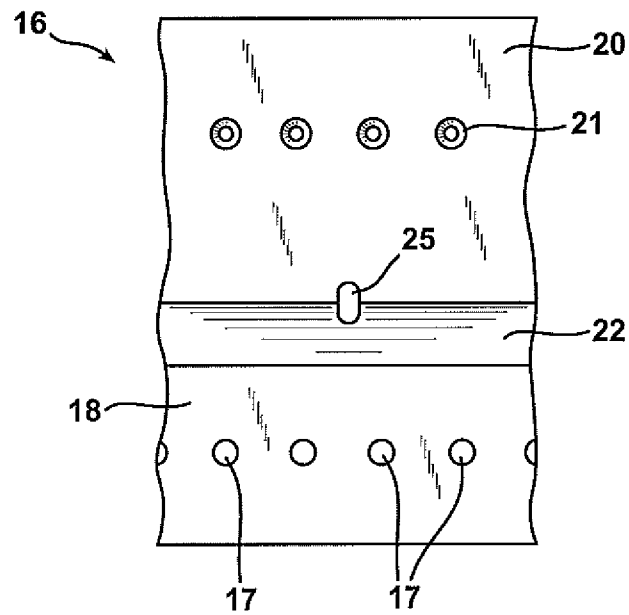


FIG. 4B

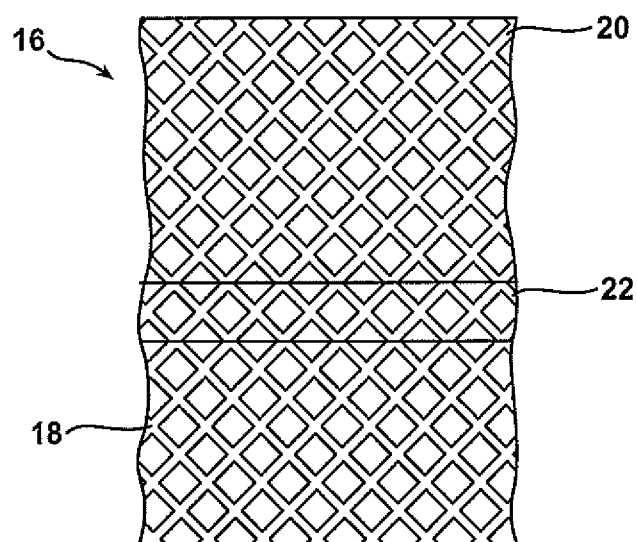


FIG. 4C

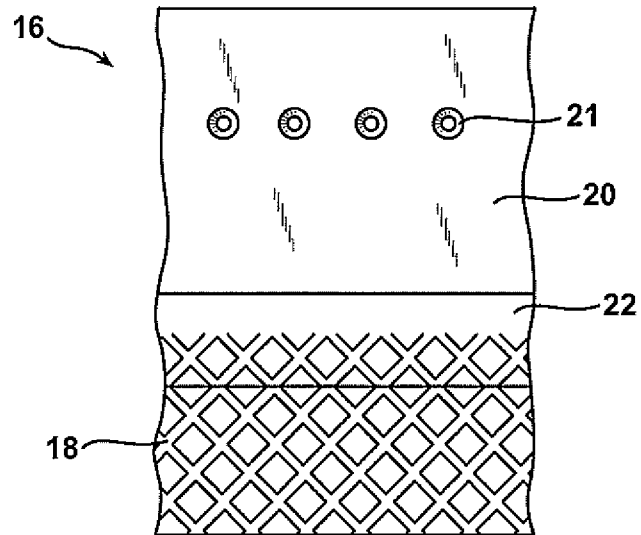


FIG. 4D

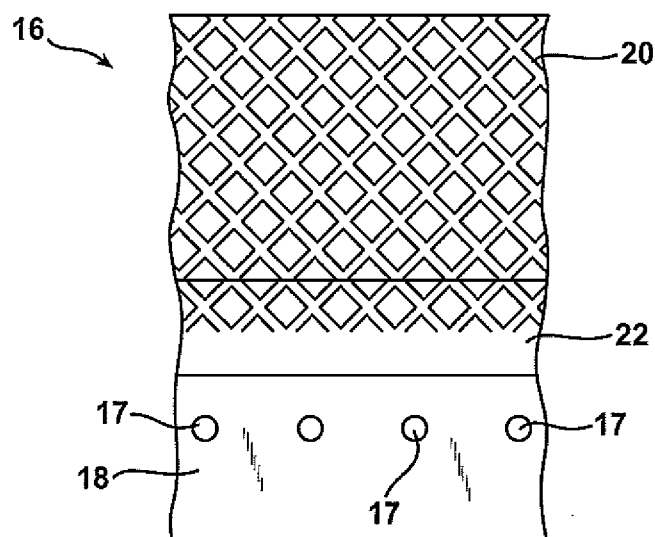


FIG. 5A

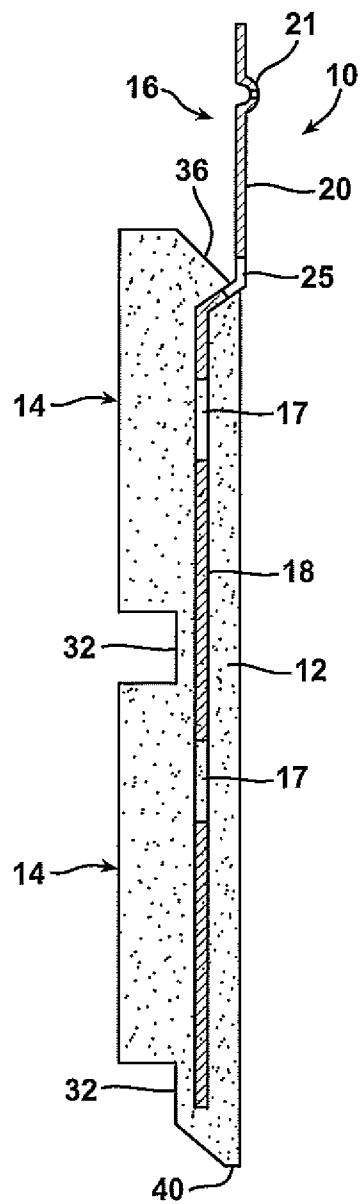


FIG. 5B

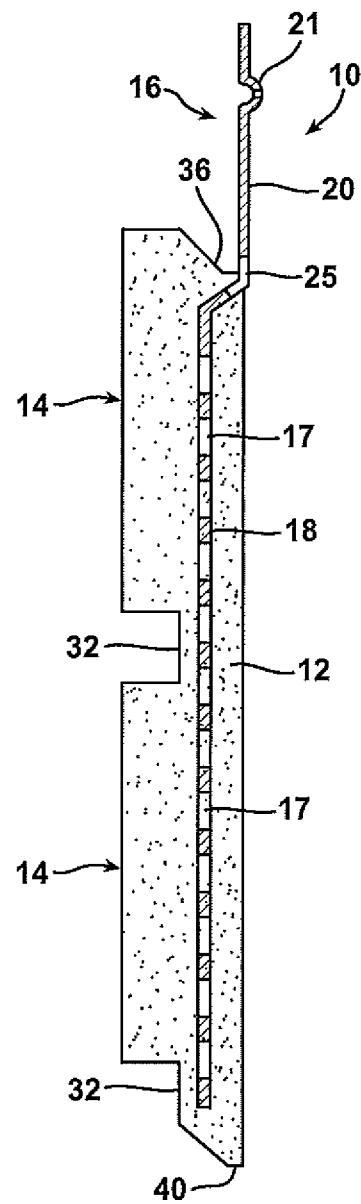


FIG. 5C

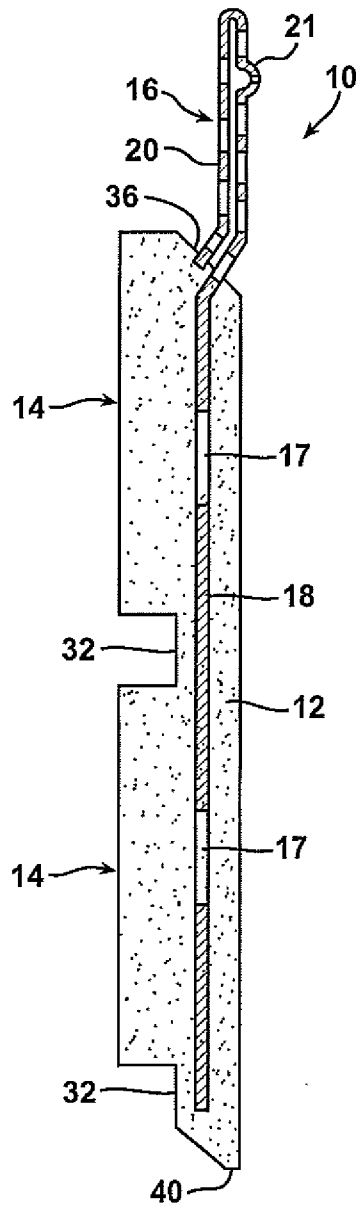


FIG. 5D

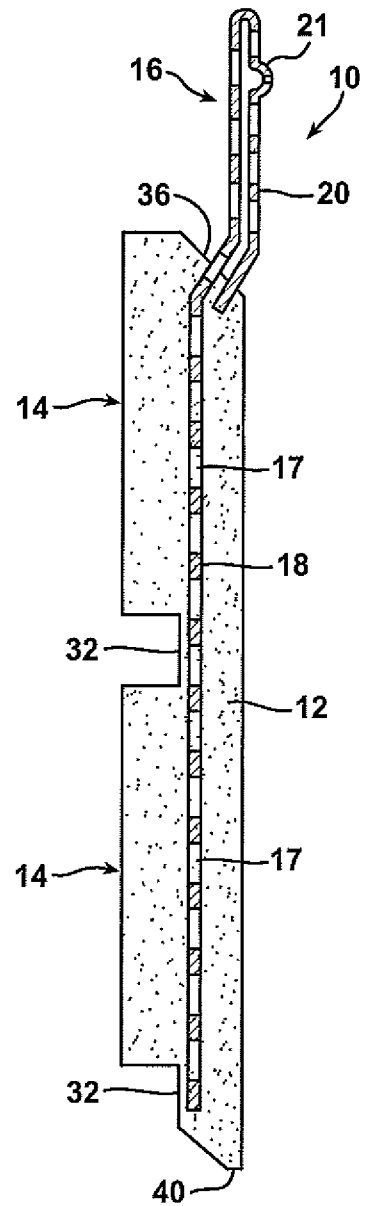


FIG. 5E

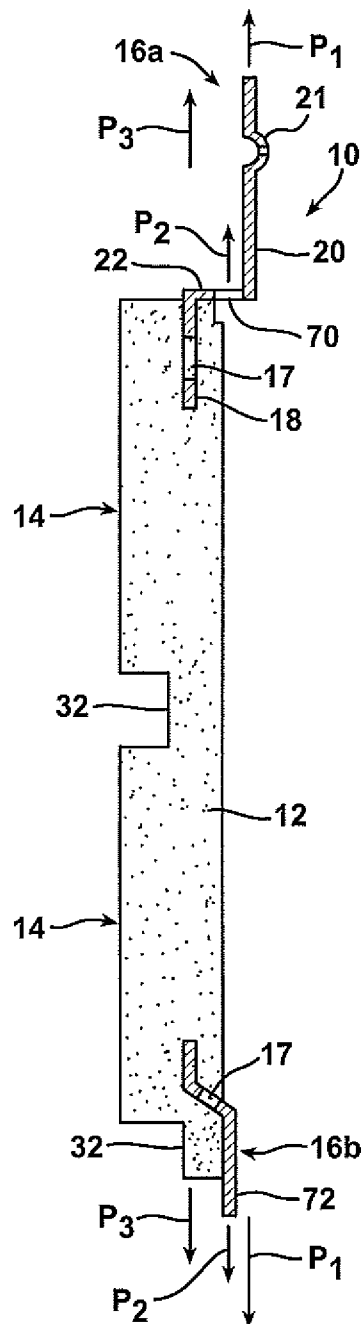


FIG. 5F

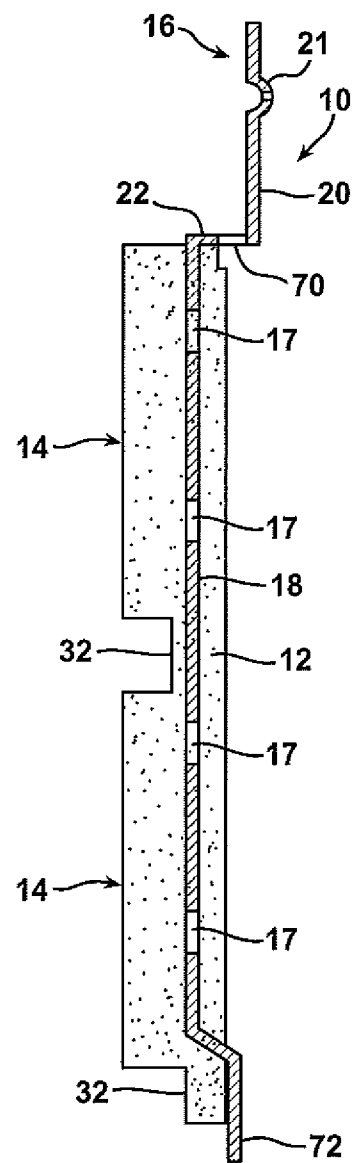


FIG. 5G

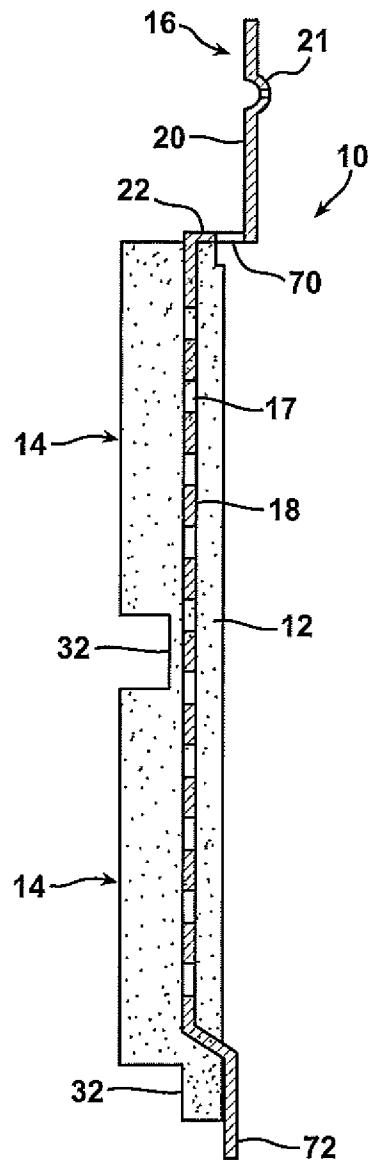


FIG. 6

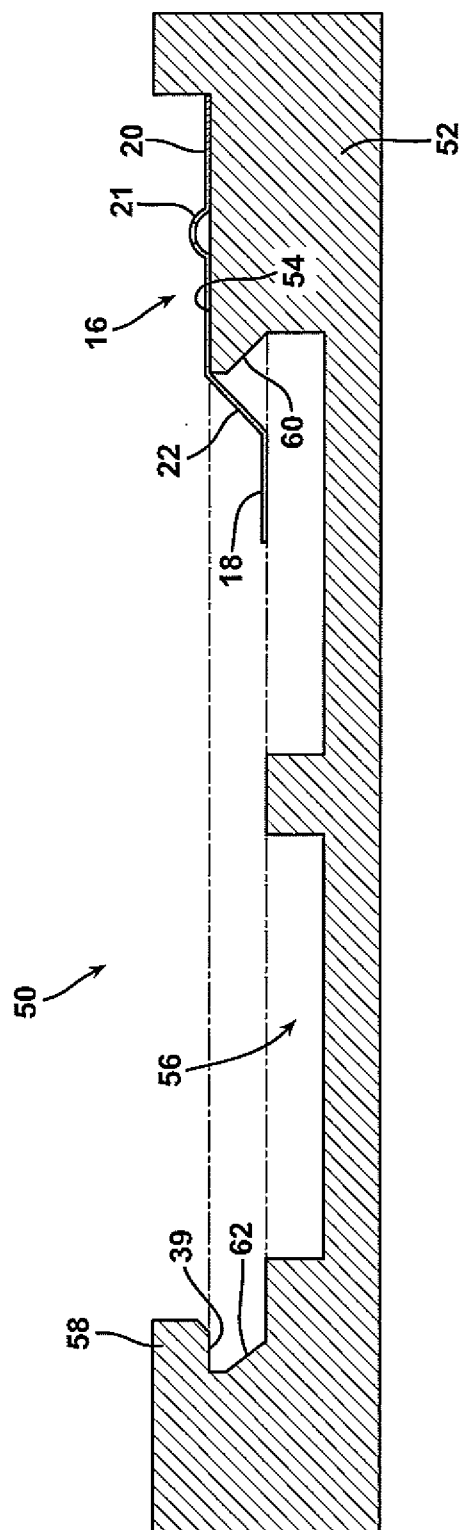


FIG. 7A

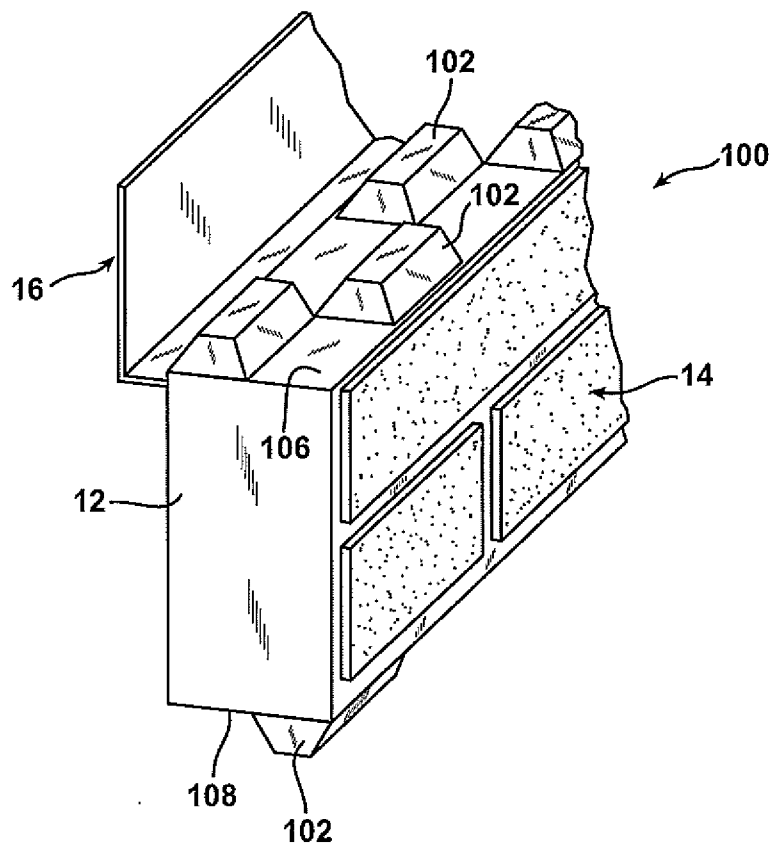


FIG. 7B

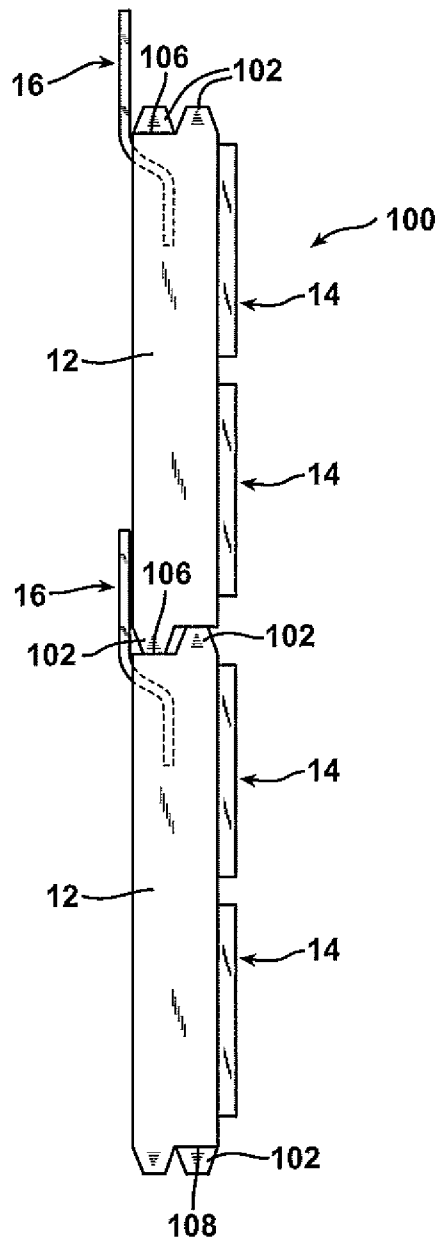


FIG. 8

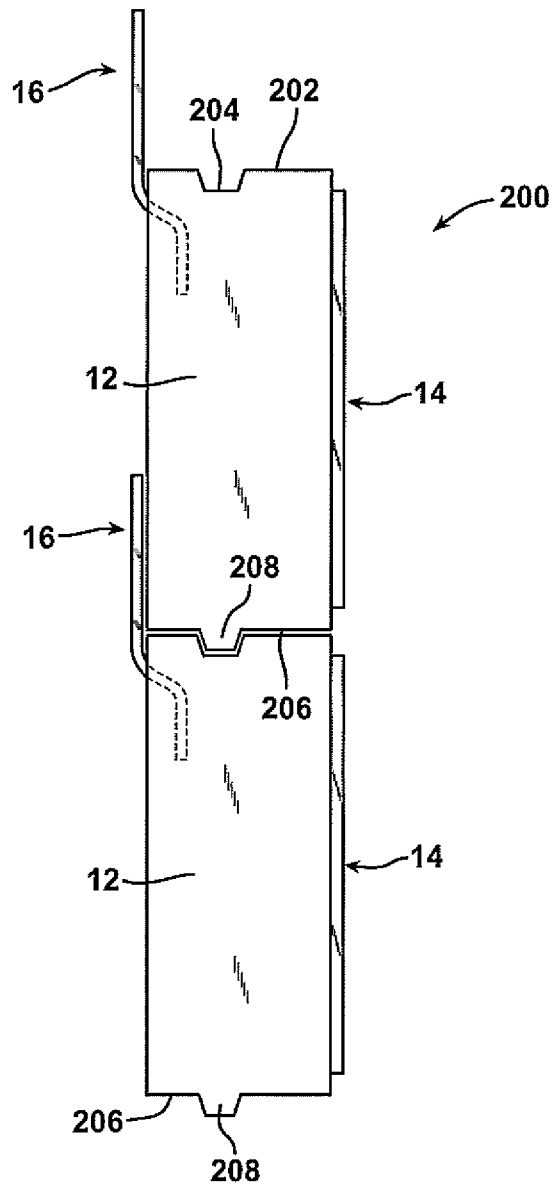


FIG. 9

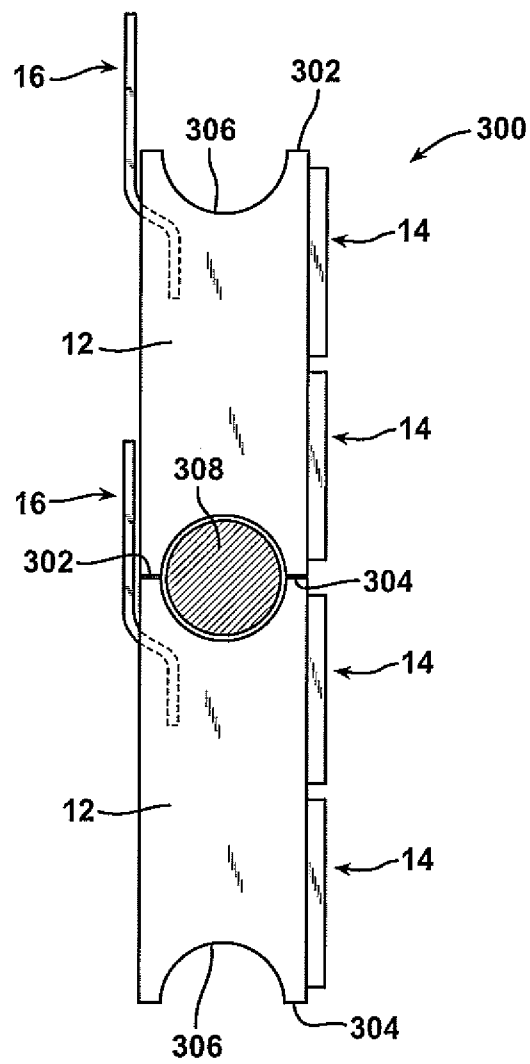
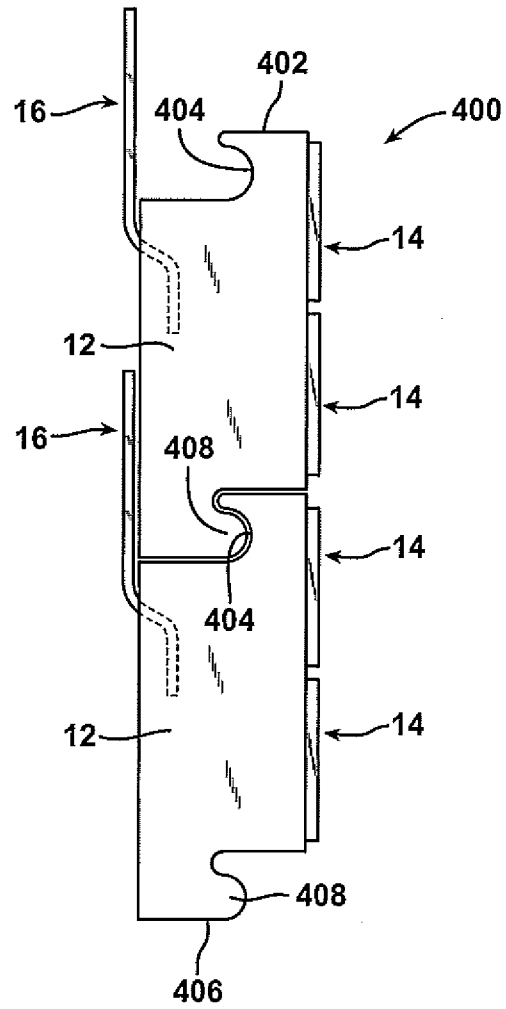
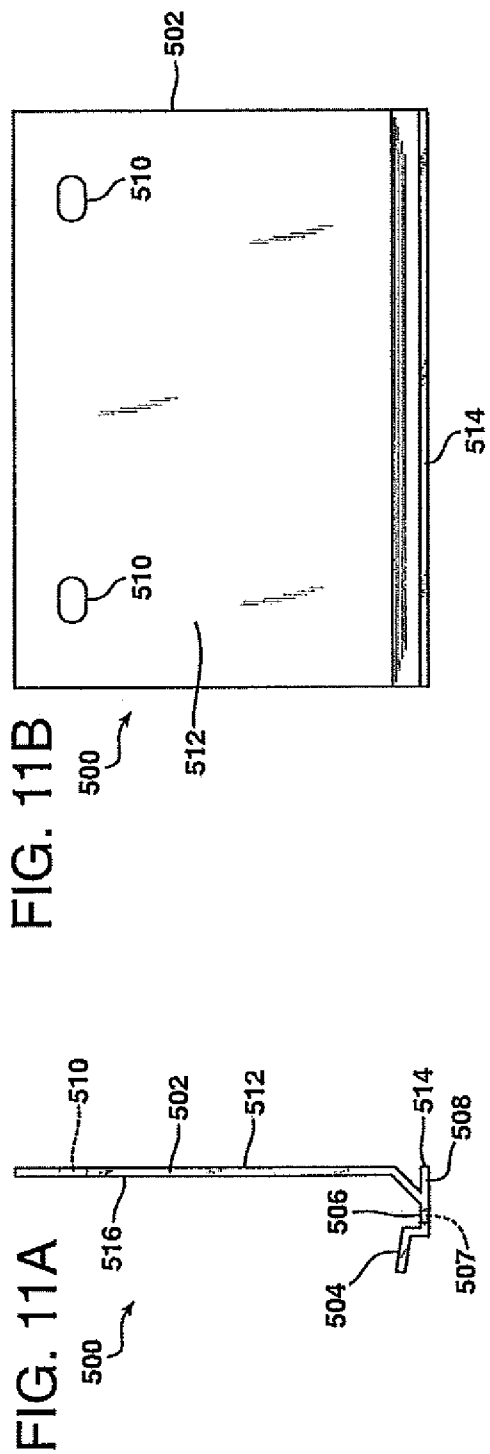


FIG. 10





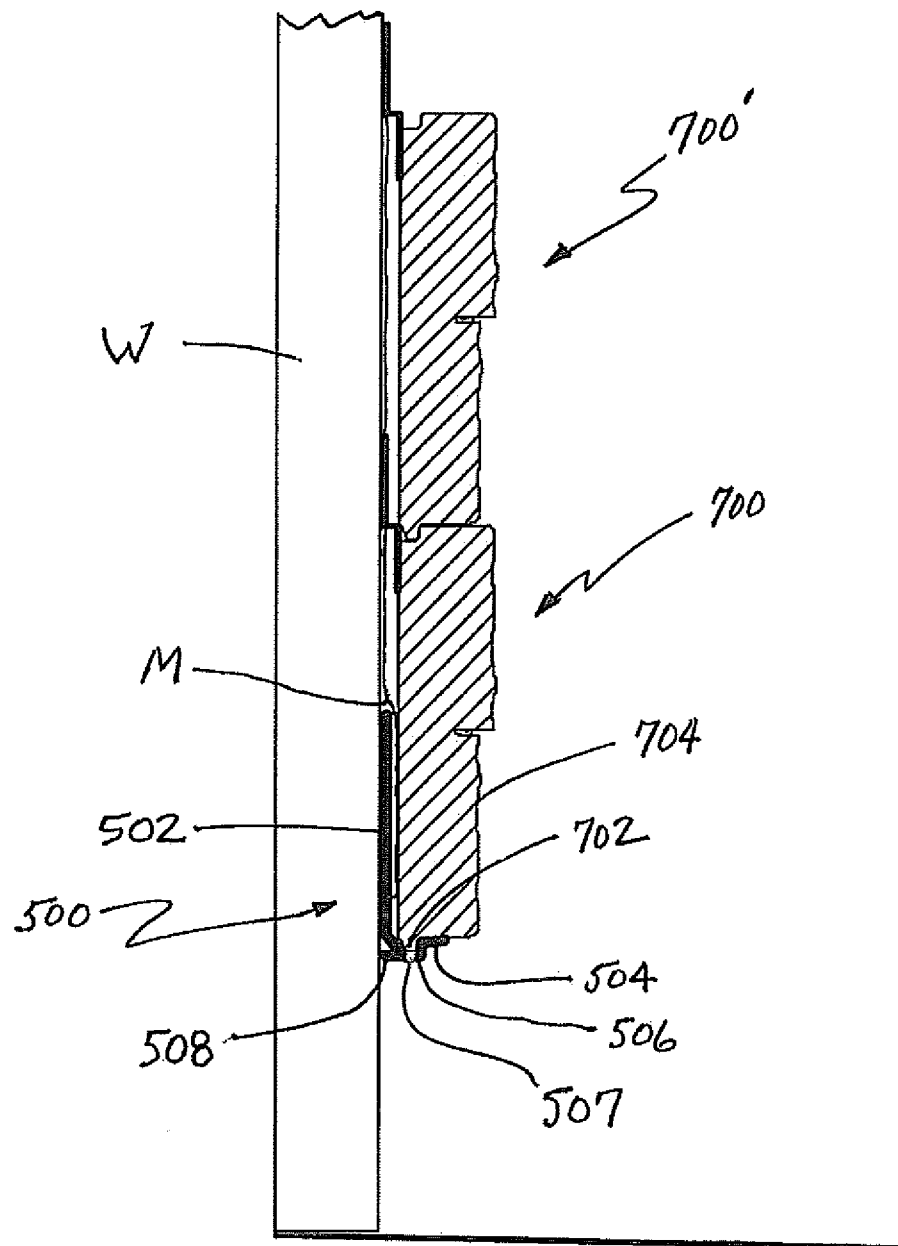


Fig. 13

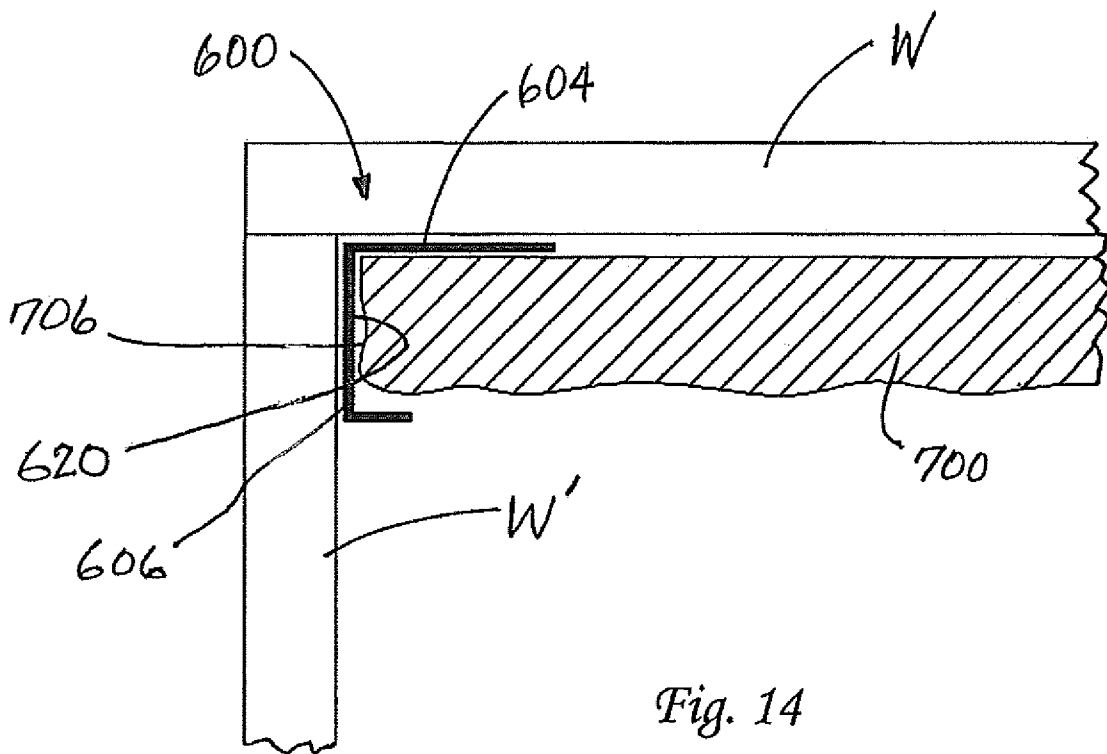
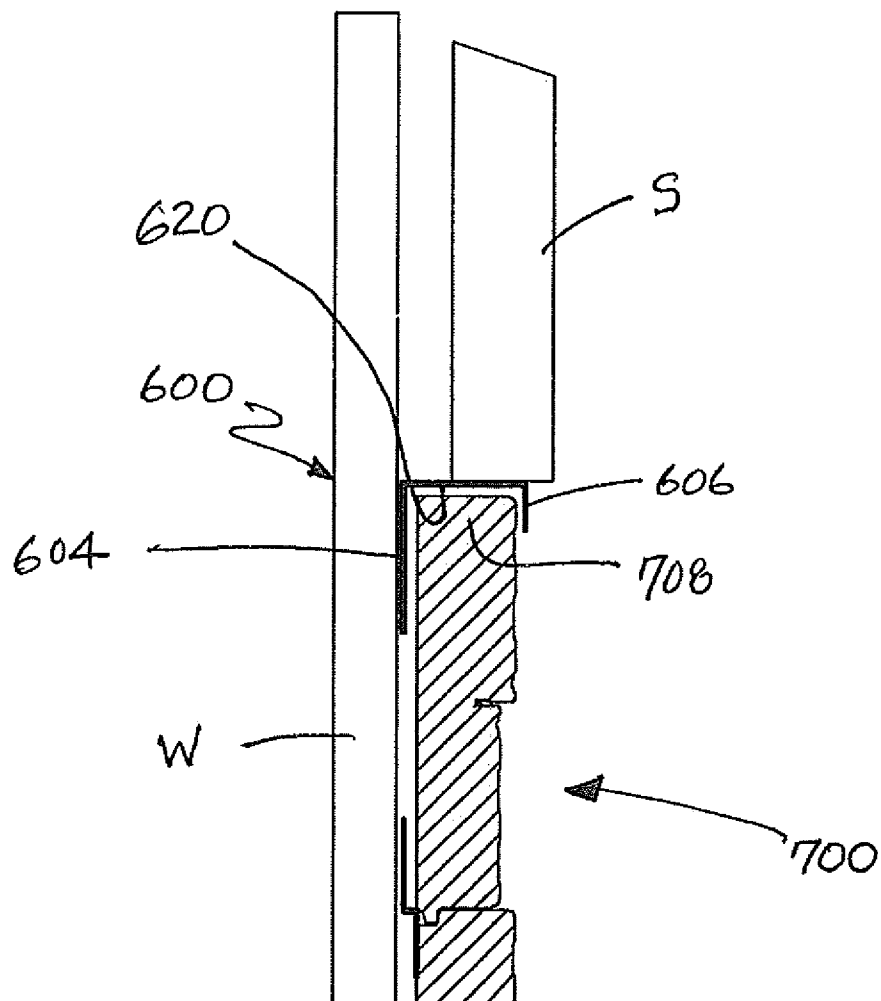


Fig. 14

*Fig. 15*

# INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2009/033405

**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. E04F13/08 E04F13/14

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
E04F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)  
EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                           | Relevant to claim No.                       |
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|           | -----<br>-/-                                                                                                                 |                                             |

☒ Further documents are listed in the continuation of Box C.

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Date of the actual completion of the international search

18 May 2009

Date of mailing of the international search report

03/06/2009

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Authorized officer

Fournier, Thomas

## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2009/033405

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

International application No

PCT/US2009/033405

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