United States Patent

Watson

[15] **3,665,664**

[45] **May 30, 1972**

[54] BUILDING PANEL AND STRUCTURE CONSTRUCTED THEREWITH

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[21] Appl. No.: **21,388**

[52] **U.S. Cl.** **52/211,** 52/309

[51] **Int. Cl.** **E06b 1/04**

[58] **Field of Search** ..... 52/309, 593, 293, 261, 204, 52/206, 208, 205, 615, 601, 627, 624; 264/45; 161/161, 190, 159, 160; 220/9 F, 9 G

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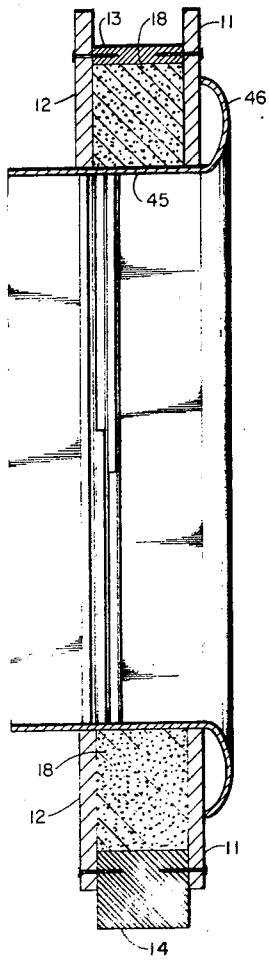
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[57] **ABSTRACT**

A building panel comprising spaced-apart inner and outer facing members having a foamed plastic material therebetween. The building panel including load-bearing surfaces along the top, bottom and side edges thereof, the load-bearing surfaces at the side edges of the panel adapted to engage with load-bearing surfaces on the next adjacent panel and to be secured thereto for retaining the panels in their proper erected position. Some of the aforesaid panels being provided with openings to receive a door and/or window structure to thus provide a panel structure and arrangement of panels whereby a dwelling may be readily constructed with the aforesaid panels.

4 Claims, 12 Drawing Figures



Patented May 30, 1972 3,665,664

4 Sheets-Sheet 1

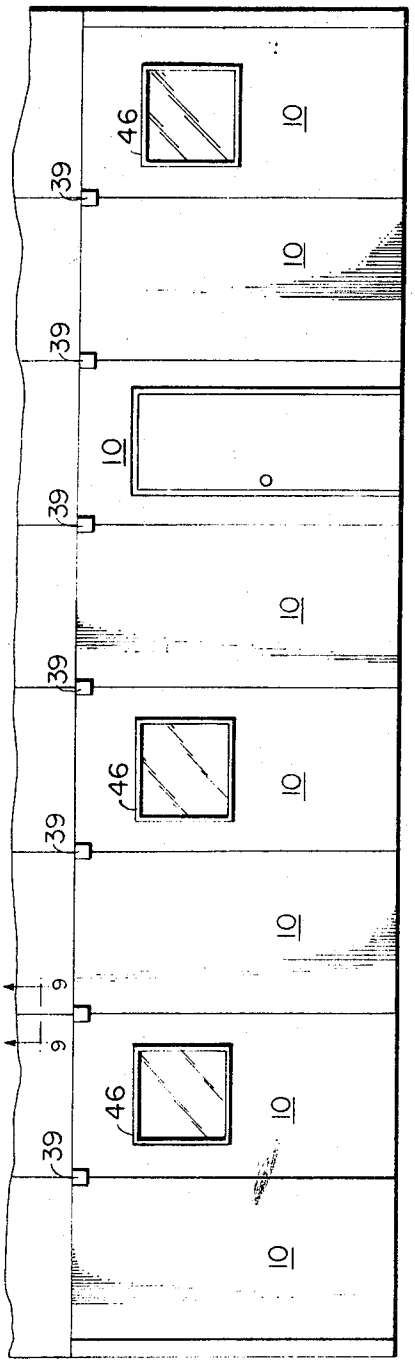


FIG. 2

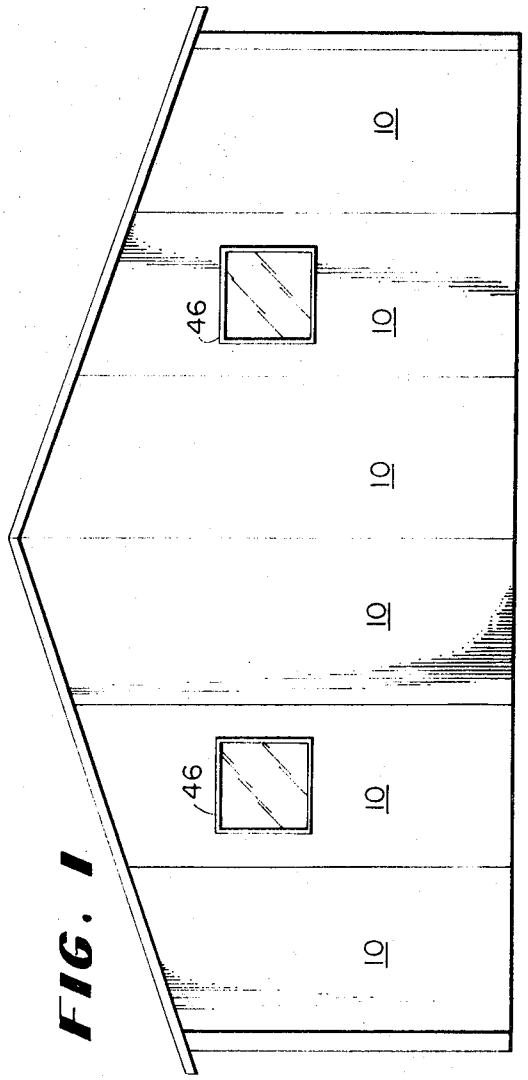


FIG. 1

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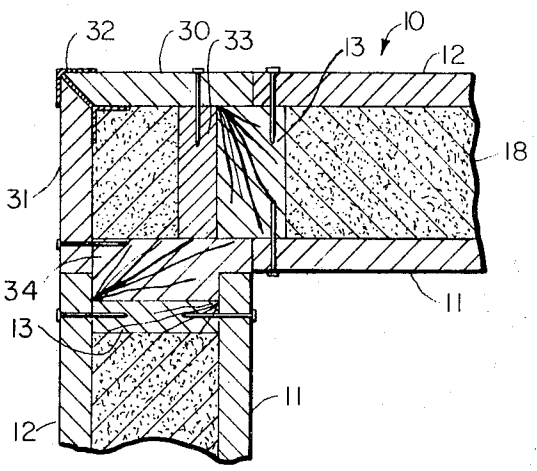


FIG. 3

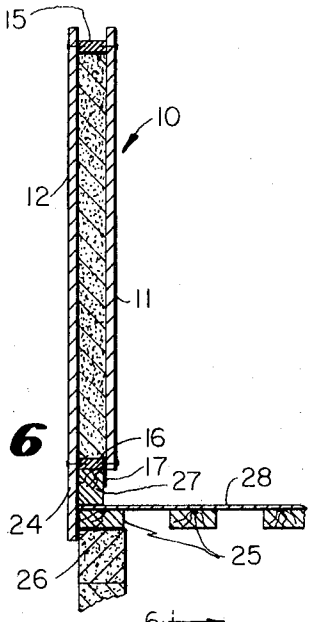


FIG. 6

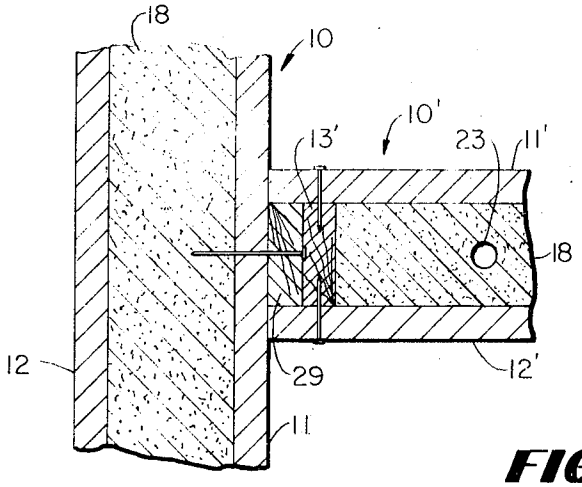


FIG. 4

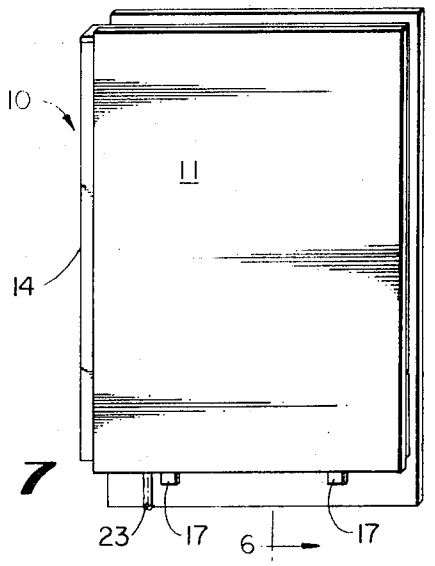


FIG. 7

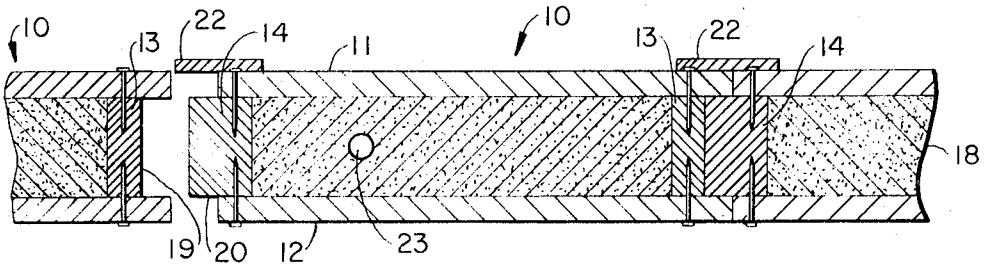


FIG. 5

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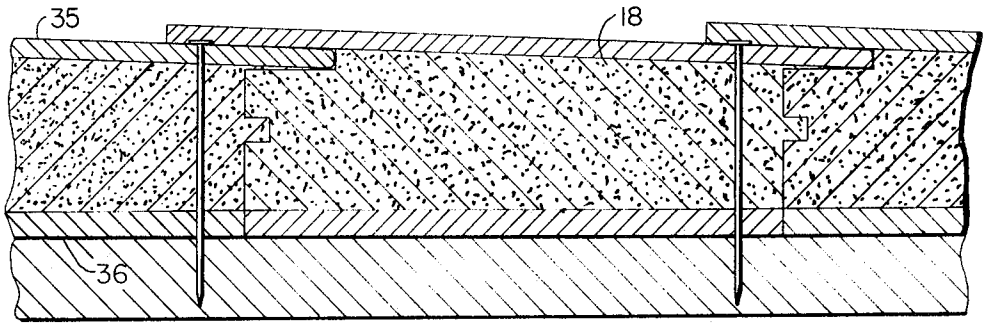


FIG. 8

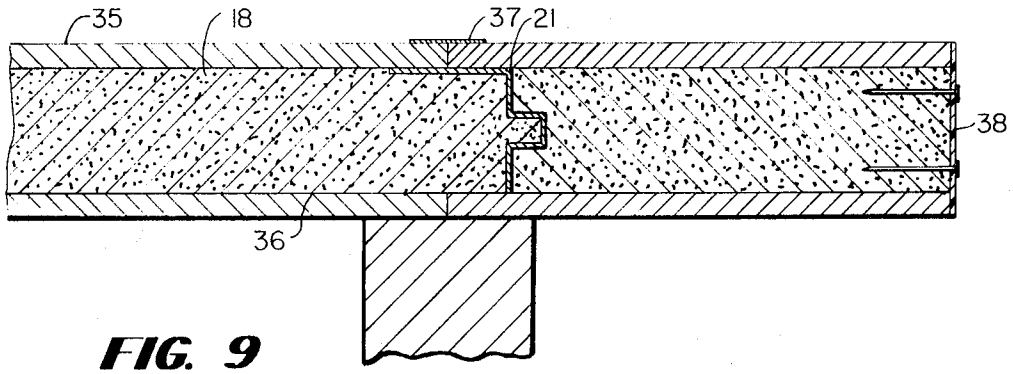


FIG. 9

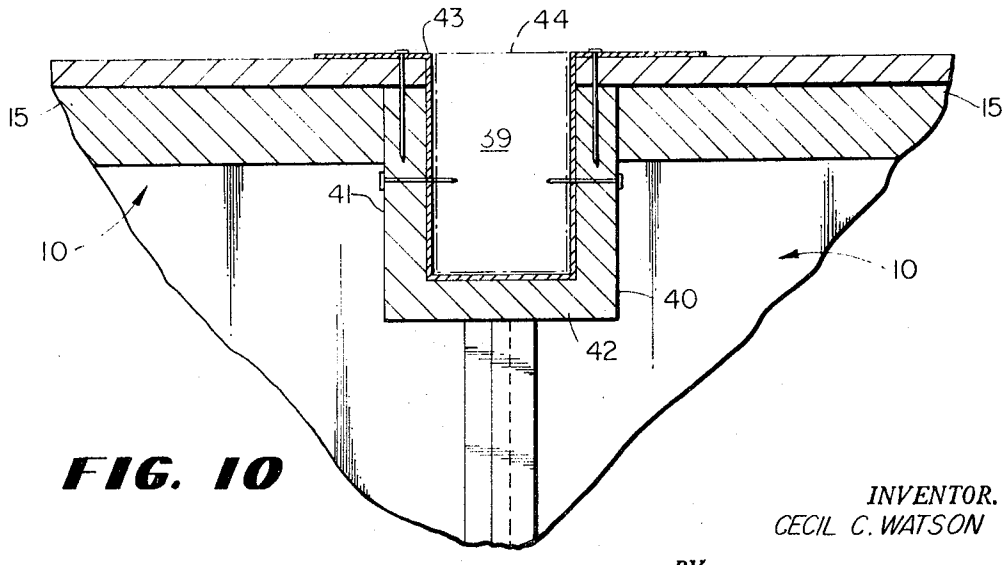


FIG. 10

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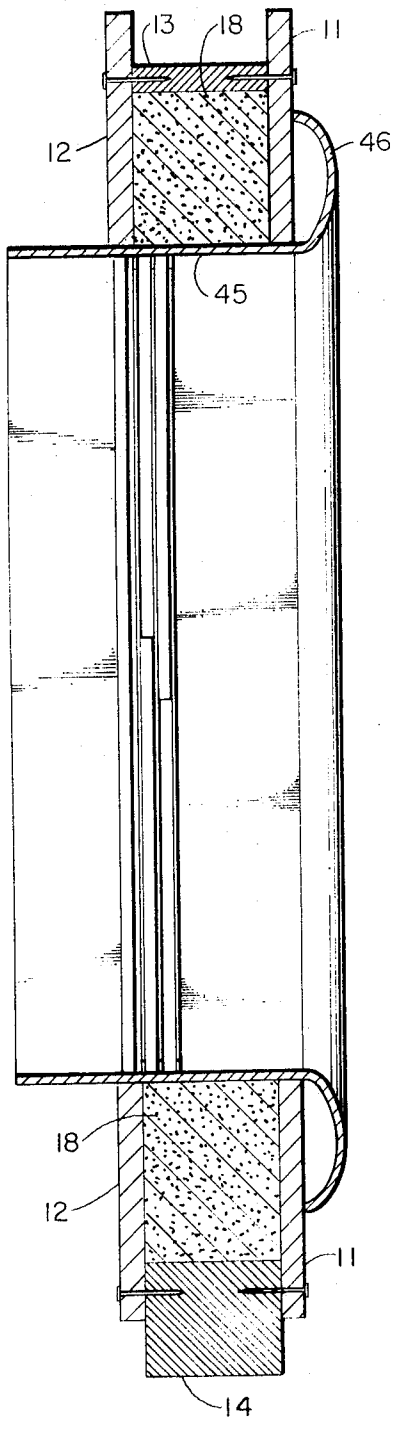


FIG. 11

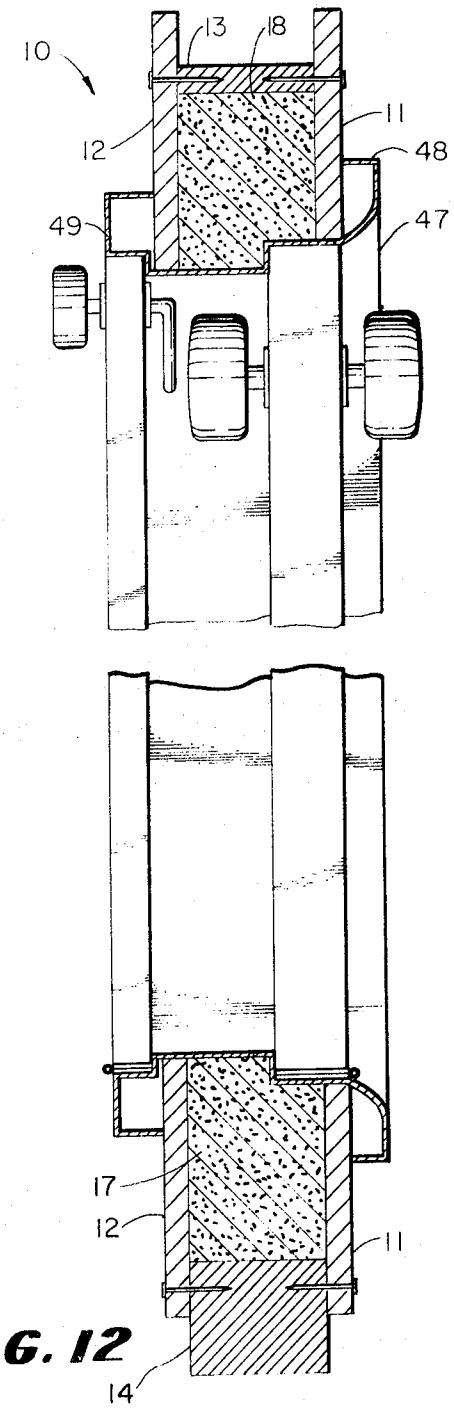


FIG. 12

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BUILDING PANEL AND STRUCTURE CONSTRUCTED THEREWITH

BACKGROUND OF THE INVENTION

In the past, numerous attempts have been made to provide panel structures which can be fabricated at a plant facility, and when so formed, the panel units can then be adequately packaged for shipping to the building site and then easily assembled to form the desired structure. Panels such as utilized in the present invention are such that they may be easily molded to the desired configuration as will enable one to readily assemble the panel units to form a structure of the desired height without the use of the conventional vertical studding, thus reducing materially the costs in erecting a building.

With the above in mind, it is the primary object of the invention to provide a panel structure, comprising an interior and an exterior panel, with an insulating foam material extending therebetween which will serve as an effective means to properly insulate the dwelling without the use of an extraneous material to effect the desired insulation for the dwelling.

Another object of the invention is to mold as an integral building panel, an interior and an exterior surface constructed of any suitable material and providing each of said panel units with load-bearing surfaces which are adapted to engage with like load-bearing surfaces on the next adjacent building panel and secured thereto to form a completed wall unit without the employment of the usual vertical studding.

Another object of the invention is to form a composite building panel unit with the exterior surface constructed so as to overlie the exterior of the foundation and customary floor joists so as to prevent the ingress of rodents, rain water, etc., into the undersurface of the customary sub-flooring commonly employed in the formation of a dwelling or like structure.

Another object of the invention is to provide suitable cut-out areas at the upper portion of the panels so as to receive therein the customary rafters employed in the support of a flat or slanted roof structure.

Another object of the invention is to provide each of a number of composite building panels with equally spaced conduits extending into the insulating material disposed between the interior and exterior facings employed in the formation of the instant building panel, thus facilitating the placement therein of suitable electrical wiring, etc.

Another object of the invention is to mold a composite building panel having an interior and an exterior facing constructed of any suitable material with suitable insulating material between the spaced inner and outer facings and to enclose said insulating material within load-bearing surfaces which extend along all sides of the panel.

Another object of the invention is to mold a composite building block comprising an inner and an outer facing member formed of any suitable material and to form openings in the desired panel to receive a door and/or window casing and to secure said casing within the aforesaid opening by reason of adhesion of the foamed insulating material which extends between the said inner and outer facing members, thus providing a building panel which will combine therewith the desired door and/or window unit mounted therein when the building panel is constructed at the plant facility and obviating the need for installing doors and/or windows at the building site, thereby effecting a considerable savings in the construction of a dwelling or like structure.

Another object of the invention is in the utilization of a building panel constructed as aforesaid in the formation of partitions within an enclosure, the building panel providing the necessary insulation desired between different rooms within a dwelling, thus greatly enhancing the insulating properties of partitions of a room-divider wall and the like.

Another object of the invention is to provide suitably spaced recesses along the upper edge of the panels wherein roof-supporting rafters may be placed and secured therein to properly support either a flat or a slanted roof construction.

A still further object of the invention is to mold a composite building panel in the manner aforesaid and to include as a part of the panel a series of strap members mounted along the lower edge of the panel, the strap members adapted to engage with a suitable load-supporting surface extending on the conventional sub-flooring to thus effectively secure the lower edge of the panel to the said sub-flooring assembly.

Unusual strength is imparted to the building by novel formation of the building panels employed in erecting the same. Such building panels enable the same to support considerable stresses without any special supporting framework, thereby contributing to the economy of the building. Additional strengthening is imparted by the novel way in which the panels fit together and by the novel fastening connections extending between each adjacent panel.

Thus, the general objects of the invention are to provide a rapidly assembled prefabricated building which can be quickly erected on a building site from panel sections which have been formed as in a mold at factory site, and which, after having been thus formed, can be easily transported to the building site and erected without resorting to special tools, extra fasteners or special skill to assemble the panels in the formation of an enclosure such as a dwelling or the like.

Other objects and advantages of the invention will appear from the following description of the preferred embodiments thereof.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective end view of a dwelling constructed with the panel structure of the invention.

FIG. **2** is a perspective view of a side of a dwelling constructed with the panel structure.

FIG. **3** is an enlarged sectional view taken at a corner of a dwelling.

FIG. **4** is an enlarged sectional view disclosing the manner in which interior partitions are constructed.

FIG. **5** is an enlarged sectional view disclosing the manner in which the panels abut one another.

FIG. **6** is a section taken on lines **6—6** of FIG. **7** looking in the direction of the arrows.

FIG. **7** is a perspective view of a panel constructed in accordance with the present invention.

FIG. **8** is an enlarged sectional view showing the manner in which the panels overlap in the formation of a roof structure.

FIG. **9** is an enlarged sectional view taken on line **9—9** of FIG. **2** looking in the direction of the arrows.

FIG. **10** is an enlarged sectional view disclosing the recess formed for accomodation of a roof rafter.

FIG. **11** is an enlarged sectional view disclosing the manner in which a window opening is formed in the panel structure, and

FIG. **12** is an enlarged section disclosing the manner in which a door assembly is mounted within the panel.

PREFERRED EMBODIMENTS OF THE INVENTION

Referring now to the drawings, there is disclosed at FIGS. **1** and **2**, respectively, a side and an end view of a dwelling constructed with the building panels of the present invention. FIG. **1** of the drawings discloses a dwelling structure having a slanted roof, however, as will be described more fully hereinafter, the dwelling may be equally fabricated with a flat roof.

The panels of the present invention are shown generally by reference numeral **10**. The panels **10** comprise an interior and an exterior facing **11** and **12**. The exterior surface **12** of the panel **10** may be formed of any weather-resistant material such as masonite or weather-proofed plywood formed with or without a decorative exterior surface. Or, the exterior facing may be constructed of a plastic sheeting or any other number of materials capable of being employed to present an exterior

surface which will effectively withstand the weather elements. The interior surface **11** may likewise be formed of any known suitable material such as set forth above and may, where desired, have a decorative surface formed on the panel so as to obviate the need for applying paint, wallpaper and the like in order to present an interior surface which will be pleasing to the eye.

The panel **10** is formed by selecting the materials utilized for the interior and exterior facings, and when so selected, a load-bearing surface in the nature of a relatively thin strip of wood or the like **13** is secured as by nails or the like to a position adjacent to, but spaced from, the side edges of the aforementioned facings **11** and **12**. On the opposite edge of the facings, a relatively thick load-bearing surface **14** of wood or the like is likewise secured between the facings **11** and **12** with a portion thereof extending beyond the edges of facings **11** and **12** as clearly shown in FIG. **5** of the drawings. Also, a load-baring surface **15**, in the nature of a strip of wood, metal and the like, is secured as by nails or the like to a position adjacent to, but spaced from, the upper ends of the top of the facings **11** and **12**. A load-bearing surface **16**, also of wood, metal or the like, is secured to the edge of the inner facing **11** and intermediate the edge of the outer facing **12** as more clearly shown in FIG. **6** of the drawings.

With the interior and exterior facings arranged in the manner aforesaid, with the load-bearing surfaces **13**, **14**, **15**, **16** and straps **17** secured therebetween, the assembly is then placed in an appropriate mold which will contain the assembly therebetween, and following the placement of the assembly in a mold, as aforesaid, a suitable foamable material such as polyurethane **18** is admitted in any known manner into the area defined between the interior and exterior facings and the load-bearing surfaces aforesaid. Thus, there is provided a composite panel comprising an inner and an outer facing and a foamable material therebetween which will add to the insulating properties of the panel and likewise by virtue of the inner layer of foamable material, the strength of the composite panel has been greatly increased.

Referring again to FIG. **5** of the drawings, it will be seen that one edge of the panel **10** is provided with a relatively thin bearing surface **13** whereas the opposite edge of the panel is provided with a relatively thick bearing surface **14**. The arrangement of the load-bearing surfaces **13** and **14**, as aforesaid, produces a groove **19** which is adapted to receive the tongue **20** which extends from the bearing surface **14**, and when the parts are assembled with the tongue **20** inserted within the groove **19**, the parts may be permanently joined to one another as by means of a mastic or like adhesive **21** extending between the abutting edges of the load-bearing surfaces. A batten strip **22** of suitable material is adapted to be mounted in any known manner over the jointed ends of the load-bearing surfaces to enhance the exterior appearance of the assembled assembly and to likewise prevent the seepage of rain water and the like between the joined parts.

As can be seen in FIG. **5** and **7** of the drawings, a tubing **23** of any known material is positioned a known distance from the edge of the panel and will provide a means whereby electrical wiring can be placed therein and will enable one to easily determine the location of the wiring, thus facilitating the taping therein for placing the necessary electrical outlets at the desired locations either interiorly and/or exteriorly of the panel structure.

The load-bearing surfaces **13** to **16**, inclusive, have been described as being made of wood, however, if desired, metal may be employed in lieu of the wood and as can be appreciated, when the foamable material sets within the confines of the framework provided as aforesaid at the top, bottom and side edges of the panel, the foamed material engages with the wood or metal or other material employed to form the load-bearing surfaces and thus forms a composite structure which will be characterized by its great strength and stability once erected in a manner to be more fully described hereinafter.

There has thus been described a building panel constructed in accordance with the terms of this invention, and likewise there has been described the manner of securing the panels in edge-to-edge relationship such as when building a wall for a building.

Referring now to FIG. **6** of the drawing, there is shown therein the formation of the exterior facing **12** of the panel **10**. As shown in this figure of the drawings, the lower edge or bottom **24** of the facing extends to a position below the lower edge of the interior facing **11**. As can be seen, the lower edge or bottom **24** is adapted to overlie the sill **25** and foundation **26**, thus preventing the entry of rain water, rodents and the like at the foundation level of the dwelling. To secure the panel to the foundation level of the dwelling, a strip **27** in the nature of a conventional two-by-four is secured in any known manner to the sub-flooring **28**. Thereafter, the panel is placed over the said two-by-four and the panel secured thereto as by means of nails, etc., extending through straps **17** and into the said two-by-four structure. Thus, with the panels secured to the two-by-four extending over the sub-flooring in the manner aforesaid, and with the edges of the panels mounted in abutting relationship with one another as shown more clearly in FIG. **5** of the drawings, a wall constructed with the panel of the present invention can be easily and economically erected with a minimum of labor and parts, thus reducing considerably the overall costs in the construction of a suitable dwelling.

Referring now to FIG. **4** of the drawings, there is shown therein the manner of providing for partitions within the confines of the dwelling. The panel **10'** which forms the partition aforesaid comprises facings **11'** and **12'** with the foamed material therebetween. The edge of the panel is provided with a relatively thin load-bearing surface **13'** secured inwardly of and between the ends of the facings as by nails and the like. When it is desired to form a partition within the building or enclosure, a strip **29** of wood or other suitable material is nailed or otherwise secured to the interior facing **11**, and the parts assembled as shown in FIG. **4** of the drawings. If desired, an adhesive mastic may be applied between the strip **29** and the load-bearing surface **13'** to retain the parts in their proper assembled position. Also, if desired, the facings **11'** and **12'** may be nailed or otherwise secured to the strip **29** to assist in retaining the elements in their assembled relationship.

Referring now to FIG. **3** of the drawings, there is shown therein a corner construction which is employed in association with the panel of the present invention The corner structure comprises a pair of exterior facing members **30**, **31** which are disposed at right angles to one another with a corner channel member **32** extending between the facing members and secured thereto an any known manner. In constructing the corner section such as shown in FIG. **3** of the drawings, the exterior facings **30**, **31** and the corner channel disposed therebetween are mounted in a suitable mold, and wooden barriers **33** and **34** are likewise placed in the said mold apparatus, and with the parts in their respective positions within the mold, the foamable material is introduced into the mold, thus filling in the space between the exterior facings **30**, **31** and wooden barriers **33**, **34**, and when the foamable material sets, it will adhere to all of the wall areas within the aforementioned space, thus resulting in a corner structure which will interfit with the next adjacent panels and to be connected thereto as by an adhesive mastic between the parts so joined, and if desired, nails or other type fasteners may be employed along with the adhesive to assist in retaining the assembly in proper assembled relationship. Of course, the lower edge of the exterior facings forming the corner structure aforesaid will extend over the sub-flooring, sill and foundation such as described with respect to FIG. **6** of the drawings and will perform the function previously described.

Referring now to FIG. **8** of the drawings, there is shown a type of insulating panel which is employed in the formation of a roof structure. FIG. **8** of the drawings shows an overlapping type panel constructed of an exterior surface **35** and an interior surface **36** and the manner of joining the top and bottom

edges of the panel with a tongue and groove arrangement. The exterior surface **35** of the panel is formed of any suitable weather-resistant material and the inner surface **36** of the roof may be formed of any suitable material and may, if desired, be provided with a suitable decorative surface. The panels of FIGS. **8** and **9** of the drawings are formed in a suitable mold in the manner aforesaid with a foamed material **18** extending between the interior and exterior roof sections. A suitable tongue and groove arrangement is formed along the side edges of the panels for interlocking the panels in their assembled relationship to one another. A suitable mastic **21** extends between the tongue and groove arrangement to assist in retaining the panels in their proper relationship to one another, and in the case of an overlapping arrangement of the panels such as such in FIG. **8** of the drawings, a nail or the like can be employed for nailing the panel to a rafter extending thereunder. The roof structure shown in FIGS. **8** and **9** of the drawings is one to be employed in the formation of a slanted roof, with the rafters underlying the roof likewise disposed on a slant and retained in that position in a well known manner.

In installations employing a roof such as shown in FIGS. **8** and **9** of the drawings, a suitable weather-resistant strip **37** overlies the abutting edges of the panels so as to prevent the entry of rain water, etc., at the joint between the adjoining panels. The panel employed in forming the ends of the roof may be suitably capped as by a weather-resistant end piece **38** which is nailed or otherwise secured to the ends of the panels. A mastic **21** is placed between the tongue and groove arrangement shown in FIGS. **8** and **9** of the drawings to assist in retaining the panels in their assembled relationship to one another. If deemed necessary, rafters can extend below the joined panels to support the same in their proper assembled position.

Referring now to FIG. **10** of the drawings, there is shown therein the manner in which the customary rafters employed in the support of a roof are mounted on the upper position of the panels and secured thereto to retain the rafters in their proper supporting position. In FIG. **10**, there is shown a pair of panels **10** which have been joined at the edges thereof in the manner set forth previously with respect to FIGS. **5** and **6** of the drawings. The panels **10** are each provided at their top surfaces with the load-bearing surfaces **15** shown more particularly in FIG. **6** of the drawings. To provide for a rafter-supporting surface, the upper edges of each panel **10** are cut to form a substantially U-shaped area **39**. The U-shaped area comprises a pair of vertically extending side pieces **40, 41** joined at the bottom thereof by a horizontally extending connector member **42**. The aforesaid U-shaped member may be constructed of wood or any other suitable material and the same is lined with a metal reinforcement strap **43** which is secured to the said U-shaped member as by nailing or any other suitable means to effect the retaining of the strap within the U-shaped area. In instances where a flat roof is to be installed, the rafters are placed within the confines of the aforementioned U-shaped area and are caused to extend horizontally across the area of the dwelling and to be similarly placed in corresponding U-shaped areas provided for on the opposite side of the dwelling. With the rafters so assembled, one for each of the aforesaid U-shaped areas, the same can be nailed therein in order to retain the same in their proper supporting position. A rafter is illustrated generally at **44** in FIG. **10** of the drawings. In instances where the installation calls for a slanted roof structure, the rafters **44** are placed in the aforesaid U-shaped area and disposed at the desired angle to form the slanted roof-supporting surfaces and then nailed or otherwise secured therein in any known manner.

FIG. **11** of the drawings discloses the manner in which a panel constructed in the manner aforesaid is provided with a window casing and trim which is formed within the panel at factory site. The casing and trim are shown at **45** and **46**, respectively, and the same may comprise an integral structure having formed therein the customary guide rails for the window, screen, and the like. To assemble the casing and trim within the panel, an opening corresponding to the area to be occupied by the casing is cut away from the interior and exterior facing of the panel. Then, the panels with their cut-outs are placed in a suitable molding apparatus with the casing and trim within the aforesaid cut-outs, and the foamable material is poured into the mold area to completely fill in the space between the aforesaid interior and exterior facings **11, 12** and the area defined between the load-bearing surfaces **13, 14** and the casing **45**. The foamable material **18**, when caused to set, will adhere tightly to the casing **45** and thus retain the same within the panel without resorting to any extraneous means for holding the same in proper position.

Referring now to FIG. **12** of the drawings, there is disclosed therein a door assembly which can likewise be positioned within a panel assembly in substantially the same manner as previously described with respect to the window unit shown in FIG. **11** of the drawings. The door frame comprises a unitary structure formed of metal, plastic or any other suitable material and includes the trim areas **48** and **49** which are adapted to be disposed on either side of the panel opening formed for the reception of the frame. The door frame may be formed with the necessary stops for the conventional swinging door and also for the customary storm or screen door. To assemble the door frame and its hinged storm or screen and main door within the panel **10**, the opening of the required size is formed in both the interior and exterior facings, and the door frame, minus the aforementioned doors, is placed within the formed openings. This assembly is placed within a suitable mold apparatus, and with the load-bearing surfaces **13** and **14** secured to the facings as shown in FIG. **12** of the drawings, the foamable material **18** is poured into the mold, thus filling the area defined between the aforesaid facings and load-bearing surfaces and the area bridged by the door frame. Upon setting of the foamable material, the same is caused to adhere to the area of the door frame coming in contact with said foamable material, thus retaining the frame within the confines of the opening formed therefor in the facings in the manner aforesaid. Thus, it will be seen that the door frame can be installed within a panel of the present invention, and that the same can be assembled at factory site and later conveniently shipped to the building site for assembly with next adjacent panels in the manner previously described.

To erect a building with the panels of the present invention, the usual foundation, including the customary sub-flooring, is first formed in the well known manner with two-by-fours or the like extending over the edges of the sub-flooring and secured thereto in any known manner. Thereafter, the panels of the present invention, which have been formed at factory site and which are of the desired height and width, will be secured to the two-by-fours as by nails, etc., with the exterior facings of the panels extending below the sub-flooring, sill and foundation so as to present a barrier for the entry of rodents and the like to the area under the sub-flooring. Following the placement of the panels in the manner aforesaid, and following the placement of a plurality of panels in this manner, a header plate of considerable length (not shown) is nailed or otherwise secured to the load-bearing surfaces **15** of each of the panels, thus rigidifying the panel assembly. Thereupon, the roof may be applied to the dwelling in the manner aforesaid to complete the structure.

In the description of the invention, I have designated certain types of material which can be employed to form the interior and outer facings. Obviously, many other type materials can be employed in the formation of the panels, and likewise, while I have referred to polyurethane as the foamable material employed between the panel facings, it is obvious that other type foamable material can be employed for accomplishing the same purpose. Also, if desired, a suitable fire-resistant material may be added to the foamable material so as to add to the fireproofing qualities of the panel. Also, it is conceivable that an insect or rodent repellant could be added to the foamable material so as to render the installation rodent and/or insect free.

Prefabricated panel units constructed in accordance with the invention are rigid modular units which replace the heavy mullions and floating panels of conventional curtain-type building walls. The normal loading is distributed throughout the entire building wall formed by these panels joined together. Also, the panel units constructed in accordance with the invention may be shipped and handled with a minimum of expense and trouble and can be quickly erected on the building site in attractive and effective building wall structures.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from spirit and scope of the invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

I claim:

1. A building panel comprising spaced-apart inner and outer facing members with a core of a foamed material therebetween, load-bearing and confining surfaces secured to the top, bottom and side edges, said surfaces being separate and independent from the facing members and adapted to support contiguous panels and to confine the foamed material, there being an opening formed between the side edges of said panel, a unitary hollow casing member within said opening with the walls thereof extending beyond the plane of said inner and outer facing members, the portion of the casing extending beyond the outer face member being bent outwardly towards said facing member forming a trim area for said member, said foamable material constituting the only means of adhesion for said casing in the panel.

2. The structure set forth in claim 1 in that the portion of the casing extending beyond the plane of the inner face member is bent towards said facing member forming a trim area for said member.

3. The structure recited in claim 1 wherein said casing houses a window therein.

4. The structure recited in claim 2 wherein said casing houses a door therein.

* * * * *