

[54] **INSULATED PREFABRICATED BUILDING MODULE**
[72] Inventor: Bobby G. Johnson, P.O. Box 1621, Durham, N.C. 27702
[22] Filed: Oct. 24, 1969
[21] Appl. No.: 869,054
[52] U.S. Cl.52/309, 50/314, 52/586, 52/629
[51] Int. Cl.E04b 2/10, E04b 2/38, E04d 3/35
[58] Field of Search.....52/309, 600, 314, 586, 629, 52/404, 406, 615; 161/159-161

[56] References Cited

UNITED STATES PATENTS
3,051,277 8/1962 Day52/586
3,325,585 6/1967 Brenneman.....52/586
3,163,434 12/1964 Krueger.....296/1 P

3,258,889 7/1966 Butcher52/407
3,302,362 2/1967 Lang.....52/309

FOREIGN PATENTS OR APPLICATIONS

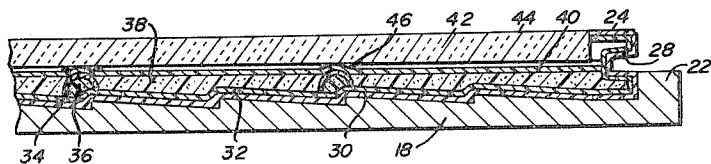
598,425 6/1960 Canada.....161/161

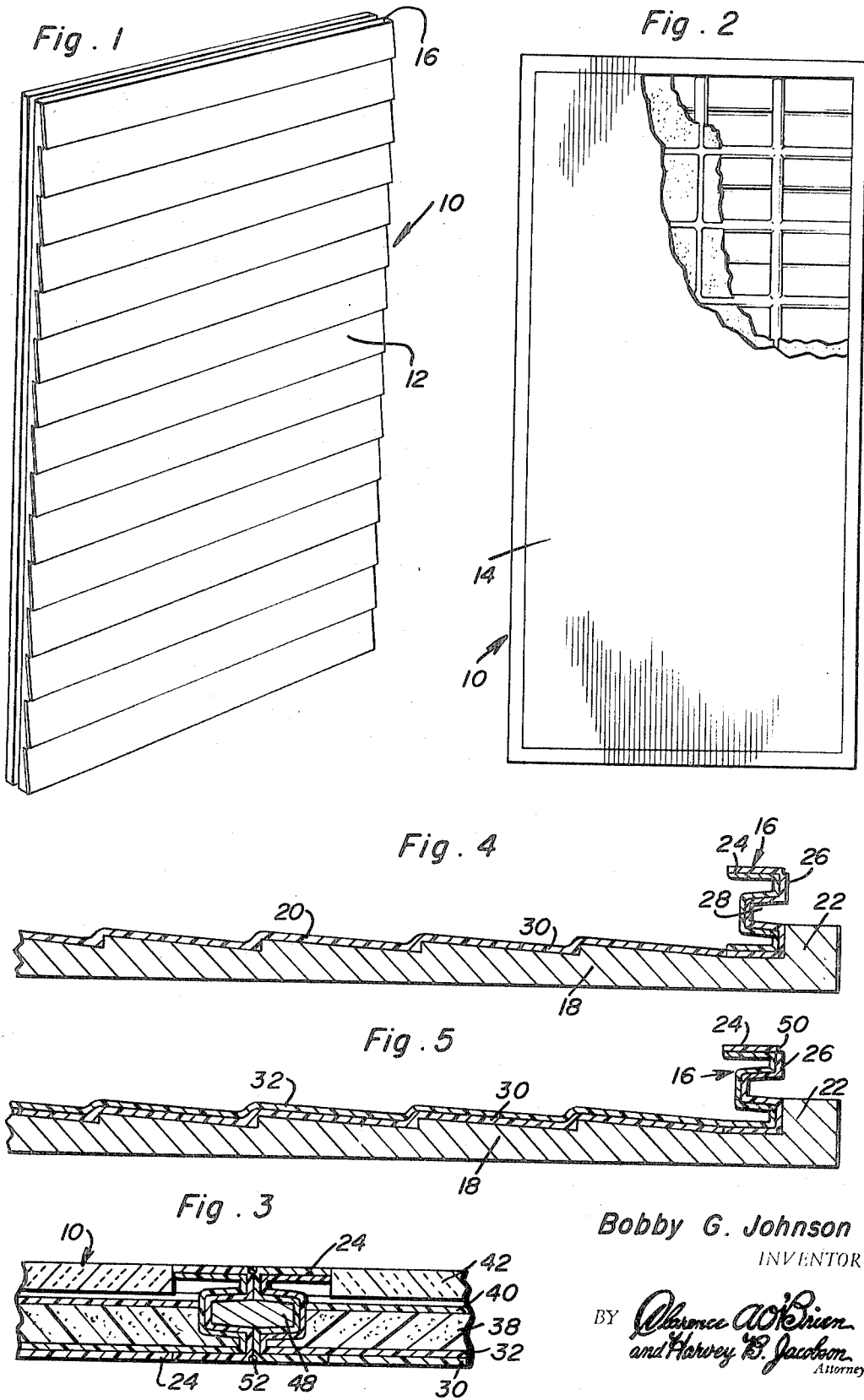
Primary Examiner—John E. Murtagh
Attorney—Clarence A. O'Brien and Harvey B. Jacobson

[57] ABSTRACT

A building structure module in the form of a wall panel capable of load bearing constructed of glass fiber reinforced plastic resin, semicylindrical structural members for load bearing and reinforcement and foam plastic for insulation purposes with the module having fire-retardant properties and a peripheral edge channel member to enable adjacent modules to be readily interconnected. The module is constructed by employing a procedural method so that the sequential steps are performed in a production line technique to facilitate construction of the modules.

5 Claims, 10 Drawing Figures





Bobby G. Johnson
INVENTOR.

BY *Clarence A. O'Brien*
and *Harvey E. Jacobson*
Attorneys

Fig. 6

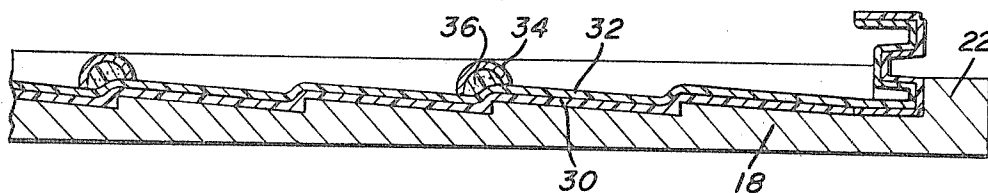


Fig. 7

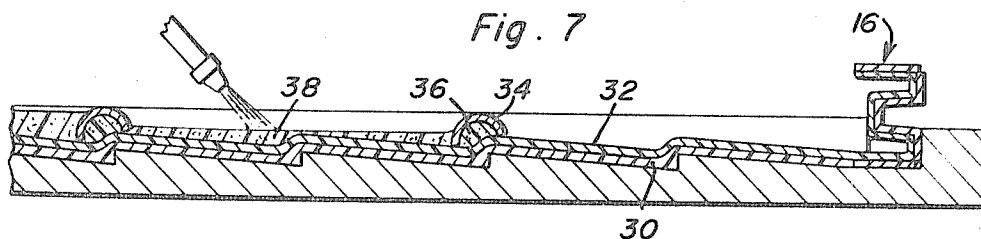


Fig. 8

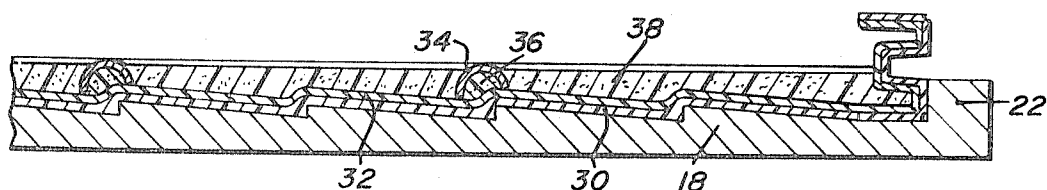


Fig. 9

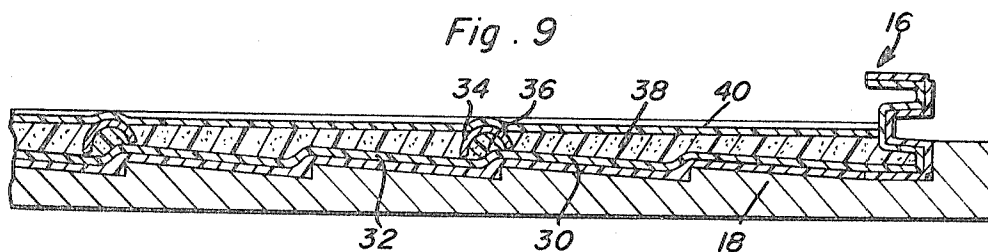
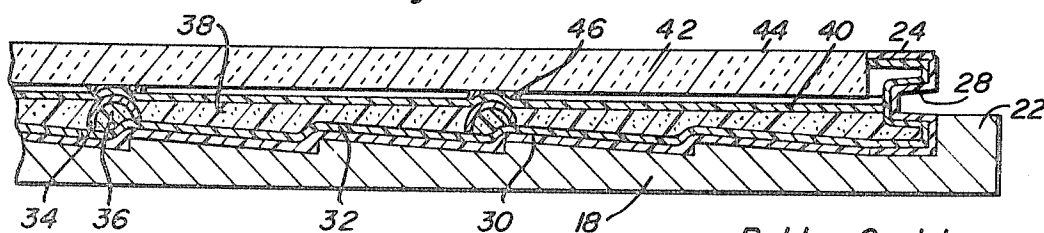


Fig. 10



Bobby G. Johnson

INVENTOR.

BY *Clarence A. Olson*
and *Harvey B. Jacobson*
Attorneys

INSULATED PREFABRICATED BUILDING MODULE

The present invention generally relates to a building structure module that is prefabricated and insulated and incorporates therein structural features enabling a wall panel to form a load-bearing element in a building structure.

An object of the present invention is to provide a building structure module which has an external surface of selected configuration formed in a mold and provided with any suitable appearance characteristics in a gel coat together with fiber glass material on the inner surface thereof and semicylindrical reinforcement and load-bearing elements joined thereto in a grid pattern to provide both lateral and longitudinal stability to the module.

Another object of the present invention is to provide a module in accordance with the preceding object in which the interior surface of the module with the reinforcement members thereon is provided with a foam urethane layer which terminates slightly below the crest of the semicylindrical reinforcement member with the foam plastic material being fire retardant along with the other components of the module.

A further object of the invention is to provide a module in accordance with the preceding objects in which the foam insulating plastic material is covered with a layer of fiber glass impregnated resin to provide a complete module which may be employed with various interior surfaces depending upon the use of the module or panel.

Yet another object of the present invention is to provide a building structure module having a channel fitting around the periphery thereof in which the channel faces outwardly and is adapted to receive a connector received telescopically in facing channels together with a seal between the periphery of the adjacent panels to provide a continuity of the wall structure and to provide a sealed joint between adjacent modules.

Yet another important object of the present invention is to provide a prefabricated insulated building structure module constructed by employing a mold having the desired exterior shape incorporated therein in which a sequence of steps is followed to form the finished product without removing the module from the mold until it has been completed with the module being relatively inexpensive to manufacture but versatile in utility, load bearing in character, fire-retardant and neat and attractive in appearance.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a perspective view of the building structure module of the present invention.

FIG. 2 is a plan view from the interior thereof with the interior components broken away to various levels illustrating the internal structural details of the module.

FIG. 3 is a detailed sectional view illustrating a typical joint between adjacent modules.

FIG. 4 is a sectional view of a mold with the gel coat thereon and the preformed peripheral channel therein.

FIG. 5 is a sectional view similar to FIG. 4 but illustrating the first layer of glass fiber reinforced plastic resin applied thereto.

FIG. 6 is a sectional view illustrating the next step in the procedure in which semicylindrical foam plastic filled reinforcing and strengthening members are added to the module.

FIG. 7 is a sectional view illustrating the manner in which the foam plastic is applied.

FIG. 8 is a sectional view illustrating the module with the foam plastic disposed within the grid work defined by the reinforcing members and being covered to a height slightly below the crests of the reinforcing members.

FIG. 9 is a sectional view similar to FIG. 8 illustrating the next procedure step in which a layer of fiber glass reinforced resin is applied to the foam plastic.

FIG. 10 is a sectional view similar to FIG. 9 illustrating the mounting of an inside insulating panel to form the module il-

lustrated in FIGS. 1-3. Referring now specifically to the drawings, the building structure module of the present invention is generally designated by the numeral 10 and is illustrated in FIGS. 1-3, the module 10 includes an exterior surface 12 and an interior surface 14 joined peripherally by a channel-shaped edge member 16. As illustrated, the exterior surface 12 is constructed to provide the appearance of shiplap siding but it is pointed out that other appearance characteristics may be provided on the exterior surface of the module 10 without departing from the present invention. By selecting the desired shape and configuration of the exterior surface and the material involved, substantially any appearance characteristics may be provided for the external surface of the module. The internal surface 14 may be planar or may also be provided with any finish that may be desired depending upon the use of the panel and, in some instances, the interior finish may be omitted where the interior appearance characteristics are of no concern.

In the construction of the module, a generally flat mold 18 is provided which may be in the form of a continuous mold such as on a conveyor or the like capable of movement in a production line. The upper surface of the mold 18 is provided with a shiplap surface configuration 20 conforming with the surface 12 of the module and an upstanding edge may be provided on the mold 18 as designated by the numeral 22 to provide a retainer for the preformed channel 16 which extends peripherally of the panel or module 10. The channel 16 includes a pair of substantially parallel flanges 24 interconnected by a web 26 having an inwardly disposed channel-shaped groove or recess 28 formed longitudinally and continuously therein so that each side of the module will include surfaces 26 on either side of the channel-shaped recess 28 and flanges 24 forming a continuation of the external and internal surface of the module 10.

The mold 18 is provided with the usual mold release material of conventional and well-known construction which is used in the usual manner and thereafter, a gel coat 30 is formed in the mold 18 and the gel coat may be white in color or any other color as desired depending upon the finish on the exterior surface of the module. For the shiplap configuration, a white gel coat is desired and the gel coat is placed in position and after setting, a relatively thin coating of fiber glass reinforced resin 32 is sprayed over the interior surface of the gel coat 30 by the use of a conventional "chopper gun."

The channel 16 was preformed with the exterior gel coat and the inner layer of fiber-reinforced resin or plastic 32 and when the gel coat and the fiber glass reinforced layer 32 is applied to the mold, the channel 16 will, in effect, become unitary with the remainder of the module inasmuch as the fiber glass reinforced resin on the channel and the fiber glass reinforced resin sprayed onto the gel coat will unite into a single unitary structure.

Before the reinforced fiber glass resin layer 32 is completely dry and while it is still slightly tacky, semicylindrical members 34 are placed on the coating 32 and adhered thereto by the tackiness of the coating 32. The reinforcing members 34 are continuous longitudinally of the module and are spaced predetermined distances apart and the transverse reinforcing members are interrupted by the longitudinal members and thus form a gridwork having predetermined space relationship such as being on 16-inch centers. The interior of the semicylindrical reinforcing members 34 are filled with a foam plastic 36 prior to assembly thus producing a grid work of reinforcement members with the longitudinal reinforcement members serving as load-bearing reinforcements while the lateral reinforcement members serve to provide lateral stability and lateral load bearing to the modules. The foam plastic may be foam polyurethane having fire-retardant characteristics and the other components of the plastic material including the fiber glass reinforced plastic and the gel coat may have fire-retardant characteristics.

After the semicylindrical reinforcement members 34 have been put into position, the area between the reinforcement

members is provided with a layer of foam polyurethane 38 which is foamed in situ to a depth so that the crest of the semicylindrical reinforcement members 34 will project above the upper surface of the foam plastic 38. The foam plastic is approximately 1 inch in depth depending upon the insulation requirement desired and will have fire-retardant characteristics as well as appropriate insulating characteristics.

After the foam plastic layer 38 has been foamed in place, and after it has substantially set up, a second layer of fiber glass reinforced resin 40 is applied over the foam plastic as well as the semicylindrical reinforcement members 34 to retain and seal the foam plastic and to structurally interconnect all of the components of the panel including the gel coat, plastic material 32, foam plastic material 38, reinforcement 34 and the panel members 16 thus forming a rigid assembled unit in which the inner flange 24 is spaced above the layer of fiber glass material which is also applied with a "chopper gun" in a manner well known in the art.

If a finished interior construction is desired, a panel 42 of foam plastic material having a finished surface 44 thereon may be placed against the crest of the fiber glass material 40 defined by the reinforcement members 34 and bonded thereto by virtue of the fiber glass layer 40 not being completely set up with the bonding area being designated by the numeral 46 or if the fiberglass 40 has set up, separate bonding adhesive may be employed along the crest formed by the reinforcement members which provides level ridges for attachment of the panel 42. As illustrated, the panel 42 has an inner surface generally flush with the surface of the channel-shaped member 24 and this joint may be sealed or otherwise bonded together in any suitable manner. Depending upon the overall thickness desired for the panel and the insulation characteristic thereof, the insulated foam plastic panel 42 may be relatively thin or may be only a finish panel with no insulation characteristics if desired. In any event, a complete panel will be formed having the peripheral channel which may be joined to other panels by the use of a joining strip or connecting member 48 as illustrated in FIG. 3. As illustrated, the connecting strip 48 is shaped to telescopically fit tightly within the spacing channels 28 and the connecting strip 48 may be secured in place by bonding material or the panels may be secured together in any suitable manner employing any suitable fastening devices. Also, as illustrated, each outer corner of the channel 16 is provided with a groove 50 receiving a tubular seal 52 to provide an effective seal between adjacent panels and to maintain adjacent panels in weathertight condition.

The modular panel may be employed as a load-bearing wall unit or a nonload-bearing partition and also may be employed in various panel arrangement including ceilings, floors, roof structures and the like. Also, the panel may be constructed in various shapes and configurations including angular corner panels. For example, the corner panels at the corner of a building may have portions thereof arranged at 90° angles or at the corner of a roof, the panels may be arranged at 60° angles or any other suitable angle depending upon the pitch of the roof. Also, the panel may be constructed with an overhang with a fascia or gutter incorporated therein by changing the shape and configuration of the mold while employing the same procedures and techniques. For example, a channel may be faced downwardly on the interior surface of a module at an appropriate angle for connecting registry with an upwardly facing channel on a wall module with the distance of overhang being variable by varying the positioning of the channel on the

interior surface of the module. The channel may be formed integral with the interior surface of the module during the last coating operation so that the fiber glass resin coating 40 will also secure the channel in place in downwardly facing and appropriate angular position.

The time required for a sequence of the operation may be varied depending upon conditions of temperature and humidity. For example, the module may be moved through a drying oven or the like to accelerate the procedure. Various commercially available materials may be employed in constructing the modules having desired fire-retardant characteristics, strength characteristics and the like. Also, the semicylindrical reinforcing members may be constructed of cardboard material, metal or plastic material. By varying the size characteristics of the panels, various modular dimensions may be constructed and the curvature and angles may be varied to enable the modules to be employed in constructing various types of buildings, shelters or the like.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. (Amended) A building structure module comprising a facing panel of plastic material, a plurality of reinforcement members attached to the inner surface of the facing panel, foam plastic insulating material on the inner surface of the facing panel, said reinforcement members being in the form of semitubular members having the longitudinal edges thereof secured to the facing panel and having a central portion spaced away from the facing panel to rigidify the facing panel and provide load-bearing characteristics to the module, said reinforcement members being arranged in a grid pattern with the reinforcement members extending in one direction on the facing panel being continuous, said reinforcement members being filled with foam plastic insulating material, the foam plastic insulating material being disposed throughout the enclosed areas defined by the grid work of the reinforcement members and having a depth slightly less than the depth of the reinforcement members so that the crest of the reinforcement members will be exposed above the foam plastic, and a layer of glass fiber reinforced resin plastic overlying the foam plastic insulating material and the crest of the reinforcement members.

2. The combination of claim 1 together with a peripheral channel-shaped member integral with the facing panel and the other components of the module, said channel having an outwardly facing groove for receiving a connector for connecting adjacent modules.

3. The structure as defined in claim 2 wherein said facing panel includes a gel coat layer and a layer of glass fiber reinforced plastic resin, the gel coat layer having a finish and shape to provide a desired exterior appearance to a module for use in a building structure.

4. The structure as defined in claim 3 in which said gel coat is shaped to provide a shiplap finish to the exterior surface of the facing panel.

5. The structure as defined in claim 4 wherein the interior surface of said module is formed by an interior panel flush with the inner surface of the peripheral channel member.

* * * * *