PREFABRICATED PORTABLE BUILDING

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ABSTRACT OF THE DISCLOSURE

A prefabricated portable building installation has a prestressed cambered roof section and vertical wall sections formed of rectangular panels rigidly connected to and supported by a floor section which rests on inwardly spaced skids such that the weight of the prestressed roof and walls is carried into the outer peripheral edges of the floor to develop a bending moment about the skids countering any concentrated loading or weight applied to the floor section between the skids. Further, the cambered roof section is provided with undercut surrounding edges to afford better drainage.

This invention relates to novel and improved building structures, and more particularly relates to a portable, prefabricated building installation being characterized by its structural stability, unitary construction and weather-resistance.

The present invention is best exemplified by reference to its use in housing packaged electronic systems, such as for microwave communication stations. Customarily, these stations are situated in isolated locations and necessitate an enclosure which has good insulating and weather-resistance characteristics while requiring a minimum of maintenance. Moreover, it is desirable that the building including the packaged system be entirely factory prefabricated and assembled prior to its transportation to the intended site of use, and at the site can merely be anchored in place ready for operation without further assembly. In this relation, a particular problem inherent in housing such systems has to do with external and internal loading of the building with the following, namely, may be caused by snow and wind as well as by the internal weight of the system and personnel within the building. In accordance with the present invention a building structure has been devised which is capable of withstanding external and internal loads without resorting to complicated bulky roof, roof or wall sections, and furthermore wherein the weight due to external loading is evenly distributed and carried into the floor structure in such a way as to counteract internal loading on the floor. At the same time, the building structure according to the present invention is very compact, economical to manufacture, simple to install and is readily serviceable for use in virtually any application requiring a weatherproof, dustproof, easily portable installation with high strength and excellent insulating characteristics.

Accordingly, it is the principal and foremost object of the present invention to provide for a novel and improved building structure capable of being fabricated and assembled at the factory prior to shipment to the intended site of use, and wherein once installed the building structure is capable of withstanding heavy loading, both externally and internally, such as, may be attributable to wind, snow, or equipment and personnel housed within the building.

It is another object of the present invention to provide a prefabricated building structure adaptable for use in housing electronic systems and which is characterized by being rugged and durable with excellent insulating and weather-resisting properties.

It is a further object of the present invention to provide a prefabricated fiberglass, lightweight building installation which is prestressed in a novel and improved manner to counteract both external and internal loading applied thereto and specifically wherein the building is composed of prefabricated fiber glass wall panels of uniform thickness being constructed such that external loading applied to the roof and wall sections is carried into the floor section to counteract internal loading applied to the floor section in use.

It is an additional object of the present invention to provide in a prefabricated building installation for a novel and improved fiber glass roof structure which is prestressed to more effectively withstand both external and internal loading and further to facilitate good drainage and runoff for rain and snow.

In accordance with the present invention, there has been devised a novel and vastly improved building structure which is essentially made up of fiber glass panel sections that may be preassembled at the plant to form a unitary housing of non-porous, free of seams except at the overlapping edges of the outer fiber glass reinforced surface layers construction. The roof structure is raised or arched preferably by prestressing to more effectively withstand heavy loading and is also provided with depressed surrounding edges to afford improved drainage characteristics. Further, the entire weight of the roof and wall sections is transmitted through the outer peripheral edges of the floor section, the latter resting on inwardly disposed base support means whereby the weight of the walls and roof will develop a bending moment acting to oppose internal loading or weight applied to the floor section. Yet, the entire building structure is comprised of roof and floor sections of uniform thickness, relatively light in weight in which combination offer a high degree of structural stability and strength for use in prefabricated, portable buildings of the desired size and basic configuration.

The above and other objects, advantages and features of the present invention will become more readily understood and appreciated from a consideration of the following detailed description of a preferred form of the present invention when taken together with the accompanying drawings, in which:

FIGURE 1 is a perspective view of a building installation in accordance with the present invention.

FIGURE 2 is an enlarged, fragmentary sectional view of a building section formed in accordance with the present invention.

FIGURE 3 is a somewhat schematic view illustrating the roof line of the building.

Referring in more detail to the drawings, there is shown by way of illustrative example a building installation adaptable for use in housing electronic systems, such as a microwave communication system. As shown in FIGURE 1, the building installation is broadly comprised of a prefabricated building unit 12 having a base support assembly 14 to support the building on a foundation here represented by concrete piers 15 imbedded in the ground. In the preferred form, the building unit 12 is illustrated as being generally rectangular in configuration and is formed of horizontal floor and roof sections 16 and 18, respectively, together with a pair of side wall sections 19 and a pair of end wall sections 20, all sections being rectangular in configuration and being rigidly connected together into unitary relation in a manner to be described. Essentially, in the form illustrated, the walls are designed to be of maximum strength and of minimum weight with good insulating characteristics; and to this end, each of the floor, wall and roof sections are composed of a relatively thick, but lightweight panel of one-piece con-
struction and which panels in assemblage relation are surfaced with an external fiber glass layer to provide a seamless, watertight, hermetic enclosure.

In the specific form of construction and assembly illustrated in FIGURE 2, the floor panel 16 is formed of an upper, relatively thick skin member 22 and a lower skin member 23 secured by bonding to opposite sides of a frame containing a structural insulating layer 24. The frame is defined by a series of beams 25 and 26 for extension along opposite sides and ends of the floor panel with joists, not shown, disposed at spaced intervals across the width so as to lend increased rigidity and strength to the panel. In this relation, the inner and outer skin members 22 and 23 may be suitably composed of plywood or asbestos board and the layer 24 composed of a resin-treated, honeycomb structural insulating material, whereby to define a lightweight but high strength panel. The external surface of the lower skin 23 as well as the exposed edges of the stud members 25 along the lateral edges of the floor panel are coated with a fiber glass layer 26 which may be sprayed or otherwise applied in bonded relation to the desired thickness.

In a similar manner, the side and end wall panels 19 and 20 are each correspondingly formed of inner and outer skin members 28 and 29 separated by an intermediate insulating layer 30 disposed within a framework including headers 31 and 32 extending horizontally between the inner and outer skin members and along the upper and lower edges of each panel. A side wall panel 20 is illustrated in FIGURE 2, and it will be noted that the lower edge of the wall panel as defined by the inner skin member 31 and the header plate 32 rests on the upper surface of the floor panel with the outer skin member 29 including an extension 29' projecting downwardly and overlapping the outer exposed edge of the floor panel. Again, the external surface of the outer skin is covered by an outer fiber glass layer 34, the latter being applied over the extension 29' and being bonded along the inner surface to the fiber glass layer 26 covering the exposed edge of the header plate 25 on the floor panel. The end wall panels are likewise assembled into overlapping relation to the exposed peripheral edges of the floor panel, and the four wall panels are correspondingly attached in fixed relation to the floor panel by suitable means, such as, lag screws 35 projecting upwardly through the header 25 and into the lower header 32 in each of the wall panels. Adjoining vertical edges of the side and end wall panels are also aligned and secured together into unitary relation. In the roof panels, the insulating layer may be composed of either a honeycomb or other cellular insulating material, fiber glass batting, or may be left as a dead space between the members 28 and 29.

In turn, the roof section 18 is defined by a unitary panel composed of inner and outer skin members 38 and 39, respectively, separated by an intermediate structural insulating layer 40 contained within a frame having header plates 41 extending along opposite sides and ends of the roof panel and again with intermediate joists, not shown, arranged at spaced intervals across the width of the roof panel. In general, the roof panel section is co-extensive with the floor panel and of uniform thickness throughout; however, as illustrated in FIGURE 3, the panel is prestressed to form an arched or cambered roof section inclining downwardly toward opposite ends of the roof from a common center line extending at right angles to the length of the building unit. The degree of camber given the roof section may be very slight and may be established by forming a slight convexity in the upper edge portions 42 of the side wall panels 19; that is, by curving or inclining the upper edges 42 downwardly in opposite directions away from the mid point. Thereafter, the roof panel is bent to conform to the upper convex edges 42 when attached in place to the side and end wall panels. Further, it will be seen that the outer skin member 39 terminates in beveled edges 43 spaced inwardly of the outer peripheral edges both along the sides and ends of the roof panel thereby forming a recessed or lowered upper surrounding edge portion. An external fiber glass covering 44 is once again applied to the external surface of the member 39 and to the exposed upper surface of the studs 41. In addition, the vertical adjoining edges between the side and end walls as well as the horizontal adjoining edges betwixt the wall and roof panels are covered with preformed fiber glass caps 45 and the headers 41 of the roof panel are rigidly connected to the upper edges of the wall panels preferably by bonding together. In assembled relation it will be evident that the surrounding edges along with the slight rise given the roof section will cause water to run off or drain age thereby to prevent accumulation of water on the roof section. Moreover, the prestressed, arched roof section will more effectively withstand horizontally or vertically applied loads without increasing the thickness of, or otherwise reinforcing, the roof section.

To complete the building unit, suitable apertures may be formed in the wall or roof panels, for example, to accommodate a vent 48 and door 49 as illustrated in FIGURE 1. Thereafter, the base support assembly 14 is secured to the underside of the floor panel 16, and the assembly 14 may be suitably comprised of a pair of longitudinally extending skid members 15 interposed by transversely extending channels or angle irons 53 at spaced intervals therebetween as shown dotted in FIGURE 1. It is important that the base support assembly be dimensioned such that the skids 52 are mounted in inwardly spaced but adjacent relation to the lateral edges of the floor panel, that is to say, are positioned relatively near the lateral edges and away from the center line of the floor panel. In this way, the weight of the roof and wall sections is carried into the lateral edges of the floor panel and outwards of the skid members 52 to develop bending moments downwardly about the skids and in a direction tending to raise the intermediate portion of the floor panel between the skid members. Preloading of the floor section in this manner will thus tend to counteract internal loads applied to the center of the floor panel.

Once assembled as described, the building unit may be equipped according to its desired application prior to shipment, and most desirably this is accomplished by mounting the equipment in permanently attached relation to the interior of the panel sections. The building unit as described will thus constitute a prefabricated assembled structure ready for transportation to the intended site of use. At the side, the concrete piers or footings 15 are aligned to rest beneath the corners of the building, and opposite ends of the skids 52 are suitably anchored to the fittings by means of anchor bolts 54 and clamping plates 55 which wedgily engage the lower edge of the skid 52.

It will be apparent from the foregoing that a building structure of the type described may assume various configurations and sizes while nevertheless incorporating the desired characteristics as hereinbefore set forth. Specifically, the prestressed roof section as well as the recessed surrounding edges of the roof section and manner of mounting the building unit on a base support assembly may be adopted and followed in rectangular, square or circular building shapes; or a plurality of building units may be joined together while incorporating the same basic building structure. In particular by establishing rigid connection between the roof, wall and floor sections as described and further supporting the building on a base support assembly disposed inwardly of the connection between the wall and floor panels, the entire structure is effectively prestressed and preloaded to withstand both internally and externally applied loads, and will afford greatly increased structural stability and strength in a relatively lightweight structure. Of course, the size of the building will be dictated by its intended use and application and,
in larger sized buildings it may be desirable to employ one or more additional skid members beneath the floor panel to serve as an added means of support. Moreover, depending upon the configuration of the building, the roof section may be arched or raised inwardly either from opposite ends or opposite sides of the building thereby stressing the roof section in either direction to withstand loading and to prevent accumulation of water thereon. In this connection, and as an alternative to formation of upper convex edges, the roof section may be cambered simply by placing shims or spacers between the upper edges of the side wall panels and the roof section, the shims being of progressively decreasing thickness away from the center. Although forming no part of the present invention, it will be further noted that the fiber glass coating may be applied individually to each of the panels prior to assembly or may be applied in a single operation following assembly of the panels. As employed herein, the term fiber glass layers or coating has specific reference to glass fibers bonded together by a suitable bonding agent, such as, a synthetic resinous compound which when applied will harden and set into firm bonded relation to the panel surfaces.

While a preferred embodiment of the present invention has been set forth and described herein, it is to be understood that various modifications and changes may be adopted, such as, in the composition of materials employed, construction and arrangement of parts as well as in the configuration and shape of the building units and installation, without departing from the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A prefabricated portable building comprising in combination a floor section, vertical wall sections being rigidly connected to and supported by said floor section, a prestressed cambered roof section inclining upwardly and inwardly toward the center of said building and being rigidly connected to and supported by said wall sections, said floor, wall and roof sections each being of uniform thickness, an outer fiber glass layer being applied to said floor, wall and roof sections to define a non-porous enclosure, and base support members secured to the underside of said floor section and spaced inwardly of the connection between said wall sections and said floor section.

2. A prefabricated portable building unit according to claim 1, said floor, wall and roof sections each being defined by a rectangular panel section formed of inner and outer spaced skin members and a structural insulating layer separating said skin members, and said roof section being cambered in a direction lengthwise of said building.

3. A prefabricated portable building according to claim 1, the outer peripheral surface of said roof section being depressed beneath the plane of the upper surface of said roof section.

4. A prefabricated portable building according to claim 1, said base support members being further characterized by including skid members extending parallel to the length of said building in inwardly spaced adjacent relation to the lateral edges of said floor section.

5. A prefabricated fiber glass portable building installation comprising in combination a floor panel, a pair of side wall panels and a pair of end panels rigidly connected to and being supported by said floor panel, a prestressed upper roof panel being rigidly connected to and supported by the upper edges of said wall panels, each of said panels being of uniform thickness and being formed of inner and outer spaced skin members and an insulating layer therebetween, said panels being assembled to define a unitary, rectangular enclosure and an outer fiber glass reinforced surface layer applied to the outer surfaces of said assembled panels to define a non-porous enclosure and base support members being secured to the underside of said floor panel and in inwardly spaced parallel relation to the connection between said wall panels and said floor panel.

6. A prefabricated fiber glass portable building installation according to claim 5, said roof panel being further characterized by inclining inwardly and upwardly toward a center line directed at right angles to the direction of extension of said base support members.

7. A prefabricated portable building according to claim 5, said side wall panels having upper convex edges inclining downwardly toward opposite ends, and said roof panel being connected to conform to the contour of the upper edges of said side wall panels.

8. A prefabricated portable building installation according to claim 5, said side and end wall panels including outer skin members projecting downwardly in overlapping relation to the peripheral edges of said floor panel, and said fiber glass surface layer being applied in the joint formed between the outer skin members on said wall panels and the peripheral edges of said floor panel.

9. A prefabricated portable building installation according to claim 5, the upper skin member of said roof panel terminating inwardly of the peripheral edges of said roof panel to define upper relatively flat, lowered surface portions in surrounding relation to the upper surface of said roof panel.

References Cited

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Date</th>
<th>Inventor(s)</th>
<th>Class Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>853,560</td>
<td>5/1907</td>
<td>T. R. Ott</td>
<td>52—143</td>
</tr>
<tr>
<td>1,529,516</td>
<td>5/1923</td>
<td>Thorne</td>
<td>52—299 XR</td>
</tr>
<tr>
<td>2,297,058</td>
<td>9/1942</td>
<td>Hansenburger et al.</td>
<td>52—295 XR</td>
</tr>
<tr>
<td>2,365,934</td>
<td>12/1944</td>
<td>Black</td>
<td>52—94 XR</td>
</tr>
<tr>
<td>2,894,783</td>
<td>7/1959</td>
<td>Bird</td>
<td>52—288 XR</td>
</tr>
<tr>
<td>3,057,119</td>
<td>10/1962</td>
<td>Kessler</td>
<td>52—222 XR</td>
</tr>
<tr>
<td>3,125,186</td>
<td>3/1964</td>
<td>Adkinson et al.</td>
<td>52—143 XR</td>
</tr>
<tr>
<td>3,330,080</td>
<td>7/1967</td>
<td>Grieb et al.</td>
<td>52—309 XR</td>
</tr>
<tr>
<td>3,531,173</td>
<td>7/1967</td>
<td>Eishner</td>
<td>52—309</td>
</tr>
</tbody>
</table>

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P. C. FAW, Assistant Examiner.
U.S. CL. X.R.
52—288, 299, 309