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Bergmann, Jr.

[11] **3,886,699**

[45] **June 3, 1975**

[54] **PORTABLE BUILDING STRUCTURE**

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[52] **U.S. Cl.** **52/90;** 52/281; 52/582

[51] **Int. Cl.** **E04b 1/343**

[58] **Field of Search** 52/57, 90, 127, 204, 281, 52/284, 285, 282, 582, 586, 91, 92, 93, 615, 309, 619, 406

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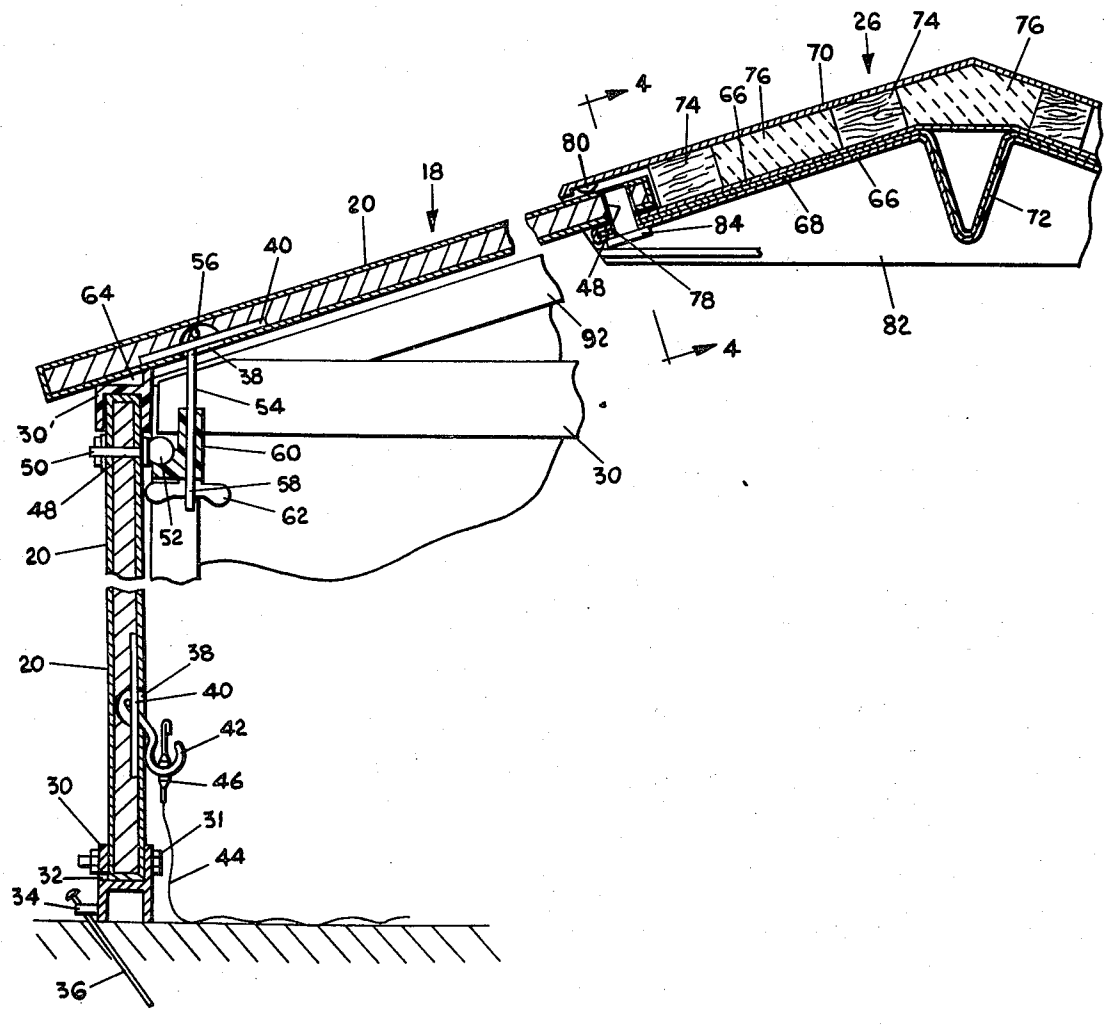
Primary Examiner—Price C. Faw, Jr.

Attorney, Agent, or Firm—McGarry & Waters

[57] **ABSTRACT**

A portable and demountable building structure where the roof and walls are formed of a plurality of substantially equal sized panels joined together at the edges by special H-shaped joiner strips. The panels are formed by a pair of rigid skins of a formed plastic material and a core of low-density material such as foamed plastic. Each skin has L-shaped connecting flanges in back-to-back relationship with the flanges of the other skins. The H-shaped connectors engage the panel connecting flanges in a resilient manner to tightly retain the flanges together. Special corner pieces join the H connectors together at the corners and join the roof to the side walls at gabled portions thereof. A special roof central ridge connector rigidly joins roof panels together forming a rigid peak. Window and door structures are formed within regular sized panels.

18 Claims, 10 Drawing Figures



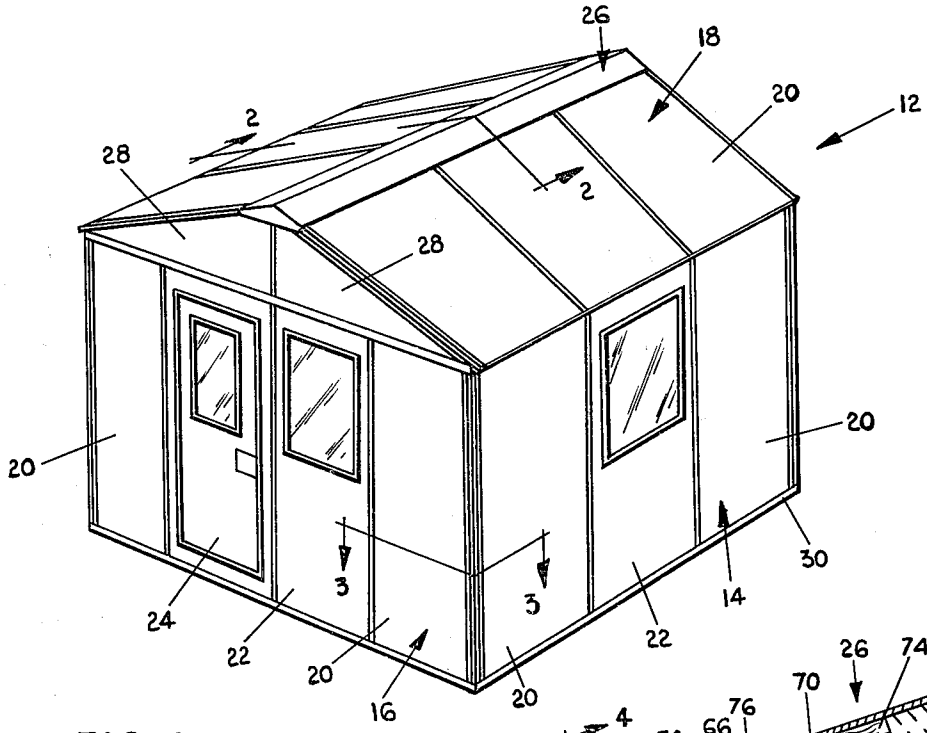

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FIG. 1

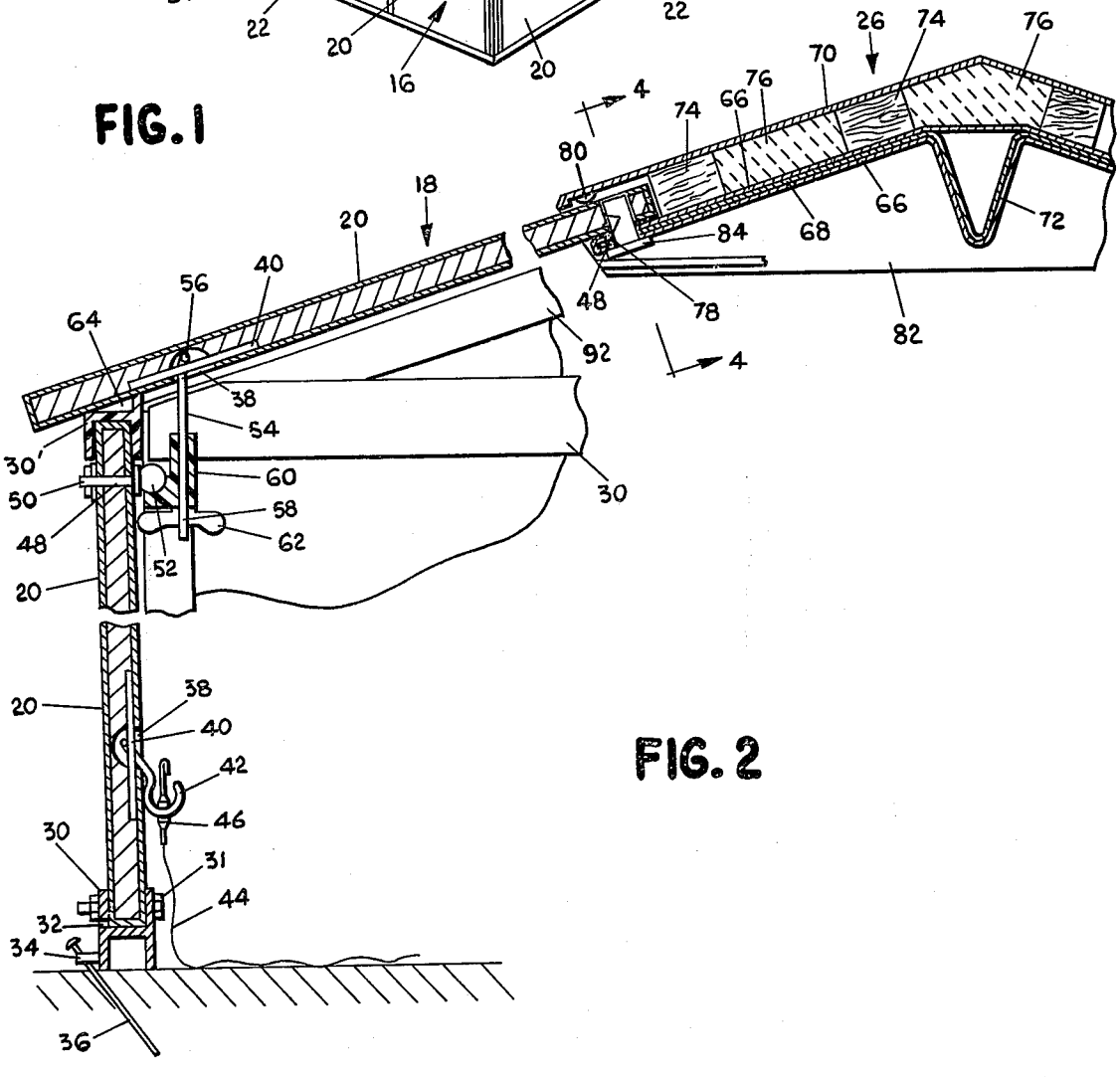

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FIG. 2

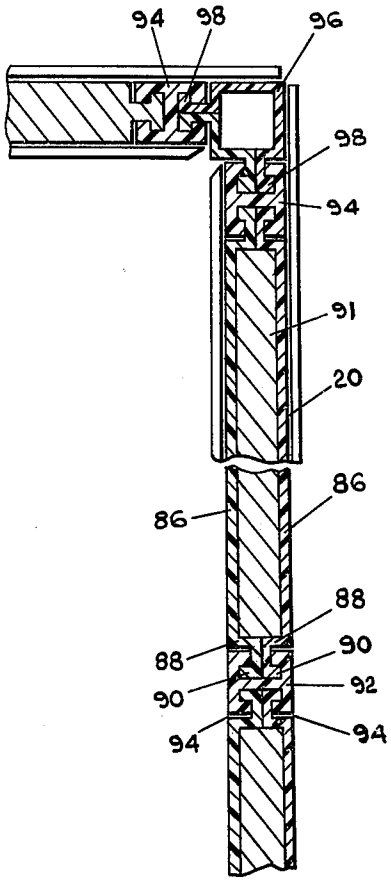


FIG. 3

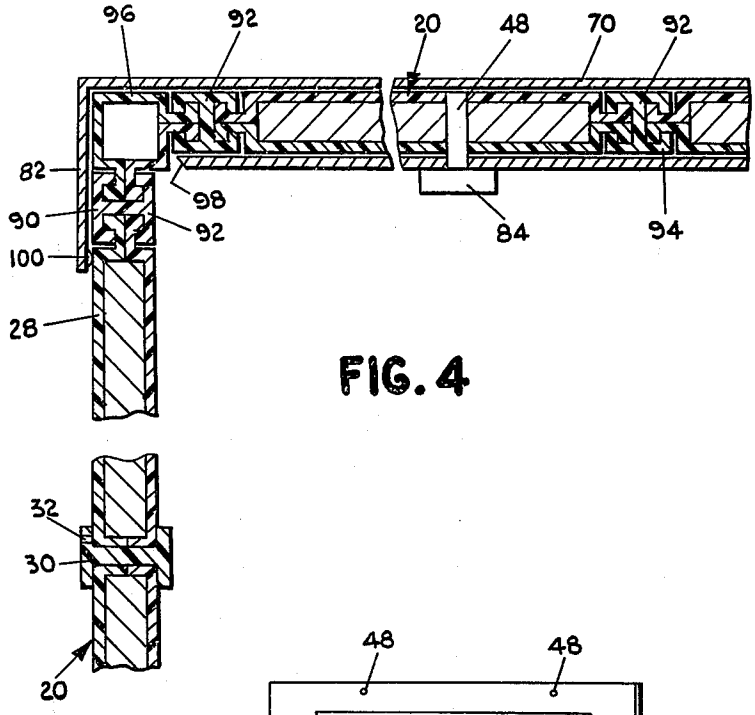


FIG. 4

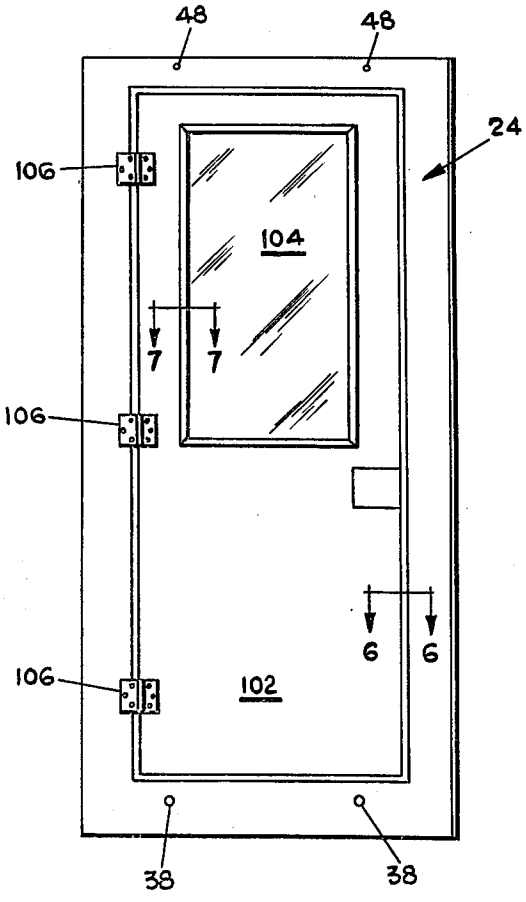


FIG. 5

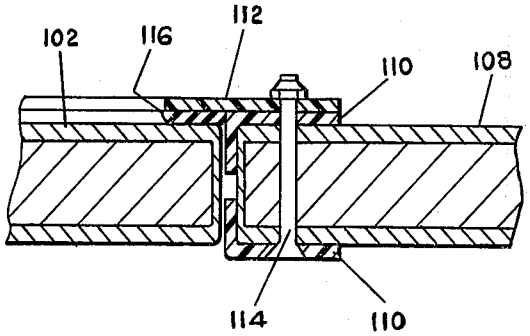


FIG. 6

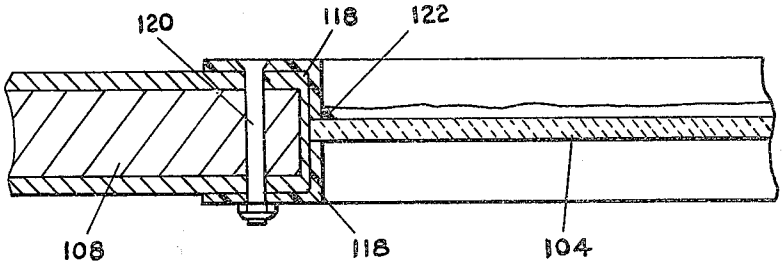


FIG. 7

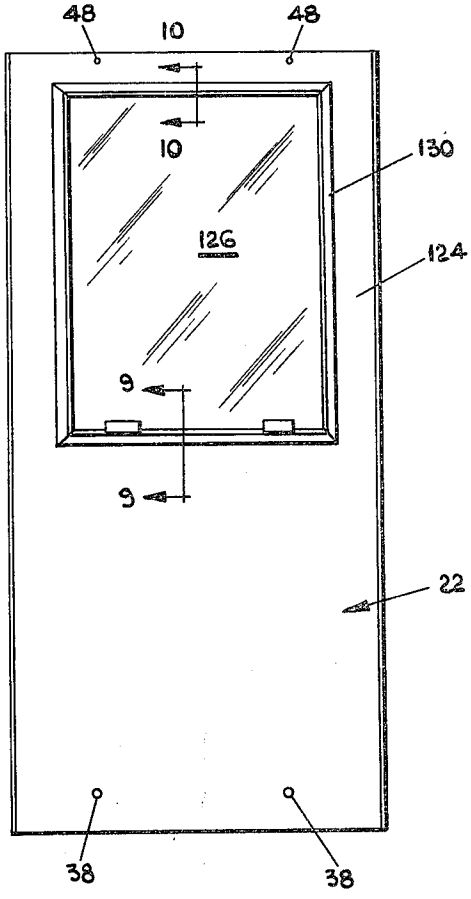


FIG. 8

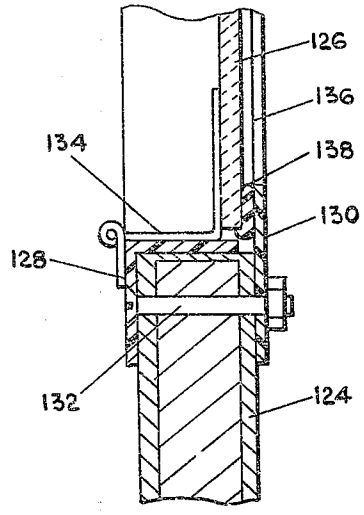


FIG. 9

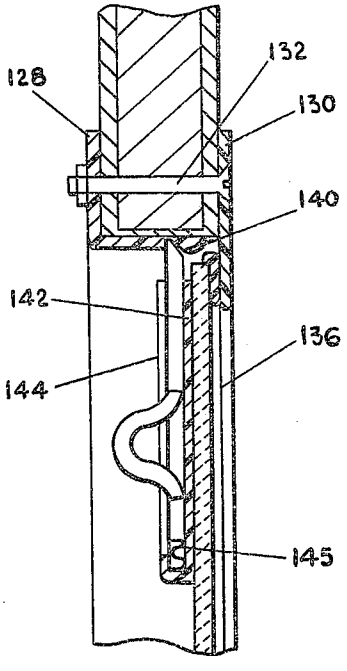


FIG. 10

PORTABLE BUILDING STRUCTURE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to portable building structures. In one of its aspects, the invention relates to a light-weight building structure which can be quickly assembled and disassembled on temporary sites.

2. State of the Prior Art

In the recreational industry, there is a need for portable structures which are more substantial, warmer, and dryer than tents, yet less bulky than trailers and mobile homes. A portable prefabricated structure which is assembled in sections is disclosed in the Moss, U.S. Pat. No. 3,562,975. The panels which form the structure are formed of a resilient material such as plywood and backed with a foamed plastic material such as Ensolite. The panels are shaped like isoceles trapezoids with curvilinear sides and lateral edges. The panels are bent over to form a domelike shape. H-shaped plastic strips join the panels together in their bent over condition.

Other pre-fabricated building structures of a more permanent nature are disclosed in the U.S. Pat. Nos. to Cherdron, et al. 1,885,330, McAvoy, et al. 1,925,769, and Shimano 3,738,083. In each of these prior art structures, panels are secured together at the edges through joining techniques which include H-shaped strips in the Cherdron, et al. structure. In the Shimano, et al. structure, the panels are made from foamed polystyrene covered with a metal foil. Metal extrusions of a special shape are secured to the edges of the panel and form an interlocking configuration with adjacent panels.

SUMMARY OF THE INVENTION

According to the invention, there is provided a relatively inexpensive portable building which is easy and quick to assemble without tools and by one or at the most two persons. The structure is light in weight, water tight and insulated.

The building is formed from a plurality of panels, preferrably substantially all of equal size and shape with the panels joined together at the edges to form walls and a roof. Desirably, the panels are each formed of a pair of rigid skins of a formed plastic material and a core of low density insulating material. The skins are joined at the edge of the panels to enclose the core. L-shaped connecting flanges are formed at the side edges of the panels and are positioned in back-to-back relationship with each other, forming a T-shaped connecting flange at the edges of the panels. An H-shaped panel connector is formed of an extruded plastic material and joins the panels together at the adjacent edges thereof. The connector has a central web and parallel legs shaped so as to cover the adjoining L-shaped connector flanges. The legs have inwardly directed retaining lips at the ends thereof which fit behind the outwardly directed portions of the L-shaped connector flanges of the skins to retain the panels in joined relationship with each other. The legs of the panel connector are desirably of a resilient material and biased toward each other to provide positive sealing of the joints of the panels.

The panels are connected together at the corners thereof through corner connectors having elongated T-shaped flanges which engage H-shaped connectors on the panels adjacent the corner. The same corner

connectors are used between the roof panels and triangular gable panels beneath the roof gables.

Each panel further comprises an anchor means at one end thereof which may include a rod embedded in the plastic with an opening for engagement with a hook and the like. The roof panels are secured to the side walls through a ball locking member which is secured to the top of the side walls and a socket member which at one end engages the anchor of the roof panel and at the other end engages the ball. Desirably, the socket member is adjustably secured to the ball containing member.

Further, according to the invention, a central ridge connector provides central support for the roof and has slots at opposite sides thereof for receiving the edges of the roof panel members. Means are provided for rigidly and demountably securing the roof panel members to the ridge connector at the slots thereof.

The equal sized panels are light-weight and easy to stack and carry. Further, the equal sized panels reduce the die cost and thus reduce the manufacturing cost. The ridge panel can be sectional or be cut to size so that buildings of different lengths can be constructed without any change in parts.

The structure thus formed according to the invention is easily assembled and usually disassembled without the use of tools. The insulated panels provide a warm structure which avoids condensation on the inner walls and ceiling, and the unique connectors between the panels seal out moisture and wind to provide a warm and dry structure. The central ridge connector provides the structural strength for the roof and thus normally avoids interior or side wall posts. A canvas or fabric floor can be provided and secured to the side walls of the panel at the anchor means or the structure can be assembled on a platform of concrete, wood or other suitable material.

The complete structure is assembled with only a few standard pieces: namely, standard sized panels which include a door panel and a window panel, joiner strips for the panels, corner posts, H-bars between the roof and walls, ball and socket connectors for the roof. If desirable, ground plates can also be used. The structure in demounted form is easily transportable on the top of a car, in a stationwagon, in a small boat, whether in the water or towed behind a car on a trailer, or in a small plane.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of a portable building structure according to the invention;

FIG. 2 is a partial cross-sectional view through the portable building structure seen generally along lines 2—2 of FIG. 1;

FIG. 3 is a partial cross-sectional view through lines 3—3 of FIG. 1;

FIG. 4 is a partial cross-sectional view through lines 4—4 of FIG. 2;

FIG. 5 is a plan view of a door panel;

FIG. 6 is a partial sectional view taken through lines 6—6 of FIG. 5;

FIG. 7 is a partial sectional view taken through lines 7—7 of FIG. 5;

FIG. 8 is a plan view of a window section;

FIG. 9 is a partial sectional view taken through lines 9—9 of FIG. 8; and

FIG. 10 is a partial sectional view taken through lines 10—10 of FIG. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, and to FIG. 1 in particular, there is illustrated a portable building structure 12 comprising opposite side walls 14 (only one of which is shown in FIG. 1), a front wall 16, and a hip roof 18. A back wall (not shown) similar to front wall 16 is also provided to complete the structure.

The side walls 14 are made from one or more basic panels 20 and may include a window panel 22. The opposite side wall can be of like construction. The front wall 16 is made from one or more basic panels 20, one or more window panels 22, and a door panel 24. In like manner, the back wall can have one or more basic panels 20, one or more window panels 22, and optionally a door panel 24. Triangular panels 28 extend between the top of the wall panels 20, 22, 24, and the gabled sides of the roof 18. A plurality of basic panels 20 connected to a structural ridge connector 26 forms the hip roof 18. All panels 20, 22, and 24 are desirably of equal size so that the panels are interchangeable and different door and window arrangements are possible.

Reference is now made to FIGS. 2 and 3 for a description of the manner in which the panels are secured together. All of the upright panels 20, 22, and 24 are optionally positioned in H-shaped ground bars 30 which rim the perimeter of the portable building structure. Drain holes 32 are provided in one side of the bars 30 to permit the drainage of water. An anchor flange 34 can be provided on the outside edge of the bar 30 adjacent the ground with a hole therein for receiving an anchoring stake 36. Desirably, the wall is bolted to the ground bars 30 through a suitable bolt 31. The ground bars 30 can take any shape, for example, a U-shape, or can be eliminated, if desired. Also, the anchoring stake 36 can pass through both the side wall panel 20 and the ground bar 30, thereby eliminating the need for the bolt 31.

The basic panels 20 have a hook opening 38 at a bottom portion thereof and a retainer 40 is embedded in the panels in the opening 38. These panels are used for the side walls as well as for the roof. A hook 42 is pivotably mounted to the retainer 40 in one or more side wall panels and engages the grommets 46 in a flexible ground cover sheet 44. At the upper portion of the panels 20 a hole 48 is provided.

A bolt 50 extends through the hole 48 in some side wall panels and has a ball at one end thereof. In the basic panel 20 forming part of the roof 18, a rod 54 has a hook end which engages the retainer 40 therein. A socket member 60 is slidably received on the rod 54 and has a socket portion which receives the ball end 52 of bolt 50. A wing nut 62 engages a threaded end 58 of the rod 54 to securely retain one or more panels 20 forming roof 18 in place above the side walls of the building structure. A modified H-shaped ground bar 30' is provided on top of the side wall panel 20 for supporting the roof panel. Insulation 64 is provided in the open space beneath the roof panel 20.

The bottom portion of the structural ridge connector 26 comprises a support member formed from a formed metal sheet 68 sandwiched between two layers of plastic material 66. The support member carries the top edge of the roof panels and extends to the peak of the roof. A strengthening beam is formed at a central portion of the ridge connector by a downwardly extending, rigidifying hump 72 of the metal sheet 68 as well as the lower of the plastic sheets 66. The upper of the plastic sheets 66 extends directly across the base of the hump. The strengthening beam can alternately be formed by a separate panel or pole which is connected to the support members of the ridge connector. The strengthening beam can be formed of wood, an aluminum I-beam, or can be a special cast shape integral with the support members. A surface plastic sheet 70 forms a cap member for the ridge connector 26 to cause the rain water to flow over the top of the roof panels. Wood spacer blocks 74 and insulation 76 are provided between the plastic layers 66 and 70. Tapped holes 78 are provided through the layers of plastic 66 and the formed metal sheet 68 near the edges thereof to receive and threadably engage machine bolts 84. As illustrated in FIGS. 2 and 4, the machine bolt extends through the hole 48 in the upper portion of the roof panel 20. Desirably, a sealing gasket 80 of a rubbery material is provided along the lower lip of the plastic layer 70 for sealing purposes.

The structural ridge connector 26 is of such strength that central support posts can be eliminated although support posts can be used if desired. Some support for the ends of the ridge connector 26 is provided at the front and back walls through the triangular panels 28 although the main rigidity comes from the ridid nature of the ridge connector 26 and the rigid connections between the roof panels and the rigid connector at the upper end and between the roof panels and the side walls at the lower end.

The connection between the panels forming the side walls is illustrated in FIG. 3. Each of the basic panels 20 is formed from a pair of identical dish-shaped skins 86 placed in back-to-back relationship at side edges 88 and leaving a hollow interior which is filled with a low density and insulating material 91, e.g., a plastic foam material such as foamed polyurethane or fiberglass batting. Outwardly extending L-shaped connecting flanges 90 extend from the side edges 88 and fit within H-shaped plastic connectors 92.

The H-shaped plastic connectors 92 are desirably formed of an extruded plastic material. As seen in FIGS. 3 and 4, the H-shaped connectors 92 have a central web and parallel legs which extend over the L-shaped flanges 90 of adjacent panels. The legs have inwardly directed retaining lips 94 at the ends thereof which fit behind and interlock with the L-shaped flanges 90. The legs are biased in contact with the L-shaped flanges 90 for positive sealing.

The side panels are assembled in easy fashion by laying the panels adjacent one another on the ground and sliding the plastic H-shaped connectors 92 along the edges of the panel to grip the connecting flanges 90 thereof.

The panels are connected together at the corners through the plastic H-shaped connectors 98 and through a special corner post 96. The corner post has T-shaped connecting flanges 98 in a manner similar to the connecting flanges 90 of the panels 20, but disposed at an angle of 90° with respect to each other. If desirable, the angle between the T-shaped flanges 98 can be disposed at other angles with respect to each

other if other polygonal or non-polygonal shaped structures are desired. Thus, the angles can range from 60° for a regular triangular wall structure to substantially less than 180°, for example, 135° for regular octagonal wall structures.

Each of the panels **20, 22, 24,** and **28,** have the same basic construction, i.e., with the skin and low density center **91.** In addition, each of the panels has the connecting flanges at the sides thereof for engagement with the plastic H-shaped connectors **92.** Each of the panels can thus be connected in like manner with the standard connectors **92.**

As illustrated in FIG. **4,** a plurality of the basic panels **20** form the roof. The panels **20** are connected together at the side edges **88** through the connecting flanges **90** and H-shaped connectors **92.** At the corner of the roof, an H-shaped connector **92** is used in conjunction with a corner post **96,** and another H-shaped connector **92** to secure the triangular panel **28** to the roof panel **20.** As seen in FIG. **4,** the ridge connector **26** has a depending side flange **82** which extends down alongside the corner post **96.** A sealing gasket **100** can be provided on the bottom edge of the depending flange **82** in order to seal the ridge connector against wind.

An H-shaped channel **30** is also provided at the top of the front or back wall panel, which for the sake of illustration is shown as a basic panel **20.** The H-shaped channel runs along the entire top of the back wall and the front wall **16.** The triangular panels **28** have a flush bottom edge which fits into the top of the H-shaped channel **30** at the top of the panels forming the front and back walls of the building. As illustrated in FIG. **4,** the triangular panel **28** has connecting flanges **90'** which run along the top edge thereof for retention by the H-shaped connectors **92** at the gabled roof edge. The triangular panels **28** also have connecting flanges **90'** (not shown) at the central edge thereof to join with the corresponding edge of the adjacent triangular panel through a suitable H-shaped connector **92** in a manner similar to that described for panel **20.**

Reference is now made to FIGS. **5–7** for a description of the door panel. A door **102** having a window **104** is mounted on hinges **106** on a peripheral fram **108.** L-shaped channels **110** extend around the entire opening in the peripheral frame **108** on either side thereof. A faceplate **112** is provided adjacent one of the L-shaped channels **112** at the inside of the peripheral frame **108** as a door stop. The L-shaped channels **110** and the faceplate **112** are secured to the peripheral frame **108** through a plurality of suitable bolts **114.** Weatherstripping **116** is provided on the inside of the faceplate **112** in conventional manner for proper sealing of the door against the faceplate **112.** Alternately, the L-shaped channels **110,** the faceplate **110** and the sealing gasket **116** can be made integrally from extruded plastic.

A pair of L-shaped channels **118** are secured around the window opening in the door **108** through a bolt **120.** The window **104** is positioned between the facing edges of the L-shaped channel **118** and is retained thereby. Weatherstripping material or glazing compound **122** is desirably provided between the window **104** and the mounting L-shaped channel **118.**

Reference is now made to FIGS. **8–10** for a description of the window panel **22.** A main frame portion **124** has a window **126** mounted therein through an L-shaped channel **128** on one side and a faceplate **130** on the other side suitably secured to the main frame portion **124** through a bolt **132.** If desirable, the L-shaped channel **128** and the faceplate **130** can be integrally made in one piece of extruded plastic. The window is desirably hinged at a bottom portion to the frame portion **124** through a suitable hinge **134.** One of the leaves of the hinge **134** is secured to the L-shaped channel **128** through suitable screws and nuts (not shown) and the other leaf of the hinge **134** is suitably secured to the window **126** through a suitable adhesive. Desirably, a screen **136** is provided on the outside of the window **126** and is retained on the frame between packing material **138** and the faceplate **130.** A latch is provided at the top of the window for securing the window in the closed position. To this end, a latch bolt **142** is slidably mounted in a retainer **144** which in turn is secured to the top of the window. The L-shaped channel **128** has a notch **140** for seating of the top of the latch **142.** A wave spring **145** holds the latch bolt **142** in the locked position.

The novel structure described is thus easily assembled and disassembled, warm, dry, and relatively light. It is light in weight, transportable by virture of the light weight, substantially equal size panels. The equal size panels also make many shapes and sizes possible without a change of basic construction materials.

Reasonable variation and modification are possible within the scope of the foregoing disclosure without departing from the spirit of the invention which is defined by the accompanying claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A portable and demountable building structure having a plurality of walls joined together to form an enclosure, and a roof demountably secured to and covering the enclosure; the improvement which comprises:

at least one of the walls and roof formed by at least first and second panel members, each of said panel members formed by a pair of rigid skins of a formed plastic material and a core of low density insulating material, the skins being joined together at the edges of the panels to enclose the core, the skins at the sides of the panels further forming a substantially outwardly extending L-shaped connecting flange, with the L-shaped flanges of one skin being in a back-to-back relationship with the L-shaped flanges of the other skin;

an H-shaped panel connector formed of an extruded plastic material joining said panels together at adjacent edges thereof, said connector having a central web and parallel legs shaped so as to cover adjoining L-shaped connector flanges, the legs having inwardly directed retaining lips at the ends thereof which fit behind the outwardly directed portions of the L-shaped connector flanges to retain the panels in joined relationship with each other, whereby adjoining panels can be connected by sliding the H-shaped panel connectors along the L-shaped connecting flanges thereof.

2. A portable and demountable building structure according to claim **1** where said H-shaped panel connector is formed of a resilient material so that the parallel legs thereof are spring biased in contact with the L-shaped flanges to provide positive sealing of the joints of the panels.

3. A portable and demountable building structure according to claim **1** wherein said panels are wall panels

and one of said panels has a door hingedly mounted therein.

4. A portable and demountable building structure according to claim **1** wherein said panels are wall panels and one of said panels has a window therein.

5. A portable and demountable building structure according to claim **4** and further comprising means for pivotably mounting said window in said one panel and means for latching said window in said closed position.

6. A portable and demountable building structure according to claim **1** wherein said panels are roof panels and further comprising a rigid ridge connector extending across said enclosure and forming a portion of said roof;

means for demountably joining said panels to said ridge connector at one edge of said panels; and

means for positioning said roof panels at an inclined acute angle with respect to the horizontal.

7. A portable and demountable building structure according to claim **6** wherein said ridge connector - panel joining means includes sealing means to prevent wind and moisture from seeping through the connection between the roof panels and the ridge connector.

8. A portable and demountable building structure according to claim **1** wherein said panels are wall panels and further comprising a third panel member formed in the manner of said first and second panels and an H-shaped panel connector retained at one edge thereof;

a distal edge of said first panel has an H-shaped connector retained thereby;

a corner connector having first and second T-shaped connecting flanges shaped to engage and be retained by said H-shaped connectors, said T-shaped connecting flanges being at an angle substantially less than 180° with respect to each other; and

said first T-shaped connecting flange being retained by said H-shaped connector secured to the opposite edge of said first panel and said second T-shaped connecting flange being retained by the H-shaped connector at the edge of the third panel.

9. A portable and demountable building structure according to claim **8** wherein said first T-shaped connecting flange is at an angle of about 90° with respect to the second T-shaped connector flange.

10. A portable and demountable building structure according to claim **9** wherein said roof is formed in a hip shape and further comprising triangular shaped panels between slanting portion of said roof and the top edges of side walls therebeneath, and corner connectors securing said roof to said triangular shaped panels at the top portion thereof.

11. A portable and demountable building structure according to claim **1** wherein said walls and said roof are formed of a plurality of substantially equal sized panel members joined together at the edges thereof through L-shaped flanges on said panels and H-shaped connectors.

12. A portable and demountable building structure according to claim **11** wherein said panels have an anchor means in one end thereof and a hole in another end thereof and coupling means engaging said anchor means on said panel members and said holes in said upper portion of said panel members forming said side walls to rigidly secure said side walls to said roof.

13. A portable and demountable building structure according to claim **12** wherein said coupling means includes a ball member secured to said side wall panel member, a socket member, means adjustably securing said socket member to said roof panel member anchor means.

14. A portable and demountable building structure having a plurality of walls joined together to form an enclosure, and a roof demountably secured to and covering said enclosure, the walls and the roof are formed of a plurality of substantially equal sized panel members joined together at the edges thereof and means for rigidly coupling the roof panels to the wall panels, the improvement in said coupling means comprising:

anchoring means on said roof panels;

a ball member secured to an upper portion of said wall member and protruding inwardly thereof;

a socket member engagable with said ball member; and

means adjustably securing said socket member to said anchor means.

15. A portable and demountable building structure having a plurality of walls joined together to form an enclosure, and a roof demountably secured and covering said enclosure, the improvement which comprises:

said roof formed of a plurality of substantially equal sized panel members joined together at the sides thereof;

a central ridge connector, said ridge connector being rigid in nature and providing a central support for said roof panels, said ridge connector having slots at opposite sides thereof for receiving an edge of panel members; and

means for rigidly and demountably securing said panel members to said ridge connector at said slots.

16. A portable and demountable building structure according to claim **15** wherein said ridge connector is shaped so as to provide a hip roof with one group of said panels extending down from one slot and a second group of panels extending downwardly from a second slot thereof.

17. A portable and demountable building structure according to claim **15** wherein said ridge connector is provided with a strengthening beam extending downwardly from a central portion thereof and bracing opposite sides of said ridge connector.

18. A portable and demountable building structure according to claim **15** wherein said central ridge connector comprises inclined support members carrying the top edges of said panel members at a lower end thereof, a strengthening beam rigidly secured to an upper end of said support members, and a cap member covering said strengthening beam and said support members to deflect rain water over said ridge connector to upper portions of said panel members.

* * * * *