United States Patent [19]

Tracy

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[45] **Aug. 12, 1975**

[54] **MODULAR BUILDING PANELS AND ENCLOSURES**

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[73] Assignee: **Apollo Plastics, Inc.**, Fla.

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[21] Appl. No.: **491,580**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 407,012, Oct. 16, 1973.

[52] **U.S. Cl.** **52/264;** 52/90; 52/227; 52/300

[51] **Int. Cl.**[2] **E04B 7/02;** E04C 3/10

[58] **Field of Search** 52/264, 90–93, 52/300, 227–229, 317, 275, 496

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Primary Examiner—James L. Ridgill, Jr.

Attorney, Agent or Firm—Jones, Tullar & Cooper

[57] **ABSTRACT**

A building system for constructing lightweight, strong enclosures and partitions is disclosed. Preformed wall and roof panels having corresponding interlocking edges are provided, with the wall panels having corresponding tongues and grooves on adjacent vertical edges to hold them in aligned edge-to-edge relationship. Formed along the upper and lower edges of the wall panels are upwardly and downwardly facing channels which in cross section are generally V-shaped, or trapezoidal. A lintel beam corresponding to the shape of the upper channel is received in this channel and serves to align adjacent panels, while a similar base beam, or wedge, locates the panels on a floor or foundation and is received in the bottom channel. The top beam may, in one embodiment, be incorporated on, be formed integrally with, and depend from a roof or ceiling panel. When so formed, the lower surface of each ceiling panel is indented, or grooved, on each side of the depending lintel to receive the upper edges of the wall panels, whereby the roof and wall panels are interlocked. The top surface of the roof panels incorporates a peripheral trough adapted to receive a flat tie bar which extends across adjacent roof panels to hold them in assembled relationship. The roof panels are offset from the wall panels to provide strength at the joints between adjacent panels. The lintel and base beams are secured in the upper and lower panel channels by vertical tension rods or cables which extend downwardly through the panels and are suitably fastened at top and bottom to place the wall panels in compression.

61 Claims, 12 Drawing Figures

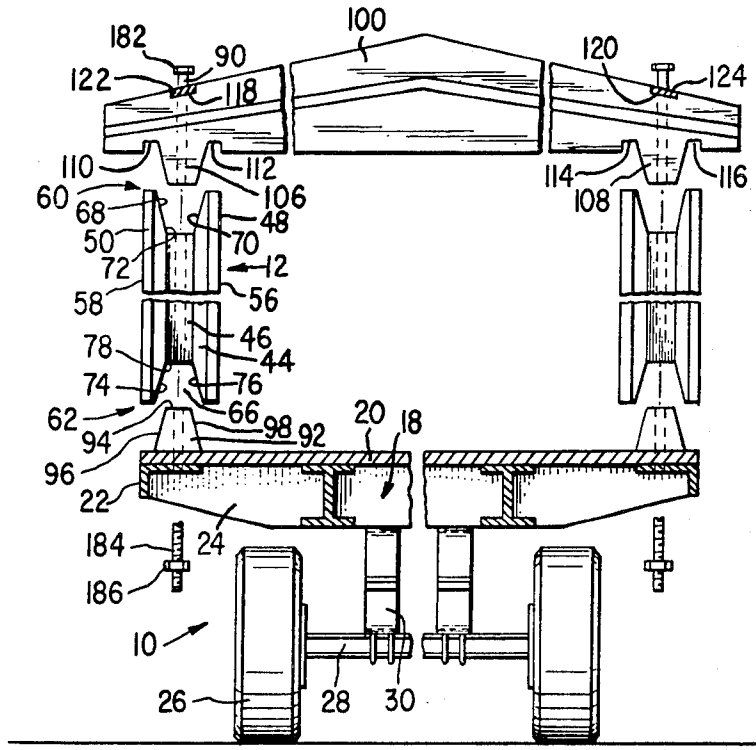
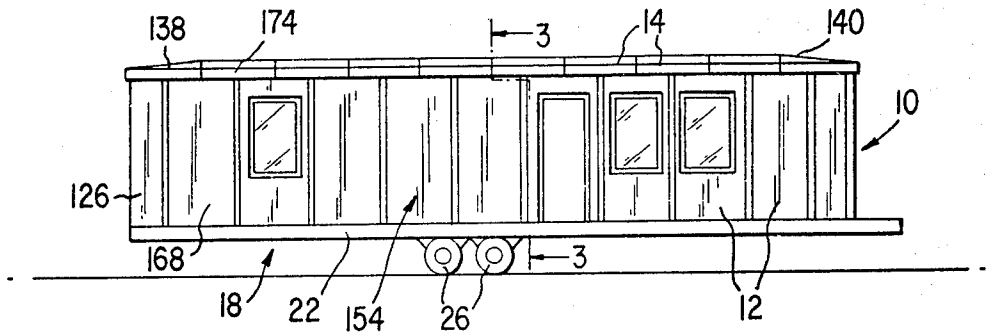


FIG. 1


138
174
3
14
140
10
126
168
3
18
22
154
26
12

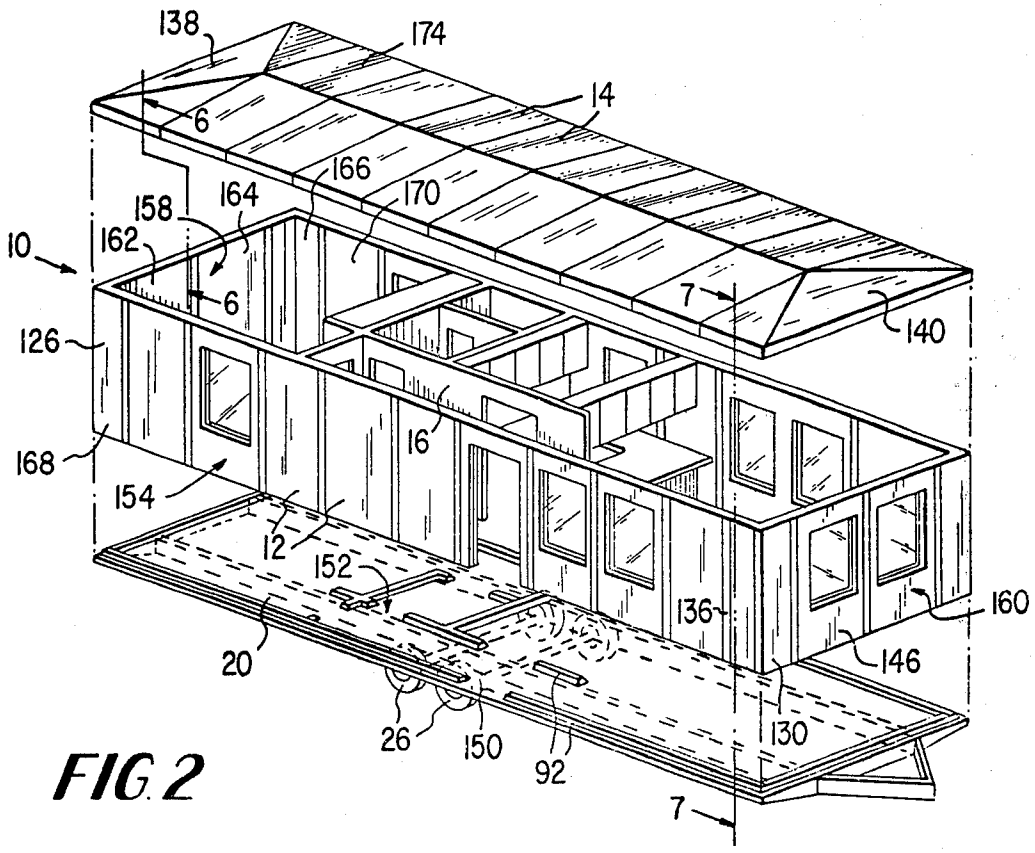

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146
26
150
92
130
7

FIG. 2

FIG 3

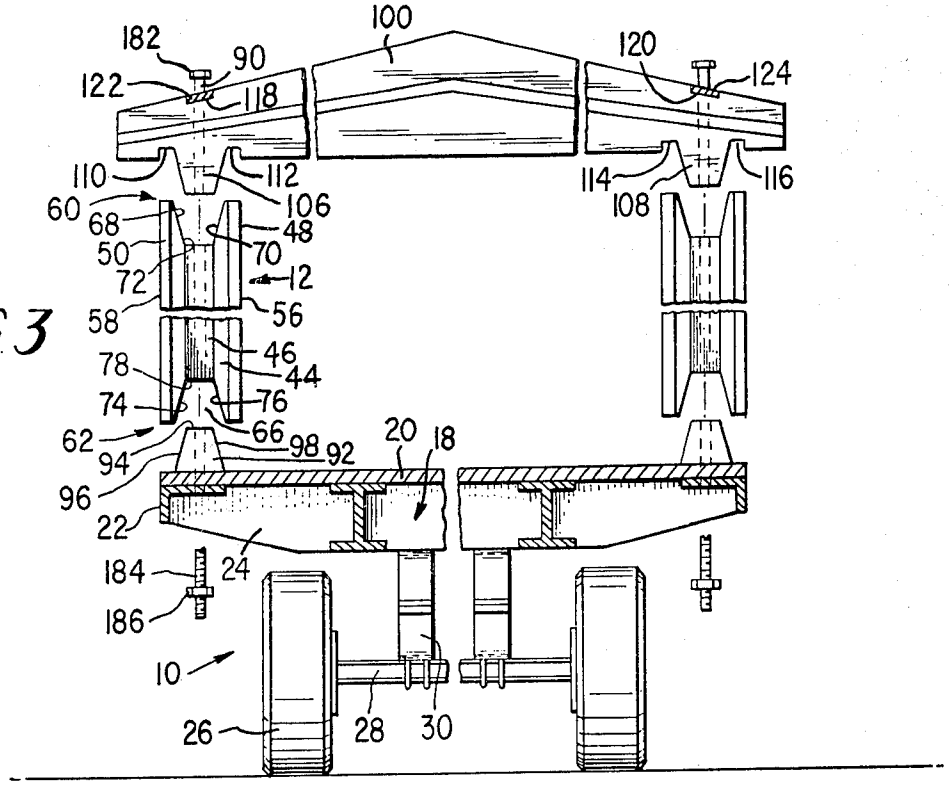


FIG 4

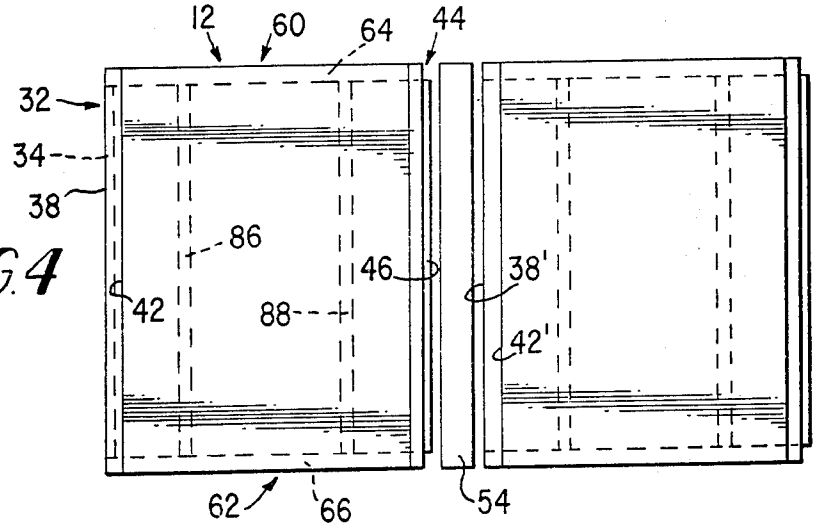
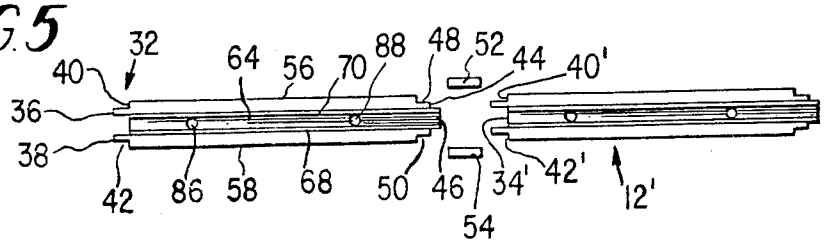


FIG 5



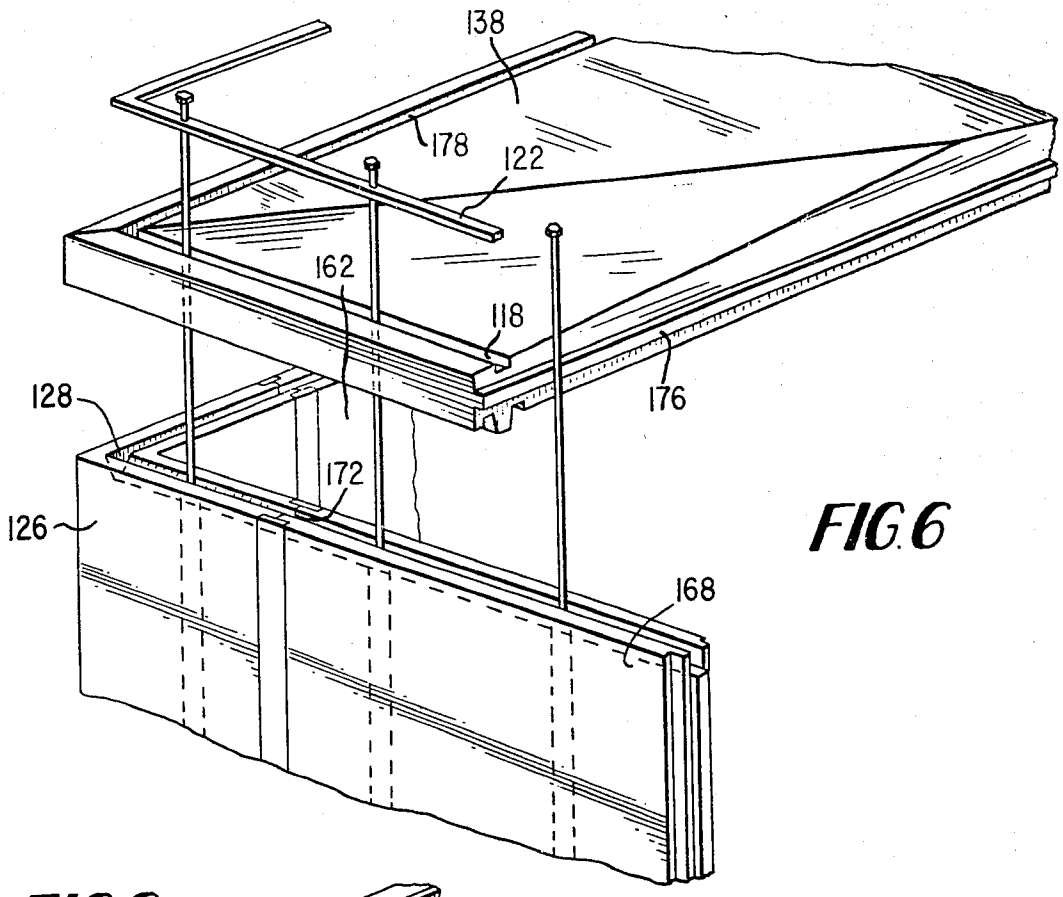


FIG. 6

FIG. 8

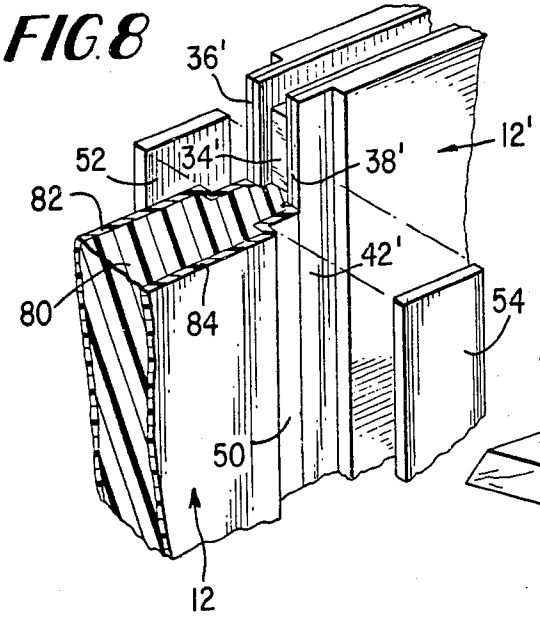


FIG. 9

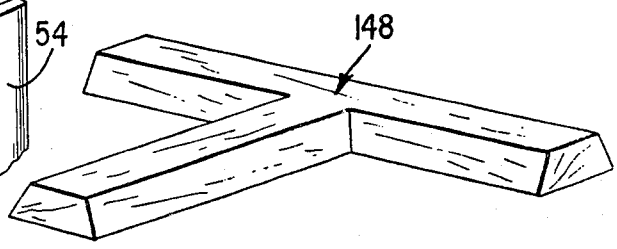


FIG 7

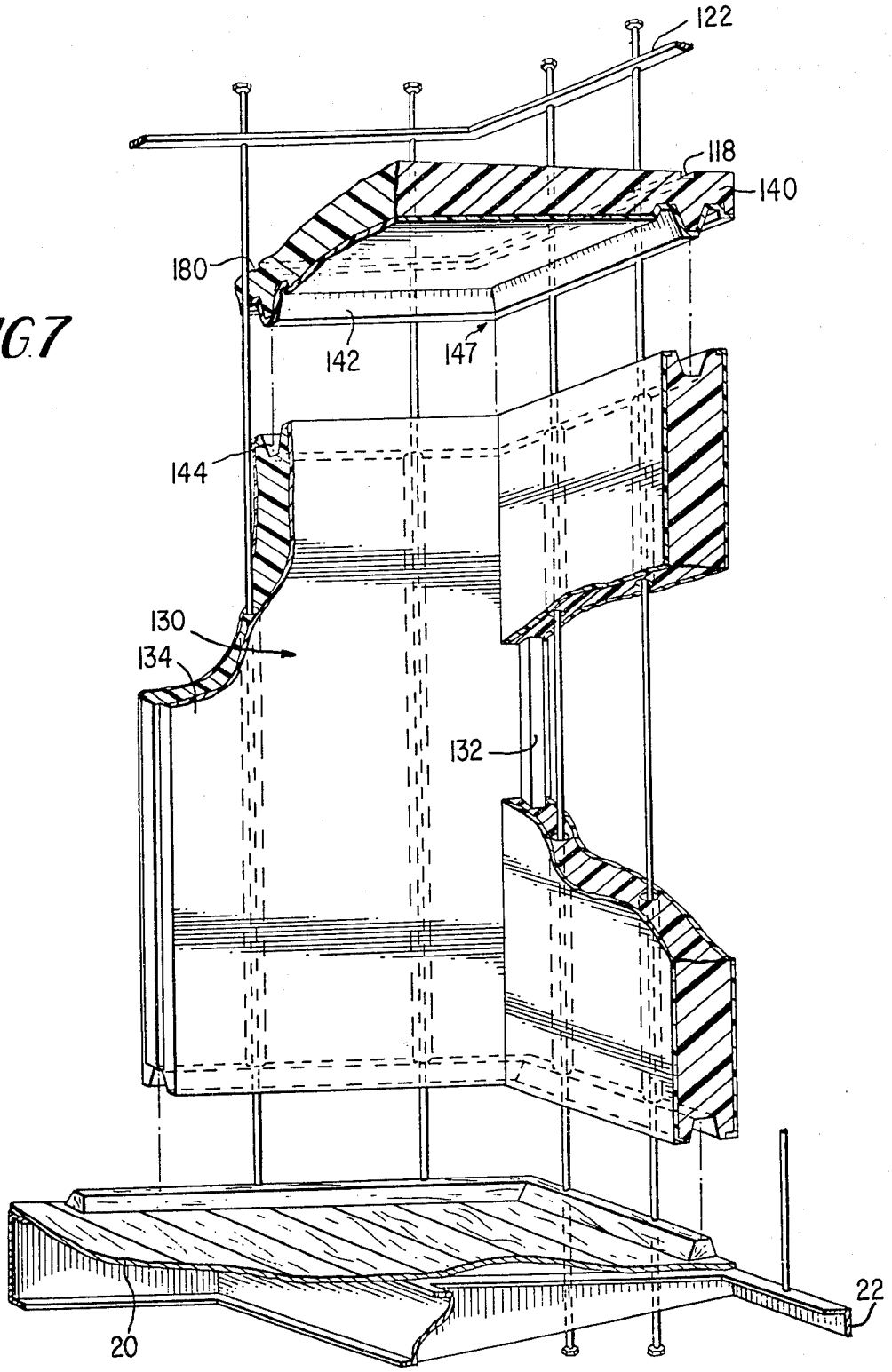


FIG. 10

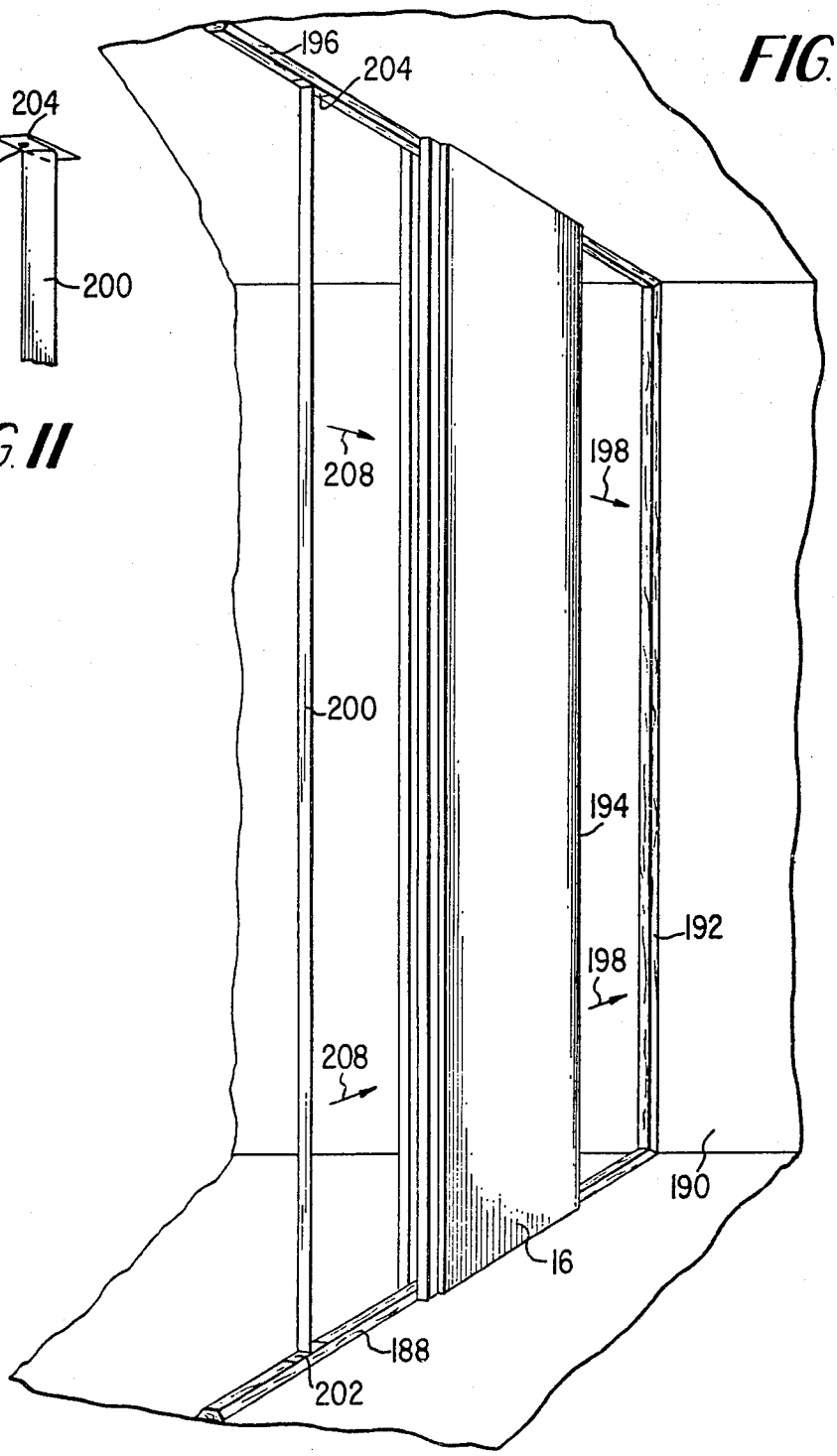


FIG. 11

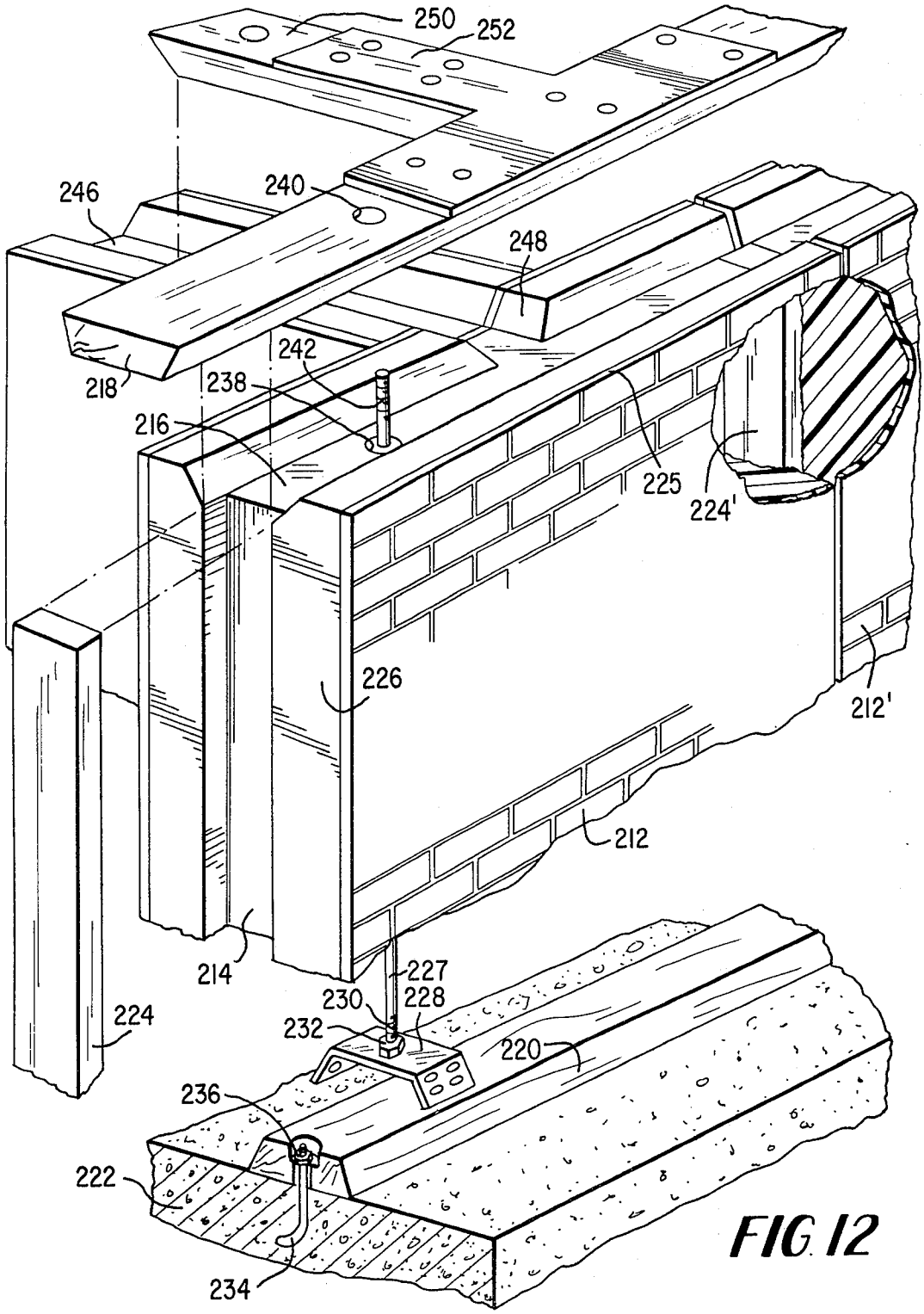

250
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248
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216
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224'
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212'
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232
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222
234

FIG. 12

MODULAR BUILDING PANELS AND ENCLOSURES

BACKGROUND

This application is a continuation-in-part of application Ser. No. 407,012 of Charles W. Tracy, filed Oct. 16, 1973 and entitled "Modular Building Enclosure".

The present invention relates, in general, to modular building systems, and in particular to structural panels for buildings and the method and apparatus for assembling walls, roofs and building enclosures from such panels. More specifically, the invention relates to a building system for use, among other things, in the manufacture of single and multiple story structures such as mobile homes, trailers, truck bodies, utility buildings, motels, and the like, and for the construction of walls and partitions within such structures or within more conventional building structures.

The application is related to copending application Ser. No. 385,353 of Charles W. Tracy, filed on Aug. 3, 1973, entitled "Combined Wall Panel and Forms", and assigned to the assignee of the present application.

In recent years the increasing cost of conventional housing, caused in part by the scarcity of natural materials, the increasing price of land, and increasing labor costs, has produced a strong impetus to the development of modular building structures, and to the use of new materials. Panels, wall units, and complete enclosures have been constructed from a wide range of materials using a great variety of techniques, and the art is replete with description of structural configurations designed to facilitate the manufacture and assembly of buildings and building components. However, none of the prior systems has met with complete acceptance, for all present problems of varying kinds.

Although panels of varying configurations and materials have been used in the construction of building components and enclosures, such panels have not been satisfactory for they have generally required the use of complex and expensive supporting framework, which itself present fabrication and construction problems. Further, the panels must be secured to the frame by means of fasteners which will pull out of lightweight panels, and which are often difficult to install. The requirement for light weight reduces the strength of the panels, while the complexity of installation eliminates any cost advantage they might provide. Thus, the assembly of panels to frames often produces an enclosure that provides no real cost or strength advantage.

The burgeoning mobile home industry is faced with many of the problems encountered in more conventional homes, in that new techniques and materials are needed to counterbalance increasing costs of labor and of conventional materials. But special problems are faced in this industry, in that the home enclosures must not only provide the strength, safety and convenience of conventional housing, but must also be able to withstand the rigors of mobility. When a mobile home is being towed on the road, or is being moved into position on an owner's property, the structure is subject to a great deal of vibration, twisting, racking and bending, and thus is subject to structural damage if great care is not taken in its construction. Accordingly, mobile homes generally incorporate a double wall secured to opposite sides of a rigid frame by rivets or similar fasteners. However, such a construction is expensive, is often not sufficiently strong to avoid damage in transit,

and is difficult to repair in the event of damage. The extremely thin wall coverings used in conventional mobile home construction provides only a small degree of thermal insulation, and the multitude of rivet fasteners used to secure the covering skin to the wall frame make the original construction time consuming and expensive, and make repairs difficult.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to overcome the difficulties encountered in the prior art, and to provide a building construction that is durable, strong, lightweight, inexpensive, and easy to handle.

It is another object of the invention to provide a modular building system for small buildings, mobile homes, truck and trailer bodies and the like which is light and strong, yet easy to assemble, maintain, and repair.

It is another object of the invention to provide a lightweight building panel for use in constructing small enclosures or partitions, wherein the building may be quickly and easily erected without the use of frames, yet is strong and durable.

It is a further object of the present invention to provide a lightweight building panel formed to interlock with adjacent panels and adapted to be secured tightly together to form a rigid, stable, load-bearing wall construction particularly suited for building enclosures, partitions, and the like.

In accordance with the invention there is provided a building panel constructed of a layer of foamed urethane sandwiched between inner and outer layers of a strong, molded plastic skin material such as styrene, wood paneling, or any other suitable skin material. The inner and outer panel skins are shaped and colored to provide the desired aesthetic appearance of the interior and exterior of the building, and the edges of the panel are formed to provide an interlocking arrangement by means of which the structure is made rigid.

The walls of the enclosure are formed by vertical wall panels, the two side edges of each panel being formed with conventional tongue and groove arrangements or with grooves adapted to receive a nailing strip or stud so that the panels can be vertically aligned when erected and assembled, and will be held in vertical alignment. The top and the bottom edge of each wall panel is formed with a tapered channel, each channel being generally V-shaped in cross section, having a flat base and outwardly sloped walls. The top and bottom edge channels are adapted to engage similarly-shaped lintel and floor beams which locate the wall panels on the enclosure foundation and hold them in alignment. These panels may be used to form the exterior building walls, with the exterior and interior wall surfaces being prefinished to provide corresponding appearances, or they may be used to form interior wall partitions with both sides being prefinished to provide the desired interior wall surfacing. In a preferred form, the wall panels are formed with interior vertical openings or passageways extending the height of the panels and adapted to receive tensioning means for securing the building, or to receive electrical wiring for the trailer.

Roof or ceiling panels are provided in one form of the to span the space between vertical wall panels and to interlock with the upper edges of the wall panels to form the rigid construction required for mobil homes and similar buildings and other enclosures. The ends of

the roof panels which abut each other are formed with a conventional tongue and groove arrangement, so that a plurality of panels may be connected end-to-end to form a roof surface. The under surfaces of the side edges of the roof panels, which form the peripheral edge of a completed roof, are formed to interlock with the upper edges of the wall panels. This is accomplished by means of a depending projection and adjacent parallel grooves which form the lintel beam adapted to engage the V-shaped channel formed in the upper edges of the wall panels and to embrace the edges of the panel on either side of the channel. The lintel beam is formed to match the shape of the channel so that the roof panel tightly engages the wall. The top surface of the roof panels incorporates a peripheral trough adapted to receive a flat tie bar which extends across adjacent roof panels to hold them in assembled relationship.

In assembling an enclosure or building structure, floor wedges are installed on the enclosure foundation, which may be a floor formed on the chassis of a mobile home, for example. The wall panels are installed with the bottom channels engaging the floor wedges to form the walls of the enclosure. Lintel beams are then positioned along the top of the vertical wall panels. Where ceiling panels are used, the depending lintel beams formed thereon engage the top channel of walls, and the edges of the walls engage the lintel grooves. Tie bars are then positioned in the peripheral trough on the surface of the roof panels, and tension rods or cables are passed down through the tie bar, through the roof and the vertical passageways in the wall, and through the floor wedge to be affixed to the foundation to secure the assembly together. Where no ceiling panel is used, the tension means passes through the top lintel beam, through the panel, and is secured to the bottom beam either by suitable bracket means on the bottom beam, by being secured in the foundation, or, if the under surface of the foundation is available, as where it is the floor of a vehicle or trailer, the tension means may pass through the floor and be secured to the under surface thereof. Assembly of the enclosure is completed by tightening the tension rods to pull the intel beams and floor wedges into tight engagement with the wall channels, thereby forming a rigid building structure of great strength and durability, the interlocking portions of the enclosure cooperating to prevent twisting, racking or other deformation of the enclosure under static or kinetic loads.

In a modified form of the invention, the wall panels may be adapted for use as partition walls either in conventional buildings or in enclosures formed in accordance with the present invention. The partition panels are formed in the same manner as the wall panels, with edge tongues and grooves, and top and bottom channels. However, assembly of the partitions differs in that the partitions may be free standing or secured to an existing ceiling structure such as suspended ceiling tiles or the like. A floor wedge is provided, as with the wall panels, and is secured to the floor to define the desired partition location. A ceiling wedge is also provided, and this may either be fastened to the ceiling or may be unsecured if the partition is to form an L-shaped wall or a complete enclosure. The panels are positioned between the floor and ceiling wedges in edge-abutting relationship, with each panel being secured in place by tension means fastened to the wedges. The tension means preferably is a thin flat belt secured at each end to a T-fitting adapted to be screwed or otherwise fastened to the wedges. After a panel is located on the wedges, a tension band is positioned along the edge of the panel, preferably in the edge groove, with one arm of the upper T-fitting extending into the upper channel between the panel and the upper edge. The other arm of the upper fitting is securely fastened to the wedge, as by a screw. The lower T-fitting is similarly secured to the lower wedge, the tightening of the fastening screws placing the band in tension, pulling the two wedges toward each other, and firmly holding the partition. The next partition panel may similarly be positioned between the wedges and secured.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and additional objects, features and advantages of the present invention will be more fully appreciated from a consideration of the following detailed description of a preferred embodiment thereof, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a side elevation view of a mobile home constructed in accordance with the present invention;

FIG. 2 is a partially exploded perspective view of the mobile home of FIG. 1;

FIG. 3 is a partial cross section of the mobile home enclosure of FIG. 1 taken along line 3—3;

FIG. 4 is an exploded side elevation of a wall panel and a portion of an adjacent panel constructed in accordance with the present invention;

FIG. 5 is a top plan view of the panels of FIG. 4;

FIG. 6 is an exploded perspective view of a portion of the roof and wall assembly of FIG. 2, taken along lines 6—6;

FIG. 7 is an exploded perspective view of a portion of the roof, wall and floor assembly of FIG. 2, taken at lines 7—7;

FIG. 8 is a partial perspective view of an assembled wall joint;

FIG. 9 is a perspective view of a portion of a typical floor wedge used with the present invention;

FIG. 10 is a perspective view of a partition formed in accordance with the present invention;

FIG. 11 is an enlarged view of a portion of the partition securing band; and

FIG. 12 is a partially exploded perspective view of a portion of a modified wall and floor assembly.

DESCRIPTION OF PREFERRED EMBODIMENTS

Turning now to a more detailed consideration at the present invention in its preferred forms, FIGS. 1, 2 and 3 illustrate a mobile home 10 constructed from wall panels 12, roof panels 14, and partition panels 16 manufactured in accordance with the present invention. As may be seen, the wall panels are formed with doors and windows in conventional manner, and are secured to a trailer chassis 18 to form an enclosure which is utilized as a mobile home. The trailer chassis comprises a bed, or floor, portion 20 supported on suitable longitudinal and lateral frame members 22 and 24 in conventional manner and carried by wheels 26 secured by means of axles 28 and springs 30 to the bed portion. Although in this portion of the description the enclosure of the present invention is shown as being secured to a trailer bed for a mobile home, it will be apparent that any suitable foundation or base for the enclosure may be provided.

Thus a truck bed, a concrete slab, a wooden platform, or other similar structures may easily be adapted for use with the present wall and roof panels to construct a building, enclosure or a partition in accordance with the present invention.

The wall panels, **12** which form the perimeter of the mobile home enclosure, are generally rectangular in shape, as illustrated in FIGS. **4** and **5**, and are formed with tongue and groove to facilitate assembly and to hold the assembled panels in alignment. The left hand vertical side edge **32** of panel **12**, as viewed in FIG. **4**, incorporates a groove **34** extending the height of the panel. The portion of the edge **32** remaining after formation of the groove is in the form of a pair of projections **36** and **38** which are adapted to mate with the tongue portion of a next adjacent panel.

Notches or grooves **40** and **42** are formed on the corners of the panel along edge **32**, which notches extend the full length of the panel and are of a shape and size to receive one half of a cover strip which is provided to cover the joint between adjacent panels.

The right hand edge **44** of panel **12**, as viewed in FIG. **4**, incorporates a tongue portion **46** which extends the full length of the panel and is adapted to mate with the corresponding groove on an adjacent panel. This edge of the panel is also provided with a pair of notches or grooves **48** and **50** which are adapted to receive cover strips. FIG. **5** illustrates a pair of cover strips **52** and **54** which are adapted to be secured in the corner notches of panel **12** and, for example, the corresponding notches **40'** and **42'** of an adjacent panel **12'**, when they have been assembled. The cover strips **52** and **54** fit flush with the inner and outer surfaces **56** and **58**, respectively, of the panels when assembled, and cover the joint between panels **12** and **12'** to hide it and to prevent the entry of water, air, or the like.

When the adjacent panels **12** and **12'** are assembled, as illustrated in FIG. **8**, the tongue **46** engages groove **34'**, with the projections **36'** and **38'** abutting the edge **44** of panel **12**, so that notches **50** and **42'** cooperate to form a cut-out, or trough, to receive cover strip **54**. Similarly, the notches on the opposite sufaces of panels **12** and **12'** cooperate to produce a trough adapted to receive cover strip **52**.

The top and bottom edges **60** and **62** of wall panel **12** are formed with tapered channels **64** and **66**, respectively, which are trapezoidal, or generally V-shaped, in cross section and which extend across the width of the panels, as may be seen in FIGS. **3, 4, 5** and **8**. Channel **64** opens upwardly and includes side walls **68** and **70** which taper outwardly from a flat base **72**. Similarly, channel **66** includes side walls **74** and **76** which taper outwardly and downwardly from a flat base **78** to form a downwardly opening channel.

Each wall panel **12** is preformed of a foamed material having the desired characteristics of light weight, heat and sound insulation, low cost, etc., preferably covered on its outer surfaces by a strong, durable, non-marring, attractive skin layer to give the panel a finished and pleasing appearance. Structural panels utilizing foamed materials are well known in the art, and methods of molding such panels and the materials from which they can be made do not require specific description. Many examples of foamable organic resinous materials may be given and include, but are not limited to, polyurethane foams; foamed resole resins such as urea formaldehyde resins; foamed aminoplast resins such as melamine formaldehyde resins; hydrocarbon resins such as foamed polystyrene, polyethylene, and polypropulene; polyvinyl resins such as polyvinyl chloride and copolymers thereof; foamed polyacetals much as foamed polyacrolien; and other foamed organic resins known in the art. In a preferred form of the invention, however, the panel is a high density polyurethane which is foamed in a mold formed by inner and outer skin layers that have been preformed to the desired shape, size, and surface appearance and configuration of the panel, as described and illustrated in the aforementioned application Ser. No. **385,353** of Charles W. Tracy.

In making the panel, the skin layers are suitably supported in spaced relationship within a mold frame, and the urethane is placed between them and caused to expand by foaming. The expanding material generates a high pressure and completely fills the cavity defined by the two skin layers, forming a bond with the skin layers to produce a unitary panel. When the resin has cured, the completed panel which is removed from the mold frame includes a foam core **80**, (FIG. **8**) an inner skin layer **82** forming the interior surface **56** of the panel and an outer skin layer **84** forming the exterior surface **58** of the panel.

The inner and outer skin layers **82** and **84** preferably are molded of a plastic material such as styrene which may be treated in known manner to produce panel surface configurations and colorings that simulate various natural materials such as stone, wood paneling, brick, or the like. The preformed skin layers may themselves be used as the mold for the urethane foam core. Alternatively, the outer surface material may be placed in a shaped mold, and formed at the same time the core is formed.

The unitary panel so formed is constructed to be of sufficient thickness to provide the desired degree of thermal and sound insulation. The high density foamed urethane core produces a structural, load-bearing panel which may be used in the construction of a building enclosure without the need for supporting framework, while the integral interior and exterior skin layers provide finished surfaces that need no further covering, painting, or other treatment.

In the molding of the wall panels, longitudinal cavities **86** and **88** (FIGS. **4** and **5**) are formed in the manner illustrated in the above-mentioned copending application Ser. No. **385,353**, the cavities extending through the panels from the upper channel **64** to the lower channel **66**. These cavities are provided to accomodate electrical wiring for the enclosure, but more importantly to accomodate tie rods such as that illustrated at **90** in FIG. **3**, which serve to fasten the building enclosure to its base and to hold the enclosure securely together.

The partition panels **16** used in the interior of the mobile home **10**, and further illustrated in FIG. **10**, are essentially the same as the wall panels **12**, having channels on their upper and lower edges, and tongues and grooves on their side edges, in the manner described with respect to FIG. **4**. Further, the interior partition panels are preferably of the sandwich construction described with respect to the illustration of FIG. **8**, having a foamed core between two skin layers which provide the desired wall decor. Both the wall panels and the partition panels may be formed with window and door openings, as desired, which openings may be designed

to receive, or may incorporate, conventional door and window frames.

To locate the wall and partition panels on the floor **20**, or on any other suitable base, a plurality of elongate floor wedges **92** (FIGS. **2** and **3**) may be provided. These wedges have a cross-sectional shape which is complementary to the shape of the lower channel **66** of the wall panels, and are adapted to engage the base and wall portions of the bottom channel to hold the panels in place. The wedges may be secured to the floor by screws, adhesive, or other suitable fastening means, in a pattern defining the location of the walls and partitions. As seen in FIG. **2**, the floor wedges are located around the periphery of the floor **20** define the location of the exterior walls of the enclosure, and are located interiorly of the enclosure to define the location of room dividing partitions.

The floor wedges may be of wood, plastic, or other suitable material, and are located sufficiently close to the edge of the floor **20** to insure that the outer surface of the panel **12** overlaps the outer edge of the floor, thereby preventing water leakage into the enclosure. The wedge is trapezoidal in cross-section, and is generally in the form of an inverted V, having dimensions substantially equal to, but slightly less than, the dimensions of the lower channel **66.** Thus, the wedge includes an upper flat face portion **94** and side walls **96** and **98** tapering outwardly from the face portion **94** in a configuration that insures a snug, firm fit between the wedge and the corresponding walls of the channel so that all of the channel walls are in load contact with corresponding wedge walls when the panels are correctly located on the floor wedges. It should be noted that the degree of taper shown for the side walls of the channel **66** and wedge **92** are exagerated for purposes of illustration, and that the actual angle preferably is less than that shown. The height of the floor wedge is preferably slightly greater than the depth of the bottom channel so that the panel can fit tightly on the wedge without engaging the floor or foundation.

The upper edges **60** of the panels are held in place in the embodiment by means of lintel beams formed on the ceiling panels, **14,** the beams being shaped to engage the upper channels **64** of the walls panels **12.** The ceiling or roof panels are molded from high density polyurethane in the manner of the wall panels described above, although they may differ in that the outer surface **100** of the panel may be formed without a protective skin layer, allowing the roof to be covered by a protective vinyl layer or by more conventional roofing materials after the enclosure has been assembled. The lower, or inner, surface **102** of the roof panel is, however, preferably formed with a thin skin layer which provides the finished ceiling for the enclosure.

As indicated in FIGS. **2** and **3,** the roof panel is formed in a generally triangular shape, with the upper surface **100** forming the exterior roof surface and the lower surface **102** forming the enclosure ceiling. The shape and thickness of the foamed roof panel provides sufficient strength to enable the panel to span the distance between the side walls of the enclosure, while still meeting the load-bearing requirements for comparably sized structures. The front and rear edges of the panel are provided with a tongue and groove arrangement, as with the side edges of the wall and partition panels, whereby adjacent roof panels interlock with each other to provide additional support and strength. The roof panel **14** illustrated in FIG. **3** includes a tongue **104** which extends laterally across the panel. As shown, the groove is formed in an inverted, spread V shape, but if desired the groove may extend in a straight line across the panel. It will be understood that the tongue is adapted to engage a corresponding groove on a next adjacent roof panel, and that the opposite end of the panel incorporates a groove (not shown) adapted to engage the tongue portion of its next adjacent panel, whereby the panels may be assembled in end-to-end relationship.

The bottom surface **102** of each roof panel **14** is formed with spaced depending projections **106** and **108** which are adapted to engage the upper channels of the panels which make up the opposite side walls of the mobile home enclosure **10.** These downward projections are generally trapezoidal in cross-section and extend the length of the panel. Flanking, and adjacent, the downward projections **106** and **108** are a pair of parallel grooves **110** and **112,** and **114** and **116,** respectively, which cooperate with projections **106** and **108** to form spaced, depending lintel beams each having a surface in the form of a return curve. The trapezoidal shape of the lintel beam portions **106** and **108** is complementary to the shape of the upper channel **64** of the wall panel, with the slope of the walls and the width of the beam and channel corresponding to each other to provide a snug, firm, contact when the roof engages the wall. The grooves **110, 112** and **114, 116** are shaped to receive the upper edge **60** of the wall panel, with the side walls of the grooves engaging and embracing the edge **60** so that when assembled the lintel beam fits into the upper channel on the wall panel and the upper edge of the wall panel fits into the grooves on either side of the lintel to provide a firm load-bearing surface contact between all of the corresponding wall portions of the linted, its adjacent grooves, and the upper edge and channel portion of the wall panels.

As seen in FIG. **3,** the lintel portion of the roof panel incorporates four generally vertical wall portions which are adapted to engage corresponding generally vertical surfaces on the wall panel **12;** the sides of the lintel portion **106** engage the sides **68** and **70** of channel **64,** and the outer sides of the lintel grooves (**110** and **112,** e.g.) engage the outer and inner surfaces of the wall panel. The lintel portion also incorporates three generally horizontal wall portions which are adapted to engage corresponding generally horizontal surfaces on the upper edge of the wall panel; the bottoms of grooves **110** and **112** engaging corresponding surfaces of upper edge **60,** and the bottom face of linted portion **106** engaging the base **72** of channel **64** when the roof and wall are assembled. The tapered channel and lintel facilitate assembly of the units and assure correct alignment of the panels, while the horizontal contact faces provide flat load-bearing surfaces to insure that loading of the structure will not split the wall panels. The return curvature of the lintel surface enables the roof panel to grip the outer sides of the wall panel to provide additional stability to the assembly and to strengthen it against side loads such as those produced by high winds. Additional side load strength is provided by the fact that the width of the depending portion **106** or **108** or the lintel beam is substantially less than the thickness of the wall panel so that the foamed core portion of the panel extends to the edges **60.** The thickness of each edge **60** is, therefore, greater than that of the skin mate-

rial forming the surfaces of the panels, so that the core material, instead of the skin material by itself, withstands any side loads.

Aligned with the lintel beam portions **106** and **108** and located on each side of the upper surface of the roof panel **14** are tie-in troughs **118** and **120** which are adapted to receive corresponding tie bars **122** and **124** (see FIG. 3). The tie bars extend along the edges of the panels and bridge the joint between adjacent roof panels to hold the panels in assembled relationship. In addition, the bars act as supports, or washers, for the tension rods **90**, preventing the heads of the rods from pulling into the foam material of the roof when the enclosure is assembled. The tie bars extend around the periphery of the roof on the enclosure **10**, not only to tie the panels together, but to prevent twisting of the enclosure caused by forces against the side walls thereof.

The wall, roof and partition panels thus far described have been considered to be generally rectangular in shape, and identically shaped. However, in order to construct an enclosure from such panels, it is apparent that certain variations will be required in order to form corners or corner joints, and to close off the ends of the roof. Accordingly, it is contemplated that the wall panels **12** may be modified, as required, to provide a corner construction, such as the L-shaped panel **126** illustrated in FIG. **6**. Except for the bend, or corner, formed midway across the panel, it is identical to the wall panels previously described, having an upper channel **128** and a lower channel (not shown) extending across the top and bottom of the panel from one side edge to the other, and having a tongue and groove arrangement on the side edges to enable the corner panel to be joined to the wall panels **12**. Alternatively, the enclosure corners may be formed by a corner panel **130** (FIG. 7) which is formed with a tongue **132** (or a groove) on the inner surface **134** of the panel instead of on the side edge thereof. The tongue **132** is adapted to engage the side edge groove on an adjacent panel **136** in the normal manner, to form the desired corner arrangement. It will be apparent that such tongues may also be provided at locations other than at the edge of a panel to provide locator means for interior partitions.

A modified form of roof panel is also provided for use at the ends of a roofing structure. The modified roof panel, such as the panels **138** and **140** illustrated in FIGS. **1**, **2**, **6** and **7**, are provided with laterally extending lintel beams, such as the beam **142** in FIG. **7**, which are adapted to engage the upper channels **144** in the panels, such as wall panels **130** and **146** which form the end walls of the enclosure. The lintel beam **142** is similar to the spaced lintel beams **106** and **108** formed on the roof panels **14**, and in fact joins these side beams in an L-shaped joint, as illustrated at **147** in FIG. **7**, to form a continuous lintel. Thus continuous lintel engages the corresponding continuous channel formed in the wall panels to secure the enclosure.

The manner in which an enclosure may be assembled from the wall, roof and partition panels will be evident from the foregoing description and from the various drawings. Briefly, however, an enclosure may be assembled in accordance with the present invention, and as illustrated, by locating on a suitable floor or base a series of elongated floor wedges to define a continuous locator strip that defines the location of the wall panels to be used in forming the enclosure. The floor locator strip may be formed from a plurality of elongated pieces secured in end-to-end or end-to-side relationship and from L-shaped or T-shaped wedge pieces such as that illustrated at **148** in FIG. **9**. It is preferred that the strips be so positioned that any joints that are required fall between joints in the wall panels, to assure proper alignment of the walls. As may be seen in FIG. **2**, the wedge strips are provided with openings, as at **150** and **152**, where doorways are formed in the wall or partition panels.

After the floor strips are in place, the exterior wall panels **12** are positioned, with the lower channels on the panels receiving and engaging the upstanding floor wedges. The wall panels are pressed down into place, and adjacent panels pressed together for edge-to-edge assembly by means of the tongue and groove arrangement. Suitable corner panels such as the panel **126** or the panel **130** are used at the four corners of the assembly, with the adjacent panels being interlocked and positioned to form opposite side walls **154** and **156** and opposite end walls **158** and **160**, and producing a continuous wall around the edge of the base **20**, as illustrated in FIGS. **2**, **6** and **7**. It will be seen that the last panel to be positioned in the wall may be inserted by sliding it down from the top of the wall, its side edges interlocked with the already-positioned adjacent panels by means of the tongue and groove arrangement.

Upon completion of the wall assembly, the roof panels are placed in position, starting, for example, with one of the end panels **138** or **140**. The end panel **138**, e.g., is positioned along the end wall **158** and spans the width of the enclosure, with one end resting on wall **154** and the other end resting on wall **156**. The depending lintel beam of roof panel **138** engages the top channel in the wall panels forming end wall **158** and the top channels of at least a part of the corner and endmost panels on walls **154** and **156**, thereby bridging the enclosure and linking the side and end walls together. Thus, for example, as shown in FIGS. **1** and **2**, the roof panel **138** engages the corner panel **126**, the wall panels **162** and **164** making up end wall **158**, the opposite corner panel **166**, a portion of panel **168** on side wall **154**, and a portion of panel **170** on side wall **156**. As may be seen in FIG. **6**, the roof panel overlaps the juncture **172** between panels **126** and **168** so that the lintel beam of the roof panel will hold the two wall panels in alignment, whereby any side forces imposed on the wall panels by motion of the mobile home, by wind forces, or the like, will produce shear forces on the continuous lintel beam rather than on any junction point between adjacent roof panels. This offsetting of the panels results in improved strength characteristics for the enclosure. It will be understood that as the roof panel is positioned over juncture **172**, the cover strips **52** and **54** are positioned in the troughs formed by the notches in the adjacent panels. Being flush with the panel surfaces, the upper ends of the strips fit into the grooves **110** and **112** and are secured in place by the roof panel. The lower ends of the strips may be secured by adhesives or other fasteners.

A second roof panel **174** is then positioned on the enclosure, spanning the walls **154** and **156** and engaging the upper channels in the side wall panels. The roof panel **174** is pressed into the edge-to-edge engagement with panel **138**, the tongue **176** on panel **138** engaging a corresponding groove on the adjacent panel to align the roof panels and provide additional load strength. As

illustrated in FIGS. 1 and 2, roof panel 174 overlaps the junctures between side wall panels 168 and 170 and their next adjacent panels, as explained, to insure proper alignment of the top edges of the walls. The remaining roof panels are positioned on the walls in similar manner, with roof panel 140 also engaging the opposite end wall 160, whereby the side walls are linked together and to the end walls by the bridging roof panels.

As the enclosure is assembled, the roof throughs 118 and 120 in each roof panel are aligned to form continuous troughs extending the length of the enclosure. The troughs also extend laterally across the end panels 138 and 140, as shown at 178 and 180 in FIGS. 6 and 7, respectively, to provide a continuous identation around the periphery of the upper surface of the roof in vertical alignment with the continuous lintel beam depending from the lower surface (or ceiling portion) of the roof. Upon assembly of the panels, the tie bars 122 and 124 are positioned in the troughs, the tie bars extending around the periphery of the enclosure.

To complete the assembly of the enclosure, tension rods 90 are inserted through holes drilled in the tie bars and roof panels in alignment with the cavities 86 and 88 in each wall panel. The tension rods are passed down through the tie bars, the roof panels and the wall panel cavities and are connected to floor wedges by suitable brackets to be described or pass through corresponding holes drilled in the floor wedges, in the floor 20, and in the supporting framework 22 (See FIG. 3). The upper end of each tension rod is provided with an enlarged head 182, while the lower end is threaded as at 184 to receive a nut 186. The nuts are threaded onto the tension rods and tightened against the frame 22, pulling the upper head portion down against the tie bar and compressing the roof panel against the wall panels and the wall panels against the floor wedges. When all of the tension rods have been firmly tightened so that they all are in tension between the tie bar and the base frame, the forces exerted by the rods firmly seat the lintel beam in the upper wall channels and seat the floor wedge in the lower wall channels, thereby producing a strong, rigid enclosure structue. The interlocking tongue and groove joints, the lintel beams with their adjacent wall-receiving grooves which interlock with the top edges of the wall panels, the bottom channel interlocking with the floor wedge, the overlapping roof and wall panels, the tie bars which overlap the roof panel joints, and the tension bars pulling all of these components together, all cooperate in a new and unique way to produce a building enclosure which is stable, strong, and resistant to twisting, racking, vibration, and other external forces. All of the components are shaped to cooperate in such a way that they reinforce each other, with the return curvature of the joints between the roof and wall panels providing a large number of bearing surfaces to produce exceptional strength. It will be noted that the cavities 86 and 88 in the wall panels are of larger diameter than the tension rods 90. This permits the wall panels themselves to remain slightly more flexible under wind loads, so that the walls are able to withstand higher wind pressures without damage, than would be the case if the tension rods were in contact with the wall panel; such contact would transmit the wind force directly to the tension rods and tend to bend them, whereas the present arrangement transfers the forces due to the wind load to the lintel beam and thence to the roof panels. This distributes the load over large areas through a large number of bearing surfaces, providing greater stability for the enclosure.

Upon completion of the roof assembly and tightening of the tension rods, the troughs 118 and 120 may be filled flush with the roof surface with a suitable filler material such as blocks of urethane foam. Thereafter, the roof may be covered by sheet roofing, a poured coating, or by other conventional roofing structures to produce a water-tight cover for the enclosure.

During the assembly of the exterior walls, or after their completion, the interior partition walls may be assembled, using the partition panels 16. A method of assembling these walls is illustrated in FIGS. 10 and 11, to which reference is now made. The panel 16 is of the sandwich type construction described above, and is formed with tongue and groove on the side edges and trapezoidally-shaped channels on the top and bottom edges, as with the wall panels 12 previously discussed.

The partition panels are located within the enclosure, which may be the mobile home of FIGS. 1 and 2, some other building enclosure constructed with the panels of the present inventon, or an enclosure of more conventional construction, by means of floor wedges 188 secured to the floor, foundation, or other base on which the partition is to be located. If the partition panels are to form a flat wall abutting an existing wall 190 at an angle, a locator strip 192 may be secured to the existing wall, as shown. This locator strip may form a tongue adapted to engage a corresponding groove in the side edge 194 of panel 16 to hold the panel in a vertical position. The tongue 192 may, of course, be molded as an integral part of a wall panel which the partition is to abut.

The top of the panel 16 engages a lintel wedge or strip 196 which may be secured to an existing ceiling of any type. Where the ceiling is too high, or the partition is to be free standing, strip 196 is left unsecured, but is placed in the top channel of the panel. To assemble a partition, where strip 196 is secured to the ceiling, panel 16 is placed between strip 188 and lintel 196 and is pressed in the direction of arrows 198 into engagement with strip 192. Where lintel 196 is not secured to the ceiling, the panel is positioned on strip 188, pressed into engagement with strip 192, and lintel 196 is placed in the upper channel of the panel.

The partition panel is secured in position by means of a tension band 200 which is fastened between the wedge strip 188 and the lintel 196. Band 200 is a thin, flat belt or web of metal, fabric or other suitable material, which terminates at its ends in T-fasteners 202 and 204. As seen in FIG. 11, the fasteners are provided with an aperture 206 by means of which they may be secured to the lintel and floor wedges. After panel 16 is properly located, the tension band is moved into position against the exposed side edge of the panel, as indicated by arrows 208, with one arm of each T-fastener extending into the channels formed in the panel. The other arm of each fastener is then screwed or otherwise secured to its corresponding wedge, the tightening of the screws placing the band 200 in tension and pulling the lintel and floor wedges toward each other. This forces the wedges tightly into the upper and lower channels, firmly holding the partition panel. In similar manner, additional panels may be secured between the upper and lower wedges to form a partition wall.

FIG. 12 illustrates a modified form of the interlocking means by which adjacent wall or partition panels may be held together and vertically aligned. Instead of the tongue and groove arrangement with the joint covering strips illustrated in FIG. 8, each panel, such as the panel indicated generally at 212, is formed with grooves 214 on both of its side edges. The remainder of the panel, including a top channel 216 and a bottom channel (not shown), is constructed in accordance with the prior embodiments, with the top channel being adapted to receive a lintel beam 218 of trapezoidal cross section and the bottom channel being adapted to fit over a trapezoidal bottom wedge 240 secured to a suitable base of foundation 222. The grooves 214 in the adjacent side edges of adjoining panels are shaped to receive a corresponding vertical nailing strip, or stud 224, a single stud being sufficiently long to extend to, but not into, the upper and lower channels.

Upon assembly of a wall, the stud 224 is keyed into the corresponding side edge channels of the adjacent panels, and the panels are secured, as by nailing through the surface skin or panel 225 and the core material 226 to the stud to hold them in assembly relationship. Nailing strips are provided between all adjoining panels, strip 224' between adjacent panels 212 and 212' being illustrative of this embodiment of the interlocking of the panels in forming a wall structure. This construction allows the side edges of adjacent panels to abut, eliminating the need for cover strips of the type illustrated in FIG. 8.

The wall panel 212 is secured between the upper lintel beam 218 and the lower locator wedge 220 by means of suitable tension means such as a tension rod 227 of the type described hereinabove. However, in the embodiment of FIG. 12 the rod does not extend into or through the base 222, but instead is secured to a bracket 228 which is shaped to conform to the shape of wedge 220 and is adapted to be secured thereto by nails, screws, or other suitable fasteners. The lower end of rod 227 is threaded, as at 230, the threads engaging a suitable receiver such as a nut 232 welded to the upper surface of plate 228. Alternatively, the tension means may be welded directly to the bracket 228 if desired. It will be noted that the wedge 220 is secured to the foundation 222 as by a J-bolt 234 having one end embedded in the foundation, which may be concrete, and the other end passing through a suitable aperture in wedge 220 and secured thereto by a nut or other fastener 236. Similar securing bolts are spaced along the wedge 220 to provide a firm base for the wall panels.

The tension rod 227 passes through an aperture 238 in the panel 212 and a corresponding aperture 240 in lintel beam 218, and is threaded at its upper end at 242 to receive a nut or other fastener (not shown). The lintel beam 218 thus may be drawn down into channel 216 when the tension rod is secured, thereby placing the panel in compression, as described above. In this embodiment, the lintel beam 218 may be of wood, plastic, or other suitable material, and is used to align and secure adjacent panels in a wall, without regard to the particular ceiling or roofing construction used for the building or enclosure. As in prior embodiments, the lintel beam is arranged to span the joints between adjacent panels so that shear forces tending to separate the panels at their adjoining edges are borne by the lintel beam as well as by the studs 224. Again, as illustrated in FIG. 12, the width of the beam 218 is less than that of the core that 226 of the panel so that shear forces bearing on the panels are borne by the core material rather than the skin or surface finishing material 225.

The present structure facilitates the construction of various wall configurations from the panels of the present invention, with the use of a bracket such as that illustrated at 228 permitting quick and easy assembly of a wall without the problem of aligning wall panels with prepositioned apertures or lugs in the foundation. Thus, in using the bracket and tension rod assembly illustrated in FIG. 12, the rod is fed through the panel aperture and the bracket secured to the end of the rod. The panel to be erected is placed on the wedge 220, and is aligned with the preceding panel, the nailing strip 224 being inserted in the corresponding edge grooves to assure vertical alignment. Thereafter, the panel is raised enough to expose the bracket 228, which may then be pulled down against the wedge 220 and nailed in place, thus insuring proper location of the tension means. The panel is lowered over the wedge and bracket, and the next adjacent panel is similarly located. Thereafter the beam 218 is placed in the top channels 216 of the panels, with the tension rods 227 passing through corresponding apertures in the beam. Nuts or other fasteners are threaded onto the tops of the rods and the top beam is drawn down tightly into channel 216, thereby firmly securing the wall to the foundation. The wedge shapes of the upper and lower channels and their corresponding beams create a strong, properly aligned wall structure, with the panels being pulled into compaction to, in effect, pre-stress them. The panel side edges can be fastened, as by nailing, to the studs to complete the assembly.

The panels of the present invention not only facilitate construction of straight wall portions, but of corners, intersecting walls, partitions, and the like. FIG. 12 illustrates the ease with which intersecting walls can be formed, showing a panel 244, abutting panel 212 to form an angular wall portion. The edge of panel 244 may be secured to the surface of panel 212 by means of a nailing strip such as that shown at 224 which is first secured, as by an adhesive, to the surface of panel 212 in the manner illustrated in FIG. 10 for strip 192, with the edge groove of panel 244 fitting over the nailing strip and being fastened thereto. The top channel 246 of panel 244 is then made continuous with channel 216 by cutting away the top edge of panel 212, as at 248, and the bottom channels (not shown) are similarly treated. The top beam 218 is then modified by joining to it a second beam portion 250, as by means of a T-bracket 252, adapting it to fit into channels 216 and 246.

Panel 244 may fit over a floor wedge (not shown) provided on the foundation 222 and secured, if desired, to wedge 220 by a T-bracket. Tension means are provided, as before, to secure the panel to the floor. When the tension means are secured to draw the top lintel beams 218, 250 down into the channels 216, 246, the panels are interconnected and tightly secured to the foundation.

Thus, there has been provided a new and novel building system in which wall, roof and partition panels may be interlocked with each other and secured to a base to form strong, durable enclosures, walls, and other building elements and structures. The enclosure is secured by means of tension rods which eliminate the need for fasteners which terminate in the panels,

thereby avoiding the problem of fasteners pulling out of the foam core panels under stress. The present construction also is highly advantageous in that it is easily assembled and disassembled, so that if one or more panels should become damaged, it is an easy matter to unbolt the tension rods and remove and replace any damaged ceiling or roof panels. Damaged wall panels may be replaced by merely sliding them up and out of the wall and sliding the new panel into place. The lintel beam or roof panels are then replaced and the assembly is bolted together again.

This same replacability feature provides another advantage in that it provides a simple means of access if it is desired to expand the building by adding on one or more rooms. Such added rooms may be easily connected to the existing walls, and are a simple matter using the panels and assembly techniques of the present invention.

Because of the extreme stresses that often are encountered in moving a mobile home, considerable damage can occur with prior structures. The twisting and racking forces which tend to force the walls and roof out of square cause considerable damage to these units, often causing cover panels to pop loose from the structural framework and necessitating costly repairs. The present construction is resistant to this type of damage, since there are no skin panels to come loose from frame members. But if it is anticipated that severe stresses are likely to be encountered in moving the mobile home, trailer, or the like, the tension rods of the subject unit can be loosened, relieving damaging stresses, and the unit can be moved in this condition. When the unit reaches its destination, the tension rods are retightened, returning the building to its initial condition.

Although a particular embodiment disclosed herein is a mobile home, it should again be noted that this construction is suited to a variety of building enclosures, and that modification of the disclosed panels for such purposes will be within the skill of the art. Accordingly, it is desired that the true spirit and scope of the invention be limited only by the following claims.

What is claimed is:

1. A building structure including foundation means supporting a plurality of load-bearing wall panels assembled in side-by-side relationship, each said panel extending the full height of a wall of said structure, and each panel including:

a core of foamed, high density organic resinous material formed as a generally rectangular panel having spaced major surfaces;

a surface layer bonded to at least one of said major surfaces to provide a finished wall surface;

interlock means on each side edge of said panel for aligning and interlocking said panel with adjacent panels upon assembly of said structure;

top channel means formed in and extending across the top edge of said panel, said top channel means being narrower than the thickness of said panel and having a trapezoidal cross section;

a top beam having a trapezoidal cross section corresponding to the cross sectional shape of said top channel means;

tension means secured at one end to said foundation and extending vertically through said panel and said top beam; and

means adjustably securing said tension means to said top beam to draw said top beam down into said top channel means to place said panel in compression and fasten it in position on said foundation, the complementary cross sectional shapes of said top beam and said top channel means preventing splitting of said panel and distributing the compressive load produced by said tension means.

2. The building structure of claim **1**, wherein each of said wall panels includes corner notches extending the length of said panel, the notches on adjacent panels cooperating to provide a recess at the juncture between adjacent panels, said structure further including a cover strip for each said recess for covering said juncture.

3. The building structure of claim **1**, wherein each of said wall panels incorporates at least one cavity extending from said top edge channel means through said panel to the bottom thereof, said cavity being adapted to receive said tension means.

4. The building structure of claim **1**, wherein said top beam spans the juncture between adjacent panels to align said panels.

5. The building structure of claim **1**, wherein said top channel means is formed in said panel by a flat base and upwardly and outwardly tapering sidewalls; and

wherein said top beam is formed with a flat base adapted to engage the flat base of said top channel and tapered sidewalls adapted to engage the sidewalls of said channel when said top beam has been drawn into said channel by said tension means.

6. The building structure of claim **5**, further including:

locator means secure to said foundation, said locator means having a trapezoidal cross sectional; and

a locator channel formed in and extending across the bottom edge of each of said panel, said locator channel being narrower than the thickness of said panel and having a trapezoidal cross section corresponding to the cross sectional shape of said locator means, said locator channel being adpated to receive said locator means to align said panels on said foundation.

7. The building structure of claim **6**, wherein said tension means further extends through said locator means to draw said panel down onto said locator means, thereby rigidly securing said panel to said foundation.

8. The building structure of claim **7**, wherein said interlock means comprises tongue means for one side edge of each panel and groove means for the other side edge of each panel.

9. The building structure of claim **1**, further including a plurality of ceiling panels adapted to engage the tops of said wall panels to form a building enclosure, and wherein said top beam comprises a lintel beam integrally formed on each said ceiling panel.

10. The building structure of claim **9**, wherein each said ceiling panel includes two spaced lintel beams adapted to engage the channel means formed along the top edges of spaced wall panels, said ceiling panel spanning said spaced wall panels to form an enclosure.

11. The building structure of claim **9**, wherein each said ceiling panel includes an arched upper surface adapted to form a roof surface, and interlock means on each side edge of each panel for aligning said pane with adjacent panels.

12. The building structure of claim 9, wherein each of said ceiling panels has a tongue formed on one side edge and a groove formed on the opposite side edge, whereby each ceiling panel is interlocked with adjacent ceiling panels upon assembly of said enclosure.

13. The building structure of claim 9, wherein each said lintel beam includes a central portion of generally trapezoidal cross-section depending from the lower surface of said ceiling panel and a groove on each side of, and parallel to, said central portion, whereby the surface of said lintel beam defines a return curve.

14. The building structure of claim 13, wherein said tension means extends through said ceiling panel, whereby said tension means draws said lintel beam down into said channel means, the top of said panel adjacent said channel engaging said lintel beam grooves.

15. The building structure of claim 9, wherein each of said ceiling panels is constructed of a foamed material having at least its lower surface finished by a skin layer which provides the desired ceiling appearance for said enclosure.

16. The building structure of claim 15, wherein said foamed material is a high density foamed urethane.

17. The building structure of claim 9, wherein each of said lintel beams includes a centrally located portion of generally trapezoidal cross section depending from the surface of said ceiling panel and a groove formed in the said under surface on each side of said depending portion, whereby the surface of said lintel beam defines a return curve, said depending portion of said lintel beams being adapted to intimately engage corresponding channels in said wall panels, and said grooves on each side of said depending portion being adapted to engage the upper edge portions of said wall panels adjacent said channel and to engage the interior and exterior surface faces of said wall panels.

18. The building structure of claim 17, wherein each of said ceiling panels incorporates trough means on its upper surface aligned with said spaced lintel beams, and further including tie bar means for said trough means.

19. The building structure of claim 18, wherein said tension means comprises a plurality of tension rods extending vertically through said tie bar means, said roof panels, said lintel beams, said wall panel channels, and said wall panels to draw said lintel beams and adjacent grooves into rigid contact with said channels and the upper edges of said panels.

20. The building structure of claim 18, wherein each of said wall panels incorporates two spaced cavities extending from said top edge channel through said panel to the bottom thereof, said cavities being adapted to loosely receive said tension means.

21. The building structure of claim 20, wherein each of said wall panels incorporates a lower channel formed across its bottom edge.

22. The building system of claim 21, further including locator means secured to said foundation for engaging said lower channels of said wall panels, said locator means defining the location of said enclosure walls.

23. The building structure of claim 22, wherein said tension means further extend through said locator means and through said foundation to rigidly secure said enclosure to said foundation.

24. The building structure of claim 23, further including partition panels for constructing walls within said enclosure, said partition panels having interlocking side edges and top edges and bottom edge channels for assembly to adjacent partition and wall panels and to said locator means.

25. The building structure of claim 24, further including ceiling locator strips for said upper channels and tension bands securable between said locator means on said foundation and said ceiling locator strips to hold said partition panel in position.

26. The building system of claim 25, wherein said enclosure is a mobile home.

27. The building system of claim 25, wherein said foundation is a vehicle bed, said enclosure forming a vehicle body.

28. The building system of claim 25, wherein said roof panels overlap the junctures between said wall panels, whereby said lintel beams bridge said junctures, and wherein said tie bars overlap the junctures between said roof panels, whereby said enclosure panels are secured against racking and twisting due to externally applied forces.

29. A lightweight, modular wall structure incorporating a plurality of vertical, loadbearing wall panels aligned in edge-to-edge relationship, each said panel comprising:

a core of foamed, high density organic resinous material formed as a generally rectangular panel having parallel, sapced major surfaces defining the thickness of said core, said core being bounded by spaced top and bottom edges and spaced first and second side edges;

a skin layer bonded to at least one of said major surfaces of said core to provide a finished wall surface;

first interlock means formed on and extending substantially the length of said first side edge and adapted to interlock with a first adjacent panel;

second interlock means formed on and extending substantially the length of said second side edge and adapted to interlock with a second adjacent panel;

a lintel channel formed in and extending the length of said top edge and adapted to be aligned with the lintel channel of adjacent panels, said lintel channel being substantially trapezoidal in cross section;

a base channel formed in and extending the length of said bottom edge and adapted to be aligned with the base channel of adjacent panels, said base channel being substantially trapezoidal in cross section, said lintel and base channels being narrower than the thickness of said core and being centrally located in the top and bottom edges respectively, of said core;

a lintel beam having a substantially trapezoidal cross section complementary to the shape of said lintel channel;

base wedge means having substantially trapezoidal cross section complementary to the shape of said base channel; and

tension means connected between said lintel beam and said base wedge to draw said lintel beam into said lintel channel and said base wedge into said base channel to place said panel under a compressive load.

30. The wall structure of claim 29, further including cavity means extending vertically through said panel, said tension means extending through said cavity for connection to said lintel beam and to said base wedge.

31. The wall structure of claim 29, wherein said lintel channel includes a flat base and upwardly and outwardly tapered sidewalls centered in said top edge of said panel and spaced from said major surfaces thereof; and

wherein said lintel beam includes a flat base adapted to engage the flat base of said lintel channel and tapered sidewalls adapted to engage the sidewalls of said lintel channel.

32. The wall structure of claim 31, wherein said lintel beam and said base wedge means extend across adjacent panels to align said panels.

33. A lightweight, modular wall structure incorporating a plurality of vertical, load-bearing wall panels aligned in edge-to-edge relationship, each said panel comprising:

a core of foamed, high density organic resinous material formed as a generally rectangular panel having spaced major surfaces defining the thickness of said core, said core being bounded by spaced top and bottom edges and spaced first and second side edges;

a surface layer bonded to at least one of said major surfaces of said core to provide a finished wall surface;

first interlock means formed on and extending substantially the length of said first side edge and adapted to interlock with an adjacent panel;

second interlock means formed on and extending substantially the length of said second side edge and adapted to interlock with an adjacent panel;

a lintel channel integral with, formed in, centrally located in, and extending the length of, said top edge and adapted to be aligned with the lintel channel of adjacent panels, said lintel channel being substantially trapezoidal in cross-section and narrower than the thickness of said core;

a base channel integral with, formed in, centrally located in, and extending the length of, said bottom edge and adapted to be aligned with the base channel of adjacent panels, said base channel being substantially trapezoidal in cross-section and narrower than the thickness of said core;

a lintel beam having a substantially trapezoidal cross-section complementary to the shape of said lintel channel;

base wedge means having a substantially trapezoidal cross-section complementary to the shape of said base channel; and

tension means connected between said lintel beam and said base wedge to draw said lintel beam into the lintel channel and said base wedge into said base channel to place said panel under a compressive load which is distributed continously across the width of said panel, said core providing support at the sides of said lintel beam and said base wedge.

34. The structure of claim 33, wherein said lintel beam comprises a ceiling locator strip and wherein said tension means comprises a tension band.

35. The structure of claim 33, wherein at least one of said panels is generally L-shaped to provide a corner section for said wall.

36. The structure of claim 33, wherein at least one of said first and second interlock means is located on a major surface of said panel, whereby said panel may be aligned with an adjacent panel to form intersecting wall panels.

37. The strucure of claim 33, wherein said first and second interlock means comprise tongue means for one side edge of each panel and groove means for the other side edge of each panel.

38. The structure of claim 33, wherein said first and second interlock means comprises groove means formed in the side edges of said panel and nailing strip means for each groove, said nailing strip extending between and being received in the groove means of adjacent panels.

39. The structure of claim 33, wherein said panel surface layer comprises a preformed plastic material simulating natural materials.

40. The structure of claim 33, wherein said panel surface layer comprises wood paneling.

41. The structure of claim 33, wherein said tension means comprises a least one tension bar passing vertically through each said panel.

42. The panel of claim 33, wherein said lintel channel includes a flat base and upwardly and outwardly tapered sidewalls centered in said top edge of said panel and spaced from said major surfaces thereof; and

wherein said lintel beam includes a flat base adapted to engage the flat base of said lintel channel and tapered sidewalls adapted to engage the sidewalls of said lintel channel.

43. The panel of claim 33, wherein said lintel beam and said base wedge means extend across adjacent panels to align said panels.

44. The structure of said claim 33, wherein each of said panels further includes cavity means extending vertically through said panel between said lintel channel and said base channel, said cavity means being adapted to receive said tension means.

45. The structure of claim 33, wherein said lintel and base channels each are formed with a flat base and wherein said lintel beam wedge each are formed with a flat base, said tension means drawing the bases of said lintel beam and said base wedge into engagement with the bases of said lintel and base channels, respectively, to compress said panel core between the bases of said lintel beam and base wedge.

46. The structure of claim 45, wherein said lintel and base channels each are formed with outwardly tapered sidewalls and wherein said lintel beam and base wedge each are formed with outwardly tapered sidewalls complementary to said lintel and base channel sidewalls, respectively, said tension means drawing corresponding complementary sidewalls of said lintel beam and lintel channel and said base wedge and base channel into engagement, whereby the sidewalls of said lintel beam and base wedge are continuously engaged with said channel sidewalls to distribute the compressive load produced by said tension means, the tepering of said sidewalls increasing the area of panel compression between said beam and said base wedge.

47. The structure of claim 33, wherein at least one of said panels further includes third interlock means, said third interlock means being located on a major surface of said panel for receiving and aligning an adjacent intersecting wall panel.

48. The structure of claim 47, wherein said third interlock means comprises a wall panel locator strip forming a tongue adapted to engage a corresponding groove on said adjacent intersecting wall panel.

49. The structure of claim 47, wherein said third interlocking means comprises a groove formed in said major surface of said at least on panel.

50. The structure of claim 47, wherein said lintel beam is generally T-shaped to engage the lintel channels of said at least one panel and said intersecting panel.

51. The structure of claim 50, wherein said base wedge means is generally T-shaped to engage the base channels of said at least one panel and said intersecting panel.

52. The panel of claim 33, futher including a surface layer bonded to both of said major surfaces of said core to provide a finished wall appearance on both sides of said panel.

53. The panel of claim 52, further including a corner notch at each side edge on each said major surfaces and extending the length of said panel, and a cover strip for each said notch.

54. The structure of claim 33, wherein said tension means is secured at one end to said base wedge means and extends vertically through said panel and said lintel beam, said structure further including means adjustably securing said tension means to said lintel beam to draw said beam down into said lintel channel to place said panel in compression and fasten it in position on said base wedge, the complementary cross-sectional shapes of said lintel beam and said lintel channel distributing the compressive load produced by said tension means and preventing splitting of said panel.

55. The structure of claim 54, further including bracket means shaped to conform to the shape of said base wege means for securing said tension means to said base wedge means, and fastener means for said bracket means.

56. The structure of claim 33, further including foundation means supporting said base wedge means.

57. The structure of claim 56, wherein each of said wall panels incorporates at least one vertical cavity extending from said base channel through said panel to said lintel channel, said cavity being adapted to receive said tension means.

58. The structure of claim 57, wherein said tension means is secured at one end to said foundation and extends vertically through said base wedge means, through the vertical cavity in a corresponding panel, and through said lintel beam, and including means adjustably securing said tension means to said lintel beam to draw said lintel beam down into said lintel channel to rigidly secure said panel to said foundation.

59. The structure of claim 58, wherein said first and second interlock means comprises grooves formed in the side edges of each panel and nailing strip means for each groove, said nailing strips extending between said being received in the corresponding grooves of adjacent panels to vertically align adjacent panels and secure said panels in abutting relationship.

60. The structure of claim 59, wherein said lintel beam and said base wedge means extend across the junctures of adjacent panels to align said panels.

61. The structure of claim 59, wherein said tension means comprises at least one tension bar for each panel of said wall structure.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,898,779

DATED : Aug. 12, 1975

INVENTOR(S) : Charles W. Tracy

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the claims

Claim 6, line 3, change "secure" to --secured--.

Claim 11, line 4, change "pane" to --panel--.

Claim 17, line 4, change "the surface" to --the under surface--

Claim 21, line 2, change "panels incorporates" to --panels further incorporates--.

Claim 24, line 4 (the first line at column 18) change "top edges and bottom edge" to --top and bottom edge--.

Claim 29, line 7, change "sapced" to --spaced--.

Claim 41, line 2, change "a" to --at--.

Claim 45, line 3, change "beam wedge" to --beam and base wedge--.

Claim 46, line 12, change "tepering" to --tapering--.
line 14, (the last line in the claim) change "said beam" to --said lintel beam--.

Claim 55, line 3, change "wege" to --wedge--.

Claim 59, line 4, change "between said" to --between and--.

Signed and Sealed this

twenty-first Day of *October 1975*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks