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**Fulton et al.**

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[45] **Dec. 4, 1973**


[54] **MODULAR STRUCTURES**


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[52] **U.S. Cl.**..... **52/236,** 52/79, 52/237

[51] **Int. Cl.**..... **E04h 1/02,** E04h 1/04

[58] **Field of Search**..... 52/79, 234, 237, 52/236



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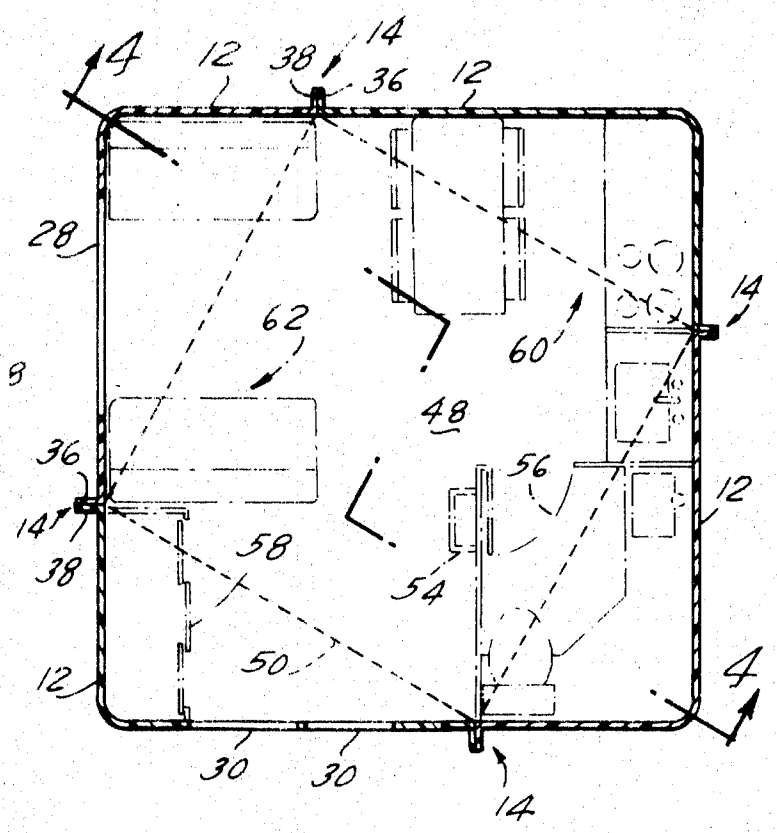
*Primary Examiner*—John E. Murtagh
*Attorney*—Douglas W. Wyatt



[57] **ABSTRACT**

Single and multi-modular structures suitable for use as living quarters or as office space are fabricated from a plurality of pre-formed basic construction sections. The basic construction sections may be assembled to provide a single or basic modular unit and two or more basic modular units may be assembled in various configurations to provide multi-modular units.


**4 Claims, 10 Drawing Figures**



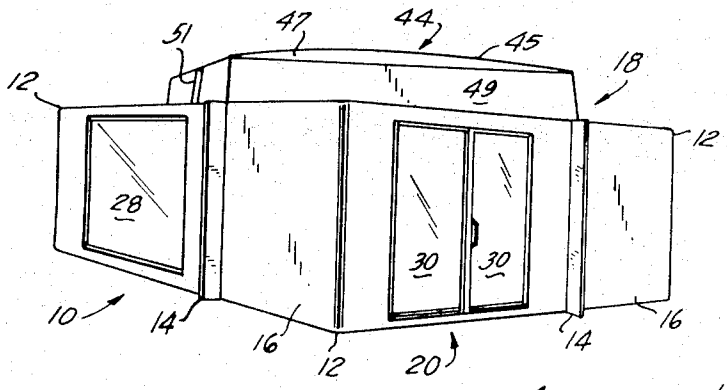



FIG.1

FIG.2

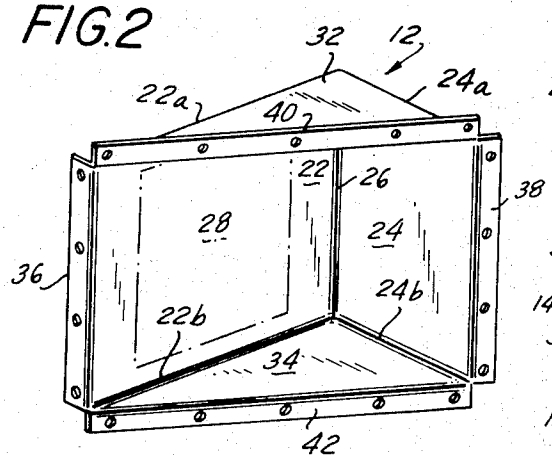
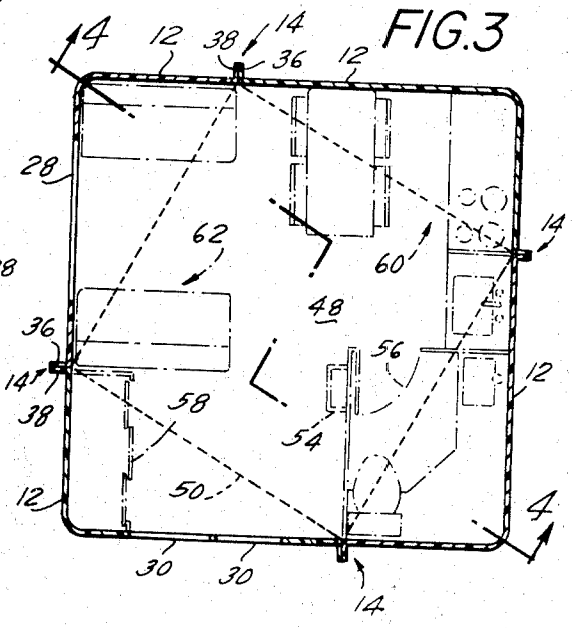



FIG.3



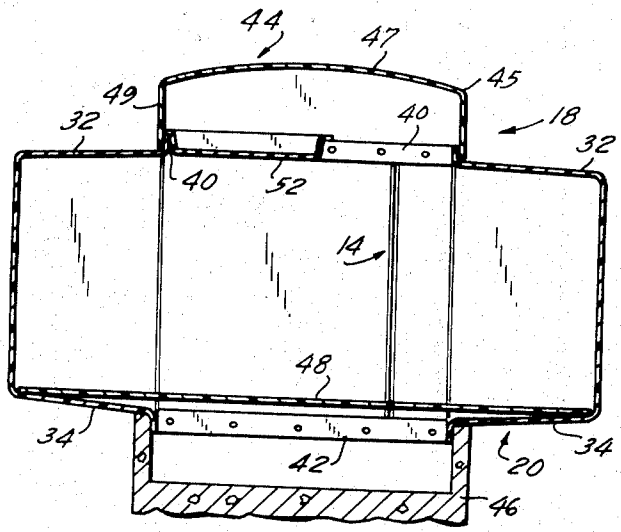




FIG.4

FIG.5

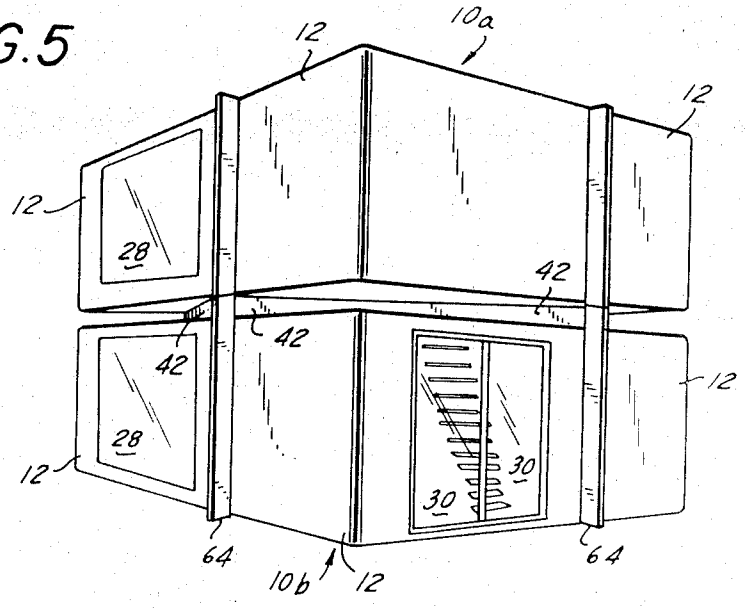

12
10a
12
12
28
42
42
42
12
28
30
30
12
64
10b
12
64

FIG.6

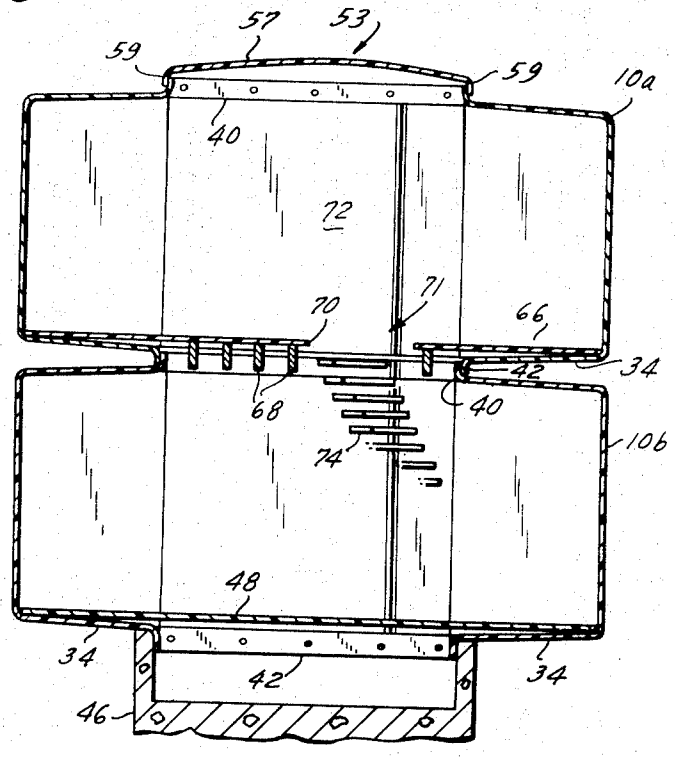

57
53
59
59
10a
40
72
70
71
66
42
34
68
40
74
10b
48
34
42
34
46

FIG. 7

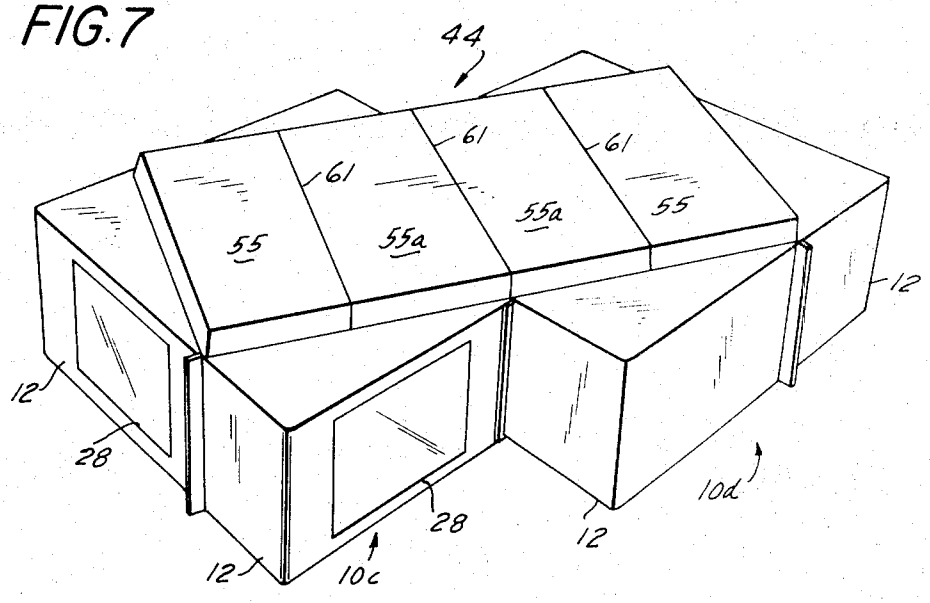
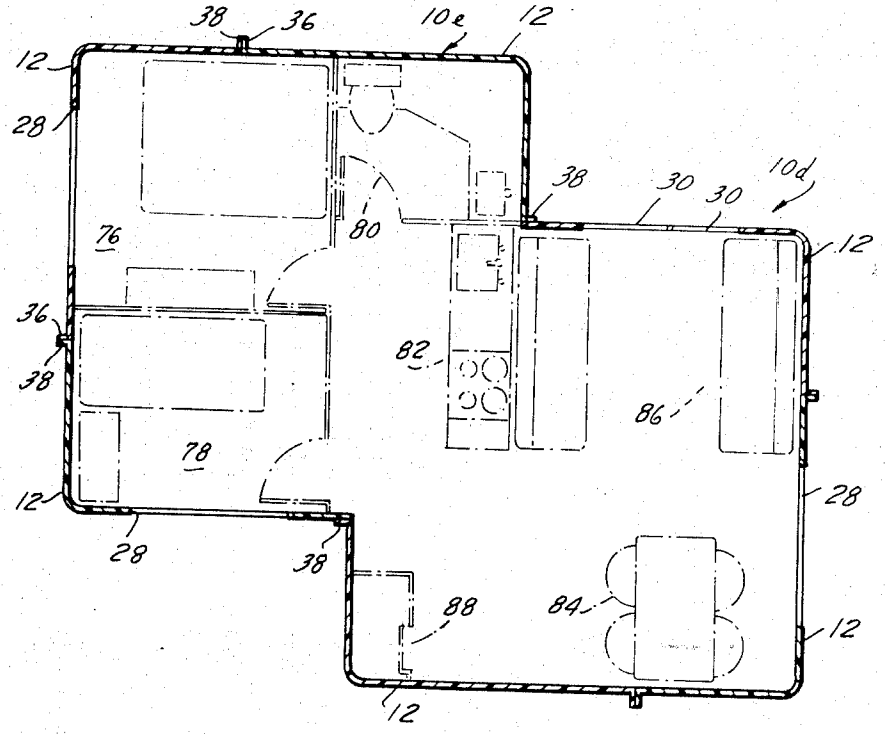

44
61
61
61
55
55a
55a
55
12
12
28
28
12
10c
12
10d

FIG. 8


38
36
10e
12
12
28
38
30
30
10d
12
76
80
36
38
82
86
78
12
28
38
28
88
84
12
12

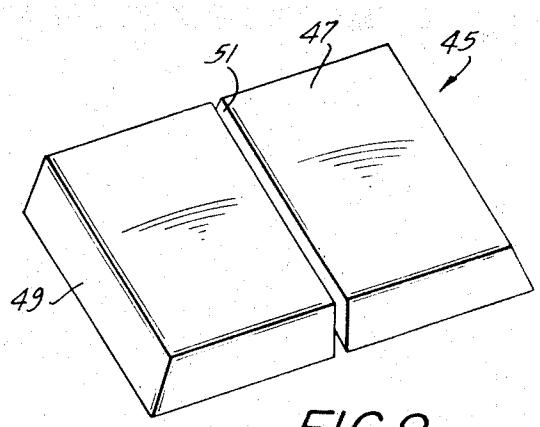



FIG. 9

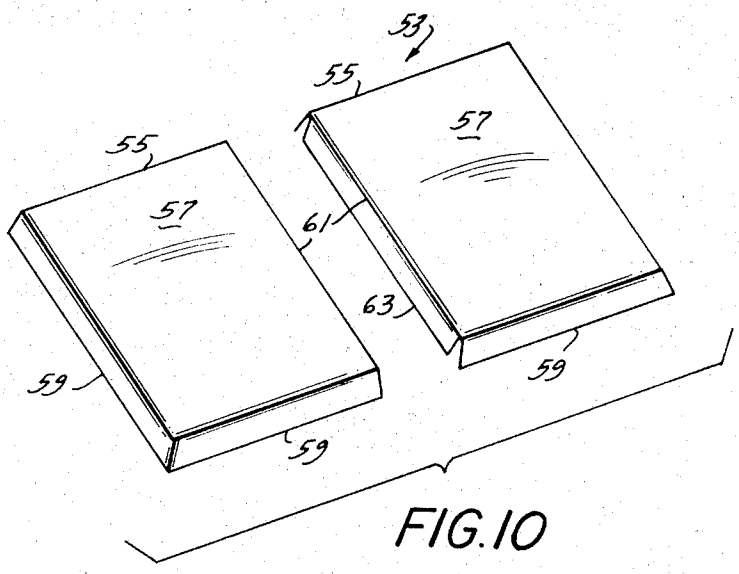



FIG. 10

# MODULAR STRUCTURES

## BACKGROUND OF THE INVENTION

Modular structures are suitable for use as hunting or ski lodges, office space, or as a basic unit for a motel complex. Conceptually, such modular structures are intended to be mass produced, attractive, structurally sound dwelling or office units capable of providing the customary comforts with little or no maintenance being required of the occupants. A number of building materials notably, molded fiberglass, are available for manufacturing such modular structures within the intended design concepts.

In practice modular structures are fabricated at factory locations and are shipped for assembly and installation at the building site. Preferably, the modular structures are fabricated in sections for convenient shipment and assembly at "on-site" locations. In this way fabrication from raw materials such as molded fiberglass occurs at a central location while assembly of the final structure is carried out with relative ease at remote locations ordinarily selected for hunting or skiing lodges.

These arrangements for fabrication and assembly of basic sections tend to limit modular structures to a single design of common appearance for a fixed number of occupants.

## SUMMARY OF THE INVENTION

The present invention is directed to modular structures and more particularly to a basic construction section from which a variety of modular structures may be assembled. The basic construction section is readily fabricated from a suitable construction material such as fiberglass and is convenient for shipment to and assembly at a remote construction site. The basic construction section of the present invention forms a portion of the side wall, roof, and base portion of the completed modular structure. Preferably, the basic construction section is of sufficient strength to have load-bearing capability in the finished modular unit. The load-bearing ability inheres in the design of the basic construction sections which include integral generally perpendicular side wall panels joined at their top edges to a roof panel and at their bottom edges to a base panel. The basic construction sections are further provided with connector flanges at the exposed edges of the side, top, and base panels for connection to adjacent sections in assembly of a modular unit. Each basic construction section, when assembled, contributes to a rigid box-like modular structure without requiring an internal support frame. The connector flanges are turned outwardly (with respect to the interior of the modular unit) and contribute to the strength and rigidity of the side walls, roof, and base portion of the assembled modular unit. The basic construction sections include, as desired, suitable openings for doorways and windows.

Basic construction sections may be arranged to form a single modular structure or a variety of multi-modular structures as desired to accommodate individual taste and space requirements. For example, the basic construction sections may be assembled to form a single modular unit, one story high, having a generally rectangular or square floor plan. The basic construction sections when assembled form the side walls, a portion of the roof, and a portion of the base of the modular unit.



The base is mounted on a suitable foundation. Separate roof sections cooperate with the basic sections to completely enclose the roof portion of the modular unit.

A multi-modular unit may be formed by stacking one modular unit atop another to define a two-story unit with each story having a generally rectangular or square floor plan.

In another modular unit according to the present invention, the basic construction sections may be arranged to provide one story or multi-story units having larger floor plans than the basic rectangular or square floor plans. Such larger floor plans are defined by arranging adjoining modules in various patterns.

The basic construction sections of the present invention may be formed from suitable materials such as molded fiberglass at a central factory location. The basic sections are designed for convenient and economical shipment to the point of assembly. Modular units may be assembled quickly and easily at the construction site.

## DESCRIPTION OF DRAWING

A preferred embodiment has been chosen for illustrating the principles of the present invention and is shown in the accompanying drawing wherein:

FIG. 1 is a perspective view of a single modular unit according to the present invention;

FIG. 2 is a perspective view of a basic construction section for assembling modular units according to the present invention;

FIG. 3 is a top plan view in section illustrating the floor plan of the single modular unit of FIG. 1;

FIG. 4 is a section view taken along line 4—4 of FIG. 3;

FIG. 5 is a perspective view of a modified form of the present invention comprising stacked modular units defining a two-story multi-modular unit;

FIG. 6 is a side elevation in section of the multi-modular unit of FIG. 5;

FIG. 7 is a perspective view of a modified form of the present invention comprising adjoining modular units, and;

FIG. 8 is a plan view in section showing the floor plan of the structure illustrated in FIG. 7.

## DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIGS. 1–4 of the drawing, a basic modular dwelling unit **10** comprises a plurality of, preferably four, corner sections or basic construction sections **12**, joined by suitable flanges **14**, to define upstanding side walls **16** and portions of the roof **18** and base **20**. Each corner section includes a pair of vertical panels **22** and **24** joined at a corner line **26** in approximate right angle relation to each other. Each vertical panel **22** and **24** forms part of the upstanding side walls **16** of the modular unit. If desired, one of the vertical panels in each corner section may be provided with an open area to accommodate a window **28** or door panels **30**. Each corner section **12** includes top and bottom wedge panels **32** and **34** which join the adjacent vertical panels at their top and bottom edges respectively to define the portions **18** and **20** of the roof and base of the modular unit.

Each of the vertical panels **22** and **24** and the top and bottom wedge panels **32** and **34** carry flange members **36, 38, 40, 42** respectively. Each flange member is connected in approximate right angle relationship to its re-

spective carrier panel. The vertical flange members **36, 38** are joined to corresponding flange members of adjacent corner sections in assembling the completed modular unit. The top flanges **40** secure roof panels **44** to the corner section by means of suitable fastener means (not shown). The bottom flanges **42** secure the entire modular unit to a modular unit supporting foundation **46** which preferably is formed of concrete. The foundation may serve also as a suitable location for various dwelling utilities, such as heating and plumbing (not shown).

As best illustrated in FIG. **3**, a basic modular unit is formed by joining four corner sections **12** at their adjacent vertical flange portions **36, 38.** The basic modular unit may have a generally square floor plan as illustrated or may be rectangular in form if desired. A floor member **48** supported by the corner sections is located within the modular unit to span the open area over the foundation. The corner sections when assembled define a basic modular unit having an open roof area (indicated by broken line **50** in FIG. **3**) which is covered by the roof panels **44.** If desired, the roof panels may be transparent or translucent to aid interior lighting of the dwelling unit.

In one form of the invention a deep roof panel **44a** may be used to create additional space within the modular unit. As best illustrated in FIG. **4**, a sleeping loft **52** is mounted on adjacent top flange members **40** to accommodate one or two persons. Access to the sleeping loft is by a suitable wall mounted ladder **54,** shown in FIG. **3.**

The modular unit may be furnished with basic facilities such as lavatory **56,** a storage area **58,** kitchen and dining area **60,** and living area **62,** as illustrated in FIG. **3.**

A basic modular unit according to the present invention comprises six performed sections, i.e., four corner sections **12** and a pair of roof panels **44** together with a floor member **48** which are trucked to a building site and assembled upon the concrete foundation **46.** A corner section measuring 9 feet and 5 feet along adjoining side wall panels will provide a 14 foot × 14 foot dwelling providing basic housekeeping facilities and storage for four persons. The living area may convert to sleep two persons and two additional persons may be accommodated in the optional sleeping loft **52.**

The basic modular unit may be expanded by stacking units as shown in FIGS. **5** and **6.** Each of the stacked units is formed from a plurality of corner sections as described above in connection with FIGS. **1–4.** The lower modular unit is fastened to a concrete foundation by means of bottom flanges. A floor member spans the open foundation to provide a floor in the lower unit.

The top unit **10***a* is stacked on the lower unit **10***b* with its downwardly directed base flanges **42** engaging and fastened to the upwardly directed top flange members **40** of the lower unit. The flanges **40, 42** extend to the outer edges in a rectangular or square patterns (as seen in FIGS. **3** and **5**) to provide adequate support and stability of the upper unit. In addition the vertical external **14** flanges may be reinforced by suitable strength members **64** to add rigidity and stability to the stacked units.

The upper unit is provided with a floor **66** reinforced by suitable beams **68.** The floor is open **70** to define a stair well for access to the upper compartment **72** by means of a suitable ladder **74.** A roof member **44** caps and encloses **30** the upper unit as described previously. Window **28** and door panels are included in the wall panels of the multi-modular unit.

A bilevel or stacked module includes the floor plan features of the basic modular unit as described above, and, in addition the upper level provides individual bedrooms or a sleeping dormitory. Ordinarily, the stacked modules do not require the optional raised roof panel, however, such raised roof panels may be used as desired.

In another form of the present invention, (shown in FIGS. **7** and **8**), two modules **10***c* and **10***d* can be assembled adjoining each other providing a more varied floor plan for greater storage and for private bedrooms. A corner section may be eliminated from each of the two modules **10***c* and **10***d* which may be joined at corresponding flanges. That is, each module includes three instead of four corner sections. Preferably, one of the outwardly extending flanges **36** is eliminated (compare corner sections FIG. **2**) for ease in joining adjacent modules. The open roof defined by the corner sections may be closed by the usual roof panels **44.** Of course, one or more deep roof panels may be used to provide sleeping lofts or added storage space as described above. In this form a corresponding foundation is provided for the extended double module.

A floor plan of any desired configuration may be arranged, and typically, the floor plan may include separate bedrooms **76, 78,** a lavatory **80,** a kitchen area **82,** a dining area **84,** a living area **86** and storage space **88.** Windows **28** and doors **30** may be provided as described in the module side walls.

An extended double module can comfortably accommodate six persons.

The modular units according to the present invention are preferably constructed from molded fiberglass. The corner sections are structurally self-supporting and eliminate the need for an interior frame within the unit. The modules may be of single wall thickness or of an insulated sandwich construction according to geographic location and intended use.

In constructing a modular unit according to the present invention, a concrete foundation is poured on site. Then two corner sections are positioned on the foundation and bolted to each other. Two additional sections are placed and likewise bolted. The unit is bolted also to the foundation.

It will be appreciated that the present invention provides a modular dwelling unit constructed from a basic corner section. The corner section is designed so that a single module, a stacked double module, or an extended double module may be constructed from basic components.

Having thus described the invention what is claimed is:

1. A modular structure including a plurality of corner sections arranged in edge to edge relationship to form an enclosure, each of said corner sections having first and second generally rectangular side wall panels joined along a common edge forming a corner, generally flat wedge shaped roof and base panels extending in generally parallel planes and being spaced apart by said side wall panels, said roof panel being joined along adjacent edges to corresponding upper edges of said side wall panels, said base panel being joined along adjacent edges to corresponding lower edges of said side wall panels, each of said side wall panels and said roof and base panels having an exposed edge with a connec-

tor flange extending therefrom to strengthen the corner section and for use in connecting the corner sections to adjacent supports, said side wall panels and said roof and base panels forming a rigid box-like corner section in cooperation with said connector flanges; means for securing together the side wall panel flanges of adjacent corner sections; means for securing base panel flanges to a foundation; and means defining a roof section secured to said connector flanges of said roof panels.

**2.** The modular structure of claim **1** wherein four similarly configured corner sections are joined by adjacent side wall panel connector flanges to form said enclosure, and wherein said connector flanges are turned outwardly from said side wall panels and contribute to the strength and rigidity of the structure.

**3.** The modular structure of claim **1** wherein said plurality of corner sections comprises an upper modular unit, and wherein the foundation for said upper modular unit includes a lower modular unit having a plurality of corner sections arranged in edge to edge relationship to form an enclosure, and wherein said corner sections of said lower modular unit are configured in the same manner as the corner sections of said upper modular unit, and wherein said base connector flanges of said upper modular unit are secured by fastening means to the connector flanges of the roof panels of the corner sections of said lower modular unit.

**4.** The modular structure of claim **3** wherein said upper and lower modular units each consists of four similarly configured corner sections joined by adjacent side wall panel connector flanges, and wherein said connector flanges are turned outwardly from said side wall panels and contribute to the strength and rigidity of the structure.

* * * * *