United States Patent [19]

Speidel

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[54] **BUILDING STRUCTURES**

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[52] **U.S. Cl.** **52/73**, 52/79, 52/237, 52/309

[51] **Int. Cl.** **E04b 1/34**

[58] **Field of Search** 52/79, 236, 237, 52/73, 586

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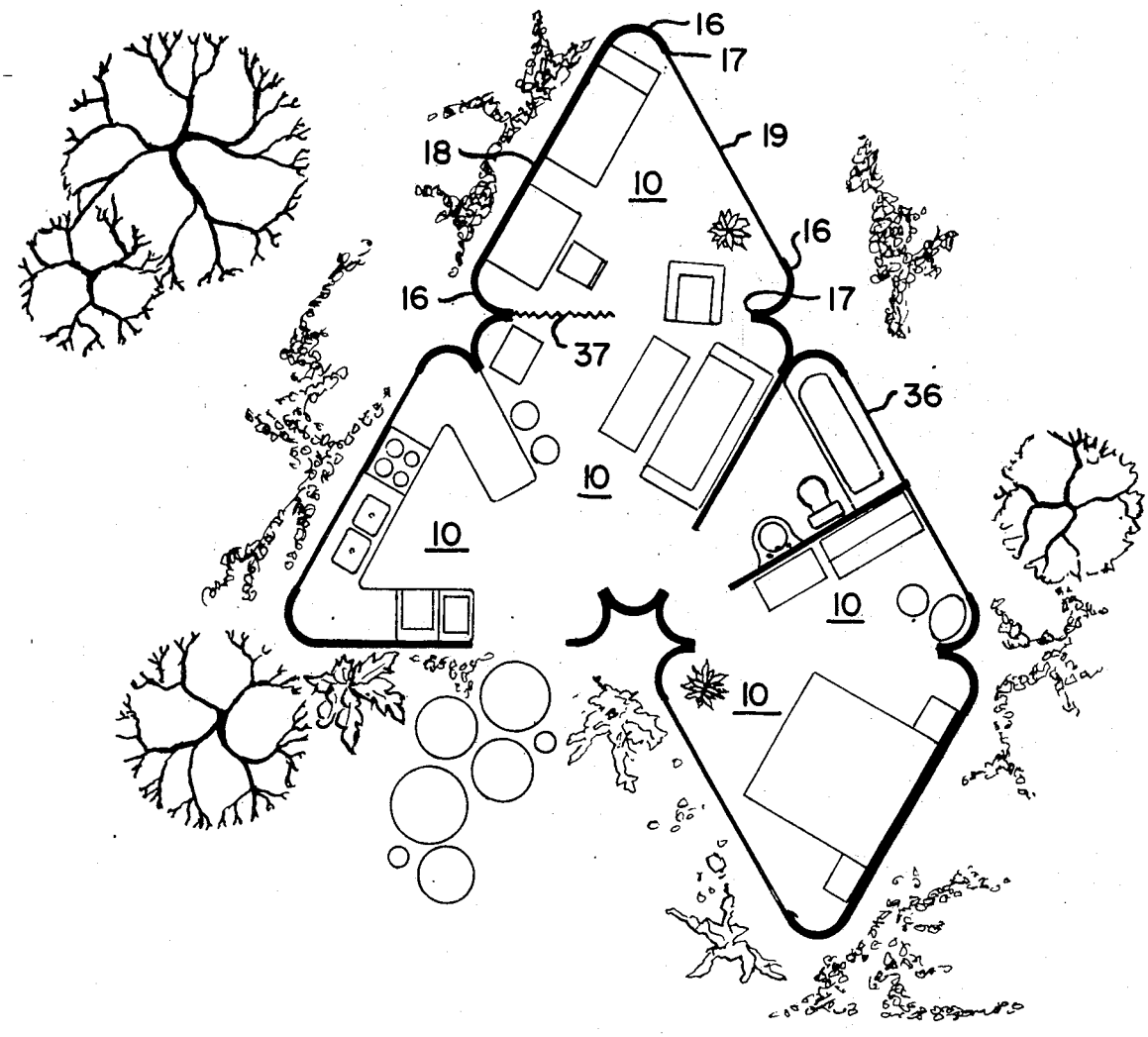
Assistant Examiner—H. C. Raduazo
Attorney—Buell, Blenko & Ziesenheim

[57] **ABSTRACT**

A building module is provided for assembly into a multiple module building. Each separate module comprises a hollow formed body including at least one generally equilateral triangular horizontal section with spaced apart roof and bottom members connected by arcuate vertical corner members, at least one side wall opening defined by the roof, bottom and corner members and interchangeable fastening means adapted selectively to fasten adjacent modules together and to fasten an insert in said opening.

10 Claims, 12 Drawing Figures



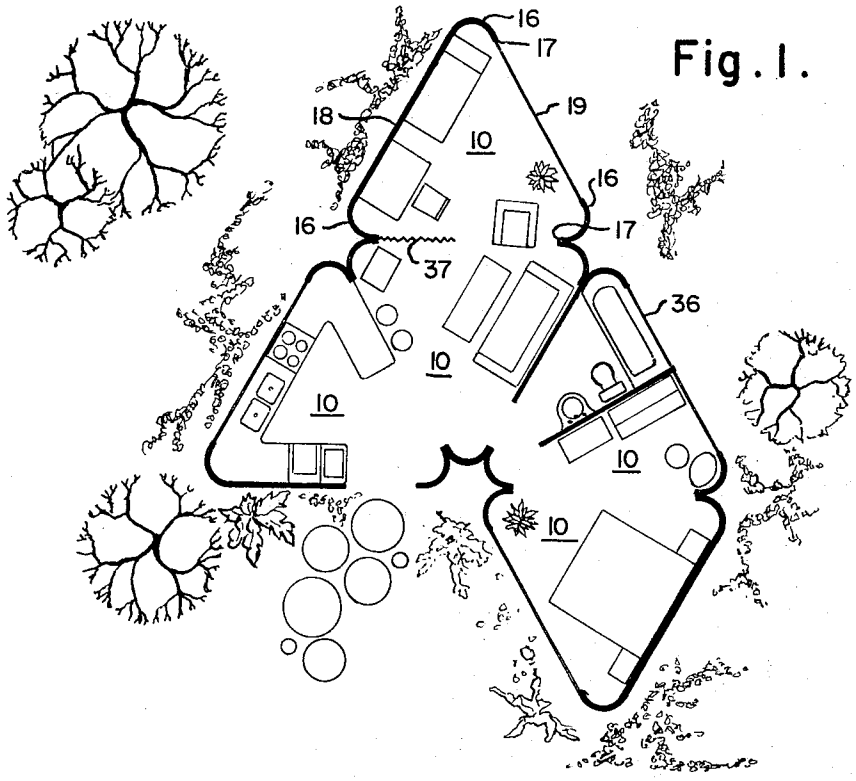


Fig. 1.

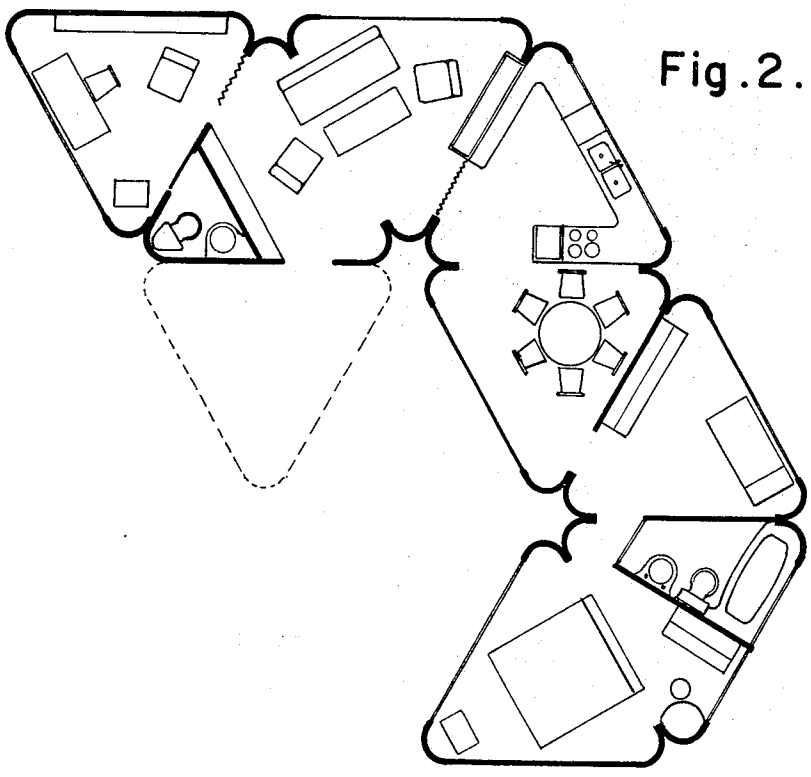
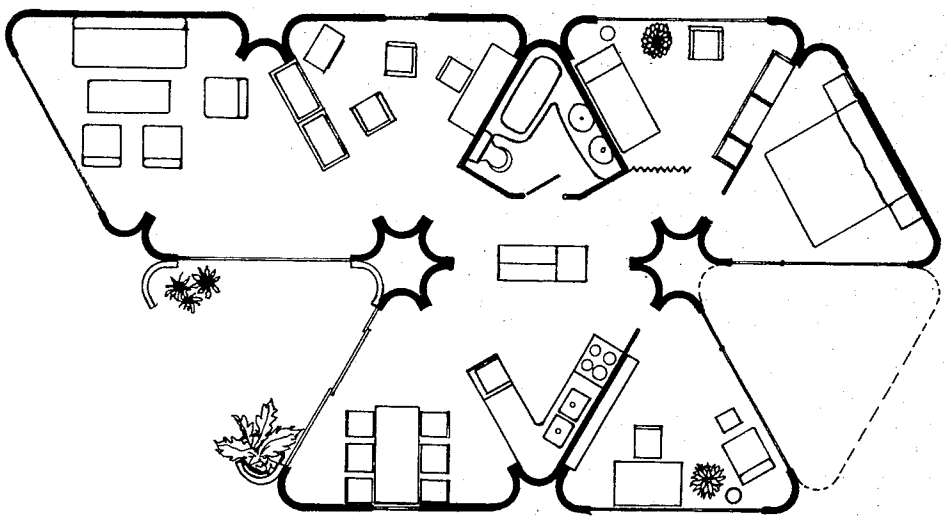


Fig. 2.

Fig. 3.



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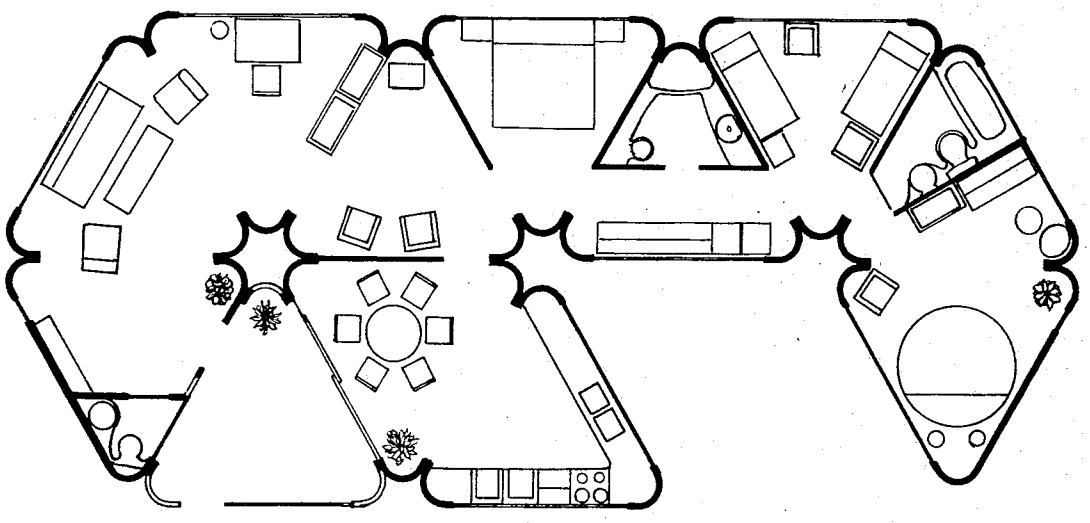

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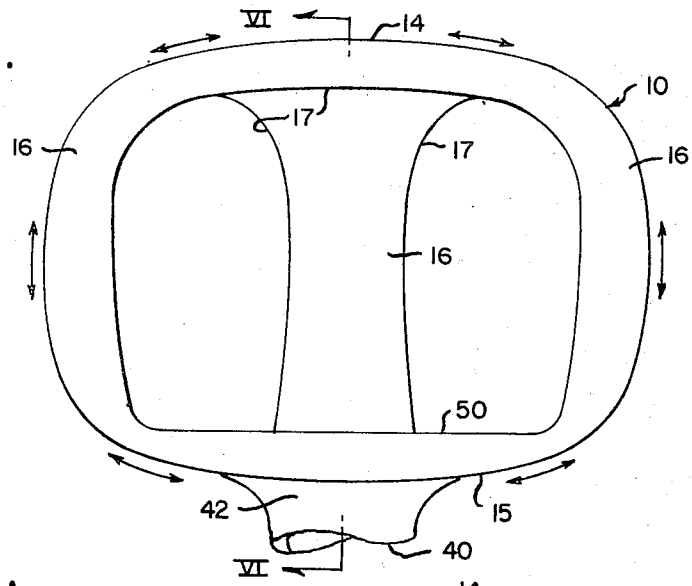

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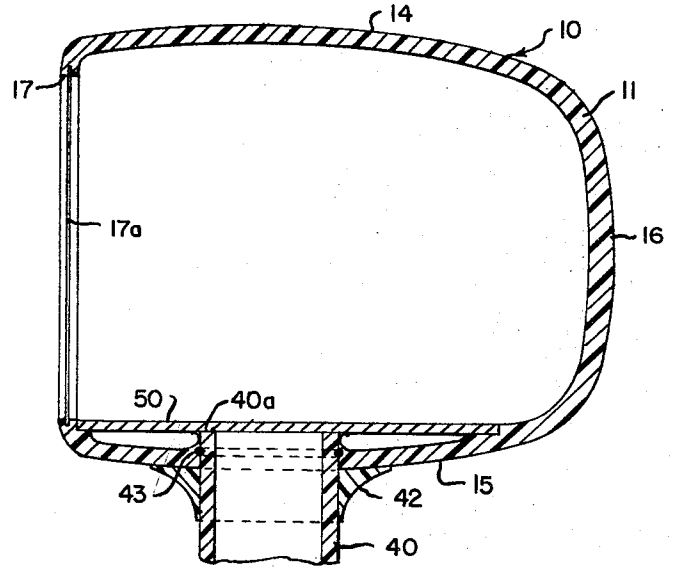

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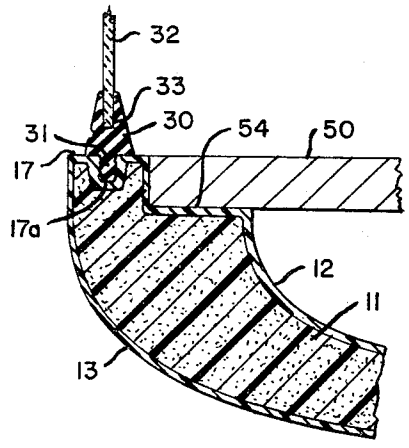

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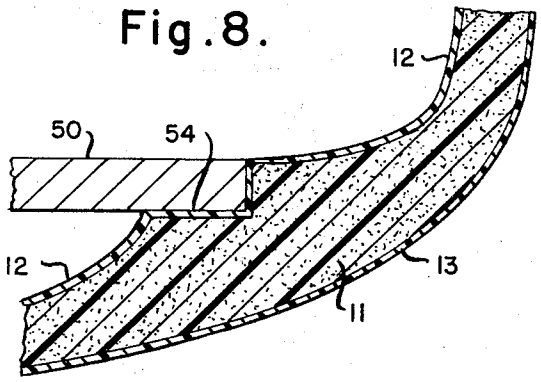

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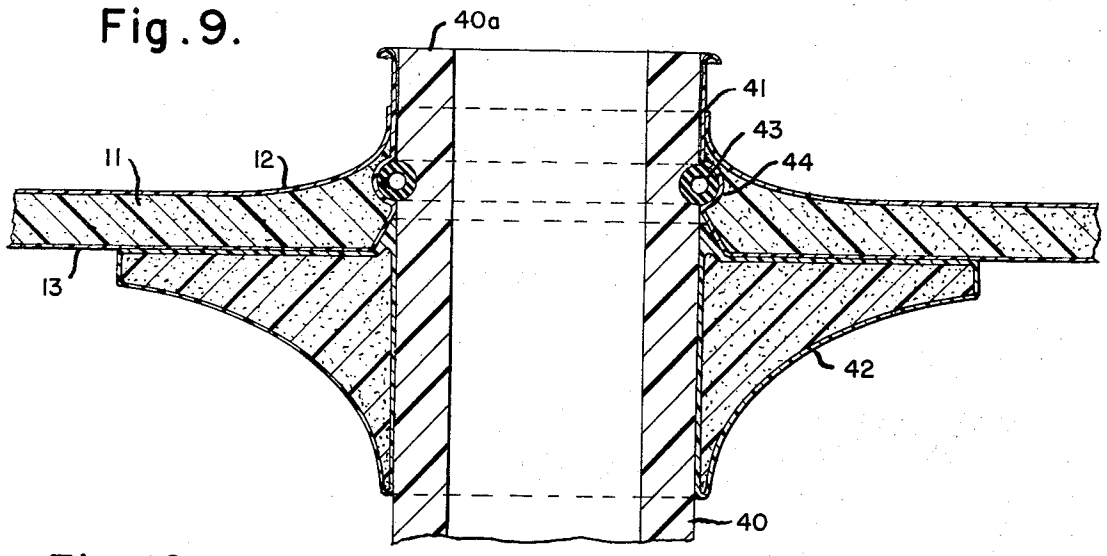
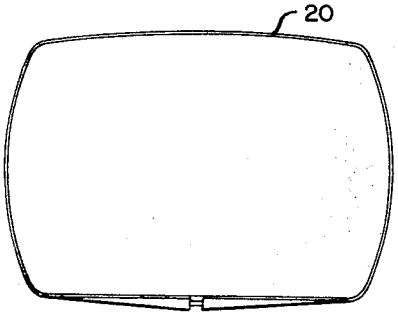


Fig. 10.



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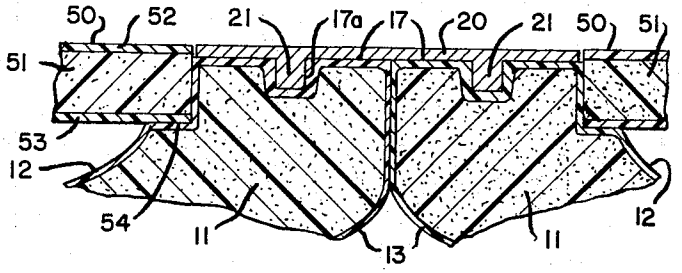
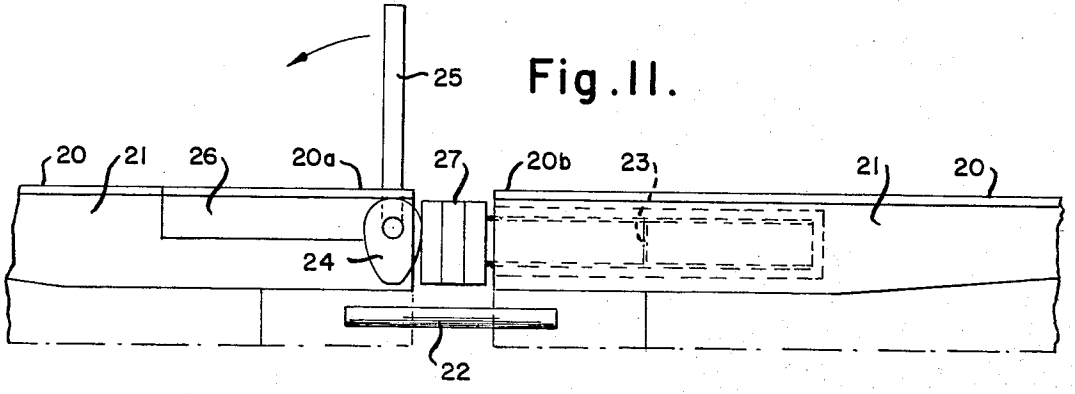


Fig. 11.



BUILDING STRUCTURES

This invention relates to building structures and particularly to a building module which may be assembled into a variety of shapes and structural configurations.

The problem of providing readily assembled prefabricated building modules is one which has been studied and worked on for many years. Many types of prefabricated and pre-cut forms of building structures have resulted from these efforts. However, even with this long history of effort, no really universal building module has been provided which could be assembled with other like units to provide a vast number of varied building configurations.

The present invention does provide a building module which has the capacity to be assembled into a great variety of building configurations rapidly and attractively.

Preferably this invention provides a building module having a generally equilateral triangular horizontal section with spaced apart roof and floor members connected by arcuate vertical corner members and three generally rectangular side wall openings defined by the roof, bottom and corner columns. The side wall openings are preferably provided with interchangeable glass windows, solid sidewalls or connecting strips by which separate modules are interconnected. Each module is preferably mounted on a pedestal member anchored in the earth beneath the mid point of the triangular area. Preferably the modules are formed of a high strength foamed plastic as a single unit, each unit being separately supported. The pedestal member is preferably hollow and carries the utility services to the various modules. Preferably adjacent modules are connected by an expandable ring which engages a slot formed in the inner periphery of each side wall opening. A similar expandable ring is used to fix a window or removable wall in one of said openings.

In the foregoing general statment of my invention, I have set out certain objects, advantages and purposes of this invention. Other objects, purposes and advantages will be apparent from a consideration of the following description and the accompanying drawings in which:

FIG. 1 is a plan view of one form of building structure made from a plurality of modules according to this invention;

FIG. 2 is a plan view of a second form of building structure assembled from the modules of this invention;

FIG. 3 is a plan view of a third form of building structure assembled from the modules of this invention;

FIG. 4 is a plan view of a fourth form of building structure assembled from the modules of this invention;

FIG. 5 is an elevational view partly cut away of a module according to this invention;

FIG. 6 is a section on the line VI—VI of FIG. 5;

FIG. 7 is an enlarged fragmentary section of the floor and opening of FIG. 6;

FIG. 8 is an enlarged fragmentary section of the floor and column structure of FIG. 6;

FIG. 9 is an enlarged fragmentary section of the connection between the pedestal and module of FIG. 6;

FIG. 10 is an elevational view of a module connector ring;

FIG. 11 is an enlarged fragmentary section of the expansion joint in the connector ring of FIG. 10; and

FIG. 12 is a fragmentary section through the joint between two modules showing the placement of the connector ring.

Referring to the drawings, I have illustrated a building module **10** of cast rigid plastic foam **11** surrounded by an impervious inner skin **12** and outer skin **13**, preferably of fiberglass reenforced resin. The module **10** has a horizontal section in the form of an equilateral triangle whose corners are rounded, and is defined by a curved roof **14**, a curved base **15** and three vertical columns **16** connecting the roof and base at each corner of the triangle. The sides between the columns **16** may have an opening **17** or they may have an integrally cast wall **18**. The openings **17** may be filled with a glass sash **19** or two adjacent modules **10** may be connected at their respective adjacent openings by a connector ring **20**. The connector ring **20** is preferably a metal ring having two spaced apart depending flanges **21** which fit within slots **17***a* in the inner periphery of each opening. Each connector ring is provided with at least one guide pin **22** fitting in openings in ring ends **20***a* and **20***b*. An adjustment screw **23** is threaded in one end **20***b* of the connector ring. The other end of the connector ring **20***a* is provided with a cam **24** pivotally mounted therein and operated by a lever **25** which fits into a groove **26** in the end **20***a* of connector ring **20**. The cam **24** bears against a spring **27** on the end of screw **23** to force the connector ring into its enlarged position in tight engagement within the adjacent openings **17** to lock the two adjacent modules together.

Where it is desired to mount a window glass in opening **17**, a rubber mounting ring **30** extending within the periphery of the opening and having a depending flange **31** fitting into the groove or slot **17***a* of the opening, is placed in opening **17** with the flange **31** in groove **17***a*. The glass pane **32** is then placed in groove **33** in the outwardly extending resilient member. In a similar manner a nontransparent wall member **36** might be inserted in place of a glass pane. Similarly a sliding door member **37** could be installed in an opening **17**.

Each module **10** is mounted preferably on a hollow cylindrical pedestal **40** which enters an opening **41** in the bottom of the module. The module bottom rests on and is supported by a support ring **42** fixed to pedestal **40** by an appropriate cement. An O-ring **43** is placed in groove **44** in the opening **41** of module **10** to seal the same to the pedestal.

Each module is provided with an inner floor **50**, preferably of a honeycomb structure **51** with inner **52** and outer **53** impervious faces. The floor **50** is supported on a ledge **54** which surrounds and is spaced above the bottom of the module and on the top **40***a* of pedestal **40**.

The modules may be assembled in a great variety of configurations, a few of which are illustrated in FIGS. **1** through **4**.

The service connections to bath fittings and kitchen fittings is through the hollow pedestal and beneath the inner floor.

The structure of this invention is based upon the theory that utilization of a single column support and a double curved surface places substantially the entire unit in tension when loads are applied. This results in stresses being applied as indicated by arrows in the drawings. The tension stresses on the unit are transmitted to the column where the result is compression on the column.

The module has preferably a cross section corresponding to an equilateral triangle, however, its section may embrace a plurality of such triangles, for example, a pentagon, a hexagon, an octogon or the like.

In the foregoing specification, I have set out certain preferred embodiments of my invention, however, it will be understood that this invention may be otherwise embodied within the scope of the following claims.

I claim:

1. A building module for assembly into a multiple module building comprising a unitary hollow formed module having a continuous outer skin free from supporting structural framework and a spaced inner skin separated from said outer skin by spacer means including spaced apart roof and bottom members connected by arcuate vertical corner members, at least one side wall opening defined by the roof, the bottom and the corner members, interchangeable fastening means in said opening, adapted selectively to fasten adjacent modules together and to fasten an insert therein, and a vertical support column beneath each said module engaging the bottom generally centrally thereof and supporting said module and placing said module in stress, a portion of the outer skin adjacent and surrounding the support column being stressed in compression and the balance of said skin being stressed in tension, said support column being stressed in vertical and radial compression at its engagement with the module.

2. A building module as claimed in claim **1** wherein the column is a cylindrical pedestal which enters an opening in the bottom of the module and is provided with a supporting flange on which the module rests.

3. A building module as claimed in claim **1** wherein the interchangeable fastening means includes a ring which engages within an annular groove in the periphery of the opening.

4. A building module as claimed in claim **1** wherein the module has a generally equilateral triangular horizontal section and is formed of foamed resin between spaced impermeable inner and outer skins, with the outer skin under tension.

5. A building module as claimed in claim **4** wherein the inner and outer skins are fiberglass reenforced resin.

6. A building module as claimed in claim **1** wherein a floor member is provided spaced above the bottom.

7. A building module as claimed in claim **6** wherein said module has an inner ledge surrounding the periphery of the bottom and spaced above the same, receiving and supporting the periphery of said floor member.

8. A building module as claimed in claim **7** wherein the support column extends through an opening in the bottom portion of the module to the level of said ledge to support the floor member and a ring fixed to the outer periphery of the column engages the module bottom portion at said opening.

9. A building module as claimed in claim **1** wherein the support column is formed of foamed resin between spaced impermeable inner and outer skins.

10. A building module for assembly into a multiple module building comprising a hollow formed module including at least one generally equilateral triangular horizontal section with spaced apart roof and bottom members connected by arcuate vertical corner members, at least one side wall opening defined by the roof, the bottom and the corner members, and interchangeable fastening means, adapted selectively to fasten adjacent modules together and to fasten an insert therein, said fastening means being a generally ovoid split ring having a pair of parallel radially outwardly extending flanges, each engageable in an annular groove in the periphery of an opening and spring loaded cam means urging the ring into engagement with the opening with the flanges in said groove.

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