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Schliemann et al.

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[54] **STRUCTURAL MODULE**

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[52] **U.S. Cl.** **52/36,** 52/86, 52/245, 52/308, 52/625, 52/629

[51] **Int. Cl.** **E04b 1/32**

[58] **Field of Search** 52/6, 18, 36, 74, 80, 81, 52/86, 245, 247, 239, 285, 618, 625, 629, 308

[56] **References Cited**

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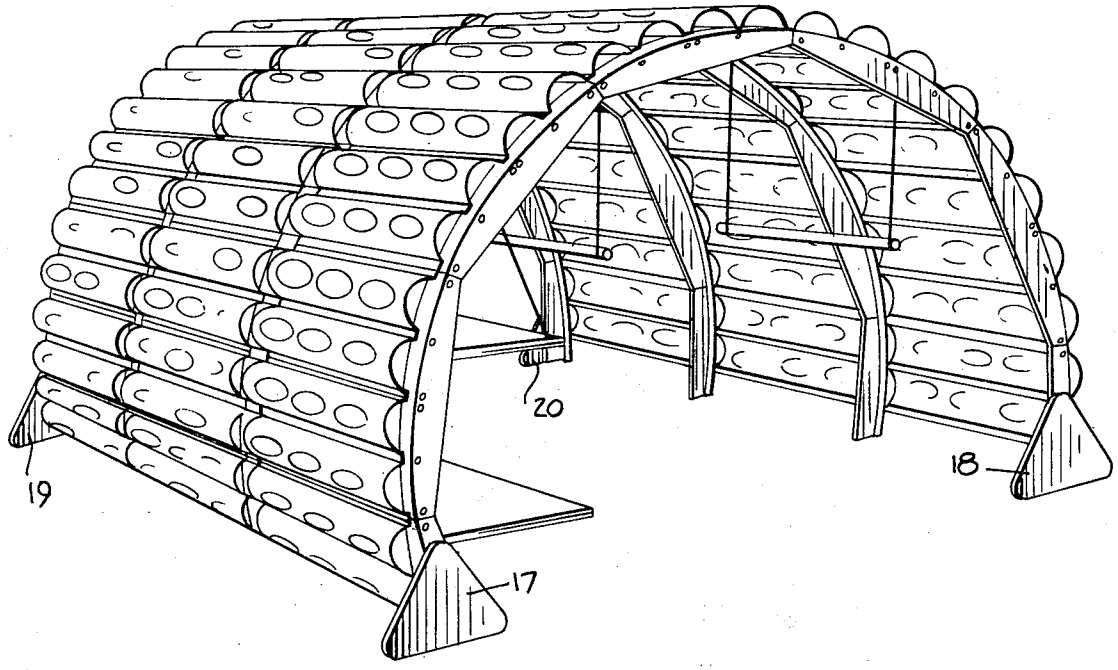
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Primary Examiner—Alfred C. Perham

[57] **ABSTRACT**

A structural module comprising a pair of parallel arcuate beams each having a side flange and a top flange, and a corrugated facing sheet marginally secured to the top flanges of the beams, the ends of the sheet being bent downwardly to form connecting flanges. Two or more modules may be interconnected at their adjoining connecting flanges as well as by coupling plates straddling the modules at their juncture and attached to the side flanges thereof. Each module constitutes a segment of a circular cylinder so that by combining such segments, one may erect caves, enclosures, dividers and other useful structures.

4 Claims, 6 Drawing Figures



PATENTED AUG 1 3 1974

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SHEET 1 OF 2

Fig. 4.

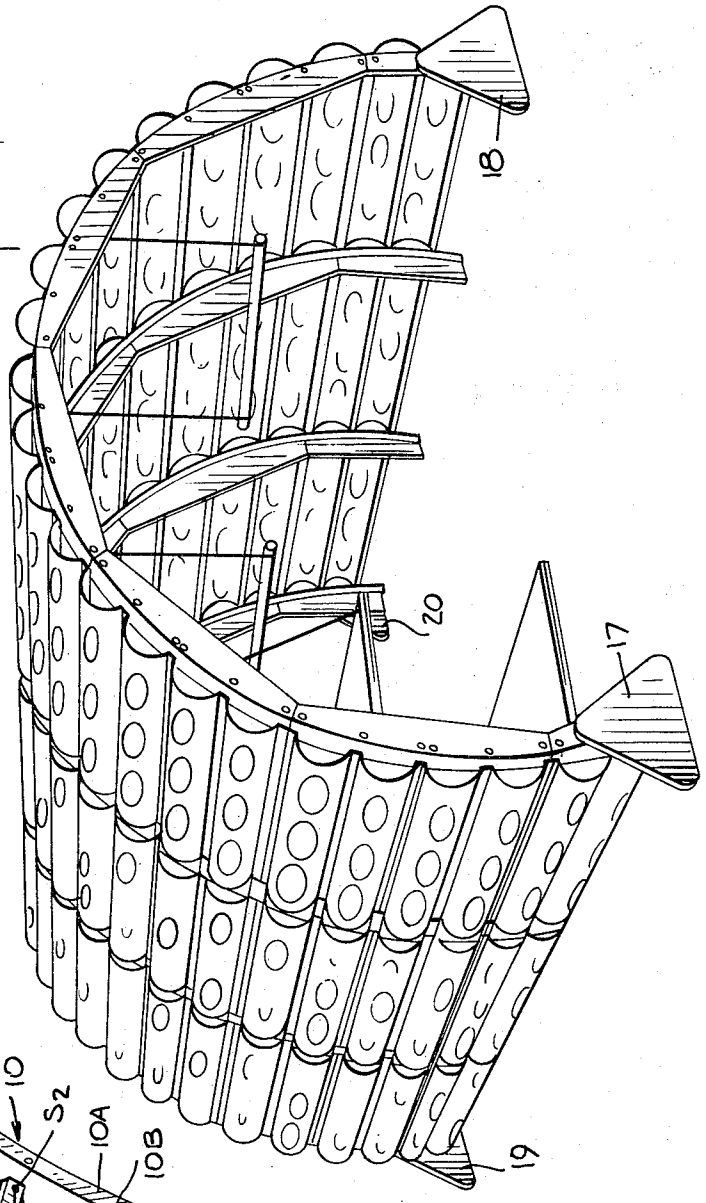
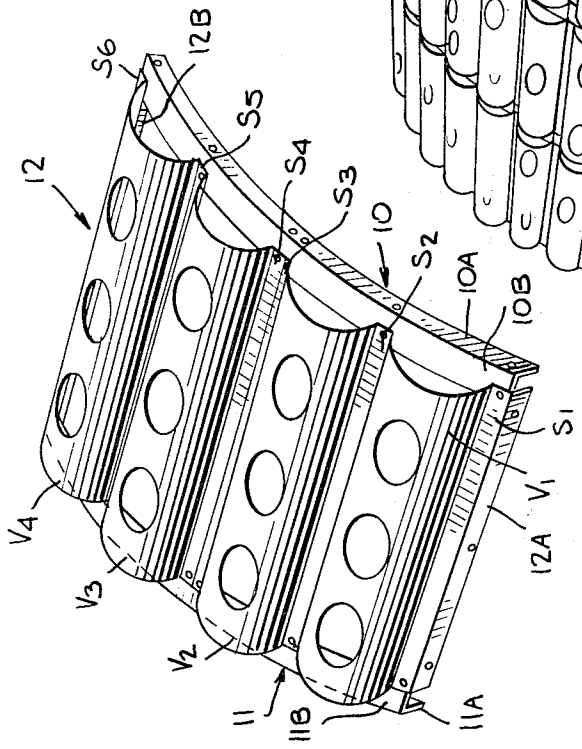


Fig. 1.



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PATENTED AUG 1 3 1974

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SHEET 2 OF 2

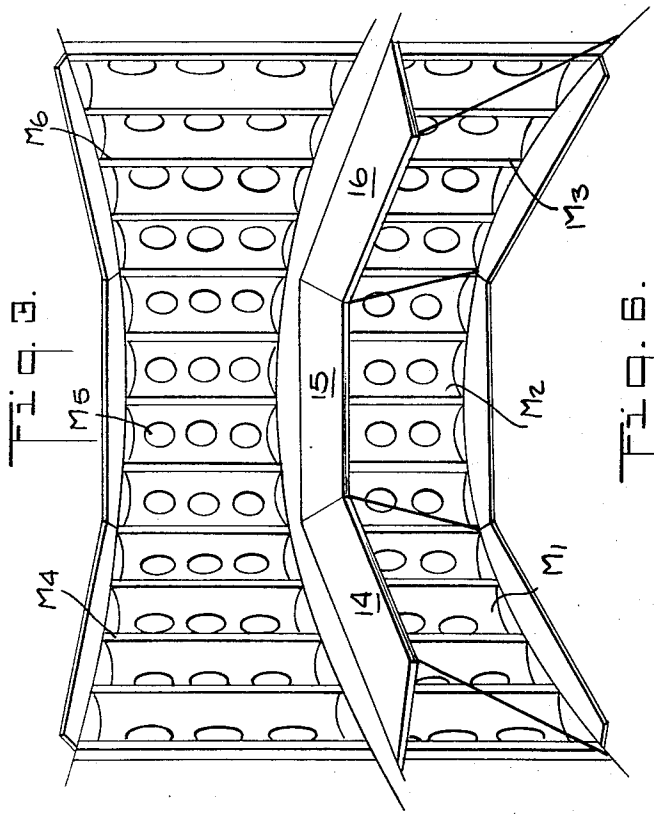


FIG. 3.

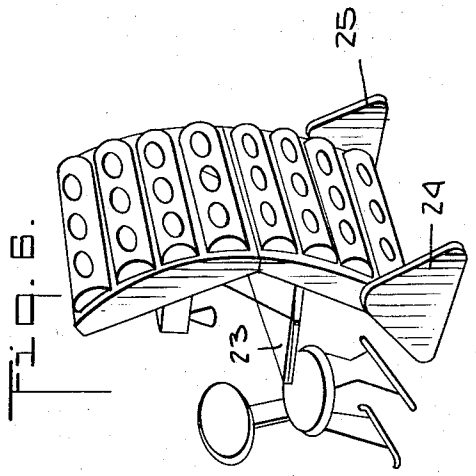


FIG. 6.

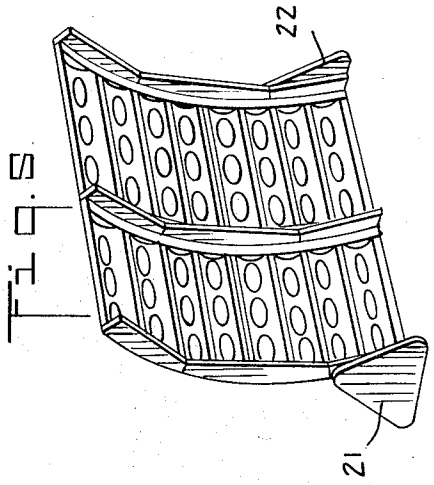


FIG. 5

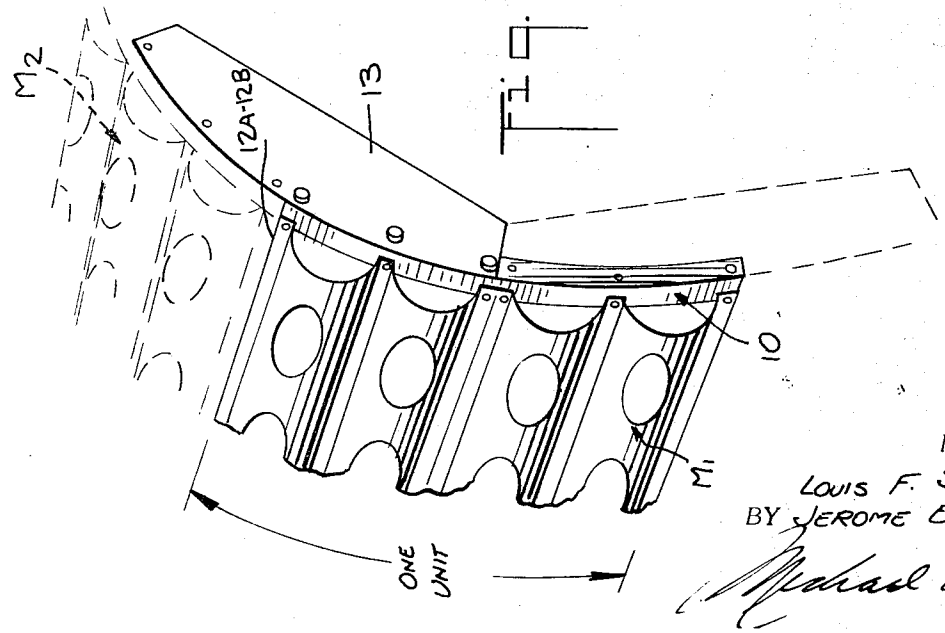


FIG. 2

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STRUCTURAL MODULE

BACKGROUND OF THE INVENTION

This invention relates generally to structural units or modules, and more particularly to a strong, light-weight module in a form constituting a segment of a circular cylinder whereby, by combining segments, one may define a variety of structures.

Flexibility and simplicity are the hallmarks of modern interior architecture, for when an interior space is intended for diversified purposes, one must be able to readily transform this space from an existing configuration to another form adapted to a new use. It is for this reason that buildings designed to present trade shows, exhibitions and other types of displays often make use of detachable interior walls that may be set up in various patterns to divide an available space into temporary sub-chambers which meet the needs of the moment. But it is also necessary to create smaller structures capable of being erected and dismantled to provide interior configurations suitable for a given purpose.

In public buildings and department stores having large unbroken floor areas, it is often necessary, in order to make a special presentation, to segregate a particular zone of the available space. One could, of course, by means of temporary partitions, erect a special enclosure for this purpose, but this involves relatively expensive carpentry and may be disruptive to existing activity being carried out on the floor.

Attempts have heretofore been made to solve this problem by providing structural modules or building blocks capable of being interconnected to define various structural forms, but such modules, even though relatively heavy and cumbersome, have been lacking both in strength and flexibility so that only a limited number of forms could be created.

SUMMARY OF THE INVENTION

In view of the foregoing, the main object of this invention is to provide a structural module which is capable of being quickly combined with like modules to define a large variety of structural forms.

A significant feature of the invention is that the module constitutes the segment of a circular cylinder, so that in combination with like modules, one may, for example, create a cylindrical enclosure, a semi-cylindrical cave or hut, a curved dividing wall, and various other useful forms whose geometry is determined by a combination of two or more modules.

A combination of modules in accordance with the invention may be supported by base plates attached thereto to define self-supporting arches or curved enclosure walls, and shelves, lamps, and other useful appendages may be readily attached to the modules.

Also an object of the invention is to provide a structural module which, though light-weight and easily handled, is of exceptional strength and is capable, when necessary, of supporting substantial loads. Thus, when the modules are used in department stores to afford a segregated display area, such as a temporary boutique, the articles of merchandise on display may be suspended from the modules, or placed on shelves supported thereby.

Briefly stated, these objects are attained in a module comprising a pair of parallel, arcuate beams, each having a side flange and a top flange, with a corrugated facing sheet marginally secured to the top flanges, the ends of the sheet being bent downwardly to form connecting flanges whereby two or more modules may be interconnected at their adjoining ends by connecting flanges, as well as by coupling plates straddling the modules at their junctures and attached to the side flanges thereof.

OUTLINE OF THE DRAWING

For a better understanding of the invention, as well as other objects and further features thereof, reference is made to the following detailed description to be read in conjunction with the accompanying drawings, wherein:

FIG. **1**, in perspective, shows a module in accordance with the invention;

FIG. **2** shows the manner in which two or more modules are joined together;

FIG. **3** shows a tank-like enclosure formed by a tiered combination of modules;

FIG. **4** illustrates a cave created by an arched combination of modules;

FIG. **5** shows a room divider formed by a set of interconnected modules; and

FIG. **6** shows a desk created by still another module combination.

DESCRIPTION OF THE INVENTION

Referring now to the drawings, and more particularly to FIG. **1**, a module in accordance with the invention comprises a pair of parallel, arcuate beams **10** and **11** which are held together by a facing sheet **12**. In order to provide a module which is both light-weight and of high strength, the beams and sheet are preferably fabricated of aluminum, although in practice, other metals or high-strength plastic materials may be used for the same purpose. Sheet **12** may be a single sheet of the dimensions required to cover the beams, or a pair of sheets may be used, each of half size.

Beams **10** and **11** have right-angle formations providing side flanges **10A** and **11A**, and top flanges **10B** and **11B**. Holes are bored in these flanges to accommodate connecting screws or bolts. Sheet **12** is corrugated to create an array of vault-like forms V_1, V_2, etc., and a row of ribs S_1, S_2, etc., which alternate with the vaults, the ribs being bolted at their ends to the top flanges of the beams. The vaults are shown as having large openings therein to further lighten the structure and to impart a transparent quality thereto. One may place translucent plastic windows over the openings. However, in practice, these openings may be omitted.

The ends of sheet **12** are bent downwarly to define connecting flanges **12A** and **12B**, which flanges have holes therein to permit adjoining flanges to be interconnected. The corrugated formation of the sheet and the vaults resulting therefrom markedly increase the resistance of the module to transverse bending forces, whereas the right-angled construction of the beam serves to augment the resistance of the module to longitudinal bending forces, this resistance being further enhanced by the coupling plates, to be later described, attached to the side flanges of the beams. Hence, despite the skeletal nature of the module, it possesses exceptional structural strength and is capable of sustaining heavy loads.

In order to interconnect two or more modules, such as modules M_1 and M_2, shown in FIG. **2**, the adjoining connecting flanges (**12B** and **12A**) are bolted together and a coupling plate **13**, which straddles the juncture of the two modules, is bolted to the side flanges (**10A** and **10B**) of both beams. The upper edges of the coupling plates are curved to conform to the curvature of the beams, whereas the straight ends of the plates are angled with respect to the straight lower edges to coincide with the radius of beam curvature, so that the ends of the plates are in abutting relationship.

Thus all one need do to join two or more modules together is to interconnect the modules at their connecting flanges and attach the coupling plates thereto.

Referring now to FIG. **3**, there is shown one of the structures made possible by modules in accordance with the invention. In this instance, a tank-like structure is produced by joining together a lower tier of modules (only M_1, M_2 and M_3 being shown), above which is mounted a second tier of modules (M_4, M_5, M_6) joined to the first tier to produce a curved enclosure suitable for a store boutique or for similar purposes.

In this tiered arrangement, one may readily attach shelves **14, 15** and **16** to the modules at the junctions of the upper and lower tiers, the shelves being buttressed by suitable struts. The height of the enclosure depends on the number of tiers used, and one may, in practice, use a single tier or two or more tiers.

FIG. **4** shows a cave-like structure defined by interconnected modules in an arch-formation to create a semicylindrical housing useful as a portico, an outdoor gardenhouse, a swimming-pool covering and for any number of other applications. In this instance, three arched rows of interconnected modules are shown, although in practice a greater or smaller number may be used. In order to stabilize this structure, triangular base plates **17, 18, 19** and **20** are provided at either end of the arch, which plates are bolted to the side flanges of the modules. Also provided along the interior wall of the arch are shelves.

It is often necessary to set up divider walls to partition off large areas. This may be accomplished, as shown in FIG. **5**, by two rows of interconnected modules which stand on their ends and are maintained in this position by base plates **21** and **22.** A single row of such modules, as shown in FIG. **6**, may, in combination with a shelf **23** and base plates **24** and **25** as well as a lamp fixture **26**, serve as a desk.

From the foregoing, it will be apparent that the module lends itself to a wide variety of applications, only a few of which have been illustrated. One can also provide modules whose facing sheets are not only curved longitudinally to conform to the curvature of the beams, but also curved transversely so that in an arch structure as illustrated in FIG. **4**, the modules with compound curvature, when used in multiple rows, will extend along a curved path, or in the case of the multiple-tier arrangement shown in FIG. **3**, the enclosure will develop an overhang, depending on the number of tiers.

Thus while there have been shown preferred embodiments of the invention, it will be appreciated that many changes and modifications may be made therein without, however, departing from the essential spirit of the invention.

For example, one may also use the module to construct curved walls with shelves mounted thereon, arched walls, arched entry-ways, arcades and ceiling light fixtures for dropped ceilings. It is also possible to construct guest houses using the modules, and to mount shelves on the walls of the house to serve as bunk-type beds.

We claim:

1. A structure formed by a plurality of structural modules, each structural module constituting a segment of a circular cylinder and comprising a pair of parallel beams having an arcuate formation, each beam having a side flange and a top flange, a curved, generally rectangular sheet whose long sides are marginally secured to the top flanges of said beams to provide the only connection therebetween and to define a segment therewith, the ends of said sheet being bent downwardly in the free space between said beams to provide connecting flanges, said sheet being transversely corrugated to define alternate vaults and strips which lie in parallel relation to said flanges, said strips being secured at their ends to the top flanges of the parallel beams, said vaults having large openings therein to provide transparency to the module whereby like modules may be interconenected at adjoining connecting flanges, and coupling plates straddling the junction of two adjoining modules and attached to the side flanges thereof.

2. A cave formed by interconnecting modules of the type set forth in claim **1**, to define an arch, and further including base plates secured to the feet of the arch to stabilize the cave.

3. A cave as set forth in claim **2**, further including shelves mounted on the inner wall of said cave.

4. An enclosure formed by interconnected modules of the type set forth in claim **1**, to define a tank-like enclosure having at least two tiers of modules.

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