United States Patent [19]

Sadao

[11] **3,810,336**

[45] **May 14, 1974**

[54] **GEODESIC PENTAGON AND HEXAGON STRUCTURE**

[75] Inventor: **Shoji Sadao**, Boston, Mass.

[73] Assignee: **Fuller & Sadao, Incorporated**, Cambridge, Mass.

[22] Filed: **May 9, 1972**

[21] Appl. No.: **251,803**

[52] **U.S. Cl.** **52/81**
[51] **Int. Cl.** **E04b 1/32**
[58] **Field of Search** .... 52/80, 81, DIG. 10

[56] **References Cited**

UNITED STATES PATENTS

2,918,992	12/1959	Gelsavage	52/81
D217,760	6/1970	Critchlow	52/81 UX
3,114,176	12/1963	Miller	52/81
3,530,621	9/1970	Rutzebeck	52/81

OTHER PUBLICATIONS

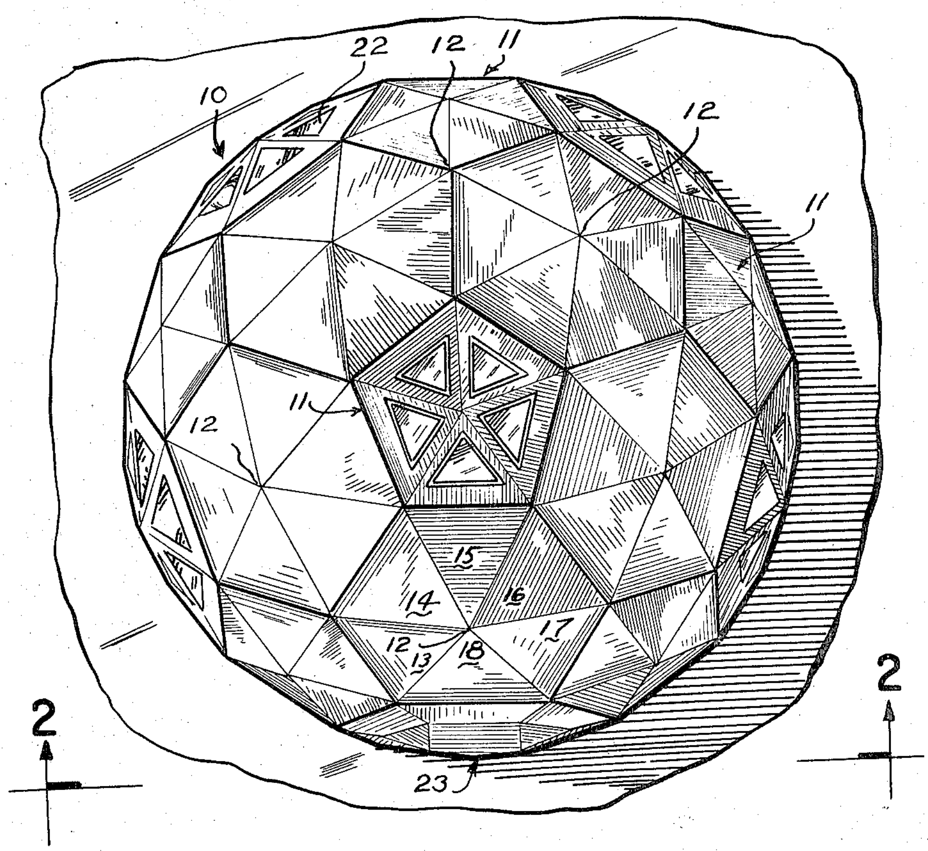
Domebook 2, May 1971, pages 14, 25, 31.

Primary Examiner—Henry C. Sutherland
Assistant Examiner—Henry Raduazo
Attorney, Agent, or Firm—Smythe & Moore

[57] **ABSTRACT**

A geodesic-type dome structure having the structural elements connected in a pattern of great circle arcs and lesser circle arcs in a three-way grid defining isosceles triangles and including hexagon and pentagon modules.

5 Claims, 7 Drawing Figures



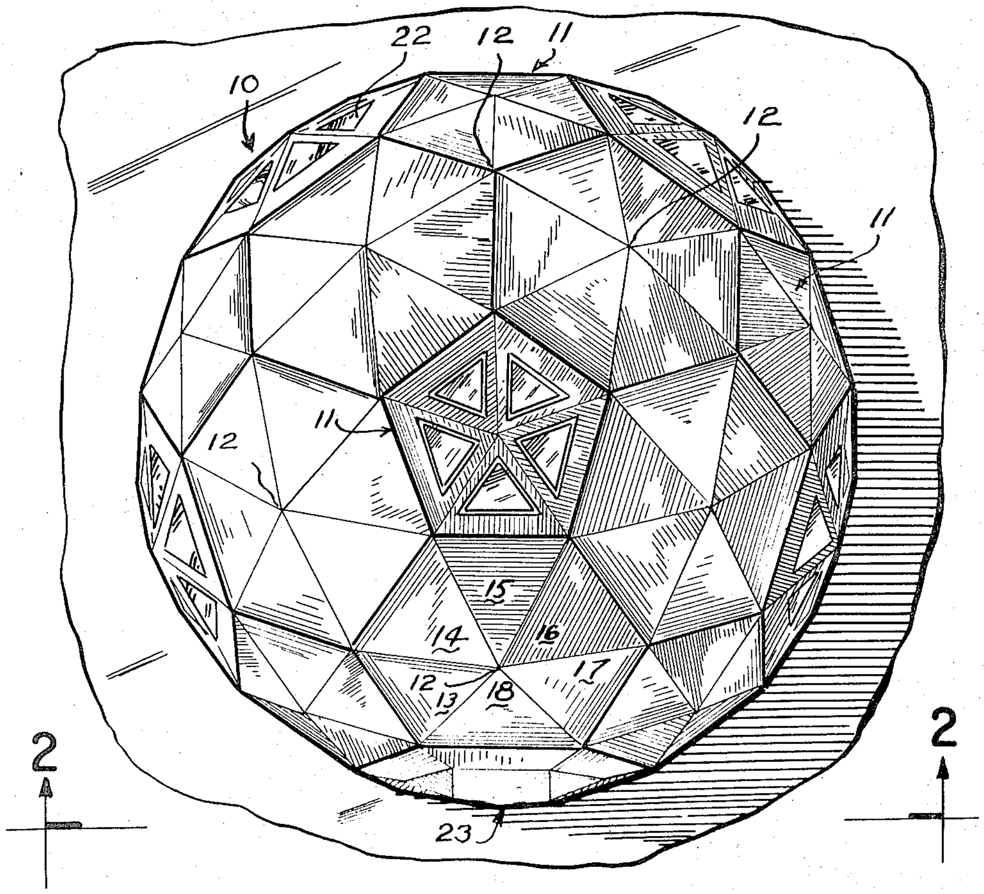

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FIG. 1

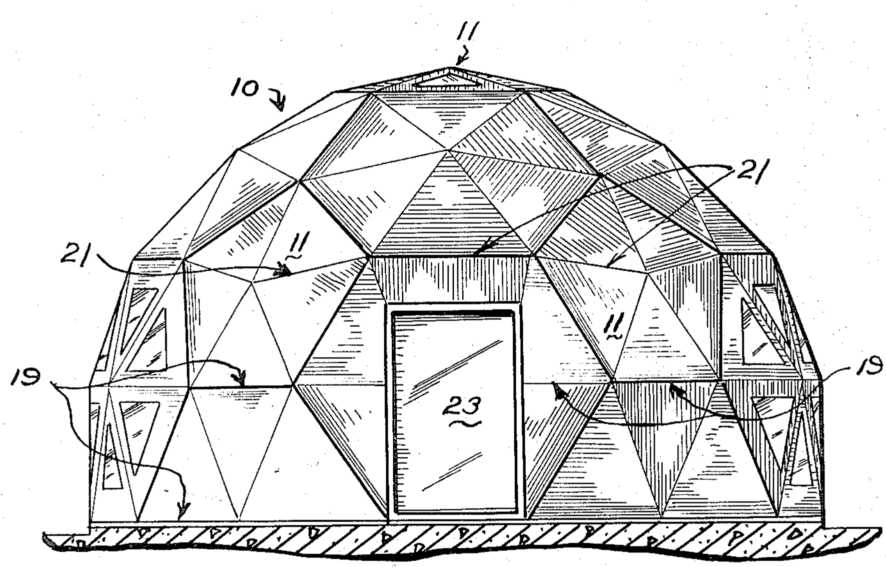
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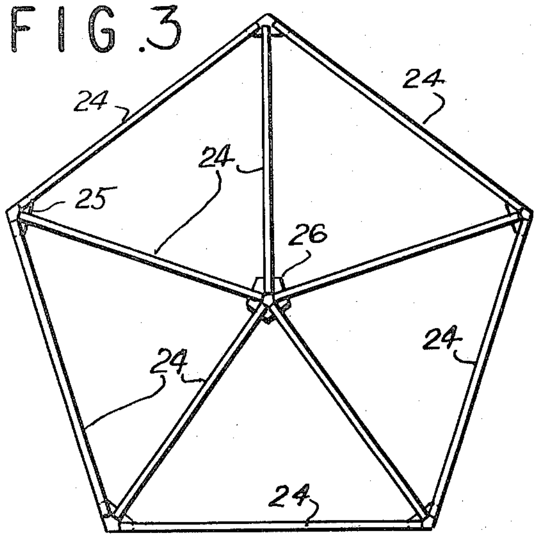
FIG. 2

FIG. 3



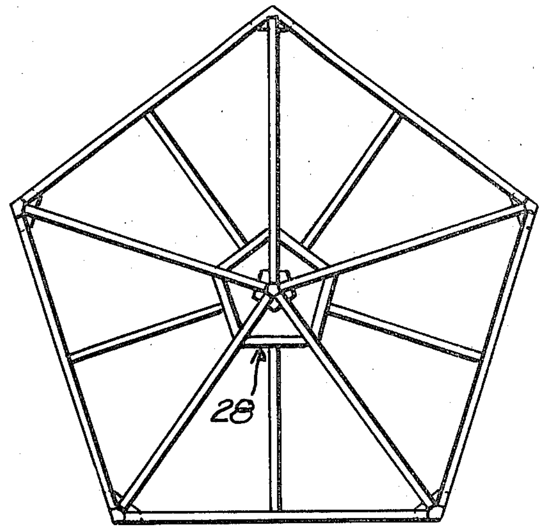


FIG. 4

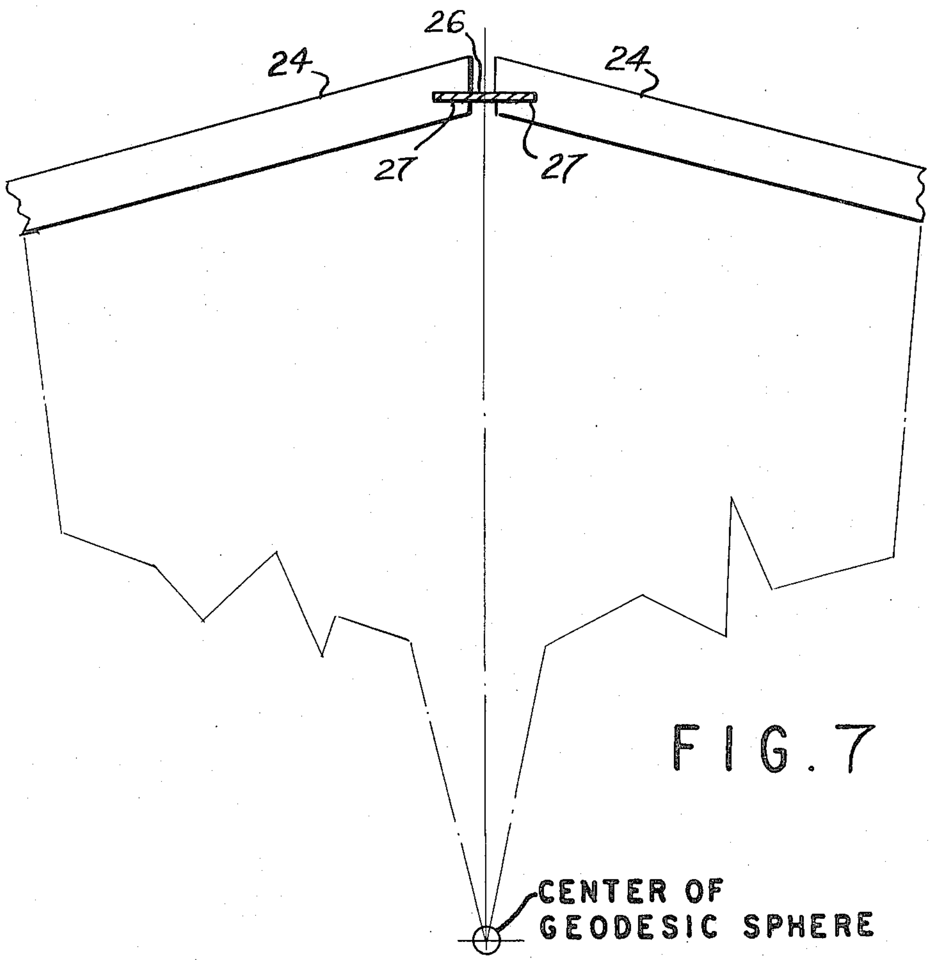


FIG. 7

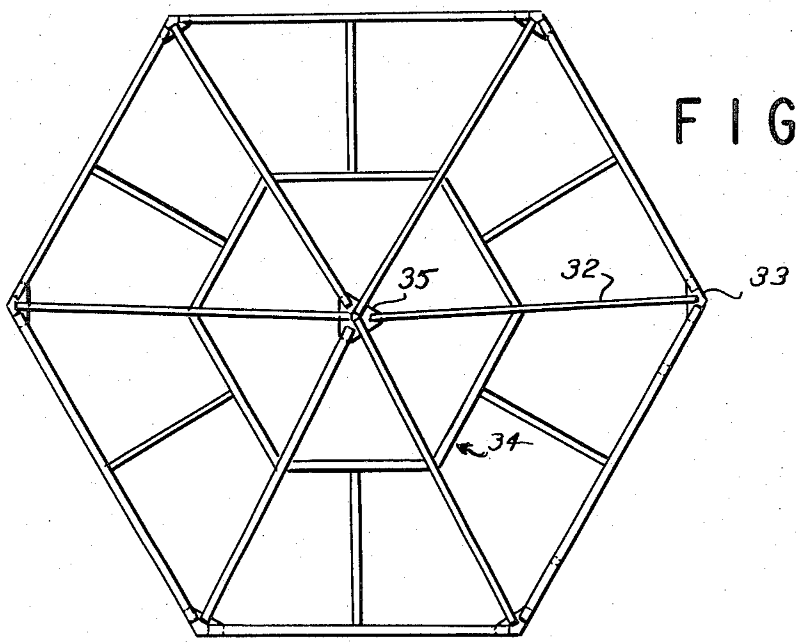
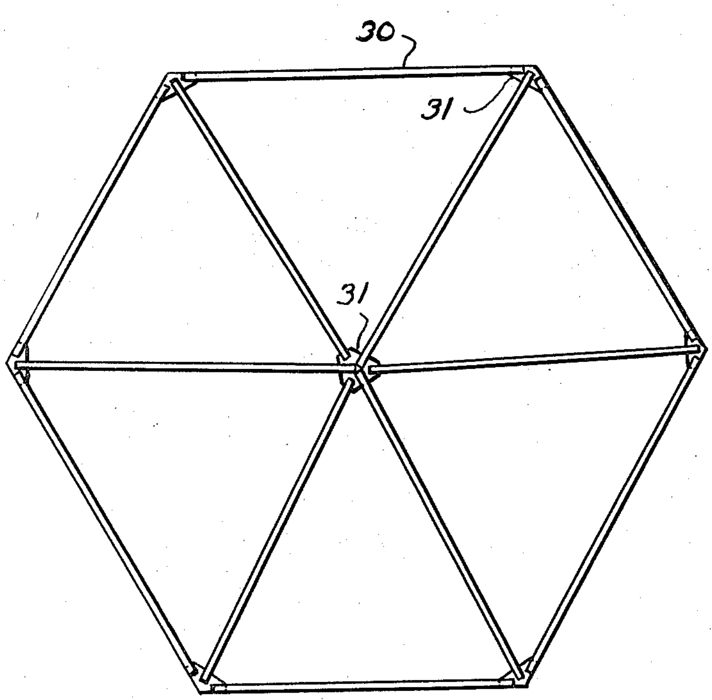


FIG.6

FIG.5



GEODESIC PENTAGON AND HEXAGON STRUCTURE

This invention relates to building structures of the geodesic-type dome.

It is desirable in building structures and frames to obtain maximum strength and space with a minimum of materials. An example of such is described in U.S. Pat. No. 2,682,235 to R. Buckminister Fuller. Geodesic dome structures have been used extensively for various purposes, such as radomes, houses and shelters. Another example of a larger dome is the geodesic dome at the Montreal "Expo '67" exposition.

It is desirable to simplify the structures as much as possible so that individuals can build the same or so as to reduce cost of the materials involved.

One of the objects of the invention is to provide an improved structural arrangement of the modules.

Another of the objects of the invention is to provide a structural arrangement that will not require special modules at the lower or supporting edge.

Still another of the objects is to provide an improved joint arrangement.

In one aspect of the invention, the building framework of generally spherical form has main structural elements connected in a pattern of great circle arcs and lesser circle arcs of at least three frequency. The arcs intersect to form a three-way grid of isosceles triangles, and the modules include hexagons and pentagons. The joints can be secured by using gusset plates that are perpendicular to the radial from the center of the sphere formed by the framework.

These and other objects, advantages and features of the invention should become apparent from the following description and drawings which are merely exemplary.

In the drawings:

FIG. 1 is a top plan view of a structure utilizing the present invention;

FIG. 2 is an elevational view looking in the direction of line 2—2 of FIG. 1;

FIG. 3 shows the joined struts for a pentagon module;

FIG. 4 is similar to FIG. 3 except there is an additional pentagon adjacent the center;

FIG. 5 shows the joined struts of a hexagon module;

FIG. 6 is similar to FIG. 5 except that there is an additional hexagon adjacent the center; and

FIG. 7 is a schematic view showing an arrangement of the gusset plates relative to the struts and center of the dome.

Where appropriate, like parts will be given the same reference numerals in the various figures.

Referring to FIG. 1, a plurality of modules forms the surface of the structure. The elements or edges of the modules form a substantially spherical icosahedron form structure **10** or portion thereof. The pentagon-shaped modules **11** are at the vertices of the icosahedron-like structure. The hexagon-shaped modules **12** fill in the space between the pentagons.

The hexagon modules **12** are composed of a plurality of isosceles triangles **13, 14, 15, 16, 17** and **18.**

As mentioned, the centerlines of some of the struts lie generally in a lesser circle plane such as **19,** and others lie generally in a great circle plane **21.**

If desired, windows **22** can be placed where needed in various of the modules. A door **23** also can be inserted in one of the modules.

By using great and lesser circle arcs, it is possible to have the bottom edge of the structure terminate in one of the planes as desired without requiring special edge or bottom module construction. As an example, the structure in FIG. 2 shows the cutoff being below the equator of the structure.

A strut framework for the pentagon modules is seen in FIG. 3 having struts **24** of suitable material, such as wood. The ends of the struts are joined by gusset plates **25, 26.** As shown schematically in FIG. 7, the flat face or plane of gusset plate **26** is fitted and fastened into slots **27** cut into the ends of the struts **24** and at the angle needed, so that the struts are positioned properly relative to each other. The plane of the various gussets is arranged so as to be substantially perpendicular to the radial to the center of the sphere.

FIG. 4 illustrates a structure wherein there is an internal pentagon **28** to support the edges of the plywood or other covering material when the distance involved is such that one sheet of standard material is not wide enough and two sheets or pieces must be used.

FIG. 5 is similar to FIG. 3 except it shows the arrangement of struts **30** and gusset plates **31** for a hexagon module.

FIG. 6 is similar to FIG. 4 except it shows an internal hexagon **34** with struts **32** and gusset plates **33** for a hexagon module for use where more than one piece of covering material must be used for a facet.

The exterior or edge struts of the various modules can be assembled to appropriate hexagon or pentagon modules by bolts (not shown) or any desired means. The covering facet material may be plywood or a suitable plastic sheet. By employing the hexagon and pentagon as basic modules rather than triangles, fewer bolts and less strut material is needed.

It should be apparent that variations may be made in constructional details and configurations without departing from the spirit of the invention except as defined in the appended claims.

What is claimed is:

1. A building framework structure of spherical form of at least three frequency in which the main structural elements are connected in a geodesic-type pattern of great circle arcs and lesser circle arcs intersecting to form three-way grids defining isosceles triangles, the bottom edge of said structure terminating at a lesser circle other than the hemisphere and providing a planar surface edge without other edge structures.

2. A building framework structure as claimed in claim 1 and including hexagon and pentagon modules.

3. A building framework as claimed in claim 2 wherein the structural elements are joined by gusset plates perpendicular to the radial from the center of the sphere of the structure.

4. A building framework as claimed in claim 2 wherein the modules have struts, the ends of said struts being joined by gusset plates perpendicular to the radial from the center of the sphere of the structure.

5. A building framework as claimed in claim 4 wherein the struts of a module include an external array of struts and an internal array of struts parallel to the external array, there being struts from the external array to the center of the module and struts from an external strut of the outer array to the internal array.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,810,336 Dated May 14, 1974

Inventor(s) Shoji Sadao

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

Patent Front Page, [73], "Fuller & Sadao, Incorporated" should be --Fuller and Sadao, Inc.--.

Signed and sealed this 24th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents