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March 19, 1968

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3,373,531

WIDE SPAN INFLATED STRUCTURE

Filed April 4, 1966

2 Sheets-Sheet 2

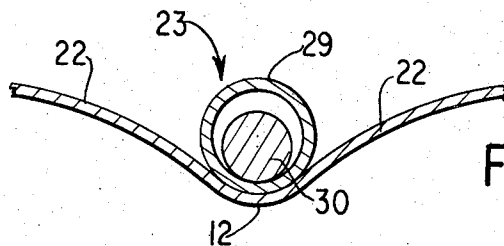


FIG. 3

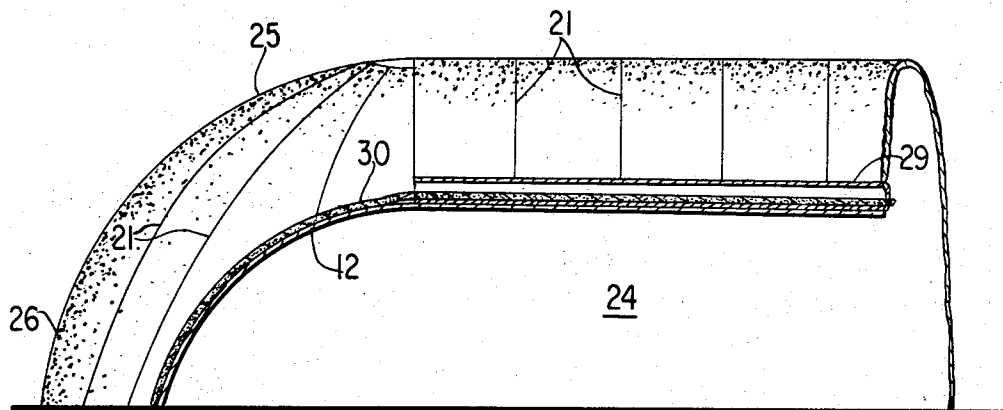


FIG. 4

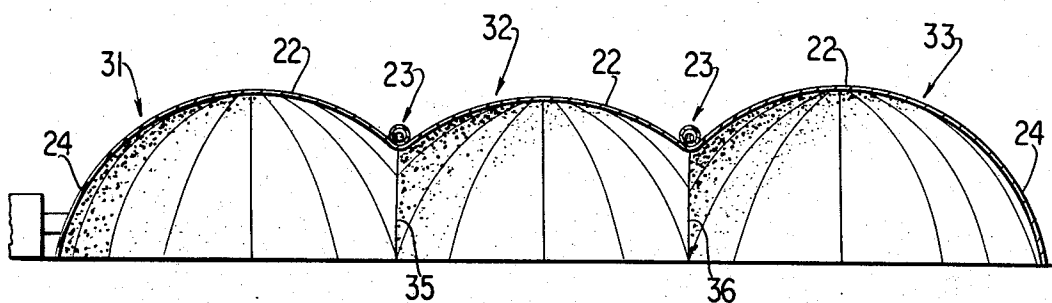


FIG. 5

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WIDE SPAN INFLATED STRUCTURE

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Filed Apr. 4, 1966, Ser. No. 540,085
4 Claims. (Cl. 52—2)

ABSTRACT OF THE DISCLOSURE

A wide span inflated structure comprising two elongated arcuate building sections intersecting along a longitudinally extending line, a rigid tubular member extending along the line of intersection, and a cable extending through the tubular member and anchored at each end to maintain the contour of the building against the thrust of air pressure within the building.

The present invention relates to inflated structures, and, more particularly, to such structures which are supported by filling substantially the entire interior volume of the structure with air having a pressure greater than atmospheric.

In the past, buildings of this type have had, in their inflated condition, a cross-sectional configuration which is substantially an unbroken arc of a circle extending from the ground level at one side up to the top of the building and down to the ground level at the other side. These buildings were made either in the shape of a single hemisphere, or in an elongated "quonset hut" configuration having a central portion assuming the shape of a half cylinder and end portions in the shape of quarter spheres.

The cross sectional shape of the buildings was dictated by the fact that the internal air pressure, acting equally upon all portions of the fabric, forces the fabric to conform to the arc of a circle, the center of which lies vertically below the highest point of the building.

In order to provide the maximum usable space within such a building, it is essential that the walls rise as nearly vertically as possible. The sides rise most vertically when the center of the circle defined by the fabric is located at or near the ground level so that the cross section of the building is essentially a half circle. This of course necessitates that the fabric at the center of the building be spaced from the ground by a distance equal to about 1/2 the span across the section.

For building of small spans the resulting center height is entirely satisfactory. However, where a wide span building is desired the resulting center height in most cases would be greatly in excess of the required ceiling height. For example, a building of this old design having a 40 foot width-wise span would provide a center height of 20 feet which is a great deal more than that normally required of a building.

This excess ceiling height greatly increases the total volume of the building over that needed. Therefore, more air to sustain the building, more heat, and more air conditioning are required for this type of structure than would be needed for a building more closely conforming to the volume actually utilized.

This excess ceiling height also requires that the area of fabric necessary to enclose a predetermined floor area is greater than that which would be needed for a building having a more realistic ceiling height. The pressure within the building has a vertical component acting upon substantially the entire area of the fabric, and the resulting upward force is transmitted through the fabric to the points at which the building is anchored. Therefore, the

prior art structures require not only more fabric but also stronger fabric than would a building which has a lower ceiling height.

Accordingly, it is an object of the present invention to provide a wide span inflated structure which has a high proportion of usable volume.

Another object is to provide such a structure which has a low ceiling in proportion to its span.

Another object is to provide such a structure which has steep side walls.

A further object is to provide such a structure which is simple and is inexpensive to build and operate.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

In accordance with the present invention, the foregoing objects are accomplished by providing a completely enclosed inflatable building of the type which is fixed to a horizontal surface and is supported by filling substantially the entire volume of the building with air having a pressure greater than atmospheric pressure comprising in combination at least two flexible air supported ceiling portions each having an upwardly arched contour along a cross section thereof, the ceiling portions being joined one to another along a line disposed in a plane perpendicular to the cross sections to form a wide span ceiling spaced above the surface, flexible wall portions around the outer periphery of the building contiguous with the ceiling and extending to the surface and secured thereto, and contour retaining means acting along the junction line between the ceiling portions for restraining the junction line against the upward thrust of the pressure within the building to maintain predetermined contours in the ceiling portions.

FIG. 1 is a top view of a building in accordance with the present invention.

FIG. 2 is a cross sectional view taken along the line 2—2 on FIG. 1.

FIG. 3 is an enlarged view of a portion of FIG. 2.

FIG. 4 is a partial longitudinal sectional view taken along the line 4—4 on FIG. 1.

FIG. 5 is a cross-sectional view of a modified structure having a still greater span.

Referring now to FIGS. 1 to 4 of the drawings in detail, there is shown a building according to the present invention which generally comprises two elongated arcuate building sections 10 and 11 intersecting along a longitudinally extending line 12. The sections 10 and 11 each include semi-cylindrical center sub-sections 14 and 15 respectively, and semi-spherical end sub-sections 16, 17 and 19, 20 respectively. These sub-sections are each constructed of a plurality of fabric panels sewn or otherwise joined together along stitch lines 21.

The junction line 12 includes a straight line part joining sub-sections 14 and 15, a first curved part joining sub-sections 16 and 19, and a second curved part joining sub-sections 17 and 20.

As best shown in FIG. 2, each of the central sub-sections 14 and 15 are arcuate in cross-section having an upper or ceiling portion 22 and having, along the periphery of the building, a wall portion 24 which is a continuation of the ceiling portion 22. Likewise, as best shown on FIG. 4, each of the end sub-sections have an upper or ceiling portion 25 and a wall portion 26 which extends downwardly from the ceiling portion along the periphery of the building.

The lower edges of the wall portions 24 and 26 are secured to the ground by pins, anchors, weights, or the

like, (not shown) in a manner to both hold the building in place and to form an air seal between the fabric and the ground.

The interior of the building is pressurized by means of an air blower 27 which delivers air into the building through a conduit 23. According to the usual practice in buildings of this type, the blower 27 is operated continuously to maintain the pressure within the building slightly greater than atmospheric. Access to the interior of the building may be provided by a set of double doors (not shown) which perform the function of an air lock to prevent the interior of the building from being placed in direct communication with the outside atmosphere.

A contour retaining assembly 23 is positioned along the junction line 12 and includes a rigid tubular member 29 and a cable 30. The tubular member 29 extends along and rests upon the part of the junction line 12 which joins the central sub-sections 14 and 15, and the cable 30 extends through the member 29. The end portions of the cable 30 extend downwardly along the first and second end parts of the junction line 12 which join sub-sections 16 and 19 and sub-sections 17 and 20 respectively. The ends of the cable 30 are secured to the ground so that the member 29 and the cable co-act to maintain the contours of the building against the thrust of the air pressure within the building.

The cable 30 holds the rigid member 29 in place to maintain the central part of the junction line 12 in a straight line properly spaced from the ground level, and the end portions of the cable 30 engage the end parts of junction line 12 to maintain the semi-spherical shape of the sub-sections 16, 17, 19 and 20.

In FIG. 5 there is shown slightly modified structure having a still greater width-wise span which generally comprises three side-by-side elongated arcuate building sections 31, 32, and 33 intersecting along longitudinal junction lines 35 and 36. The building sections 31 and 33 are similar in shape and construction to the sections 10 and 11 respectively of the structure shown in FIGS. 1 to 4, and the building section 32 is a portion of such a section having no side walls on the center sub-section thereof. In this embodiment a contour maintaining assembly 23 is provided at each of the junction lines 35 and 36 to retain the shape of the building against the thrust of the interior air pressure.

It will be seen that additional building sections similar to section 32 and additional assemblies 23 may be added to this structure between the building sections 31 and 33 to produce a building of any desired width-wise span.

From the foregoing, it will be seen that the present invention provides a simple and inexpensive wide span inflated structure which has steep side walls and a low ceiling in proportion to its span so as to make a high proportion of its volume usable.

As various changes may be made in the form, construc-

tion and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. A completely enclosed inflatable building of the type which is fixed to a horizontal surface and is supported by filling substantially the entire interior volume of the building with air having a pressure greater than atmospheric pressure comprising in combination at least two flexible air supported ceiling portions each having an upwardly arched contour along a cross-section thereof, said ceiling portions being joined one to another along a line disposed in a plane perpendicular to said cross-sections to form a wide span ceiling spaced above said surface, flexible wall portions around the outer periphery of the building contiguous with said ceiling and extending to said surface and secured thereto, and contour retaining means acting along said junction line between said ceiling portions for restraining said junction line against the upward thrust of the pressure within said building to maintain predetermined contours in said ceiling portions, said contour retaining means including a rigid member extending along said junction line, and means for anchoring said rigid member against the thrust of the pressure within the building.

2. A building according to claim 1, wherein said anchoring means includes a cable means extending from each end of said rigid member downwardly along wall portions to said surface, and anchoring devices for securing said cable means to said surface.

3. A building according to claim 2 wherein one of said wall portions comprises two partially spherical sections intersecting along a line in the same plane as said junction line between said ceiling portions, and wherein said cable means extends along said line of intersection to restrain said one of said wall portions against the outward thrust of the pressure within said building to maintain the shape of said partially spherical sections.

4. A building according to claim 2 wherein said rigid member is of tubular construction, and said cable means is a single cable member extending through said tubular rigid member and downwardly at each end of said rigid member to said anchoring devices.

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