ROOF FROM ASSEMBLED SHELL SUPPORTED BY CABLE NET

Filed Feb. 24, 1966 3 Sheets-Sheet 1

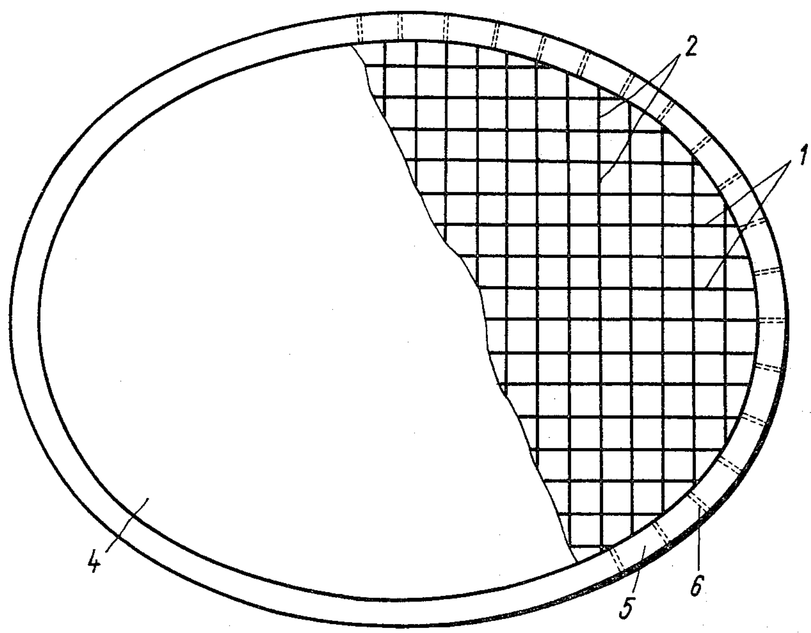

FIG. 1

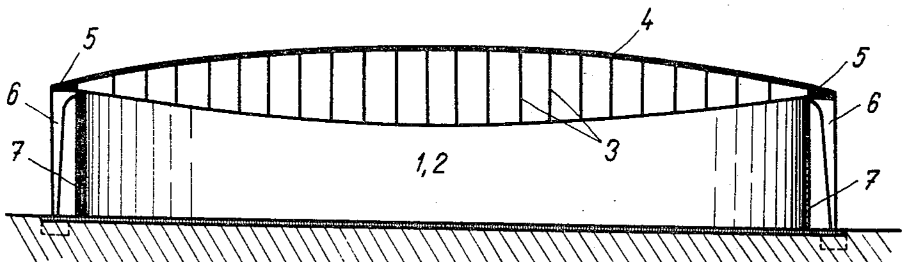

FIG. 2

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ROOF FROM ASSEMBLED SHELL SUPPORTED BY CABLE NET

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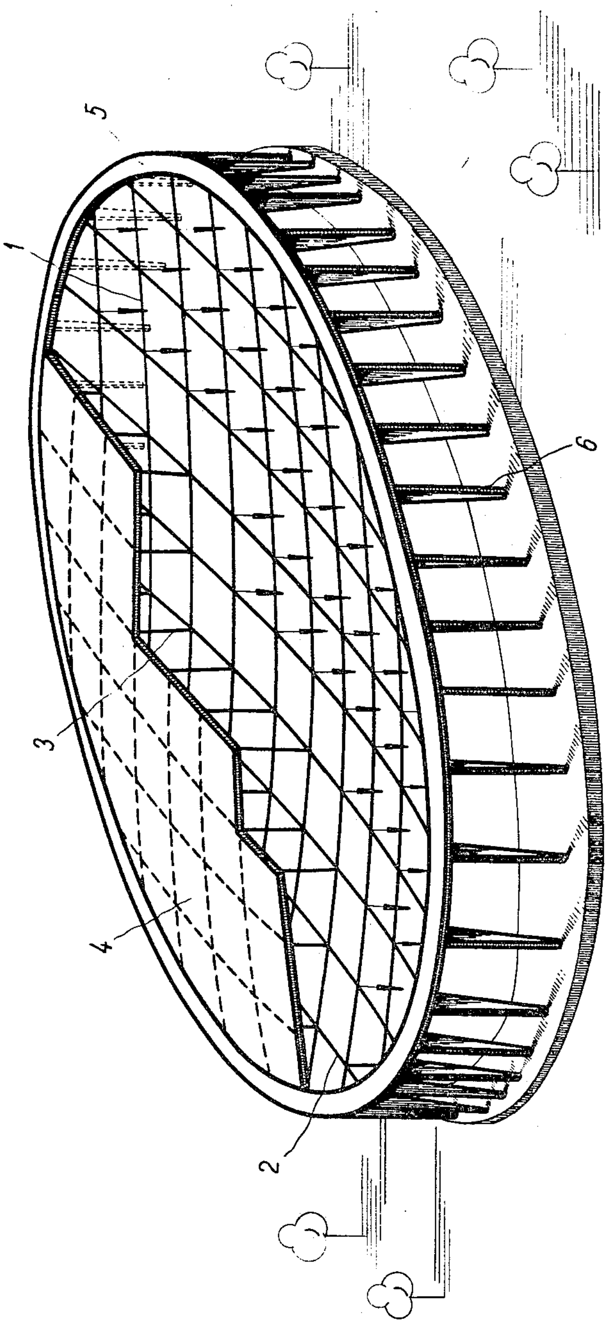

FIG. 3

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ROOF FROM ASSEMBLED SHELL SUPPORTED BY CABLE NET

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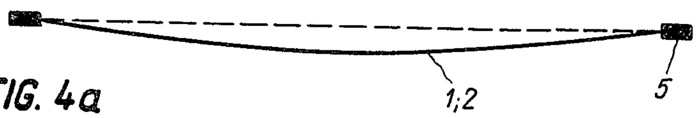

FIG. 4a

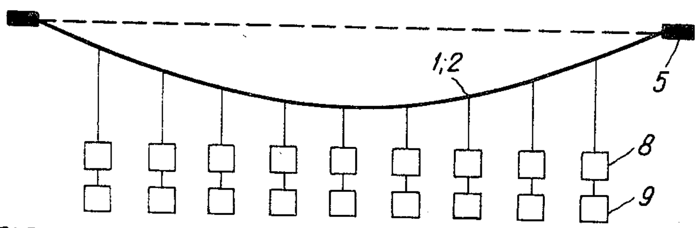

FIG. 4b

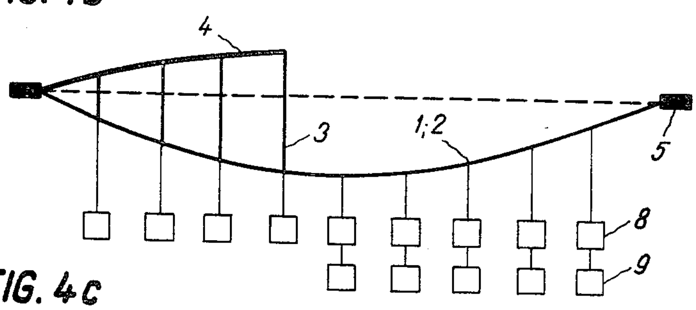

FIG. 4c

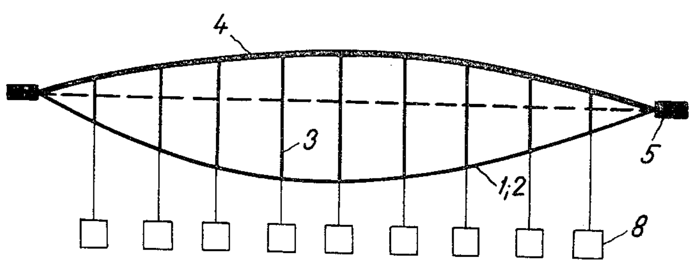

FIG. 4d

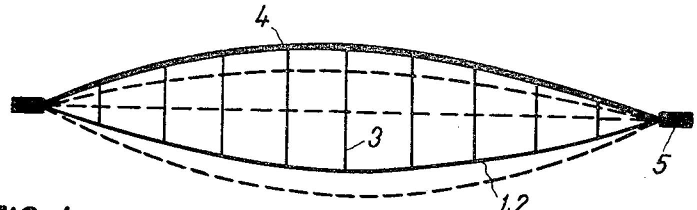

FIG. 4e

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ROOF FROM ASSEMBLED SHELL SUPPORTED BY CABLE NET

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Claims priority, application Czechoslovakia, Mar. 9, 1965, 1,585/65
5 Claims. (Cl. 52—80)

ABSTRACT OF THE DISCLOSURE

A lens-shaped roof includes a compression ring and a network of two groups of equidistant, practically parallel cables which intersect each other at right angles and are fastened to each other at the points of intersection below the plane of the compression ring, and whose ends are attached to the ring. The rim of a roof shell of arcuate cross section is fastened to the ring while the central roof portion rises above the plane of the ring and is connected to the cable intersections by rigid struts attached to corners of the identical, rectangular panels which mainly constitute the shell.

This invention relates to roofs having the shape of a lens or of a low dome and being of oval, elliptical, or circular shape in plan view, and particularly to roofs which are supported about their rim only.

A roof of the type described should provide good drainage for rain water, yet should be low to reduce construction costs and facilitate the heating of the space covered by the roof. It should also be stable and sufficiently rigid to withstand the bending stresses caused by non-uniform snow and wind loads. It should also exert as little stress as possible on a compression ring by which it is bounded horizontally, and it would be convenient to cover such a roof with identical panels.

If the roof consists of a membrane or thin outer shell and of supporting cables, it has been necessary heretofore to provide an otherwise unnecessary load in the center of the shell to provide aerodynamic stability, and such roofs have been made to slope downward toward the center, requiring a downspout for rain water to enter the covered space from the lowermost central point of the roof. Other cable supported roofs required several cable systems if their shell was to be made light, and be composed essentially of panels of uniform size and shape.

The object of the invention is the provision of a roof of the type described which meets the requirements outlined above, but avoids the shortcomings of the known structures.

With this object and others in view, the invention provides a roof in which the two end portions of each of a plurality of cables are fastened to a compression ring which extends in a substantially horizontal plane. A portion of each cable intermediate the ends is downwardly offset from that plane and the end portions of the cable.

The rim portion of a roof shell of arcuate cross section is attached to the ring, and the central portion of the shell is upwardly offset from the plane of the compression ring. Struts are fastened between the several cables and the shell.

The cables form at least two groups, and the cables of each group extend in respective parallel, substantially vertical planes, and intersect the cables of another group to which they are fastened at the points of intersection. The lower end portions of the struts are fastened to the cables at the points of intersection.

The spacing of the cables in each group being uniform, the connected panels which form the roof shell may be

substantially identical in size and shape, the upper end portions of the struts being fastened to the corners of the panels. When there are only two groups of cables intersecting each other at approximately right angles, the panels may be rectangular.

Other features, additional objects, and many of the attendant advantages of this invention will readily be understood from the following detailed description of a preferred embodiment when considered with reference to the accompanying drawing in which:

FIG. 1 is a top plan view of a building provided with a roof of the invention, the roof shell being partly removed;

FIG. 2 shows the building of FIG. 1 in elevational section;

FIG. 3 is a perspective view of the same building prior to completion; and

FIGS. 4*a* to 4*e* illustrate sequential stages of construction of the building in partly diagrammatic elevational section.

Referring initially to FIGS. 1 and 2, there is seen a hall of elliptical plan whose roof includes two groups **1**, **2** of cables arranged in groups of respective, uniformly spaced, vertical planes which intersect each other at right angles so that the cables form a network having square openings. The outer skin of the roof is formed by an upwardly convex shell **4** consisting of identical square panels. The cables **1**, **2** are fastened to each other at the points of intersection which are connected with the corners of the panels by vertical struts **3**. The panels are covered on the outside with a watertight, thermally insulated coating not shown in detail in the drawing, and are of lightweight material.

The rim of the shell **4** and the ends of the cables **1**, **2** are fastened to a compression ring **5** which is supported in a horizontal plane by columns **6** uniformly spaced about the circumference of the roof. A circumferential wall **7** is suspeneded from the ring **5**.

The method of erecting the building of FIGS. 1 and 2 is illustrated in FIGS. 3 and 4*a* to 4*e*. The ends of the cables **1**, **2** are first anchored on the ring **5**, and are connected to each other at the points of intersection. The cables are mounted slack, and their sag is selected according to the shape of the finished roof and the desired normal tension in the cables.

Weights **8** are suspended from the intersections of the cables to simulate an expected snow load on the roof, and weights **9** are provided to simulate the static loading of the cables by the weight of the roof panels **4**, including the insulating material, and of the struts **3**.

When all cables **1**, **2** assume their loaded shape, as shown in FIG. 4*b*, the shell of panels **4** is assembled, beginning from the ring **5**, on struts **3** of suitable length. Each panel is fastened to adjacent panels by threaded connectors or by welding, and the outermost panels are similarly fastened to the ring **5**. As the installation of the panels **4** and struts **3** proceeds, the weights **9** are removed (FIG. 4*c*), until the completed roof is only weighted by the weights **8** (FIG. 4*d*). When the latter are removed, the shell moves upward to assume its normal shape. This is shown in FIG. 4*e* which also illustrated the roof position of FIG. 4*d* in broken lines.

When the weights **8** are removed, the tension in the cables **1**, **2** is reduced, but the outer shell is put in tension. The shell, therefore, is only under light compressive stress when loaded with snow, or may actually still be under tensile stress. The normal stress in the shell can be selected by suitably choosing the weights **8**.

What I claim is:

1. In a substantially lens-shaped roof, in combination:

(a) a compression ring extending in a substantially horizontal plane;

(b) a plurality of cables,
  (1) each cable having two end portions fastened to said ring, and a portion intermediate said end portions and downwardly offset from said plane, and said end portions,
  (2) said cables constituting a plurality of groups,
  (3) the cables of each group extending in respective, parallel, substantially vertical planes and intersecting the cables of another group;

(c) a roof shell of arcuate cross section having a rim portion attached to said ring and a central portion upwardly offset from said substantially horizontal plane; and

(d) a plurality of struts,
  (1) each strut having a lower end portion fastened to one of said cables and an upper end portion fastened to said shell,
  (2) the shell essentially consisting of a plurality of connected panels.

2. In a roof as set forth in claim **1**, the cables of each of said groups being fastened to the intersecting cables of said other group at the points of intersection.

3. In a roof as set forth in claim **2**, said lower end portions of said struts being respectively fastened to said cables at said points of intersection.

4. In a roof as set forth in claim **3**, said vertical planes associated with each group being substantially uniformly spaced, said panels being angular and substantially identical in size and shape, and said upper portions of said struts being fastened to the corners of said panels.

5. In a roof as set forth in claim **4**, said substantially vertical planes intersecting each other at substantially right angles, and said panels being substantially rectangular.

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