A hub joint for geodesic domes consisting of a circular metal hub plate with holes in its outer circumference to which are bolted metal T section struts with their vertical flanges removed at each end. The horizontal flanges at the ends of the struts are tapered so as to permit stable side to side nesting of the struts extending radially from the hub plate.

6 Claims, 10 Drawing Figures
HUB JOINTS FOR GEODESIC DOMES

This is a continuation of application Ser. No. 279,457, filed Aug. 10, 1972, and now abandoned.

This invention relates to a hub structure for geodesic and other type domes which will permit standardization of parts, rigidity of structure, and ease of assembly.

Geodesic domes are formed by combining triangles into three-dimensional forms, often the 20-sided icosahedron, which can be further subdivided into a two or three frequency structure. Only a portion of the entire icosahedron forms the dome, usually three-eights, one-half or five-eights, with the cutoff being made anywhere along the base of the icosahedron, so that whole triangles remain around the bottom to be fastened to a foundation.

While such domed structures have received a general acceptance, few conventional builders are prepared to construct a geodesic dome shell from scratch because of the difficulty experienced in connecting the individual triangular elements. Thus, with demand for geodesic domes at a high and the price of materials increasing, there is a present need to supply dome kits which can be readily constructed, even by those unskilled in the trade.

It is, therefore, an object of this invention to provide the structural elements of a geodesic dome which may be supplied in kit form and assembled on location with a minimum of tools and skill.

It is another object to provide a dome framework composed of a maximum number of standardized, identical components for ease of assembly.

A further object is to provide a new and improved hub joint structure for domes which is easy to manufacture and assemble.

Another object is the provision of a lightweight, inexpensive, yet strong, framework for dome structures.

A still further object is the provision of mounting and sealing surfaces for exterior panels mounted in the dome's framework.

Yet another object is to simplify maintenance and removal of dome panels without disturbing the structural integrity of the dome framework.

The above and other objects are realized in accordance with the present invention by providing an improved hub joint and framework structure. Basically, the invention consists of a flat, circular, metal hub plate with holes drilled in its outer circumference for receiving strut mounting bolts. Attached to the hub and radiating therefrom, are T-section metal struts which have their vertical flanges removed at both ends for a distance slightly greater than the radius of the hub plate. The horizontal flanges are tapered at each end to permit the nesting of adjacent struts bolted to the hub plate. When the hubs and struts are connected in common geodesic form, triangular areas are formed between the strut members. Triangular panels are secured into these areas, either by bolting them directly to the horizontal flanges formed by the T-section strut members, or by screwing them to a mounting strip, which overlaps the strut members and simultaneously acts to hold two panels against the T-strut along its length. A weather seal is provided by filling the space between the panels and the T-struts with caulking and then attaching a sealing strip along the length of the T-strut. In similar fashion, a circular weather cap is adapted to be placed over the panels and struts in the areas of the hub joints.

These and other objects and advantages will become apparent from the accompanying description and drawings wherein:

FIG. 1 is a perspective view of a geodesic dome constructed in accordance with the present invention;

FIG. 2 is an enlarged perspective view showing the arrangement between the circular hub plate and the attached T-section strut members;

FIG. 3 is a perspective view, similar to FIG. 2, but showing the panel members in place;

FIG. 4 is another perspective view, similar to FIG. 3, illustrating the sealing strip and weather cap attached to the panels;

FIG. 5 is a bottom plan view of the hub joint showing the mounting strips in place;

FIG. 6 is a sectional view taken along line 6-6 of FIG. 4;

FIG. 7 is a sectional view taken along line 7-7 of FIG. 4;

FIG. 8 is a perspective view illustrating the attachment of the hub joint to the dome's foundation, as viewed from outside the structure;

FIG. 9 is a perspective view, similar to FIG. 8, but viewed from inside the dome structure;

FIG. 10 is a sectional view taken along line 10-10 of FIG. 8.

Proceeding next to the drawings, wherein like reference symbols indicate similar parts throughout the various views, a specific embodiment of the present invention will be described in detail.

In FIG. 1 there is illustrated a geodesic dome structure incorporating the hub joint of the present invention which may be of metal, plastic or other suitable material. The hub joint 2, consists of a flat, circular, hub plate 3 with holes 4 and 4' evenly distributed around its outer circumference. Attached to the hub plate 3 are T-section strut members 5 consisting of horizontal and vertical flanges 6 and 7, respectively. The ends 8 of the T-section struts have a portion of the vertical flange 6 removed for a distance slightly greater than the radius of the hub plate. The strut members may be of the same material as the hub plate. As can be best seen in FIG. 7, this allows the horizontal flange 7 to be bent, at 9, in a direction away from the vertical flange 6 to provide a proper interface angle at the hub joint perimeter. This further permits the drilling of holes 10 and 10' in the ends 8 of the T-section strut at a position which will align with holes 4 and 4' respectively in the circular hub plate 3. In addition, ends 8 are tapered at their sides 11 to permit the nesting of adjacent T-strut members 5 attached to hub plate 3 by mounting bolts 12 passing through aligned holes 4 and 10 in the hub plate and T-struts, respectively. While it is not necessary, two bolts 12 and 12' may be used to attach each strut member 5 to hub plate 3, in order to provide a more rigid connection and prevent any possible hub joint rotation. This can be achieved by the inclusion of one extra hole 4' in hub 3 to receive a mounting bolt 12' passing through a correspondingly aligned hole 10' in strut member 5. While all of the struts could be so attached, hub joint rotation can be prevented if only one strut member per joint is secured by two bolts. In the embodiment illustrated, vertical flanges 6 lie on the outside of a completed dome structure and horizontal flanges 7 face within.

In practice, five or six strut members 5 may be attached to each hub plate 3 in the construction of a geo-
desic dome framework. The dome illustrated in FIG. 1 utilizes both configurations.

With the exception of the hub joints at the base of the dome’s framework, all of the hub joints, according to the present invention, are identical. As can be seen in FIGS. 8 to 10, the base of the dome structure rests upon sill members 13 of wood, metal, or other suitable material to which are attached L-brackets 14 such as by screws 15. The bottom portion of the hub plates 3 are in turn secured by bolts 12 to the L-brackets. The upper portion of the hub plates have T-section struts 5 attached thereto, each radiating outwardly and attached to another hub joint assembly at its other end. The completed dome framework consists of a multiplicity of T-section strut members 5 attached to hub plates 3, with the base of the dome being secured to a sill base ring 13 by the use of L-brackets 14.

Once the dome framework has been constructed, triangular panel members 16, of plywood, plastic, metal, glass or any other suitable material, can be set into the triangular area formed between adjacent T-section strut members 5. As can be seen in FIG. 3, each half of the T-section strut members offers an L-shaped ledge 17 onto which a panel 16 may be placed. When the panels are so positioned, they can either be attached directly to the horizontal flange 7 by screws and the like (not shown), or they can be secured by panel retaining strips 18. Each panel strip is contoured so that it may extend across the bottom surface of horizontal flange 7. The edges of said triangular panels and said L-shaped ledges of said strut members are filled with caulking.

To prevent the entry of wind and rain into the living space within the dome, sealing means are provided between the panel and strut member interfaces. One method of attaining such a seal is to place a suitable caulking 20 into the area between the edge of triangular panels 16 and the L-shaped ledges 17. To insure a permanent seal, sealing strips 21 of contoured metal, or other suitable material, such as Scotch Brand Y-9057 Pressure Sensitive Tape made of weather resistant Tedlar Film and manufactured by 3-M Company, are positioned along the open joint formed between the panel edges and the vertical flanges 6. In the embodiment shown, the flange 6 is higher than the thickness of the panels, so that the sealing strip 21 is raised along its longitudinal center line to accommodate the extra height of the flange 6 and conform to the surface of the panels.

Sealing in the areas above the hub joint structure, is accomplished by providing a sealing cap 22 which is contoured at its periphery so that it sealingly contacts the sealing strips 21 and the triangular panels 16, at their points of intersection in the area of the hub joint structure.

A geodesic dome constructed in accordance with the structural framework and hub joint assembly of the present invention provides an easy to assemble, strong and weather-tight building.

It will be understood that various details of construction and arrangement of parts may be made without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. A Hub joint structure for geodesic domes including a foundation base, generally flat circular hub plates with each plate having first apertures therein adjacent its circumference, and second apertures therein spaced inwardly of said first apertures, T-section strut members attachable at opposing ends to said hub plates with each member having an outwardly extending vertical flange and a transverse horizontal flange, a portion of said vertical flange being removed at each end for a distance slightly greater than each hub plate radius to provide extended horizontal flanges, said horizontal flanges being angled away from said vertical flanges so as to flatly engage the outer surfaces of said hub plates and being tapered so that said strut ends abut and nest on said plates, and spaced apertures in said extended horizontal flanges aligned with said first and second apertures in said hub plates for receiving mounting elements therethrough for radially connecting said strut members to said hub plates, whereby the first connection of said hub plates to said foundation base and subsequent successive interconnection of said strut members and hub plates enables the upward formation and erection of a completed dome framework.

2. In a hub joint structure, as claimed in claim 1, wherein triangular panels are attached to said strut members in the area defined by adjacent strut members, the edges of said panels resting on the L-shaped ledge formed by one-half of each T-section strut member.

3. In a hub joint structure, as claimed in claim 1, wherein panel retaining strips are attached to a triangular panel on either side of and extending across a corresponding T-strut member.

4. In a hub joint structure, as claimed in claim 1, wherein panel sealing strips are attached to and cover the area formed between adjacent panels mounted on a T-section strut member.

5. In a hub joint structure, as claimed in claim 1, wherein a sealing cap is attached to and covers said triangular panels and said sealing strips at their point of intersection over said hub plate.

6. In a hub joint structure as claimed in claim 1, wherein the areas between the edges of said triangular panels and said L-shaped ledges of said strut members are filled with caulking.

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