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Expandable Space Frames

Space frames are commonly used in construction as scaffoldings around buildings and as support structures for domes and towers. A typical space frame is made from a large number of struts which are either riveted, bolted, welded, or brazed together at the construction site. After the construction is finished, the frame is disassembled to be used elsewhere. The assembly and the disassembly take a long time. Time, however, can be saved using newly-developed expandable space frames.

The expandable space frame consists of struts connected by hinge joint assemblies. Because the struts are hinged, the entire frame can be collapsed during transportation and expanded at the construction site.

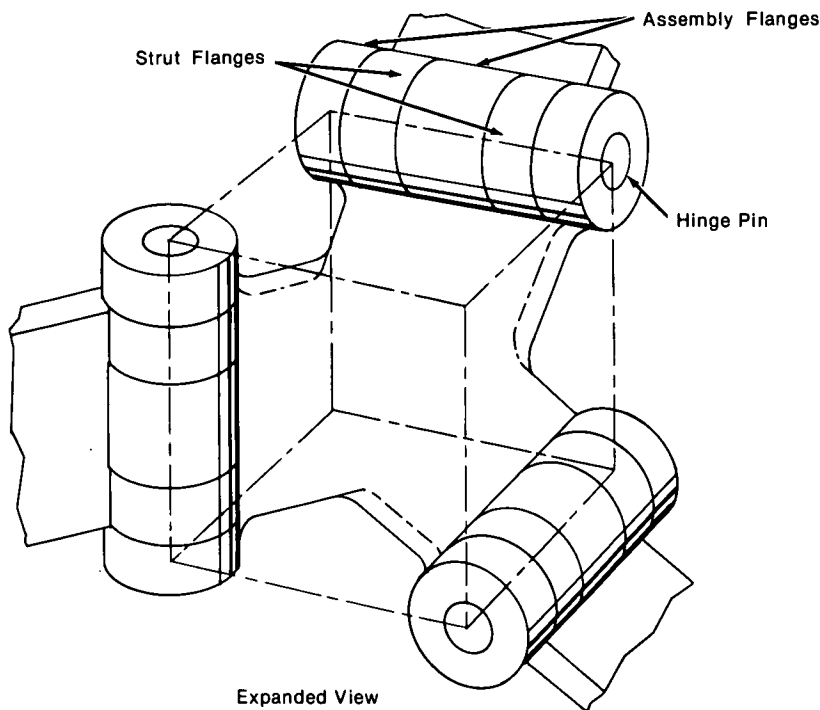
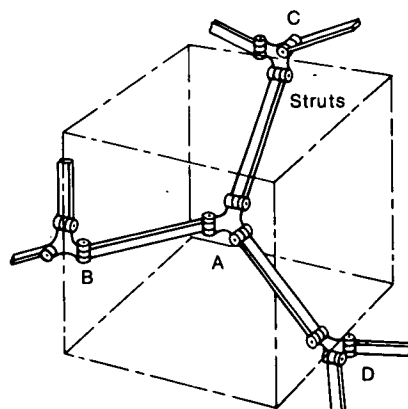
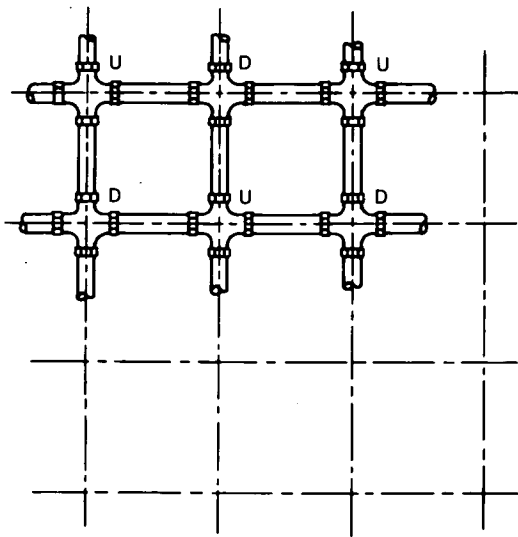


Figure 1. Three-Dimensional Space-Frame Construction

(continued overleaf)



The frame has two types of hinge joint assemblies. One as shown in Figure 1 is used for a three-dimensional space frame expansion. The other as illustrated in Figure 2 is used for a two-dimensional expansion. The latter has two different configurations.

The three-dimensional assembly is made up of three joints with mutually orthogonal axes. Each joint has three washer-shaped flanges that interlock with the strut flanges and are held with the hinge pins. The lattice structure shown repeats itself. The struts are collapsible about the assembly located at A, the vertex point of an imaginary cube. The volume collapse ratio is 80 to 1.

Similar joints are used in two-dimensional structures. In one design the joint axes are orthogonal in a two-dimensional plane, and in another they are set at 60° to each other. The frames are collapsed by raising the joints labeled U and dropping the joints labeled D. The volume collapse ratio is 400 to 1.

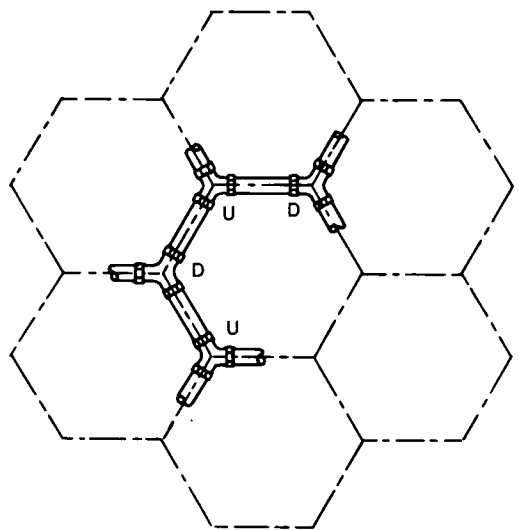


Figure 2. Two-Dimensional Space-Frame Structures

Note:

Requests for further information may be directed to:

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 Reference: TSP74-10252

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,757,476). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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