Manufacturing & Prototyping

Mercuric Iodide Anticoincidence Shield for Gamma-Ray Spectrometer

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A film-growth process was developed for polycrystalline mercuric iodide that creates cost-effective, large-area detectors for high-energy charged-particle detection. A material, called a barrier film, is introduced onto the substrate before the normal mercuric iodide film growth process. The barrier film improves the quality of the normal film grown and enhances the adhesion between the film and the substrate.

The films grown using this improved technique were found to have adequate signal-to-noise properties so that individual high-energy charged-particle interactions could be distinguished from noise, and thus, could be used to provide an anticoincidence veto function as desired.

This work was done by Neal Hartsough and Jan Iwanczyk of DxRay, Inc. for Goddard Space Flight Center. For further information, contact the Goddard Innovative Partnerships Office at (301) 286-5810. GSC-15635-1

Improved Method of Design for Folding Inflatable Shells

Designs of gores reflect multiple considerations of assembly, stowage, and deployment.

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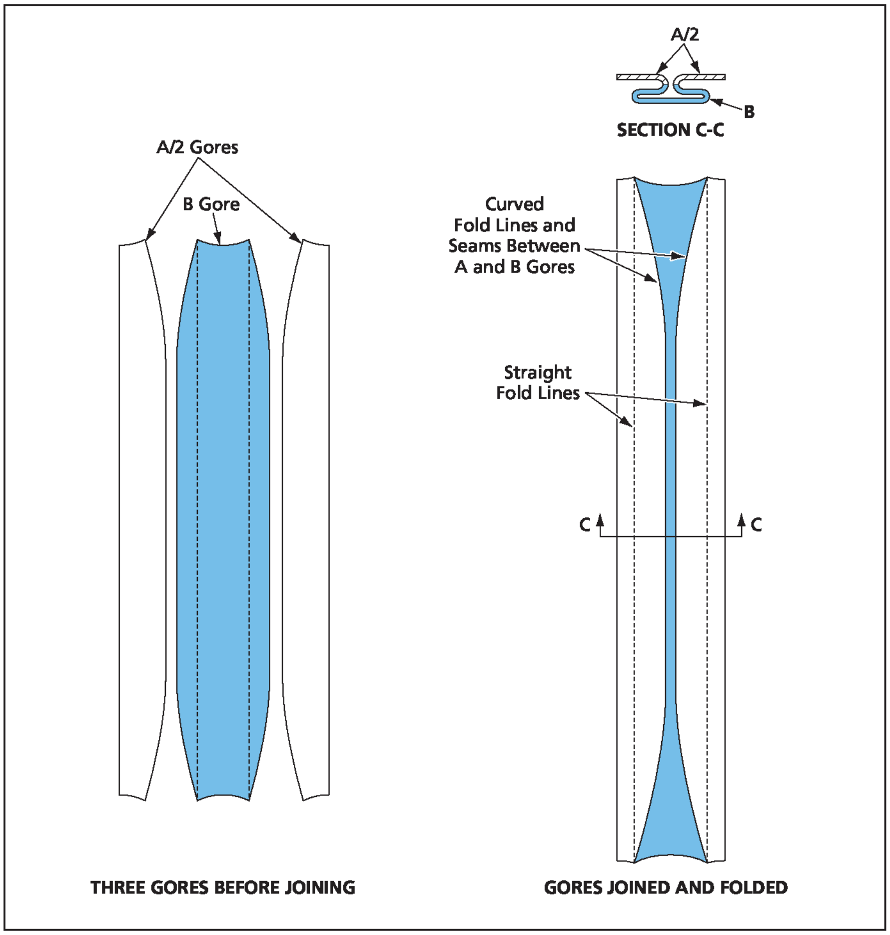
An improved method of designing complexly shaped inflatable shells to be assembled from gores was conceived for original application to the inflatable outer shell of a developmental habitable spacecraft module having a cylindrical midlength section with toroidal end caps. The method is also applicable to inflatable shells of various shapes for terrestrial use.

The method addresses problems associated with the assembly, folding, transport, and deployment of inflatable shells that may comprise multiple layers and have complex shapes that can include such doubly curved surfaces as toroids and spheres. One particularly difficult problem is that of mathematically defining fold lines on a gore pattern in a double-curvature region. Moreover, because the fold lines in a double-curvature region tend to be curved, there is a practical problem of how to implement the folds. Another problem is that of modifying the basic gore shapes and sizes for the various layers so that when they are folded as part of the integral structure, they do not mechanically interfere with each other at the fold lines.

Heretofore, it has been a common practice to design an inflatable shell to be assembled in the deployed configuration, without regard for the need to fold it into compact form. Typically, the result has been that folding has been a difficult, time-consuming process resulting in a



The **Basic Repeating Unit** of a shell comprising a cylinder with toroidal end caps is a subassembly of three gores.

poor stowed configuration. Hence, yet another problem is to design the shell to be assembled in the stowed configuration, bypassing the folding process at the vehicle level.

The problem of weight relief can be summarized as one of securing the stowed shell against shifting under its own weight during transport, without imposing excessive stress on any part of the shell. The weight-relief problem may not be significant in all applications, but launch acceleration makes it so in the original spacecraft application.

To solve these problems, in the improved method, one does more than merely choose the sizes and shapes of the gores to obtain the specified deployed shape of a shell. In addition, one chooses the sizes and shapes of the gores and the fold lines, in conjunction with the sequence of incorporation of the gores, to enable assembly of the shell in the stowed configuration, without interference between layers. To make this possible, the fold lines and the shapes of the gores are defined by equations that reflect the aforementioned problems and requirements. These equations incorporate the required modifications for the layers in each gore, accounting for the thicknesses of the layers and providing corresponding margins to prevent interference at fold lines.

The equations also provide for simplification of fold lines in double-curvature regions. For example, in the original application, the basic repeating unit for forming a cylinder with toroidal end caps consists of a gore designated B between two gores designated A/2, as shown in the figure. The B gore contains two straight fold lines that run the entire length, including the toroidal regions at the ends. The seams between the A/2 and B gores constitute a second pair of fold lines that are curved in the end regions, the curvature being such as to enable the flat folded pattern to deploy to the desired toroidal shape at the ends. When repeating units are joined together at vehicle installation, adjacent A/2 gores become a full A gore.

The weight-relief problem is solved by use of straps attached between (1) suitably chosen locations near fold lines and (2) adjacent supporting fixtures on a rigid structure on which the folded shell is to be stowed.

This work was done by Christopher J. Johnson of Johnson Space Center. Further information is contained in a TSP (see page 1).

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to the Patent Counsel, Johnson Space Center, (281) 483-1003. Refer to MSC-24149-1.