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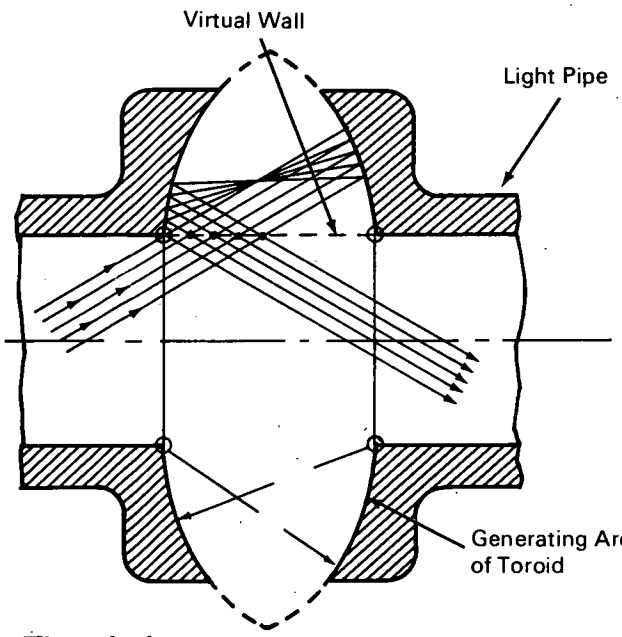
Brief 70-10632

NASA TECH BRIEF

Toroidal Mirrors Provide Virtual Walls for Breaks in Light Pipes

The problem:

To effect a circumferential break or separation in a light pipe without introducing aperture losses and interrupting or obstructing the continuity of the light beam. Such a break is required for insertion of measuring probes, choppers, and samples into the light pipe.



The solution:

A section of light pipe consisting of separated segments having opposed toroidal mirrors that will intercept meridional rays to present a virtual wall in the space between the mirrors, thus ensuring uninterrupted transmission of the rays down the pipe.

How it's done:

Each segment of the light pipe in the open section has a flange with a machined and polished surface to form a toroidal mirror. The center of the generating arc (radius r) of each toroidal surface is at the intersection of the opposite generating arc with the inside diameter of the light pipe. With this geometry, meridional rays incident on one toroidal mirror are reflected by the other so that the incident and reflected rays intersect at points defining a virtual wall of nearly constant diameter (approximating that of the inside diameter of the light pipe proper). As the toroidal mirrors are surfaces of revolution about the longitudinal axis of the light pipe, they are axially symmetrical and off-axis meridional rays of even large angles will be propagated down the pipe.

Notes:

1. In addition to affording internal access to a light pipe section (e.g., for insertion of measuring devices, samplers, choppers, etc.), this design allows the segments to be axially rotated when required and also to be electrically or thermally insulated from one another.
2. No additional documentation is available. Specific questions, however, may be directed to:
   Technology Utilization Officer
   Ames Research Center
   Mail Stop N-240-2
   Moffett Field, California 94035
   Reference: B70-10632

Patent status:

No patent action is contemplated by NASA.

Source: Niels Young of
Block Engineering, Inc.
under contract to
Ames Research Center
(ARC-10031)

Category 03