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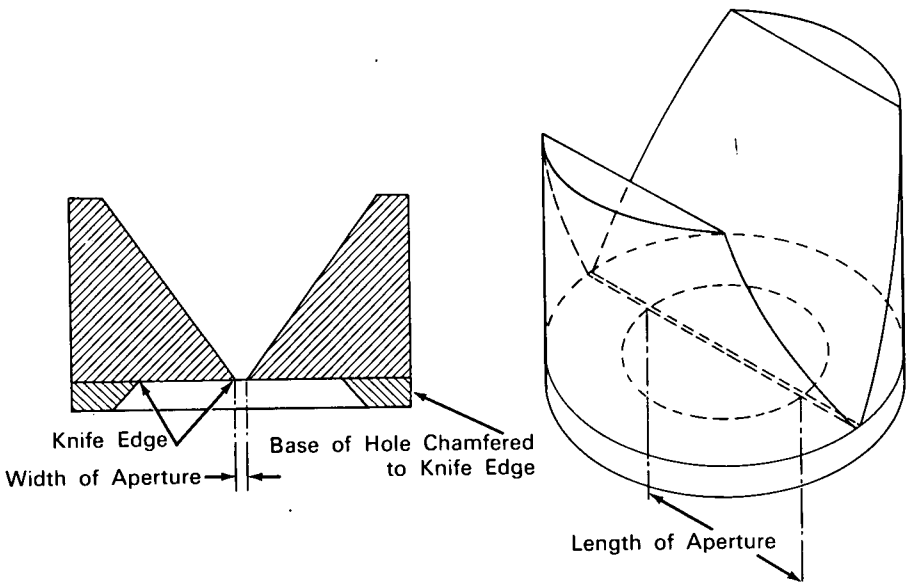
Brief 64-10211

NASA TECH BRIEF

Micromachining Produces Optical Apertures to Micron Dimensions



The problem: Investigation and measurement of discrete components of light rays have been limited in the past by the size of optical entrance and exit apertures available. Prior techniques have produced minimum aperture widths no smaller than 10 microns.

The solution: A manufacturing method that produces rectangular optical apertures to minimum dimensions of 0.006-inch ±0.0005-inch long by 4.5-microns ±0.5-micron wide.

How it's done: A base plate or disc is machined and lapped to near-perfect flatness. Two rectangular blocks are chamfered along one corner of their longest dimension to a knife-blade edge. A small (0.006-inch ±0.0005-inch) chamfered hole is machined in the base on a microdrilling machine so that the chamfer accomplishes a knife-blade configuration in the above dimension at the lapped (flat) side of the base. The aperture is formed under a high-powered toolmaker's microscope by laying the two knife-edged blocks over the miniature knife-edged hole in the base. The two knife edges form the width of the aperture and the exposed portion of the hole in the base forms its length. Calibration of the aperture is also accomplished using the toolmaker's microscope. When calibrated, the unit is positioned by precision dowel pins and held in place by small screws.

(continued overleaf)

Notes:

1. The knife edges and hole edge are all in the same relative plane, allowing the complete aperture to be focused at the same focal point.
2. This method was used in the manufacture of the entrance and exit apertures of the Orbiting Solar Observatory (OSO-B) spectrophotometer.
3. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Goddard Space Flight Center
   Greenbelt, Maryland, 20771
   Reference: B64-10211

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA Headquarters, Washington, D.C., 20546.

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