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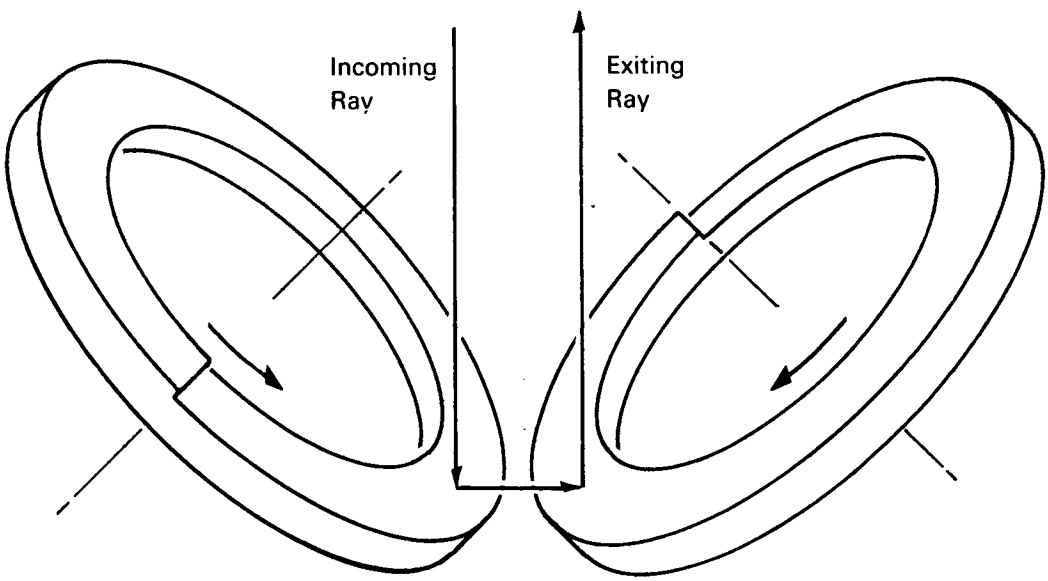
NASA TECH BRIEF

Twin Helix System Produces Fast Scan in Infrared Detector



The problem:

To achieve a linear speed for the motion of an assembly of two orthogonally placed mirror surfaces while eliminating the normal time loss involved in their return motion. The major difficulty in a fast scanning infrared microscope is to obtain the optimum use of the low level of radiant energy emitted by the target.

The solution:

Two rotating wheels in orthogonal relationship with helicoidal reflecting surfaces mounted on their outer rims. The helicoidal surfaces' pitch equals the displacement that the mirrors must traverse and they are continuous except for one single step, whose height equals the pitch.

How it's done:

The two wheels rotate synchronously and are phased so that the two steps face each other once per revolution. Because of the displacement of the reflecting surfaces in the planes passing through the axes of wheel rotation, for each turn, starting from the position where the two steps are facing, the two reflecting surfaces move in the X direction at uniform speed and, at the end of 360° of revolution, effectively return to the starting position (because of the steps) with negligible time loss. This effects a perfect sawtooth energy placement of the incoming energy with linear speed and zero return time. If the incoming energy is composed of multiple rays rather than a single ray, time loss for the return is equal to that increment required for the step in the reflecting surface to cross the whole radiant beam.

(continued overleaf)

Notes:

1. For a single optical ray, there is no distortion. For an optical field reflected by a finite area of the mirrors, there is distortion because the helicoidal surfaces are not true planes. This distortion can be largely removed by locating the two helicoidal surfaces so that the outside rim of each faces the inside rim of the other.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B66-10638

Patent status:

No patent action is contemplated by NASA.

Source: Ricardo Vanzetti
of Raytheon Company
under contract to
Marshall Space Flight Center
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