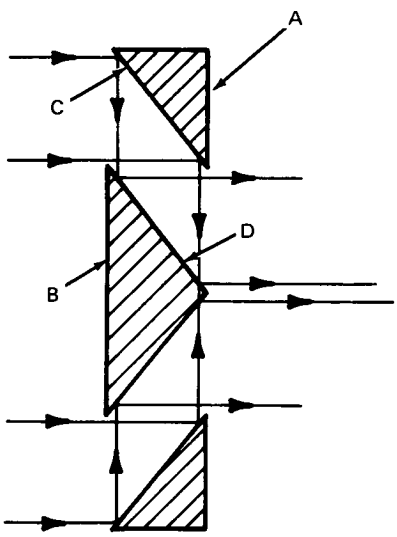
May 1972

B72-10147

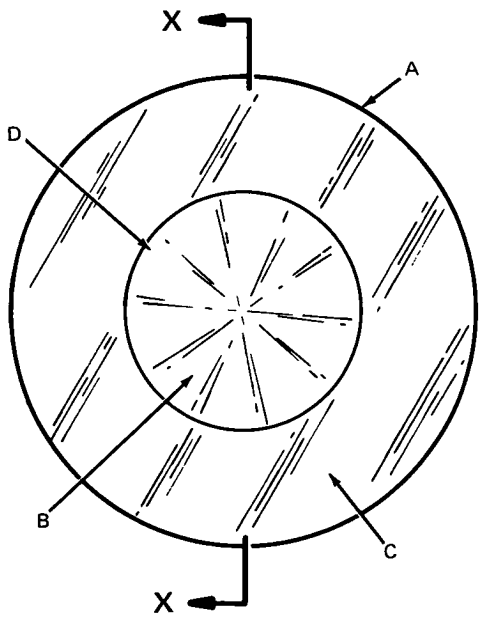
NASA TECH BRIEF

Marshall Space Flight Center

Conical Electromagnetic Radiation Flux Concentrator



SECTION X-X



The radiation flux concentrator provides a method of concentrating a beam of electromagnetic radiation into a smaller beam, presenting a higher flux density. Conversely, a smaller beam may be made larger by sending the radiation through the device in the reverse direction. The use of mirrors or lenses with complex surface shapes, e.g., spherical, parabolic, or aspheric, in previous techniques of concentrating or expanding electromagnetic radiation was a disadvantage due to the difficulty and expense required for manufacture of the surfaces.

A cross-section of the concentrator shows part A to be a truncated right angle cone of 90° (half-angle of 45°) with the reflector surface shown at C. Part B is also a right angle cone of 90° (half angle of 45°) with a reflector surface at D. Part B is positioned such that the two cones, or parts, are concentric.

Electromagnetic radiation striking surface C is reflected to surface D and subsequently into a smaller diameter shaft of radiation with a higher flux density. Part A, being twice the diameter of part B, will collect four times the amount of energy that would have been contained in a collector the diameter of part B. Taking away the obscuration caused by part B, the overall advantage is 3 to 1 in gained concentration, minus small losses due to the reflecting surfaces C and D.

The cones may be made at different angles but must bend the light a total of 180°. The 90° cones are thought to be more efficient as concentrators in terms of providing the most concentration for a given diameter of the device. The cones may also be made from various materials. However, reflector surfaces must be coated such that they are efficient reflectors for the frequency with which the device is to be used.

(continued overleaf)

The main advantage of the concentrator is in the use of simple surfaces that are easy to manufacture to provide electromagnetic radiation concentration. The concentrator may be used alone or in series for further concentration, or it may be used in conjunction with another optical device to increase its aperture and, hence, its radiation input and resolution.

Note:

Requests for further information may be directed to:

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Reference: B72-10147

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to:

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