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Laser Action Generated Within a Light Pipe: A Concept

The problem:

In optical communications systems currently under development, fiber optics (light pipes) are used to conduct laser beams. When a laser beam is coupled to the light pipe, there is a signal loss at the interface.

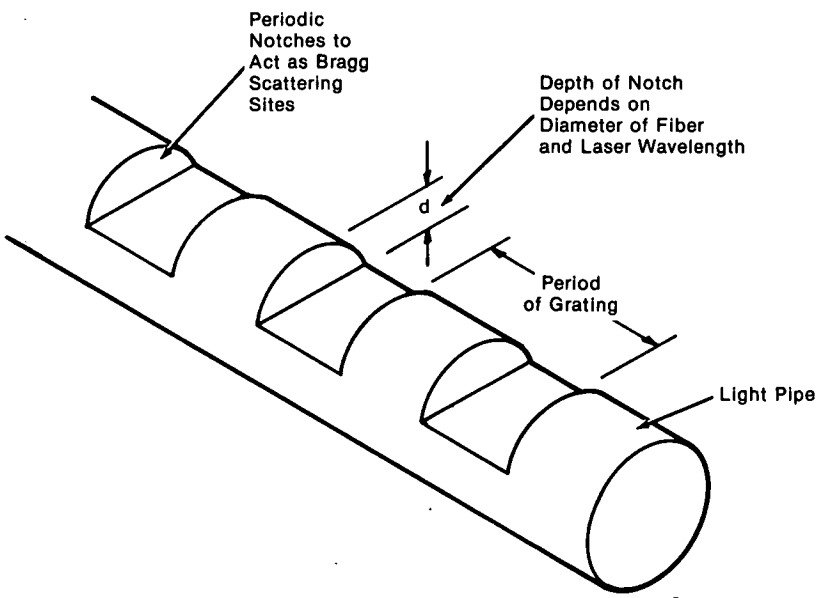
The solution:

The laser light could be generated within the light pipe itself, thereby eliminating coupling losses.

How it's done:

The light pipe is made to act as a distributed-feedback laser, which would be incorporated in the beginning of the optical transmission line. In such a system, distributed reflections at periodic sites replaces end reflection as the method of reinforcing the light signal. The light pipe is doped with active material, and could be micromachined to have periodic variations in its index of refraction as shown in the figure. The pipe has what are essentially Bragg gratings that generate a feedback wave which leads to self oscillation.

Theoretical calculations have shown the feasibility of a light-pipe laser propagating in the circularly-polarized TE mode. It is predicted that a fiber-optic distributed-feedback laser would have a gain on the order of 25 dB. However, the fiber optic design and the laser frequency would have to be chosen to optimize performance.



Light Pipe Grated To Act as a Laser

(continued overleaf)

Note:

Requests for further information may be directed to:

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Reference: TSP75-10127

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

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