



US005371814A

# United States Patent [19]

[11] Patent Number: **5,371,814**

Ames et al.

[45] Date of Patent: **Dec. 6, 1994**

## [54] PASSIVE, MULTI-CHANNEL FIBER OPTIC ROTARY JOINT ASSEMBLY

[75] Inventors: **Gregory H. Ames, Gales Ferry; Roger L. Morency, Voluntown, both of Conn.**

[73] Assignee: **The United States of America as represented by the Secretary of the Navy, Washington, D.C.**

[21] Appl. No.: **151,396**

[22] Filed: **Nov. 8, 1993**

[51] Int. Cl.<sup>5</sup> ..... **G02B 6/32**

[52] U.S. Cl. .... **385/25; 385/26**

[58] Field of Search ..... **385/25, 26**

### [56] References Cited

#### U.S. PATENT DOCUMENTS

4,109,998	8/1978	Iverson	385/26
4,258,976	3/1981	Scott et al.	385/26
4,943,137	7/1990	Speer	385/26
5,157,745	10/1992	Ames	385/26
5,271,076	12/1993	Ames	385/26

*Primary Examiner*—John D. Lee  
*Attorney, Agent, or Firm*—Michael J. McGowan;  
Prithvi C. Lall; Michael F. Oglo

### [57] ABSTRACT

A passive multi-channel optical fiber rotary joint cou-

ples optical fiber communication channels via axially bilaterally symmetrically disposed lens housings, or array pieces, for receiving miniature-collimation-lenses to one and the other sides of an image-derotation-prism-and-prism-rotational-drive-subassembly including an image derotation prism which rotates at a predetermined ratio of the relative rotation of the array pieces. This establishes transverse pseudo-planar rotary interfaces respectively between the one and another array piece and the confronting sides of the prism-and-prism-drive-subassembly. Each channel, at the axially outward side of each of one and the other array pieces, includes a fiber and lens junction in which the fiber is attached to the axially outward side of the collimation lens at (i) a predetermined axially bilaterally symmetrical position chosen for maximum coupling of signal power through the joint, and (ii) individual lateral positions relative to the lens chosen to provide coupling with a path of beam propagation perpendicular to the rotary interface at the other side of the collimation lens. Each array piece forms a precision tolerances locality of axial engagement with the confronting side of the prism-and-prism-drive-subassembly, which in turn defines the respective rotary interfaces.

15 Claims, 4 Drawing Sheets

