



[54] SYSTEM AND METHOD FOR GENERATING A DISPLACEMENT WITH ULTRA-HIGH ACCURACY USING A FABRY-PEROT INTERFEROMETER

[75] Inventor: Timothy J. McIntyre, Knoxville, Tenn.

[73] Assignee: Martin Marietta Energy Systems, Inc., Oak Ridge, Tenn.

[21] Appl. No.: 65,285

[22] Filed: May 20, 1993

[51] Int. Cl.⁵ G01B 11/02

[52] U.S. Cl. 356/358; 356/356; 356/352; 250/442.11

[58] Field of Search 356/356, 358, 352, 357, 356/405, 5, 381; 250/442.1

[56] References Cited

U.S. PATENT DOCUMENTS

4,506,154 3/1985 Scire 250/442.1
4,659,224 4/1987 Monchalin 356/352

OTHER PUBLICATIONS

The Fabry-Perot Interometer; History, Theory, Practice, and Applications, J. M. Vaughan (Adam Hilger, IOP Pub. Ltd., Bristol, England, 1989) pp. 184-213.

Test and Measurement Catalog/Hewlett Packard Laser Interferometers 1992 pp. 423-426.

Axiom 2/20 Optical Heterodyne Interferometers/-ZYGO Laser Measurement Systems, Chapt., 2, pp. 2-1 to 2-44.

Status of a Silicon Lattice Measurement and Dissemina-

tion Exercise, R. D. Deslattes and E. G. Kessler, Jr., IEEE Trans' Apr., 91, pp. 92-97.

OPTRAMETER and OPTRALITE Product Bulletins, OPTRA, Peabody, Mass.

Product Bulletin, X-Y Piezo-Flex(TM) Micropositioner, Wye Creek Instruments, Fredrick, Md., Nov. 1988.

Primary Examiner—Davis L. Willis

Assistant Examiner—LaCharles P. Keesee, II

Attorney, Agent, or Firm—Michael E. McKee; James M. Spicer; Harold W. Adams

[57] ABSTRACT

A system and method for generating a desired displacement of an object, i.e., a target, from a reference position with ultra-high accuracy utilizes a Fabry-Perot etalon having an expandable tube cavity for resolving, with an Iodine stabilized laser, displacements with high accuracy and for effecting (as an actuator) displacements of the target. A mechanical amplifier in the form of a micropositioning stage has a platform and a frame which are movable relative to one another, and the tube cavity of the etalon is connected between the platform and frame so that an adjustment in length of the cavity effects a corresponding, amplified movement of the frame relative to the cavity. Therefore, in order to provide a preselected magnitude of displacement of the stage frame relative to the platform, the etalon tube cavity is adjusted in length by a corresponding amount. The system and method are particularly well-suited for use when calibrating a high accuracy measuring device.

21 Claims, 3 Drawing Sheets

