TECHNOLOGY

Fiber Tip Based Fiber Optic Sensor Systems

OVERVIEW

Design and control of complex structural and mechanical systems such as household appliances, aircraft, automobiles, underwater vehicles, and theaters requires acoustic and structural vibration analysis. Vibrations may be the source of a noisy environment and/or the cause of fatigue damage, as in the case of automobiles, aircraft, and ships. Experimental work is often required to design these systems in the laboratory as well as to study them in the field. Therefore, sensors that can measure accelerations, velocities, and acoustic pressure are in great demand for many industrial, defense, and commercial applications.

Researchers at the University of Maryland have developed a fiber tip based Fabry-Perot optical sensor system (FTFP) for acoustic, pressure, and acceleration measurements. The system uses a low coherence interferometry technique for the optical component and a novel multistep algorithm to recover the optical phase from interference pattern.

The advantages of such system sensor are as follows:

· High sensitivity (1 rad/Pa)
· Insensitivity to the electromagnetic interference
· Large bandwidth (up to 7.5 kHz for the sensor shown on the left)
· Multiplexible for a distributed sensor array and phase matched sensors
· Light weight
· Can be miniaturized to the level of fiber optic diameter for MEMS applications
· Can be used in harsh environments
· Has remote sensing capabilities

This system can be developed into a fiber tip-based microphone, velocity sensor, accelerometer sensor, and fiber optic acoustic intensity sensor. Its applications range from the aerospace industry to the architecture industry. Specific applications include acoustic emission measurements in computer hard disk drives; pressure measurements for ignition chambers of automobiles; integrated distributed pressure sensor arrays for smart wing structures; distributed acoustic pressure array panels for acoustic measurement in concert halls and conference rooms; health monitoring technologies; and background noise suppression systems in automotive telematics.

See US patent no.

Experimental results, regarding the microphone application of this technology, are compared to a Brüel & Kjær microphone and attached to this summary.

For additional information, please contact the Office of Technology Commercialization, University of Maryland, College Park, MD 20742. tel: (301) 405-3947, . e-mail: otc@umd.edu

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Additional Information

INSTITUTION

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PATENT STATUS

Issued

LICENSE STATUS

Contact OTC for licensing information

CATEGORIES

- Microelectronics
- Engineering
- Sensors/Monitors

EXTERNAL RESOURCES

- US Patent 6,901,176

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