



Florida Institute of Technology

FIBER-OPTIC FABRY PEROT INTERFEROMETER AND ASSOCIATED METHODS

Summary

The method for making the fiber optic Fabry-Perot sensor includes securing and optical fiber to a substrate having a characteristic which is changeable in response to a sensed condition; and forming at least one gap in the optical fiber after the optical fiber is secured to the substrate to define at least one pair of self-aligned opposing spaced apart optical fiber end faces for the Fabry-Perot sensor, and wherein the at least one gap changes in response to changes in the characteristic of the substrate. The opposing spaced apart optical fiber end faces are self-aligned because the pair of optical fiber end portions are formed from a single fiber which has been directly secured to the substrate. Also, each of the self-aligned spaced apart optical fiber end faces may be substantially rounded due to an electrical discharge used to form the gap. This results in integral lenses being formed as the end faces of the fiber portions.

Applications

- The use of optical fibers allows for the manufacture of extremely compact and economic sensors known as Fiber-optic Fabry-Perot interferometric (FFPI) sensors. Ends of optical fiber portions form partially reflective surfaces with the cavity or gap there between. Changing the distance between optic fiber ends in the cavity or stretching an optical fiber in the cavity changes the intensity of the combined optical intensity due to interference. The sensor can be designed to sense, for example, acoustic noise, stress/strain, temperature, vibration, shock etc.

Advantages

- The fibers must be very accurately aligned and able to maintain that alignment during operation. Conventionally, this is an expensive and timely process that involves aligning the fibers in three planes and at a plurality of angles. In a conventional passive alignment, fibers are inserted into a small micro capillary tube and glued in place. Both of these processes are also difficult to automate. The sensor 14 of the present invention does not need any alignment process because the resulting opposing fiber portions are automatically self-aligned.

The Technology

The basic structure and operation of the FPI sensor is well-known in the art and is described in many physics and optics texts. This interferometer includes an optical cavity formed between two typically reflecting, low-loss, partially transmitting mirrors. The use of optical fibers allows for the manufacture of extremely compact and economic sensors known as Fiber-optic Fabry-Perot interferometric (FFPI) sensors. Ends of optical fiber portions form partially reflective surfaces with the cavity or gap there between. Changing the distance between optic fiber ends in the cavity or stretching an optical fiber in the cavity changes the intensity of the combined optical intensity due to interference. The sensor can be designed to sense, for example, acoustic noise, stress/strain, temperature, vibration, shock etc. The fibers must be very accurately aligned and able to maintain that alignment during operation. This is typically an expensive and timely process that involves either an active alignment or a passive alignment. The active alignment typically includes launching light into one fiber while maximizing the light coupled into the second fiber. The fibers are aligned in three planes and at a plurality of angles. In a conventional passive alignment, fibers are inserted into a small micro capillary tube and glued in place. These processes are also difficult to automate.

Florida Institute of Technology Contact:
Assistant Vice President for Research
John P. Politano Jr.
321-674-7239 /jpolitano@fit.edu

Florida Tech Inventor: Dr. Syed Murshid