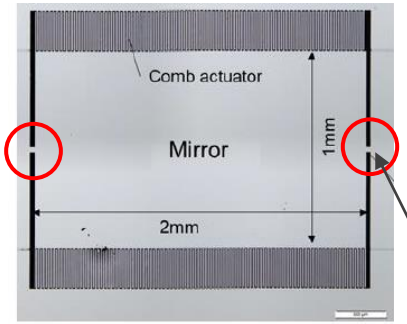
Tohoku Univ. Technology

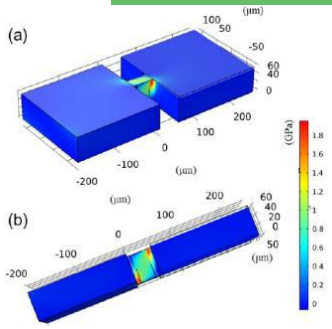
Obtained product claim

Scanning mirror and its manufacturing method

Torsion bar resistant to torsional fatigue! Vacuum sealing not needed but long life and low cost MEMS laser scanner

Reference [1]





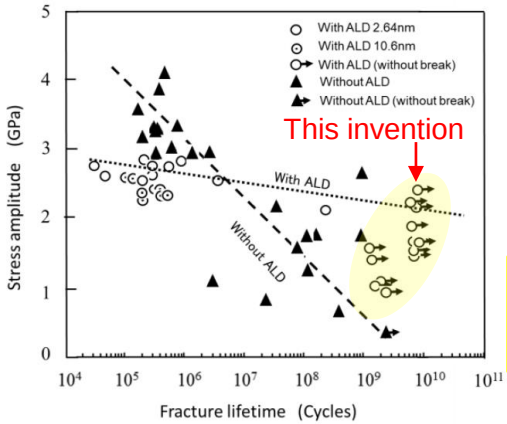
Torsion bar on mirror subjected to torsional stress (torsion spring)

Overview

The micro-scanner which is being developed to reduce the LiDAR (Light Detection and Ranging) size is a MEMS device that has a mirror and a **torsion bar** to support it, and scans with the laser beam in 2D. So far, the torsion bar could break in a short time due to hydroxylation/oxidation caused by moisture/oxygen adhesion to its surface. In addition, even a standard protective film is formed on the torsion bar surface, it cannot completely prevent moisture and oxygen adhesion, so the degradation of the torsion bar cannot be avoided. As consequence, vacuum sealing of the mirror device was required to obtain a practical life of the torsion bar.

This invention is able to provide a scanning mirror and its manufacturing method that can prevent deterioration from oxidation and hydroxylation of the torsion bar **in the atmosphere**. This invention is composed of a mirror section and a torsion bar in which the surface is covered with an ALD (Atomic Layer Deposition) layer.

Performance characteristic



Measurement results of fatigue life versus stress amplitude

▲ : Measured value at destruction of Si-torsion bar without ALD coating

○► : Measured value that does not lead to destruction of silicone torsion bar with ALD coating

Extend life by over 1-2 orders of magnitude and reduce cost by 1/3-1/5

Product Application

- Laser projector, laser display
- Head mounted display (VR / AR / MR)
- Automated driving technology (LiDAR)

Related Works

[1] Y. Fujita, T. Sasaki, K. Fukuda, N. T. Tung, F. Ogawa, T.Hashida, and K. Hane, TRANSDUCERS, 2021, pp. 549-552

IP Data

IP No. : JP 6795165, US 17/417,981, CN 202080007573.0, EP *
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