MAGNETIC JOINT AND OPTICAL MOUNT USING THE SAME

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FIELD OF THE DISCLOSURE

[0001] This disclosure relates generally to the mounting, positioning, and actuation of a payload, and in particular, to a magnetic joint and use thereof in mounting and actuation of an optical component.

BACKGROUND

[0002] Optical scanners can be used to steer a laser beam or a sensor that defines an imaging system field of view. Optical scanners may be used in materials processing, marking, packaging, optical coherence tomography, laser light shows, laser-based templating, and numerous other applications. The majority of optical scanners are mechanical systems using one of two implementations. A first implementation has two mirrors, each actuated along one rotational axis and positioned orthogonally to the other mirror to achieve a two-dimensional scanning field. A second implementation has a single mirror actuated in two orthogonal axes commonly known as tip-tilt. Both of these implementations, as they are currently available, have a number of non-trivial drawbacks.

Summary

[0002a] In an aspect, there is a laterally unconstrained magnetic joint comprising:

a first component comprising a permanent magnet material; and a second component comprising a permanent magnet or ferromagnetic material, wherein the first component and the second component are magnetically attracted to each other, and wherein the first component and the second component interface via continuous interface surfaces of different curvature that form and maintain point contact throughout a range of angular and lateral actuation. In an aspect, there is magnetic joint, comprising:

a first component having a first body extending along a first axis to a first interface surface, the first interface surface defining a first radius of curvature; and

a second component having a body extending along a second axis to a convex second interface surface in contact with the first interface surface, the second interface surface defining a second radius of curvature that is different from the first radius of curvature;

wherein at least one of the first component and the second component comprises a permanent magnet and wherein the first and second components are magnetically attracted to each other. In an aspect, there is a system comprising:

a payload having a first surface and an opposite second surface;

at least one linear actuator; and

a magnetic joint between the payload and the at least one linear actuator, the magnetic joint including

a first component with a first body defining a first interface surface, and

a second component defining a convex second interface surface in contact with the first interface surface, wherein at least one of the first component and the second component comprises a permanent magnet, and wherein the first component is laterally unconstrained with respect to the second component

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] Embodiments of the present disclosure are illustrated as examples and are not limited by the figures of the accompanied drawings, in which:

[0004] FIG. 1A illustrates a perspective view of a laterally unconstrained magnetic joint that includes a first component and a second component magnetically attracted to each other along a joint axis, in accordance with an embodiment of the present disclosure.

[0005] FIG. 1B illustrates a perspective view of the magnetic joint of FIG. 1A showing freedom of movement about X and Y axes, in accordance with an embodiment of the present disclosure.

[0006] FIG. 1C illustrates the magnetic joint of FIG. 1A with arrows representing possible movement of the first component relative to the second component, in accordance with an embodiment of the present disclosure.