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(54) **HYBRID MEMS FABRICATION METHOD AND NEW OPTICAL MEMS DEVICE**

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(58) **Field of Search** 438/31; 385/16, 385/17, 18

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(57) **ABSTRACT**

A new hybrid method of fabricating optical micro electro mechanical system (MEMS) devices is disclosed that uses both bulk and surface micromachining techniques, and a new optical MEMS device is also disclosed that is fabricated using the new method. The method includes the step of mounting a handle layer to one or more layers of MEMS structural material. Layers of structural and sacrificial material are then built up on the MEMS structural material using surface micromachining techniques. Drive electronics are mounted to the layers of structural and sacrificial material. The handle layer is removed to reveal the MEMS structural layer and the sacrificial material within the various layers is dissolved. The new method is particularly applicable to fabricating optical MEMS devices, with the handle layer being adjacent to a Si mirror layer. The surface micomachining layers form electrode and spring structures. Drive electronics are then mounted on the layers of structural material, so that a bias can be applied to the MEMS structures. The handle layer is removed from the mirror layer to reveal the mirror's reflective surface, and the sacrificial material is dissolved away, freeing the MEMS structures to operate. For optical or other MEMS arrays, a linking framework can be included to attach the MEMS devices.

29 Claims, 7 Drawing Sheets