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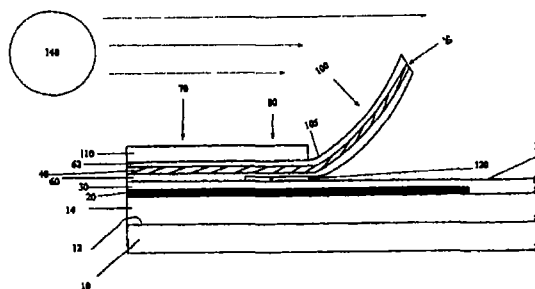
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(54) Title: MICROMACHINED ELECTROSTATIC ACTUATOR WITH AIR GAP



(57) Abstract: A MEMS (Micro Electro Mechanical System) electrostatic device operated with lower and more predictable operating voltages is provided. An electrostatic actuator, an electrostatic attenuator of electromagnetic radiation, and a method for attenuating electromagnetic radiation are provided. Improved operating voltage characteristics are achieved by defining a non increasing air gap between the substrate electrode and flexible composite electrode within the electrostatic device. A medial portion of a multilayer flexible composite overlying the electromechanical substrate is held in position regardless of the application of electrostatic force, thereby sustaining the defined air gap. The air gap is relatively constant in separation from the underlying microelectronic surface when the medial portion is cantilevered in one embodiment. A further embodiment provides an air gap that decreases to zero when the medial portion approaches and contacts the underlying microelectronic surface. A moveable distal portion of the flexible composite is biased to curl naturally due to differences in thermal coefficients of expansion between the component layers. In response to electrostatic forces, the distal portion moves and thereby alters the distance separating the flexible composite from the underlying microelectronic surface. Structures and techniques for controlling bias in the medial portion and the resulting air gap are provided. The electrostatic device may be disposed to selectively clear or intercept the path of electromagnetic radiation. Materials used in the attenuator can be selected to pass, reflect, or absorb various types of electromagnetic radiation. A plurality of electromagnetic attenuators may be disposed in an array and selectively activated in subsets.

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