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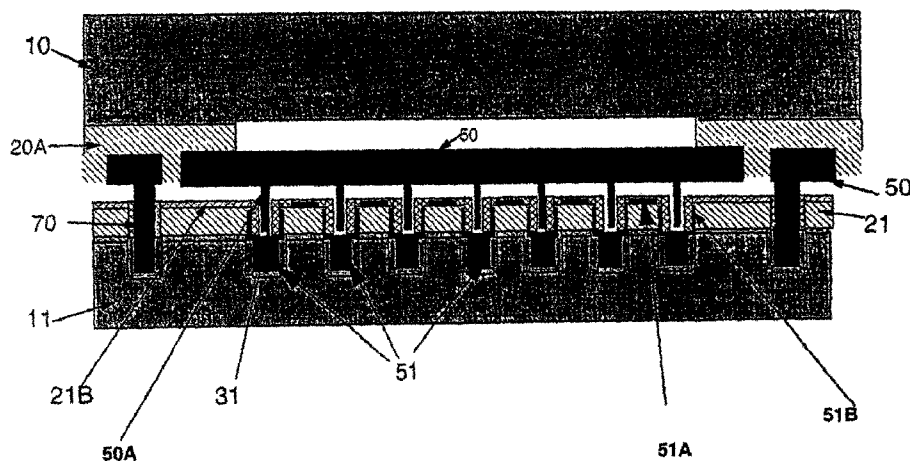
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(54) Title: MICRO-ELECTROMECHANICAL VARACTOR WITH ENHANCED TUNING RANGE



(57) Abstract: A three-dimensional micro-electromechanical (MEM) varactor is described wherein a movable beam (50) and fixed electrodes (51) are respectively fabricated on separate substrates coupled to each other. The movable beam with comb-drive electrodes are fabricated on the "chip side" while the fixed bottom electrode is fabricated on a separated substrate "carrier side". Upon fabrication of the device on both surfaces of the substrate, the chip side device is diced and "flipped over", aligned and joined to the "carrier" substrate to form the final device. Comb-drive (fins) electrodes are used for actuation while the motion of the electrode provides changes in capacitance. Due to the constant driving forces involved, a large capacitance tuning range can be obtained. The three dimensional aspect of the device avails large surface area. When large aspect ratio features are provided, a lower actuation voltage can be used. Upon fabrication, the MEMS device is completely encapsulated, requiring no additional packaging of the device. Further, since alignment and bonding can be done on a wafer scale (wafer scale MEMS packaging), an improved device yield can be obtained at a lower cost.

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