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(54) Title: **PIEZOELECTRIC VIBRATIONAL ENERGY HARVESTING SYSTEMS INCORPORATING PARAMETRIC BENDING MODE ENERGY HARVESTING**

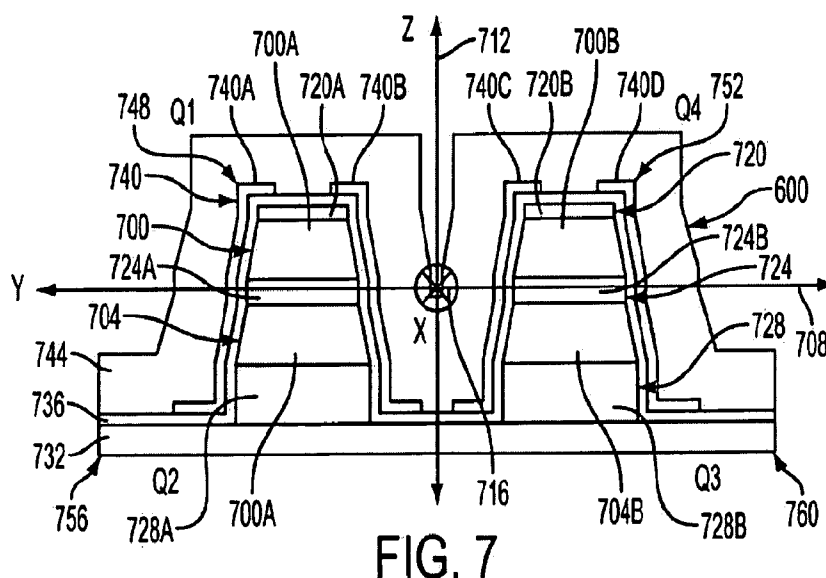


FIG. 7

(57) Abstract: Vibrational energy harvesting (VEH) structures that include resonant beams each having a fundamental resonance frequency and a parametric mode frequency and including at least one piezoelectric layer for generating electrical charge in response to each of fundamental-resonance excitation and parametric-mode excitation of that beam. Circuitry is provided for harvesting the electrical charge from the resonant beam. In some embodiments, the parametric mode frequency of the beam is tuned to be close to its fundamental resonance frequency so as to increase the effective bandwidth of a VEH structure. The effective bandwidth of a VEH structure can be further increased by tuning ones of multiple parametric-mode-enabled resonant beams to slightly different fundamental resonance frequencies and parametric mode frequencies.

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