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[54] SINGLE BAR TYPE VIBRATING ELEMENT ANGULAR RATE SENSOR SYSTEM

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[58] Field of Search 310/316, 318, 329, 332, 310/351-353, 366; 73/505, 517 AV, 517 R

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[57] ABSTRACT

An angular rate sensor system [10] comprising a vibratory sensing element [12] and signal processing circuit [14]. The element [12] is preferably a polymorphic rectangular bar fabricated from two layers of piezoceramic material [26, 28] divided by a thin center electrode [E_c], and a plurality of electrodes [E₁-E₄] scored onto the planar conductive surfaces [30, 32]. The element [12] is suspended at its acoustic nodes [N, N'] to vibrate in one direction [V] normal to the physical plane of the electrodes [E_c, E₁-E₄] using any suitable mounting structure such as parallel crossed filaments [34] or inwardly angled support arms [64] that provide predetermined degrees of lateral [S'] and longitudinal [S] stiffness. The circuit [14] may optionally constitute totally shared [FIG. 7], partially shared [FIG. 8], or totally isolated [FIG. 9] driving and sensing functions, the corresponding element [12] being configured with dual-pair, single-pair, or single-triple outer electrodes [E₁-E₄], respectively. The circuit [14] typically utilizes an automatic gain control and two operational amplifiers, and may include various signal conditioning components and a separate tuning module.

74 Claims, 8 Drawing Sheets

