Concept of a MEMS Load Cell Sensor of Mechanical Quantities Based on High-Frequency Effects

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Abstract. This article describes technological concept of a new MEMS sensoric structure, the principle of which is in indirect measurement of the mechanical quantity (force / pressure) by means of deformation of its elastic component. The deformation, or the mutual change of the crush element parts causes the change in the resonance frequency of the resonace circuit (composed generally of an L-C circuit) being a part of that crush element. The resonance frequency of the crush element induced by the measured quantity is transmitted by means of change of the electromagnetic (EM) field properties. This principle is calculated and simulated on small 3D objects while there is a continuous effort to fabricate them as micro-technologal devices. Such sensor can find its application practically in all areas where both the value of the measured quantity as well as its dynamic characteristics are required. Based on simulations, a functioning prototype of the proposed sensor has been developed in macroscopic level (of several milimeters) by a 3D printing method and miniaturized prototype of a MEMS microdevice (of several micrometers dimension) is described here. This method gives also a possibility of solving 2D arrays of one-component force sensors when the structure placed in such array is in the EM field formed by a strip conductor being directly part of the structure.