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Parametric structural schematic diagram of electroelastic actuator for nano and microdisplacement in nanotechnology

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The electroelastic actuator (piezoactuator) is piezomechanical device intended for actuation of mechanisms, systems or management based on the piezo effect, converts electrical signals into mechanical movement or force. The electroelastic actuator for nano- and microdisplacement solves problem of the precise matching in the nanotechnology and the adaptive optics, the compensation of temperature and gravitational deformations, atmospheric turbulence by wave front correction. Piezoactuator for nano- and microdisplacement provide the movement range from several nanometers to tens of microns, the sensitivity of up to 10 nm/V, the loading capacity of up to 1000 N. Piezoactuator provide high stress and speed of operation and return to the initial state when switched off. Piezoactuator is used in the majority of the scanning tunneling microscopes, the scanning force microscopes and the atomic force microscopes. By solving the wave equation using the Laplace transform and taking the equation of the electroelasticity, the boundary conditions on loaded faces of electroelastic actuator the strains along the coordinate axes, it is possible to construct its structural parametric model. Effects of the geometric and physical parameters of the electroelastic actuator and external load on its dynamic characteristics are determined. For calculation of the control systems the generalized parametric structural (schematic diagram figure-1) and the transfer functions of the electroelastic actuator are obtained. The static and dynamic characteristics of the piezoactuator are determined. The decision wave equation, the generalized structural-parametric model, the generalized parametric structural schematic diagram, the generalized transfer functions of the electroelastic actuator is obtained. The generalized structural-parametric model of the electroelastic actuator provides the determination of the parametric structural schematic diagrams, the transfer functions of the electroelastic actuator and calculation of its static and dynamic characteristics. The parametric structural schematic diagrams, the transfer functions of the piezoactuator for transverse, longitudinal, shift piezoeffects are determined from the generalized structural-parametric model of the electroelastic actuator for nano and microdisplacement.

Recent Publications

1. Afonin S M (2015) Structural-parametric model and transfer functions of electroelastic actuator for nano- and microdisplacement, Chapter 9 in Piezoelectrics and Nanomaterials: Fundamentals, Developments and Applications. Ed. Parinov IA. *New York: Nova Science;* 225-242.

2. Afonin S M (2015) Block diagrams of a multilayer piezoelectric motor for nano- and microdisplacements based on the transverse piezoeffect: *Journal of Computer and Systems Sciences International*; 54(3): 424-439.

Biography

Sergey Mikhailovich Afonin is presently an Associate Professor of Department of Intellectual Technical Systems, National Research University of Electronic Technology (Moscow Institute of Electronic Technology, MIET). He has completed his graduation degree Engineer in Electronic Technology from the National Research University of Electronic Technology MIET. He has obtained his PhD in Electronic Technology Engineering and Control Systems from National Research University of Electronic Technology MIET. He has also received academic title of Senior Researcher in MIET in 1991. He has more than 200 scientific paper publications and recipient of silver medal and two bronze medals at VDNKH Russia.

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