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Author: Prof. Aladdin Allahverdiyev
Russian Federation

METHOD FOR OPTIMIZING THE SHAPE OF OSCILLATING PIEZOELECTRIC DEVICES

Abstract

The optimal design of piezoelectric transducers, used in flying technology for given values of electrophysical parameters, is of great practical importance. For piezoelectric emitters and receivers serving as transmission and reception of necessary information, the task is usually to minimize the weight and volume at given parameters. The report solves the problem of optimal design of piezoelectric plates performing longitudinal and transverse oscillations at a given first natural frequency within the lower and upper boundaries of the cross-sectional area. It is necessary to optimize geometric shape of oscillating piezoelectric plate, with its minimum mass, providing a given frequency. The proposed method for solution involves using Pontryagin's maximum principle, equations of the piezoelectric effect, Maxwell's equation for electrostatistics, and equations of motion for longitudinal and transverse vibrations, corresponding to mechanical and boundary conditions over the entire frequency range, which provides the determination of the geometric shape of receiving emitting piezoelectric plate.