INVESTIGATION OF LINEAR IMPULSE ELECTROMECHANICAL CONVERTER

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Linear impulse electromechanical converters (LIEC) are designed to create mechanical shock pulses to the an object of influence with a slight movement of the actuator, or to accelerate it in a short active leg. These converters are used in many branches of science and technology as the shock-power devices and electromechanical accelerators. LIEC induction type provides non-contact displacement an electrically conductive armature relative to a stationary inductor excited by capacitive energy storage device using the electronic system of formation of the current pulse.

A mathematical model of coaxial LIEC, taking into account inter-related and ultrafast electromagnetic, thermal and mechanical processes that occur when you move the massive armature relative to the fixed multiturn inductor in the presence of ferromagnetic outer screen is developed.

Solving systems of equations of the mathematical model obtained by using the finite element method by integrating the spatial variables and improved method Gere in the integration over time.

It is shown that the electromechanical LIEC processes are complex, time-space character, and every time there is a significant spatial non-uniformity of the current density induced in the massive disc-shaped armature.

The technique of experimental research, which is the simultaneous recording of electrical and mechanical parameters characterizing the power and speed LIEC indicators is developed. Power parameters are recorded using a piezoelectric transducer, strain gauge system, pressure pulsation sensor and high-speed video and high-speed performance - using resistive displacement sensors.

On the basis of experimental studies determined: the shape, the peak value and duration of the inductor current pulse, delay time of vibration of the object exposure in relation to the time of occurrence of the inductor current, the average speed of the armature acceleration value proportional to the instantaneous electrodynamics force, and the magnitude of vibration, which is proportional to the momentum force acting the impact on the object.

To investigate LIEC, electromechanical operating as an accelerator in addition to the inductor current is measured while moving armature at each time of acceleration at the site using a resistive displacement transducer.

On the stand for the study LIEC using instantaneous velocity measurements were carried out with strain gauges armature striker video using a digital camera. After the shooting recording processing and decomposition of it into individual frames was carried out. At the same time by the time in which the anchor with the striker passes the distance to the shock plate was determined. The measured average speed in the area armature stroke in satisfactory agreement with the results of the experiments described above.