INVESTIGATIONS OF FREE SPACE VIBRATIONS OF A WOODWORKING SHAPER, CONSIDERED AS A MECHANICAL SYSTEM WITH THREE MAIN BODIES

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ABSTRACT

Investigation of free undamped spatial vibrations of a woodworking shaper, considered as a mechanical system with three main bodies, is the object of the proposed study. First, an original mechanic-mathematical model of a woodworking shaper developed by the authors is presented. The model considers woodworking shapers with lower placement of the spindle. In this model the woodworking shaper, the spindle and the electric motor's rotor are regarded as rigid bodies, which are connected by elastic elements with each other and with the motionless floor. The model takes into account the needed mass, inertia and elastic properties of the elements of the considered system. It includes all necessary geometric parameters of this system. After that a system of matrix differential equations is compiled and analytical solutions are derived. Numerical calculations are carried out by using the developed model and modern computer programs. The calculations use the parameters of a machine used in practice. As a result of the whole study, the natural frequencies and the mode shapes of the free spatial vibrations of the studied mechanical system are obtained and illustrated.

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