Experimental and theoretical study of vibrations of a rigid body with a layered liquid

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The article considers the problem of small movements of liquids and motion of the rigid body with a circular cylindrical cavity completely filled with three incompressible perfect liquids. Assuming vortex-free motion of liquid, boundary value problems are formulated and solutions are obtained for displacement potentials of the particles of liquids. The equations of hydromechanical system motion are obtained using the Lagrange equations of the 2nd kind. The difference between motions of a rigid body with a cavity filled with liquids and motion in the case considered by N.E. Zhukovsky is shown. The problems of the natural liquid vibrations in a stationary tank and the motion of a rigid body with liquids are considered as well as formulae, determining the natural frequencies and modes of vibration. The article presents the results of the experimental study of motion of rigid body and liquids.

Keywords*: rigid body, liquid, natural frequencies, mode of vibration*

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