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Lift Force Acting on Bodies in Viscous Liquid Under Vibration[1]
VITALIY SCHIPITSYN, ALEVTINA IVANOVA, OLGA VLASOVA, VICTOR KOZLOV, Laboratory of vibrational hydromechanics, PSHPU — The averaged lift force acting on a rigid body located near the wall of the cavity with a viscous liquid under high-frequency oscillations of various types is studied experimentally and theoretically. The experiments are conducted with cylindrical and rectangular solids. Amplitude and frequency of vibration, viscosity and density of fluid, specific solid size, its density and shape vary. Lift force was measured by the dynamic hanging of the body in the gravity when the body oscillates without touching the cavity walls. The vibrations generate a repulsive force, holding a heavy body above the bottom of the cavity, and the light one at some distance from the ceiling. Lift force changes qualitatively in case of combined translational and rotational oscillations of the cavity containing fluid and solid; it is much greater than at the translational vibrations and appears throughout the entire volume of the liquid. The work contains a theoretical description of the mechanism of lift force generation and the comparison of the experimental and theoretical results. The agreement of the results is found in the limit of high dimensionless frequencies. The considered effects could be interesting for vibrational control of solid inclusions in viscous liquids.

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Vitaliy Schipitsyn
Laboratory of vibrational hydromechanics, PSHPU

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