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Determination of acoustic radiation acting on a spherical rigid particle placed in an elastic tube filled with liquid. (Ukrainian. English summary) ⏢Zbl 07450285⏢

Summary: Acoustic radiation force effect upon a rigid spherical particle placed in the thin elastic tube is studied. The problem of determination of the acoustic radiation forces acting on an obstacle in an ideal liquid is formulated with respect to the Lagrange coordinate system. Thus, the radiation pressure is defined as timeaveraged value of the acoustic pressure over the obstacle surface. This approach is adequate if, at determining of the acoustic pressure in a fluid, the deviation of the pressure from the harmonic law in time domain is taken into account in the obstacle vicinity. An action of the acoustic radiation force on the rigid spherical particle placed in the thin tube with elastic wall is studied here for the case of the incident plane sound wave propagating along the tube axis. Model is developed to describe the response of the sys-tem consisting of the compliant infinite thin circular cylindrical tube filled with the ideal compressible liquid and rigid spherical body which is immovable and located on the tube axis under the plane wave propagating along the tube axis. The problem of the hydrodynamic characteristics determination is reduced to the solution of the infinite system of algebraic equations that can be solved by the reduction method. The formula for the acoustic radiation force calculation is derived to characterize the force acting upon rigid spherical particle in the thin compliant elastic cylindrical tube.

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ideal liquid; plane acoustic wave; rigid spherical particle; hydrodynamic force; radiation force

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