INTERACTION OF STRAIN SOLITONS IN GRANULAR MEDIUM WITH INTERNAL STRESSES

V.I. Erofeev, V.V. Kazhaev, A.O. Malkhanov, I.S. Pavlov

Mechanical Engineering Research Institute of RAS, 603024, Belinskogo str., 85,

Nizhny Novgorod, Russia

A model of a granular medium with internal stress is considered that represents a chain consisting of elastically interacting ellipsoidal shaped particles, which possess translational and rotational degrees of freedom. By means of a long-wavelength approximation, nonlinear differential equations have been derived that describe the propagation of longitudinal, transverse and rotational waves in such a medium. Analytical dependencies of the velocities of elastic waves and the nonlinearity coefficients on the sizes of particles and the parameters of interactions between them have been found. If longitudinal waves are not excited in the medium and in the field of low frequencies, when the rotational degree of freedom of particles can be neglected, the obtained three-mode system reduces to one equation for the transverse mode. On the base of this equation containing cubic nonlinearity, numerical investigations of counter and passing interactions of strongly nonlinear soliton-like subsonic and supersonic waves have been performed. In particular, effects of splitting of supersonic solitary waves are demonstrated.