ON FOUNDATIONS OF ULTRASONIC NON-DESTRUCTIVE METHOD OF DETERMINATION OF RESIDUAL STRESSES IN NEAR-THE-SURFACE LAYERS OF BODIES

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General regularities of surface waves propagation in elastic bodies with initial stresses using three-dimensional linearized theory [1,2] of elastic waves propagation in bodies with initial stresses are considered. Investigations are carried out in a general case for an isotropic solid with an arbitrary structure of an elastic potential. Specific numerical results for isotropic solids with a Murnaghan type potential for compressible relatively rigid materials are obtained.

Results of propagation of surface waves (in bodies with initial stresses) along planar and curvilinear (cylinder and spheric) surfaces are presented. Solutions of problems under external loadings on boundary surfaces for cases of "tracking" and "dead" loadings are obtained.

Propagation of surface waves along a planar boundary, Rayleigh waves (a planar problem), Love waves and Stonely waves (a planar problem) is investigated. Problems for Love and Stonely waves are considered in an expanded formulation, when in various materials coefficients of elongation along the direction of waves are unequal. Propagation of surface waves on a circular cylinder in cases of singleaxis and omnilateral uniform loading of a cylinder is investigated, in last case an analysis for "tracking" and "dead" loads is carried out.

Propagation of surface waves on a sphere in cases of omnilateral uniform loading as "tracking" and "dead" loads is investigated.

The analysis of an effect of initial stresses on the velocity of propagation of surface waves is carried out. Conclusions of main regularities of influence of initial stresses are formulated.

On the basis of shown regularities relations of acoustoelasticity for determination of biaxial stresses in near-the-surface layers of bodies are proposed.

Results of investigations of using ultrasonic non-destructive method of determination of biaxial stresses in near-the-surface layers of bodies are presented. Non-destructive method of stress measurement is intended for measurement of stresses the level of which is lower than yield point (as a result of using physical relations, corresponding to acoustoelasticity).

LITERATURE
1. Guz A.N. Elastic waves in bodies with initial stresses, V.1. General problems, Kiev: Naukova Dumka, 1986. − 276 pp. (In Russian).
2. Guz A.N. Elastic waves in bodies with initial stresses, V.2, Regularities of propagation, Kiev: Naukova Dumka, 1986. − 536 pp. (In Russian).