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Смотреть меньше

Interaction of harmonic axisymmetric waves with a thin circular absolutely rigid separated inclusion

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Краткое описание

We study stress concentration near a circular rigid inclusion in an unbounded elastic body (matrix). In the matrix, there are wave motions symmetric with respect to the axis passing through the inclusion center and perpendicular to the inclusion. It is assumed that one of the inclusion sides is completely fixed to the matrix, while the other side is separated and the conditions of smooth contact are realized on that side. The solution method is based on the fact that the displacements caused by waves reflected from the inclusion are represented as a discontinuous solution of the Lamé equations. This permits reducing the original problem to a system of singular integral equations for functions related to the stress and displacement jumps on the inclusion. Its solution is constructed approximately by the collocation method with the use of special quadrature formulas for singular integrals. The approximate solution thus obtained permits numerically studying the stress state in the matrix near the inclusion. Technological defects or constructive elements in the form of thin rigid inclusions contained in machine parts and engineering structure members are stress concentration sources, which may result in structural failure. It is shown that the largest stress concentration is observed near separated inclusions. Static problems for elastic bodies with such inclusions have been studied rather comprehensively [1, 2]. The stress concentration near separated inclusions under dynamic actions on the bodies has been significantly less studied even in the case of harmonic vibrations. The results of these studies can be found in [3, 4], where bodies with a thin separated inclusion were considered, and in [5], where the problem about torsional vibrations of a body with a thin circular separated inclusion was studied. The aim of the present paper is to study stress concentration near such an inclusion in the case of interaction with harmonic waves under axial symmetry conditions. © Allerton Press, Inc., 2009.

Темы SciVal

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