On one contact problem of plane elasticity theory

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Abstract

The paper addresses an axis-symmetric contact problem of plane elasticity theory with partially unknown boundary. To every segment of the broken line of the elstic body are applied absolutely smooth, with rectilinear bases, stamps which are under action of the force. Unknown full-strength part of the boundary is free from external forces.

Tangential normal stresses and tangential normal moments whose values depend on external loads and hole shapes play an important role in the plasticity zone formation in the plates with the holes and also in the plate destruction in the neighborhood to the plate's hole boundary. Proceeding from the above -mentioned, the following tasks were assigned: in conditions of provided external loads the shapes of the holes in plates should be chosen so that on the boundaries tangential normal stresses (tangential normal moments) module's maximal value will be the same and minimal in the same body in all other possible holes tangential normal stresses (tangential normal moments) maximal value of module.

It's proven that for infinite domains tangential normal stresses (tangential normal moments) the minimum of maximal value will be obtained on such contours, where this value maintains the constant value. These contours are named full-strength contours.The solvability of these problems provides controlling stress optimal distribution selecting the appropriate hole boundary.

Using the methods of complex analysis [1], the unknown full-strength part of the boundary and a stressed state of the body are defined. Developed a method by which dealt the considered problem with partially unknown boundary reduced to the known boundary value problem of analytical function theory. The numerical analysis and corresponding diagrams are constructed.

References

1.Muskhelishvili, N.: Some Basic Problems of the Mathematical Theory of Elasticity. Fundamental Equations, Plane Theory of Elasticity, Torsion and Bending, XXXI. Noordhoff International Publishing, Leyden, (1975).