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Three-Dimensional Problem of the Contact by Doubly Connected Domain Taking into Account Roughness and Friction

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Modern engineering level is characterized by diversity of machine parts contact interaction. Contact problem of doubly-connected punch is researched taking into account friction, roughness. Main equation of the problem contains integrals with weak singularity:

$$\varphi_0(p(\rho_0,\theta_0)) + \iint_\Omega \lambda\, p(\rho,\theta)/r\, d\Omega + \iint_\Omega \cos\widehat{rx}/r\, \psi(p(\rho,\theta))\, d\Omega = f(\rho_0,\theta_0).$$

The technique is developed for doubly-connected punch reduction to the sequence of problems for annular punch. In every approximation, with use of found expansion of potential with nonsymmetrical density, integral operators are transformed to Frechet differentiable operators. The problems are reduced to linear in every approximation besides zero approximation in case of nonlinear laws of roughness. Accounting friction with nonlinear laws the method is also developed for approximate and exact solutions. The method is acceptable for engineering practice. Specific examples of doubly-connected punches are presented in the paper in case of linear and nonlinear laws of roughness, friction.

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