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Combined axial shearing, extension, and straightening of elastic annular cylindrical sectors.

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Summary: The combined axial shearing, extension, and straightening of an annular cylindrical sector is a deformation that, following [*C. Truesdell* and *W. Noll*, The non-linear field theories of mechanics, Encyclopedia of Physics III/3. Berlin: Springer (1965), 2nd ed. (1992; [Zbl 0779.73004](#)) and *J. M. Hill*, *Z. Angew. Math. Phys.* 24, 609–618 (1973; [Zbl 0327.73036](#))], we describe in terms of two prescribed constants and two unknown functions that depend only on the radial material coordinate. Under the assumption that the material is elastic, compressible, and isotropic we show that for equilibrium in the absence of body forces the unknown functions must satisfy a system of first-order nonlinear ordinary differential equations. The system of differential equations can be decoupled for certain material classes, one of which is the class of Hadamard-Green materials. Thus, several new exact solutions are obtained and, under the assumption that the annular cylindrical sector is composed of a Hadamard-Green material that is strongly elliptic, the existence and uniqueness of solutions for two types of boundary conditions is established.

MSC:

74B20 Nonlinear elasticity

Cited in **3** Documents

Keywords:

finite elastic deformations; nonlinear elastostatics

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