LEONOV, M.Ya.; ROMANIV, O.N.

A shaft of double rigidity passing through resonance. Nuzh.zap. IMA AN URSR. Ser.mashinoved. 6 no.5:5-15 '57. (MIRA 10:7)
(Shafts and shafting) (Resonance)

SOV/124-58-3-3156

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 3, p 88 (USSR)

AUTHOR: Leonov, M. Ya.

TITLE: Introduction Into the Elementary Theory of Torsion (Vvedeniye v elementarnuyu teoriyu krucheniya)

PERIODICAL: Nauchn. zap. In-ta mashinoved. i avtomatiki. AN UkrSSR, 1957, Vol 6, pp 109-119

ABSTRACT: The paper presents an approximated solution of the problem of free torsion of elastic rods of a uniform continuous section. The author discusses an orthogonal network of stress contours and of the lines normal to them which intersect at a point taken as the center of the torsion. The total tangential stress at any point of the section is determined by the formula

$$\tau = 2G\,\theta\,\frac{\partial\omega}{\partial n}$$

Here G is the shear modulus; θ is the relative angle of twist; $\partial\omega$ is the area of the curvilinear triangle formed by two normal lines and segment ∂n of the stress contour passing through the given point. For the determination of the position of the

Card 1/2

SOV/124-58-3-3156

Introduction Into the Elementary Theory of Torsion

intersection point the author uses a theorem according to which the tangential stress flow through any normal line going from the intersection point to the outer body contour is of a constant value which does not depend upon the selection of the particular normal line. The results obtained permit the determination of the stress at points of the normal lines the position of which is known. Values are given for the stresses on the axes of symmetry of sections having the form of an incomplete circular ring, a semicircle, a regular polygon, and a rectangle. The accuracy of the results depends upon proper selection of a normal line close to an axis of symmetry. Two principles of "locality" are expressed, with the help of which, once a solution is had for a torsion problem for a given rod, it is sometimes possible to determine the stresses in another rod.

K. V. Solyanik-Krassa

Card 2/2

LEONOV, M. Ya.

SOV/124-58-4-4422

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 4, p 104 (USSR)

AUTHORS: Leonov, M. Ya., Burak, Ya. I.

TITLE: A Rod Having a Constant-torsional-strength Distribution of Cross-sectional Contours (Sterzhen' s ravnoprochnym konturom poperechnogo secheniya pri kruchenii)

PERIODICAL: Nauchn. zap. In-ta mashinoved. i avtomatiki. AN UkrSSR, 1957, Vol 6, pp 120-125

ABSTRACT: The authors are attempting to find the forms of cross sections of rods possessing the quality of constant stresses on the contour during free torsion. They base their conclusions upon the elementary theory of torsion (see Nauchn. zap. In-ta machinoved. i avtomatiki AN UkrSSR, 1956, Vol 5, pp 41-45; RZhMekh, 1957, Nr 4, abstract 4596; Nauchn. zap. In-ta machinoved. i avtomatiki AN Ukr SSR, 1957, Vol 6, pp 109-119). They present a graphic and analytical solution of the formulated problem assuming that the cross section of the rod has an axis of symmetry and that the normals to the lines of the stresses on the segment of the contour up to their intersection with the axis of symmetry are straight lines perpendicular to the circumference of the cross

Card 1/2

SOV/124-58-4-4422

A Rod Having a Constant-torsional-strength Distribution (cont.)

section, and that they coincide from there on with the axis of symmetry. Formulae are presented for the determination of the tangential stresses within the cross section of the form obtained. The assumed nature of the normal lines has little probability.

K. V. Solyanik-Krassa

1. Rods--Torque 2. Rods--Stresses 3. Mathematics

Card 2/2

SOV/124-58-3-3341

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 3, p 112 (USSR)

AUTHORS: Leonov, M. Ya., Kopeykin, Yu. D.

TITLE: Stability of Centrally Compressed Thin-walled Beams (Ob ustoychivosti tsentral'no szhatykh tonkostennykh sterzhney)

PERIODICAL: Nauchn. zap. In-ta mashinoved. i avtomatiki. AN UkrSSR, 1957, Vol 6, pp 126-129

ABSTRACT: A simplified critical load calculation for a centrally compressed thin-walled open-profile beam is presented for a case of a small discrepancy between the center of flexure and the center of gravity of the cross-sectional area. It is assumed that the critical load differs from the smaller value of the Eulerian force P_y under flexure collapse or from the critical force P_ω under torsional collapse by a comparatively small value the magnitude of which is determined by the V. Z. Vlasov equation of critical forces [Tonkostennyye uprugiye sterzhni (Thinwalled Elastic Beams) Stroyizdat, 1940].

V. F. Lukovnikov

Card 1/1

BURAK, Yaroslav Iosifovich; LEONOV, M.Ya., prof., doktor fiziko-matem. nauk, otv.red.; VESELOVSKIY, T. [Veselovs'kyi, T.], tekhred.

[Torsion and bending of prismatic rods] Deiaki zadachi kruchennia ta zhynu pryzmatychnykh sterzhniv. Kyiv, Vyd-vo Akad. nauk URSR, 1959. 84 p. (MIRA 13:8)
(Elastic rods and wires)

LEONOV, M.Ya., prof., doktor fiz.-matem.nauk, otv.red.; LABINOVA, N.M., red.izd-va; MAZURIK, T.Ya. [Mazuryk, T.IA.], tekhn.red.

[Thermal stresses in thin-walled structures] Temperaturni napruzhennia v tonkostinnykh konstruktsiiakh. Kyiv, 1959. 172 p. (MIRA 13:2)

1. Akademiia nauk URSR, Kiev. Instytut mashynoznavstva i avtomatiki. (Strains and stresses) (Elastic plates and shells)

LEONOV, M.Ya. (L'vov); CHUMAK, K.I. (L'vov)

Pressure under an approximately circular die. Prykl.mekh. 5 no.2:191-199 '59. (MIRA 12:9)

1. Institut mashinoznavstva ta avtomatiki AN URSR.
(Dies (Metalworking))

LEONOV, M.Ya. (L'vov); PANASYUK, V.V. (L'vov)

Formation of slight cracks in a solid body. Prykl. mekh. 5 no.4:391-401 '59. (MIRA 13:3)

1. Institut mashinovedeniya i avtomatiki AN USSR.
(Elastic solids)

PLYATSKO, Grigoriy Vasil'yevich; LEONOV, M.Ya., doktor fiz.-mat.nauk, prof., otv.red.; KAZANTSEV, B.A., red.izd-va; MATVEYCHUK, A.A., tekhn. red.

[Nonstationary problems in heat conductivity and thermoelesticity; supplement for calculatory elements of heat power units] Nestatsionarnye zadachi teploprovodnosti i termouprugosti; s prilozheniem k raschetu elementov teplosilovykh ustanovk. Kiev, Izd-vo Akad.nauk USSR, 1960. 103 p. (MIRA 14:12)

(Heat—Conduction) (Thermal stresses)

LEONOV, M. YA.

report presented at the 1st All-Union Congress of Theoretical and Applied Mechanics, Moscow, 27 Jan - 3 Feb '60.

168. S. D. Leites (Dnepropetrovsk): On space buckling of columns in the elastic-plastic range.

169. V. S. Lenskii (Moscow): Vibro-creep at room temperature.

170. V. S. Lenskii (Moscow): Plasticity of metals under combined loading.

171. A. I. Leonov (Moscow): Some problems of non-stationary flow of an incompressible visco-elastic (Maxwellian) liquid.

172. A. I. Leonov, M. D. Nusinov (Moscow): Some problems of quasi-steady flow of an incompressible visco-elastic (Maxwellian) liquid.

173. M. Ia. Leonov (Lvov): The generalization of the torsion theory of thin-walled bars.

174. M. Ia. Leonov, V. V. Panasyuk (Lvov): The development of microcracks.

175. Iu. R. Lepik (Tartu): Plastic flow of circular plates under tension and bending of compression and bending.

176. S. G. Lekhnitskiy (Leningrad): Torsion of an anisotropic curved bar.

177. A. D. Lizarev (Sverdlovsk): Free vibrations and stability of ordinary and prestressed elastic restrained beams.

178. A Lisowski (Krakow): Displacement of rocks due to excavation of sloping layers.

179. N. V. Litvinov (Kiev): On the application of matrix transformations to the solution of large sets of linear equations of elasticity theory.

180. O. I. Lotkin (Tomsk): The selection of [illegible]tional parameters for structures of equal stability consisting of plates and stringers.

181. P. A. Lukash (Moscow): Large deflections of shallow shells of non-linear elastic materials.

182. Ia. B. Lhin (Voronezh): Methods for the solution of the problems of axisymmetric states of stress in shells of revolution.

183. B. A. Malakhovskii (Omsk): Analysis of an orthotropic circular conical shell under an arbitrary load applied to a ring.

184. S. V. Malashenko (Kiev): On the experimental study of strains in plates and shells.

185. N. I. Malinin (Novosibirsk): Creep strains and ruptures of high polymers.

186. R. L. Malkina (Sverdlovs): Vibrations of non circular cylindrical shells.

187. A. K. Malmeister (Riga): Some problems of combined loading of quasi-isotropic bodies.

188. K. A. Maltsov (Leningrad): The influence of structural discontinuity in concrete on its strength.

189. S. O. Mamedova (Baku): Investigation of the state of stress in a square prism with coaxial cylindrical hole under internal pressure.

190. G. P. Mandzhavidze (Tbilisi): Solving the plane elastic problem for anisotropic bodies by reduction to the problem of linear coupling with "displacements".

191. L. I. Manevich, Iu. A. Zhevliakov (Dnepropetrovsk): The stability of a cylindrical shell in bending.

192. V. M. Marchenko (Moscow): Stress and strain in naturally twisted bars.

193. V. I. Makhovikov (Taranchka): The problems of conformal transformation and plane elasticity for the exterior of an infinite number of holes.

194. Ia. A. Macheret (Moscow): The design of finite and infinite beams on elastic foundation including time effects and without adopting the hypothesis of Zimmerman and Winkler.

195. A. S. Maliakovatskii (Stalino): Vibrations of a curved bar in an elastic medium and on elastic supports.

196. S. R. Mestaian (Erevan): An experimental study of basic creep laws for soils.

197. G. S. Migirenko (Novosibirsk): On statically equivalent loadings.

198. M. Sh. Mikeladse (Tbilisi): Contribution to the theory of plastic shells of uniform strength.

199. K. S. Minasian (Erevan): On the bending of a simply supported parallelogram plate.

200. S. V. Mikhailov (Moscow): Evaluation of the rheological properties of elastic, visco-plastic materials in homogeneous strain-rate under constant shearing stress.

S/179/60/000/03/036/039
E081/E441

AUTHORS: Burak, Ya.I. and Leonov, M.Ya. (L'vov)

TITLE: Torsion of a Bar the Cross-Section of Which is Bounded by Arcs of Two Intersecting Circles

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Mekhanika i mashinostroyeniye, 1960, Nr 3, pp 181-183 (USSR)

ABSTRACT: The problem has been previously discussed by Uflyand (Ref 1), using bi-polar coordinates. The present solution is less general but is found in terms of elementary functions. The Prandtl torsion function is given by Eq (1.1), where b is a constant and φ is a function harmonic within the cross-section, having the value (1.2) at the boundary and the value given by Eq (1.3) at an arbitrary internal point $M_0(r_0, \alpha_0)$, where $\Gamma(r_0, \alpha_0; r, \alpha)$ is Green's function and n is the internal normal. If the cross-section is bounded by the arcs of two circles, intersecting at an angle π/m, where m is a whole number (see figure, p 181), the Green's function can be found as Eq (1.4) by inversion of the value of this function for a wedge-shaped region

Card 1/3

S/179/60/000/03/036/039
E081/E441

Torsion of a Bar, the Cross-Section of Which is Bounded by Arcs of the Two Intersecting Circles

(In Eq (1.4), ℓ_{2i-2}, ℓ_{2i-1}, denote the distance of the point $M(r,\alpha)$ from the points $M_{2i-2}(r_{2i-2}, \alpha_{2i-2})$, $M_{2i-1}(r_{2i-1}, \alpha_{2i-1})$ respectively.)
The shear stresses are found to be a maximum at the points B and D (Figure, p 181); they are given by Eq (2.1) for m = 2 and by Eq (2.2) for m = 4 (τ_B and τ_D are the shear stresses; k = b/a; see figure). The magnitude of these stresses for various values of k are given in Table 1. The torsional moment M corresponding to an angle of twist Θ is determined by Eq (3.1) and (3.2), where G is the shear modulus and J_2 is the polar moment of inertia about the point O_2. For m = 2, the moment is obtained as Eq (3.5); values of M calculated from Eq (3.5) are given in Table 2 for various values of k. There are 1 figure, 2 tables and 2 Soviet references.

ASSOCIATION: Institut mashinovedeniya i avtomatiki, Akademii nauk USSR (Institute of Machine Practice

Card 2/3

S/179/60/000/03/036/039
E081/E441

Torsion of a Bar, the Cross-Section of Which is Bounded by Arcs of the Two Intersecting Circles

and Automatics, Academy of Sciences UkrSSR)

SUBMITTED: February 9, 1960

Card 3/3

VITVITSKIY, P.M. [Vytvyts'kyi, P.M.]; LEONOV, M.Ya.

Dislocation with an elliptical hollow. Dop.AN URSR no.3: 314-317 '60. (MIRA 13:7)

1. Institut mashinovedeniya i avtomatiki AN USSR. Predstavleno akademikom AN USSR G.N.Savinym [H.M.Savinym].
(Dislocations in crystals)

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S/021/60/000/006/004/019
A153/A029

11.9100 also 3716

AUTHORS: Leonov, M.Ya.; Yarema, S.Ya.

TITLE: Thermal Stress Distribution in the Shell Bulk

PERIODICAL: Dopovidi Akademiyi nauk Ukrayins'koyi RSR, 1960, Nr. 6, pp. 751 - 754

TEXT: The authors give a solution of the heat conductivity equation

$$\frac{\partial^2 t}{\partial z^2} = \frac{1}{a}\frac{\partial t}{\partial \tau}, \qquad (1)$$

(where a is the temperature conductivity coefficient, τ is the time, z is the point coordinate in the bulk, counting from the middle surface of the plate), for an infinite plate at a given initial temperature distribution and the boundary conditions linearly variable in time

$$t(\tau, z)|_{z=\delta} = b_1\tau + t(0,\delta),$$
$$t(\tau, z)|_{z=-\delta} = b_2\tau + t(0,-\delta), \qquad (2)$$

The solution (3) is simplified by neglecting the members that damp during an interval of several $\frac{\delta^2}{a}$ (where 2δ is the plate thickness and t (0, z) is the given

Card 1/2

84836

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A153/A029

temperature distribution when $\tau = 0$), and its application is extended to thin shells in the case when the surface temperature is a given function of time and space coordinates. The conditions for the applicability of the resulting formula

$$t(\tau, z, x_1, x_2) = \frac{\delta^2}{2a}\left(\frac{\bar{p}}{3\delta^3} z^3 + \frac{\bar{q}}{\delta^2} z^2 - \frac{\bar{p}}{3\delta} z - \bar{q}\right) + \frac{r}{\delta} z + s, \qquad (5)$$

where $2\bar{p} = \frac{\partial t}{\partial \tau}\Big|_{z=\delta} - \frac{\partial t}{\partial \tau}\Big|_{z=-\delta}$, $2\bar{q} = \frac{\partial t}{\partial \tau}\Big|_{z=\delta} + \frac{\partial t}{\partial \tau}\Big|_{z=-\delta}$,

(x_1, x_2 are curvilinear systems of coordinates on the shell surface) are indicated. On the basis of formula (5) expressions (9) are given for temperature terms in the initial system of equations (6) of the shell theory, and the law of thermal stress distribution in the shell bulk is derived. There is 1 Soviet reference.

ASSOCIATION: Instytut mashynoznavstva ta avtomatyky AN UkrSSR (Institute of Science of Machines and Automation of the AS UkrSSR)

PRESENTED: by H.M. Savin, Academician, AS UkrSSR

SUBMITTED: June 17, 1959

Card 2/2

BURAK, Ya.I.(L'vov); LEONOV, M.Ya. (L'vov)

Torsion of a curvilinear biangular rod. Prykl.mekh. 6 no.2:229-232 '60. (MIRA 13:8)

1. Institut mashinovedeniya i avtomatiki AN USSR.
(Torsion)

SAVIN, G.N. [Savin, H.M.]; LEONOV, M.Ya.; PODSTRIGACH, Ya.S. [Podstryhach, IA.S.]

Possibilities for generating thermal stresses in a strained body by mechanical means. Prykl.mekh. 6 no.4:445-448 '60. (MIRA 13:11)

1. Institut mekhaniki AN USSR, Kiyev i Institut mashinovedeniya i avtomatiki AN USSR, L'vov.
(Thermal stresses)

LEONOV, M.Ya.

Theory of pure torsion. Nauch.zap.IMA AN URSR.Ser.mashinoved. 7 no.6:5-15 '60. (MIRA 13:8)

(Torsion)

LEONOV, M.Ya., IVASHCHENKO, A.N.

Torsion of simple double-bound bars. Nauch.zap.IMA AN URSR. Ser. mashinoved 7 no.6:16-30 '60. (MIRA 13:8)
(Torsion)

LEONOV, M.Ya., KIT, G.S.

Torsion of thin-walled bars with an open profile. Nauch.zap. IMA AN URSR. Ser.mashinoved. 7 no.6:31-43 '60. (MIRA 13:8)

(Torsion)

KIT, G. S., LEONOV, M. Ya.

Pure torsion of a rolled angle. Nauch.zap.IMA AN URSR. Ser. mashinoved. 7 no.6:44-51 '60. (MIRA 13:8)
(Torsion)

LEONOV, M. Ya., SHVETS, R. N.

Torsion of regular prisms. Nauch. zap. IMA AN URSR. Ser. mashinoved. 7 no.6:52-60 '60. (MIRA 13:8)

(Torsion)

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S/021/61/000/002/006/013
D210/D303

AUTHORS: Leonov, M.Ya., and Panasyuk, V.V.

TITLE: Development of a crack having a circular form in the plan

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Dopovidi, no. 2, 1961, 165 - 168

TEXT: The authors consider a body with the crack as above. At infinitely far points of the body, tensile stresses σ_∞ are applied, perpendicular to the surface of the crack. The purpose of the paper is to determine the value of σ_∞ at which the body fails. The conditions are: a) Hooke's law is valid if the stresses are smaller than σ_p, b) ultramicroscopic cracks appear if no state is possible that would satisfy the conditions of linear theory of elasticity at $\sigma \leqslant \sigma_p$, c) the surfaces of such cracks attract each

Card 1/6

other with the stress σ_p, if the distance between them is not larger than δ_k and they do not interact at all if that distance is larger than δ_k. For an ideally brittle (amorphous) substance

$$\delta_k = \frac{2T}{\sigma_p} \quad (1)$$

T being the surface energy of the substance; a denotes the radius of the crack before the deformation of the body, r the polar radius of the points situated in the plane of the crack, R the radius of the crack after the deformation. There are normal stresses at the surface of the crack, equal to

$$\sigma_z(r, 0) = \begin{cases} = 0 \text{ if } r \leqslant a \\ = \sigma_p \text{ if } a < r \leqslant R \end{cases} \quad (2)$$

Substracting the homogeneous stressed state σ_∞ one obtains the auxiliary state, vanishing at infinity and characterized by p(r) =

$$p(r) = \begin{cases} \sigma_\infty & \text{if } r < a \\ \sigma_\infty - \sigma_n & \text{if } a < r < R \end{cases} \quad (3)$$

(at the surface of the crack). Using the results of M.Ya. Leonov's paper (Ref. 1: Prikladnaya matematika i mekhanika. 3, 65, 1939) and specifically formula (38), one obtains for the normal displacements w(r) of the walls of the crack

$$\frac{\pi E}{4(1-\nu^2)} w(r) = \sqrt{R^2 - r^2}\left(\sigma_\infty - \frac{\sigma_n}{R}\sqrt{R^2 - a^2}\right) + \sigma_n \int_{\arcsin \frac{a}{R}}^{\arcsin \frac{a}{r}} \sqrt{a^2 - r^2 \sin^2 \alpha}\, d\alpha, \quad (4)$$

E being Young's modulus, ν - Poisson's coefficient. Differentiating with respect to r

$$\frac{\pi E}{4(1-\nu^2)}\frac{dw(r)}{dr}=\frac{-r}{\sqrt{R^2-r^2}}\left(\sigma_\infty-\frac{\sigma_n}{R}\sqrt{R^2-a^2}\right)-$$

$$-\sigma_n r\int_{\arcsin\frac{a}{R}}^{\arcsin\frac{a}{r}}\frac{\sin^2\alpha\,d\alpha}{\sqrt{a^2-r^2\sin^2\alpha}}. \qquad (5)$$

The tensile stresses in the body cannot be larger than the ultimate strength σ_p. It follows that

$$\left[\frac{dw(r)}{dr}\right]_{r=R+0}=0,\ \sigma_\infty R-\sigma_n\sqrt{R^2-a^2}=0.$$

Then one finds

$$R=\frac{a}{\sqrt{1-\left(\frac{\sigma_\infty}{\sigma_n}\right)^2}}. \qquad (6)$$

Formula (4) becomes

$$w(r) = \frac{4(1-\nu^2)\sigma_n}{\pi E} \int\limits_{\arcsin\frac{a}{R}}^{\arcsin\frac{a}{r}} \sqrt{a^2 - r^2\sin^2\alpha}\, d\alpha. \qquad (7)$$

The points situated on opposite surfaces of the crack, separated by distances larger than δ_k will be called the front of failure. The existence of the latter is determined by the condition $2w(a) = \delta_k$, i.e.

$$\sqrt{1-\left(\frac{\sigma_\infty}{\sigma_n}\right)^2} = 1 - \frac{a_n}{a}, \qquad (9)$$

where

$$a_n = \frac{\pi E \delta_k}{8(1-\nu^2)\sigma_n}. \qquad (10)$$

This formula is meaningless if $a < a_p$. (9) can be written

$$\sigma_{\infty} = \sigma_{n} \sqrt{\frac{2a_{n}}{a}} \cdot \sqrt{1 - \frac{a_{n}}{2a}}, \quad (a \geqslant a_{n}). \tag{11}$$

The authors conclude from (11) and (6) that the strength of the body with circular crack is the same as that of a body without cracks, if the radius of the crack is not larger than a_p. If $a \approx a_p$ the strength is determined from (11). If $a \gg a_p$ one can put $\sqrt{1 - (a_p/2a)} \approx 1$. In this case one obtains Sack's formula. There are 2 figures and 7 Soviet-bloc references.

ASSOCIATION: Instytut mashynoznavstva ta avtomatyky AN URSR (Institute of Machine Science and Automation, AS UkrSSR)

PRESENTED: by Academician UkrSSR, H.M. Savin

SUBMITTED: April 5, 1960

28700

S/021/61/000/003/001/013
D274/D301

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AUTHORS: Leonov, M.Ya. and Shvayko, M.Yu.

TITLE: Elementary elastic-plastic deformations under torsion

PERIODICAL: Akademiya nauk UkrSSR. Dopovidi, no. 3, 1961, 282-285

TEXT: It is assumed that the body follows Hooke's law and that the displacement function w(x,y) is continuous except on the surfaces $F_k(x,y)$ $(k = 1,2,\ldots n)$. The stressed state is given by

$$\tau_{xz} = G\frac{\partial w}{\partial x}, \quad \tau_{yz} = G\frac{\partial w}{\partial y}, \quad (\sigma_x = \sigma_y = \sigma_z = \tau_{xy} = 0). \qquad (2)$$

The function w(x,y) satisfied the Laplace equation. If the contour L is composed of a finite number of segments of the y-axis, the harmonic function w is given by

$$w(x,y) = \mathrm{Re}\left\{\frac{1}{2\pi i}\int_L \frac{\delta(s)\,dt}{t-\zeta}\right\}, \quad (\zeta = x + iy). \qquad (5)$$

Card 1/5

28700

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D274/D301

For elastic stresses one obtains

$$\tau_{xz} - i\tau_{yz} = \frac{G}{2\pi} \int_L \frac{\mu(s)dt}{\zeta - t} . \qquad (6)$$

where

$$\mu(s) = \frac{d\delta(s)}{ds} .$$

The function $\mu(s)$ can be considered as the density of screw dislocations along the contour L. If the point ζ approaches the point t_o of the contour L ($t_o = iy$) from the left (right), one obtains (by Sokhots'kyy-Plemel's formula) from Eq. (6),

$$\tau_{xz}(0,y) - i\tau_{yz}(\pm 0,y) = \frac{G}{2\pi} \int_L \frac{\mu(s)ds}{y - s} \pm i \frac{G}{2} \mu(y). \qquad (7)$$

If $\mu(-y) = -\mu(y)$ and L is symmetrical with respect to the x-axis, one obtains $\tau_{yz}(x,0) = 0$, i.e. the plane $y = 0$ is stress-free. The space can be divided by that plane without changing the stressed

Card 2/6

state. Elementary plastic displacements under torsion are considered. It is assumed that before the appearance of plastic deformations, the maximum stress attains its limiting value τ_m at a single point of the contour only. The depth h (see Figure) of the plastic displacement is considered small in comparison with the cross-section of the body; hence the latter is considered a half-space. One denotes by $w^o(x,y)$, τ^o_{xz}, τ^o_{yz} the displacement and stresses in the absence of plastic deformations, and by $w^{(1)}(x,y)$, $\tau^{(1)}_{xz}$, $\tau^{(1)}_{yz}$ the displacement and stresses due to plastic deformation. By Eq. (7), $\mu(y)$ is given by

$$\frac{G}{2\pi}\int_{-h}^{h}\frac{\mu(s)}{y - s}ds = f(y), \qquad (9)$$

where

$$f(y) = \tau_c - \tau^o_{xz}(0,y). \qquad (10)$$

The general solution of Eq. (9) is

28700

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D274/D301

Elementary elastic-plastic...

$$\mu(y) = \frac{2}{\pi G \sqrt{h^2 - y^2}} \int_{-h}^{h} \frac{\sqrt{h^2 - s^2}}{s - y} f(s)ds + \frac{c}{\sqrt{h^2 - y^2}} . \quad (11)$$

For $s < 0$, one should understand by $f(s)$ the mirror image of the function $\tau_c - \tau^o_{xz}$ $(0,y)$. The constant c and the depth h are determined from the condition of boundedness of stress at the point $x = 0$, $y = h$. The displacement and stresses in the beam after the appearance of the plastic displacement, are given in terms of $\mu(y)$ by the formulae

$$w(x,y) = w^o(x,y) + \frac{1}{2\pi} \int_{-h}^{h} \mu(s) \operatorname{arc\,tg} \frac{s - y}{x} ds,$$

$$\tau_{xz} - i\tau_{yz} = \tau^o_{xz} - i\tau^o_{yz} + \frac{Gi}{2\pi} \int_{-h}^{h} \frac{\mu(s)}{\zeta - is} ds. \quad (12)$$

Card 4/6

28700
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D274/D301

Elementary elastic-plastic...

For elastic stresses one obtains

$$\tau_{xz} - i\tau_{yz} = \frac{G}{2\pi} \int_L \frac{\mu(s)dt}{\xi - t} . \qquad (6)$$

where

$$\mu(s) = \frac{d\delta(s)}{ds} .$$

The function $\mu(s)$ can be considered as the density of screw dislocations along the contour L. If the point ξ approaches the point t_0 of the contour L ($t_0 = iy$) from the left (right), one obtains (by Sokhots'kyy-Plemel's formula) from Eq. (6),

$$\tau_{xz}(0,y) - i\tau_{yz}(\pm 0,y) = \frac{G}{2\pi} \int_L \frac{\mu(s)ds}{y - s} \pm i \frac{G}{2}\mu(y). \qquad (7)$$

If $\mu(-y) = -\mu(y)$ and L is symmetrical with respect to the x-axis, one obtains $\tau_{yz}(x,0) = 0$, i.e. the plane $y = 0$ is stress-free. The space can be divided by that plane without changing the stressed

Card 2/6

25156

S/021/61/000/004/008/013
D213/D303

24.4200

AUTHORS: Leonov, M.Ya., and Onyshko, A.V.

TITLE: Influence of a linear dislocation on tensile strength

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Dopovidi, no. 4, 1961, 447 - 450

TEXT: This paper studies the effect of the removal of an atomic half-plane from an infinite crystalline body (linear dislocation) on the ultimate strength when a uniform tension σ is applied at infinity perpendicular to the half-plane. This is done by using a simplified model of a brittle body. The assumptions of this model are: a) the maximum tensile stresses do not exceed the ultimate brittle strength σ_n; b) the relation between stress and strain obeys Hooke's law, when the stress is less than σ_n; c) cavities develop in the body if it is impossible to have a strained state which satisfies the conditions of linear elastic theory for $\sigma \leqslant \sigma_n$;

Card 1/5

25156

S/021/61/000/004/008/013
D213/D303

Influence of a linear ...

d) the walls of the cavities may either attract each other with a stress of σ_n, if the distance between them does not exceed a certain magnitude (area of relaxed contacts), or they may not act on each other if the distance between them is greater than δ (area of broken contacts). For an ideal brittle body

$$\delta = \frac{2T}{\sigma_n} \qquad (1)$$

where T is the surface energy. The problem is solved by considering the half-plane

$$X \geq 0, \ /Y/ < \frac{\lambda}{2}.$$

In the case of a dislocation λ (magnitude of Bürgers' vector) equals the interatomic separation. On removal of the half-plane if only Hooke's law applied the stresses on the OX axis would be given by

$$Y_Y = \sigma_\infty + \frac{E\lambda}{4\pi(1-\nu^2)X}, \ X_Y = 0. \qquad (2)$$

Card 2/5

But in fact, on appearance of the cavity there is (Fig. 2)

$$Y_y(x, \pm 0) = \begin{cases} 0 & (-L < x < b) \\ c_n & (b < x < L), \end{cases} \quad (3)$$

where x = X - L, y = Y. To obtain a solution, corresponding to these conditions, a linear elastic problem with a cavity has to be solved, where the pressure on the cavity walls is given by

$$p(x) = -Y_y(x, \pm 0) = \begin{cases} \sigma_\infty + \dfrac{E\lambda}{4\pi(1-\nu^2)(L+x)}; & (-L < x < b) \\ \sigma_\infty + \dfrac{E\lambda}{4\pi(1-\nu^2)(L+x)} - \sigma_n, & (b < x < L). \end{cases} \quad (4)$$

The point of transition in the cavity (x=b) between the area of relaxed contacts and the area of broken contacts is called the point of collapse, and it is defined by the cavity width, viz.

$$2v\ (b, \pm 0) = \delta \quad (5)$$

25156

S/021/61/000/004/008/013
D213/D303

while the separation in the whole interval (-L, L) is given by

$$v(x, +0) = -\frac{1-\nu^2}{\pi E}\int_{-L}^{L} p(\xi)\ln\frac{L^2 - x\xi - \sqrt{(L^2-x^2)(L^2-\xi^2)}}{L^2 - x\xi + \sqrt{(L^2-x^2)(L^2-\xi^2)}}d\xi. \quad (6)$$

The authors, after further substitution conclude that the critical stress σ_k = max σ_∞ is given by

$$\sigma_k = \frac{\delta}{\lambda}\sigma_n, \quad (\delta < \lambda), \quad (15)$$

which shows that the linear dislocation decreases the critical stress by a factor equal to the value by which Bürgers' vector exceeds the critical interval. There are 2 figures and 3 Soviet-bloc references.

ASSOCIATION: Instytut mashynoznavstva ta avtomatyky AN URSR (Institute of Machine Technology and Automation, AS UkrSSR)

SUBMITTED: June 24, 1960

Card 4/5

S/137/62/000/009/015/033
A006/A101

AUTHORS: Leonov, M. Ya., Onyshko, L. V.

TITLE: On the propagation of finest cracks

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 9, 1962, 48, abstract 9I304 ("Nauchn. zap. In-ta mashinoved. i avtomatiki, AN UkrSSR, Ser. Mashinoved.", 1961, 8, 16 - 25)

TEXT: Brittle failure conditions were determined. Break resistance σ_0 and critical range δ were taken as basic strength characteristics (if the width of cracks exceeds δ, the surfaces do not interact). For calculations, the initial crack is formed by removing the material semi-plane of $\lambda/2$ width, where λ is the magnitude of the Bürger's vector of linear dislocation. It was established by calculation that the linear dislocation of the model of a brittle body reduced the stress limit by as many times as λ exceeded the critical range δ, or did not reduce the strength if $\delta \geqslant \lambda$. The length of a crack was determined at ultimate load $L_n \approx \rightarrow 2.8\,\lambda$. These results are in agreement with the solution of problems for other models of a solid body. With the use of the equations derived

29227

S/198/61/007/005/007/015
D274/D303

10.7600

AUTHORS: Vytvyts'kyy, P.M., and Leonov, M.Ya., (L'viv)

TITLE: On the fracture of a plate having a crack

PERIODICAL: Prykladna mekhanika, v. 7, no. 5, 1961, 516 - 520

TEXT: An infinite plate with a crack of length $2l$ (see Fig.) is under stresses, normal to the crack. Fracture occurs at the value σ_∞ of stress. It is assumed that the maximum normal stresses do not exceed a certain fixed value (the limit strength of the material):

$$\sigma_{max} \leqslant \sigma_{ls}; \qquad (1)$$

Hooke's law applies; if a stress-strain state occurs which does not comply with linear theory, nor with condition (1), then breaches (regions of weakened bonds) appear in the body; the effect of these breaches depends on the critical distance δ_{cr}. For an ideal brittle (amorphous) body, δ_{cr} is found from

Card 1/6

29227
S/198/61/007/005/007/015
D274/D303

$$\delta_{cr} = \frac{2T}{\sigma_{ls}}, \qquad (2)$$

T being the surface energy of the material. For various materials, whose fracture is accompanied by microplastic deformations, the quantity δ_{cr} can be experimentally determined. In the above model, the breaches always occur (notwithstanding very small σ_{∞}), hence the fracture (crack) is enlarged (see Fig.), and

$$X_y(x, \pm 0) = 0; \; Y_y(x, \pm 0) = \begin{cases} 0, & /x/ < l; \\ \sigma_{ls}, & l \leqslant /x/ \leqslant L. \end{cases} \qquad (3)$$

The length 2L of the enlarged fracture is unknown; it has to be determined in accordance with (1). This problem is solved by N.I. Muskhelishvili's method (Ref. 2: Nekotoryye osnovnyye zadachi matematicheskoy teorii uprugosti, AN SSSR, 1954). After computations, one obtains

29227

S/198/61/007/005/007/015
D274/D303

On the fracture of a plate ...

$$L = l \sec \frac{\pi\sigma_{\infty}}{2\sigma_{ts}}. \qquad (15)$$

Formulas for the stresses in the plate are derived, in particular, on the real axis, for $L < /x/ < \infty$, one obtains

$$Y_y = \sigma_{\infty} - \frac{2\sigma_{ts}}{\pi} \operatorname{arctg} \frac{l\sqrt{L^2 - l^2}}{l^2 - x^2 - x\sqrt{x^2 - L^2}};$$

$$X_x = -\frac{2\sigma_{ts}}{\pi} \operatorname{arctg} \frac{l\sqrt{L^2 - l^2}}{l^2 - x^2 - x\sqrt{x^2 - L^2}}; \quad X_y = 0. \qquad (17)$$

For the quantity δ, which denotes the distance traversed by the points $(\pm l, +0)$ and $(+ l, -0)$ of opposite surfaces of the breach as a result of the deformation, one obtains

$$\delta = -\frac{8l}{\pi E} \sigma_{ts} \ln \cos \frac{\pi\sigma_{\infty}}{2\sigma_{ts}}. \qquad (18)$$

Card 3/6

By the adopted model, these opposite surfaces will no longer interact if $\delta > \delta_{cr}$, hence the fracture increases. Thus, the critical stress σ_{cr} is such a value of σ_{∞} that $\delta = \delta_{cr}$. Hence (18) yields

$$\sigma_{cr} = \frac{2}{\pi} \sigma_{ls} \arccos \exp \left(- \frac{\pi E \delta_{cr}}{8 l \sigma_{ls}}\right). \quad (19)$$

For $\sigma_{cr} \ll \sigma_{ls}$,

$$\sigma_{cr} = \sqrt{\frac{E \sigma_{ls} \delta_{cr}}{\pi l}}. \quad (20)$$

For brittle materials, one obtains from (2) and (20) Griffith's formula:

$$\sigma_{cr} = \sqrt{\frac{2ET}{\pi l}}. \quad (21)$$

For $l \rightarrow 0$, formula (21) yields infinitely large σ_{cr}; this disadvantage is not shared by formula (19) which yields (for $\ell \rightarrow 0$), $\sigma_{cr} \rightarrow \sigma_{\ell s}$, i.e. the strength of plate with "zero" crack equals the strength of a faultless plate. Griffith's results are also unsuitable for very small cracks. Formulas (19) and (20) can also be used for fracture processes accompanied by microplastic deformations. Thereby, $\sigma_{\ell s}\delta_{cr}$ (denoted by A) is the work expended on the formation of two surfaces of same area during the development of a breach. Hence formulas (19) and (20) are written

$$\sigma_{cr} = \frac{2}{\pi}\sigma_{\ell s} \arccos \exp\left(-\frac{\pi EA}{8\ell\sigma_{\ell s}^2}\right), \quad (22)$$

$$\sigma_{cr} = \sqrt{\frac{EA}{\pi\ell}} \qquad (\sigma_{cr} \ll \sigma_{\ell s}). \quad (23)$$

Formula (22), proposed by Orowan, remains valid for any σ_{cr}, even if σ_{cr} is of the same order as $\sigma_{\ell s}$. There are 1 figure and 5 refe-

29227

S/198/61/007/005/007/015
D274/D303

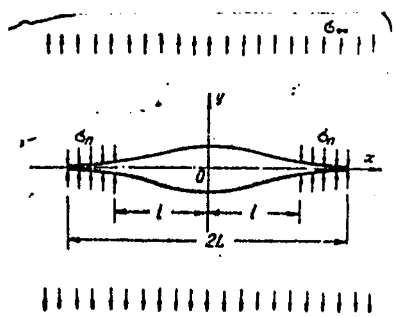
On the fracture of a plate ...

rences: 3 Soviet-bloc and 2 non-Soviet-bloc. The references to English-language publications read as follows: A.A. Griffith, Phenomena of rupture and flow in solids, Trans. Roy. Soc., A 221, London, 1920; E. Orowan, Energy criteria of fracture, Welding J., March 1955.

ASSOCIATION: Instytut mashynosnavstva i avtomatyky AN USSR (Institute of the Science of Machines and Automation AS UkrSSR)

SUBMITTED: June 10, 1960

Fig.



Card 6/6

21370
S/021/61/000/012/007/011
D251/D305

10.7600 2808 1327

AUTHORS: Leonov, M. Ya, and Rusynko, K. M.

TITLE: On the macroscopic theory of brittle destruction

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Dopovidi, no. 12, 1961, 1582-1586

TEXT: The author introduces the concept of macro-stress in a solid body, defined by the strains averaged within some sphere. It is assumed that in a rigid body plastic deformation does not occur and the values of resistance determined by G. V. Uzhik (Ref. 1: Soprotivleniye otryvu i prochnost' metallov (Resistance to Cracking and the Strength of Metals), Izd-vo AN SSSR, 1950) are used. Basic hypothesis: Brittle destruction takes place when the maximum macrostress of the resistance to cracking is attained. The formula

$$S_p = \sqrt{\frac{\pi E T}{2(1 - v^2)a}} \quad (5)$$

Card 1/3

On the macroscopic ...

21370
S/021/61/000/012/007/011
D251/D305

In this case Muskhelishvili's formula is used to give the displacement. There are 1 figure, 1 table and 8 Soviet-bloc references.

ASSOCIATION: Instytut mashynoznavstva ta avtomatyky AN URSR (Institute of Machine Science and Automation AS UkrSSR)

PRESENTED: by H. N. Savin, Academician AS UkrSSR

SUBMITTED: May 16, 1961

X

Card 3/3

KARPENKO, G.V., otv. red.; LEONOV, M.Ya., doktor fiz.-mat. nauk, zam. otv. red.; KRIPYAKEVICH, R.I., kand. tekhn. nauk, red.; MAKSIMOVICH, G.G., kand. tekhn. nauk, red.; PANASYUK, V.V., kand. fiz.-mat. nauk, red.; PODSTRIGACH, Ya.S., kand. fiz.-mat. nauk, red.; STEPURENKO, V.T., kand. tekhn. nauk, red.; TYNNYY, A.A., kand. tekhn. nauk, red.; CHAYEVSKIY, M.I., kand. tekhn. nauk, red.; YAREMA, S.Ya., kand. tekhn. nauk, red.; REMENNIK, T.K., red. izd-va; LISOVETS, A.M., tekhn. red.

[Machines and devices for testing metals] Mashiny i pribory dlia ispytanii metallov. Kiev, Izd-vo Akad.nauk USSR, 1961. 132 p. (MIRA 15:2)

1. Akademiya nauk URSR, Kiev. Instytut mashinoznavstva i avtomatyky. 2. Chlen-korrespondent Akad. nauk USSR(for Karpenko).
(Testing machines)

PODSTRIGACH, Yaroslav Stepanovich[Pidstryhach, IA.S.]; YAREMA, Stepan Yakimovich; LEONOV, M.Ya., doktor fiziko-matem. nauk, otv. red.; MEL'NIK, T.S.[Mel'nyk, T.S.], red. izd-va; LISOVETS', O.M.[Lysovets', O.M.], tekhn. red.

[Thermal stresses in shells] Temperaturni napruzhennia v obolonkakh. Kyiv, Vyd-vo Akad. nauk URSR, 1961. 211 p. (MIRA 15:4)

(Elastic plates and shells) (Thermal stresses)

LEONOV, M.Ya. (L'vov)

Fundamentals of the theory of brittle fracture. PMTF no.3:85-92 S-O '61. (MIRA 14:8)
(Strains and stresses) (Deformations (Mechanics))

LEONOV, M.Ya. [L'vov]; SHVAYKO, N.Yu. [Shvaiko, M.IU.] (L'vov)

Torsion of a cylindrical pipe having a cross section limited by eccentric circumferences. Prykl.mekh. 7 no.4:442-448 '61. (MIRA 14:9)

1. Institut mashinovedeniya i avtomatiki AN USSR.
(Torsion)

VITVITSKIY, P.M. [Vytvyts'kyi, P.M.] (L'vov); LEONOV, M.Ya. (L'vov)

Fracture of a plate containing a crack. Prykl.mekh. 7 no.5:516-520 '61. (MIRA 1:10)

1. Institut mashinovedeniya i avtomatiki AN USSR.
(Elastic plates and shells)

LEONOV, M.Ya.; PANASYUK, V.V.

Stressed state of a solid body having a circular crack and point defect (vacancy). Nauch.zap.IMA AN URSR. Ser.mashinoved. 7 no.7: 5-9 '61. (MIRA 15:1)

(Strains and stresses)

LEONOV, M.Ya.; LIBATSKIY, L.L.

Stressed state in the vicinity of a point defect in a plate with a crack. Nauch.zap.IMA AN URSR. Ser.mashinoved. 7 no.7:10-15 '61. (MIRA 15:1)

(Strains and stresses)

LEONOV, M.Ya.; ONYSHKO, L.V.

Propagation of the smallest cracks. Nauch.zap.IMA AN URSR. Ser.-mashinoved. 7 no.7:16-25 '61. (MIRA 15:1)
(Metals--Brittleness)

LEONOV, M.Ya.; CHERNUKHA, Yu.A.

Investigating longitudinal-lateral bending. Nauch.zap.IMA AN URSR. Ser.mashinoved. 7 no.7:85-89 '61. (MIRA 15:1)
(Elastic plates and shells)

ZORIY, L.M.; LEONOV, M.Ya.

Survey of the development of the theory of the stability of elastic rod equilibrium. Nauch.zap.IMA AN URSR. Ser.mashinoved. 7 no.7: 119-126 '61. (MIRA 15:1)

(Elastic rods and wires)

ZORIY, L.M.; LEONOV, M.Ya.

Effect of friction on the stability of nonconservative systems.
Nauch.zap.IMA AN URSR. Ser.mashinoved. 7 no.7:127-136 '61.
(MIRA 15:1)

(Friction)

ZORIY, L.M.; LEONOV, M.Ya.

Theory of the stability of equilibrium. Nauch.zap.IMA AN URSR. Ser.mashinoved. 7 no.7:137-141 '61. (MIRA 15:1)
(Equilibrium)

LEONOV, M.Ya.; ZORIY, L.M.; VASIL'YEV, Ye.D.

Vibrations of a system with one degree of freedom subjected to the action of an attenuating perturbing force. Nauch.zap.IMA AN URSR. Ser.mashinoved. 7 no.7:142-147 '61. (MIRA 15:1)
(Elastic solids--Vibration)

S/879/62/000/000/028/088
D234/D308

AUTHORS: Leonov, M. Ya., Vitvitskiy, P. M. and Yarema, S. Ya.
(L'vov)

TITLE: Theoretical and experimental investigation of elastic-plastic deformations during the extension of a plate with a slot

SOURCE: Teoriya plastin i obolochek; trudy II Vsesoyuznoy konferentsii, L'vov, 15-21 sentyabrya 1961 g. Kiev, Izd-vo AN USSR, 1962, 196-199

TEXT: The elastic-plastic deformation is reduced to the deformation of an ideal elastic body whose displacements are discontinuous on certain surfaces. With the aid of this model the authors solve the problem of an infinite plate with a slot, subject to forces perpendicular to the slot. N. I. Muskhelishvili's method is used. The critical load is found to be $\sqrt{(1 - 2/\ )}$ multiplied by critical stress. The experiments, carried out on steel plates, gave results coinciding with the theoretical data in the initial stages except in the incubation period. There are 2 figures.

Card 1/1

S/879/62/000/000/029/088
D234/D308

AUTHORS: Leonov, M. Ya. and Onyshko, L. V. (L'vov)

TITLE: Brittle failure of a plate with two closely situated slots

SOURCE: Teoriya plastin i obolochek; trudy II Vsesoyuznoy konferentsii, L'vov, 15-21 sentyabrya 1961 g. Kiev, Izd-vo AN USSR, 1962, 200-203

TEXT: The authors consider an infinite plate with two slots of the same length d, situated on a straight line at a distance 2a from one another. It is assumed that the material of the plate corresponds to a simplified model of a brittle body (M. Ya. Leonov, PMTF, no. 3, 1961) and that a domain of weakened adhesion is formed between the slots. Then these can be regarded as a single slot. The authors find the expression for the critical stress

$$\sigma = \frac{2\sigma_0}{\pi} \arcsin t \quad (14)$$

Card 1/2

LEONOV, M.Ya.; SHVAYKO, N.Yu.

Elastic-plastic deformation caused by torsion of a rod with a shallow semicylindrical groove on the surface. Vop. mekh. real'. tver. tela no.1:5-12 '62. (MIRA 16:1)
(Elastic rods and wires) (Deformations (Mechanics))

42175
S/813/62/000/001/001/008
E081/E183

AUTHORS: Vitvitskiy, P.M., and Leonov, M.Ya.

TITLE: Slip bands in the heterogeneous deformation of a plate

SOURCE: Akademiya nauk Ukrayins'koyi RSR. Instytut mashynoznavstva i avtomatyky, L'viv. Voprosy mekhaniki real'nogo tverdogo tela. no. 1. Kiev, 1962, 13-28.

TEXT: The paper is a continuation of previous work (M.Ya. Leonov, N.Yu. Shvayko, Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no.2, 1961. P.M. Vitvitskiy, M.Ya. Leonov, DAN URSR, no.3, 1960. P.M. Vitvitskiy, M.Ya. Leonov, Prikladna mekhanika, v.7, no.5, 1961). The problem of the elasto-plastic deformation of a body may be reduced to the linearly elastic problem of a material containing a distribution of dislocations. In accordance with this concept, the plane stress state is investigated in a thin plate containing a slit or a circular hole and subjected to a stress system which at infinity becomes $Y_y = p$ (tensile), $X_x = X_y = 0$. At a certain stress slip bands

Card 1/2

APPROVED FOR RELEASE: 07/12/2001 CIA-RDP86-00513R000929230003-3

LEONOV, M.Ya.; IVASHCHENKO, A.N.

Generalized theory of pure torsion of thin-walled rods. Vop. mekh. real'. tver. tela no.1:101-130 '62. (MIRA 16:1)
(Torsion) (Elastic rods and wires)

24375

S/207/62/000/001/016/018
B104/B108

10.7100

AUTHORS: Vitvitskiy, P. M., Leonov, M. Ya. (L'vov)

TITLE: Extension beyond the elastic limit of a plate with circular opening

PERIODICAL: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no. 1, 1962, 109 - 117

TEXT: Conditions are laid down under which the deformation of a body beyond the elastic limit can be studied with the linear elastic theory of the deformation of a body with linear dislocations distributed according to a certain law. The distribution of these dislocations and the dimensions of the region in which they occur are determined from the given forces of the inelastic bonds and from the condition of conservation of elasticity outside the inelastic deformations. On the basis of such a model the stress in a thin infinitely long plate with a circular opening (Fig. 1) subjected to forces p is studied. Stress and strain in the complex plane which result only from the load are determined by the functions

Card 1/2

S/207/62/000/001/016/018
B104/B108

Extension beyond the elastic limit...

$$\Phi^{\circ}(z) = \frac{1}{4} p \left(1 + 2\frac{R^2}{z^2}\right), \quad \Psi^{\circ}(z) = \frac{1}{2} p \left(1 + \frac{R^2}{z^2} + 3\frac{R^4}{z^4}\right) \tag{1.1}$$

That part of the stress produced by the dislocations is determined in such a way that in the regions of inelastic deformation the sum of the stresses produced by p and those produced by the dislocations fulfills the condition

$$Y_y^{\circ}(x, 0) + Y_y^{g}(x, 0) = \sigma_H = \text{const} \quad (R \leqslant |x| \leqslant L) \tag{1.3}$$

Some auxiliary problems about linear dislocations in the plane that are necessary for the present problem are investigated with reference to a paper by N. I. Muskhelishvili (Nekotoriye osnovyye zadachi matematicheskoy teorii uprugosti, Izd-vo AN SSSR, 1954). The integral equation

$$\int_R^L \left\{\frac{t}{t^2 - x^2} + \frac{R^4}{t}\left[\frac{1}{R^2 x^2} + \frac{R^4 (x^2 - t^2)}{x^2 (t^2 x^2 - R^4)^2} + 4t^2 R^2 \frac{(t^2 - R^2)(x^2 - R^2)}{(t^2 x^2 - R^4)^3}\right\} \mu(t)\, dt =$$
$$= \frac{1}{4D}\left[\sigma_H - \frac{1}{2} p \left(2 + \frac{R^2}{x^2} + 3\frac{R^4}{x^4}\right)\right] (R \leqslant |x| \leqslant L) \tag{3.2}$$

for the density $\mu(t)$ of the dislocation distribution is solved in the variables

Card 2/3

S/207/62/000/001/016/018
B104/B108

Extension beyond the elastic limit...

$$\xi = \frac{x^2}{R^2}, \qquad \eta = \frac{t^2}{R^2}$$

$$\frac{L^2}{R^2} = \alpha, \qquad \mu(t) = \mu(R\sqrt{\eta}) = \mu_0(\eta)$$

by approximation:

$$\mu_0(\eta) \approx \frac{\sigma_s}{D} \sum_{n=0}^{m} a_n \eta^n \qquad (1 \leqslant \eta \leqslant \alpha) \qquad (3.4).$$

α characterizes the length of the region of inelastic deformation. The dependence of the length l of the region of the inelastic deformation on the radius R is calculated as a function (Fig. 3). Finally, the critical load for brittle rupture of the plate is determined. There are 4 figures, 1 table, and 10 references: 9 Soviet and 1 non-Soviet. The reference to the English-language publication reads as follows: Griffith A. A., Phenomena of Rupture and Flow in Solids, Trans. Roy. Soc., A 221, London, 1920.

Card 3/4

33751
S/021/62/000/002/006/010
D299/D304

10.7600 1327 4016

AUTHORS: Vytvyts'kyy, P. M. and Leonov, M. Ya.

TITLE: Brittle fracture of plate with circular hole

PERIODICAL: Akademiya nauk UkrRSR. Dopovidi. no. 2, 1962, 174-178

TEXT: An infinite plate with a circular hole of radius R is subjected to stresses which create (at infinity) the uni-axial stresses state $Y_y^{\infty} = p$, $X_x^{\infty} = X_y^{\infty} = 0$. It is assumed that the material of the plate corresponds to the simplified model of a brittle body (Ref. 1: M. Ya. Leonov, Inform. byull., no. 1, VINITI AS SSSR, 1960, p. 16). According to this model, at first, cracks appear, whose sides are attracted towards each other as long as the distance between them does not exceed a certain value δ (which is considered as a constant of the material); when this distance is reached, the interaction between the sides ceases and local fracture occurs; the corresponding load is called critical. The component v of the displacements, normal to the cracks, has a discontinuity

Card 1/7

$\lambda(x)$. The discontinuities are related to linear dislocations. Muskhelishvili's function for a linear dislocation is

$$\Phi_1(z) = \Psi_1(z) = D\frac{\lambda}{z} \qquad (4)$$

where $D = \frac{G}{\pi(1+\varkappa)}$; G is the shear modulus, $\varkappa = 3-4\nu$ (for plane strain) and $\varkappa = (3-\nu)/(1+\nu)$ - for plane stress. In the case of a pair of dislocations λ and $-\lambda$ which pass through the points t and -t of the real axis, one obtains

$$\Phi_2(z) = -2D\frac{\lambda t}{z^2 - t^2}, \quad \Psi_2(z) = -4D\frac{\lambda t z^2}{(z^2 - t^2)^2} \qquad (5)$$

Further, Muskhelishvili's function for a pair of linear dislocations in a plane with a hole is derived. The discontinuity is expressed by

$$v(x,+0) - v(x,-0) = \lambda(x) = \int_L^x \mu(t)dt \quad (R \leqslant |x| \leqslant L) \qquad (8)$$

The function $\mu(t) = \lambda'(t)$ is called the density-distribution of dislocations. After a change of variables (in particular $t^2/R^2 = \eta$, $\mu(t) = \mu(R\sqrt{\eta}) = \mu_0(\eta)$), one obtains the integral equation for μ_0:

$$+ \frac{p}{4D}\left(2 + \frac{1}{\xi} + \frac{3}{\xi^2}\right) = \frac{\sigma_0}{2D}, \qquad 1 \leqslant \xi \leqslant \alpha \tag{9}$$

The approximate solution of this equation is sought in the form of a polynomial with unknown coefficients a_n, viz.:

$$\mu_0(\eta) \approx \frac{\sigma_0}{D} \sum_{n=0}^{m} a_n \eta^n \quad (1 \leqslant \eta \leqslant \alpha) \tag{10}$$

Substituting (10) in (9), one obtains

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D299/D304

Brittle fracture of ...

$$\sum_{n=0}^{m} a_n J_n(\alpha,\xi) + \frac{p}{\sigma_0} f(\xi) \approx \frac{1}{2} \qquad (1 \leqslant \xi \leqslant \alpha) \qquad (11)$$

For (11) to hold, it is necessary that

$$\sum_{n=0}^{m} \alpha_n \alpha^n = 0 \qquad (13)$$

The quantity α, by which the length of the crack can be found: $l = R(\sqrt{\alpha} - 1)$, is determined by (13). The coefficients a_n are found by means of a system of (m+1) equations. This system in conjunction

Card 5/ 7

with (13), yields p/σ_0 (σ_0 being the constant stress between the sides of the cracks which attract each other). Thus, an approximate relationship is obtained between the length of the crack, the load and the dislocation density-distribution. The maximum distance between the crack sides is

$$\lambda(R) = \frac{\sigma_0}{D} R \sum_{n=0}^{m} \frac{a_n}{2n+1}\left[1 - \left(\frac{L}{R}\right)^{2n+1}\right] \qquad (14)$$

Plots of 1/R versus p/σ_0 and of $\lambda(R)D/R\sigma_0$ versus p/σ_0 are shown. These graphs are used for determining the critical load p_k at which fracture occurs. Depending on $\delta D/R\sigma_0$, the critical load varies between $\frac{1}{3}\sigma_0 \leqslant p_k \leqslant \sigma_0$. With a given constant δ, ($\delta D/\sigma_0$) $p_k \to \frac{1}{3}\sigma_0$ with

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D299/D304

Brittle fracture of ...

large R, and $p_k \to \sigma_0$, with $R \to 0$. There are 3 figures and 5 Soviet-bloc references.

ASSOCIATION: Instytut mashynoznavstva ta avtomatyky AN UkrRSR (Institute of the Science of Machines and Automation of the AS UkrRSR)

PRESENTED: by Academician H. M. Savin of the AS UkrRSR

SUBMITTED: June 22, 1961

X

Card 7/7

LEONOV, M.Ya.; VASIL'YEV, Ye.D.

Effect of the length of the suspension of a rod on the frequency of its natural vibrations. Nauch.zap.IMA AN URSR.Ser.mashinoved. 9:157-160 '62. (MIRA 15:12)

(Elastic rods and wires--Vibration)

LEONOV, M. Ya. (Frunze); SHVAYKO, N. Yu. (Frunze)

Helical dislocations in prismatic rods. Inzh. zhur. 2 no.4: 293-302 '62. (MIRA 16:1)

(Elastic rods and wires)

LEONOV, M. Ya. (Kiyev); ONYSHKO, L. V.

Brittle fracture of a plate having two meighboring holes.
Prykl. mekh. 8 no.6:639-644 '62. (MIRA 15:10)

1. Institut mashinovedeniya i avtomatiki AN UkrSSR.

(Elastic plates and shells)

S/020/62/145/002/007/018
B178/B104

AUTHORS: Leonov, M. Ya., Academician AS KirSSR, and Zoriy, L. M.

TITLE: The effect of friction on the kinetic load of a compression strut

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 145, no. 2, 1962, 295-297

TEXT: An elastic strut of length l fixed at one end only and resisting two separate loads at its free end is examined. The system has two degrees of freedom, and the mass of the strut is ignored. Small vibrations of the system are described by the equation

$$m\frac{d^2v}{dt^2} = F - b_1\frac{dv}{dt}, \quad I\cdot\frac{d^2\varphi}{dt^2} = M - b_2\frac{d\varphi}{dt} \qquad (1),$$

where F = force, M = moment acting on the strut, b_1 and b_2 = small positive parameters, and $I = m\varrho^2$ = central moment of inertia of the two loads. The distance between the loads is 2ϱ. F and M are given by

Card 1/4

S/020/62/145/002/007/018
B178/B104

The effect of friction on the...

$$F = -c_{11}v - c_{12}\varphi, \quad M = -c_{21}v - c_{22}\varphi, \tag{2}$$

$$c_{11} = \frac{G+H}{\Delta} k \sin kl, \quad c_{12} = \frac{G+H}{\Delta}(\cos kl - 1 + \eta\Delta), \tag{3}$$

$$c_{21} = \frac{G+H}{\Delta}(\cos kl - 1), \quad c_{22} = \frac{G+H}{\Delta}(\sin kl - kl \cos kl);$$

$$\Delta = 2 - 2\cos kl - kl \sin kl; \tag{4}$$

$$\eta = \frac{H}{G+H}, \quad k = \sqrt{\frac{G+H}{D}}, \tag{5}$$

where D = rigidity. Eq. (1) then takes the form

$$m\frac{d^2v}{dt^2} + b_1\frac{dv}{dt} + c_{11}v + c_{12}\varphi = 0, \tag{6}$$

$$I\frac{d^2\varphi}{dt^2} + b_2\frac{d\varphi}{dt} + c_{21}v + c_{22}\varphi = 0.$$

Card 2/4

which is solved by substituting $v = Ae^{\omega t}$ and $\varphi = Be^{\omega t}$, where A and B = const, and A is a parameter. This leads to the characteristic equation

$$p_0\omega^4 + p_1\omega^3 + p_2\omega^2 + p_3\omega + p_4 = 0, \qquad (8),$$

$$p_0 = Im, \quad p_1 = b_2 m(\mu\rho^2 + 1), \quad p_2 = m(\rho^2 c_{11} + c_{22}), \qquad (9),$$
$$p_3 = b_2(\mu c_{22} + c_{11}), \quad p_4 = c_{11}c_{22} - c_{12}c_{21},$$
$$\mu = b_1/b_2, \qquad (10).$$

The zero solution of (6) is stably asymptotic if all the roots of (8) lie in the left-hand half of the plane of complex numbers. It is necessary and sufficient for this that the coefficients of (9) all be positive and satisfy the condition $\Delta_3 > 0$, where $\Delta_3 = p_3(p_1p_2 - p_0p_3) - p_1^2p_4$. In the interval (0,2) Δ has no zeros. The functions $c_{ij}(kl)$, $p_2(kl)$, $p_3(kl)$, $p_4(kl)$, and $\Delta_3(kl)$ are continuous if $0 < kl < 2\pi$. With a small compressive force $\dot{G}$ + H all roots have negative real parts. p_2, p_3, p_4, and Δ_3 change with increasing G + H. Instability occurs either if a root ω becomes positive or if two complex-conjugate roots with negative real parts become changed into purely imaginary parts. At the boundary of the region of stability, p_4 vanishes in the first case and Δ_3 in the second. There are 2 figures.

SUBMITTED: October 2, 1961

40562
S/020/62/146/002/003/013
B104/B108

24.4200

AUTHORS: Leonov, M. Ya., Member of the AS KirSSR, Shvayko, N. Yu.

TITLE: Elementary elastoplastic deformation of a twisted rod with a fine longitudinal groove on its surface

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 146, no. 2, 1962, 325 - 327

TEXT: The state of stress and strain in the neighborhood of an elementary elastoplastic displacement on a twisted rod with a semicylindrical groove is investigated on the following assumptions: (1) The strength of the rod is reduced by torsion; (2) the radius of the groove is small as compared to that of the rod; (3) the surface of the rod is not curved in the vicinity of the groove (Fig. 1). The maximum tangential strength τ_{max} acts along the line AB during torsion until plastic deformation occurs ($\tau_{max} < \tau_m$). When $\tau_{max} > \tau_m$, displacement occurs down to a depth h; fracture is caused on the slip planes by screw dislocations with the density distribution $\mu(x)$ along the Ox-axis. The stresses and displacements are then described by

Card 1/4

$$\tau_{xz}^{(1)} - i\tau_{yz}^{(1)} = \frac{G}{2\pi i}\int_L \frac{\nu(s)}{\zeta - s} \quad (\sigma_x^{(1)} = \sigma_y^{(1)} = \sigma_z^{(1)} = \tau_{xy}^{(1)} = 0, \zeta = x + iy) \qquad (1)$$

$$w^{(1)}(x, y) = \mathrm{Re}\left\{\frac{1}{2\pi i}\int_L \frac{\varkappa(s)\,ds}{s-\zeta}\right\} \quad (u^{(1)} = v^{(1)} = 0), \qquad (2),$$

where the path of integration, L, has two sections, $\{-n,-m\}$ and $\{m,n\}$, and where $n = a + h$, $m = a^2/n$. The functions $\nu(s)$ and $\varkappa(s)$ are determined from the equations

$$\nu(s) = \begin{cases} \mu(s) & (a \leqslant s \leqslant n), \\ -\frac{a^2}{s^2}\mu\left(\frac{a^2}{s}\right) & (m \leqslant s \leqslant a), \end{cases} \quad \nu(-s) = -\nu(s); \qquad (3)$$

$$\varkappa(s) = \int_{-n}^{s} \nu(\sigma)\,d\sigma. \qquad (4).$$

On the slip planes,

$$\tau_{yz}^{0}(x, 0) + \tau_{yz}^{(1)}(x, 0) = \tau_c \quad (a \leqslant x \leqslant a + h) \qquad (5),$$

where τ_{yz}^{0} is the stress obtained without allowing for plastic deformation;

τ_c is the lower limit of strength. The additional tangential stress owing to plastic displacement is then

$$\tau_{xz}^{(1)} - i\tau_{yz}^{(1)} = \frac{G}{2\pi i}\sqrt{(\xi^2 - n^2)(\xi^2 - m^2)}\int_L \frac{f(s)ds}{\sqrt{(n^2 - s^2)(s^2 - m^2)}(s - \xi)} \qquad (10),$$

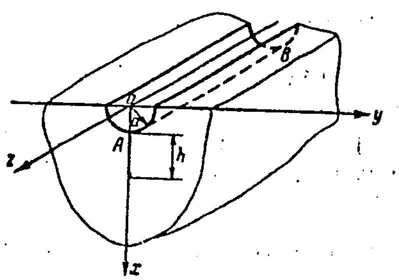
where $\sqrt{R(\xi)} = \sqrt{(\xi^2 - n^2)(\xi^2 - m^2)}$ is a holomorphous branch in the plane $\xi = x + iy$ with a section along L. There are 2 figures.

ASSOCIATION: Institut mashinovedeniya i avtomatiki Akademii nauk USSR (Institute of Science of Machines and Automation of the Academy of Sciences UkrSSR)

SUBMITTED: July 14, 1961

Elementary elastoplastic deformation... S/020/62/146/002/003/013
B104/B108

Fig. 1



Card 4/4

LEONOV, Mikhail Yakovlevich. Prinimali uchastiye: ZORIY, L.M.; CHERNUKHA, Yu.A.; SHVAYKO, N.Yu.; IVASHCHENKO, A.N.; LIBATSKIY, L.L.; BURAK, Ya.I.; RUSINKO, K.N.; FOMENKO, V.L., red.izd-va; ANOKHINA, M.G., tekhn. red.

[Fundamentals of the mechanics of an elastic solid] Osnovy mekhaniki uprugogo tela. Frunze, Izd-vo AN Kirgizskoi SSR. No.1. 1963. 328 p. (MIRA 16:12)

(Elastic solids)

S/207/63/000/001/013/028
E200/E441

AUTHORS: Leonov, M.Ya., Rusinko, K.N. (L'vov)

TITLE: Macrostresses in an elastic body

PERIODICAL: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no.1, 1963, 104-110

TEXT: Work in this article is based on the assumption that if the distance between two points in a solid body exceeds some critical distance 2ρ then the movement between these points is identical with the movement between two points in a homogeneous body. It is assumed that macrostrain is equal to mean elastic strain. Authors derive equations for normal k and tangential k_T macrostress concentration factors for an infinite body with an elliptical flaw $(a, b$ half-axis). According to the authors, brittle fracture will occur if

$$\frac{\sigma_0}{\tau_s} < 2\frac{k}{k_T} \qquad (3.1)$$

For $b \gg \rho$ equation for brittle fracture is

Card 1/3

S/207/63/000/001/013/028
E200/E441

Macrostresses in an elastic body

$$\frac{\sigma_0}{\tau_s} < 2\sqrt{\frac{3(2+\sqrt{6})}{2(1+\sqrt{2})}}\,\frac{4\nu\sqrt{1+\sqrt{2}}+(3-\nu)\sqrt{2}-(1+\nu)}{(3+\nu)\sqrt{6}-2(1-\nu)} \qquad (3.2)$$

where σ_0 - tensile strength, τ_s - shear strength and ν - Poisson's ratio. By equating Griffiths equation for ultimate applied stress

$$S_p = \sqrt{\frac{2ET_1}{\pi b}} \qquad (3.11)$$

to their equation

$$S_p = \frac{2(1+\nu)\sqrt{2(1+\sqrt{2})}\,\sigma_0}{4\nu\sqrt{1+\sqrt{2}}+(3-\nu)\sqrt{2}-(1+\nu)}\sqrt{\frac{\rho}{b}} \quad (b \gg \rho) \qquad (3.10)$$

the authors obtain equation for ρ

$$\rho = \frac{[4\nu\sqrt{1+\sqrt{2}}+(3-\nu)\sqrt{2}-(1+\nu)]^2}{4\pi(1+\sqrt{2})(1+\nu)^2}\,\frac{ET_1}{\sigma_0^2} \qquad (3.12)$$

where E - Youngs modulus, T - surface energy. The formulas for limiting stresses calculated by the authors compare well with those obtained by Griffiths and Sack. The paper concludes with

Card 2/3

Macrostresses in an elastic body S/207/63/000/001/013/028
E200/E441

a discussion of the growth of cracks in a brittle body. There are 2 figures.

SUBMITTED: April 5, 1961

Card 3/3

S/020/63/148/003/010/037
B104/B186

AUTHORS: Leonov, M. Ya., Academician AS KirSSR, Vitvitskiy, P. M., Yarema, S. Ya.

TITLE: Gliding strips occurring due to the stretching of plates having crack-like concentrators

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 148, no. 3, 1963, 541 - 544

TEXT: Thin plates (200·300 mm) made of soft sheet steel that has crack-like stress concentrators in a direction perpendicular to the concentrators produced by cutters are stretched. The gliding strips could be observed by eye. Four stages of deformation were estbalished: 1) A stage of incubation with no plastic deformation occurring; 2) the stage, which is characteristic of the first appearance of mat spots at the ends of the cracks; 3) the stage, which is characteristic of the appearance of gliding strips, 20 - 40 mm long, that start from the end of the crack and make an angle of 47 - 54° with the axis of the concentrators; 4) the stage, which is characteristic of the simultaneous appearance of gliding strips at many spots combining into a gliding band. The results of an analytic investigation of the stages using

LEONOV, Mikhail Yakovlevich; RUSINKO, Konstantin Nikolayevich; SHVAYKO, Nikolay Yur'yevich; GUROVICH, Viktor TSalevich; RYAZIN, P.A., otv. red.

[Problems of strength and elasticity] Voprosy prochnosti i plastichnosti. Frunze, Izd-vo AN Kirg.SSR, 1964. 81 p. (MIRA 17:8)

1. AN Kirgizskoy SSR, Frunze. Institut fiziki, matematiki i mekhaniki.

LEONOV, M.Ya. (Frunze); RUSINKO, K.N. (Frunze)

Fracture of a body with linear dislocation. PMTF no.5:83-90 S-O '64. (MIRA 18:4)

LEONOV, M.Ya.; LIBATSKIY, L.L.

Contour stress caused by pure torsion of single-connected rods. Nauch.zap.IIA AN URSR.Ser.mashinoved. 10:35-50 '64.

(MIRA 17:10)

Determining contour stress caused by the torsion of multiconnected rods. Ibid.:51-54

LEONOV, M.Ya.; akademik; RUSINKO, K.N.

Dislocation theorem. Dokl. AN SSSR 157 no.6:1321-1324 Ag '64
(MIRA 17:9)

1. Institut fiziki, matematiki i mekhaniki AN KirgSSR i Institut mashinovedeniya i avtomatiki AN UkrSSR. 2. AN KirgSSR (for Leonov).

L 21079-65 EWT(1) AEDC(a)/ASD(f)-3
ACCESSION NR: AP5001507 S/0020/64/159/005/1007/1010

AUTHOR: Leonov, M. Ya. (Academician AN KirgSSR); Shvayko, N. Yu.

TITLE: Complex plane deformation

B

SOURCE: AN SSSR. Doklady, v. 159, no. 5, 1964, 1007-1010

TOPIC TAGS: plastic deformation, plane deformation, slip velocity

ABSTRACT: The authors investigate plastic deformation which has components in only two dimensions (plane deformation) and assume that this deformation is monotonic, i.e., the intensity of the slip increases with time. It is shown that such a monotonic deformation is possible when the directions of the principal stresses rotate with a certain limited speed. The plastic deformation is completely defined by a stress tensor at a given instant of time, if the maximum tangential stress is a monotonically increasing function of the time and if the speed of rotation of its direction is bounded. The Bauschinger effect and arbitrary continuous plastic deformation are considered as examples. Orig. art. has: 4 figures and 20 formulas.

Card 1/2

L 21079-65
ACCESSION NR: AP5001507

ASSOCIATION: Institut fiziki i matematiki Akademii nauk KirgSSR (Institute of Physics and Mathematics, Academy of Sciences KirgSSR)

SUBMITTED: 23May64 ENCL: 00

SUB CODE: ME NR REF SOV: 001 OTHER: 000

Card 2/2

ACC NR: AP6036836 SOURCE CODE: UR/0020/66/171/002/0306/0309

AUTHOR: Leonov, M. Ya. (Academician AN KirgSSR); Shvayko, N. Yu.

ORG: Institute for Physics and Mathematics, Academy of Sciences KirgSSR (Institut fiziki i matematiki Akademii Nauk KirgSSR)

TITLE: Concerning the dependence between stresses and strains in the vicinity of the yield point of the loading curve

SOURCE: AN SSSR. Doklady, v. 171, no. 2, 1966, 306-309

TOPIC TAGS: elasticity theory, elastic deformation, plastic deformation, yield stress, mechanics

ABSTRACT: The paper deals with the theory of the stress-strain relationship in the immediate vicinity of the yield point upon two-dimensional plastic deformation. It is assumed that the kink of the curve occurs after monotonic loading. The treatment is based on the mathematical model suggested by the authors in a previous paper (Doklady Akad. Nauk SSSR 159, No. 5 (1964). Under certain additional assumptions, the obtained results can be extended to the three-dimensional case. This is done on the basis of the isotropy postulate formulated by A. A. Il'yushin in Plasticity (Plastichnost'), published by the Academy of Sci. SSSR, 1963, and by using the transition from vectors to tensors. As a result, the expressions for the components of the rate of plastic

 UDC: 539.37

ACC NR: AP6036836

deformation immediately behind the yield point are obtained. Orig. art. has: 2 figures and 16 equations.

SUB CODE: 20/ SUBM DATE: 16Oct65/ ORIG REF: 002

Card 2/2

LEONOV, N.

Some results of fulfilling the yearly plan and budget by public health organizations. Zdrav. Tadzh. 8 no.3:57-58 My-Je '61.
(MIRA 14:6)

1. Nachal'nik planovo-finansovogo otdela Ministerstva zdravookhraneniya Tadzhikskoy SSR.
(TAJIKISTAN--PUBLIC HEALTH)