6.9000,16.7800,9.9000

77953
SOV/109-5-3-7/26

AUTHOR: Ivanov, V. I.

TITLE: Shortwave Asymptotic of a Diffraction Field in the Shadow of an Ideal Parabolic Cylinder

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol 5, Nr 3, pp 393-402 (USSR)

ABSTRACT: For the wave propagation theory and its applications, the asymptotic law of decrease of the diffraction field in the geometrical shadow of a convex body for $\lambda \to 0$ is of great interest. There is no exact method known as yet. The present paper analyzes this problem, and asymptotic equations are developed expressing the field in the shadow through averaged characteristics of the wave propagation path. This problem was also investigated by S. O. Rice (see U.S. refs), but only as far as the development of approximated formulas for the zone near the light-shadow boundary. (1) Statement of Problem. Expressions of Solution as a Series. A plane wave u_0 is assumed falling upon a parabolic cylinder,

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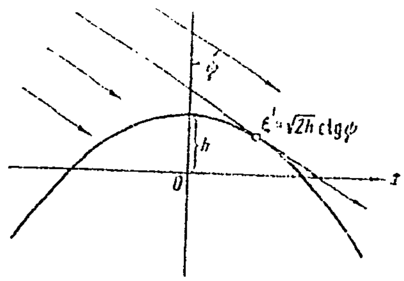
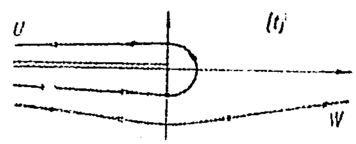
having a parabola parameter h, at an angle ψ to the axis of the parabola and normal to the cylinder generatrices.





Card 2/15 Fig. 1 Fig. 2

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The wave is given by:

$$u_0 = e^{-ik(x \sin \varphi - y \cos \varphi)}$$

(time factor $e^{i \omega t}$ omitted). A function $u = u_0 + v$ is sought which satisfies the Helmholtz equation $\Delta u + k^2 u = 0$, with a boundary condition $u|_{\Sigma} = 0$ on the cylinder surface and radiation conditions in infinity. Following Rice's designations, functions $U_{\nu}(z)$ and $W_{\nu}(z)$ are introduced:

$$W_{\nu}(z) = \frac{1}{2\pi i} \int_{W} \exp\{-t^2 + 2tz - (\nu + 1) \ln t\}\, dt, \qquad (1)$$

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where W is contour shown on Fig. 2 in the complex plane t with a cut from $-\infty$ to 0 ($-\pi < \arg t < \pi$); $U_\nu(z)$ is determined by a similar integral taken along contour U. These functions are expressed through Weber's functions $D_\nu(z)$:

$$W_\nu(z) = -2^{\nu/2} e^{z^2/2} \frac{D_{-\nu-1}(iz\sqrt{2})}{\sqrt{2\pi}},$$

$$U_\nu(z) = 2^{\nu/2} e^{z^2/2} \frac{D_\nu(\sqrt{2}\, z)}{\Gamma(\nu+1)}.$$

The Wronskian for this system is:

$$W_\nu U_\nu' - U_\nu' W_\nu = i \frac{2^\nu e^{z^2}}{\sqrt{\pi}\, \Gamma(\nu+1)}. \qquad (2)$$

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The plane wave can be resolved per Hermite's functions:

$$e^{-ik(x \sin\psi - y \cos\psi)} = \sec\frac{\psi}{2} e^{iky} \sum_{n=0}^{\infty} n! \left(-\frac{i}{2} \operatorname{tg}\frac{\psi}{2}\right)^n U_n(\sqrt{ik}\,\xi)\, U_n(\sqrt{-ik}\,\eta)$$

(in the above equation and below for simplicity $\sqrt{i}$ and $\sqrt{-i}$ are written for $e^{i\frac{\pi}{4}}$ and $e^{-i\frac{\pi}{4}}$), for which asymptotic formulas are developed, which are valid for all values of $0 < |\psi| < \pi/2$. The secondary field is expressed by superposition of functions:

$$e^{iky} U_n(\sqrt{ik}\,\xi) \times$$

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satisfying the radiation conditions for $\eta \to \infty$, and the solution of the problem may be written as:

$$u = \sec\frac{\psi}{2} e^{iku} \sum_{n=0}^{\infty} n! \left(-\frac{i}{2} \operatorname{tg}\frac{\psi}{2}\right)^n U_n(\sqrt{ik}\xi) \times$$
$$\times \left[U_n(\sqrt{-ik}\eta) - \frac{U_n(\sqrt{-2ikh})}{W_n(\sqrt{-2ikh})} W_n(\sqrt{-ik}\eta) \right] \quad (3)$$

This series converges slowly for large k ($kh \gg 1$), and in order to find the asymptotic it is modified per Watson's method into an integral per complex variable. But before this the simpler problem of current induced on the surface of the cylinder is investigated.
(2) Asymptotic of Currents on the Cylinder Surface. The variable $j = \left.\frac{\partial u}{\partial n}\right|_{\Sigma}$ is called current for Dirichlet's problem, but $j = u|_{\Sigma}$ for Neumann's problem (in electrodynamics j is proportional to the current on the surface of an ideally conducting body). Differentiating

(3) and using the Wronskian (2) for the Dirichlet problem, an expression of J is derived:

$$J = \frac{e^{ikr}}{2} \sqrt{\frac{k}{2\pi i r}} \sec\frac{\psi}{2} \int_{C_1} \frac{\left(i \,\mathrm{tg}\, \frac{\psi}{2}\right)^{\nu}}{\sin \pi\nu} \frac{U_\nu(\sqrt{2ik}\,\xi)}{W_\nu(\sqrt{2ikh})} \, d\nu \qquad (4)$$

The contour C_1 is shown on Fig. 3. The integrand of (4) is a meromorphic function with poles of the first order at points $\nu = 0,1,2,3,\ldots$. Contour C_1 can be transformed into the vertical straight line C_2. In the shadow, where $\xi > \sqrt{2h} \cot \psi$, the asymptotic of the integral per C_2 is determined by the poles of the integrand function, which are located left of C_2 (since in this case C_2 can be transformed into C_3), as stated

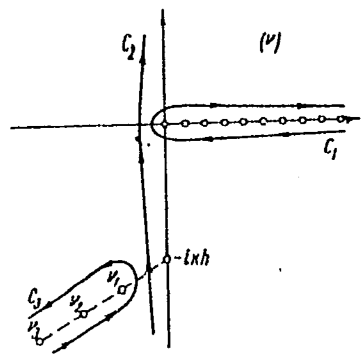

Fig. 3.

by S. O. Rice (see U.S. ref). Therefore, in the shadow:

$$f = \sqrt{\frac{ik\pi}{2r}}\, e^{-ikr} \sec\frac{\psi}{2} \sum_s \frac{\left(i \operatorname{tg}\frac{\psi}{2}\right)^{\nu}}{\sin \pi\nu} \left.\frac{U_\nu(\sqrt{ik}\,\xi)}{\frac{\partial}{\partial\nu} W_\nu(\sqrt{-2ikh})}\right|_{\nu=\nu_s} \quad (5)$$

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where ν_3 = roots of function W_ν $\sqrt{-2ikh}$. To determine the asymptotic of the field for $k \to \infty$, the asymptotic formulas are needed for functions U_ν (z) and W_ν (z) for large values of ν and z. For the function W_ν ($\sqrt{-2ikh}$) the ratio $z^2/2\nu \simeq 1$ and its asymptote are expressed by Fock's type formulas (appendix A). For function U_ν ($\sqrt{ik}\,\xi$) ratio $z^2/2\nu$ is finite and does not approach one, wherefore its asymptote is expressed by formulas of Debye's type (appendix B). Substituting the asymptotic formulas into (5) after long transformations the formula (6) is derived, where all terms of the series are small compared with the first term, and can be included into the term O $\{(kh)^{-1/3}\}$.

$$f = -\frac{e^{i\frac{\pi}{6}}\sqrt{\pi}\, k (kh)^{5/12}}{\left(k\frac{\xi^2+2h}{2}\right)^{1/4}\sqrt{\sin\psi}\, w'(t_1^0)} \exp\{-ikL + e^{\frac{5\pi i}{6}} t_1^0 D\}\,(1 + O\{(kh)^{-1/3}\}), \quad (6)$$

where

$$t_1^0 \sim 2{,}3381 e^{i\frac{\pi}{3}}; \quad w'(t_1^0) \sim 2{,}4855 e^{\frac{5\pi i}{6}}$$

(3) Asymptote of the Diffraction Field in Space. The series (3) is transformed per Watson, and integrated per C_3 after deforming contour C_1 to C_3 (Fig. 3). Substituting the asymptotic functions of Debye, Fock, and Stirling into the developed expression, and after several transformations and substitutions, the following equation is derived:

$$u = -\frac{2\sqrt{\pi}\, e^{i\frac{\pi}{12}} h^{1/3} k^{-1/6}}{\sqrt[4]{(\xi^2+2h)(\eta^2-2h)}\,\sqrt{\sin\psi}} \frac{v(t_1^0)}{w'(t_1^0)} \exp\left\{-ikL + e^{\frac{5\pi i}{6}} t_1^0 D\right\} \left(1 + O\left((kh)^{-1/3}\right)\right) \quad (8)$$

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where

$$L = \frac{\xi}{2}\sqrt{\xi^2+2h} + \frac{\eta}{2}\sqrt{\eta^2-2h} + h\ln\left(\frac{\xi+\sqrt{\xi^2+2h}}{\eta+\sqrt{\eta^2-2h}}\operatorname{tg}\frac{\psi}{2}\right);$$

$$D = (kh)^{1/3}\ln\left(\frac{\xi+\sqrt{\xi^2+2h}}{\eta+\sqrt{\eta^2-2h}}\operatorname{tg}\frac{\psi}{2}\right).$$

(4) Interpretation of Results. To prove that the derived asymptotic formulas can be easily explained in terms of the geometric theory of diffraction (see J. B. Keller, U.S. ref), Fig. 4 is shown, where p = tangent point of the incident ray; n = point of detachment of the diffraction ray (tangent to curve from observation point M); Q = base of perpendicular from O to the incident ray. The geometrical terms are determined through the parabolic coordinates of point M(ξ , η) and angle ψ of incident wave. The asymptote of the diffraction field at point M is derived in the form of:

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$$u(M) = \frac{\sqrt{\pi}\, e^{-i\frac{\pi}{12}}}{|v'(-z_1^0)|^2} \frac{1}{\sqrt{2kr_0}} \left(\frac{ka(P)}{2}\right)^{1/6} \left(\frac{ka(N)}{2}\right)^{1/6} \times$$

$$\times \exp\left\{-ikL^* - e^{i\frac{\pi}{6}} z_1^0 D^*\right\} \left(1 + O\left((kh)^{-1/3}\right)\right). \qquad (9)$$

Here, $a(P)$, $a(N)$ = curvature radii of parabola in points P and N; r_0 = length of tangent NM; L^* = sum of lengths of tangent QP, arc PN, and tangent NM; and

$$D^* = \int_P^N \left(\frac{k}{2a^2(s)}\right)^{1/3} ds$$

is the averaged characteristic of the wave propagation path PN; the real number $(-z_1^0)$ is the first root of Airy integral:

$$v(-z_1^0) = 0 \text{ for } t_1^0 = z_1^0 e^{\left(i\frac{\pi}{3}\right)};\ z_1^0 \simeq 2{,}3381;\ v'(-z_1^0) \simeq 1{,}2428.$$

The current on the cylinder surface for same notations is:

$$j = \frac{e^{i\frac{\pi}{3}}\sqrt{\pi}}{v'(-z_1^0)}(2k^2)^{1/3}\frac{a^{1/6}(P)}{a^{1/2}(N)}\exp\left\{-ikL - e^{i\frac{\pi}{6}}z_1^0 D\right\}\left(1 + O\left((kh)^{-1/3}\right)\right). \quad (10)$$

The final asymptotic equation for the case of magnetic polarization of the incident wave is given without derivation:

$$u(M) = \frac{\sqrt{\pi}e^{-i\frac{\pi}{12}}}{z_1|v(-z_1)|^2}\frac{1}{\sqrt{2kr_0}}\left(\frac{ka(P)}{2}\right)^{1/6}\left(\frac{ka(N)}{2}\right)^{1/6}\times$$

$$\times\exp\left\{-ikL - e^{i\frac{\pi}{6}}z_1 D\right\}\left(1 + O\left((kh)^{-1/3}\right)\right). \quad (11)$$

Here, z_1' = first root of derivative of the integral of Airy:

$$v'(-z_1') = 0; \quad z_1' \simeq 1,0188; \quad v(-z_1') \simeq 0,9494.$$

It seems that Eqs. (9)-(11) express a universal asymptotic law of shortwave diffraction on an ideal smooth convex cylinder. A. N. Tikhonov guided this work. Appendix A. Given asymptotics of Fock's type for Hermite's functions and asymptotic of roots of function W. Appendix B. Debye type asymptotic for Hermite's functions. There are 8 figures; and 11 references, 7 Soviet, 2 U.S., 1 U.K., 1 German. The U.S. references are: J. B. Keller, IRE Trans., 1956, AP-4, 3, 312; S. O. Rice, Bell Syst. Techn. J., 1954, 33, 2, 417. The U.K. reference is: C. Chester, B. Friedman, F. Ursell, Proc. Cambridge Philos. Soc., 1957, 53, 3, 559.

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SUBMITTED: June 11, 1959

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77971
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AUTHOR: Ivanov, V. I.

TITLE: Electromagnetic Waves Between Two Confocal Parabolic Cylinders (Brief Communication)

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol 5, Nr 3, pp 522-524 (USSR)

ABSTRACT: In the theory of bent waveguides the problem of a waveguide consisting of two confocal parabolic cylinders is of special interest because there is no transformation of different wave types. This problem has not been investigated yet, and the author refers to the only paper known to him which deals with related problems (Ye. R. Ustel', ZhTF, 1955, 25, 10, 1788). The two-dimensional problem of wave propagation, varying in time as per $e^{i\omega t}$, in a waveguide with ideally conducting walls in the shape of confocal parabolic cylinders (Fig. 1), is investigated by solving the wave equation:

$$\Delta u + k^2 u = 0$$

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for boundary conditions u = 0 (H-waves) and du/dn = 0 (E - waves) on the waveguide walls. In parabolic coordinates:

$$x = \xi\eta; \; y = \frac{\eta^2 - \xi^2}{2}$$

the waveguide walls are coordinate surfaces, determined by $\eta_1 = \sqrt{2h_1}$ and $\eta_2 = \sqrt{2h_2}$. The Helmholtz equation in parabolic coordinates is:

$$\frac{\partial^2 u}{\partial \xi^2} + \frac{\partial^2 u}{\partial \eta^2} + k^2 (\xi^2 + \eta^2) u = 0.$$

What is sought is a solution satisfying boundary conditions $u = 0$ or $\partial u/\partial \eta = 0$ for $\eta = \eta_1$ and $\eta = \eta_2$, having the shape of a wave moving to infinity for $\xi \to + \infty$. The radiation condition satisfied by this wave for $\xi \to + \infty$ is:

$$\lim_{\xi \to +\infty} \sqrt{\xi} \left(\frac{1}{\xi} \frac{\partial u}{\partial \xi} + iku \right) = 0.$$

Separating variables $u = X(\xi) Y(\eta)$, it is found that $X(\xi)$ must satisfy the modified Weber's equation:

$$X'' + (k^2\xi^2 - a) X = 0$$

and radiation condition for $\xi \longrightarrow +\infty$. For $Y(\eta)$, the limit problem is:

$$Y'' + (k^2\eta^2 + a) Y = 0,$$
$$Y(\eta_1) = Y(\eta_2) = 0 \text{ (for } H\text{-waves)}, Y'(\eta_1) = Y'(\eta_2) = 0 \text{ (for } E\text{-waves)}, \quad (1)$$

where constant a is a root of this boundary equation. (all a are real numbers). Solution of equation for $X(\xi)$ is given by Weber's function:

$$D_{-\frac{1}{2}+\frac{ia}{2k}}(\sqrt{2ik}\,\xi) \text{ and } D_{-\frac{1}{2}+\frac{ia}{2k}}(-\sqrt{2ik}\,\xi)$$

For simplicity we express $\sqrt{i} = e^{i\frac{\pi}{4}}$. Of these two functions, only one: $D_{-\frac{1}{2}+\frac{ia}{2k}}(\sqrt{2ik}\,\xi)$,

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satisfied the radiation asymptotic for $\xi \longrightarrow +\infty$, which is:

$$D_{-\frac{1}{2}+\frac{ia}{2k}}(\sqrt{2ik}\,\xi) \simeq$$
$$\simeq e^{-\frac{ik\xi^2}{2}}(\sqrt{2ik}\,\xi)^{-\frac{1}{2}+\frac{ia}{2k}}.$$

For $\xi \longrightarrow -\infty$, the asymptotic expression is:

$$D \simeq -e^{\frac{ik\xi^2}{2}}(\sqrt{2ik}\,\xi)^{-\frac{1}{2}-\frac{ia}{2k}}\frac{\sqrt{2\pi}\,e^{-i\pi\left(\frac{ia}{2k}-\frac{1}{2}\right)}}{\Gamma\left(\frac{1}{2}-\frac{ia}{2k}\right)}+e^{-\frac{ik\xi^2}{2}}(\sqrt{2ik}\,\xi)^{-\frac{1}{2}+\frac{ia}{2k}}\ (\arg\xi=-\pi),$$

where the first term is the primary wave coming from $-\infty$, but the second is reflected wave propagated in the opposite direction. The reflection coefficient (ratio of reflected wave amplitude to amplitude of incident wave) is:

$$R = \left| \frac{1}{\sqrt{2\pi}} (\sqrt{2ik}\xi)^{\frac{ia}{k}} e^{-\frac{\pi a}{4k}} \Gamma\left(\frac{1}{2} - \frac{ia}{2k}\right) \right| = \frac{e^{\frac{\pi a}{4k}}}{\sqrt{2\operatorname{ch}\frac{\pi a}{2k}}}$$

because

$$\left| \Gamma\left(\frac{1}{2} - \frac{ia}{2k}\right) \right| = \frac{\sqrt{\pi}}{\sqrt{\operatorname{ch}\frac{\pi a}{2k}}}$$

The transit coefficient T is:

$$T = \frac{e^{-\frac{\pi a}{4k}}}{\sqrt{2\operatorname{ch}\frac{\pi a}{2k}}}$$

where

$$T^2 + R^2 = 1.$$

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The frequency at which $T = R - 1/\sqrt{2}$ is called critical frequency, and corresponds to the case when $a = 0$ is the proper solution of the limit problem (I). To determine the relation between the critical wavelength λ_{cr} and waveguide parameters for the simplest waves H_1 and E_1, $a = 0$ must be considered the minimum solution of (I). Equation:

$$Y'' + k_{cr}^2 \quad \eta^2 Y = 0$$

has the general solution:

$$Y(\eta) = \sqrt{\eta}\left[AJ_{1/4}\left(\frac{k_{cr}\eta^2}{2}\right) + BJ_{-1/4}\left(\frac{k_{cr}\eta^2}{2}\right)\right].$$

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At boundary conditions $Y(\sqrt{2h_1}) = Y(\sqrt{2h_2}) = 0$ (for H-wave) the characteristic equation for determining K_{er} is:

$$\frac{J_{1/4}(k_{cr}h_1)}{J_{-1/4}(k_{cr}h_1)} = \frac{J_{1/4}(k_{cr}h_2)}{J_{-1/4}(k_{cr}h_2)}.$$

Analogously, for boundary condition $Y'(\eta_1) = Y'(\eta_2) = 0$ (for E-wave) the characteristic equation is:

$$\frac{J_{3/4}(k_{cr}h_1)}{J_{-3/4}(k_{cr}h_1)} = \frac{J_{3/4}(k_{cr}h_2)}{J_{-3/4}(k_{cr}h_2)}.$$

The dependence of λ_{cr}/h_2 (where $\lambda_{cr} = 2\pi/K_{cr}$) on the ratio of parabola parameters h_2/h_1, for waves H_1 and E_1 is shown in Fig. 2. For determination of the transit

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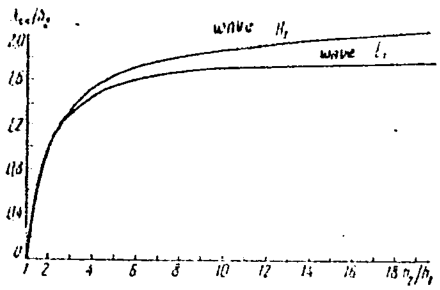

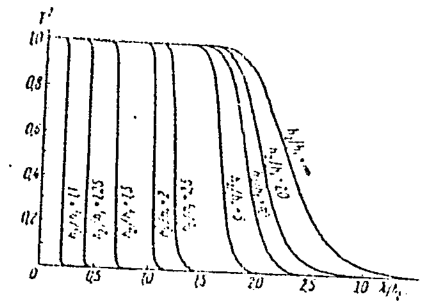

Card 9/10 Fig. 2. Fig. 3.

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coefficient T with relation to the wavelength, the root a of Eq. (1) must be found as function of k. Figure 3 shows T vs. λ for different waveguide parameters. The transition from the above case to the problem of a three-dimensional waveguide, limited by two parabolic cylinders and two planes perpendicular to these cylinders, is not difficult. There are 3 figures; and 3 references, 2 Soviet, 1 U.K. The U.K. reference is: "Tables of Weber Parabolic Cylinder Functions, "National Physical Laboratory, London, 1955.

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77972
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AUTHOR: Ivanov, V. I.

TITLE: Diffraction of Plane Short Electromagnetic Waves on a Smooth Convex Cylinder at Acute Angles of Incidence (Brief Communication)

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol 5, Nr 3, pp 524-528 (USSR)

ABSTRACT: In the present communication the results of a previous work by the author are generalized (NDVSh (Phys-Mathematical Series) 1958, 1, 6) for the case of nonnormal incidence of a plane electromagnetic wave. The polarization of the diffraction field and currents are investigated. On a convex ideally conductive cylinder a plane, plane-polarized electromagnetic wave, falls at an angle ϑ to the cylinder axis, varying in time as $1^{-i\omega t}$. The cylinder generatrix, which is the boundary of the geometrical shadow, is made the z-axis of a rectangular coordinate system. The y -axis is an external normal

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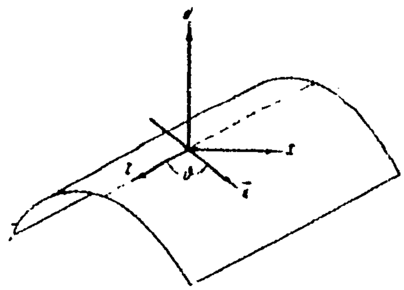
to the cylinder at a point on the z-axis, while the x-axis is a tangent directed towards the shadow (see figure):



In this coordinate system vector K has components:

$$\left\{\frac{\omega}{c}\sin\vartheta;\ 0;\ \frac{\omega}{c}\cos\vartheta\right\}$$

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The wavefield around the cylinder is represented as the sum of the E-wave (for which $H_z = 0$) and the H-wave (with $E_z = 0$), which are expressed through the electric and magnetic Hertz potentials:

$$\vec{E} = \mathrm{curl}\,\mathrm{curl}\,\vec{\Pi}^{e} + ik\,\mathrm{curl}\,\vec{\Pi}^{m}, \quad \vec{H} = -ik\,\mathrm{curl}\,\vec{\Pi}^{e} + \mathrm{curl}\,\mathrm{curl}\,\vec{\Pi}^{m}$$

Only components Π_z^e and Π_z^m are different from zero, and are denoted simply by Π^e and Π^m. By introducing potentials the vectorial diffraction problem is divided into two scalar problems:

$$\begin{cases} \Delta\Pi^e + k^2\Pi^e = 0, \\ \Pi^e|_\Sigma = 0 \end{cases} \qquad (1)$$

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$$\begin{cases} \Delta \Pi^m + k^2 \Pi^m = 0, \\ \left. \frac{\partial \Pi^m}{\partial n} \right|_{\Sigma} = 0. \end{cases} \qquad \text{(II)}$$

The primary plane wave is resolved into an electric and a magnetic wave. The solution of (I) and (II) is sought as:

$$\Pi^e = \Pi_0^e + u; \; \Pi^m = \Pi_0^m + \hat{u},$$

where functions u and u must comply with conditions of radiation in infinity. The three-dimensional problem with inclined incidence of the primary wave can be reduced to the already known two-dimensional

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problem of diffraction on an arbitrary cylinder (see ref above), assuming:

$$\Pi^e = U(x,y)\, e^{ikz\cos\theta};\quad \Pi^m = \hat{U}(x,y)\, e^{ikz\cos\theta}.$$

For the functions $U(x,y)$ and $\hat{U}(x,y)$, boundary equations are given:

$$\begin{cases} \Delta_2 U + k_1^2 U = 0, \\ U\,|_S = 0, \\ U = A e^{ik_1 x} + v, \end{cases} \qquad (1)$$

$$\begin{cases} \Delta_2 \hat{U} + k_1^2 \hat{U} = 0, \\ \left.\dfrac{\partial \hat{U}}{\partial n}\right|_S = 0, \\ \hat{U} = \hat{A} e^{ik_1 x} + \hat{v}. \end{cases} \qquad (2)$$

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where

$$k_1 = k \sin \vartheta; \quad A = \frac{E_0 \sin \psi}{k^2 \sin \vartheta}; \quad \hat{A} = \frac{E_0 \cos \psi}{k^2 \sin \vartheta}$$

and functions v and $\hat{v}$ satisfy radiation conditions. In the x,y plane new coordinates s,n are introduced, where n is shortest distance from point to cylinder; s is corresponding length of guideline S, measured at shadow boundary; a(s) denotes curvature radius of this guideline. It is assumed $k_1 a(s) \gg 1$. Equations (1) and (2) may be solved based on the above reference work. The field in the shadow, satisfactory far away from the cylinder ($k_1 n \gg 1$) is:

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$$U(M) = -A\sqrt{\frac{2}{k_1 r_0}}\left(\frac{k_1 a(0)}{2}\right)^{1/6}\left(\frac{k_1 a(s_0)}{2}\right)^{1/6} e^{ik_1(r_0+s_0)} g(\xi_0); \qquad (3)$$

$$\dot{U}(M) = -A\sqrt{\frac{2}{k_1 r_0}}\left(\frac{k_1 a(0)}{2}\right)^{1/6}\left(\frac{k_1 a(s_0)}{2}\right)^{1/6} e^{ik_1(r_0+s_0)} \hat{g}(\xi_0), \qquad (4)$$

where

$$g(\xi_0) = \frac{e^{i\frac{\pi}{4}}}{\sqrt{\pi}}\int_{\Gamma} e^{i\xi_0 t}\,\frac{v(t)}{w_1(t)}\,dt; \quad \hat{g}(\xi_0) = \frac{e^{i\frac{\pi}{4}}}{\sqrt{\pi}}\int_{\Gamma} e^{i\xi_0 t}\,\frac{v'(t)}{w_1'(t)}\,dt;$$

Here, s_0 is tangent point of tangent passing from point M to curve S;

$$= \int_0^{s_0}\left(\frac{k_1}{2a^2(s)}\right)^{1/3} ds;$$

Diffraction of Plane Short Electromagnetic Waves on a Smooth Convex Cylinder at Acute Angles of Incidence (Brief Communication)

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r_0 is length of tangent s_0M; Γ, contour on complex plane through $\infty e^{\frac{2\pi i}{3}}$ to 0 and further to $+\infty$; $w_1(t)$ and $v(t)$, Airy functions, introduced by Fock. For the field in the thin "boundary layer" adjacent to the cylinder:

$$\lesssim\left(\frac{a(s)}{2k_1^2}\right)^{1/3})$$

applying the correcting amplitude coefficient $\left(\frac{a(0)}{a(s)}\right)^{\frac{1}{3}}$:

$$U = Ae^{ik_1 s}\left(\frac{a(0)}{a(s)}\right)^{1/6} F(\xi,\zeta), \qquad (5)$$

$$\hat{U} = \hat{A}e^{ik_1 s}\left(\frac{a(0)}{a(s)}\right)^{1/6} \hat{F}(\xi,\zeta), \qquad (6)$$

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Diffraction of Plane Short Electromagnetic Waves on a Smooth Convex Cylinder at Acute Angles of Incidence (Brief Communication)

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SOV/109-5-3-26/26

where

$$F(\xi, \zeta) = \frac{i}{2\sqrt{\pi}} \int_{\Gamma} e^{i\xi t} \left[w_2(t - \zeta) - \frac{w_2(t)}{w_1(t)} w_1(t - \zeta) \right] dt;$$

$$G(\xi, \zeta) = \frac{i}{2\sqrt{\pi}} \int_{\Gamma} e^{i\xi t} \left[w_2(t - \zeta) - \frac{w_2'(t)}{w_1'(t)} w_1(t - \zeta) \right] dt$$

are the well-known Fock's functions; $\xi = \left(\frac{2K_1^2}{a(s)}\right)^{\frac{1}{3}} n$. The expressions of Hertz potentials contain an exponential factor $e^{ik(s \sin \vartheta + z \cos \vartheta)}$; the part of the power exponent in brackets is the length of the geodesic line of the cylinder under angle ϑ to the generatrices. Equations (3), (4), (5), (6) are transformed into invariant form:

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$$\Pi^{e} = -Ae^{ik(l_0+d_0)}\sqrt{\frac{2}{kd_0}}\left(\frac{kR(0)}{2}\right)^{1/6}\left(\frac{kR(l_0)}{2}\right)^{1/6} g(\xi_0); \qquad (3')$$

$$\Pi^{m} = -Ae^{ik(l_0+d_0)}\sqrt{\frac{2}{kd_0}}\left(\frac{kR(0)}{2}\right)^{1/4}\left(\frac{kR(l_0)}{2}\right)^{1/6} \hat{g}(\xi_0). \qquad (4')$$

for the field in the wave zone (kn sin $\vartheta \gg 1$), and

$$\Pi^{e} = Ae^{ikl}\left(\frac{R(0)}{R(l)}\right)^{1/6} F(\xi, \zeta); \qquad (5')$$

$$\Pi^{m} = \lambda e^{ikl}\left(\frac{R(0)}{R(l)}\right)^{1/6} \hat{F}(\xi, \zeta) \qquad (6')$$

for the field in the boundary zone $n \leqslant \left(\frac{R(L)}{2K2}\right)^{\frac{1}{3}}$. The current distribution on the cylinder surface is

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Diffraction of Plane Short Electromagnetic Waves on a Smooth Convex Cylinder at Acute Angles of Incidence (Brief Communication)

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SOV/109-5-3-26/26

investigated, using equation:

$$\vec{I} = \frac{c}{4\pi}[\vec{n}\,\vec{H}]|_{\Sigma}.$$

For the electric-type wave the z-component of current only is different from zero:

$$I_z^0 = \frac{c}{4\pi} ik \frac{\partial \Pi^e}{\partial n} = \frac{ick^3}{4\pi} A \left(\frac{kR(0)}{2}\right)^{1/6}\left(\frac{kR(l)}{2}\right)^{1/6} f(\xi),$$

where

$$f(\xi) = \frac{F(\xi,\zeta)}{\partial\zeta}\Big|_{\zeta=0} = \frac{1}{\sqrt{\pi}}\int_{\Gamma}\frac{e^{i\xi t}}{w_1(t)}\,dt.$$

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Diffraction of Plane Short Electromagnetic Waves on a Smooth Convex Cylinder at Acute Angles of Incidence (Brief Communication)

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For the magnetic-type wave the calculations are more complicated:

$$\vec{I}^m = \frac{c}{4\pi}\left[\vec{n} \times \left(\operatorname{grad}\frac{\partial \Pi^m}{\partial z} + k^2 \vec{\Pi}^m\right)\right] = \frac{c}{4\pi} k^2 \sin^2 \vartheta \Pi^m \vec{e}_s - \frac{c}{4\pi} ik \cos\vartheta \frac{\partial \Pi^m}{\partial s} \vec{e}_z,$$

where $\vec{e}_s$ and $\vec{e}_z$ are single vectors of tangent to the cylinder directrice and generatrice. This equation is transformed into:

$$I^m = \frac{c}{4\pi} k^2 \sin\vartheta e^{ikl} \left(\frac{R(0)}{R(l)}\right)^{1/6} A\hat{f}(\xi),$$

Card 12/15 where

$$f(\xi) = F(\xi, 0) = \frac{1}{\sqrt{\pi}} \int_{\Gamma} \frac{e^{i\xi t}}{w_1(t)}\, dt.$$

The direction of surface currents in the shadow and half-shadow zone almost coincides with the geodesic line. Calculations of the electric and magnetic field in space beyond the adjacent layer prove that the direction of the Poynting-Umov vector almost coincides with the diffraction ray (tangent to the geodesic line), the magnetic vector of E-wave being parallel to the normal to the cylinder in the tangent point; direction of the electric vector of H-wave is directed analogously. The voltage amplitudes of the electric and magnetic fields are:

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Diffraction of Plane Short Electromagnetic Waves on a Smooth Convex Cylinder at Acute Angles of Incidence (Brief Communication)

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$$E_0 \sin\psi \sqrt{\frac{2}{kd_0}} \left(\frac{kR(0)}{2}\right)^{1/6} \left(\frac{kR(l_0)}{2}\right)^{1/6} |g(\xi_0)|$$ for electric-type wave

$$E_0 \cos\psi \sqrt{\frac{2}{kd_0}} \left(\frac{kR(0)}{2}\right)^{1/6} \left(\frac{kR(l_0)}{2}\right)^{1/6} |\hat{g}(\xi_0)|$$ for magnetic-type wave

Since fading and additional incidence of phase, determined by functions $g(\xi_0)$ and $\hat{g}(\xi_0)$ are different for electric and magnetic waves, the wave in the shadow area is elliptically polarized, and is plane-polarized only for pure H-waves ($\psi = 0$) or pure E-waves ($\psi = \pi/2$). The process of wave penetration into the shadow area starts with the current flowing from the illumined side of the cylinder to the shaded side, or with the plane fading wave being propagated along the geodesic lines; this wave radiates and at each point in the direction tangential to the geodesic line a diffraction ray is diverted along which the wave is propagated to the observation point M, fading in

Card 14/15

24.5200

S/124/62/000/004/017/030
D251/D301

AUTHORS: Rolinskiy, V. Yu. and Ivanov, V. I.

TITLE: The heat-exchange of a smooth cylinder in conditions of free motion in a medium with subsonic perturbances

PERIODICAL: Referativnyy zhurnal, Mekhanika, no. 4, 1962, 89, abstract 4B587 (Tr. Nikolayevskogo korablestroit. in-ta, 1961, no. 22, 81-84)

TEXT: The heat-echange is studied of a heated cylinder in a medium subjected to the action of subsonic vibration. On the basis of the experimental data of two investigations, the authors find the experimental dependence relationship $N = 0.776\ R^{0.5}$, which indicates that the scoring of the medium intensifies the process of heat-exchange approximately by 30%. The experimental data obtained by the authors indicate a satisfactory correspondence with the above-mentioned formula. 8 references. /Abstracter's note: Complete translation./

Card 1/1

68028

SOV/155-58-6-30/36

~~9(9)~~ 9,9000

AUTHOR: Ivanov, V.I.

TITLE: Diffraction of Short Waves on a Smooth Convex Cylinder

PERIODICAL: Nauchnyye doklady vysshey shkoly, Fiziko-matematicheskiye nauki, 1958, Nr 6, pp 192-196 (USSR)

ABSTRACT: The author considers the diffraction field in the shadow region of an arbitrary convex cylinder. The wave number k of the incoming plane wave $U_a = e^{ikx}$ is assumed to be large. The author seeks a function $U = e^{ikx} + U^*$ which satisfies the Helmholtz equation $\Delta U + k^2 U = 0$, the boundary conditions $U = 0$ or $\frac{\partial U}{\partial n} = 0$ and the condition $\frac{\partial U^*}{\partial r} - ik\, U^* = o(r^{-1/2})$ at infinity. He essentially uses results of V.A. Fok [Ref 1] and A.S. Goryainov [Ref 4] (reduction of the problem to a parabolic equation), and some considerations of Keller [Ref 5]. The final result contains among others the asymptotic expansions

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Diffraction of Short Waves on a Smooth Convex Cylinder SOV/155-58-6-30/36

for the diffraction field given in [Ref 5].
The author thanks A.N. Tikhonov for posing the problem and D.P. Kostomarov for assistance.
There are 2 figures, and 5 references, 4 of which are Soviet, and 1 American.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet imeni M.V. Lomonosova (Moscow State University imeni M.V. Lomonosov)

SUBMITTED: October 21, 1958

Card 2/2

IVANOV, V.I.

Simple diffractometer for single crystals, based on the URS-50I X-ray unit. Kristallografii 5 no.5:783-787 S-O'60. (MIRA 13:10)

1. Institut geokhimii i analiticheskoy khimii im. V.I. Vernadskogo AN SSSR.
(X rays--Diffraction) (X-ray crystallography)

9.9821
9.1300

35507
S/208/62/002/002/004/014
D234/D302

AUTHOR: Ivanov V.I. (Moscow)

TITLE: Diffraction of plane short waves on a parabolic cylinder

PERIODICAL: Zhurnal vychislitel'noy matematiki i matematicheskoy fiziki, v. 2, no. 2, 1962, 241 - 254

TEXT: The author considers an ideally reflecting parabolic cylinder on which a plane wave falls. A solution of the differential equation is obtained in the form of a series, which is transformed by Watson's method into an infinite integral of an eypression containing Weber's functions and gamma functions. Instead of the solution U the author studies the "current" I equal to the value of $\partial U/\partial n$ (in case of Dirichlet's problem) or U (in that of Neumann's problem) on the surface of the cylinder. The expressions in the integrals are replaced by their asymptotic values and are found to oscillate in a certain interval and to decrease exponentially outside it. The method of stationary phase is applied to the integrals of the oscillating expression and it is estab-

Card 1/2

S/208/62/002/002/004/014
Diffraction of plane short waves ... D234/D302

lished that the distribution of the current in the illuminated domain is asymptotically determined by geometrical optics. It is concluded that by the method of stationary phase one can find the position of the most significant integration interval and establish where the formulae of geometrical optics are applicable (a condition is given for their applicability). Asymptotic formulae for I are deduced, valid both in the penumbra domain and the shadow domain. The field is investigated next; A quantitative expression is given for the wave propagating along the surface of the cylinder in the shadow domain, and another is deduced for the field at large distances from the cylinder. A single asymptotic formula is proposed for both cases. There are 6 figures and 7 references: 3 Soviet-bloc and 4 non-Soviet-bloc. The references to the English-language publications read as follows: S.O. Rice, Bell System techn. J. 1954, 9a, no. 9, 705-716; J.B. Keller, IRE Trans. 1956, AP-4, no. 3, 312 - 316

SUBMITTED: October 26, 1961

Card 2/2

L 4457-66 EWT(m)/EWP(t)/EWP(b) IJP(c) JD/JG

ACCESSION NR: AP5018718 UR/0070/65/010/004/0509/0514
548.736:535.342

58
55
B

AUTHORS: Ivanov, V. I.; Varfolomeyev, M. B.; Petrov, K. I.; Pervykh, V. G.; Plyushchev, V. Ye.

TITLE: X-ray diffraction and infrared spectroscopic study of tetrahydrates of perrhenate of rare earth elements and yttrium

SOURCE: Kristallografiya, v. 10, no. 4, 1965, 509-514

TOPIC TAGS: x-ray diffraction analysis, IR spectroscopy, crystal lattice structure, crystal symmetry, crystal unit cell, rare earth element

ABSTRACT: The authors investigated crystals of tetrahydrates of perrhenate of lanthanum, lanthanoids, and yttrium, the production and chemical analysis of which were described in an earlier paper (Dokl. AN SSSR v. 158, 664, 1964). A schematic study of the single crystals in x-ray cameras and with a diffractometer has shown that these substances crystallize in three different structural types. The syngony,

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L 4457-66

ACCESSION NR: AP5018718

2

ASSOCIATION: Institut geokhimii i analiticheskoy khimii im. V. I. Venadskogo AN SSSR (Institute of Geochemistry and Analytical Chemistry, AN SSSR ; Moskovskiy institut tonkoy khimicheskoy tekhnologii im. M. V. Lomonosova (Moscow Institute of Fine Chemical Technology)

SUBMITTED: 22Dec64 ENCL: 00 SUB CODE: OP, SS

NR REF SOV: 003 OTHER: 003

Card 3/3

L 4457-66
ACCESSION NR: AP5018718

the space group, and the unit-cell dimensions of representatives of these three groups are presented. The first group (La, Ce, Pr), consists of crystals belonging to the monoclinic syngony, space group C_{2h}^5 -- $P2_1/c$ with four formula units per unit cell. The second group includes Pr, Nd, Sm, Eu, Gd, Tb, and Dy, with crystals of rhombic symmetry, and space group C_{2v}^9 -- $Pna2_1$, with four formula units per unit cell. The third group includes Ho, Er, Tu, Yb, Lu, and Y, forming crystals of triclinic syngony. The space group is T1 and the unit cell contains two formula units. The parameters of the unit cells and the infrared absorption spectra were obtained for some of these elements. In the case of the tetrahydrate of praseodymium perrhenate, it crystallizes from solutions in both monoclinic and rhombic syngony under the same conditions. 'The authors thank Ye. S. Makarov for interest in the work.' Orig. art. has: 3 figures and 2 tables.

Card 2/3

L 33244-65 EWT(m)/EWP(t)/EWP(b) IJP(c) JD/JG

ACCESSION NR: AP5005880 S/0020/65/160/003/0608/0611

AUTHOR: Komissarova, L. N.; Vaifolomeyev, M. B.; Ivanov, V. I.; Plyushchev, V. Ye

15

TITLE: Synthesis and some properties of scandium perrhenates

SOURCE: AN SSSR. Doklady, v. 160, no. 3, 1965, 608-611

TOPIC TAGS: scandium perrhenate synthesis, anhydrous scandium perrhenate, scandium perrhenate monohydrate, scandium perrhenate trihydrate, scandium perrhenate

TOPIC TAGS: scandium perrhenate synthesis, anhydrous scandium perrhenate, scandium perrhenate monohydrate, scandium perrhenate trihydrate, scandium perrhenate stability, scandium perrhenate physical property

ABSTRACT This is the first time that such compounds have been synthesized. Both the ... compound with the formula Sc $(ReO_4)_3$ were pre- ... of $HReO_4$ (from metal ...

viewed under X-ray, have a triclinal primitive cell. At 50 C

Card 1/2

L 33244-65

ACCESSION NR: AP5005890

[illegible] monohydrate, stable up to 140 C, after which it becomes anhydrous. The anhydrous form is stable up to 550 C. At higher temperatures, it slowly dissociates into Sc_2O_3 and R_2O_7. Thermographic and thermogravimetric [illegible]. Results of

Card 2/2

ACC NR: AP7005966 (A) SOURCE CODE: UR/0145/66/000/011/0059/0064

AUTHOR: Bogdanov, O. I. (Candidate of technical sciences); Ivanov, V. I. (Engineer)

ORG: None

TITLE: Calculation of a flat hydrostatic thrust bearing with central chamber taking account of nonisothermicity due to rotation

SOURCE: IVUZ. Mashinostroyeniye, no. 11, 1966, 59-64

TOPIC TAGS: hydrostatic bearing, fluid flow ~~mechanics~~, hydrodynamics, viscous fluid, incompressible fluid, lubricant

ABSTRACT: The authors consider the problem of designing a flat externally pressurized thrust bearing with a central oil feed chamber taking rotational nonisothermicity into account. Energy dissipated through pumping is disregarded. Thus the problem reduces to a special case of the hydrodynamic problem of motion of a viscous fluid in the clearance between bearing and base. It is assumed that flow of the lubricating layer is laminar, that all generated heat is carried away by the oil, that viscosity is independent of pressure and constant with respecto the thickness of the layer, that the lubricant adheres to the base and to the bearing and completely fills the gap between them. Forces of inertia and gravity are disregarded and the lubricant is treated as an incompressible fluid. An expression is derived for the supporting power of a bearing of this type in terms of oil pressure and viscosity, flow parameters and geo-

Card 1/2

ACC NR: AP7005568

metric dimensions. Formulas are also given for the rate of oil flow, the power required for oil pumping, temperature distribution and the moment of friction. The article was presented for publication by Candidate of technical sciences S. K. D'yachenko, Lecturer at the Kharkov Polytechnical Institute. Orig. art.has: 1 figure, 26 formulas.

SUB CODE: 13, 20, 11/ SUBM DATE: 19Oct65

L 59559-65 EWT(d)/EWT(l)/EEC(m)/EWP(v)/EEC-4/EWP(k)/EWP(h)/EWP(l)/EWA(h) Pg-4/ Pf-4/Pg-4/Peb

ACCESSION NR: AP5013848 UR/0103/65/026/005/0915/0917

AUTHOR: Ivanov, V. I. (Moscow)

TITLE: Velocity error of frequency-type parametric sensor

SOURCE: Avtomatika i telemekhanika, v. 26, no. 5, 1965, 915-917

TOPIC TAGS: frequency type sensor, computer type automatic control

ABSTRACT: The dynamic error of a primary-quantity-into-frequency sensor is theoretically considered. The sensor comprises an LC-type self-excited oscillator and a capacitive parametric transducer connected to the grid circuit of the oscillator. The dynamic error is given by $\nu = \sqrt{1+\varkappa} - 1 \approx 0.5\varkappa \quad (\varkappa \ll 1)$.

of the oscillatory-circuit capacitance. Orig. art. has: 4 figures and 15 formulas.

ASSOCIATION: none

SUBMITTED: 02Jul64 ENCL: 00 SUB CODE: DP, IE

NO REF SOV: 000 OTHER: 000

Card 1/1 dm

L 33373-66 EWT(d)/EWT(1)/EWP(1) IJP(c) GG/BB

ACC NR: AP6021475 SOURCE CODE: UR/0413/66/000/011/0099/0099

INVENTOR: Kisets, D. Kh.; Ivanov, V. I.

41
B

ORG: none

TITLE: Analog-to-digital converter. Class 42, No. 182407

25

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 11, 1966, 99

TOPIC TAGS: analog digital converter, computer component

ABSTRACT: An analog-to-digital converter containing a nonlinear two-terminal network, such as a reverse-biased diode or a triode operating as a diode, with a

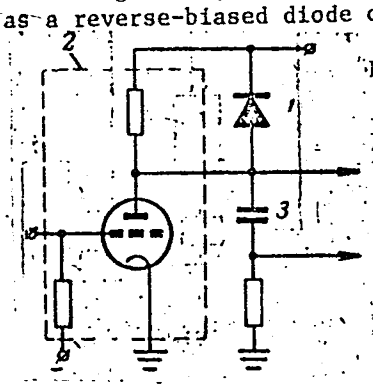

Fig. 1. Analog-to-digital converter

1 - Nonlinear two-terminal network;
2 - linear amplifier; 3 - capacitance.

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UDC: 681.142.07

L 33373-66

ACC NR: AP6021475

capacitive feedback is introduced (see Fig. 1.). To simplify the circuit, a linear amplifier is coupled as a load to the two-terminal network. The input of the amplifier is connected to a voltage source, while its output is connected to the common point between the capacitance and the two-terminal network. Orig. art. has: 1 figure. [JR]

SUB CODE: 09/ SUBM DATE: 16Dec64/ ATD PRESS: 5026

Card 2/2 JS

L 47209-66 EWT(1)

ACC NR: AR6020717 SOURCE CODE: UR/0274/66/000/002/A091/A091

AUTHOR: Yakovlev, G. V.; Ivanov, V. I.

TITLE: High-reliability slow trigger with digital input and a multivibrator using current switches

SOURCE: Ref. zh. Radiotekhnika i elektrosvyaz', Abs. 2A642

REF SOURCE: Tr. 6-y Nauchno-tekhn. konferentsii po yadern. radioelektron. T. I. M., Atomizdat, 1964, 107-114

TOPIC TAGS: trigger, digital input, multivibrator

ABSTRACT: The use of transistors with different types of conductivity has made possible the design of a trigger which does not have a vacuum tube analog and in which both transistors are closed or open simultaneously. These circuits, which are easily connected in series: 1) are not sensitive to the spread of transistor and component parameters or to fluctuation in power supply voltage, 2) permit the use of low gain transistors, and 3) operate steadily within a temperature range of 20 to +70C. Their disadvantages are a low speed (maximal frequency 1 to 2 kc) and a relatively high pulse of the current passing through the bias voltage source

Card 1/2 UDC: 621.373.545

Card 2/2 fv

IVANOV, V. K.

Gidromekhanizirovannoe proizvodstvo zemlianykh rabot potochnym metodom (Hydromechanical earthwork by a production-line method). Moskva, Transzheldorizdat. 1953. 32 p.

SO: Monthly List of Russian Accessions, Vol. 7, No. 6, Sep. 1954.

MASLENNIKOV, D.S., arkhitektor; Prinimali uchastiye: GOSTIHTSEVA, starshiy tekhnik-meteorolog; ABRAMOVA, V.S., starshiy tekhnik-chertezhnik; IVANOV, V.K., maketchik-fotograf.

Sun exposure of building in block no.9 in Novyye Cheremushki. Issl.po mikroklim.nasel.mest i zdan.i po stroi.fiz. no.1:34-53 '62. (MIRA 15:9)

(Moscow—city planning)

IVANOV, V.K.

IVANOV V. K.

KOSMACHEV, I.G

25(1) PHASE I BOOK EXPLOITATION SOV/1404

Levinson, Ye. M., B. G. Gutkin, A. P. Dyatchenko, and Ye. I. Vladimirov

Poluchenlye polostey i otverstii v metalle elektroiskrovym sposobom (Electrospark Method of Cutting Cavities and Holes in Metals) Moscow, Mashgiz, 1952. 95 p. (Series: Bibliotechka elektrotekhnologa, No. 4) 6,000 copies printed.

Ed. (Title page): Gusev, V. N., Laureate of the Stalin Prize, Engineer; Ed. (Inside book): Popilov, L. Ya., Engineer; Tech. Ed.: Sokolova, L. V.; Managing Ed. for Literature on Machine Building Technology (Leningrad Division, Mashgiz): Nikitin, P. S., Engineer.

PURPOSE: This booklet is intended for technologists working in the field of electrical metalworking processes and for skilled workers.

COVERAGE: The booklet presents basic principles of the electrospark machining of holes and cavities in metals. Information on electrospark equipment is given and some examples of the applications of electrospark machining methods are presented. The following personalities were awarded Stalin prizes for their contributions to the development of electromachining methods; B. R. Lazarenko, N. I. Lazarenko, and V. N. Gusev. For the purpose of introducing and promoting electromachining methods, the Leningrad branch of Mashgiz (State Scientific

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Electrospark Method of Cutting Cavities (Cont.) SOV/1404

and Technical Publishing House of Literature on Machinery) on the recommendation of the Committee on electromachining of Lonitomash (Leningrad Branch of the Scientific, Engineering and Technical Society of Mechanical Engineers) undertook publication of the "Library for Electrotechnologists" which includes the following booklets: 1. Gusev, V.N. Anodic-mechanical Machining of Metals. 2. Levinson, Ye. M. Electrospark Machining of Metals 3. Kosmachev, I.G., P. S. Kryzhanovskiy, and P.D. Klimchenkov. Anodic-mechanical Sharpening of Hard Alloy Tools 4. Levinson, Ye.M., B.G. Gutkin, A.P. Dyatchenko, and Ye. I. Vladimirov. Electrospark Method of Cutting Cavities and Holes in Metal 5. Chetyrkin, N.P. Anodic-mechanical Cutting of Metals 6. Ivanov, V.K. Anodic-mechanical Machining of Draw Plates and Dies 7. Kan, B. I., and I. G. Kosmachev. Anodic-mechanical Metal Finishing 8. Gutkin, B.G. and A. L. Vishnitskiy. Controls for the Operating Regime of Electrospark and Anodic-mechanical Machine Tools 9. Alekseyev, A.V., and L.Ya. Popilov. Electric Hardening of Tools, 10. Bogorad, L.Ya. Electrochemical Metal Polishing: The booklet contains illustrations and diagrams. There are no references.

TABLE OF CONTENTS:

Card 2/3

Ivanov, V.K.

28-1-17/42

AUTHOR: Ivanov, V.K., Engineer

TITLE: Basic Dimensions of Washers (Osnovnyye razmery shayb)

PERIODICAL: Standartizatsiya, # 1, Jan-Feb 1957, p 57-58 (USSR)

ABSTRACT: Industrial organizations have developed their own types and sizes of washers, since the dimensions of standardized washers did not meet the requirements of the current production. The author suggests a system of washer sizes for a unified state standard, and a practical production method. The system of sizes - shown in a chart - is based on the inner diameters which have to be fixed in conformity with standards for threads and clearances. Since the outer diameters are not restricted, they can be selected in such a way that in stamping of washers in mass production (in a series of sizes in sequence) the inner diameter of a bigger washer would be the outer diameter of the next smaller one, or vice versa. In such stamping, there would be almost no waste.
The article contains 3 charts.

AVAILABLE: Library of Congress

Card 1/1

IVANOV, V.K.

Age and seasonal variations in the total protein level and the ratio of basic protein fractions in the blood serum of Red Steppe calves and hybrids of Red Steppe and milking Shorthorns. Trudy Inst.morf.zhiv. no.31:88-92 '60. (MIRA 13:6)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut gibridizatsii i akklimatizatsii zhivotnykh "Askaniya-Nova".
(Blood proteins) (Calves)

GLUSHENKO, N.V.; IVANOV, V.K.

Paleolimulus from the lower Permain of the Donets Basin. Paleont. zhur. no.2:128-130 '61. (MIRA 14:6)

1. Ukrainskiy filial Vsesoyuznogo nauchno-issledovatel'skogo instituta prirodnogo gaza.
(Novoselovka region (Stalino Province)--Xiphosura, Fossil)

ANDRONIKASHVILI, T.G.; SABELASHVILI, Sh.D.; IVANOV, V.K.

Device for injecting samples into the KhT-2M chromathermograph.
Zav.lab. 28 no.5:631 '62. (MIRA 15:6)

1. Institut khimii AN Gruzinskoy SSR.
(Chromatographic analysis)

Ivanov, V. K.

USSR/Physics of the Earth - Geophysical Prospecting, 0-5

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 36468

Author: Veshev, A. V., Fokin, A. F., Ivanov, V. K., Semenov, A. S.

Institution: None

Title: Experimental Work on Dipole Profile Tracing

Original Periodical: Geofizicheskiye metody razvedki, Moscow, Gosgeoltekhizdat, 1955, 3-18

Abstract: Experimental work was performed in a water tank measuring 2 x 2 x 1.5 m. The observations were made on the following models: (1) conducting sphere (aluminum sphere with a radius of 3 cm); (2) conducting plate (duraluminum plate measuring 20 x 20 x 0.4 cm); (3) 2 conducting plates of the same material and size; (4) 2 non-conducting plates (glass plates of the same size); (5) 2 plates, one conducting the other not; (6) step-like contact of 2 medium (dihedral right angle made of plywood); (7) conducting plate in the presence of a step-like contact (vein of ore near a fault).

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of similar objects. What makes the curves obtained by dipole profile tracing substantially different is the presence of additional extrema and the high extent to which the lines are cut up in the anomalous zones (over conducting and nonconducting bodies of the above form). The degree ... anomalies is greater in dipole curves than in curves obtained by combined

Card 2/3

USSR/Physics of the Earth - ~~Geophysical~~ Prospecting, 0-5

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 36468

Abstract: profile tracing of the same object. The results obtained make it possible to recommend extensive testing of the dipole profile tracing under field conditions. One must bear in mind in this case that in addition to ore objects, there will be disclosed also sharp anomalies and irregularities of the containing rocks, which can also be used for detailed mapping. What makes the method of dipole profile tracing difficult to employ is the need for good grounding devices, particularly in the supply circuit, for otherwise the difference of potentials that is to be measured will be too small. Dipole profile tracing offers promising prospects because of the possibility of employing alternating current in this case.

Card 3/3

IVANOV, V.K. (Sverdlovsk)

Improperly posed problems. Mat. sbor. 61 (103) no.2:211-223
Je '63. (MIRA 16:10)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000619130002-9"

GLUSHENKO, N.V.; IVANOV, V.K.; LAPKIN, I.Yu.; PODOBA, B.G.; SHCHEGOLEV, A.K.

Flora of the red sill in the Schwagerina strata of the Donets Permian. Dokl.AN SSSR 145 no.1:157-159 Jl '62. (MIRA 15:7)

1. Ukrainskiy filial Vsesoyuznogo nauchno-issledovatel'skogo instituta prirodnogo gaza. Predstavleno akademikom A.L.Yanshinym.
(Bakhmut region--Paleobotany, Stratigraphic)

L 12890-63 EWP(k)/EWP(q)/EWT(m)/BDS AFFTC/ASD Pf-4 JD/HW
ACCESSION NR: AP3001424 S/0136/63/000/006/0084/0085

60

AUTHOR: Kushch, E. V.; Ivanov, V. K.; Denisov, Ye. L.

TITLE: Draw plate with adjustable roll section for drawing rectangular cross section tubing 18

SOURCE: Tsvetny*ye metally*, no. 6, 1963, 84-85

TOPIC TAGS: draw plates, roll sections, tubing

ABSTRACT: Authors describe a new type of draw plate with adjustable roll section used for drawing tubing, and which is intended for small scale production. Machine is described in enclosure. Orig. art. has: 3 figures.

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 09Jul63 ENCL: 02

SUB CODE: 00 NO REF SOV: 000 OTHER: 000

Card 1/3/

L 09508-67 EWT(m)/FCC/EWP(t)/ETI/EWP(n) IJP(c) JD/WB

ACC NR: AT6023741 SOURCE CODE: UR/2755/66/000/005/0151/0162

44
43
B+1

AUTHOR: Beskorovaynyy, N. M.; Ivanov, V. K.

ORG: none

TITLE: Mechanism of corrosion of carbon steels in lithium

SOURCE: Moscow. Inzhenerno-fizicheskiy institut. Metallurgiya i metallovedeniye chistykh metallov, no. 5, 1966, 151-162

TOPIC TAGS: intergranular corrosion, carbon steel, lithium

ABSTRACT: Thermodynamic calculations show that at a temperature at least up to 723°C, when carbon is present in the steel in the form Fe_3C, there is the possibility of the following reaction between lithium and cementite:

$$2Li(liq) + 2Fe_3C(solid) = Li_2C_2(solid) + 6Fe(solid) \quad (1)$$

The article reviews a great number of data from the literature and comes to the following overall conclusions. 1) At temperatures up to 723°C, corrosion failure of carbon steels in lithium is bound up with the reactive penetration of the lithium into the steel as a result of reaction with cementite by Equation (1). The forming lithium carbide then dissolves in the liquid lithium, and the carbon content in the corrosion zone decreases. 2) The liquid phase forming in the corrosion zone during the dissolution of Li_2C_2 in the lithium should promote the development of diffusion

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L 09508-67

ACC NR: AT6023741

processes for the penetration of lithium into the steel as the elimination of carbon in the corrosion zone decreases. 3) The formation of lithium carbide and its subsequent dissolution is accompanied by an increase in volume. The stresses which develop as a result of this lead to plastic deformation of the corrosion zone. 4) The differences in the volume changes on the surface and in the depth of the corrosion zone lead to the development of a state of complex stress in the samples which exerts an effect on the course of the corrosion process and the form of the diffusion curves of the lithium. "Engineer Chang, Chia-shou participated in the work." Orig. art. has: 3 formulas, 7 figures and 5 tables.

SUB CODE: 11/ SUBM DATE: none/ ORIG REF: 005

Card 2/2

IVANOV, V. K.

"The Temperature Field in a Single-Electrode Furnace," Teoriya i Praktika Rudnoy Elektrotermii, Sverdlovski-Moscow, No. 23-24, 1948

IVANOV. V. K.

IVANOV, V. K., GEL'D, P. V. I MIKULINSKIY, A. S.
36129 O raschetaKh elektrichestiKh i teplovyKh poley v eleKTrorudnotermichesKiKh pechaKh.
V. sb: Teroiya i praKtiKa rudnoy eleKtrotermii. Sverdlovsk-MosKva, 1948, S. 64-71.

SO: Letopis' Zhrunal' nykh Statey, No. 49, 1949

IVANOV, V. K.

IVANOV, V. K., GEL'D, P. V., I MIKULINSKIY, A. S.
36081 Temperaturnoye pole v odnoelektrodnoy pechi. V sb: Teoriya i praKtiKa rudnoy eleKtrotermii. Sverdlovsk-Moskva, 1948, S. 72-75.

SO: Letopis' Zhurnal' nykh Statey, No. 49, 1949

IVANOV, V. K.

IVANOV, V. K., MIKULINSKIY, A. S., I GEL'D, P. V.
36091 ElektrichesKoye pole v dvuKheleKtrodnoy pechi. V sb: teoriya i praKtika rudnoy eleKtrotermii. Sverdlovsk-Moskva, 1948, S. 76-78.

SO: Letopis' Zhurnal' nykh Statey, No. 49, 1949

IVANOV, V. K.

IVANOV, V. K. I MIKULINSKIY, A. S.

36128 K raspredeleniyu toka v rudnotermicheskikh pechakh. V sb: Teoriya i praktika rudnoy elektrotermii. Sverdlovsk-Moskva, 1948, S. 79-80.

SO: Letopis' Zhrunal' nykh Statey, No. 49, 1949

IVANOV, V. K.

IVANOV, V. K. I MIKULINSKIY, A. S.

36089 Analiz eleKtricheskogo polya v odnofaznoy pechi s tochKi zreniya teorii podobiya. V sb; Teoriya i praKtiKa rudnoy eleKtrotermii. Sverdlovsk-MosKva, 1948, S. 81-82.

SO: Letopis' Zhurnal' nykh Statey, No. 49, 1949

IVANOV, V. K.

IVANOV, V. K. MIKULINSKIY, A. S., I GEL'D, P. V.

36090 Temperaturnoye pole Kerna grafitirovochnoy pechi. V sb: Teoriya i praKtika rudnoy eleKtrotermii. Sverdlovsk-Moskva, 1948, S. 83-90.-Bibliogr: 8 nazv.

SO: Letopis' Zhurnal' nykh Statey, No. 49, 1949

IVANOV, V. K.

Electrical Engineering.

"Principles of Rational Design of the Metal Framework for the Main Building of Thermal Electric Power Stations," Elek. Stan., No. 7, 1949.

IVANOV, V.K.

USSR/Engineering - Welding, Methods

Dec 51

"Automatic Welding of the Rotating Joints of Pipelines," V. K. Ivanov, Engr, NIIStroyneft'

"Avtogen Delo" No 12, pp 4-7

Discusses results of expts to establish optimum technology of welding pipes on permanent and removable backing rings. Suggests electrode wire 2 mm in diam for welding pipes of 150 mm and larger diam. Thin electrode secures complete penetration

200T69

USSR/Engineering - Welding, Methods (Contd)

Dec 51

at small vol of welding bath and permits welding on low currents, which possibility is essential in field conditions.

200T69

IVANOV, V.K., inzh.

Automatic butt welding of rotation pipelines. Truly VNIIStroinefti no.3:13-25 '52. (MIRA 12:2)
(Pipelines--Welding) (Electric welding)

ACCESSION NR: AT4012725 S/2981/63/000/002/0141/0147

AUTHOR: Ivanov, V. K.; Kishnev, P. V.; Bazurina, Ye. Ya.

TITLE: Resistance butt welding of SAP wire

SOURCE: Alyuminiyevy*ye splavy*. Sbornik statey, no. 2. Spechenny*ye splavy*. Moscow, 1963, 141-147

TOPIC TAGS: powder metallurgy, aluminum, aluminum welding, aluminum powder, sintered powder, SAP, sintered aluminum powder, welding, resistance welding, butt welding

ABSTRACT: As noted by both A. S. Gel'man and W. F. Haessly a most important condition for obtaining high-quality weld joints is simultaneous switching off of current and switching on of pressure. This is true for aluminum and its alloys and can be expected to be even more important in welding of SAP. Studies with SAP on the ASIF-5 and MSR-25 machines showed that good welds are possible only if the Al and Al_2O_3 melt at the same time. The present study was carried out on SAP wire (4, 5 and 6 mm in diameter) prepared from PP-4 and APS-1 aluminum powder (containing 4 and 6-10% Al_2O_3, respectively). Comparison of the microstructure and mechanical properties of the weld joints showed that flash welding results in satisfactory joints with SAP wire. Under optimal welding conditions,

BESKOROVAYNYY, N.M.; YEREMEYEV, V.S.; ZUYEV, M.T.; IVANOV, V.K.; TOMASHPOL'SKIY, Yu.Ya.

Corrosion resistance of iron in lithium. Met. i metalloved. chist. met. no. 4:130-143 '63. (MIRA 17:5)

IVANOV, V.K., prof.; KAZAKOVA, L.E.

Approximation in the mean of a harmonic function of three variables by harmonic polynomials. Mat.zap.Ural.mat.ob-va UrGu 3 no.2:24-29 '62. (MIRA 19:1)

IVANOV, V. K.

"Types of Drought in Western Siberia," Trudy Pervovo Sib. Krayev n-i S'yezda (Works of the First Siberian Krayn (n.-i.) Conference), vol III, 1927.

1. IVANOV, V. K.

2. USSR (600)

<u>The Climate of Omsk Oblast</u>. Omsk State Press, Omsk 1948, 32 Pages.

9. Meteorologiya i Gidrologiya, No. 3, 1949.
[redacted] Report U-2551. 30 Oct 52

CH IVANOV, V.A.

The influence of fertilizer on perennial grasses and cover crops. V. K. Ivanov. *Sovet. Agron.* 6, No. 4, 35-41 (1948).—Tests with $(NH_4)_2SO_4$, acid phosphate, and KCl, separately and in combination, brought out what was known that on chernozem soils phosphates are in the first minimum. On the carbonate chernozem K was also bene-ficial. In comparison with stable manure the combination of P and K fertilizers was just as good. J. S. Joffe

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000619130002-9"

IVANOV, V. K.

USSR (600)

Fertilizers and Manures, Castor-Oil Plant

Spot method of fertilizing castor plants with granulated super-
phosphate. Dokl. Ak. sel'khoz., No. 5, 1952
Vsesoyuznyy N-I. Institute
Maslichnykh Kul'tur rcd. 11 Jan. 1952

Monthly List of Russian Accessions, Library of Congress, August 1952. UNCL.

IVANOV, V.K.

Fertilizers and Manures

Problem of the allocation of manure and mineral fertilizers in grass crop rotation systems without "weedless fallow." Sov.agron 10, no. 10, 1952.

9. Monthly List of Russian Accessions, Library of Congress, December 1952 ~~1953~~, Unclassified.

1. IVANOV, V. K.

2. USSR (600)

4. Agriculture-Study and Teaching

7. Work practice of agricultural education groups in the second year of study. Dost. sel'khoz. no. 11, 1952.

9. Monthly List of Russian Accessions, Library of Congress, March 1953, Unclassified.

Name: IVANOV, Vladimir Konstentinovich

Dissertation: Basis of the System of Fertilization in Grass-Field Crop-Rotations in Steppe Areas of the moist Zone of Krasnodarskiy Kray

Degree: Doc Agr Sci

Affiliation: /Not indicated/

Defense Date, Place: 16 Feb 55, Council of Ukrainian Order of Labor Red Banner Agr Acad

Certification Date: 1 Dec 56

Source: BMVO 6/57

IVANOV, V.K.

IVANOV, V.K.; FISHMAN, G.M.; SHAKHBAZYAN, Z.M.

The Shakhbazyan machine for removing seeds from apricots and plums. Kons. i ov. prom. 12 no.2:4-7 F '57. (MLRA 10:6)

1. Batumskiy filial Vsesoyuznogo nauchno-issledovatel'skogo instituta konservnoy i ovoshchesushil'noy promyshlennosti (for Ivanov and Fishman).
2. Armyanskiy konservnyy trest.(for Shakhbazyan)
(Canning industry--Equipment and supplies) (Apricot) (Plum)

IVANOV, V. K.

AFANAS'YEVA, A.L., kand.biol.nauk; BAYMRTUYEV, A.A., kand.sel'skokhozyaystvennykh nauk; BAL'CHUGOV, A.V., kand.sel'skokhozyaystvennykh nauk; BELOZEROVA, N.A., agronom; BELOZOROV, A.T., kand.sel'skokhozyaystvennykh nauk; MAKSIMENKO, V.P., agronom; BERNIKOV, V.V., doktor sel'skokhozyaystvennykh nauk; BOGOMYAGKOV, S.T., kand.sel'skokhozyaystvennykh nauk; VOLYNETS, O.S., agronom; BODROV, M.S., kand.sel'skokhozyaystvennykh nauk; BOGOSLAVSKIY, V.P., kand.tekhn.nauk; KHRUPPA, I.F., kand.tekhn.nauk; VERNER, A.R., doktor biol.nauk; VOZBUTSKAYA, A.Ye., kand.sel'skokhozyaystvennykh nauk; VOINOV, P.A., kand.sel'skokhozyaystvennykh nauk; VYSOKOS, G.P., kand.biol.nauk; GALDIN, M.V., inzhener-mekhanik; GERASIMOV, S.A., kand.tekhn.nauk; GORSHENIN, K.P., doktor sel'skokhozyaystvennykh nauk; YELENEV, A.V., inzhener-mekhanik; GERASKEVICH, S.V., mekhanik [deceased]; ZHARIKOVA, L.D., kand.sel'skokhozyaystvennykh nauk; ZHEGALOV, I.S., kand.tekhn.nauk; ZIMINA, Ye.A., agronom; BARANOV, V.V., kand.tekhn.nauk; PAVLOV, V.D.; IVANOV, V.K., kand.sel'skokhozyaystvennykh nauk; KAPLAN, S.M., kand.sel'skokhozyaystvennykh nauk; KATIN-YARTSEV, L.V., kand.sel'skokhozyaystvennykh nauk; KOPYRIN, V.I., doktor sel'skokhozyaystvennykh nauk; KOCHERGIN, A.Ye., kand.sel'skokhozyaystvennykh nauk; KOZHEVNIKOV, A.R., kand.sel'skokhozyaystvennykh nauk; KUZNETSOV, I.N., kand.sel'skokhozyaystvennykh nauk; LAMBIN, A.Z., doktor biol.nauk; LEONT'YEV, S.I., kand.sel'skokhozyaystvennykh nauk; MAYBORODA, N.M., kand.sel'skokhozyaystvennykh nauk; MAKAROVA, G.I., kand.sel'skokhozyaystvennykh nauk; MEL'NIKOV, G.A., inzhener; ZHDANOV, B.A., kand.sel'skokhozyaystvennykh nauk; MIKHAYLENKO, M.A., kand.sel'skokhozyaystvennykh nauk; MAGILEVTSEVA, N.A., kand.sel'skokhozyaystvennykh nauk;

(Continued on next card)

AFANAS'YEVA, A.L.... (continued) Card 2.

NIKIFOROV, P.Ye., kand.sel'skokhozyaystvennykh nauk; NENASHEV, N.I., lesovod; PERVUSHINA, A.N., agronom; PLOTNIKOV, N.A., kand.biol.nauk; L.G.; kand.sel'skokhozyaystvennykh nauk; PAVLOV, V.D., kand.tekhn. nauk; PRUTSKOVA, M.G., kand.sel'skokhozyaystvennykh nauk; GURCHENKO, V.S., agronom; POPOVA, G.I., kand. sel'skokhozyaystvennykh nauk; PORTYANKO, A.F., agronom; RUCHKIN, V.N., prof.; RUSHKOVSKIY, T.V., agronom; SAVITSKIY, M.S., kand.sel'skokhozyaystvennykh nauk; BOLDIN, D.T., agronom; NESTEROVA, A.V., agronom; SERAFIMOVICH, L.B., kand. tekhn.nauk; SMIRNOV, I.N., kand.sel'skokhozyaystvennykh nauk; SEREBRYANSKAYA, P.I., kand.tekhn.nauk; TOKHTUYEV, A.V., kand. sel'skokhozyaystvennykh nauk; FAL'KO, O.S., inzh.; FEDYUSHIN, A.V., doktor biol.nauk; SHEVLYAGIN, A.I., kand.sel'skokhozyaystvennykh nauk; YUFEROV, V.A., kand.sel'skokhozyaystvennykh nauk; YAKHTENFEL'D, P.A., kand.sel'skokhozyaystvennykh nauk; SEMENOVSKIY, A.A., red.; GOR'KOVA, Z.D., tekhn.red.

[Handbook for Siberian agriculturists] Spravochnaia kniga agronoma Sibiri. Moskva, Gos. izd-vo sel'khoz. lit-ry. Vol.1. 1957. 964 p.
(Siberia--Agriculture) (MIRA 11:2)

IVANOV, V.K., doktor sel'skokhoz.nauk

Crops preceding wheat and their effect on wheat yields in the southern Ukraine. Zemledelie 6 no.8:53-57 Ag '58. (MIRA 12:11)
(Ukraine--Wheat)

IVANOV, V.K., doktor sel'skokhozyaystvennykh nauk

Ways of increasing sunflower yields in the southern Ukraine. Zemledelie 7 no.3:71-75 Mr '59. (MIRA 12:4)

1. Khersonskiy sel'skokhozyaystvennyy institut.
(Ukraine--Sunflowers)

IVANOV, V.K., doktor sel'skokhozyaystvennykh nauk

Irrigation during the vegetative period and its effect on castor bean yields. Dokl. Akad. sel'khoz. 24 no.11:19-23 '59 (MIRA 13:3)

1. Khersonskiy sel'skokhozyaystvennyy institut. Predstavlena akademikom V. S. Pustovoytom.
(Castor bean) (Irrigation farming)

IVANOV, V.K., prof., doktor sel'skokhozyaystvennykh nauk

Cultivation of the castor-oil plant in the Ukraine. Zemledelie 24 no.1:50-53 Ja '62. (MIRA 15:2)

1. Kharsonskiy sel'skokhozyaystvennyy institut.
(Ukraine--Castor-oil plant)

IVANOV, V. K.

Balancing relationships between precipitation in Western Siberia and the Ukraine in dry years. Meteor. i gidrol. no.1:37-40 Ja '63. (MIRA 16:1)

1. Omskiy sel'skokhozyaystvennyy institut.

(Siberia, Western--Rain and rainfall)
(Ukraine--Rain and rainfall)