22254

The kinetic power theorem ... S/109/61/006/005/001/027
D201/D303

search Conference, Durham, New Hamshire, June 1951) and H.A. Haus (Ref. 28: A kinetic-power theorem, URSI, Boulder, August 1957). The expression for the kinetic power is derived, assuming small amplitudes, from the Maxwell equations of continuity and motion of one electron inside a volume V within a surface S. After several mathematical transformations e.g.

$$(P_{r}) + (P_{K}) = 0, \quad (16)$$

is obtained, where $(P_r)$ is given by

$$(P_{r}) = \frac{1}{2}\,\mathrm{Re}\int_{S}[\vec{E}\vec{H}^{*}]\,d\vec{S}; \quad (17)$$

and $(P_K)$ by

$$(P_{K}) = \frac{1}{2}\,\mathrm{Re}\sum_{n=1}^{N}\int V_{Kn}\,\vec{i}_{n}^{*}\,d\vec{S}; \quad (18)$$

Card 3/~~22~~ 31

$(P_r)$ being the average over a cycle power radiated through the surface S; $(P_K)$ - the average over a cycle the kinetic power of a N-beam stream; $V_{kn} = \frac{m}{e} v_{on} v_n$ - the kinetic potential of the stream of order N, where $v_{on}$ is the constant component of velocity independent both of time and of co-ordinates and $v_n$ is the amplitude of position dependent velocity of electrons. Eq. (18) can be rewritten as

$$(P_K) = \frac{1}{2} \mathrm{Re} \left[ \sum_{n=1}^{N} \dot{I}_n(l) V_{Kn}(l) - \sum_{n=1}^{N} \dot{I}_n(0) V_{Kn}(0) \right], \qquad (20)$$

where

$$\dot{I}_n(l) = \dot{S} j(l); \quad \dot{S} = \int_{S_0} \psi^2 \, dx \, dy; \quad j_n(0), \; V_{Kn}(0), \; j_n(l), \; V_{Kn}(l)$$

values of the current density $j_n$ and of $V_{kn}$ at the first and last cross-sections of the electron stream. The problem is reduced next to evaluating the quantity $(P_e) = (P_k)$ for different waves in elec-

22254

S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

tron streams and to determining conditions for which $(P_k) < 0$, $P_e$ being the average over a cycle power of the interaction between the stream and the field as given by

$$(P_e) = \frac{1}{2} \mathrm{Re} \int \vec{j}^* \vec{E} dV. \tag{19}$$

2) Waves in an electron stream and the kinetic power theorem. The kinetic power theorem is applied to waves in an electron stream. As known from V.N. Shevchik (Ref. 11: Op. cit.) in a stream of electrons with an average velocity $v_0$ and average density $\rho_0$, two waves with angular frequency $\omega$ can propagate having propagation constants $\beta_1$ and $\beta_2$

$$\beta_1 = \beta_e - \beta_p, \tag{21}$$

$$\beta_2 = \beta_e + \beta_p, \tag{22}$$

where $\beta_e = \frac{\omega}{v_0}$; $\beta_p = \frac{\omega_0}{v_0}$; $\omega_0^2 = \frac{e\rho_0}{me_0}$.

Card 5/22
21

S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

The equivalent resistance Z of the electron stream at cross-section Z is given by

$$Z = \frac{V_k}{I} = Z_0 \frac{E_1 e^{i\beta_p z} - E_2 e^{-i\beta_p z}}{E_1 e^{i\beta_p z} + E_2 e^{-i\beta_p z}}, \quad (34)$$

where

$$Z_0 = (\beta_p \omega \varepsilon_0 S_0)^{-1}. \quad (35)$$

Eq. (34) is equivalent to that of a complete resistance of a twin-feeder with the characteristic impedance $Z_0$ and propagation constant $\beta_p$. The average over a cycle interaction power between current and kinetic potential $V_k$ at a cross-section Z is given by

$$\langle P \rangle = \frac{S_0 m v_0}{e} [\rho_0 \langle (\mathrm{Re}\, \tilde{v})^2 \rangle + \tilde{v}_0 \langle \mathrm{Re}\, \tilde{\rho}\, \mathrm{Re}\, \tilde{v} \rangle]. \quad (36)$$

where $S_0$ is the cross-section area of the beam. It follows from

Card 6/22

(36) that the average value of the kinetic power in the wave $\{\hat{P}\}$ consists of two components, positive, proportional to $\{(\mathrm{Re}\ \tilde{v})^2\}$, and negative, proportional to $\{(\mathrm{Re}\ \tilde{\rho}\ \mathrm{Re}\ \tilde{v}\}$. The above considerations were made for a stream of positive particles, but the same will apply to a stream of negative particles - electrons, in which case

$$\overline{\{\hat{P}\}} = (2Z_0\beta_p^2)^{-1}(E_1E_1^* - E_2E_2^*). \quad (37)$$

is obtained. The average power of interaction between current I and the kinetic potential $V_k$ is the sum of the power flow of a fast and of a slow wave given by

$$\{\hat{P}_1\} = (2Z_0\beta_p^2)^{-1} E_1 E_1^* > 0 \quad (38)$$

and

$$\{\hat{P}_2\} = -(2Z_0\beta_p^2)^{-1} E_2 E_2^* < 0, \quad (39)$$

respectively. The kinetic power (P) of an electron stream should

22254
S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

not be confused with the electromagnetic power ($P_{em}$) of the field. From W.H. Louisell, J.R. Pierce (Ref. 31: Power flow in electron beam devices, Proc. I.R.E. 1955, 43, 4, 425) the magnitude of the electromagnetic power flow has been obtained much smaller than that of kinetic power, because the problem has been treated as a unidimensional one. The correct treatment of the problem can be found in works by S.D. Gvozdover (Ref. 32: Teoriya elektronnykh priborov (Theory of Electronic Devices) SVCh, GTI, 1956), D.A. Watkins (Ref. 33: TWT Noise figure, Proc. I.R.E., 1952, 40, 1,65) and G.M. Branch, T.G. Mihran (Ref. 34: Plasma frequence reduction factors in electron beams, IRE Trans. Electron Devices, 1955, 2, 2,3). The finite dimensions of the beam cross-section and the wave guide reduce the effective plasma frequency; 3) The kinetic power theorem as applied to the problem of excitation of a resonator. The resonator consists of a surface S surrounding the cavity of resonator, the field of which varies according to the law $\mathcal{E}e^{i\omega t}$. The kinetic power theorem has in this case the form of

Card 8/~~22~~ 21

22254
S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

$$\{P_r\} + \{\hat{P}(\varphi_0)\} - \{\hat{P}(0)\} = 0 \quad (40)$$

where $\{P_r\}$ is the radiated power, averaged over one cycle; $\{\hat{P}(\varphi_0)\}$ and $\{\hat{P}(0)\}$ are average kinetic powers at the input and output respectively, as given by

$$\{\hat{P}(0)\} = (2Z_0\beta_p^2)^{-1}[E_1(0)E_1^*(0) - E_2(0)E_2^*(0)], \quad (41)$$

and

$$\{\hat{P}(\varphi_0)\} = (2Z_0\beta_p^2)^{-1}[E_1(\varphi_0)E_1^*(\varphi_0) - E_2(\varphi_0)E_2^*(\varphi_0)], \quad (42)$$

where $E_1(0)$ and $E_2(0)$ - amplitude of the fast and slow waves respectively at the cross-section $z = o$; $E_1(\varphi_0)$ and $E_2(\varphi_0)$ - their respective amplitude at the cross-section $z = d$; $Z_0$ - full impedance of the beam; $\beta_p = \omega_p/v_0$. Comparing (40) with the equation of energy

$$\{P_r\} + \{P_e\} = 0, \quad (47)$$

Card 9/~~22~~ 21

22254

S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

$$\{\hat{P}(\varphi_0)\} - \{\hat{P}(0)\} = \{P_e\} \qquad (48)$$

is obtained, which in general cases permits evaluation of the changes in the amplitudes of both fast and slow waves in the stream due to the transit through the resonator. Let the beam waves, having frequency $\omega$, be excited by shot noise, they will then be designated noise waves and it follows that a resonator can damp the amplitude of the fast noise wave, but cannot damp the amplitude of a slow moving noise wave; 4) Energy flow in a double cavity klystron-amplifier. This problem has been analyzed by J.R. Pierce (Ref. 10: Op. cit.) the graphs in Fig. 3 show that if the resonator is excited by an electron beam, then behind the resonator the amplitude of the slow wave increases and that of the fast wave decreases; 5) The kinetic power theorem as applied to a TWT. The above problem has been analyzed by S.D. Gvozdover (Ref. 32: Op.cit.), V.H. Lopukhin (Ref. 35: Vozbuzhdeniye kolebaniy i voln elektronnymi potokami (Oscillation Wave Excitation by Electronic Currents) GITTL, 1953) and V.N.

Card 10/22

22254

S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

Shevchik (Ref. 36: Osnovy Teorii SVCh. IZD. Sovetskoye radio, 1958). As shown by L.N. Loshakov (Ref. 37: K teorii rasprostraneniya voln v elektronnom potoke (On the Theory of Wave Distribution in an Electron Stream) ZhTF, 1952, 22, 2, 193) that in a rectangular wave guide, filled with dielectric, there exist waves of the type $e^{i(\omega t-\beta z)}$, where $\omega$ - the angular frequency assumed to be known; ($\beta$) - the propagation constant defined by the dispersive equations

$$y_1(\beta) = y_2(\beta); \quad (56)$$

$$y_1(\beta) = \frac{k^2_{mn}}{k^2-\beta^2}; \quad (57)$$

$$y_2(\beta) = 1 - \frac{\omega_0^2}{(\omega-\beta v_0)^2}; \quad (58)$$

and

$$k^2_{mn} = \left(\frac{m\pi}{a}\right)^2 + \left(\frac{n\pi}{b}\right)^2; \; m, n = 1, 2, \ldots; \; \omega_0^2 = \frac{e\rho_0}{m\varepsilon_0}.$$

Card 11/~~22~~ 21

22254
S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

The article gives the graphs of $y_1(\beta)$ and $y_2(\beta)$ for three different values of $\omega_0$. The same effect can be obtained for $\omega_0$ = constant and varying $\beta_e$ i.e. the average velocity of the electron beam. The fast wave with propagation constant $\beta_3 < \beta_e$ does not show increasing solutions. The wave $\beta_2$ slow with respect to the electron beam, has a negative component of kintic power while wave $\beta_3$, travelling faster than the beam, has a positive kinetic power component. Both waves conform to the idea of a slow and fast wave of a unidimentional electron beam. The full expression for the field for the three different values of $\omega_0$ represents a superimposition of four waves

$$E = \sum_{n=1}^{4} E_n e^{-i\beta_n z} \quad (59)$$

where $\beta_n$ is determined by the dispersive equation (56) and the amplitudes of waves E depend on the boundary conditions of the input and output of the tube. Let the kinetic power theorem be applied to a TWT. Of most interest is the case of the exponentiality rising

Card 12/22 21

22254

S/109/61/006/005/001/027
D201/D30

The kinetic power theorem ...

waves. In the present case the kinetic power theorem is given by

$$\{P_r\} + \{P_K\} = 0,$$

where $(P_r)$ - the average power radiated through the surface S ; $(P_k)$ - the average kinetic power. Assuming surface S to be ideally conducting $(P_r)$ is given by

$$(P_r) = \frac{1}{2}\,\mathrm{Re}\int [\vec{E}\vec{H}^*]_z dS - \frac{1}{2}\,\mathrm{Re}\int [\vec{E}\vec{H}^*]_z dS, \quad (64)$$

the difference in power at the input and output of the wave guide. For straight electron trajectories $(P_k)$ is given by

$$\{P_k\} = \frac{1}{2}\,\mathrm{Re}\,[I^*(l)V_k(l) - I^*(0)V_k(0)], \quad (65)$$

where $I(0)$, $V_k(0)$, $I(1)$, $V_k(1)$ - the values of convection current and of kinetic potential at cross-sections $z = 0$ and $z = 1$, corres-

Card 13/~~22~~ 21

22254

S/109/61/006/005/001/027
D201/D30

The kinetic power theorem ...

ponding to the input and output of TWT. Evaluating $(P_k)$ it is shown that in general I and $V_k$ in a TWT are given by the sum of three waves. This sum, after a few simple algebraic transformations is given by

$$\frac{1}{2}\mathrm{Re}\, I(z)V_k(z) = \frac{1}{2}\mathrm{Re}\sum_{n=1}^{3}\sum_{n'=1}^{3} A_{nn'}(z), \qquad (66)$$

where

$$A_{nn'} = \frac{\beta_p}{Z_0\beta_e^3}\frac{E_n^* E_{n'}}{a}\left(1-\frac{\beta_{n'}}{\beta_e}\right)e^{i(\beta_n^*-\beta_{n'})z};$$

$$Z_0 = (\omega\varepsilon\beta_p S_0)^{-1};\ \beta_e = \frac{\omega}{v_0};\ a = \left(1-\frac{\beta_n^*}{\beta_e}\right)\left(1-\frac{\beta_n}{\beta_e}\right)\left(1-\frac{\beta_{n'}}{\beta_e}\right),$$

and $\beta_n$ are the roots of the dispersion equation corresponding to direct waves. In considering various cases it is shown that in a TWT the slow electron wave with the exponentially rising amplitude, transfers through the surface S a negative kinetic power $(P_k) < 0$

Card 14/22 21

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22254

S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

which means that $(P_k) > 0$. This in turn is accompanied by an exponential increase of the kinetic power $(P_k) < 0$ related to the slow moving electron wave,

$$v_{\phi 1} < v_0, \quad \gamma > \beta_e.$$

Evaluating in Eq. (66) terms of the order $e^{\alpha l}$ shows that they are periodic functions of z with a period

$$2\pi(\gamma - \beta_3)^{-1}.$$

Exponentially decreasing terms, proportional to $e^{-\alpha l}$ and $e^{-2\alpha l}$ can be neglected for $\alpha l > 3$ but must be taken into account near the input to TWT. Terms $e^{-\alpha l}$ are periodic, the term proportional to $e^{-2\alpha l}$ is periodic; 6) The kinetic power theorem and a double beam tube. From a wave guide model of a double beam tube the expression for the kinetic power $(P_k)$, for the increasing wave of current and kinetic potential and for the beyond-the-cut-off wave guide is gi-

Card 15/22
21

22254

S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

ven by

$$\langle P_{\kappa}\rangle = \langle P_{\kappa 1}\rangle + \langle P_{\kappa 2}\rangle, \tag{70}$$

where

$$\langle P_{\kappa 1}\rangle = (2Z_1\beta_{e1}^2)^{-1}\frac{\beta_{p1}}{\beta_{e1}}\frac{E_1(0)E_2^*(0)\left(1-\frac{\gamma}{\beta_{e1}}\right)e^{2\alpha l}}{\left(1-\frac{\beta_2^*}{\beta_{e1}}\right)^2\left(1-\frac{\beta_2}{\beta_{e1}}\right)^2}(1+O_1); \tag{71}$$

and

$$\langle P_{\kappa 2}\rangle = (2Z_2\beta_{e2}^2)^{-1}\frac{\beta_{p2}}{\beta_{e2}}\frac{E_1(0)E_2^*(0)\left(1-\frac{\gamma}{\beta_{e2}}\right)}{\left(1-\frac{\beta_2^*}{\beta_{e2}}\right)^2\left(1-\frac{\beta_2}{\beta_{e2}}\right)^2}e^{2\alpha l}(1+O_2); \tag{72}$$

It follows that with such a wave guide and a double beam amplification, the energy flow is analogous to that in the drift space of a double cavity klystron. The advatage of a double beam TWT over a klystron lies in the fact that the positive kinetic power increases

Card 16/~~22~~ 21

22254

S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

with the tube length l, which permits a larger signal at the output. At the same time, however, the negative kinetic power exponentially increases, which is related to the slow moving electrons and which remains in the beam after the information has been removed; 7) Parametric electron beams and the theorem of kinetic power. As was shown above, using special communication devices, it is possible to damp the amplitude of the fast noise of the electron stream. It follows that a signal having the form of such a fast wave cannot be amplified in an ordinary TWT. For this purpose parametric amplifiers have been suggested. Let the power of a signal at a frequency $\omega$ be applied to an electron beam together with the power from a pumping generator at a frequency $\omega p$. Owing to the non-linear effects there would be then produced in the beam an infinite sequence of waves having frequencies $\omega_p \pm n\omega$, then the expressions for the charge density, the electron flow density and the velocity of electrons can be represented by

$$\rho_p = \sum_{-\infty}^{\infty} \rho_m \exp im\omega_p t, \quad (73)$$

Card 17/22 21/

22251
S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

$$v_{\beta} = \sum_{-\infty}^{\infty} v_m e^{im\omega_\beta t}, \qquad (74)$$

$$j = \sum_{m=-\infty}^{\infty} \sum_{n=\pm 1} j_{m,n} e^{i(m\omega_\beta + n\omega)t}, \qquad (75)$$

$$p = \sum_{m=-\infty}^{\infty} \sum_{n=\pm 1} p_{m,n} e^{i(m\omega_\beta + n\omega)t}, \qquad (76)$$

$$v = \sum_{m=-\infty}^{\infty} \sum_{n=\pm 1} v_{m,n} e^{i(m\omega_\beta + n\omega)t}, \qquad (77)$$

where $p_m$ and $\bar{v}_m$ are the amplitudes of the Fourier coefficients as related to the pump; $j_{m,n}$, $\rho_{mn}$ and $v_{mn}$ - amplitudes of the combined frequencies of the signal are given under the assumption that only

Card 18/~~22~~ 21

22254

S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

the nearest combined frequencies are of importance, so that n takes only two values ( n = ± 1). Using again the Maxwell equations, the equation of the electron motion and applying the condition of small amplitudes it can be shown according to H.A. Haus (Ref. 29: A Kinetic power theorem for parametric longitudinal electron beam amplifiers, IRE Trans. Electron Devices, 1958, 5, 4, 225) that the following

$$\mathrm{Re} \sum_{m=-\infty}^{\infty} \oint_S \left( \frac{[\vec{E}_m \vec{H}_m^*]}{m\omega_n + \omega} + \frac{V_m j_m^*}{m\omega_n + \omega} \right) d\vec{S} = 0, \quad (78).$$

(78)

holds, where $\vec{E}_m$ and $\vec{H}_m$ are the intensities of the electric and magnetic fields of a combined frequency $m\omega_p + \omega$; $j_m$ - current density; $V_m = mv_0v_m/e$ - kinetic potential of same frequency; S - the limiting surface. The above equations are the generalized equations of the kinetic potential in case of a parametric beam and the methods of analysis discussed previously can be applied in this case as

Card 19/22 21

22254
S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

well. The author states that from the point of noise, figure transverse field parametric amplifiers, utilizing the so-called cyclotron waves, seem to be the best. Finally, various types of parametric amplifiers, as met in Western literature are shortly discussed and it is stated in conclusion that the theory of parametric amplifiers with transverse field is by no means finalized. The existing theories do not take into account the coulomb forces, the interaction between transverse and longitudinal shift of electrons, and the role of harmonics in the electron beam with transverse excitation remains to be explained. There are 7 figures and 43 references: 10 Soviet-bloc and 33 non-Soviet-bloc. The references to the English-language publications read as follows: M.R. Currie, D.C. Forster, Low noise preamplifiers for microwave receivers, Proc. IRE, 1958, 46, 3, 570; M. Currie, A new type low noise electron gun for microwave tubes, Proc. IRE, 1958, 46, 5, 911; M. Caulton, S-band TWT with F below 4db, Proc. IRE, 1958, 46, 5, 911; M.R. Currie, D.C. Forster, New mechanism for noise reduction in electron beams, J. Appl. Phys.

Card 20/22 21

22254

S/109/61/006/005/001/027
D201/D303

The kinetic power theorem ...

1959, 30, 1, 95.

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Card 21/~~22~~ 21

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S/109/61/006/010/014/027
D266/D302

AUTHORS: Glasko, V.B., Zyuzin-Zinchenko, A.A., and Lopukhin, V.M.

TITLE: The influence of beam scalloping on the noise figure of TWT's

PERIODICAL: Radiotekhnika i elektronika, v. 6, no. 10, 1961, 1688 - 1699

TEXT: The purpose of the present work is to study on a simplified model the effect of varying beam cross section on the minimum noise figure. Although the work is based on material published prior to 1955 a number of recent references on ultra-low noise amplifiers are included. The authors use a three-electrode gun which ensures a sufficiently smooth potential profile. The varying beam radius is obtained by calculating the trajectory of an edge electron in the combined electric and magnetic fields neglecting the effect of space charge forces. Without going into the details of calculations the following formula is given for the beam radius 4

Card 1/4

$$b = b_0[1 + \Delta \sin \beta k(x)\, x], \qquad (1)$$

where $b_0$ is the radius in infinite magnetic field; x - distance along the axis in mm-s, $\Delta$ and $\beta k(x)$ are parameters representing the amplitude and wave number of scalloping, and k(x) is given by the approximate formula

$$k(x) = 820(x + 6)^{-3} + 0.4. \qquad (2)$$

In the subsequent calculations they employ S. Bloom and R. Peter's (Ref. 25: RCA Rev., 1954, 15, 1, 95) transmission line equations. but assume that the reduced plasma frequency varies due to beam scalloping. 22 different cases are investigated which are summarized in a table. The inhomogeneous transmission line equations are solved (with the usual input conditions of uncorrelated current and velocity fluctuations) for these parameters on a computer and the results, noise current density against distance, are plotted in a number of figures. It appears that under the conditions investigated the noise due to shot noise is negligible so the subse-

29316

S/109/61/006/010/014/027
D266/D302

The influence of beam ...

quent calculations are confined to the study of noise due to velocity fluctuations at the potential minimum. In Figs. 10a and 10 b the noise figure is plotted against normalized drift distance. [Abstractor's note: Details of the calculation are not given, but it is noted that the beam entering the helix is assumed to have a constant diameter]. It is found that with the exception of one curve the minimum noise figure is increased if the scalloping of the beam is taken into account. The noise generated by a beam of constant diameter is given by the dotted lines. The numbers on the curves refer to the cases investigated. The final conclusion is that if $\Delta$ and $\beta$ are different of zero the minimum available noise figure is increased. There are 12 figures, 1 table and 27 references: 7 Soviet-bloc and 20 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: J. Berghammer, S. Bloom, J. Appl. Phys., 1960, 31, 3, 454; W.M. Mueller, M.R. Currie, J. Appl. Phys., 1959, 30, 12, 1876; R. Adler, Proc. I.R.E., 1959, 47, 10, 1713; C. Curtis, C. Johnson, J. Appl. Phys., 1960, 31, 2, 338.

Card 3/4

29316
S/109/61/006/010/014/027
D266/D302

The influence of beam ...

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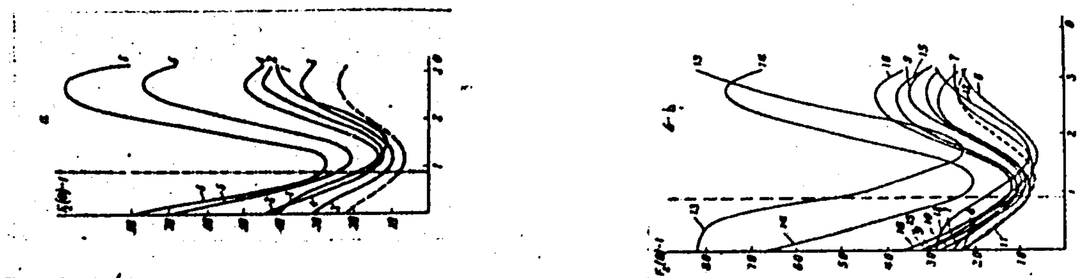
SUBMITTED: December 22, 1960

Figs. 10a and 10b: Dependence of $F_2 - 1$ on $\theta = \beta_p$ ($\beta_p$ is the reduced plasma wave number) for case I (case I corresponds to a certain choice of the potential profile).



Card 4/4

S/109/62/007/004/007/018
D230/D302

9,4230

AUTHORS: Lopukhin, V.M., and Roshal', A.S.

TITLE: Reverse electron-stream amplifier

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 4, 1962, 643 - 651

TEXT: The linear theory of electron-wave amplifier for electron streams is presented. Theoretical results of the double-beam travelling-wave tubes (TWT) and those of backward-wave tubes (BWT) show that it is possible to obtain substantial amplification of constant amplitude waves by means of interference, alternatively, increased amplification of gradually-increasing waves is obtained in which case a double-beam TWT is more effective than the double-beam BWT. It is further possible to gain considerable amplification of the electron wave-type over a broad frequency band using constant amplitude standing waves which result from space-charge beating. The interaction of the reverse electron streams can also cause increased oscillations and self-excitation of the system. Thus a reflex klystron without an external resonator can generate oscilla-
Card 1/2

S/109/62/007/004/007/018
D230/D302

Reverse electron-stream amplifier

tions tuneable over wide limits by varying the potential; this demonstrates the mechanism of the electron-wave oscillations. The solution of the dispersion equation of the amplifier is examined and the distribution of the variables of the velocity and current is calculated. The possibility of the oscillation amplification is demonstrated for sufficiently large values of the current density in streams. The problem is solved by a linear approximation. The evaluation of the propagation constant and the plotting of the variable velocity and current density was performed on a digital computer; the significance of these results is discussed in detail. There are 5 figures and 6 references: 3 Soviet-bloc and 3 non-Soviet-bloc. The references to the English-language publications read as follows: W.G. Dow, J.E. Rowe, General aspects of beating-wave amplification, Proc. I.R.E., 1960, 48, 1, 115; J.E. Rowe, Theory of the Crestatron - a forward-wave amplifier, Proc. I.R.E., 1959, 47, 4, 536; J.R. Pierce, Double-stream amplifiers, Proc. I.R.E., 1949, 37, 9, 980.

SUBMITTED: December 22, 1960

Card 2/2

39430
S/109/62/007/008/009/015
D409/D301

9,2572

AUTHORS: Lopukhin, V.M. and Martynov, V.P.

TITLE: Theory of backward-wave electron-beam amplifier with preliminary double-frequency modulation of the electron beam

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 8, 1962, 1355-1360

TEXT: The results of this work were reported to the All-Union Conference of the MVSSO USSR on Radioelectronics, Khar'kov, 1960. By joint integration (on an electronic computer) of the equations of continuity and of motion of the electron, and of the equations of the backward-wave decelerating system, the authors obtained the amplitude distribution of the variable components of the current density, the electron-velocity distribution, and that of the delay-line voltage; the gain factor was also calculated. An electron beam, modulated at the frequency $2\omega_c$, travels in the field of the backward wave, created by the decelerating system; the voltage to be

Card 1/3

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000930520(

S/109/62/007/008/009/015
D409/D301

Theory of backward-wave ...

amplified has the frequency $\omega_c$. The system of equations (of the electron and of the decelerating system) is set up, as well as the boundary conditions. Numerical integration was performed for 50 different sets of values of the parameters m, $\varphi$, b, a', $a_o$ and $\beta_2$; m denotes the depth of beam modulation at the frequency $2\omega_c$; $\varphi$ is the phase angle between the waves with frequency $\omega_c$ and $2\omega_c$; a' is related to the beam's plasma frequency; $a_o$ is the space-charge parameter and $\beta$ the propagation constant of the wave in the absence of the beam; b denotes the velocity difference between electron and wave. The results of the integration are shown in the following diagrams: Dependence of the gain factor G on the parameter b, dependence of G on m, dependence of the amplification on $\varphi$, and the distribution of the amplitudes of the current density, of the electron velocity, and of the voltage. Conclusion: Calculations showed that preliminary modulation of the electron beam shifts the gain curve towards the region of negative values of b. Optimum gain occurs if the mean electron-velocity becomes smaller than the velocity of the wave in the absence of the beam. For values of b, which correspond to maximum gain in an ordinary backward-wave amplifier, the ampli-

Card 2/3

field signal of frequency $\omega_c$ is suppressed. G depends strongly on m and $\varphi$. There are 4 figures. The most important English-language reference reads as follows: G. Wade, R. Adler, Proc. IRE, 1959, 47, 1, 79.

ASSOCIATION: Fizicheskiy fakul'tet Moskovs'kogo gosudarstvennogo universiteta im. V.V. Lomonosova, Kafedra radiotekhniki (Physics Division of Moscow State University im. V.V. Lomonosov, Radio Engineering Department)

SUBMITTED: October 17, 1961



APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R00093052OC

LOPUKHIN, V. M.

Dissertations defended at the Institute of Radioengineering and Electronics for the academic degree of Doctor of Physicomathematical Sciences: 1962

"Excitation of Electromagnetic Vibrations and Waves by Electron Beams."

Vestnik Akad Nauk, No. 4, 1963, pp. 119-145

ACCESSION NR: AP4017594 S/0109/64/009/002/0241/0251

AUTHOR: Lopukhin, V. M.; Roshal', A. S.

TITLE: Removal of noise due to a space-charge fast wave by means of a resonator

SOURCE: Radiotekhnika i elektronika, v. 9, no. 2, 1964, 241-251

TOPIC TAGS: microwaves, superhigh frequency, SHF tube, parametric longitudinal field tube, fast wave noise, electron beam tube, electron beam tube resonator, noise reduction

ABSTRACT: The propagation of noise described by a matrix of spectral densities in a resonator with a uniform longitudinal field is theoretically investigated by means of a single-dimensional single-velocity approximation. The effect of a passive resonator upon the fluctuation of an electron beam (e.g., in a parametric microwave device) is considered. It is demonstrated that as a result of an inter-

Card 1/2

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000930520(

ACCESSION NR: AP4017594

action between the beam and the resonator field, the amplitude relation between the fast and slow noise waves in the beam is altered; a correlation between these waves is established. By proper selection of the resonator and beam parameters (formulas, recommendations, and a numerical example supplied), a considerable reduction of the noise fast wave at the resonator output can be achieved. Such a resonator is recommended for parametric longitudinal-field electron-beam SHF devices. Orig. art. has: 5 figures, 24 formulas, and 1 table.

ASSOCIATION: Moskovskiy gosudarstvenny*y universitet im. M. V. Lomonosova (Moscow State University)

SUBMITTED: 17Oct62 DATE ACQ: 18Mar64 ENCL: 00

SUB CODE: GE NO REF SOV: 002 OTHER: 004

Card 2/2

VASIL'YEV, Ye.I.; LOPUKHIN, V.M.

Excitation of harmonics in the pumping space of electronic parametric amplifiers. Radiotekh. i elektron. 9 no.6:1087-1090 Je '64. (MIRA 17:7)

Card 1/2

L 4.2?6-65
ACCESSION NR: AP5006390

the principle of parametric amplification includes a brief consideration of these
electric-pumping-field configurations: Adler's quadrupole (with single plates and

the principle of parametric amplification ... electric-pumping-field configurations: Adler's quadrupole (with single plates and section-type), an 8-start-helix twisted quadrupole with rotating pumping field, a 4-start-helix twisted quadrupole, an axisymmetrical pumping field, a 2-variable-field pumping, waveguide structures, and a double pumping wave. These parametric amplifier types are briefly described: (a) Adler's degenerate type, (b) a nondegenerate type, (c) a lower-frequency-pumping type, (d) electrostatic amplifiers, (e) a synchronous-wave type, (f) an M-type, (g) frequency converters and multipliers, (h) magnetic-field pumping types, and (i) non-magnetic types. Distinguishing features and application possibilities of parametric amplifiers are listed in the "Conclusion." Orig. art. has: 23 figures.

parametric ...

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: EC

NO REF SOV: 007 OTHER: 108

Card 2/2

LOPUKHIN, V.T.

Selecting an efficient mining system and methods of roof control in mines of the Yama Dolomite Combine. Nauch. trudy KHGI no.6: 173-190 '58. (MIRA 14:4)
(Yama region—Dolomite) (Mining engineering)

KUKLIN, B.K., gornyy inzh.; LOPUKHIN, V.T., gornyy inzh.; LIPKOVICH, S.M., dotsent

Response to P.S.Podkolzin's article "Methods of mining coal beds in the Donets Basin." Ugol' Ukr. 5 no.7:40-43 Jl '61. (MIRA 15:1)

1. Donetskiy nauchno-issledovatel'skiy ugol'nyy institut (for Kuklin). 2. Khar'kovskiy gornyy institut (for Lopukhin).
(Donets Basin--Coal mines and mining) (Podkolzin, P.S.)

LOPUKHIN, Ye. A. c/1964 1964
METEOROLOGY DECEASED

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000930520(

LOPUKHIN, Ye.A. [deceased]

Spectral composition of direct solar radiaton. Geliotekhnika no.1:44-48 '65. (MIRA 18:5)

1. Sredneaziatskiy nauchno-issledovatel'skiy gidrometeorologicheskiy institut.

CHECHET, Yu.S., doktor tekhn. nauk, prof. [deceased]; LOPUKHINA, Ye.M., kand. tekhn. nauk, dotsent

Optimum parameters of motors with hollow rotors. Trudy MEI no.39:55-59 '62. (MIRA 17:6)

LOPUKHIN, Yu.M.

New data on blood supply to the small intestinal wall in man. Uchen. zapiski vtor. moskov. med. Inst. Stalina Vol 2:162-167 1951. (CIML 21:4)

1. Candidate Medical Sciences. 2. Department of Operative Surgery and Topographic Anatomy (Head--Prof. V.A. Ivanov).

LOPUKHIN, Yu. M.

Problem of the length of the small intestine in man. Arkh. anat., Moskva 29 no.2:58-59 Mar-Apr 1952. (CLML 23:2)

1. Of the Department of Operative Surgery and Topographic Anatomy (Head -- Doctor Medical Sciences Docent V. A. Ivanov), Second Moscow Medical Institute imeni I. V. Stalin.

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000930520(

* LOPUKHIN, Yu.M. (Moskva)

Bulgarian journal Khirurgiia; brief survey of contents in 1953.
Khirurgiia no.9:58-61 S '54. (MLRA 7:12)
(PERIODICALS,
Khirurgiia, Sofia)

LOPUKHIN, Yu. M.

NIKOLAYEVA, Ye.Ye.; LOPUKHIN, Yu.M.

Effect of prolonged stimulation of the vagus and sympathetic nerves on the quantity and acidity of gastric juice. Biul.eksp.biol. i med. 37 no.4:34-36 Ap '54. (MLRA 7:7)

1. Iz kafedry operativnoy khirurgii s topograficheskoy anatomiyey (zav. prof. V.A.Ivakov) II Moskovskogo meditsinskogo instituta imeni I.V.Stalina (dir. dotsent S.I.Milovidov)

(GASTRIC JUICE,
*acidity & secretion, eff. of stimulation of sympathetic & vagus nerves in dogs)
(NERVES, VAGUS, physiology,
*eff. of stimulation on gastric juice acidity & secretion in dogs)
(SYMPATHETIC NERVOUS SYSTEM, physiology,
*eff. of stimulation on gastric juice acidity & secretion in dogs)

IVANOV, V.A., professor; LOPUKHIN, Yu.M., kandidat meditsinskikh nauk.

Experimental cholecystopathy. Khirurgiia, Moskva no.5:15-19 My '55. (MLRA 8:9)

1. Iz kafedry operativnoy khirurgii s topograficheskoy anatomiyey zav.prof. V.A. Ivanov) II Moskovskogo meditsinskogo instituta imeni I.V. Stalina.
(GALL BLADDER, dis.
exper.methods)

LOPUKHIN, Yu.M.

Surgical anatomy of arteries of the initial segment of the jejumum in man. Arkh.anat.gist. i embr. 32 no.1:59-63 Ja-Mr '55. (MLRA 8:9)

1. Iz kafedry operativnoy khirurgii i topograficheskoy anatomii (zav. prof. V.A. Ivanov) II Moskovskogo meditsinskogo instituta imeni I.V. Stalina)
(JEJUNUM, blood supply,
arteries, anat. & surg. aspects)

LOPUKHIN, Yu.M., kandidat meditsinskikh nauk

Topographical anatomy of the heart and pericardium in some heart diseases. Khirurgiia 32 no.8:45-50 Ag '56. (MIRA 9:12)

1. Iz kafedry operativnoy khirurgii s topograficheskoy anatomiyey (zav. - prof. V.A.Ivanov) II Moskovskogo meditsinskogo instituta imeni I.V.Stalina.

(HYPERTENSION, compl.
changes in topographic anat. of heart & pericardium)
(AORTIC VALVE, dis.
insuff., causing changes in tophographic anat. of heart & pericardium)
(MITRAL VALVE, dis.
same)
(PERICARDIUM, dis.
changes of topographic anat. in hypertension, aortic valve insuff. & mitral valve insuff.)

USSR / Human and Animal Morphology (Normal and Pathological).
Circulatory System. Heart.

Abs Jour : Ref Zhur - Biologiya, No 1, 1959, No. 2913

Author : Lopukhin, Yu. M.; Zheltikov, N. S.

Inst : 2nd Medical Institute of Moscow

Title : Surgical Anatomy of the Mitral Valve

Orig Pub : Uch. zap. 2-y Mosk. med. in-t, 1957, 10, 239-245

Abstract : On fresh and formalin-fixed hearts of 50 human cadavers, aged 38 to 60, which did not have any cardiovascular lesions, it was demonstrated that the diameter of the left atrioventricular opening is 2.5-3.8 cm (more often 3-3.5) and its circumference is 8-12 cm (more often 9-11). In 5 cases the circumference corresponded to the length of the heart. Also described are the structural characteristics and the measurements of the anteromedial and posterolateral vela and those of tendinous cords.

Card 1/2

Card 2/2

LOPUKHIN, Yu.M. dots.

Projectional anatomy of the posterior pleural borders. Khirurgiia 34 no.8:113-118 Ag '58 (MIRA 11:9)

1. Iz kafedry operativnoy khirurgii i topograficheskoy anatomii (zav. - prof. G.Ye. Ostroverkhov) II Moskovskogo meditsinskogo instituta imeni N.I. Pirogova.
(PLEURA, anat. & histol.
posterior pleural borders, projectional anat. (Rus))

USSR / Human and Animal Morphology (Normal and Pathological). S
Circulatory System. Heart.

Abs Jour : Ref Zhur - Biologiya, No 1, 1959, No. 2913

Author : Lopukhin, Yu. M.; Zheltikov, N. S.
Inst : 2nd Medical Institute of Moscow
Title : Surgical Anatomy of the Mitral Valve

Orig Pub : Uch. zap. 2-y Mosk. med. in-t, 1957, 10, 239-245

Abstract : On fresh and formalin-fixed hearts of 50 human cadavers, aged 38 to 60, which did not have any cardiovascular lesions, it was demonstrated that the diameter of the left atrioventricular opening is 2.5-3.8 cm (more often 3-3.5) and its circumference is 8-12 cm (more often 9-11). In 5 cases the circumference corresponded to the length of the heart. Also described are the structural characteristics and the measurements of the anteromedial and posterolateral vela and those of tendinous cords.

Card 1/2

USSR / Human and Animal Morphology (Normal and Pathological). S
Circulatory System. Heart.

Abs Jour : Ref Zhur - Biologiya, No 1, 1959, No. 2913

In the latter the authors distinguish 3 types: solitary, magistral and loose.

Card 2/2

11

LOPUKHIN, Yu.M. dots.

Projectional anatomy of the posterior pleural borders. Khirurgiia 34 no.8:113-118 Ag '58 (MIRA 11:9)

1. Iz kafedry operativnoy khirurgii i topograficheskoy anatomii (zav. - prof. G.Ye. Ostroverkhov) II Moskovskogo meditsinskogo instituta imeni N.I. Pirogova.
(PLEURA, anat. & histol.
posterior pleural borders, projectional anat. (Rus))

LOPUKHIN, Yu.M., dots.

Topographic anatomy of the main orifices of the heart under normal and pathological conditions. Khirurgiia 35 no.10:66-73 O '59. (MIRA 12:12)

1. Iz kafedry operativnoy khirurgii s topograficheskoy anatomiyey (zav. - prof. G.Ye. Ostroverkhov) II Moskovskogo meditsinskogo instituta im. N.I. Pirogova.
(HEART anat. & histol.)
(HEART VALVES anat. & histol.)

LOPUKHIN, Yu. M., Doc Med Sci -- (diss) "Topography of the cardiovascular complex in mitral defects of the heart and in hypertonic sickness. (Problems of projected anatomy)." Moscow, 1960. 31 pp; (First Moscow Order of Lenin Medical Inst im I. M. Sechenov); 250 copies; price not given; (KL, 51-60, 120)

LOPUKHIN, Yuriy Mikhaylovich; MOLODENKOV, Mikhail Nikolayevich

[Course in operative surgery] Praktikum po operativnoi khirurgii. Moskva, Medgiz, 1960. 178 p. (MIRA 13:12)
(SURGERY, OPERATIVE)

IVANOV, Vasiliy Alekseyevich; MOLODENKOV, Mikhail Nikolayevich; LOPUKHIN, Yuriy Mikhaylovich; PISAREVSKIY, A.A., red.; MIRONOVA, A.M., tekhn. red.

[Surgery] Khirurgiia. Moskva, Medgiz, 1963. 426 p. (MIRA 16:6)

(SURGERY)

OSTROVERKHOV, Georgiy Yefimovich; LUBOTSKIY, David Naumovich; BOMASH, Yuliy Maksimovich; MOVSHOVICH, I.A., red.; LOPUKHIN, Yu.M., red.; LYUDKOVSKAYA, N.I., tekhn. red.

[Course of operative surgery and topographical anatomy]Kurs operativnoi khirurgii i topograficheskoi anatomii. [By]G.E. Ostroverkhov, D.N.Lubotskii, IU.M.Bomash. Moskva, Medgiz, 1963. 739 p. (MIRA 16:3)

(SURGERY, OPERATIVE)
(ANATOMY, SURGICAL AND TOPOGRAPHICAL)

OSTROVERKHOV, G.Ye., doktor med.nauk, prof.; LOPUKHIN, Yu.M., doktor med.nauk; MOLODENKOV, M.N., kand. med. nauk; SHUBINA, L.N., tekhn. red.

[Technique of surgical operations; a portable atlas] Tekhnika khirurgicheskikh operatsii; portativnyi atlas. Moskva, Izdatel'skoe biuro tresta Meduchposobie, 1963. 143 p. (MIRA 17:1)

LOPUKHIN, Yuriy Mikhaylovich, dots.; MOLODENKOV, Mikhail Nikolayevich, dots.; GOFMAN, A.M., red.

[Practical manual on operative surgery] Praktikum po operativnoi khirurgii. Izd.2., perer. Moskva, Meditsina, 1964. 234 p. (MIRA 17:7)

LOPUKHIN, Yu.M., dcktor med. nauk (Moskva)

Kidney transplantation in man in the U.S.A.; personal impressions. (MIRA 19:1)
Urologiia no.4:43-46 '64.

1. Urologicheskaya klinika (zav. - chlen-korrespondent AMN SSSR A.Ya. Pytel') II Moskovskogo meditsinskogo instituta imeni Pirogova.

IVANOV, Vasiliy Alekseyevich; MOLODENKOV, Mikhail Nikolayevich; LOPUKHIN, Yuriy Mikaylovich; PISAREVSKIY, A.A., red.

[Surgery] Khirurgiia. 2. izd., perer. i dop. Moskva, Meditsina, 1965. 445 p. (MIRA 18:7)

BAKULEV, A.N., akademik; BUNYATYAN, A.A., kand. med. nauk; BURAKOVSKIY, V.I., doktor med. nauk; BUYANOV, V.M., dots.; GULYAYEV, A.V., prof.; ZARETSKIY, V.V., doktor med. nauk; IVANOV, V.A., prof.; KOLESNIKOV, S.A., prof.; LOBACHEV, S.V., prof.; LOPUKHIN, Yu.M., prof.; MURATOVA, Kh.N., doktor med. nauk; PETROVSKIY, B.V., zasl. deyatel' nauki RSFSR, prof.; SAVEL'YEV, V.S., prof.; SERGEYEV, V.M., doktor med. nauk; SOLOV'YEV, G.M., prof.; SOLOV'YEVA, I.F.; BURAKOVSKIY, V.I., red.

[Multivolume manual on surgery] Mnogotomnoe rukovodstvo po khirurgii. Moskva, Meditsina. Vol.6. Pt.1. 1965. 577 p. (MIRA 18:10)

1. Deystvitel'nyy chlen AMN SSSR (for Petrovskiy).

LOPUKHINA, A.M.

14-57-6-12757

Translation from: Referativnyy zhurnal, Geografiya, 1957, Nr 6, p 137 (USSR)

AUTHORS: Malevitskaya, M. A., Lopukhina, A. M.

TITLE: Data for the Study of Parasites of Fish in the Lower Dnepr (Materialy k izucheniyu parazitov ryb nizhnego Dnepra)

PERIODICAL: Tr. N.-i. in-ta prud. i oz.-rech. ryb. kh-va UkrSSR, 1955, Nr 10, pp 40-49

ABSTRACT: Parasites of 11 classes were counted during a study of fish in the Lower Dnepr. The most common types were digenetic trematodae (37 species). Multigenetic trematodae (30 species) were less common. Of a special interest were Philometra sanguinea found on the tail fins of crucian carp (54.5 percent), and Philometra obturans found in the blood stream of pike. Samples collected during this study showed that the trematodae

Card 1/2

14-57-6-12757

Data for the Study of Parasites (Cont.)

group was more numerous than any other fish parasite group; this is explained by the abundance of aquatic invertebrates which act as intermediate hosts, and of piscophagous birds. Certain fish parasite larvae can be dangerous to man, to the carnivorous and to the omnivorous animals. These larvae are Metagonimus yokogawai of the Neterophydae group, and also various species of the Opisthorcidae group. Fish which have been infested with parasite larvae may infect birds, commercial mammals and even man. Parasitological studies have shown that the scavenger fish of the Konskaya and Bazavluk backwaters on the Lower Dnepr were badly infested with the types of parasites which can also infest commercial types. This situation creates conditions dangerous for the latter. N. K. K.

Card 2/2

LOPUKHINA, A.M.

Diseases of lavarets and fishes of the Amur River observed on pond fish farms of the Ukrainian S.S.R. Trudy sov.Ikht.kom. no.9:110-113 '59. (MIRA 13:5)

1. Nauchno-issledovatel'skiy institut prudovogo i ozerno-rechnogo rybnogo khozyaystva Ministerstva sel'skogo khozyaystva USSR.

(Ukraine--Parasites) (Parasites--Whitefishes) (Parasites--Carp)

LOPUKHINA, A.M.

Effect of Triaenophorus nodulosus Pallas (Cestoda, Pseudophyllidae) of young-of-the-year rainbow trout. Dokl. AN SSSR 137 no. 1:244-247 Mr-Ap '61. (MIRA 14:2)

1. Gosudarstvennyy nauchno-issledovatel'skiy institut ozernogo i rechnogo rybnogo khozyaystva. Predstavleno akademikom Ye.N. Pavlovskim. (Cestoda) (Parasites—Trout)

LOPUKHINA, Ye. A.

24

(12) Geo

Meteorological Abst.
Vol. 5 No. 1
Jan. 1954
Part 1
Structure and Physics
of the Atmosphere

551.511:551.515

5.1-123
Berliand, M. E. and Dobryshman, E. M., Soveshchanie po voprosam issledovaniia transformatsii vozdukha. [Conference on the question of investigating the transformation of air.] *Meteorologiia i Gidrologiia*, No. 8:49-50, Aug. 1952. DLC—Review of meetings held by the Central Geophysical Observatory in cooperation with the Central Aerological Observatory, Central Institute of Weather Forecasting and Geophysical Observatories of Tashkent, Kiev and Minsk. The adiabatic air transformation (report by S. S. Gaigerov), heat transformation of cold air masses (by M. V. Zavarina), heat transformation of air masses (by M. E. Berliand) and actinometric investigations of free atmosphere (by V. G. Kastrov and E. A. Lopukhina) were discussed. Special reports on air transformation over the irrigated regions were made by P. A. Vorontsov (aerological problem) and M. I. IUdin (change of climate). *Subject Headings:* 1. Air masses. 2. Energy transformation. 3. Conferences.—*N.T.Z.*

LOPUKHINA, Ye. M. Cand. Tech. Sci.

Dissertation: "Theoretical and Experimental Investigation of an Induction Motors with a Rotor in the Form of a Hollow Nonmagnetic Cylinder." Moscow Order of Lenin Power Engineering Inst imeni V. M. Molotov, 28 Feb 47.

SO: Vechernyaya Moskva, Feb, 1947 (Project #17836)

PA 167T8

LOPUKHINA, YE. M.

USSR/Electricity - Induction Motors
Rotors

May 50

"Investigation of an Induction Motor With a Rotor in the Form of a Hollow Cylinder," Ye. M. Lopukhina, Cand Tech Sci, Moscow Power Eng Inst imeni Molotov

"Elektrichestvo" No 5, pp 26-31

Investigates eddy current distribution and losses in cylinder, magnetic field in air gaps and in cylinder for ideal system. Expressions obtained are applicable to design of induction motor with hollow, nonmagnetic rotor. Submitted 4 Jul 49.

167T8

[redacted]

LOPUKHINA, YE. M.

USSR/Electricity - Motors, Single-Phase Jul 51

"Principles of the Theory of the Single-Phase Shaded-Pole Motor," Prof T. G. Soroker, Dr Tech Sci, Ye. M. Lopukhina, Cand Tech Sci, Moscow Power Eng Inst imeni Molotov

"Elektrichestvo" No 7, pp 43-48

Investigates the basic electromagnetic processes in the motor and derives its eq. Uses the eq to draw up equiv circuits for a stationary motor. Establishes a design formula for detg the torque. Submitted 8 Jun 50.

199T21

SOV/144-58-7-5/15

AUTHORS: Lopukhina, Yelena Moiseyevna, Cand.Tech.Sci., Lecturer, and Klokov, Boris Konstantinovich, Aspirant.

TITLE: Determination of the Parameters of an Induction Motor with Non-magnetic Hollow Rotor by Means of a Phase Rotating Amplifier (Opredeleniye parametrov asinkhronnoy mashiny s nemagnitnym polym rotorom s pomoshch'yu fazovrashchatelya-usilitelya)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Elektromekhanika, 1958, Nr 7, pp 42-56 (USSR)

ABSTRACT: It is very difficult to calculate the parameters of an induction motor with hollow non-magnetic rotor. It is accordingly important to be able to determine experimentally the parameters of the equivalent circuit shown in Fig 2. Unfortunately these parameters are not constant but depend on the saturation, the speed and the temperature of the machine. Methods of determining these parameters that have been described hitherto either require that the machine be dismantled or have other disadvantages. This article describes determination of the parameters by means of a phase rotating amplifier described in the articles of Suhr and Hupp Transactions

Card 1/6

SOV/144-58-7-5/15

Determination of the Parameters of an Induction Motor with Non-Magnetic Hollow Rotor by means of a Phase Rotating Amplifier

A.J.E.E. Vol 71, Part 3, 1952. The phase rotating amplifier is described in appendix 1, the phase rotator serves to adjust the phase of the output voltage relative to the input voltage so that the equipment can be used for power measurement. The instrument is a further development of that used by Suhr and Hupp; it is described as a circuit diagram given in Fig 10 and the method of adjustment is described in appendix 2. In view of the special features of machines with hollow non-magnetic rotors the procedure described by Suhr was modified and new formulae were derived for machines of this type. The basis of the method is the equivalent circuit of a single-phase machine shown in Fig 2a and the simplifying assumptions made in the work are stated. The simplified equivalent circuit derived from the original circuit and simplifying assumptions is given in Fig 2b. The parameters of the equivalent circuit are determined from two single-phase tests: synchronous no-load and short circuit. For these test conditions the equivalent circuit can be still further simplified

Card 2/6

SOV/144-58-7-5/15

Determination of the Parameters of an Induction Motor with Non-Magnetic Hollow Rotor by means of a Phase Rotating Amplifier

as shown in Figs 3 and 4. From the synchronous no-load test there may be determined the mutual reactance; the leakage reactance of the stator winding and the referred rotor resistance at double frequency. The basic equations used in determining the parameters in the synchronous no-load test are equations (6) and (10); the corresponding vector diagram is given in Fig 5a. The voltage applied to the control winding during short circuits is given by expression (11); see also vector diagram 5b. When the no-load and short circuit test results are available expression (11) may be used to determine the active resistance of the rotor. Tests can then be made using the phase rotating amplifier and a wattmeter to determine all the impedances entering into the three main equations (6), (10) and (11). The phase rotating amplifier can be used to measure power whilst taking practically no power from the measured circuit. The test circuit used is shown in Fig 6 and a series of equations is then given for the various determinations that have to be made. The values

Card 3/6

SOV/144-58-7-5/15

Determination of the Parameters of an Induction Motor with Non-Magnetic Hollow Rotor by means of a Phase Rotating Amplifier

required for determining the characteristics of the equivalent circuit of the hollow rotor machine are found from two tests: synchronous no-load and short circuit with single-phase supply. In carrying out the tests it is necessary that the stator temperature should be the same in all cases and that the no-load and the short circuit tests should be carried out at the same current equal to the synchronous no-load current at rated voltage. The tests are all made on a test bench, a schematic circuit diagram of which is given in Fig 7. The test procedure is described. To illustrate the method numerical test results are given for a hollow rotor motor type ADP-362 with a useful output of 19 W on a 110 V supply. Tests were made at both normal and double frequencies. It is concluded that the active resistance of the rotor is not much affected by the frequency and, therefore, it is often sufficient to use the equivalent circuit parameters obtained from a single synchronous no-load test. The equivalent circuit obtained for the motor ADP-362 is shown in Fig 8. The

Card 4/6

SOV/144-58-7-5/15

Determination of the Parameters of an Induction Motor with Non-Magnetic Hollow Rotor by means of a Phase Rotating Amplifier

correctness of the results may be judged by comparing the mechanical characteristic calculated from the experimentally determined equivalent circuit with that determined experimentally. This comparison is made in Fig 9 and the agreement is shown to be very satisfactory; the greatest difference between the torques is 8% and the starting torque as calculated differs from the experimental value by only 0.5%. It is concluded that the method can be used to determine the parameters of the equivalent circuit without dismantling the machine, that the accuracy is high and hardly any power is drawn from the measured circuit; the synchronous no-load and short circuit tests are easily usable; the necessary formulae are very simple and the method can conveniently

Card 5/6

SOV/144-58-7-5/15

Determination of the Parameters of an Induction Motor with Non-Magnetic Hollow Rotor by means of a Phase Rotating Amplifier

be used to investigate the influence of various factors on the parameters of the machine.
There are 12 figures and 8 references, 6 of which are Soviet and 2 English.

ASSOCIATION: Kafedra elektricheskikh mashin Moskovskogo energeticheskogo instituta (Chair of Electrical Machinery, Moscow Power Institute)

SUBMITTED: May 22, 1958

Card 6/6

Lopukhina, Ye. M.

6

S/105/60/000/05/25/028
B007/B008

AUTHORS: Andrianov, V.K., Astakhov, N.V., Gubenko, T.P., Kostenko, M.P., Larionov, A.N., Lopukhina, Ye.M., Petrov, G.N., Sonikhian, G.N., Yuferov, F.M., Chilikin, M.G.

TITLE: Yu.S. Chechet (Deceased)

PERIODICAL: Elektrichestvo, 1960, No. 5, p. 89

TEXT: Yuriy Sergeyevich Chechet, Professor at the Moskovskiy energeticheskiy
institut (Moscow Institute of Power Engineering), scientist and pedagogue, and
an expert in the field of electrical micromachines, died on February 26, 1960.
He was born on February 2, 1894. He studied at the mekhanicheskiy fakul'tet
Kiyevskogo politekhnicheskogo instituta (Department of Mechanics at the
Kiyev Polytechnic Institute) from 1913 to 1919. From 1919 teaching activity in
Odessa and in Moscow. In 1925 he graduated from the elektrotekhnicheskiy
fakul'tet Moskovskogo vysshego tekhnicheskogo uchilishcha (Department of
Electrical Engineering at the Moscow Higher Technical School). He published
about 40 scientific studies. From 1931-1942 Director of the kafedra elektriche-
skikh mashin (Chair for Electrical Machines) at the Moskovskiy institut

Card 1/2

mekhanizatsii i elektrifikatsii sel'skogo khozyaystva (Moscow Institute of the
Mechanization and Electrification of Agriculture). From 1942 until his death he
was Professor at the kafedra elektricheskikh mashin Moskovskogo energeticheskogo
instituta (Chair for Electrical Machines at the Moscow Institute of Power
Engineering). At the same time he directed a chair at the Voyenno-inzhenernaya
Krasnoznamennaya akademiya im. Kuybysheva (Military "Red Banner" Engineering
Academy imeni Kuybyshev) for a number of years. He took his doctor's degree in
1940. He wrote his dissertation on "Theoretical Principles for the Designing of
Universal Micromotors" ("Teoreticheskiye osnovy proyektirovaniya universal'nykh
mikrodvigateley."). He was a Deputy of the Mossovet (Moscow Soviet of Workers'
Deputies) and holder of the Order of Lenin and a number of medals, as well as
Chairman of the Section Electrical Machines of the NORITOE. There is 1 figure.

Card 2/2

PHASE I BOOK EXPLOITATION SOV/5639

Lopukhina, Yelena Moiseyevna, and Galina Sergeyevna Somikhina

Raschet asinkhronnykh mikrodvigateley odnofaznogo i trekhfaznogo toka (Design of Single- and Three-Phase Induction Micromotors) Moscow, Gosenergoizdat, 1961. 312 p. 17,000 copies printed.

Ed.: L. M. Petrova; Tech. Ed.: G. Ye. Larionov.

PURPOSE: This book is intendedas a textbook for students of electrical and power engineering in schools of higher education. It may also be useful for technical personnel designing micromotors.

COVERAGE: The book presents the basic problems in designing micromotors with three- or single-phase squirrel-cage rotors. Fundamentals and elements of electromagnetic and thermal calculations, as well as special structural features of induction micromotors, are reviewed. The authors recommend

Card 1/9

the adoption of uniform methods of selecting basic dimensions and a single calculation pattern for all types of three- and single-phase motors. Calculation formulas and materials based on recent data required for actual calculations are given. Examples illustrate the methods adopted for the calculation of various motors. The book includes the results of investigations carried out over a period of years by the authors at the MEI (Moskovskiy energeticheskiy institut -- Moscow Institute of Power Engineering). They thank G. N. Petrov, Honored Scientist, Professor, Head of the Department of Electrical Machinery, and N. A. Mushketov, Engineer, for their advice, and T. P. Il'ina, Technician, who helped with the manuscript. Chs. 1, 2, 8, and 9 and the appendixes were written by the authors jointly; Chs. 4-7 and 12, and sec. 2, 3, and 5 of Ch. 13 were written by Ye. M. Lopukhina; Chs. 3, 10, and 11 and sec. 4 of Ch. 2, and 1 and 4 of Ch. 13, by G. S. Somikhina. There are 53 references: 31 Soviet, 20 English, and 2 Czech.

ANDRIANOV, V.N.; ASTAKHOV, N.V.; GUBENKO, T.P.; KOSTENKO, M.P.; LARIONOV, A.N.; LOPUKHINA, Ye.M.; PETROV, G.N.; SOMIKHINA, G.S., YUFEROV, F.M.; CHILIKIN, M.G.

IUrii Sergeevich Chechet; obituary. Elektrichestvo no.5:89 My '60. (MIRA 13:9)
(Chechet, IUrii Sergeevich, 1894-1960)

SOURCE: Elektrotekhnika, no. 2, 1965, 1-5

TOPIC TAGS: servomotor, capacitor servomotor, induction servomotor, mathematical simulation, drag cup servomotor

ABSTRACT: A drag-cup capacitor servomotor was simulated on an a-c calculating board, and its characteristics and performance were analyzed by the method of symmetrical components. The effects of the machine parameters and capacitor value on these operating and starting characteristics were investigated: no-load speed, rated speed corresponding to the maximum output shaft power,

Card 1/2

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ACCESSION NR: AP5006238

starting torque ratio, nonlinearity of the mechanical characteristic, and linear-regulation zone. The above characteristics in relative units are presented as curves. These conclusions are offered: (1) The method of mathematical simulation is suitable for calculating those capacitor servomotors which have complex relations between their parameters and output characteristics; (2) Such a simulation yields general relations between the machine parameters and [illegible] hand and its output characteristics on the specified ...

2 tables.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: EE

NO REF SOV: 004 OTHER: 000

Card 2/2

BAYGREK, Z., kand.tekhn.nauk; LOPUKHINA, Ye.M., kand.tekhn.nauk

Shunt running of asynchronous micromotors. Elektrotekhnika 36 no.11:7-9 N '65. (MIRA 18:11)

LOPUKHINA, Yelena Moiseyevna, kand. tekhn. nauk, dotsent; KRASNYY, Vatslav, inzh. [Krasny, Vaclav]

Choice of relative parameters of slave motors with hollow nonmagnetic rotors. Izv. vys. ucheb. zav.; elektromekh. 8 no.5:520-526 '65. (MIRA 18:7)

1. Moskovskiy ordena Lenina energeticheskiy institut (for Lopukhina).
2. Zavod imeni Lenina, gorod Pl'zen, Chekhoslovatskaya Sotsialisticheskaya Respublika (for Krasnyy).

LOPUKHINA, Yelena Moiseyevna, kand. tekhn. nauk, dotsent;
KRASNYY, Vatslav, inzh.

Contribution to a parametric method for calculating executive induction-type capacitor motors with hollow rotors. Izv. vys. ucheb. zav.; elektromekh. 8 no.11:1229-1239 '65.
(MIRA 19:1)

1. Zavod imeni Lenina v gorode Pl'zen' Chekhoslovatskoy Sotsialisticheskoy Respubliki (for Krasnyy).

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ACC NR: AP6013418 SOURCE CODE: UR/0144/65/000/011/1229/1239

AUTHOR: Lopukhina, Ye. M. (Candidate of technical sciences, Docent); 39
Krasnyy, V. (Engineer, Graduate of MEI) B

ORG: Moscow Power-Engineering Institute (Moskovskiy energeticheskiy institut)
/Krasnyy/ Factory im. Lenin, Pl'zen' (Zavod)

TITLE: "Parametric" method of designing capacitor-type induction drag-cup servomotors

SOURCE: IVUZ. Elektromekhanika, no. 11, 1965, 1229-1239

TOPIC TAGS: induction motor, servomotor, drag cup motor, electric motor

ABSTRACT: The "parametric" method of design is based on the relations between the motor output characteristics and the motor parameters connected with its size, winding type, materials, etc. The article analyzes two machine-utilization factors: (1) The coefficient of utilization $\eta = P_{em} / P_{in}$, where $P_{em}$ is

UDC: 621.313.333.

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ACC NR: AP6013418

the electromagnetic power in starting and $P_{in}$ is the power consumed in starting; (2) The specific control power $p_c = P_c / P_{em}$, where $P_c$ is the control power in watts; this factor shows the control power required for producing one synchronous watt in starting. The formulas developed for the coefficient of utilization permit designing minimum-size motors with an elliptic rotating field. To further minimize the size, a circular rotating field is recommended for the starting period. The selection of motor parameters ensuring minimum control power is specified. Orig. art. has: 9 figures and 28 formulas.

SUB CODE: 13, 09 / SUBM DATE: 18Mar64 / ORIG REF: 004

Card 2/2

KOSTENKO, A.V., inzh.; LOPUKHINA, Ye.V., inzh.; POGREBETSKAYA, T.M., inzh.; YURGENSON, A.A., inzh.

Structure of nitrided 15Kh11MF steel after soaking at high temperatures. Metalloved. i term obr. met. no.7:48-52 Jl '60. (MIRA 13:10)

(Steel, Stainless--Metallography)
(Metals at high temperature)

Lopukhina, Ye. V.

81824

S/129/60/000/07/010/013
E193/E235

18.1130
18.9520

AUTHORS: Kostenko, A. V., Lopukhina, Ye. V., Pogrebetskaya, T. M., and Yurgenson, A. A., Engineers

TITLE: Structure of Nitrided Steel 15Khl1MF After Prolonged Service at Elevated Temperatures

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, 1960, No. 7, pp. 48-52

TEXT: Following their earlier findings (Ref. 1 to 3) that hardness of nitrided stainless and austenitic steels decreased after prolonged service at high temperatures, the present authors carried out a systematic study of this effect on nitrided specimens of steel 15Khl1MF which is frequently used as the material of some parts of steam turbines, operating at approximately 570°C. The test pieces, normalised at 1050°C and tempered at 740°C, were electrolytically degreased, pickled, phosphated and then nitrided by a two-stage process (20 h at 530°C followed by 20 h at 500°C, the degree of dissociation of ammonia being 35 and 65% respectively) which produced a nitrided layer 0.37 mm thick, with hardness HRN equal 95. The structure of the nitrided layer and the effect of prolonged

Card 1/3

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Structure of Nitrided Steel 15Khl1MF After Prolonged Service at Elevated Temperatures

(up to 5000 h) treatment at 570°C in air, was studied by X-ray analysis, metallographic examination, and microhardness measurements. It was established that, starting from its surface, the following strata can be distinguished in the surface layer of a nitrided steel: (1) $Fe_2N + Fe_4N + CrN$; (2) $Fe_4N + \alpha + CrN$; (3) $\alpha + CrN$; (4) $\alpha$ + carbides. On heating in air, an oxide scale is formed whose thickness, after 5000 h at 570°C, reaches 0.09 mm, and the surface layer of the nitrided steel after such treatment contains the following strata: (a) $Fe_2O_3$ (microhardness - 768 kg/mm$^2$); (b) $Fe_3O_4$ (microhardness - 455 kg/mm$^2$); (c) $FeO.Cr_2O_3$ (microhardness - 455 kg/mm$^2$); (d) $\alpha + CrN + FeO.Cr_2O_3$; (e) $\alpha + Cr_2N$; (f) $\alpha$ + carbides. The most intensive oxidation takes place in the region which originally consisted of iron nitrides. This is attributed by the present authors to the fact that nitrides form solid solutions which are homogeneous within a wide composition limit and which are characterised by a high concentration of vacant lattice

Card 2/3

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E193/E235

Structure of Nitrided Steel 15Kh11MF after Prolonged Service at Elevated Temperatures

sites, facilitating diffusion of oxygen. Since hardness of the nitrided layer would be only slightly decreased by removing its outermost part (to a depth of say 0.1 mm), consisting mainly of iron nitrides, such a treatment should increase the resistance of nitrided steel to scale formation on prolonged heating and so prevent the decrease in hardness, usually taking place under these conditions. There are 3 figures, 2 tables and 7 Soviet references.

Card 3/3

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18.7400

AUTHORS: Kostenko, A.V., Lopukhina, Ye.V., Pogrebetskaya, T.M. and Yurgenson, A.A.

TITLE: Peculiarities in the Behaviour of Nitrided Type 1Kh18N9T Steel During Prolonged Residence at a High Temperature

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 6, pp 868 - 877 (USSR)

ABSTRACT: The authors point out that the nitriding of austenitic steels has not been used in gas-turbine construction (Ref 2) because of process and finishing difficulties and the insufficient high-temperature stability of the nitrided layer (Refs 3,4). A previous study by the authors of a group of nitrided steels (Ref 5) showed the superiority of type 1Kh18N9T steel in these respects and the present investigation aimed at a more detailed study. Specimens of the steel (0.10% C, 17.80% Cr, 9.7% Ni, 0.64% Ti, 0.012% S, 0.020% P, 0.53% Mn, 0.58% Si) were hardened from 1 150 °C, aged for 8 hours at 800 °C, pickled in hydrochloric acid and nitrided at 600 °C for 75 hours. A 0.29 mm deep nitrided layer with a hardness $H_{R_N}$ = 92 was obtained. The kinetics of reaction-diffusion of

Card1/4

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Peculiarities in the Behaviour of Nitrided Type 1Kh18N9T Steel During Prolonged Residence at a High Temperature

nitrogen and changes in the nitrided layer during prolonged holding at 680 °C in furnaces of a type IP-2 machine (as described in Ref 6) were investigated. For studying phases at increasing depth below the surface of the nitrided and scale-layer X-ray structural analyses of successive layers were carried out at the Ural'skiy gosuniversitet (Ural State University) in consultation with V.N. Konev. Figure 1 shows the structure of the nitrided layer before and after holding for 3 000 hours at 680 °C, while the oxides on an etched polished section after 250 hours is shown in Figure 2. The linear relations between the square of the gain in weight ($g/mm^2$) (Curve 1) and the square of the depth (mm) of the nitrided layer on the one hand and the duration of nitriding (hours) on the other given in Figure 3 indicates a parabolic law for nitrogen diffusion. The X-ray patterns from succesive layers before and after holding at 680 °C for 4 500 hours are shown in Figures 4 and 5, respectively, the nature of

Card2/4

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E111/E352

Peculiarities in the Behaviour of Nitrided Type 1Kh18N9T Steel During Prolonged Residence at a High Temperature

the phases being listed in Tables 1 and 2, respectively. The surface hardness of the nitrided steel is plotted against duration of holding (hours) at 680 °C in Figure 6, the corresponding effect on the depth of the nitrided layer being shown in Figure 7 (Curves 1, 2 and 3 refer to the whole, base, and transition layers, respectively). Figure 8 shows hardness as a function of depth below surface before and after holding for 3 000 hours (Curves 1 and 2, respectively). The work showed that saturation of the steel with nitrogen leads to austenite decomposition; the nitrogen is fixed as a nitride with the CrN structure. Prolonged holding at 680 °C gave an outer scale layer of ferric oxide and an inner layer of $(Cr,Fe)_2O_3$; iron nitrides dissociate; inside the nitrided layer complete austenite decomposition occurs, with equalization of nitrogen concentration with depth and formation and coagulation of nitrides. The authors recommend that nitriding conditions should be selected to give the greatest quality of stable nitrides (not iron nitrides) mechanically

Card3/4

80885

S/126/60/009/06/010/025
E111/E352

Peculiarities in the Behaviour of Nitrided Type 1Kh18N9T Steel During Prolonged Residence at a High Temperature

hindering nitrogen diffusion and to prevent formation of much alpha-phase. There are 8 figures, 2 tables and 14 references, 12 of which are Soviet, 1 English and 1 German.

ASSOCIATION: Sverdlovskiy turbomotornyy zavod (Sverdlovsk Gas-turbine Works)

SUBMITTED: January 7, 1960

Card 4/4

NEFEDOV, P.P., kand. tekhn. nauk; ZAPOROZHETS, [illegible], inzh.; KORBUT, A.A., inzh.; LOPUKHOV, A.Ye., inzh.

Present-day method of solving the problem of the distribution of masses of earth. Transp. stroi. 14 no.4:41-43 Ap '64.

(MIRA 17:9)

LOPUKHOV, Ivan Prokop'yevich; SIKHARULIDZE, Yu.M., red.; CHKHARTISHVILI, K.K., tekhn.red.

[Flowering Adzharia] TSvetushchaia Adzhariia. Batumi, Gos. izd-vo, 1957. 325 p. (MIRA 11:4)
(Adzhar A.S.S.R.--Description and travel)

ACC NR: AP6035929 (A) SOURCE CODE: UR/0413/66/000/020/0194/0195

INVENTOR: Arinushkin, L. S.; Polinovskiy, A. Yu.; Glozman, Ye. A.; Drozdov, N. G.; Lopukhov, K. K.

ORG: none

TITLE: Centrifugal pump unit. Class 59, No. 187528

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 20, 1966, 194-195

TOPIC TAGS: pump, centrifugal pump, engine fuel pump, aircraft fuel pump

ABSTRACT: An Author Certificate has been issued for a centrifugal pump unit for an aircraft fuel system, which consists of a housing (stator), oscillating assembly (rotor) mounted on a shaft, and an electric motor. To reduce the danger of fire and explosion, the pump's rotating and stationary parts are connected electrically. [WA-98]

SUB CODE: 01, 13/ SUBM DATE: 27Apr64

Card 1/1 UDC: 621.67