RUMYANTSEV, V.V.

USSR

V

MS

62

Rumyancev, V. V. Equations of motion of a rigid body having a cavity not completely filled with a fluid. Prikl. Mat. Meh. 18, 719–728 (1954). (Russian) 1 - F/W

Rumyancev, V. V. On the equations of motion of a rigid body with a cavity filled with a fluid. Prikl. Mat. Meh. 19, 3–12 (1955). (Russian)

These papers are not very easy to interpret. Perhaps the reader will be served best if the following introductory remarks are made. If a mechanical system contains a rigid part R, and if O is any point, not necessarily solid with R, the six equations of momentum can be given the following Lagrangian form in quasicoordinates [cf. Whittaker, A treatise on the analytical dynamics of particles and rigid bodies, 4th ed., Cambridge, 1937, p. 216]:

$$(24)\quad X_1 = d(\partial T/\partial v_{10})/dt + \omega_2 \partial T/\partial v_{30} - \omega_3 \partial T/\partial v_{20}, \cdots$$

$$(25)\quad L_1 = d(\partial T/\partial \omega_1)/dt + \omega_2 \partial T/\partial \omega_3 - \omega_3 \partial T/\partial \omega_2 + v_{20} \partial T/\partial v_{30} - v_{30} \partial T/\partial v_{20}, \cdots,$$

where T is the entire kinetic energy of the system, v_{i0} the velocity of O, and ω_i the angular velocity of R. If the system consists of a rigid body and a perfect, incompressible fluid, the equations of motion of the latter may be conveniently written, relative to a R-bound frame, in the Euler form,

(OVER)

V.V. [illegible]

(26) $dv_1/dt+\omega_2 v_3-\omega_3 v_2=F_1-(\partial p/\partial x_1)/\rho, \cdots,$

where F_i is the force per unit fluid mass. These equations constitute the result of the first paper. Why it was necessary to rederive them from the principle of minimum action, regarding the fluid as composed of a countable set of particles in certain equations, and as a continuum in others, is not clear to this reviewer.

In the second paper, the same equations are rewritten in terms of Lie's structure constants of the orthogonal group [following Poincaré, C. R. Acad. Sci. Paris 132, 369–371 (1901); and Četaev, ibid. 185, 1577–1578 (1927)], attaining a high degree of complexity (for instance, the numbers −1, 0, 1 are denoted by $c_{\alpha\beta\gamma}$, $\alpha, \beta, \gamma=1, \cdots, 6$, $\nu=1, 2, \cdots$, with varying positions of the upper indices), and regarding the fluid as a countable set of particles. The advantages of this form are not discussed.

A. W. Wundheiler.

RUMYANTSEV, V.V.

2016. Rumiantsev, V. V., Equations for the motion of a solid with a liquid-filled cavity (in Russian), *Prikl. Mat. Mekh.* 19, 1, 3-12, 1955.

Using a fixed Cartesian coordinate system and one moving with the body, author first discusses the kinematic characteristics and virtual displacements of a mechanical system, consisting of a rigid body in which a cavity is partly or totally filled with an ideal incompressible fluid. Expressing the kinetic energy through coordinates and kinematic characteristics, author derives the dynamic equations from an expression of Hamilton's principle of least action, which was established by him earlier. From relations for the structural constants of the group of virtual displacements can be deduced that the equations of motion of the body are identical to those established by the author earlier [title source 18, 6, 1954]. The same procedure is then applied to the problem, assuming that the second coordinate system is in translatory motion with the center of mass of the body. Using the first set of coordinates the canonical equations of motion of the system in a form due to N. G. Chetaev [title source 5, 2, p. 253, 1941] are also derived.

A. Kuhelj, Yugoslavia

RUMYANTSEV, V.V.

SUBJECT USSR/MATHEMATICS/Differential equations CARD 1/1 PG - 111
AUTHOR RUMJANZEV V.V.
TITLE The stability of the permanent rotations of a heavy rigid body.
PERIODICAL Priklad. Mat.Mech. 20, 51-66 (1956)
reviewed 7/1956

The author applies Liapunov's direct method to the investigation of the stability of the motions of a heavy rigid body with a fixed point. The six Euler-Poisson equations of motion possess certain integrals v_1 = const, v_2 = const, v_3 = 0. According to Četajev's arrangement the Liapunov function is constructed in the form

$$v = v_1 - 2\omega v_2 + \lambda v_3 + \frac{1}{4} \mu v_3^2 .$$

Here is the angular velocity; λ is a constant depending on ω, the moments of inertia and on the coordinates of the center of gravity; μ is an arbitrary constant. From this several sufficient criteria of stability are given for permanent rotations. The general case of arbitrary distribution of masses is considered as well as a series of special cases. In an illustative way the ranges of stability are determined on the cone of the permanent axes. The obtained results are illustated by numerous examples: e.g. for the conditions of S.Kovalevskij, Stecklov, N.Kovalevski and in further integrable cases.

INSTITUTION: Moscow.

RUMYANTSEV, V.V.

Correction to the article of V.V. Rumiantsev "Stability of permanent rotations of a heavy solid." Prikl. mat. i mekh. vol.20, no.1, 1956. Prikl. mat. i mekh. 20 no.6:772 N-D '56. (MLRA 10:8)
(Stability) (Motion)

~~RUMYANTSEV, V.V.~~ RUMYANTSEV, V.V.

SUBJECT USSR/MATHEMATICS/Differential equations CARD 1/2 PG - 692
AUTHOR RUMJANZEV V.V.
TITLE On the stability theory of control systems.
PERIODICAL Priklad.Mat.Mech. 20, 714-722 (1956)
reviewed 4/1957

Let the automatic control system with several control elements

$$\eta_i' = \sum_{\alpha=1}^{n} b_{i\alpha}\eta_\alpha + \sum_{\beta=1}^{k} h_{i\beta} f_\beta(\sigma_\beta) \qquad (i=1,\dots,n),$$

(1)

$$\sigma_\beta = \sum_{i=1}^{n} j_{\beta i}\eta_i \qquad (\beta=1,\dots,k)$$

be given. Here $b_{i\alpha}$, $h_{\beta i}$, $j_{\beta i}$ are constants, σ_β control parameters and $f_\beta(\sigma_\beta)$ continuous functions which satisfy all the conditions which are necessary for the uniqueness of the solutions of (1); $f_\beta(0) = 0$. Furthermore $1 \leq k < n$. In order to examine the stability of the trivial solution (this is to be the only equilibrium position which is possible) the system (1) is transformed, by introduction of the new variables

$$x_\alpha = \eta_\alpha \ (\alpha=1,\dots,m), \quad x_s = \sigma_{s-m} \quad (s=m+1,\dots,n), \quad f_s(x_s) = f_{s-m}(\sigma_{s-m}),$$

Priklad.Mat.Mech. 20, 714-722 (1956) CARD 2/2 PG - 692

into the form

(2) $$x_i' = \sum_{j=1}^{n} a_{ij}x_j + \sum_{s=m+1}^{n} g_{is}f_s(x_s) \qquad (i=1,\dots,n).$$

If it is put $f_s(x_s) = (c_s + \varepsilon\varphi_s(x_s))x_s$, then the linear system

(3) $$x_i' = \sum_{j=1}^{n} \alpha_{ij}x_j, \qquad \begin{array}{ll} \alpha_{i\beta} = a_i & (i=1,\dots,n) \\ & (\beta=1,\dots,m) \\ \alpha_{is} = a_{is}+c_s g_{is} & (s=m+1,\dots,n) \end{array}$$

is obtained which corresponds to the non-linear system (2). By application of Liapunov's direct method the author finds the conditions under which asymptotic stability or instability simultaneously hold for (2) and (3), Furthermore several related questions are discussed. Most of the results can already be found in the papers of Malkin, Letov, Lurje etc.

RUMYANTSEV, V.V. (Moskva)

Stability of permanent rotation of a solid body around a fixed point. Prikl.mat. i mekh. 21 no.3:339-346 My-Je '57. (MIRA 10:10)
(Motion) (Differential equations)

RUMYANTSEV, V.V.

Stability of motion with respect to the side of variables.
Vest. Mosk. un.Ser. mat. mekh. astron. fiz. khim. 12 no.4:9-16
'57. (MIRA 11:5)
(Motion)

RUMYANTSEV, V.V.

AUTHOR: Rumyantsev, V.V. (Moscow) 40-21-6-2/18

TITLE: The Stability of Rotation of a Solid Body With Ellipse-Shaped Cavities Filled With Liquid (Ustoychivost' vrashcheniya tverdogo tela s ellipsoidal'noy polost'yu, napolnennoy zhidkost'-yu)

PERIODICAL: Prikladnaya Matematika i Mekhanika, 1957, Vol 21, Nr 6, pp 740-748 (USSR)

ABSTRACT: The problem of the gyroscopic movement of rigid bodies which in their interior possess cavities filled with liquid, was repeatedly considered during the last time in Russian literature. The present paper is a contribution to this problem. The author essentially bases on papers of Sobolev [Ref 5] and Chetajev [Ref 6,8]. Especially the latter one applied Lyapunov's ideas in order to investigate the stability of the revolutions of the gyroscope. In the present paper now sufficient conditions for the stability of the revolution of the considered gyroscope around the vertical are investigated. The gyroscope itself is considered to be heavy, i.e. its center of gravity lies above the point of support. The ellipsoidal-shaped cavity is filled with an ideal, friction-

Card 1/2

The Stability of Rotation of a Solid Body With Ellipse-Shaped Cavities Filled With Liquid 40-21-6-2/18

less liquid which carries out a homogeneous vortex motion. The author investigates the stability of the undisturbed motion, even for the case that the cavity does not represent an ellipsoid of revolution but a general ellipsoid. Free liquid surfaces do not exist within the cavity. Some special cases are calculated. It is possible to give the conditions of stability according to Lyapunov's method. There are 8 references, 6 of which are Soviet, 1 English, and 1 French.

SUBMITTED: June 23, 1957

AVAILABLE: Library of Congress

1. Bodies of revolution--Stability--Theory

Card 2/2

RUMYANTSEV, V.V., doktor fiziko-matematicheskikh nauk.

The great Russian scientist A.M. Liapunov; on the occasion of the centennial anniversary of his birth. Vest. AN SSSR 27 no.6:44-49 Je '57. (MIRA 10:7)

(Liapunov, Aleksandr Mikhailovich, 1857-1918)

Rumyantsev, V. V.

20-2-6/50

AUTHOR: RUMYANTSEV, V.V.

TITLE: On the Motion of a Heavy Solid Body With a Fixed Point (K zadache o dvizhenii tyazhelogo tverdogo tela s odnoy nepodvizhnoy tochkoy).

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol.116, Nr 2, pp.185-188 (USSR)

ABSTRACT: In addition to his preceding publication [5] the author considers the stability behavior of a heavy solid body with a fixed point under the assumption that the moments of inertia with respect to the main axes are different from each other: $A \neq B \neq C \neq A$, and that the center of gravity lies on one of the axes: $x_0 \neq 0$, $y_0 = z_0 = 0$. With the aid of Lyapunov's and Chetayev's methods several statements are made, e.g. that the permanent rotations around all the admissible axes (see Staude [1]) lying in the xy-plane are unstable in the case $C > B > A$.

ASSOCIATION: Mechanical Institute, Acad.Sci. USSR (Institut mekhaniki AN SSSR)

SUBMITTED: April 8, 1957

AVAILABLE: Library of Congress

CARD 1/1

RUMYANTSEV, V. V. (Prof.) (Moscow)

"Die Stabilitaet des Kreisels in Kardanischer Aufhaengung."

report presented in Prague, October 1958.

Int'l. Mathematical News, No. 59/60, Vienna, Jan 1959, Uncl.

SOV/40-22-3-9/21

AUTHOR: Rumyantsev, V.V. (Moscow)

TITLE: On the Stability of the Motions of a Gyroscope in Cardanic Suspension (Ob ustoychivosti dvizheniya giroskopa v kardanovom podvese)

PERIODICAL: Prikladnaya matematika i mekhanika, 1958, Vol 22, Nr 3, pp 374 - 378 (USSR)

ABSTRACT: Starting from investigations of several authors the author considers in the present paper the stability behavior of a symmetric gyroscope in Cardanic suspension and thereby he takes into account the influence of the masses of the Cardan rings. It is assumed that the external Cardan axis is fixed in the space and vertical. The internal Cardan axis is assumed to be able to move in a horizontal plane. The center of gravity of the system is to lie on the axis of symmetry of the gyroscope.

Under the given assumptions now the stability of the vertical position of the gyroscope is proved by the construction of a Lyapunov function. The Lyapunov function is obtained thereby as a linear combination of the integrals of the problem. The following integrals are applied: 1. Theorem of energy, 2. the

Card 1/2

constancy of the vertical impulse component and 3. the stability of the impulse component of the rotor in the direction of the rotor axis. It is shown that the obtained stability condition is not only sufficient but also necessary.
In a concluding chapter it is investigated how dissipative forces take effect on the stability behavior of the gyroscope mounted on gimbals. It is assumed that frictional forces are effective around the axes of the Cardanic suspensions. For the special assumption on which these frictional forces were based the motions of the system remain asymptotically stable. This result is even retained, if the masses of the Cardan rings are subsequently neglected. It is shown that in this case the stability is identical with the secular stability given by Kelvin.
There are 3 references, 2 of which are Soviet, and 1 is German.

SUBMITTED: January 10, 1958

16(1)

SOV/40-22-4-10/26

AUTHOR: Rumyantsev, V.V. (Moscow)

TITLE: On the Stability of Motions of a Gyroscope in Cardanic Suspension. II (Ob ustoychivosti dvizheniya giroskopa v kardanovom podvese. II)

PERIODICAL: Prikladnaya matematika i mekhanika, 1958, Vol 22, Nr 4, pp 499 - 503 (USSR)

ABSTRACT: In addition to the first part of the paper the author continues the stability investigations for the motions of a heavy symmetric gyroscope in Cardanic suspension. While in the first investigations the fixed external Cardan axis was assumed to be vertical, now this axis is supposed to be horizontal. This case practically appears in many gyroscopic instruments applied in navigation.
The investigation method does not differ from the methods applied in the first part of the paper. The components of inertia of the Cardan rings are considered. Starting from an expression for the kinetic energy the author calculates the equations of motion according to the method of Lagrange. The existence of the first integrals from the energy theorem

Card 1/3

and from the theorem of momentum allows the establishment of a Lyapunov function as a linear combination of the first integrals. From the condition for positive definiteness of the Lyapunov function and of negative definiteness of its total derivative with respect to the time the stability of the motions of the gyroscope can be derived according to well-known theorems of Lyapunov and Chetayev.
Besides general investigations of this kind also the special case is considered that the system turns through 90 degrees around the internal Cardan axis. In this case the planes of internal and external Cardan ring coincide so that the system loses one of its degrees of freedom in this special position. This motion is unstable as it is well-known. The instability can be read from the Lyapunov function.
Furthermore a practically interesting case is investigated in which the fixed external Cardan axis is connected with a supporting motor. The moment of the supporting motor can be chosen so that the rotor axis of the gyroscopic system maintains a constant position in the space. An investigation of the stability of this system shows that stable relations can be ex-

On the Stability of Motions of a Gyroscope in Cardanic Suspension II

SOV/40-22-4-10/26

pected.
There are 3 references, 2 of which are Soviet, and 1 German.

SUBMITTED: April 11, 1958

Card 3/3

10(14) SOV/20-124-2-13/71

AUTHOR: Rumyantsev, V. V.

TITLE: On the Stability of the Equilibrium of a Solid Body Which has Cavities Filled With a Liquid (Ob ustoychivosti ravnovesiya tverdogo tela, imeyushchego polosti, napolnennyye zhidkost'yu)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 2, pp 291-294 (USSR)

ABSTRACT: Short reference is first made to some earlier papers dealing with this subject. The present paper deals with the problem of proving the Lagrange theorem for a solid body with liquid filling. For this purpose the author bases his investigations upon the fundamental work by A. M. Lyapunov. The aforementioned liquid is in this connection considered to be homogeneous, incompressible, and ideal. The position of the solid with respect to a certain immobile system of coordinates (Oxyz) can be determined by the independent coordinates $q_i (i = 1,\dots,n \leqslant 6)$, and the potential energy V_1 of the body is a function of these coordinates. The potential energy V_2 of the liquid depends in general on the coordinates q_i and also on the position of the

Card 1/2

liquid with respect to the body. If the definition supplied by Lyapunov is used for the stability of the shape of the liquid corresponding to equilibrium, and if, by equilibrium of the body stability in Lyapunov's sense with respect to the determining parameters q_i of the body and their derivatives q_i' with respect to time is understood, the correctness of the Lagrange theorem for the case of a solid body filled with a liquid can be proved: The theorem thus resulting is the following: If in the position of equilibrium the potential energy V of a solid body filled with a liquid has an isolated minimum V_o, then this position of equilibrium is stable in the sense mentioned. The author further supplies proof of this theorem, which, by the way, holds also in the case of viscous liquids. There are 6 references, 5 of which are Soviet.

ASSOCIATION: Institut mekhaniki Akademii nauk SSSR (Institute for Mechanics of the Academy of Sciences, USSR)

PRESENTED: September 19, 1958, by L. I. Sedov, Academician

SUBMITTED: September 15, 1958

RUMYANTSEV, V. V. - USSR Academy of Sciences, Leningrad Road 7. Moscow D-40 - USSR.

"A Stability Motion ~~THX~~ Theorem and its Application to the Investigation of Stability of a Rigid Body Filled By Fluid."

report submitted for the 10th Intl. Congress of Applied Mechanics, Stresa, Italy, 31 Aug-7 Sep. 1960.

16.7000, 16.3400

77980
SOV/40-24-1-8/28

AUTHOR: Rumyantsev, V. V. (Moscow)

TITLE: A Theorem on the Stability of Motion

PERIODICAL: Prikladnaya matematika i mekhanika, 1960, Vol 24, Nr 1, pp 47-54 (USSR)

ABSTRACT: The author gives first a proof of a theorem on the stability of a particular unperturbed motion:

$$q_i = f_i(t) \qquad (i = 1, \ldots, n) \qquad (1.1)$$

of an arbitrary holonomic mechanical system relative to certain given functions $Q_1, \ldots, Q_k$ of the generalized coordinates q_i, the velocities q_i, and the time. As a simple example, he uses the theorem to give a sufficient condition for the rotational stability of a

Card 1/7

solid about the vertical. The main portion of the paper is devoted to the motion of a free solid, containing a cavity completely or partially filled with a homogeneous incompressible perfect fluid, the cavity being a surface of revolution. The inertia ellipsoid of the body is assumed to have the same axis as the surface of revolution. If the fluid has a free surface the pressure on it is presumed constant. The theorem proved (Chetayev, N., Stability of Motion, Gostekhizdat, 1955) states that when the equations

$$\frac{dx_j}{dt} = X_j(t, x_1, \ldots, x_{2n}) \qquad (j = 1, \ldots, 2n) \qquad (1.2)$$

for the perturbations x_j $(j = 1,\ldots,2n)$ in the q_i and q_i have a first integral

$$\varphi(x_1, \ldots, x_{2n}, t) = \text{const} \qquad (1.5)$$

and when a positive-definite function $\Phi(y_1, \ldots, y_k, t)$ can be found such that

$$\Phi(y_1, \ldots, y_k, t) \quad \varphi(x_1, \ldots, x_{2n}, t) \qquad (1.6)$$

holds for all t, x_j in the region

$$t \geq t_0, \quad x_1^2 + \cdots + x_{2n}^2 < H \qquad (1.3)$$

and t, y_s in the region

$$t \geq t_0, \quad y_1^2 + \cdots + y_k^2 < H_1 \qquad (1.4)$$

then the motion (1.1) is stable, relative to the Q_1.

Card 3/7

Here, H and H_1 are certain positive constants, the

X_j are analytic in the x_j for $t \geq t_o$ with $X_j(t,0,..,0) = 0$. The quantities $y_s = Q_s - F_s$, the $F_s(j)$ being known functions to which the Q_s reduce for the unperturbed motion. Stability here is in the sense of Lyapunov, i.e., f $|y_s|$ is less than some constants for each s, when the magnitudes of the initial data perturbations are sufficiently small, then (1.1) is stable. The author then studies the motion in which the center of mass of the fluid-body system moves rectilinearly with constant speed. This case is used in approximating a large portion of the flat trajectory of a missile. The only forces acting on the body are therefore assumed to be an overturning couple due to air pressure. The moment of this couple is assumed to be proportional to the sine of the angle between a fixed axis in the body and the direction of the velocity vector of the center of mass. He then uses general theorems on the relative motion of a mechanical system near its center of mass to establish some first integrals of theequations of motion of the body-fluid system. These are then used to study the rotational stability of the solid with a steady fluid motion given by:

$$\omega_1 = \omega_2 = 0, \quad \omega_3 = \omega, \quad \gamma_1 = \gamma_2 = 0, \quad \gamma_3 = 1$$
$$v_1 = v_2 = v_3 = 0, \quad g_1 = g_2 = 0, \quad g_3 = g \qquad (2.6)$$

(It is possible to consider relative motion, i.e., as if the center of mass is fixed.) relative to the components of the angular velocity of the body ω_1, ω_2, ω_3, the components v_1, v_2, v_3 of the velocity of a fixed point in the body (either the center of mass of the combined system, if the cavity is completely filled, or that of the body). The components g_1, g_2, g_3 of the angular momentum of the fluid, and the direction cosines γ_1, γ_2, γ_3 of a fixed axis in space relative to the moving coordinate system fixed in the body. All the above components are relative to a coordinate system fixed in the body. Three integrals of the variational equations are used to compose a certain function of these variables. If the conditions

$$(C\omega + g)^2 - 4(A + S)a > 0 \qquad (2.11)$$

$$(g/S + \lambda)\eta \geqslant 0 \qquad (2.12)$$

are fulfilled, it is shown that this function will be positive-definite and will satisfy the conditions of the theorem so that the motion will be stable. Here, A, C are the principal moments of inertia of the body, S is a quantity which is proportional to

A Theorem on the Stability of Motion

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SOV/40-24-1-8/28

the largest of the principal moments of inertia of the fluid, a is the constant of proportionality for the external moment, η is the variation in g, and λ is a certain constant. If $\lambda = -g/S$, the author obtains the sufficient condition deduced by him (Prik. matem. i mekh., 1959, Nr 6). He also shows that the condition (2.11) is sufficient for the stability in the first approximation to the equations of motion. He also notes that if the fluid motion is always irrotational, the stability condition (2.12) will be satisfied. There are three Soviet references.

SUBMITTED: November 14, 1959

Card 7/7

82489

S/040/60/024/04/02/023
C 111/ C 333

10.2000

AUTHOR: Rumyantsev, V. V. (Moscow)

TITLE: On the Stability of the Rotation of a Gyroscope With a Hollow Space Filled With a Viscous Fluid

PERIODICAL: Prikladnaya matematika i mekhanika, 1960, Vol. 24, No. 4, pp. 603-609

TEXT: The author considers an unsymmetrical heavy rigid body with a fixed point O and with a hollow space of arbitrary form filled with a homogeneous, incompressible, viscous fluid. Let O_{xyz} be the common main axes of inertia of the body and of the hollow space. Let A_1, B_1, C_1 and A_2, B_2, C_2 be the corresponding main moments of inertia of the body and of the hollow space. Body and fluid are understood as a mechanic system, the equations of motion of which are obtained from the angular momentum theorem. In addition there are the Navier-Stokes equations for the fluid and the incompressibility condition. If the center of gravity of the system is on the O_z-axis in the point z_0, then the equations admit a particular solution whichdescribes the uniform rotation of the system around the vertical axis. The author

Card 1/2

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C 111/ C 333

On the Stability of the Rotation of a Gyroscope With a Hollow Space Filled With a Viscous Fluid

investigates the stability of this motion with respect to the instantaneous components of the angular velocity of the body p, q, r, with respect to the components of angular momentum of the fluid G_{2x}, G_{2y}, G_{2z} and to the direction cosines $\gamma_1, \gamma_2, \gamma_3$ of the vertical. As a sufficient stability condition the author gives

$$(2.10) \quad (C - A) w^2 - Mgz_0 > 0, \text{ where } C = C_1 + C_2, \; A = A_1 + A_2,$$

$$w = \frac{1}{C_2} G_{2z},$$

M mass of the system. If $C_2 > A_2$, $C - A > 0$, then the system is stable too, even though the rigid body alone were unstable for $A_1 > C_1$.

N. G. Chetayev, S. L. Sobolev, N. Ye. Zhukovskiy and Lyapunov are mentioned in the paper.

There are 6 references: 5 Soviet and 1 French.

SUBMITTED: February 27, 1960

Card 2/2

RUMYANTSEV, V.V. PHASE I BOOK EXPLOITATION SOV/6201

25

Vsesoyuznyy s"yezd po teoreticheskoy i prikladnoy mekhanike. 1st, Moscow, 1960.

Trudy Vsesoyuznogo s"yezda po teoreticheskoy i prikladnoy mekhanike, 27 yanvarya -- 3 fevralya 1960 g. Obzornyye doklady (Transactions of the All-Union Congress on Theoretical and Applied Mechanics, 27 January to 3 February 1960. Summary Reports). Moscow, Izd-vo AN SSSR, 1962. 467 p. 3000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Natsional'nyy komitet SSSR po teoreticheskoy i prikladnoy mekhanike.

Editorial Board: L. I. Sedov, Chairman; V. V. Sokolovskiy, Deputy Chairman; G. S. Shapiro, Scientific Secretary; G. Yu. Dzhanelidze, S. V. Kalinin, L. G. Loytsyanskiy, A. I. Lur'ye, G. K. Mikhaylov, G. I. Petrov, and V. V. Rumyantsev; Resp. Ed.: L. I. Sedov; Ed. of Publishing House: A. G. Chakhirev; Tech. Ed.: R. A. Zamarayeva.

Card 1/6

25

PURPOSE: This book is intended for scientific and engineering personnel who are interested in recent work in theoretical and applied mechanics.

COVERAGE: The articles included in these transactions are arranged by general subject matter under the following heads: general and applied mechanics (5 papers), fluid mechanics (10 papers), and the mechanics of rigid bodies (8 papers). Besides the organizational personnel of the congress, no personalities are mentioned. Six of the papers in the present collection have no references; the remaining 17 contain approximately 1400 references in Russian, Ukrainian, English, German, Czechoslovak, Rumanian, French, Italian, and Dutch.

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S/040/61/025/001/002/022
B125/B204

13,2520

AUTHOR: Rumyantsev, V. V. (Moscow)

TITLE: The stability of the motion of gyrostats

PERIODICAL: Prikladnaya matematika i mekhanika, v. 25, no. 1, 1961, 9-16

TEXT: The author investigates several motions of heavy gyrostats with an immobile point by employing the second Lyapunov method. The body S_1 has a fixed point O at the origin of two rectangular systems of coordinates: the axis of the immobile system of coordinates $O\xi\eta\zeta$ has an upward vertical direction, and the axes of the moving system of coordinates Oxyz shift with the principal axes of inertia of the gyrostat S with respect to the latters' fixed point O. The equations of motion of this heavy gyrostat read:

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$$A\frac{dp}{dt} + \frac{dk_1}{dt} + (C - B)qr + qk_3 - rk_2 = P(z_0\gamma_2 - y_0\gamma_3)$$

$$B\frac{dq}{dt} + \frac{dk_2}{dt} + (A - C)rp + rk_1 - pk_3 = P(x_0\gamma_3 - z_0\gamma_1) \qquad (1.1)$$

$$C\frac{dr}{dt} + \frac{dk_3}{dt} + (B - A)pq + pk_2 - qk_1 = P(y_0\gamma_1 - x_0\gamma_2)$$

P is the weight of the gyrostat; the constants x_0, y_0, z_0 are the coordinates of its center of mass; $\gamma_1, \gamma_2, \gamma_3$ are the cosines of the angles between the verticals $O\zeta$ and the fixed axes x,y,z. For the cosines $\frac{d\gamma_1}{dt} = r\gamma_2 - q\gamma_3$, $\frac{d\gamma_2}{dt} = p\gamma_3 - r\gamma_1$, $\frac{d\gamma_3}{dt} = q\gamma_1 - p\gamma_2$ (1.2) holds. These equations (1.1) and (1.2), however, in general are not sufficient for a complete study of the motion of the heavy gyrostat, and, in addition, the equations of the relative motion of the body S_2 are required, which depend on the shape of the body S_2, on the character of the conditions

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imposed upon it, and on the forces acting upon it. If the vector $\vec{k}$ is known from the beginning, or especially if it is constant, (1.1) and (1.2) suffice for investigating the motion of the gyrostat. The following are several first integrals of the equation of motion of the gyrostat: If the internal forces acting upon S_2 have a force function U, and if the conditions are steady, one obtains for the integral of the energies

$$Ap^2 + Bq^2 + Cr^2 + 2(pk_1+qk_2+rk_3) + 2(T_2-U) + 2P(x_o\gamma_1+y_o\gamma_2+z_o\gamma_3) = \text{const.}$$

Here T_2 is the kinetic energy of S_2 in its relative motion. With k_i = const, the first integral reads: $Ap^2+Bq^2+Cr^2+2P(x_o\gamma_1+y_o\gamma_2+z_o\gamma_3)$ = const (1.4). The surface integral is $(Ap+k_1)\gamma_1+(Bq+k_2)\gamma_2+(Cr+k_3)\gamma_3$ = const (1.5), and the integral characterizing the constancy of the angular momentum reads $(Ap+k_1)^2+(Bq+k_2)^2+(Cr+k_3)^2$ = const (1.6). From (1.2) follows $\gamma_1^2+\gamma_2^2+\gamma_3^2 = 1$. The second part deals with the stability of the permanent rotations of a gyrostat ($x_o=y_o=z_o=0$), if k_i ($i = 1,2,3$) are given

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constants. In this case, N. Ye. Zhukovskiy gave the first geometric interpretation (Ref. 2). The author, however, studies stability by the direct Lyapunov method. The permanent axis is assumed to have an unchanged position within the body, which is assumed to be determined by the direction cosines α, β, γ in the mobile axes; it then follows from (1.1) that $(C-B)\beta\gamma\omega^2 + \omega(\beta k_3 - \gamma k_2) = 0$, $(A-C)\gamma\alpha\omega^2 + \omega(\gamma k_1 - \alpha k_3) = 0$, $(B-A)\alpha\beta\omega^2 + \omega(\alpha k_2 - \beta k_1) = 0$ (2.2). From these equations the angular velocity ω may then be determined. The equations by Staude-Mlodzeyevskiy follow herefrom as a special case. The equations of the perturbed motion lead to the first integrals

$$V_1 = A(\xi_1^2 + 2p_0\xi_1) + B(\xi_2^2 + 2q_0\xi_2) + C(\xi_3^2 + 2r_0\xi_3) = \text{const}$$

$$V_2 = A^2(\xi_1^2 + 2p_0\xi_1) + B^2(\xi_2^2 + 2q_0\xi_2) + C^2(\xi_3^2 + 2r_0\xi_3) + 2(Ak_1\xi_1 + Bk_2\xi_2 + Ck_3\xi_3) = \text{const.} \quad (2.4)$$

and the corresponding Lyapunov function reads:

$$V = \lambda V_1 - V_2 = \frac{Ak_1}{p_0}\xi_1^2 + \frac{Bk_2}{q_0}\xi_2^2 + \frac{Ck_3}{r_0}\xi_3^2 \quad (2.5)$$

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where because of the equations (2.2) it holds

$$\lambda = \frac{Ap_o + k_1}{p_o} = \frac{Bq_o + k_2}{q_o} = \frac{Cr_o + k_3}{r_o}$$

In the case of $A \geqslant B$, $x_o = y_o = 0$, $z_o \neq 0$, $k_1 = k_2 = 0$, $k_3 = k = \text{const}$ (1.3) (uniform motion of the gyrostat with arbitrary angular velocity ω of the gyrostat round the vertical axis z), it follows for the first integrals

$$\begin{aligned} V_1 &= Ap^2 + Bq^2 + C(\xi^2 + 2\omega\xi) + 2Pz_0\zeta = \text{const} \\ V_2 &= Ap\gamma_1 + Bq\gamma_2 + C\xi + C(\omega + \xi)\zeta + k\zeta = \text{const} \\ V_3 &= \gamma_1^2 + \gamma_2^2 + \zeta^2 + 2\zeta = 0 \end{aligned} \qquad (3.3)$$

and for the Lyapunov function

$$\begin{aligned} V = V_1 - 2\omega V_2 + (C\omega^2 + k\omega - Pz_0)V_3 + \tfrac{1}{4}\mu V_3^2 = \\ = Ap^2 - 2A\omega p\gamma_1 + (C\omega^2 + k\omega - Pz_0)\gamma_1^2 + \\ + Bq^2 - 2B\omega q\gamma_2 + (C\omega^2 + k\omega - Pz_0)\gamma_2^2 + \\ + C\xi^2 - 2C\omega\xi\zeta + (C\omega^2 + k\omega - Pz_0 + \mu)\zeta^2 + \cdots \end{aligned} \qquad (3.4)$$

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Next, the stability of the rotation of a symmetric gyrostat ($A = B$, $x_0 = y_0 = 0$, $z_0 \neq 0$, $k_1 = k_2 = 0$) is studied. For the first integrals there follows (4.7) and for V (4.8). The results found for k_i = const ($i = 1,2,3$) are also applicable to heavy bodies, multiply connected, having cavities entirely filled with perfect homogeneous liquids (with eddy-free motion). According to N. Ye. Zhukovskiy, the equations of motion of such a gyrostat have the form of Eqs. (1.1). There are 6 references: 5 Soviet-bloc and 1 non-Soviet-bloc.

SUBMITTED: November 14, 1960

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29408
S/055/61/000/005/003/004
D205/D303

24.4100

AUTHOR: Rumyantsev, V.V.

TITLE: On the motion of some systems with non-ideal constraints

PERIODICAL: Moscow. Universitet. Vestnik. Seriya I. Matematika, Mekhanika, no. 5, 1961, 67 - 75

TEXT: The author considers the motion of a system consisting of points P_ν of masses m_ν, with respect to some Cartesian coordinate system, the coordinates of those points being x_ν, y_ν, z_ν ($\nu = 1,\dots, n$). The force acting on the points is $E_\nu(X_\nu, Y_\nu, Z_\nu)$. Differentiating theequation of constraints with respect to time

$$\sum_\nu (a_{s\nu} x''_\nu + b_{s\nu} y''_\nu + c_{s\nu} z''_\nu) + e_s = 0, \qquad s = 1,\dots, p, \qquad (1)$$

where $a_s, \dots e_s$ are functions of given coordinates, velocities x'_ν, y'_ν, z'_ν, points P_ν and time t. The sum of elementary work of the reactions of ideal constraints is

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$$\sum_{\nu}(N_{\nu x}\delta x_{\nu} + N_{\nu y}\delta y_{\nu} + N_{\nu z}\delta z_{\nu}) = 0, \qquad (3)$$

An assumption is made that displacements determined by

$$\sum_{\nu}(\alpha_{r\nu}\delta x_{\nu} + \beta_{r\nu}\delta y_{\nu} + \gamma_{r\nu}\delta z_{\nu}) = 0, \qquad r = 1, \ldots, q, \qquad (4)$$

are among those possible for a system with non-ideal constraints. $\alpha_{r\nu}$, ... are known functions of coordinates and velocities of given points. These are called (A) - displacements. The necessary and sufficient condition for their existance is given. The equation

$$\sum_{\nu}(R_{\nu x}\delta x_{\nu} + R_{\nu y}\delta y_{\nu} + R_{\nu z}\delta z_{\nu}) = 0. \qquad (5)$$

can be regarded as an axiom of non-ideal constraints. The sum of elemental work of forces $\overline{F}_{\nu}$ and the inertia forces on any (A) - displacement is equal to zero. The Gaussian principle is obtained for such systems. Theorem 1: The deviation of the actual motion of a system with non-ideal constraints from any (A) - motion is less than the deviation of the latter from the true

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motion of a system free from all constraints. Theorem 2: The deviation of the actual motion of a system with non-ideal constraints from the actual motion of a system free from any constraints is less than the deviation of the latter from any (A) - displacements. Appell's equations can be derived from the Gaussian principle and an equation of motion of a system with non-ideal constraints is obtained

$$\frac{\partial S}{\partial q''_\beta} = Q_\beta + \sum_{r=1}^{p_2} \mu_r D_{r\beta}, \qquad \beta = 1, \ldots, l, \qquad (22)$$

where $D_{r\beta}$ are known functions q_j, q'_j $(j = 1 \ldots k)$, t and $\sum_{\beta=1} D_{r\beta} \delta q''_\beta = 0$ $r = 1 \ldots, p_2$. Solving the last equation $\delta q''_r = \Sigma$

$$\delta q''_r = \sum_{s=p_2+1}^{l} c_{rs} \delta q''_s, \qquad r = 1, \ldots, p_2, \qquad (23)$$

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is obtained where c_{rs} are known functions, q_j, q'_j ($j = 1 \ldots k$)t and the variations $\delta q''_s$ ($s = p_2 + 1, \ldots, l$,) are arbitrary. When $c_{rs} \equiv 0$ ($r = 1, \ldots p_2$, $s = p_2 + 1 \ldots, l$) the equations of motion of a system with non-ideal constraints have the same form as those for systems with ideal constraints. There are 4 references: 3 Soviet-bloc and 1 non-Soviet-bloc.

SUBMITTED: June 8, 1961

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RUMYANTSEV, V.V. (Moskva)

Stability of the motion of gyrostats. Prikl. mat. i mekh. 25 no.6:9-16 Ja-F '61. (MIRA 14:6)

(Gyroscope)

RUMYANTSEV, V.V.

Motion of certain systems with nonideal constraint. Vest. Mosk. un. Ser. 1: Mat., mekh. 16 no.5:67-76 S-O '61.
(MIRA 14:11)

1. Kafedra teoreticheskoy mekhaniki Moskovskogo universiteta.
(Mechanics, Analytic)

26139
S/040/61/025/004/018/021
D274/D306

13.2520

AUTHOR: Rumyantsev, V.V. (Moscow)

TITLE: The stability of certain types of gyrostats

PERIODICAL: Prikladnaya matematika i mekhanika, v. 25, no. 4, 1961, 778-784

TEXT: Four types of heavy gyrostats are considered which are supported by a fixed horizontal plane. Type 1: The gyrostat consists of rigid body S_1 and rotor S_2. The axis of S_2 coincides with the axis of rotation of its inertia ellipsoid. The equation of motion of S_2 with respect to S_1 is given. The amount of momentum G of the gyrostat with respect to any point is equal to the geometric sum of the moments of momenta of S_1 and S_2. A modified rigid body is considered, obtained by joining to S_1 an infinitely thin rod of mass m_2 and center of gravity at O_2 (m_2 and O_2 are also the mass and center of gravity of S_2). A formula is obtained for the moment of momentum of the modified body which shows that if the gyrostat has a

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fixed point O, then its equation of motion have the form of equations (1.1) of V.V. Rumyantsev (Ref. 1: Ob ustoychivosti dvizheniya girostatov, PMM, 1961, v. 25, no. 1), all the results therein contained being applicable to system S_1S_2, (for the case k_i = const., k_i being the projections of the unit vector of the rotor axis);
Type 2: The motion of the Gerve /Abstracter's note: Russian transliteration/ gyroscope is considered on an absolutely smooth horizontal plane, under the effect of gravity. The pertinent theory was developed by Carvallo on the assumption that S_1 has no mass; taking into account the mass leads to a more complicated theory. From the integrals of energy and areas one obtains

$$(b + e \cos^2\theta)(1 + c \cos^2\theta)\theta'^2 = (\alpha - a \sin\theta)(1 + c \cos^2\theta) - (\beta - c_2\omega \cos\theta)^2 \qquad (2.5)$$

where

$$a = \frac{2Mgl}{B},\ b = \frac{A}{B},\ c = \frac{C-B}{B},\ c_2 = \frac{C_2}{B},\ e = \frac{Ml^2}{B},\ \alpha = \frac{h}{B},\ \beta = \frac{k}{B}$$

M being the mass of the gyroscope, h and k - arbitrary constants.

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θ - the angle between z_1 and z, ω - the angular velocity. Eq. (2.5) can be integrated, leading to a hyper-elliptical integral for t; thereupon, the angles Ψ and α can be found by quadratures. (Ψ is the angle between x_1 and x). Type 3: This type differs from Type 2 by the design of the mounting only, which has an additional degree of freedom as compared to Type 2. The stability of vertical equilibrium is considered, determined by

$$\theta = \tfrac{1}{2}\pi, \quad \theta' = 0, \quad \Psi = \text{const}, \quad \Psi' = 0, \quad \varphi = \varphi' = 0, \quad \omega = \text{const} \qquad (3.4)$$

The function V is introduced

$$V = V_1 + \lambda V_2{}^2 = A\theta_1{}'^2 + C\varphi'^2 + Mga_1\varphi^2 + $$
$$+ B(1 + \lambda B)\Psi'^2 - 2\lambda BC_2\omega\theta_1\Psi' + (C_2{}^2\omega^2\lambda - Mgl)\theta_1{}^2 + \ldots \qquad (3.6)$$

λ being some constant. According to Sylvester's criterion, the V-function is a positive definite if

$$a_1 > 0, \qquad C_2{}^2\omega^2 - BMgl > 0 \qquad (3.7)$$

(these conditions were obtained by an appropriate choice of λ); the derivative, with respect to time, of the V-function is zero, hence the V-function satisfies Lyapunov's stability conditions. Therefore condition (3.7) is the sufficient one for stability; it is shown that this is also the necessary condition. Condition $\alpha_1 > 0$ means that the geometrical center of the supporting circular segment should lie higher than the center of gravity of the instrument. The second of the conditions (3.7) permits determining the lowest angular velocity ω of rotor S_2, for which the gyrostat is stable. This condition is compared with Mayyevskiy's stability condition. Type 4: The rigid body S_1 has a spherical base which touches the supporting horizontal plane at one point only; (S_1 can be a hollow sphere). The axis of rotor S_2 is assumed as coinciding with the Oz-axis. The equations of motion are set up. The V-function is introduced:

$$V = V_1 + 2\lambda V_2 + \mu V_3 + \frac{1}{4}(C - A)\lambda^2 V_3^2 = \qquad (4.15)$$
$$= A(p^2 + q^2) + 2A\lambda(p\gamma_1 + q\gamma_2) + \mu(\gamma_1^2 + \gamma_2^2) +$$
$$+ C\beta_1^2 + 2C\lambda\beta_1\beta_2 + [(C - A)\lambda^2 + \mu]\beta_2^2 +$$
$$+ M(u^2 + v^2 + w^2) + 2C\left(r_0 + \lambda\frac{1}{a}\right)\beta_1 + \frac{1}{2}(C - A)\lambda^2(\gamma_1^2 + \gamma_2^2 + \beta_2^2)$$
$$\beta 2$$

where $\mu = Mga_1 - (Cr_o + C_2\omega)\lambda$, a_1 being the coordinate of the center 0_1 of the spherical base with respect to the Oz-axis. Sylvester's criterion leads to condition

$$\left(C - A\frac{a}{l}\right) r_o^2 + C_2\omega r_o + Mg\frac{a_1 l}{a} > 0 \quad (4.18)$$

which satisfies all the conditions of Lyapunov's theorem. If $a_1 < 0$, the center of gravity of the body is higher than the geometrical center 0_1 of the base. In that case the rotation will be stable for sufficiently great angular velocities, if $Cl > Aa$. If $a_1 > 0$, the center of gravity is above 0_1; the rotation will be stable for any angular velocity. In the case of an absolutely smooth horizontal plane, the necessary and sufficient stability condition is given by

$$(Cr_o + C_2\omega)^2 + 4AMga_1 > 0 \quad (4.17)$$

There are 6 references: 3 Soviet-bloc and 3 non-Soviet-bloc, which include 2 translations into Russian. The reference to the English-language publication reads as follows: S. O'Brien, T.L. Synge, The instability of the tippe-top explained by sliding friction. Proc.

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S/040/61/025/004/018/021
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The stability of certain types...

Irish Academy, 1954, v. 56, s. A. no. 3.

SUBMITTED: March 20, 1961

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S/040/61/025/006/001/021
D299/D304

AUTHOR: Rumyantsev, V.V. (Moscow)

TITLE: On systems with friction

PERIODICAL: Prikladnaya matematika i mekhanika, v. 25, no. 6, 1961, 969 - 977

TEXT: Painlevé's general definition of systems with friction is adopted which holds for any experimental law of friction. Some of Painlevé's results are extended to nonholonomic systems. Gauss's principle of least constraint is formulated for 2 types of such systems: With implicit friction forces and without implicit reaction forces (which is of greater interest). From Guass's principle the equations of motion of systems with friction are derived. By differentiating the initial equations, one obtains

$$\sum_{\nu} (a_{s\nu} x_{\nu}'' + b_{s\nu} y_{\nu}'' + c_{s\nu} z_{\nu}'') + e_s = 0 \quad (s = 1, \ldots, p, \; p = p_1 + p_2), \tag{1.3}$$

where a, b, c and e are known functions of the coordinates x, y, z,

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APPROVED FOR RELEASE: 08/22/2000 CIA-RDP86-00513R001446020018-5"

of the velocities of the points $P_\nu (\nu = 1, \ldots, n)$ of the system and of the time t. The virtual displacements δr_ν of the points P_ν are determined by p independent relationships

$$\sum_{\nu} (a_{s\nu}\delta x_\nu + b_{s\nu}\delta y_\nu + c_{s\nu}\delta z_\nu) = 0 \ (s = 1,\ldots,p). \quad (1.4)$$

Below, an extension of Painlevé's results to nonholomonic systems with friction is given. In order that the sum of the elementary work of a system of forces $F_{\nu x}$, $F_{\nu y}$, $F_{\nu z}$ on every virtual displacement of the system vanish, it is necessary and sufficient that the equalities

$$F_{\nu x} = \sum_{s=1}^{p} \lambda_s a_{s\nu}, \quad F_{\nu y} = \sum_{s=1}^{p} \lambda_s b_{s\nu}, \quad F_{\nu z} = \sum_{s=1}^{p} \lambda_s c_{s\nu} \qquad (\nu = 1, \ldots, n) \quad (1.8)$$

hold, where λ_s are coefficients which are the same for all the points of the system. Further, the reactions R_ν are considered. It is established that R_ν can be uniquely decomposed into 2 forces N_μ

and ρ_ν (called constraint force and friction force, respectively); their projections on the coordinate axes are:

$$N_{\nu x} = \sum_{s=1}^{p} \lambda_s a_{s\nu}, \quad N_{\nu y} = \sum_{s=1}^{p} \lambda_s b_{s\nu}, \quad N_{\nu z} = \sum_{s=1}^{p} \lambda_s c_{s\nu}$$

$$\rho_{\nu x} = \sum_{i=1}^{k} \mu_i A_{\nu i}, \quad \rho_{\nu y} = \sum_{i=1}^{k} \mu_i B_{\nu i}, \quad \rho_{\nu z} = \sum_{i=1}^{k} \mu_i C_{\nu i} \qquad (1.10)$$

The equations of motion can be written as

$$m_\nu x_\nu'' = X_\nu + \sum_s \lambda_s a_{s\nu} + \sum_i \mu_i A_{\nu i}$$

$$m_\nu y_\nu'' = Y_\nu + \sum_s \lambda_s b_{s\nu} + \sum_i \mu_i B_{\nu i} \quad (\nu = 1, \ldots, n) \qquad (1.11)$$

$$m_\nu z_\nu'' = Z_\nu + \sum_s \lambda_s c_{s\nu} + \sum_i \mu_i C_{\nu i}$$

If the law of friction is known, then the motion of the system is fully described by the 3n equations (1.11) in conjunction with the p equations of the constraints and k additional relationships, determined by the friction law. Assume the friction law is known. Then one obtains as the general dynamical equation of systems with friction, the equation

$$\sum_{\nu} \{(X_\nu + \rho_{\nu x} - m_\nu x_\nu'')\delta x_\nu + (Y_\nu + \rho_{\nu y} - m_\nu y_\nu'')\delta y_\nu + + (Z_\nu + \rho_{\nu z} - m_\nu z_\nu'')\delta z_\nu\} = 0 \qquad (2.2)$$

From (2.2) it is possible to obtain Gauss's principle of least constraint for systems with friction. According to this principle, among all the virtual accelerations, the real accelerations of points of a system with friction, minimize the function

$$A = \frac{1}{2}\sum_{\nu} m_\nu \left\{\left(\frac{X_\nu + \rho_{\nu x}}{m_\nu} - x_\nu''\right)^2 + \left(\frac{Y_\nu + \rho_{\nu y}}{m_\nu} - y_\nu''\right)^2 + \left(\frac{Z_\nu + \rho_{\nu z}}{m_\nu} - z_\nu''\right)^2\right\} \qquad (2.5)$$

and conversely, the minimum conditions for the function A, which satisfy conditions (1.3), lead to the equations of motion. The equations of motion of systems with friction can also be expressed in the form of Appel's equations. In Eq. (2.5), the friction forces are implicit, being components of the reactions of constraints. It is of greater interest, however, to set up G[redacted]s's principle for systems with friction without implicitly in[redacted]uding the friction forces in the function A. It is assumed that among the virtual displacements, there are displacements w[redacted] satisfy the conditions

$$\rho_{\nu x}\delta x_{\nu} + \text{[redacted]}_{\nu y}\delta y_{\nu} + \rho_{\nu z}\delta z_{\nu} = 0 \ (\nu = 1, \ldots, n). \quad (3.1)$$

For these displacements, the relation

$$\sum_{\nu} (R_{\nu x}\delta x_{\nu} + R_{\nu y}\delta y_{\nu} + R_{\nu z}\delta z_{\nu}) = 0 \quad (3.2)$$

holds. The set of virtual displacements which satisfy (3.1) are called (c)-displacements. For any(c)-displacement, Eq. (2.2) becomes:

$$\sum_{\nu} \{(X_{\nu} - m_{\nu}x_{\nu}'')\delta x_{\nu} + (Y_{\nu} - m_{\nu}y_{\nu}'')\delta y_{\nu} + (Z_{\nu} - m_{\nu}z_{\nu}'')\delta z_{\nu} = 0. \quad (3.3)$$

The constraint reactions do not enter this equation which constitu-

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tes, for systems with friction, a principle analogous to the Euler-Lagrange principle. Proceeding from Eq, (3.3), Gauss's principle is formulated, involving the following theorems. 1) The deviation of the actual system with friction from the virtual (c)-motion is smaller than the deviation of the latter from the motion of the system freed of all constraints. 2) The deviation of the actual motion of a system with friction from the motion of a constraint-free system, is smaller than the deviation of the latter from the (c)-motion. Hence Gauss's principle for systems with friction has the same formulation as for systems without friction, provided that only the virtual (c)-motions are considered. The principle thus formulated makes it possible to readily obtain the equations of motion of a system with friction. There are 5 references: 3 Soviet-bloc and 2 non-Soviet-bloc (in translation).

SUBMITTED: May 25, 1961

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RUMYANTSEV, V.V. (Moskva)

Stability of steady motions of solid bodies having cavities filled with liquid. Prikl. mat. i mekh. 26 no.6:977-991 N-D '62. (MIRA 16:1)

(Rotating bodies) (Stability)

RUMYANTSEV, V.V. (Moskva)

Using Liapunov's methods in the investigation of motion stability of solids with cavities containing liquid. Izv. AN SSSR. Mekh. i mashinostr. no.6:119-139 N-D '63. (MIRA 17:1)

RUMYANTSEV, V.V. (Moscow)

"Non-linear methods of analysing the stability of motion of solids with liquid-filled cavities"

Report presented at the 2nd All-Union Congress on Theoretical and Applied Mechanics, Moscow 29 Jan - 5 Feb 64.

RUMYANTSEV, V.V.; SKIMEL' V.N. (Moscow)

"Stability of gyroscopes, gyrostats, and gyroscopic systems"

Report presented at the 2nd All-Union Congress on Theoretical and Applied Mechanics, Moscow 29 Jan - 5 Feb 64.

AMINOV, M.Sh., red.; BOGOYAVLENSKIY, A.A., red.; KALININ, S.V., red.; KUZ'MIN, P A., red.; LUR'YE, A.I., red.; MATROSOV, V.M., red.; RUMYANTSEV, V.V., red.; SRETENSKIY, L.N., red.

[Proceedings of the interuniversity conference on the applied theory of the stability of motion and on analytic mechanics] Trudy Mezhvuzovskoi konferentsii po prikladnoi teorii ustoichivosti dvizheniia i analiticheskoi mekhanike. Kazan', Kazanskii aviatsionnyi in-t, 1964. 144 p. (MIRA 18:12)

1. Mezhvuzovskaya nauchnaya konferentsiya po analiticheskoy mekhanike i ustoychivosti dvizheniya, Kazan, 1962.

BR

S/0040/64/028/004/0746/0753

ACCESSION NR: AP4043294

AUTHOR: Rumyantsev, V. V. (Moscow)

TITLE: Stability of motion of a solid body with a liquid possessing surface tension

SOURCE: Prikladnaya matematika i mekhanika, v. 28, no. 4, 1964, 746-753

TOPIC TAGS: solid body, liquid, solid liquid, motion stability, surface tension, satellite dynamics

ABSTRACT: In a previous work of the author (Prikl. matem. i mekhanika 26, #6 (1962)), theorems were formulated which reduced the problem of stability of a stationary motion including the case of equilibrium, of a solid body with a cavity filled completely or partially with an ideal or viscous liquid, to the problem of the least changed potential energy. The surface tension was not considered. However, the latter is essential in many cases. The author expands his theory to include the effect of the surface tension. The author is grateful to N. N. Krasovskiy, N. N. Moiseyev, and G. K. Pozharitskiy for a discussion of the work. Orig. art. has: no figures and 22 equations.

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ACCESSION NR: AP4043294

ASSOCIATION: None

SUBMITTED: 06May64 ENCL: 00

SUB CODE: ME, SV NO REF SOV: 006 OTHER: 001

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MOISEYEV, Nikita Nikolayevich; RUMYANTSEV, Valentin Vital'yevich;
PAL'MOV, V.A., red.

[Dynamics of a body with cavities containing liquid]
Dinamika tela s polostiami, soderzhashchimi zhidkost'.
Moskva, Nauka, 1965. 439 p. (MIRA 19:1)

L 05080-67 EWT(l)/EWT(m)/EWP(w) IJP(c) EM/WW/GD

ACC NR: AT6022475 (A) SOURCE CODE: UR/0000/65/000/000/0153/0169

AUTHOR: Rumyantsev, V. V.

ORG: None

30

B+1

TITLE: Investigation of the stability of motion of solid bodies with cavities filled with a liquid

SOURCE: Vsesoyuznyy s"yezd po teoreticheskoy i prikladnoy mekhanike. 2d, Moscow, 1964. Analiticheskaya mekhanika. Ustoychivost' dvizheniya. Nebesnaya ballistika (Analytical mechanics. Stability of motion. Celestial ballistics); trudy s"yezda, no. 1, Moscow, Izd-vo Nauka, 1965, 153-169

TOPIC TAGS: motion stability, motion mechanics, incompressible fluid

ABSTRACT: The author reviews various nonlinear methods recently developed for studying the stability of motion of solids with cavities partially or completely filled with a liquid. Most of the procedures are based on development of the ideas and methods of Lyapunov. The various approaches to the problem are surveyed and the effectiveness of the various methods in practical applications are evaluated. The generally accepted definitions of stability are stated and the problem of stability of steady-state motions of a solid with a simply connected cavity partially or completely filled with a homogeneous incompressible ideal liquid is solved. Orig. art. has: 49 formulas.

SUB CODE: 20/ SUBM DATE: 04Dec65/ ORIG REF: 026

Card 1/1 KH

L 22692-66 EWT(d)/EWT(1)/EWT(m)/EWP(w)/EWP(c)/EWP(v)/T-2/EWP(k)/EWA(h)/ETC(m)-6
ACC NR: AP6007578 IJP(c) EM SOURCE CODE: UR/0040/66/030/001/0051/0066

AUTHOR: Rumyantsev, V. V. (Moscow)

ORG: none

57
B

TITLE: On the theory of motion of solids having cavities filled with liquid

SOURCE: Prikladnaya matematika i mekhanika, v. 30, no. 1, 1966, 51-66

TOPIC TAGS: motion equation, body having cavity, liquid sloshing, motion stability, fluid mechanics

26

21, 44, 55

ABSTRACT: The motion of an absolutely rigid body having a cavity partially or entirely filled with an ideal homogeneous incompressible liquid with surface tension is analyzed. The Hamilton Ostrogradskiy principle of least action is used to derive the equations of motion of such a body-liquid system. A simultaneous system of differential equations in Lagrange form are derived which, with boundary conditions for the pressure and the kinematic conditions on the walls of the cavity and on the free surface, describe the motion of the body-liquid system. Expressions for determining the generalized pressure force of the liquid and air upon the cavity walls are derived. First integrals of the motion equations are analyzed under the assumptions that the forces applied to the body-liquid system are continuous and that the coordinates of the liquid particles are functions of their initial values and of time. From the equations of motion, conditions are sought under which the body-liquid system is in

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L 22692-66

ACC NR: AP6007578

a state of equilibrium or in steady-state motion. The conditions are reduced to the conditions of an extremum of the potential energy π or of the steady-state motion energy W ($W = \frac{k_0^2}{2J} + \Pi$, where J is the moment of inertia of the body-liquid system about a certain fixed axis and k_0 is a constant). To establish the minimum value of W, the second variation W is established. The character of the state of equilibrium of the body-liquid system when its potential energy has no minimum is analyzed. It is proven that in this case the state of equilibrium is unstable. Orig. art. has: 71 formulas. [LK]

SUB CODE: 20 SUBM DATE: 28Jun65/ ORIG REF: 009/ OTH REF: 001/ ATD PRESS: 4216

Card 2/2

ACC NR: AP6033207 SOURCE CODE: UR/0040/66/030/005/0922/0933

AUTHOR: Rumyantsev, V. V. (Moscow)

ORG: none

TITLE: On stability of stationary motions

SOURCE: Prikladnaya matematika i mekhanika, v. 30, no. 5, 1966, 922-933

TOPIC TAGS: motion stability, motion mechanics, mechanical system, mathematic analysis

ABSTRACT: The question of the stability of stationary motions of holonomic mechanical systems with cyclical coordinates has been investigated extensively by many authors, but it cannot be considered to have been completely exhausted. The present article examines the stability of the stationary motions of holonomic mechanical systems. The theorems of Routh, Poincare, Kelvin, and Chetayev are used and certain new results are found. The example of Yu. I. Newmark and N. A. Fufayev (PMM, 1966, t. 30, vyp.2) is studied as an illustration. It is shown that with proper selection of parameters in this example no peculiarities are discovered. The method developed in this paper is characterized by uniformity in approach to investigating the stability of motion of various mechanical systems and makes it possible comparatively simply to derive the necessary and sufficient conditions of stationary motion stability. This paper states and proves two theorems. Given the notation

$$\alpha = \frac{B-C}{B}, \quad \alpha < 1, \quad \beta = \frac{c^2}{MgaB}, \quad \beta > 0$$

a typical conclusion is that in the case of stability of stationary motions of a pendulum when, in addition to gravity, dissipative forces with complete dissipation and constant forces balancing the dissipative forces in the stationary regime act upon the pendulum, the stationary motions corresponding to points of arm C_1 with any $\beta \geq 0$ and $\alpha < 0$, or $\beta < \beta_1$ and $\alpha > 0$, of arm C_2 wgeb $\beta > \beta_1$ and $\alpha < 0$, and of arm C_3 when $\alpha > 0$ are secularly stable, and those corresponding to all other points or arms C_S are unstable. Orig. art. has: 59 formulas and 1 figure.

SUBCODE:20/ SUBM DATE: 04Feb66/ ORIG REF: 014/ OTH REF: 003

Rumyantsev, V.V.

89-4-5-6/26

AUTHORS: Zeytlenok, G. A., Rumyantsev, V. V., Smirnov, V. L., Fomin, L. P., Khokhlov, V. K., Grishayev, I. A., Zeydlits, P. M.

TITLE: Principles of the Selection of the Basic Parameters of a Linear Accelerator of Electrons to High Energy (Osnovaniya dlya vybora osnovnykh parametrov lineynykh uskoriteley elektronov na bol'shiye energii)

PERIODICAL: Atomnaya Energiya, 1958, Vol. 4, Nr 5, pp. 448 - 454 (USSR)

ABSTRACT: By a comparative analysis the dependence of the accelerator length, the number of sections, the input power, the construction costs, and the possibilities of use on the value of the electric field strength in the axis of the waveguide are shown. The section of the waveguide in this case is fed independently by a high-frequency generator. The minimum of the construction cost and of the possibilities of use is not determined by the final energy of the electrons.

Card 1/3

89-4-5-6/26

Principles of the Selection of the Chief Parameters of a Linear Accelerator for Electrons of High Energy

There is no relation between these points. It could be shown that for the feeding of the accelerator sections a high-frequency generator with a power of more than 2o MW is best suited. The problem of the increase of the duration of the useful part of the high-frequency impulse is ventilated. If a rectangular waveguide is used, the duration of the impulse at the input of the excitation line must be increased by the amount of $L/V_{limit} - L/C$. In this case it is as well necessary that the high-frequency impulse reaches the amplifying klystron of the first section with a deceleration of the same amount. For that purpose a special synchronizing scheme is needed which simultaneously transfers the phase shift to the other sections. The relation between the duration of the useful part of the impulse and the total duration of the impulse is independent of the final energy of the accelerated electrons. There are 13 figures, 1 table and 2 references, 1 of which is Soviet.

Card 2/3

89-4-5-6/26

Principles of the Selection of the Chief Parameters of a Linear Accelerator of Electrons to High Energy

SUBMITTED: May 14, 1957

AVAILABLE: Library of Congress

1. Electron accelerators—Design

Card 3/3

S/275/63/000/002/004/032
D405/D301

AUTHORS: Levin, V.M., Khokhlov, V.K., Semenov, A.N., Rumyantsev, V.V., Stepanov, S.M., Suslenko, V.K., Fomin, L.P., Shikhov, V.Ya. and Chubinskaya, I.L.

TITLE: Linear 5-35 Mev electron accelerator with X-ray head for medical purposes

PERIODICAL: Referativnyy zhurnal, Elektronika i eye primeneniye, no. 2, 1963, 46, abstract 2A269 (Elektron. uskoriteli, Tomsk, Tomskiy un-t, 1961, 10-15 (Collection))

TEXT: A pulsed accelerator is described. The frequency of the microwave field is about 2800 Mc; the electron energy can smoothly vary from 3 to 35 Mev; the mean electron current in the entire range can be brought to 18 microampere. The technical characteristics and the design of the accelerator are described. The accelerating system, the microwave supply, the vacuum system and the X-ray head device are considered in detail. All the accelerator elements were tested on laboratory stands and the working drawings

Card 1/2

S/275/63/000/002/004/032
D405/D301

Linear 5-35 Mev electron ...

for the entire equipment were given over to a plant for serial production.
[Abstracter's note: Complete translation]

Card 2/2

S/181/62/004/011/020/049
B104/B102

AUTHOR: Rumyantsev, V. V.

TITLE: Multiphonon corrections to the kinetic equation

PERIODICAL: Fizika tverdogo tela, v. 4, no. 11, 1962, 3189 - 3201

TEXT: The investigation of the electron - phonon interaction in first perturbation-theoretical approximation leads to the usual kinetic equation (O. V. Konstantinov, and V. I. Perel', ZhETF, 39, 197, 1960). This equation cannot be applied at high temperatures or where the electrons are scattered from the impurities. In the present paper the corrections to the kinetic equations of the electrons in metals and semiconductors are derived for $T \gg \Theta$, taking account of the two phonon processes in the case of a Fermi equilibrium distribution function by using a graphical method developed in the above mentioned paper. After a lengthy calculation it is shown that the corrections are of the type

$$-\{[(\Omega_{k-q_1,k}+\omega_{q_1})+is][(\Omega_{k-q_1,k}+\omega_{q_1})-is]\}^{-1}\times \times 2\pi i\delta(\Omega_{k,k-q_1-q_1}-\omega_{q_1}-\omega_{q_1}). \quad (13),$$

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which describe the successive interactions with two different phonons and can be attributed, according to their magnitude, to terms that are related to the single-phonon scattering in the lowest perturbation-theoretical approximation. One such term is

$$\alpha \sim \left(\frac{1}{\tau'}\right) \Big/ \left(\frac{1}{\tau_0}\right) \simeq \left(\frac{T}{\varepsilon_0}\right) \frac{1}{ak},$$

where a is the lattice constant, and ε_0 the energy. This gives for semiconductors $\alpha \sim \hbar/(\tau T)$ and for metals $\alpha \sim \hbar/(\tau \zeta)$. α is found to be small when the coupling constant, the energy and the chemical potential ζ are renormalizable. The results of the investigations into other correction types are discussed and shown to have little reliability. There are 4 figures.

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR, Leningrad (Physicotechnical Institute imeni A. F. Ioffe AS USSR, Leningrad)

SUBMITTED: June 21, 1962

RUMYANTSEV, V. V

8c

L 46163-65 EWT(m)/EPA(w)-2/EWA(m)-2 Pt-7/Pab-10 IJP(c) GS

S/0000/64/000/000/0420/0424

ACCESSION NR: AT5007930

AUTHOR: Val'ter, A. K.; Grishayev, I. S.; Yeremenko, Ye. V.; Kondratenko, V. V.; Zeytlenok, G. A.; Kuznetsov, G. F.; Levin, V. M.; Malyshev, I. F.; Rumyantsev, V. V.; Semenov, A. N.; Turkin, F. F.; Khokhlov, V. K.

TITLE: Linear traveling-wave accelerator of electrons with output energy 2 Gev

SOURCE: International Conference on High Energy Accelerators. Dubna, 1963. Trudy. Moscow, Atomizdat, 1964, 420-424

TOPIC TAGS: high energy accelerator, traveling wave electron accelerator, klystron

ABSTRACT: The accelerator consists of an injector and 49 accelerating sections each 4.5 meters long. The accelerator operates with a traveling 1/2π-wave with constant phase velocity equal to the velocity of light c and group velocity equal to $0.04c$. The operating frequency of the accelerator is 2797 mc for a temperature of the accelerating section equal to 37°C. The energy of the accelerated electron beam is 2 Gev, the mean current is 1.2 μamp for a transmission frequency of 50 times per second and duration of the high-frequency pulse of $\tau = 2$ msec. The high-frequency power supply for each section is independent of the klystron amplifier. The exci-

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L 46163-65
ACCESSION NR: AT5007930

tation of the klystrons is carried out from a common wave-guide line, which is supplied from a high power klystron excited by a regulated master oscillator. The group velocity of the electromagnetic wave in the excitation line is equal to about 0.805 c. The constant phase of the electromagnetic wave at klystron output is maintained by a phasing system with an accuracy of $\Delta\phi = \pm 2°$. The accelerating sections are installed in a special bunker which has a concrete wall-like shield and is covered on top by sectional reinforced-concrete slabs. The output installation is shielded by a special earthen enclosure covered by reinforced-concrete slabs. Purification of the beam from harmful admixtures is carried out by means of a magnetic parallel transfer system and magnetic separators. The present report discusses the parameters of the main units, such as: the injector, the vacuum system ($2\cdot 10^{-6}$ mm/Hg), the accelerator's high-frequency pulsed power supply, the output installation, the formation and measurement of the beam, the control of the accelerator. It is planned to store the electrons and positrons which are obtained by the present accelerator in a suitable ring, but experience must first be gained with small storage rings and colliding beams, under study at the Physico-technical Institute, Academy of Sciences, Ukrainian SSR. The present accelerator was constructed in accordance with the principle of uniform structure, but not constant field. The entire adjustment phase of the large accelerator's operation is carried

Card 2/3

L 46153-65

ACCESSION NR: AT5007930

2

out by means of one injector. "The design and parameters of the one injector was the concern of V. A. Vishnyakov and associates." Orig. art. has: 5 figures, 1 table.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN UkrSSR (Physico-technical Institute, AN UkrSSR); Nauchno-issledovatel'skiy institut elektro-fizicheskoy apparatury imeni D. V. Yefremova GKAE SSSR (Scientific-research Institute of Electro-Physical Equipment GKAE SSSR)

SUBMITTED: 26May64 ENCL: 00 SUB CODE: NP

NO REF SOV: 000 OTHER: 000

Card 3/3

L 15256-65 EPA(w)-2/EWT(m)/EWA(m)-2 Pt-7/Pab-10 IJP(c) GS
ACCESSION NR: AT5007931 S/0000/64/000/000/0430/0434

AUTHOR: Zeytlenok, G. A.; Lazarenko, Yu. P.; Rumyantsev, V. V.; Ryabtsov, A. V.; Levin, V. M.

TITLE: Selection of the optimum parameters of a linear high-energy electron accelerator

SOURCE: International Conference on High Energy Accelerators. Dubna, 1963. Trudy. Moscow, Atomizdat, 1964, 430-434

TOPIC TAGS: high energy accelerator, electron beam, waveguide

ABSTRACT: Modern linear high-energy electron accelerators are complex expensive devices. The problem of lowering their cost for given characteristics of the accelerated beam is of foremost importance. In the present report, which proceeds from the condition for minimum expenditure for equipment and utilization of the accelerator, its optimum parameters are determined taking into consideration the beam capacity. It is considered here that the cost of construction and operation of the accelerator can be described by the formula

$$S = A_1L + A_2N \quad (A_i = a_i + b_it_p), \qquad (1)$$

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L 45256-65
ACCESSION NR: AT5007931

where L is the length of accelerating system; N is the number of sections; a_i and b_i are constants found from economic analysis; t_p is the total time of accelerator operation (from start-up to shut-down). [G. A. Zeytlenok et al., "Atomnaya energiya," 4, No 5 (1958); *Proc. Int'l Conf. High Energy Acc.* (CERN, 1959), p. 349.] Expression (1) omits fixed expenses which do not affect the position of the minimum S and therefore can be disregarded. To formulate the basic problem, let there be given coefficients A_i, energy W, and mean current I_ϕ of the accelerated electron beam; as well as the characteristics of the high-frequency power supply, the supply power during pulse P, the frequency of the accelerating field ω, the duration of the pulse τ_i, and the pulse repetition frequency n. It is required to determine the values of the basic parameters of the accelerator which correspond to minimum cost of the accelerator S: the accelerating field strength E_ϕ averaged over the length of the section, the length of one section l, the accelerator's effectiveness η, the geometrical dimensions of the sections, etc. The solution of the problem posed in the report is given for two accelerating systems: 1) system with field strength that does not vary along the length, $E = E_{av} =$ const. p, 2) system with a constant configuration for the wave-guide sections throughout the length. It is concluded

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L 45256-65
ACCESSION NR: AT5007931

that the system with constant field possesses definite advantages over the system with constant geometry. Under certain conditions, however, use of the system with constant geometry may be convenient. Orig. art. has: 7 figures, 1 table.

ASSOCIATION: Nauchno-issledovatel'skiy institut elektrofizicheskoy apparatury imeni D. V. Yefremova GKAE SSSR (Scientific-Research Institute of Electrophysical Equipment GKAE SSSR)

SUBMITTED: 26May64 ENCL: 00 SUB CODE: EE, NP

NO REF SOV: 001 OTHER: 003

Card 3/3

L 12779-66 EWT(1)/EWA(m)-2 IJP(c) AT

ACC NR: AP5026605 SOURCE CODE: UR/0056/65/049/004/1126/1133

44,55 58 B

AUTHOR: Rumyantsev, V. V.

44,55

ORG: Leningrad Polytechnic Institute (Leniengradskiy politekhnicheskiy institut)

TITLE: Contribution to the theory of reflection of fast electrons from conducting media

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 4, 1965, 1126-1133

TOPIC TAGS: electron energy, conduction electron, electron reflection, electron interaction, transition probability

ABSTRACT: The author investigates the influence of the conduction electrons in a solid on the behavior of the electron reflection coefficient as a function of the energy transferred to the target. In addition to taking account of the interaction between the fast electron and the lattice and with the conduction electrons, allowance is made for the interaction between the conduction electrons themselves. The target is taken to be an n-type semiconductor, so that the electron-electron interaction and plasma effects can be allowed for.

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L 12779-66

ACC NR: AP5026605

Expressions are derived from the amplitude of the transition probability in the presence of electron-electron and electron-lattice interactions and for the total probability of a transition with specified momentum transfer. The connection between the latter probability and the polarization operator is established. In the case of reflection from a semiconductor, an expression is obtained for the dependence of the reflection coefficient of electrons losing a given amount of energy on this energy loss, which is assumed small. The resonances that can occur in reflection of this type are discussed. Author thanks L. E. Gurevich for a discussion, A. R. Shul'man for interest, and also Yu. A. Morozov and A. R. Shul'man for briefing him on the status of experiments on this question and A. I. Larkin for remarks contributing to improvement of the work. Orig. art. has: 23 formulas

SUB CODE: 20/ SUBM DATE: 01Mar65/ NR REF SOV: 001/ OTH REF: 001

Card 2/2 HW

KARTASHEVSKIY, N.G., prof.; RUMYANTSEV, V.V.

Filtration of the blood during transfusion. Probl.gemat.i perel. krovi no.9:41-45 '62. (MIRA 15:12)

1. Iz Leningradskogo ordena Trudovogo Krasnogo Znameni instituta perelivaniya krovi (dir. - dotsent A.D. Belyakov, nauchnyy rukovoditel' - chlen-korrespondent AMN SSSR prof. A.N. Filatov) i kafedry fakul'tetskoy khirurgii No.2 (nach. - prof. M.S. Lisitsyn) Voyenno-meditsinskoy akademii imeni S.M. Kirova.
(BLOOD—TRANSFUSION)

RUMYANTSEV, V.V. (st. Proletarsk, Tashkentskoy dorogi)

Modernization of narrow-gauge cars. Zhel.dor.transp. 44 no.1:81-82 Ja '62. (MIRA 14:12)

1. Nachal'nik vagonnogo depo pogruzochno-transportnogo upravleniya rudnika "Sulyuktaugol'".
(Railroads--Cars)

RUMYANTSEV, V.Ya.

3723. COLLECTION AND CONVEYING OF WATER-BORNE PEAT WITH U.M.K. MACHINES. Rumyantsev, V.Ya. (Torfyannaya Promyshlennost, 1949, (6), 18, 19*. (L).

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

RUMYANTSEV, V.Ya., inzhener.

Machine for leveling fields. Torf.prom. 30 no.9:7-8 S '53. (MLRA 6:8)

1. Petrovsko-Kobelevskoye torfopredpriyatiye. (Scrapers)

RUMYANTSEV, V.Ya., inzhener.

Work of UKB-TUM machine units at the Petrovsk-Kobelevsk peat enterprise. Torf. prom. 30 no.10:5-6 O '53. (MIRA 6:10)

1. Petrovsko-Kobelevskoye torfopredpriyatiye.
(Petrovsk-Kobelevsk--Peat industry) (Peat industry--Petrovsk-Kobelevsk)

RUMYANTSEV, V.Ya., inzhener; GINZBURG, L.N., inzhener; RYABCHIKOV, M.Ya., inzhener; ANDRZHEYEVSKIY, A.M., inzhener.

Mechanization of block peat production during 1953 by enterprises of the Main Administration of the Peat Industry. Torf.prom. no.2: 6-15 '54. (MLRA 7:3)

1. Petrovsko-Kobelevskoye torfopredpriyatiye (for Rumyantsev). 2. Sverdlovskiy torfotrest (for Ginzburg). 3. Chernoramenskiy torfotrest (for Ryabchikov). 4. Orekhovskove torfopredpriyatiye (for Andrzheyevskiy). (Peat industry)

RUMYANTSEV, V.Ya., inzhener.

Mechanization of lump peat collection at the Petrovsk-Kobelevsk peat enterprise. Torf.prom. 31 no.7:11-14 '54. (MLRA 7:11)

1. Petrovsko-Kobelevskoye torfopredpriyatiye.
(Peat machinery)

RUMYANTSEV, V.Ya., inzhener.

Mechanization of work on the surface of milled-peat fields at the Petrovsko-Kobelevskii Peat Works in 1955. Torf.prom. 33 no.3:10-12 '56. (MLRA 9:7)

1.Petrovsko-Kobelevskoye torfopredpriyatiye.
(Peat industry)

RUMYANTSEV, V.Ya., inzhener.

Mechanized harvesting of block peat at the Petrovsko-Kobelevskii Peat Enterprise. Torf.prom.33 no.4:3-4 '56. (MIRA 9:9)

1.Petrovsko-Kobelevskoye torfopredpriyatiye.
(Peat industry)

RUMYANTSEV, V.Ya., inzhener.

Using TE-2 excavaters for clearing hydropeat fields of stumps. (MLRA 10:3)
Terf.prom. 34 no.2:14-16 '57.

1. Petrovske-Kobelevskoye teorfepredpriyatiye.
(Excavating machinery)

RUMYANTSEV, V.Ya.; IVANOV,A.F., red.; FRIDKIN, A.M., tekhn.red.

[Mechanizing the winning of block peat at the Petrovsko-Kobelevskoye Enterprise] Mekhanizatsiia uborki kuskovogo torfa na Petrovsko-Kobelevskom predpriiatii. Moskva, Gos. energ.izd-vo, 1958. 19 p. (MIRA 13:1)
(Peat machinery)

RUMYANTSEV, V. YA.

RUMYANTSEV, V.Ya., inzh.

Double-edged tractor-mounted scraper. Torf.prom. 34 no.6:34 '57. (MIRA 10:12)

1. Petrovsko-Kobelevskoye torfopredpriyatiye.
(Peat machinery) (Earthmoving machinery)

MÜLLER, Ferdinand; RUMYANTSEV, Ye.A. [translator]; KRASOVSKIY, A.A., red.

[Remote control; a systematic survey of methods and equipment used in remote control] Teleupravlenie; sistematicheskii obzor metodov i ustanovok teleupravleniia. Moskva, Izd-vo inostr.lit-ry, 1957. 310 p. Translated from the German. (MIRA 14:3)
(Remote control)

ANDREYEV, G., polkovnik; RUMYANTSEV, Ye., polkovnik

Decorations are presented to the brave. Voen. znan. 41 no.1:
10 Ja '65. (MIRA 18:2)