PROKOP'YEVA, M.S.; PILYUSHENOK, S.V.; NIKOLAYEVA, R.I.; CHECHENKOVA, M.V.; MIKHAYLOVA, A.A.; STRELKOVA, A.V.; LOPUKHA, N.Ye; KOZLOV, F.N., red.; VOINOV, K.F., red.; BABESHKINA, N., tekhn. red.

[Economy of Pskov Province; statistical collection] Narodnoe khoziaistvo Pskovskoi oblasti; statisticheskii sbornik. Leningrad, Gosstatizdat, 1960. 175 p. (MIRA 14:6)

1. Pskov (Province) Statisticheskoye upravleniye. 2. Rabotniki Statisticheskogo upravleniya Pskovskoy oblasti (for all except Kozlov, Voinov, Babeshkina). 3. Nachal'nik Statisticheskogo upravleniya Pskovskoy oblasti (for Kozlov). 4. Zamestitel' nachal'nika Statisticheskogo upravleniya Pskovskoy oblasti (for Voinov)
(Pskov Province—Statistics)

GANSBURG, B.M.; KRAYNES, L.Ya.; LOPUKHA, V.K.; GORYACHEV, N.I., inzh., nauchn. red.

[Assembling steel structures] Montazh stal'nykh konstruktsii. Leningrad, Gosstroiizdat, 1963. 311 p. (MIRA 17:4)

BREGER, A.Kh.; Prinimali uchastiye: KARPOV, V.L., kand.khim.nauk; BELYNSKIY, V.A.; OSIPOV, V.B., PROKUDIN, S.D.; TYURIKOV, G.S., kand.khim.nauk; GOL'DIN, V.A.; RYABUKHIN, Yu.S.; KOROLEV, G.N.; AFONIN, V.P.; POKROVSKIY, V.S.; KULAKOV, S.I.; LEKAREV, P.V.; FEDOROVA, T.P.; KOROTKOVA, M.A.; KHARLAMOV, M.T.; NIKOLENKO, G.D.; LOPUKHIN, A.F.; YEVDOKUNIN, T.F.; KASATKIN, V.M.; RATOV, A.V.

Nuclear radiation sources for radiational-chemical studies. Probl.fiz.khim. no.1:61-72 '58. (MIRA 15:11)

1. Nauchno-issledovatel'skiy fiziko-khimicheskiy institut im. Karpova.

(Radiochemistry) (Radioisotopes)

LOPUKHIN, A.G.

SOV/124-58-5-6096

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 5, p 153 (USSR)

AUTHOR: Lopukhin, A.G.

TITLE: Potential Energy of a Plane Spiral Spring (Potentsial'naya energiya ploskoy spiral'noy pruzhiny)

PERIODICAL: Nauchn. tr. Mosk. tekhnol. in-ta legkoy prom-sti, 1957, Nr 8, pp 299-302

ABSTRACT: The potential energy of a strip under flexure is determined by the methods of the strength of materials. The initial condition of the strip is that of the free spiral obtained upon coiling. The final condition is that of a tightly coiled spiral.

V.I. Fedos'yev

1. Springs--Physical properties
2. Springs--Mechanical properties

Card 1/1

LOPUKHIN, A.G., kand. tekhn. nauk, dotsent

Theory of manometer springs. Nauch. trudy MTILP no.26: 214-224 '62. (MIRA 17:5)

1. Kafedra soprotivleniya materialov Moskovskogo tekhnologicheskogo instituta legkoy promyshlennosti.

ACC NR: AP7005456 SOURCE CODE: UR/0026/66/000/008/0079/0081

AUTHOR: Lopukhin, A. S.

ORG: Geology Administration, Frunze (Upravleniye geologii Kirgizskoy SSR)

TITLE: "Organic-type" elements in the Saratov meteorite

SOURCE: Priroda, no. 8, 1966, 79-81

TOPIC TAGS: meteorite, paleontology

ABSTRACT: Spore-like formations have been found in the Saratov and Migoi meteorites. The Palynological Laboratory of the Geology Administration of the Kirgiz SSR has made four control analyses of the Saratov meteor. The spore-like matter was separated from the matter and investigated under the microscope with a magnification of 2,000. It was found that there was a relatively large number of spheroidal or flattened casings which in external appearance, structure and optical properties obviously are not of a mineral nature. They vary in diameter from 10 to 100 microns and are gray or dark gray in color, sometimes brownish. They are mostly rounded, but sometimes are deformed, sometimes folded. It has definitely been establishe that they are not contaminations of terrestrial origin, originating neither in the soil where the meteorite was found nor in the laboratory. The spores resemble those of no known

Card 1/2 UDC: 523.51:576.15

0926 2336

ACC NR: AP7005456

plants, although there is some resemblance to fungi. Nine photographs accompany the article, showing representative samples of these formations. The author is nevertheless cautious in attributing these spore-like objects to extraterrestrial sources and recommends a palynological study of the soils at the site of finding of the meteor and a study of the reactions of the spores of terrestrial lower plants to processing of the type used for the Saratov meteorite. Orig. art. has: 1 figure. [JPRS: 38,677]

SUB CODE: 03, 06, 08 / SUBM DATE: none

Card 2/2

ANDREYEV, Petr Alekseyevich; CHERKASSKIY, Yakov Samoylovich; LOPUKHIN, B.N., retsenzent; SERGEYEV, A.M., retsenzent; SANNIKOV, I.V., nauchn. red.; VLASOVA, Z.V., red.

[Economic analysis of the balance sheet of a shipbuilding enterprise] Ekonomicheskii analiz balansa sudostroitel'nogo predpriiatiia. Leningrad, Sudostroenie, 1965. 203 p. (MIRA 18:5)

LOPUKHIN, I.M.

Device used for regulating oil cut-outs. Elek. i tepl. tiaga 2 no.7:25 Jl '58.
(MIRA 11:7)

1. Master maslyanogo khozyaystva, stantsiya Kurgan, Ural'skoy dorogi.
(Electric cut-outs) (Electric railroads--Substations)

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

VOGINOV, S. [Vohynov, S.], inzh.; LOPUKHIN, M., inzh.; NOVALIKHIN, G. [Novalykhin, H.], inzh.

Installing water-supply systems on farms without using metal pipes. Sil'.bud. 9 no.10:10-14 O '59. (MIRA 13:3)

1. Upravleniye stroitel'stva Bryanskogo oblastnogo upravleniya sel'skogo khozyaystva RSFSR.
(Bryansk Province--Water supply, Rural)

LOPUKHIN, V.A.

Use of electronic modeling machines in courses in theoretical radio engineering. Izv. vys. ucheb. zav.; radiotekh. 7 no. 3:295-301 My-Je '64. (MIRA 17:9)

L 55903-65 EWT(d)/EED-2/EWP(1) Pq-4/Pg-4/Pk-4 IJP(c) BB/GG

ACCESSION NR: AP5016467 UR/0146/65/008/003/0081/0083

681.142.69

AUTHOR: Lopukhin, V. A.

TITLE: Set-reset binary counter without delay line

SOURCE: IVUZ. Priborostroyeniye, v. 8, no. 3, 1965, 81-83

TOPIC TAGS: binary counter, set reset flip flop, set reset counter

ABSTRACT: A binary counter stage is described which utilizes a set-reset type flip-flop without relying on a delay line for reset action. The set-reset type flip-flop does not depend on the height or duration of the trigger pulse. The required logical delay is

figures. [BD]

Card 1/2

L 55903-65
ACCESSION NR: AP5016467

ASSOCIATION: Leningradskiy inzhenerno-ekonomicheskiy institut (Leningrad Institute of Engineering Economics)

SUBMITTED: 24Apr64 ENCL: 00 SUB CODE: EC, DP

NO REF SOV: 000 OTHER: 000 ATD PRESS: 4034

Card 2/2

LOPUKHIN, V.A.

Discrete information filter. Trudy LIEI no.55:23-25 '65.
(MIRA 18:11)

LOPUKHIN, V.A.

Circuit of a binary counter with separate starting without delay lines. Izv. vys. ucheb. zav.; prib. 8 no.3:81-83 '65. (MIRA 18:11)

1. Leningradskiy inzhenerno-ekonomicheskiy institut. Rekomendovana kafedroy teoreticheskoy radiotekhniki Leningradskogo elektrotekhnicheskogo instituta svyazi imeni prof. Bonch-Bruyevicha.

L 04280-67 EWT(m)/EWP(t)/ETI IJP(c) JD

ACC NR: AP6013249

SOURCE CODE: UR/0413/66/000/008/0038/0038

AUTHORS: Lopukhin, V. A.; Nazarov, I. V.

ORG: none

32
B

TITLE: Apparatus for controlling the thickness of a metallized coating. Class 21, No. 180658

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 8, 1966, 38

TOPIC TAGS: metal coating, specialized coating, METALWORKING MACHINERY

ABSTRACT: This Author Certificate presents an apparatus for controlling the thickness of a metallized coating (such as that on a condenser paper) according to the magnitude of its ohmic resistance. The apparatus contains a contacting mechanism connected to the measuring block. To automate the controlling of the metallic coating thickness on the condenser paper in the course of cutting such paper, the contacting mechanism is made in the form of two rollers between which the paper is pulled. The measuring block is connected through a timing device to a cutoff mechanism (see Fig. 1). An air suction arrangement, placed between the contacting mechanism and the cutoff mechanism, serves to remove the cull portions of the condenser paper.

Card 1/2

UDC: 621.317.73:621.319.4.002.5

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

L 04280-67

ACC NR: AP6013249

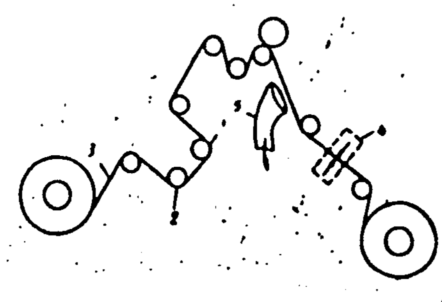

Fig. 1. 1 and 2 - contact rollers; 3 - condenser paper; 4 - cutoff mechanism; 5 - air suction arrangement

Orig. art. has: 1 figure.

SUB CODE: 13/ SUBM DATE: 19Apr65

Card 2/2

LOPUKHIN, V.I.

The RT-92 special-purpose boring machine. Biul.tekh.-ekon.inform. no.9:30-32 '60. (MIRA 13:10)
(Drilling and boring machinery)

LOPUKHIN, V., inzh.-konstruktor (Tula)

How to increase the power of the "Tula" engine. Za rul. 21 no.6:14 Je '63. (MIRA 16:11)

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R00093052O(

S/193/61/000/004/004/007
A004/A101

AUTHOR: Lopukhin, V. I.

TITLE: Special-purpose lathes made by the Ryazanskiy stankostroitel'nyy zavod (Ryazan' Machine-Tool Plant)

PERIODICAL: Byulleten' tekhniko-ekonomicheskoy informatsii, no. 4, 1961, 27 - 31

TEXT: The author gives a description of four new special-purpose lathes manufactured and designed at the Ryazan' Machine-Tool Plant. 1) PT-74C (RT-74S) screw-cutting lathe is intended for the machining of large-size parts of ferrous and non-ferrous metals. The bed consists of three sections reinforced by -shaped ribs which ensures a high rigidity of the bed structure. The bed has three prismatic bedways. The carriage travels on the front and rear bedways while the tail stock is displaced on the center bedway. The spindle is driven by an electromotor via a V-belt drive. The high-speed gears are ground while the others are shaved. The apron is fitted with four electromagnetic clutches. Owing to a free-wheeling clutch mounted in the apron housing the rapid motion can be switched on during the working feed. The gear case is of the closed type. To cut high-precision thread the lead screw can be coupled directly to the receiving shaft of the gear

Card 1/5

S/193/61/000/004/004/007
A004/A101

Special-purpose lathes made by ...

case by a clutch. The lathe is fitted with seven steadies. A flanged electric pump of 45 l/min capacity is intended for the coolant supply to the cutting tools. The possibility of high-speed machining considerably increases the efficiency of the RT-74S lathe. 2) PT -1[illegible]0 (RT-130) special purpose copying lathe for the finish machining of compressor parts. The lathe is also fitted with a mechanical carriage for rough machining. The bed, head stock, gear case and other parts do not differ in their design from the corresponding parts of the RT-74S lathe. The hydraulic copying slide for the finish machining of parts can travel in the longitudinal direction together with the carriage, and in the transverse direction together with the cross slides on the carriage bedways; besides it can be displaced at an angle of 60° to the lathe center axis on the bedways of the swivel carriage. The swivel part on the carriage cross slides can be turned through any angle and clamped in any required position. All bedways of the hydraulic carriage are of dovetail shape. 3) PT -136 (RT-136) special-purpose copying lathe is intended for the machining of shafts, stepped shafts, and various complex shapes and conical surfaces. The lathe is fitted with a four-position templet rule of the copying carriage. The lathe is set on the required dimensions by the first part. The accurate setting and fixing of the templet rule ensures the machining accuracy being maintained for all following operations, taking into account also the tool

Card 2/5

S/193/61/000/004/004/007
A004/A101

Special-purpose lathes made by the ...

wear. 4)PT -146 (RT-146) special-purpose lathe is an automatic for the machining of automobile rear axle crankcase flanges. The automatic cycle includes: clamping of parts, tool advance, machining of parts simultaneously by four slides, return of tools to the initial position, and unclamping of parts. The reducer for the automatic spindle displacement is positioned on the rear face end of the head stock in such a way that the loading and unloading of parts can be effected in a convenient manner. The lathe has two carriages mounted on the bed, and fitted with two hydraulic slides each (longitudinal and transverse). The tail stock is hydraulically operated. The front part of the tail spindle carries a device for the gripping and centering of the component mandrel. If the pressure in the hydraulic tightening system of the tail stock spindle drops or fails the lathe stops automatically. The parameters of the automatic cycle are set by electric terminal switches and catches. A control panel is mounted on each carriage which considerably facilitates the setting of the lathe. While a Bacon (Bekon) lathe takes 18 minutes to machine these parts the new RT-146 lathe needs only 2.5 - 3 minutes. The table shows the technical data of the four lathes described. There are 3 figures and 1 table.

Card 3/5

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

LOPUKHIN, V.I.

Special-purpose lathes manufactures by the Ryazan Machinery Plant.
Biul. tekh.-ekon. inform. no. 4:27-31 '61. (MIRA 14:5)
(Lathes)

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

LOPUKHIN, V.I.

The 1S63 lathe. Biul.tekhn-ekon.inform. no.6:28-29 '61. (MIRA 14:6)

(Lathes)

FEDOTOV, V.A.; ZASLAVSKIY, M.Z.; LOPUKHIN, V.I.

Machine tools manufactured at the Ryazan Machine-Tool Plant. Biul.tekh.-ekon.inform.Gos.nauch.-issl.inst.nauch.i tekh.inform. no.5:47-49 '62. (MIRA 15:7)
(Ryazan--Machine-tool industry)

LOPUKHIN, V.I.

Set of special drilling and boring machines for machining deep holes. Biul.tekh.-ekon.inform.Gos.nauch.-issl.inst.nauch.i tekh.inform. no.2:37-39 '63. (MIRA 16:2)
(Drilling and boring machinery)

SA

B 66

Self-excitation of an "undevibrator" penetrated by an electron current. Gvozdover, S., and Lopukhin, V. M. *Bull. Acad. Sci. URSS, Sér. Phys.*, 10 (No. 1) 29-36 (1946) *In Russian.*—The "undevibrator" is any device converting the kinetic energy of entering electrons into h.f. energy of electromagnetic waves. Stationary conditions only are considered, and possible regions of self-excitations and their amplitude and frequency are calculated. Two cases are treated in detail: the straightforward capacitor and a "monotron" (single cavity klystron). [See Abstr. 2701 (1946)]. A. L.

METALLURGICAL LITERATURE CLASSIFICATION

3400

621.396.611.4

The Simplest Design Calculations of Certain Cavity Resonators.—V. M. Lopukhin. (*Bull. Acad. Sci. U.R.S.S., sér. phys.*, 1950, Vol. 14, No. 1, pp. 111–116. In Russian.) Approximate formulae are derived for calculating the Q and impedance of the following resonators: simple toroidal (Fig. 1), quasi-toroidal (Fig. 2), ε type (Fig. 3) and cylindrical (Fig. 4).

LOPUKHIN, V. M. and Gvozdover, S.

"The Theory of the Monotron," Zhur Eksper i Teoret Fiz., 16, No 6, 1946.

Physics Faculty of the Moscow Order of Lenin State University im. Lomonosov.

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R00093052O(

LOPUKHIN, V. M.

USSR/Nuclear Physics - Cyclotrons Mar 1948
Nuclear Physics - Betatrons

"Electromagnetic Radiation in Accelerators," V. M. Lopukhin, V. A. Ugarov, 16 pp

"Uspekh Fiz Nauk" Vol XXXIV, No 3-p. 398-414

Various new particle accelerators such as cyclotron and betatron have given rise to many new physical phenomena. Tests conducted to determine type of radiation of charged particles in particle accelerators resulted in a series of interesting experimental data regarding this field of science. Discusses radiation and attainable energy limits in accelerators, radiation of a single electron, radiation of a system of electrons in a betatron, effect of radiation on performance of various types of accelerators, and experimental observation of phenomenon known as 'luminescent electrons' that is related to electron radiation. First attempt by Soviet scientists to study electron radiation in accelerators with energies of 100 MeV.

LC 63T68

PROCESSES AND PROPERTIES INDEX

Artificial production of mesons. V. Lapukhin and V. Ugarov. Uspekhi Fiz. Nauk 35, 110-(1948). Review; 11 references. N. Thon

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

PA 48/49T105

LOPUKHIN, V. M.

Dec 48

USSR/Radio
Amplifiers
Micro-Waves

"Traveling Wave Tube," V. M. Lopukhin, 22 pp

"Uspekhi Fiz Nauk," Vol XXXVI, No 4

Presents general data on use of new-type amplifier which makes use of the principle of the traveling wave. This type amplifier can amplify effectively up to 200 fold and is considered the best modern micro-wave amplifier. Unfortunately, there is little published work on theory of its operation. Author hopes this tube will soon be used for sets operating on centimeter waves.

48/49T105

LOPUKHIN, V.M.

USSR/Nuclear Physics - Mesons Aug 50

"Cosmic and Laboratory Mesons," V. M. Lopukhin

"Priroda" No 8, pp 52-55

Popular article on ratio of the mass of pi-mesons to that of mu-mesons; microphotographs of nuclear decays in photoemulsions; the works of Alikhanov and Alikhanyan; lifetime of mesons; energy of mesons; etc.

219T72

Valves and Thermionics

W.E.

[illegible]

621.396.615.141.2

On the Theory of the Anode Block of a Plane Magnetron. — S. D. Gvozdover & V. M. Lopukhin. (Zh. tekh. Fiz., Aug. 1950, Vol. 20, No. 8, pp. 953–960.) A mathematical discussion is presented of magnetrons with anode blocks of the hole-and-slot (Fig. 1) and slot (Fig. 2) types. To simplify the discussion, the space occupied by the anode block is divided into the interaction space, which does not include the anode resonators, and the space which includes these resonators. Equations for the electro-magnetic fields in the interaction space are derived and solved, and the natural frequencies of oscillation are determined by an approximate method in which the complex impedances of the interaction space are matched to those of the resonators. The discussion is limited to the case of two-dimensional (plane) magnetrons, and the end effects as well as the effects of couplings are neglected

Oct '51

METALLURGICAL LITERATURE CLASSIFICATION

LOPUKHIN, V. M.

PA 161T118

USSR/Physics - Radio Waves, Micro Amplifiers — Apr 50

"New Form of Microradio Wave Amplifier," V. M. Lopukhin, 22 pp

"Uspekh Fiz Nauk" Vol XL, No 4

Describes new-type amplifier and generator (oscillator) of decimeter and centimeter radio waves based on interaction between parallel electron currents possessing different average velocities. Emphasizes technical details of tubes' construction less than theoretical physical aspect of mathematical problem

161T118

USSR/Physics - Radio Waves, Micro (Contd) — Apr 50

presented. Lopukhin regards present theory on "multiray" tubes as still incomplete.

161T118

LOPUKHIN, ~~K.~~ B. M.

USSR/Electronics - Magnetrons May 51

"Electronics of a Plane Magnetron," B. M. Lopukhin, Moscow State U

"Zhur Tekh Fiz" Vol XXI, No 5, pp 505-515

Studies interaction of variable electromagnetic flds in magnetron with electronic current. Theoretically assumes currents in plane to be parallel to anode pland and perpendicular to slots. Determines distribution of elec and magnetic flds and proves that electron beam shifts resonant frequencies of magnetron into higher band. Submitted 23 Dec 49.

LC 182T52

LOPUKHIN, V. M.

USSR/Electronics-Microwaves May 51

"Electronics of Retarders of Centimeter Radio Waves," V. M. Lopukhin, Moscow State U

"Zhur Tekh Fiz" Vol XXI, No 5, pp 516-526

Studies radio wave-guiding properties of ideally conducting planes in vicinity of electron beams. Considers syst can act as filter and in specified conditions as amplifier of cm radio signals. Submitted 20 Dec 49.

LC 182T53

LOPUKHIN, V. M.

USSR/Electronics - Magnetrons, Traveling Wave Tubes May 51

"On Self-Excitation of One Type of Retarding Device," E. I. Vasil'yev, V. M. Lopukhin, Moscow State U

"Zhur Tekh Fiz" Vol XXI, No 5, pp 527-531

Solves coordinated eqs of electrodynamics and of electron motion in retarding syst, consisting of plane magnetron with resonator of "slot" anode type. Derives eq detg oscillation frequency of electron beam and plane magnetron coupling. Its particular soln in case of

LC 182T54

USSR/Electronics - Magnetrons, Traveling Wave Tubes (Contd) May 51

π-mode determines conditions necessary for excitation and frequency variations relative to parameters of electron beam and magnetron. Submitted 23 Dec 49.

LC 182T54

LOPUKHIN, V. M.

Lopukhin, V. M. Remarks to the article by V. M. Lopukhin: "A new form of amplifier of microradiowaves." P. 167 (Letters to the Editor)

SO: Uspekhi Achievements in Physical Sciences, 43, No. 1 (Jan. 1951)

LOPUKHIN, V. M.

USSR/Electronics - Resonators Mar 52

"Excitations of Oscillations in a Resonator by an Electron Stream" V. M. Lopukhin, Chair of Oscillations

"Vest Moskov U, Ser Fiz, Mat, i Yest Nauk" No 2, pp 21-28

Solves problem of excitation of arbitrary resonator, taking into account the dispersion of electrons in stream according to veolcities and the Coulomb interaction on density in stream. Derives formulas and obtains in particular cases the same results as in previous works (S. D. Gvozdover and V. M. Lopukhin, ZhETF 16 (1946), Iz AN, Ser Fiz 2 (1945); L. de Broglie, Les ondes electromagnetiques centimetriques, Paris 1947) which have been obtained by more approximate methods. Received 29 Sep 51.

242T50

242T50

LOPUKHIN, V. M.

Vibration

Excitation of vibrations in a resonator by an electric current. Vest. Mosk. un, 7, No. 3, 1952.

9. Monthly List of Russian Accessions, Library of Congress, October, 1952 [illegible], Unclassified.

LOPUKHIN, V. M.

PA 236T55

USSR/Electronics - Radio Waves Oct 52

"The Electronics of a Planar Comb," V. M. Lopukhin and V. S. Nikol'skiy

"Zhur Tekh Fiz" Vol 22, No 10, pp 1599-1605

Investigate radio-wave properties of planar comb pierced by electron currents, taking into account the scatter of the electrons according to velocity. Give general method of solving problem for arbitrary stationary function $f_o(v)$ of distribution of the electrons in the currents

236T55

according to velocity. Indebted to Prof S. D. Gvozdover. Cite related works of L. N. Loshakov (1949), A. I. Akhiyezer, and Ya. B. Faynberg (1951).

236T55

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

On the theory of an electron tube with a helical travelling wave. Zh. tekh. Fiz. 22, No.11, 1838-42 '52. (MLRA 5:12)
(MA 56 no.670:4239 '53)

PHASE I TREASURE ISLAND BIBLIOGRAPHICAL REPORT AID 388 - I

BOOK Call No.: QC661.L85

Author: LOPUKHIN, V. M.
Full Title: EXCITATION OF ELECTROMAGNETIC OSCILLATIONS AND WAVES BY ELECTRON STREAMS
Transliterated Title: Vozbuzhdeniye elektromagnitnykh kolebaniy i voln elektronnymi tokami

Publishing Data
Originating Agency: None
Publishing House: State Publishing House for Theoretical Engineering Literature
Date: 1953 No. pp.: 324 No. of copies: 7,000
Editorial Staff
Editor: None Tech. Ed.: None
Editor-in-Chief: None Appraiser: None
Others: The author expresses his gratitude for help to S. D. Gvozdover, A. A. Vlasov, and V. S. Lukoshkov

Text Data
Coverage: This work is devoted to the study of the interaction of electron streams with electromagnetic fields, wherein the kinetic energy of electrons is imparted to the field. The main center of interest here concerns problems of generating electromagnetic oscillations and waves in endovibrators and the signal amplification by means of traveling wave tube and electron-wave tube. The text is started to

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

Vozbuzhdeniye elektromagnitnykh kolebaniy i voln elektronnymi tokami AID 388 - I

cover the newer methods of generating and amplifying centimeter waves. The introduction contains a brief history of Soviet developments in this field, mentioning key personalities.

The treatment of this work is largely analytical, the basic aim being approximate mathematical expressions governing the interaction of high-frequency fields and electron streams.

TABLE OF CONTENTS

Purpose: Intended for students of radio and physics as well as for radio engineers engaged in work on high-frequency electronics

Facilities: None

No. of Russian and Slavic References: Mainly of Soviet origin, given in footnotes

Available: Library of Congress 2/2

LOPUKHIN, V. M., VASIL'YEV, E. I. and NIKOL'SKIY, V. S.

"The Applications of the Kinetic E quation in the Theory of Amplifiers of Centimetric Radio Waves," a paper given at the All-University Scientific Conference "Lomonosov Lectures", Vest. Mosk. Un., No.8, 1953

Translation U-7895, 1 Mar 56

VASIL'YEV, Ye.I.; LOPUKHIN, V.M.; NIKOL'SKIY, V.S.

Theory of traveling-wave tubes with a computation of thermal motion of electrons in flow. Vest.Mosk.un. 8 no.5:45-52 My '53. (MLRA 6:8)

1. Fizicheskiy fakul'tet Moskovskogo gosudarstvennogo universiteta.

(Electronics)

LOPUKHIN, V.M.; VEDENOV, A.A.

Absorption amplifier. Usp.fiz. nauk no.1:69-86 My '54.(MLRA 7:7)
(Radio waves) (Amplifiers, Electron-tube) (Traveling-wave tubes)

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R00093052000

LOPUKHIN, V. M.

FD-579

USSR/Electronics - Traveling Wave Tubes

Card 1/1 Pub. 153-19/28

Author : Vasil'yev, Ye. I., and Lopukhin, V. M.

Title : Theory of noises in traveling-wave tubes

Periodical : Zhur. tekh. fiz. 24, 895-898, May 1954

Abstract : Computes the noise coefficient F_0 of a traveling-wave tube in athe spirals taking into account the thermal motion of the electrons in the current. Four references, including "tubes with a traveling wave," Sovetskoye Radio, 1952. Concludes that the taking into account of the scatter of electrons according to velocities leads to an increase of the noise coefficient in the traveling-wave tube.

Institution :

Submitted : August 1, 1953

USSR/Electronics - Amplifiers

Card : 1/1 Pub. 118 - 3/15

Authors : Lopukhin, V. M. and Vedenov, A. A.

Title : An amplifier based on absorption

Periodical : Usp. fiz. nauk 53/1, 69 - 86, May 1954

Abstract : An amplifier, designed on a new idea in which the phenomenon of absorption is utilized, is described. The coefficient of amplification is about 30 db. and the band pass about 70 - 120% with respect to the carrier. Three references. Diagrams; graphs; illustrations.

Institution : ...

Submitted : ...

Translation: D 415987

LOPUKHIN, V.M.

USSR/ Nuclear Physics

Card 1/1 : Pub. 118 - 2/2

Authors : Kalinin, V.; Gershteyn, G.; and Sovetov, N.

Title : Bibliography. Book review

Periodical : Usp. fiz. nauk 54/1, 182-184, Sep 1954

Abstract : Critical review of the book by V. M. Lopukhin entitled, "Excitation of Electromagnetic Oscillations and Waves by Electron Currents", published in 1953 by GOSTEKHIZDAT, is presented.

Institution : ...

Submitted : ...

LOPUKHIN, V.M.

USSR/Physics - Electronics, Tubes and Thermionics FD-3205

Card 1/1 Pub. 153-14/28

Author : Lopukhin V. M., Samorodov Yu. D.

Title : Graphical method for investigating [traveling] wave tubes

Periodical : Zhur. Tekh. Fiz. 25, No 7, 1265-1275, 1955

Abstract : By means of a graphical investigation of amplification region of a traveling wave tube and a double-beam cathode-ray tube over a wide range of parameters it is demonstrated that for low frequencies and high currents in the traveling wave tube there is a new solution stipulated by the interaction of waves of the field and the space charge traveling in the negative direction. Graphs of phase velocity relationships under different conditions are given. The graphical method used allows investigation of algebraic dispersion equations of any degree. Ten references: seven USSR.

Institution :

Submitted : November 30, 1954

LOPUKHIN, V.M.

Calculating the interaction energy between a traveling electromagnetic wave and a stream of electrons with consideration of Coulomb forces and distribution of electron velocities. Izv.vys.ucheb.zav.; radiofiz. 1 no.2:27-35 '58. (MIRA 11:11)

1. Moskovskiy gosudarstvennyy universitet.
(Radio waves) (Electronics)

Lopukhin, V.M.

SOV/109-3-3-22/23

AUTHORS: Golubkov, P.V. and Tsimring, Sh. Ye.

TITLE: The Second All-Union Conference on Radioelectronics of the Ministry of Higher Education of the USSR (Vtoraya vsesoyuznaya konferentsiya MVO SSSR po radioelektronike) - News Item

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 3, pp 440 - 444 (USSR)

ABSTRACT: The conference took place during September 23 - 29, 1957, at Saratovskiy gosudarstvennyy universitet imeni N.G. Chernyshevskogo (Saratov State University imeni N.G. Chernyshevskiy). Apart from the universities, the conference was attended by the representatives of some scientific research institutes of the Soviet and Ukrainian Academies of Science, various industrial establishments and the interested ministries. This arrangement stimulated the discussion and evaluation of the papers presented and permitted the determination of plans for the future research to be carried out by the universities in the field of radioelectronics.
In view of a large number of papers and communications (over 150), the majority of these were read in various sections (electrodynamics, electronics, radiowave

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The Second All-Union Conference on Radioelectronics of the Ministry of Higher Education of the USSR

propagation, radio-astronomy and radiospectroscopy, semiconductors and their application in radio equipment). During the plenary session on September 23, two papers were read: "Development Trends of UHF. Electronics in the Soviet Union" by N.D. Devyatkov and "Electromagnetic Waves in the System of Vari-directional Electron Beams" by V.M. Lopukhin. N.D. Devyatkov presented numerous factual data illustrating the rapid development of the U.H.F. electronics in the Soviet Union and the vast contribution of the Soviet scientists to the theoretical foundations of this science; he also discussed the development trends of U.H.F. electronics in the immediate future. The paper described a number of original Soviet U.H.F. devices. The work of V.M. Lopukhin was concerned with the theoretical investigation of the phenomena taking place in multi-ray devices whose electron beams have different directions. The author showed that the presence of the electron beams which are perpendicular to the axis x facilitates the appearance of the solutions which are increasing functions of x for the case of n rays directed along the axis x; it also leads to the

SOV/109-3-3-22/23

The Second All-Union Conference on Radioelectronics of the Ministry of Higher Education of the USSR

appearance of exponentially increasing solutions in the presence of one beam in the above direction. The Electronics Section comprised 50 papers; more than one-third of these were concerned with the theoretical and experimental investigation of wide-band electronic devices for U.H.F. The lecture by V.N. Shevchik, L.Ya. Mayofis and L.D.Pokrovskiy dealt with the extension of the known theories of travelling-wave tubes and backward-wave tubes to the practically important cases when the delay structure necessitated the taking into account of the discrete character of the interaction of the electron beam with the high-frequency field. The lecture by V.C. Stal'makhov, V.N. Shevchik and Yu.D. Zharkov was devoted to the simplified analysis of the operation of a backward-wave tube by employing the cosinusoidal approximation of the given field. The papers by V.B. Braginskiy, A.S. Gorshkov, A.I. Kostiyenko, G.P. Lyubimov, I.T. Trofimenko and V.V. Anisimov were concerned with the detailed experimental and theoretical investigation of the possibility (first indicated by V.N. Shevchik in 1954) of expanding the bandwidth of the electronic trimming of reflex klystrons by means of the

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mutual synchronisation of several klystron tubes. The operation of reflex klystrons with multi-circuit resonant systems was also investigated. The results of experimental and theoretical investigation of two-ray amplifying and multiplying tubes were given in the communication by L.Z. Aitova, V.M. Lopukhin, L.A. Shkudova and in the communication of V.I. Kanavets. Some of the papers in the Electronics Section dealt with the investigations which were concerned with the development of novel U.H.F. devices, suitable for the generation and amplification of the waveforms in the millimetre and sub-millimetre ranges. The papers of great interest were: "Experimental Investigations of the Radiation of the Electron Bunches in the Vicinity of Non-homogeneities" by V.B. Braginskiy and Ye.P. Mustel', "Comparison of the Efficiency of Certain Methods of the Generation of Millimetre Waves" by A.S. Tager and "Application of the Higher Spatial Harmonics of the Electromagnetic Field in Slowing-down Systems" by A.S. Tager and V.A. Solntsev. The problems dealing with various fluctuation phenomena in electron and gas-discharge devices and with the physics and applications of gas discharges at

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SOV-109-3-6-11/27

AUTHORS: Kanavets, V. I., Kuz'mina, G. A. and Lopukhin, V. M.

TITLE: Noise in a 2-Ray Tube Produced by Shot Fluctuations in the Beams (Shumy dvuluchevoy lampy, vyzvannyye drobovymi fluktuatsiyami v potokakh)

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 6, pp 800-805 (USSR)

ABSTRACT: The work aims at determining the dependence of the noise figure of a 2-ray tube on a number of its parameters. It is assumed that the tube gives a comparatively high amplification and that the noise figure can be expressed by (see Ref.1):

$$F = \frac{\overline{E_{1s}^2} + \overline{E_{1t}^2}}{\overline{E_{1t}^2}}, \qquad (1)$$

where $\overline{E_{1s}}$ is the amplitude of the amplified wave at the beginning of the interaction space, which is produced by the

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Noise in a 2-Ray Tube Produced by Shot Fluctuations in the Beams

fluctuations of the current and velocity in the beam; $\overline{E_{1t}}$ is the amplitude of the amplified wave which is produced by the thermal fluctuations at the signal source (related to the origin of the interaction space). The tube is illustrated diagrammatically in Fig.1; it consists of: 1) a 2-beam electron gun, 2) an input resonator, 3) an output resonator, 4) a collector, and 5) the interaction space. Evaluation of E_{1s} and E_{1t} is carried out under the assumption that the charge density in both the beams is identical and that the amplification takes place past the modulating grids. It is further assumed (Ref.2) that the alternating components of the velocity and the current density in the beams can be written in the forms of Eqs.(2), where k is the beam wave number, n is the number of the beam (n = 1 or 2), e/m is the ratio of the charge of an electron to its mass, ρ_o is the average beam charge density, E_k is the initial amplitude of the k^{th} wave, ω is the angular frequency, β is the propagation constant and v_{on} is the mean velocity of the n^{th} beam. By solving the dispersion equation of the system (Ref.2), it is shown that the alternating

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SOV-109-3-6-11/27

Noise in a 2-Ray Tube Produced by Shot Fluctuations in the Beams

velocity and density components of the beams can also be written as Eqs.(5). On the basis of the above equations the square of the amplitude of the increasing (amplified) wave can be written in the form of the last equation on p 802. Symbols $\varkappa$, ξ and δ are defined on p 801; symbols q(o) and v(o) refer to the initial values of the alternating components of the current density and the velocity, respectively. The above results are used to derive expressions for E_{1s} and $E_{Γt}$. The mean square values of these quantities are given by expressions (16) and (20) respectively, where I_{01} and I_{02} are the electron currents in the first and the second beams respectively, S_o is the cross-section of a beam, Δf is the equivalent noise bandwidth of the system, γ is defined by Eq.(11), T_c is the temperature of the cathode, V_{on} is the electron

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Noise in a 2-Ray Tube Produced by Shot Fluctuations in the Beams

accelerating potential and $\alpha = v_{02}/v_{01}$ (the velocity ratio). On the basis of Eqs.(16) and (20) the noise figure of the system can be written in the form of Eqs.(21). A graph of the noise figure as a function of α is given in Fig.2; this was calculated for a tube operating at $I_{01} = 20$ mA, $V_{01} = 350$ V, $\omega/\omega_0 = 10$ and $Z = 100\,\Omega$ (Z is the internal resistance of the thermal noise signal). L. Z. Aitova helped the authors in the calculations. The paper contains 2 figures and 6 references, 4 of which are English and 2 Soviet.

SUBMITTED: October 9, 1956

1. Electron tubes - Analysis 2. Noise - Applications
3. Mathematics - Applications

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11

24(3) SOV/55-58-4-13/31

AUTHOR: Lopukhin, V.M.

TITLE: On the Form of the Current in a Given Field (O forme toka v zadannom pole)

PERIODICAL: Vestnik Moskovskogo universiteta, Seriya [illegible], [illegible], astronomii, [illegible], khimii, 1958, Nr 4, pp 119-124 (USSR)

ABSTRACT: In the half space x o the electric field $E_y = E_z = o$, $E_x = E_1 F(x, t)$ is given, where E_1 is the field amplitude, $F(x, t)$ is continuous in x and periodic in t, $T = \frac{2}{}$, = cyclic frequency of the field. In the plane x=o the field $E_1 F(x, t)$ is met by an electron current, where the mean velocity v_o and the current density j_o are given. The current is modulated by the field with respect to velocities and current densities. The author asks for the density of the convection current. By skilful series hypotheses the author succeeds in determining the Fourier

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On the Form of Current in a Given Field SOV/55-58-4-13/31

coefficients of the expansion of the convection currents, where also the phase focusing of electrons in the current is considered.
There are 6 Soviet references.

ASSOCIATION: Kafedra radiotekhniki (Chair of Radio Technology)

SUBMITTED: August 1, 1957

Card 2/2

AUTHORS: Gvozdover, S. D., Lopukhin, V. M. SOV/53-66-4-9/10

TITLE: Bibliography (Bibliografiya)

PERIODICAL: Uspekhi fizicheskikh nauk, 1958, Vol 66, Nr 4, pp 700-702 (USSR)

ABSTRACT: This is a detailed review of the book "Introduction to Radiophysics" (Vvedeniye v radiofiziku) by V. I. Kalinin and G. M. Gershteyn. It was published in 1957 by "Gostekhizdat" in Moscow. The book has 660 pages. Price: 12.65 Rubles. The size of the edition is not mentioned.

05496

SOV/141-2-2-21/22

AUTHOR: Lopukhin, V.M.

TITLE: Interaction of Electron Currents Having Different Directions

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1959, Vol 2, Nr 2, pp 320 - 322 (USSR)

ABSTRACT: The aim of the present note is to study electromagnetic waves in a system of electron currents having different directions. A solution of one of the special cases of this problem was given earlier in the work of J.R. Pierce and L.R. Walker (Ref 1). In the present note the problem is solved with the aid of a more general method based on the simultaneous solution of the linearized kinetic equation for the distribution function f and the Poisson equation which are given by Eqs (1) and (2), where e and m are the electronic charge and mass, respectively. $\underline{v}$ is the electron velocity,

$f(\underline{r}, \underline{v}, t)$ and $f_o(v)$ are the variable and constant components of the electron velocity distribution function,

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E (v/m) is the intensity of the electric field,

ρ (coulombs/m^{-3}) - the charge density and

$\varepsilon_0 = 8.86 \times 10^{-12}$ f/m^{-1}.

Since Eq (1) is written down in the non-relativistic approximation, the magnetic field and the induced electric field need not be taken into account. Moreover, is is assumed that:

$$|f| \ll f_0, \quad |\mathrm{grad}_{\underline{v}} f| \ll |\mathrm{grad}_{\underline{v}} f_0| .$$

The electron currents are assumed to be uniform and $f_0(v)$ is taken to be independent of $\underline{r}$. Assuming that $f(\underline{r},\underline{v},t)$ and $E(\underline{r},t)$ are proportional to $\exp[i(\omega t-\alpha x-\beta y-\gamma z)]$, the author is led to Eq (3). This equation gives the relation between the propagation constants α, β and γ and the distribution function

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Interaction of Electron Currents Having Different Directions

$f_o(v_x, v_y, v_z)$. The latter function may be looked upon as known. In the general case, $f_o(v)$ takes into account the thermal motion of the electrons. The dispersion relation (3) is then applied to three special cases. There are 4 references, of which 3 are Soviet and 1 English.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

SUBMITTED: December 25, 1958

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67851
SOV/142-2-5-6/19

AUTHOR: Zyuzin-Zinchenko, A.A., Lopukhin, V.M., Vasil'yev, V.M.

TITLE: The Influence of the Shape of the Electrostatic Field in an Electron Gun on the Noise Factor of a Traveling Wave Tube

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiotekhnika, 1959, Vol 2, Nr 5, pp 589 - 599 (USSR)

ABSTRACT: Calculation results show that the noise factor F in a traveling wave tube depends on the shape of the electrostatic field in the electron gun and that a disturbance of this field close to the cathode has a strong influence on the noise factor. The authors' task was to calculate the variable components and noise factors $q_1(x)$ and $q_2(x)$ and the noise factors F_1 and F_2 when varying the electrostatic field in the electron gun U(x) within wide ranges. The authors discuss charac-

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The Influence of the Shape of the Electrostatic Field in an Electron Gun on the Noise Factor of a Traveling Wave Tube

teristic integral curves of current and velocity fluctuations in the electron gun with different disturbances of the electrostatic field W(x). Complete space charge conditions are assumed. Current and velocity fluctuations at the virtual cathode are considered as being plane, since only the basic wave is excited in the stream. The correlation of current and velocity fluctuations at the virtual cathode was taken into account in a similar manner as in S. Bloom's papers /Ref 9,15/. The correlation of current and velocity fluctuations at the potential minimum were not considered. The problem was solved for a cylindrical electron stream (an infinite magnetic focussing field was assumed) in a one-velocity approximation. A total of 150 equations corresponding to different disturbing field in the electron gun of a traveling wave tube were integrated on an ATsVM-2 high-speed electronic computer at the MGU computer center.

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Based on a set of graphs (Figure 4), the authors arrived at the following conclusions: 1) The dependence $F_2(D)$ will be more apparent if $\beta = 3$ and will be less noticeable, if $\beta = 15$. This shows that a field disturbation close to the cathode has a stronger influence on the electron path than a disturbation far away from the cathode. 2) All $F_2(D)$ curves intersect each other in one point $F_2 = 9$ if $D = 0$. This value corresponds to the noise factor of the actual traveling wave tube under consideration in absence of the disturbing field. 3) A change of the parameter γ has little influence on the shape of the curve $F_2(D)$ if $\beta = 3$ and $\beta = 5$, i.e. in that case in which the field is disturbed sufficiently close to the cathode plane (x = 0). 4) In case $\beta = 3$, $\beta = 5$ for all γ and in case $\beta = 10$ for $\gamma = 0.01$, which corresponds

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to a sufficiently sloping field disturbation curve, $F_2(D)$ has a minimum close to the value $F_2(O) = 9$. This means that in the actual tube being examined a field disturbation will lead to a higher noise factor. In regard to the field shape, the tube is practically at its optimum. This conclusion is in agreement with the results in R.C. Knechtly's and W.R. Beam's paper /Ref 21/. These authors confirm that the field distribution as shown in Figure 1 is the most favorable one from the viewpoint of low noise. The even potential increase within the electron gun from the cathode to the helix is a characteristic feature of this field. The authors review a number of papers dealing with the calculation of the noise factor F. They mention especially A.S. Tager's paper /Ref 17/ in which numerous papers of foreign scientists were reviewed. In addi- 4

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tion S.D. Gvozdover's and B.M. Tsarev's book /Ref 2,36/ and S.K. Lesota's paper /Ref 26/ are mentioned. The publication of this paper was recommended by the Kafedra radiotekhniki (Radio Engineering Department) of the Moskovskiy ordena Lenina gosudarstvennyy universitet imeni M.V. Lomonosova (Moscow - Order of Lenin - State University imeni M.V. Lomonosov). There are 2 sets of graphs, 2 graphs and 36 references, of which 5 are Soviet and 31 English.

SUBMITTED: November 14, 1957, and after re-working, February 4, 1959

Card 5/5

SOV/109-59-4-2-9/27

AUTHORS: Lopukhin, V.M., and Sitnikova, G.A.

TITLE: Calculation of the Power Produced by the Interaction Between an Electron Beam and the Field of a Delay System by Using the Approximation of the Given Field (Raschet moshchnosti vzaimodeystviya elektronnogo potoka s polem zamedlyayushchey sistemy v priblizhenii zadannogo polya)

PERIODICAL: Radiotekhnika i Elektronika, 1959, Vol 4, Nr 2, pp 218-227 (USSR)

ABSTRACT: The paper is concerned with a general solution of the problem of the interaction of an electron beam and an electromagnetic field of an arbitrary form. The field is represented as a sum of n harmonics which propagate at various phase velocities and whose amplitudes are increasing functions of the co-ordinates. It is assumed that the longitudinal component of the electric field is in the form of $E_\chi = E_1 F(\chi, t)$, where E_1 is the amplitude of the field while $F(\chi, t)$ is a given function of χ and t. The equation of motion of an electron can be solved by the method of successive approximations.

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Calculation of the Power Produced by the Interaction Between an Electron Beam and the Field of a Delay System by Using the Approximation of the Given Field

From this it follows that the transit angle φ can be expressed by (in the first approximation):

$$\varphi = \varphi_0 - \varphi_\nu \sin(\omega t_0 + \chi_1) - \mu\omega^2 \int_{t-\frac{x}{v_0}}^{t} dt' \int_{t-\frac{x}{v_0}}^{t'} F\left[x_{00}(t'', t_0), t''\right] dt'' + Q(\mu^2, \mu\nu, \nu^2) \quad (2)$$

where Q is a small parameter which can be neglected; $\varphi_0 = \omega x / v_0$, v_0 is the direct component of the electron velocity, t_0 is the time of the entry of an electron into the interaction system and χ is initial phase of an electron. The current density can be expressed by:

$$j(x, t) = j_0 + j_0 \xi \sin(\omega t - \varphi + \chi_2) - j_0 \frac{\partial \varphi_1}{\partial \omega t}\bigg|_{x = \mathrm{const}} \quad (4)$$

where j_0 is the direct component of the current density; ξ and ν are defined by Eq (1) , where j(o) and ν(o)

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Calculation of the Power Produced by the Interaction Between an Electron Beam and the Field of a Delay System by Using the Approximation of the Given Field

denote the amplitudes of the current and velocity at the input of the system. If $\varphi = \varphi_0 + \varphi_1$, on the basis of Eq (2), φ_1 can be expressed by Eq (3). The average power of the interaction can be evaluated from the integral of Eq (5) or Eq (6) where ℓ denotes the length of the delay system. If the electric field E_x consists of n harmonics, as expressed by the equation on page 220, the transit angle φ and the alternating current density component can be expressed by Eq (7) and (8) respectively.

$$\{P\} = P_\xi + P_\nu + P_\mu \qquad (9)$$

where P_ξ is expressed by Eq (10), P_ν is given by Eq (11) and P_μ is expressed by Eq (12). P_ξ is the interaction power due to the initial electron density modulation, P_ν is the power due to the initial electron velocity modulation and P_μ is the interaction power of a non-modulated beam. If the travelling wave has a constant amplitude, the power components are expressed by Eq (13);

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Calculation of the Power Produced by the Interaction Between an Electron Beam and the Field of a Delay System by Using the Approximation of the Given Field

the efficiency of the tube for this case can be expressed by Eq (14). If the field increases as a function of the co-ordinate, the power components in the k-th harmonic are given by Eq (15) and the efficiency is defined by Eq (16). The case of a field consisting of two harmonics is analysed in detail and it is shown that P_μ is given by Eq (17). If the field in the delay system is in the form of:

$$E_x(x,t) = E_1 e^{\alpha x} \sin(\omega t - \beta x) + E_0$$

where E_0 is a constant increment to the alternating field, the transit angle φ is given by Eq (28) and the average interaction power is expressed by Eq (29). The effect of the additional field E_0 on the output power is illustrated in Fig 1. The field due to the space charge can be found as a sum of the successive approximations calculated from Eq (30) where ε_0 is the permittivity. Consequently, the corrected value of the current density

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Calculation of the Power Produced by the Interaction Between an Electron Beam and the Field of a Delay System by Using the Approximation of the Given Field

can be written as Eq (32), while the interaction power is given by Eq (33). The effect of the space charge on the interaction power is illustrated in Fig 2, where P_0 is the power obtained in the absence of the space charge effect. There are 2 figures and 14 references of which 13 are Soviet and 1 English.

SUBMITTED: 20th June 1957

Card 5/5

AUTHOR: Lopukhin, V.M. SOV/109-4-4-14/24

TITLE: Graphical Investigation of a Wavetron During its Initial Stage of Oscillation (Graficheskoye issledovaniye volnotrona v nachal'noy stadii generatsii)

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 4, pp 681 - 687 (USSR)

ABSTRACT: The system investigated (Figure 1) consists of a waveguide having an arbitrary cross-section S, which is filled with a dielectric having a permittivity ε; the waveguide is bent into a ring, having a radius of curvature $R \gg \lambda_{kp}$, where λ_{kp} denotes the critical wavelength of the guide. The system contains n ring-like electron beams whose average velocities are $v_{\varphi k} = v_k$, where $k = 1, 2, \ldots n$; the average electron concentrations are N_k. First, a system with a single electron beam is considered. The scattering equation for this case is given by (Ref 5):

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$$\frac{\omega_{kr}^2}{\omega^2 - \beta^2 u^2} = 1 - \frac{\Omega_1^2}{(\omega - \beta v_1)^2} \qquad (1)$$

where ω_{kr} is the critical frequency of the waveguide, Ω_1 is the plasma frequency of the electrons, β is the propagation constant, ε' is the permittivity of the material inside the waveguide, μ' is the permeability of the waveguide space and c is the velocity of light. By introducing new variables z, a and η_1 (which are defined on p 682), the scattering equation can be written in the form of Eq (2). When the waveguide contains n electron beams, the scattering is again represented by Eq (2) but the functions y_1 and y_2 are defined by the penultimate equations on p 682. The case of a wavetron with a single electron beam is illustrated in Figures 2, 3 and 4. From these, it is seen that for a fixed η the system can oscillate when a is greater than a certain critical value. Figures 5-7 show the curves of $(v_1/u)_{kr}$ as a function of a^2_{kr} for the values of $\eta_1^2 = 0.1;\ 1;\ 10$. The oscillation is possible in the shaded areas. In a waveguide with two electron beams, whose velocities are v_1 and v_2 and plasma frequencies are Ω_1 and Ω_2, the scattering is represented by Eq (10) where $s_1 = v_1/u$ and $s_2 = v_2/u$. When $1 < s_1 < s_2$, the scattering functions y_1 and y_2 are represented in Figure 10. If $\eta_1 = \eta_2 = \eta_o$, the functions y_1 and y_2 are given by Eqs (12) and (13), respectively. The condition

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Graphical Investigation of a Wavetron During its Initial Stage of Oscillation

for a two-beam oscillation can be written as Eq (11). This condition can also be expressed by Eq (15). There are 10 figures and 8 Soviet references.

SUBMITTED: July 30, 1957

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9(0)
SOV/53-69-2-8/10

AUTHOR: Lopukhin, V. M.

TITLE: Bibliography. The Bases of Superhigh-frequency Electronics

PERIODICAL: Uspekhi fizicheskikh nauk, 1959, Vol 69, Nr 2, pp 335-336 (USSR)

ABSTRACT: The author reviews the book "Osnovy elektroniki sverkhvysokikh chastot" by V. N. Shevchik (306 pages, price: 8.50 Rubles), which was published under the editorship of A. I. Kostiyenko by the publishing house "Sov.radio" (Moscow 1959).

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

LOPUKHIN, V.M.

PHASE I BOOK EXPLOITATION SOV/4705

Radiofizicheskaya elektronika (Radiophysical Electronics) [Moscow] Izd-vo Mosk. univ., 1960. 561 p. Errata slip inserted. 15,000 copies printed.

Ed.: N. A. Kaptsov, Professor; Tech. Ed.: M. S. Yermakov.

PURPOSE: This book has been approved by the Ministry of Higher and Secondary Special Education, USSR, as a textbook for schools of higher education. It can be also used by scientific personnel working in the fields of radio engineering and electronics.

COVERAGE: The book presents problems of vacuum, cathode, semiconductor, and gas electronics, on which is based the operation of vacuum-tube and gas-filled devices, including microwave devices and also apparatus and instruments used in electron optics. It is assumed that the readers of this book havea preliminary preparation in the fundamentals of nuclear physics, quantum mechanics, statistical physics and electrodynamics. The book was written by a group of lecturers of the Physics Division of Moscow State University.

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Chapters I, II, and III were written by Professor N. A. Kaptsov; Ch. IV. by Professor S. D. Gvozdover and Docent V. M. Lopukhin; Ch. V. by Professor G. V. Spivak and Assistant Ye. M. Dubinina; Ch. VII. by Docent A. A. Zaytsev and Professor N. A. Kaptsov; Ch. VIII. by Professor N. A. Kaptsov and Assistant G. S. Solntsev. The authors thank Professor S. Yu. Luk'yanov and Docent M.D. Karasev, who reviewed the book. There are 76 references: 68 Soviet (including 14 translations), 6 English, and 2 German.

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9.2572
9.3270

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

TITLE: Account of the Electron Velocity Spread in a Parametric Amplifier of Space-Charge Waves

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol.5, No.10, pp.1614-1618

TEXT: The object of this article is to obtain the characteristic equation (for ξ) for a stream of electrons, velocity and current-density modulated at a frequency w, further velocity and current-density modulated at the double-frequency 2w, taking into account the electron-velocity spread. It is assumed that the modulation at the double frequency is large compared to the signal-frequency modulation. The roots of the dispersion equation are obtained on the assumption of Poisson distribution of electron-velocities. The initial starting equations are the equations of motion obtained by Louisell and Quate (Ref.2)

(1)

(2)

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where v is the velocity of the electron beam; i is the beam current density; v_o is the constant component of the electron-velocity; I_o is the constant component of the current-density; w_q is the plasma frequency of a cylindrical beam, related to the plasma frequency of a one-dimensional beam w_p by $w_q = Rw_p$; R is the reduction coefficient. A simplified calculation method is proposed, viz. the propagation coefficient is calculated from the dispersion equation. From the characteristic equation it is concluded that, in general, the system can have four waves, the propagation constants of which depend on the system parameters and also on μ - the velocity-spread parameter. If the modulation depth is greater than a particular threshold value, then two roots of the characteristic equation are real, one corresponds to exponential growth and the other to exponential decay of the waves in the system. The other two roots are imaginary and characterize waves propagated with constant amplitude. When the modulation is less than the threshold value, then all the roots are imaginary and only waves of constant amplitude are propagated. Finally, it is shown that the electron spread leads to increase in the value of the critical threshold modulation and reduction in

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the gain. There are 2 figures and 10 references: 4 Soviet and 6 non-Soviet.

ASSOCIATION: Fizicheskiy fakul'tet Moskovskogo gosudarstvennogo universiteta im M.V.Lomonosova Kafedra radiotekhniki (Division of Physics, Moscow State University imeni M.V.Lomonosov, Department of Radioengineering)

SUBMITTED: December 15, 1959

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88161

S/109/60/005/011/010/014
E074/E485

9,4230 (also 1052, 1071)

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

TITLE: The Linear Theory of Double-Beam Backward-Wave Tube and Travelling-Wave Tube Amplifiers

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol.5, No.11, pp.1837-1847

TEXT: A theoretical investigation of the double-beam travelling-wave tube and backward-wave tube is given. In these tubes the interaction of the beams on each other is superimposed on their interaction with the delay line. The tubes thus represent a combination of an electron-wave tube and a travelling-wave tube and an electron-wave tube and a backward-wave tube respectively. Since the bunching mechanism in the t.w.t. and electron-wave tube is similar, when the average velocities of the beams are sufficiently close the second beam would be expected to introduce travelling-wave interaction. In the limiting case of equal beam velocities, a t.w.t results. With increase in the difference in the beam velocities the bunching mechanism begins to differ from that in the backward-wave tube and the amplification decreases. In the double beam backward-wave tube the situation is more complex

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since the beams and energy travel in opposite directions and the bunching mechanism in the backward-wave and electron-wave tube are different. For small electron densities, the electron wave interaction might possibly be small and the process may simply be a superposition of backward wave interactions. In deriving the dispersion equations the notation in Pierce's book is adhered to. Assuming the conditions of small signal theory and using the result of Johnson's paper (Ref.4) for a double-beam backward wave tube the propagation constant Γ will satisfy the dispersion equation

Eq. (4)

$$\frac{jI_{01}\beta_{e1}\Gamma}{2U_{01}(j\beta_{e1}-\Gamma)^2}+\frac{jI_{02}\beta_{e2}\Gamma}{2U_{02}(j\beta_{e2}-\Gamma)^2}=\frac{1}{\dfrac{-j\Gamma\Gamma_1K}{\Gamma_1^2-\Gamma^2}+2QK}. \quad (4)$$

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where I_{om} and U_{om} are the constant components of the current and potential in the beam of number m, $\beta_{em} = \omega/u_{om}$ where u_{om} is the average velocity of a beam of number m and the factor $\mu = 1$ when a delay line is present and zero when it is absent. In the presence of a delay line the parameter C_1 is given by the dispersion equation

Eq. (8)

$$\frac{C_1}{\delta^2} + \frac{C_2^3}{-\frac{1}{a}(1-a)^2 + 2j(1-a)C_1\delta + aC_1^2\delta^2} = \frac{C_1(b+jd-j\delta)}{1-4QC_1(b+jd-j\delta)}, \qquad (8)$$

где
where

$$a = \frac{\beta_{e1}}{\beta_{e2}} = \frac{u_{02}}{u_{01}}; \qquad (9)$$

Eq. (9) (10)

$$C_m^3 = \frac{I_{0m}K}{4U_{0m}} \qquad (m = 1, 2); \qquad (10)$$

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Eq.(8) determines the propagation constants of five forward waves

$$\Gamma_k = j\beta_{e1} - \beta_{e1} C_1 \delta_k \qquad (k = 1,2,3,4,5) \qquad (11)$$

For the two beam travelling-wave tube, similarly we have, using Pierce's result

Eq. 12.

$$\frac{E}{\Gamma} = \left[\frac{\Gamma\Gamma_1 K}{\Gamma_1^2 - \Gamma^2} + 2QK\right] i. \qquad (12)$$

which gives the dispersion equation

Eq. 13

$$\frac{C_1}{\delta^2} + \frac{C_2^3}{-\frac{1}{a}(1-a)^2 + 2j(1-a)C_1\delta + aC_1^2\delta^2} = \frac{C_1(b + jd - j\delta)}{-\mu - 4QC_1(b + jd - j\delta)}, \qquad (13)$$

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where the symbols have their usual meaning. The roots of the two dispersion equations were calculated on a computer considering amplification conditions only and not oscillation. Investigation of the roots of Eq.(8) and (13) enables the following conclusions to be drawn. In both tubes there are five waves, one having constant amplitude. The others may have constant amplitude or may be amplified or attenuated within certain limits depending on the parameters. The phase velocities of two of these waves are close to the average velocity of one beam and the phase velocities of the other two are close to that of the second beam. In the degenerate case ($a = 1$ or $C_2 = 0$) there are three waves, one of constant amplitude and two increasing or attenuated waves with velocities close to that of the first beam. The roots δ_K in this case agree with those obtained for the ordinary backward wave tube. The increase or decrease of the waves is determined by the corresponding root $Re\delta_K$ since the amplification factor is proportional to $C_1NRe\delta_K$. The beams also affect each other very

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strongly when their average velocities differ slightly, but in this case an ordinary t.w.t. or b.w.t. is obtained. The relation of the roots to the different tube parameters is shown in Fig.2 for the b.w.t. and in Fig.3 and 4 for the t.w.t. Expressions for the field and current can be found from the solutions of the dispersion equation and the boundary conditions. For the b.w.t. these are given by

Eq. (26)

$$E(z) = \sum_{k=1}^{6} E_k e^{-\Gamma_k z}, \qquad (26)$$

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$$i(z) = i_1(z) + i_2(z) = Bj \exp\left(-2\pi Nj \frac{z}{l}\right) \times$$

$$\times \sum_{k=1}^{3} \left[\frac{1}{\delta_k^2} + \frac{C_2^3}{C_1} \frac{1}{-\frac{1}{a}(1-a)^2 + 2j(1-a)C_1\delta_k + aC_1^2\delta_k^2}\right] E_k e^{2\pi C_1 N\delta_k \frac{z}{l}}, \quad (27)$$

Eq. 27. 28.

$$B = \frac{I_{01}}{2U_{01}\beta_{e1}C_1^2} = \frac{2C_1}{K\beta_{e1}}. \quad (28)$$

The field at the output may be larger than at the input depending on the parameter C_1, C_2, a and QC_1. For certain values 25 dB amplification is possible. The variation of field with coordinate z is shown in Fig.6. The fluctuations are due to beating of the natural waves of the system. The field and current for a t.w.t. may be calculated in a similar manner and give results of an analogous nature. The amplification depends on the parameter.

$$\varkappa = \frac{\omega}{\omega_p}\frac{a-1}{a+1} = (2C_1\sqrt{QC_1})^{-1}\frac{a-1}{a+1} > \sqrt{2}. \quad (29)$$

Eq. 29

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and may be as high as 80 dB at the optimum value. Acknowledgments are expressed to the post-graduate students U.Ven-ta and R.T.Denchevyy for their assistance. There are 8 figures and 5 non-Soviet references.

ASSOCIATION: Fizicheskiy fakul'tet Moskovskogo gosudarstvennogo universiteta im. M.V.Lomonosova Kafedra radiotekhniki Physics Division, Moscow State University imeni M.V.Lomonosov, Department of Radioengineering)

SUBMITTED: January 21, 1960

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MIGULIN, V.V.; LOPUKHIN, V.M.; GUSEV, V.D.

Fourth All-Union Conference of the Ministry of Higher and Secondary Specialized Education of the U.S.S.R. on Radio Electronics. Vest. Mosk. un. Ser. 3: 82-84 Ja-F '61. (MIRA 14:4)
(Radio—Congresses)

22254

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

9.3130 (1138, 1140, 1163, 1538)

AUTHOR: Lopukhin, V.M.

TITLE: The kinetic power theorem and its application to the electron beam devices (Survey)

PERIODICAL: Radiotekhnika i elektronika, v. VI, no. 5, 1961, 683 - 705

TEXT: The purpose of the present article is to set forth several problems related to the flow of energy in electron-beams and to the application to the electron-beam devices of the kinetic power theorem. In the introductory remarks to the article the author states that a general survey of related works prior to 1957 has been given by A.S. Tager (Ref. 1: Issledovaniye shumovykh svoystv lamp s begushchey volnoy, Radiotekhnika i elektronika, 1957, 2,2, 222) and by A.A. Zyuzin-Zinchenko, V.M. Lopukhin, V.M. Vasil'yev (Ref. 2: Vliyaiye elektrostaticheskogo polya pushki na faktor shuma LBV, IZV. Vuzov MVO SSSR (Radiotekhnika), 1959, 2,5, 589). Also, the work of

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The kinetic power theorem ...

V.N. Shevchik, G.N. Shvedov (Ref. 11: Volny prostranstvennogo zaryada v elektronnykh potokakh, Izv. Vuzov MVO SSSR (Radiotekhnika) 1959, 2,5, 511) is mentioned together with that of J.R. Pierce (Ref. 10: The wave picture of microwave tubes, Bell System Techn. J. 1954, 33, 11, 1343) explaining the time dependent variables of the electron beam as a superimposition of fast and of slow waves of the electron beam; the work of V.M. Lopukhin, B.D. Charkin, N.G. Zeveke (Ref. 17: Eksperimental'noye obnaruzheniye parametricheskogo usileniya na lampe obratnoy volny, Radiotekhnika i elektronika, 1959, 4, 10, 1747) and of D.K. Akulina, S.A. Akhmanov, S.D. Gvozdover, A.S. Gorshkov, I.T. Trofimenko (Ref. 18: Parametricheskiye yavleniya v volnovykh sistemakh s dlinnymi potokami elektronov, Radiotekhnika i elektronika 1960, 5, 10, 1736) gives the experimental investigation of the amplification effect as that of the parametric interaction. The article proper is divided into 7 parts: These are as follows: 1) The kinetic power theorem for an N-beam stream. The original theorem for a single beam electron stream was given by L.J. Chu (Ref. 27: A kinetic power theorem, IRE PGED Electron Tube Re-

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